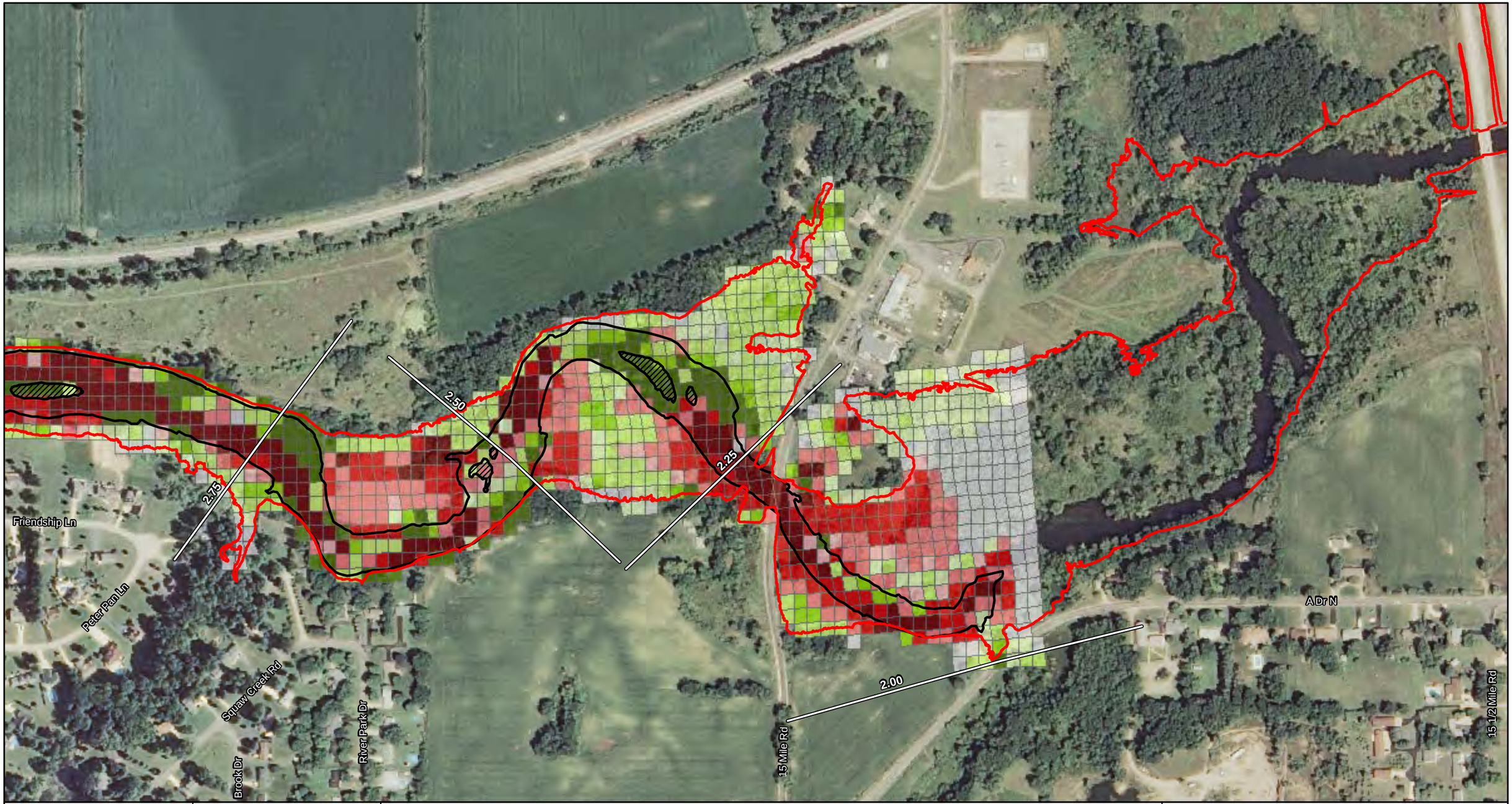
Figure 6-14

Floodplain Grid: Sedimentation Rate

All Grid Cells

100-Year Flood

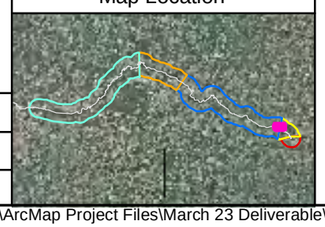
Sheets 1 through 45



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

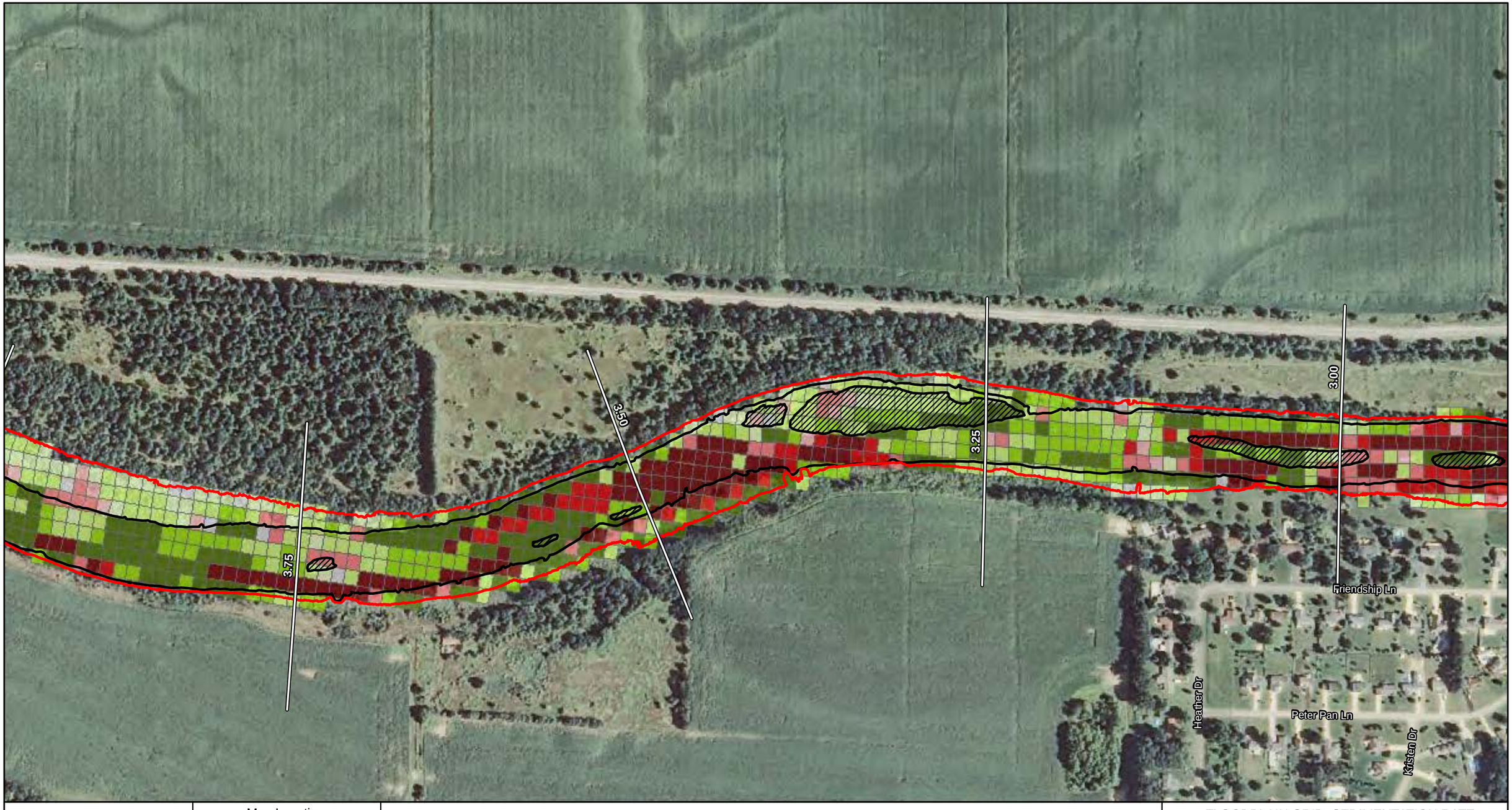
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 01.88 - MP 02.91

SHEET 1 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_100yr.mxd

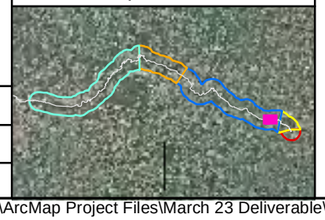
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 02.91 - MP 03.93

SHEET 2 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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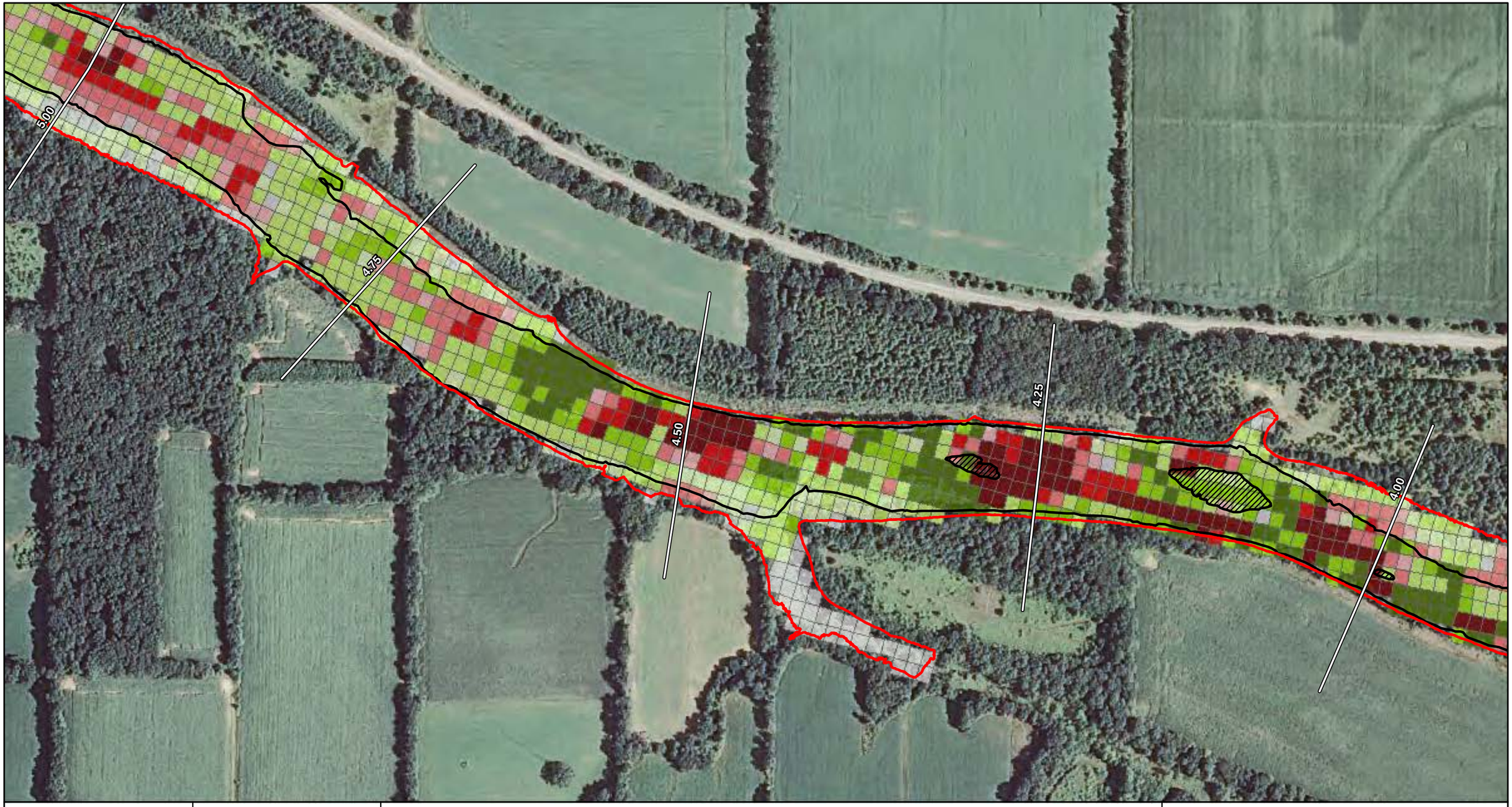
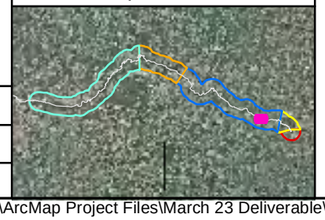
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 03.93 - MP 04.98

SHEET 3 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 04.98 - MP 06.03

SHEET 4 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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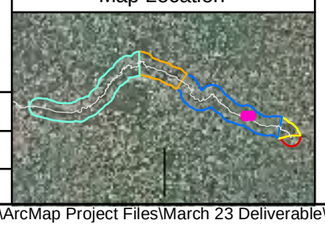
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 06.03 - MP 06.85

SHEET 5 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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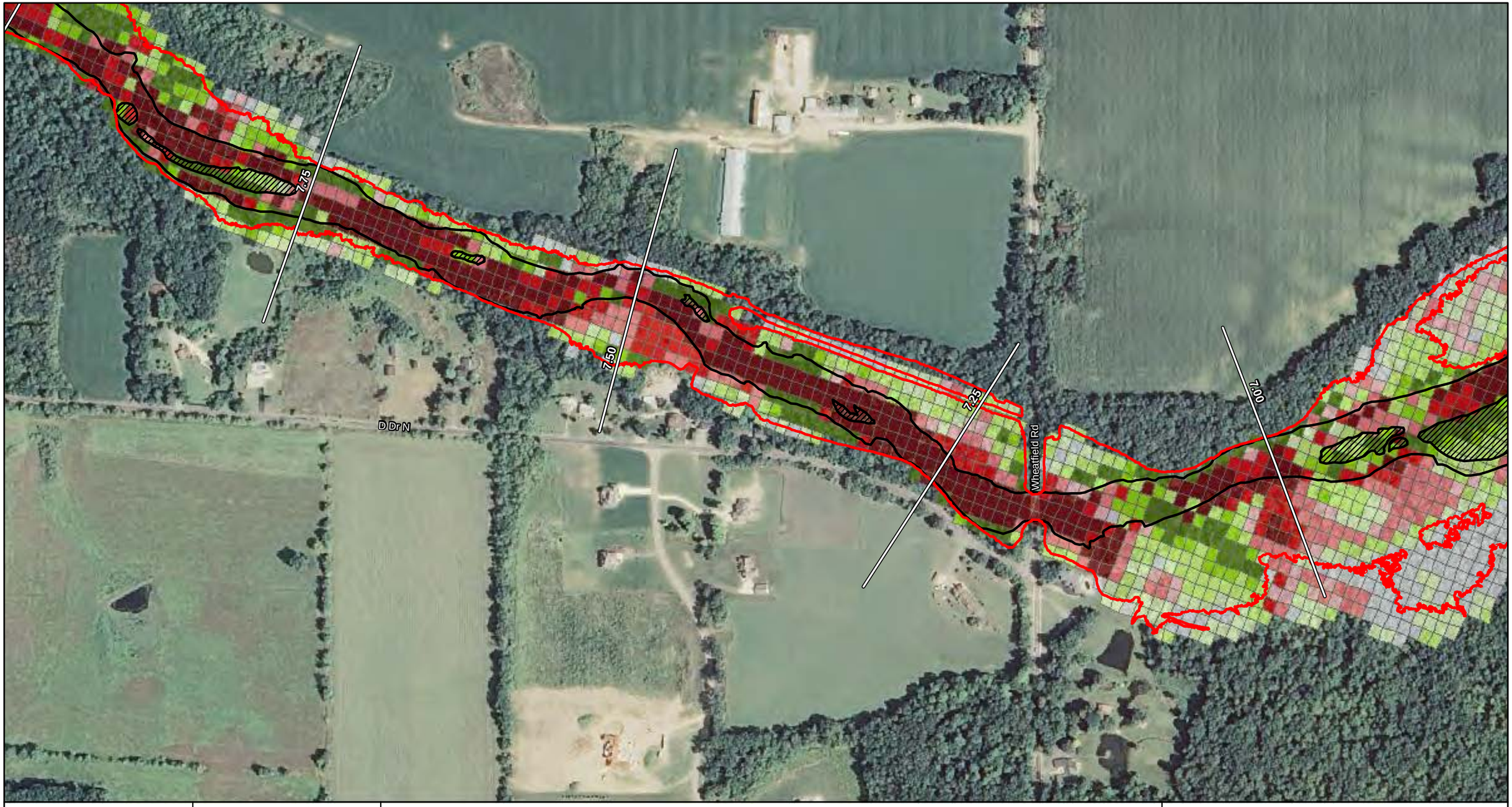
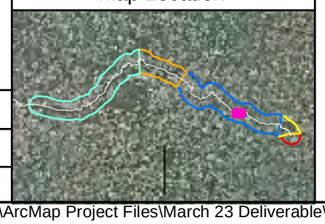
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 06.85 - MP 07.95

SHEET 6 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 07.95 - MP 08.93

SHEET 7 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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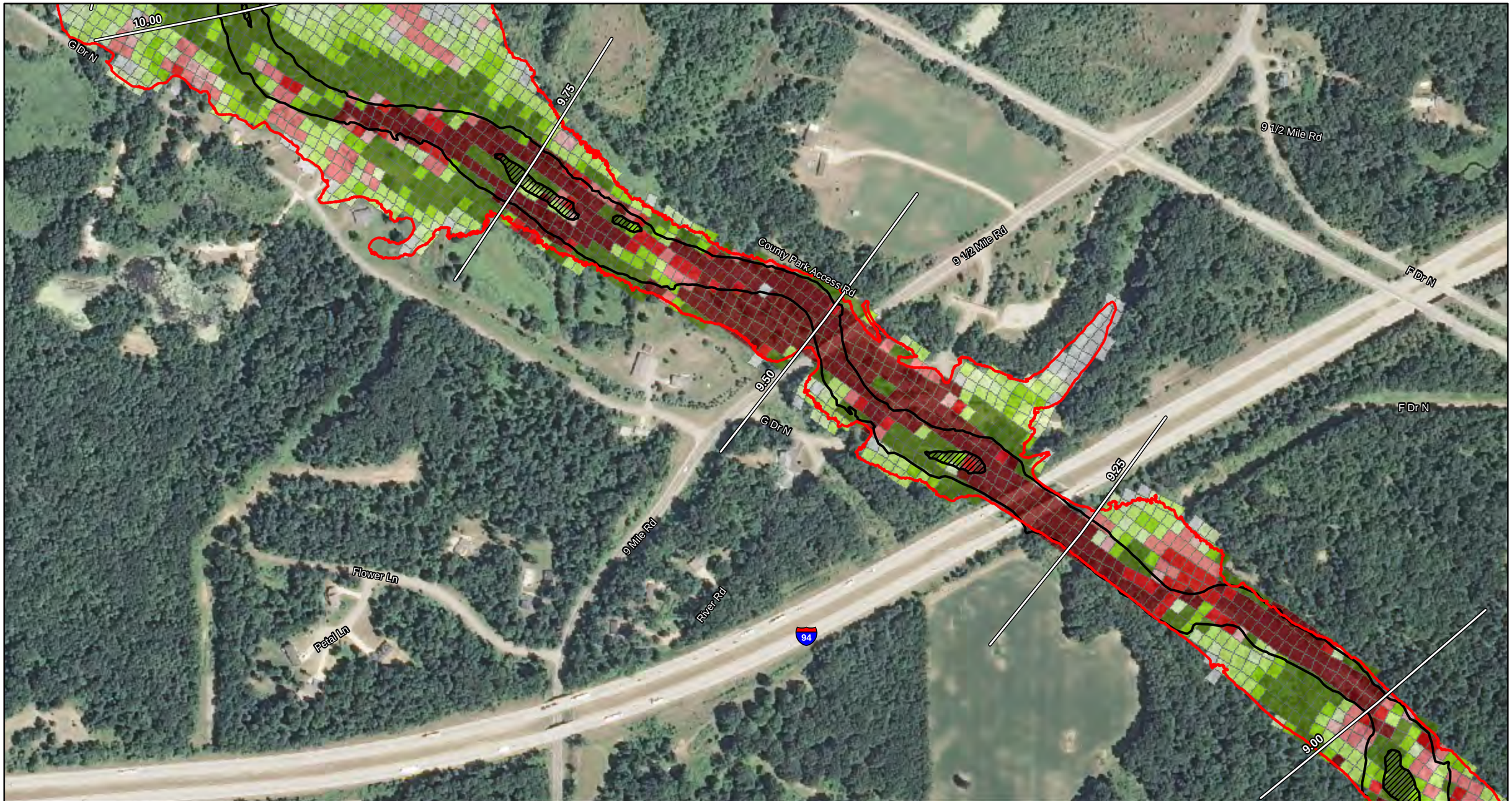
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 08.93 - MP 10.00

SHEET 8 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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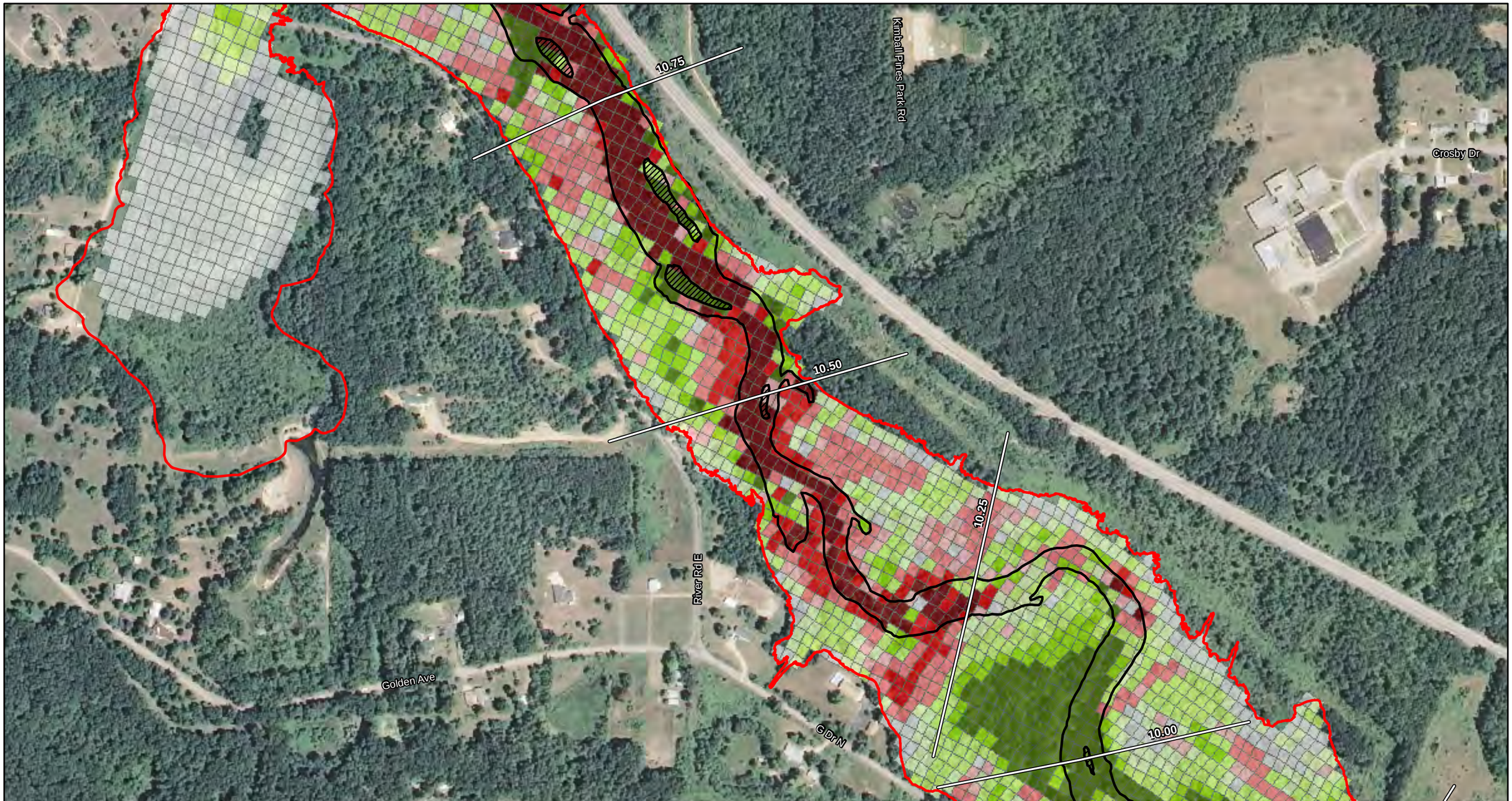
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 10.00 - MP 10.80

SHEET 9 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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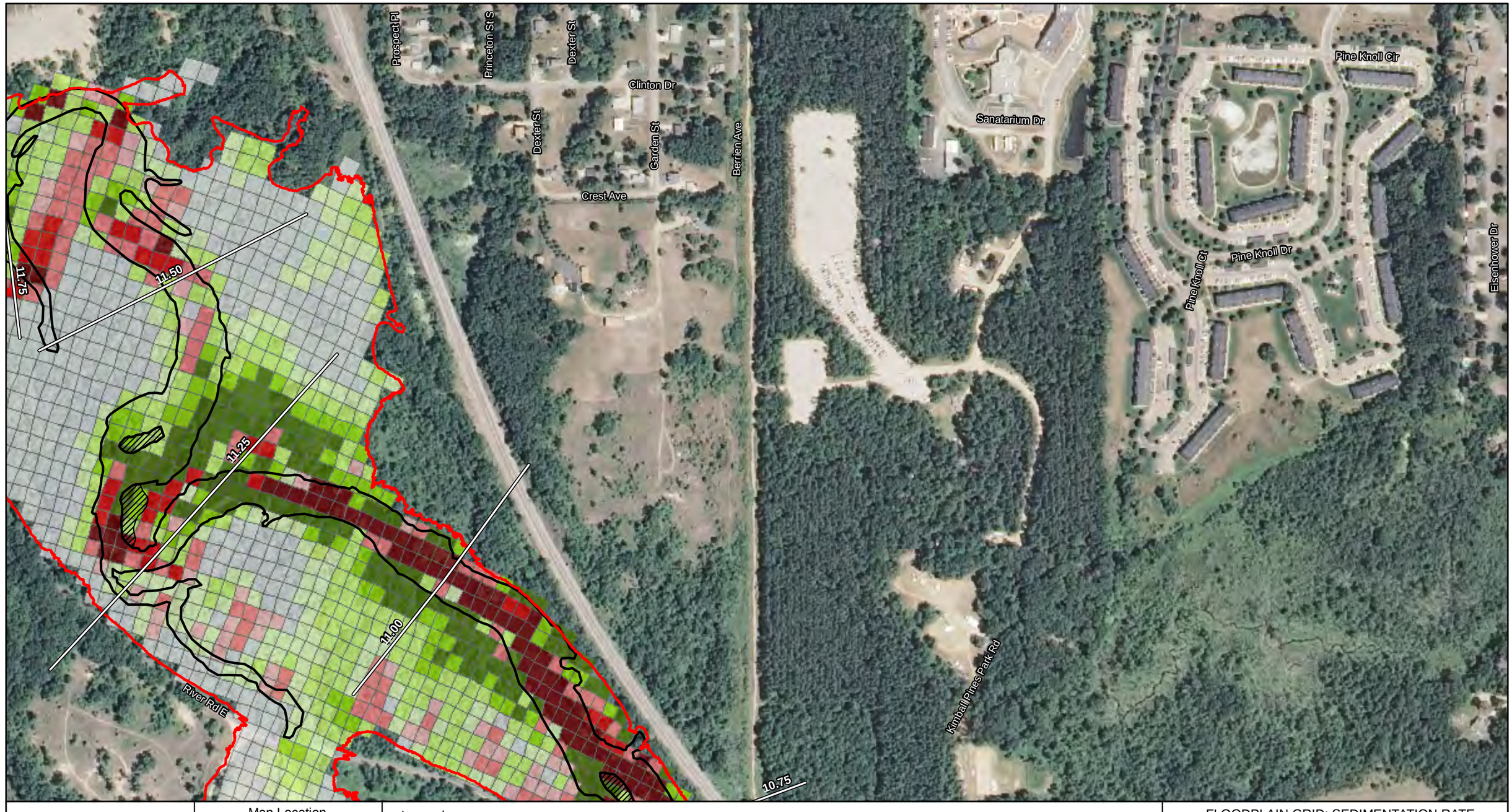
Aerial Photography Date: July & August 2009



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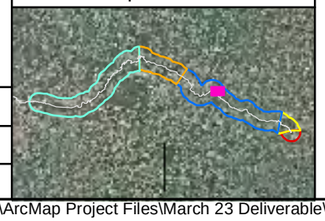

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 10.80 - MP 11.70

SHEET 10 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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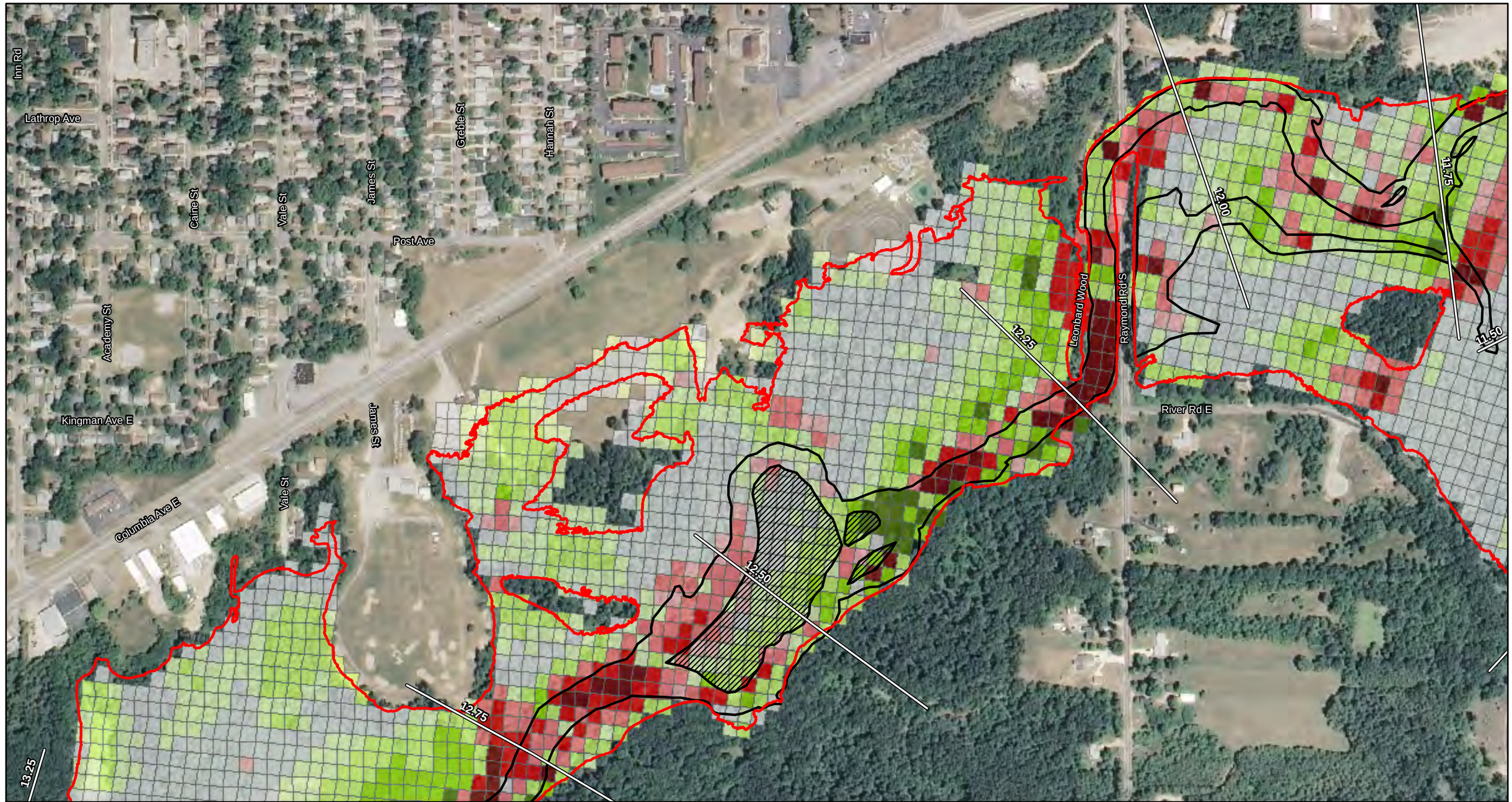
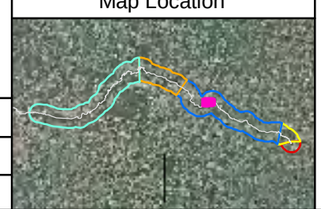
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 11.70 - MP 12.77

SHEET 11 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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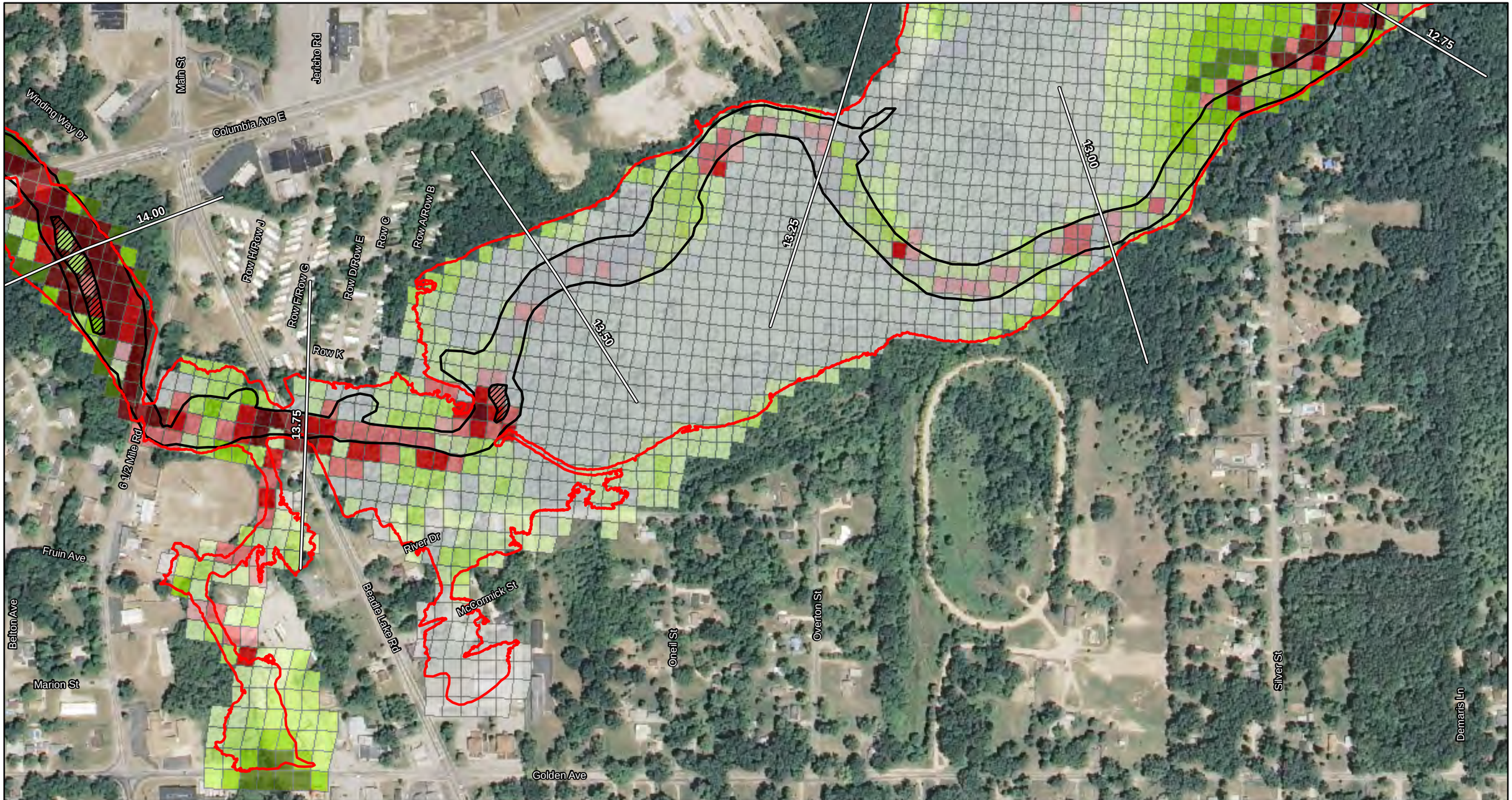
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 12.77 - MP 14.00

SHEET 12 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 14.00 - MP 15.05

SHEET 13 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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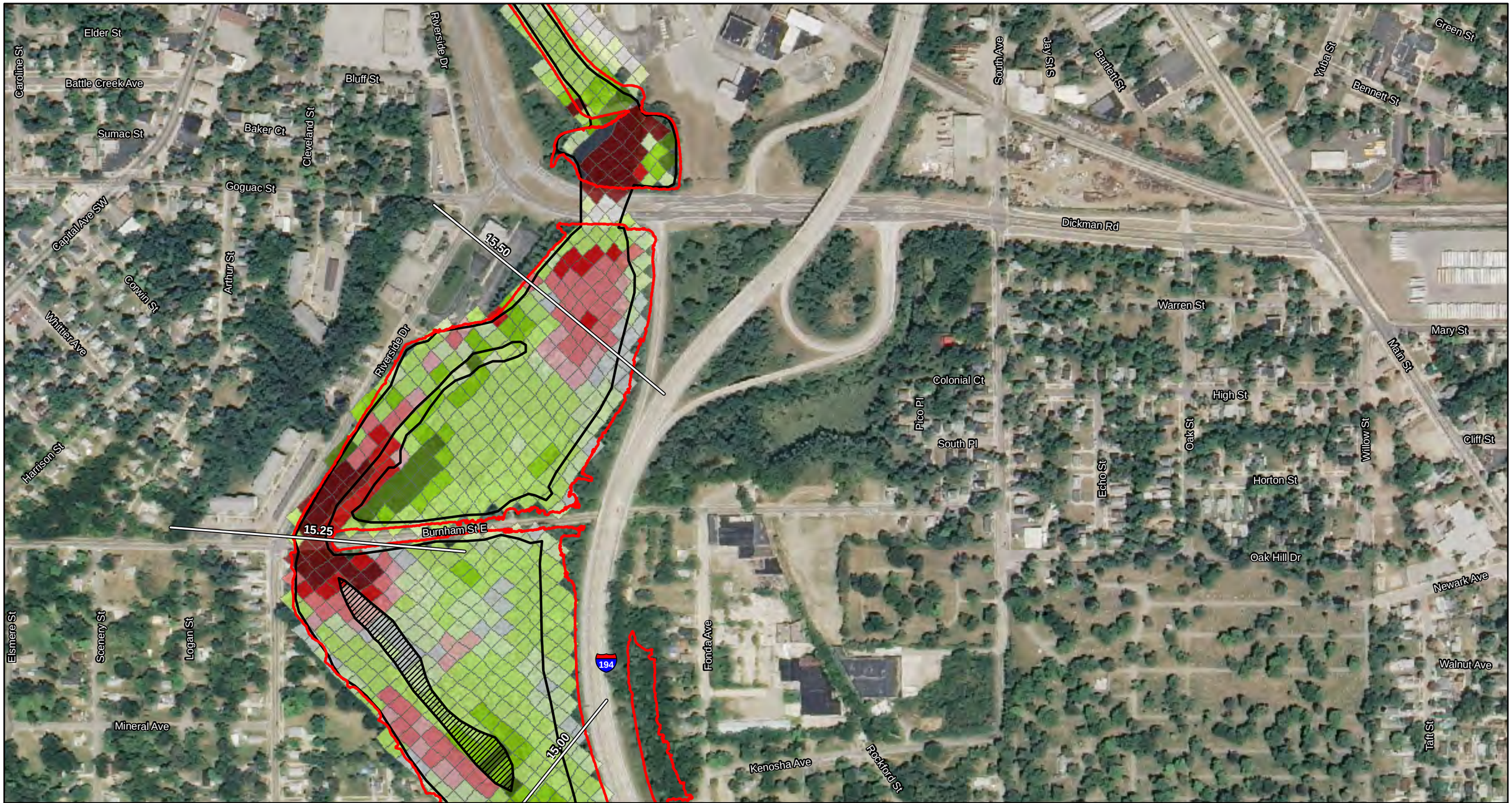
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 15.05 - MP 15.71

SHEET 14 OF 45

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

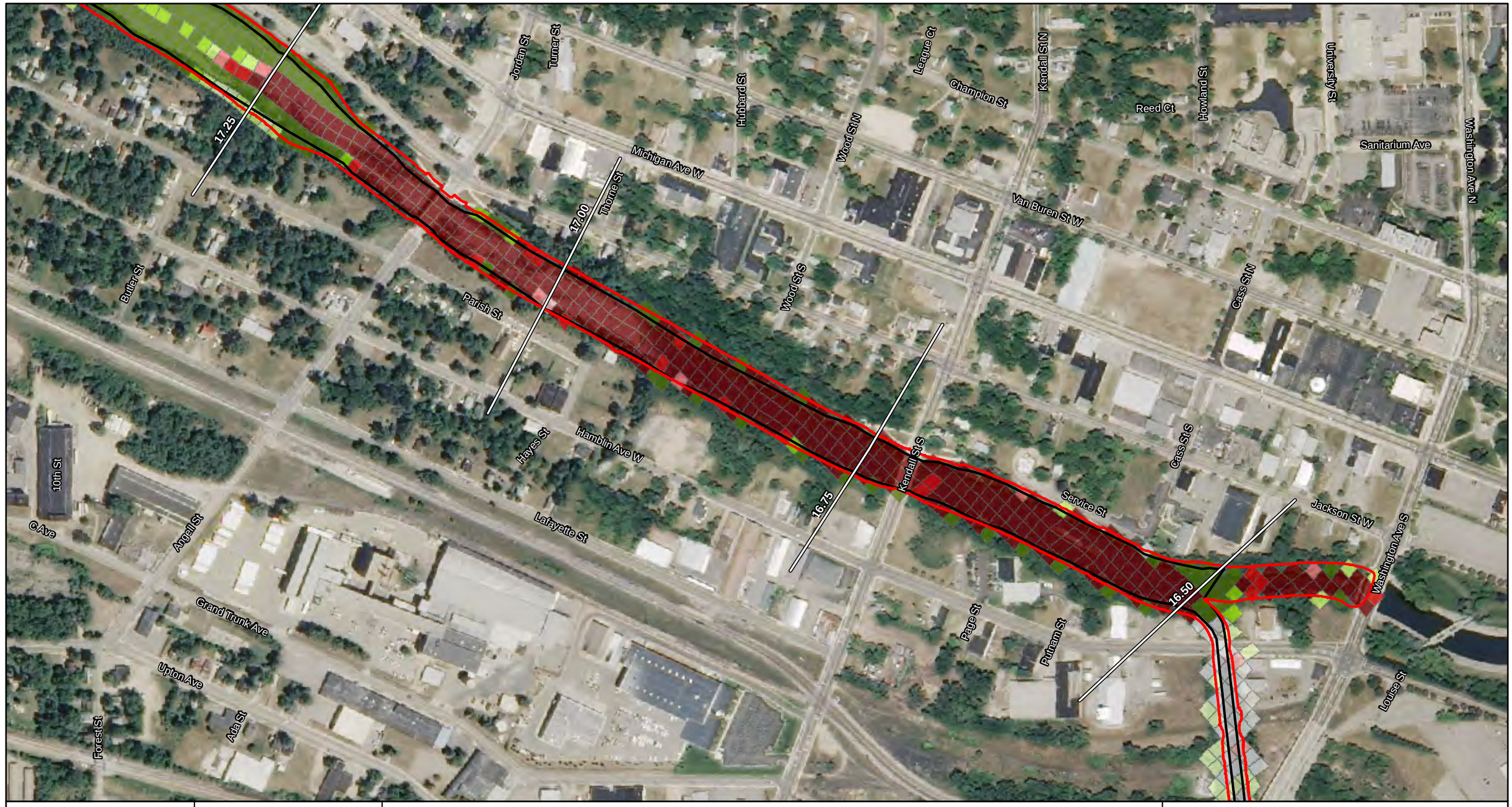
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 15.71 - MP 16.38

SHEET 15 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_100yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 16.38 - MP 17.30

SHEET 16 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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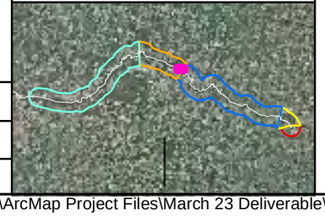
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 17.30 - MP 18.11

SHEET 17 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 18.11 - MP 19.18

SHEET 18 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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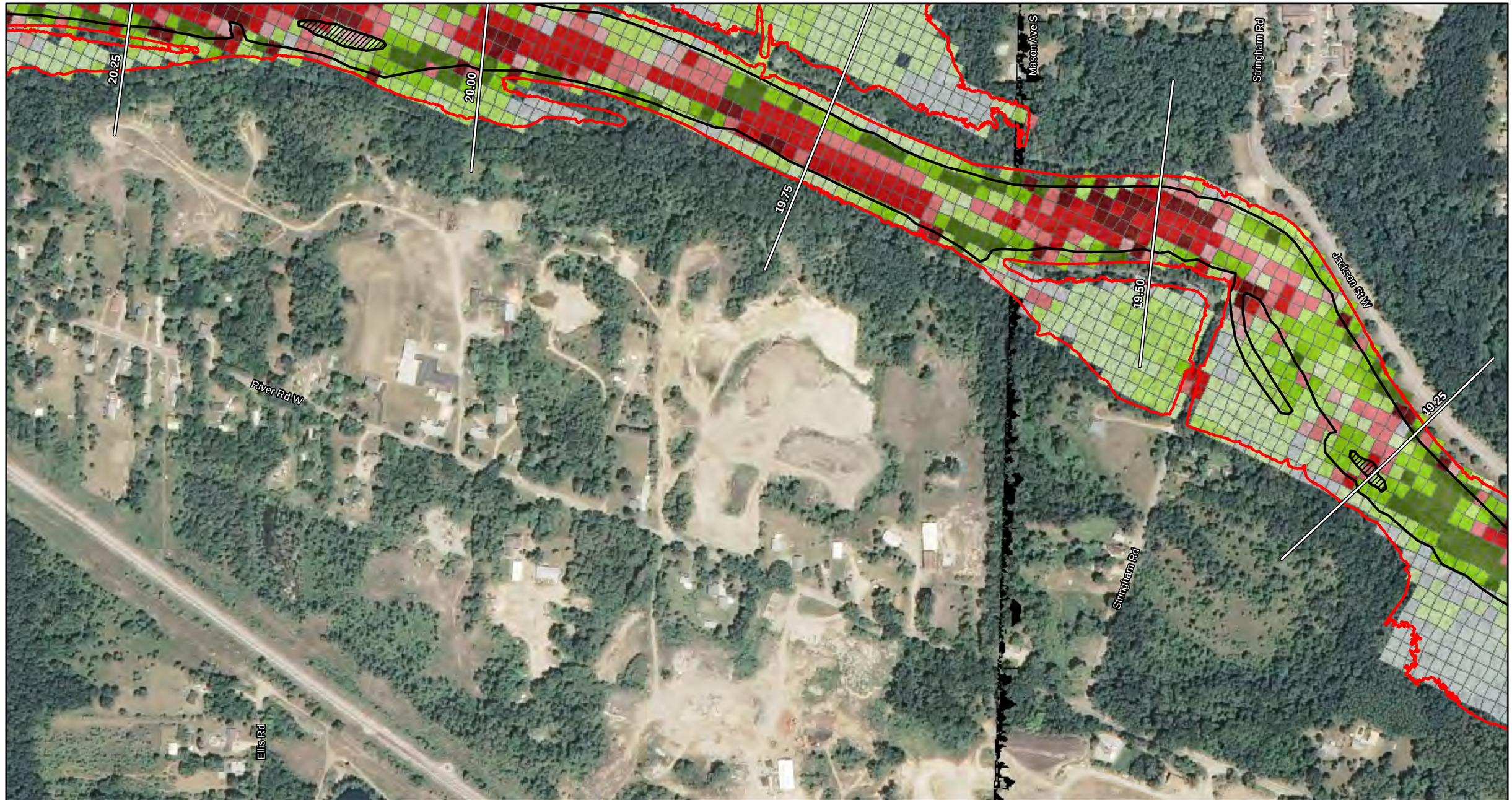
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 19.18 - MP 20.00

SHEET 19 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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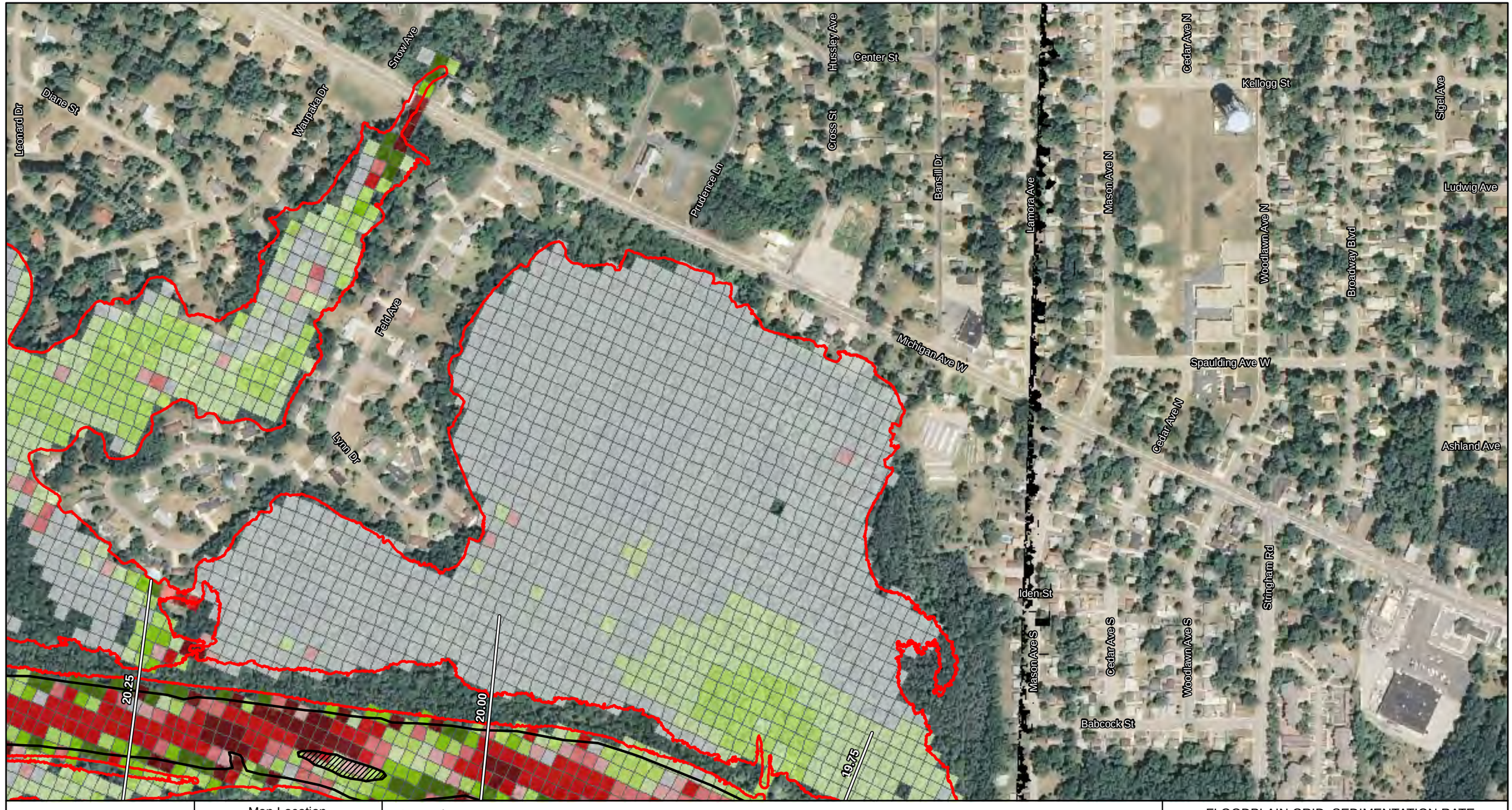
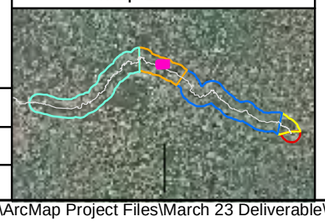
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 20.00 - MP 20.32

SHEET 20 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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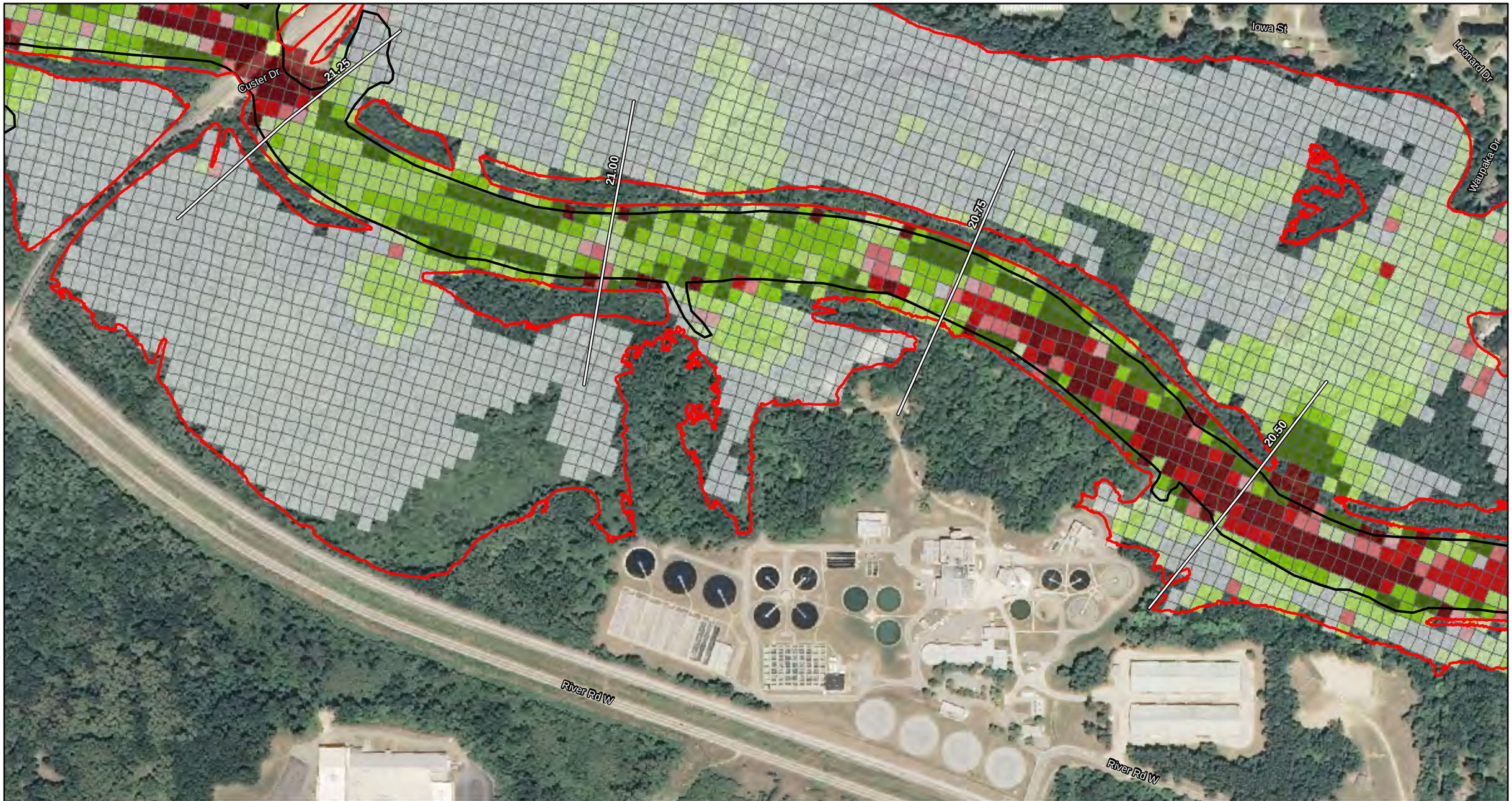
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 20.32 - MP 21.36

SHEET 21 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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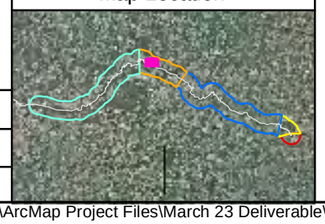
Aerial Photography Date: July & August 2009

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 21.36 - MP 21.59

SHEET 22 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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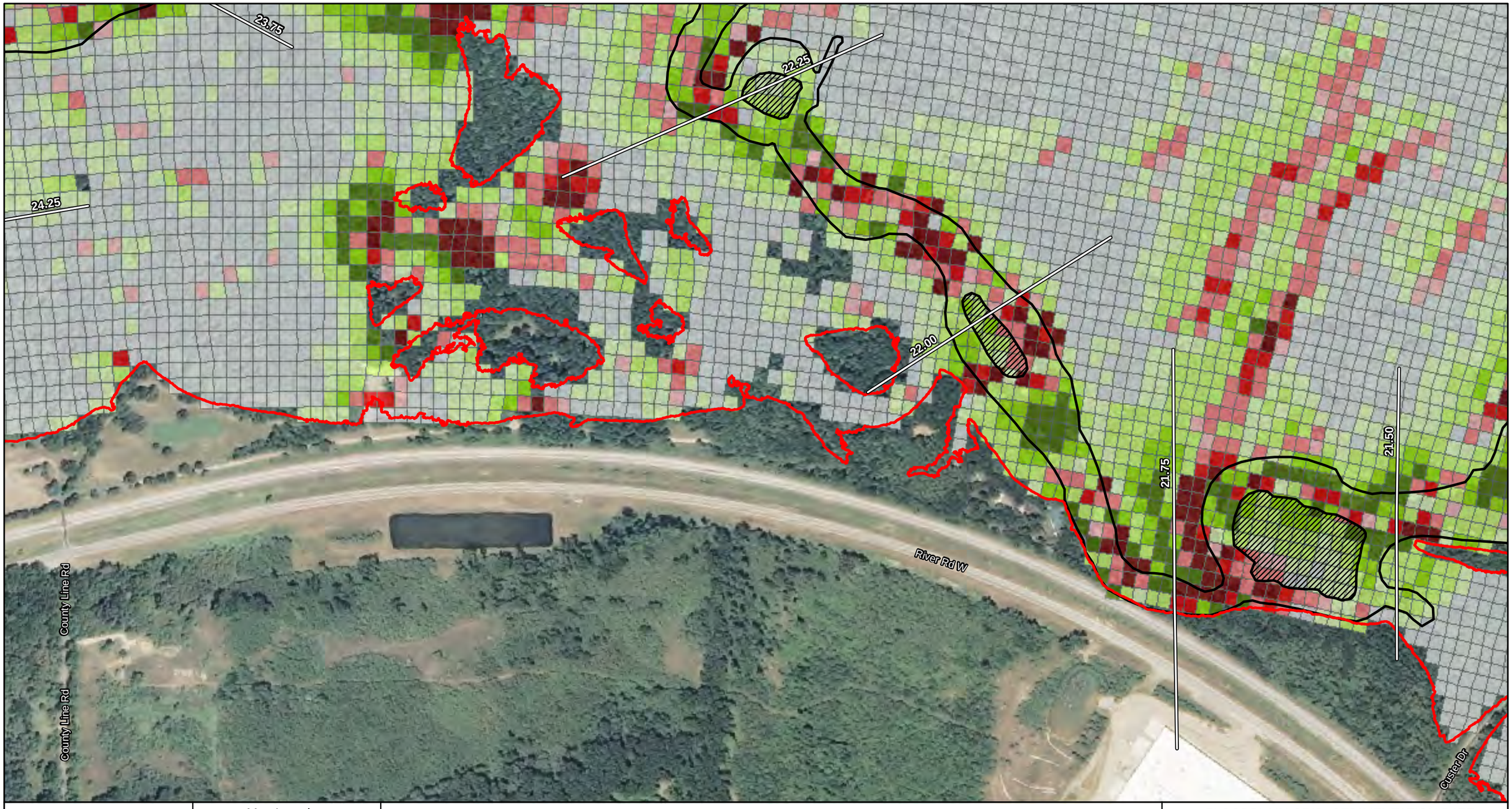
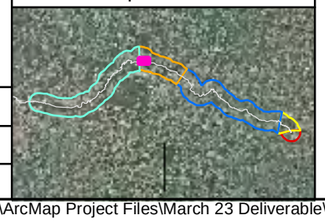
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 21.59 - MP 22.33

SHEET 23 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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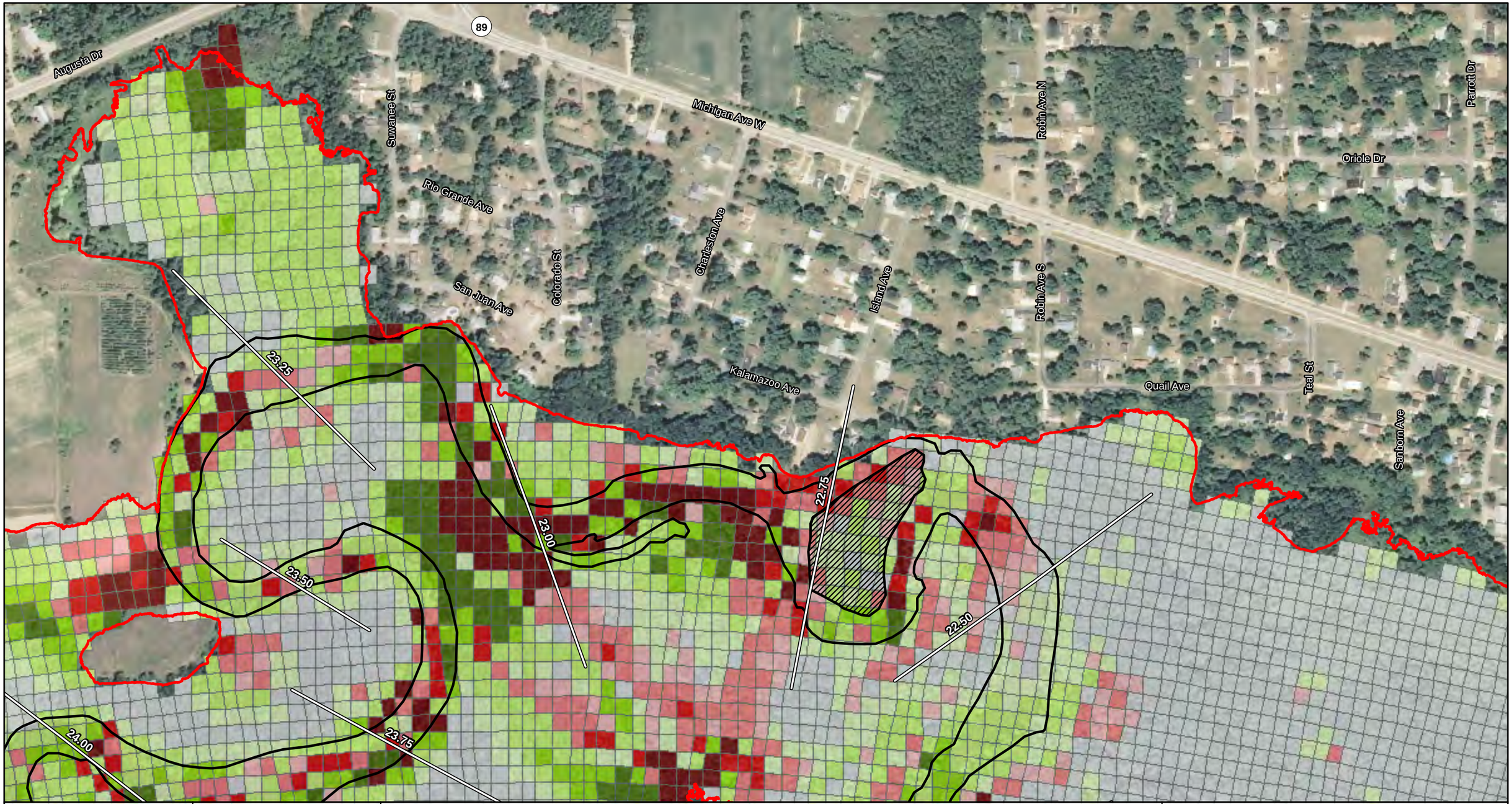
Aerial Photography Date: July & August 2009



Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 22.33 - MP 24.01

SHEET 24 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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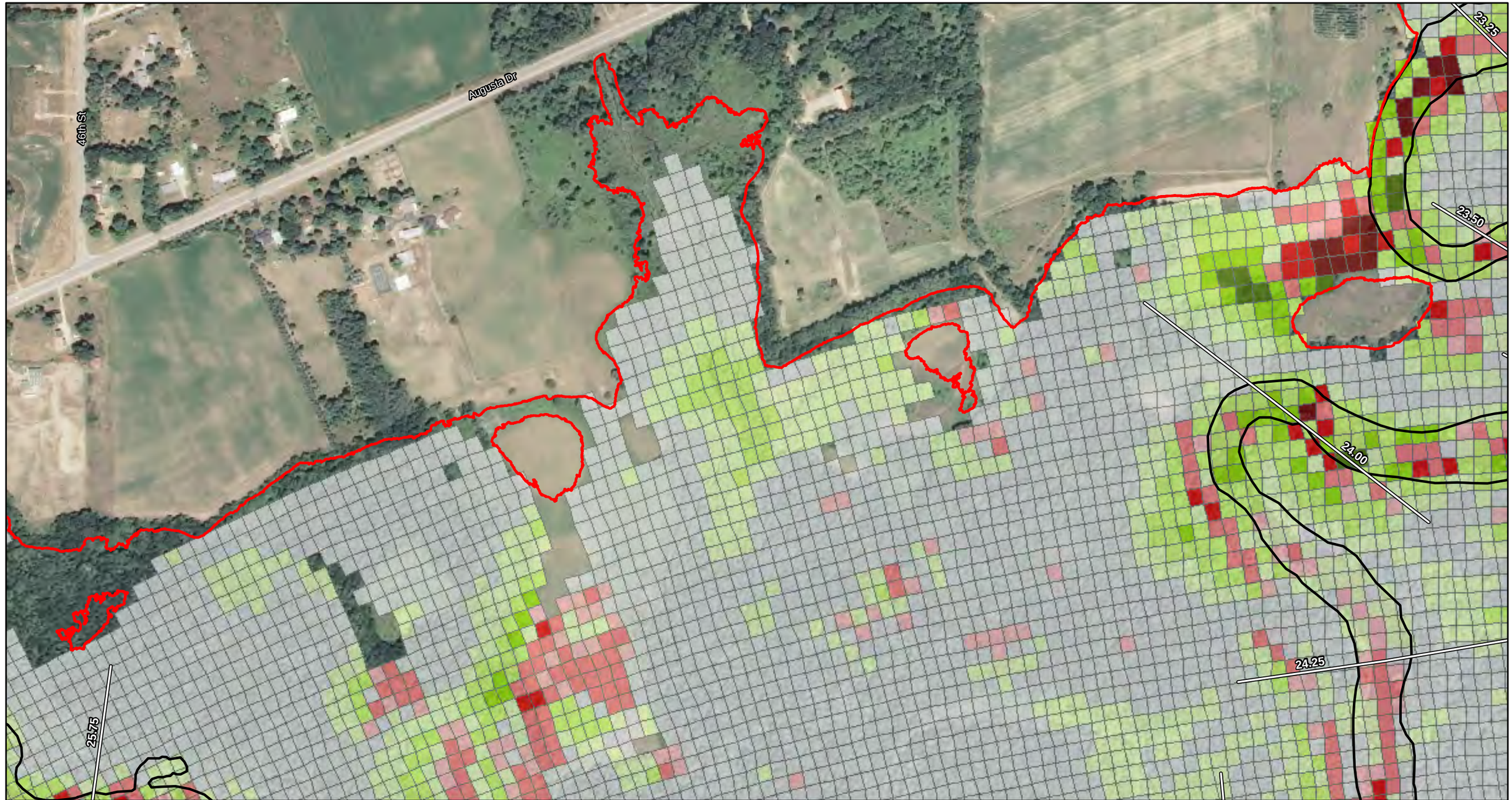
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 24.01 - MP 24.33

SHEET 25 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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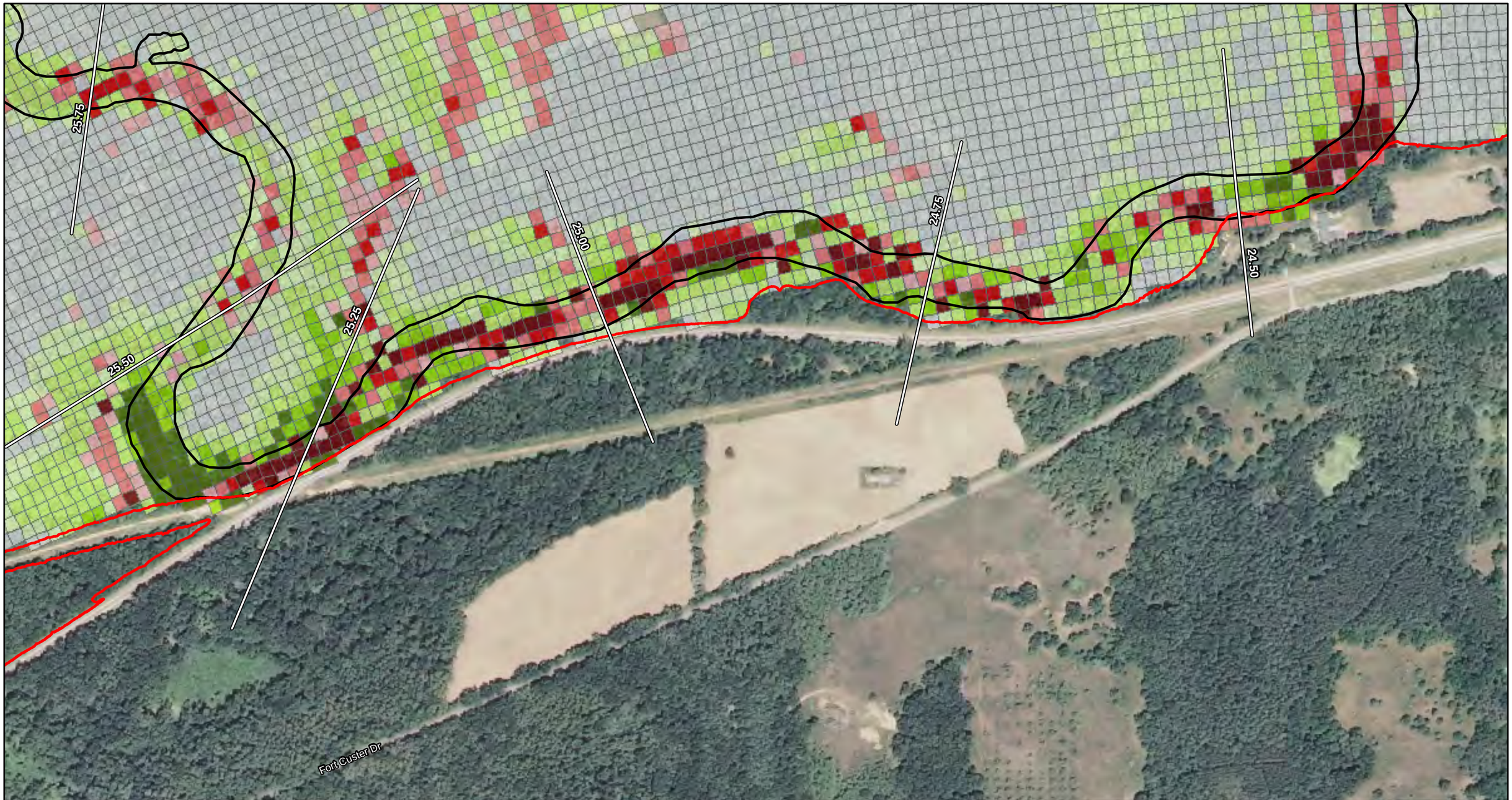
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 24.33 - MP 25.79

SHEET 26 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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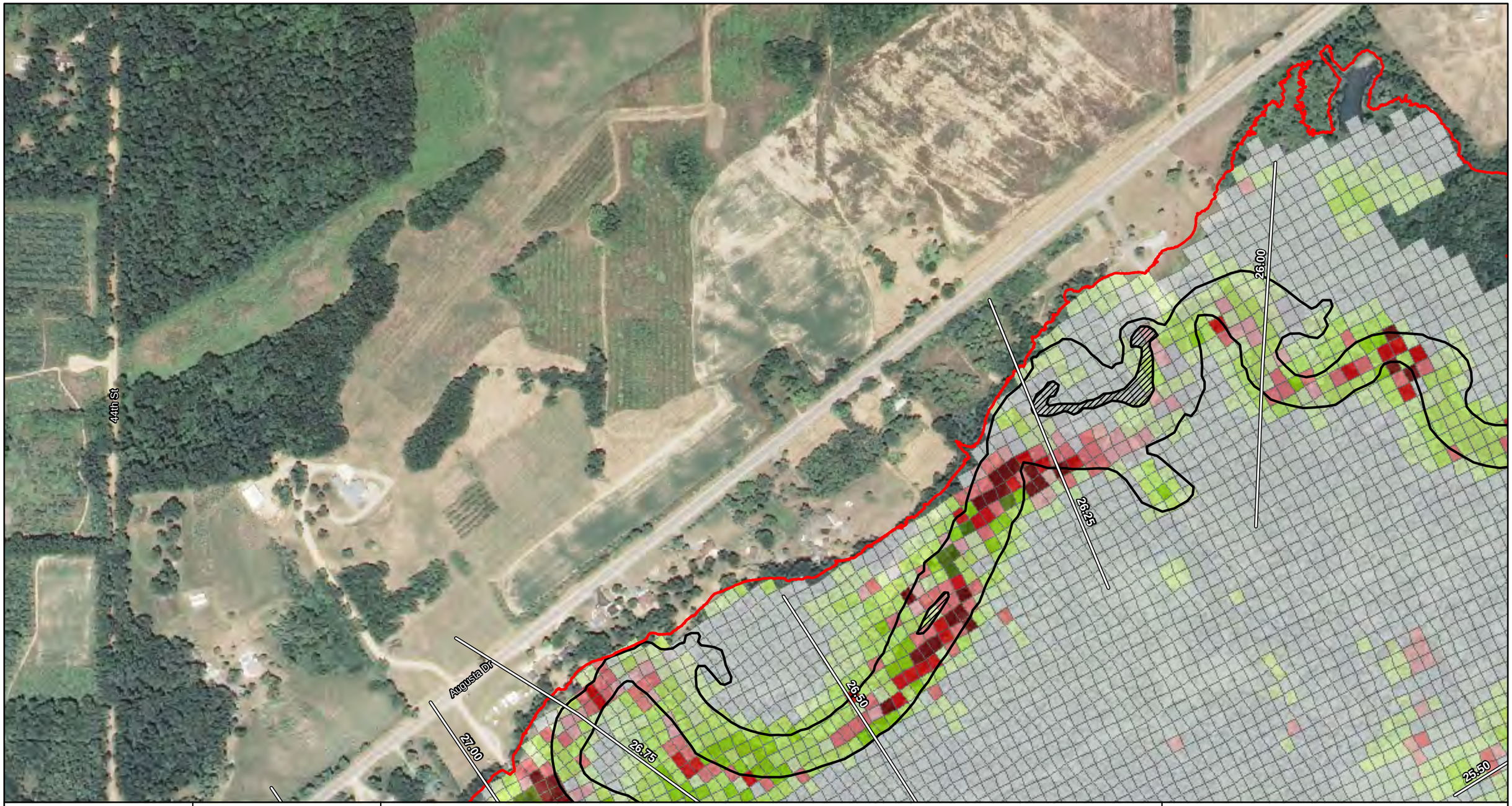
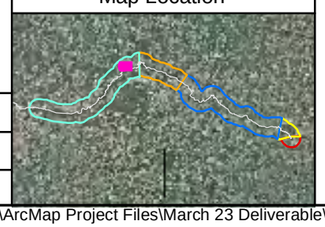
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 25.79 - MP 26.80

SHEET 27 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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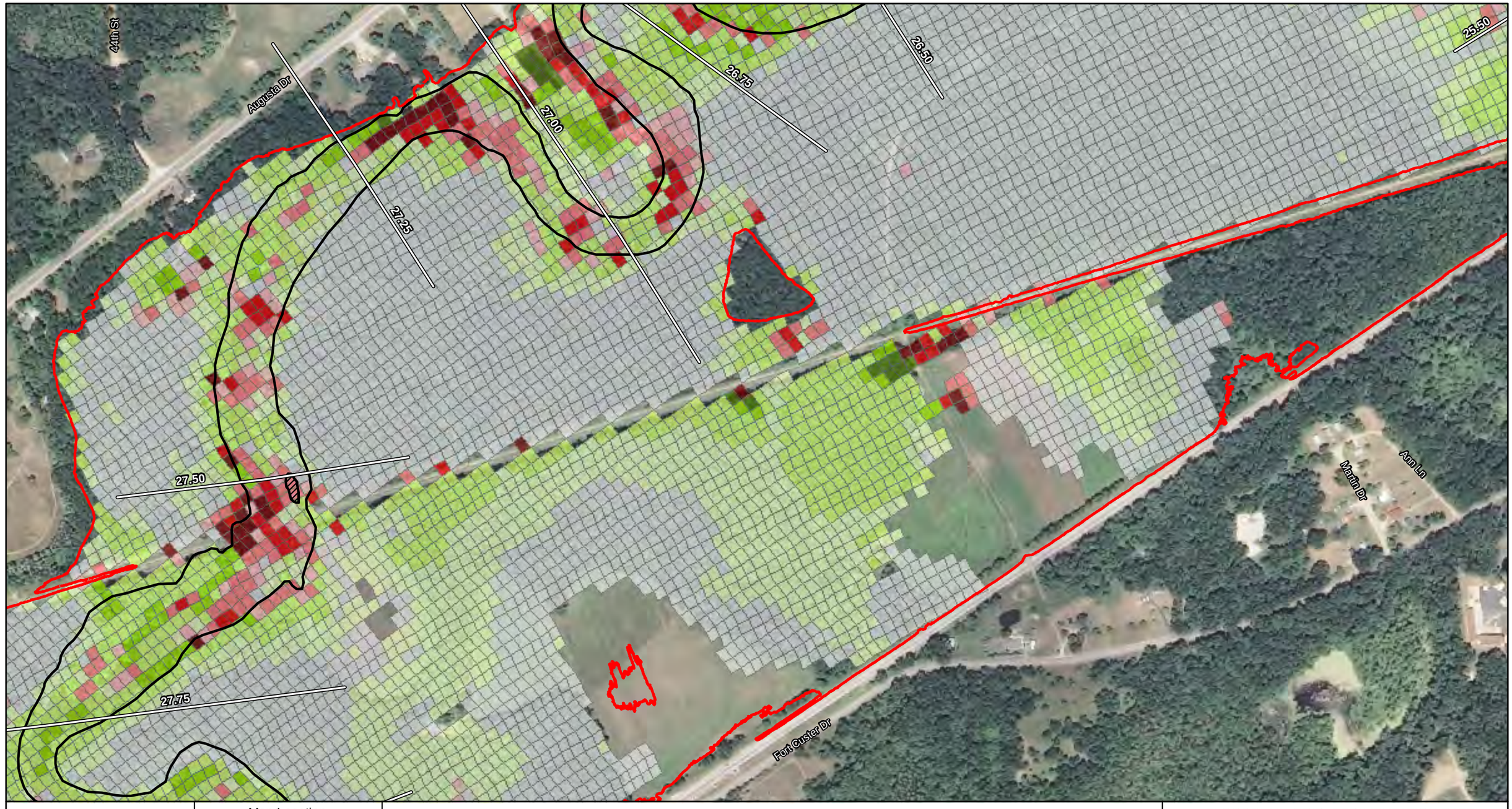
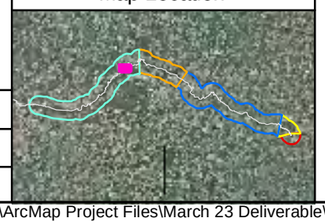
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 26.80 - MP 27.80

SHEET 28 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 27.80NW - MP 28.22NW

SHEET 29 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

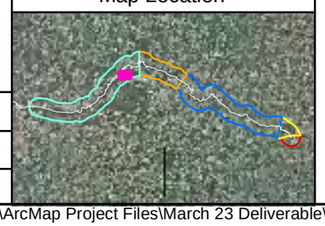
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 27.80SE - MP 28.22SE

SHEET 30 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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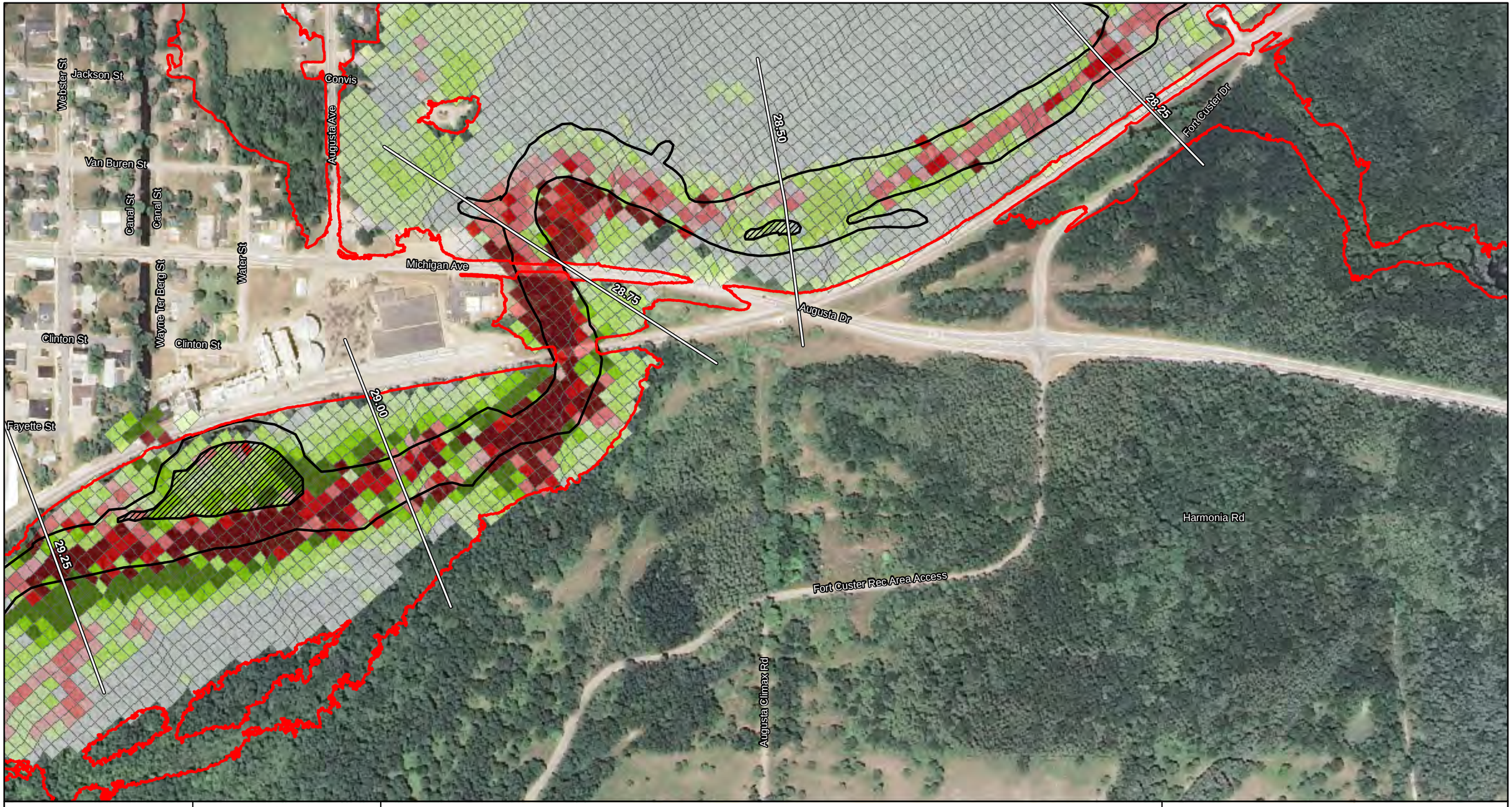
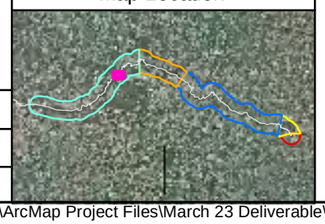
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 28.22 - MP 29.20

SHEET 31 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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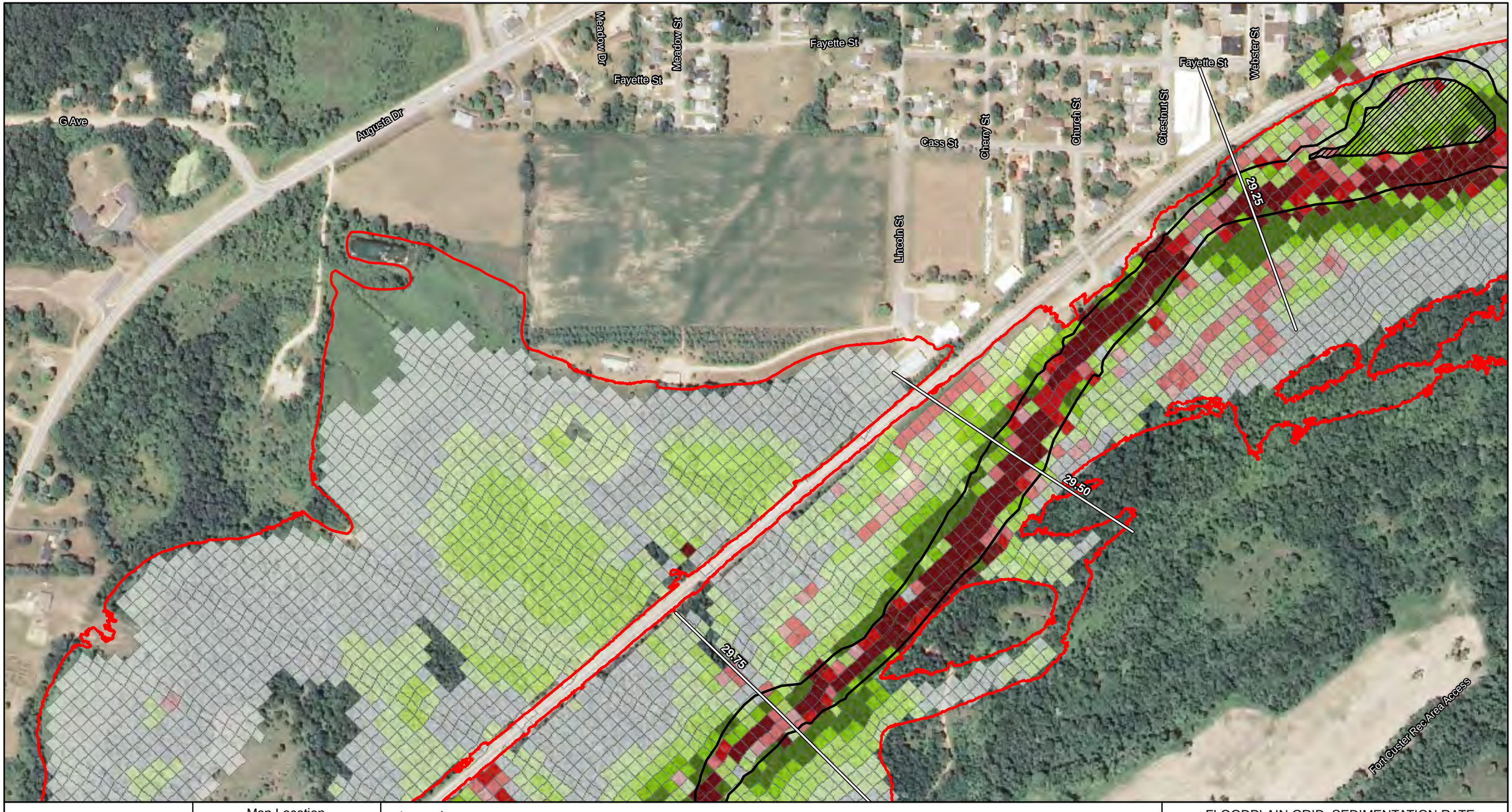
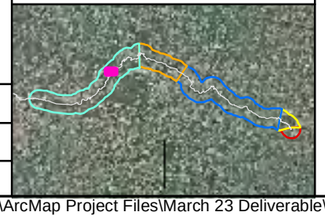
Aerial Photography Date: July & August 2009



Map Location



ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 29.20 - MP 29.82

SHEET 32 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 29.82 - MP 30.84

SHEET 33 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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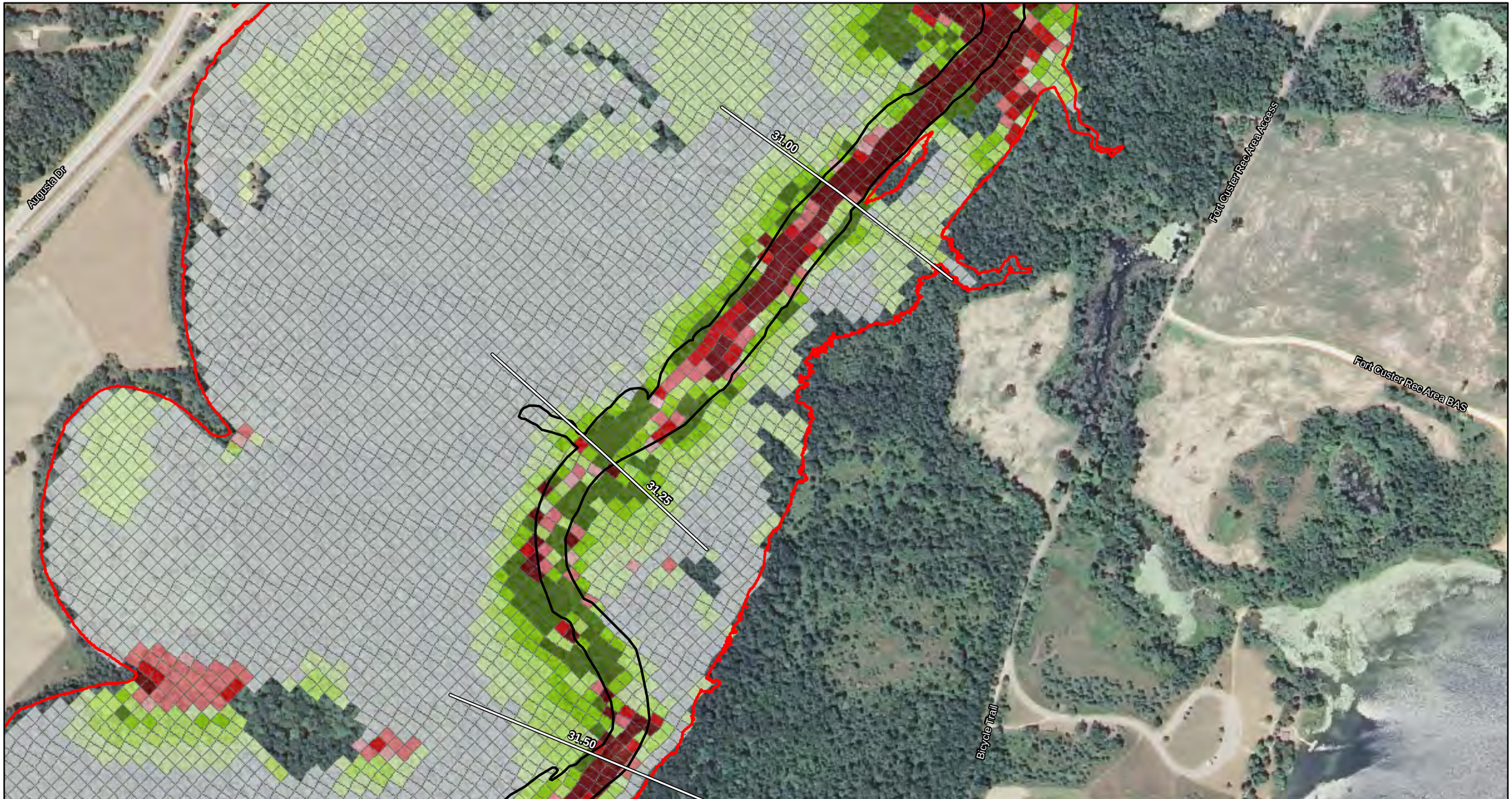
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 30.84 - MP 31.40

SHEET 34 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

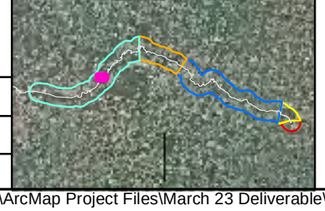
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 31.40 - MP 31.94

SHEET 35 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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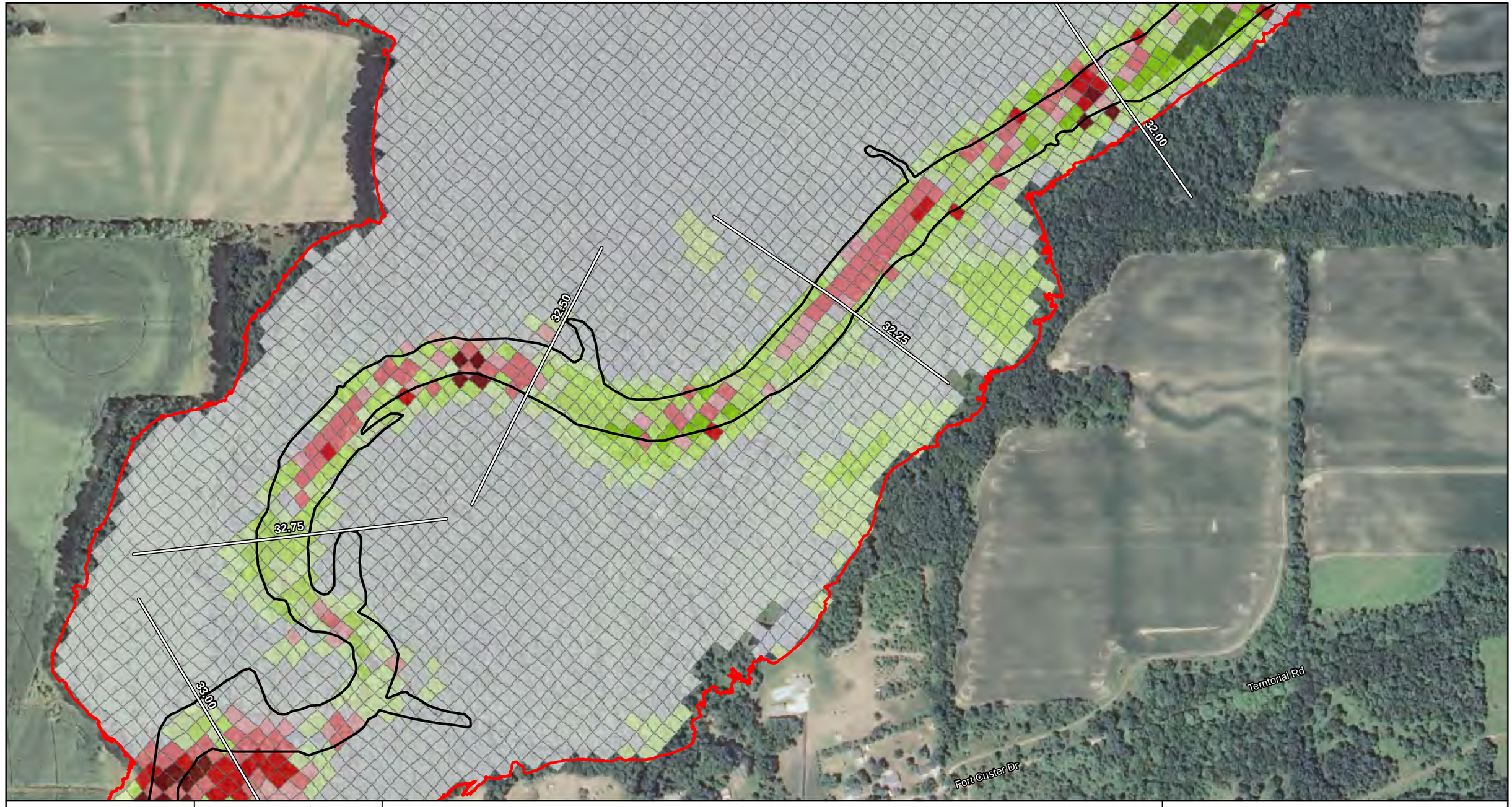
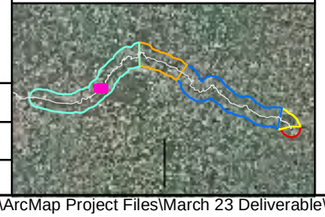
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 31.94 - MP 33.00

SHEET 36 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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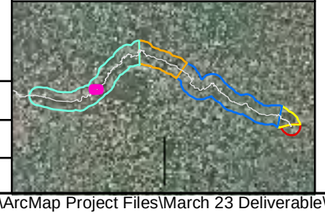
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 33.00 - MP 33.52

SHEET 37 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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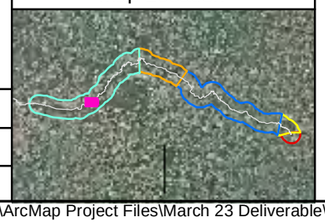
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 33.52 - MP 34.70

SHEET 38 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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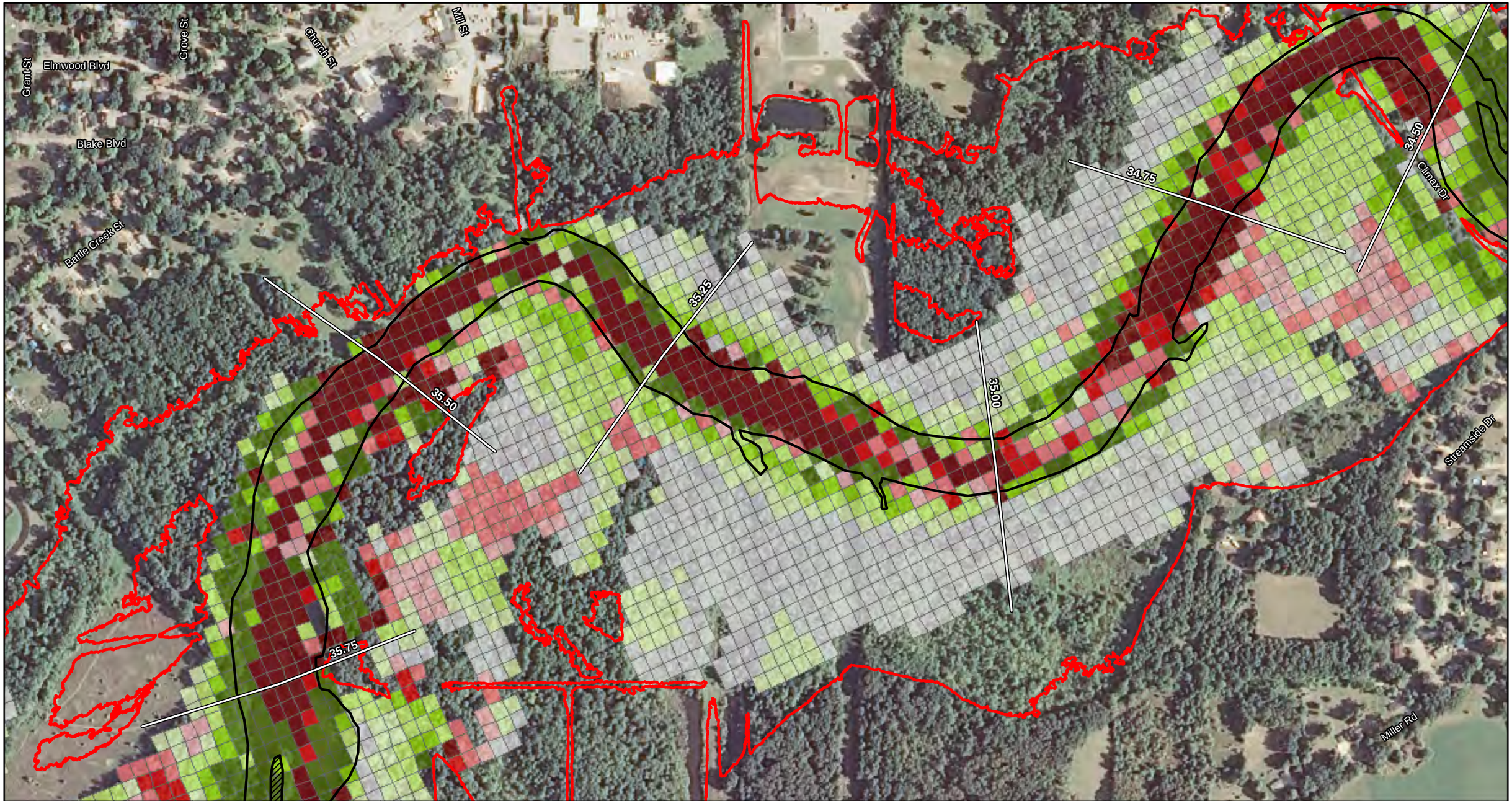
Aerial Photography Date: July & August 2009



Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 34.70 - MP 35.75

SHEET 39 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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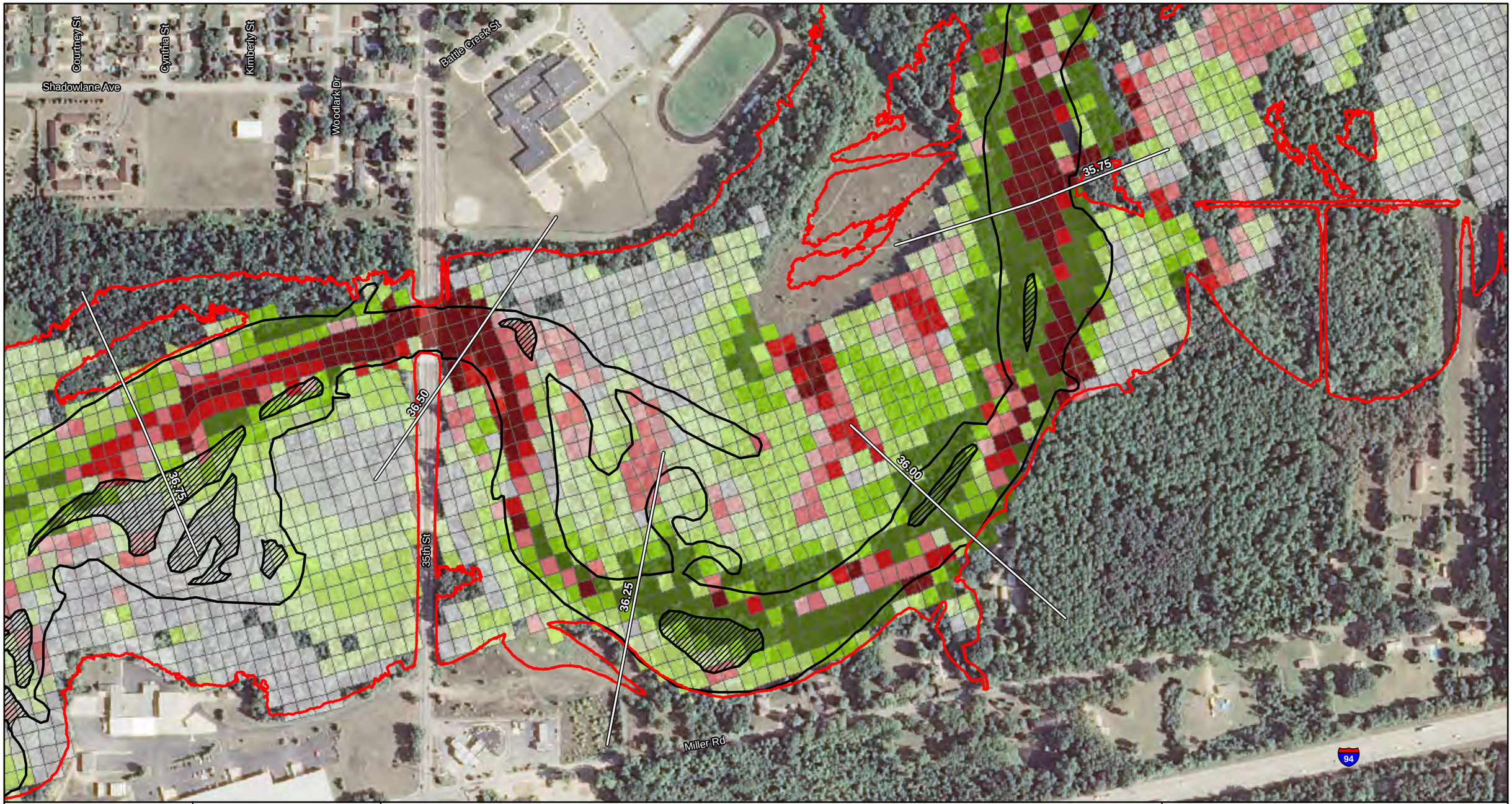
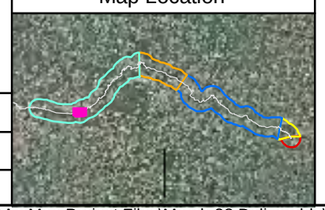
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 35.75 - MP 36.75

SHEET 40 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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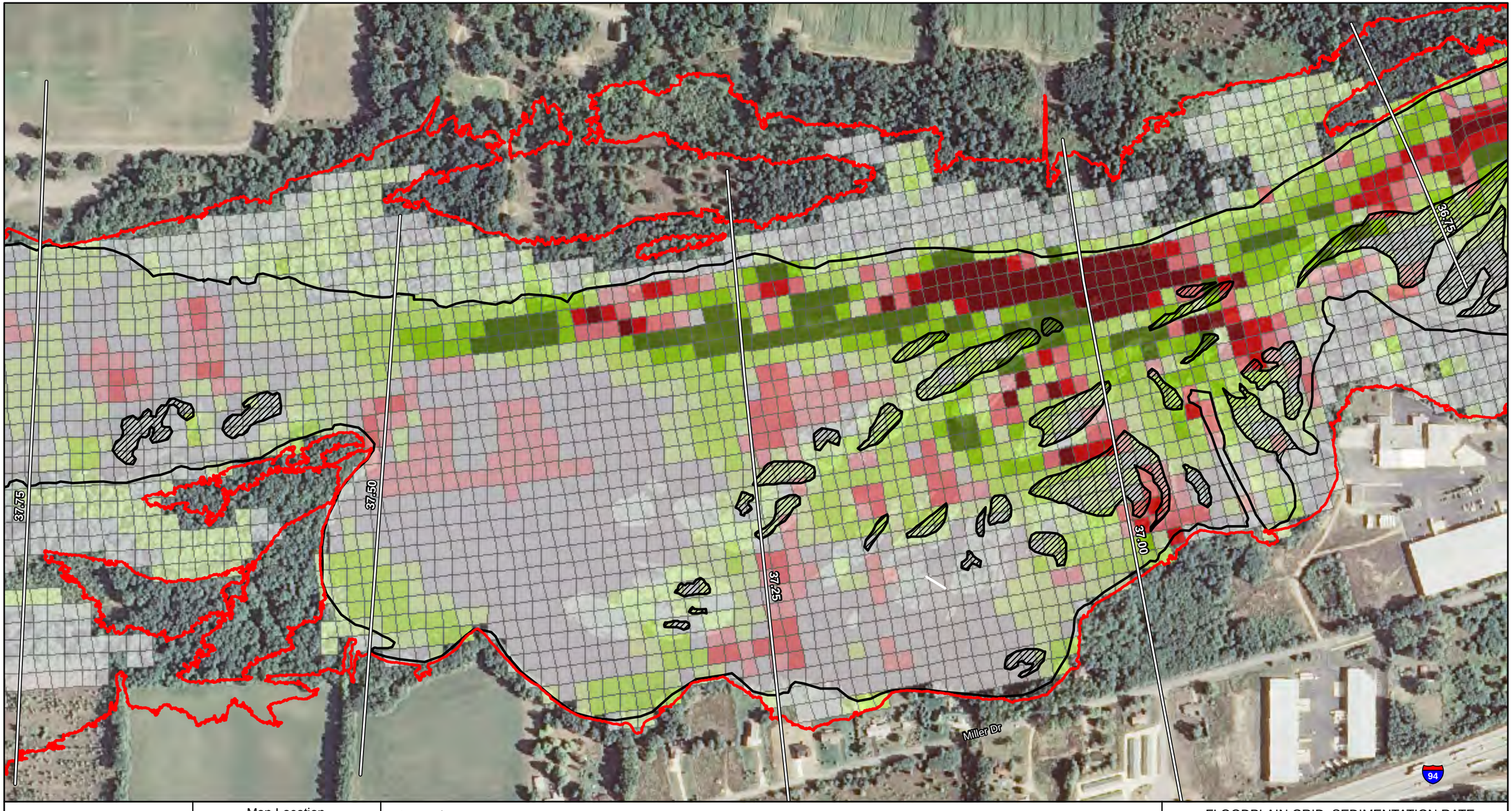
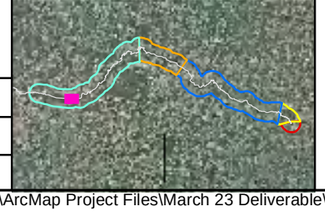
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 36.75 - MP 37.75

SHEET 41 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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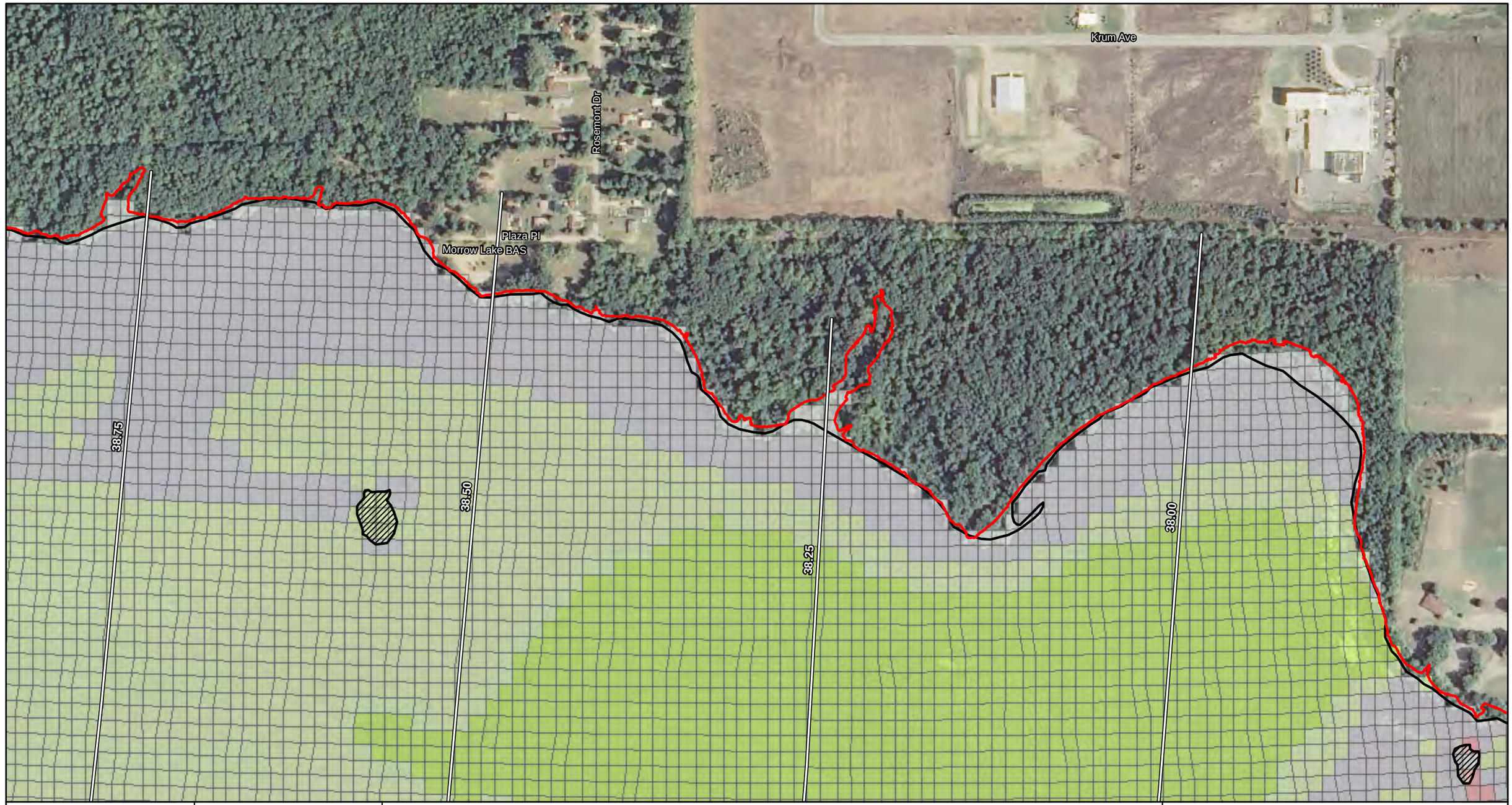
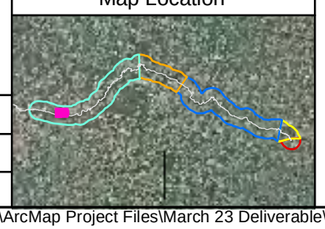
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 37.75N - MP 38.80N

SHEET 42 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

38.75
38.50
38.25
38.00
37.75
94
Lyth Rd
Miller Dr

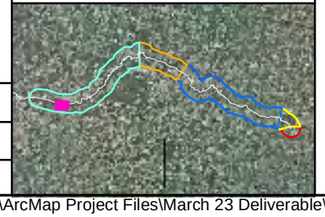
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 37.75S - MP 38.80S

SHEET 43 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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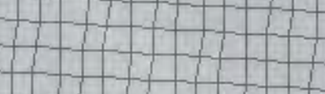
Aerial Photography Date: July & August 2009

Arden Ave
Morrow St
Elliot Rd
Lawndale Ave
Chene Dr
Consumers Power Dr
39.75
39.50
39.25
39.00

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

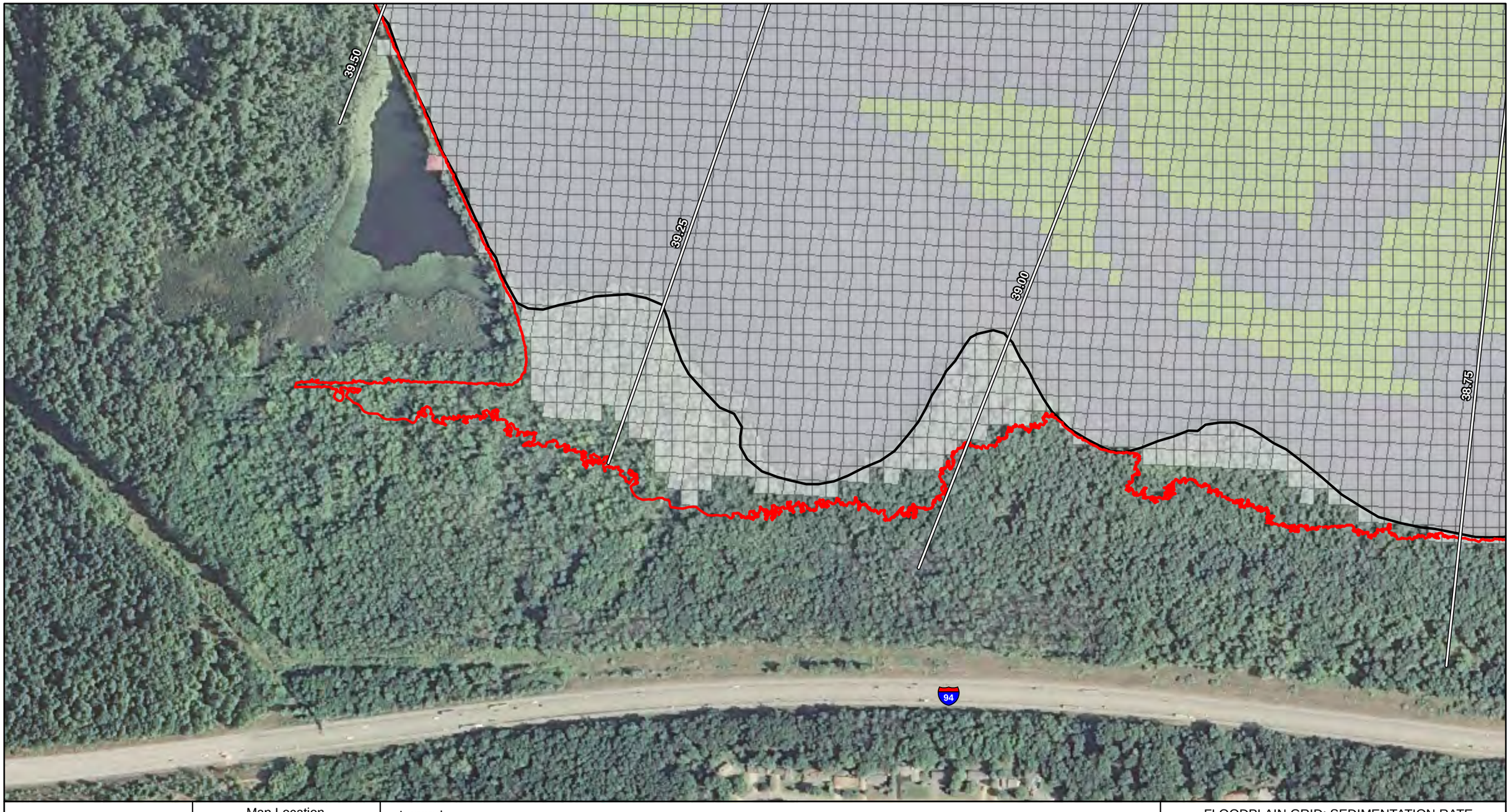
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 38.80N - MP 39.95N

SHEET 44 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_100yr.mxd

Aerial Photography Date: July & August 2009



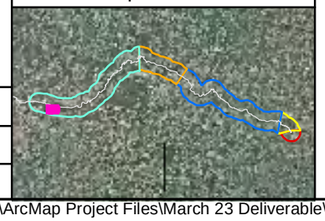
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
100-YEAR FLOOD
MP 38.80S - MP 39.95S

SHEET 45 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

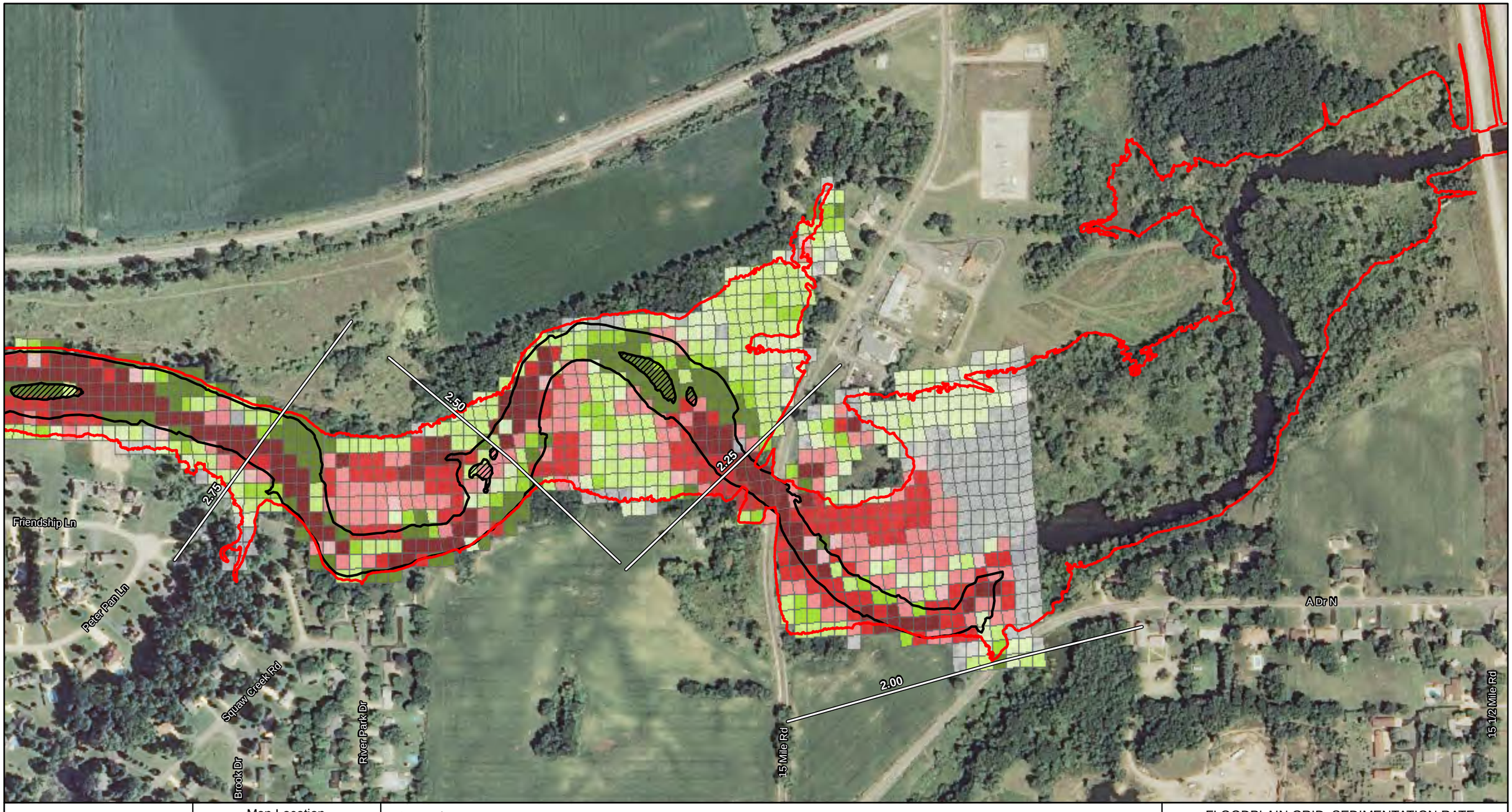
Figure 6-15

Floodplain Grid: Sedimentation Rate

Cells with Net Change in Silt or Clay Mass

100-Year Flood

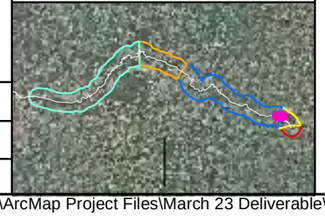
Sheets 1 through 45



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 01.88 - MP 02.91

SHEET 1 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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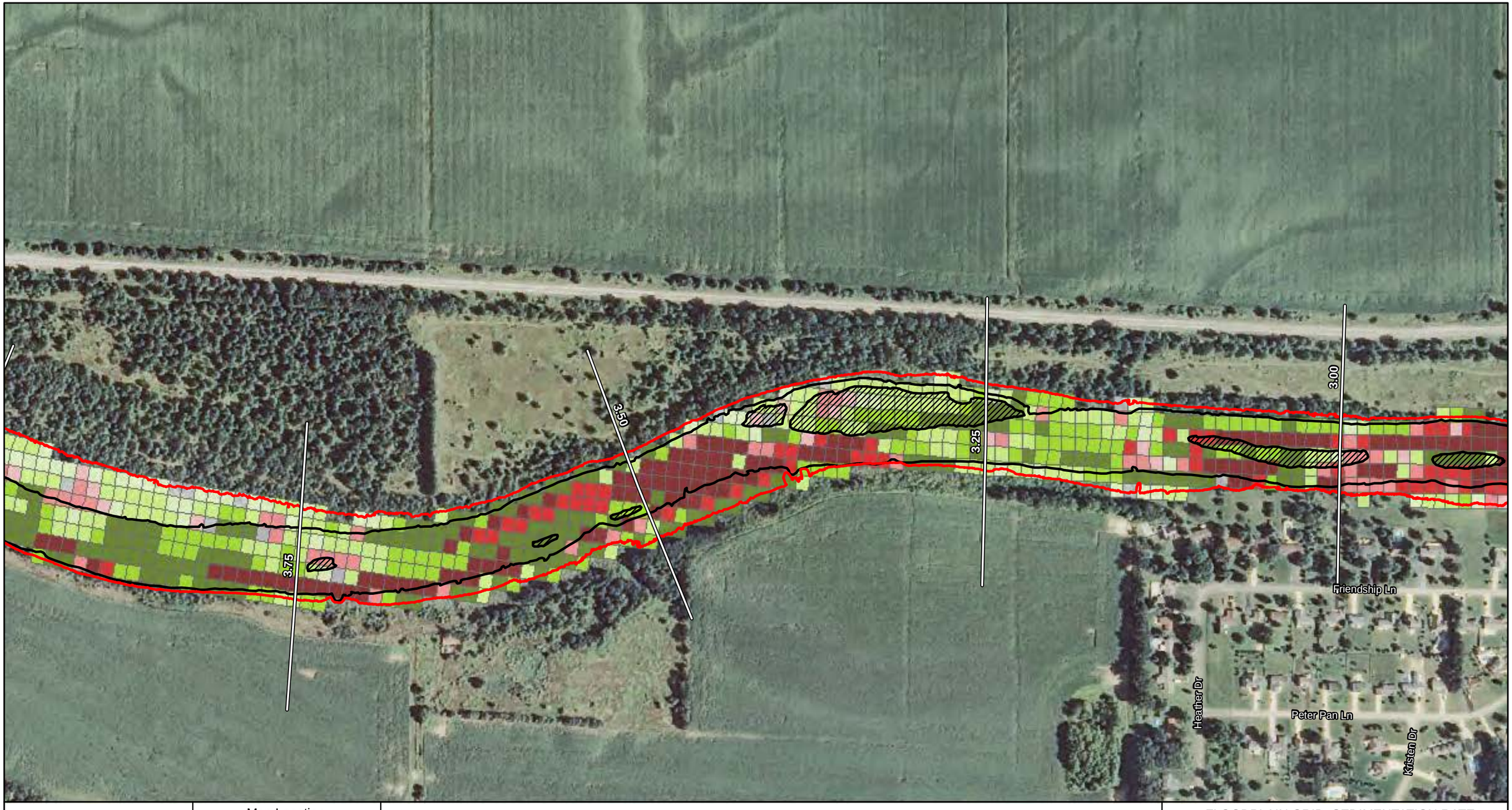
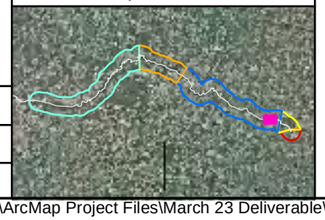
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 02.91 - MP 03.93

SHEET 2 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 03.93 - MP 04.98

SHEET 3 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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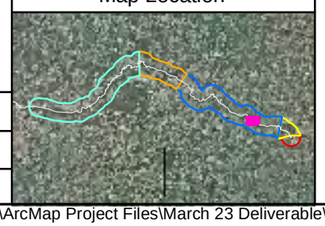
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 04.98 - MP 06.03

SHEET 4 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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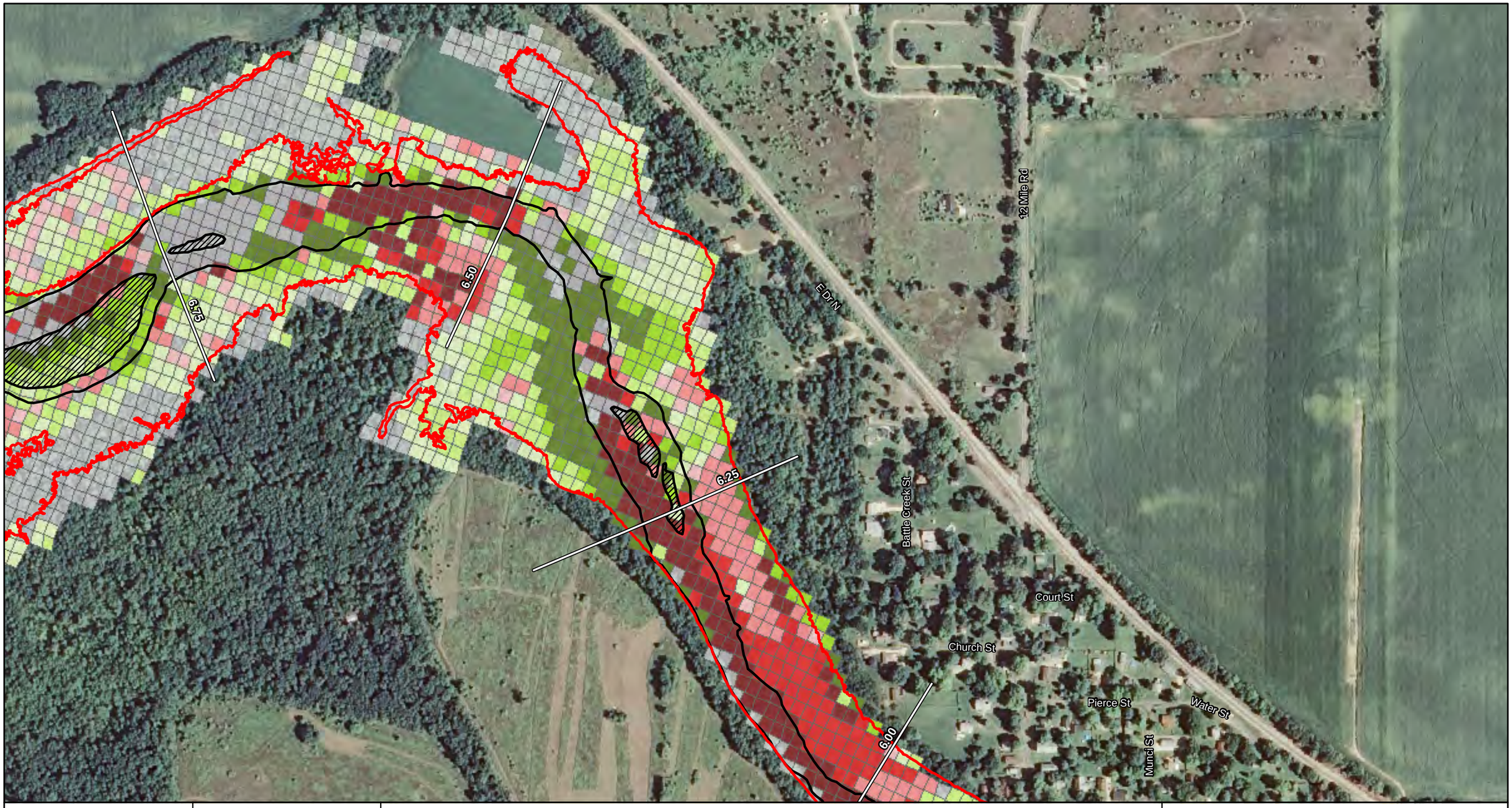
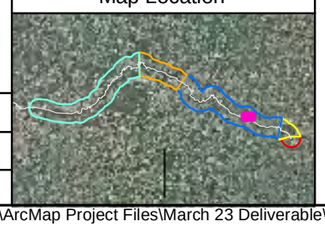
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 06.03 - MP 06.85

SHEET 5 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

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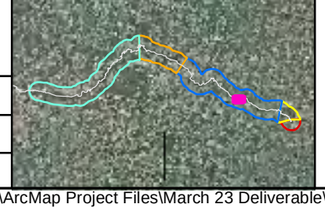
Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 06.85 - MP 07.95

SHEET 6 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

9.00

8.75

8.50

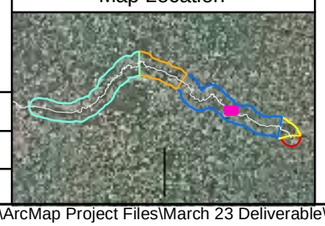
8.25

8.00

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD

MP 07.95 - MP 08.93

SHEET 7 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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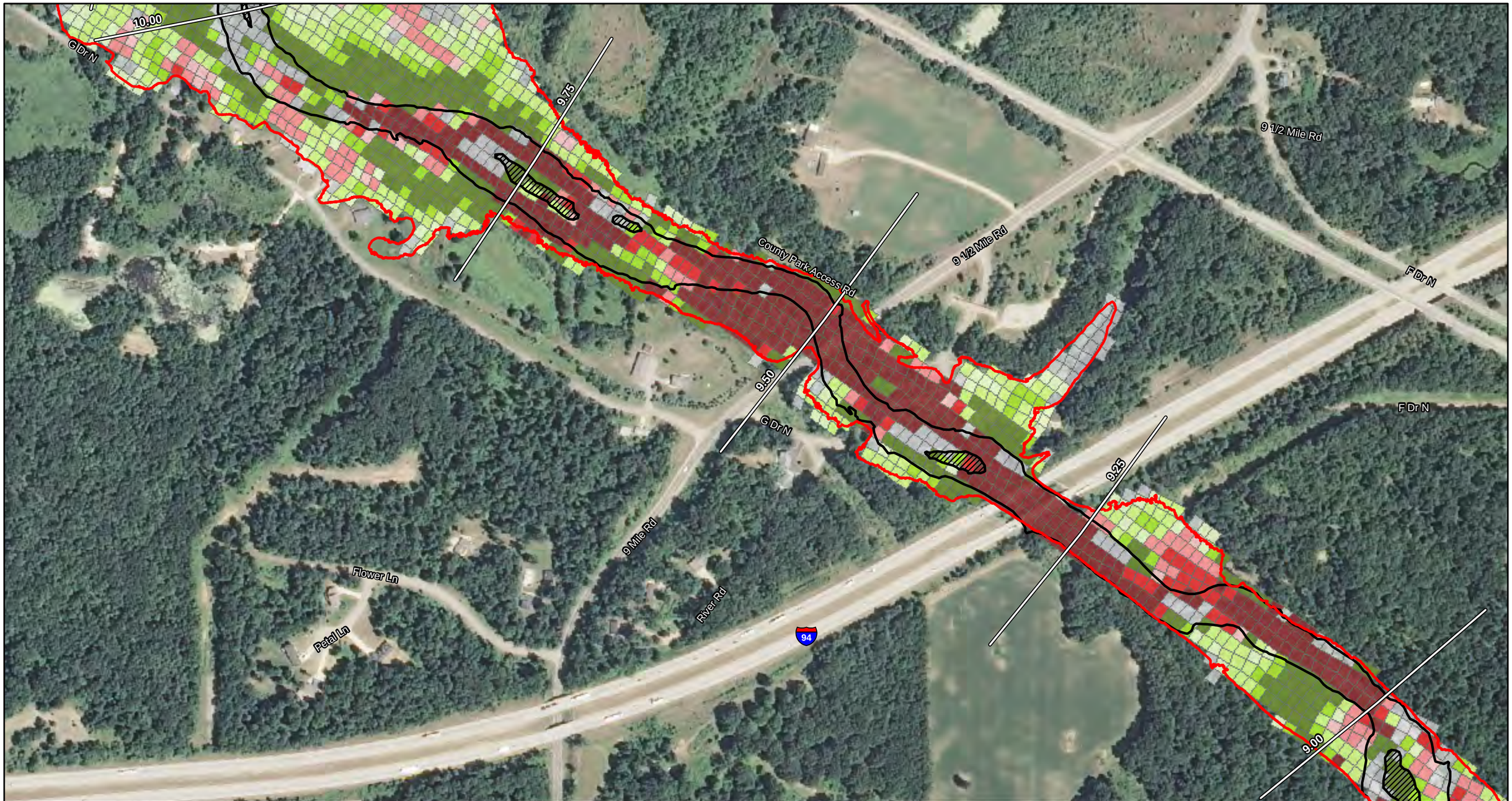
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 08.93 - MP 10.00

SHEET 8 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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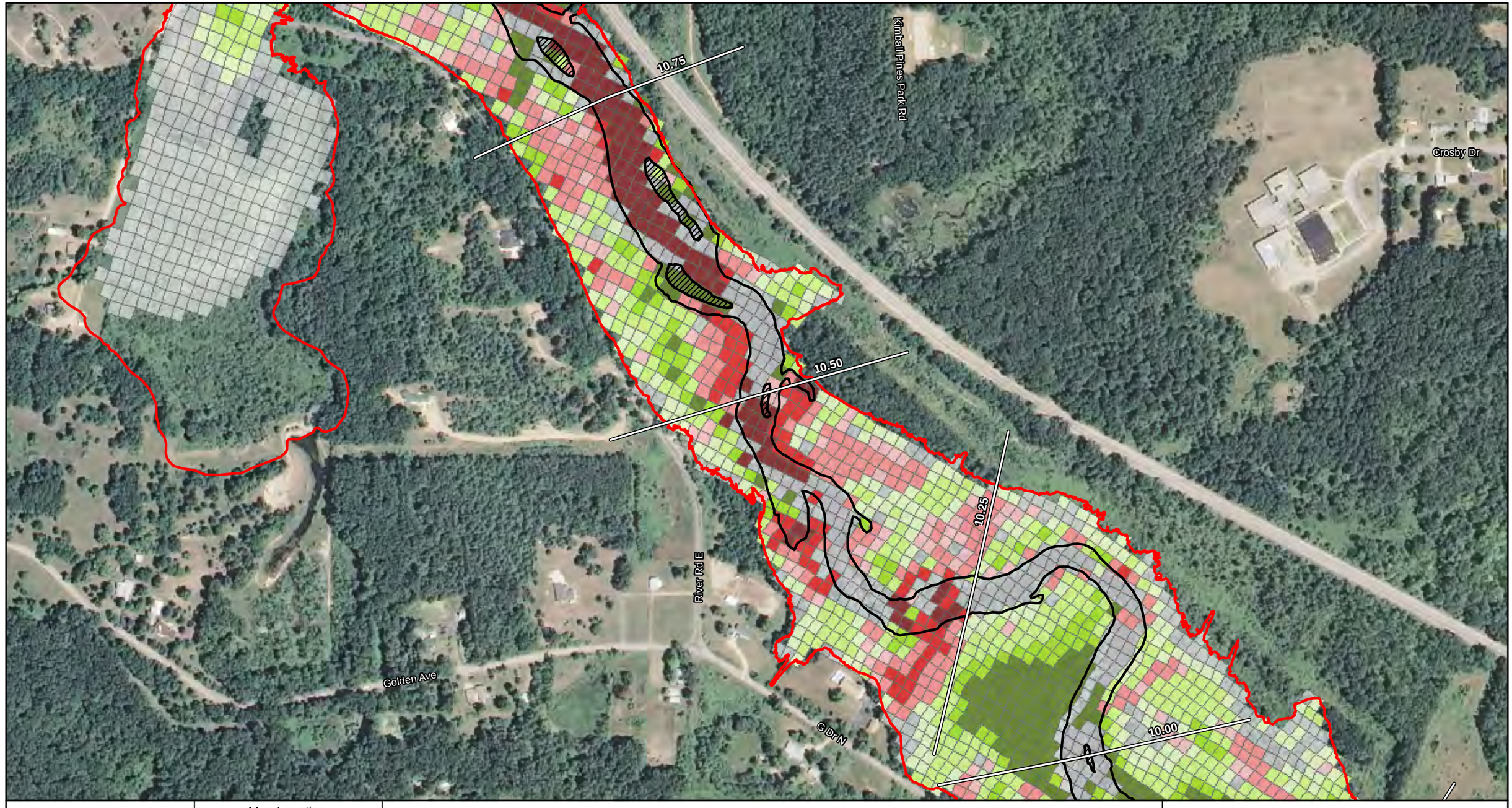
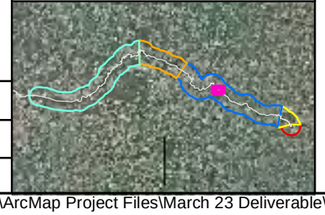
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 10.00 - MP 10.80

SHEET 9 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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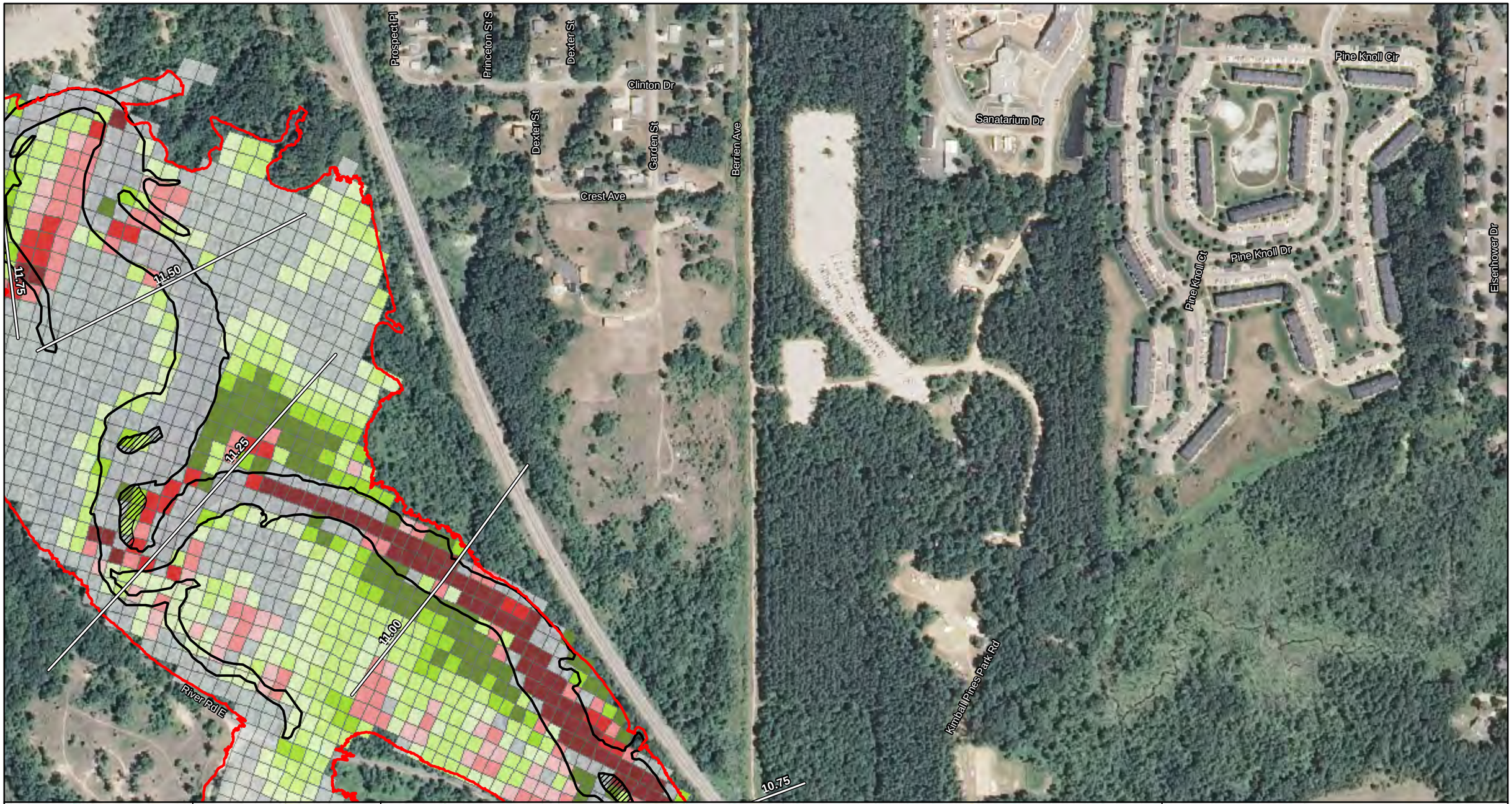
Aerial Photography Date: July & August 2009



Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 10.80 - MP 11.70

SHEET 10 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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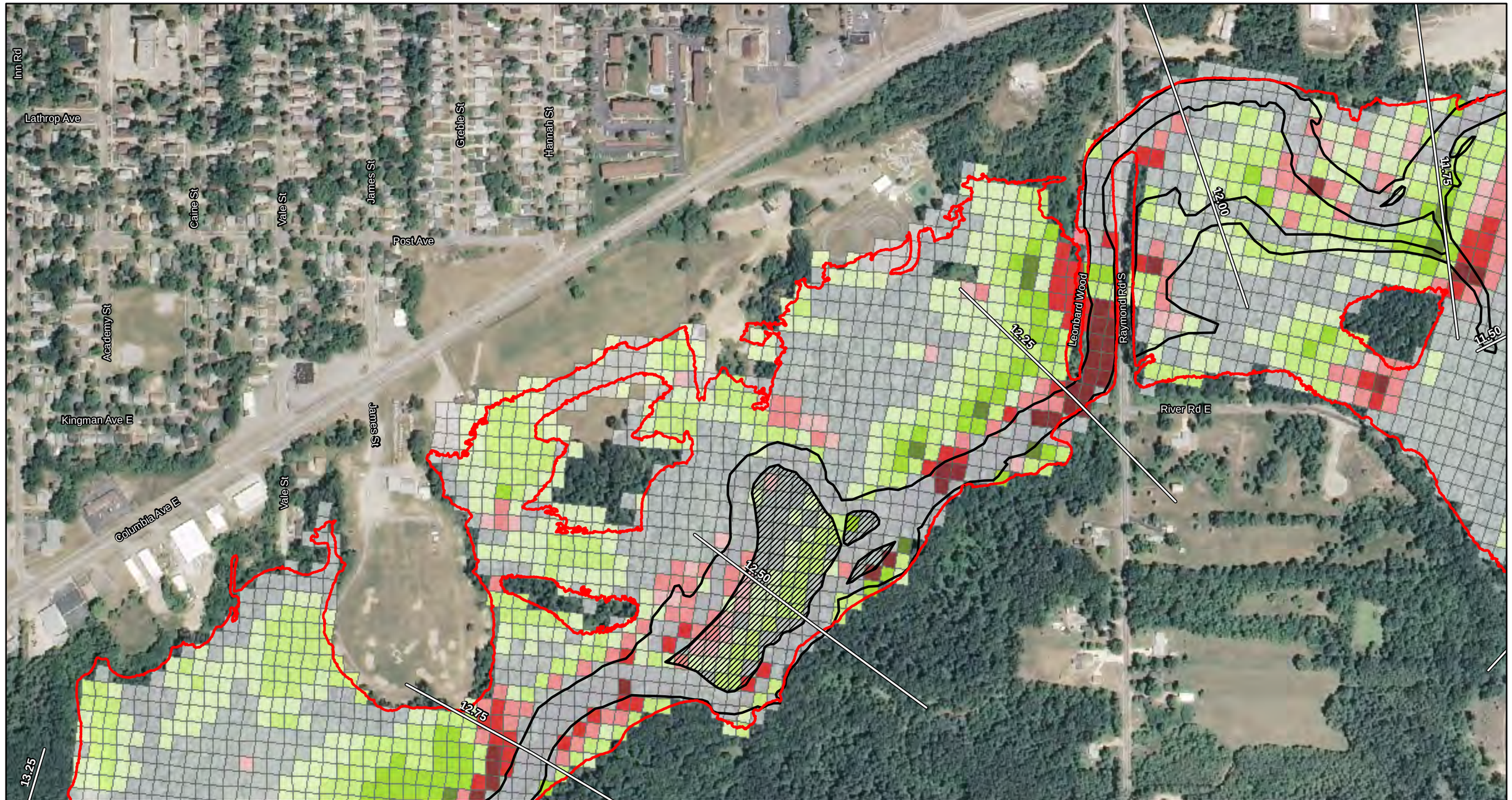
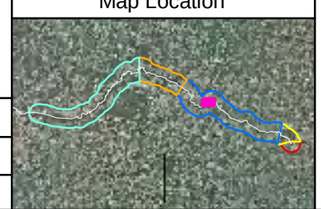
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 11.70 - MP 12.77

SHEET 11 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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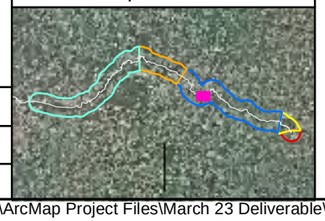
Aerial Photography Date: July & August 2009

Winding Way Dr
Main St
Jericho Rd
Columbia Ave E
14.00
Row H/Row J
Row F/Row G
Row D/Row E
Row C
Row A/Row B
Row K
13.50
13.25
13.00
12.75
13.75
6 1/2 Mile Rd
River Dr
Fruin Ave
Belton Ave
Beadle Lake Rd
McCormick St
Marion St
Golden Ave
Oneil St
Overton St
Silver St
Demaris Ln

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 12.77 - MP 14.00

SHEET 12 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 14.00 - MP 15.05

SHEET 13 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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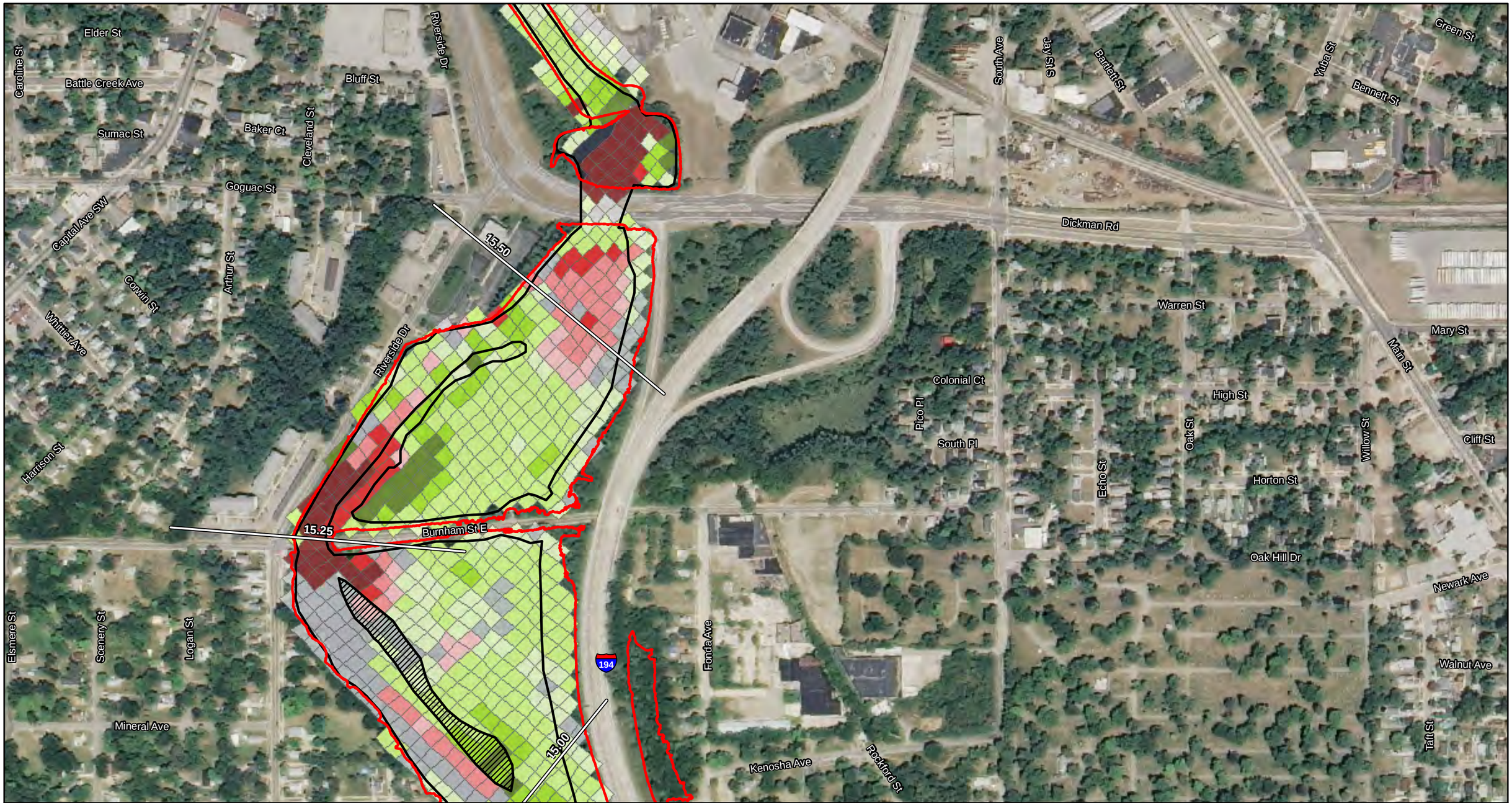
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 15.05 - MP 15.71

SHEET 14 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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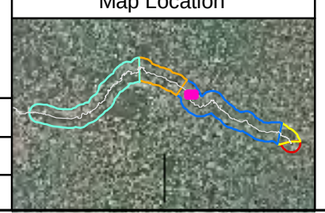
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 15.71 - MP 16.38

SHEET 15 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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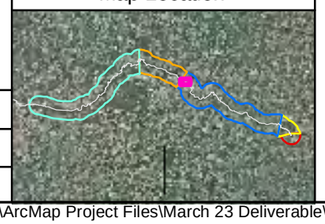
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 16.38 - MP 17.30

SHEET 16 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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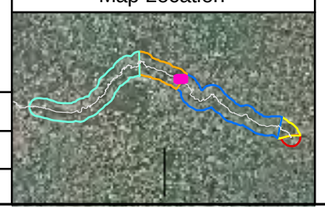
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 17.30 - MP 18.11

SHEET 17 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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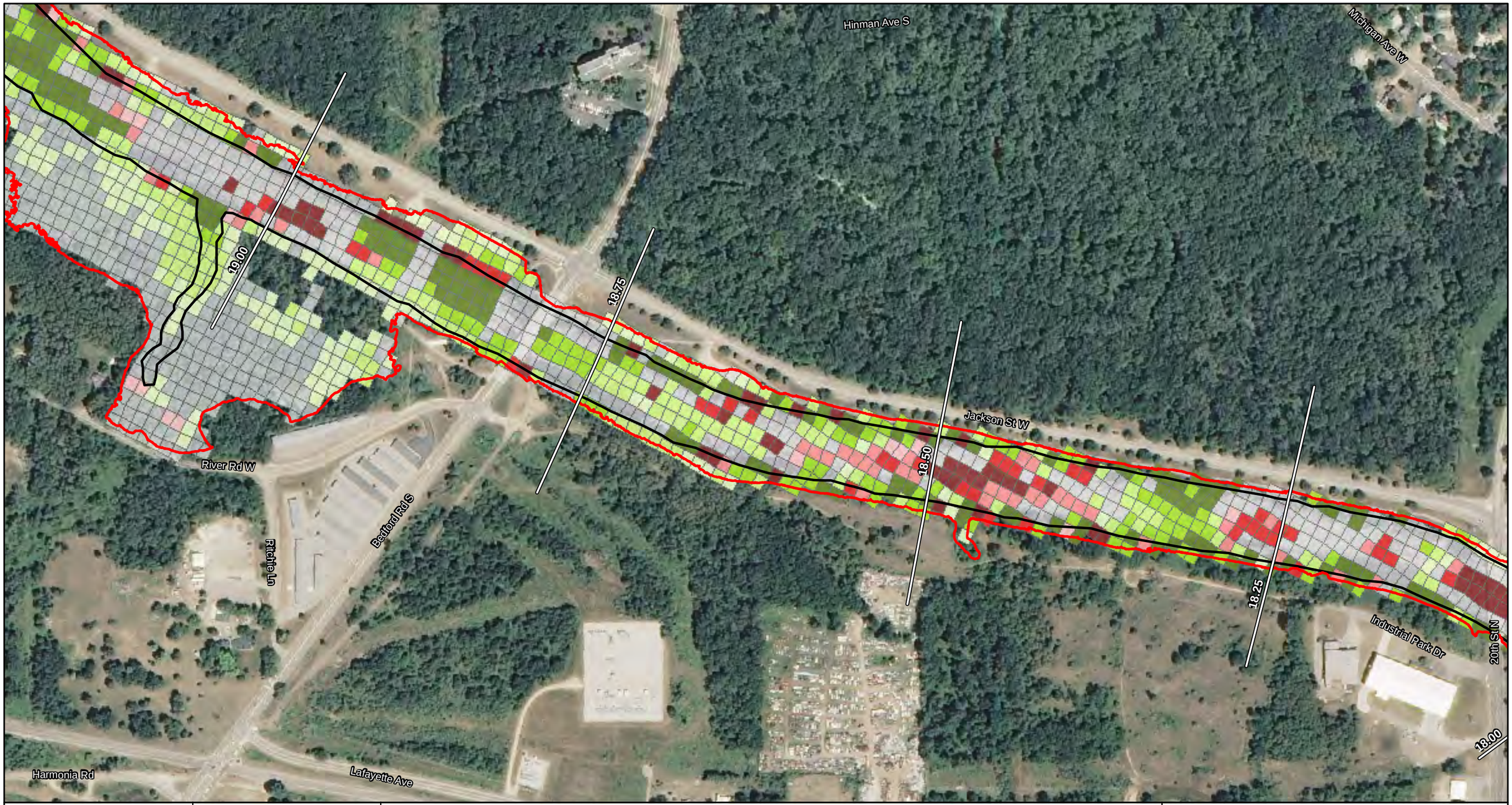
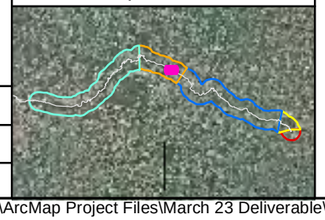
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 18.11 - MP 19.18

SHEET 18 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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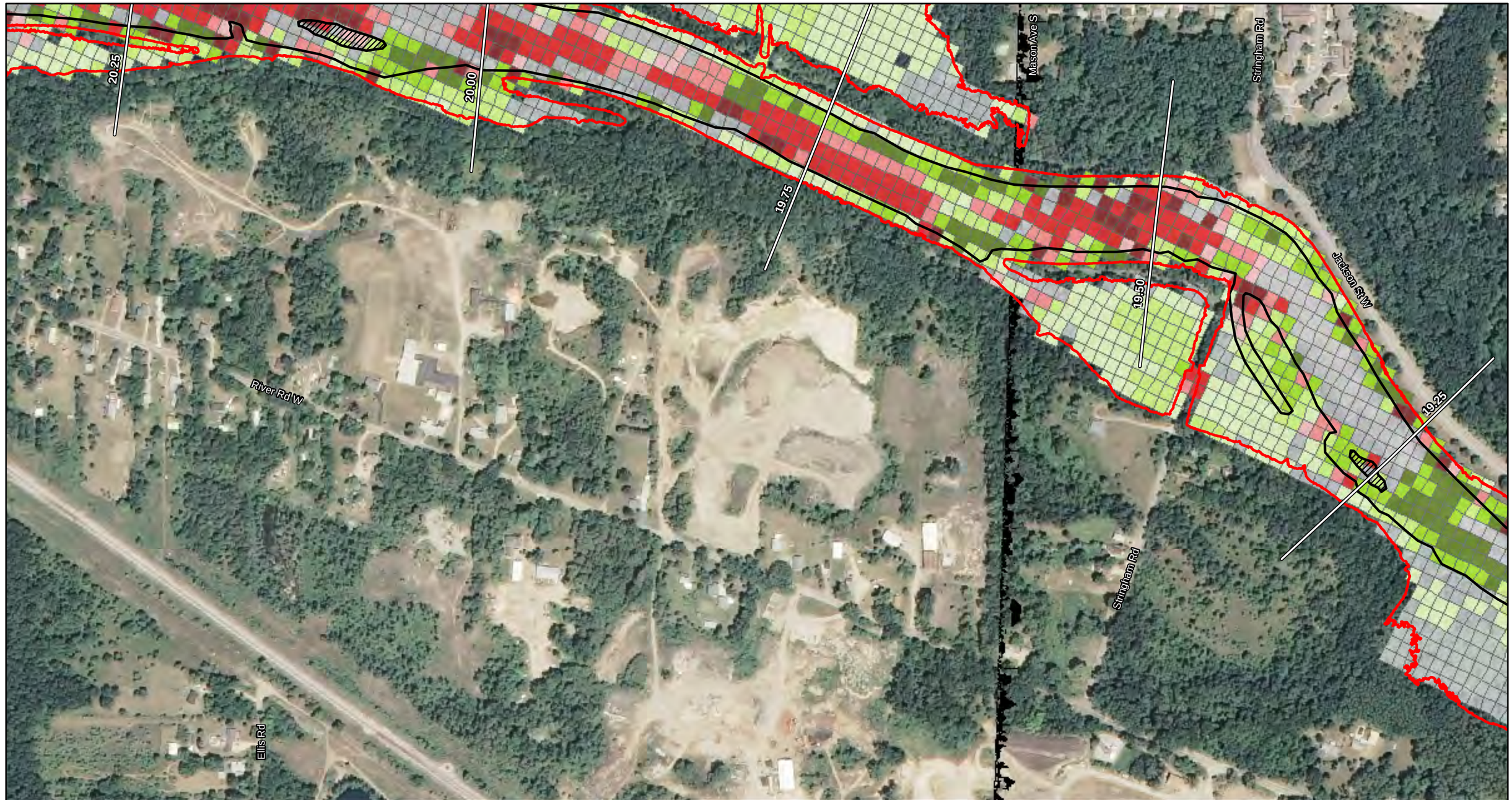
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 19.18 - MP 20.00

SHEET 19 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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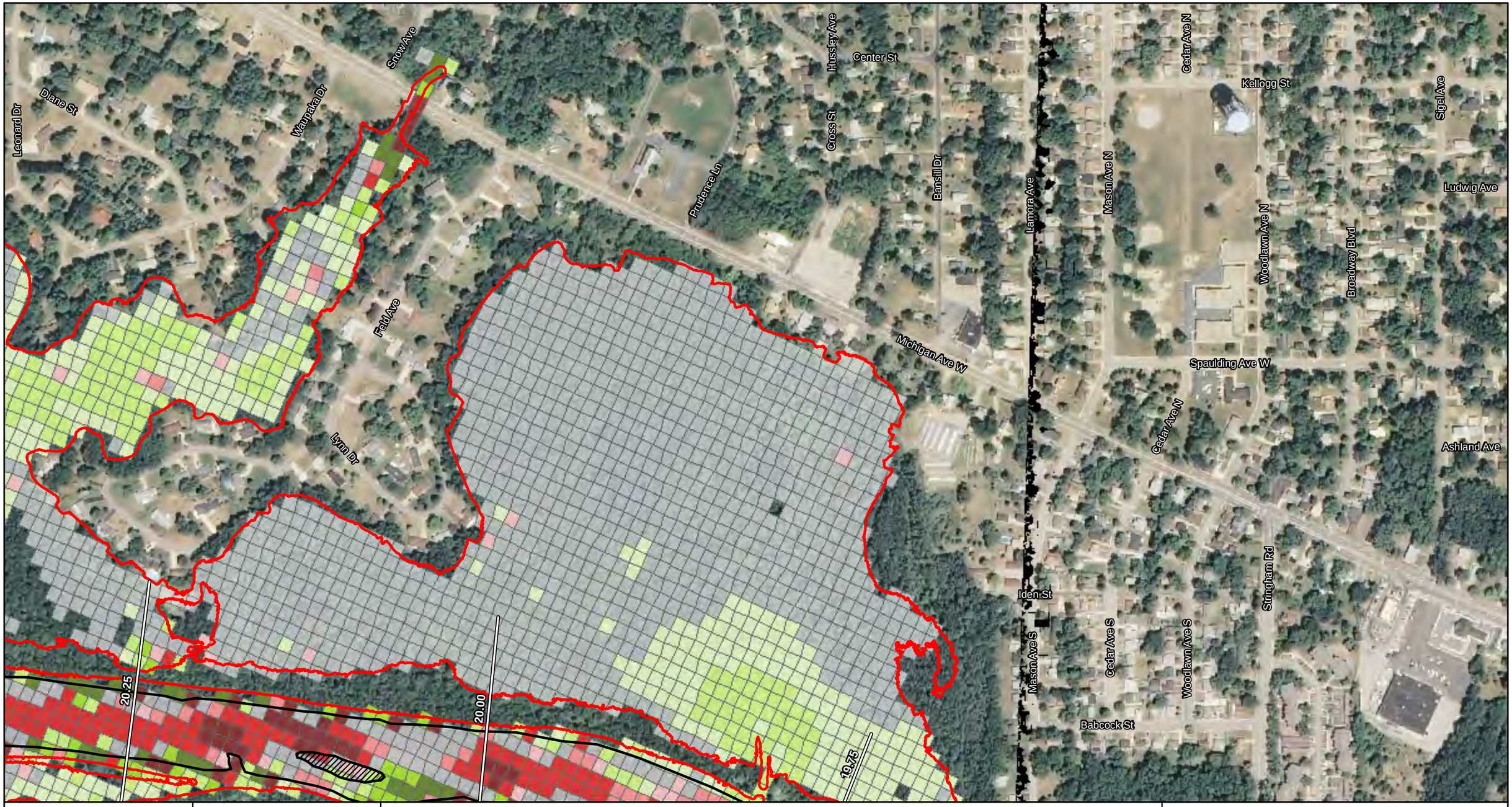
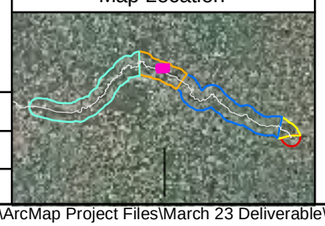
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 20.00 - MP 20.32

SHEET 20 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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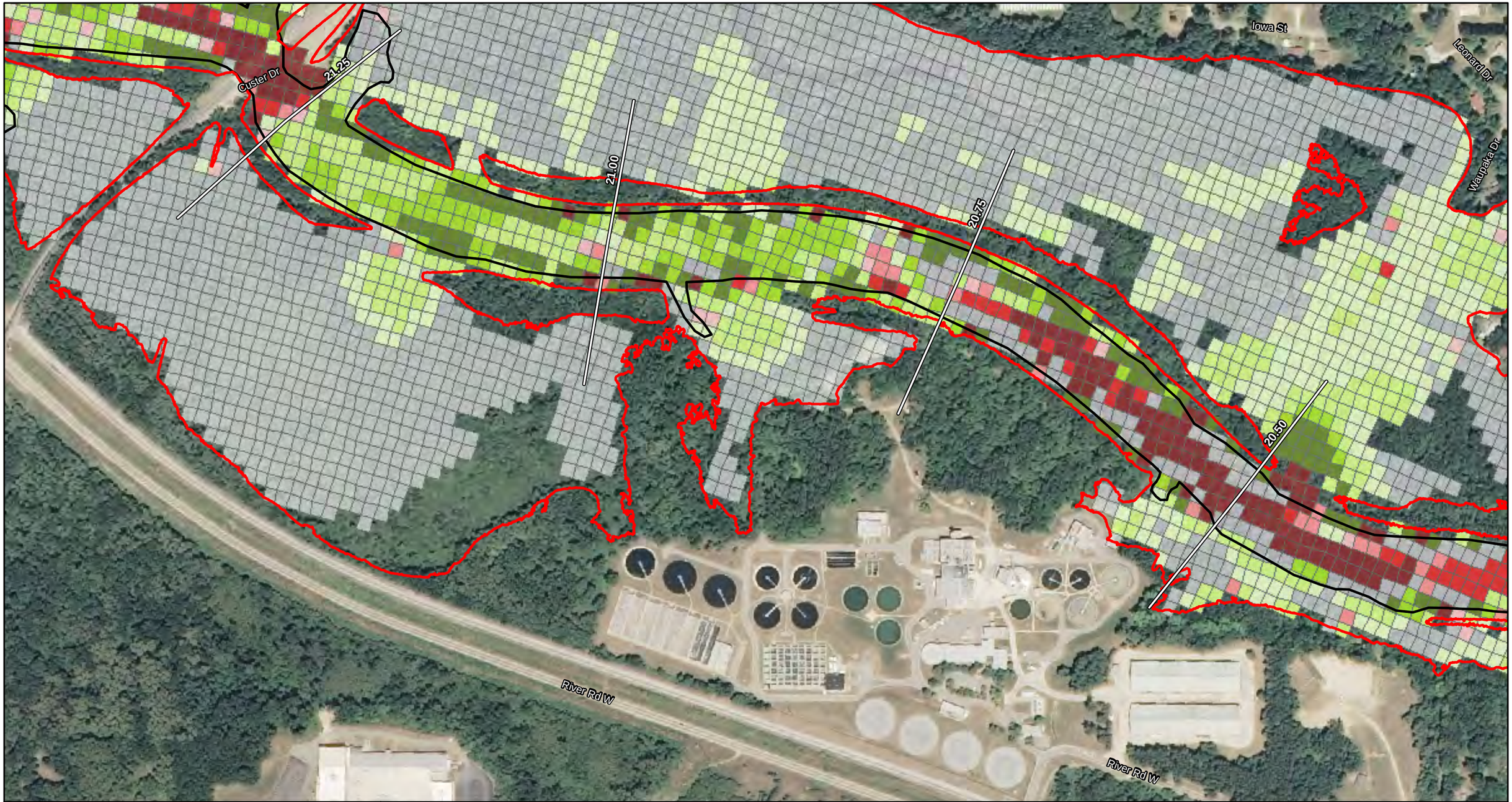
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 20.32 - MP 21.36

SHEET 21 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 21.36 - MP 21.59

SHEET 22 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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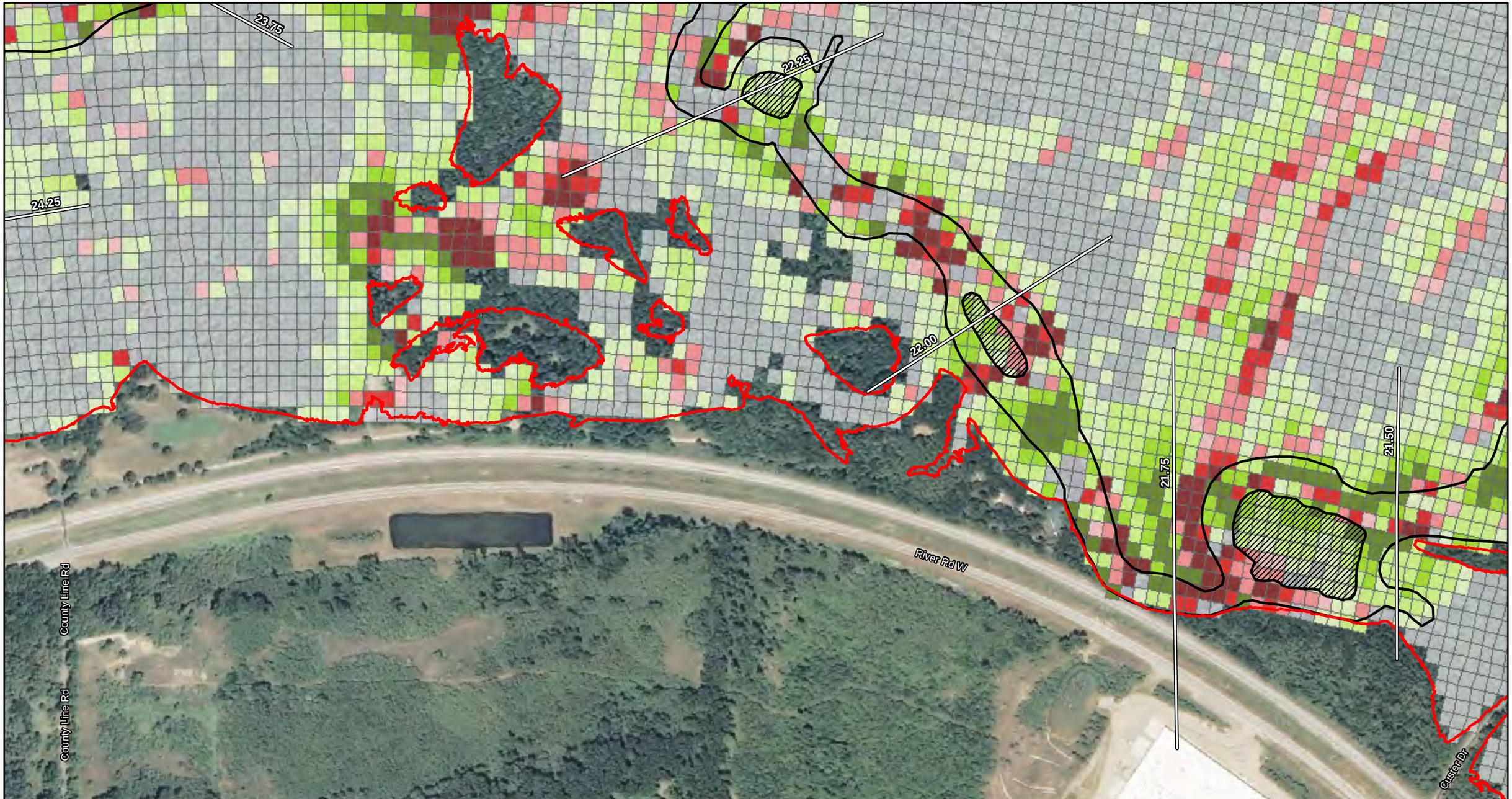
Aerial Photography Date: July & August 2009



Map Location

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 21.59 - MP 22.33

SHEET 23 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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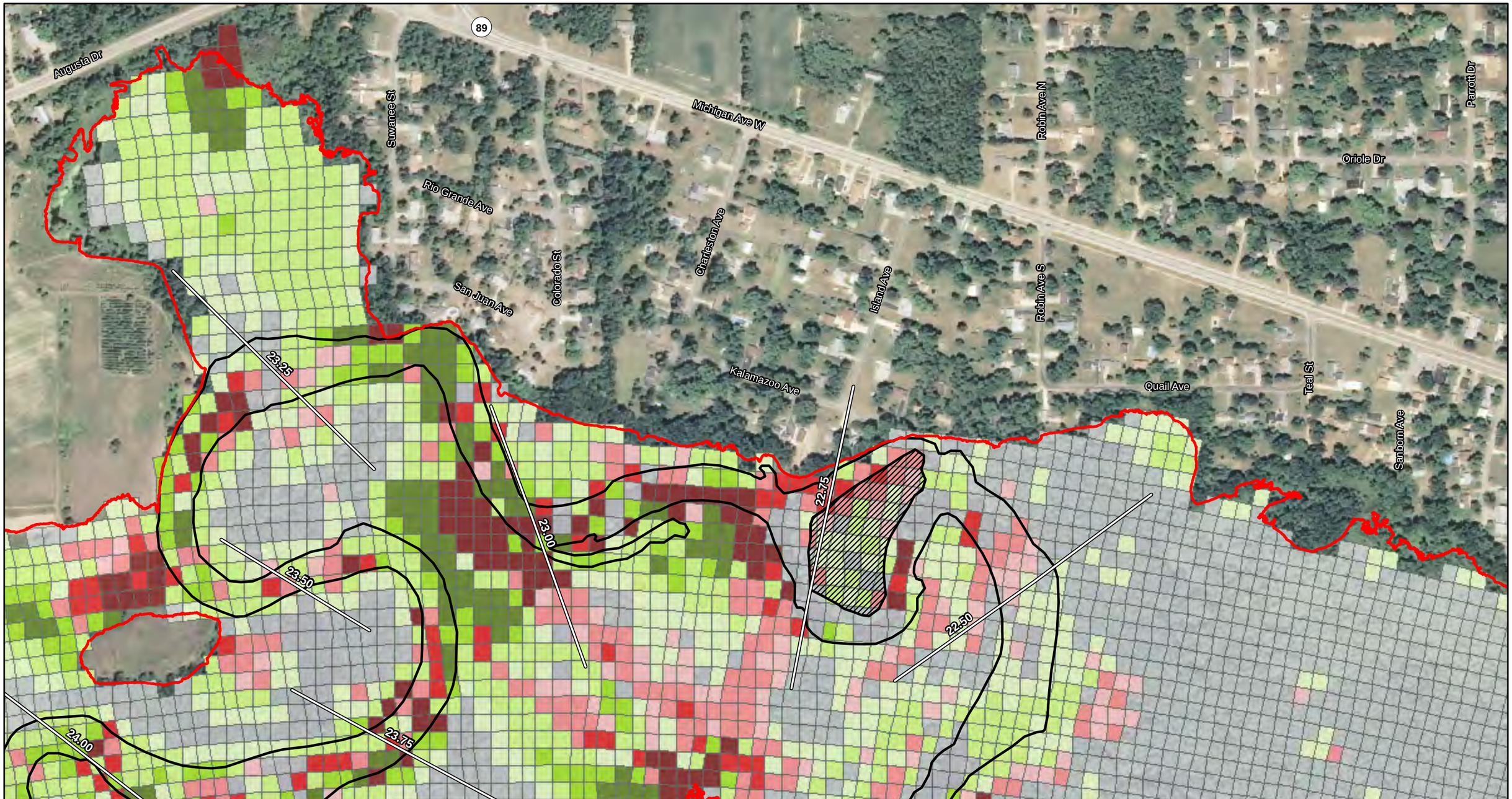
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 22.33 - MP 24.01

SHEET 24 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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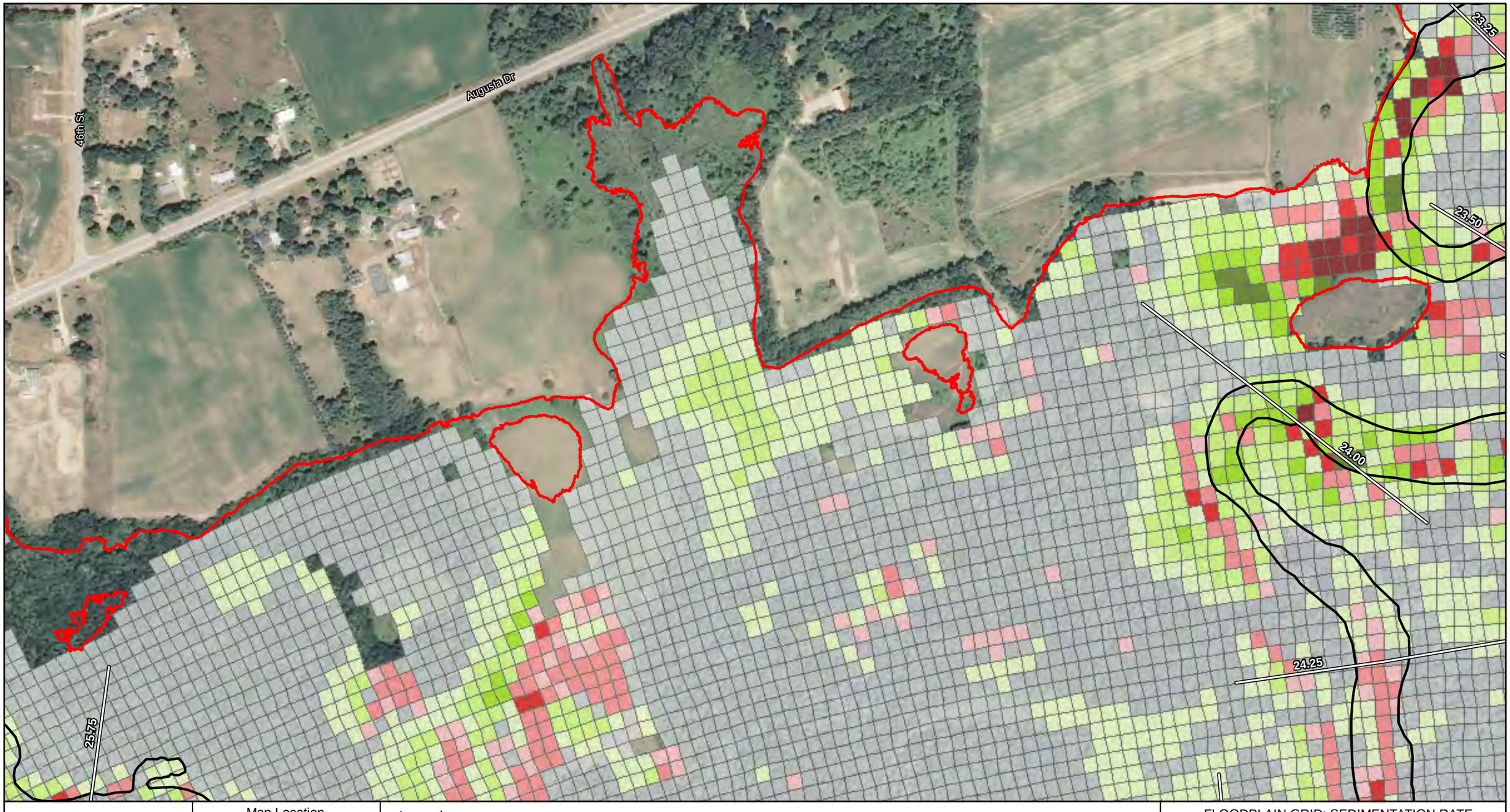
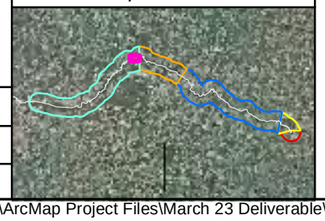
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 24.01 - MP 24.33

SHEET 25 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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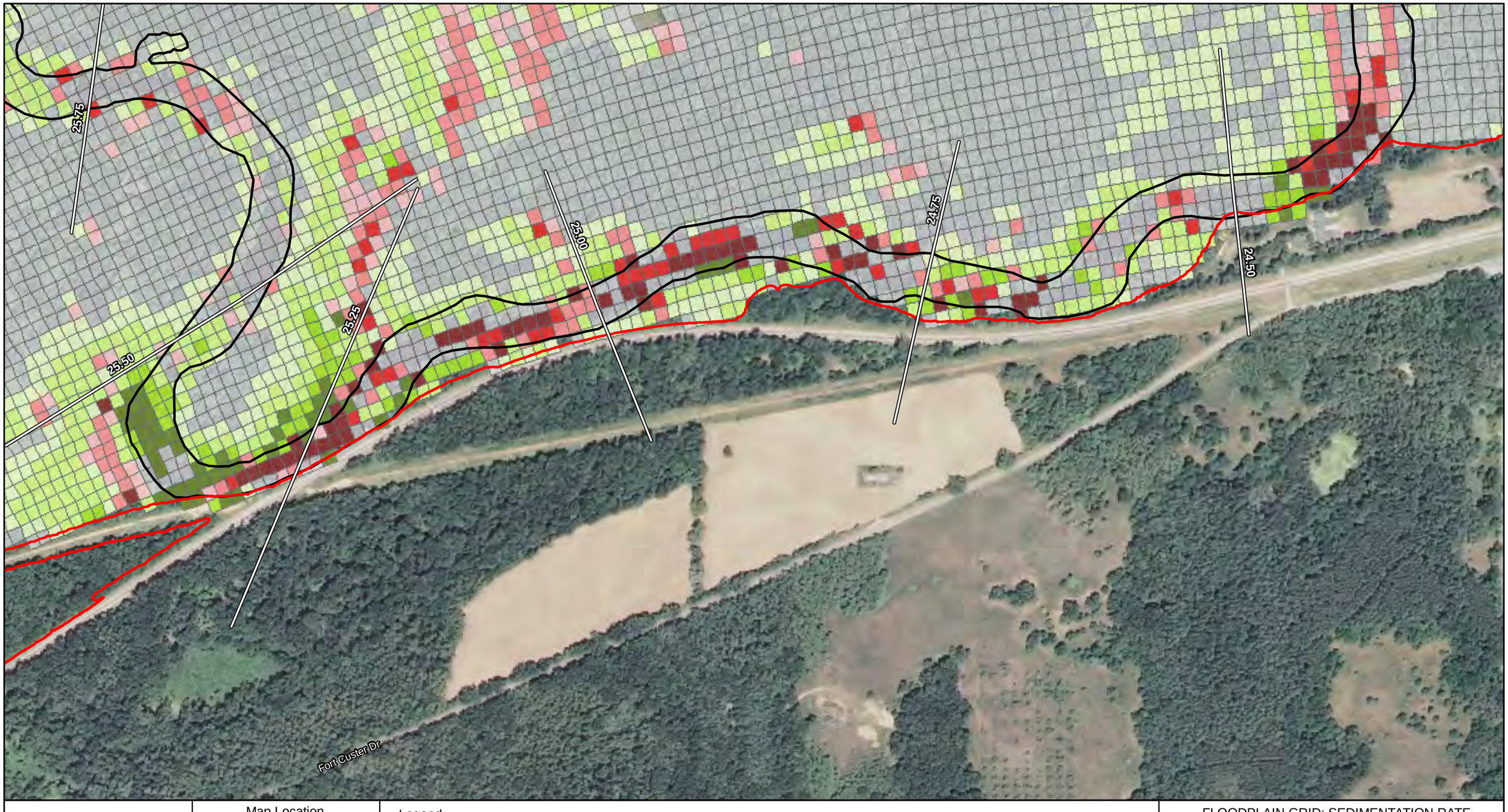
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 24.33 - MP 25.79

SHEET 26 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 25.79 - MP 26.80

SHEET 27 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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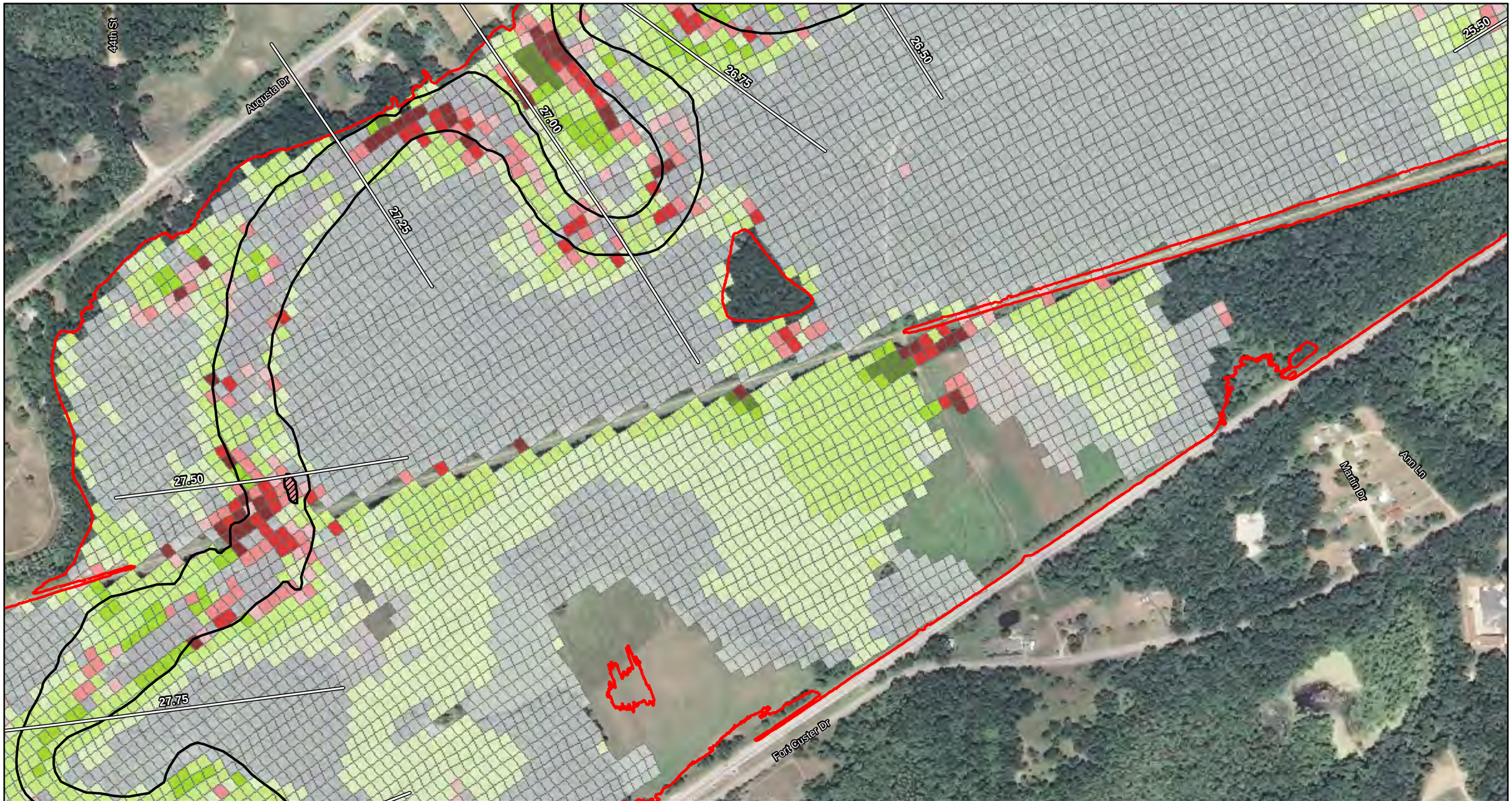
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 26.80 - MP 27.80

SHEET 28 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 27.80NW - MP 28.22NW

SHEET 29 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 27.80SE - MP 28.22SE

SHEET 30 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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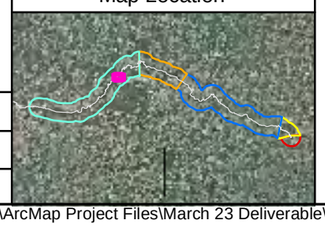
Aerial Photography Date: July & August 2009

Webster St
Jackson St
Convis
Augusta Ave
Van Buren St
Canal St
Canal St
Water St
Wayne Ter Berg St
Michigan Ave
28.75
28.50
28.25
Fort Custer Dr
Augusta Dr
Clinton St
Clinton St
29.00
Fayette St
29.25
Harmonia Rd
Fort Custer Rec Area Access
Augusta Climax Rd

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 28.22 - MP 29.20

SHEET 31 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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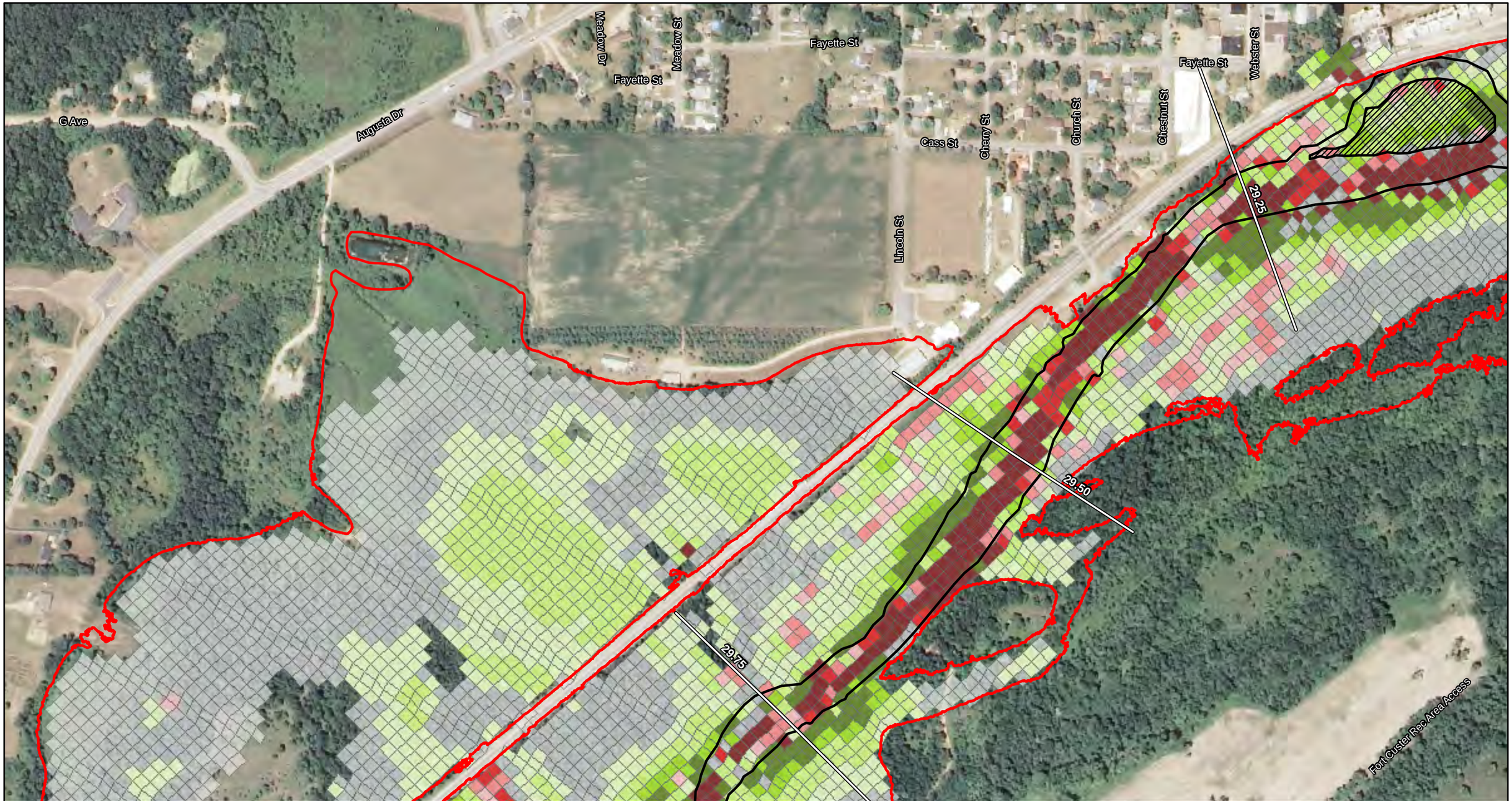
Aerial Photography Date: July & August 2009



Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 29.20 - MP 29.82

SHEET 32 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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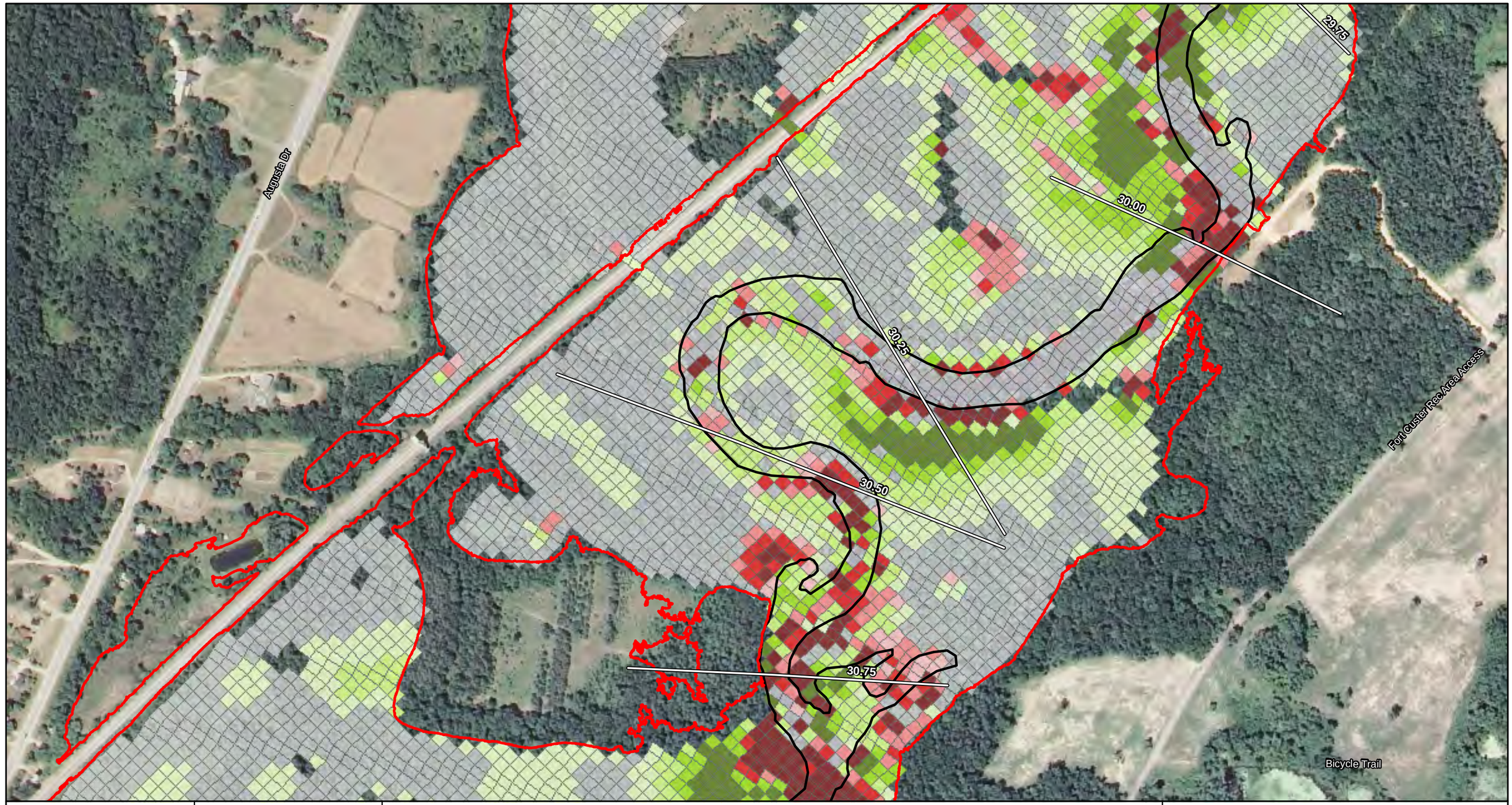
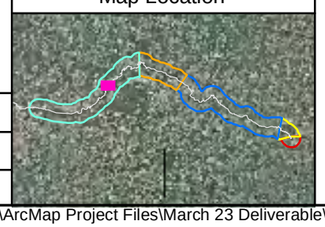
Aerial Photography Date: July & August 2009



Map Location



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Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 29.82 - MP 30.84

SHEET 33 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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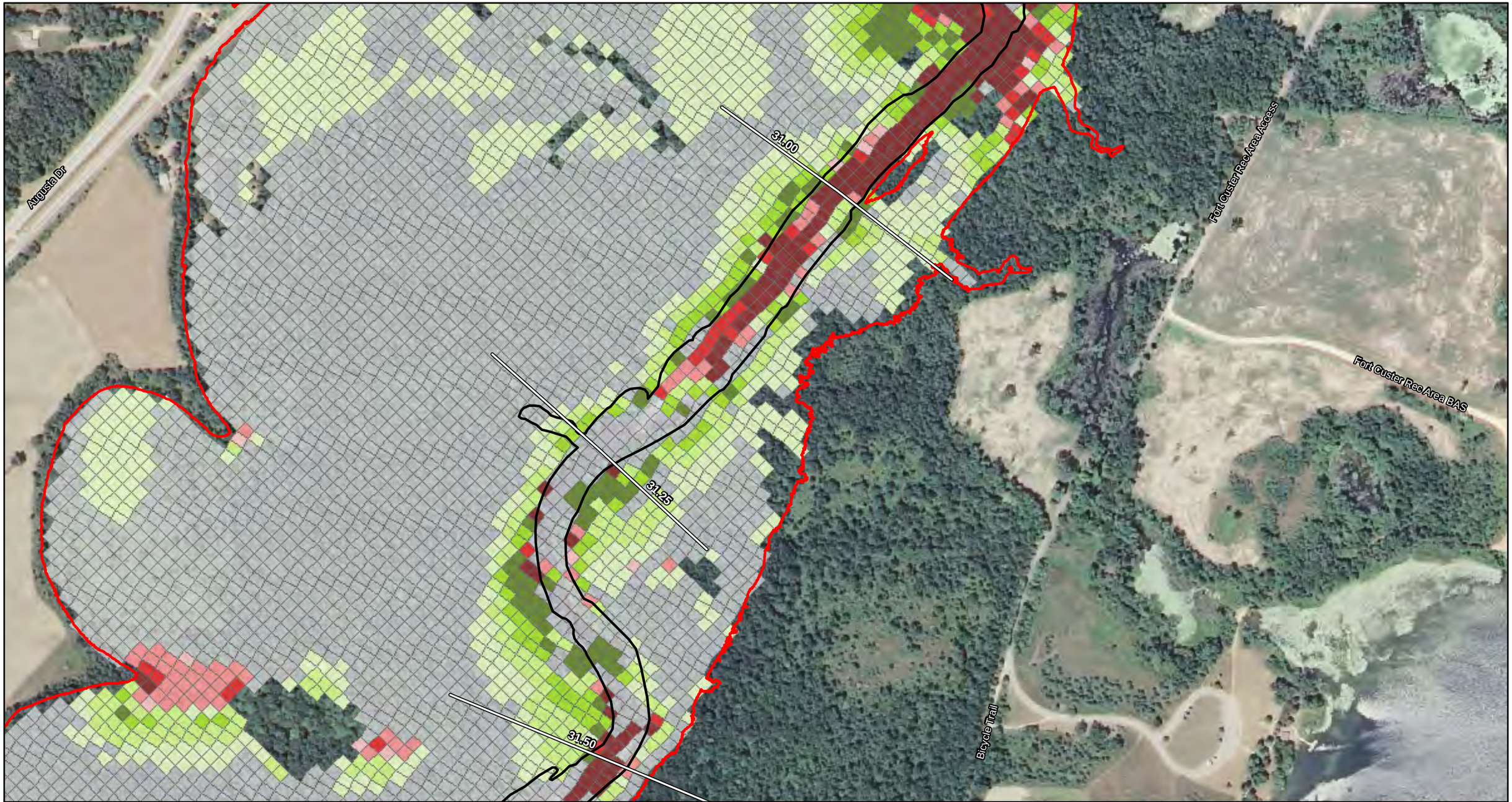
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 30.84 - MP 31.40

SHEET 34 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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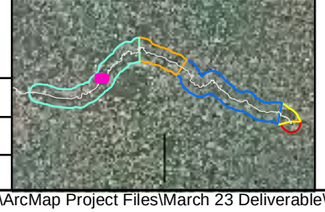
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 31.40 - MP 31.94

SHEET 35 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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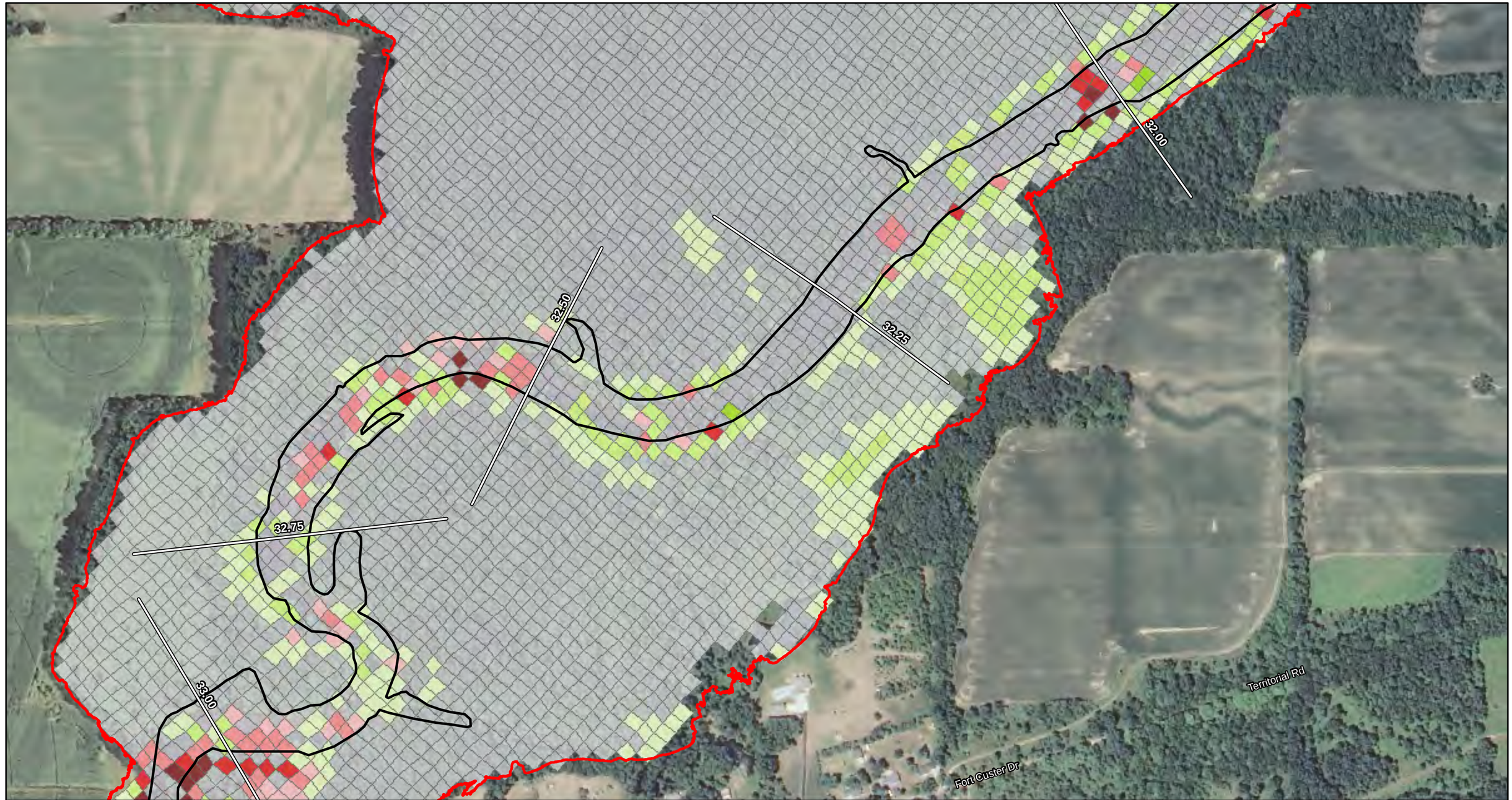
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 31.94 - MP 33.00

SHEET 36 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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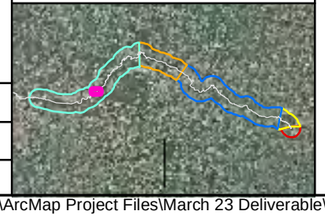
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 33.00 - MP 33.52

SHEET 37 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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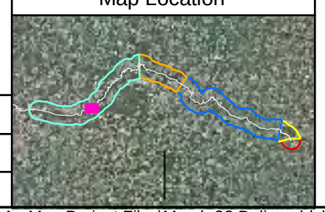
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 33.52 - MP 34.70

SHEET 38 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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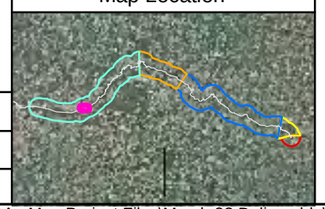
Aerial Photography Date: July & August 2009

Grant St
Elmwood Blvd
Grove St
Church St
Mill St
Blake Blvd
Battle Creek St
Climax Dr
34.50
34.75
35.25
35.50
35.00
35.75
Streamside Dr
Miller Rd

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 34.70 - MP 35.75

SHEET 39 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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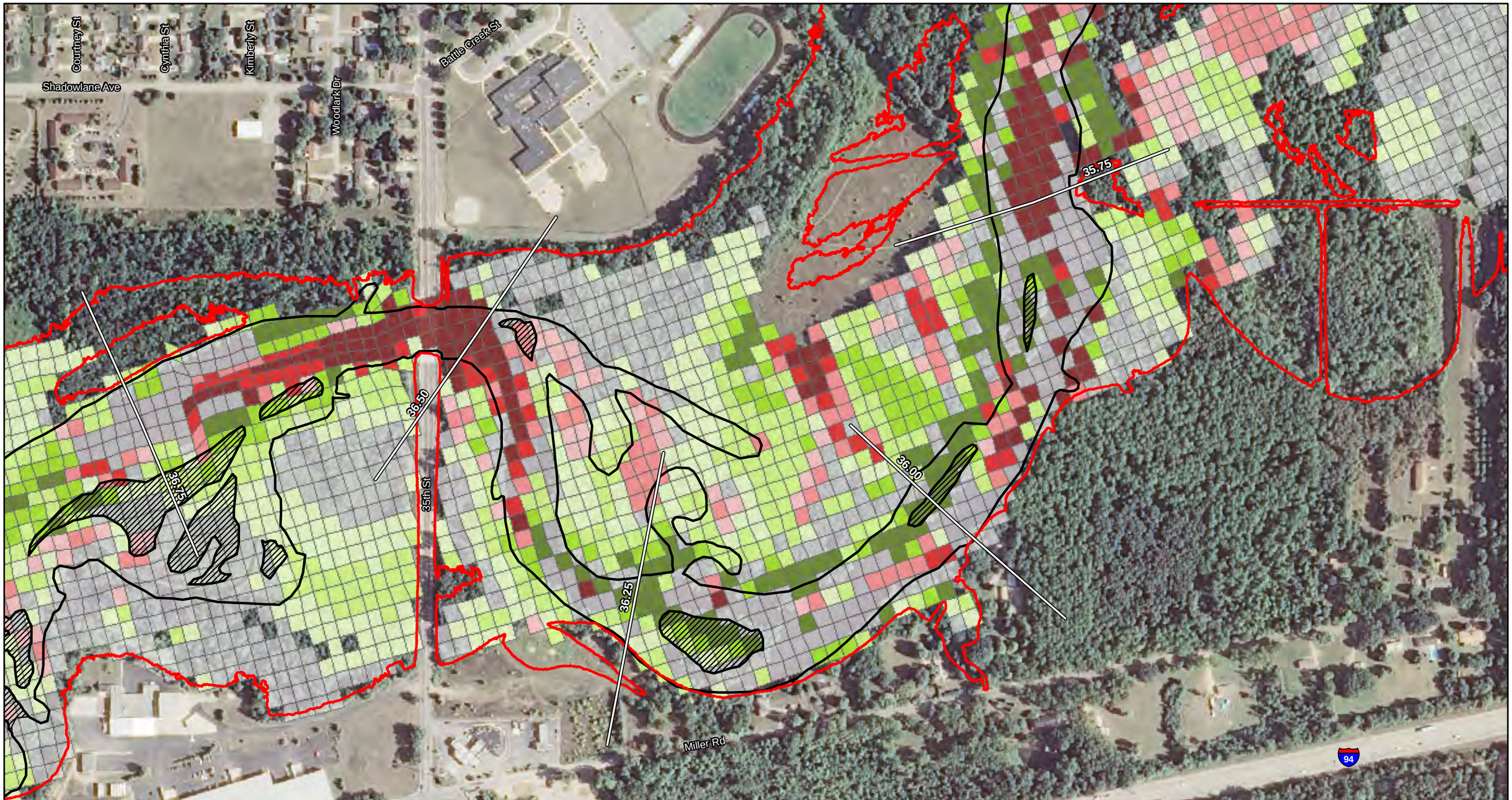
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 35.75 - MP 36.75

SHEET 40 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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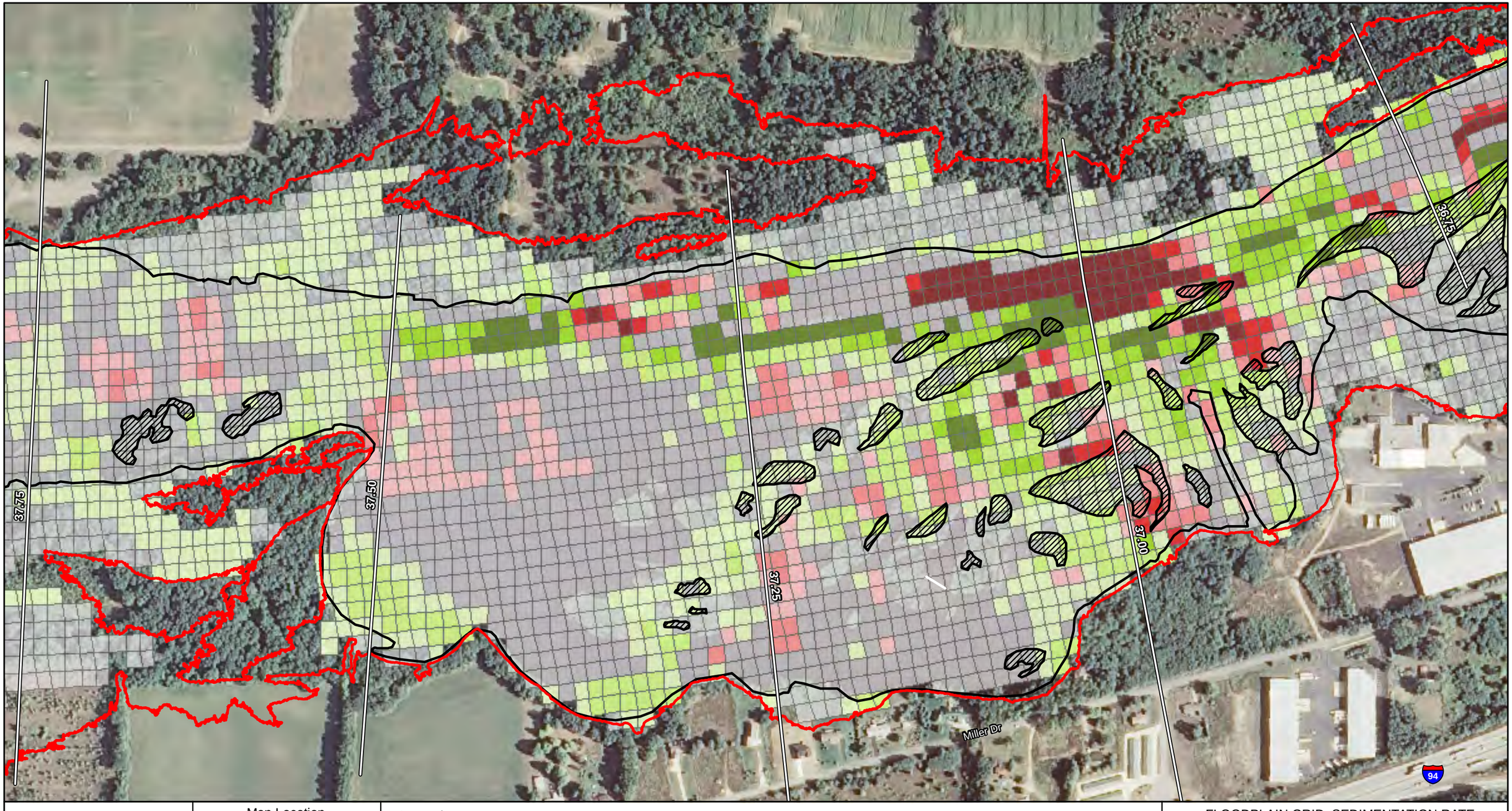
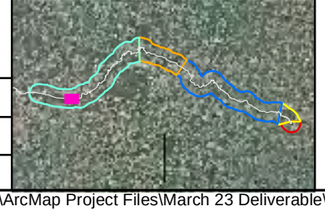
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 36.75 - MP 37.75

SHEET 41 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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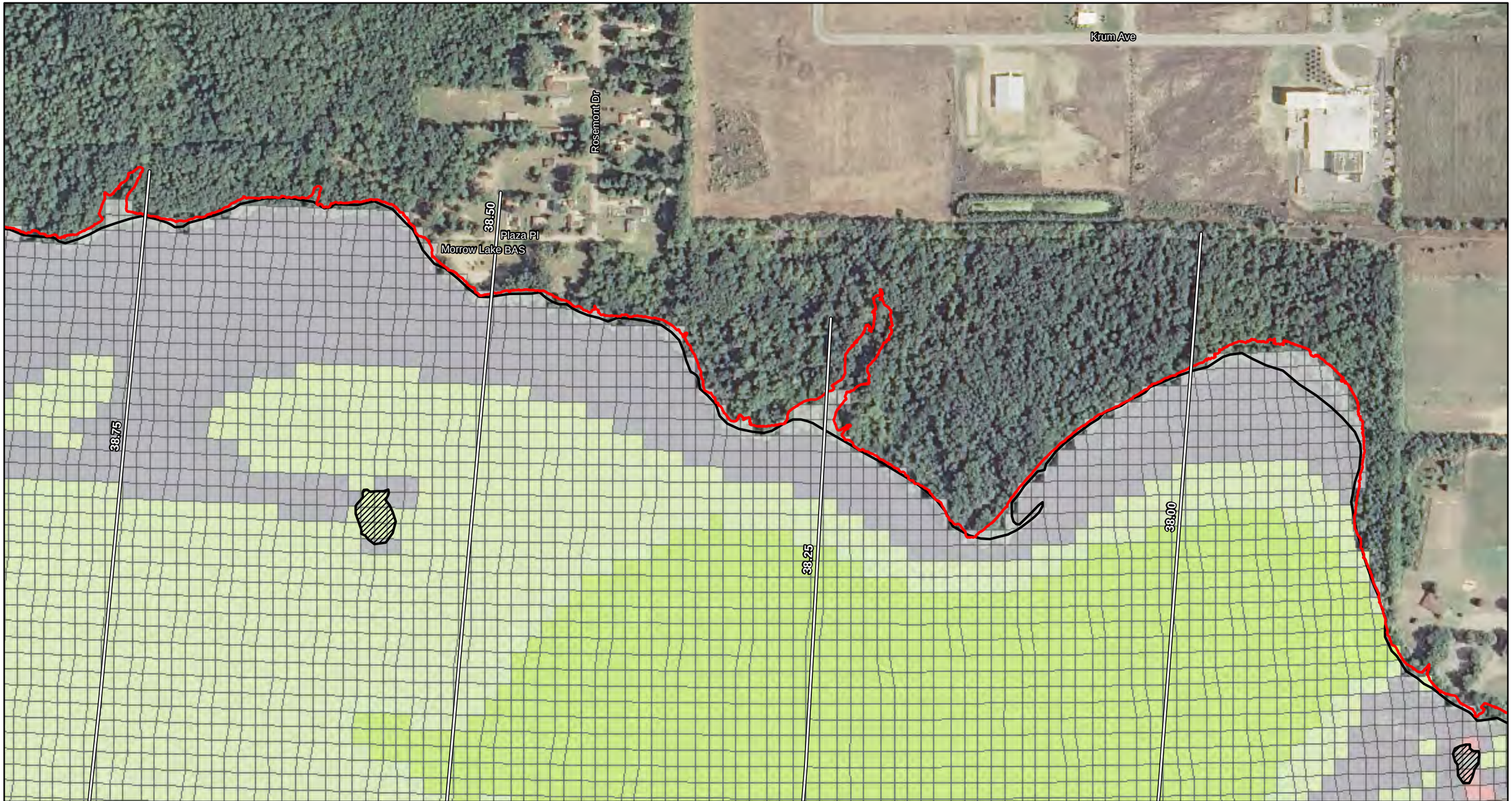
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 37.75N - MP 38.80N

SHEET 42 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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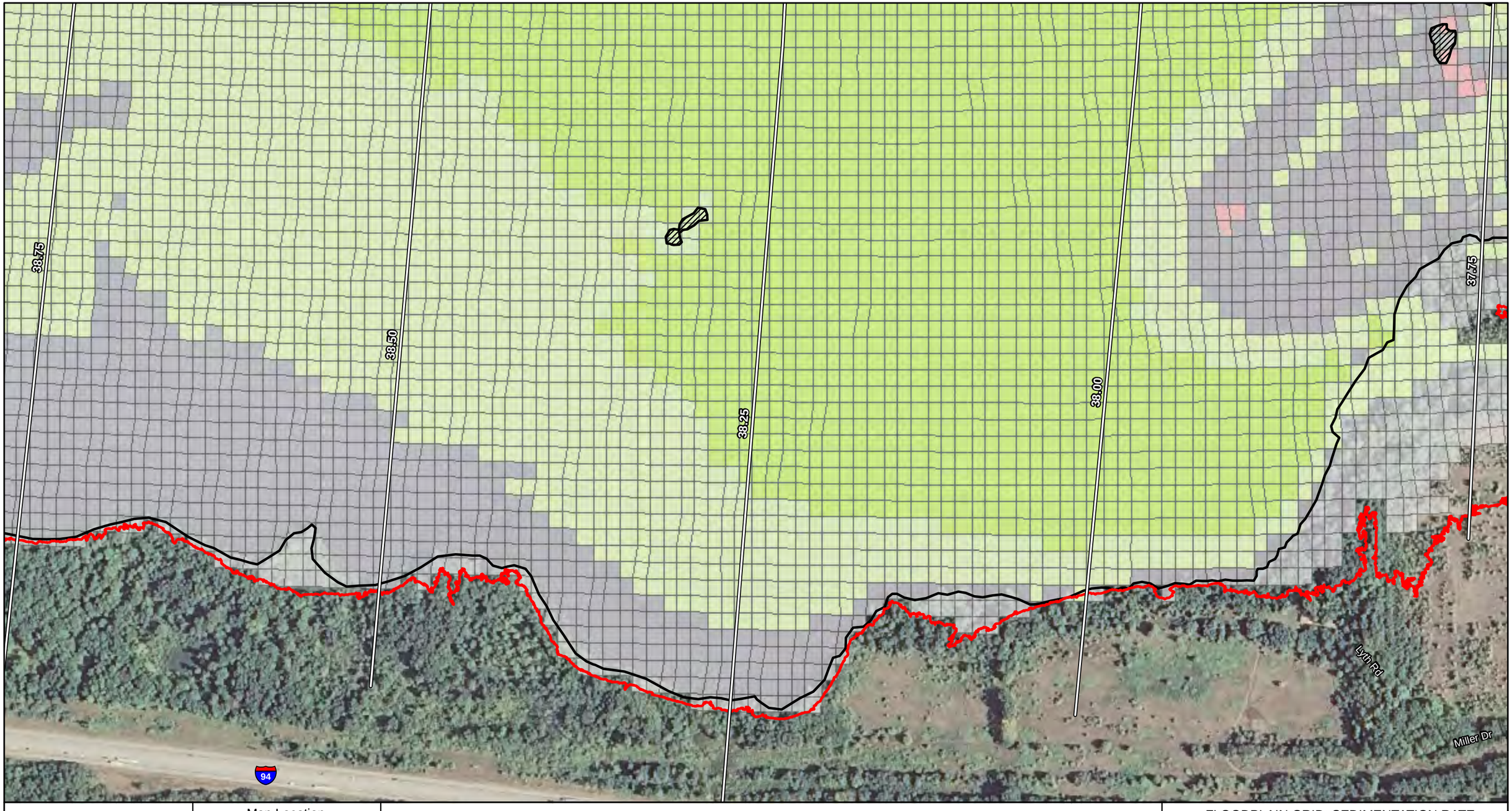
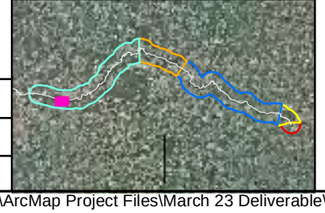
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 37.75S - MP 38.80S

SHEET 43 OF 45

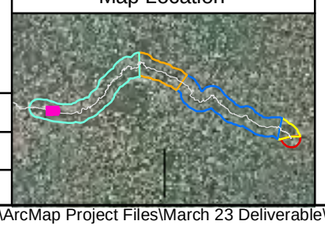
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_100yr.mxd

Aerial Photography Date: July & August 2009

Arden Ave
Morrow St
Elliot Rd
Lawndale Ave
Chene Dr
Consumers Power Dr
39.75
39.50
39.25
39.00

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700
Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 38.80N - MP 39.95N

SHEET 44 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_100yr.mxd

Aerial Photography Date: July & August 2009

39.50

39.25

39.00

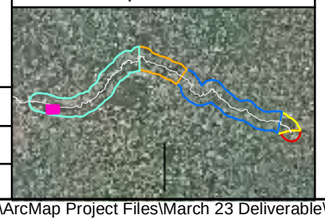
38.75

94

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD
MP 38.80S - MP 39.95S

SHEET 45 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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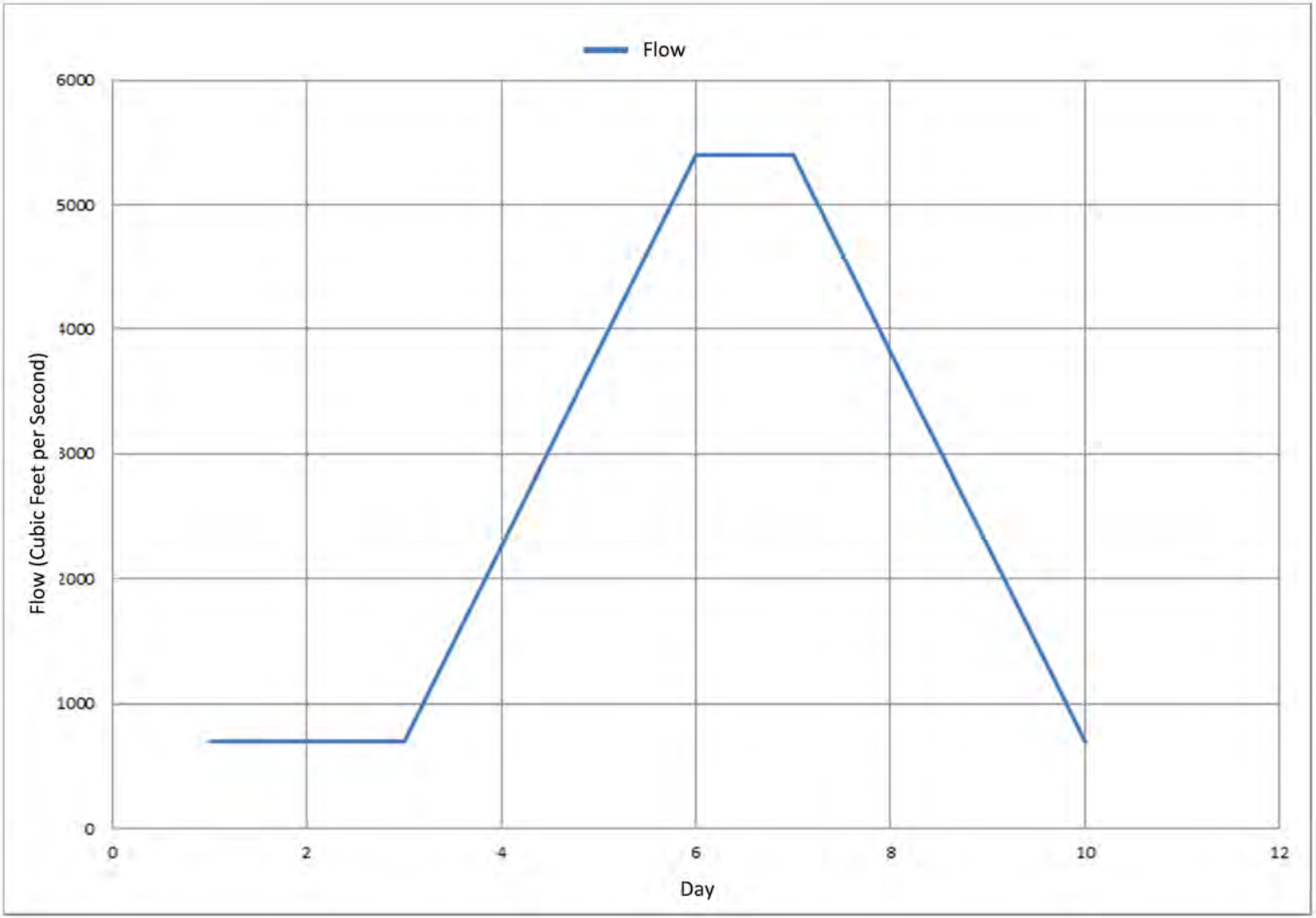
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_100yr.mxd

Aerial Photography Date: July & August 2009

Figure 6-16

50-Year Flow at Kalamazoo River Near Battle Creek



ENBRIDGE

Drawn:	JLH	04/17/2012
Approved:	DBR	04/17/2012
Project #:	106-4186	

50-YEAR FLOW AT KALAMAZOO RIVER NEAR BATTLE CREEK

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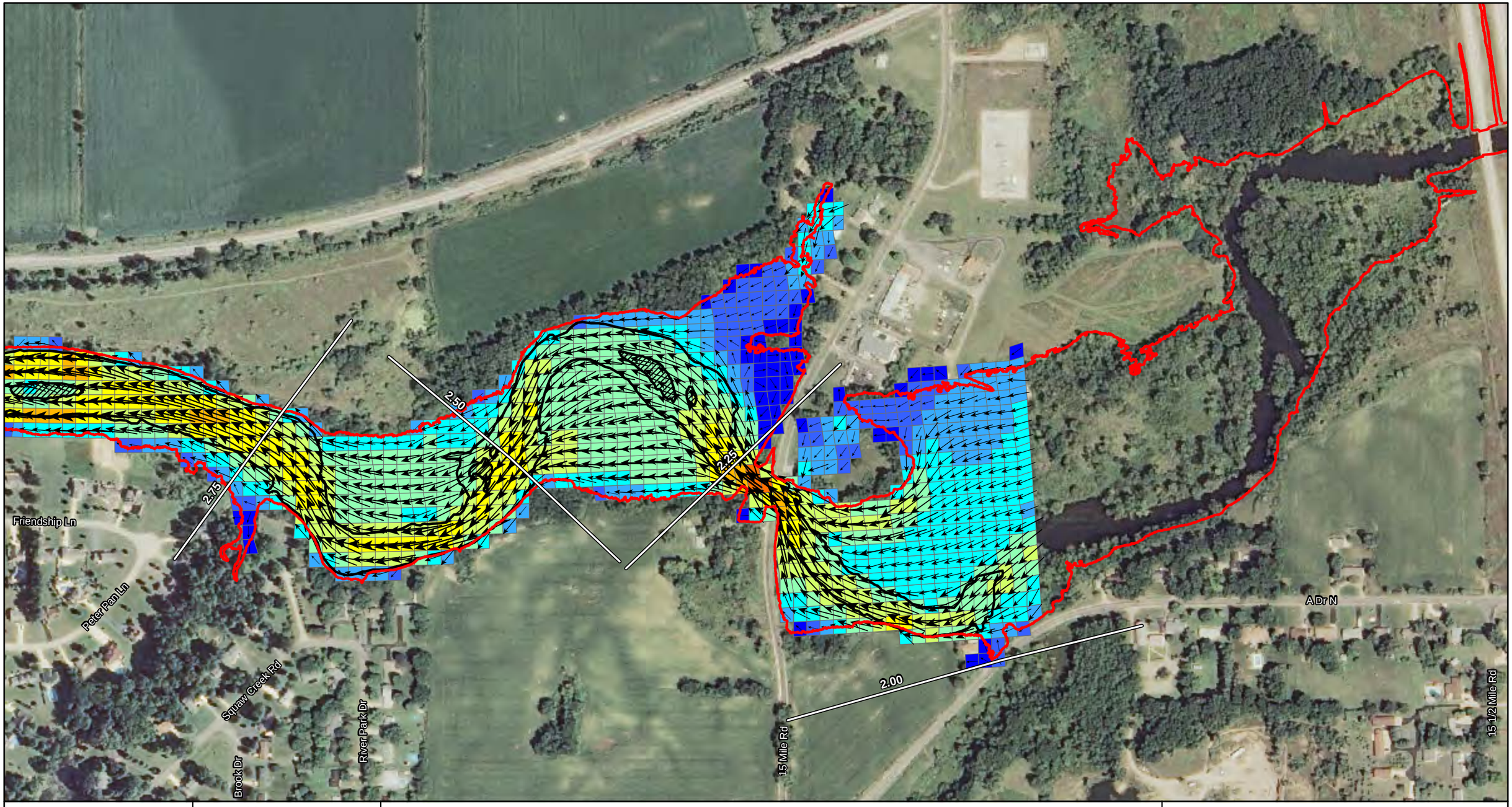
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 6-17

Floodplain Grid: Velocity

50-Year Flood

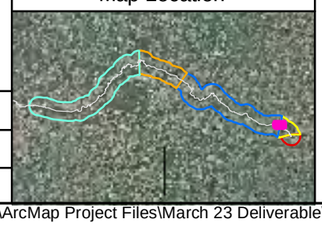
Sheets 1 through 45



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 01.88 - MP 02.91

SHEET 1 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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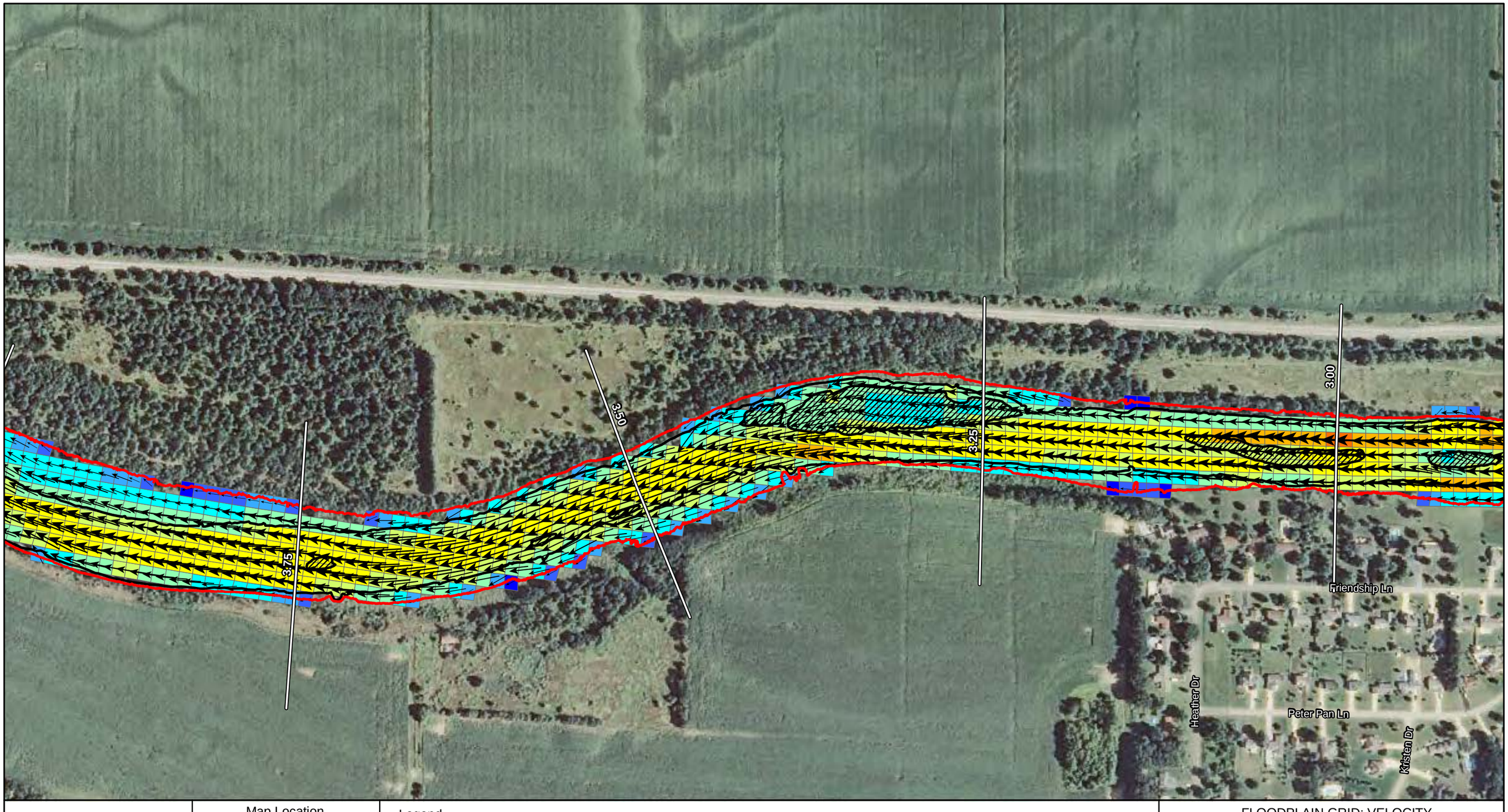
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

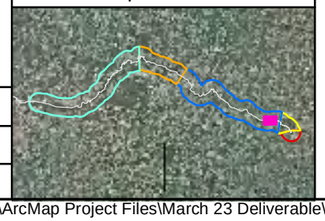
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 02.91 - MP 03.93

SHEET 2 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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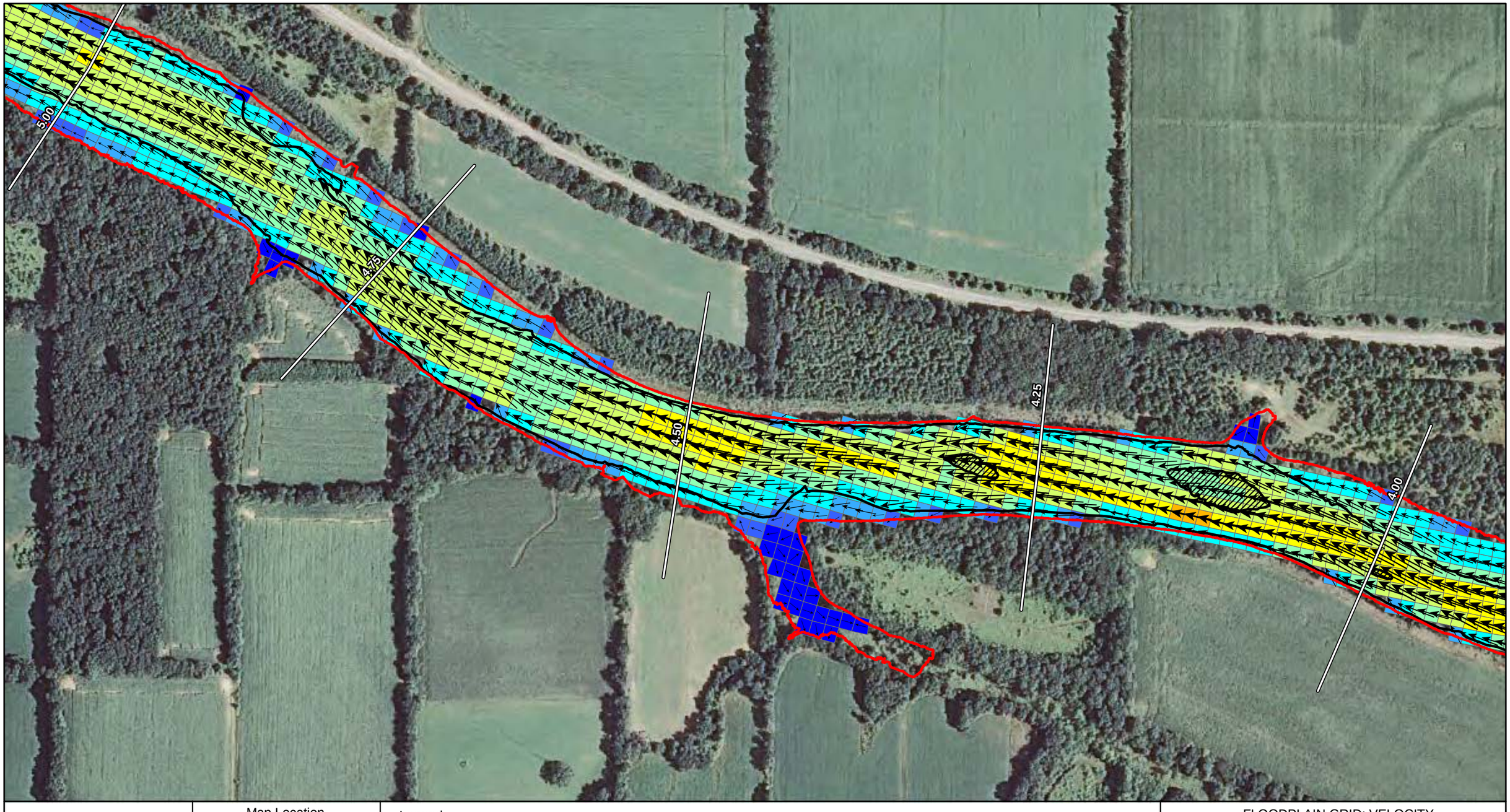
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

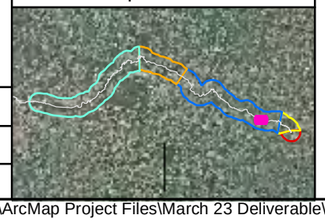
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

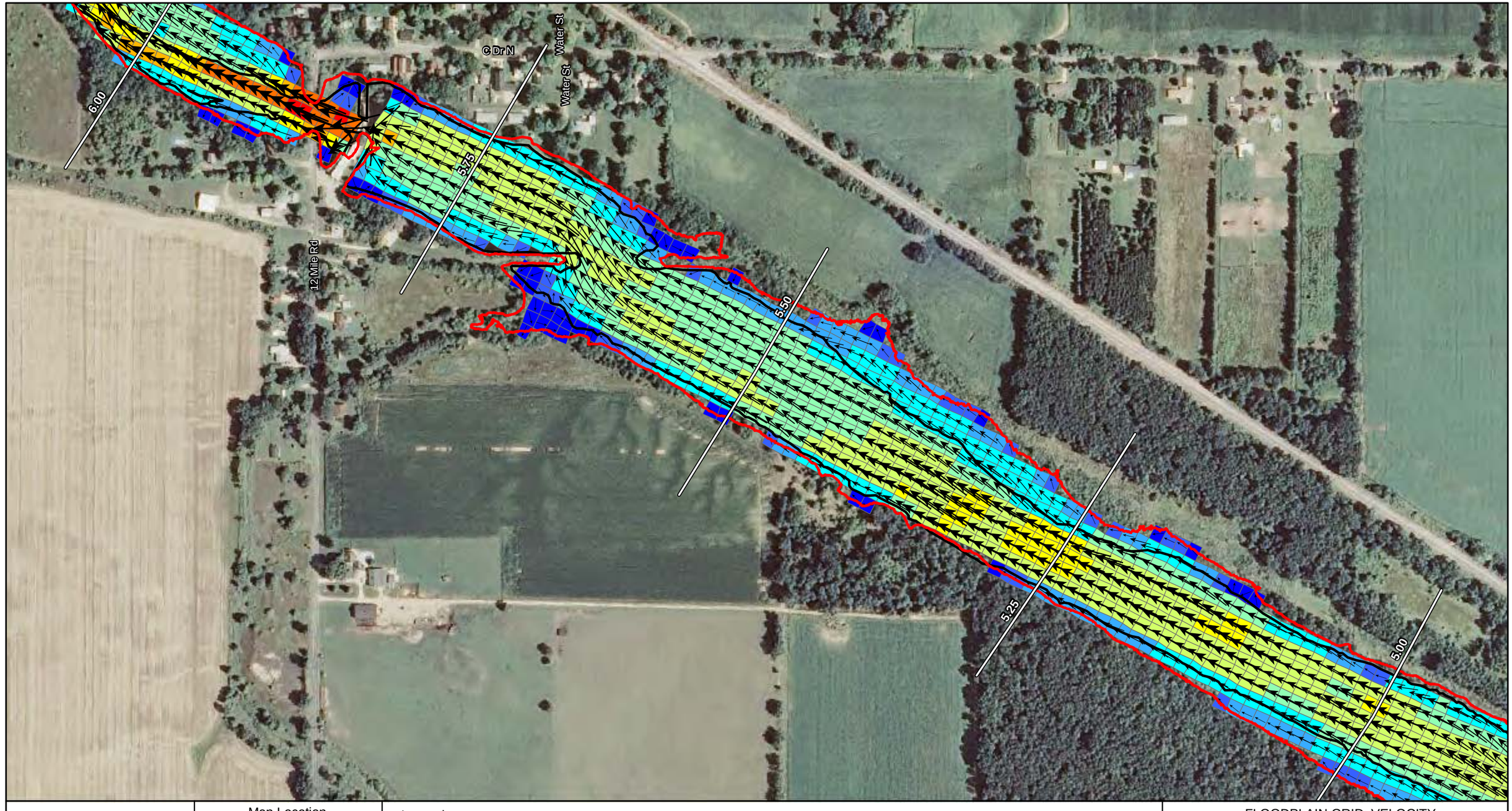
MP 03.93 - MP 04.98

SHEET 3 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

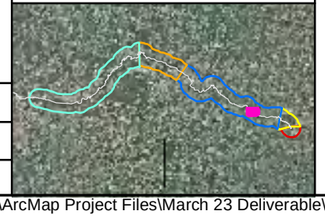
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

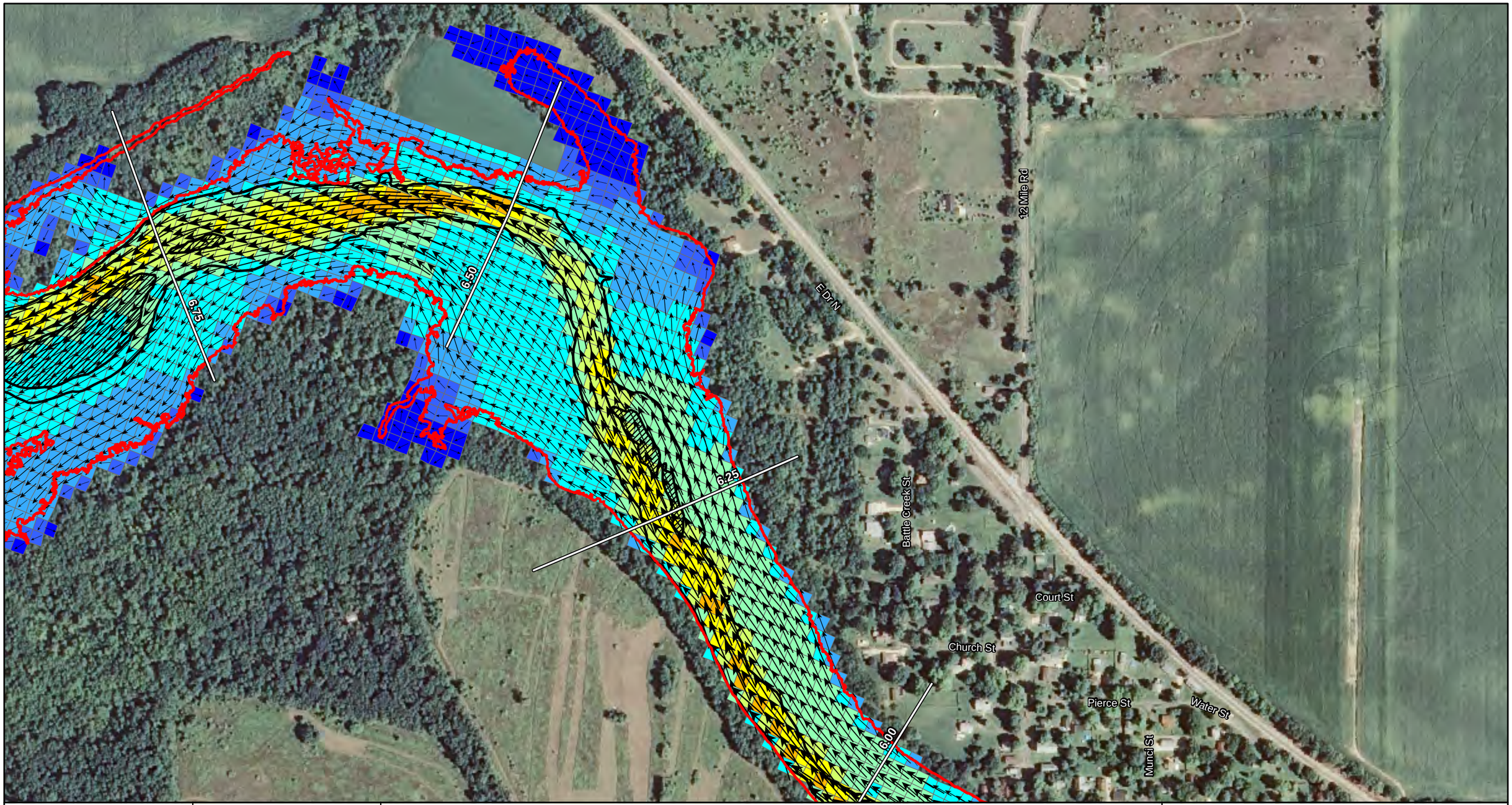
MP 04.98 - MP 06.03

SHEET 4 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

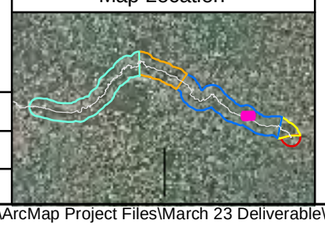
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

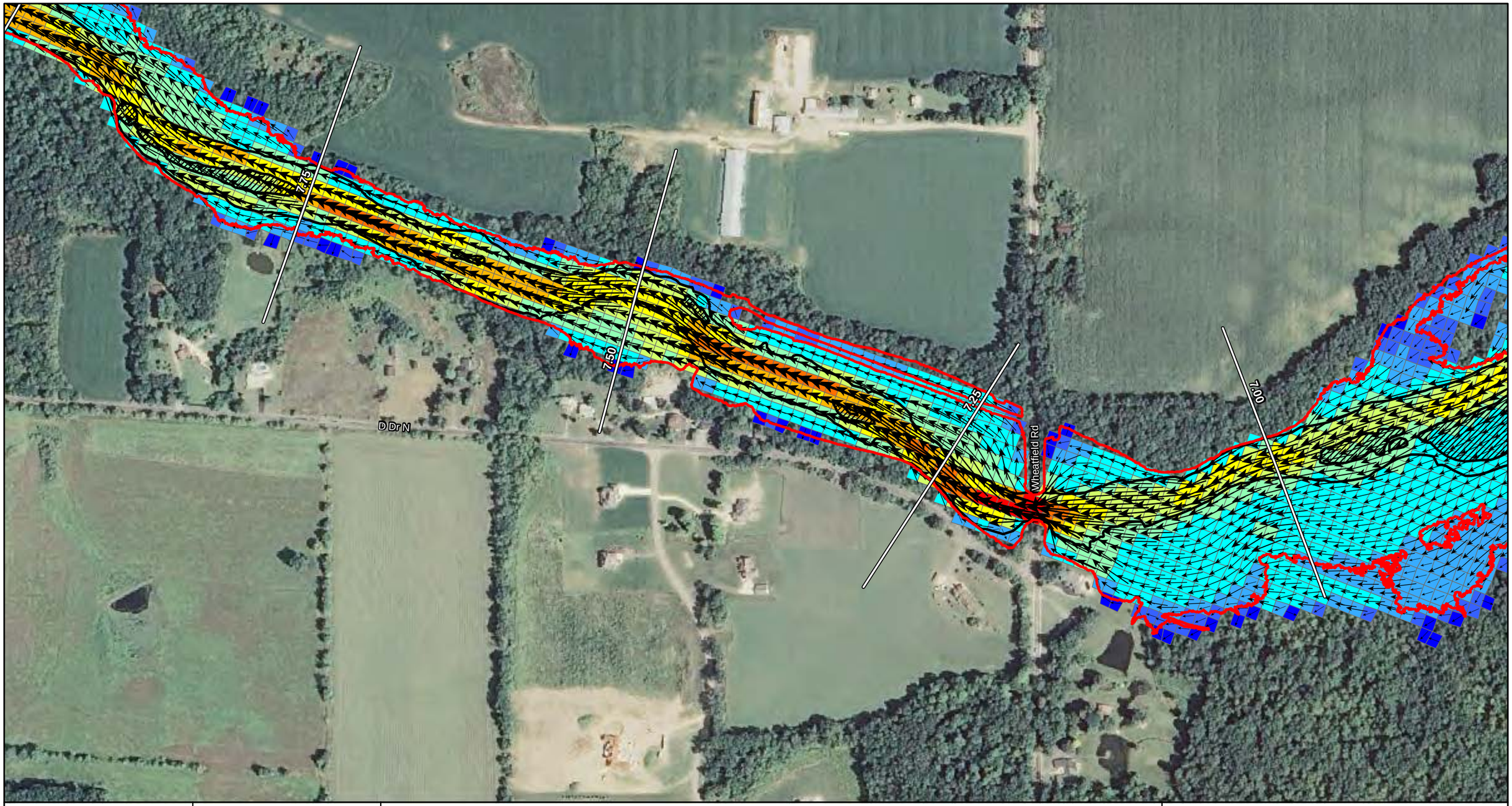
MP 06.03 - MP 06.85

SHEET 5 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

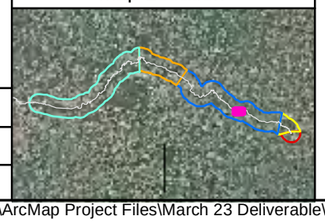
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 06.85 - MP 07.95

SHEET 6 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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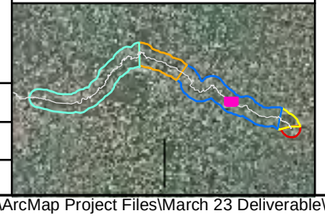
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

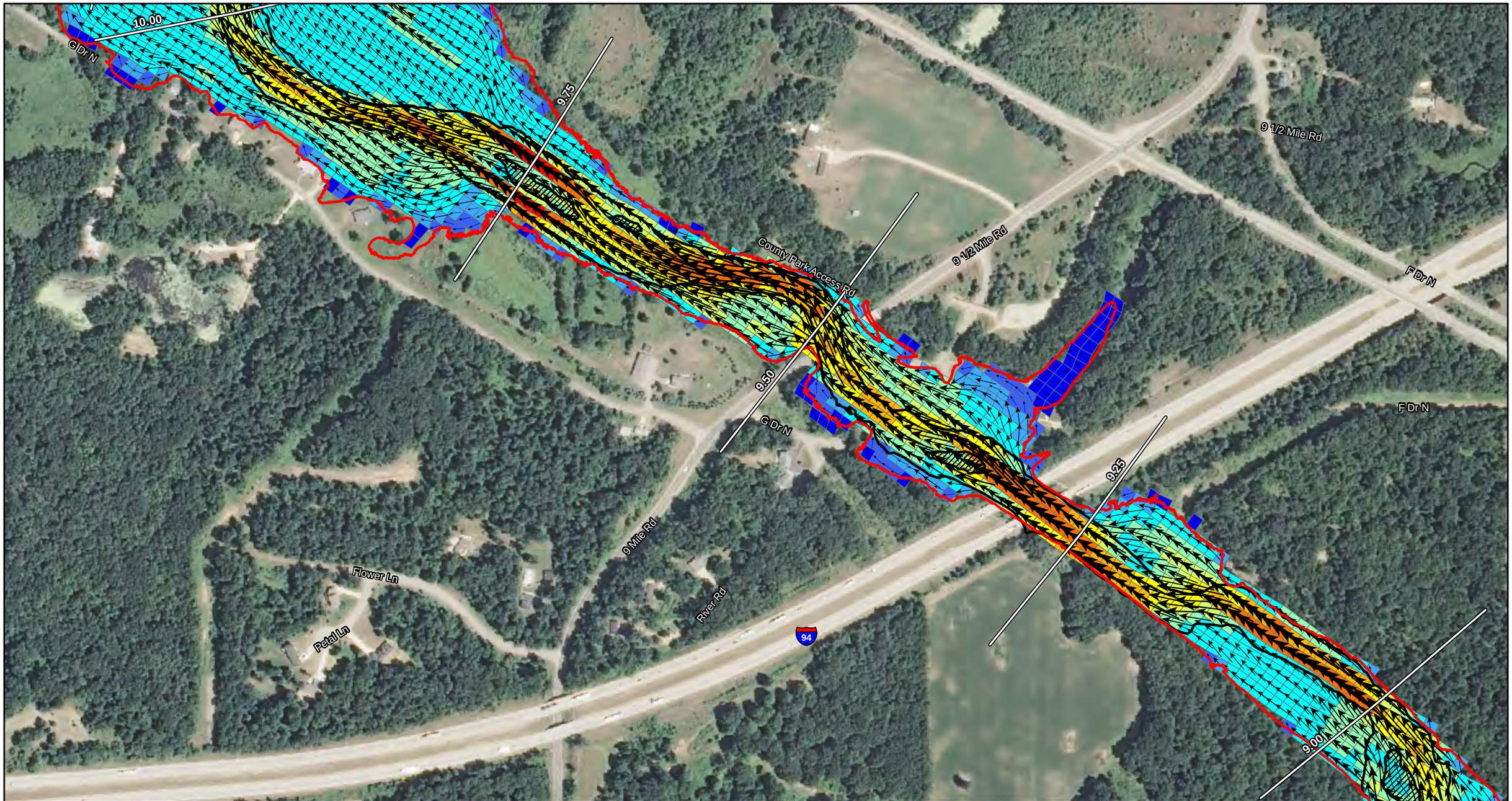
MP 07.95 - MP 08.93

SHEET 7 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 08.93 - MP 10.00

SHEET 8 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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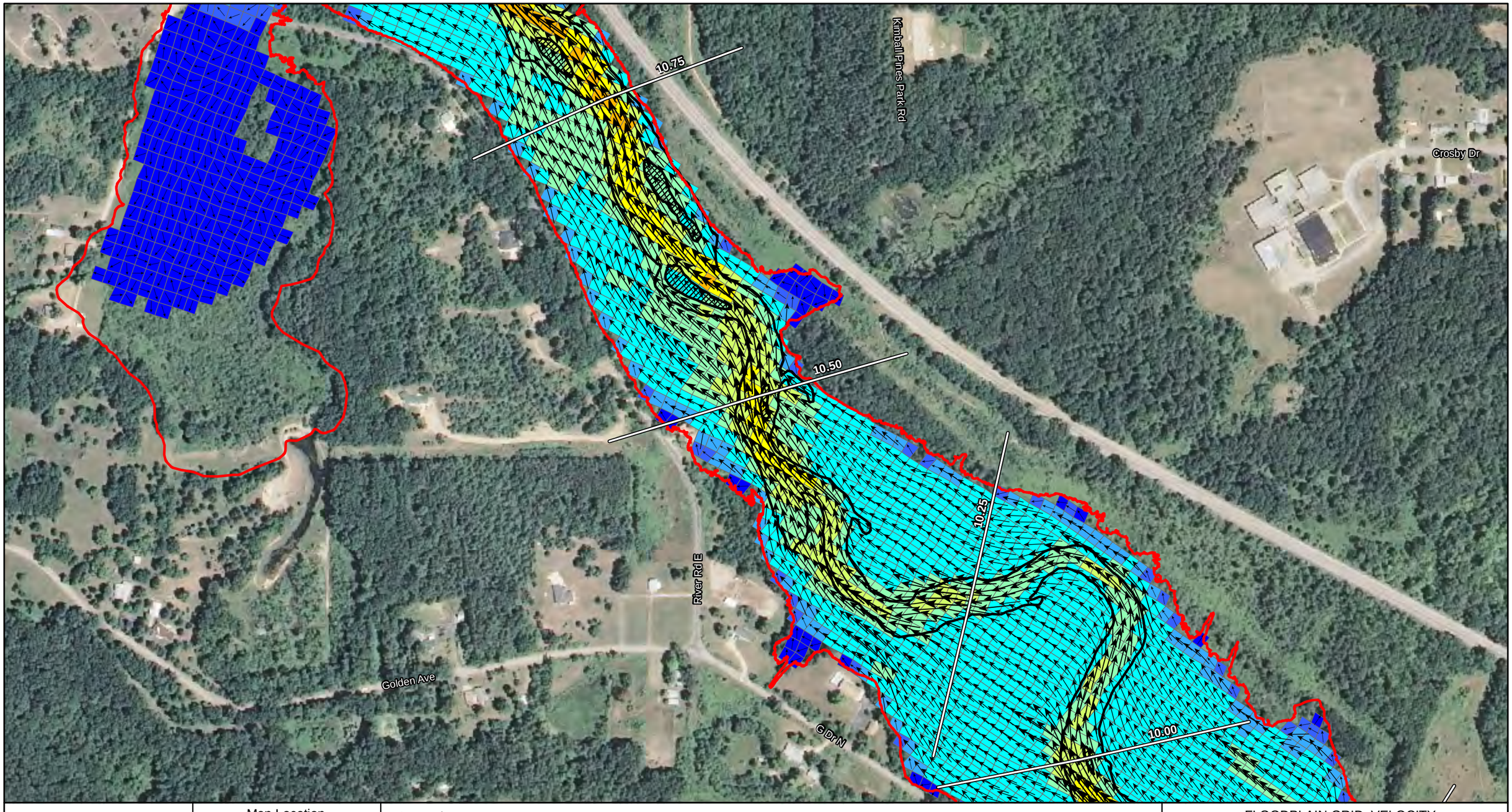
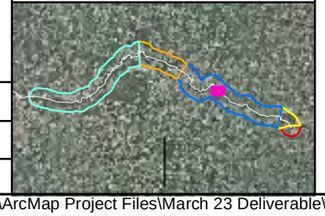
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 10.00 - MP 10.80

SHEET 9 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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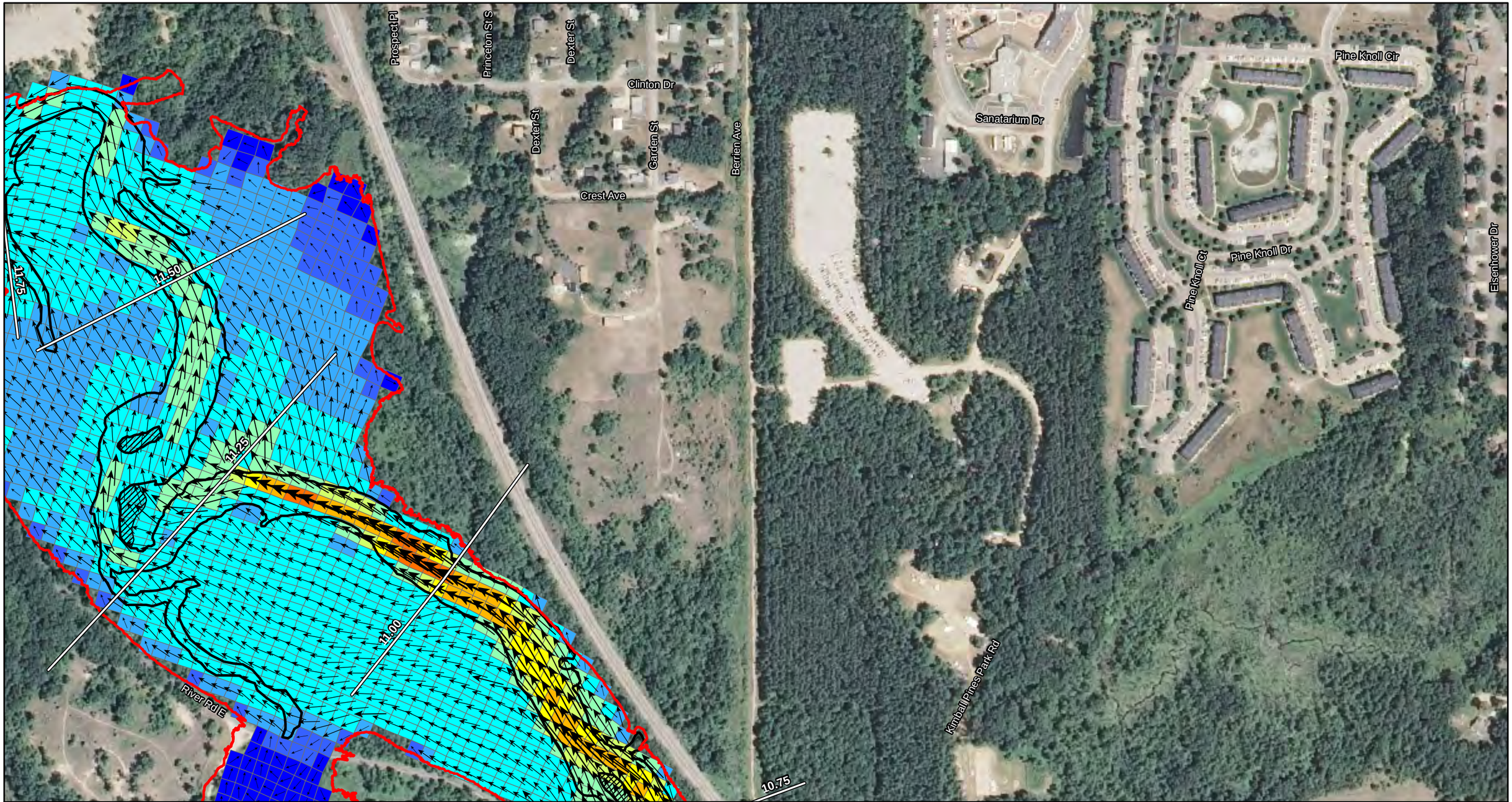
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 10.80 - MP 11.70

SHEET 10 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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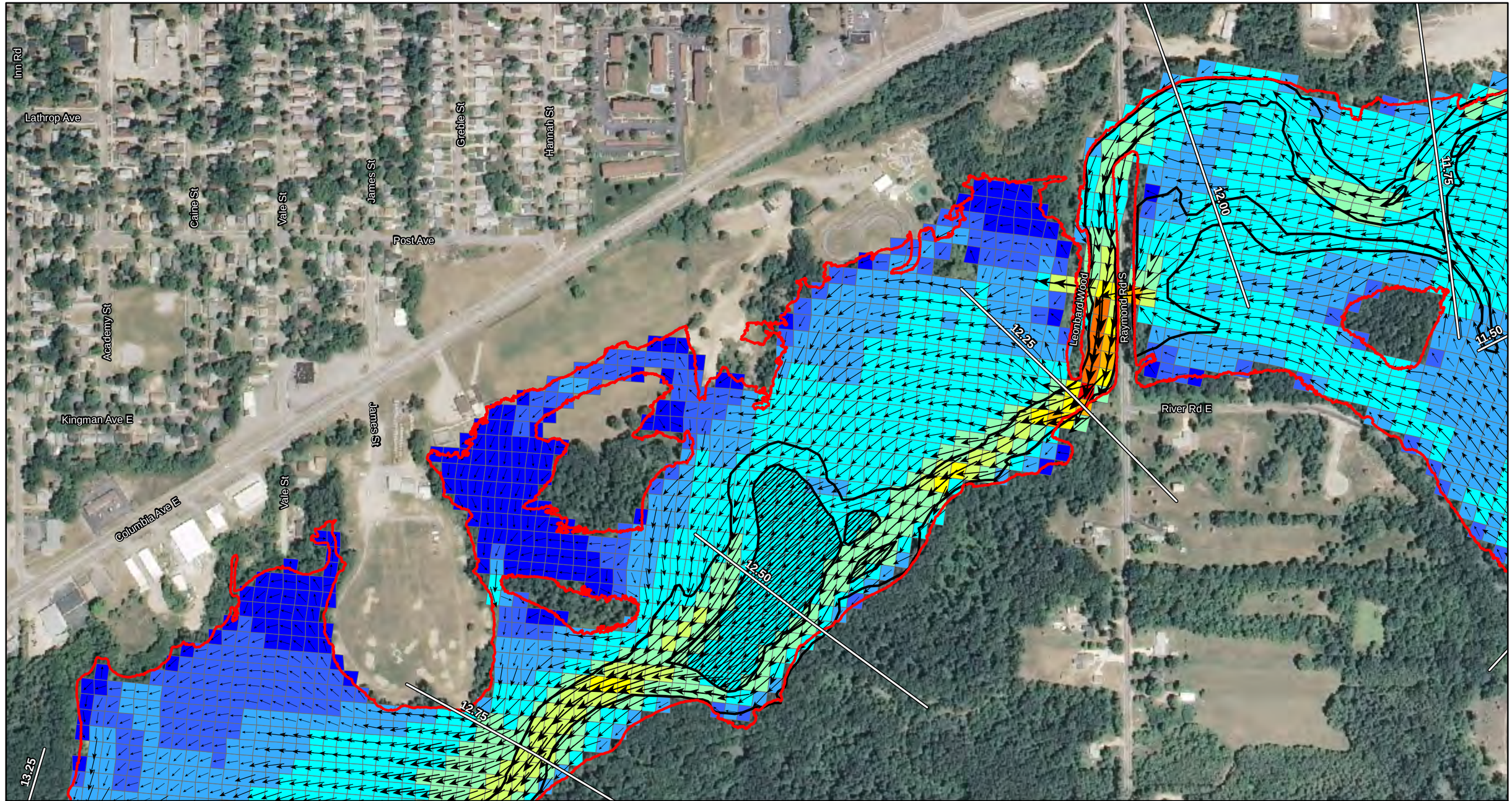
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

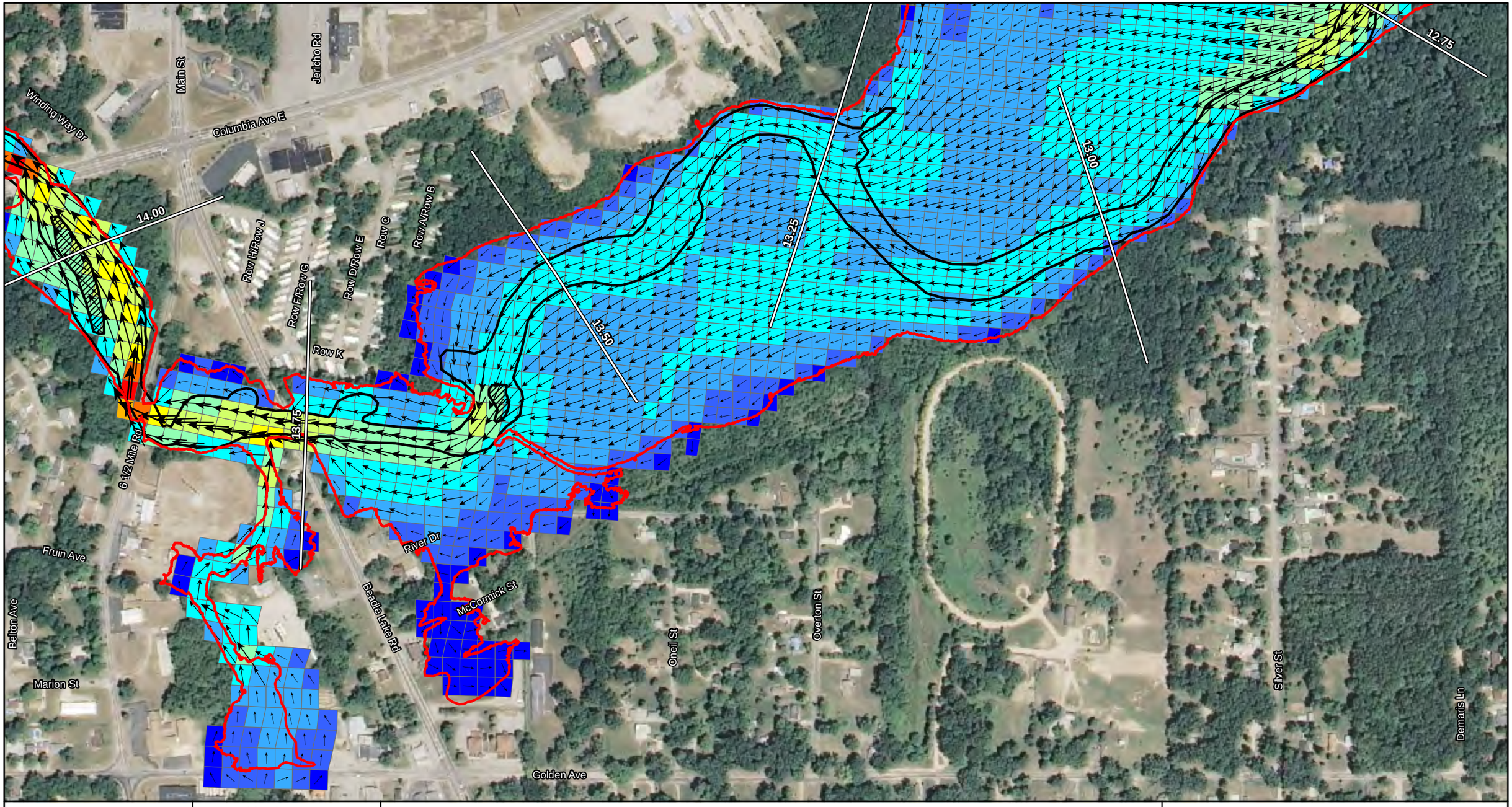
MP 11.70 - MP 12.77

SHEET 11 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

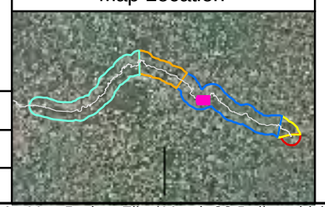
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec)
- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude
Channel Bankline
Island Bankline
HEC-RAS 100-Year Floodplain
Quarter Mile Grid Segment
ft/sec = Feet Per Second

N

0 175 350 700
Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

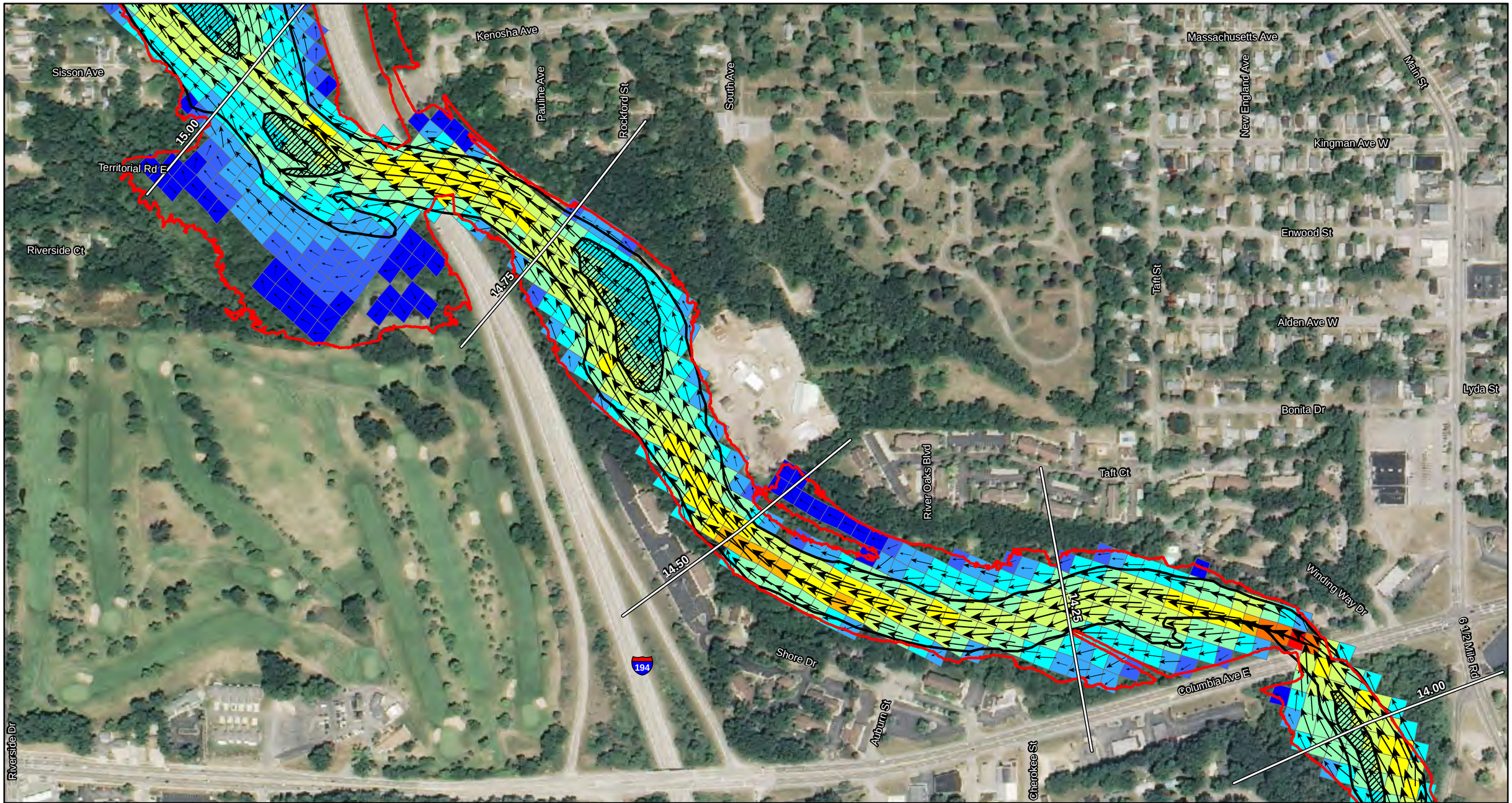
MP 12.77 - MP 14.00

SHEET 12 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

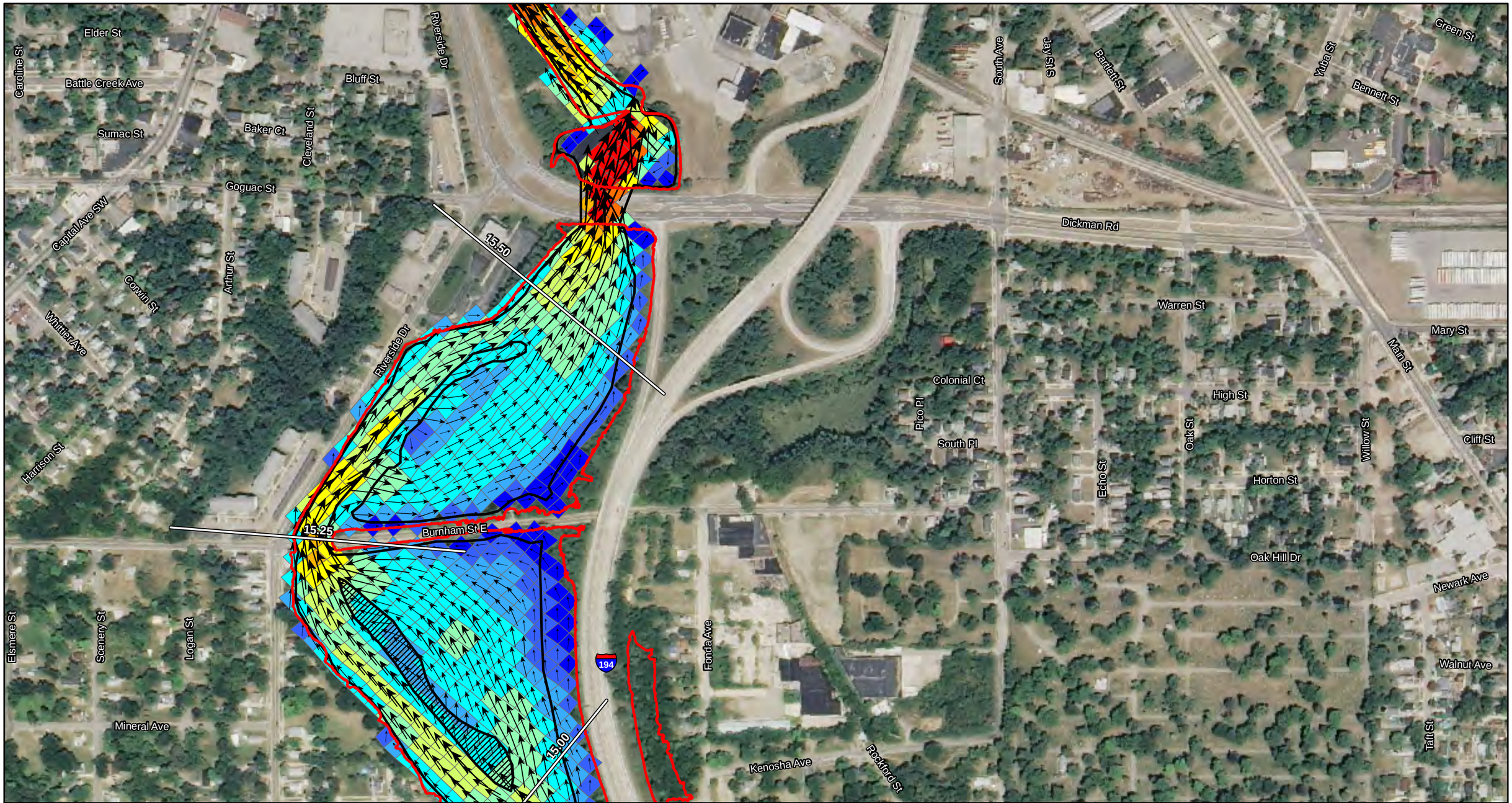
MP 14.00 - MP 15.05

SHEET 13 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

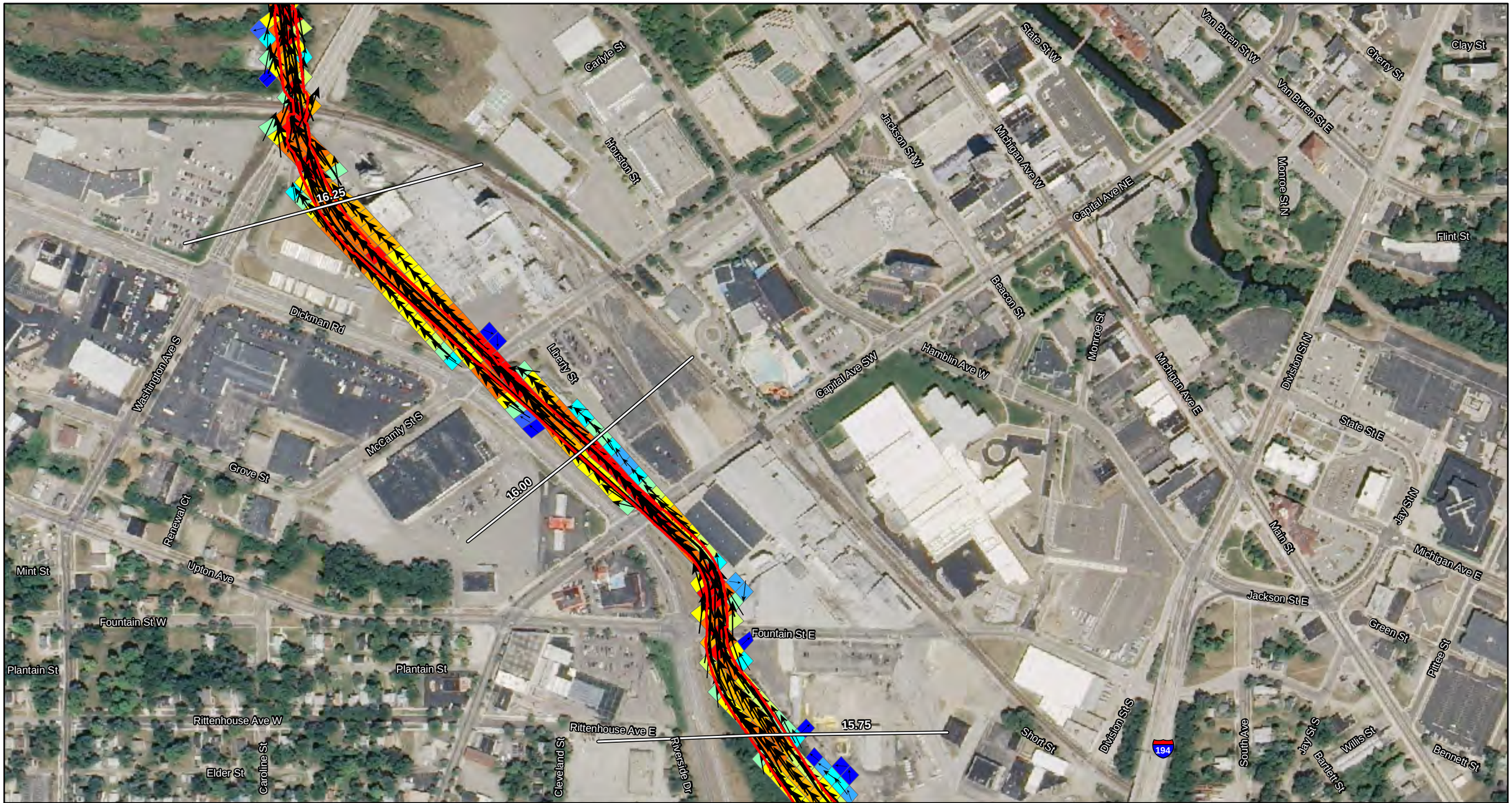
MP 15.05 - MP 15.71

SHEET 14 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 15.71 - MP 16.38

SHEET 15 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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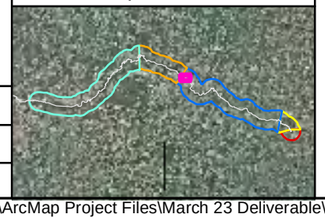
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

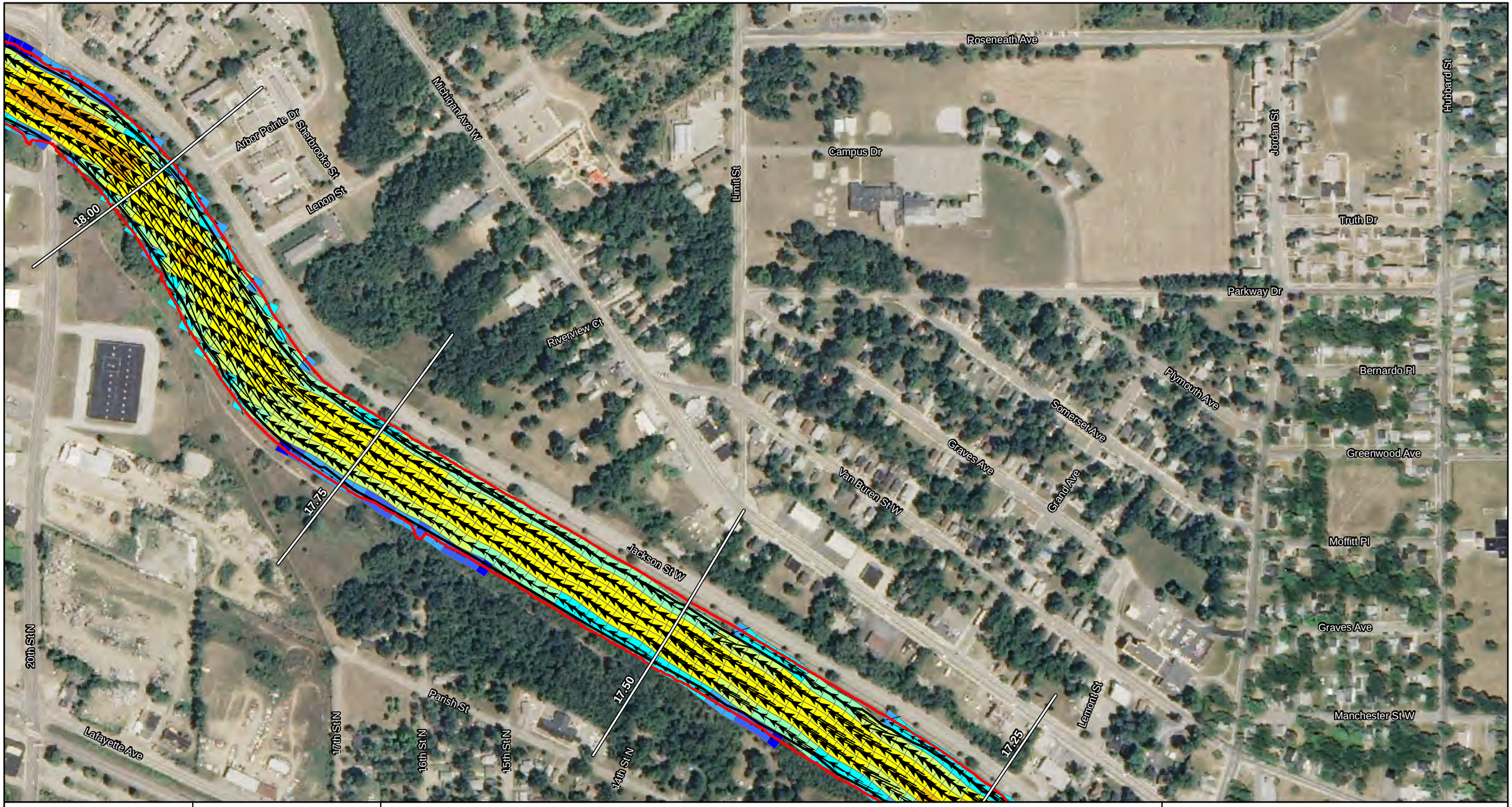
MP 16.38 - MP 17.30

SHEET 16 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

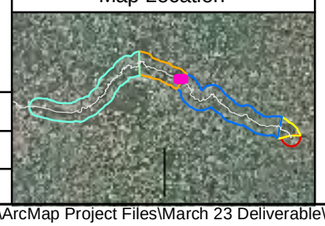
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

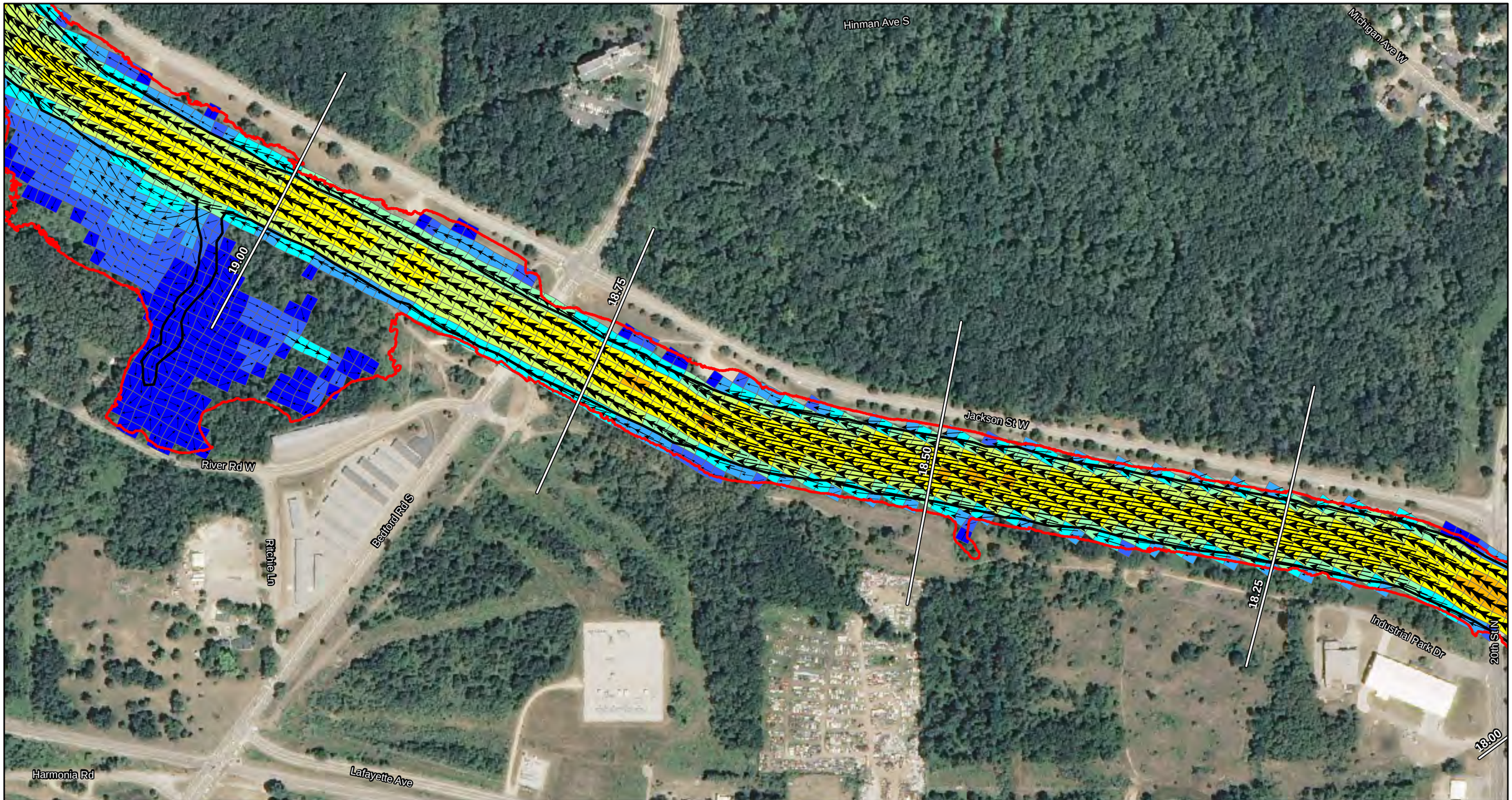
MP 17.30 - MP 18.11

SHEET 17 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 18.11 - MP 19.18

SHEET 18 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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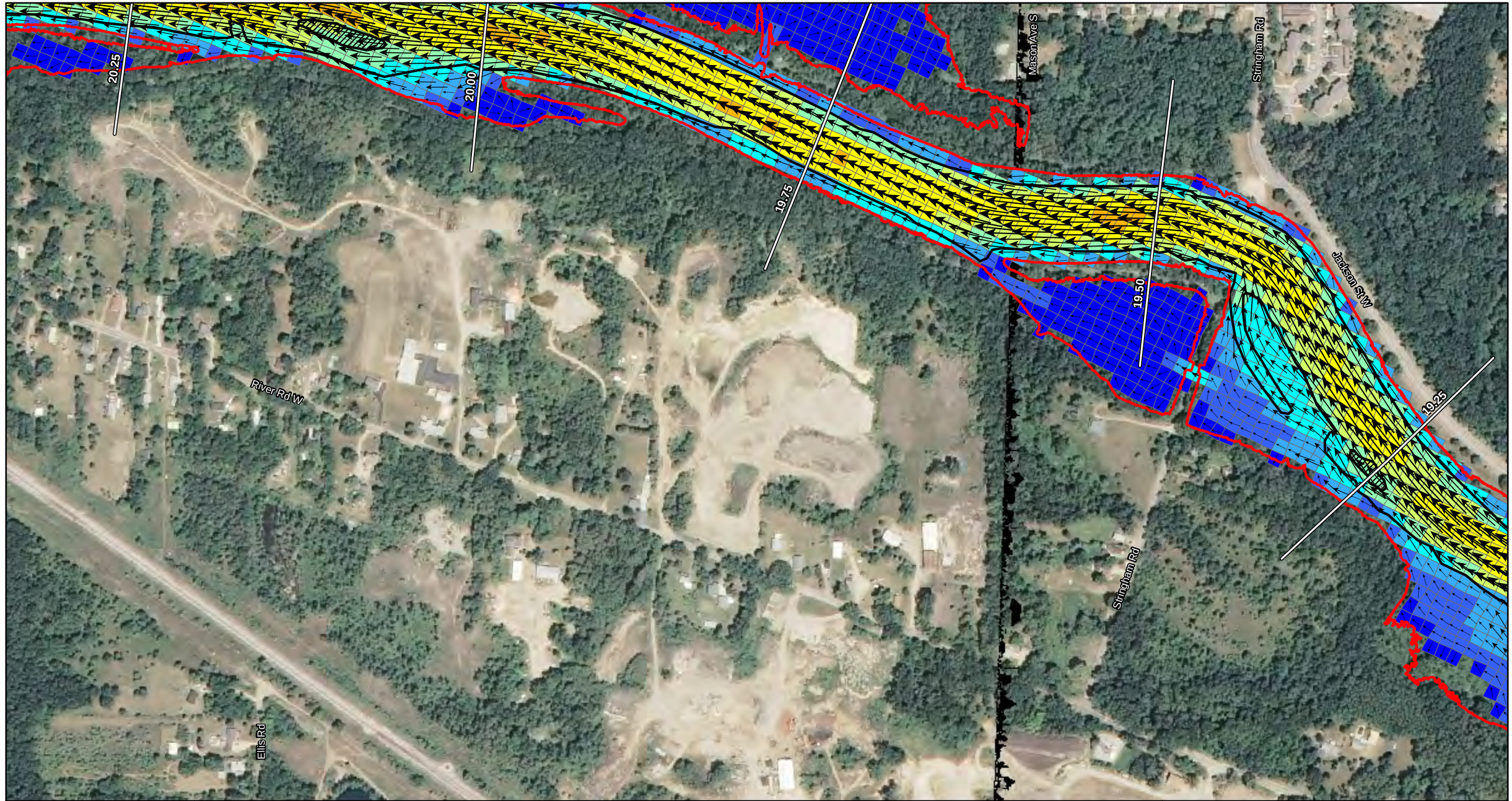
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 19.18 - MP 20.00

SHEET 19 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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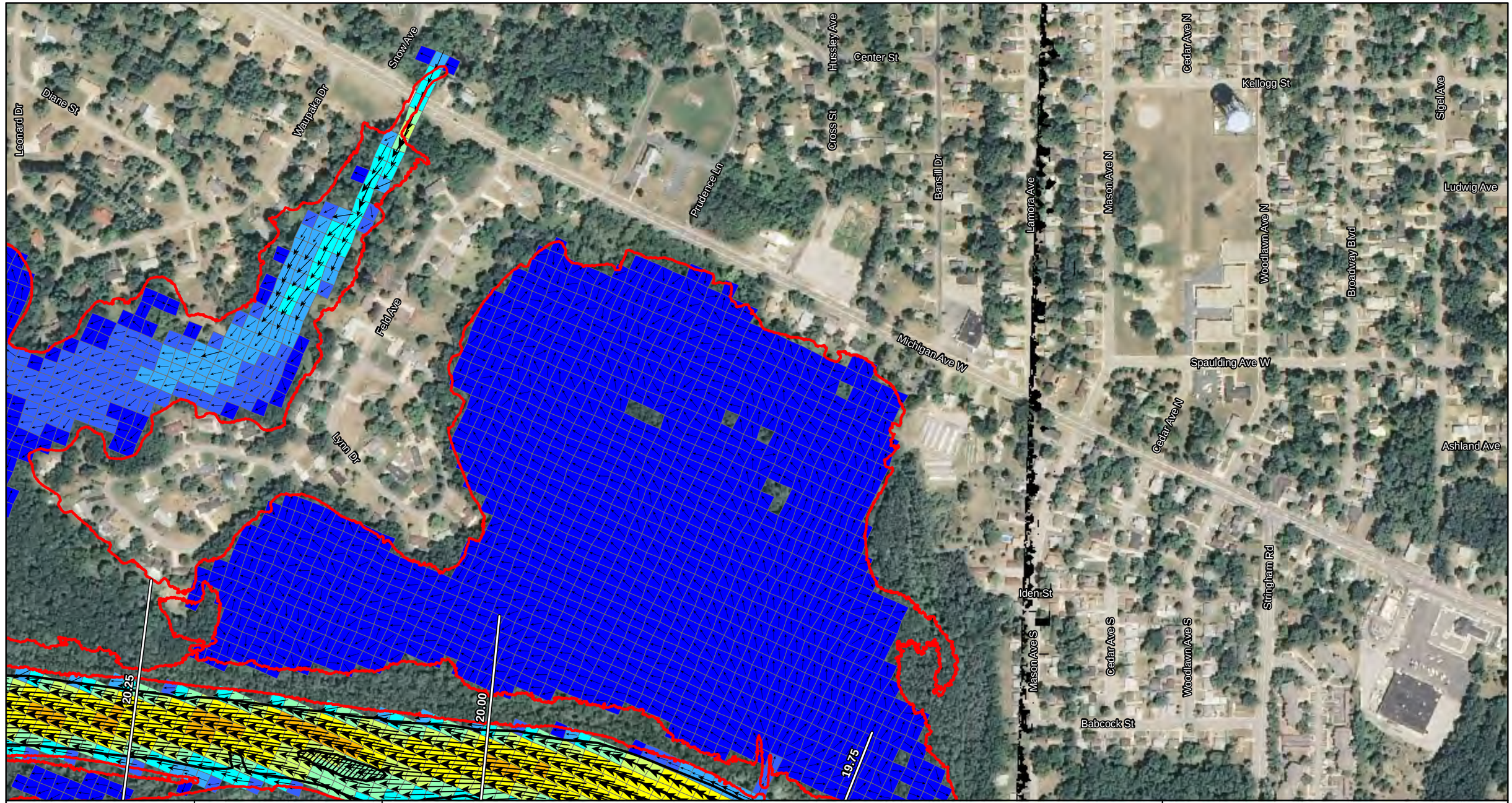
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 20.00 - MP 20.32

SHEET 20 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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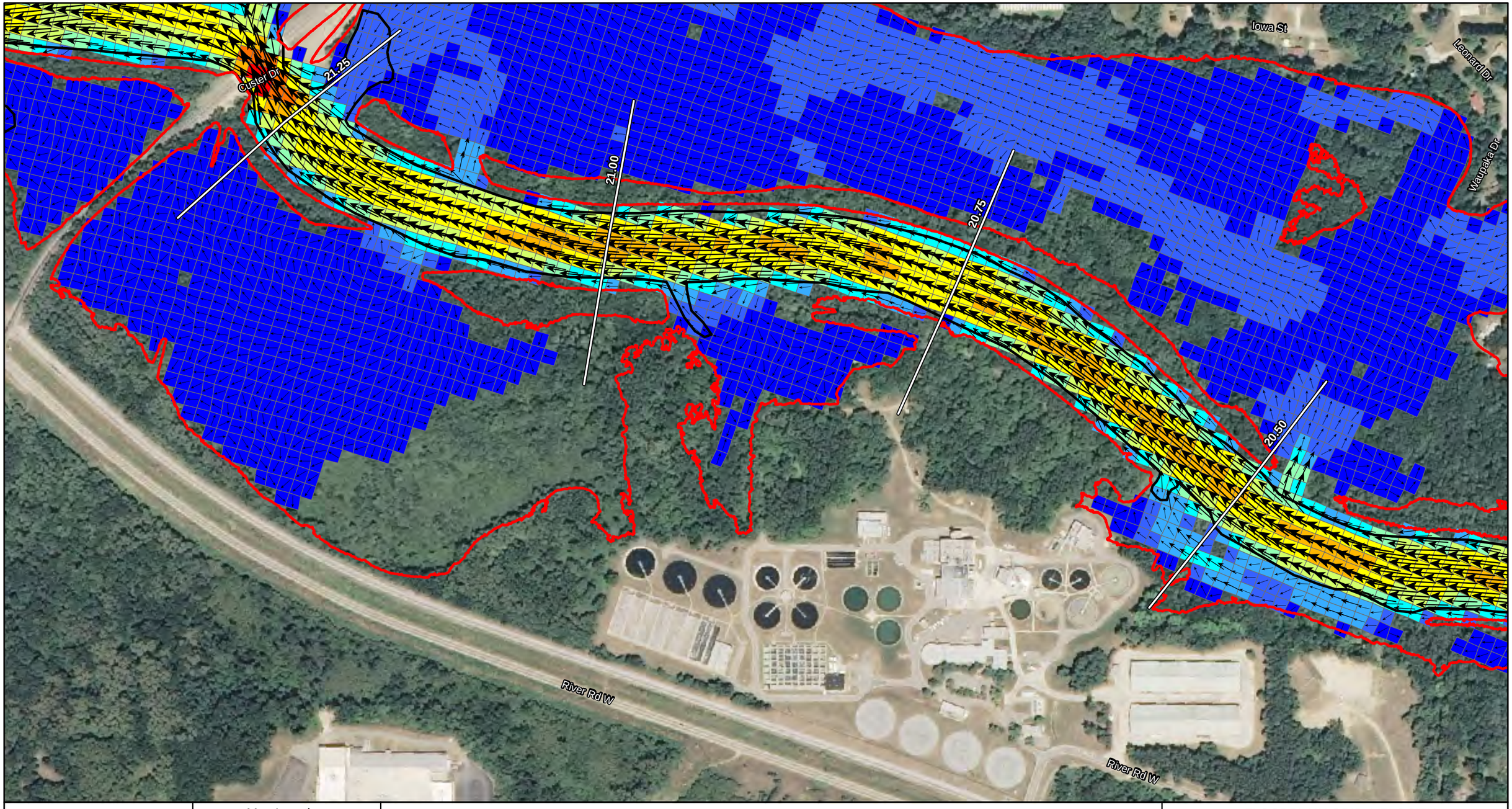
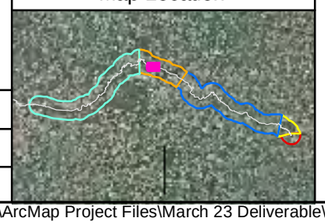
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 20.32 - MP 21.36

SHEET 21 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009

Avon Dr
Sperry Ave
Finlay Ave
Coldwater Ave
Custer Dr
Duane St
Michigan Ave W
Stillson Blvd
Gardner Ave
Bonny St
South St
Iowa St
21.50
21.25

ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

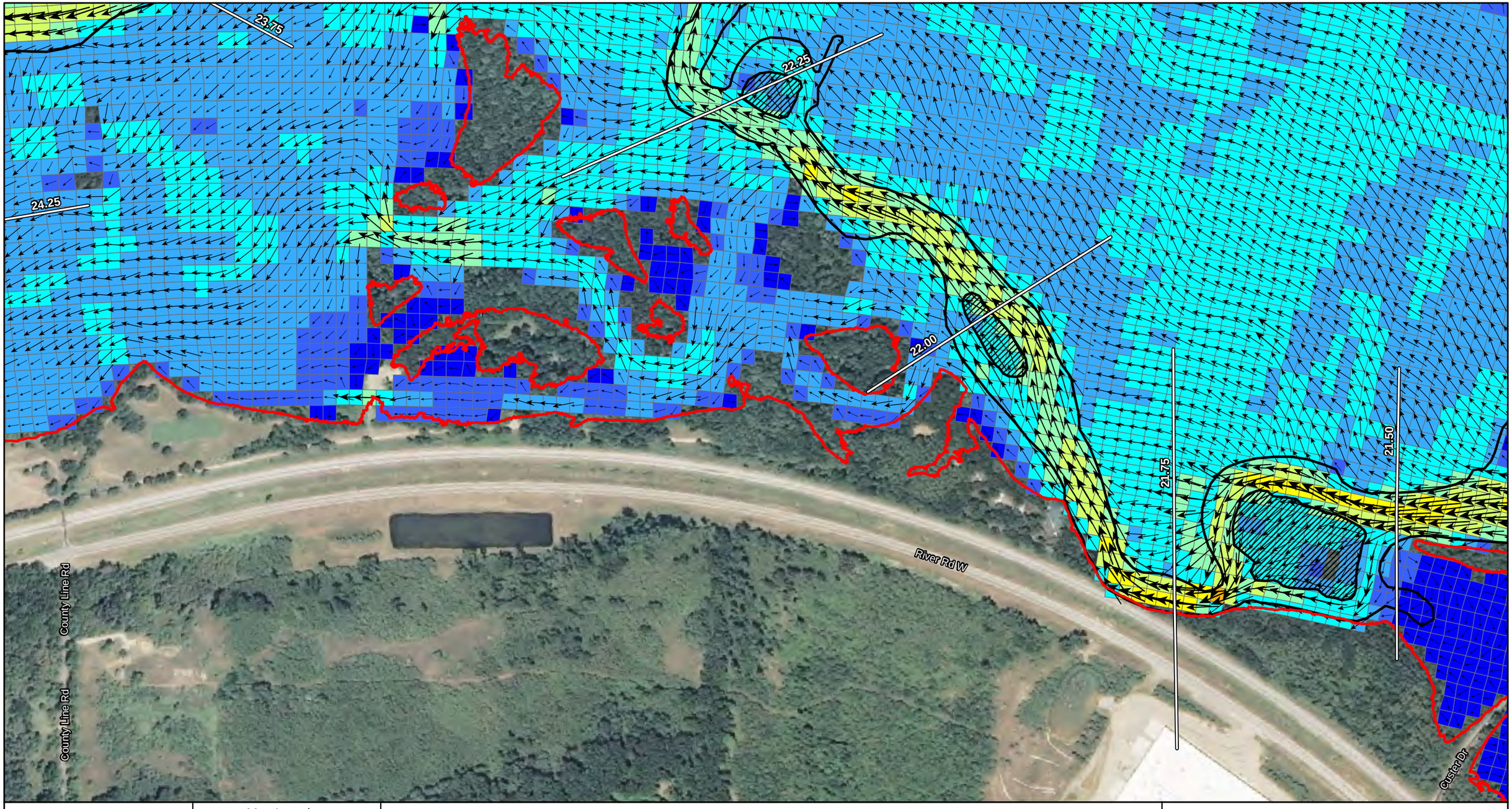
MP 21.36 - MP 21.59

SHEET 22 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

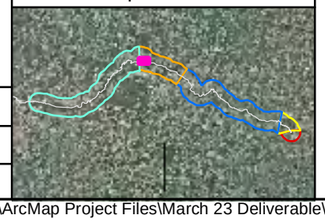
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

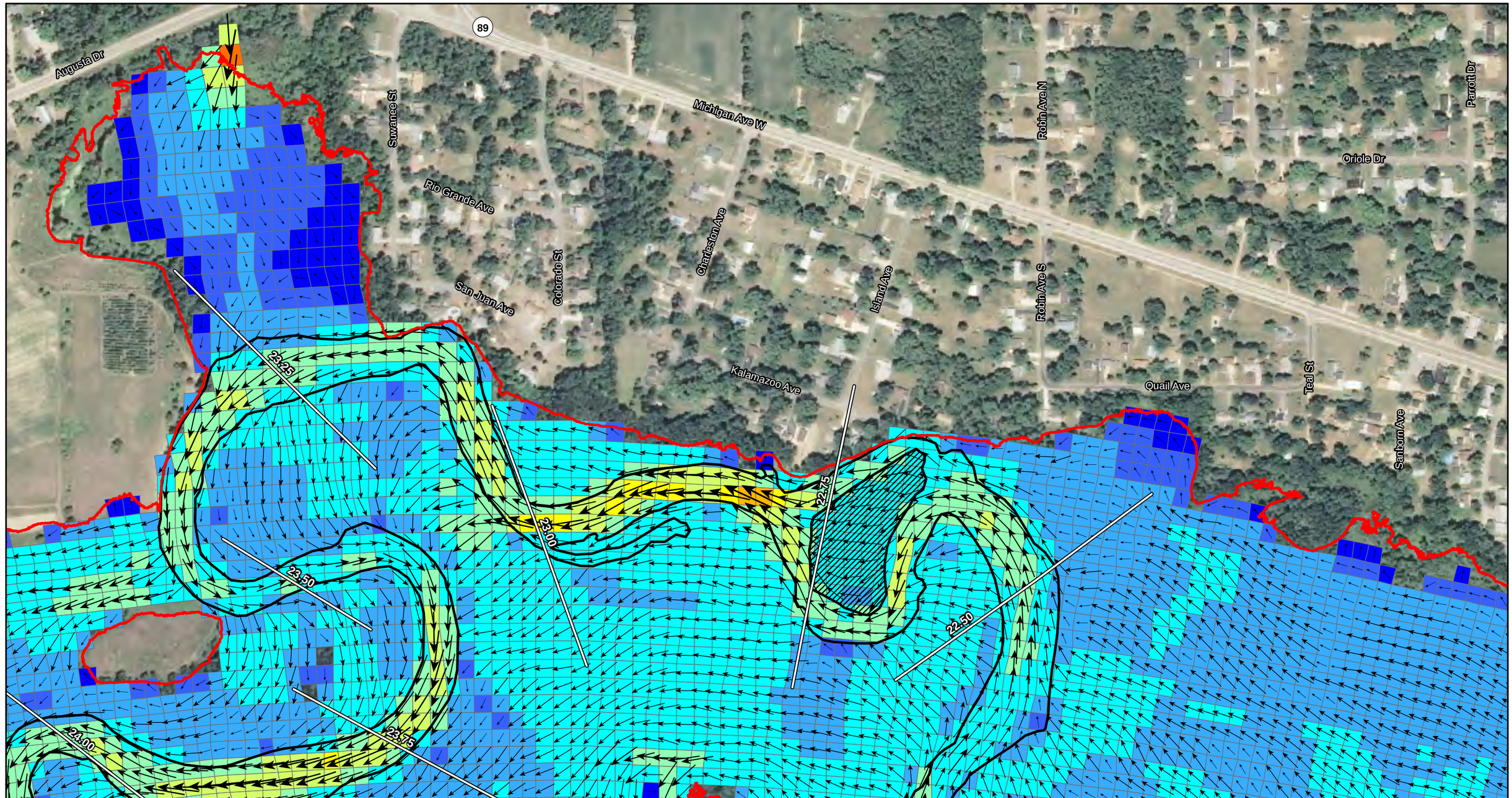
MP 21.59 - MP 22.33

SHEET 23 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

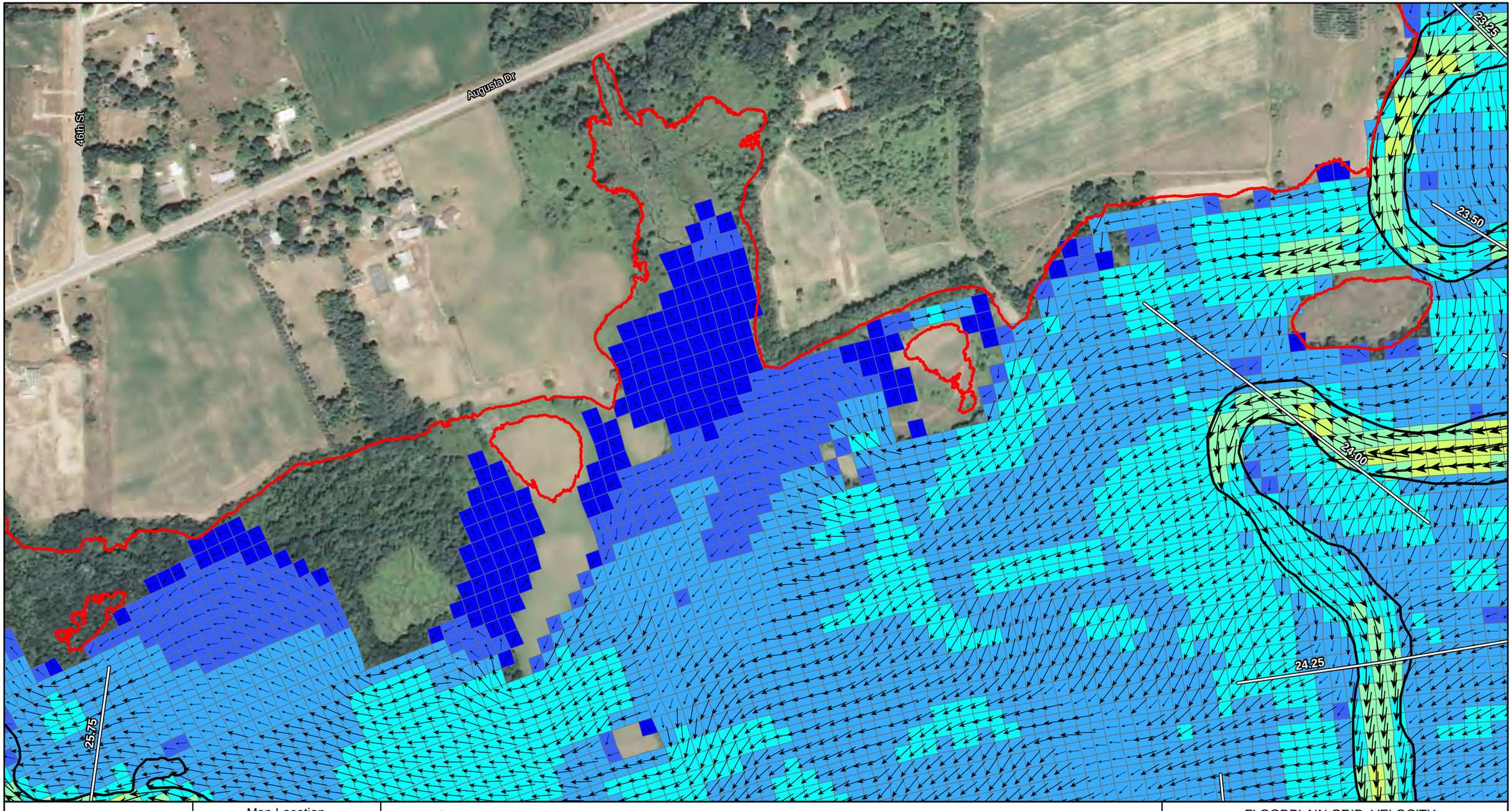
MP 22.33 - MP 24.01

SHEET 24 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

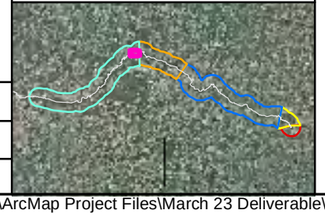
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 22.33 - MP 24.01

SHEET 25 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009

25.75
25.50
25.25
25.00
24.75
24.50
Fort Custer Dr

ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

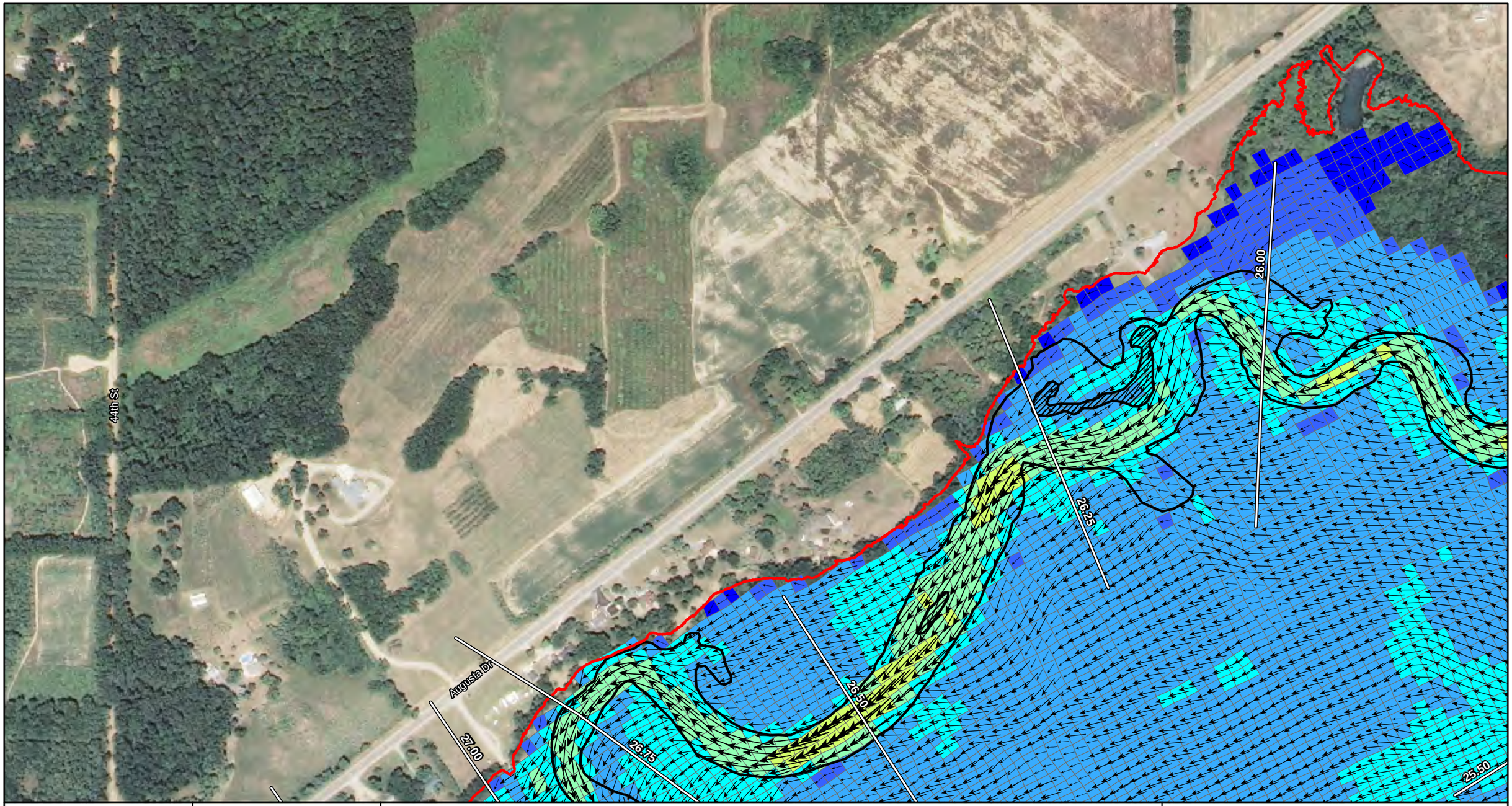
MP 24.33 - MP 25.79

SHEET 26 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

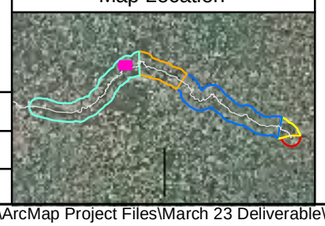
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

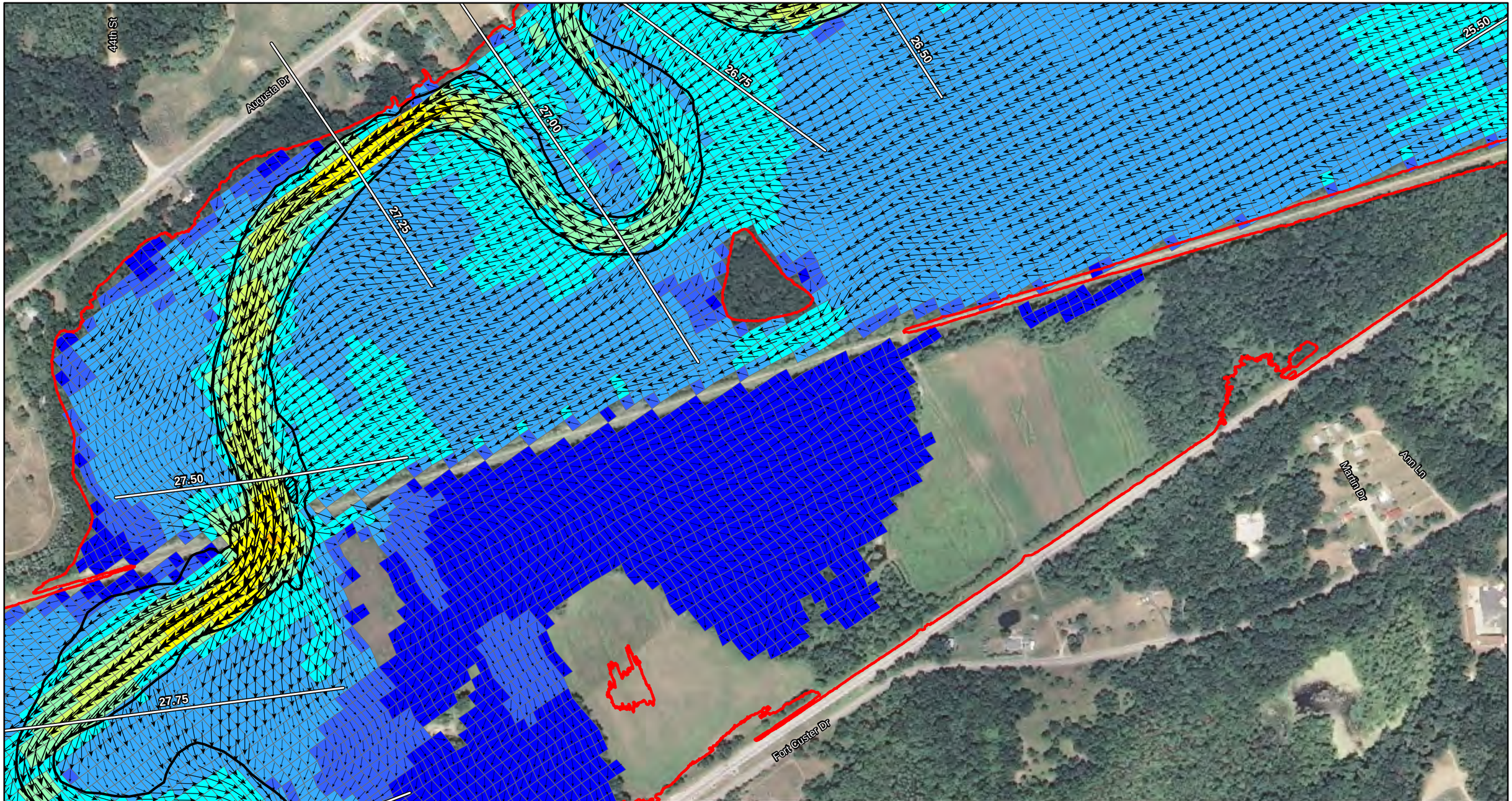
MP 25.79 - MP 26.80

SHEET 27 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

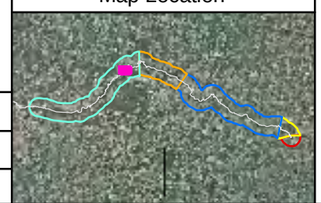
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

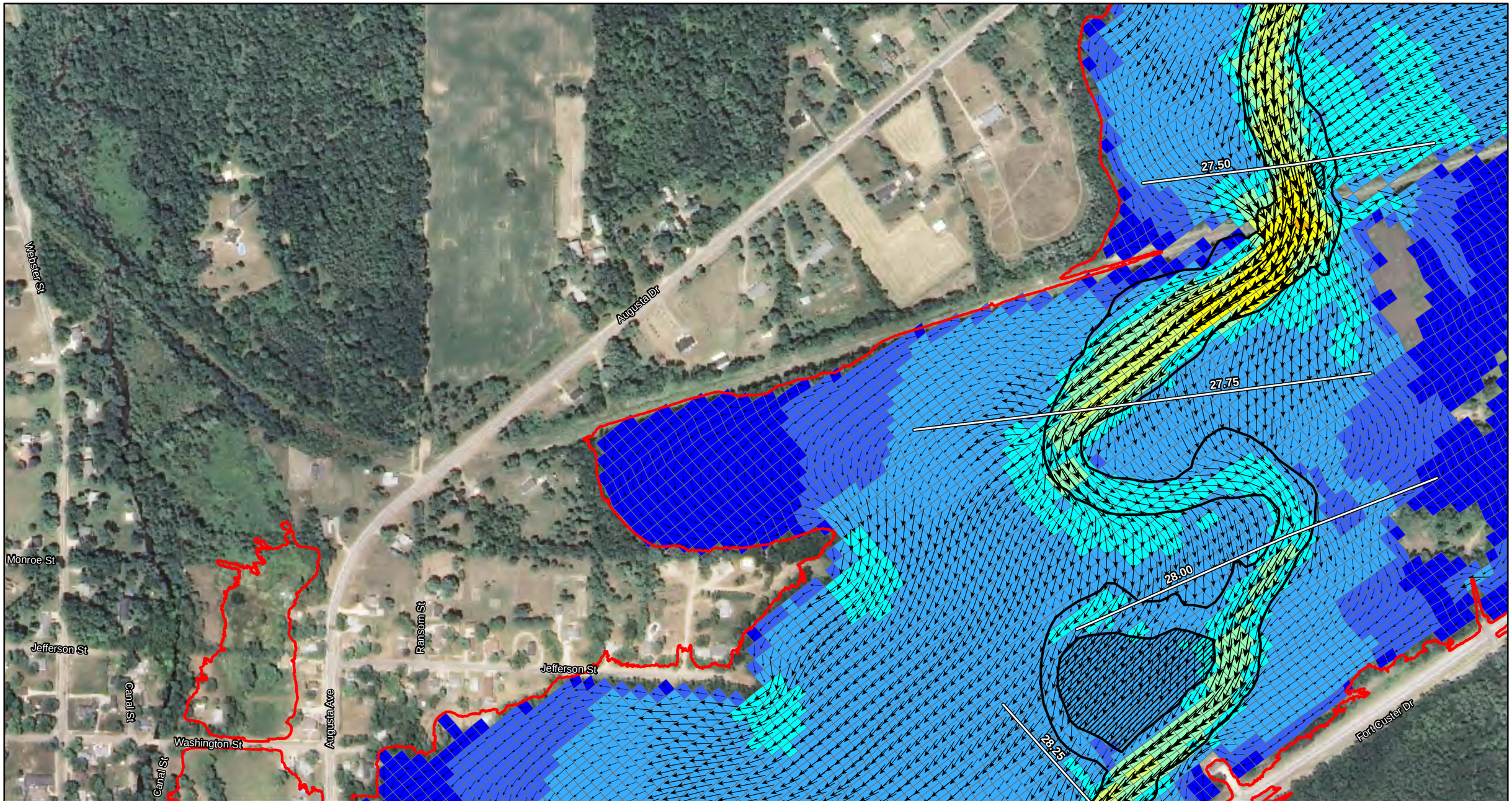
MP 26.80 - MP 27.80

SHEET 28 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

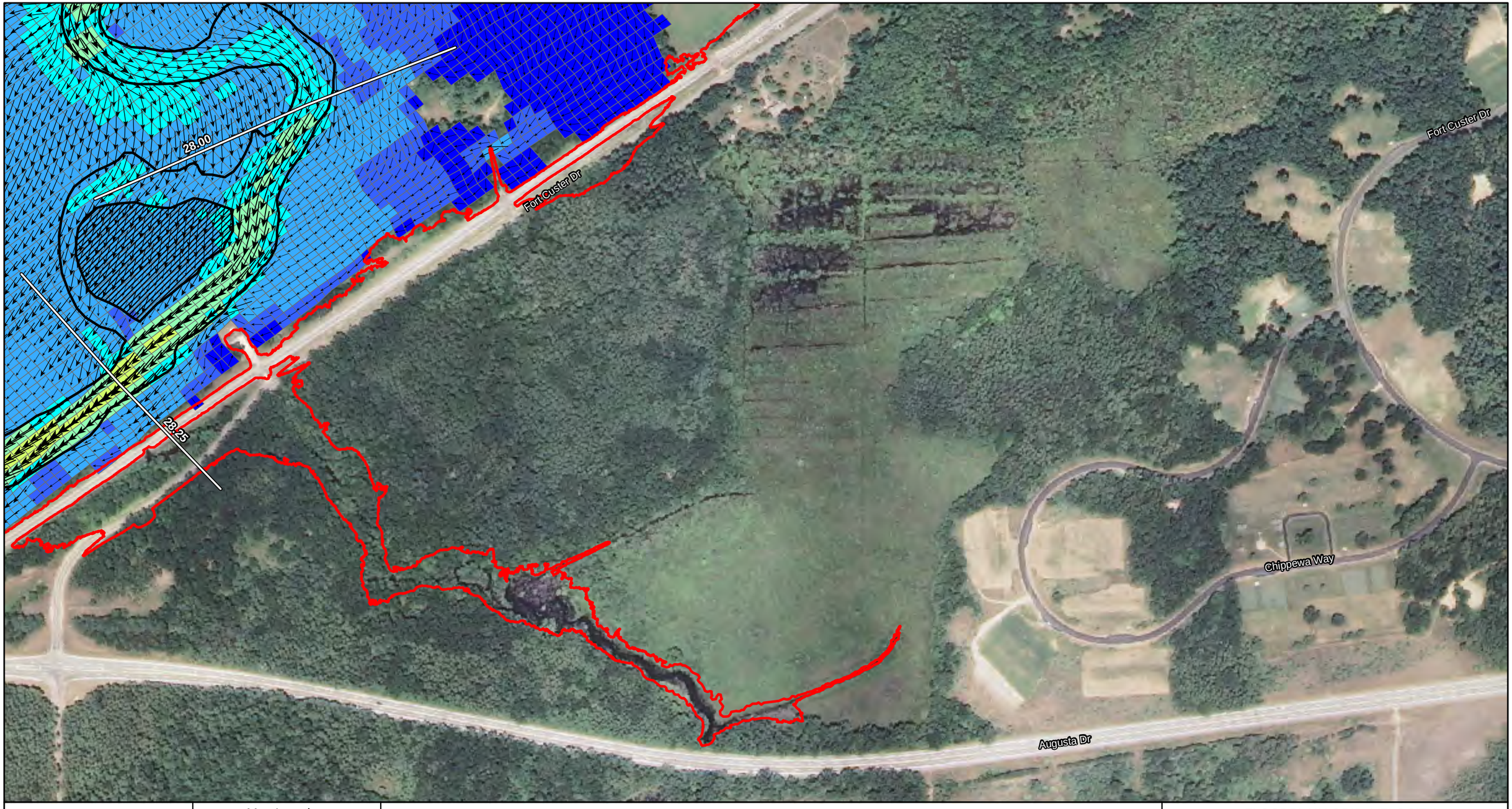
MP 27.80NW - MP 28.22NW

SHEET 29 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

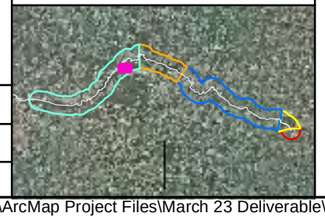
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 27.80SE - MP 28.22SE

SHEET 30 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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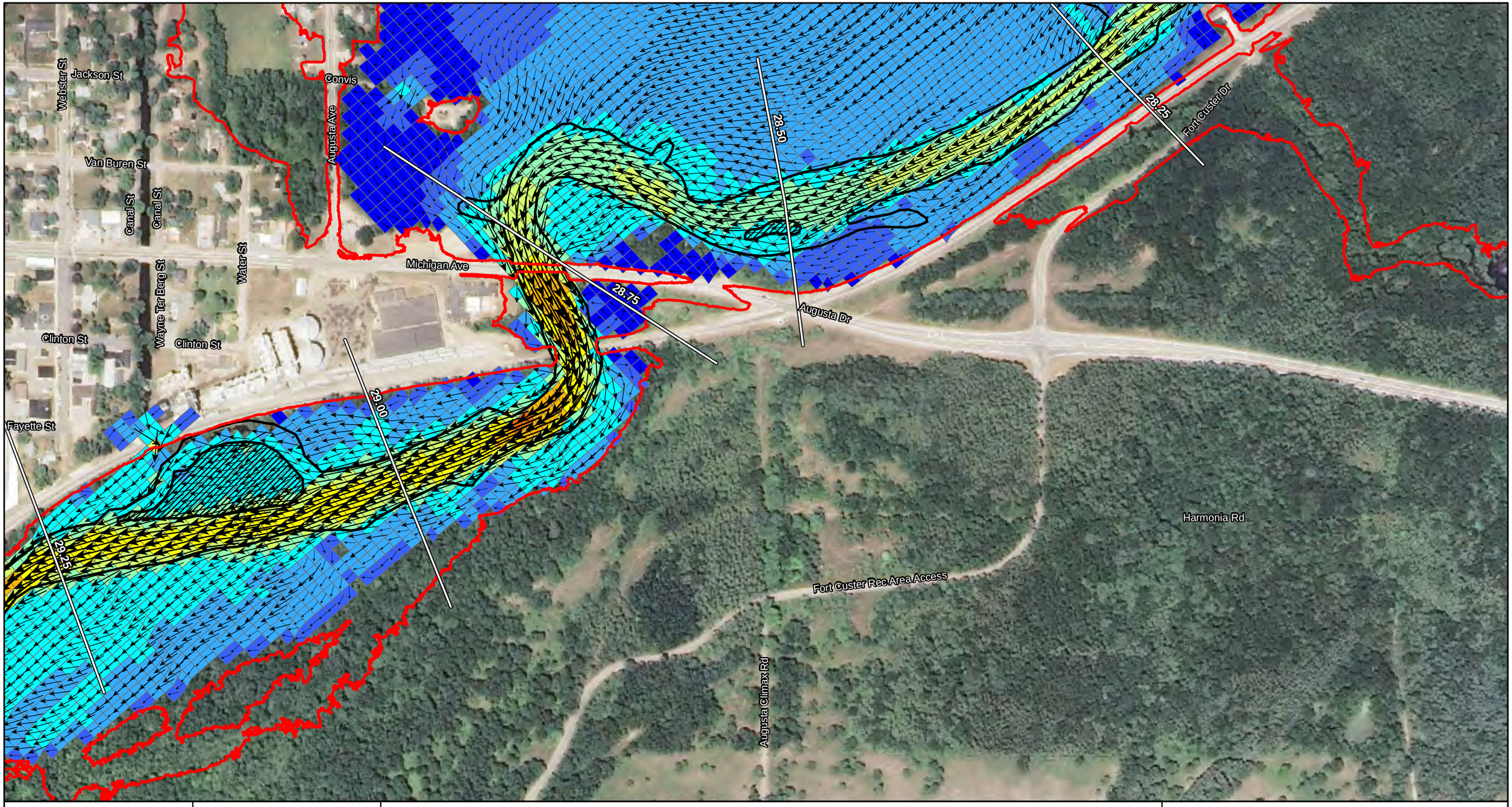
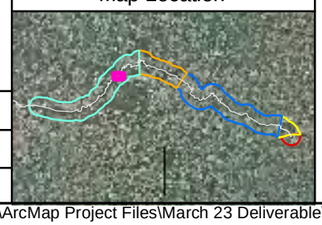
Aerial Photography Date: July & August 2009



Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 28.22 - MP 29.20

SHEET 31 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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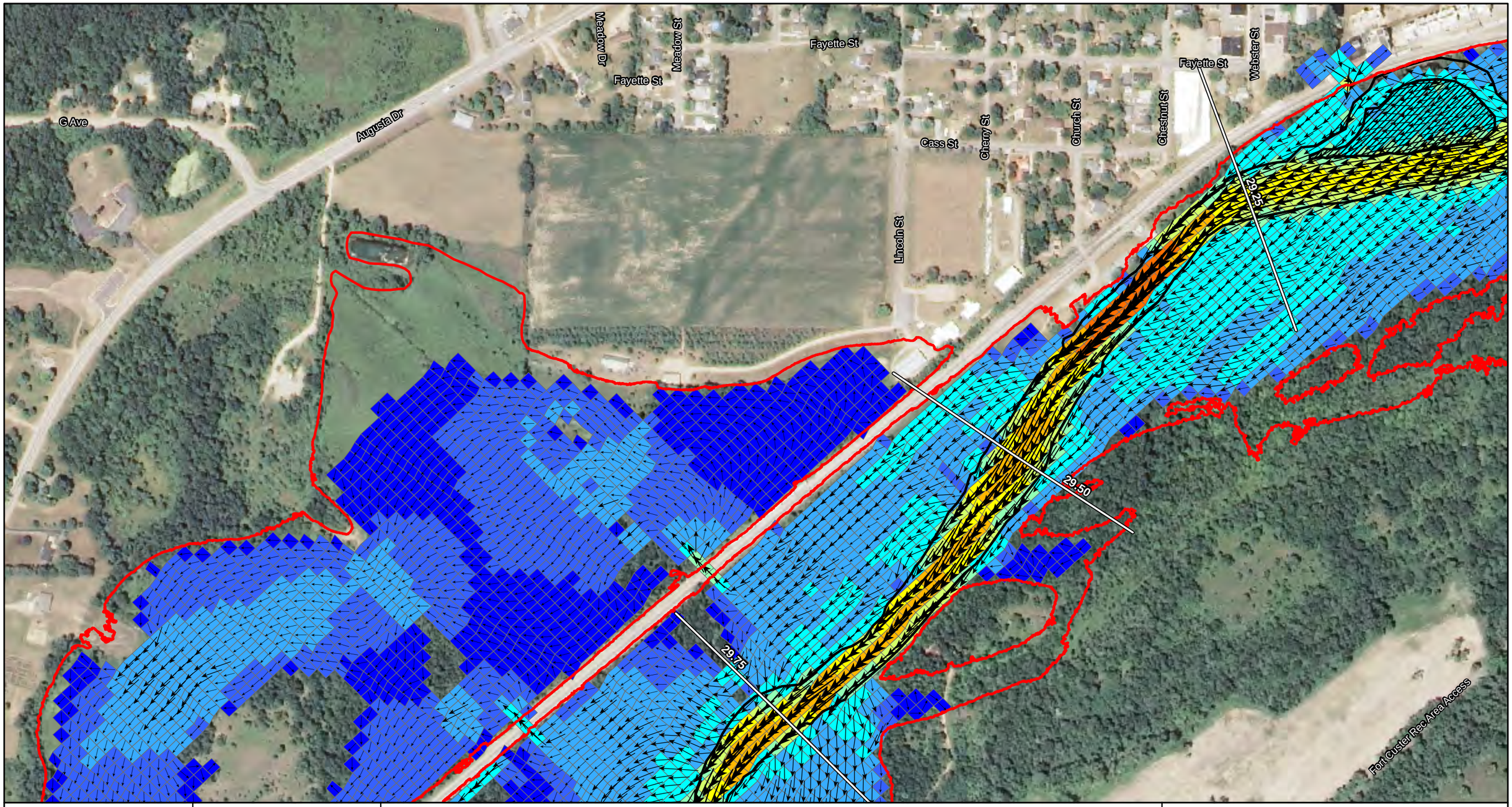
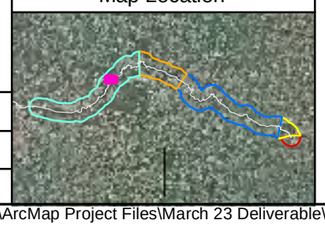
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)
- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700
Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

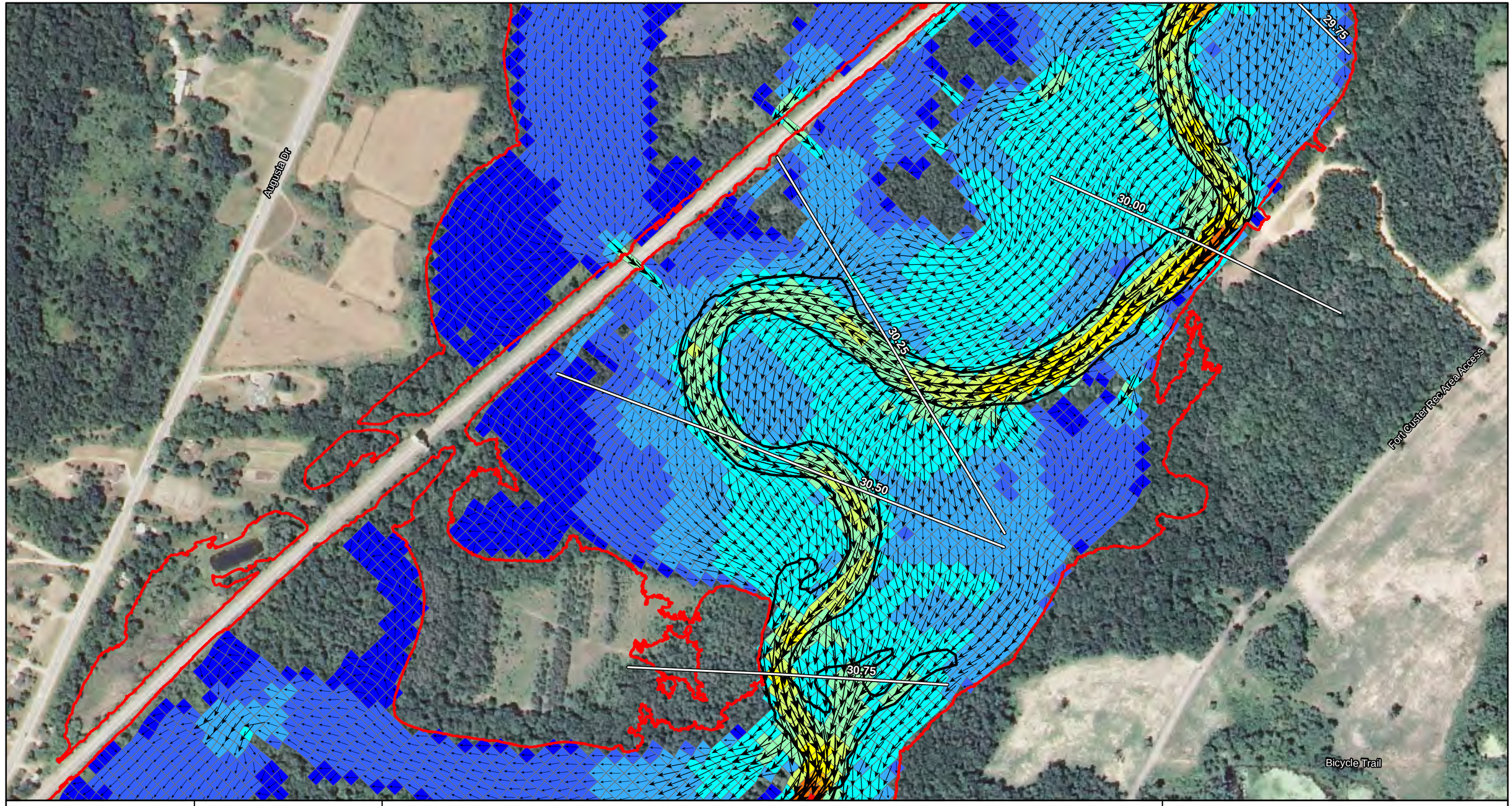
MP 29.20 - MP 29.82

SHEET 32 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

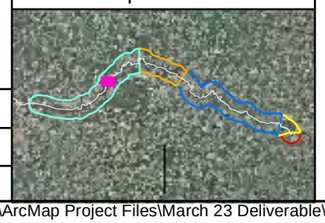
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

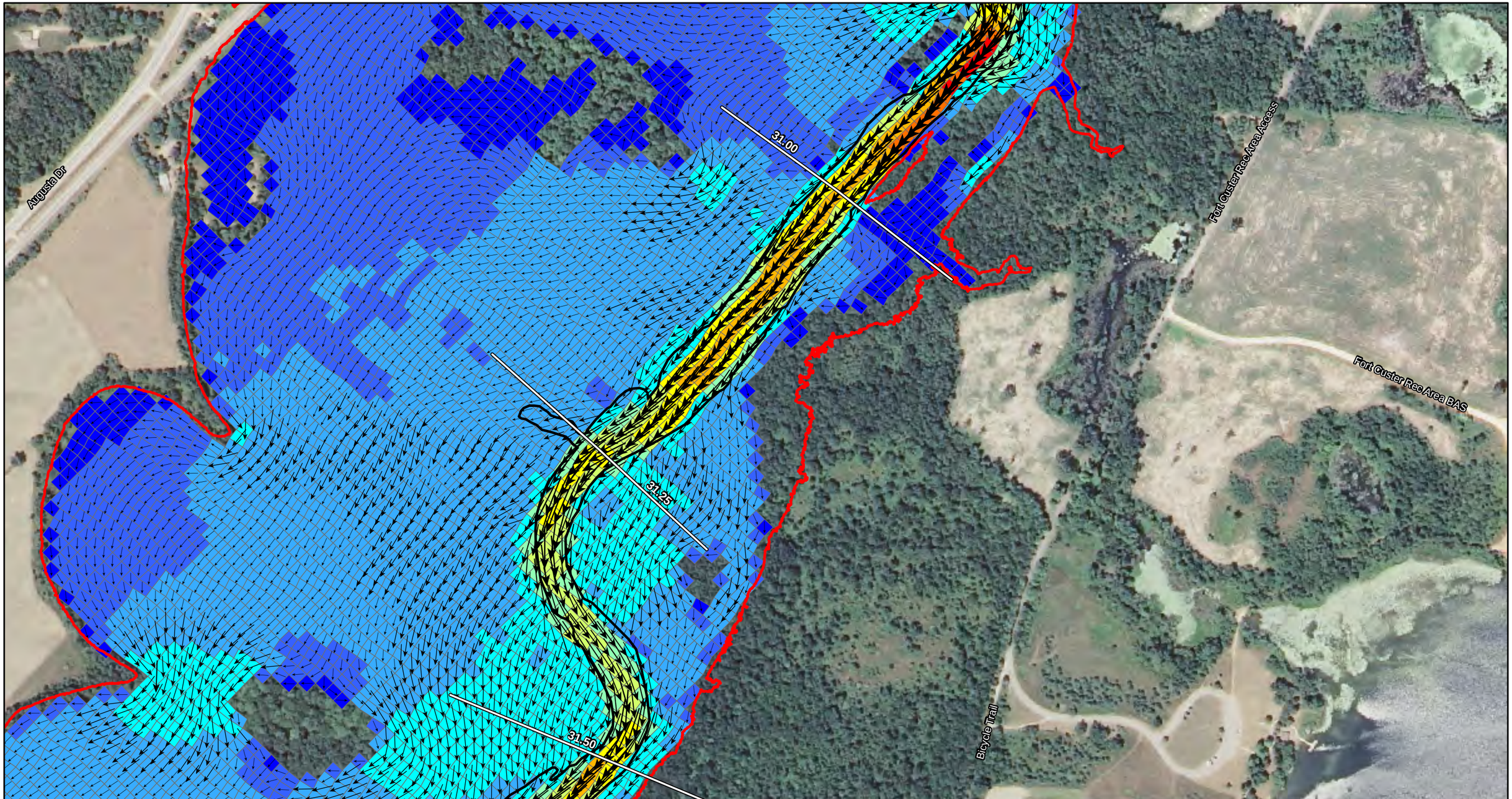
MP 29.82 - MP 30.84

SHEET 33 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

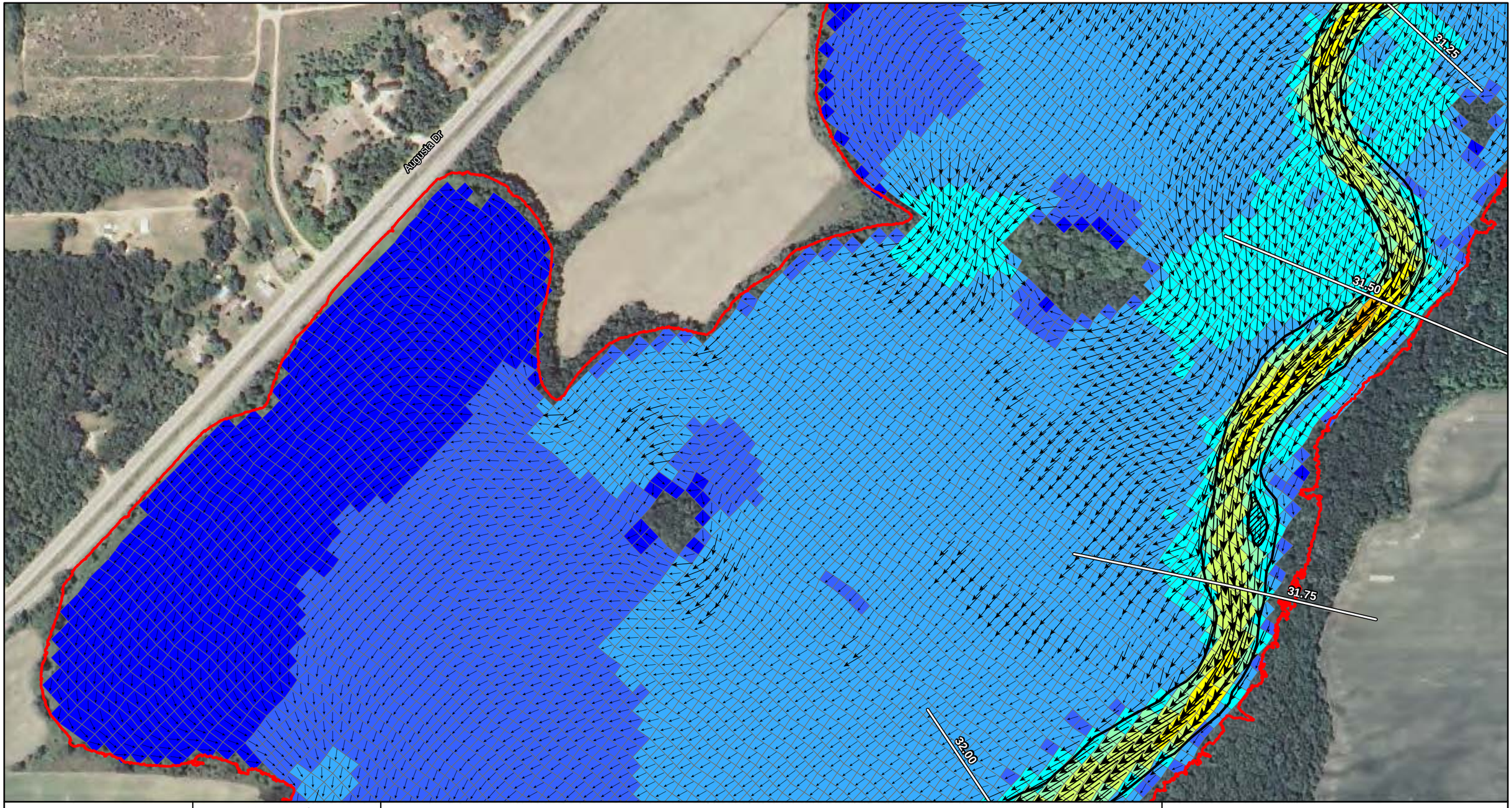
MP 30.84 - MP 31.40

SHEET 34 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

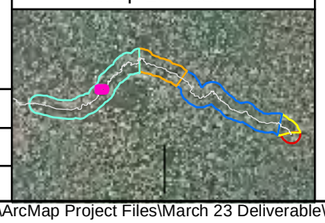
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

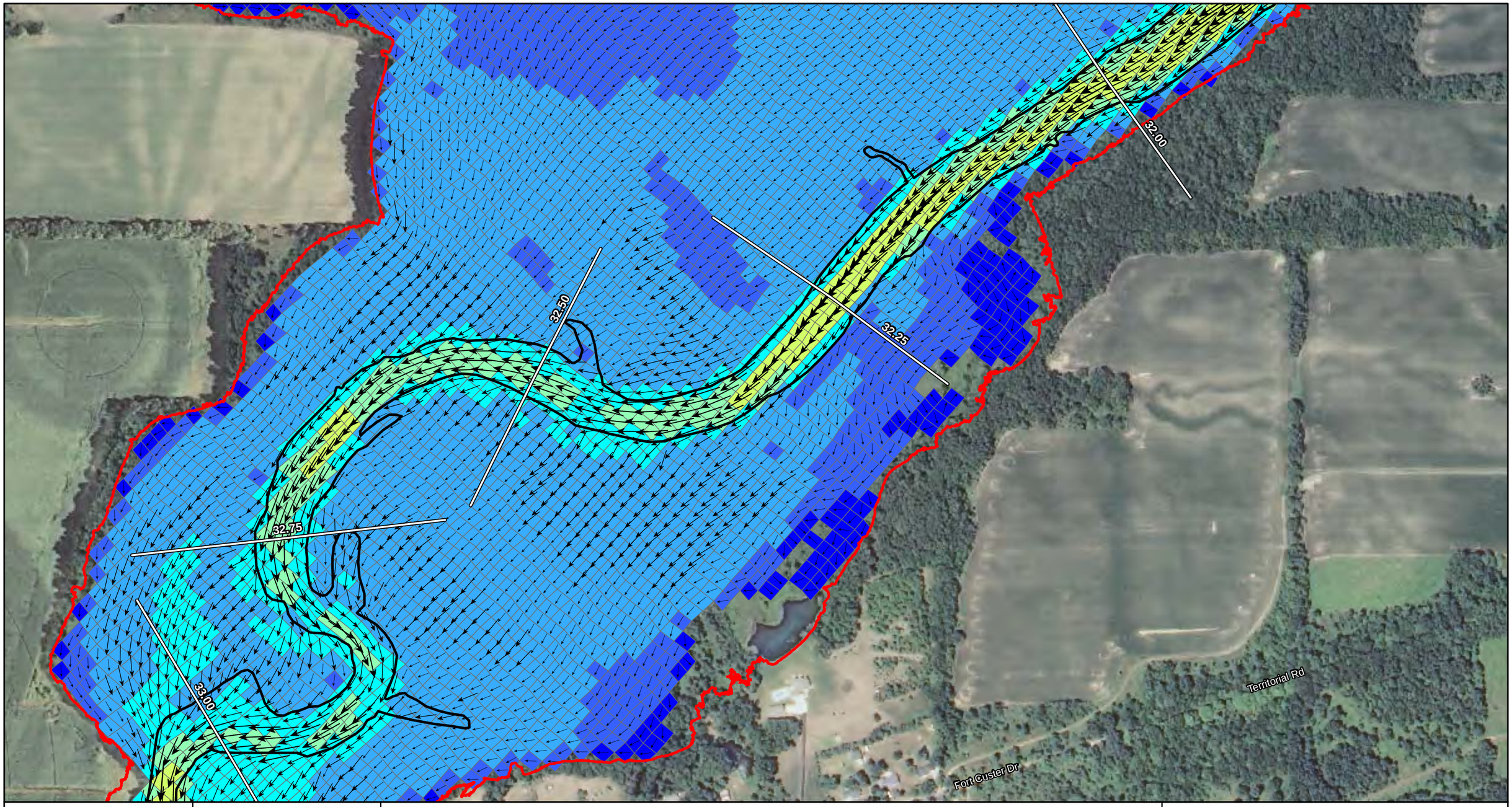
MP 31.40 - MP 31.94

SHEET 35 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

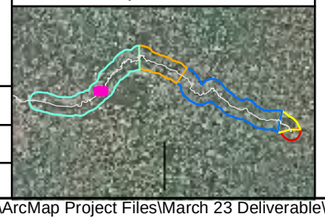
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

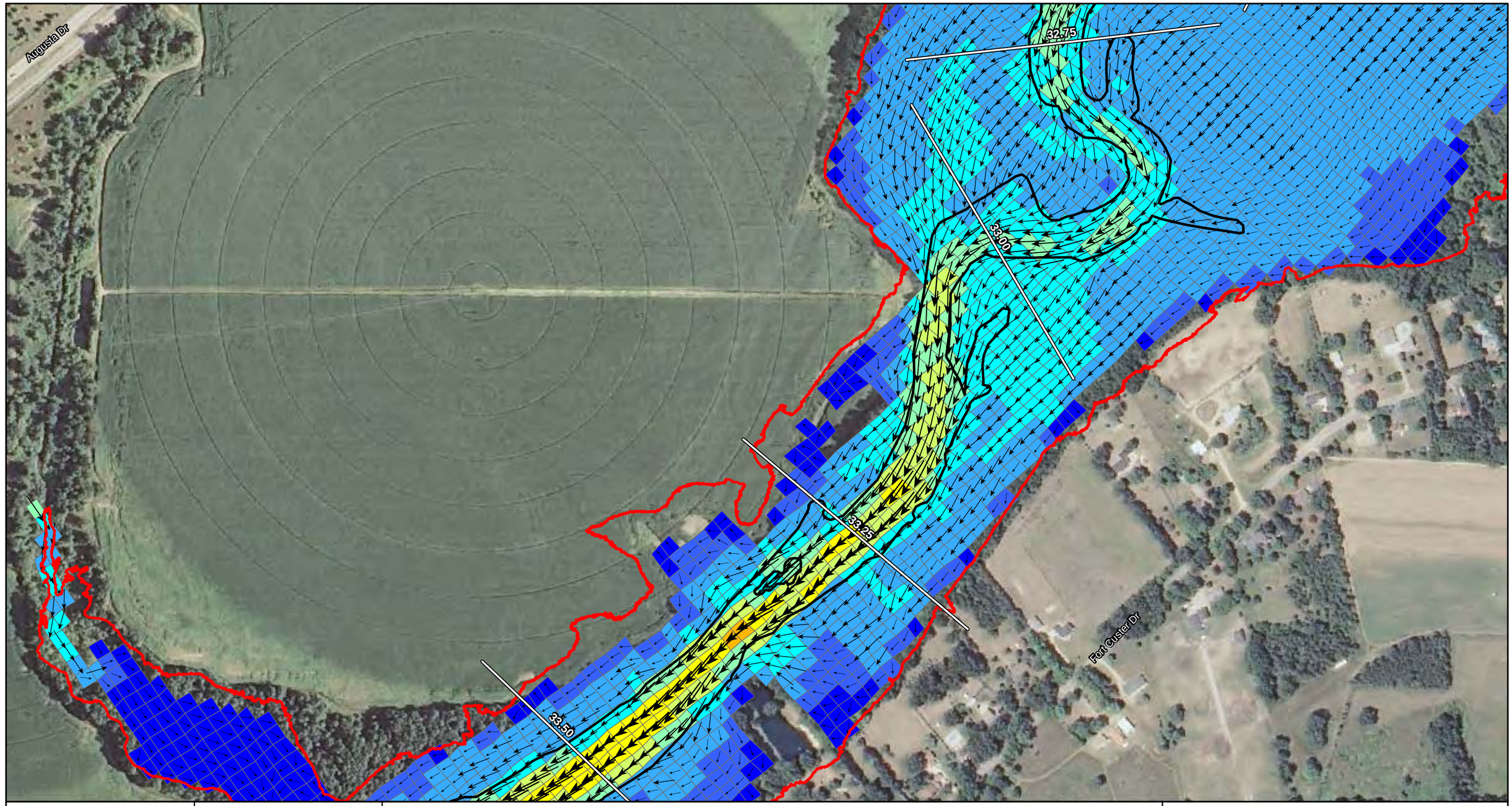
MP 31.94 - MP 33.00

SHEET 36 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

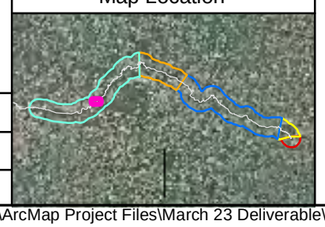
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 33.00 - MP 33.52

SHEET 37 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

Bridge St
Eagle Dr
Winding Way
McCollum Rd
Greenfield Ave
Valley Dr
Climax Dr
Streamside Dr
Climax Dr
Miller Rd
Maplewood Dr
Michigan Ave
Pinehill Dr
Fort Custer Dr
33.50
33.75
34.00
34.25
34.50
34.75

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

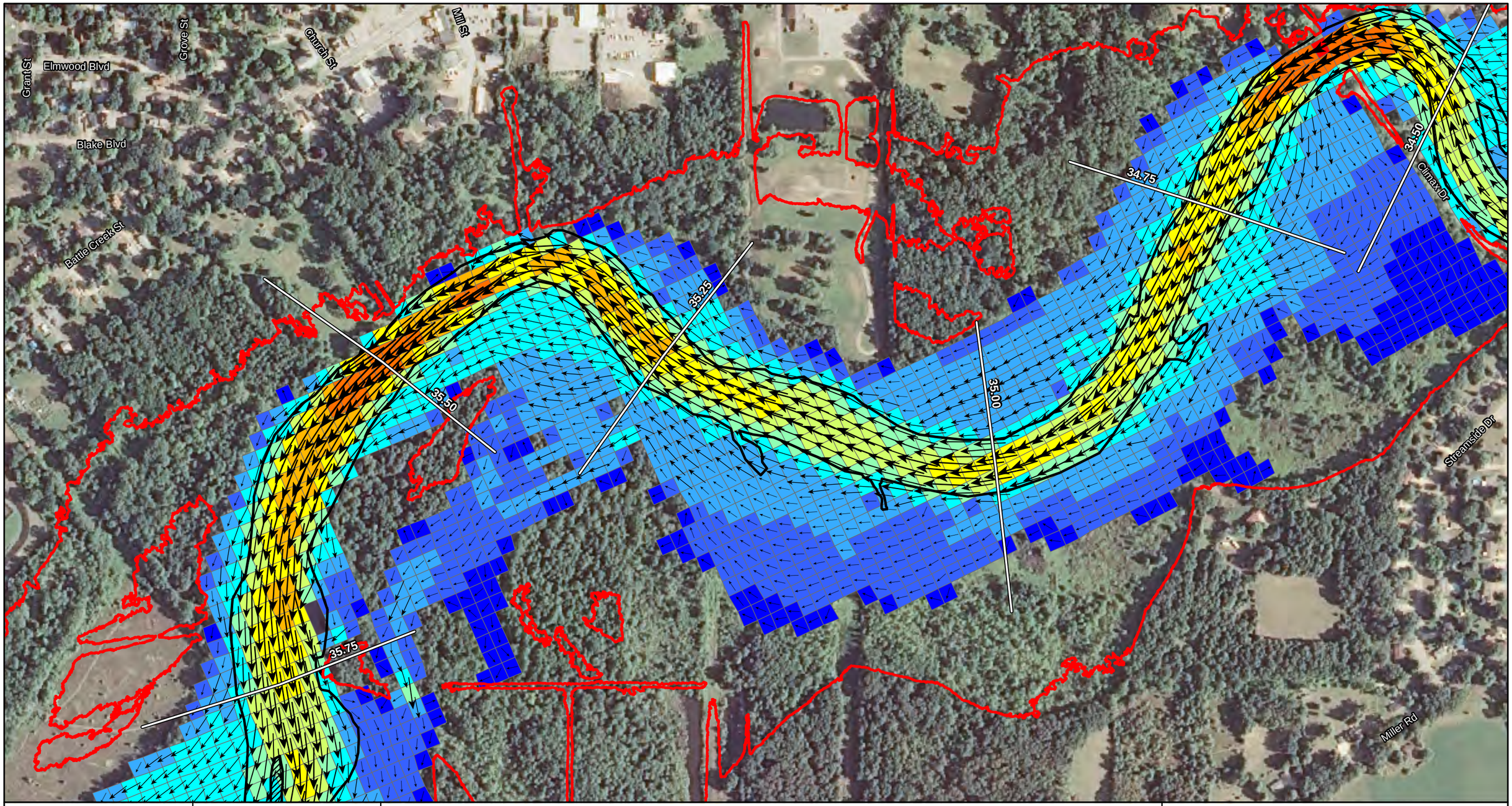
MP 33.52 - MP 34.70

SHEET 38 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



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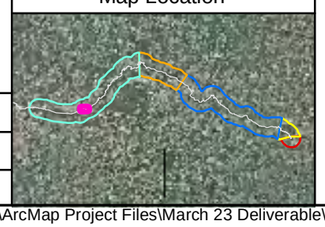


Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

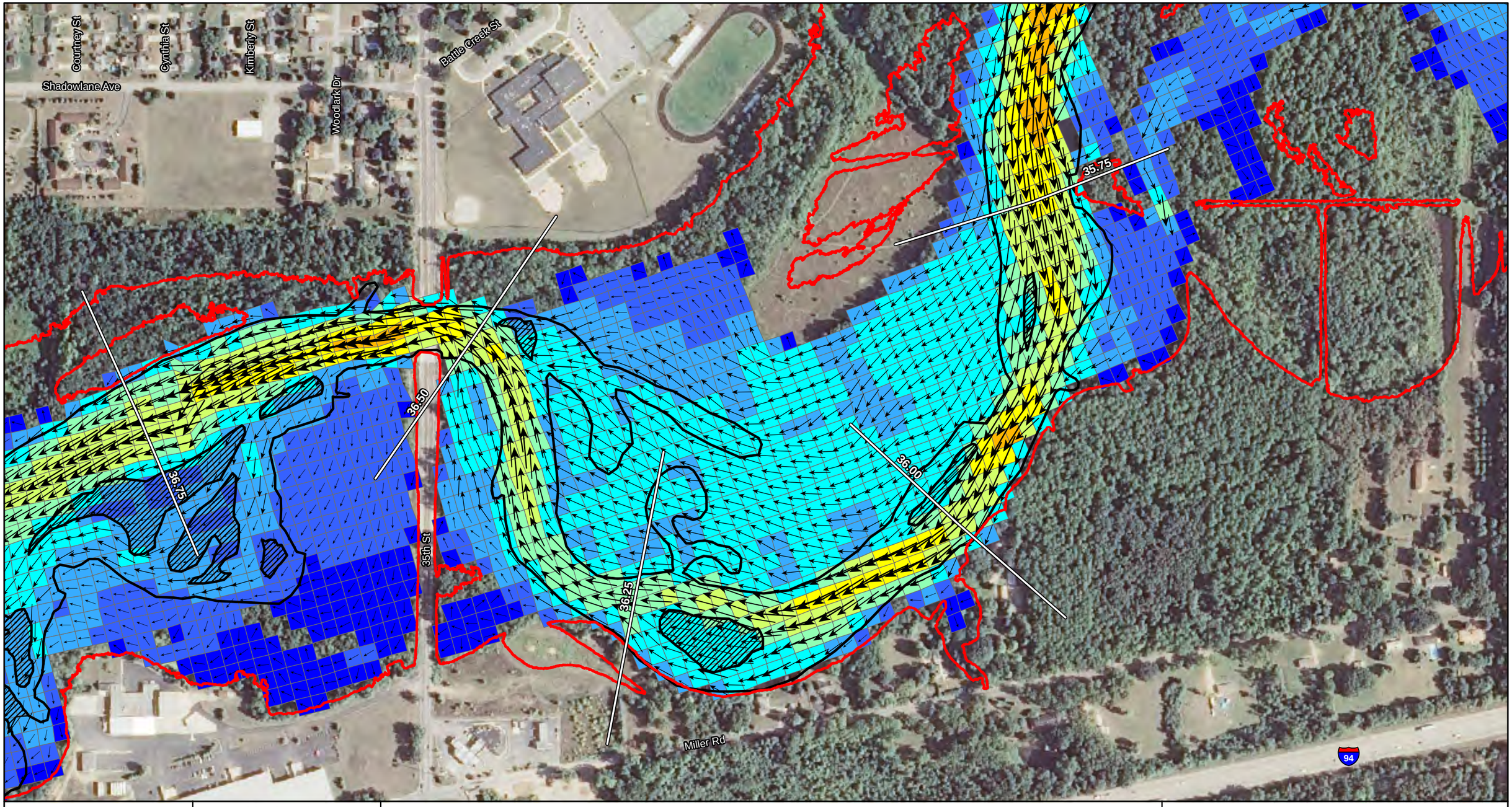
MP 34.70 - MP 35.75

SHEET 39 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

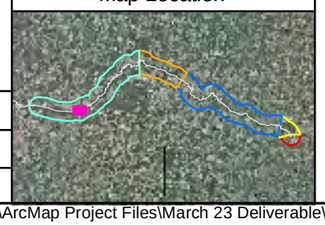
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

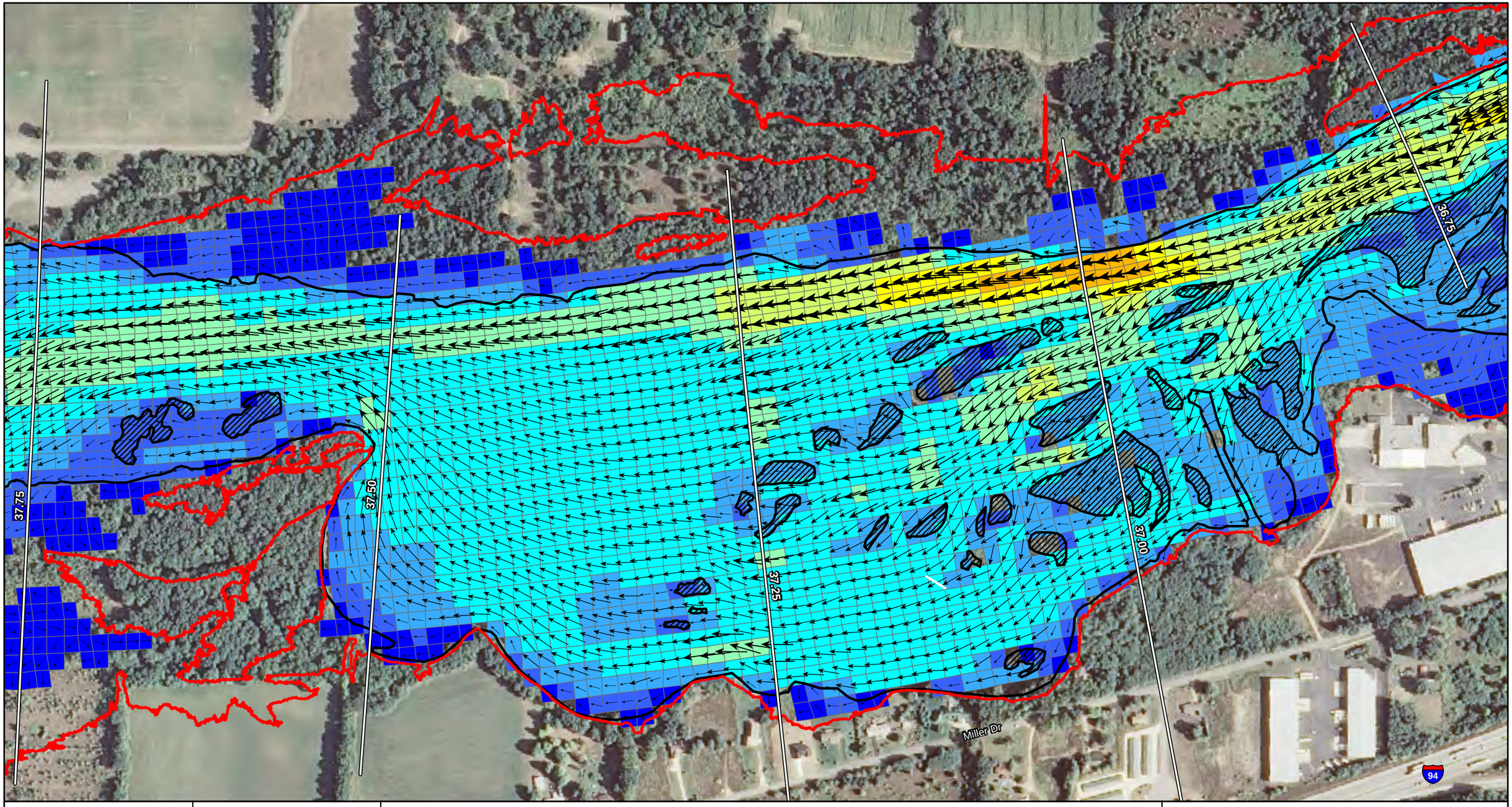
MP 35.75 - MP 36.75

SHEET 40 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

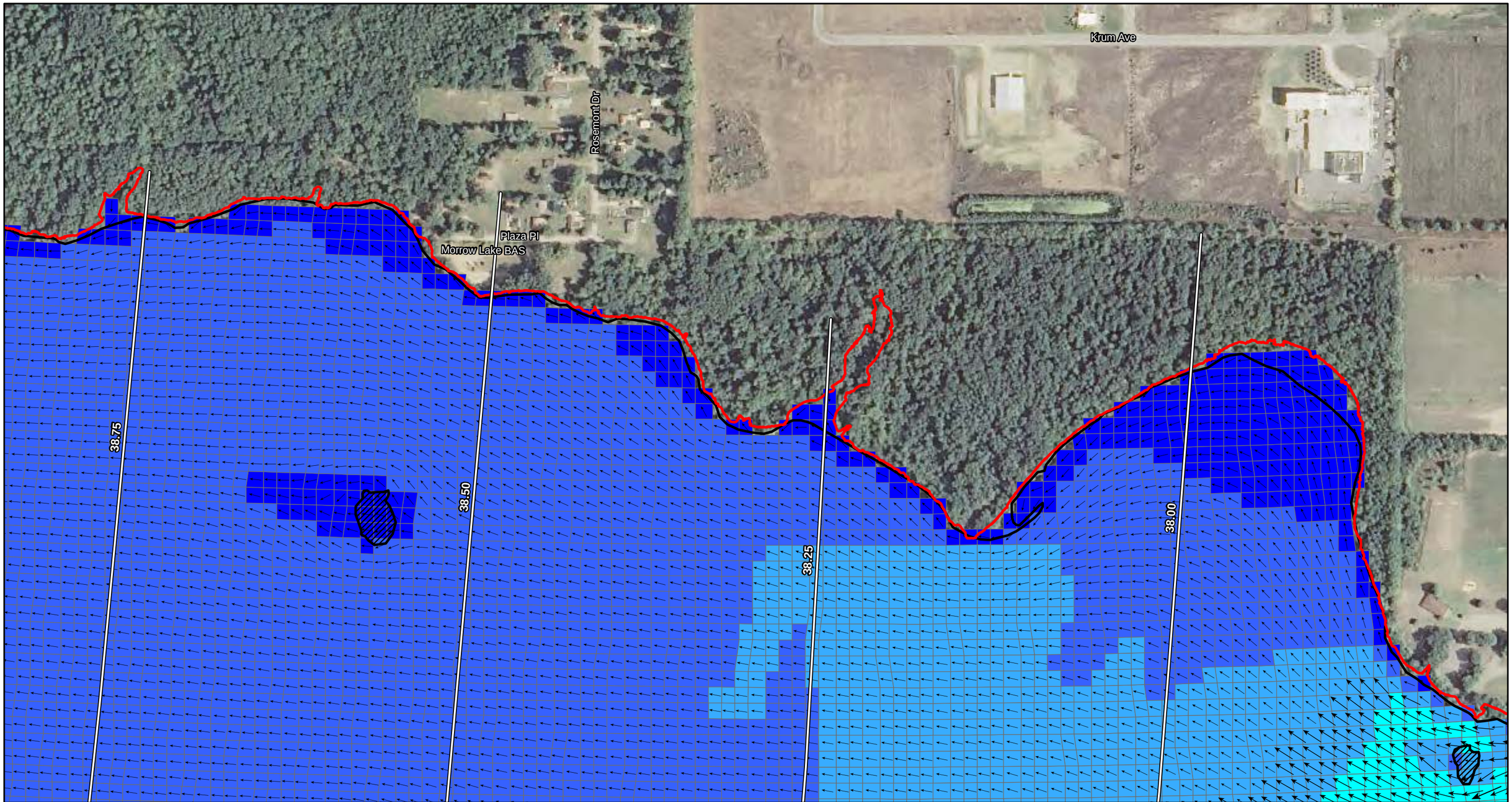
MP 36.75 - MP 37.75

SHEET 41 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 37.75N - MP 38.80N

SHEET 42 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

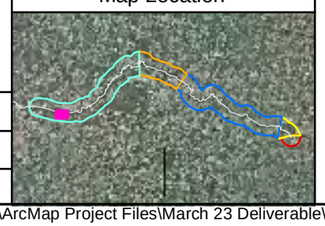
Aerial Photography Date: July & August 2009

38.75
38.50
38.25
38.00
37.75
94
Lyon Rd
Miller Dr

ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)
- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700
Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

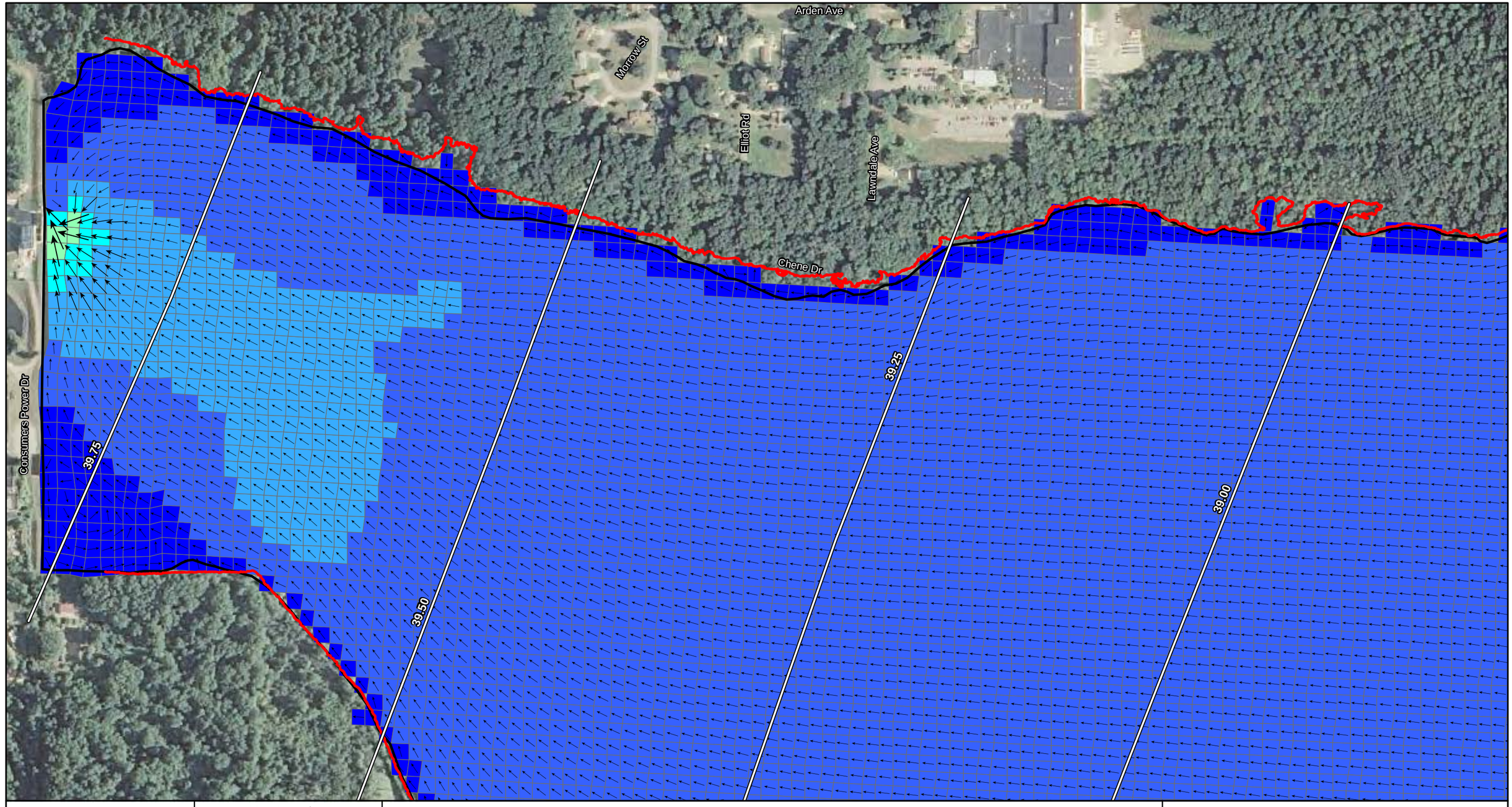
MP 37.75S - MP 38.80S

SHEET 43 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

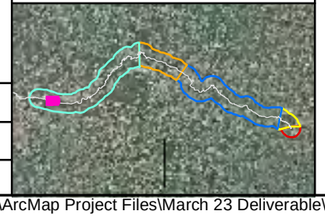
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

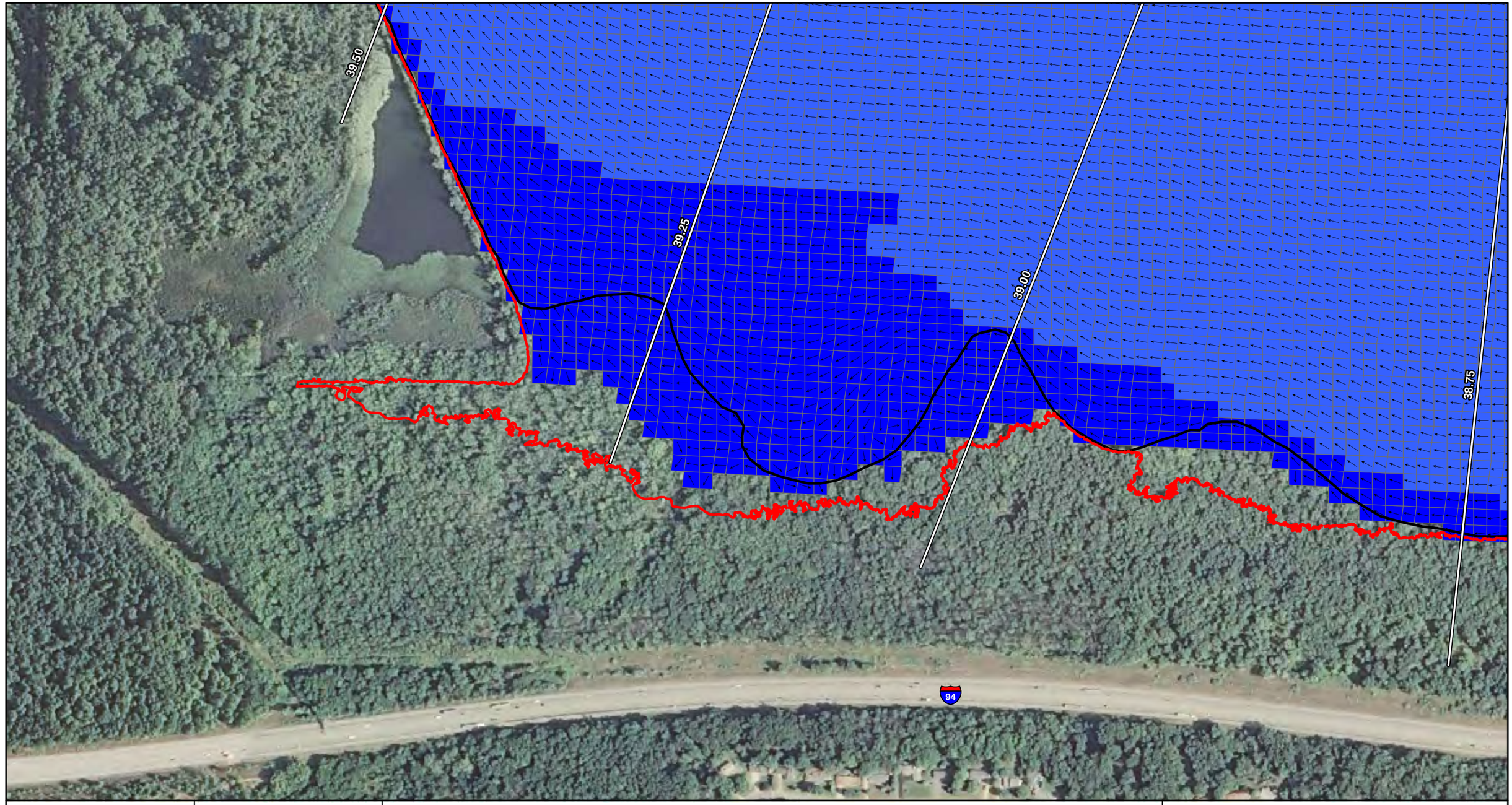
MP 38.80N - MP 39.95N

SHEET 44 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

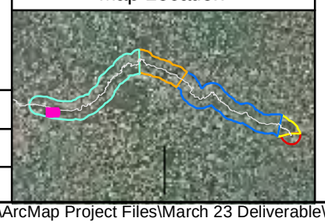
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec)
- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

- Flow Direction and Relative Magnitude
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

ft/sec = Feet Per Second

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: VELOCITY
50-YEAR FLOOD

MP 38.80S - MP 39.95S

SHEET 45 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Velocity_50yr.mxd

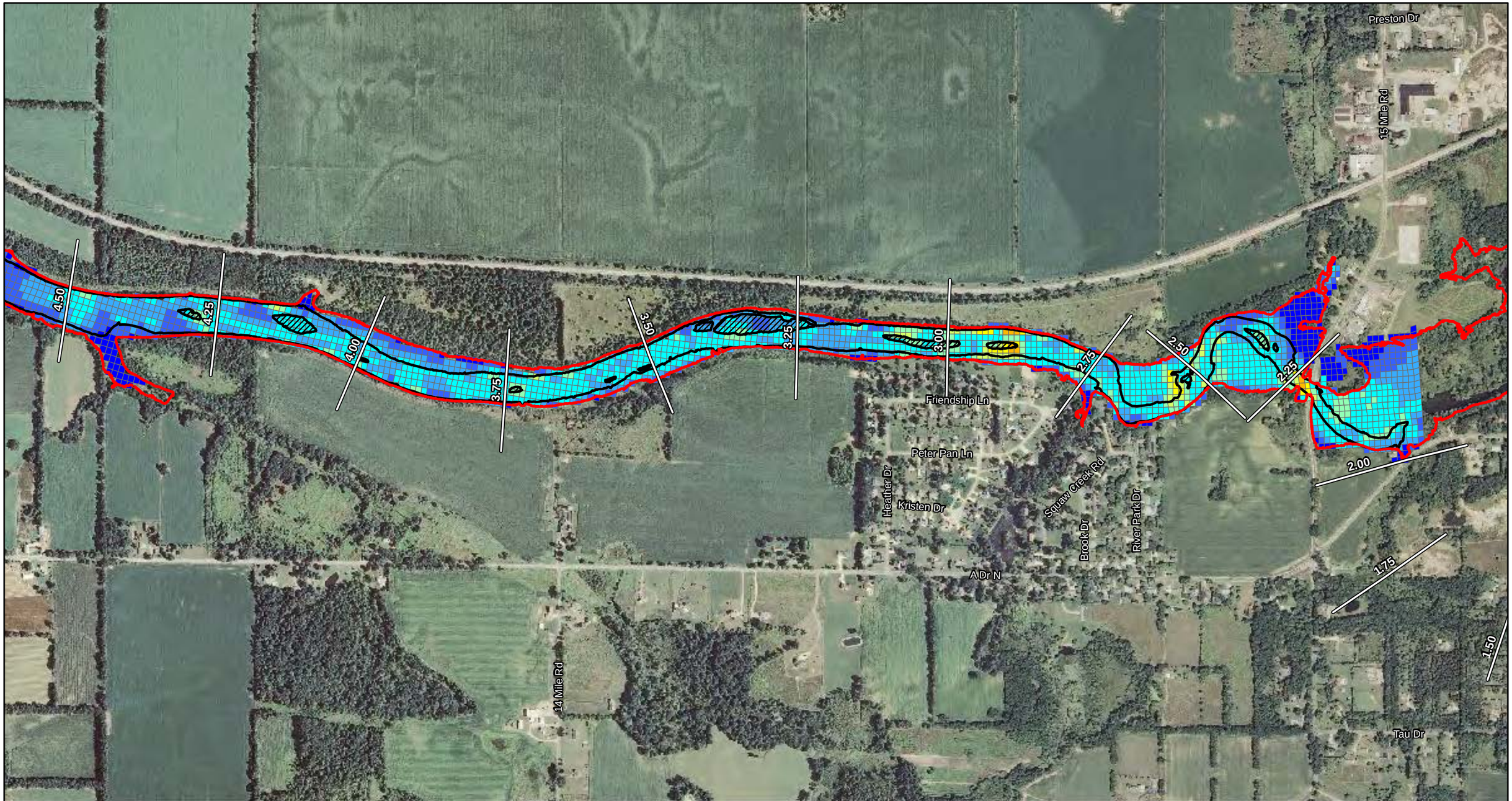
Aerial Photography Date: July & August 2009

Figure 6-18

Floodplain Grid: Bed Shear Stress

50-Year Flood

Sheets 1 through 16



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

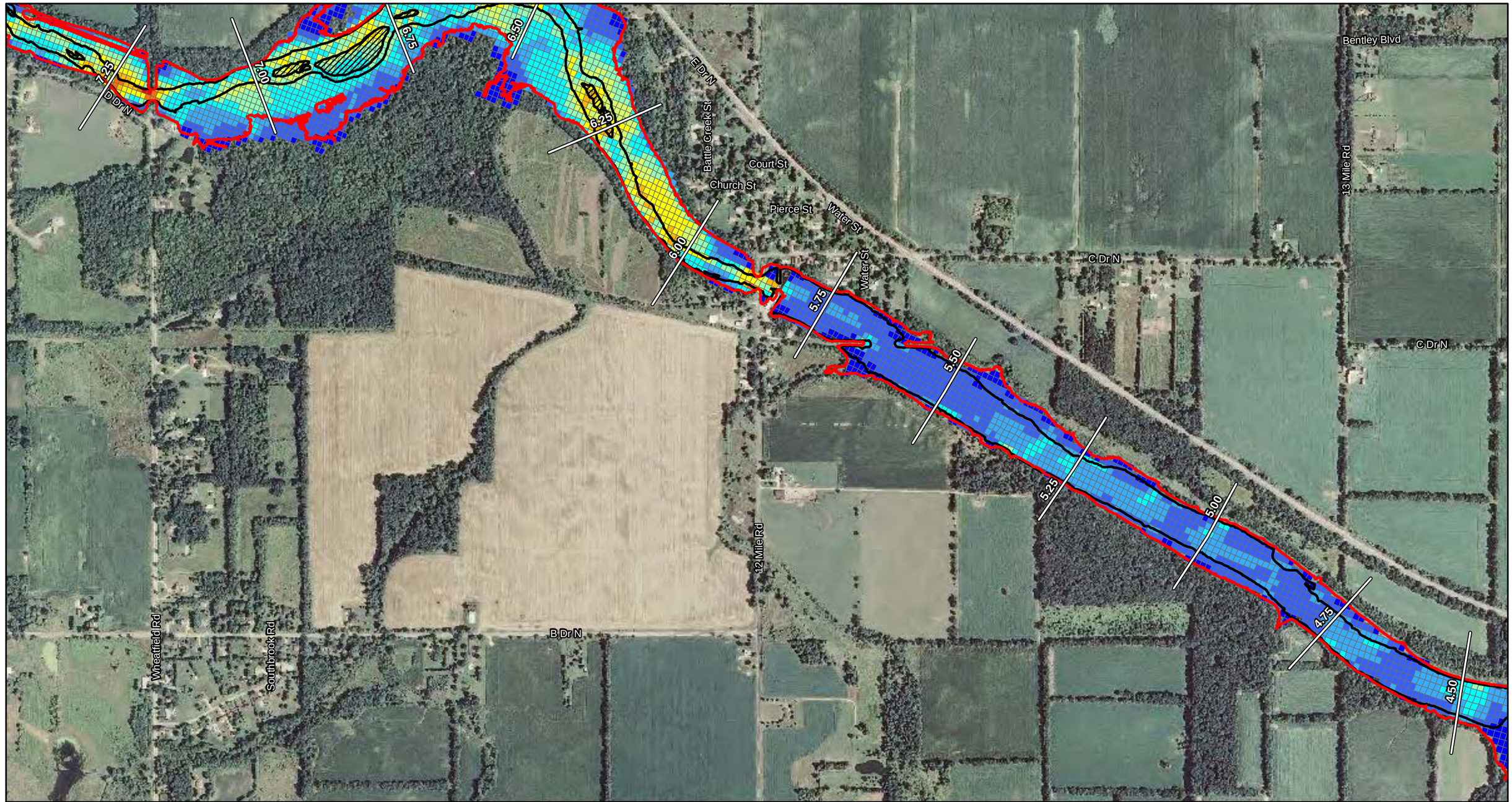
MP 1.50 - MP 4.50

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Bed_Shear_Stress_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

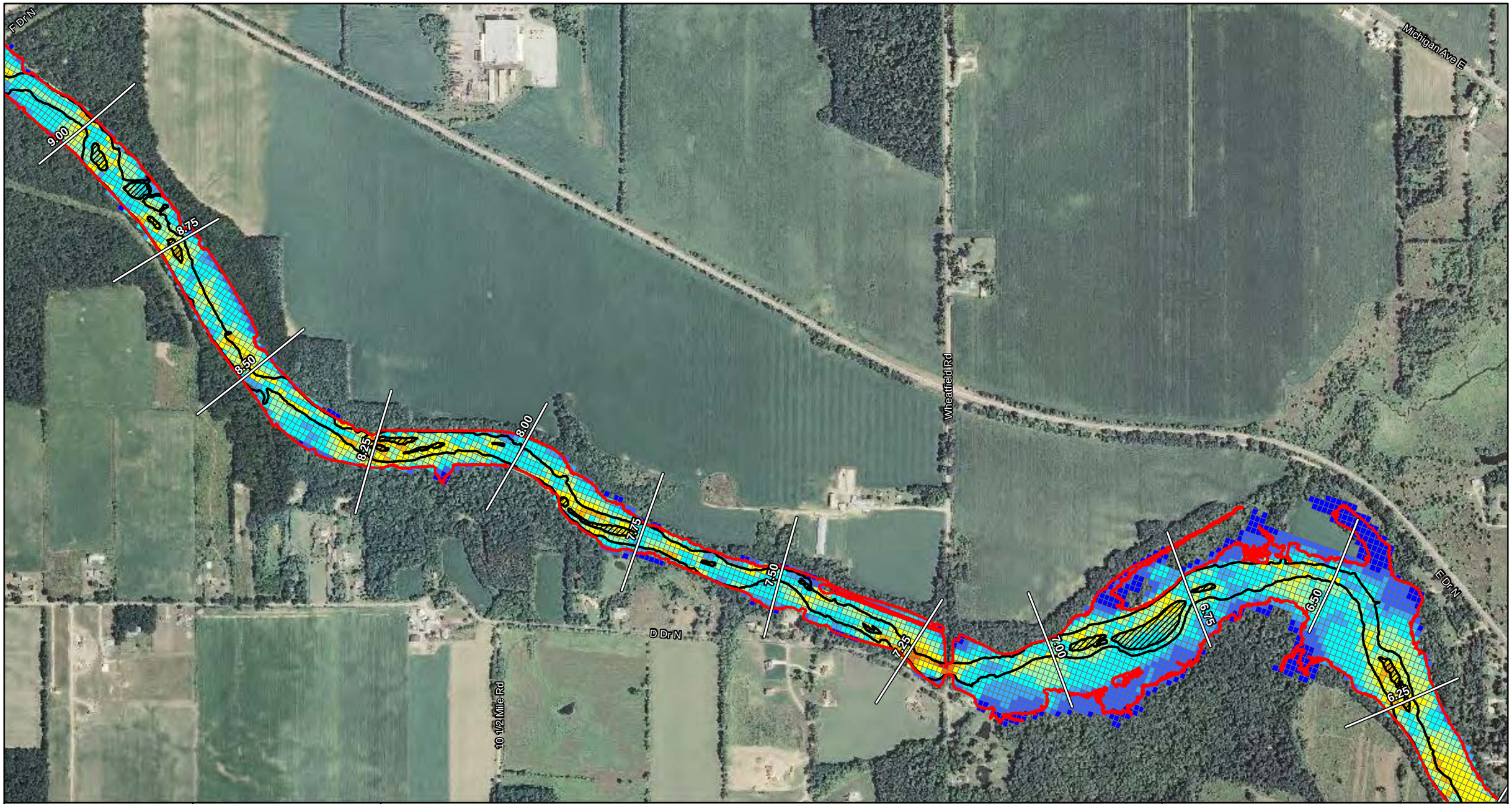
MP 4.50 - MP 6.25

SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Bed_Shear_Stress_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

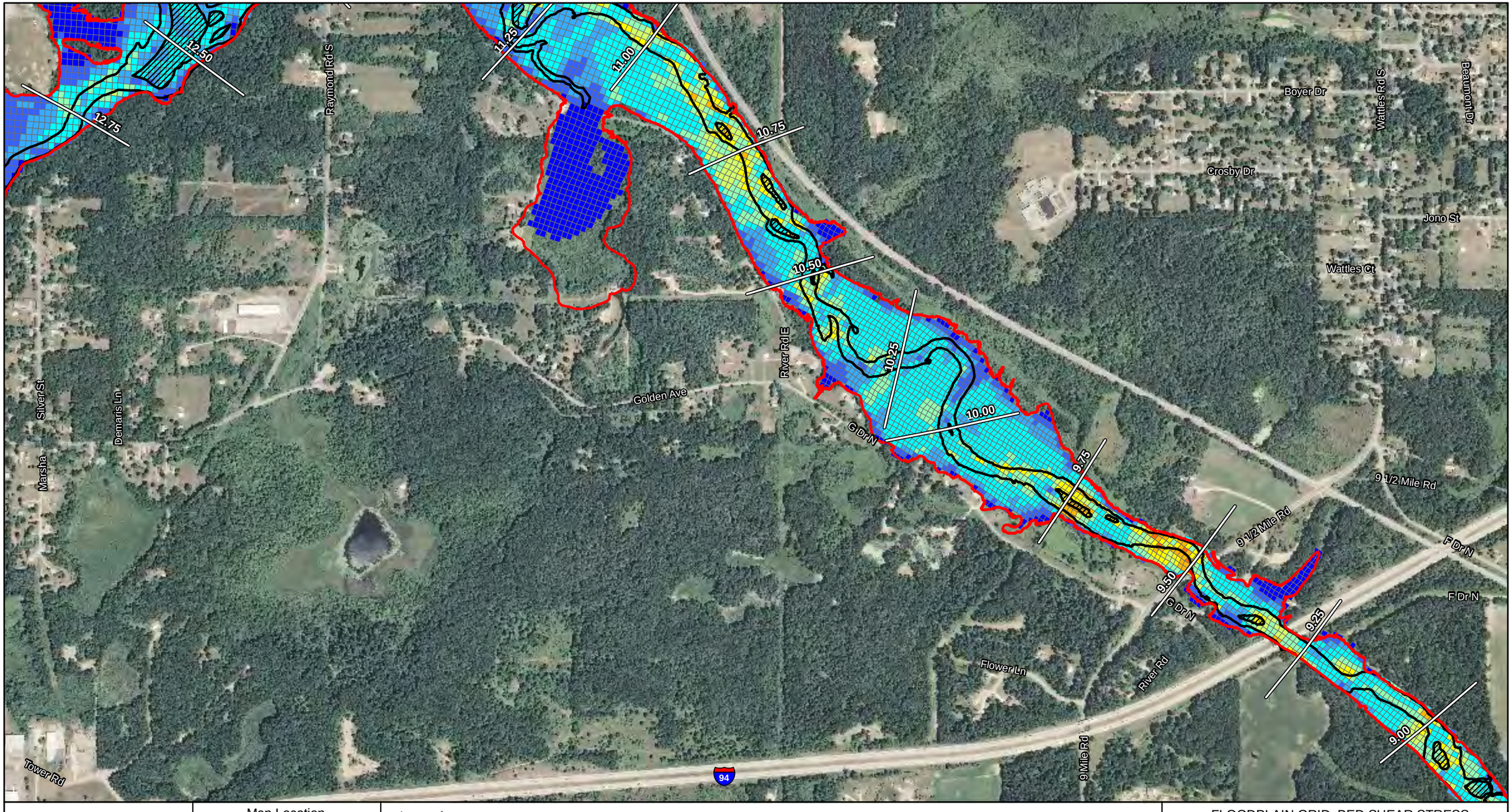
MP 6.25 - MP 9.00

SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Bed_Shear_Stress_50yr.mxd

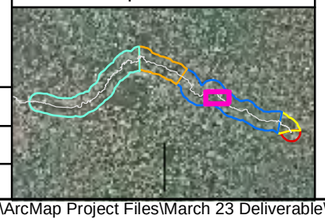
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

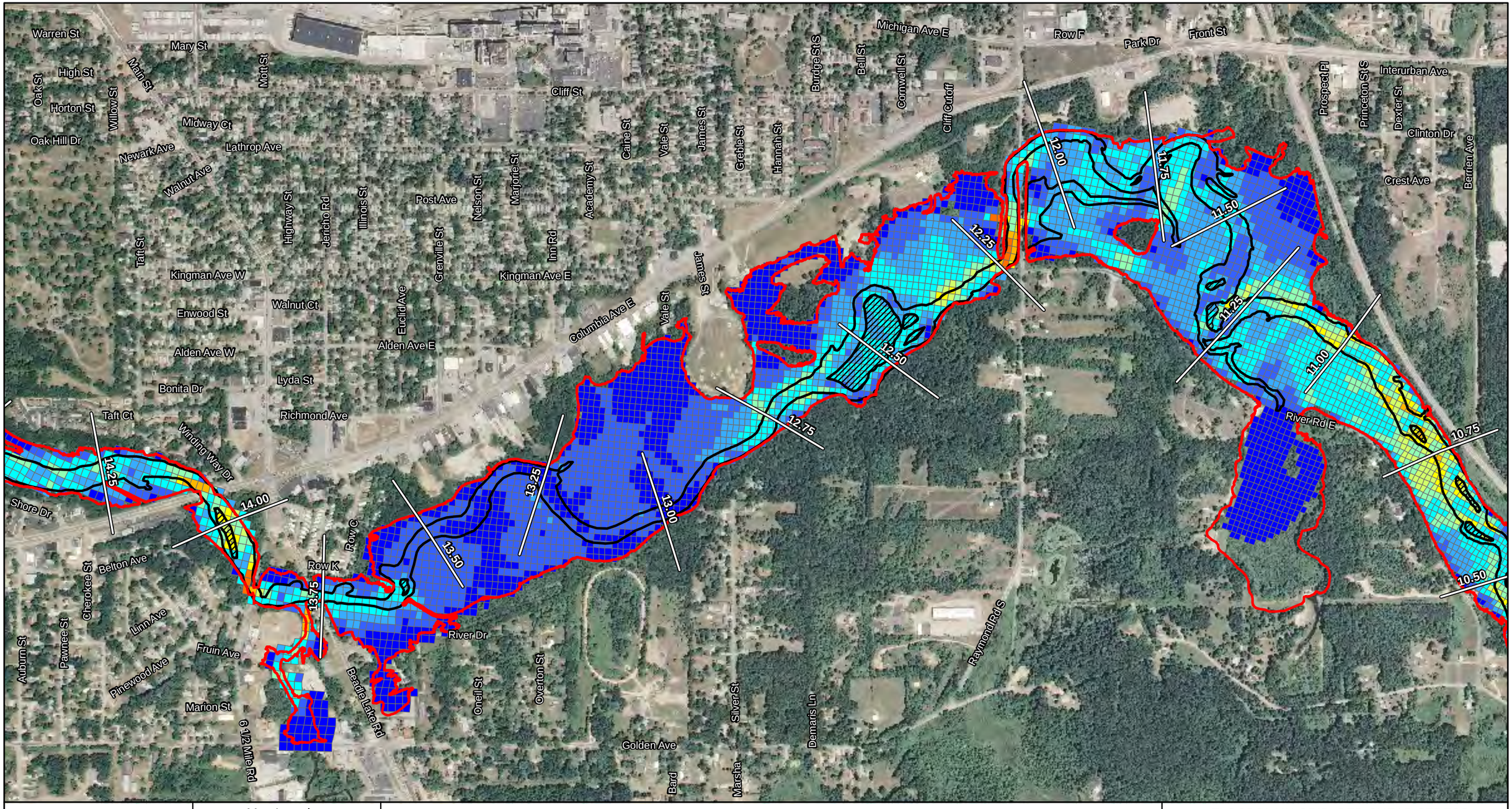
MP 9.00 - MP 10.50

SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Bed_Shear_Stress_50yr.mxd

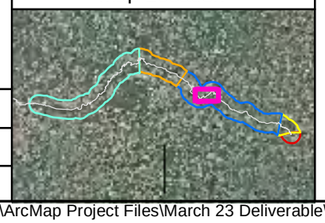
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

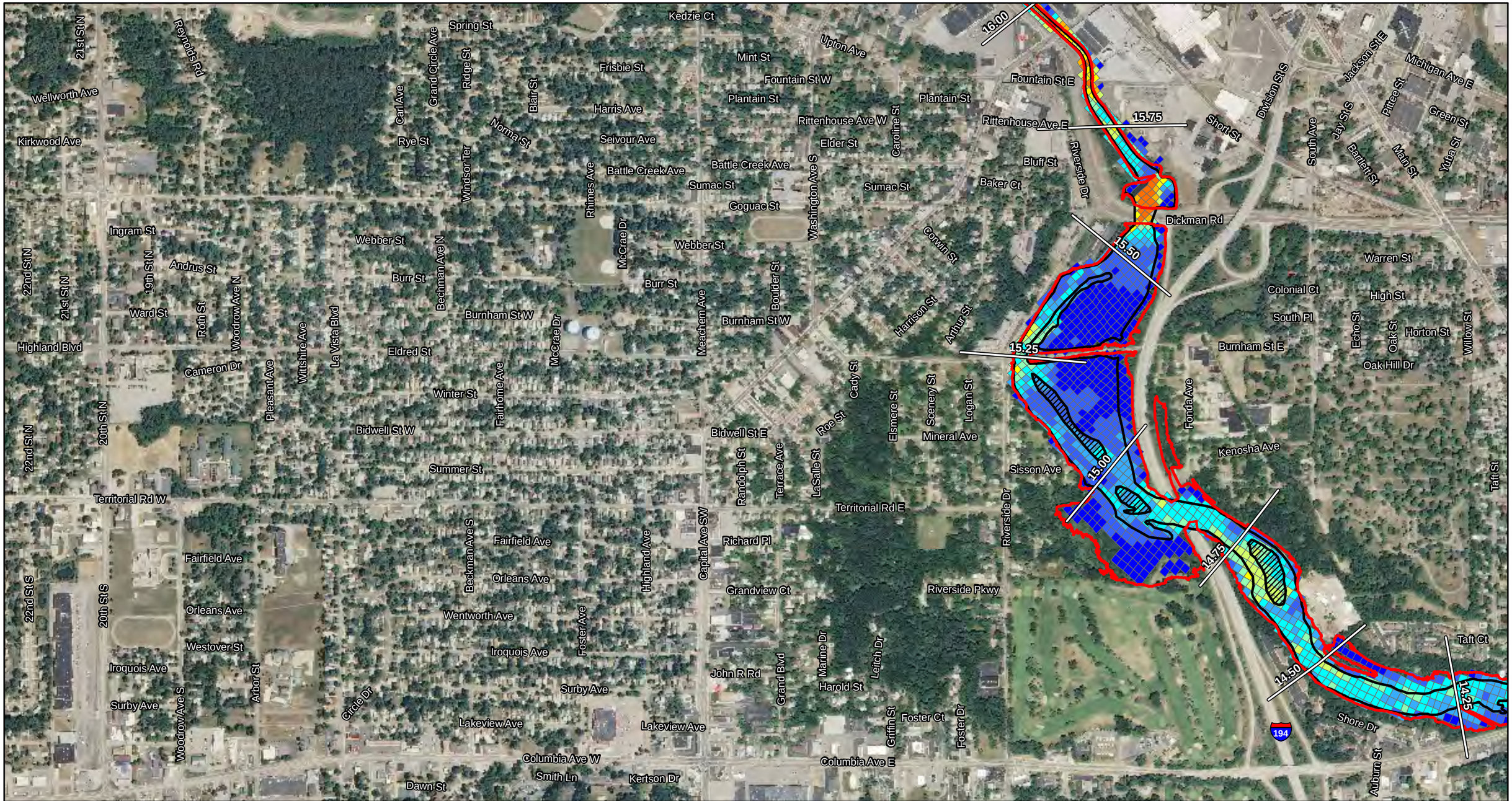
MP 10.50 - MP 14.25

SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Bed_Shear_Stress_50yr.mxd

Aerial Photography Date: July & August 2009



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

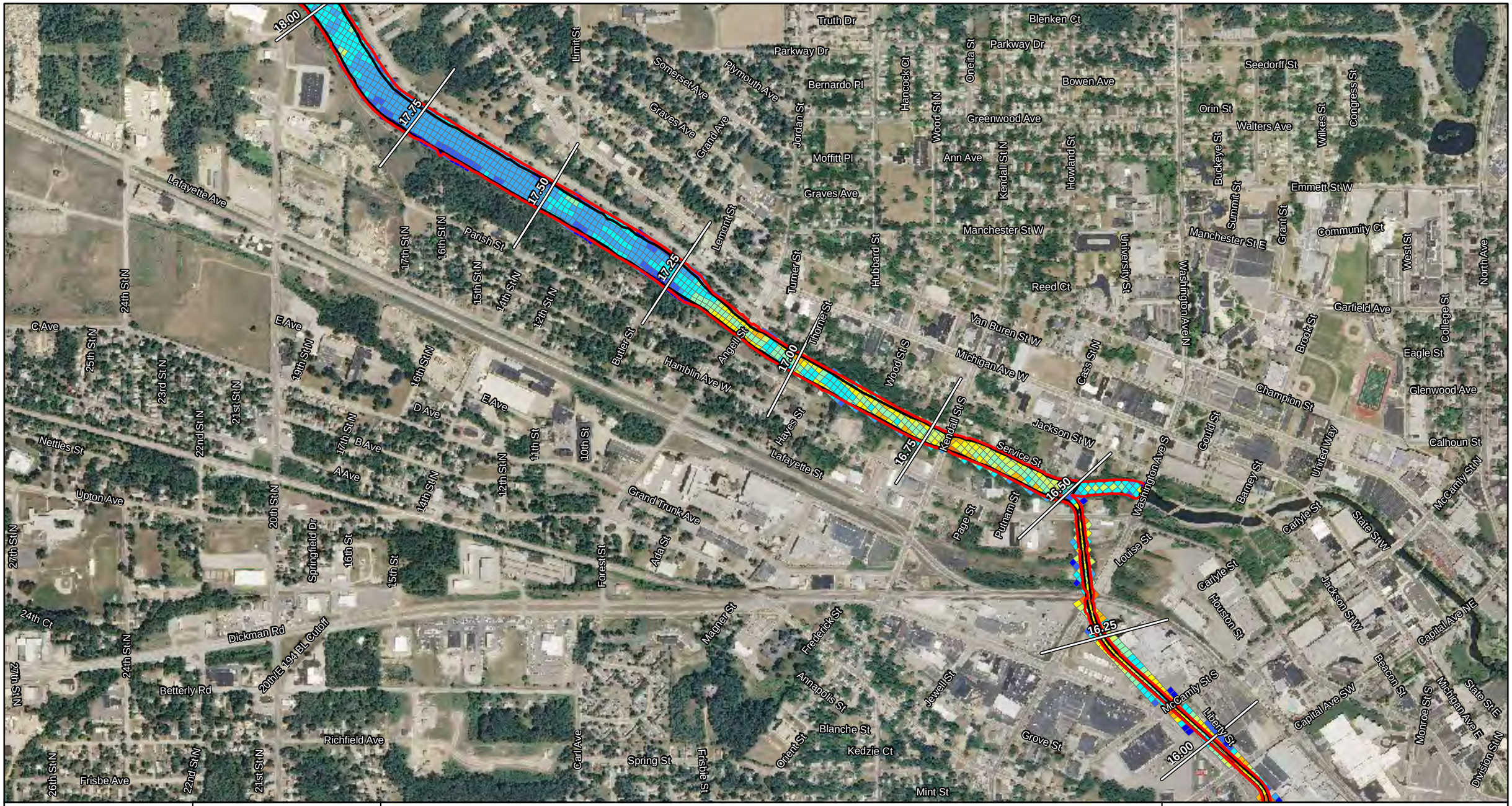
MP 14.25 - MP 16.00

SHEET 6 OF 16

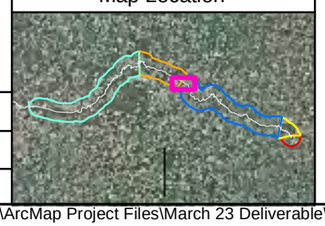
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Bed_Shear_Stress_50yr.mxd

Aerial Photography Date: July & August 2009



Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

Channel Bankline
Island Bankline
HEC-RAS 100-Year Floodplain
Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600
Scale in Feet

ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

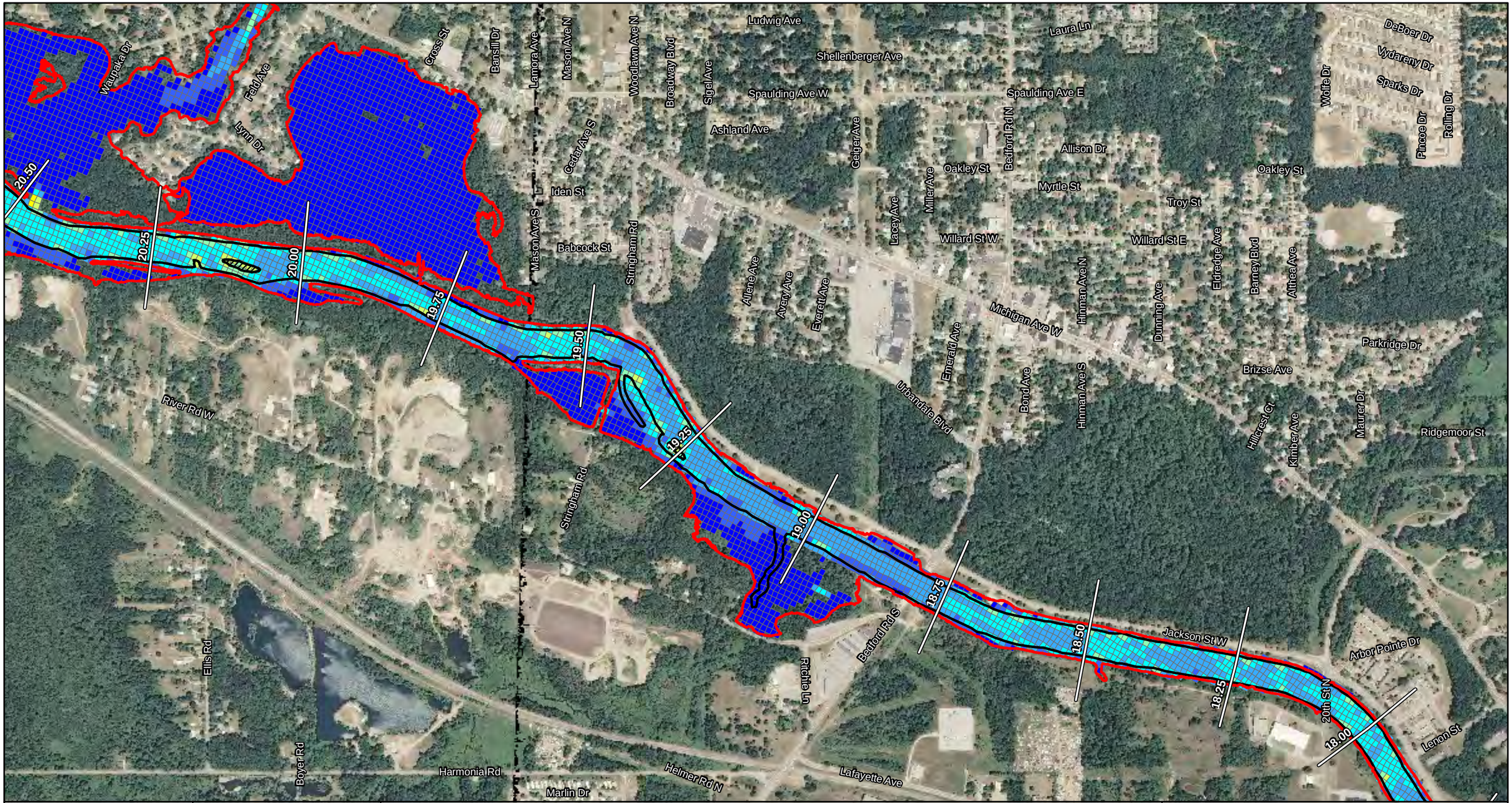
MP 16.00 - MP 18.00

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Bed_Shear_Stress_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

MP 18.00 - MP 20.00

SHEET 8 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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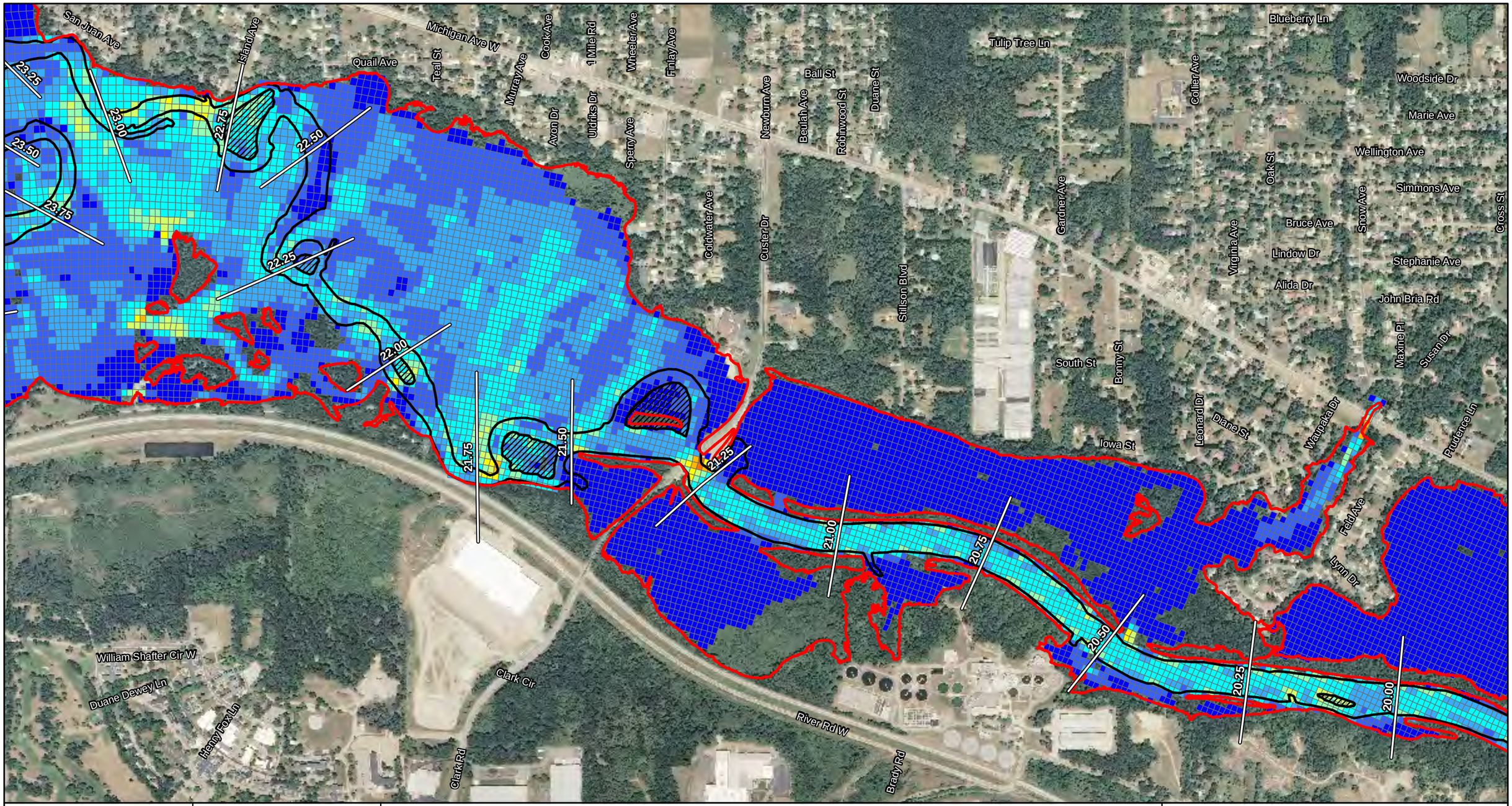
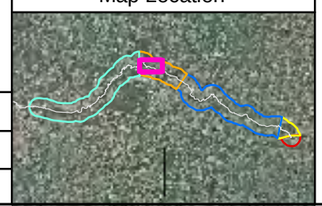
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

MP 20.00 - MP 22.50

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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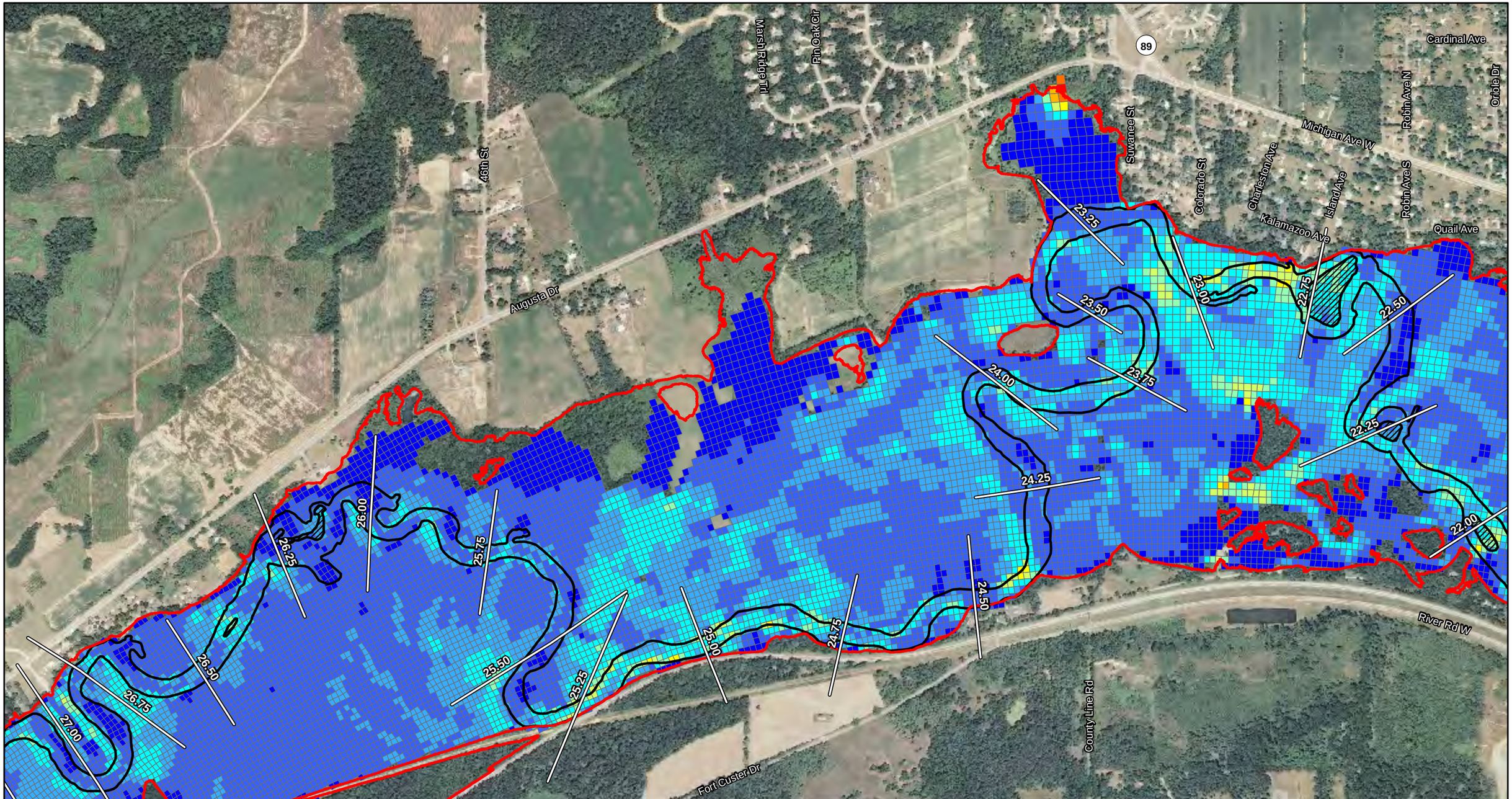
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

MP 22.50 - MP 27.00

SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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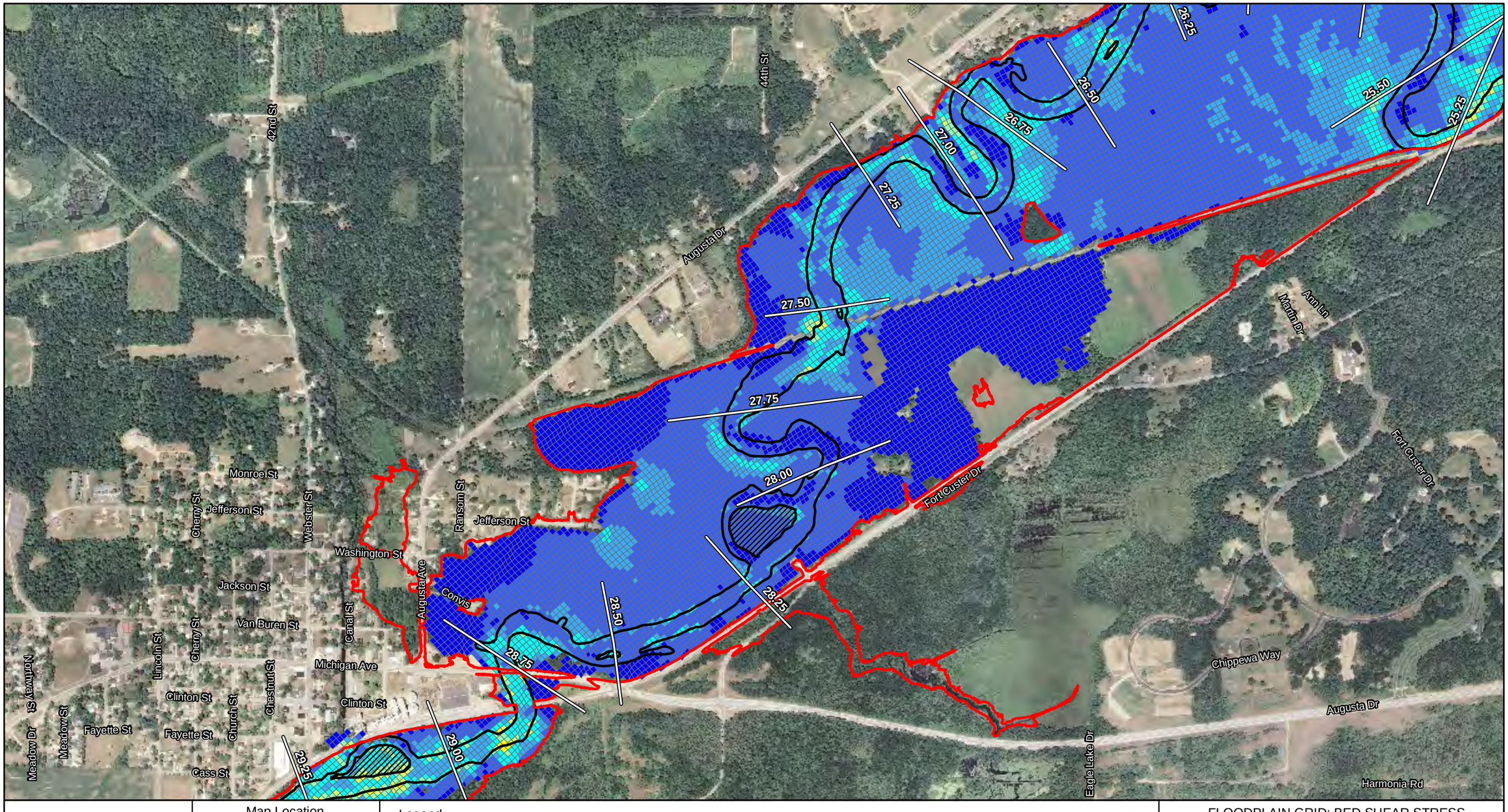
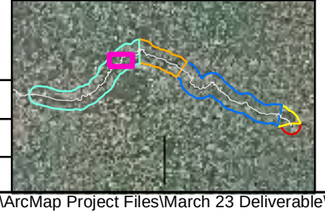
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

MP 27.00 - MP 28.75

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
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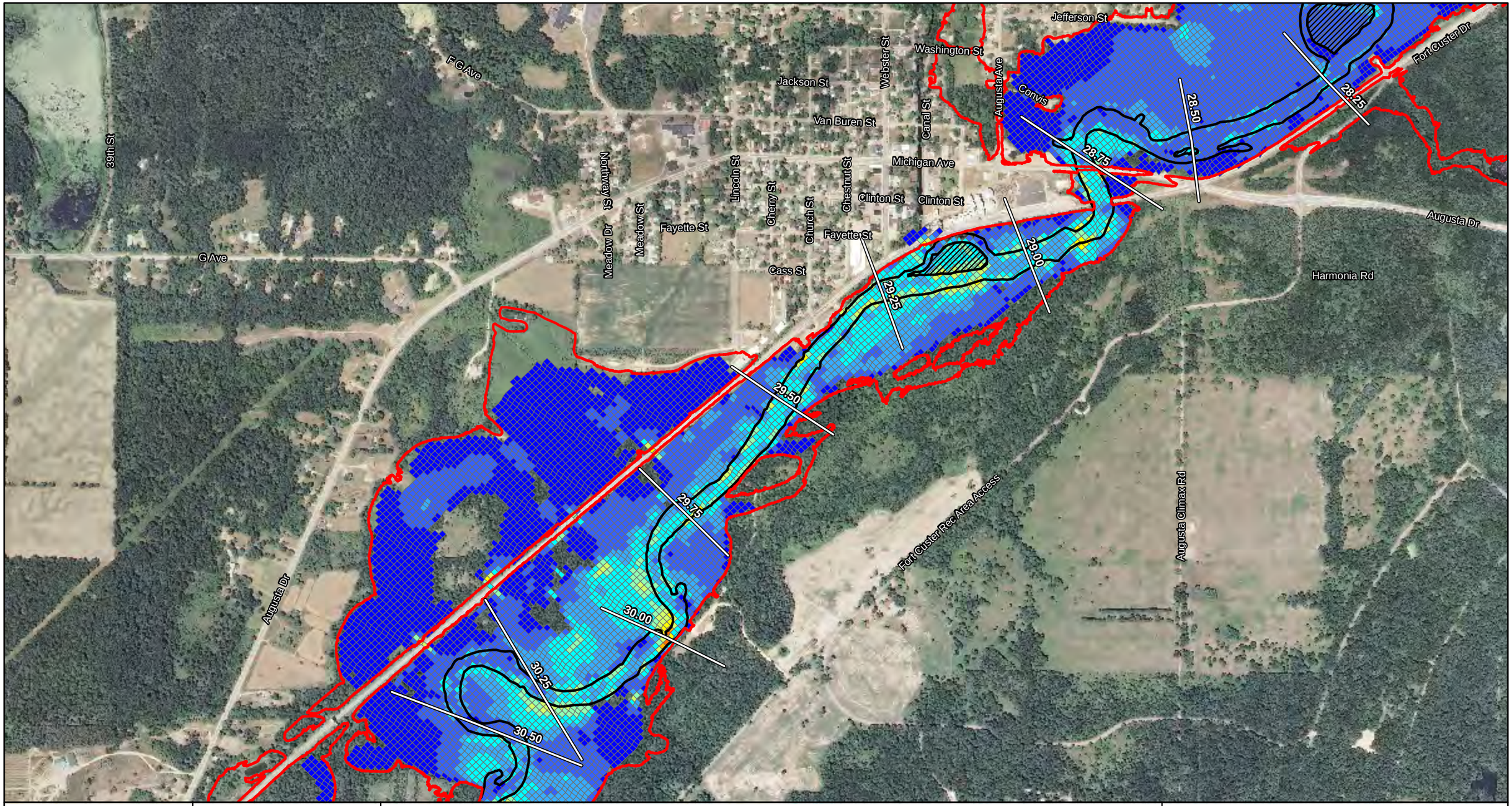
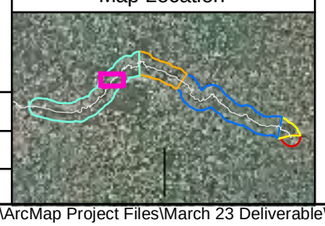
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

MP 28.75 - MP 30.50

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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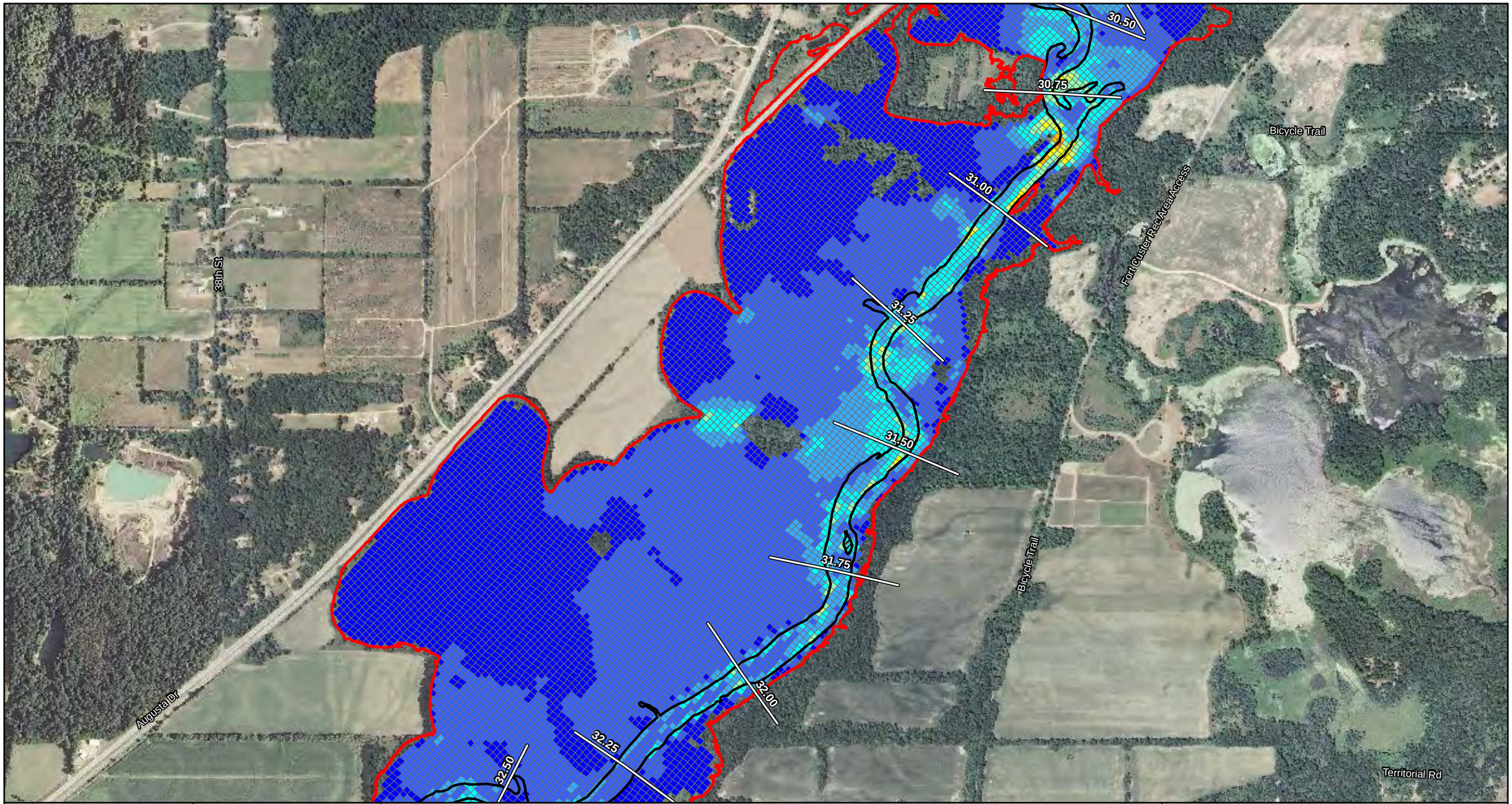
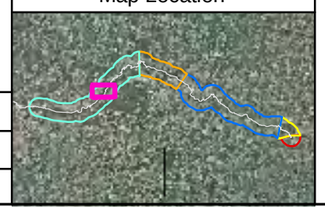
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

MP 30.50 - MP 32.25

SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
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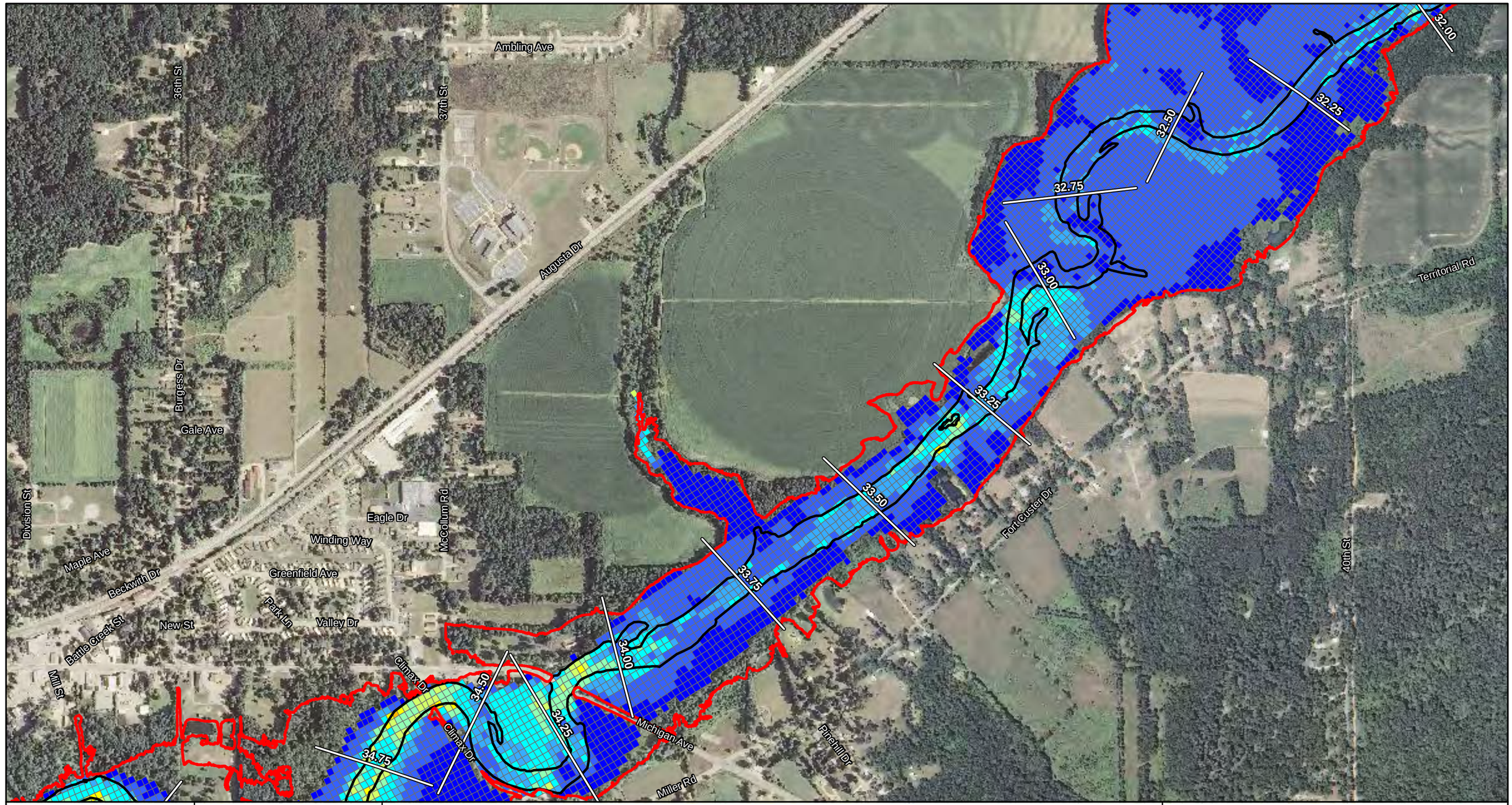
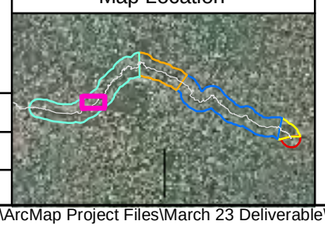
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

Channel Bankline
Island Bankline
HEC-RAS 100-Year Floodplain
Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

MP 32.25 - MP 34.75

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
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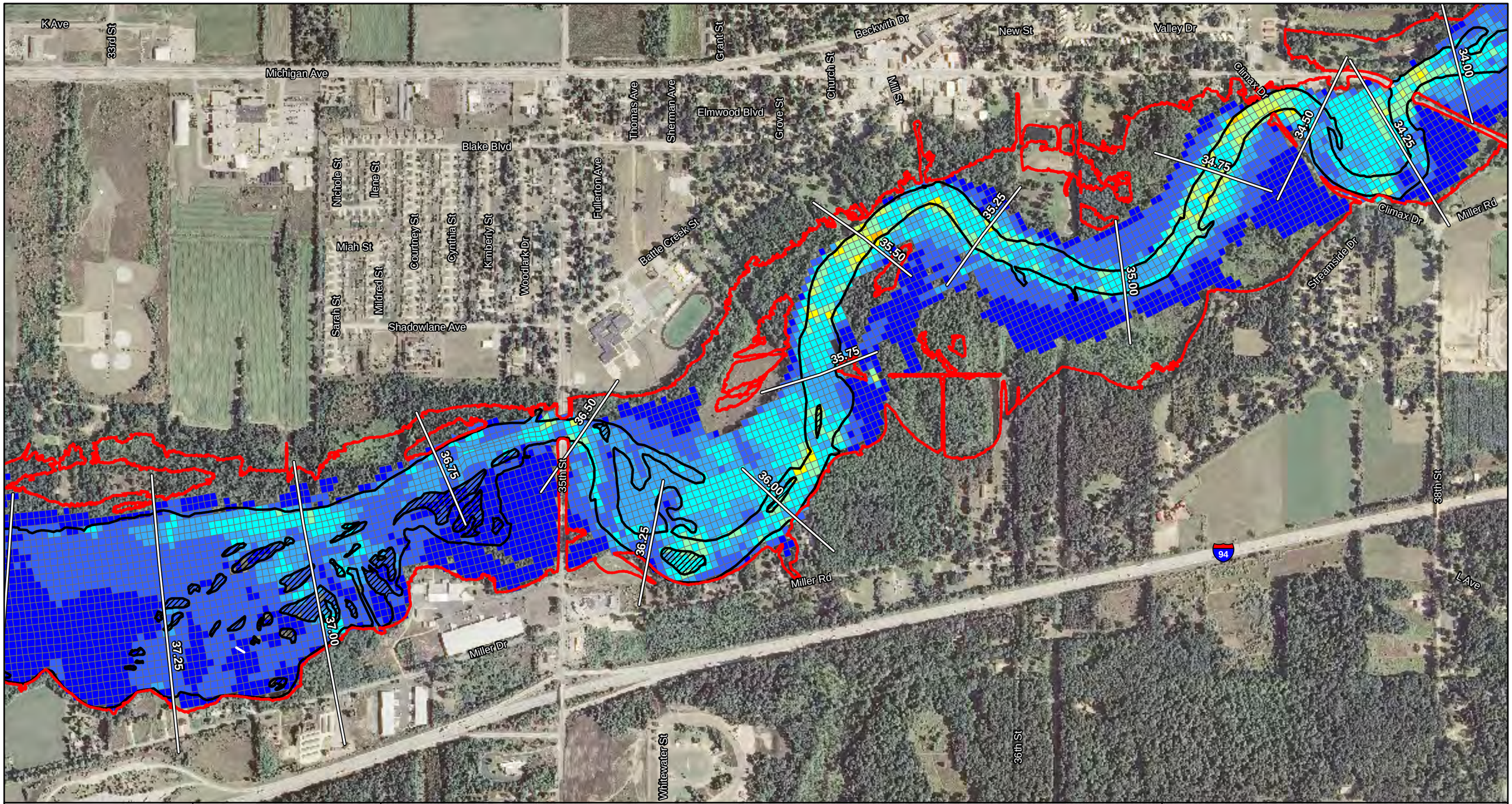
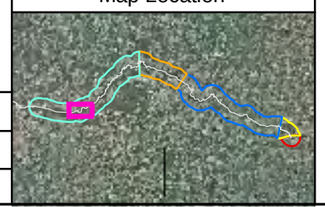
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

MP 34.25 - MP 37.50

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
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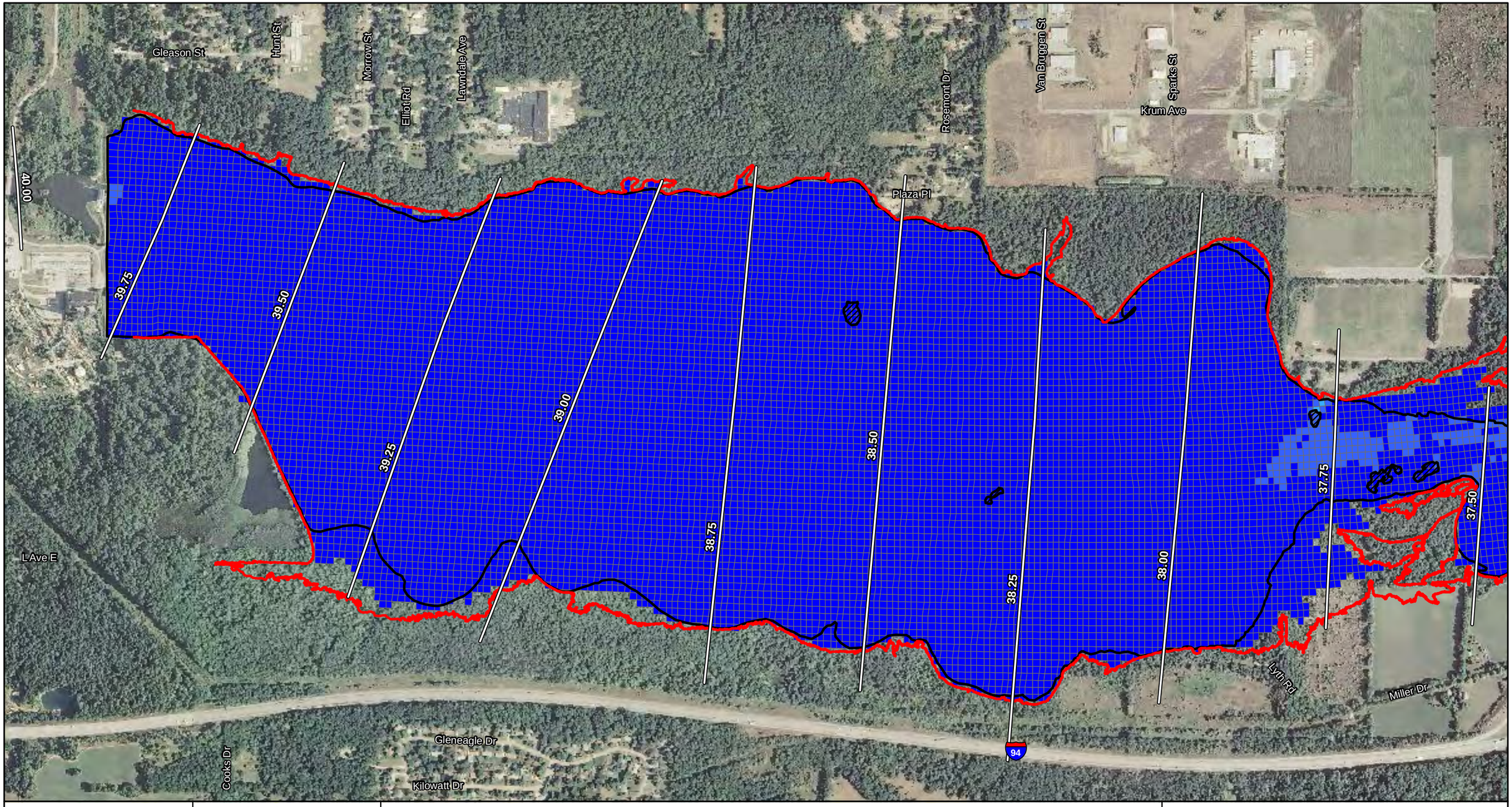
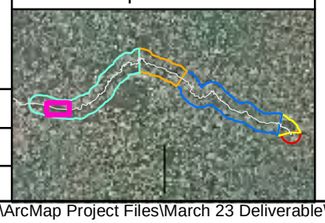
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa)

- < 1.000001
- 1.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 15.000000
- 15.000001 - 20.000000
- 20.000001 - 30.000000
- 30.000001 - 50.000000
- 50.000001 - 100.000000
- > 100.000000

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

Pa = Pascals

N

0 400 800 1,600

Scale in Feet

FLOODPLAIN GRID: BED SHEAR STRESS
50-YEAR FLOOD

MP 37.50 - MP 40.00

SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: July & August 2009

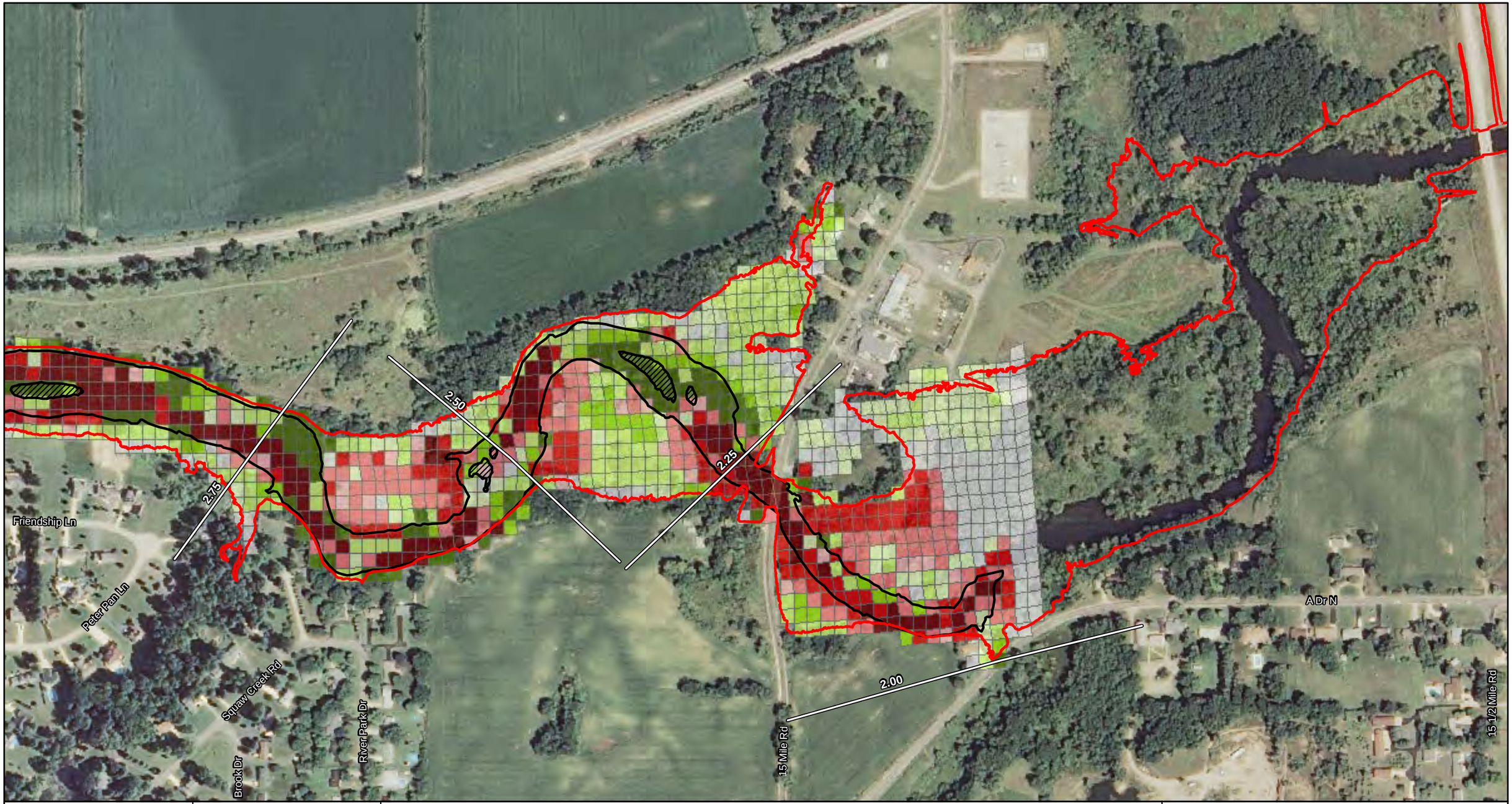
Figure 6-19

Floodplain Grid: Sedimentation Rate

All Grid Cells

50-Year Flood

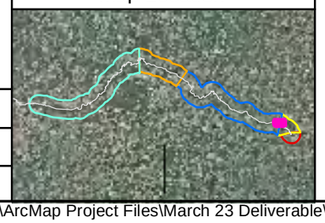
Sheets 1 through 45



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 01.88 - MP 02.91

SHEET 1 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: July & August 2009

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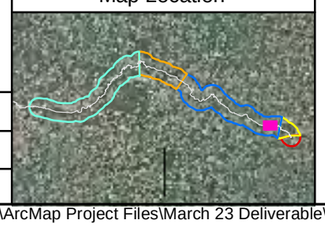
Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 02.91 - MP 03.93

SHEET 2 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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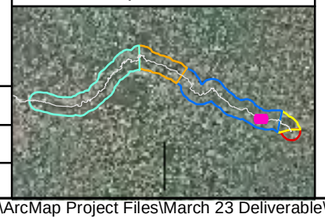
Aerial Photography Date: July & August 2009

5.00
4.75
4.50
4.25
4.00

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 03.93 - MP 04.98

SHEET 3 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: July & August 2009

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Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 04.98 - MP 06.03

SHEET 4 OF 45

ENBRIDGE LINE 6B MP 608
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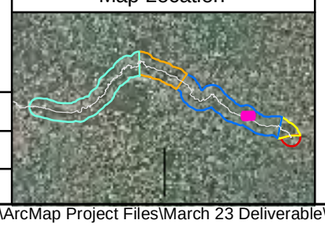
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 06.03 - MP 06.85

SHEET 5 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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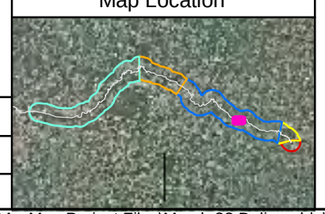
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 06.85 - MP 07.95

SHEET 6 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_50yr.mxd

Aerial Photography Date: July & August 2009

9.00

8.75

8.50

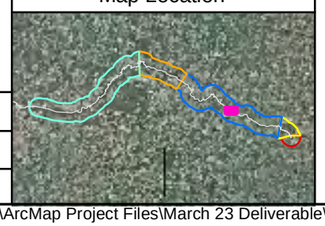
8.25

8.00

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

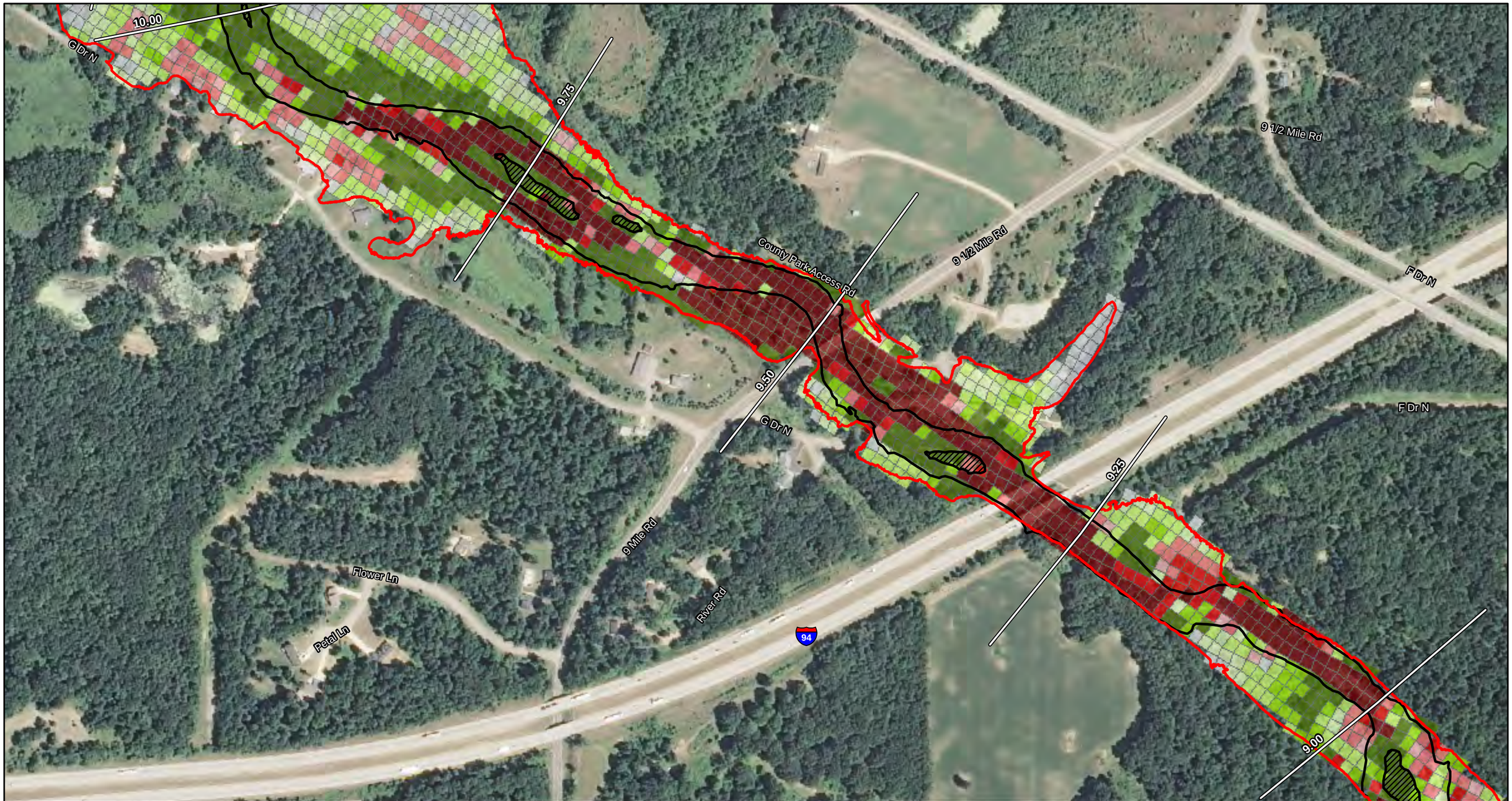
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 07.95 - MP 08.93

SHEET 7 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_50yr.mxd

Aerial Photography Date: July & August 2009



Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

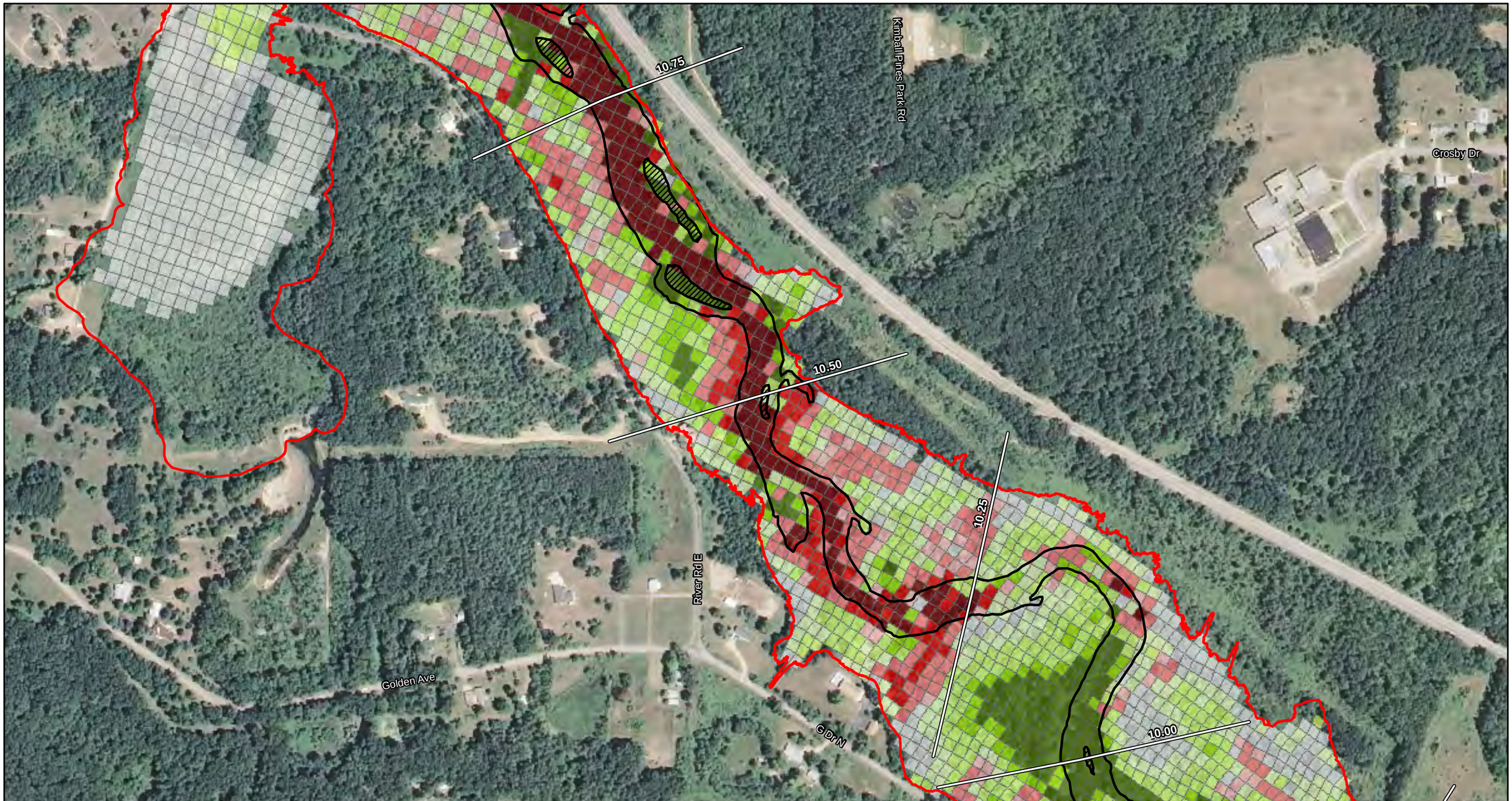
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 08.93 - MP 10.00

SHEET 8 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 10.00 - MP 10.80

SHEET 9 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 10.80 - MP 11.70

SHEET 10 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

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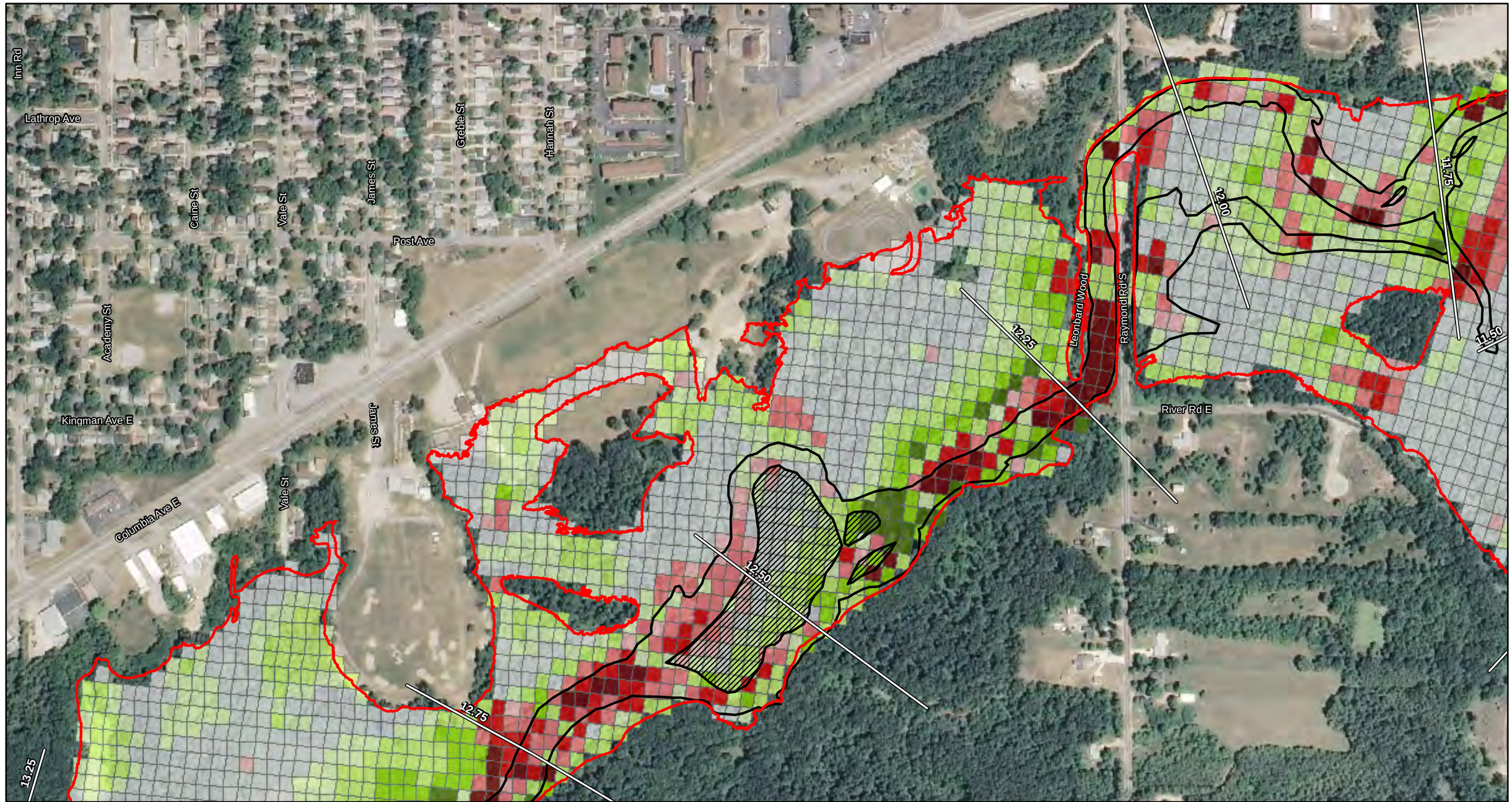
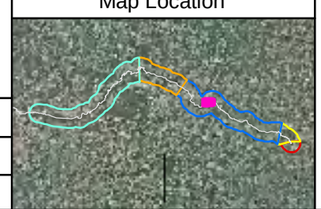
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 11.70 - MP 12.77

SHEET 11 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

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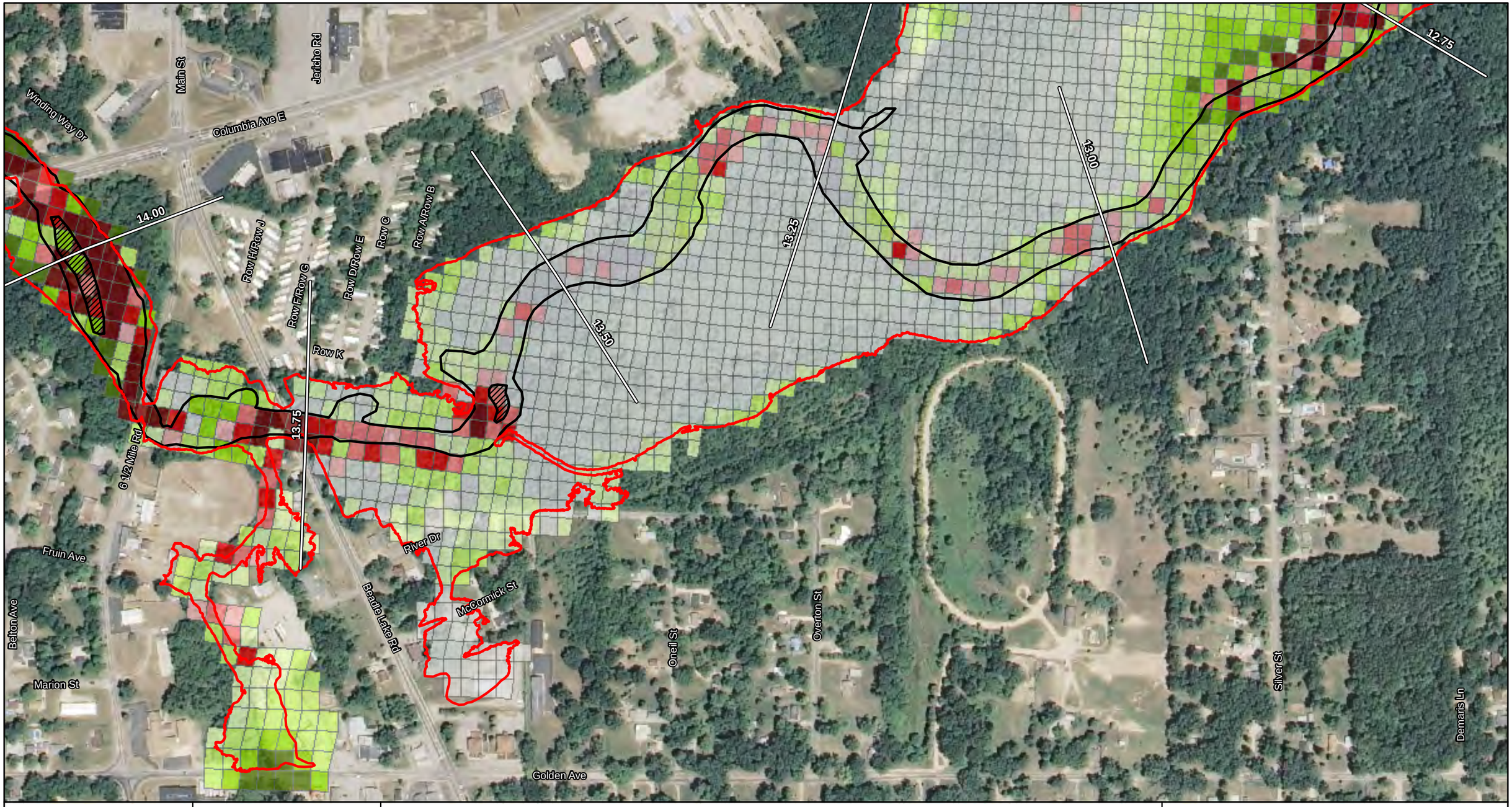
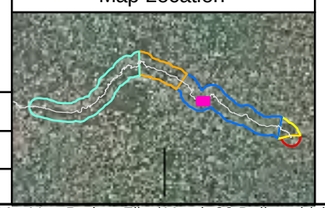
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 12.77 - MP 14.00

SHEET 12 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 14.00 - MP 15.05

SHEET 13 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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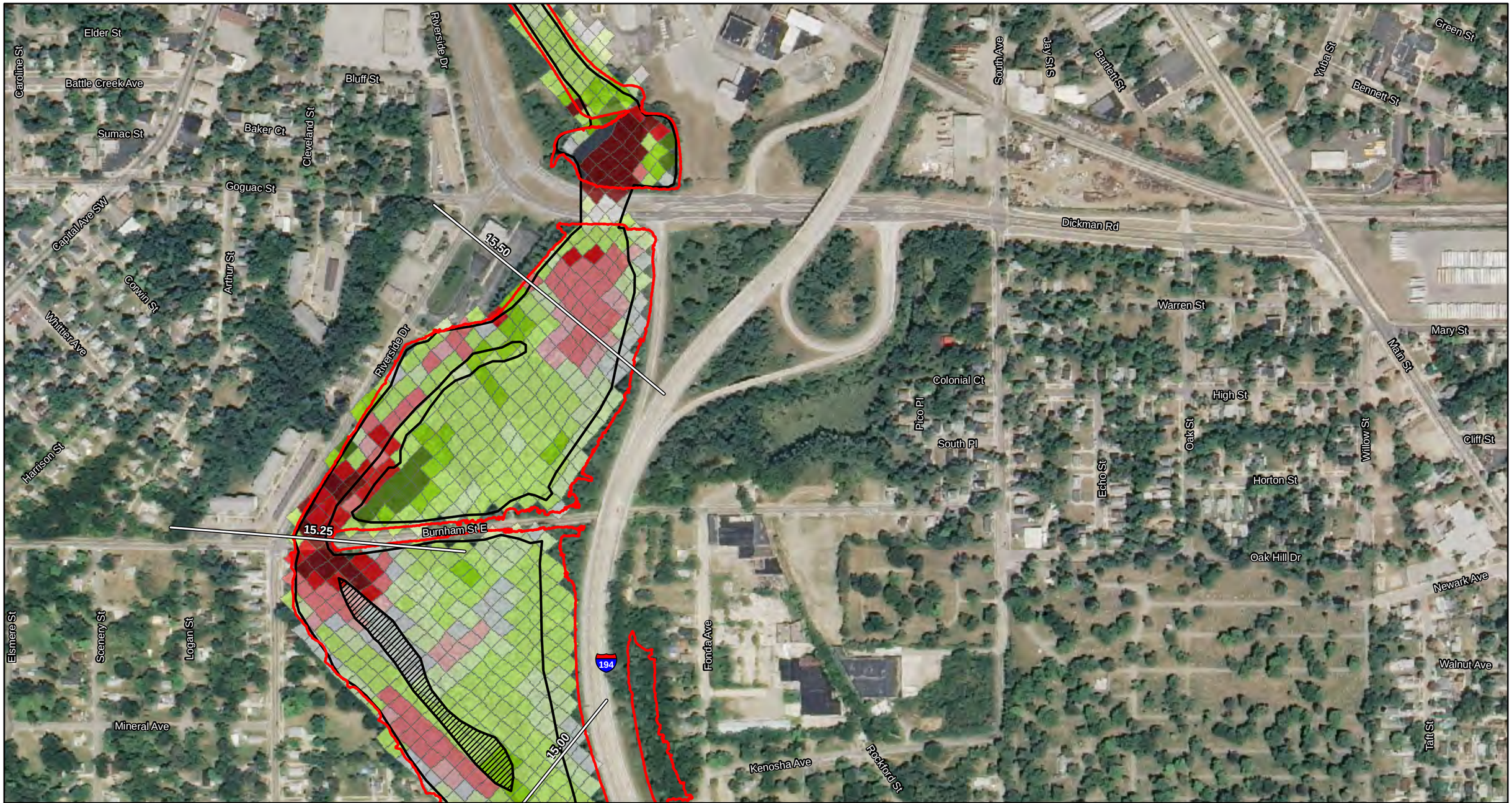
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 15.05 - MP 15.71

SHEET 14 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

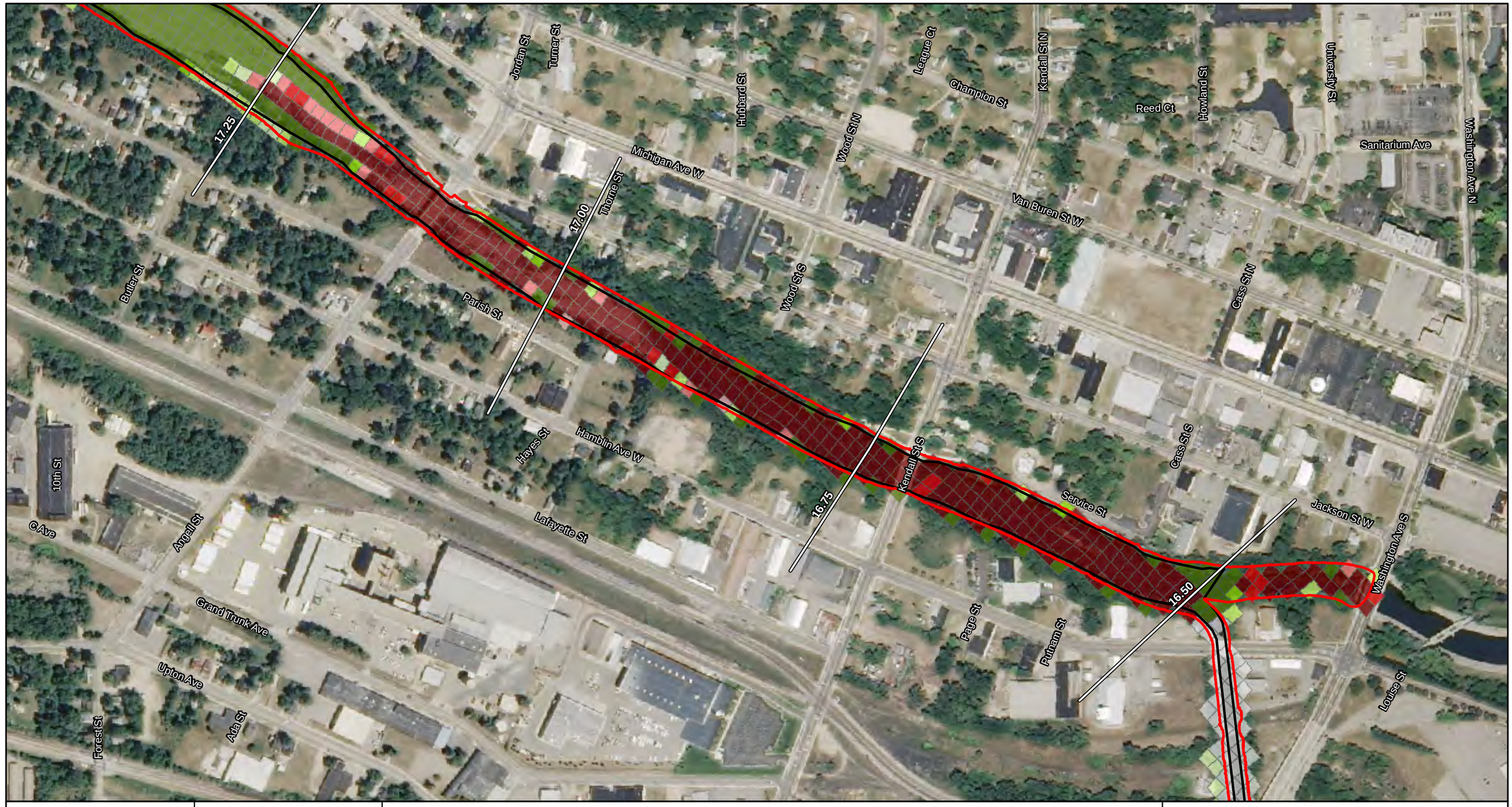
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 15.71 - MP 16.38

SHEET 15 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_50yr.mxd

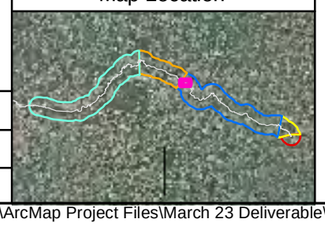
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 16.38 - MP 17.30

SHEET 16 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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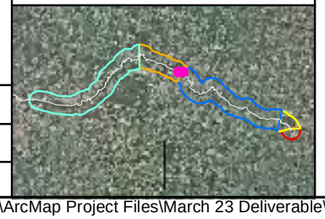
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 17.30 - MP 18.11

SHEET 17 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_50yr.mxd

Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 18.11 - MP 19.18

SHEET 18 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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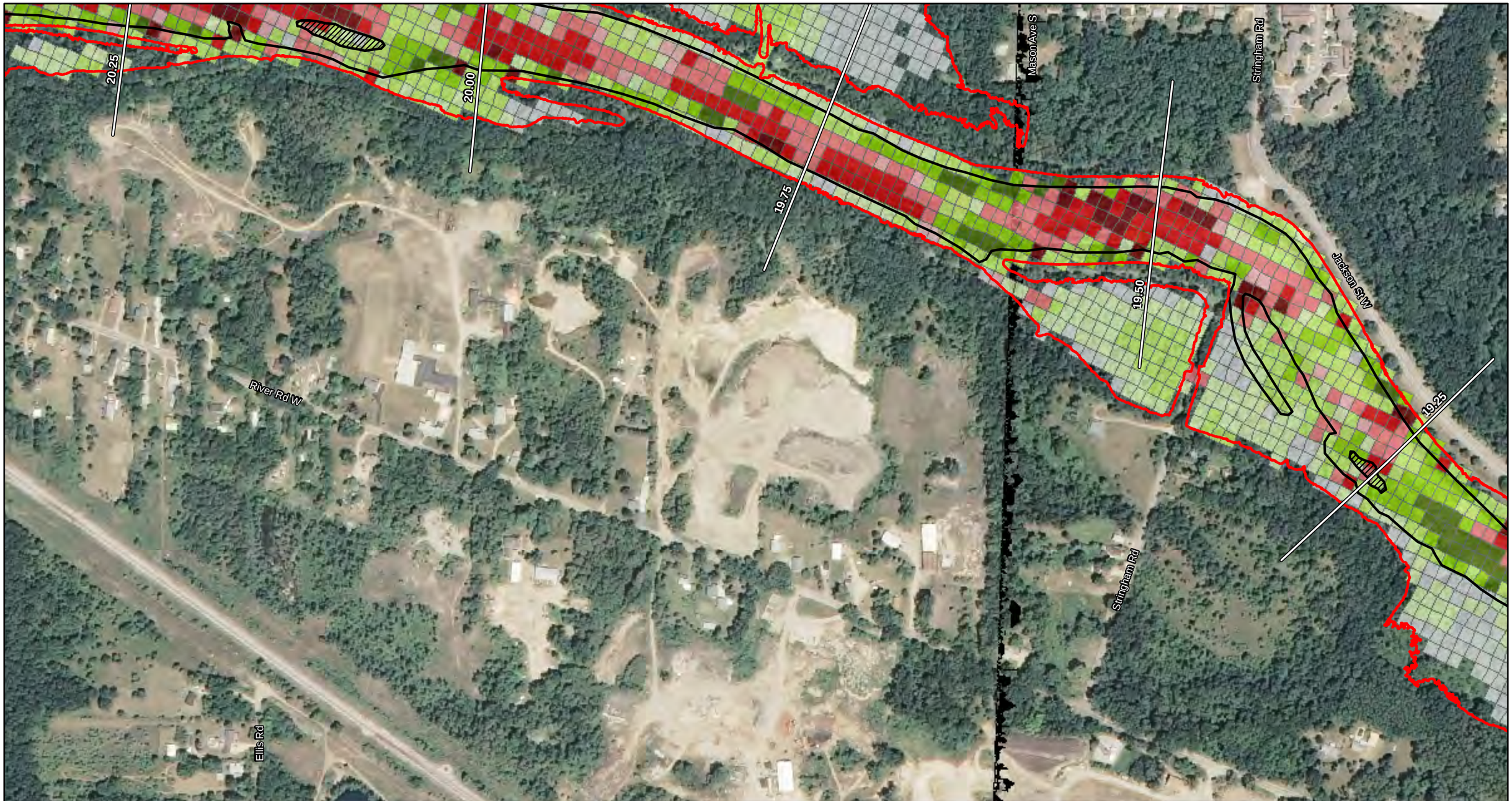
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 19.18 - MP 20.00

SHEET 19 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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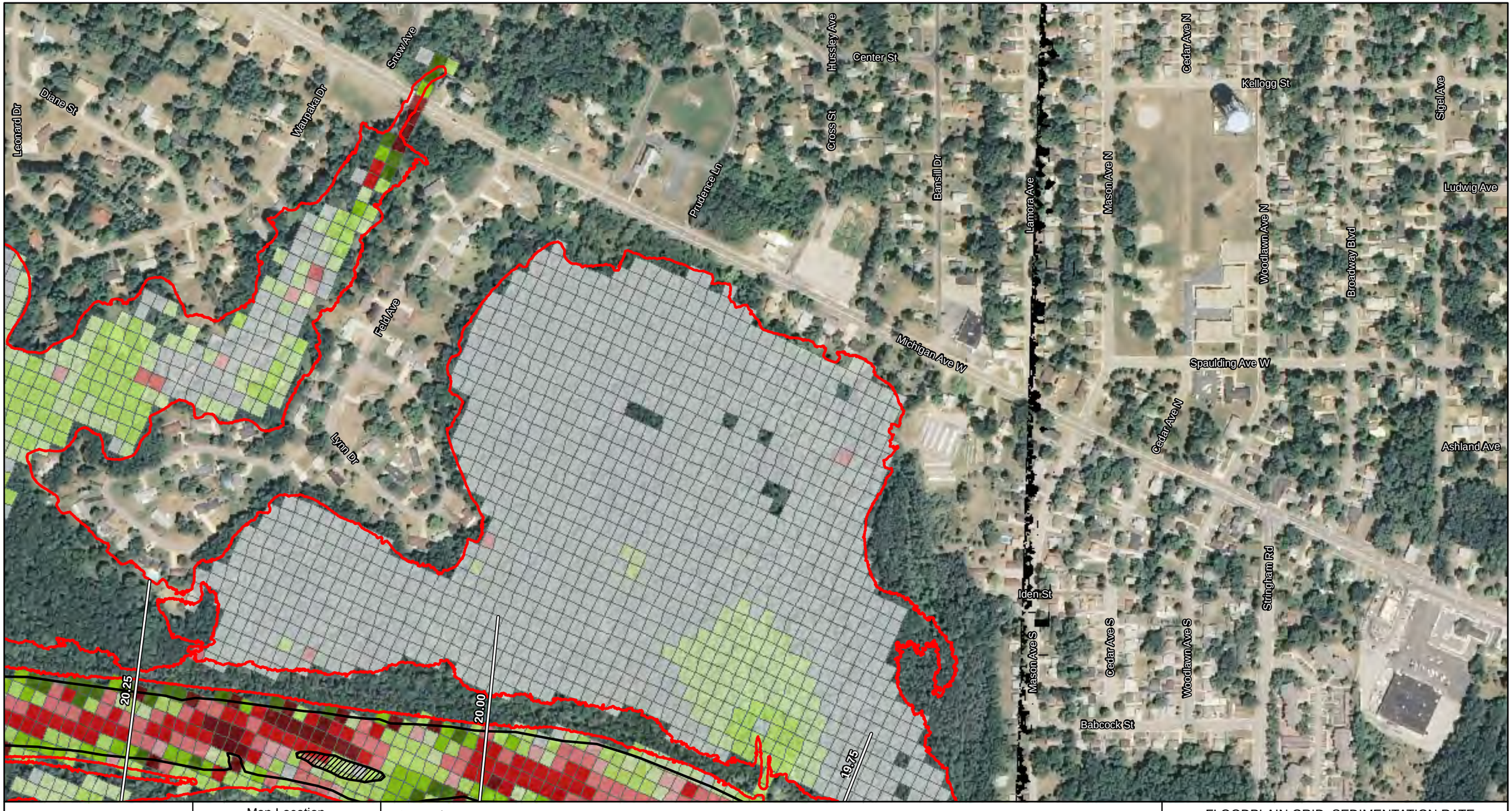
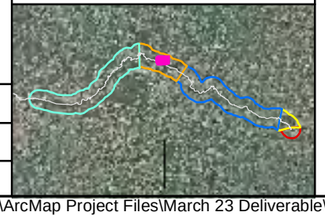
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

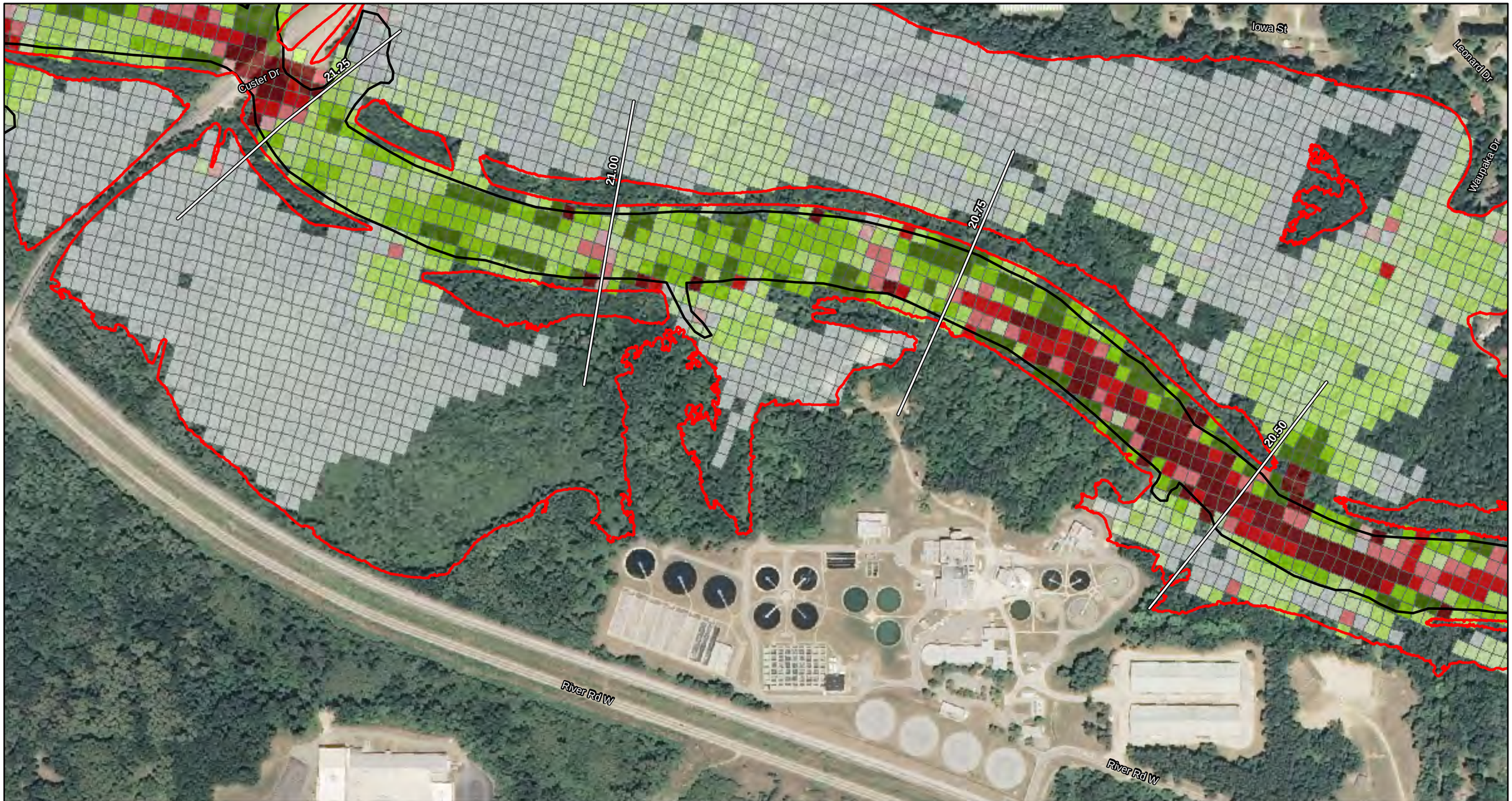
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 20.00 - MP 20.32

SHEET 20 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

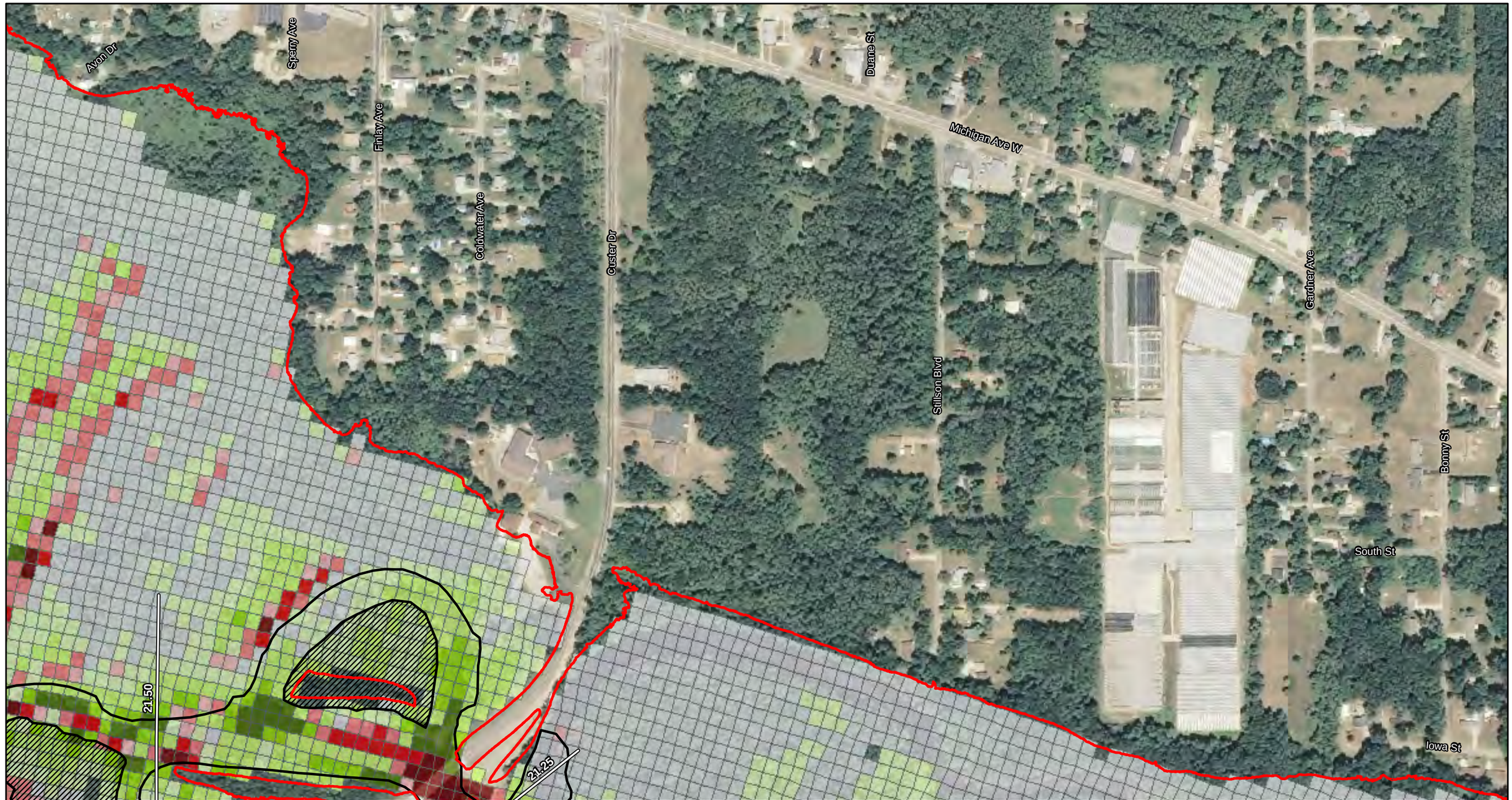
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 20.32 - MP 21.36

SHEET 21 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_50yr.mxd

Aerial Photography Date: July & August 2009



Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 21.36 - MP 21.59

SHEET 22 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

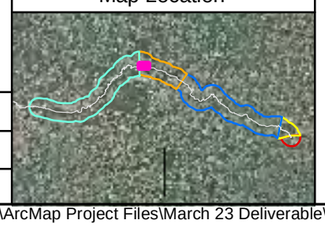
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

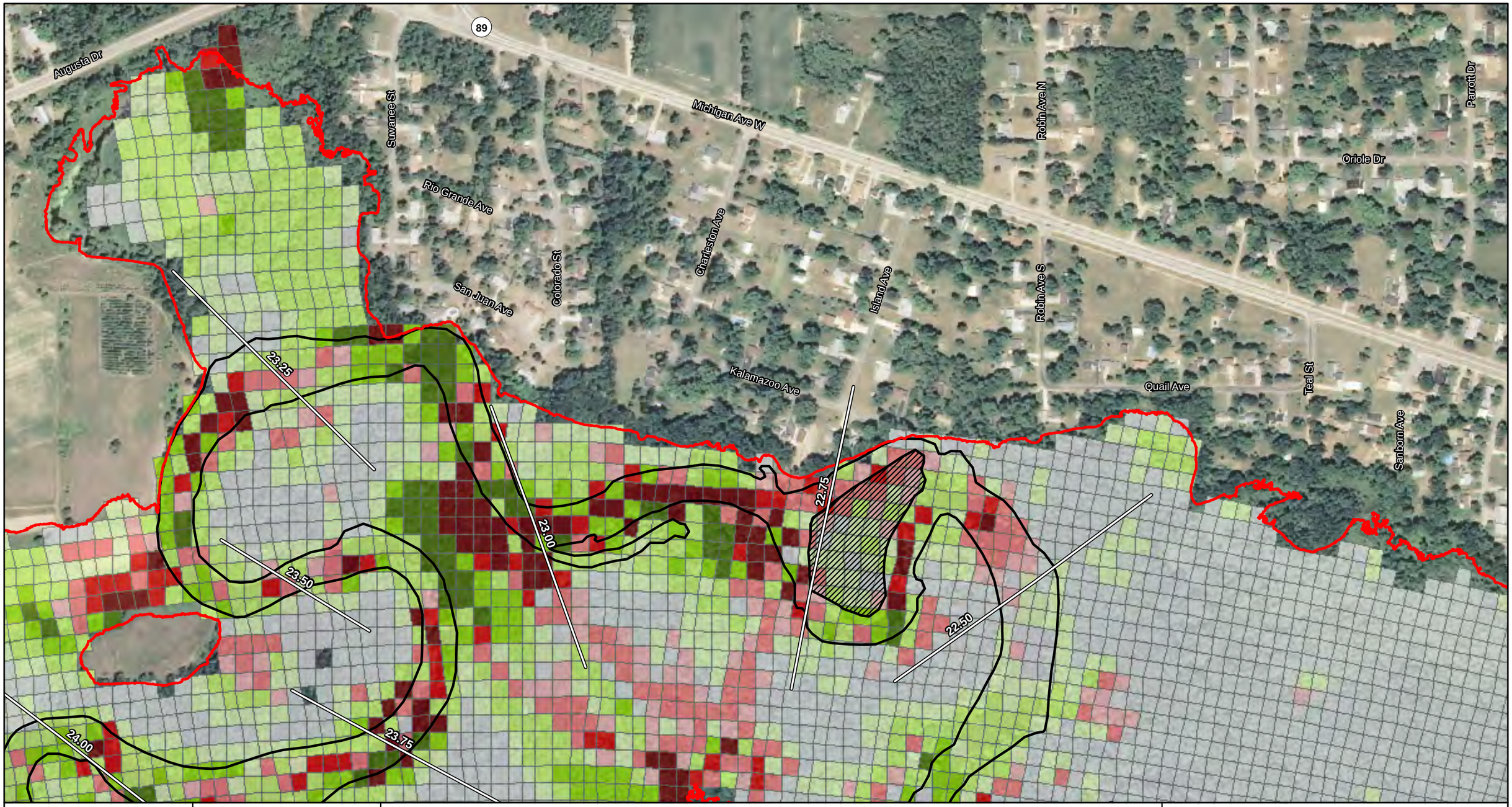
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 21.59 - MP 22.33

SHEET 23 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_50yr.mxd

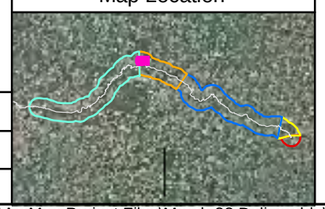
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 22.33 - MP 24.01

SHEET 24 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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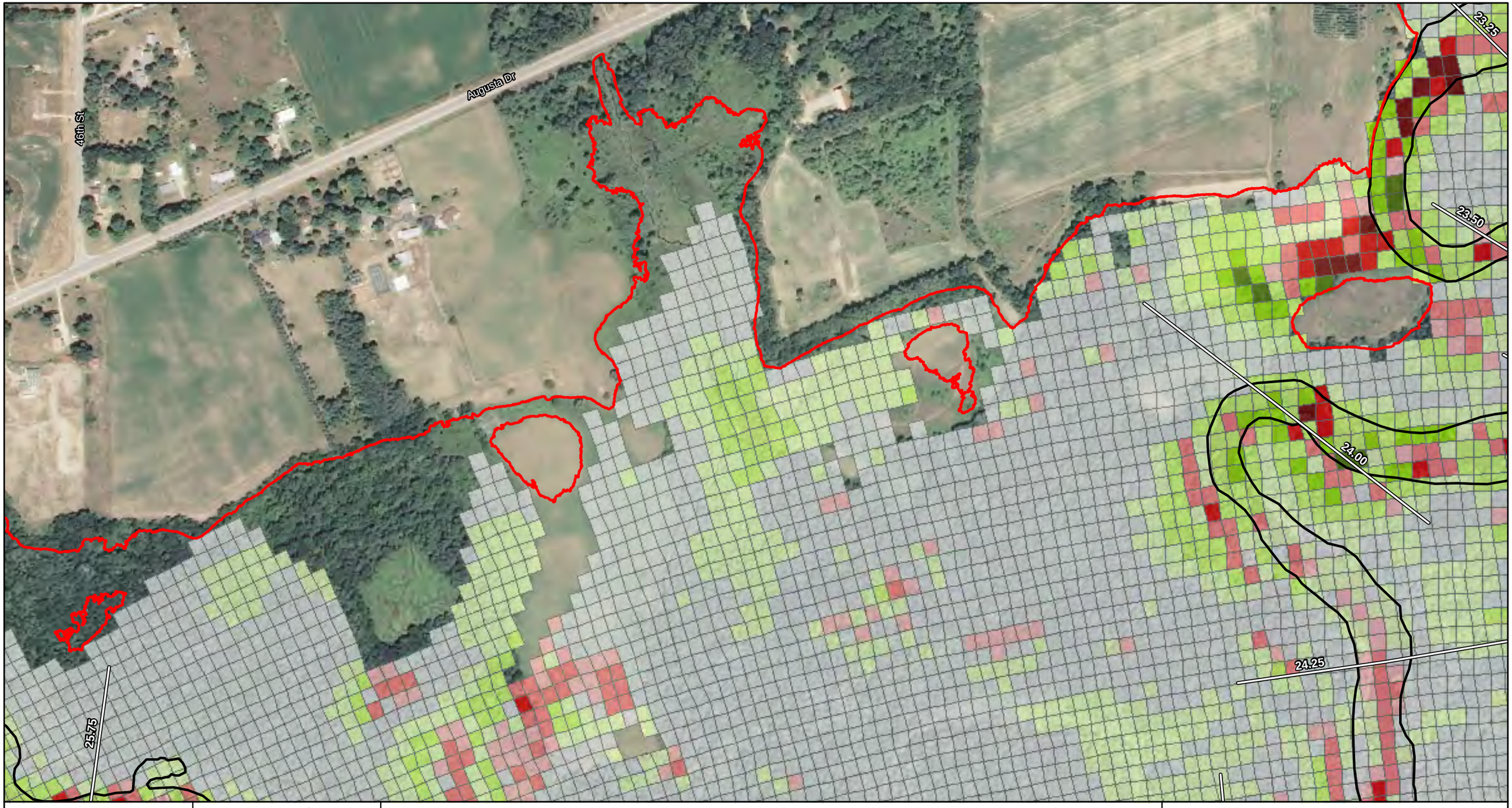
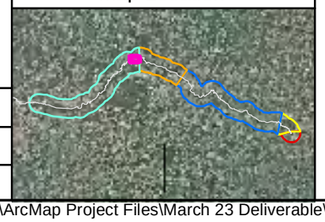
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 24.01 - MP 24.33

SHEET 25 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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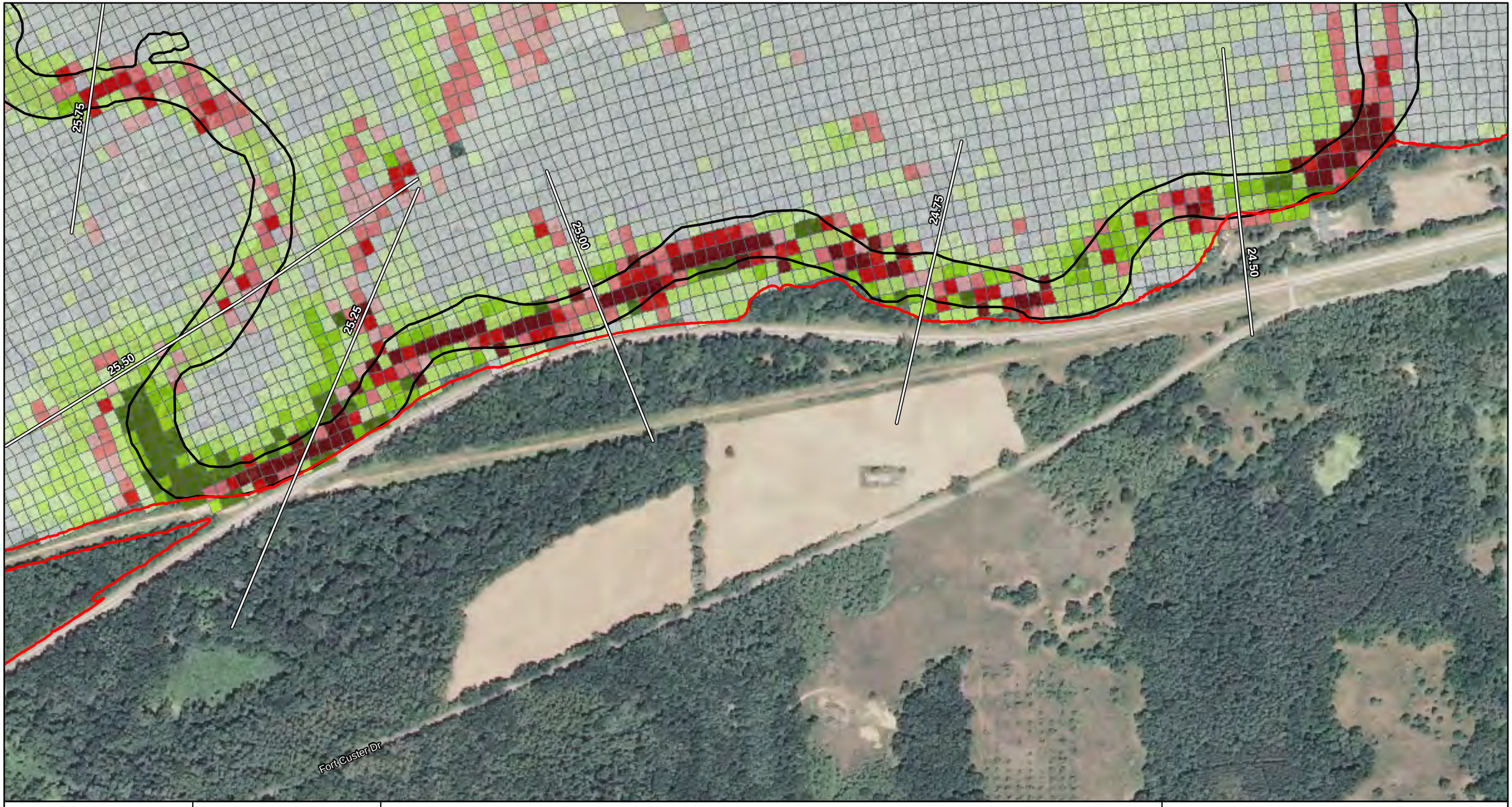
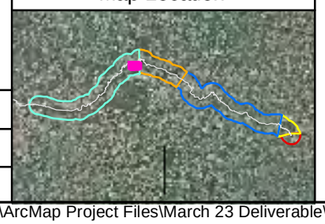
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 24.33 - MP 25.79

SHEET 26 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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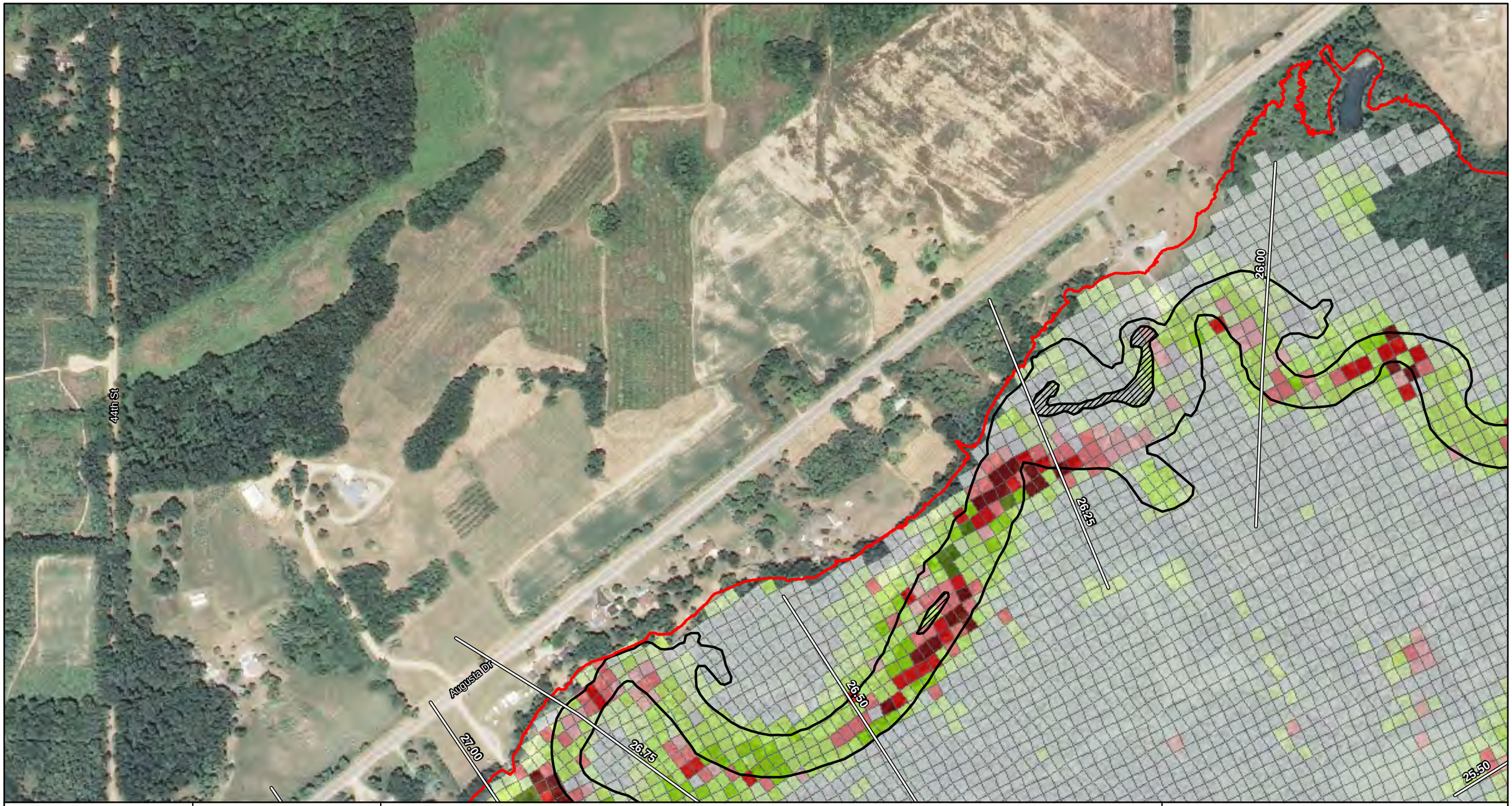
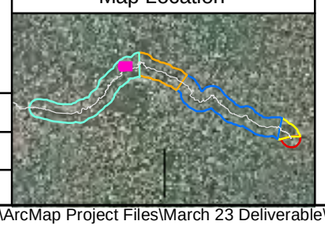
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 25.79 - MP 26.80

SHEET 27 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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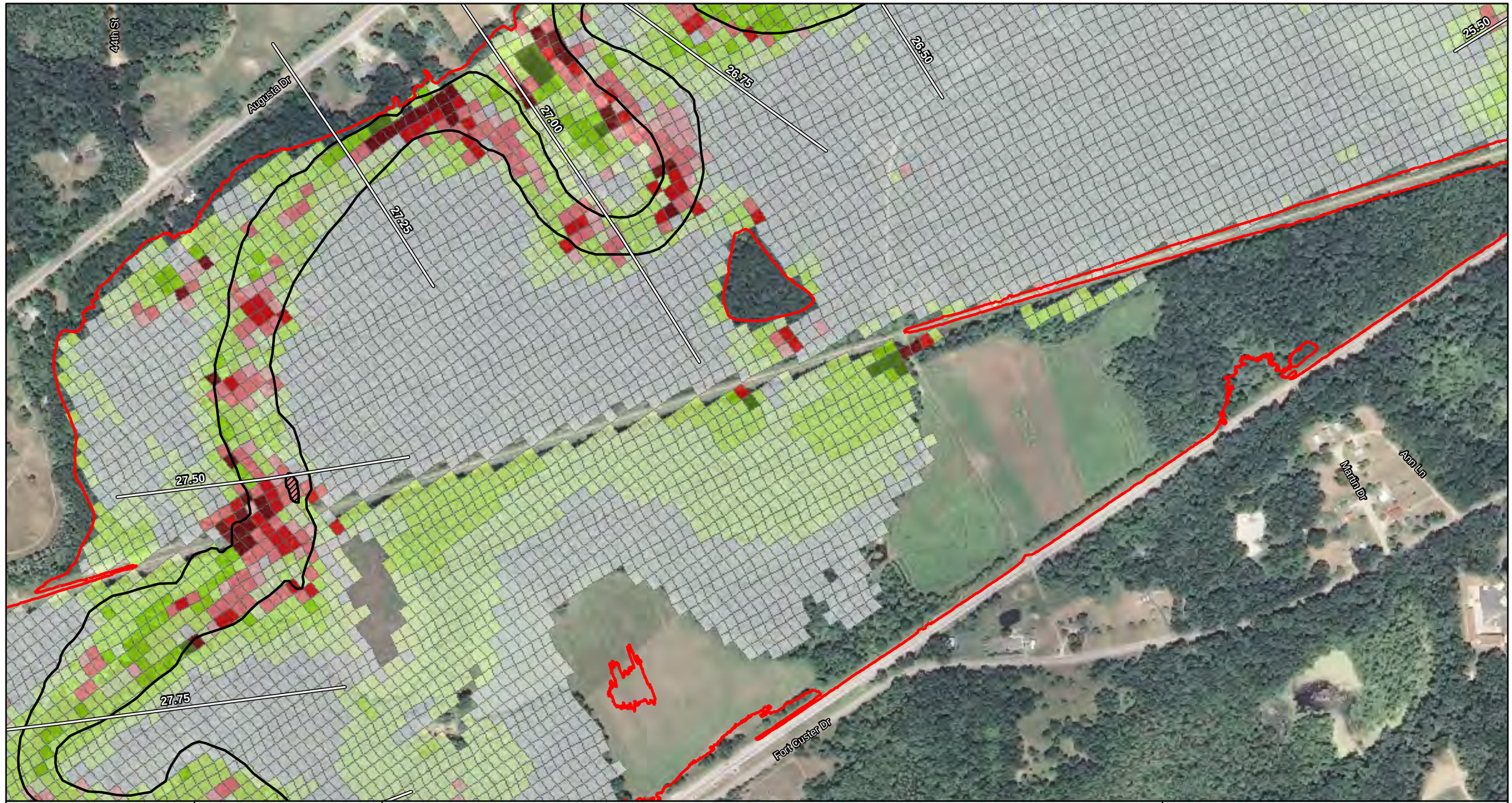
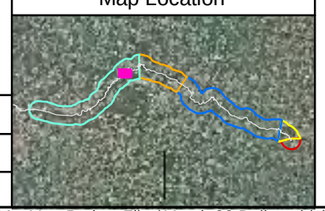
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 26.80 - MP 27.80

SHEET 28 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 27.80NW - MP 28.22NW

SHEET 29 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

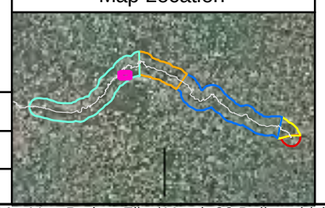
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 27.80SE - MP 28.22SE

SHEET 30 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

Webster St
Jackson St
Convis
Augusta Ave
Van Buren St
Canal St
Canal St
Water St
Michigan Ave
Wayne Ter Berg St
Clinton St
Clinton St
Fayette St
28.75
29.00
29.25
28.50
28.25
Fort Custer Dr
Augusta Dr
Harmonia Rd
Fort Custer Rec Area Access
Augusta Climax Rd

ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 28.22 - MP 29.20

SHEET 31 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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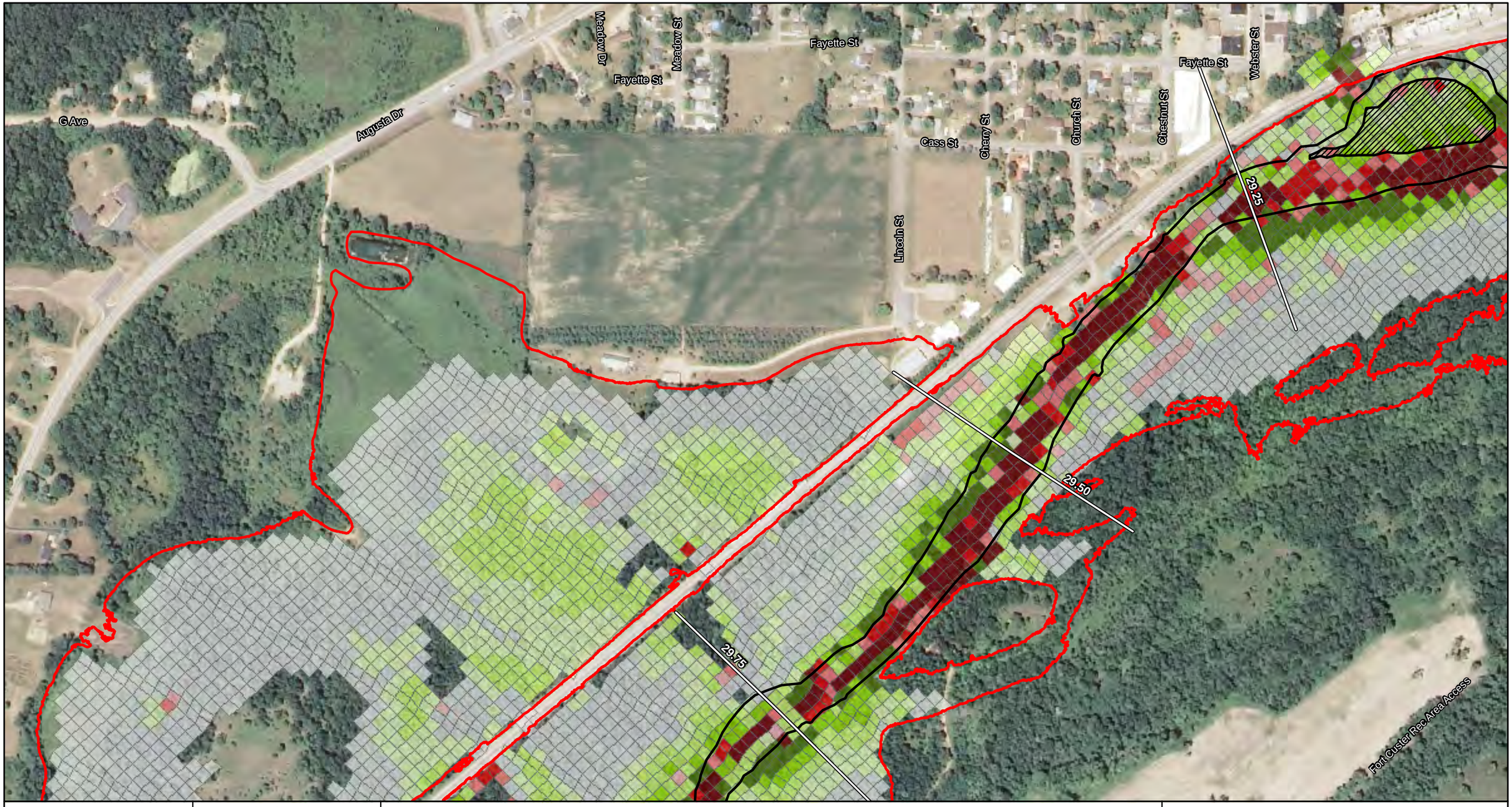
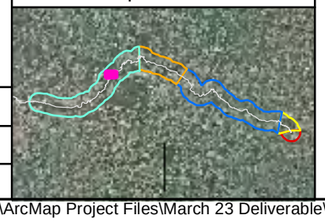
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 29.20 - MP 29.82

SHEET 32 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

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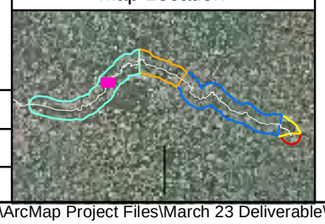
Aerial Photography Date: July & August 2009

Map Location



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 29.82 - MP 30.84

SHEET 33 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 30.84 - MP 31.40

SHEET 34 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

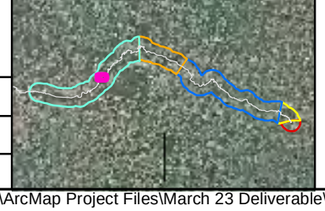
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 31.40 - MP 31.94

SHEET 35 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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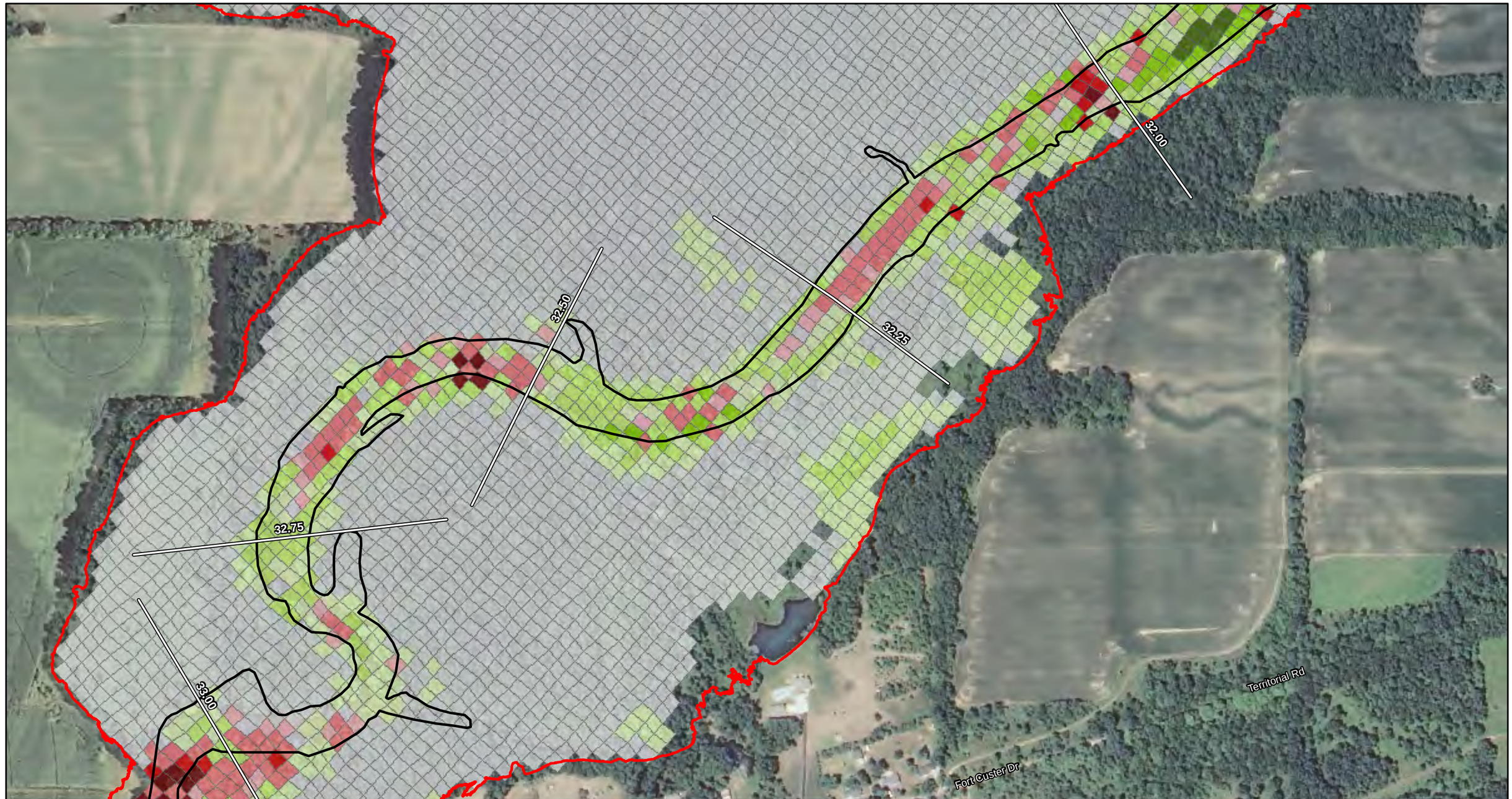
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

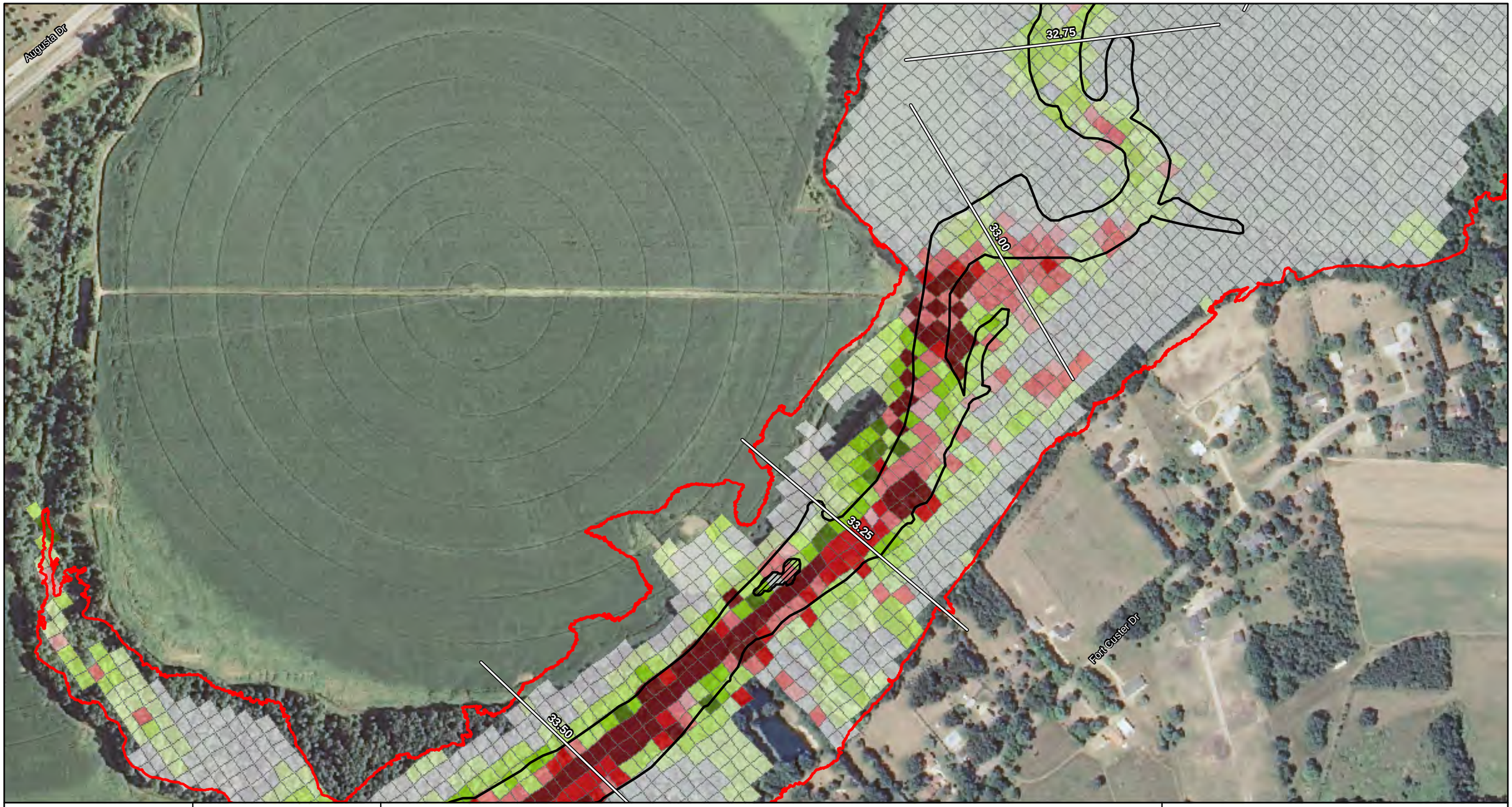
FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 31.94 - MP 33.00

SHEET 36 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate_50yr.mxd

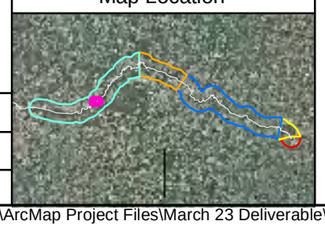
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 33.00 - MP 33.52

SHEET 37 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 33.52 - MP 34.70

SHEET 38 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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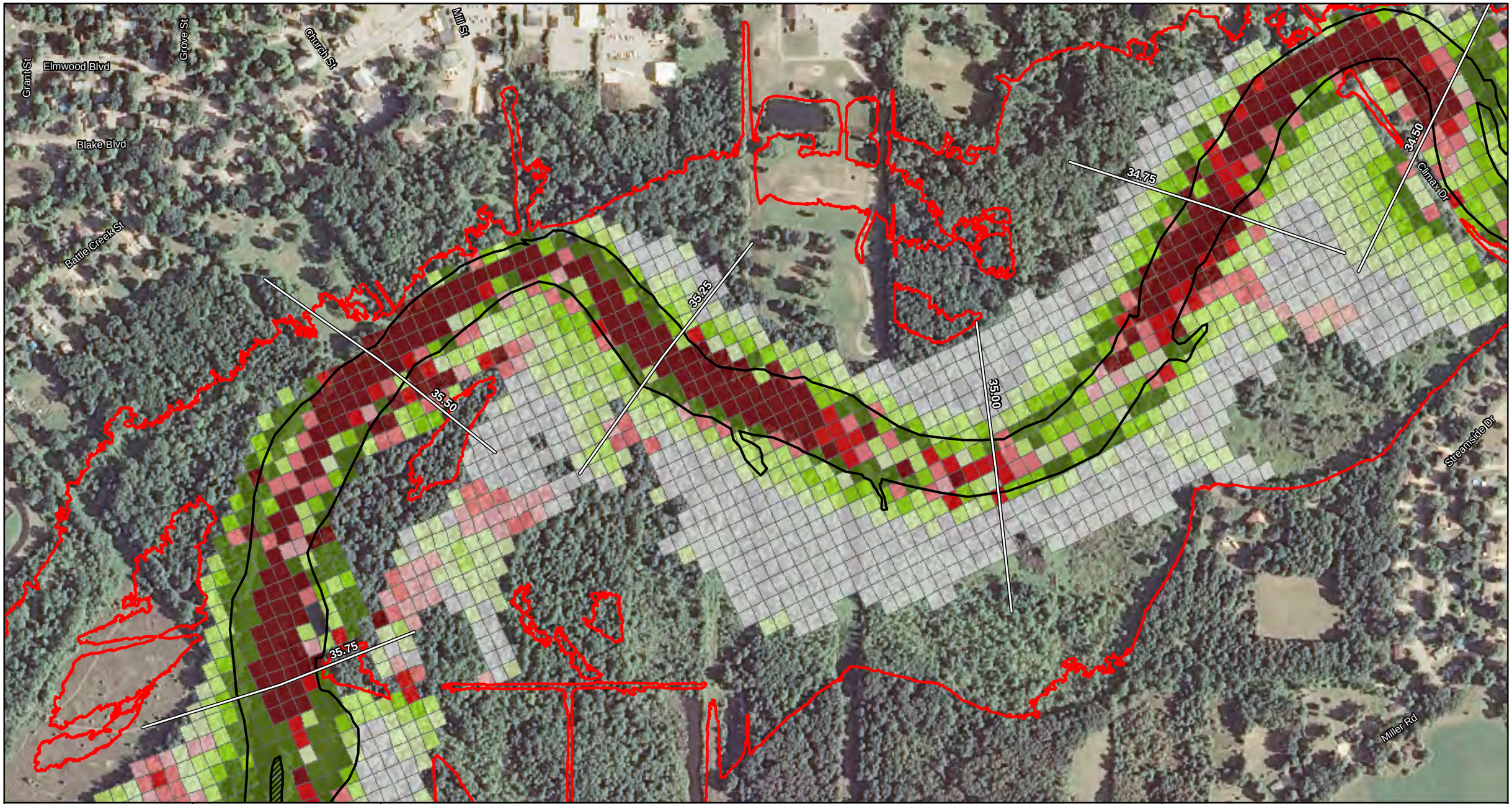
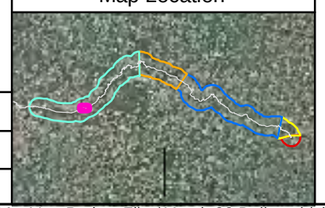
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 34.70 - MP 35.75

SHEET 39 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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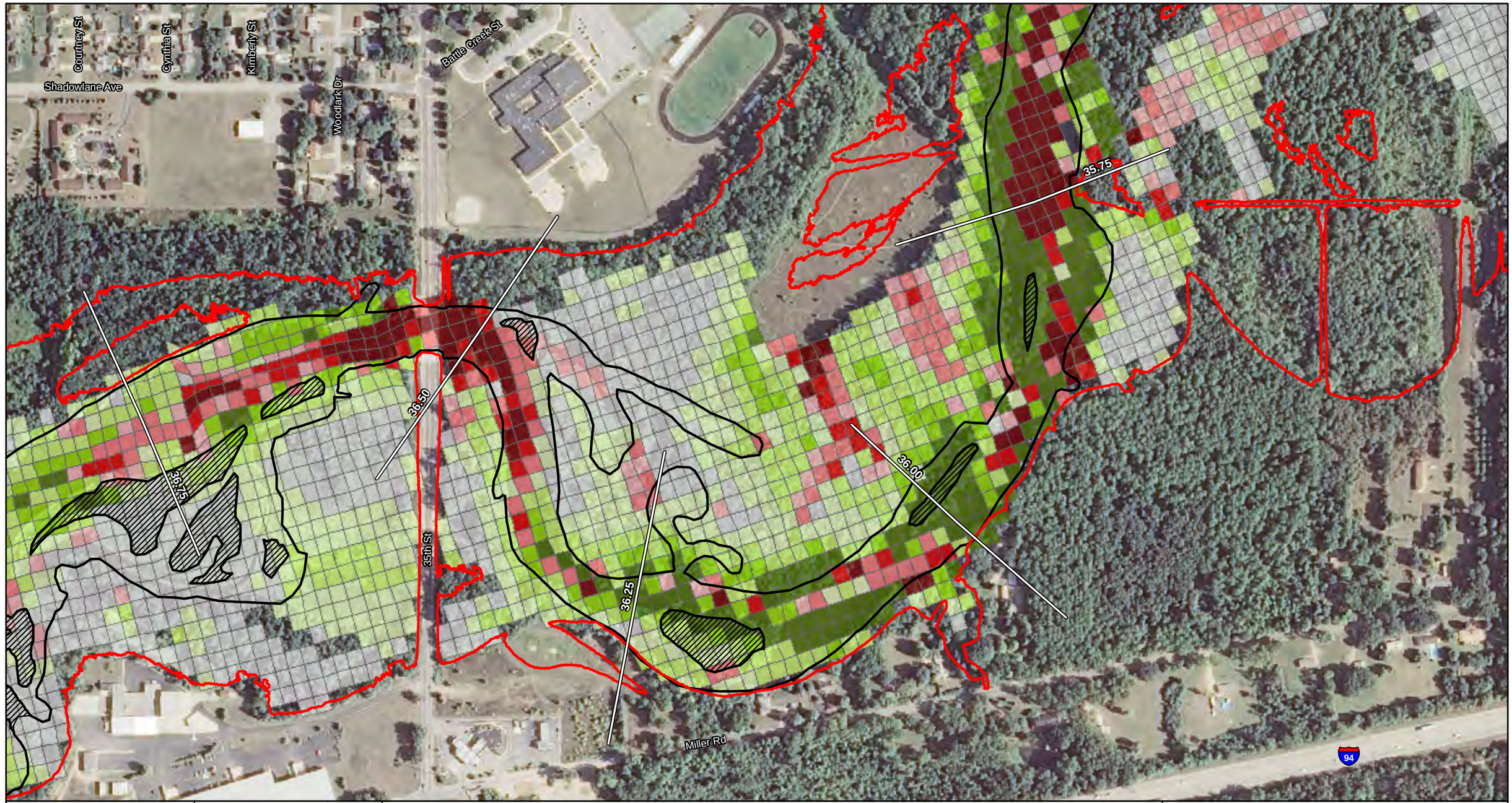
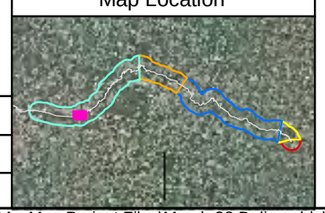
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 35.75 - MP 36.75

SHEET 40 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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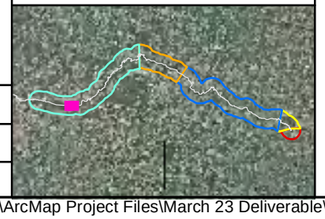
Aerial Photography Date: July & August 2009

37.75
37.50
37.25
37.00
36.75
Miller Dr
94

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 36.75 - MP 37.75

SHEET 41 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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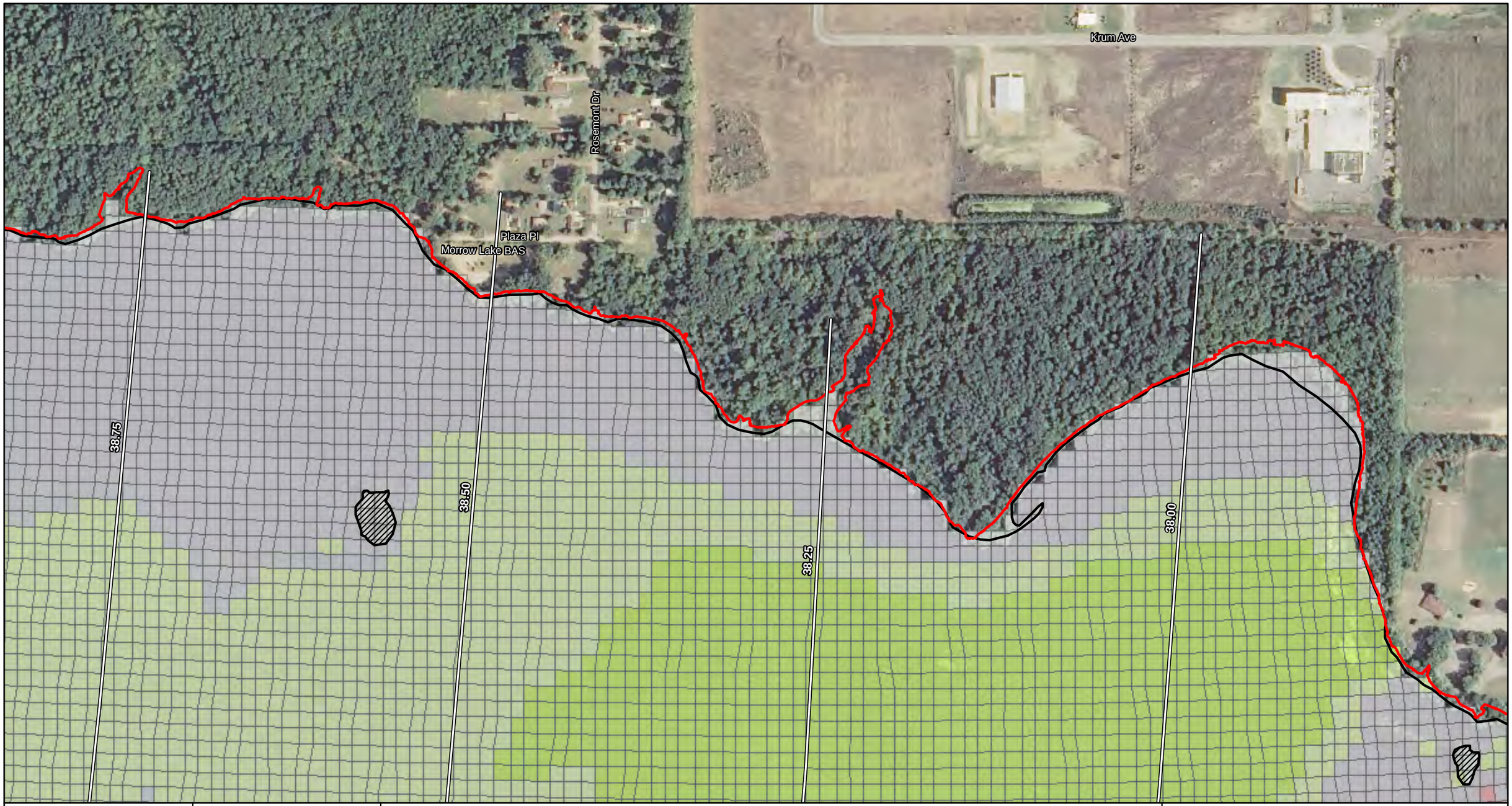
Aerial Photography Date: July & August 2009



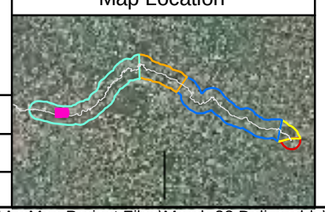
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 37.75N - MP 38.80N

SHEET 42 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

38.75
38.50
38.25
38.00
37.75
94
Lyth Rd
Miller Dr

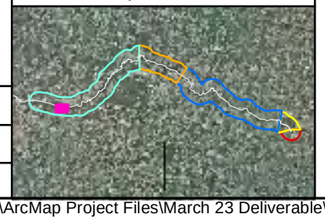
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 37.75S - MP 38.80S

SHEET 43 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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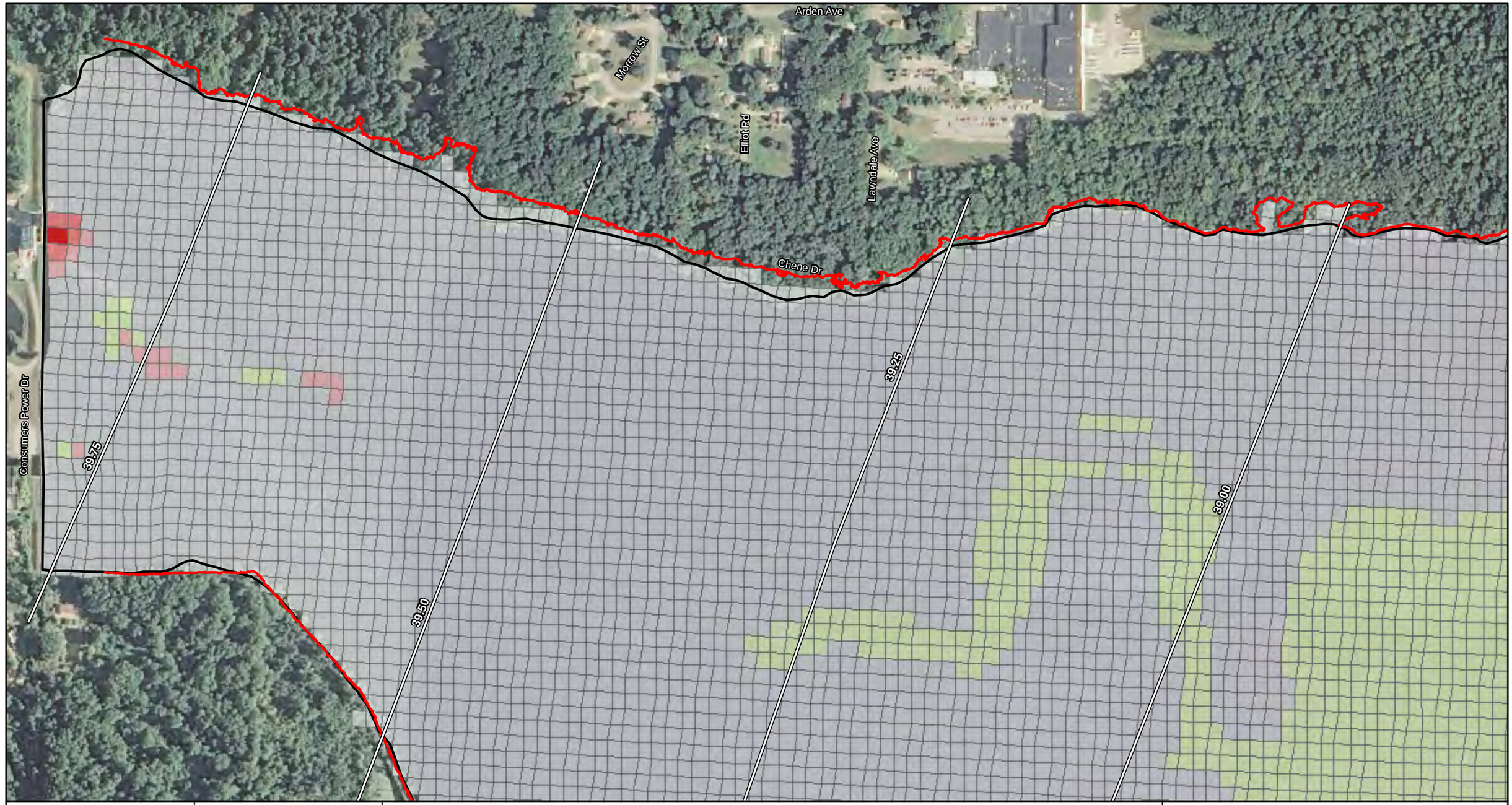
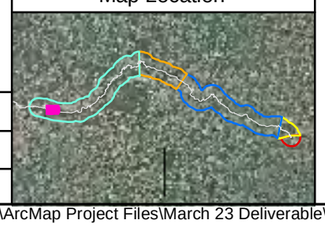
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 38.80N - MP 39.95N

SHEET 44 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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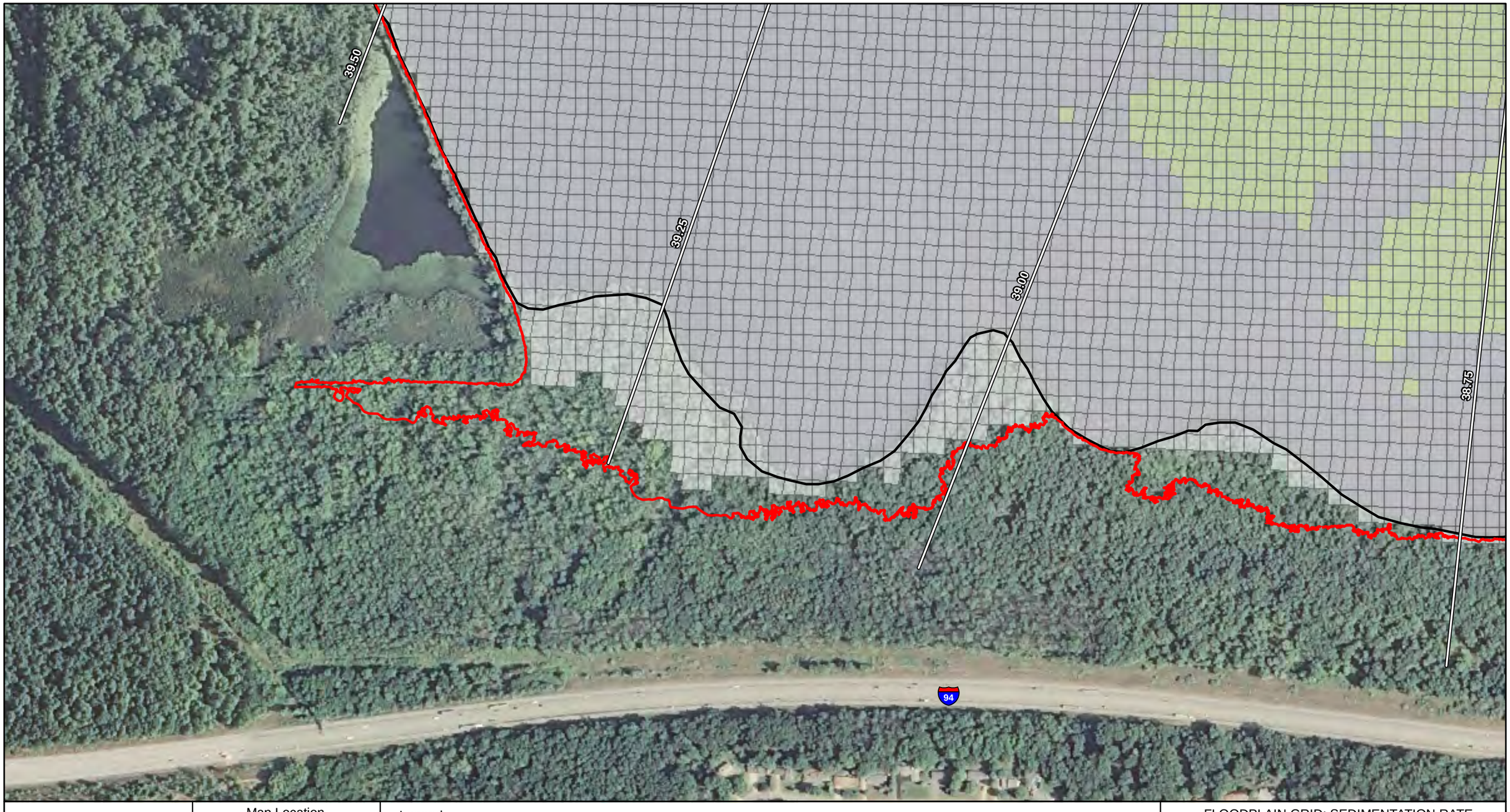
Aerial Photography Date: July & August 2009



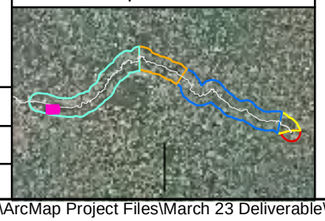
ENBRIDGE

Drawn: BRS 4/2/2012

Approved: DBR 4/2/2012

Project #: 106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
ALL GRID CELLS
50-YEAR FLOOD
MP 38.80S - MP 39.95S

SHEET 45 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

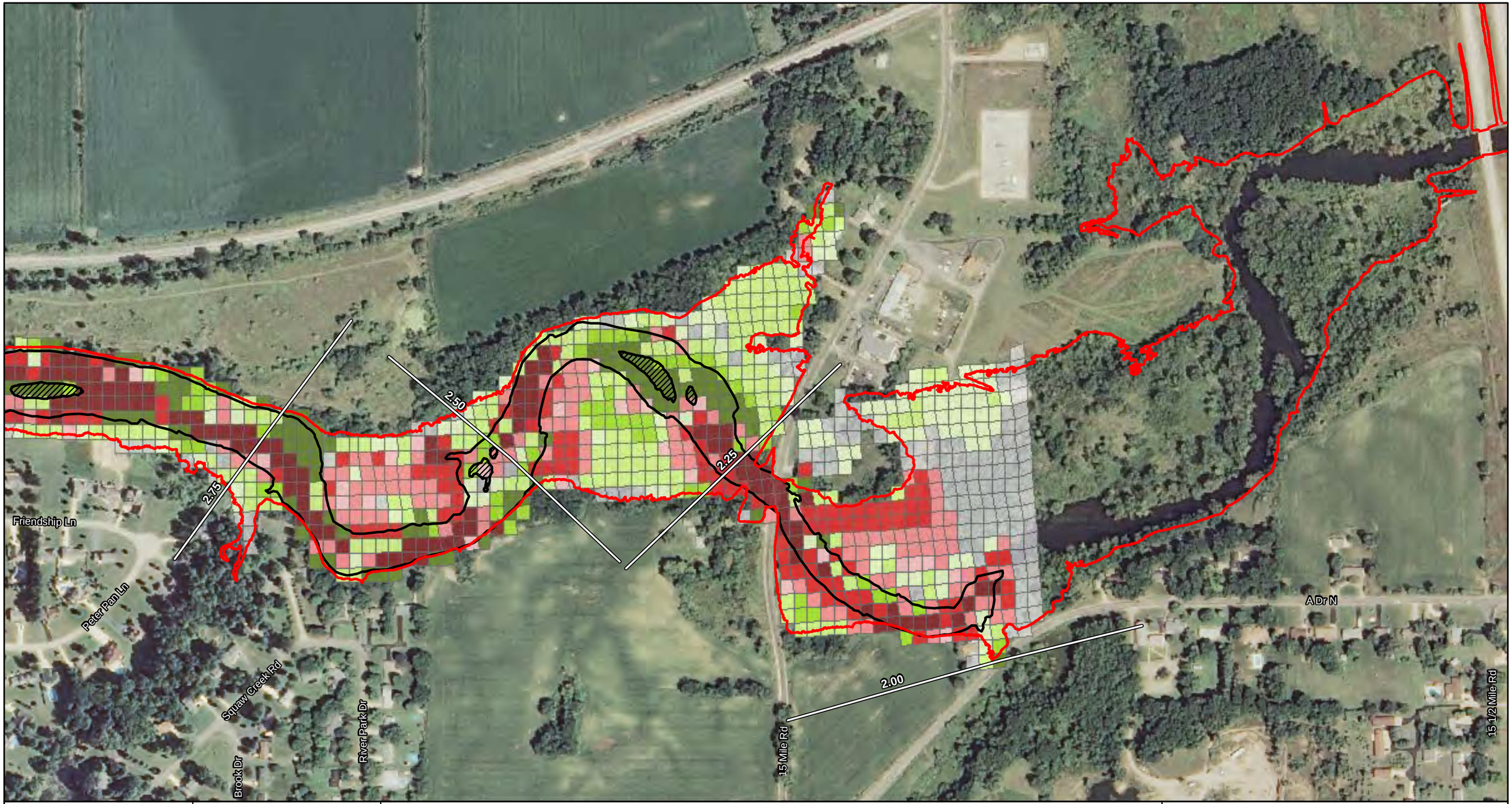
Figure 6-20

Floodplain Grid: Sedimentation Rate

Cells with Net Change in Silt or Clay Mass

50-Year Flood

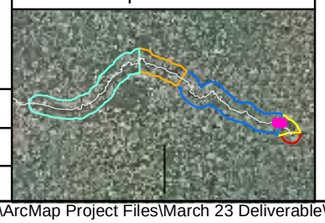
Sheets 1 through 45



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 01.88 - MP 02.91

SHEET 1 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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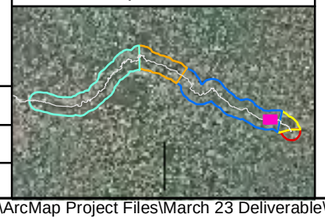
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 02.91 - MP 03.93

SHEET 2 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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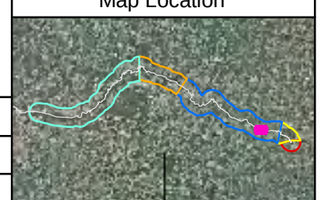
Aerial Photography Date: July & August 2009

5.00
4.75
4.50
4.25
4.00

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 03.93 - MP 04.98

SHEET 3 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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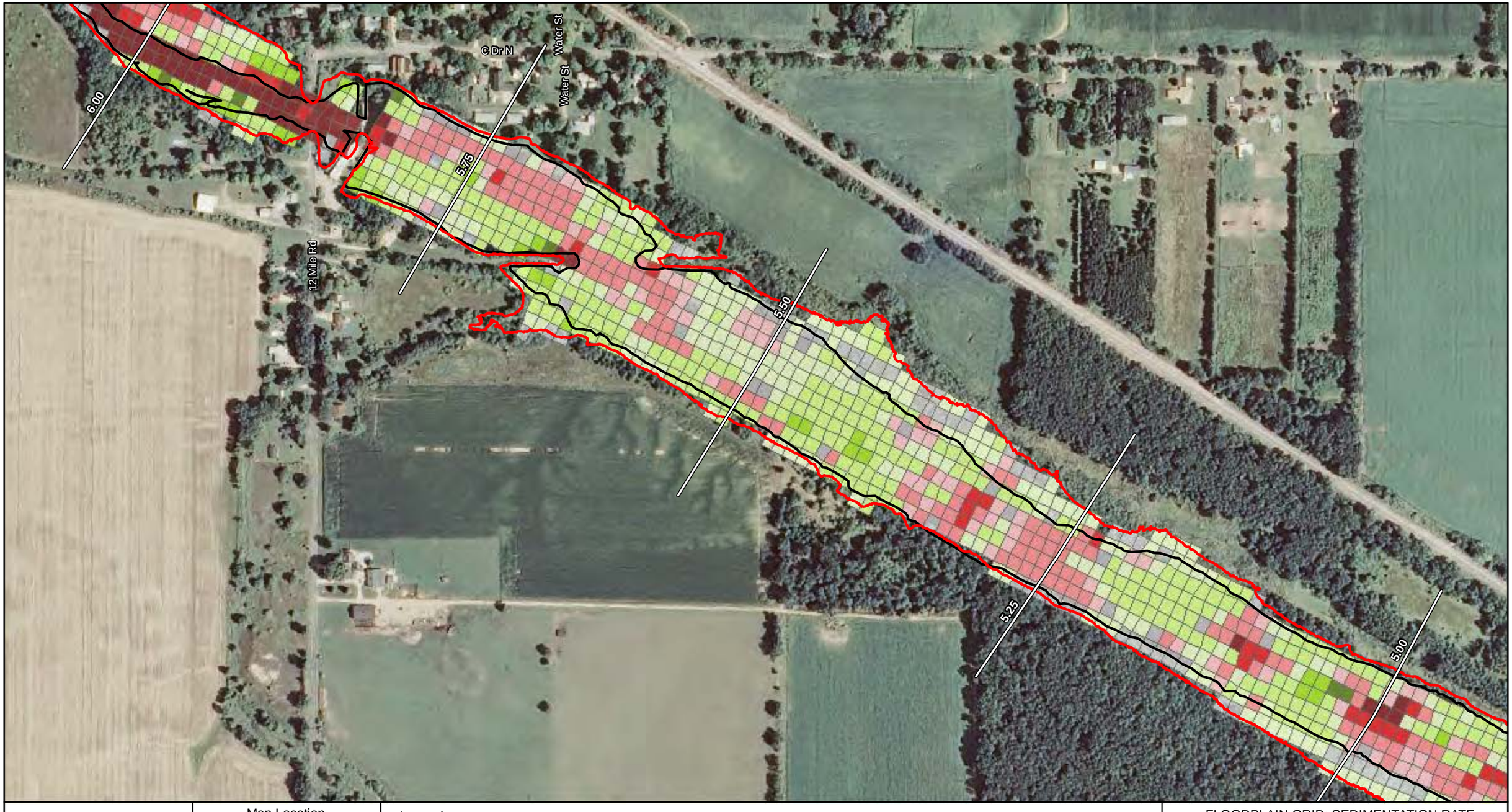
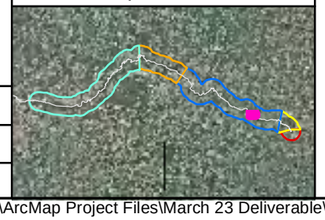
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

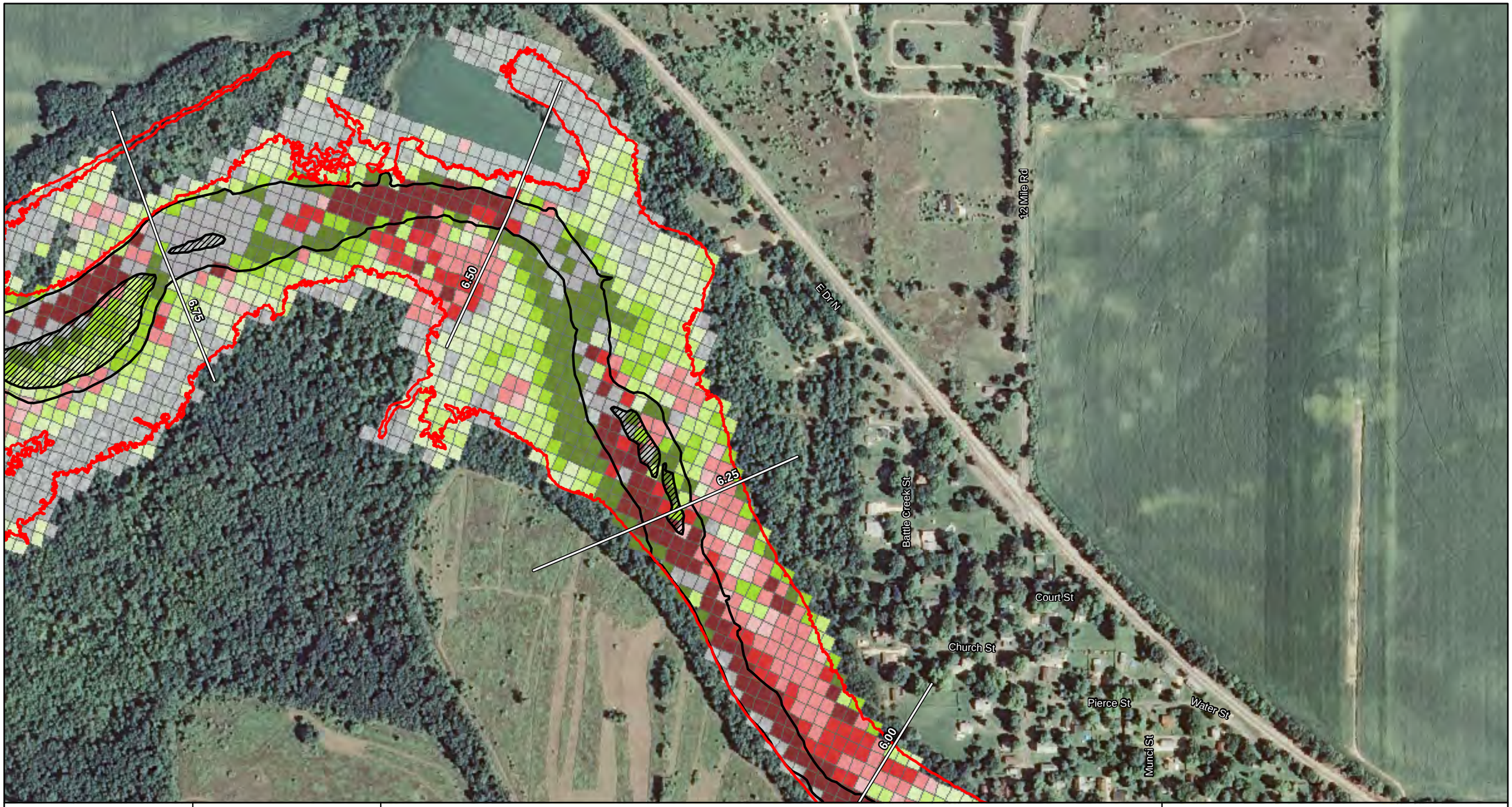
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 04.98 - MP 06.03

SHEET 4 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_50yr.mxd

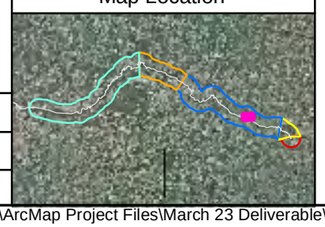
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD

MP 06.03 - MP 06.85

SHEET 5 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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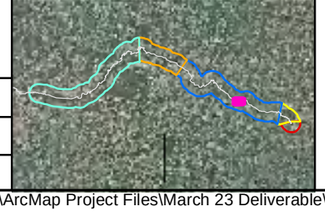
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 06.85 - MP 07.95

SHEET 6 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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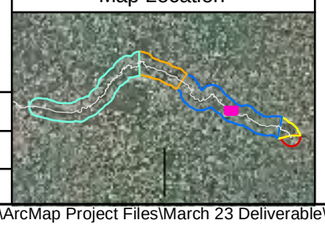
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD

MP 07.95 - MP 08.93

SHEET 7 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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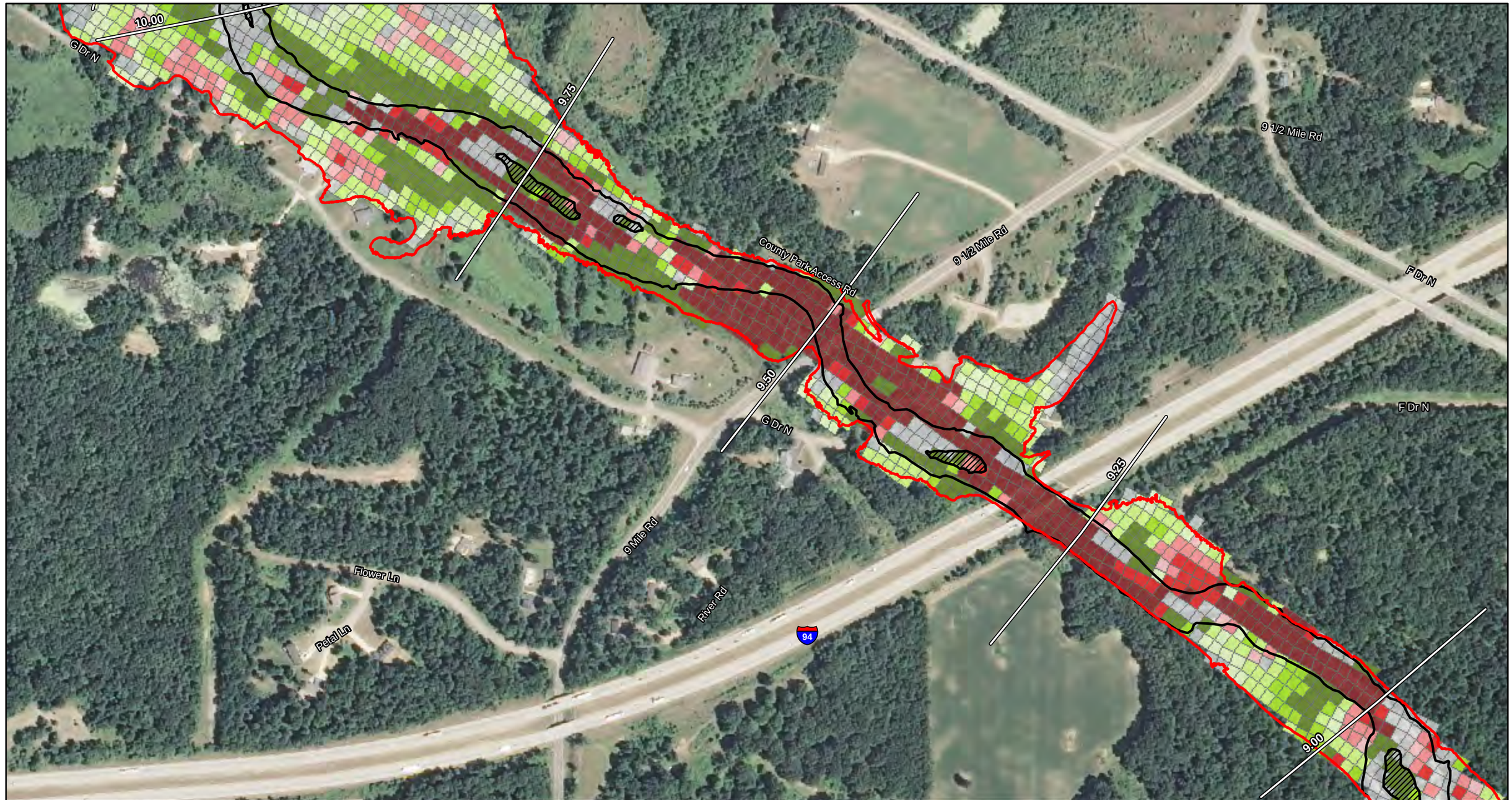
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 08.93 - MP 10.00

SHEET 8 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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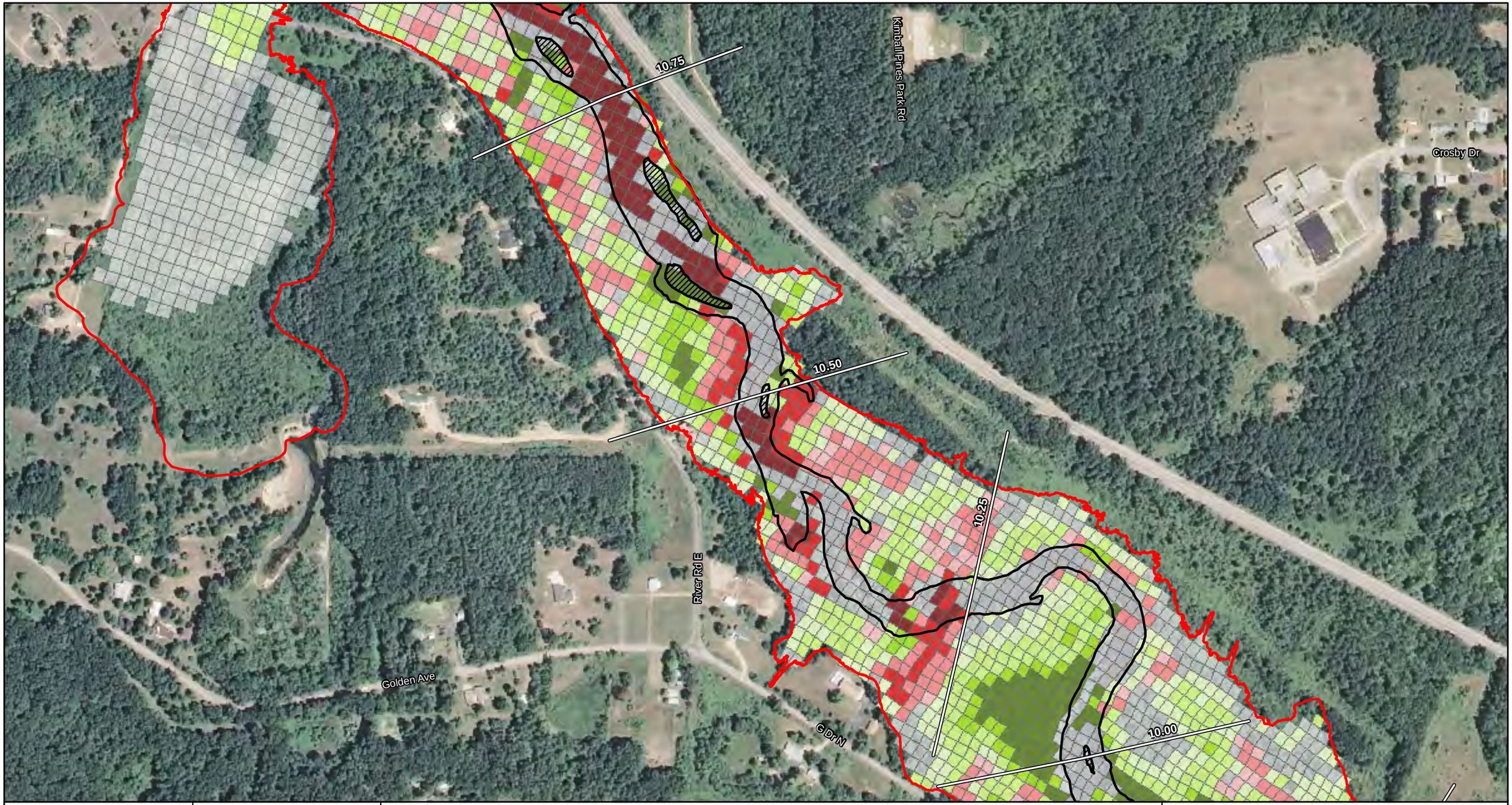
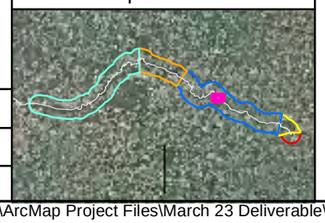
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 10.00 - MP 10.80

SHEET 9 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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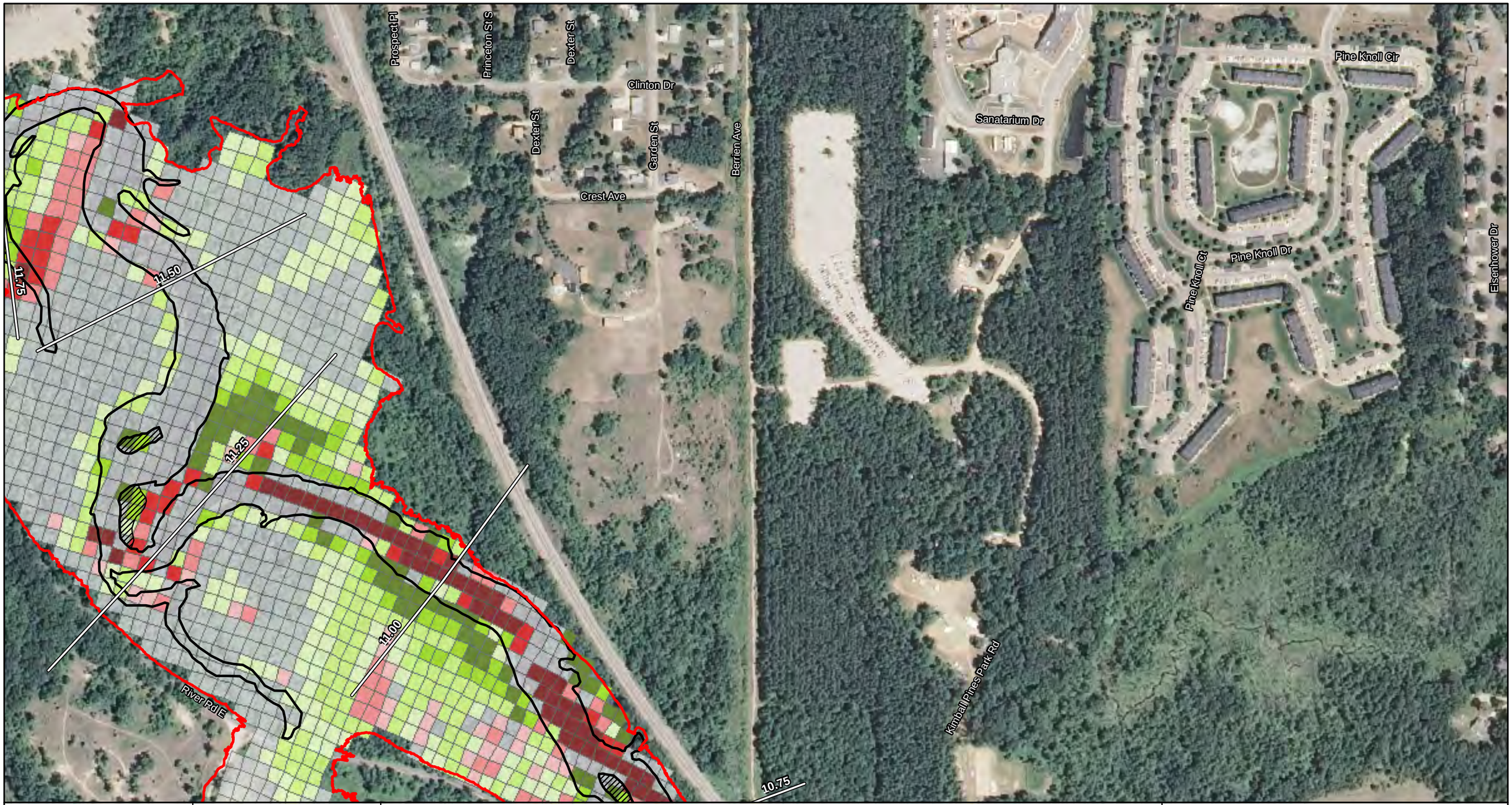
Aerial Photography Date: July & August 2009



Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 10.80 - MP 11.70

SHEET 10 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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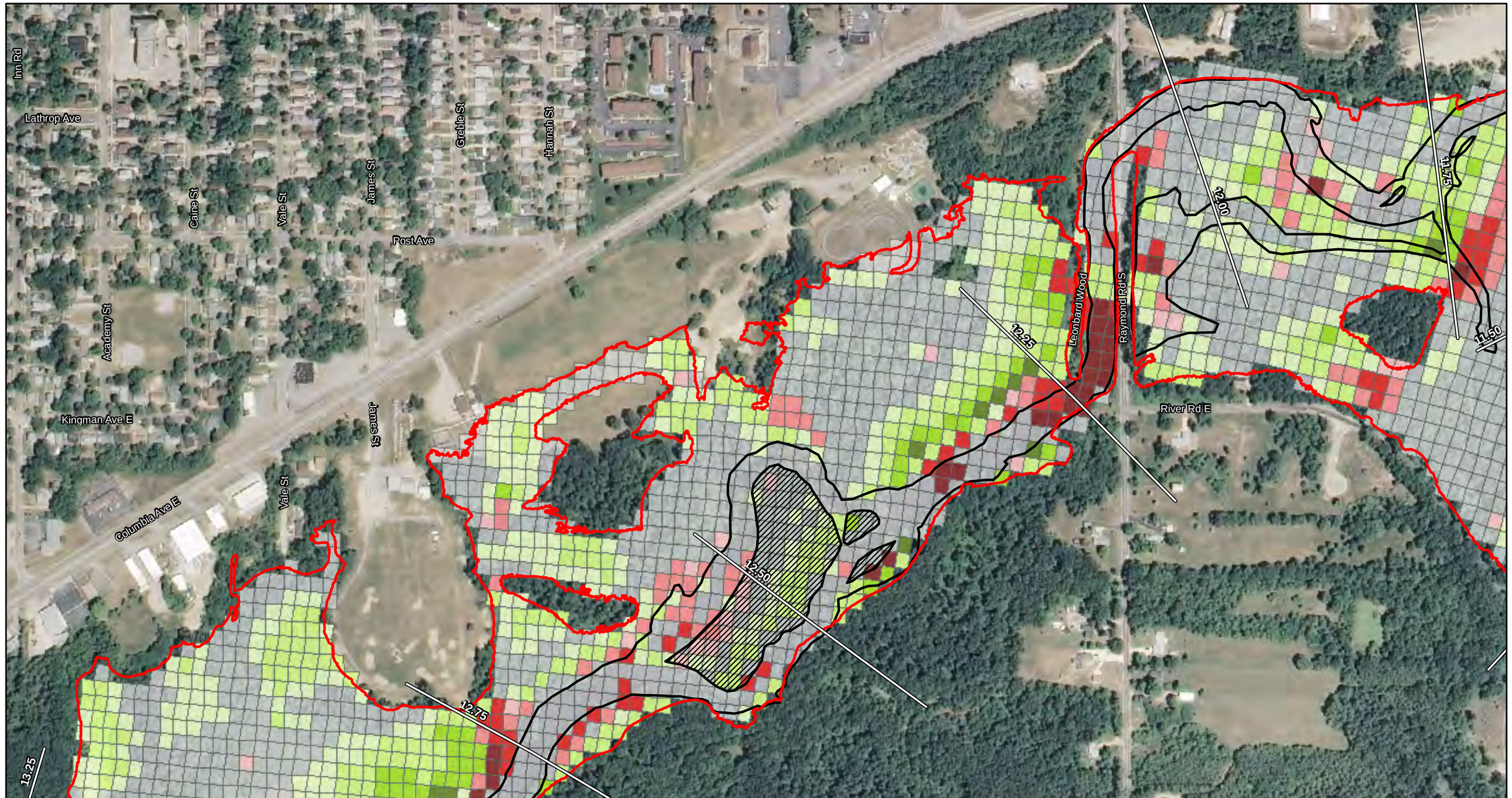
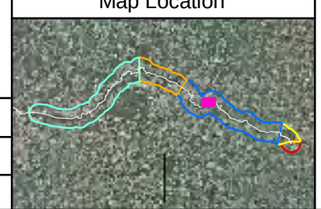
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 11.70 - MP 12.77

SHEET 11 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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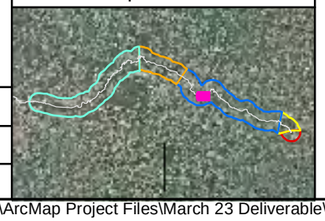
Aerial Photography Date: July & August 2009

Winding Way Dr
Main St
Jericho Rd
Columbia Ave E
14.00
Row H/Row J
Row F/Row G
Row D/Row E
Row C
Row A/Row B
Row K
13.50
13.25
13.00
12.75
6 1/2 Mile Rd
13.75
Beadle Lake Rd
River Dr
McCormick St
Fruin Ave
Belton Ave
Marion St
Golden Ave
Oneil St
Overton St
Silver St
Demaris Ln

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 12.77 - MP 14.00

SHEET 12 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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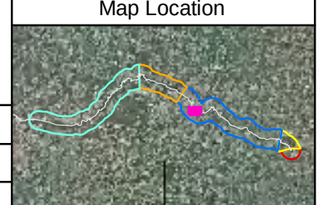
Aerial Photography Date: July & August 2009

Sisson Ave
Territorial Rd E
Riverside Ct
Riverside Dr
Kenosha Ave
Pauline Ave
Rockford St
South Ave
Massachusetts Ave
New England Ave
Main St
Kingman Ave W
Enwood St
Tafft St
Alden Ave W
Lyda St
Bonita Dr
Tafft Ct
River Oaks Blvd
Winding Way Dr
6 1/2 Mile Rd
Columbia Ave E
Shore Dr
Auburn St
Cherokee St
194
15.00
14.75
14.50
14.25
14.00

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 14.00 - MP 15.05

SHEET 13 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

Elder St
Caroline St
Battle Creek Ave
Bluff St
Riverside Dr
Sumac St
Baker Ct
Cleveland St
Goguac St
Capital Ave SW
Arthur St
Corwin St
Whittier Ave
Harrison St
15.50
15.25
15.00
Burnham St E
Elsmere St
Scenery St
Logan St
Mineral Ave
194
Fonda Ave
Kenosha Ave
Rockford St
South Ave
Jay St
Bartlett St
Yuba St
Green St
Bennett St
Dickman Rd
Warren St
Mary St
Main St
Colonial Ct
Pico Pl
South Pl
High St
Oak St
Echo St
Willow St
Cliff St
Horton St
Oak Hill Dr
Newark Ave
Walnut Ave
Taft St

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 15.05 - MP 15.71

SHEET 14 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 15.71 - MP 16.38

SHEET 15 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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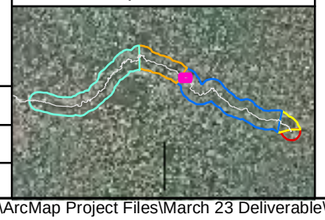
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 16.38 - MP 17.30

SHEET 16 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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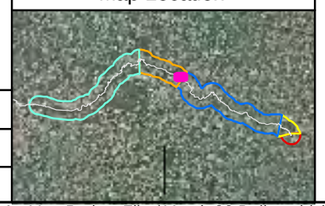
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 17.30 - MP 18.11

SHEET 17 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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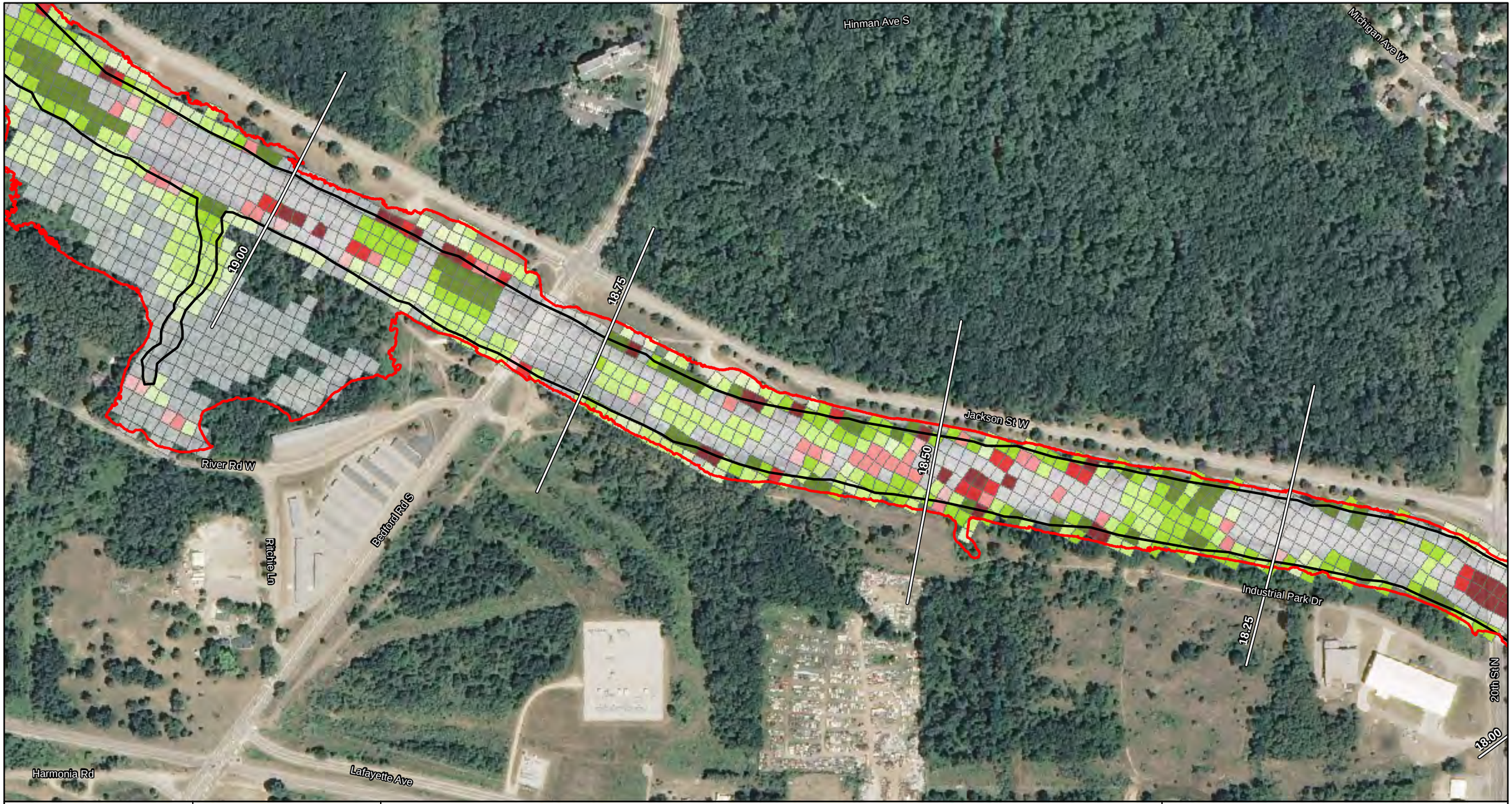
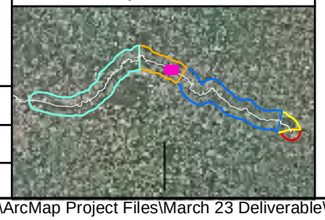
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

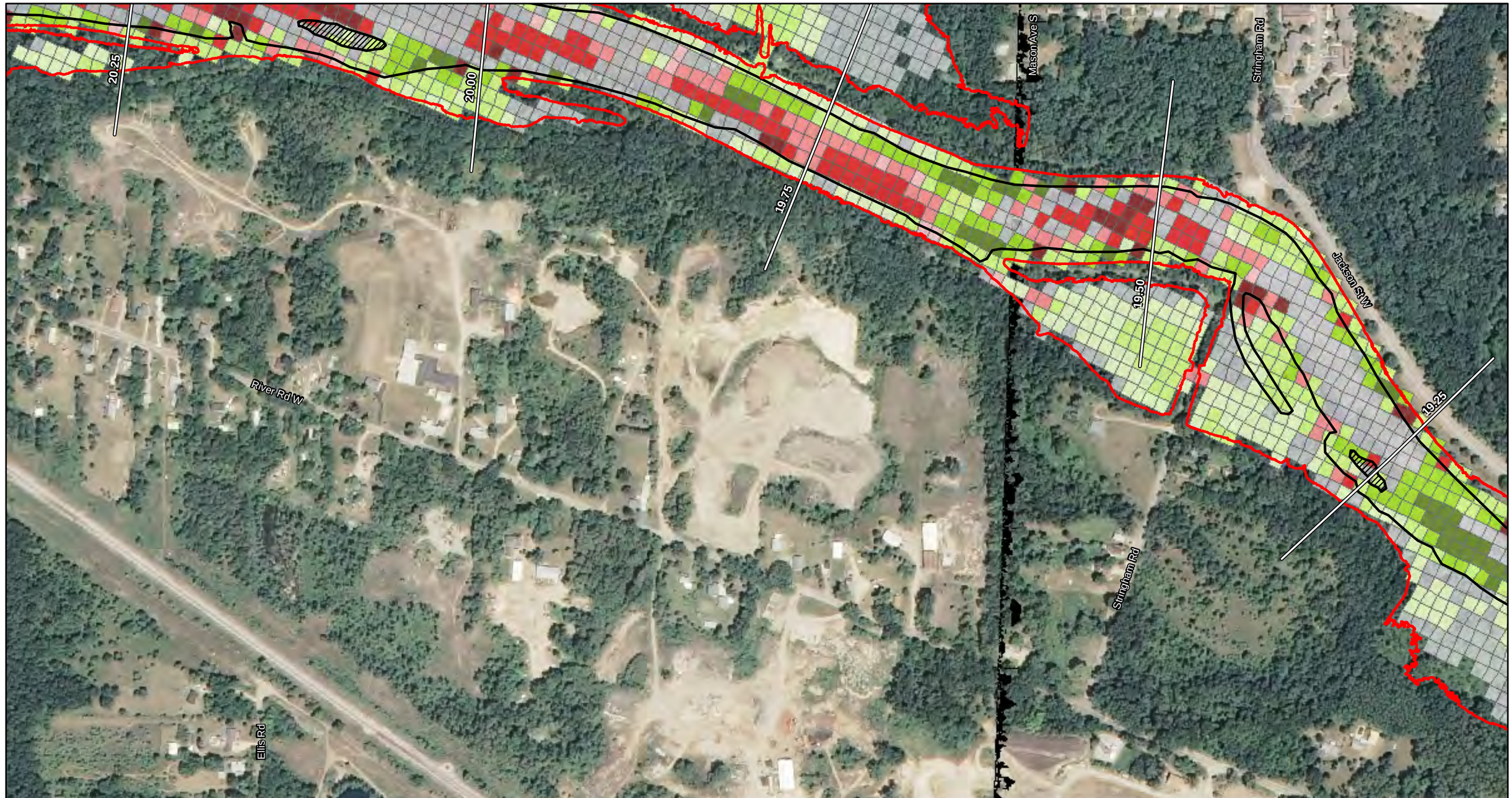
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 18.11 - MP 19.18

SHEET 18 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 19.18 - MP 20.00

SHEET 19 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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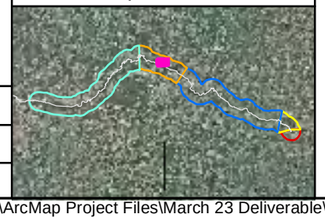
Aerial Photography Date: July & August 2009

Leonard Dr
Diane St
Waupaka Dr
Snow Ave
Hussey Ave
Center St
Cross St
Prudence Ln
Bansill Dr
Lamora Ave
Mason Ave N
Cedar Ave N
Kellogg St
Sigel Ave
Ludwig Ave
Woodlawn Ave N
Broadway Blvd
Feld Ave
Michigan Ave W
Spaulding Ave W
Cedar Ave W
Lynn Dr
Ashland Ave
Iden St
Mason Ave S
Cedar Ave S
Woodlawn Ave S
Stringham Rd
Babcock St
20.25
20.00
19.75

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 20.00 - MP 20.32

SHEET 20 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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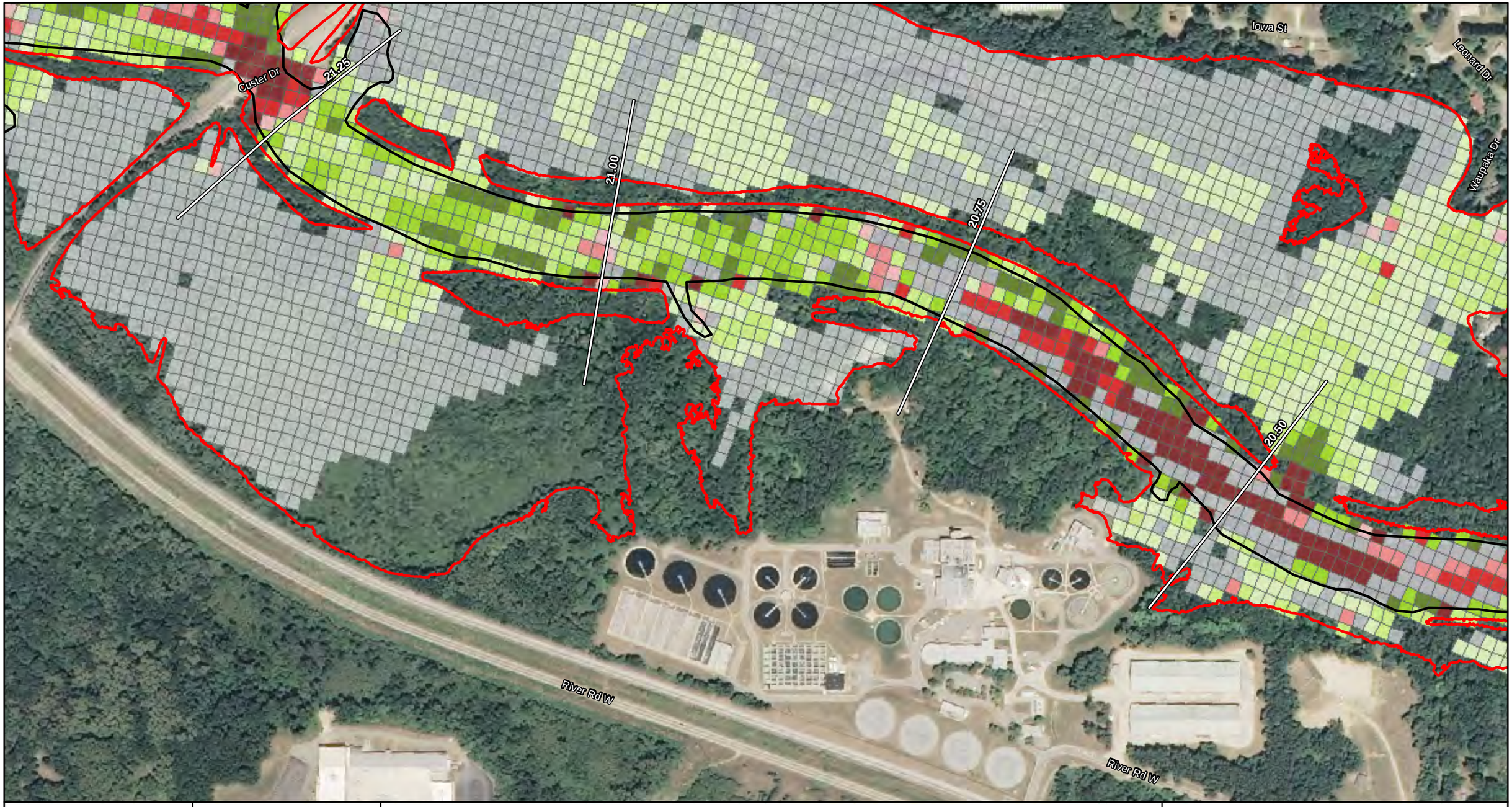
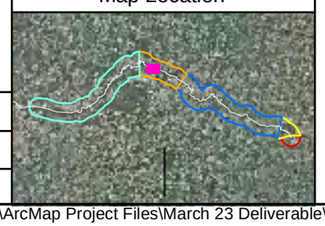
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 20.32 - MP 21.36

SHEET 21 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 21.36 - MP 21.59

SHEET 22 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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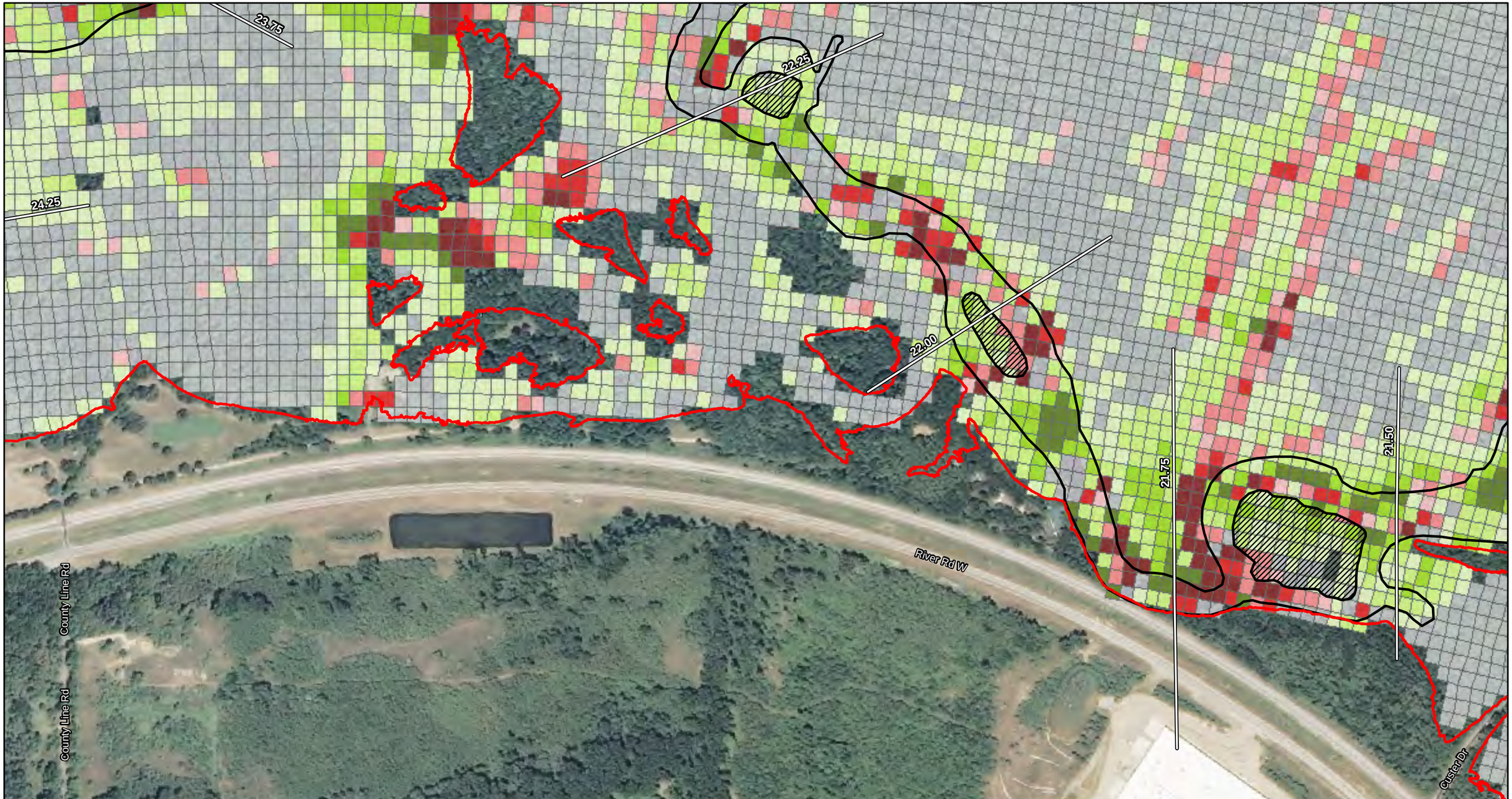
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 21.59 - MP 22.33

SHEET 23 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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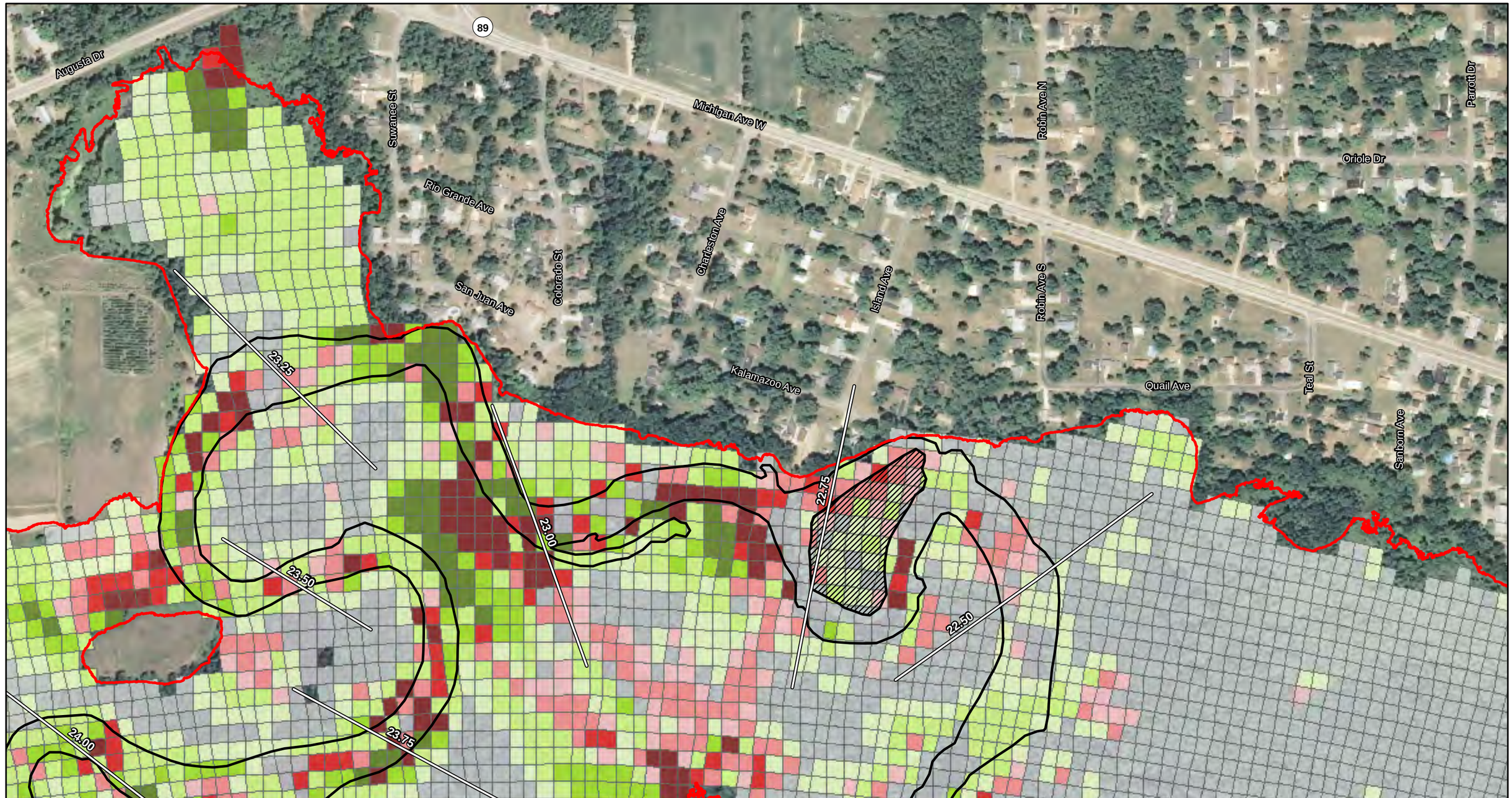
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 22.33 - MP 24.01

SHEET 24 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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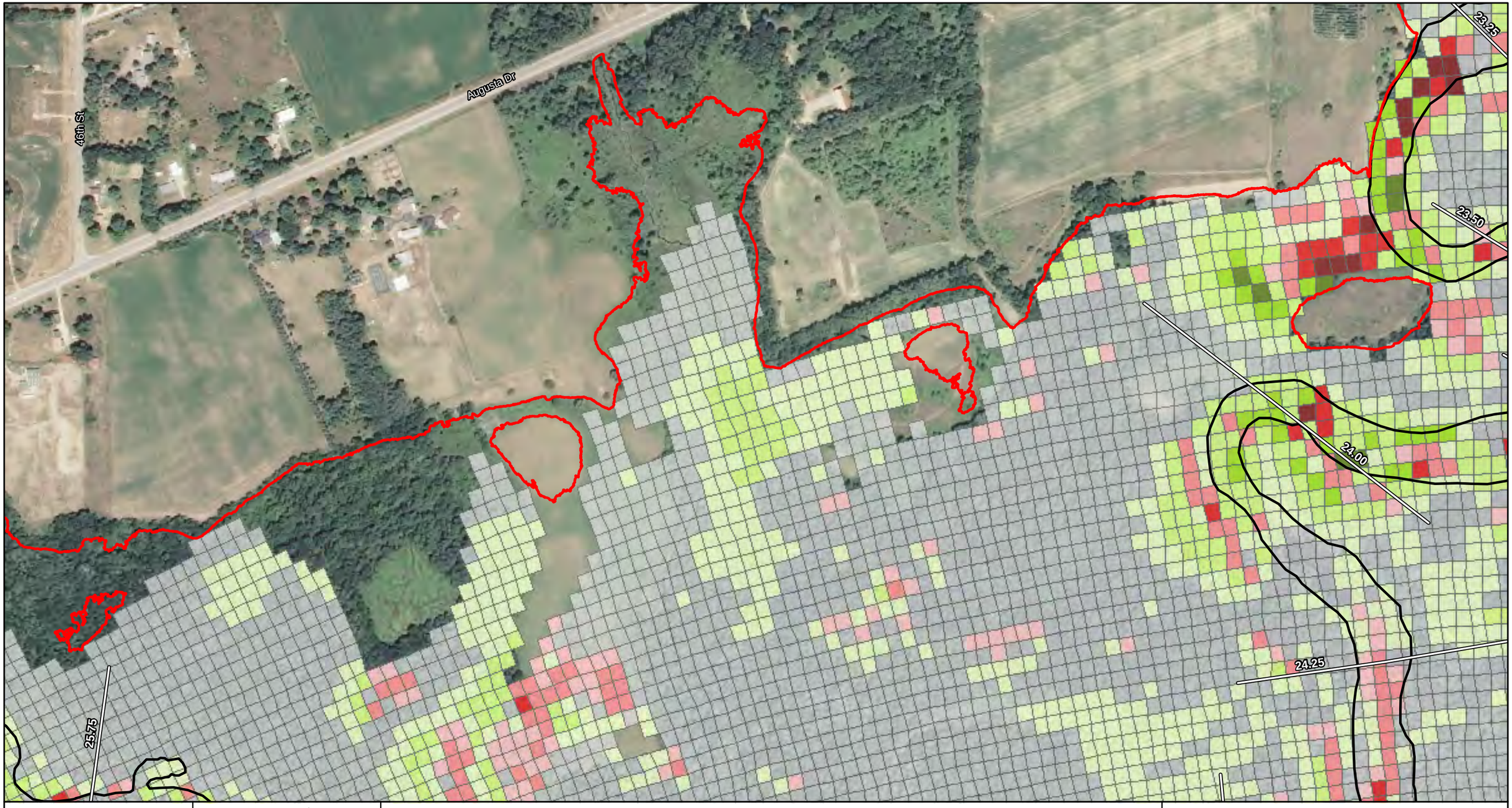
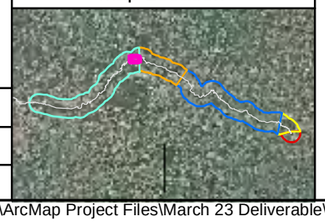
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 24.01 - MP 24.33

SHEET 25 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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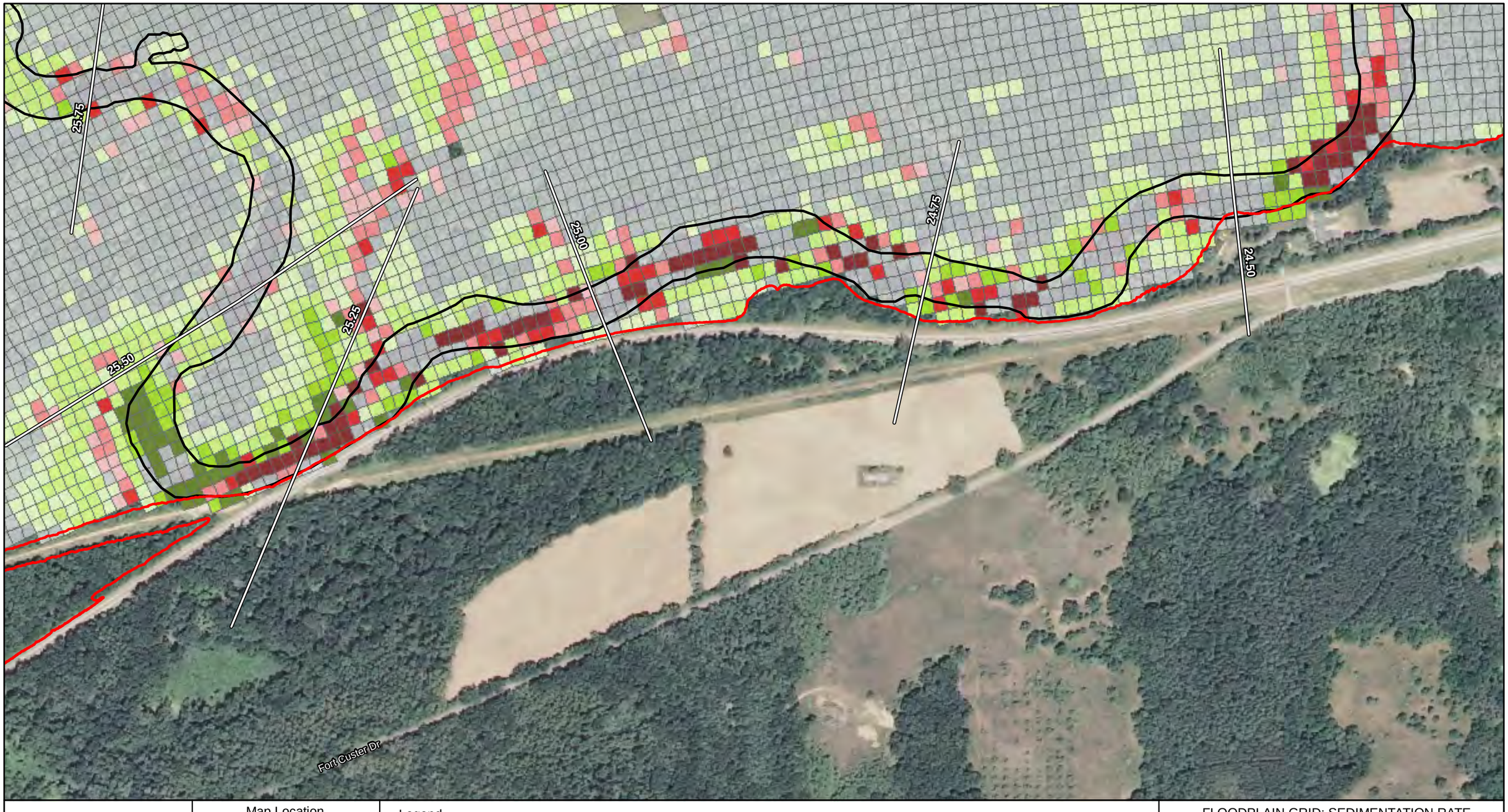
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 24.33 - MP 25.79

SHEET 26 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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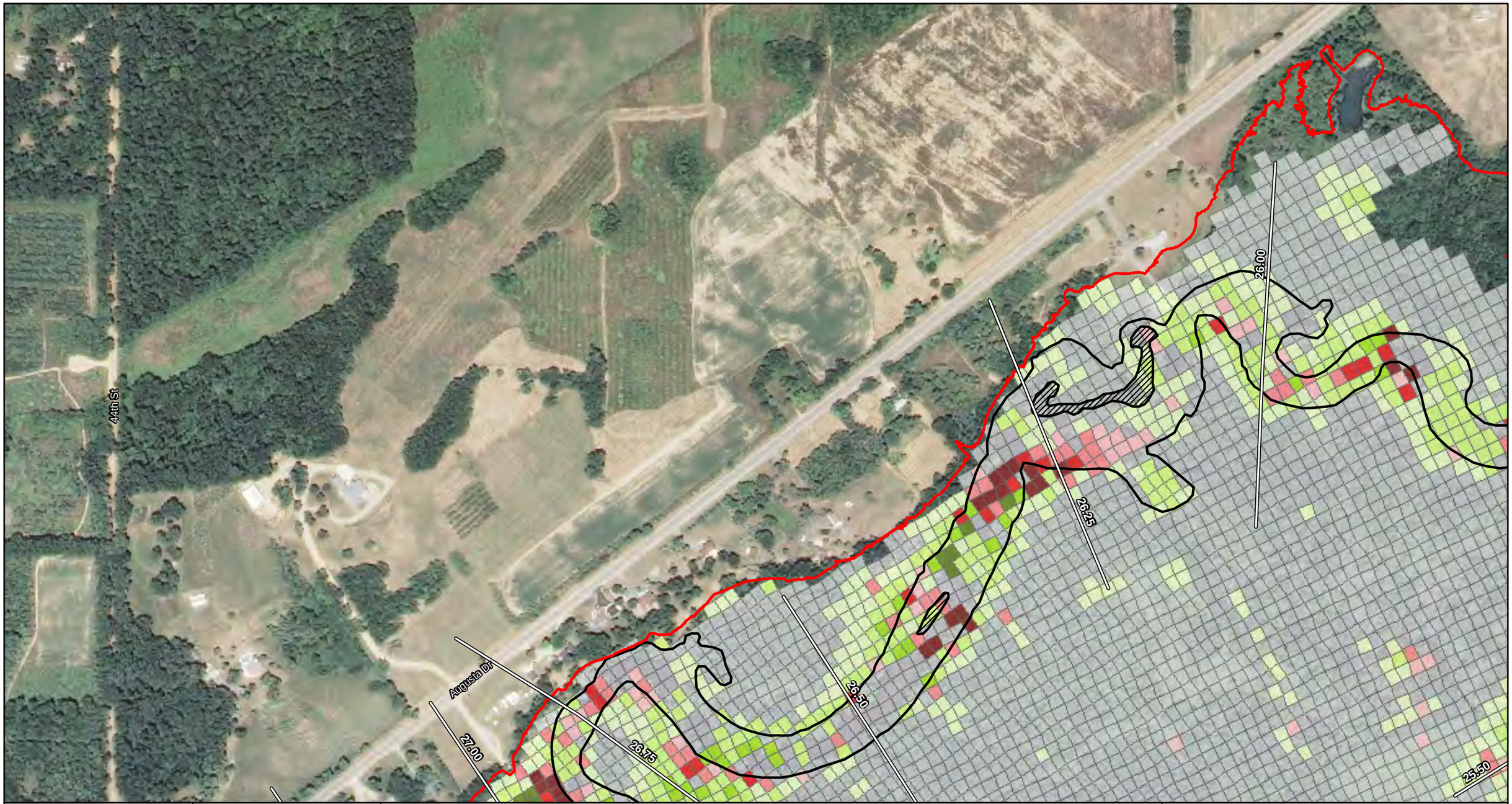
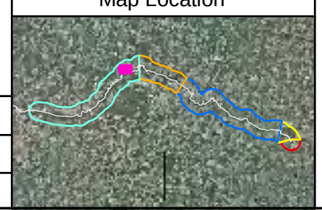
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 25.79 - MP 26.80

SHEET 27 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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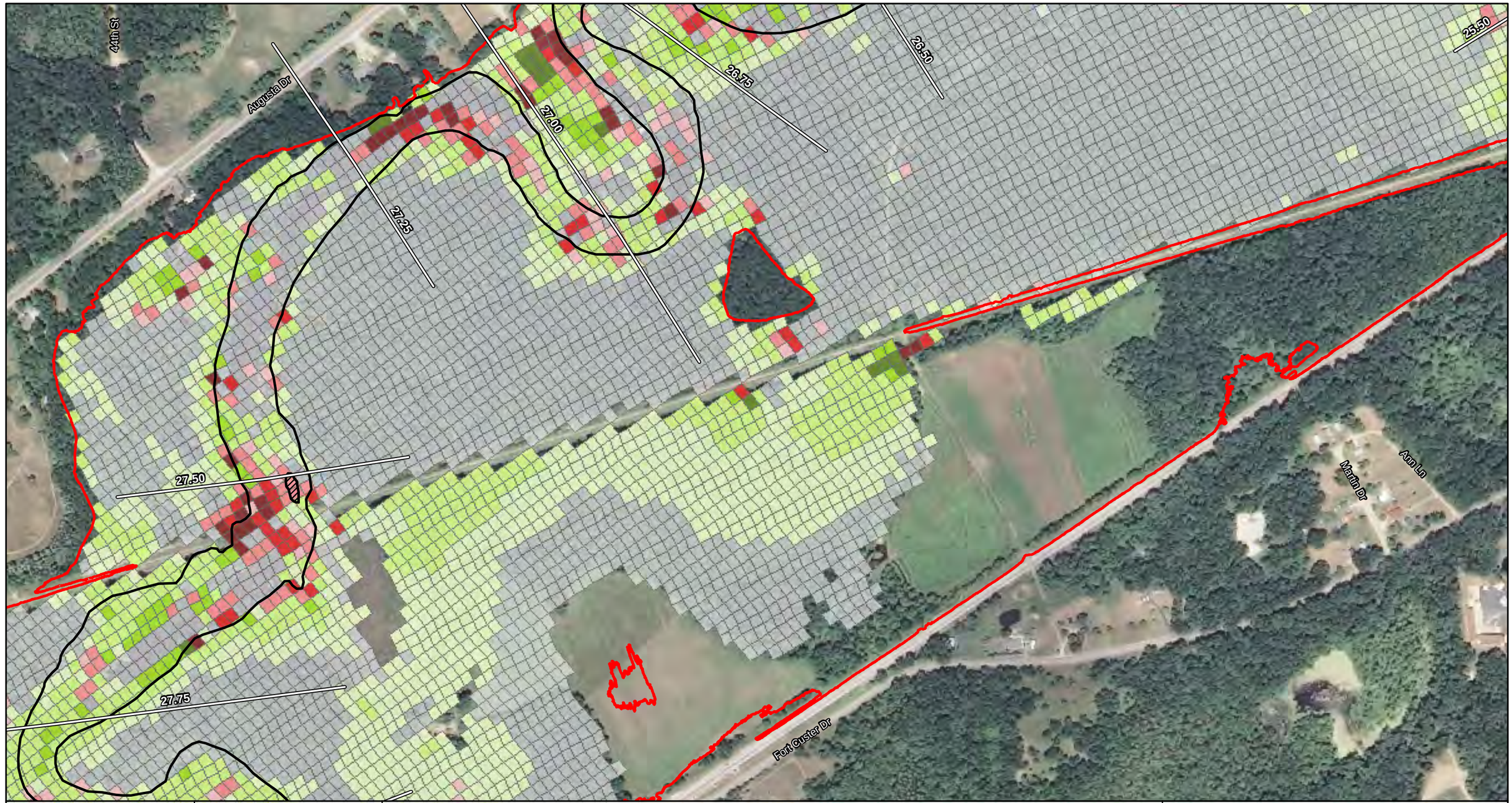
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 26.80 - MP 27.80

SHEET 28 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 27.80NW - MP 28.22NW

SHEET 29 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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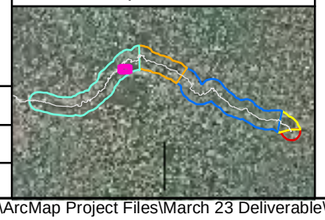
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 27.80SE - MP 28.22SE

SHEET 30 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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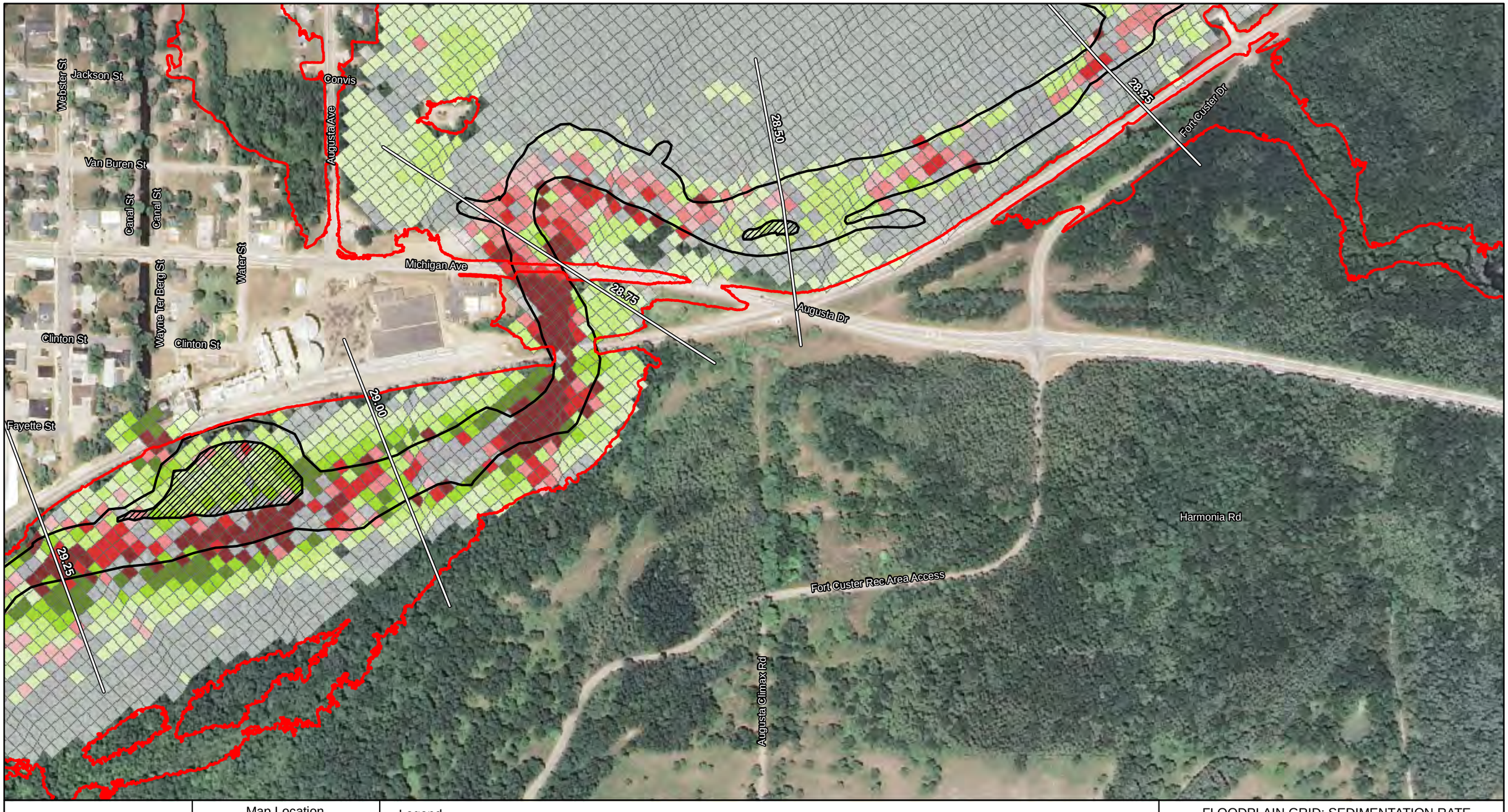
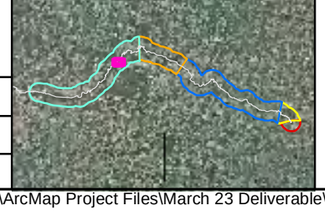
Aerial Photography Date: July & August 2009



Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 28.22 - MP 29.20

SHEET 31 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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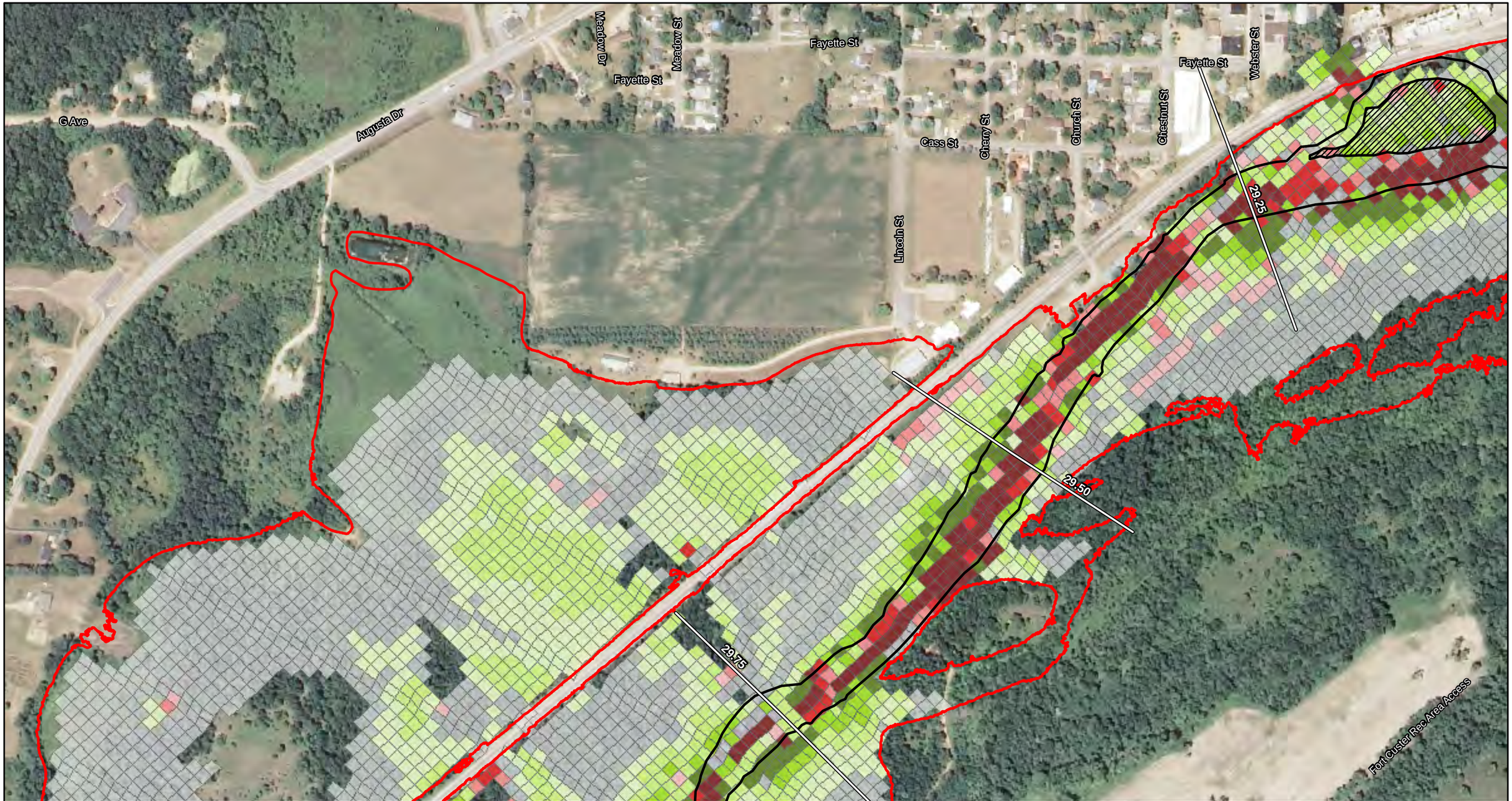
Aerial Photography Date: July & August 2009



Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 29.20 - MP 29.82

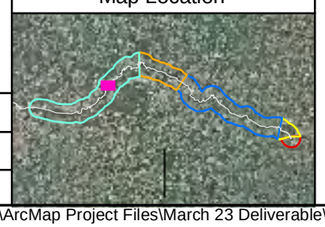
SHEET 32 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_50yr.mxd

Aerial Photography Date: July & August 2009

Map Location



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 29.82 - MP 30.84

SHEET 33 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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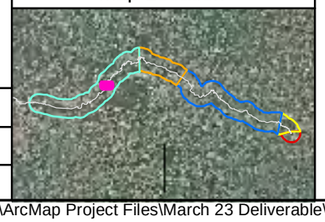
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 30.84 - MP 31.40

SHEET 34 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 31.40 - MP 31.94

SHEET 35 OF 45

ENBRIDGE LINE 6B MP 608
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ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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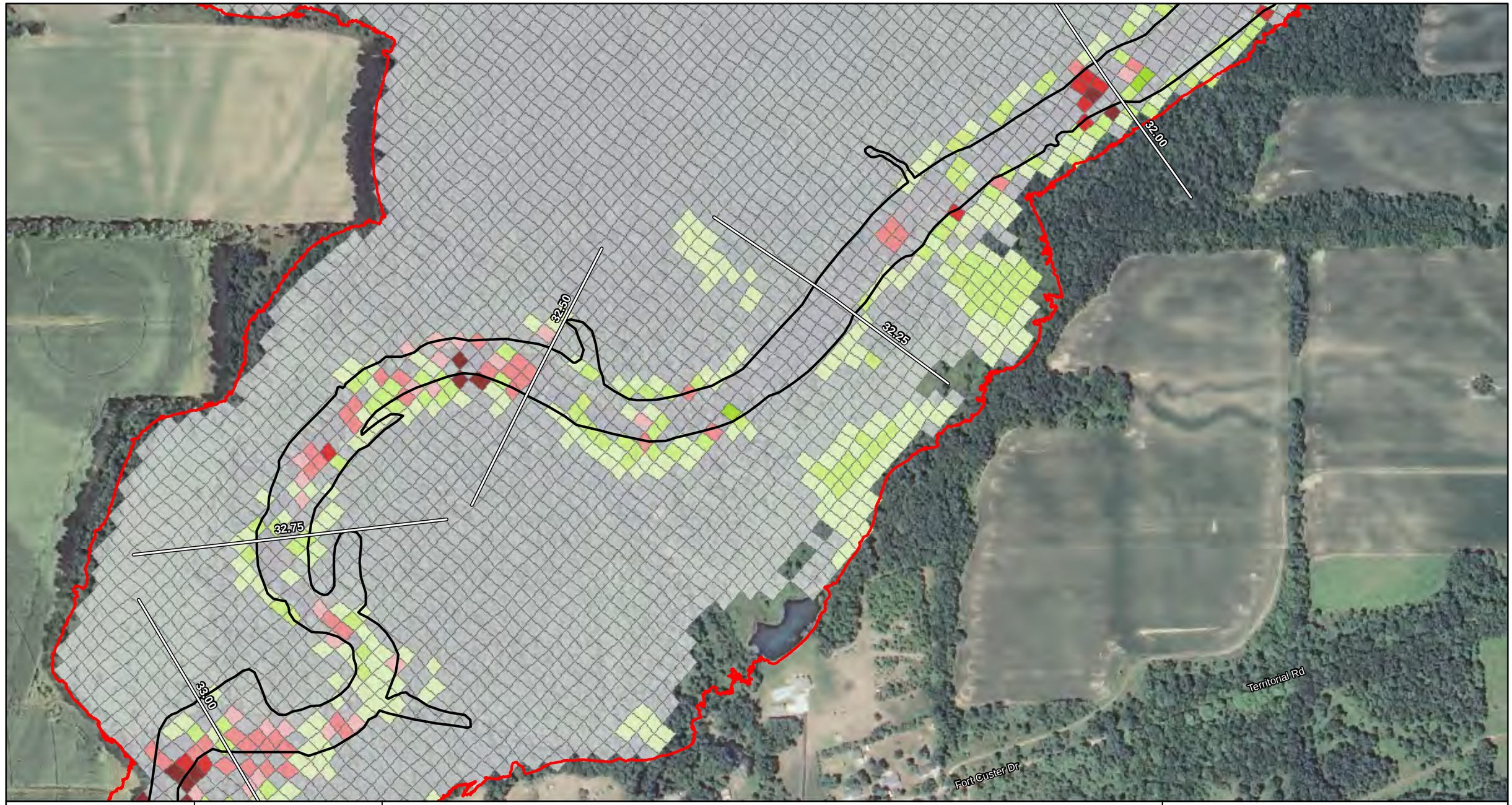
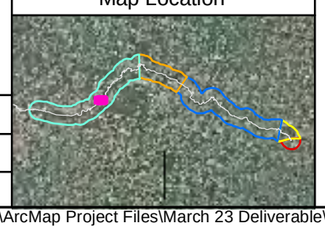
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 31.94 - MP 33.00

SHEET 36 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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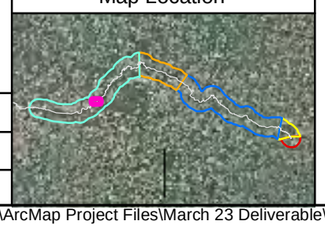
Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD

MP 33.00 - MP 33.52

SHEET 37 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

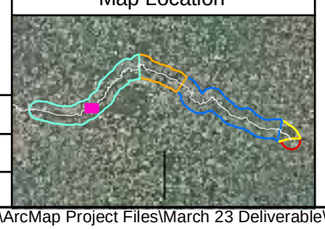
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_50yr.mxd

Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

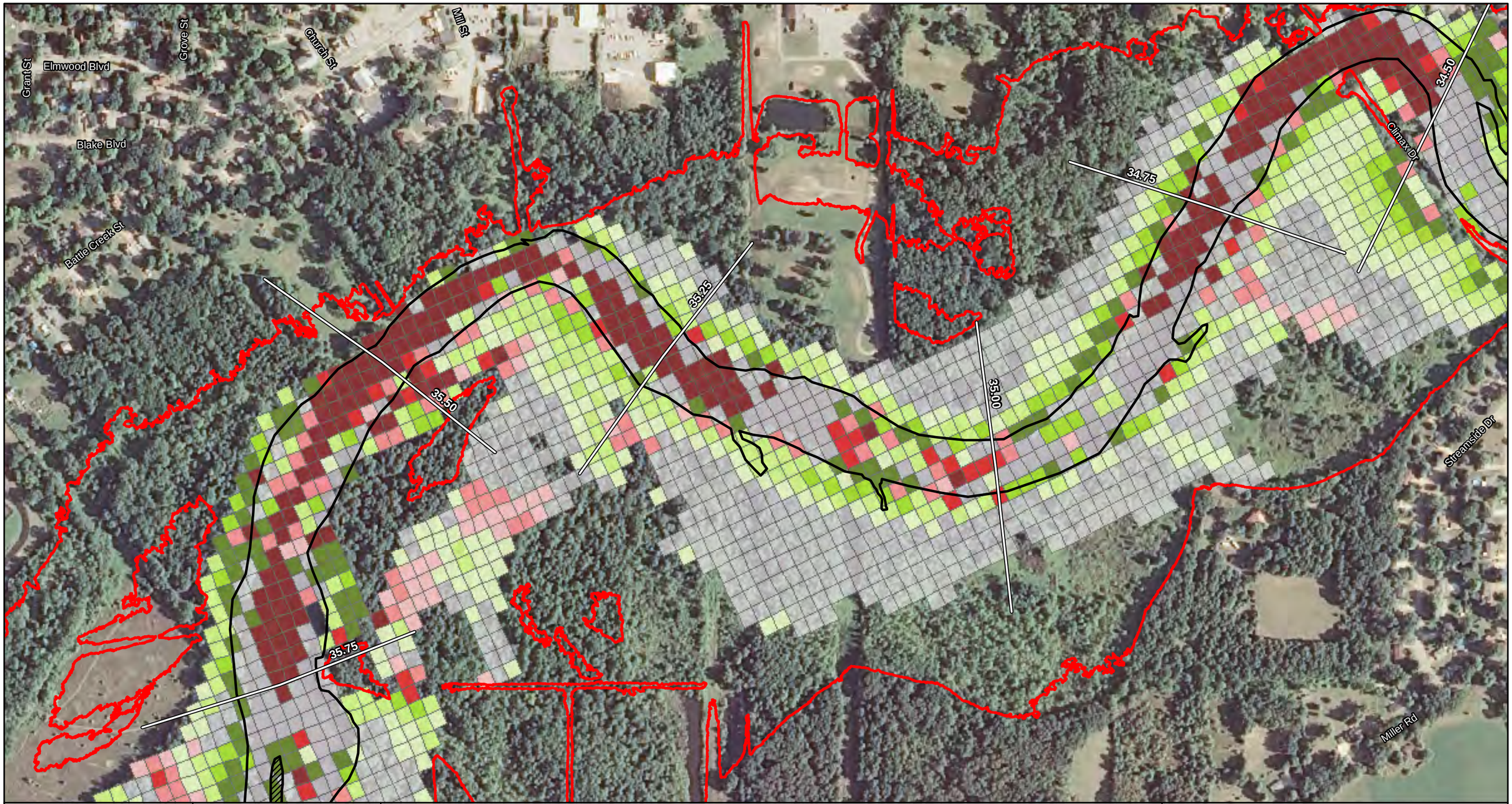
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 33.52 - MP 34.70

SHEET 38 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

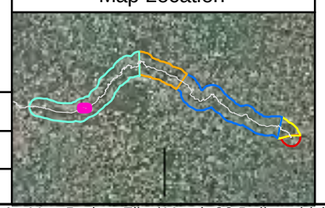
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_50yr.mxd

Aerial Photography Date: July & August 2009



Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

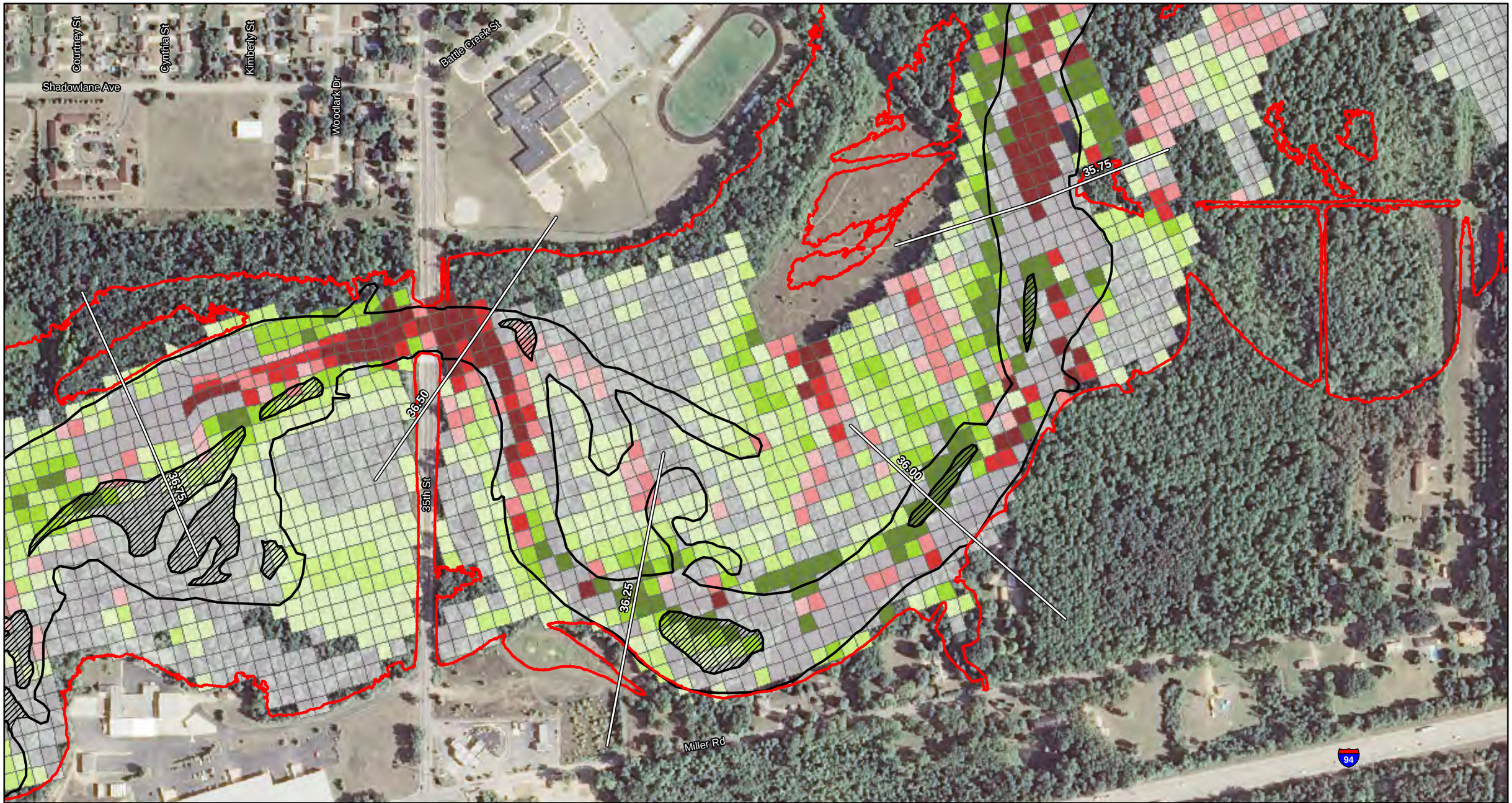
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 34.70 - MP 35.75

SHEET 39 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_50yr.mxd

Aerial Photography Date: July & August 2009



Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 35.75 - MP 36.75

SHEET 40 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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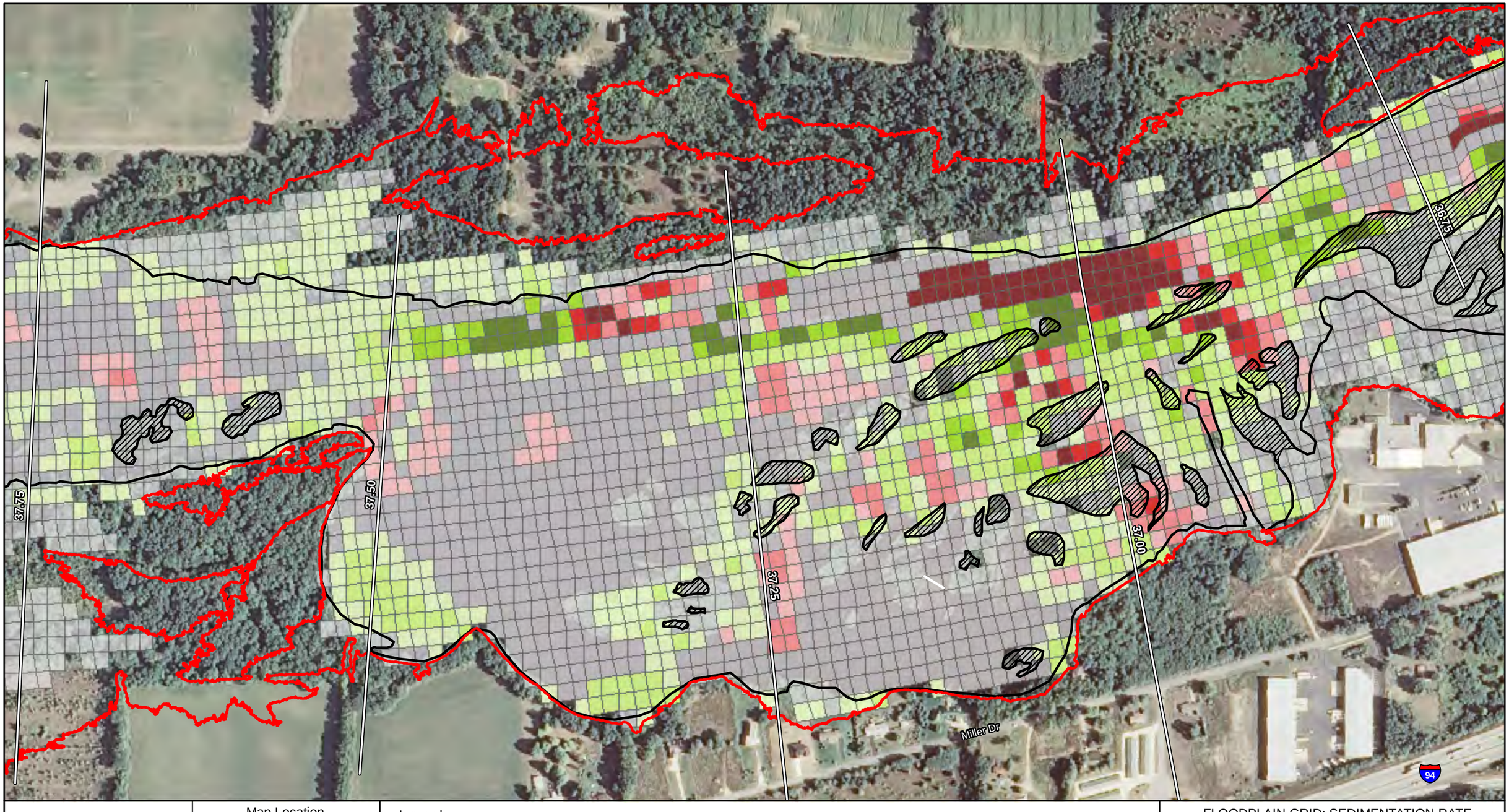
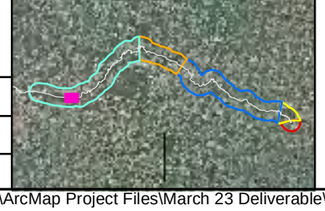
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 36.75 - MP 37.75

SHEET 41 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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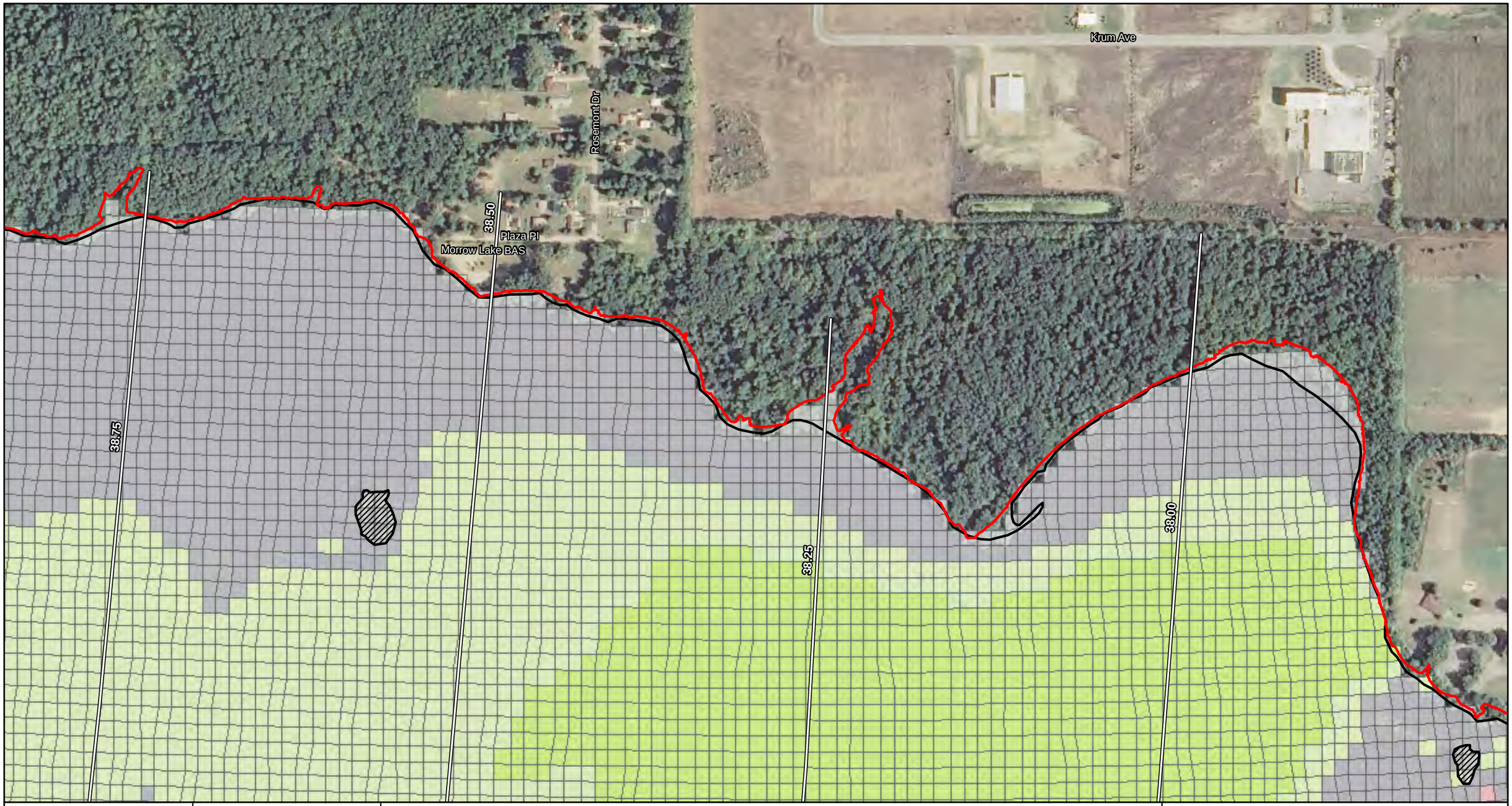
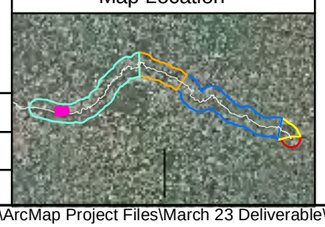
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 37.75N - MP 38.80N

SHEET 42 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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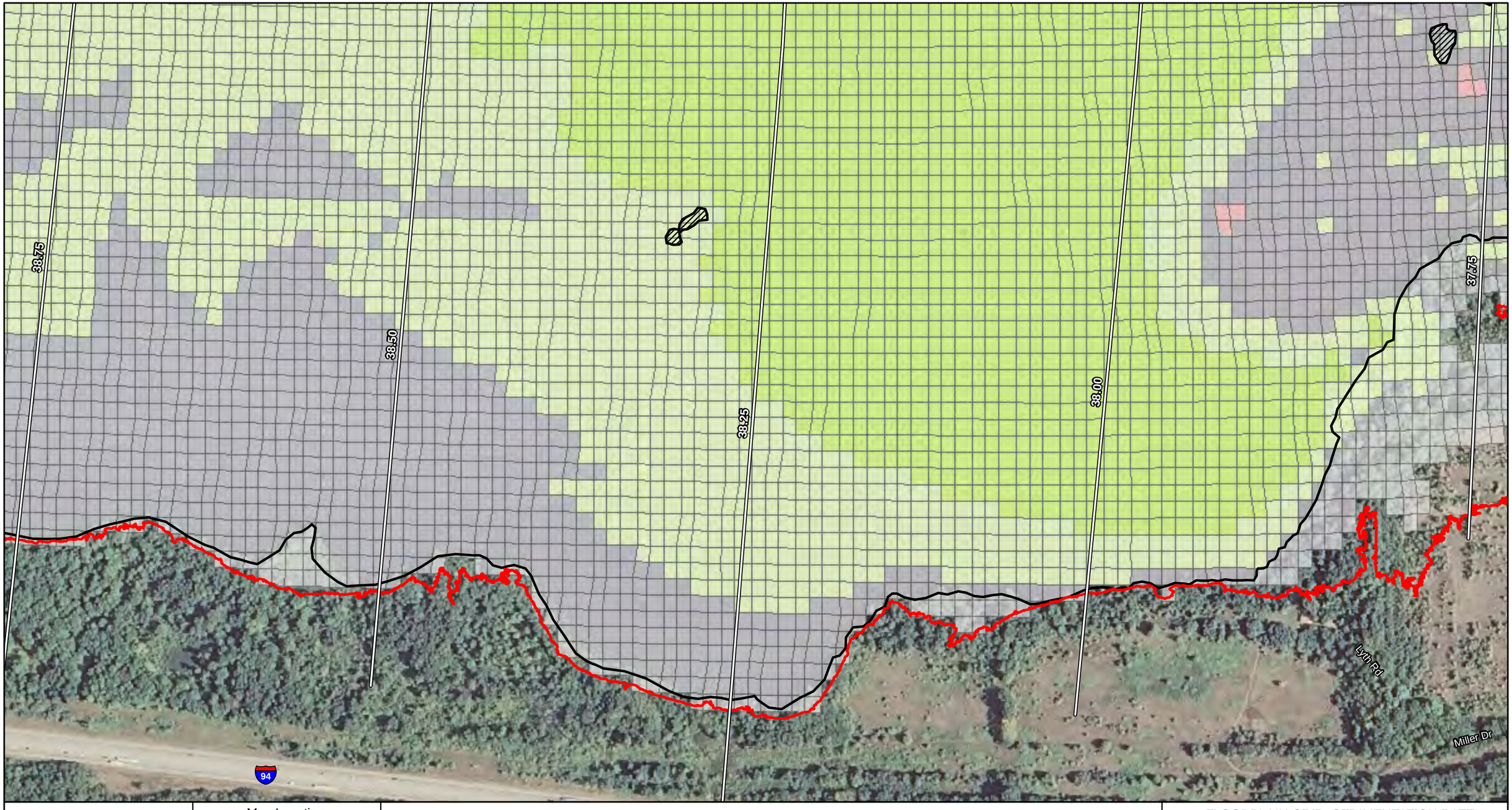
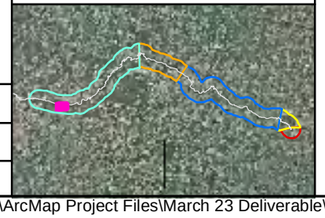
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 37.75S - MP 38.80S

SHEET 43 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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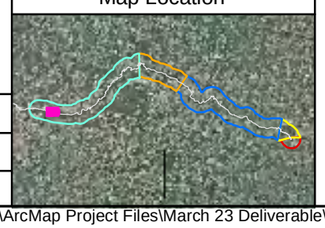
Aerial Photography Date: July & August 2009

Arden Ave
Morrow St
Elliot Rd
Lawndale Ave
Chene Dr
Consumers Power Dr
39.75
39.50
39.25
39.00

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 38.80N - MP 39.95N

SHEET 44 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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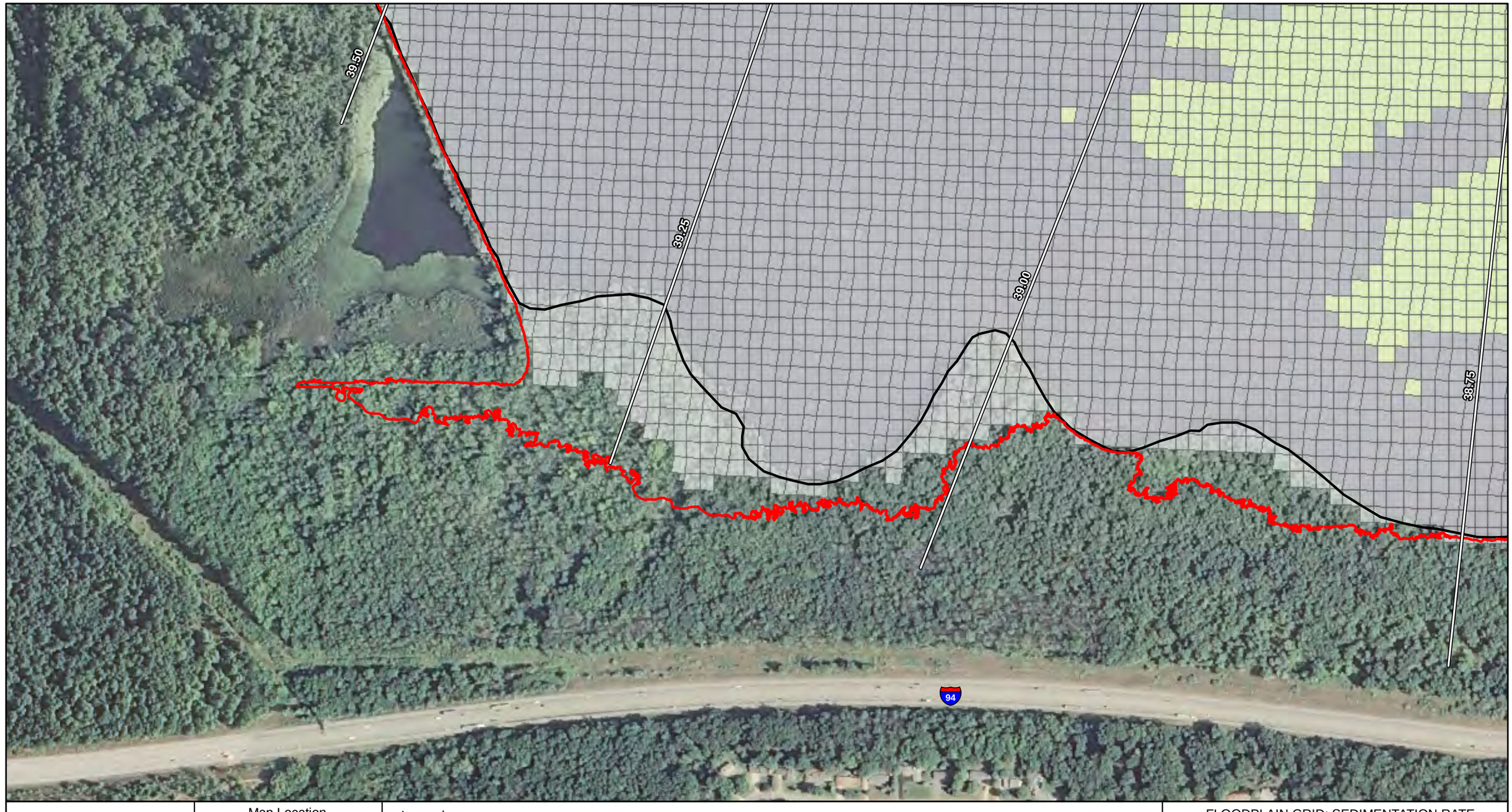
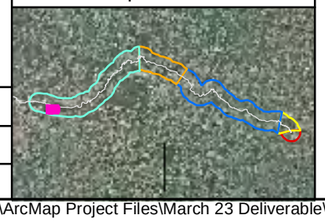
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

N

0 175 350 700

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
50-YEAR FLOOD
MP 38.80S - MP 39.95S

SHEET 45 OF 45

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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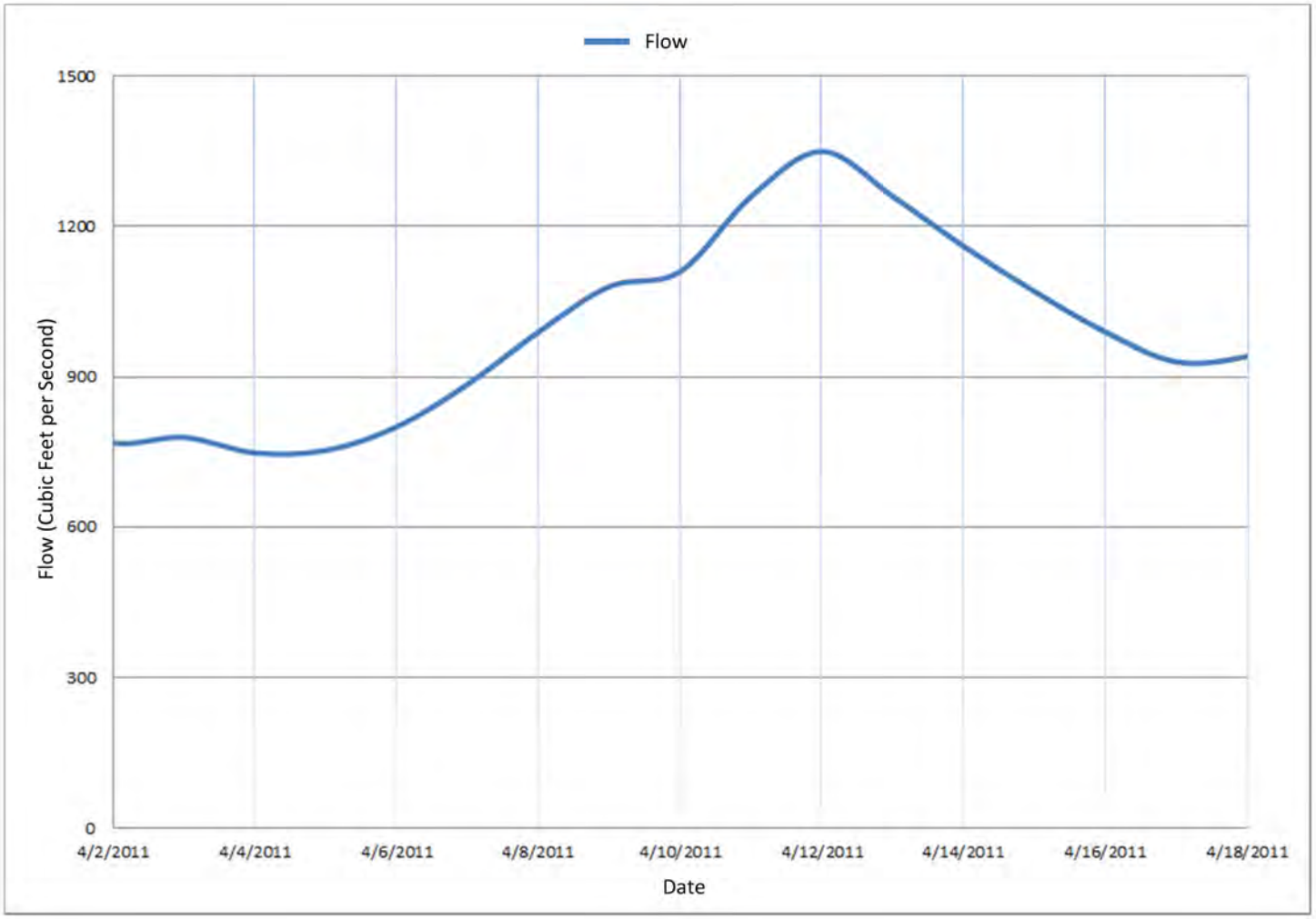
Aerial Photography Date: July & August 2009

Figure 6-21

Flow at Kalamazoo River Gage Near Battle Creek for April 2011



ENBRIDGE

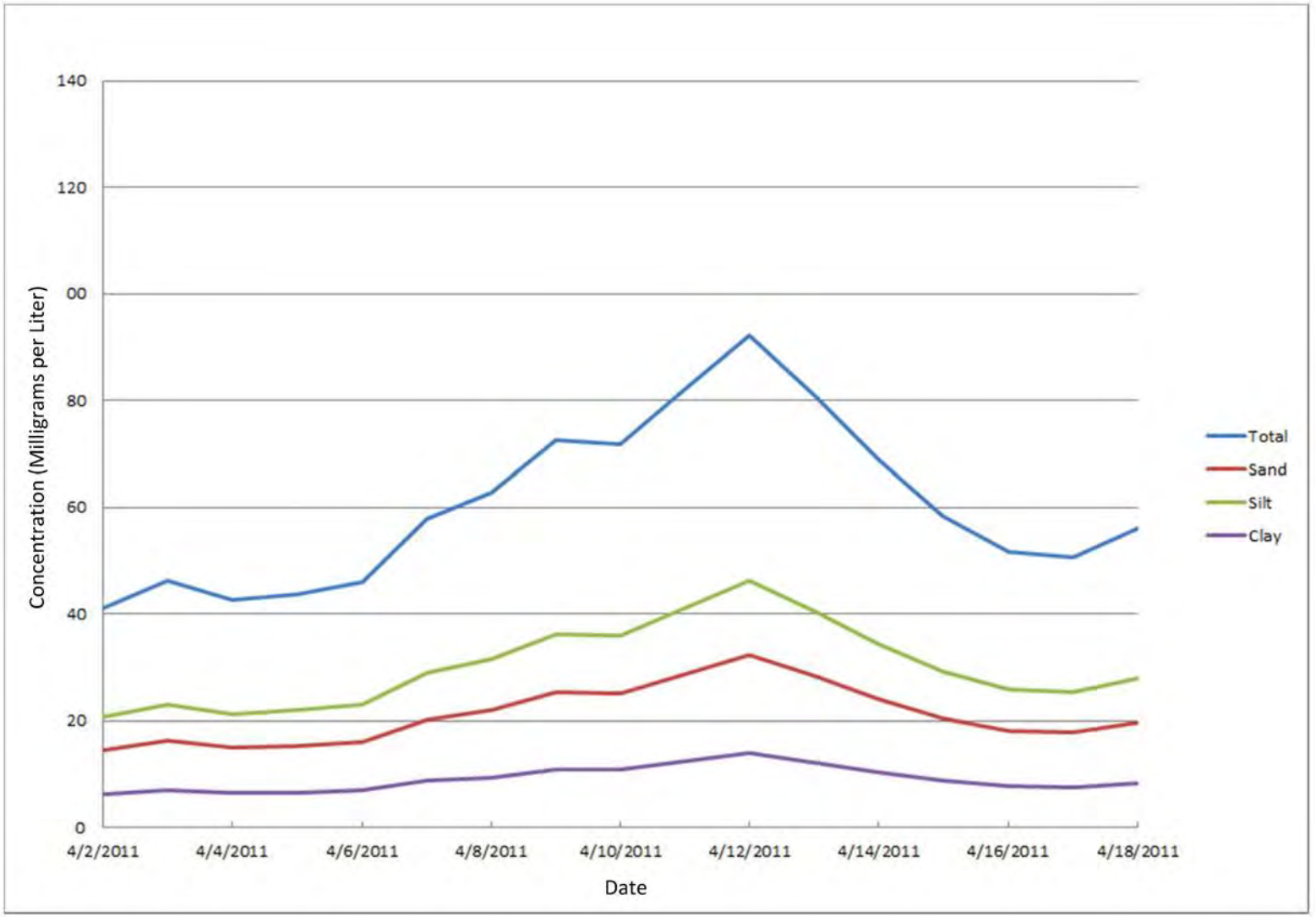
Drawn:	JLH	04/17/2012
Approved:	DBR	04/17/2012
Project #:	106-4186	

FLOW AT KALAMAZOO RIVER
GAGE NEAR BATTLE CREEK
FOR APRIL 2011

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 6-22

Boundary Sediment Concentration for April 2011



ENBRIDGE

Drawn:	JLH	04/17/2012
Approved:	DBR	04/17/2012
Project #:	106-4186	

BOUNDARY SEDIMENT CONCENTRATION FOR APRIL 2011

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 6-23

Riverine Grid: Velocity

April 9, 2011

Sheets 1 through 56

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 01.95 - MP 02.75

SHEET 1 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

3.25

3.00

2.75

2.50

Friendship Ln

Heather Dr

Peter Pan Ln

Kristen Dr

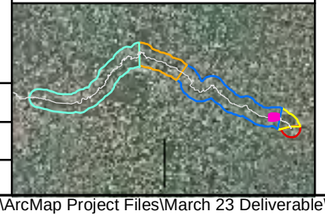
Squaw Creek Rd

River Park Dr

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 02.60 - MP 03.40

SHEET 2 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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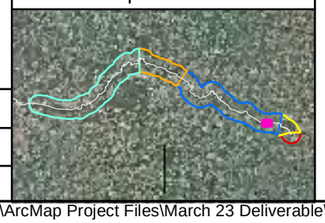
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 03.40 - MP 04.20

SHEET 3 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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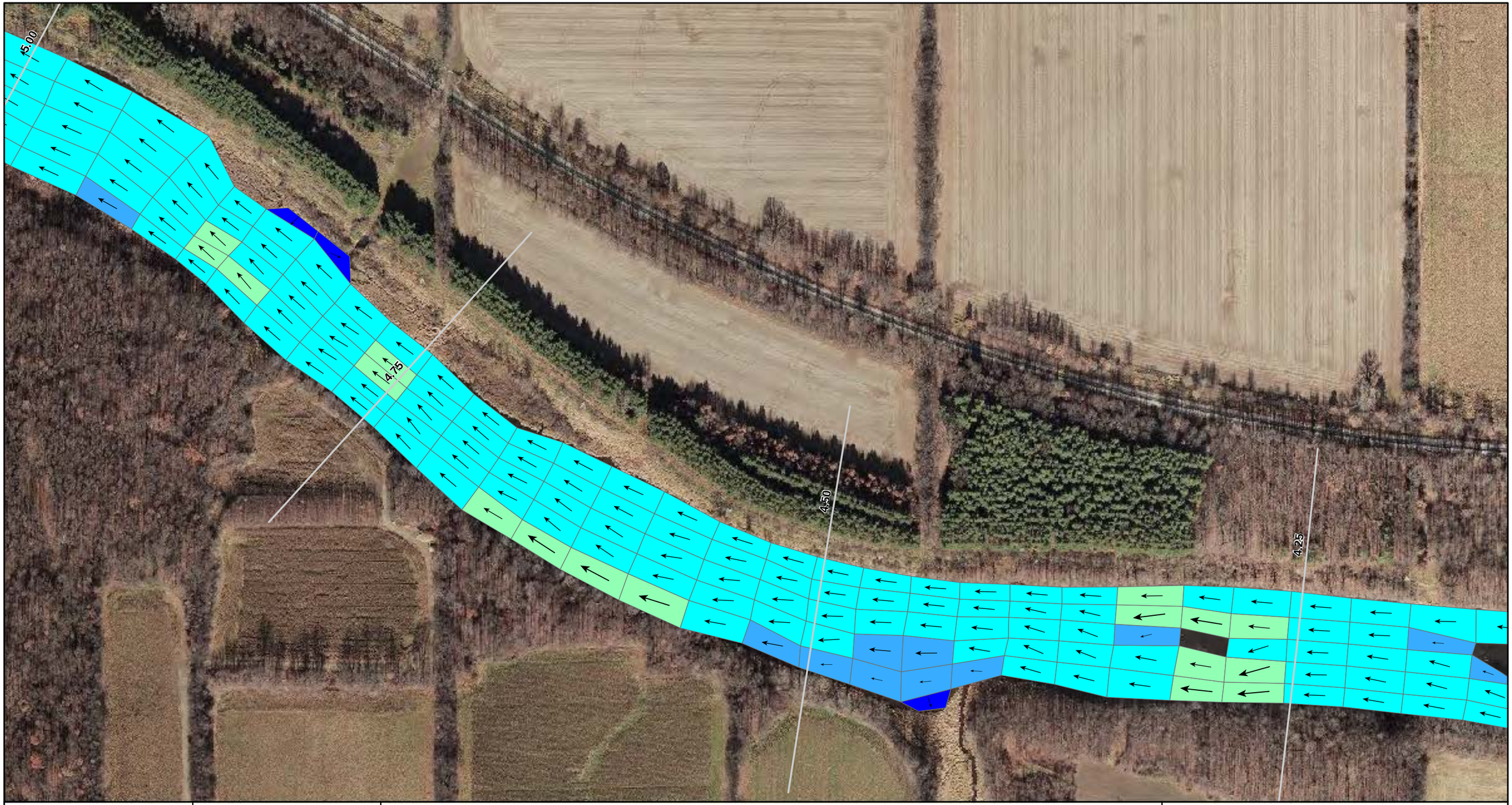
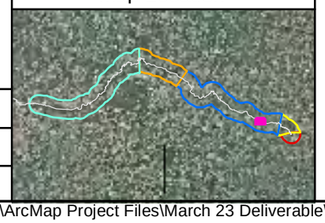
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 04.15 - MP 05.00

SHEET 4 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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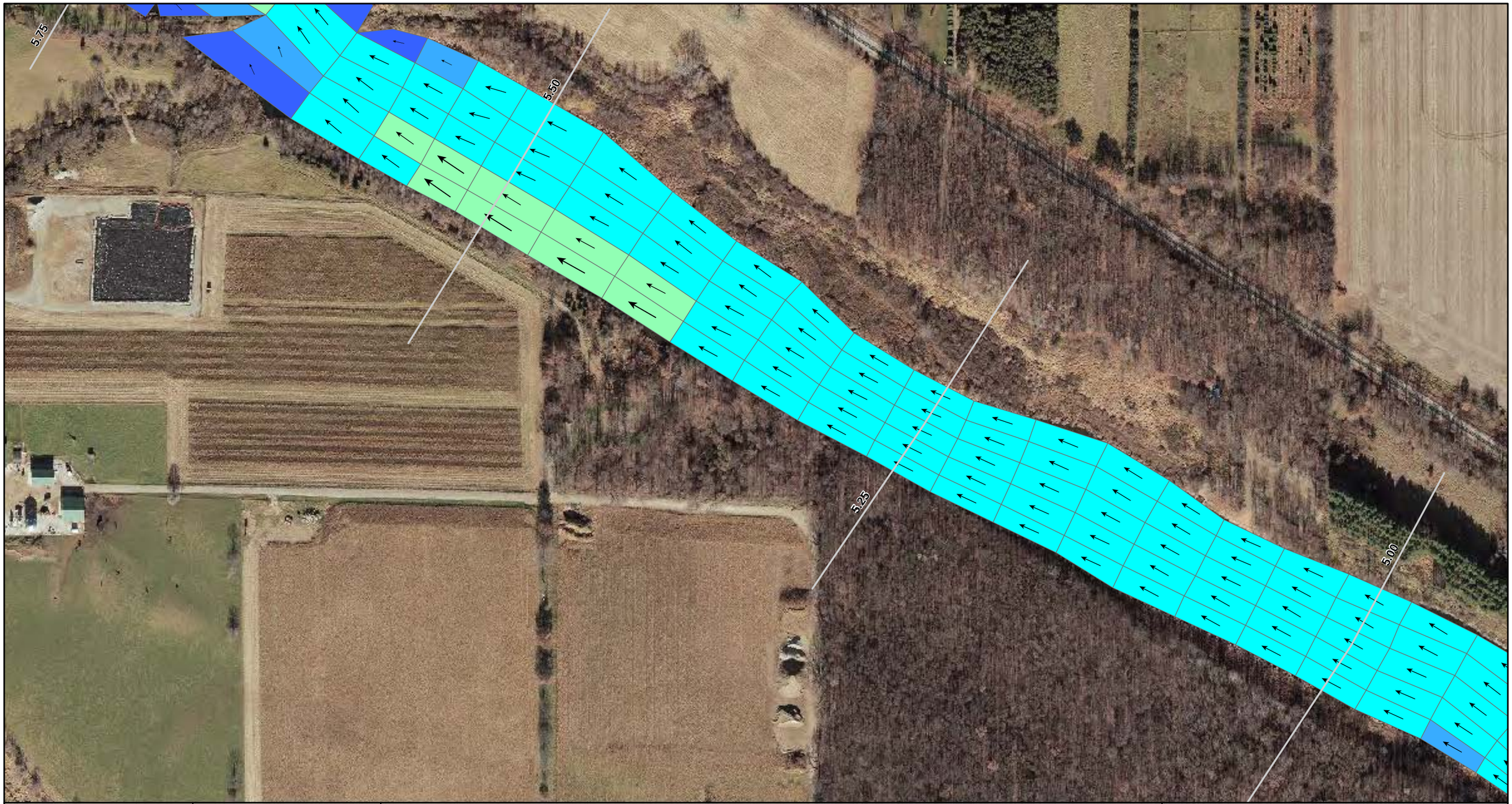
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 04.90 - MP 05.65

SHEET 5 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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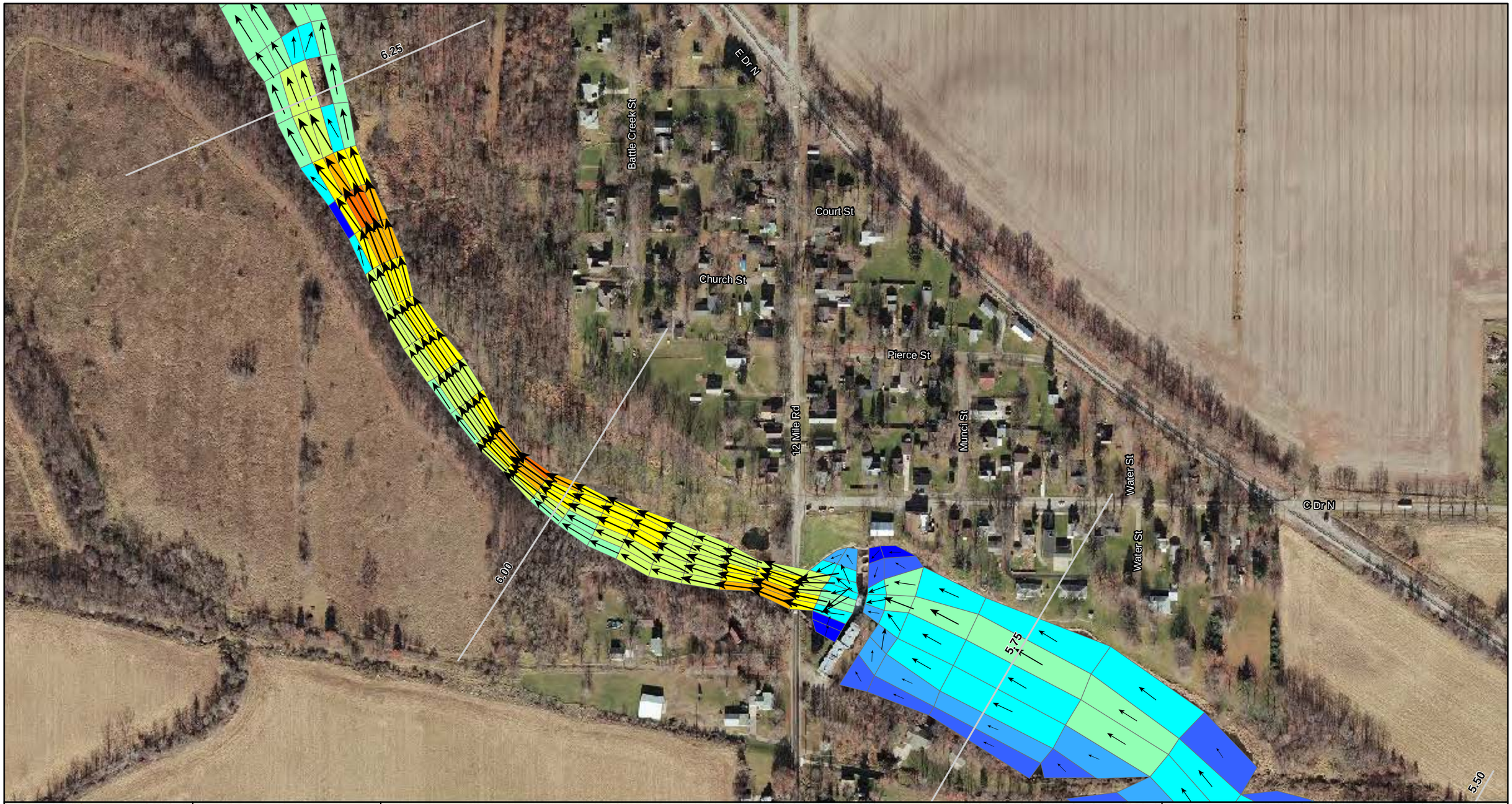
Aerial Photography Date: November 2011



Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
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Project #:	106-4186	

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 05.65 - MP 06.30

SHEET 6 OF 56

ENBRIDGE LINE 6B MP 608
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ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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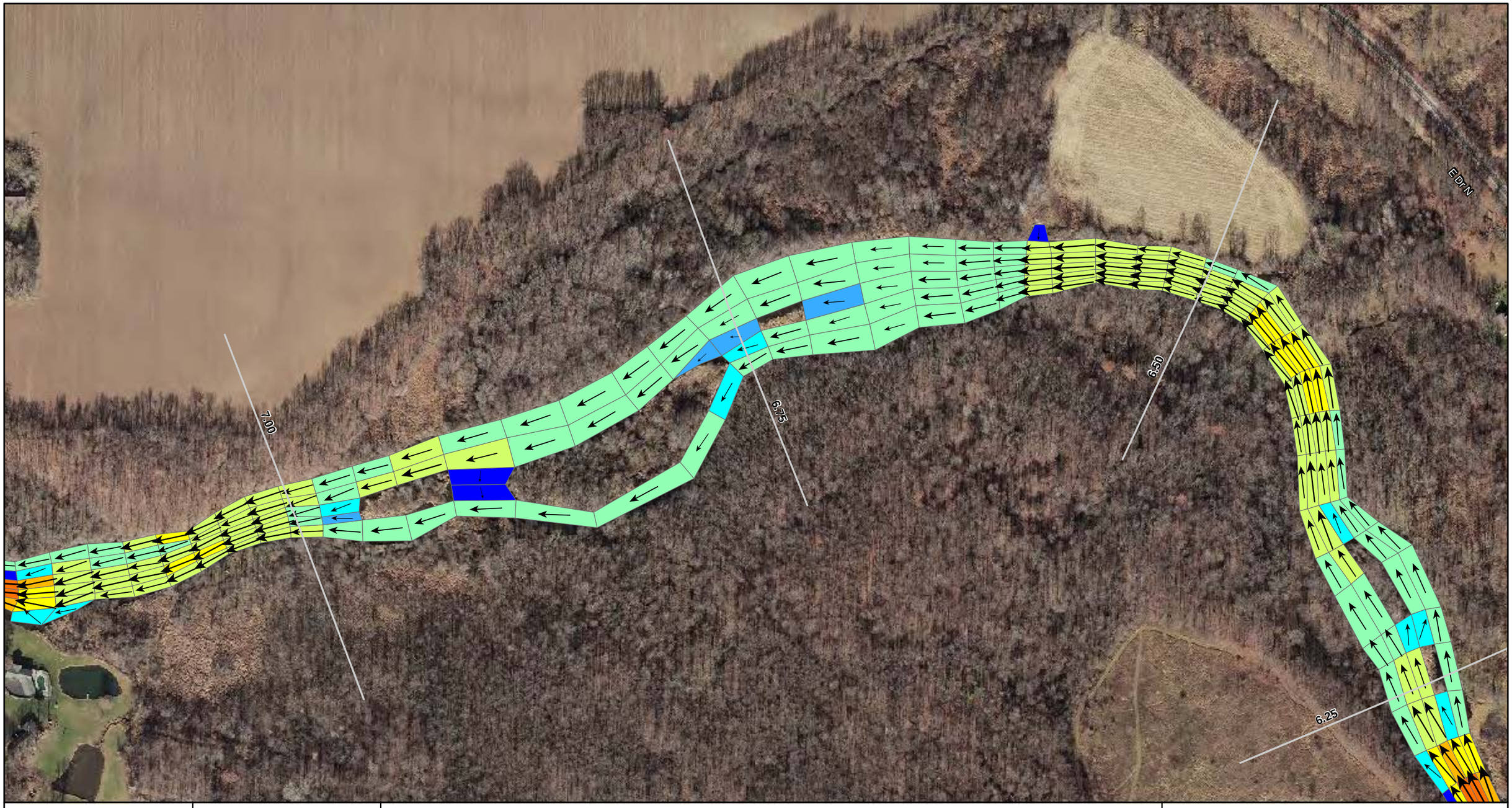
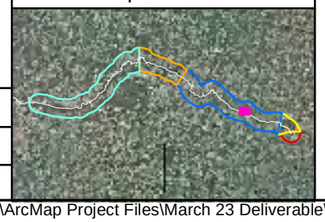
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 06.20 - MP 07.15

SHEET 7 OF 56

ENBRIDGE LINE 6B MP 608
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ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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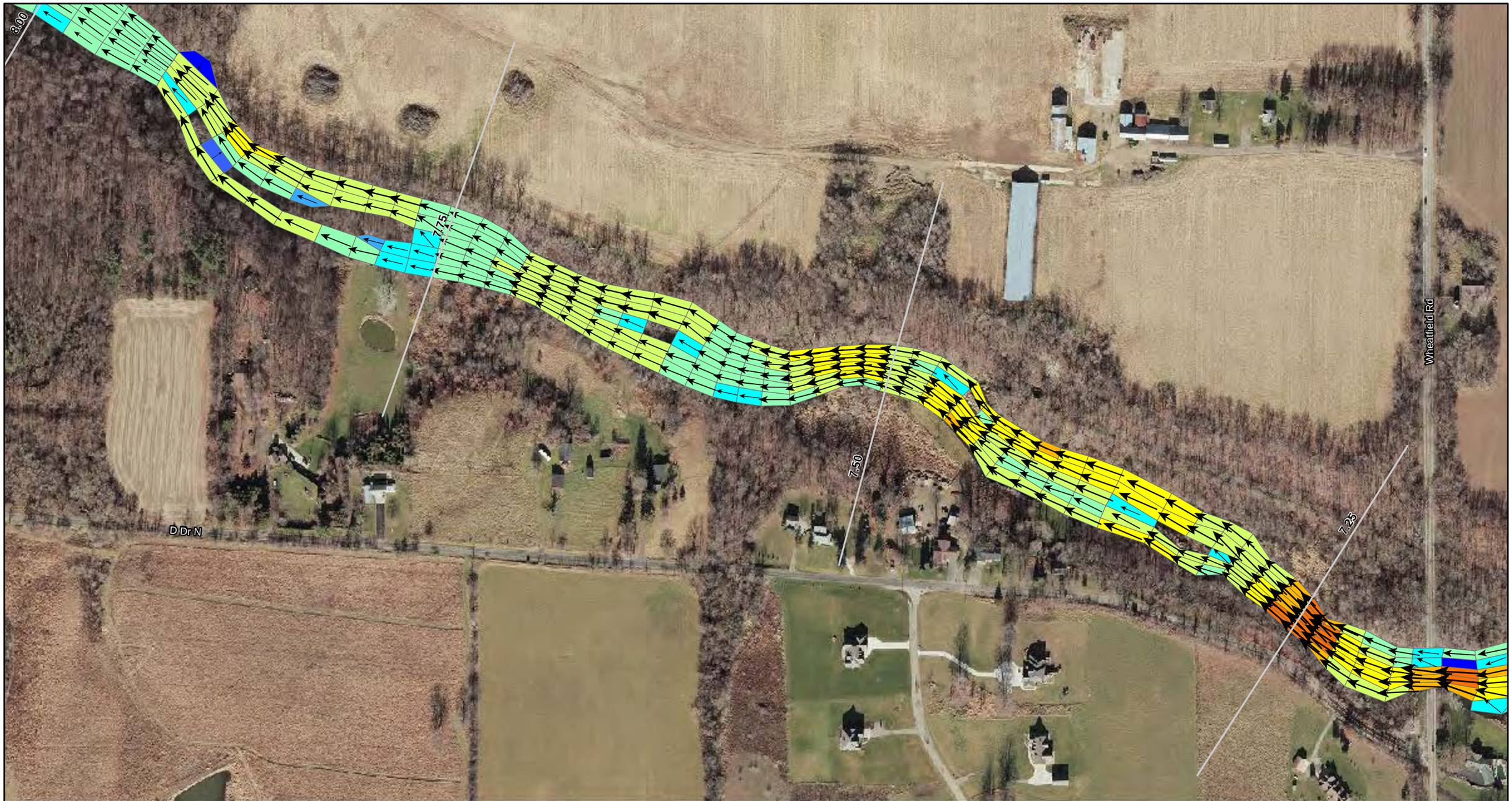
Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 07.15 - MP 07.95

SHEET 8 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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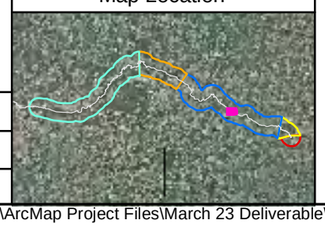
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 07.90 - MP 08.75

SHEET 9 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 08.70 - MP 09.30

SHEET 10 OF 56

ENBRIDGE LINE 6B MP 608
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ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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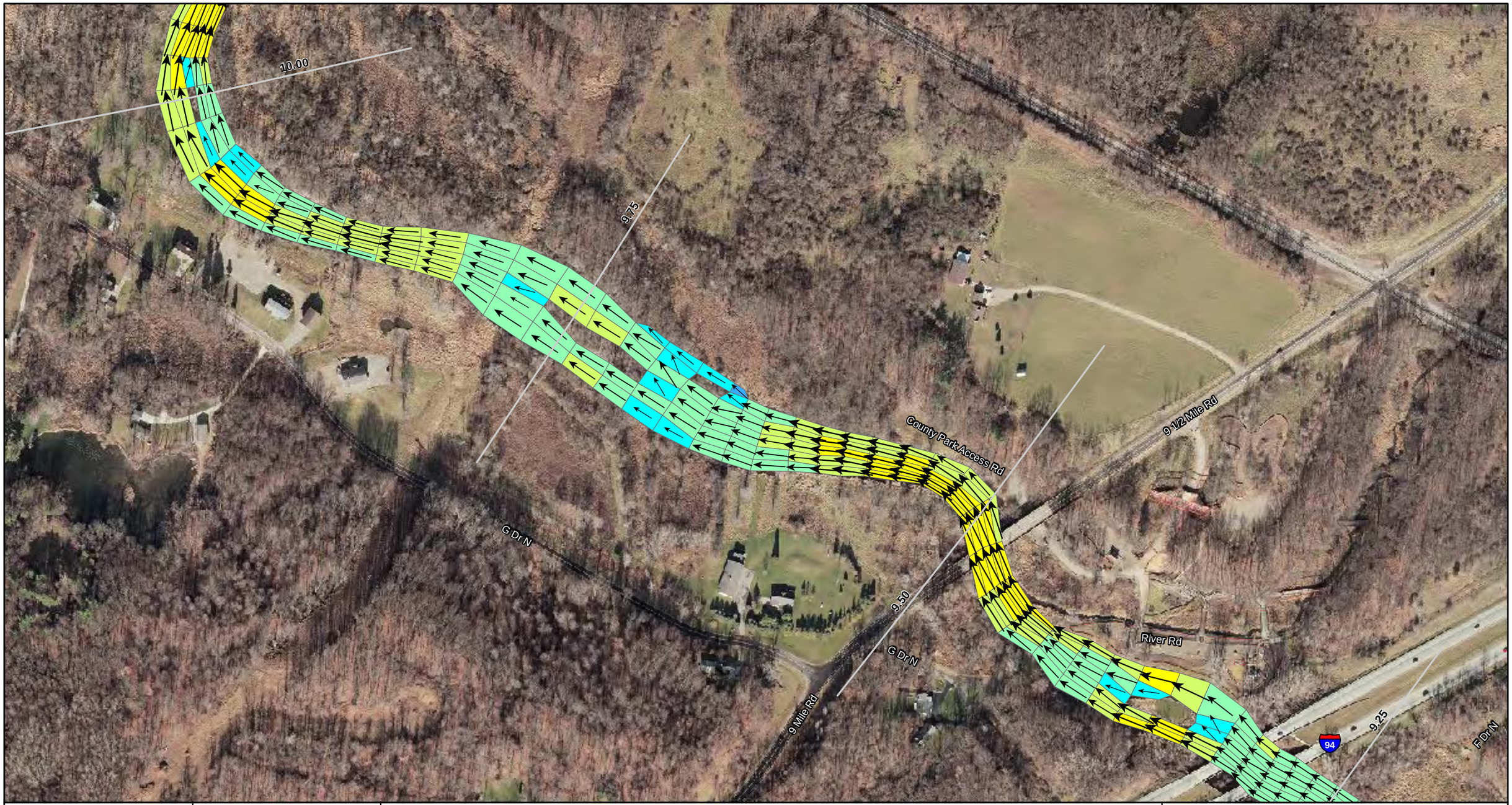
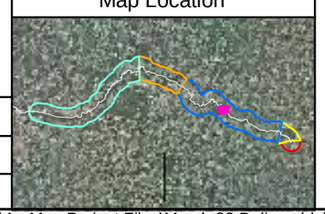
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 09.25 - MP 10.05

SHEET 11 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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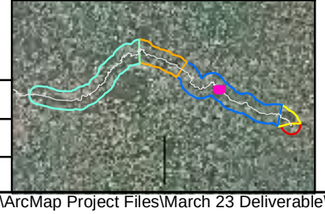
Aerial Photography Date: November 2011

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 10.00 - MP 10.65

SHEET 12 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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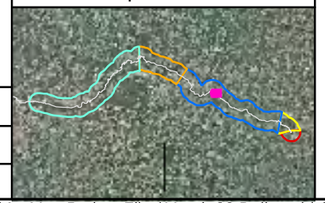
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 10.60 - MP 11.40

SHEET 13 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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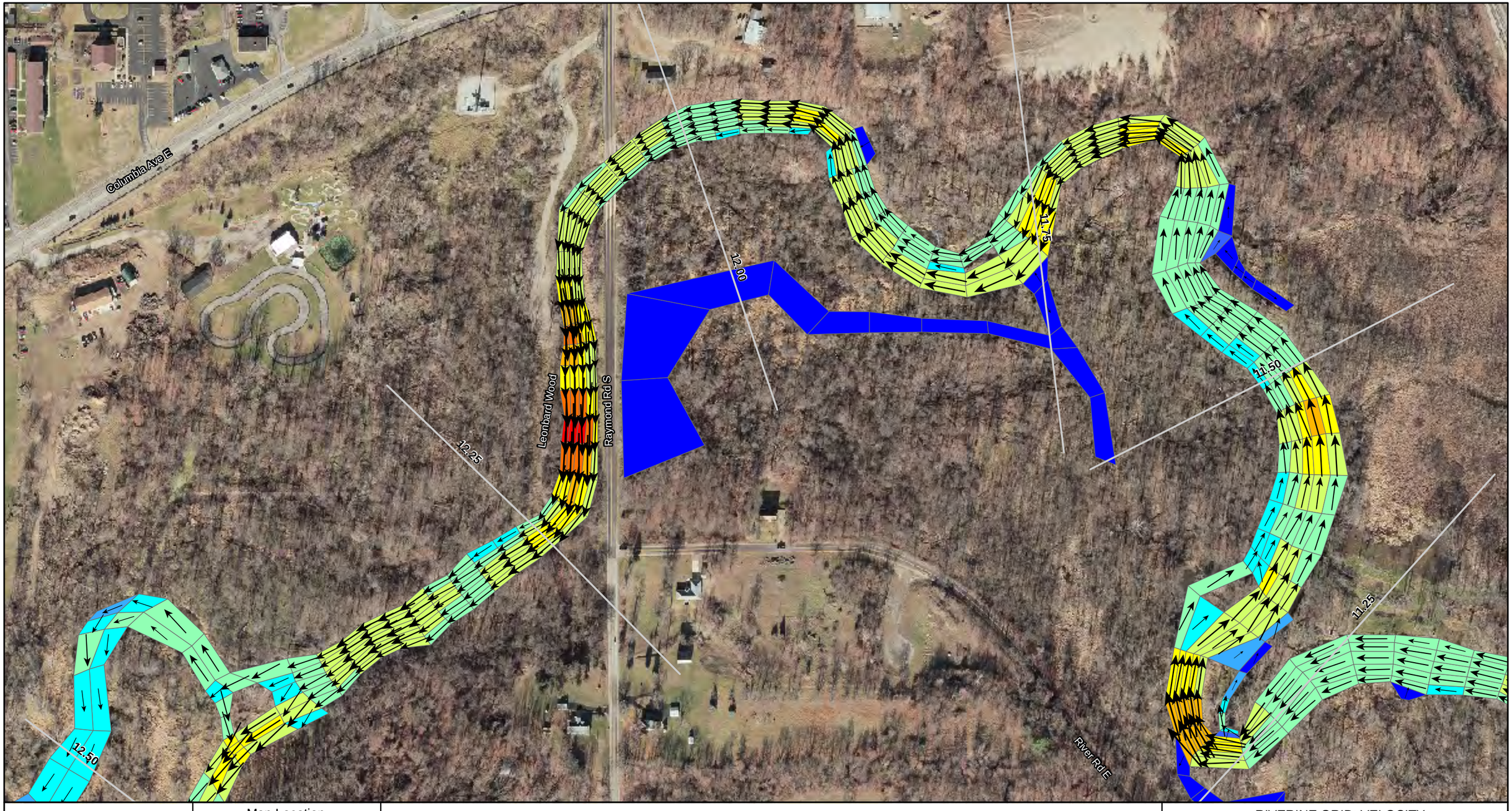
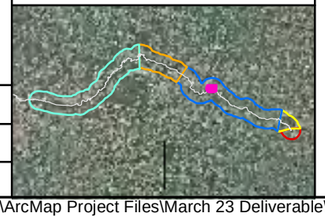
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

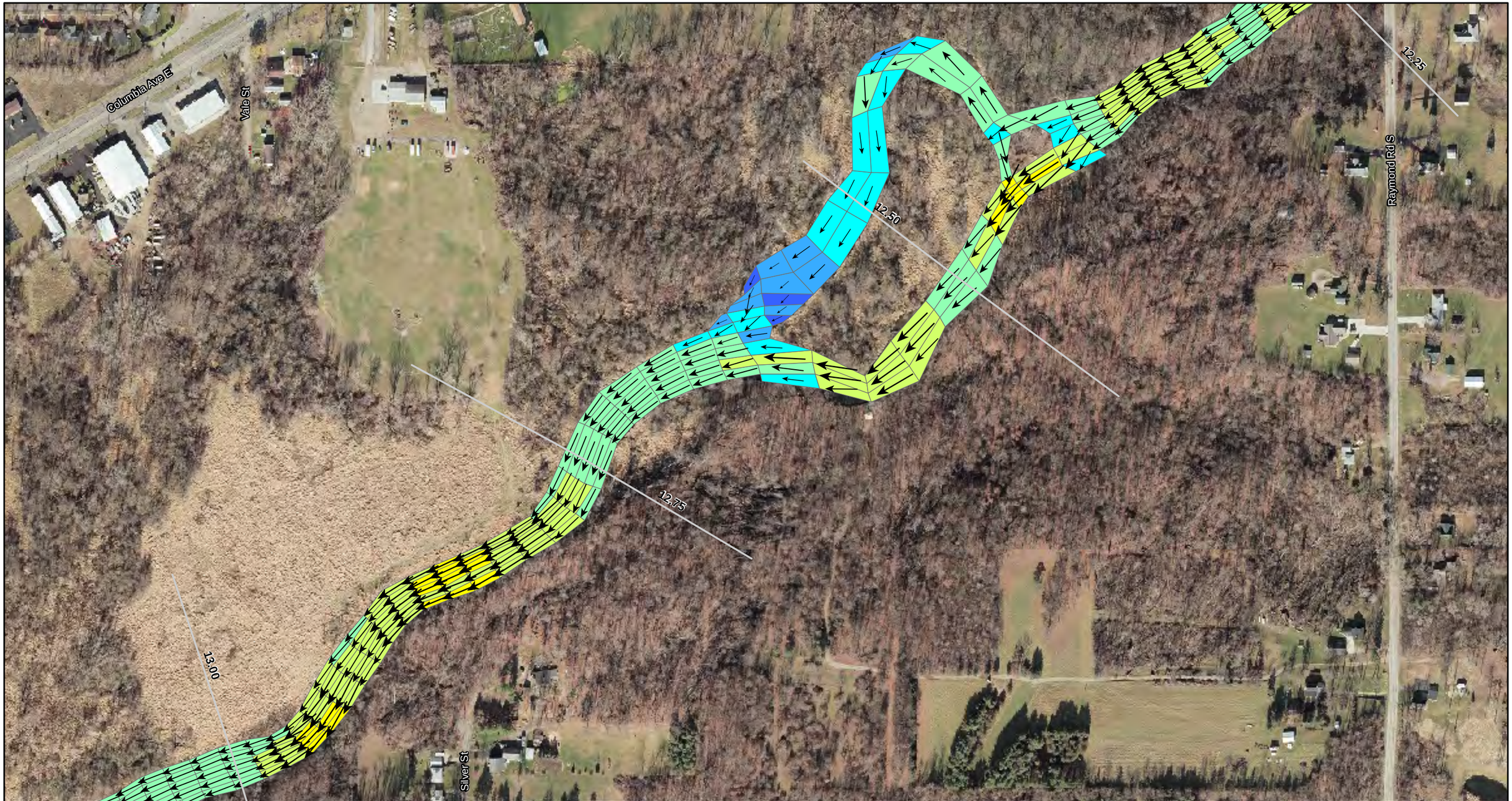
MP 11.10 - MP 12.45

SHEET 14 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

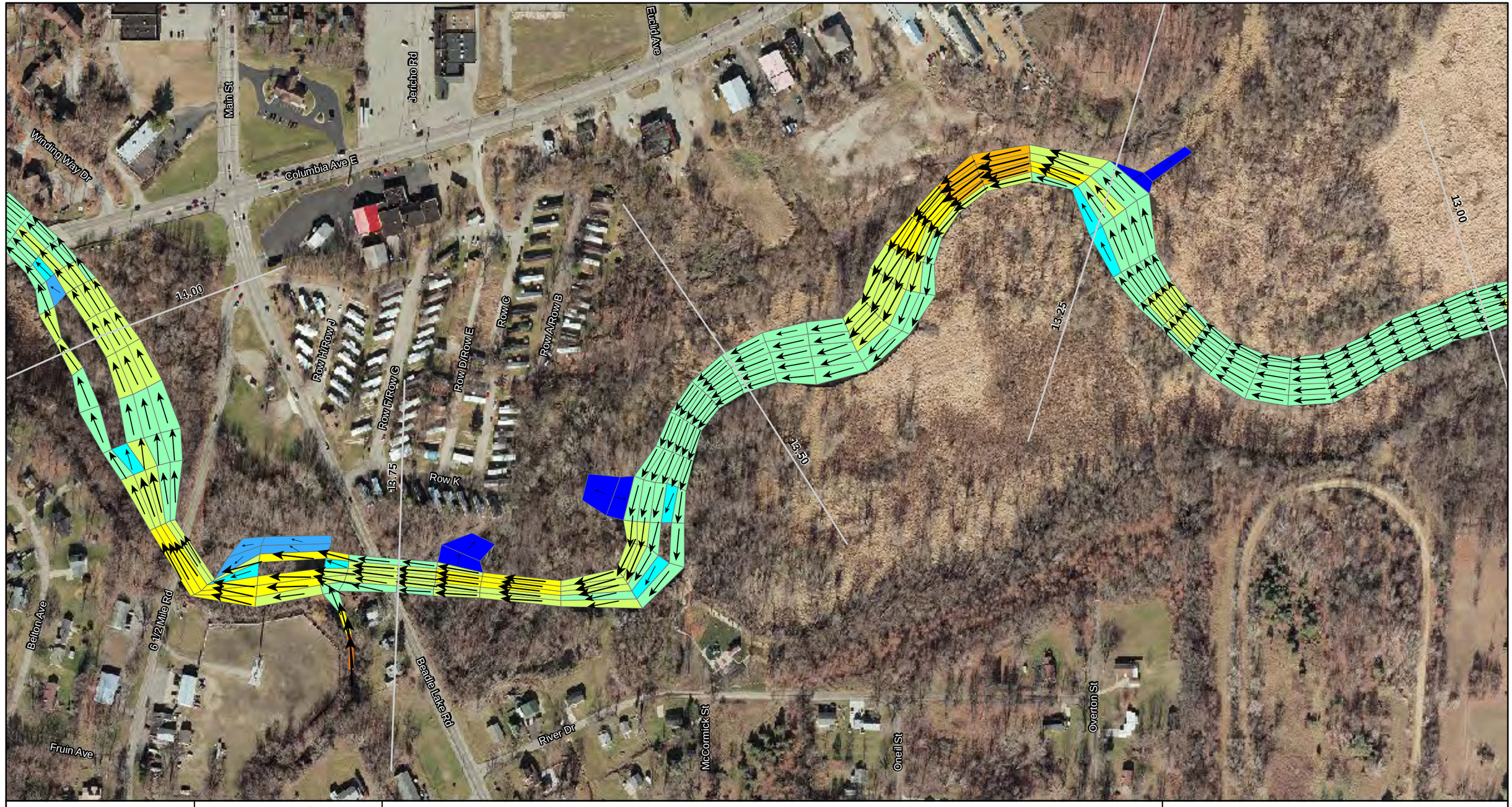
MP 12.30 - MP 13.05

SHEET 15 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

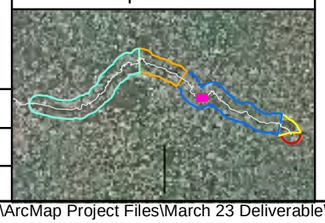
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

⟵ Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

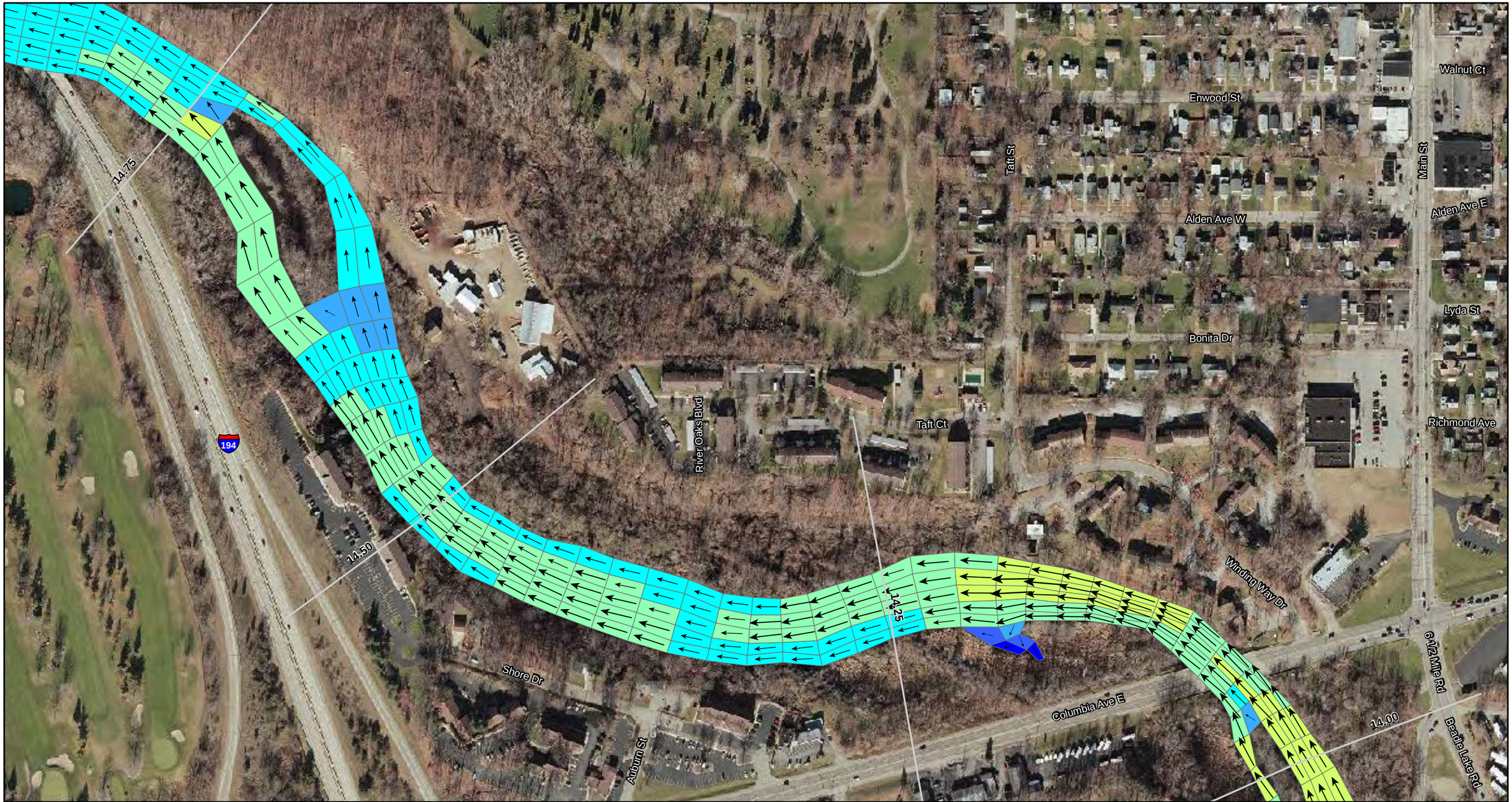
MP 13.00 - MP 14.10

SHEET 16 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

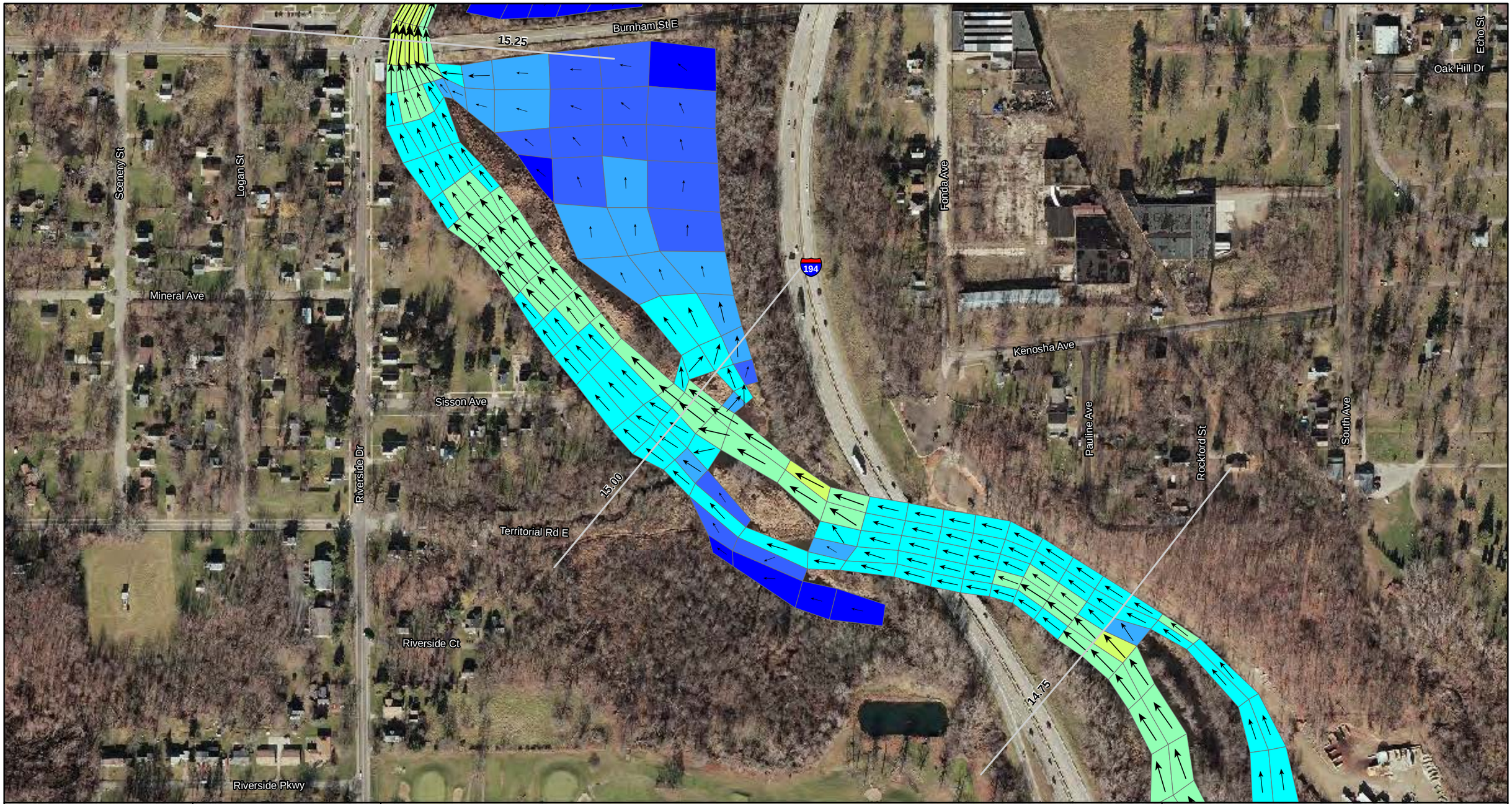
MP 14.00 - MP 14.85

SHEET 17 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

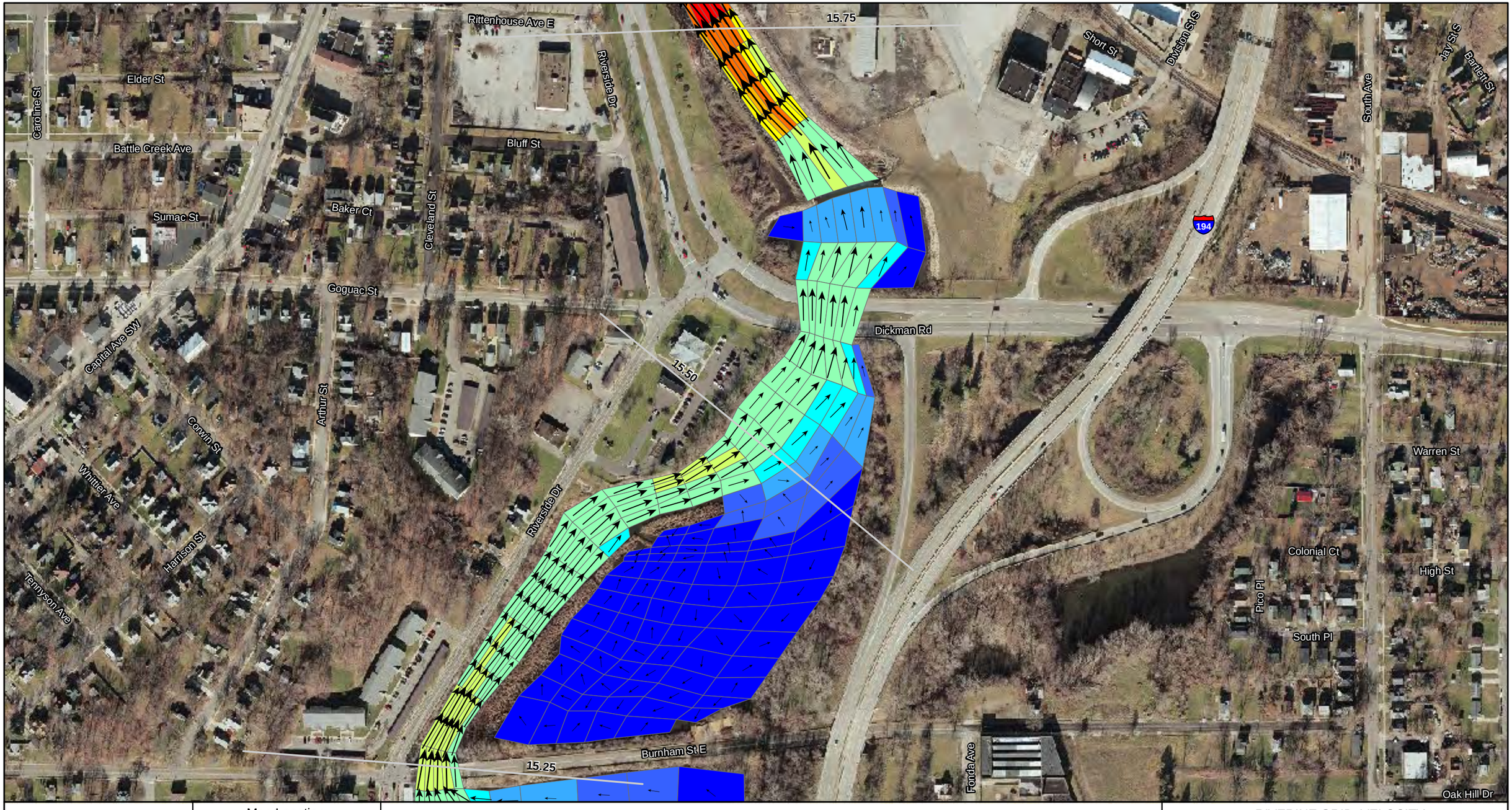
MP 14.65 - MP 15.25

SHEET 18 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

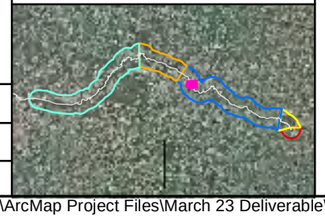
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

⟵ Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 15.25 - MP 15.75

SHEET 19 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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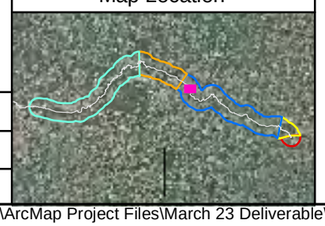
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 15.75 - MP 16.30

SHEET 20 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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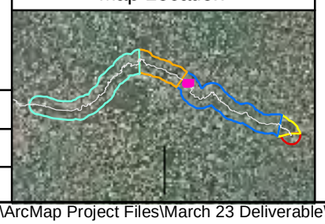
Aerial Photography Date: November 2011

Cass St N
Michigan Ave W
Washington Ave N
Champion St
Brook St
Cass St S
Could St
Van Buren St W
Archer Ct
Jackson St W
Service St
Hamblin Ave W
16.75
Barney St
Washington Ave S
16.50
Lafayette St
Kendall St S
Putnam St
Page St
Louise St
Carlyle St
Houston St
Grand Trunk Ave
Dickman Rd
16.25

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: VELOCITY
APRIL 9, 2011

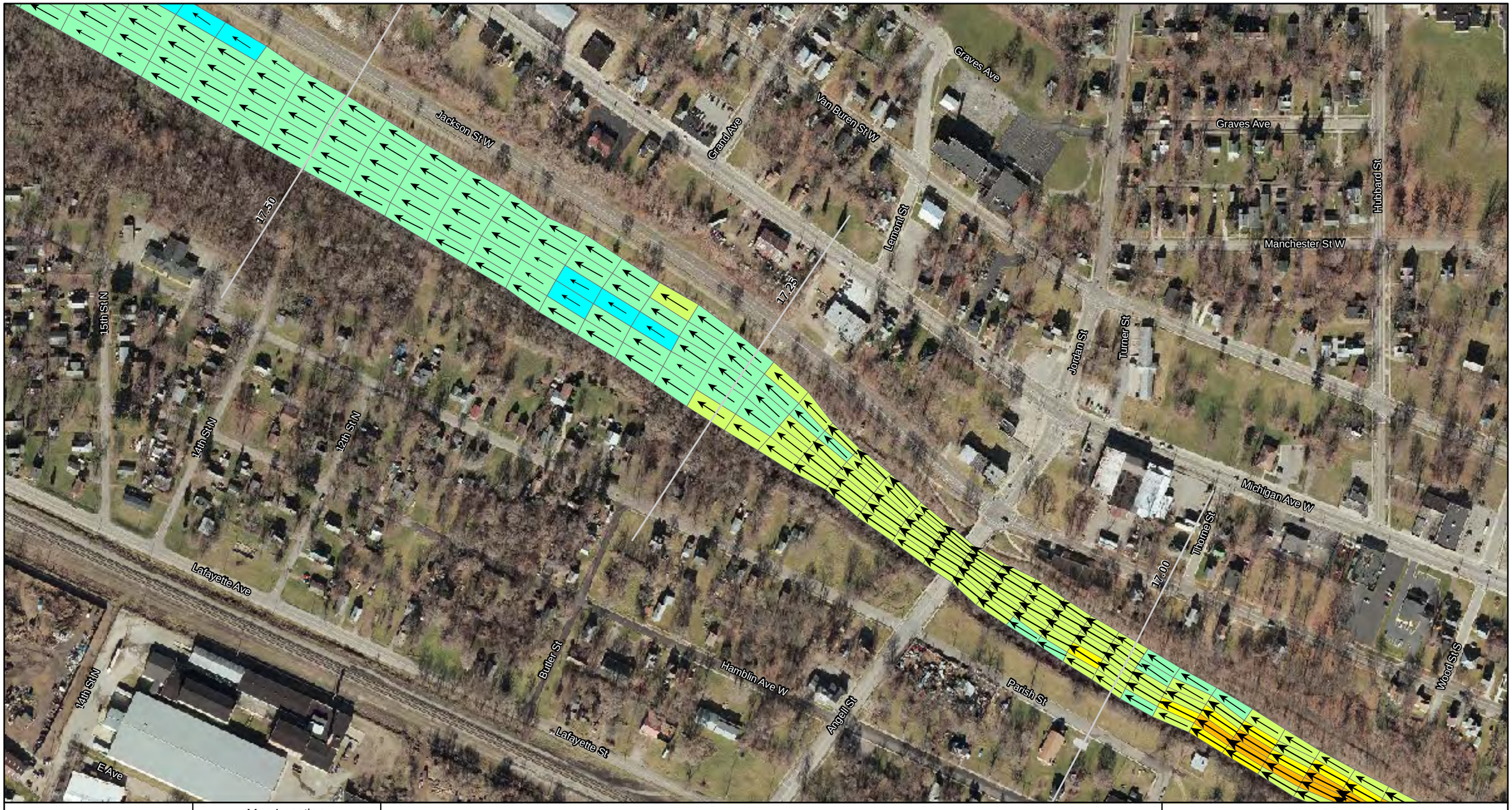
MP 16.30 - MP 16.95

SHEET 21 OF 56

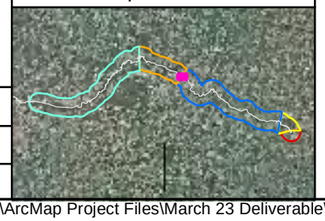
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 16.85 - MP 17.60

SHEET 22 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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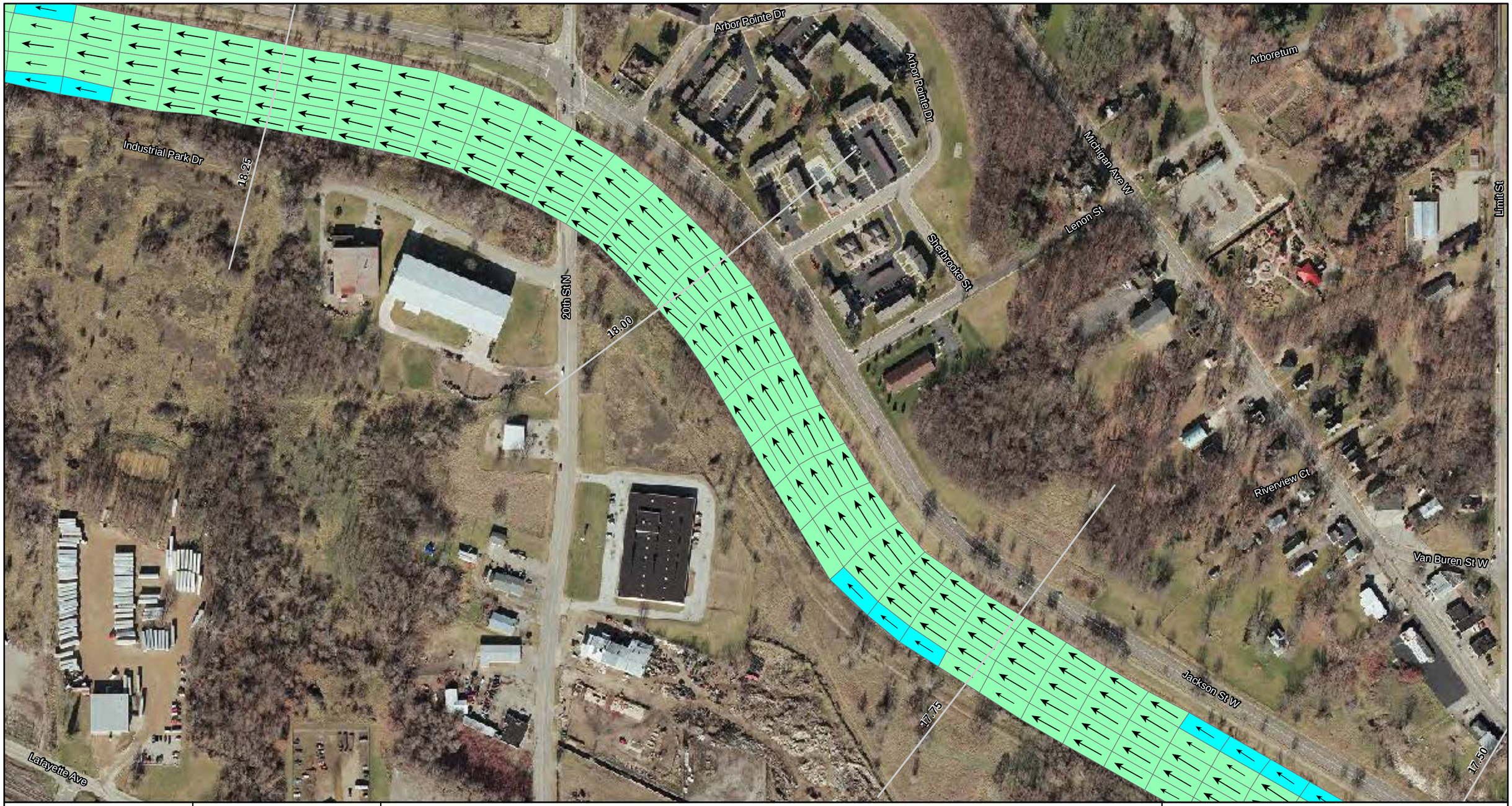
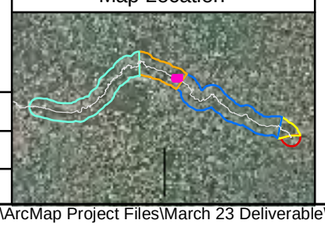
Aerial Photography Date: November 2011



Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 17.60 - MP 18.40

SHEET 23 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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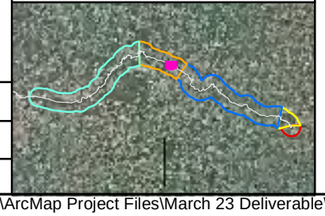
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

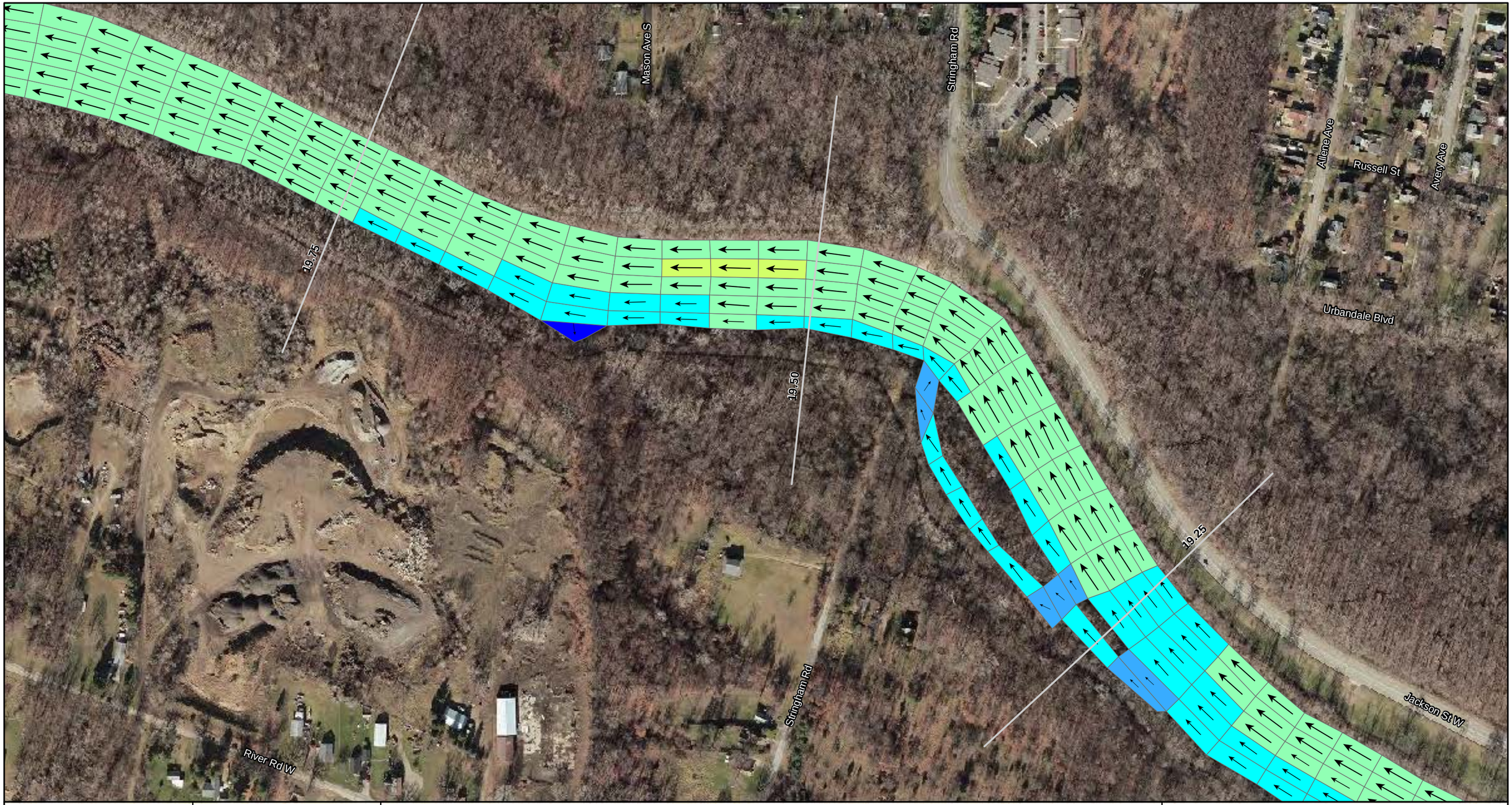
MP 18.30 - MP 19.15

SHEET 24 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

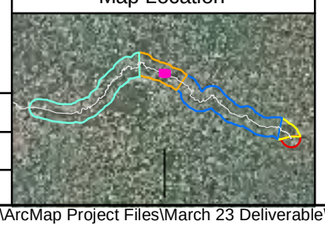
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

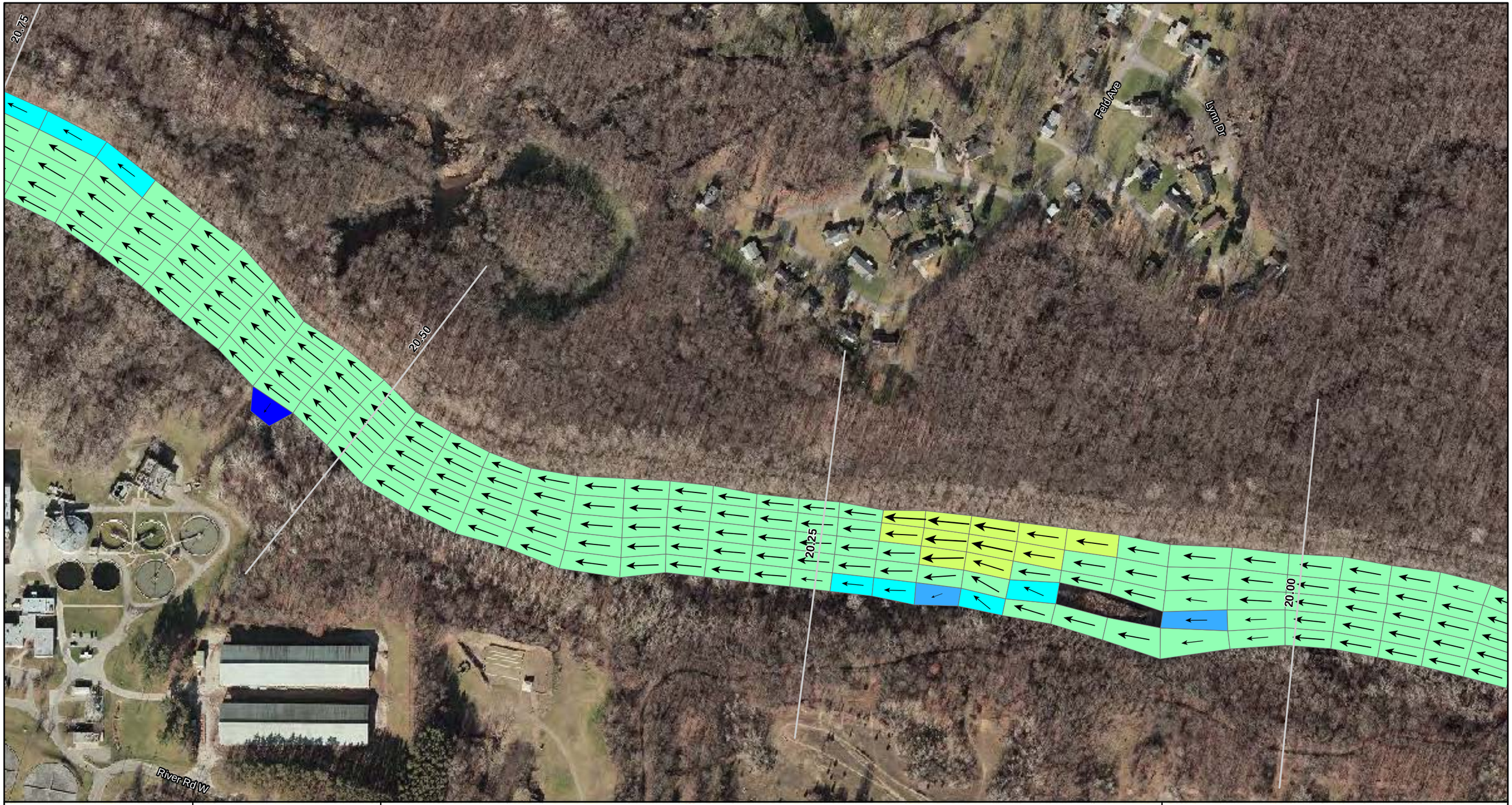
MP 19.10 - MP 19.95

SHEET 25 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

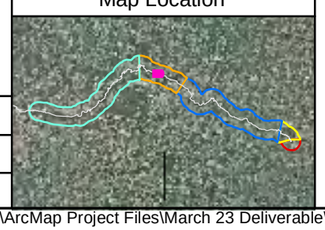
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

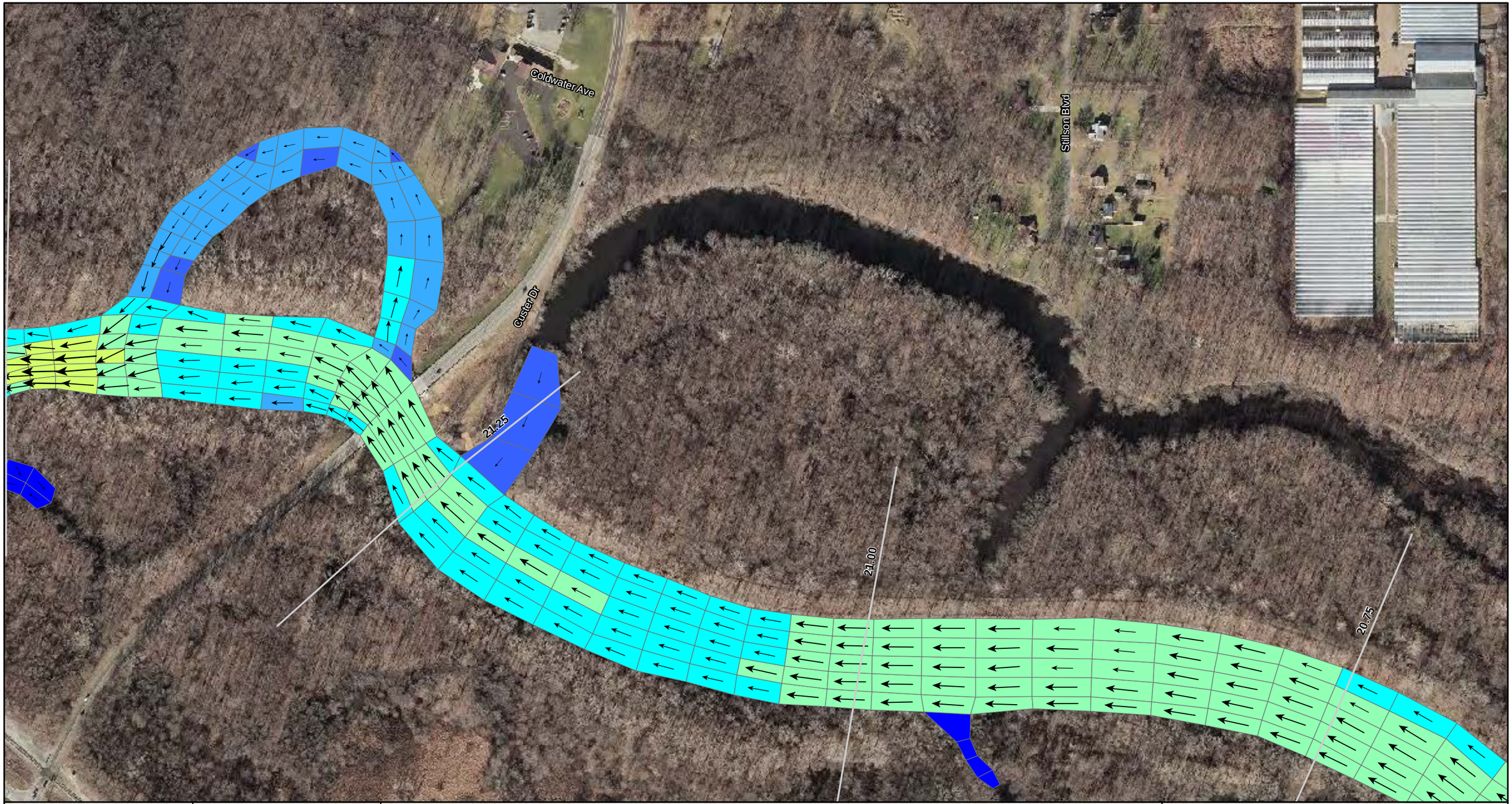
MP 19.90 - MP 20.75

SHEET 26 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 20.70 - MP 21.50

SHEET 27 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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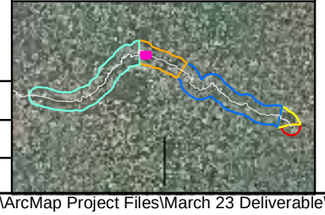
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

⟵ Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

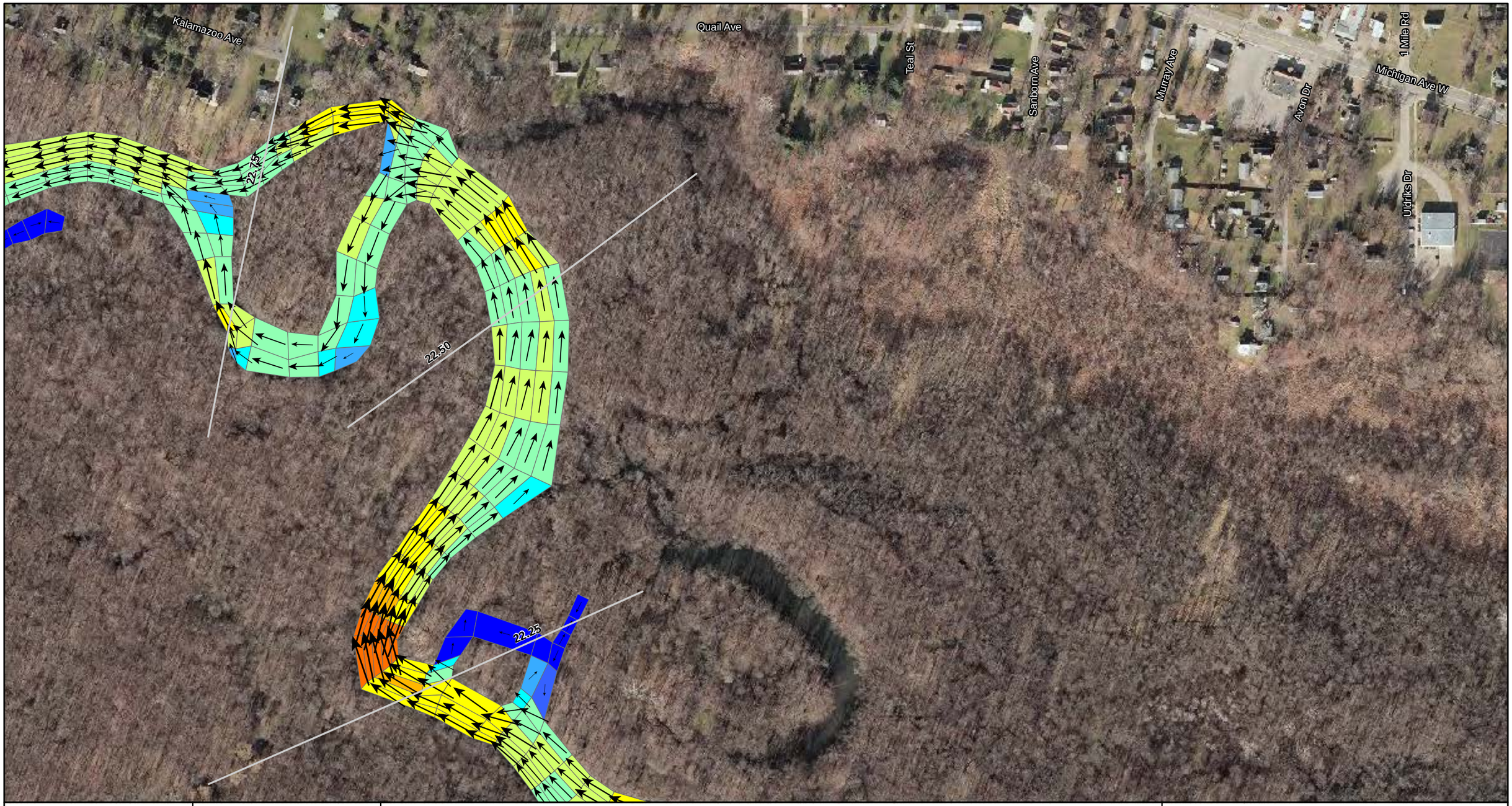
MP 21.35 - MP 22.15

SHEET 28 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

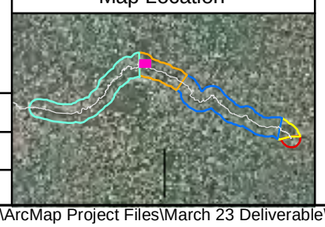
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

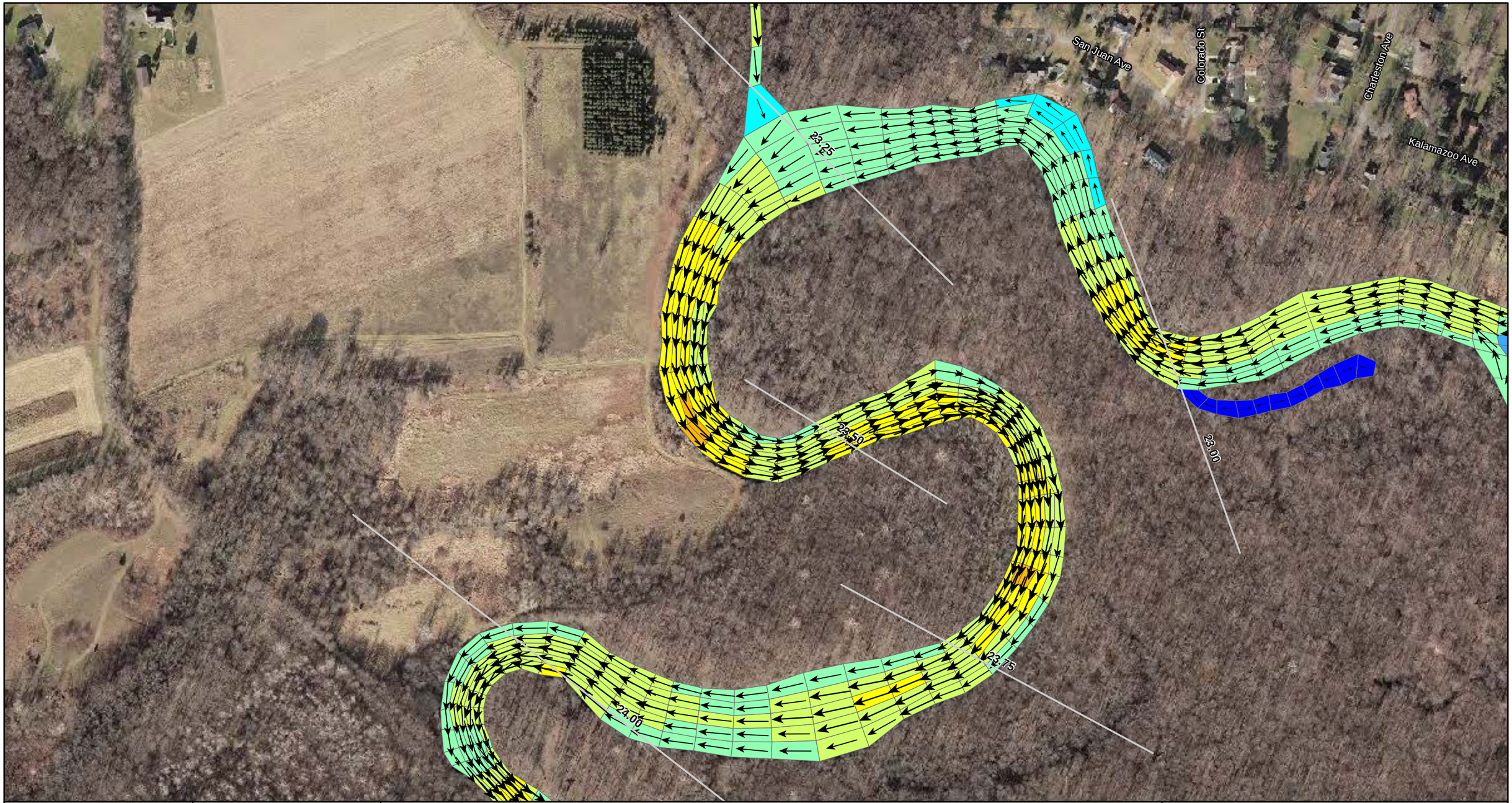
MP 22.15 - MP 22.90

SHEET 29 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 22.80 - MP 24.10

SHEET 30 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

24.00
24.25
24.50
24.75
River Rd W
Fort Custer Dr
County Line Rd

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 24.10 - MP 24.85

SHEET 31 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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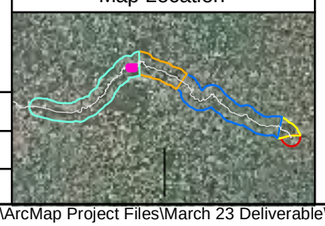
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 24.80 - MP 25.65

SHEET 32 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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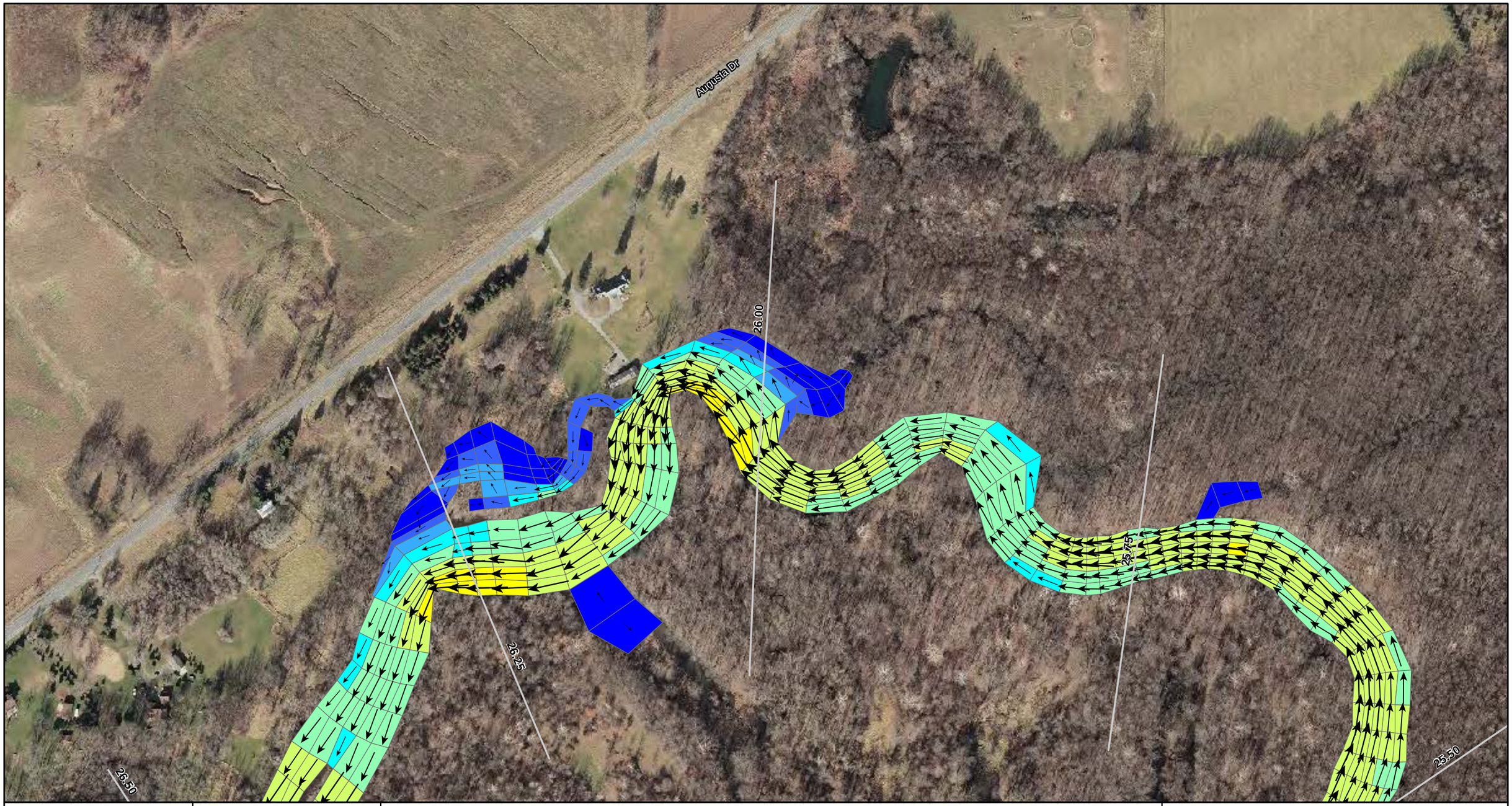
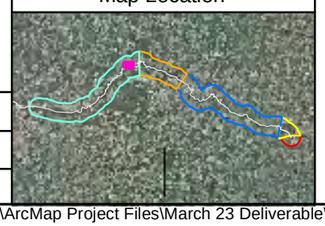
Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 25.55 - MP 26.40

SHEET 33 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 26.40 - MP 27.45

SHEET 34 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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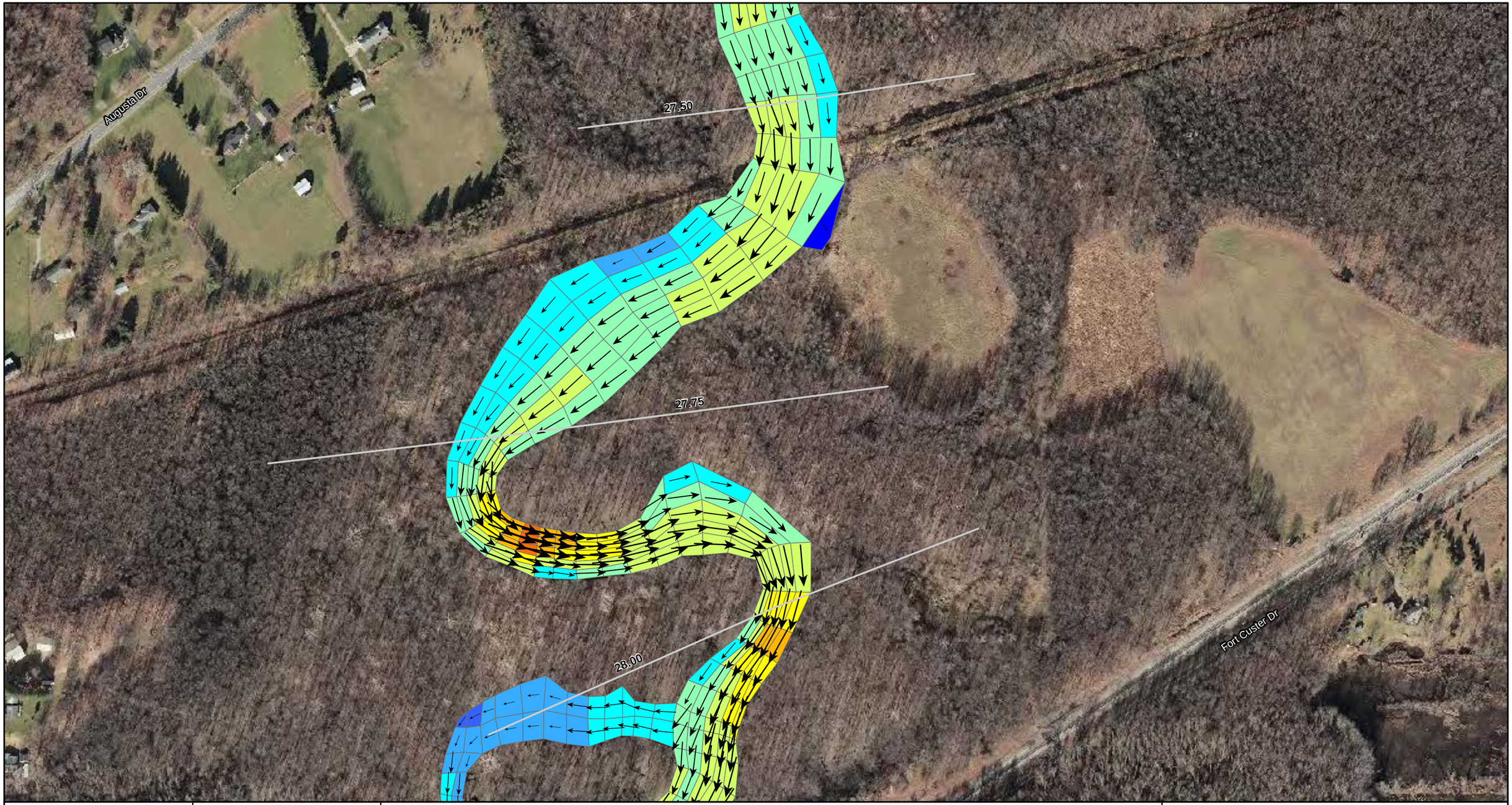
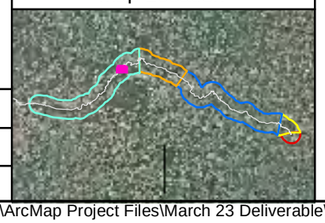
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 27.45 - MP 28.10

SHEET 35 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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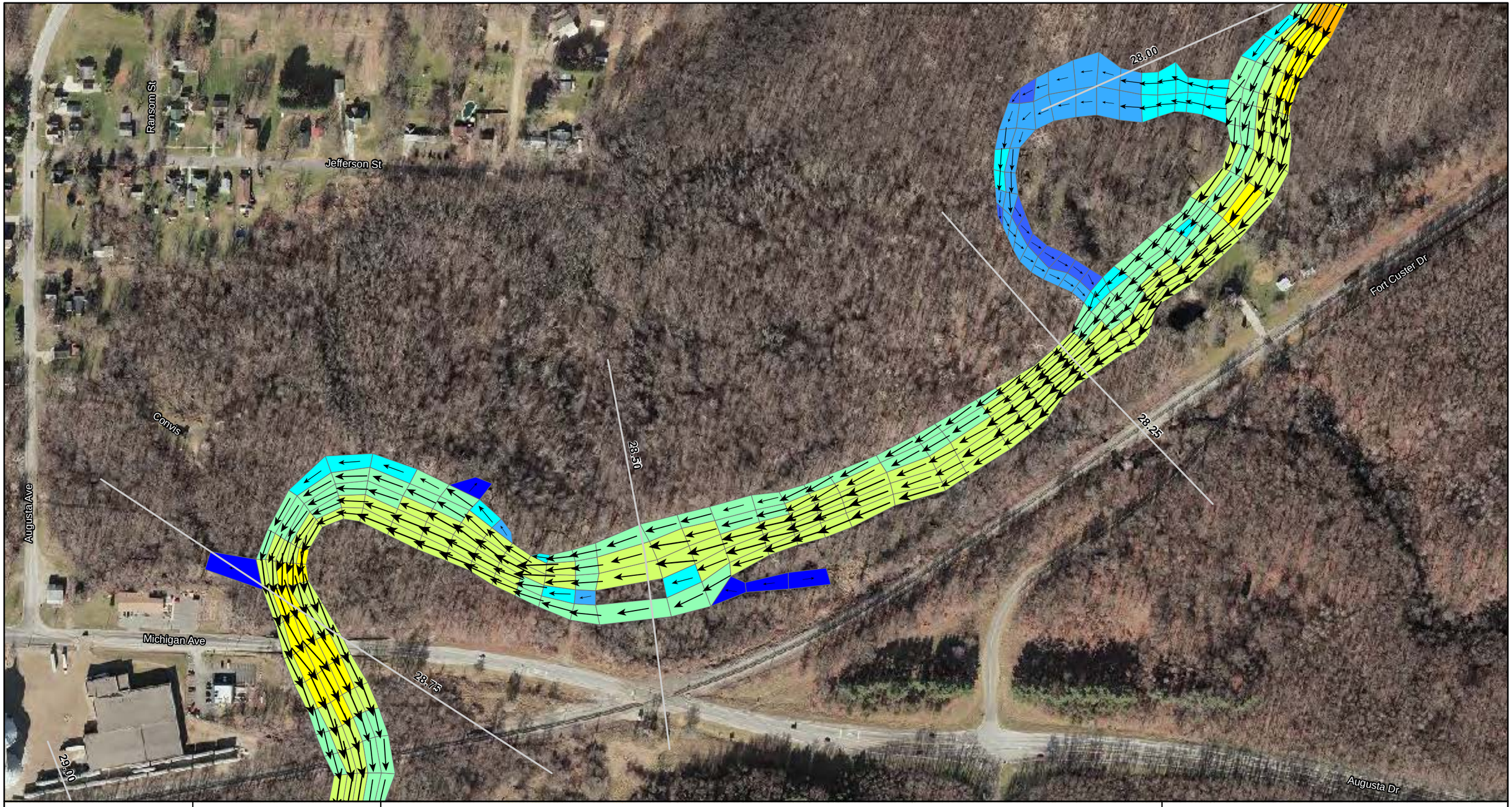
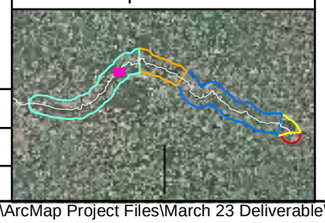
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 28.05 - MP 28.85

SHEET 36 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 28.85 - MP29.55

SHEET 37 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

29.50

29.75

Fort Custer Rec Area Service

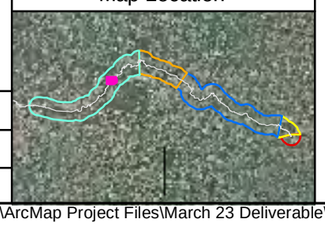
Fort Custer Rec Area Access

30.25

30.00

ENBRIDGE	
Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 29.50 - MP29.95

SHEET 38 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 29.95 - MP 30.80

SHEET 39 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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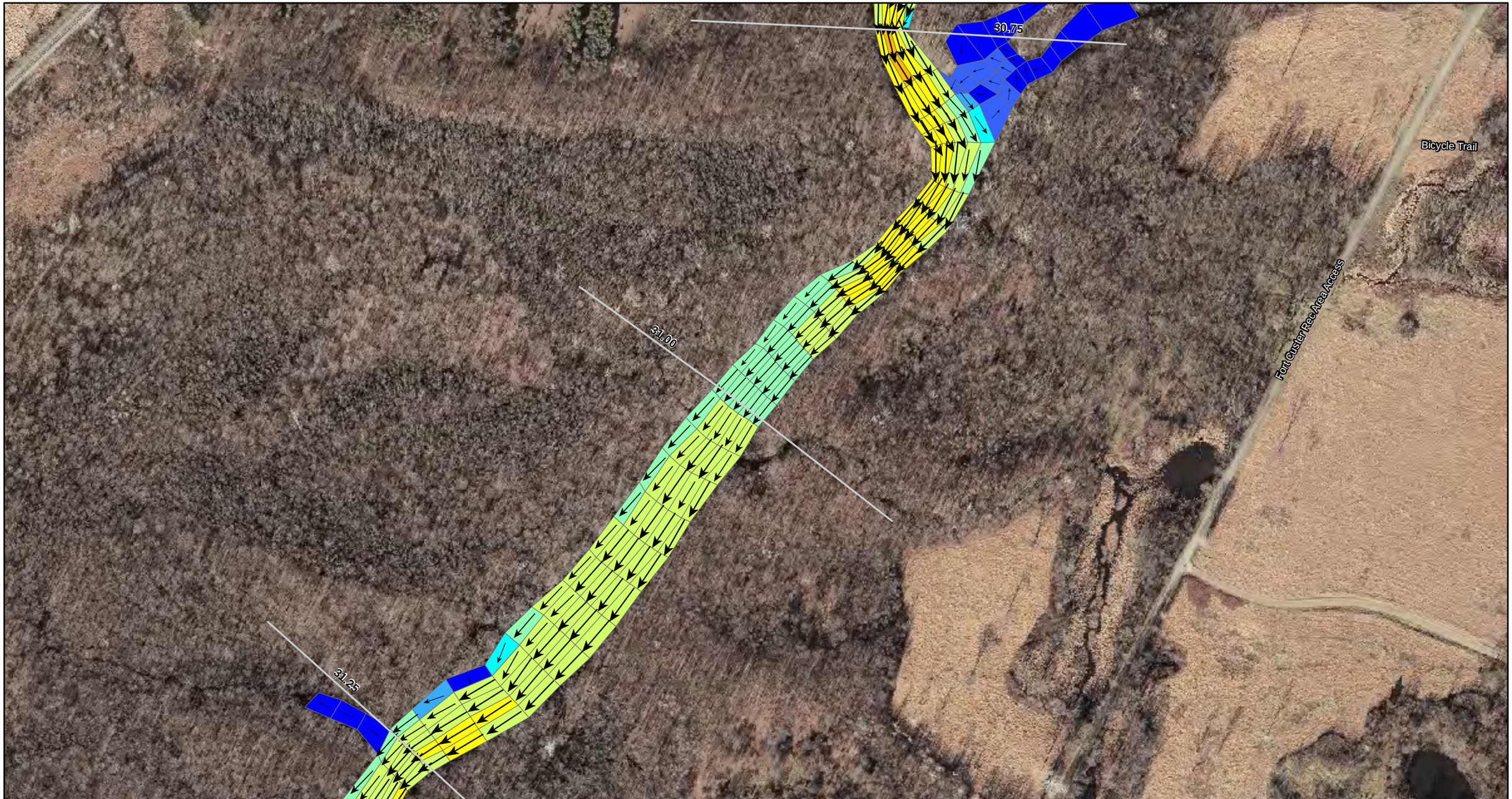
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 30.75 - MP 31.25

SHEET 40 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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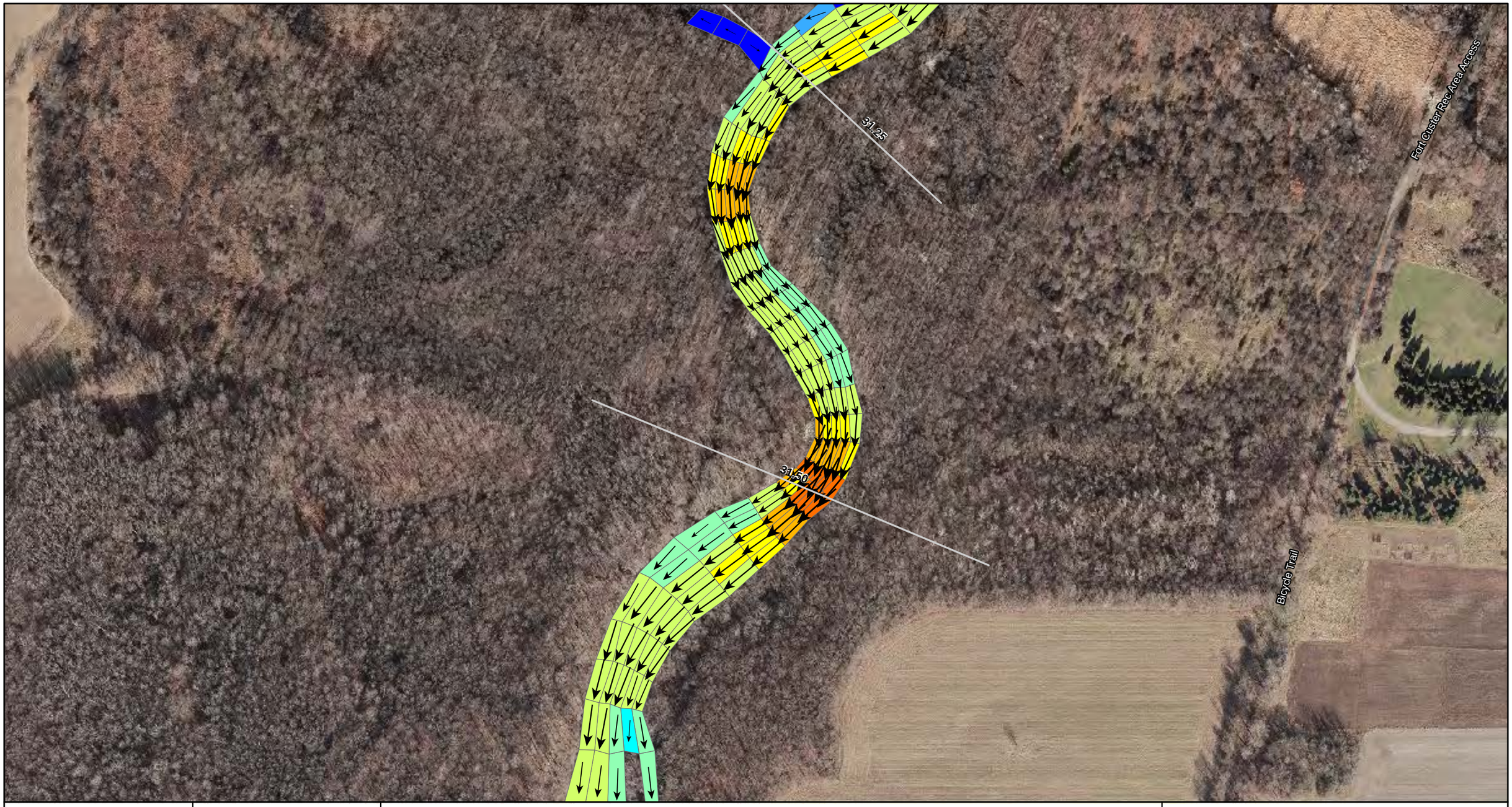
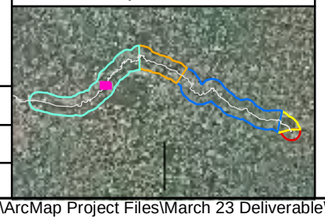
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 31.25 - MP 31.70

SHEET 41 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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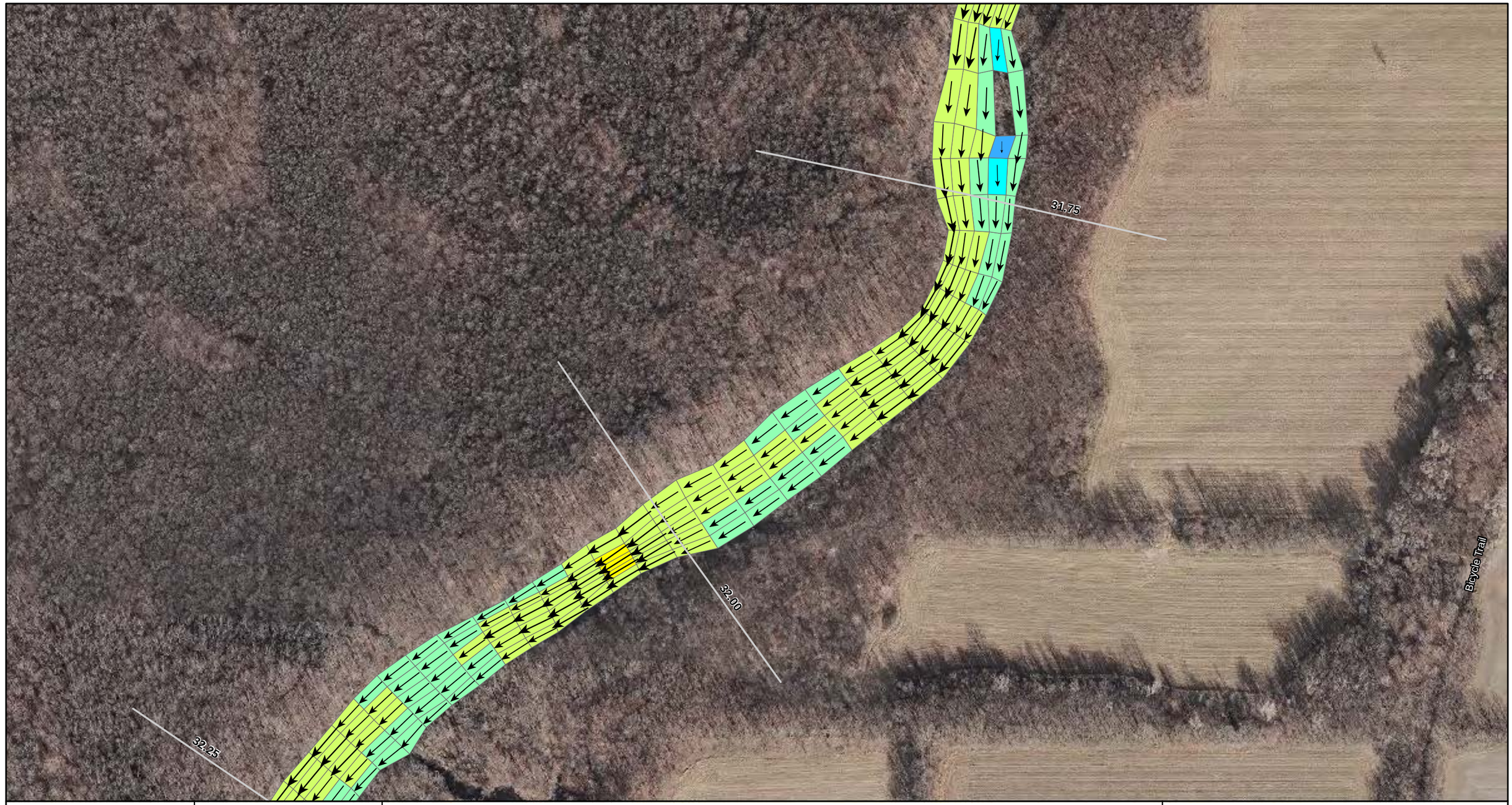
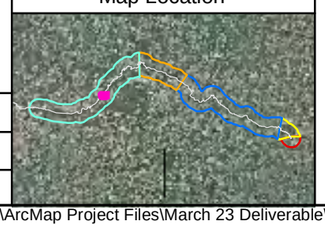
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

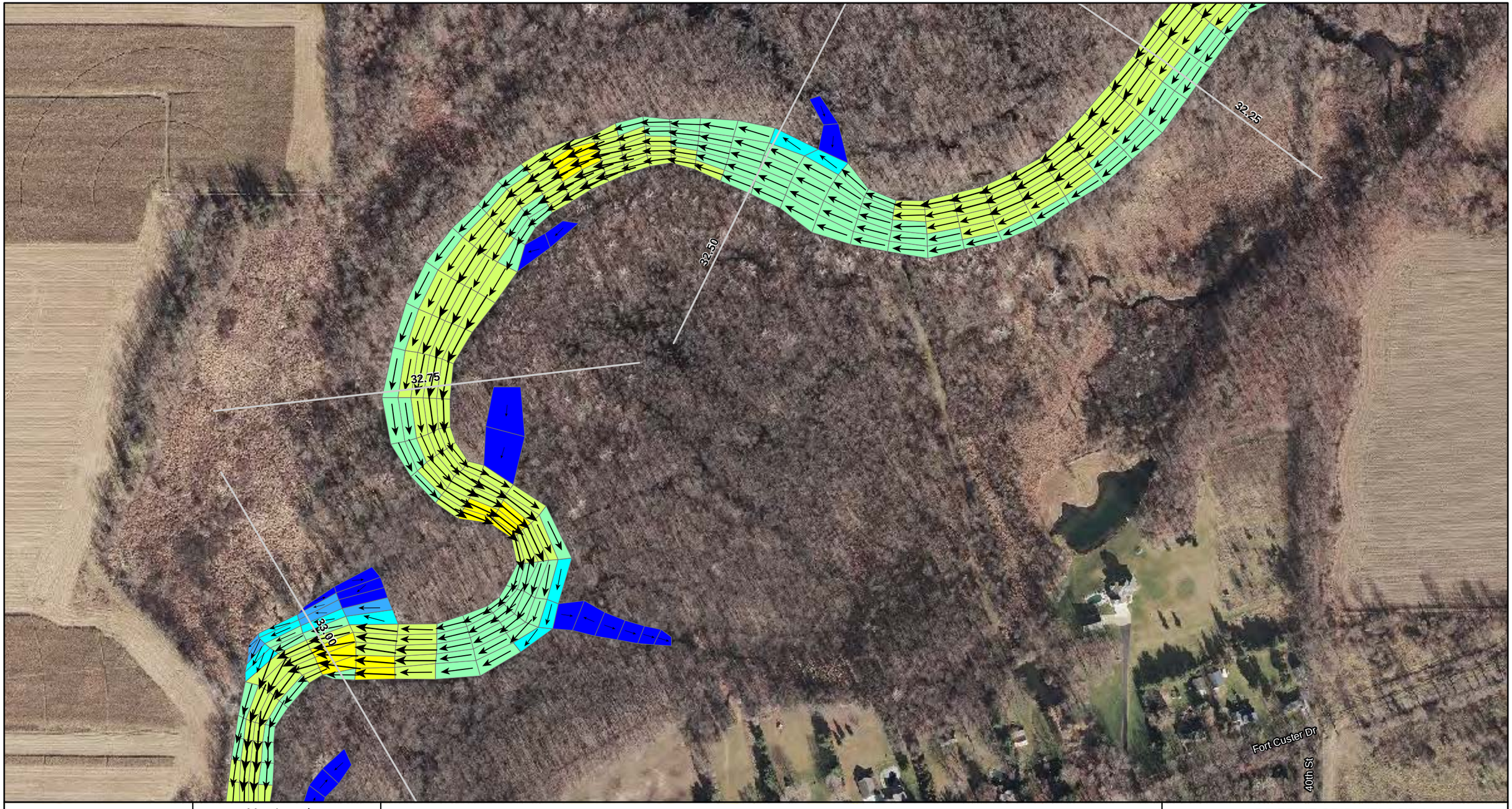
MP 31.65 - MP 32.25

SHEET 42 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

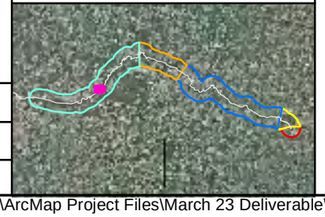
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 32.25 - MP 33.10

SHEET 43 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

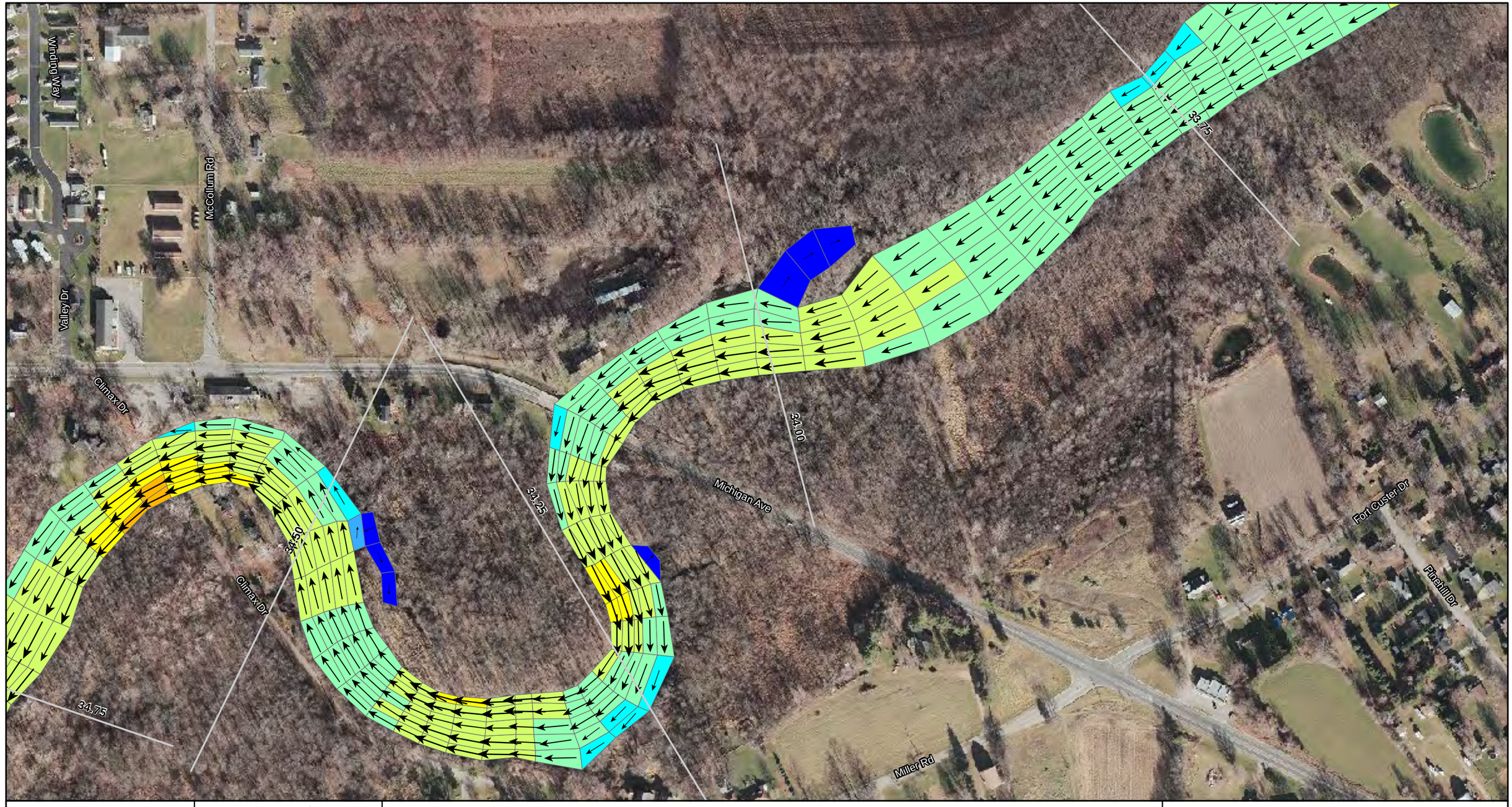
MP 33.10 - MP 33.70

SHEET 44 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

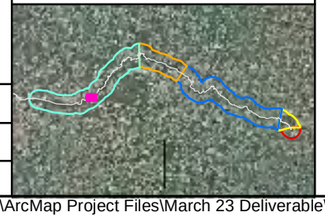
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 33.70 - MP 34.70

SHEET 45 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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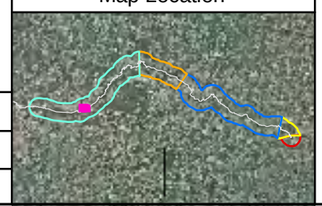
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

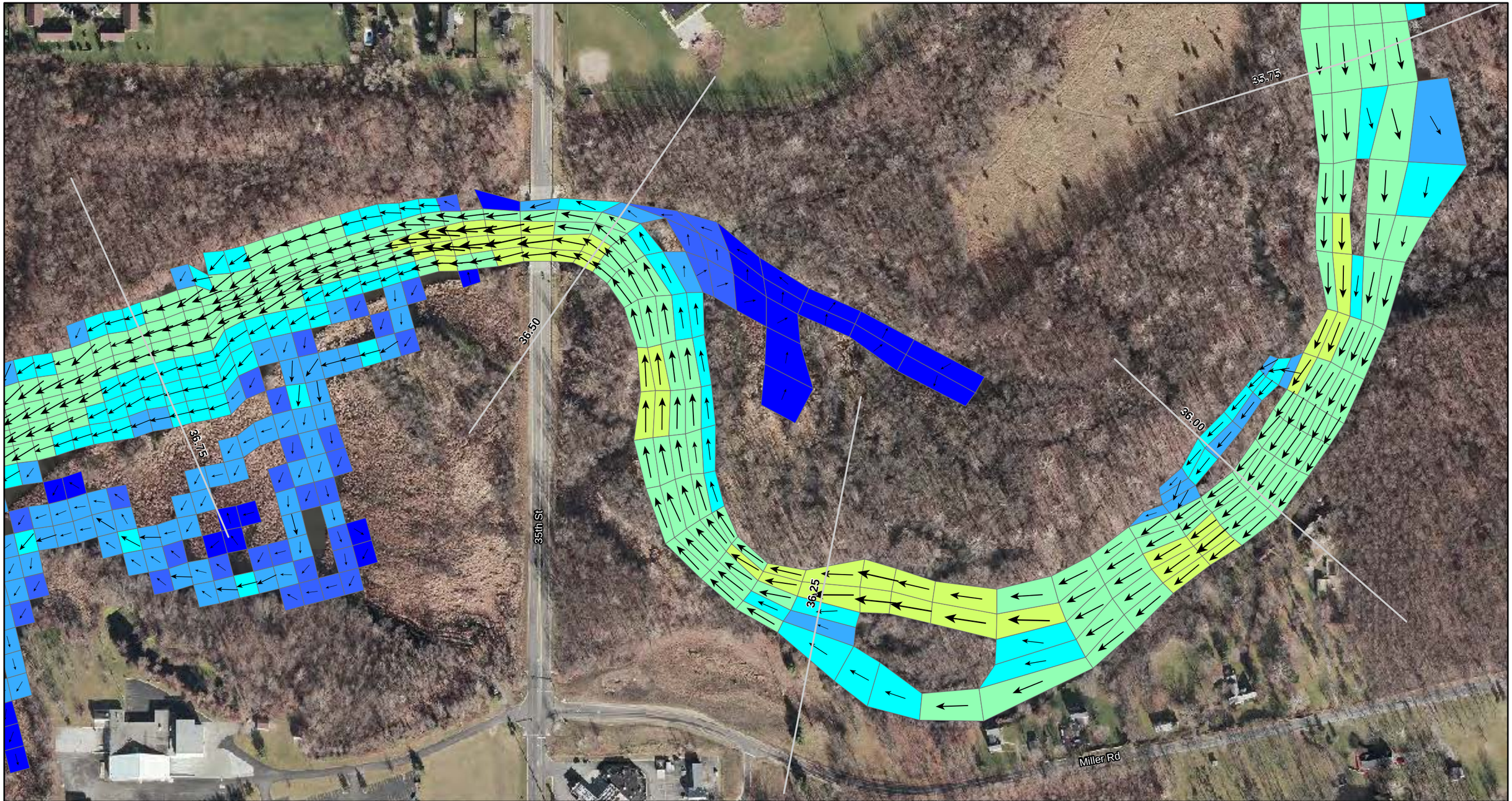
MP 34.70 - MP 35.75

SHEET 46 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 35.75 - MP 36.80

SHEET 47 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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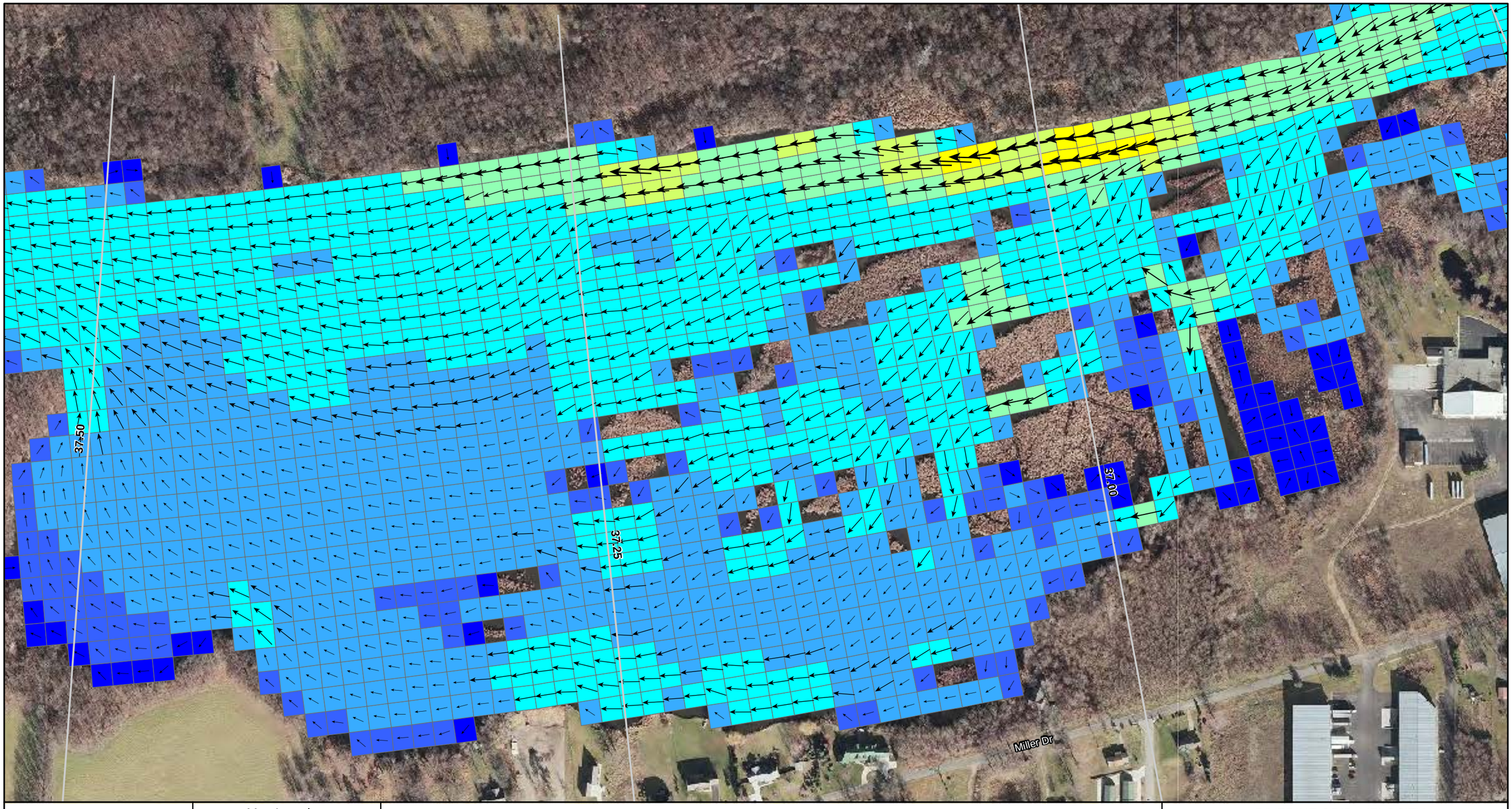
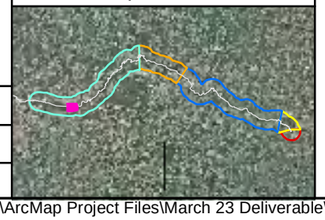
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 36.80 - MP 37.55

SHEET 48 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011

38.25

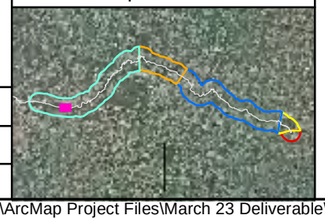
38.00

37.75

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 37.55 - MP 38.30

SHEET 49 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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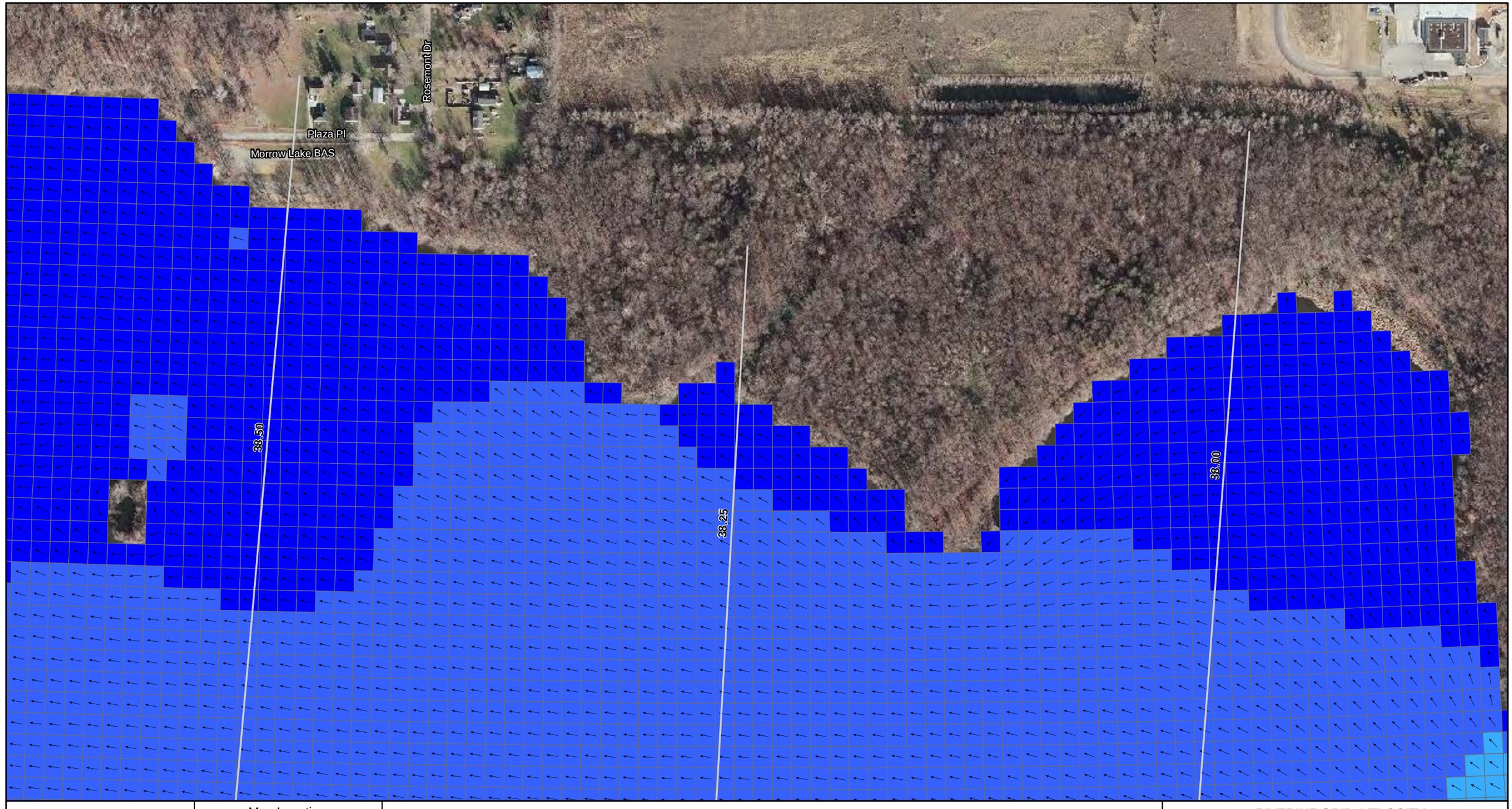
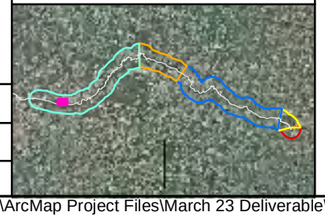
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

⟵ Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 37.80 - MP 38.60N

SHEET 50 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

38.50

38.25

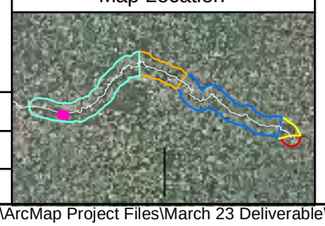
38.00

Lyth Rd

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

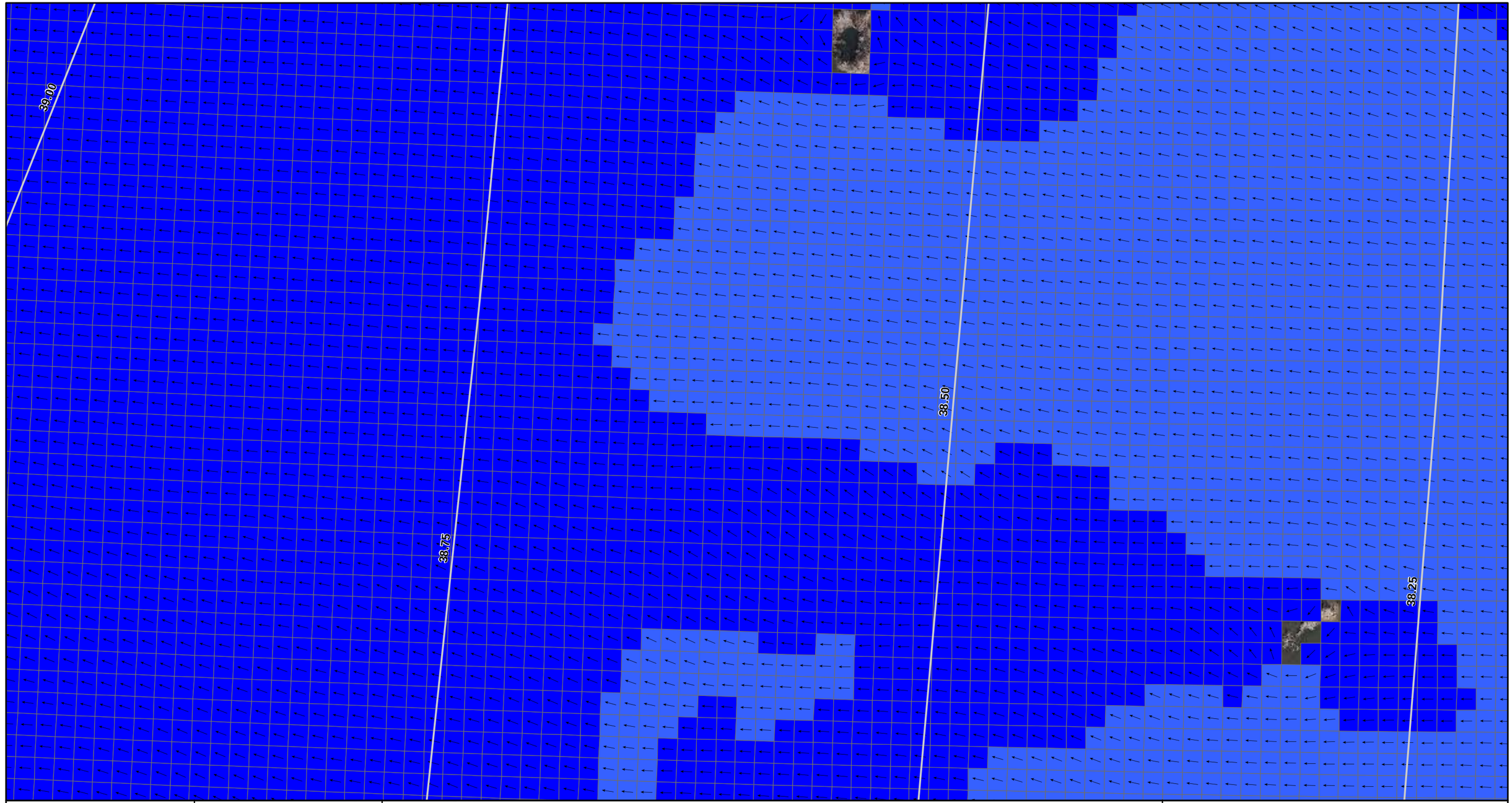
MP 37.80 - MP 38.60S

SHEET 51 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

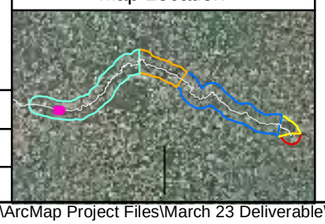
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

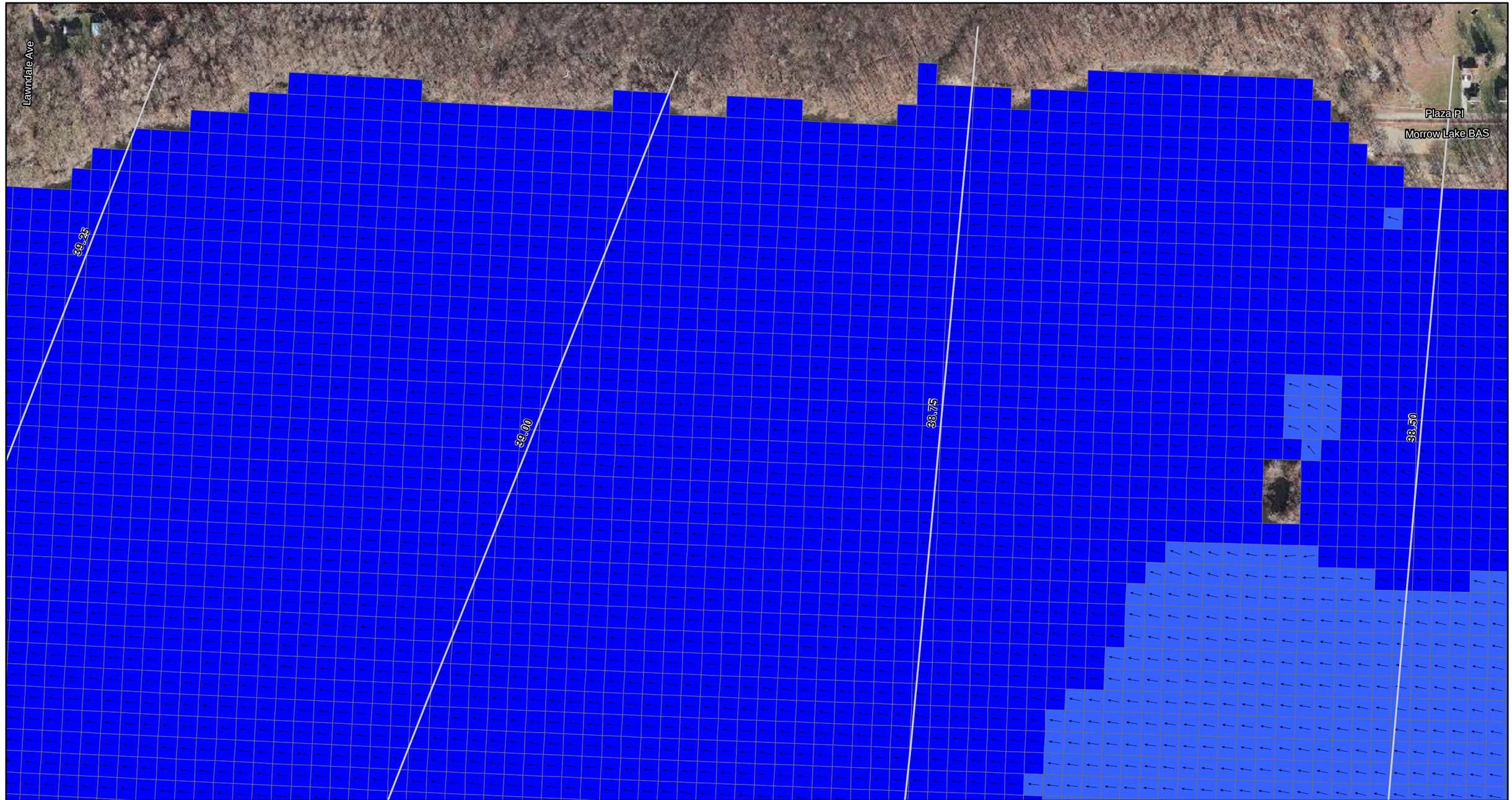
MP 38.25 - MP 39.00C

SHEET 52 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

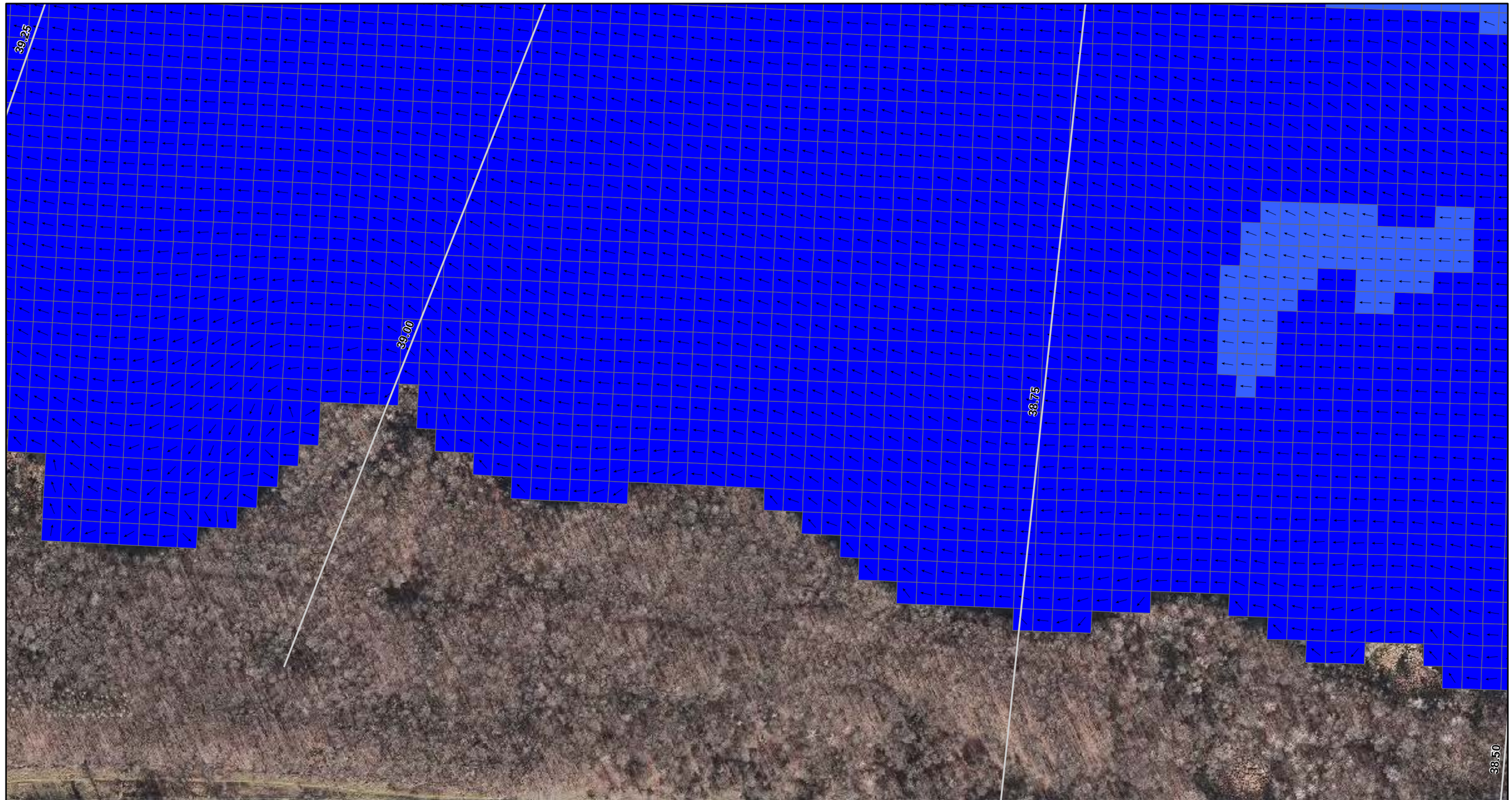
MP 38.50 - MP 39.25N

SHEET 53 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

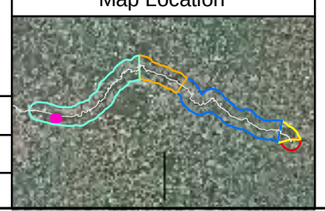
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

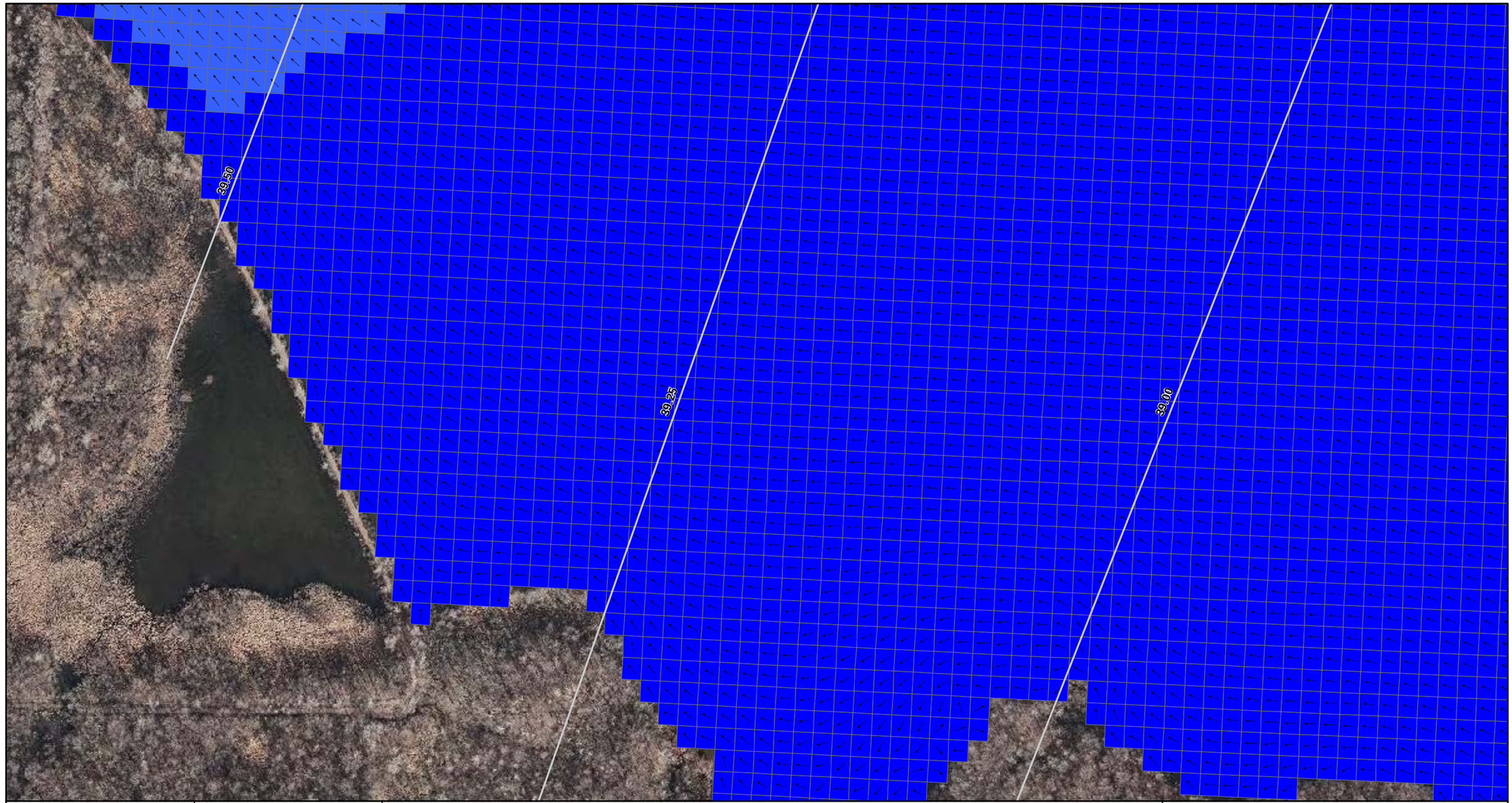
MP 38.50 - MP 39.25S

SHEET 54 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

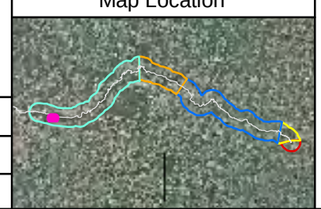
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

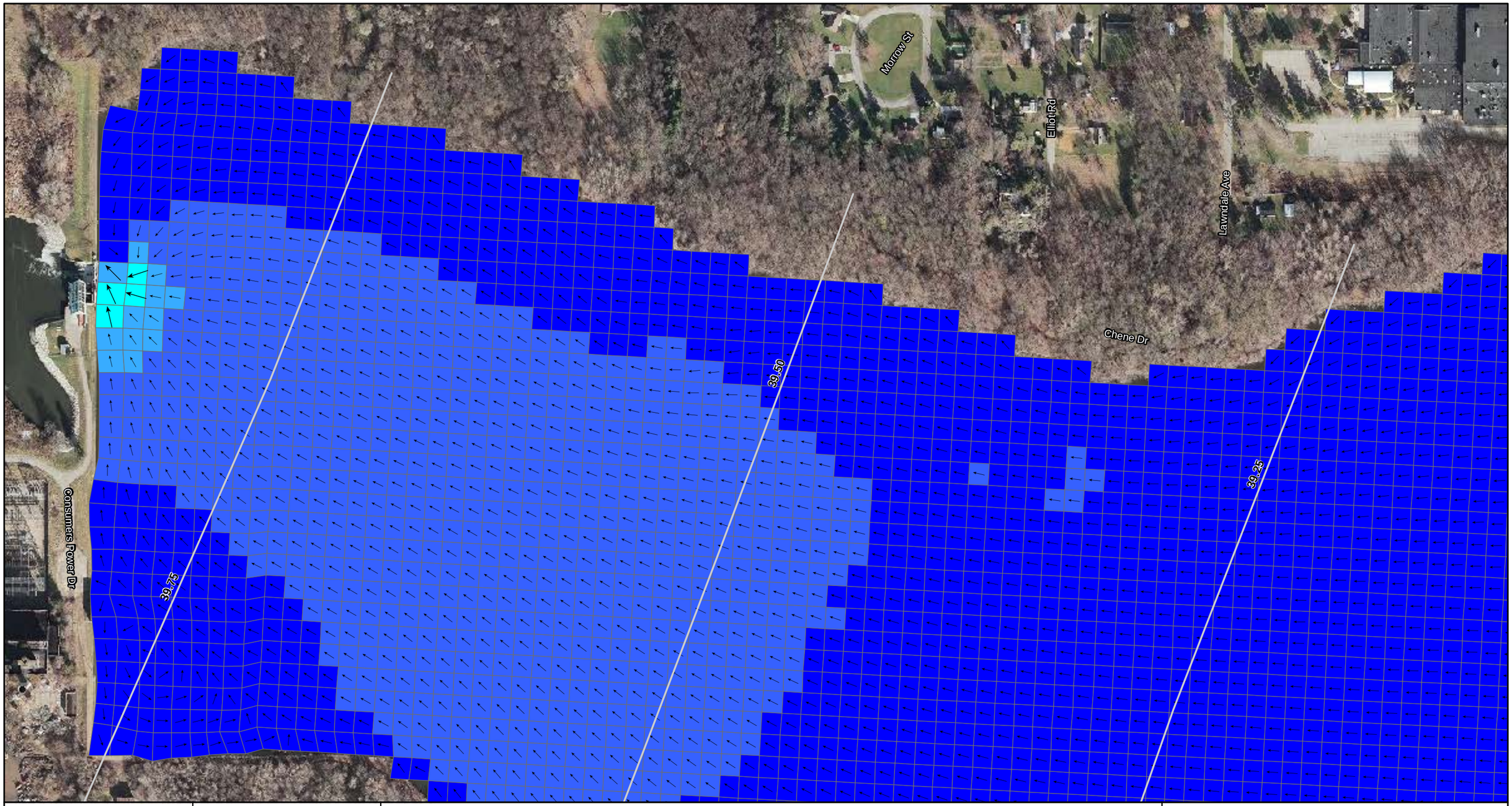
MP 38.90 - MP 39.60S

SHEET 55 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

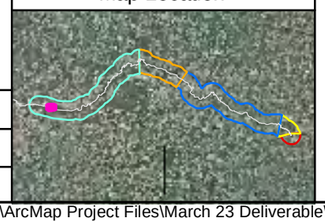
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 9, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 9, 2011

MP 39.15 - MP 39.85

SHEET 56 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr9_2011.mxd

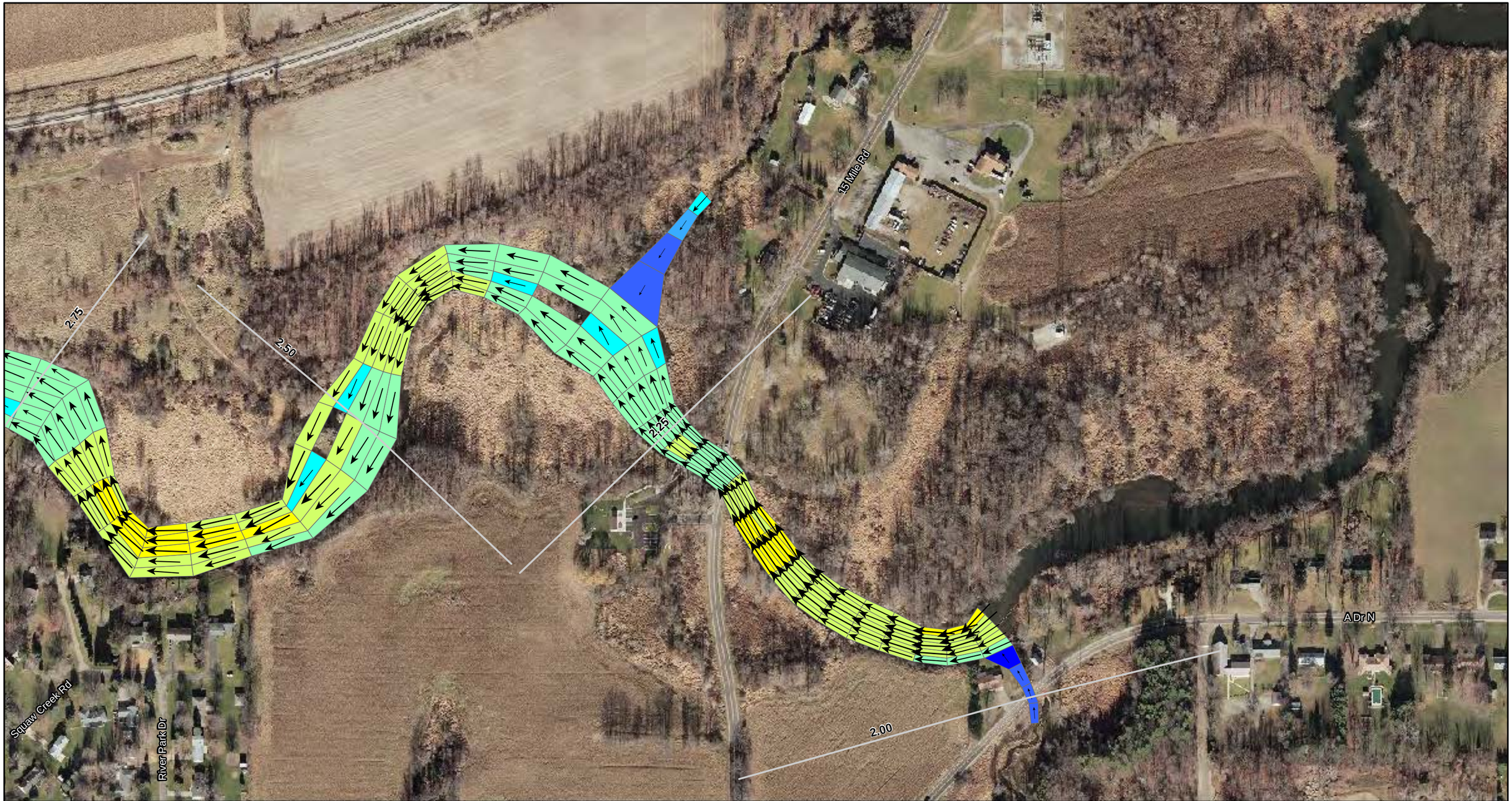
Aerial Photography Date: November 2011

Figure 6-24

Riverine Grid: Velocity

April 12, 2011

Sheets 1 through 56



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

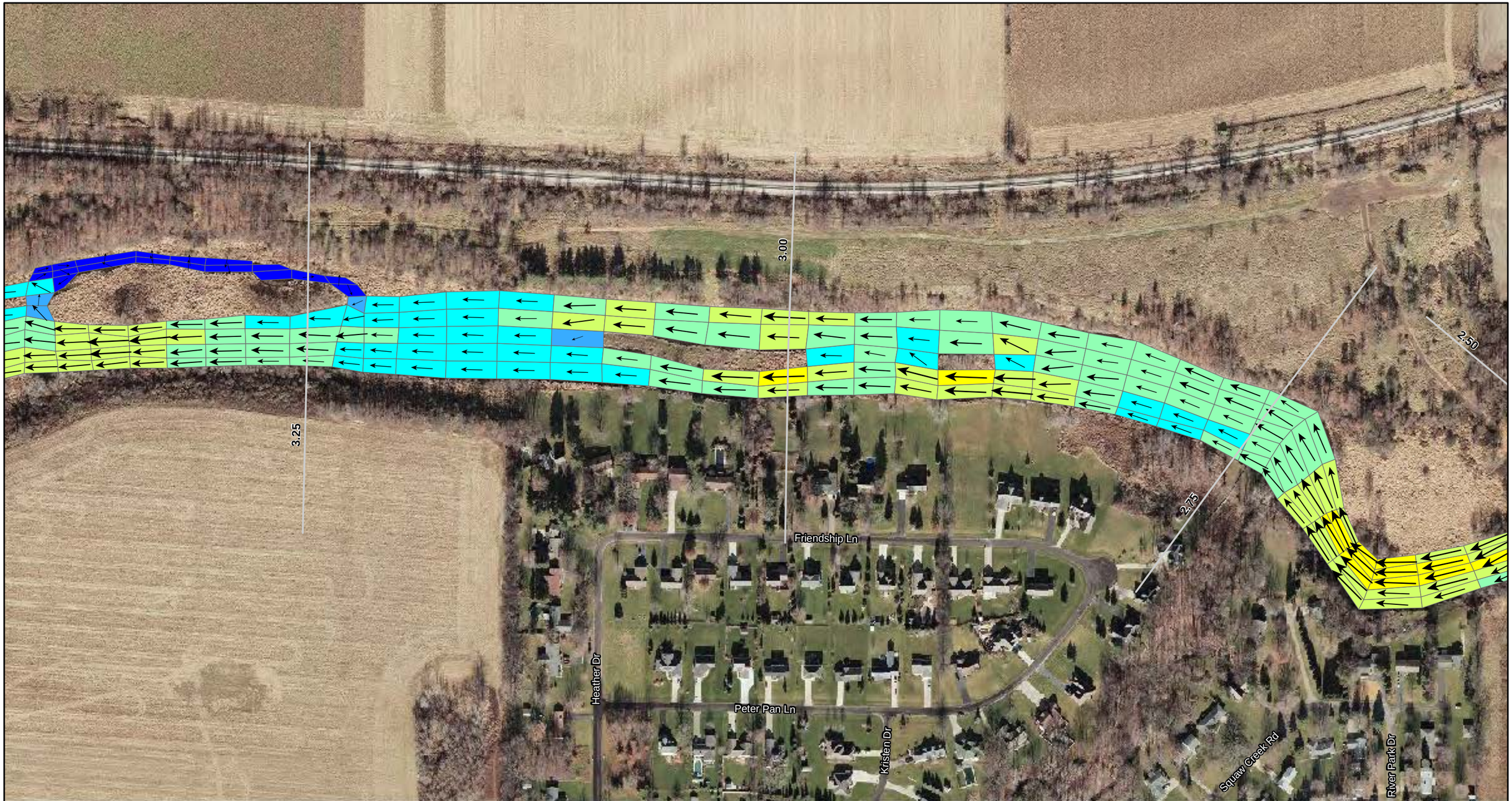
MP 01.95 - MP 02.75

SHEET 1 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

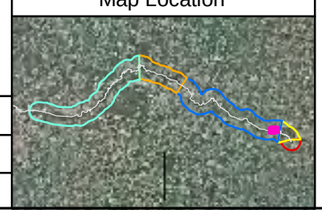
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 02.60 - MP 03.40

SHEET 2 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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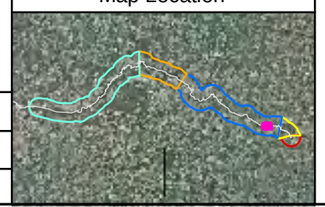
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

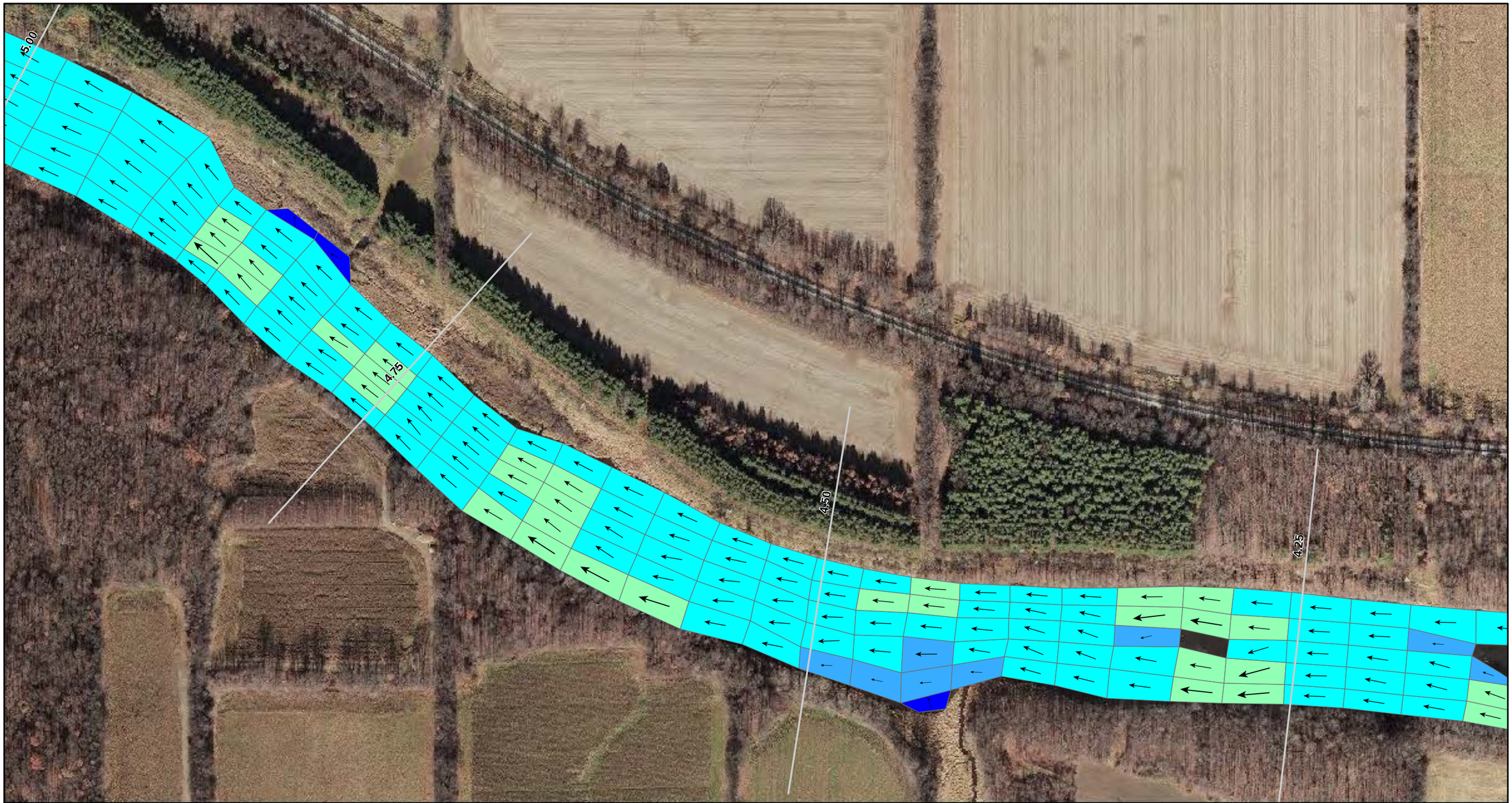
MP 03.40 - MP 04.20

SHEET 3 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

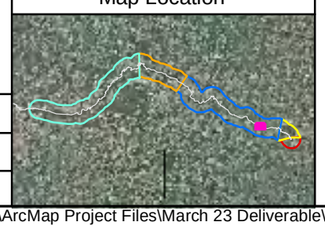
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

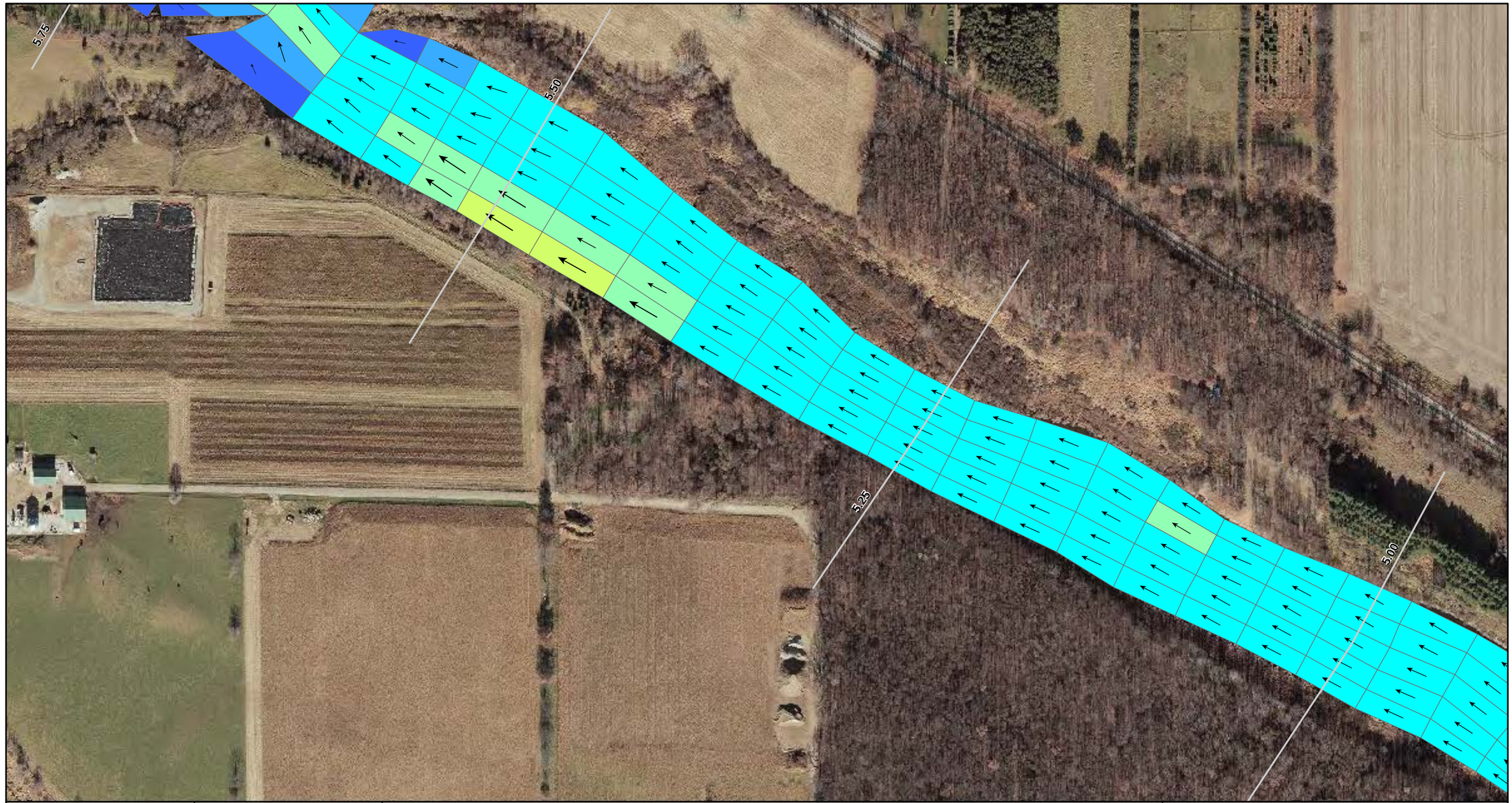
MP 04.15 - MP 05.00

SHEET 4 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

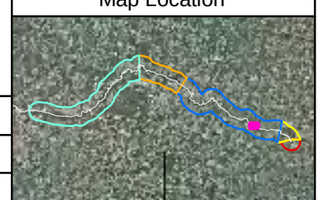
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 04.90 - MP 05.65

SHEET 5 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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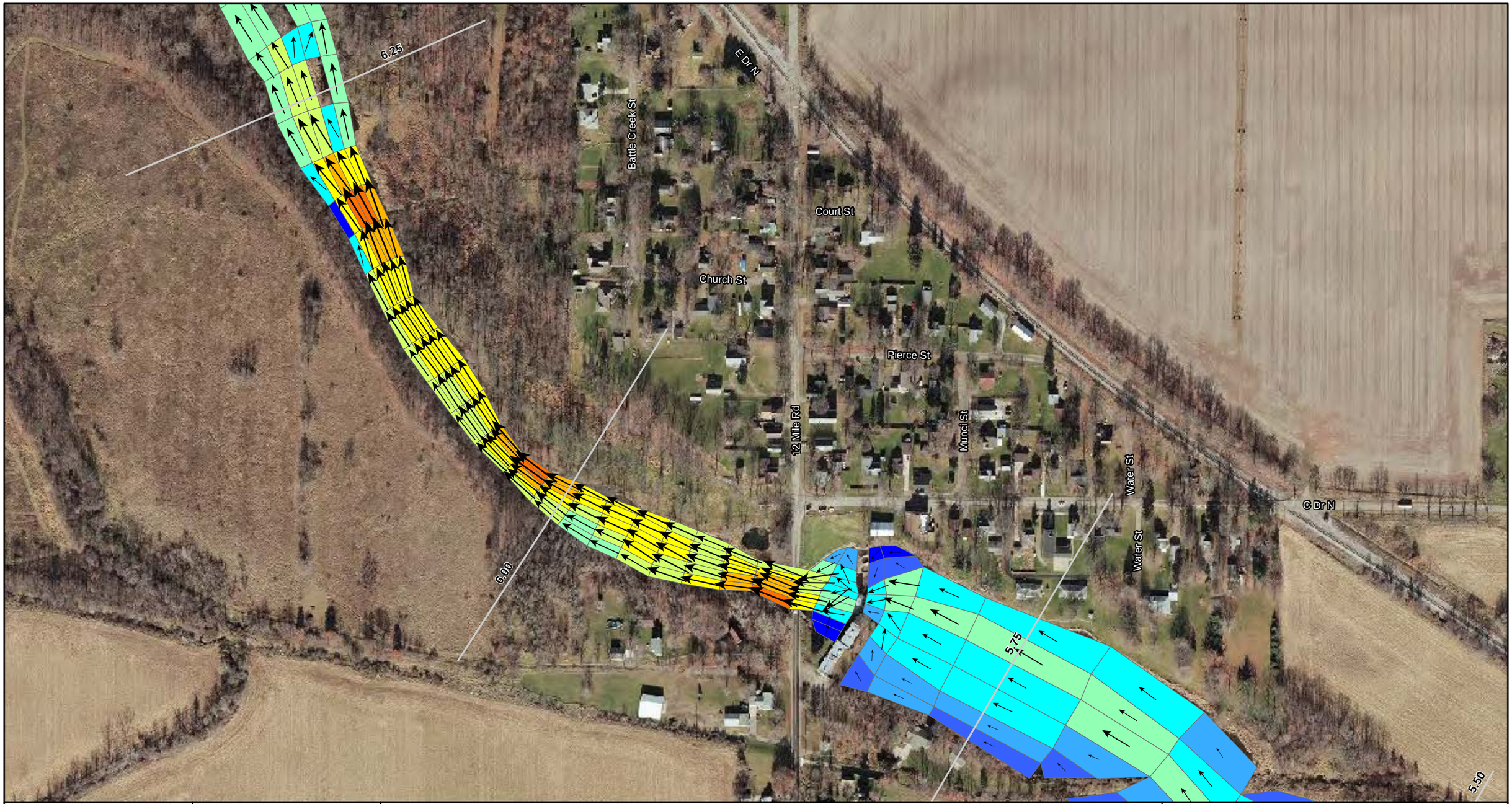
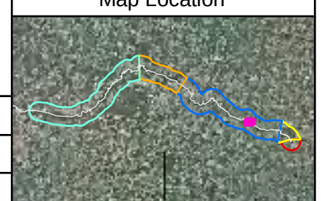
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

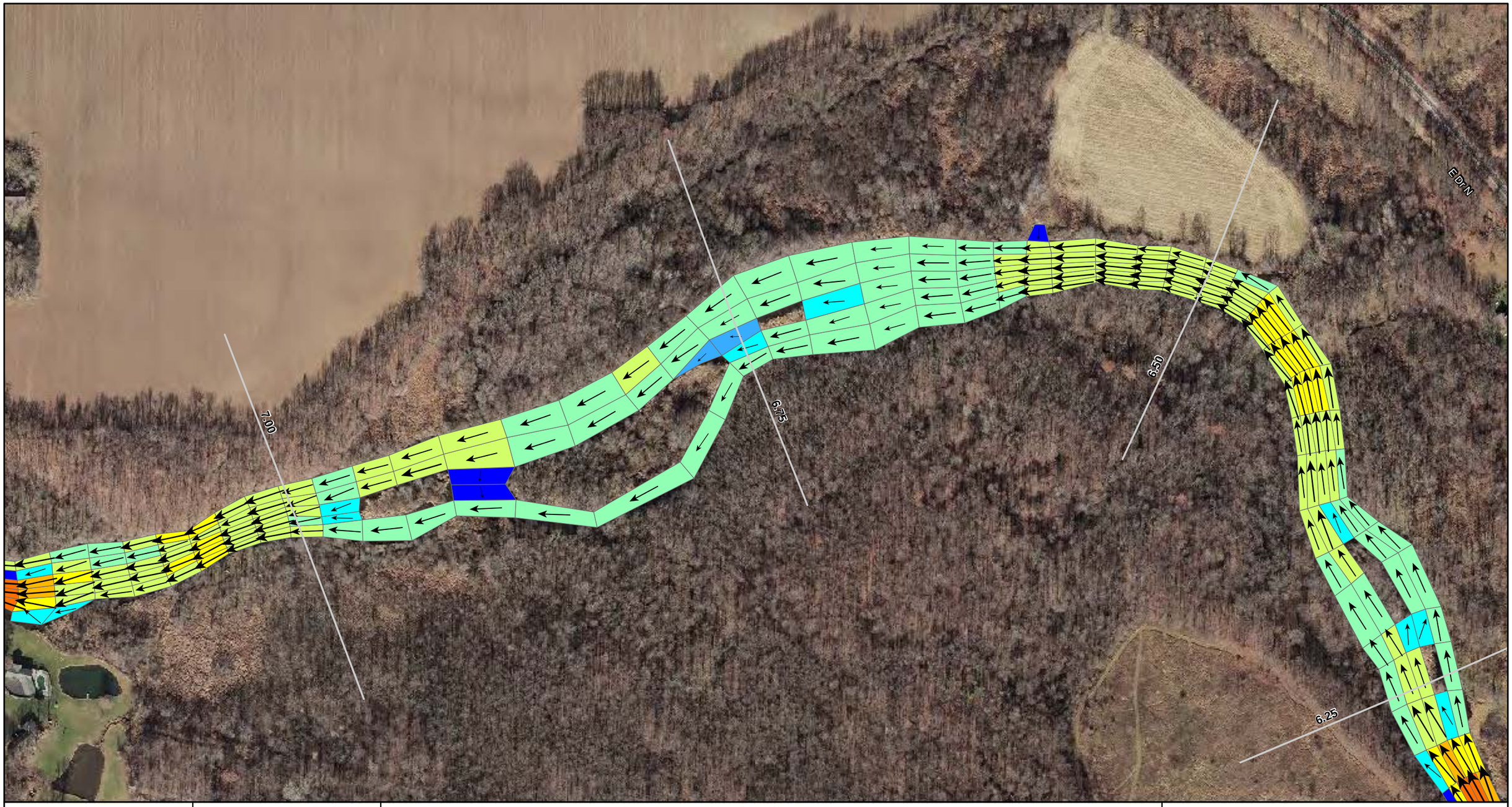
MP 05.65 - MP 06.30

SHEET 6 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

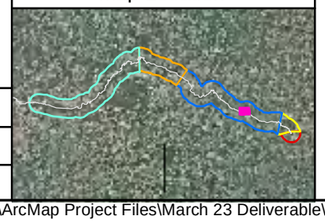
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

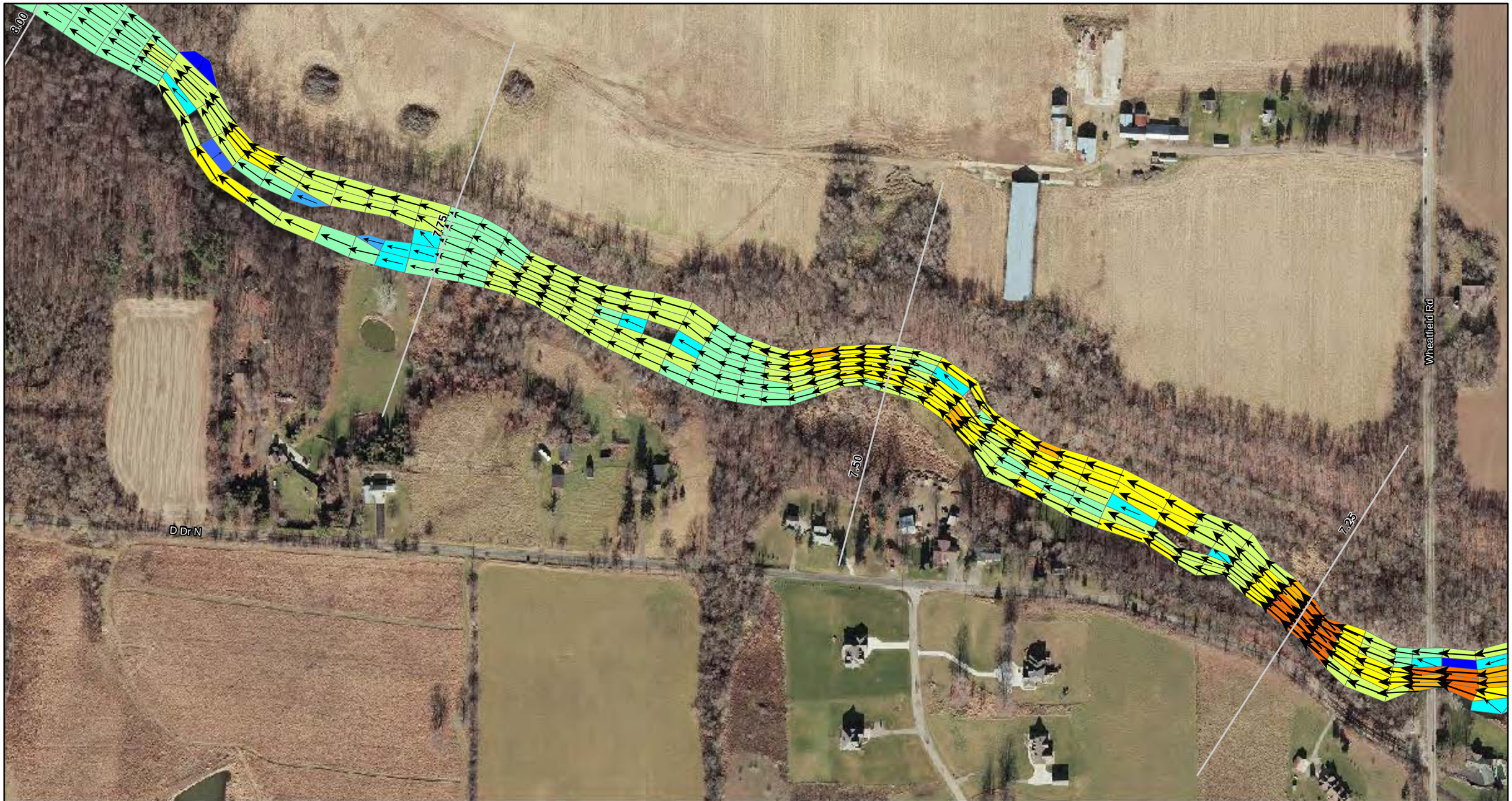
MP 06.20 - MP 07.15

SHEET 7 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

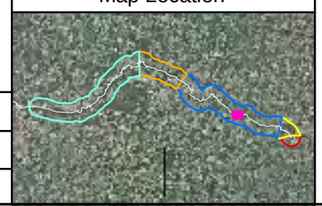
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 07.15 - MP 07.95

SHEET 8 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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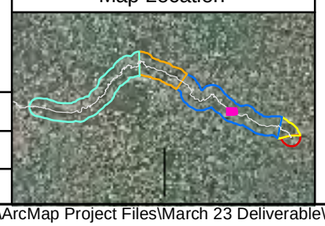
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 07.90 - MP 08.75

SHEET 9 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 08.70 - MP 09.30

SHEET 10 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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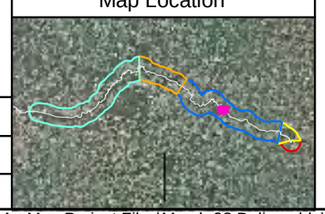
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 09.25 - MP 10.05

SHEET 11 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

10.50

10.25

10.00

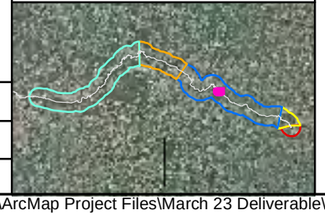
River Rd E

Golden Ave

G Dr N

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 10.00 - MP 10.65

SHEET 12 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

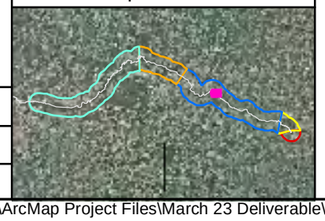
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 10.60 - MP 11.40

SHEET 13 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

Columbia Ave E

Leonard Wood

Raymond Rd S

River Rd E

12.00

11.75

11.50

11.25

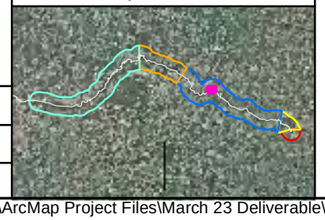
12.25

12.50

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

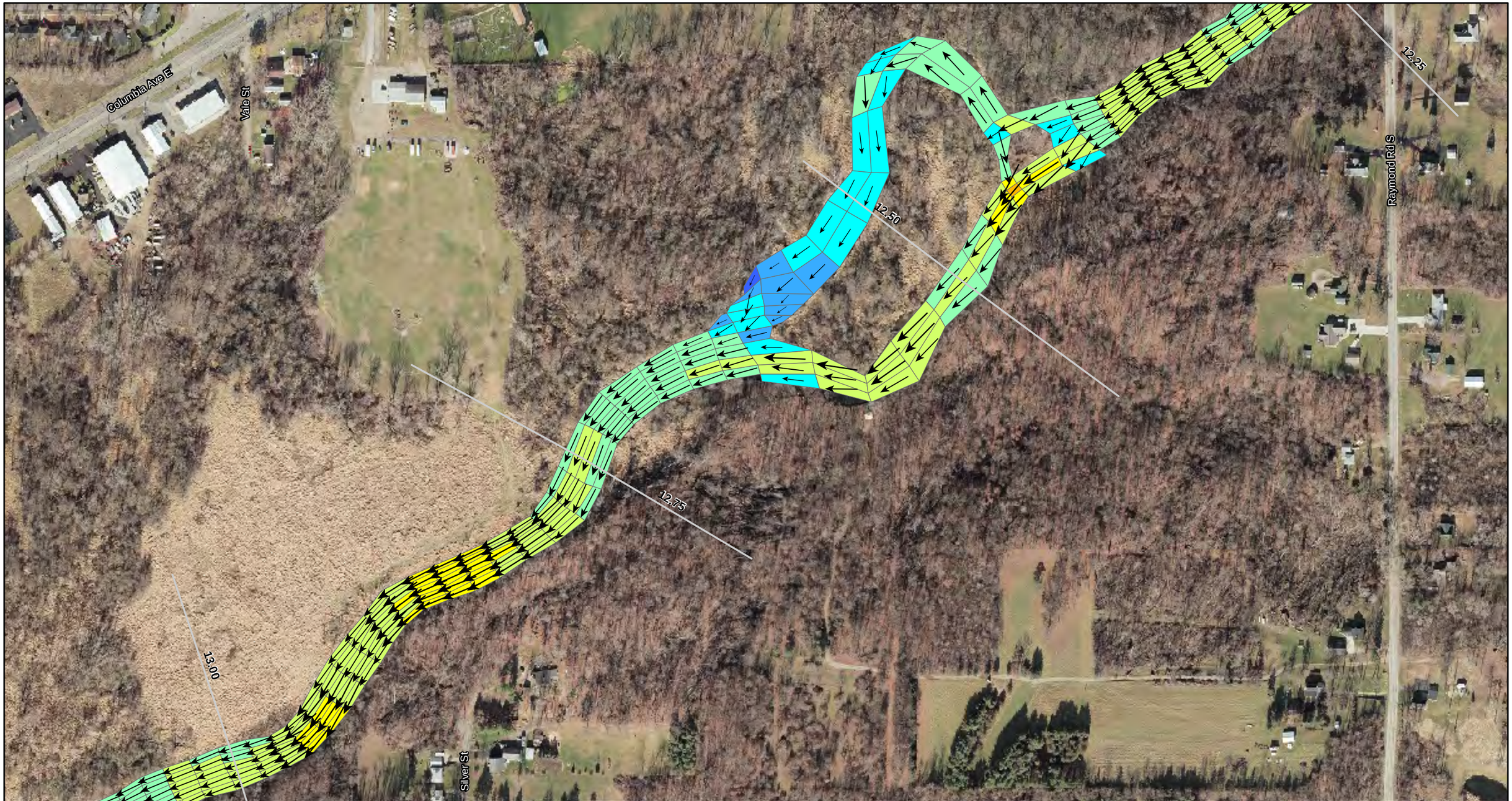
MP 11.10 - MP 12.45

SHEET 14 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

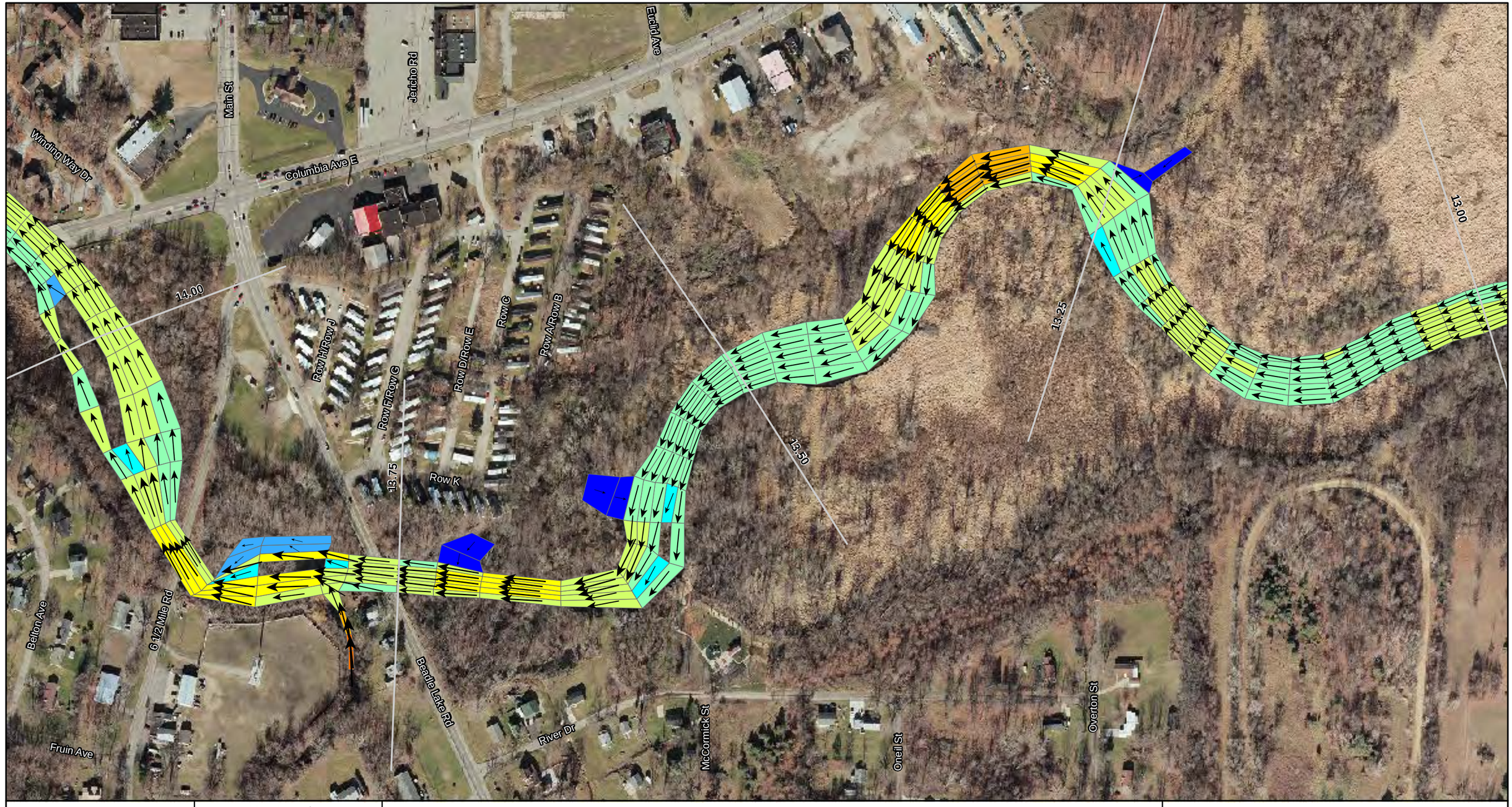
MP 12.30 - MP 13.05

SHEET 15 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

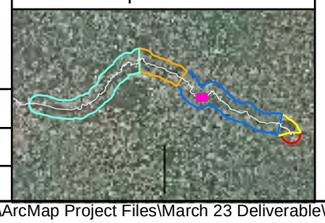
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

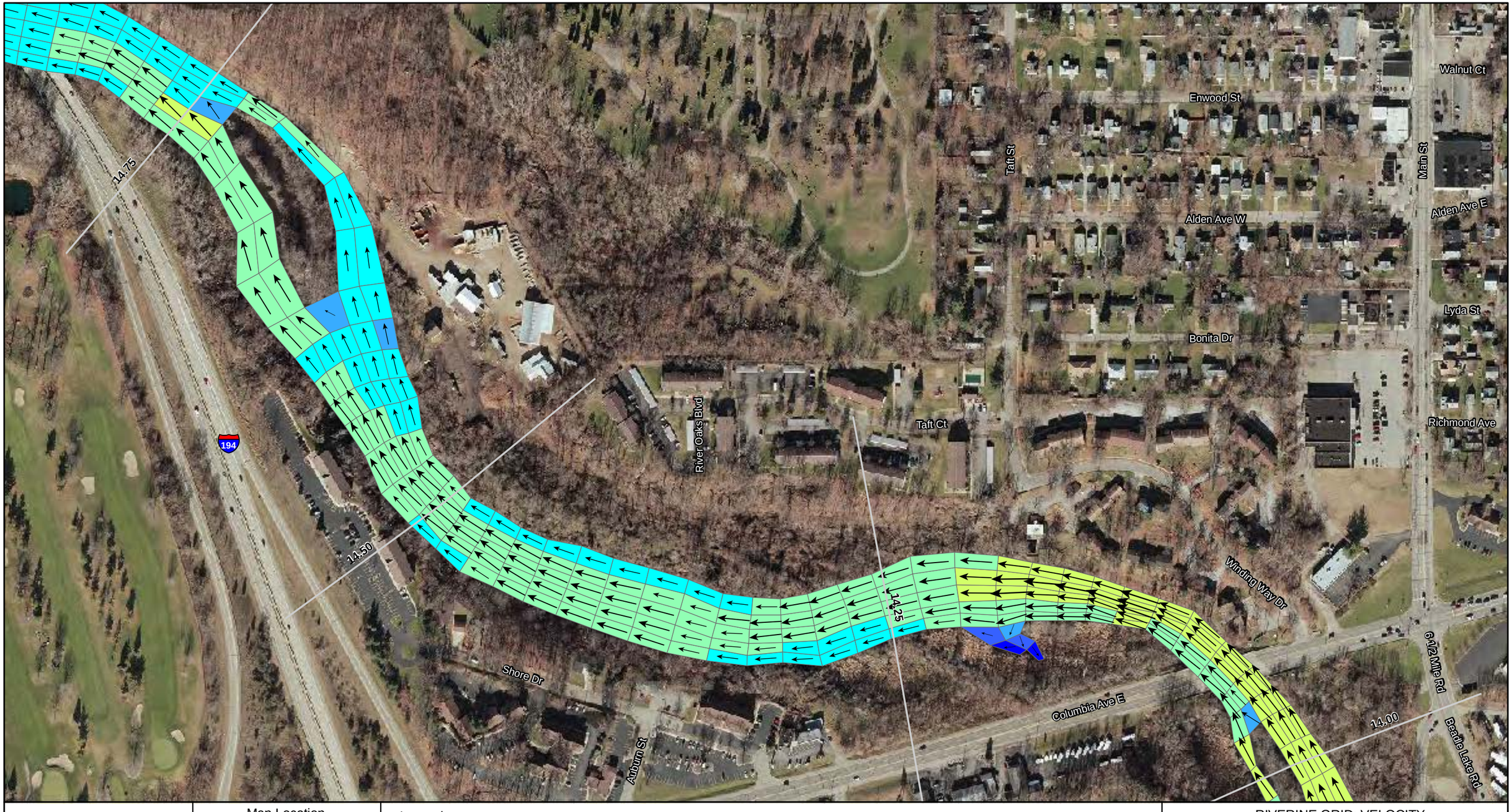
MP 13.00 - MP 14.10

SHEET 16 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

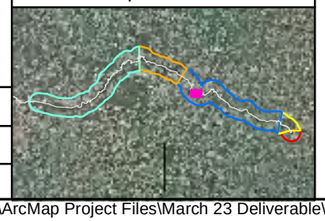
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

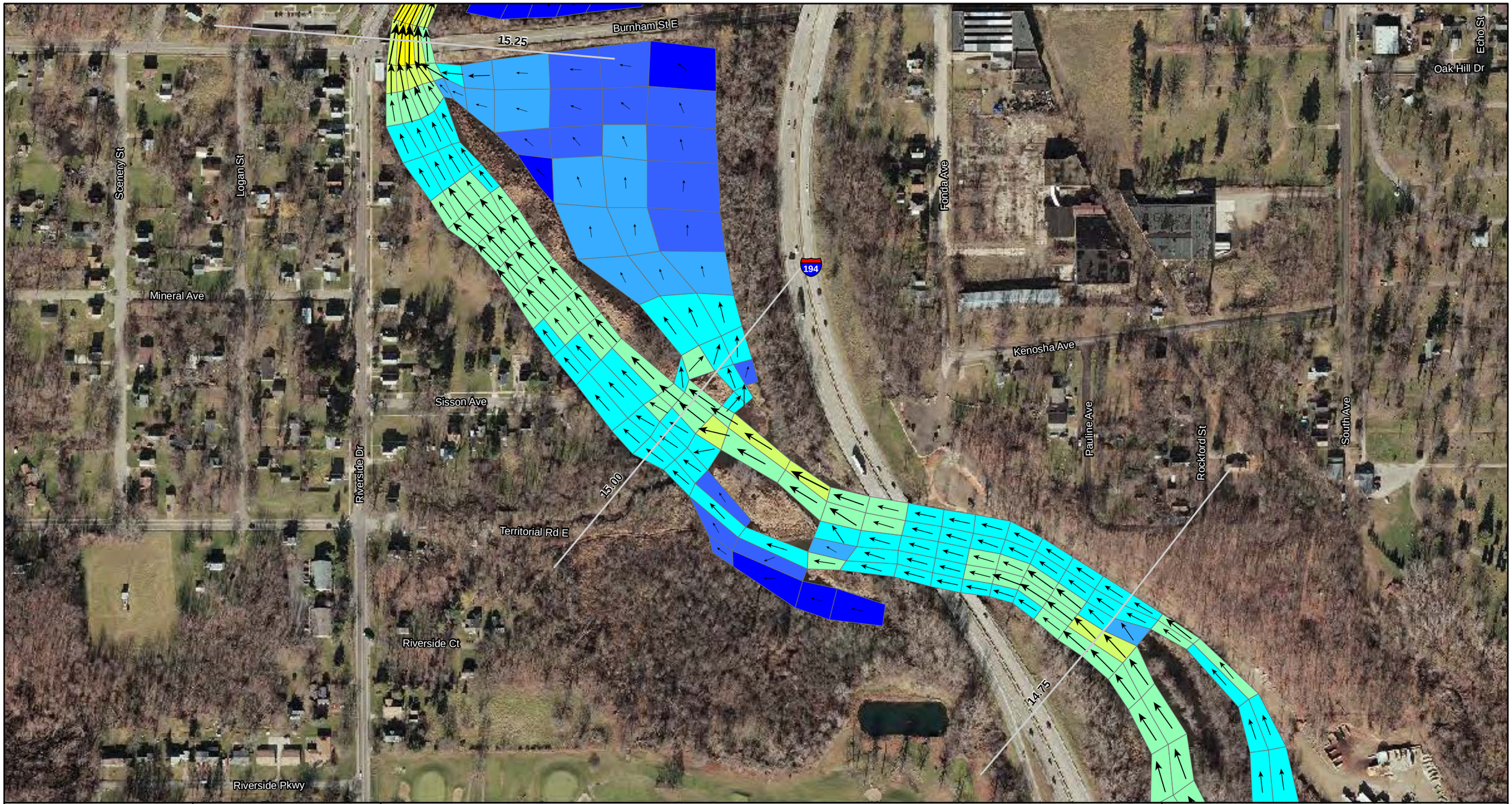
MP 14.00 - MP 14.85

SHEET 17 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011



Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: VELOCITY
APRIL 12, 2011

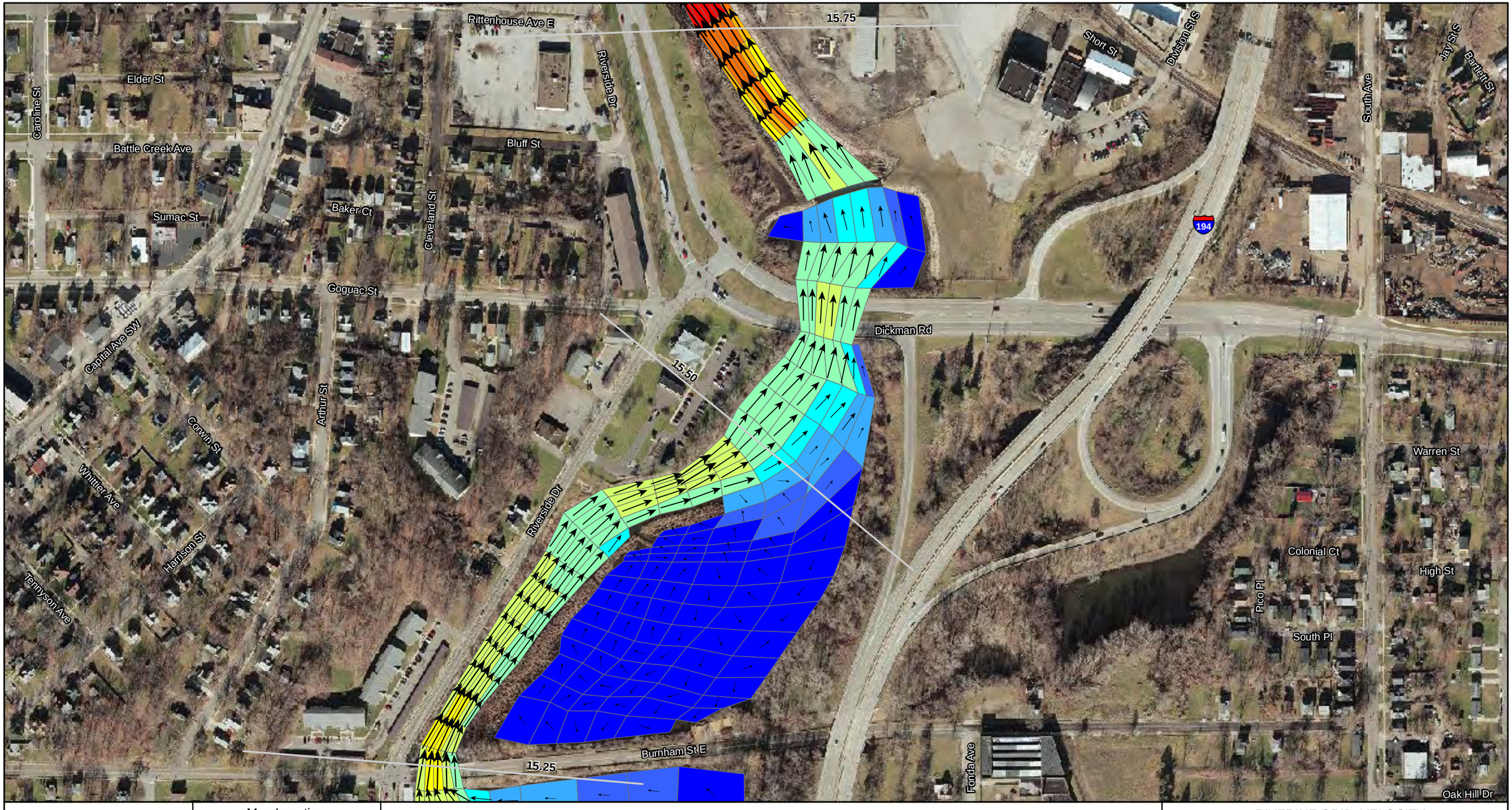
MP 14.65 - MP 15.25

SHEET 18 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

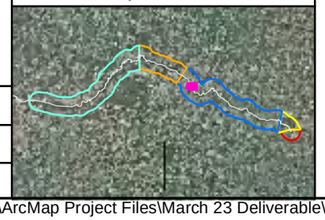
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 15.25 - MP 15.75

SHEET 19 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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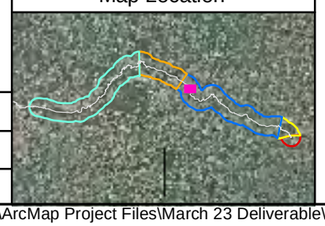
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 15.75 - MP 16.30

SHEET 20 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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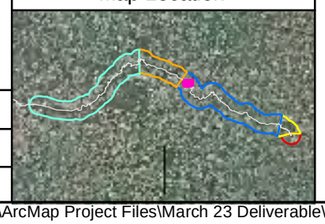
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

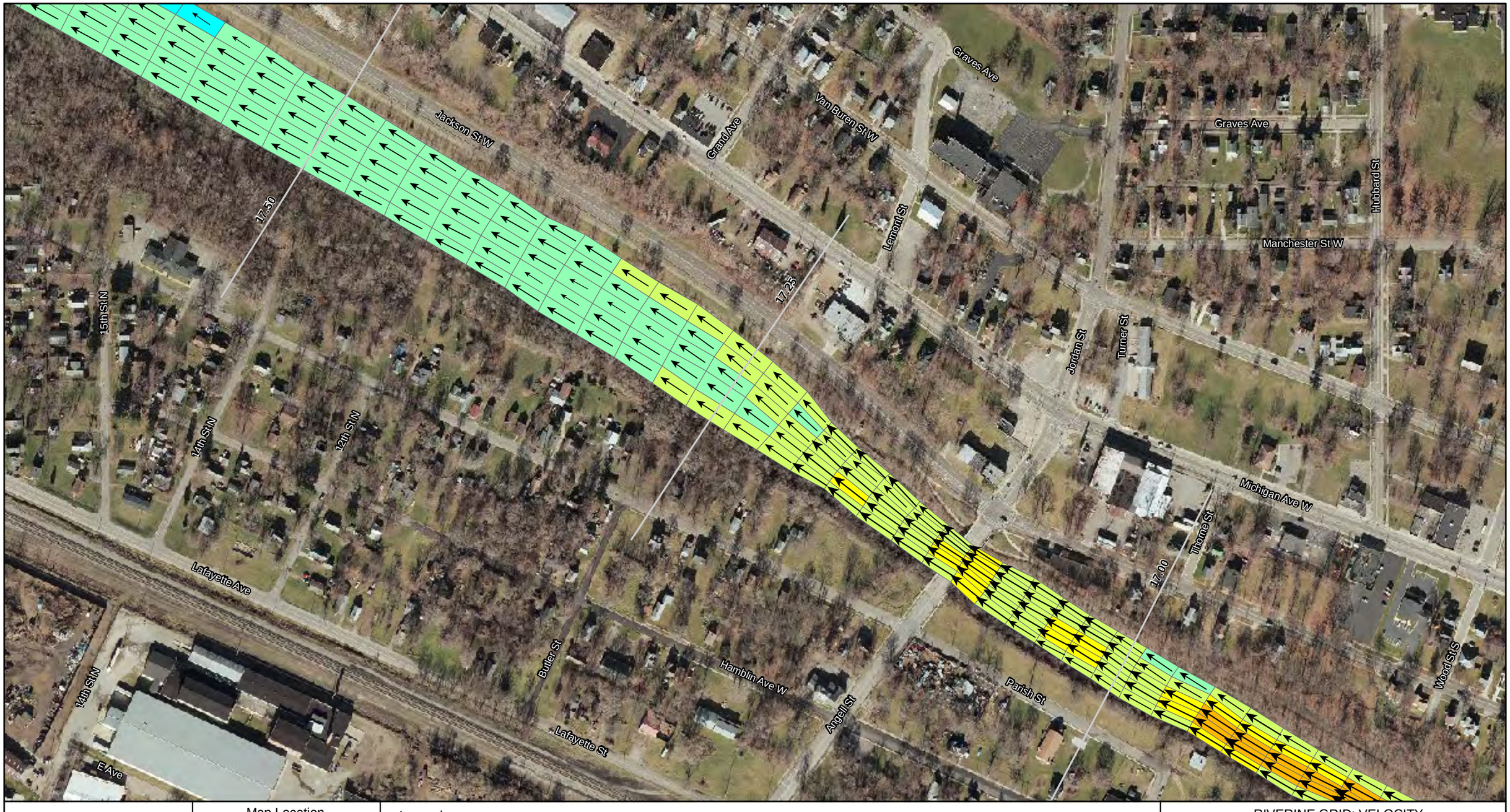
MP 16.30 - MP 16.95

SHEET 21 OF 56

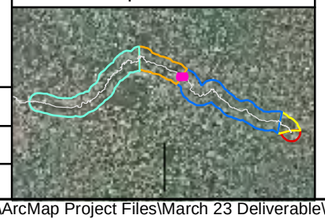
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 16.85 - MP 17.60

SHEET 22 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

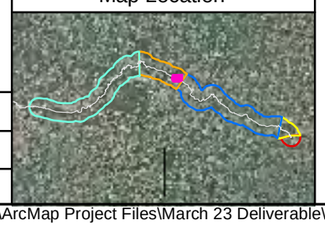
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 17.60 - MP 18.40

SHEET 23 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

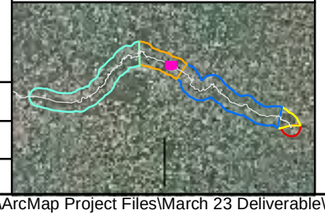
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

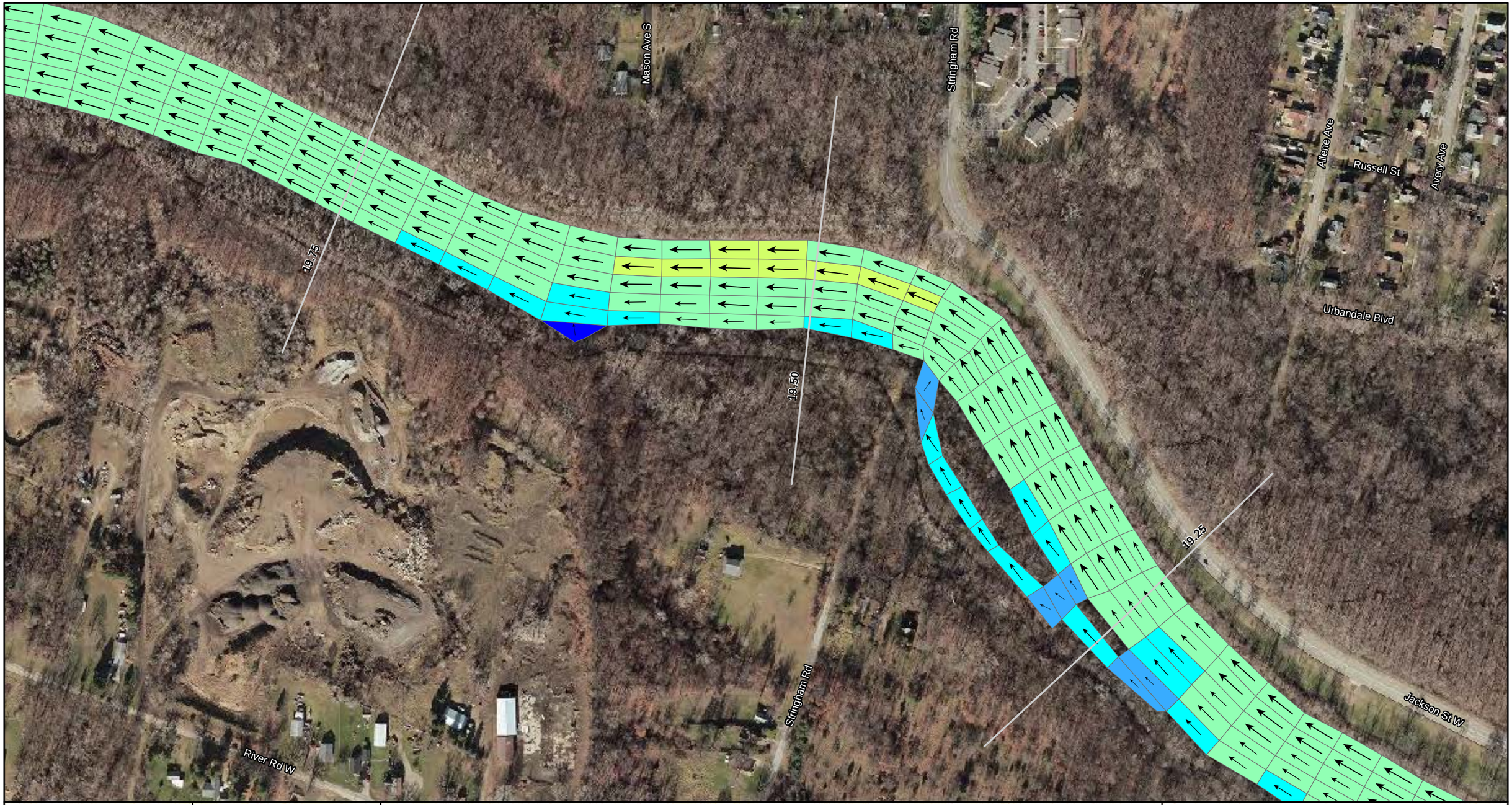
MP 18.30 - MP 19.15

SHEET 24 OF 56

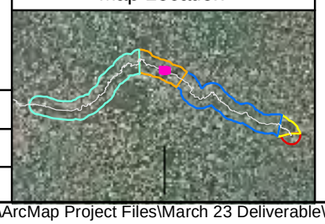
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011



Map Location



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

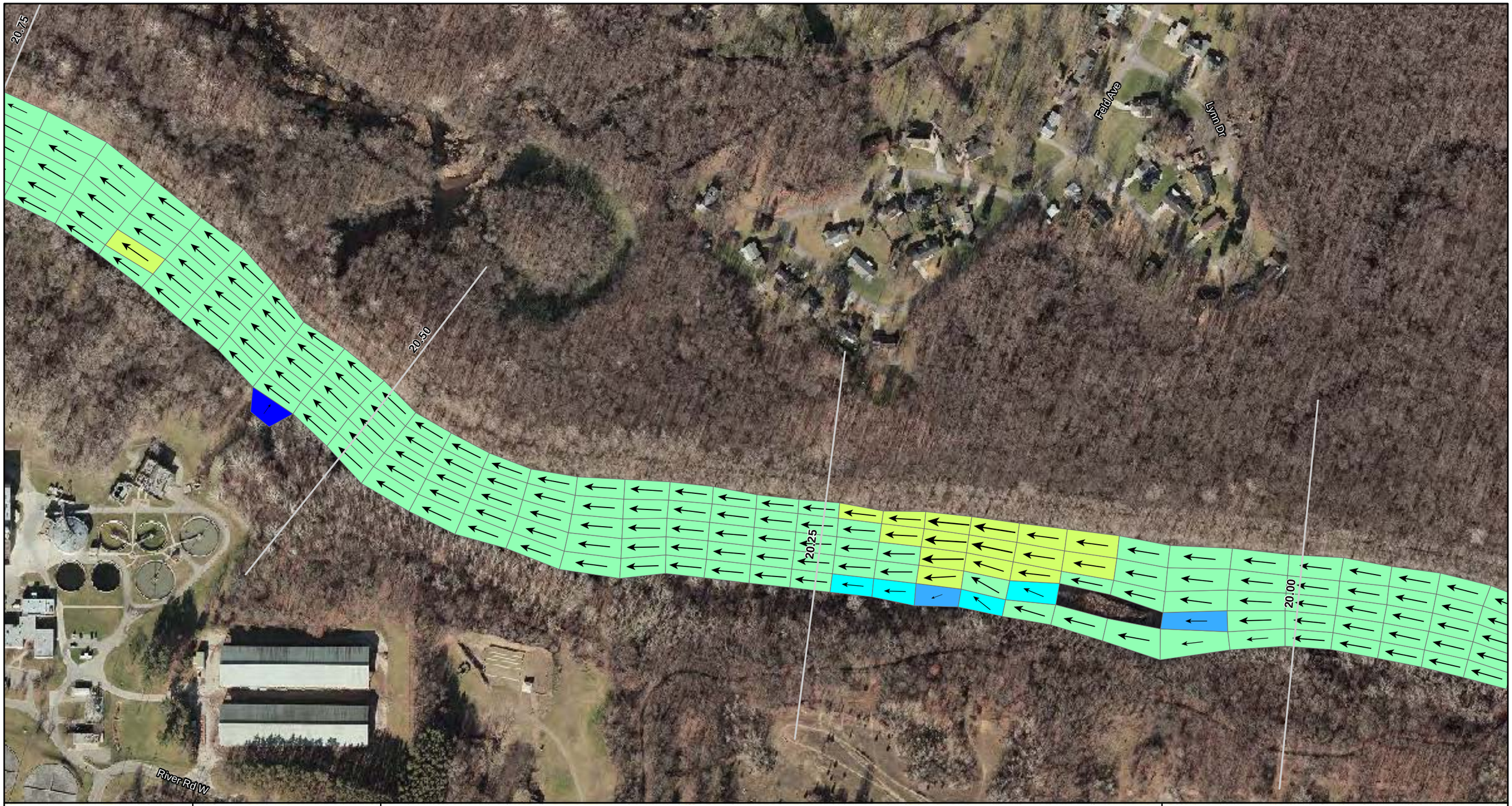
MP 19.10 - MP 19.95

SHEET 25 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

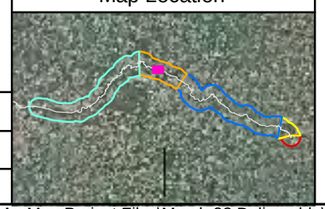
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

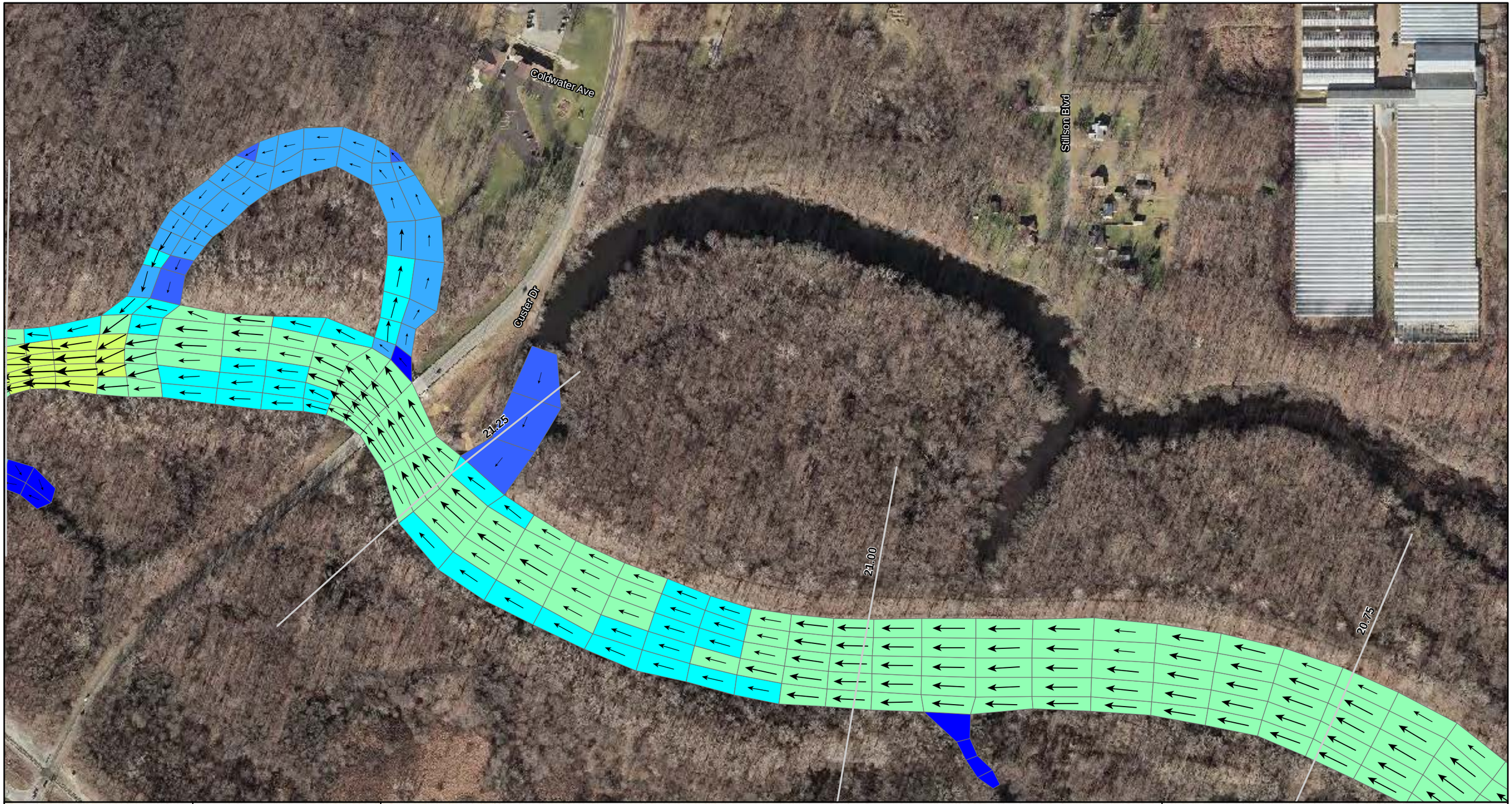
MP 19.90 - MP 20.75

SHEET 26 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 20.70 - MP 21.50

SHEET 27 OF 56

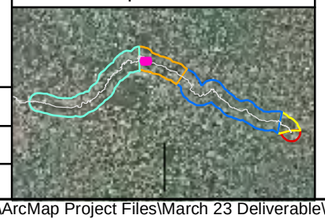
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

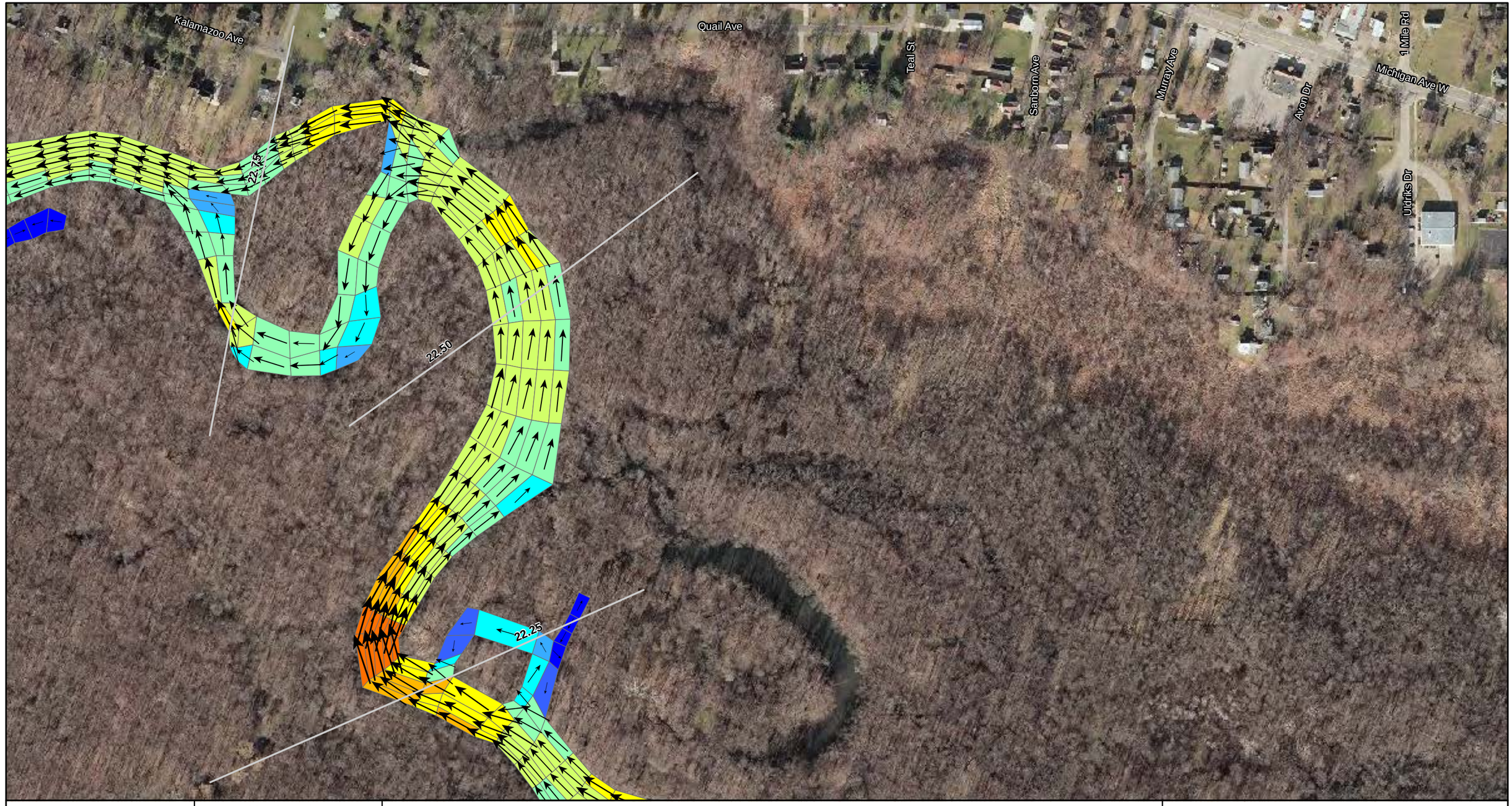
MP 21.35 - MP 22.15

SHEET 28 OF 56

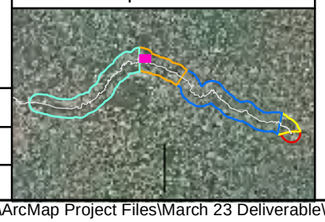
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

⟵ Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 22.15 - MP 22.90

SHEET 29 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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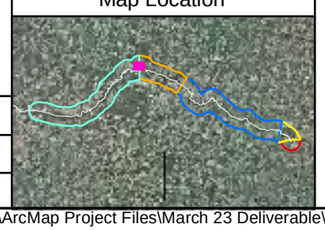
Aerial Photography Date: November 2011

San Juan Ave
Colorado St
Charleston Ave
Kalamazoo Ave
23.25
23.50
23.00
23.75
24.00

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 22.80 - MP 24.10

SHEET 30 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 24.10 - MP 24.85

SHEET 31 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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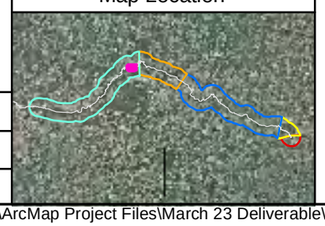
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

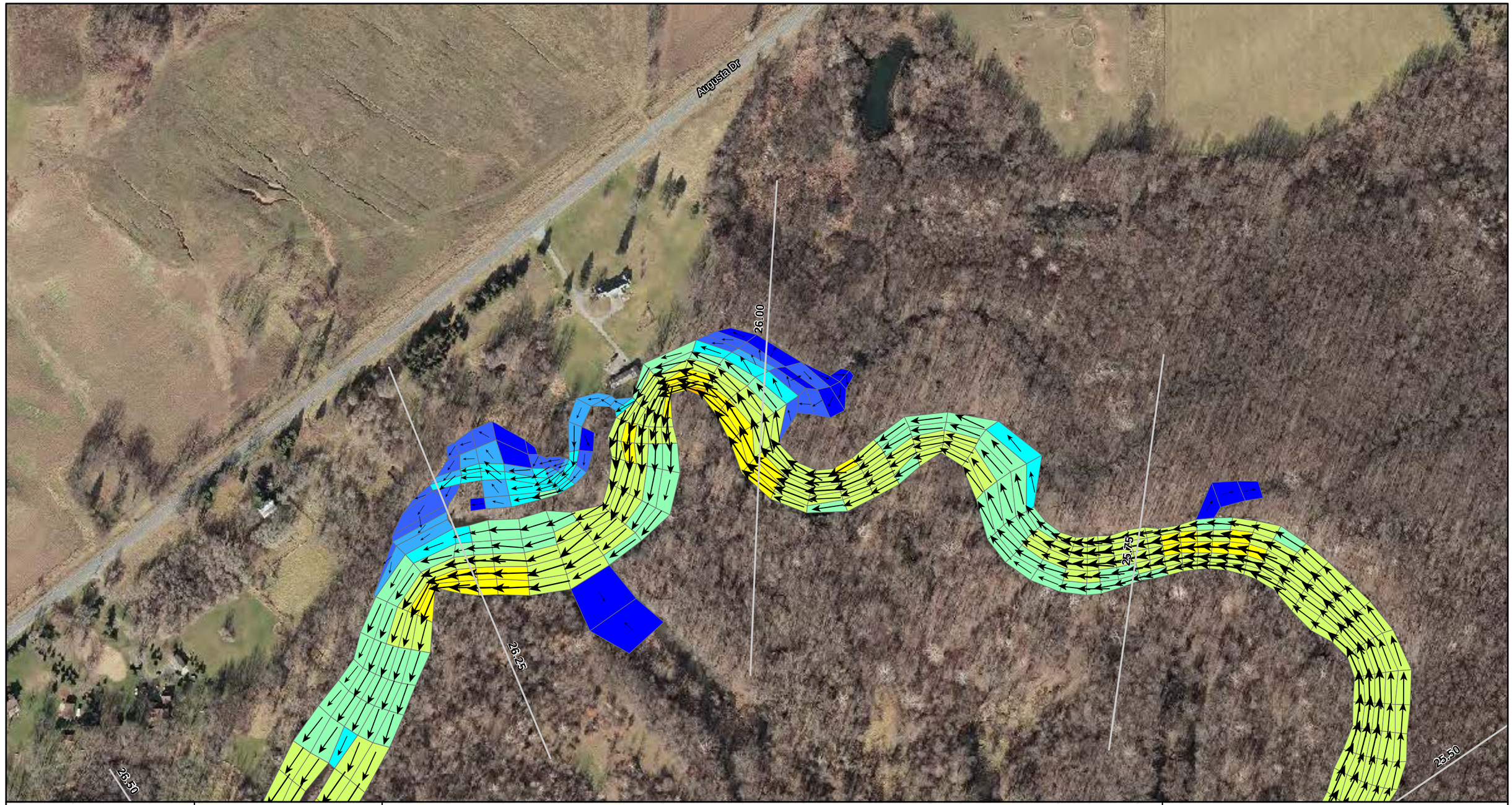
MP 24.80 - MP 25.65

SHEET 32 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

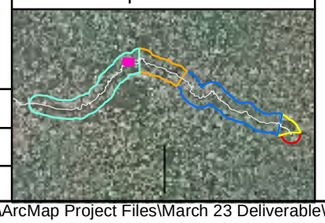
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 25.55 - MP 26.40

SHEET 33 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 26.40 - MP 27.45

SHEET 34 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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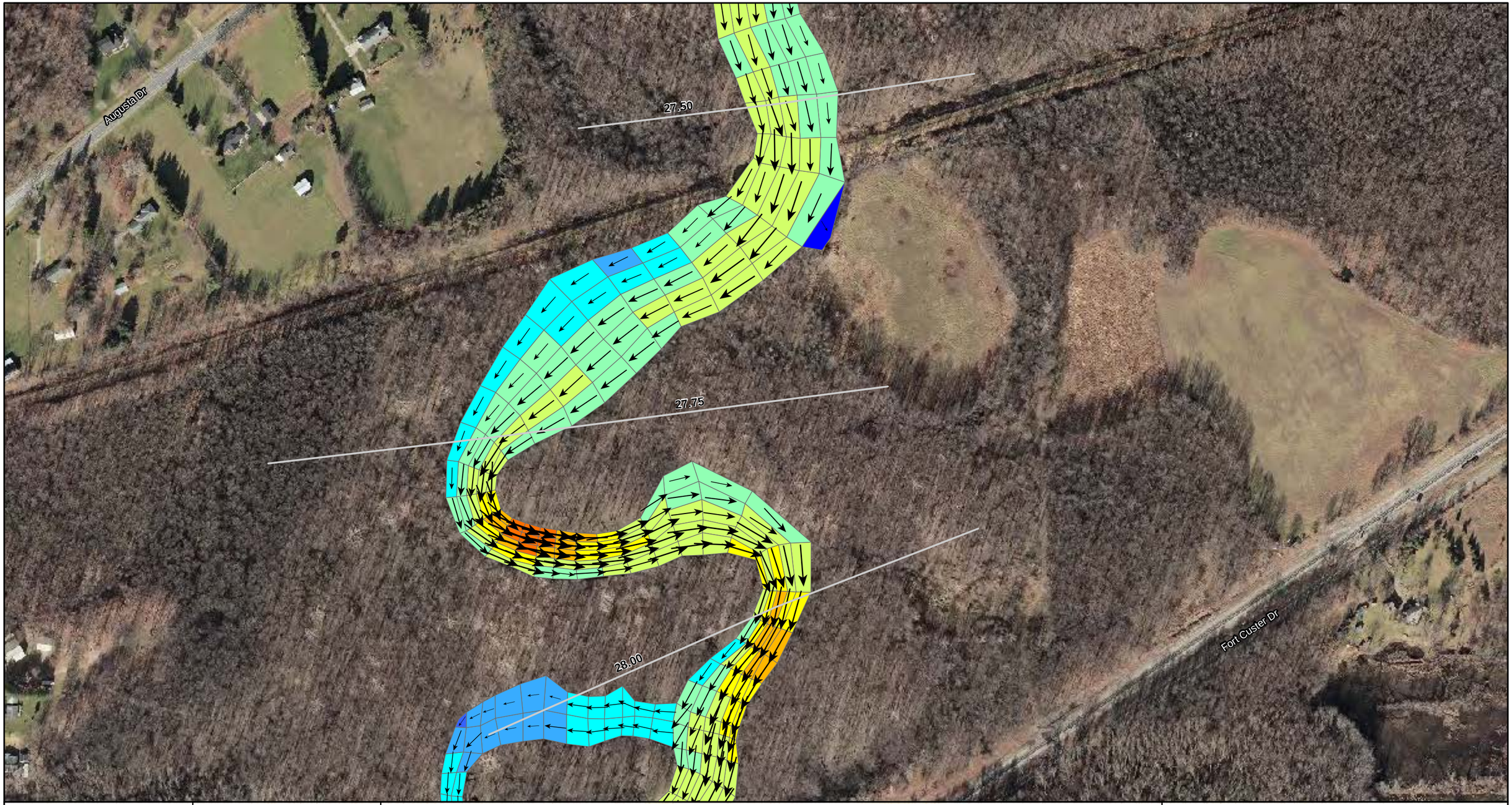
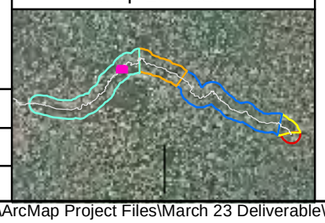
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 27.45 - MP 28.10

SHEET 35 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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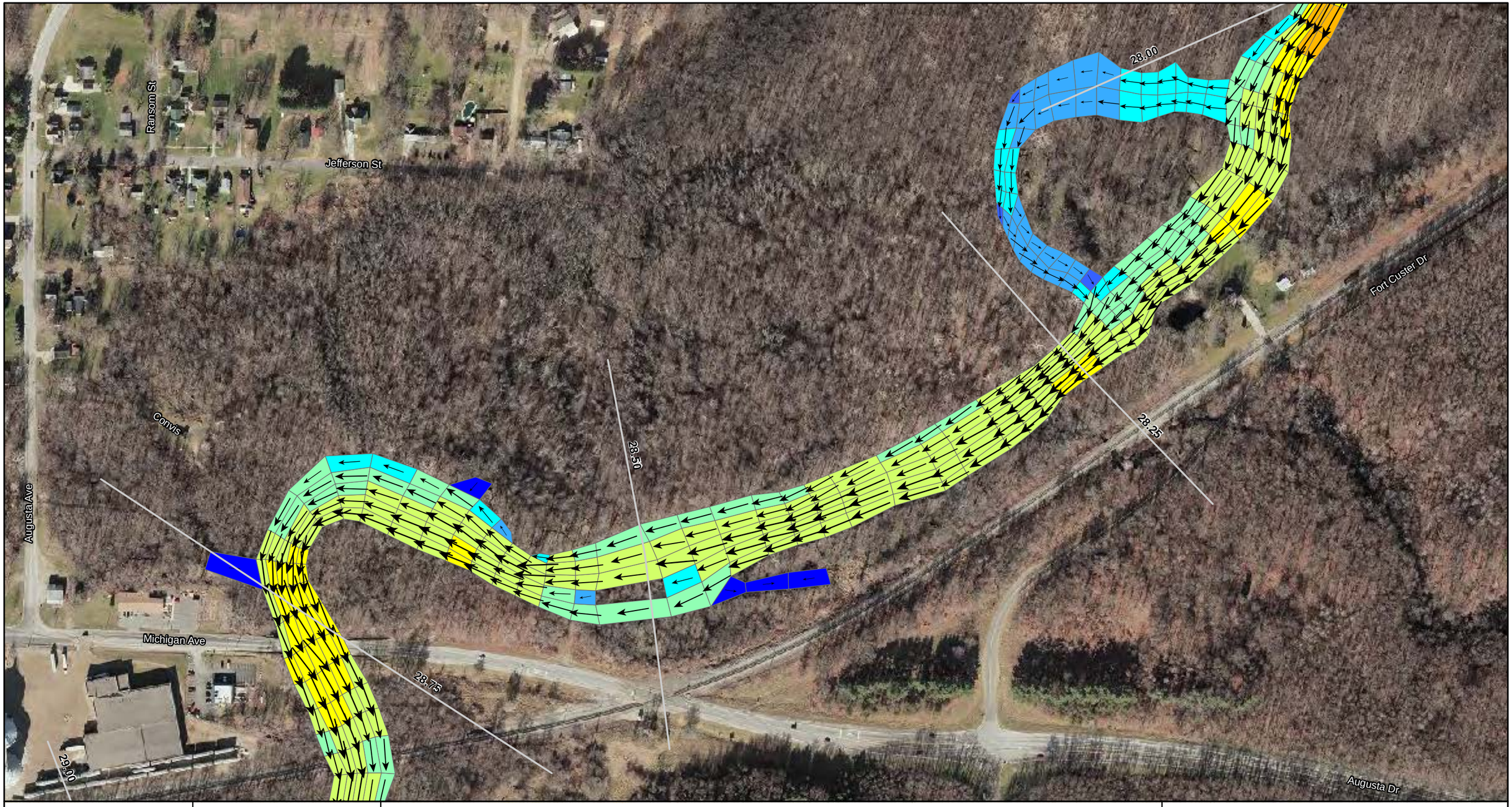
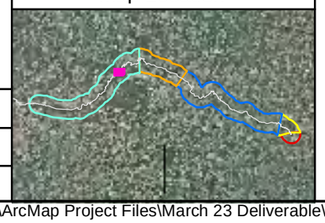
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 28.05 - MP 28.85

SHEET 36 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Clinton St
Clinton St
Chestnut St
Webster St
Church St
Fayette St
Cass St
Cherry St
Lincoln St
28.75
29.00
29.25
29.50
Augusta Climax Rd
Fort Custer Rec Area Access

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 28.85 - MP29.55

SHEET 37 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

29.50

29.75

Fort Custer Rec Area Service

Fort Custer Rec Area Access

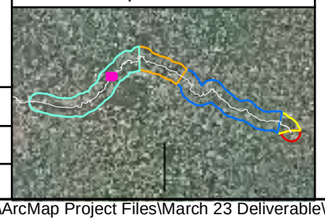
30.25

30.00

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 29.50 - MP29.95

SHEET 38 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

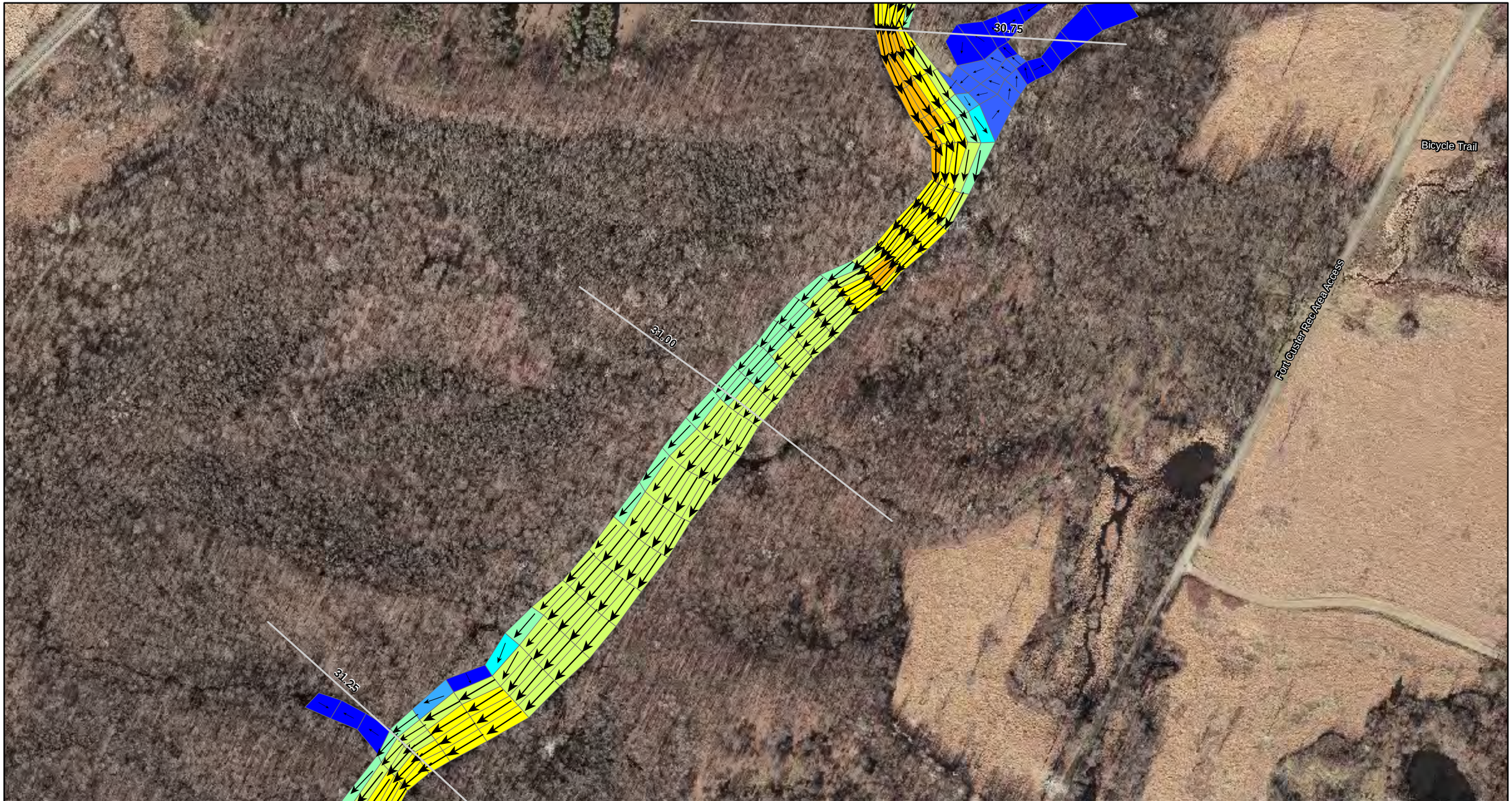
MP 29.95 - MP 30.80

SHEET 39 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 30.75 - MP 31.25

SHEET 40 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

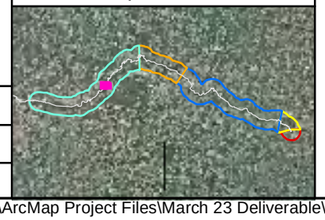
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 31.25 - MP 31.70

SHEET 41 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

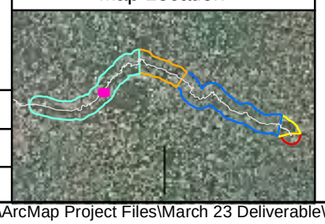
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 31.65 - MP 32.25

SHEET 42 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

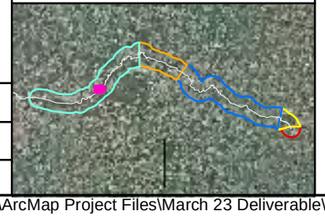
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 32.25 - MP 33.10

SHEET 43 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

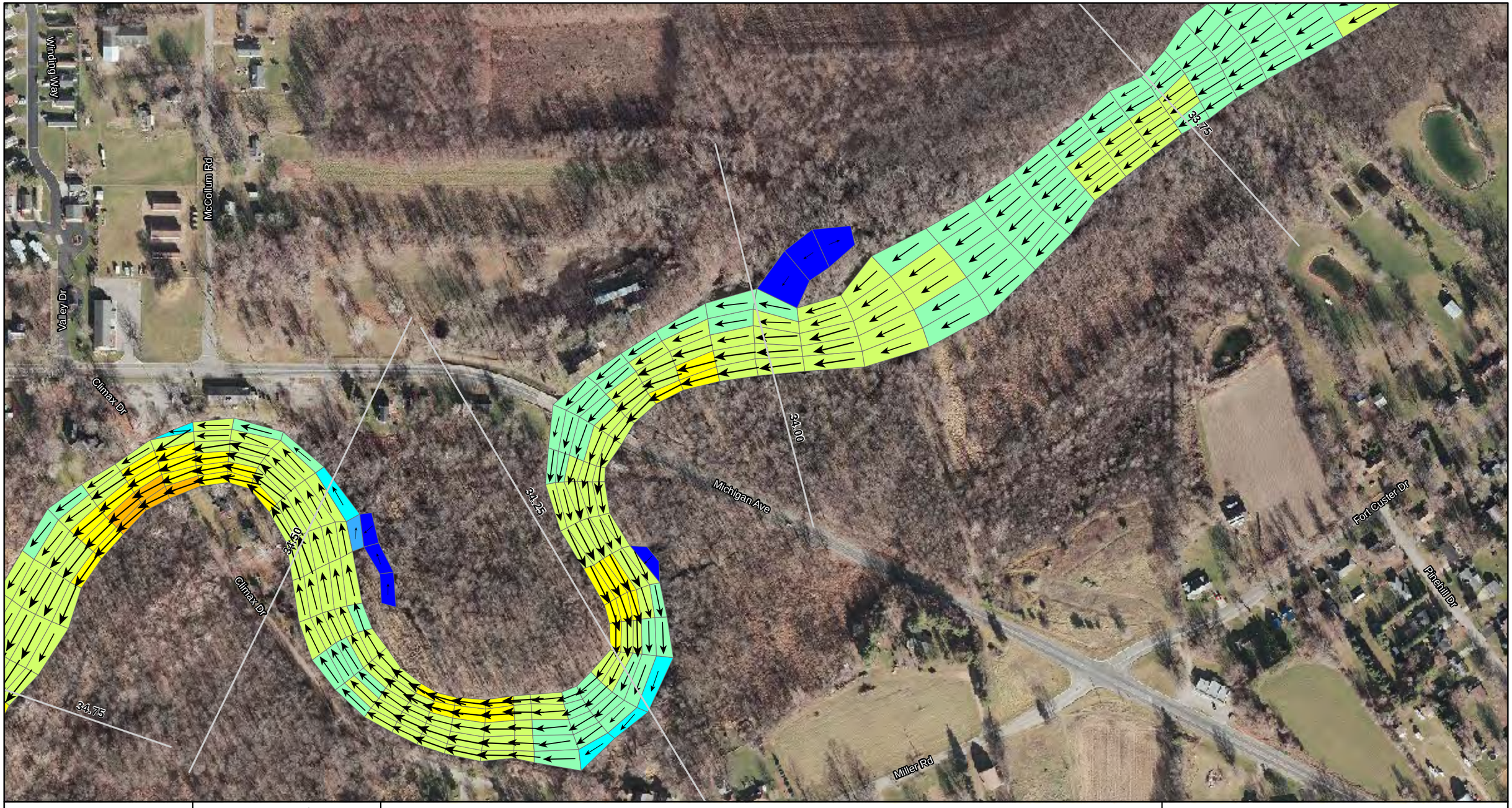
MP 33.10 - MP 33.70

SHEET 44 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

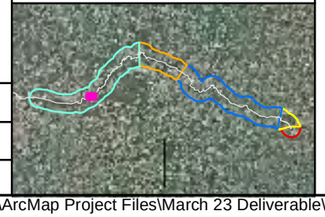
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 33.70 - MP 34.70

SHEET 45 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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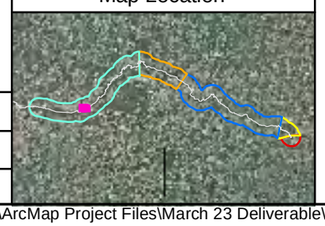
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 34.70 - MP 35.75

SHEET 46 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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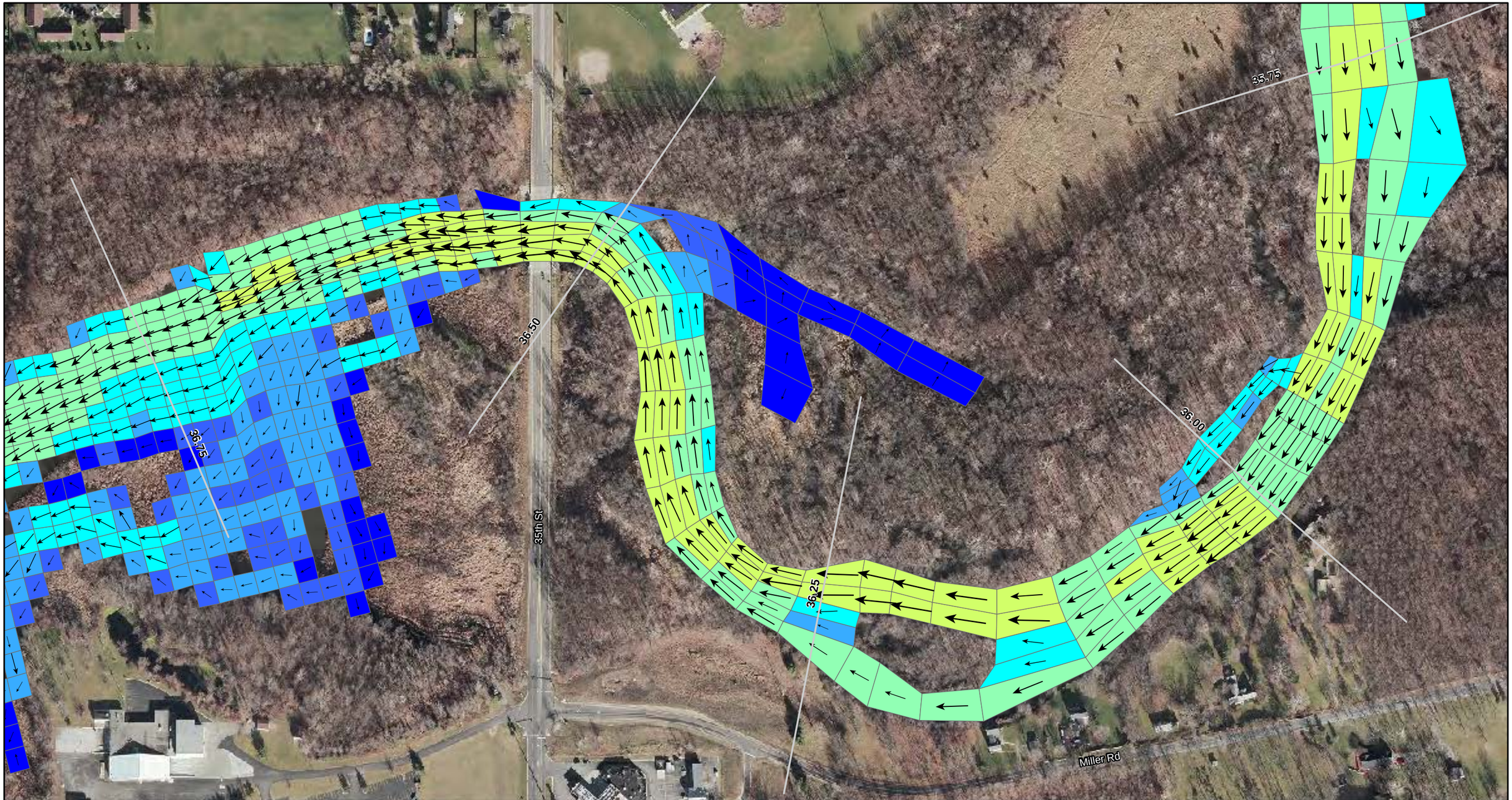
Aerial Photography Date: November 2011



Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 35.75 - MP 36.80

SHEET 47 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

37.50

37.25

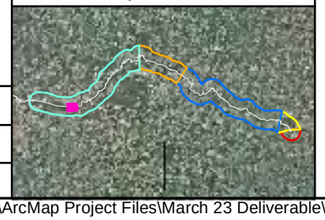
37.00

Miller Dr

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 36.80 - MP 37.55

SHEET 48 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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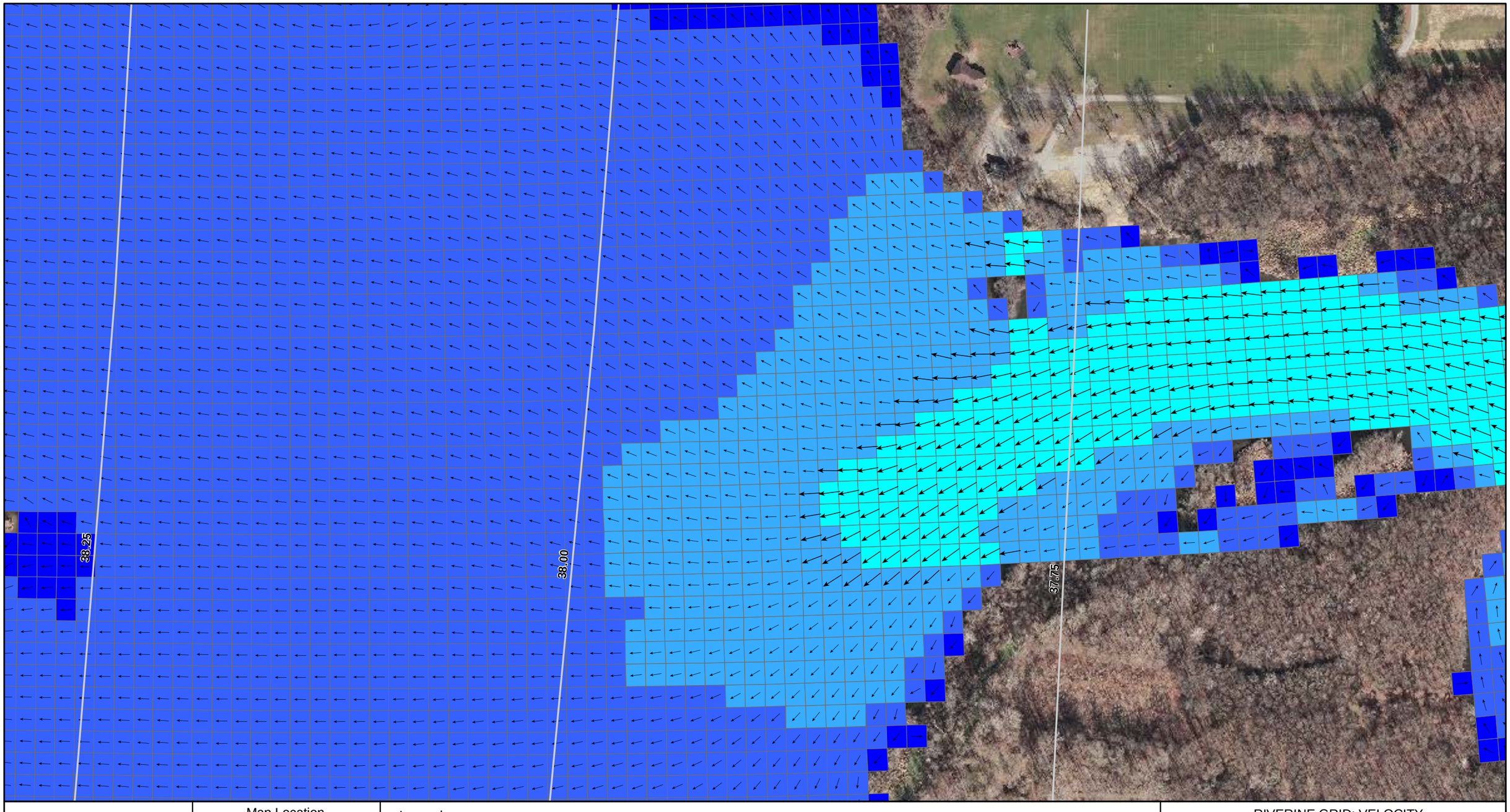
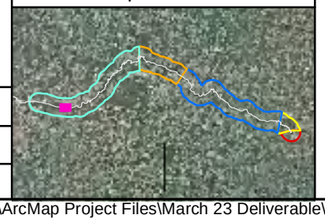
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 37.55 - MP 38.30

SHEET 49 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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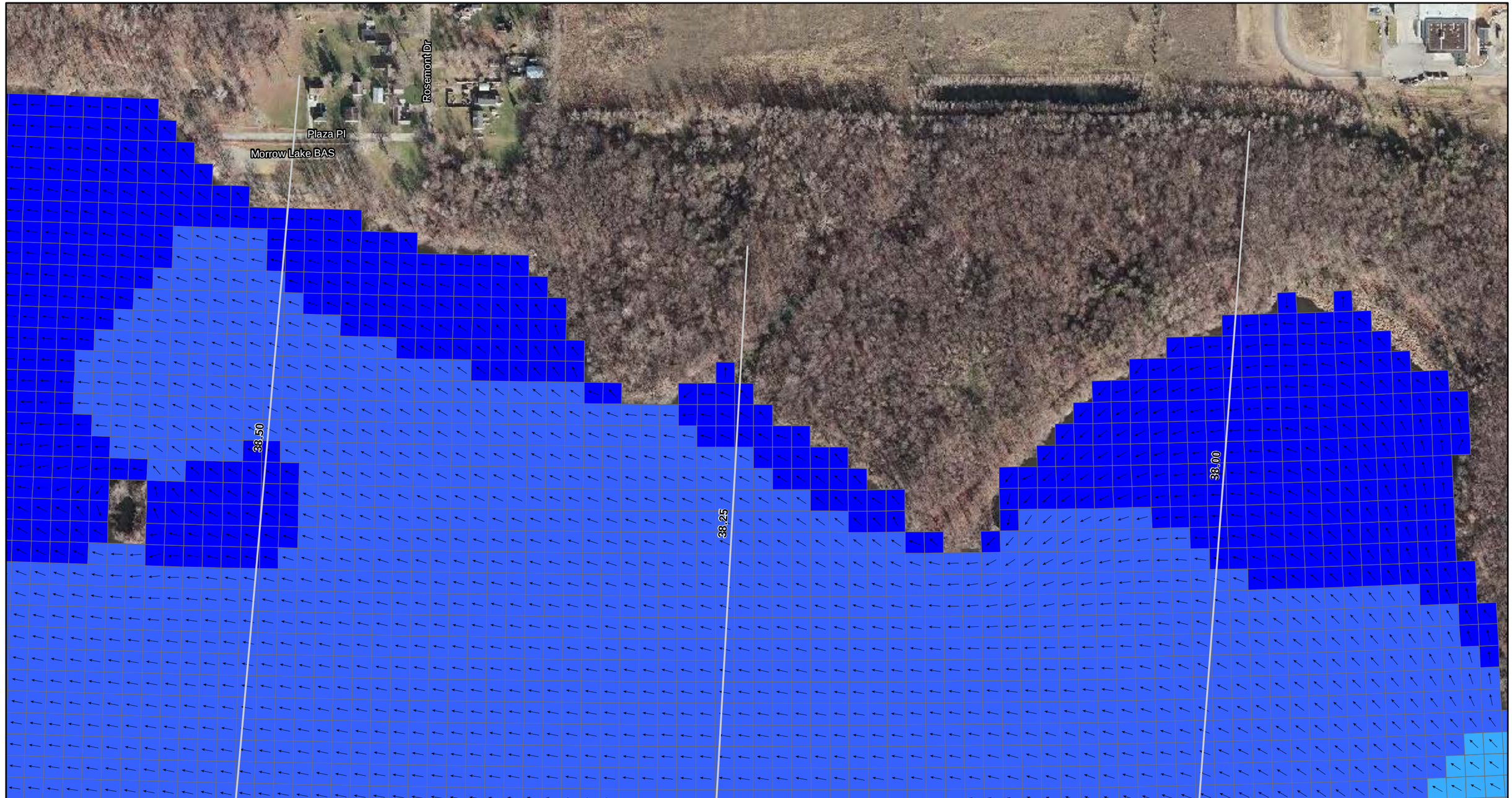
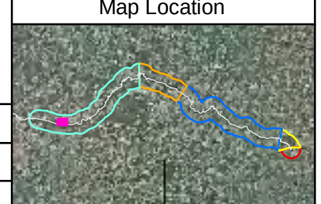
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 37.80 - MP 38.60N

SHEET 50 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

38.50

38.25

38.00

Lyth Rd

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 37.80 - MP 38.60S

SHEET 51 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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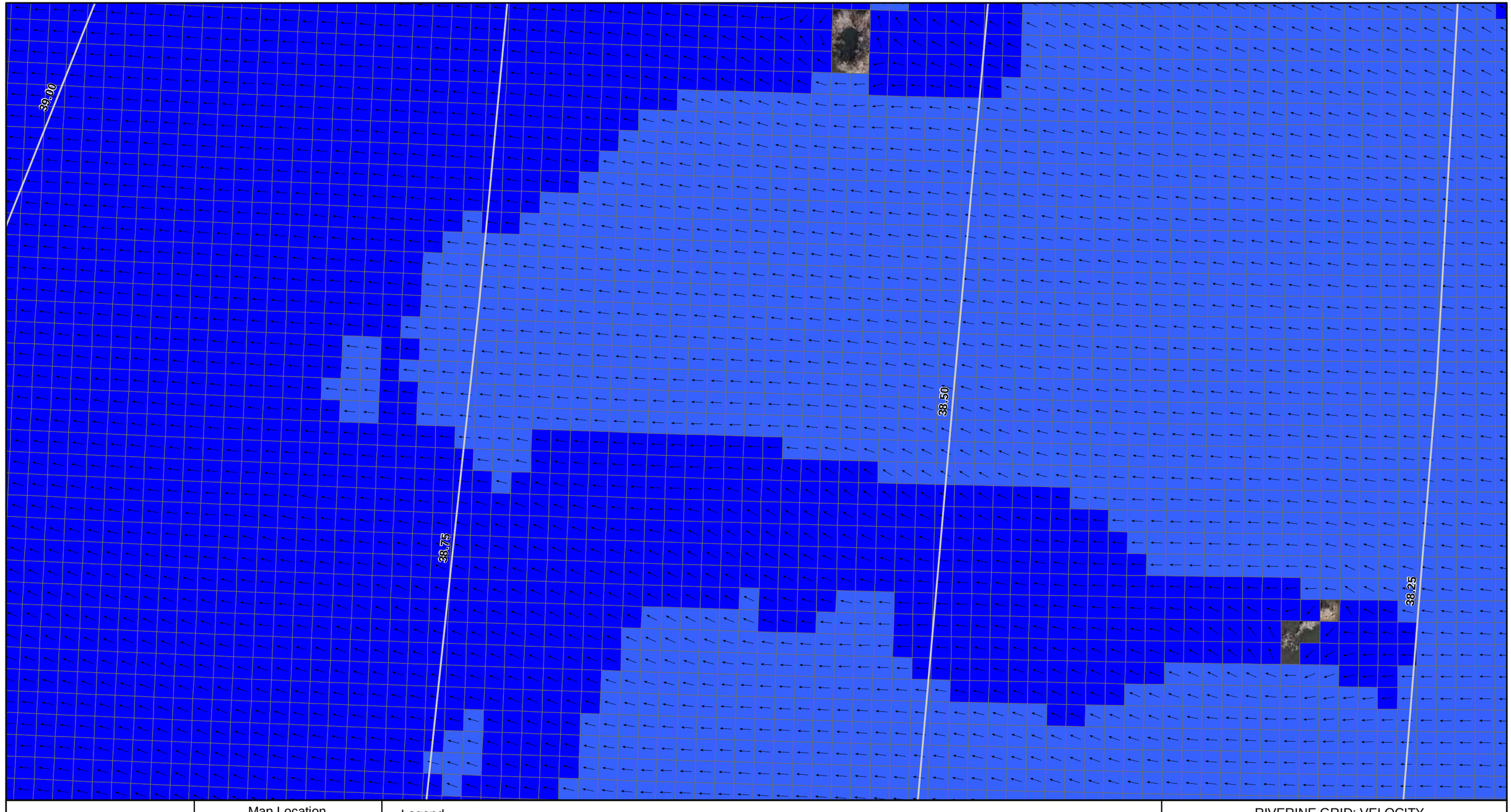
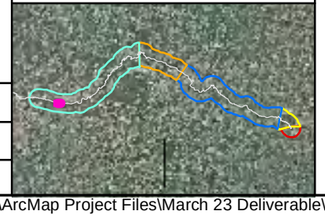
Aerial Photography Date: November 2011



ENBRIDGE	
Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 38.25 - MP 39.00C

SHEET 52 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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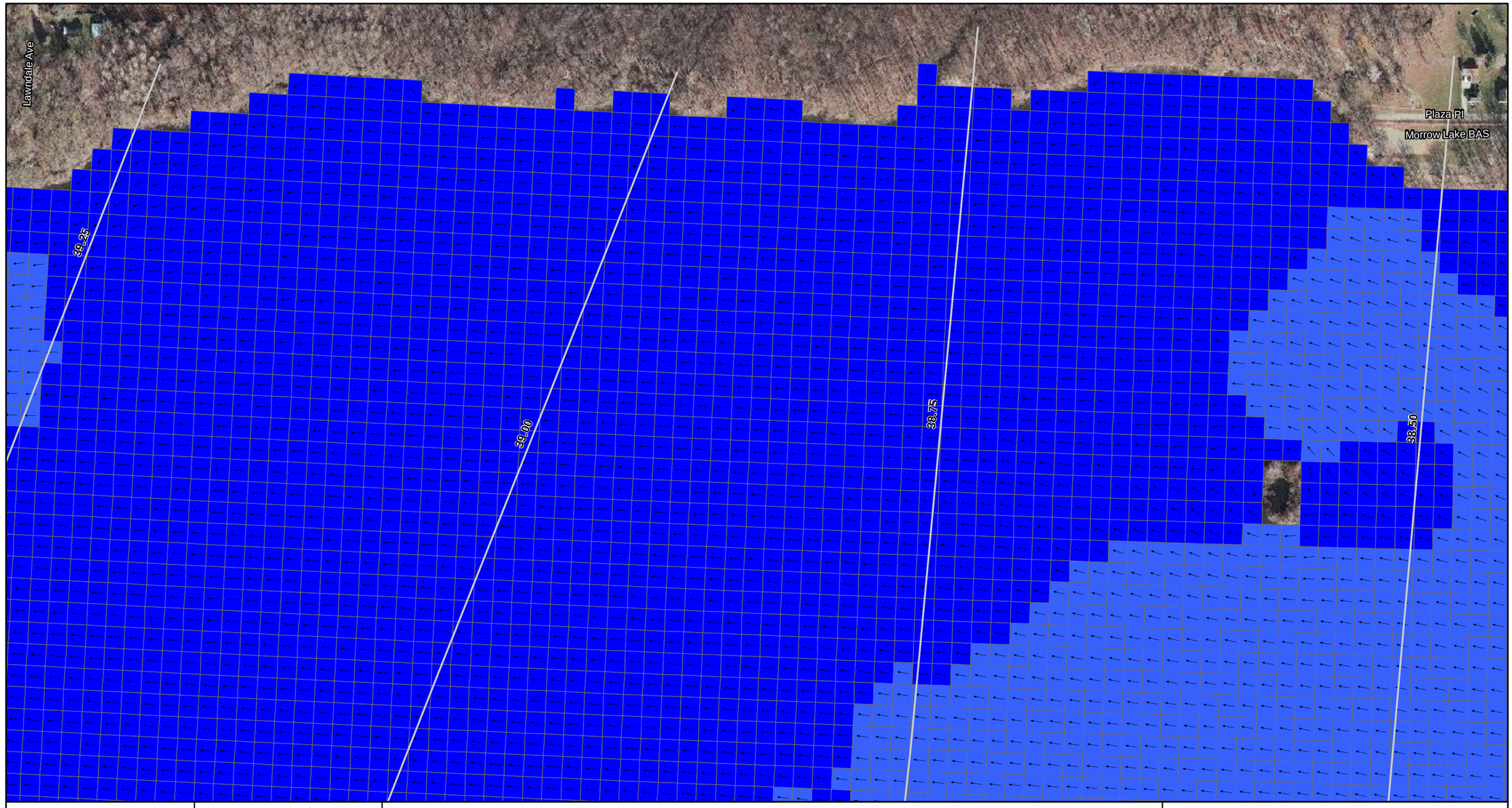
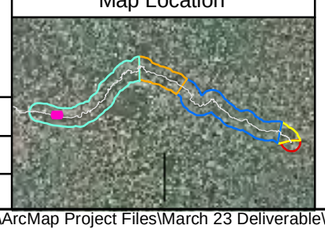
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 38.50 - MP 39.25N

SHEET 53 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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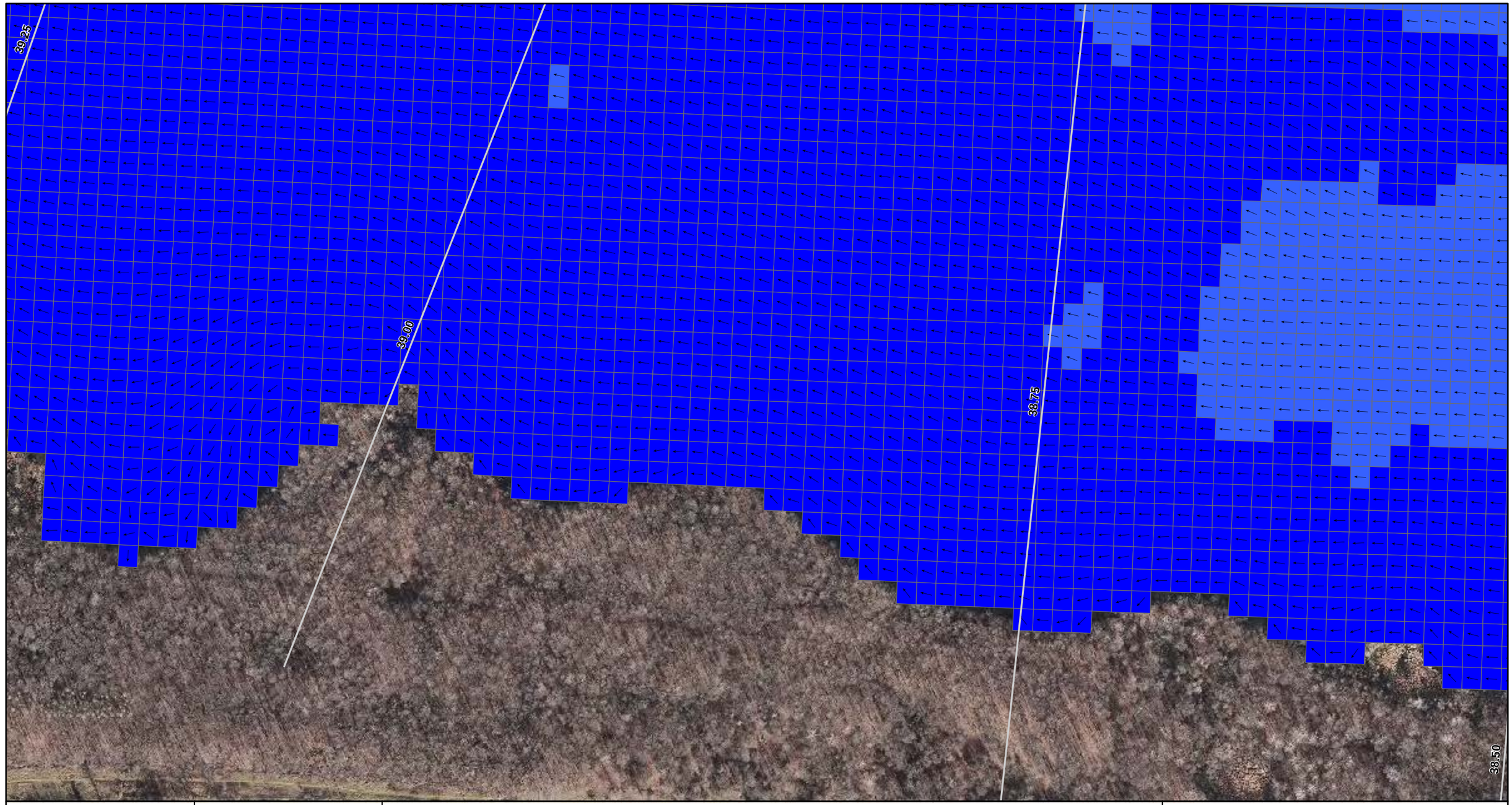
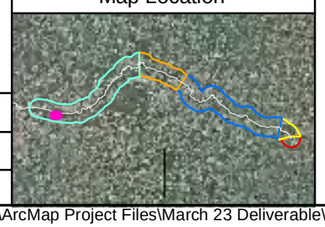
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 38.50 - MP 39.25S

SHEET 54 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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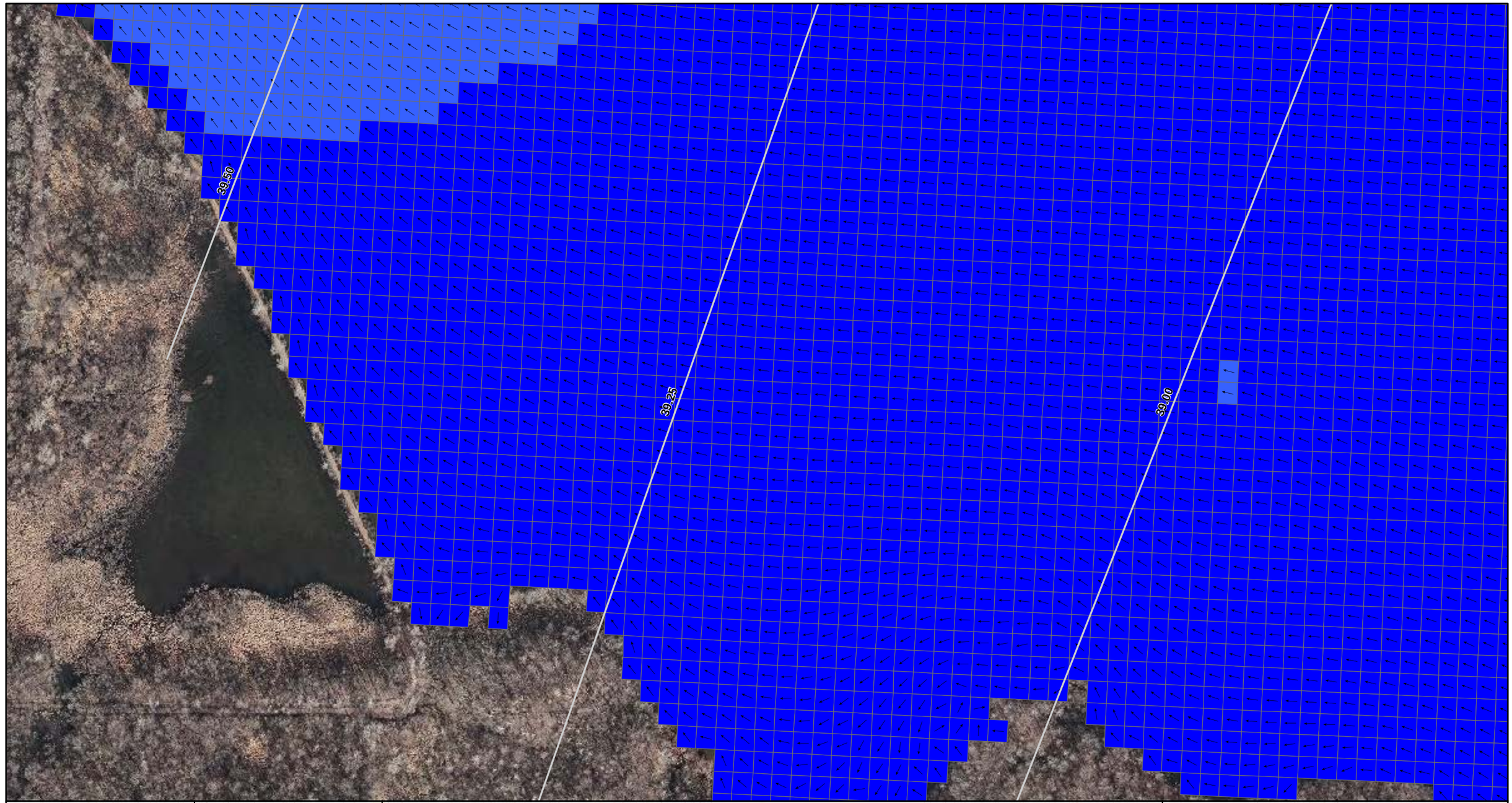
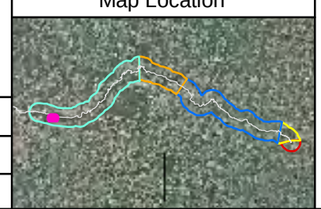
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

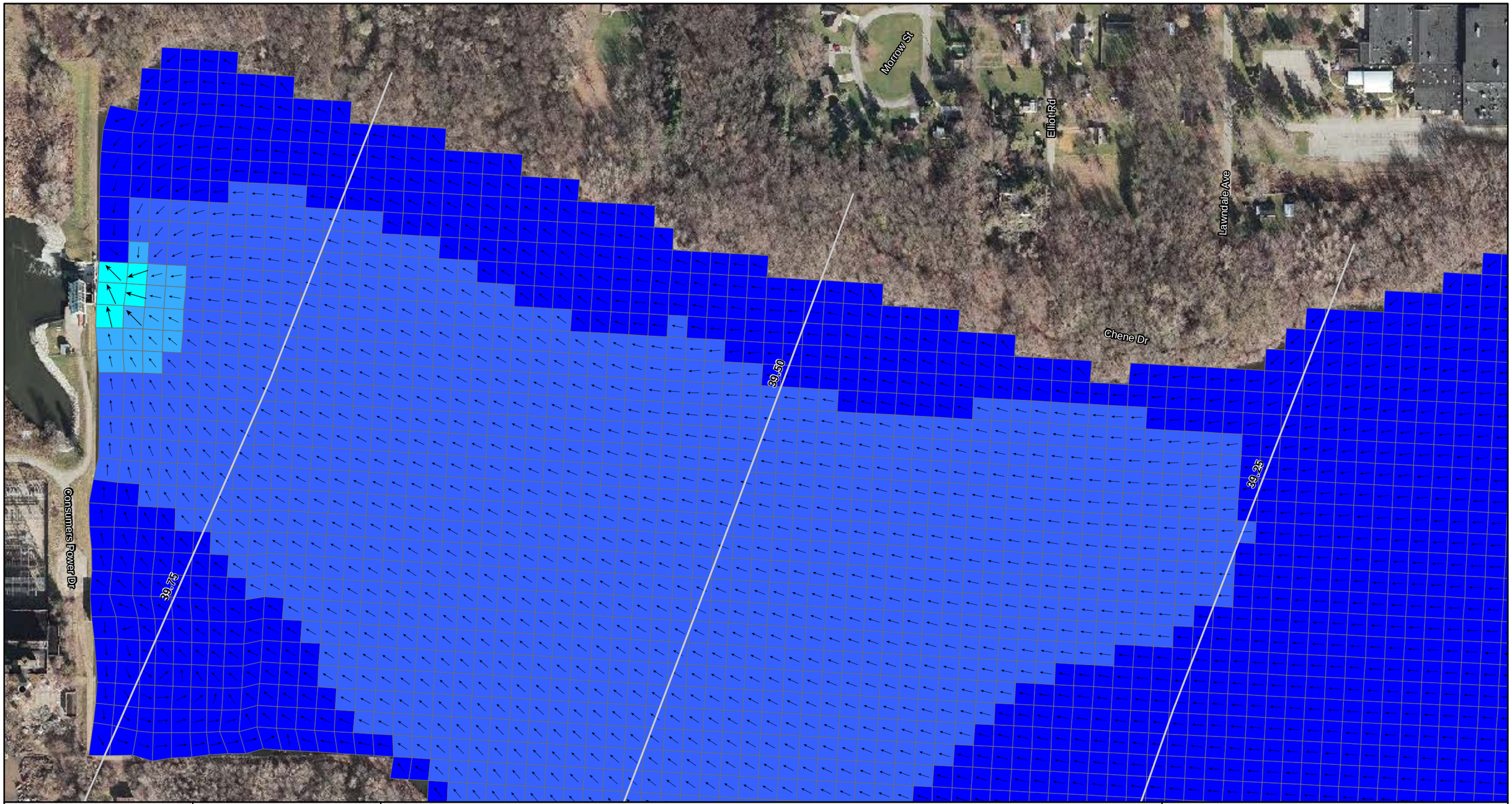
MP 38.90 - MP 39.60S

SHEET 55 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

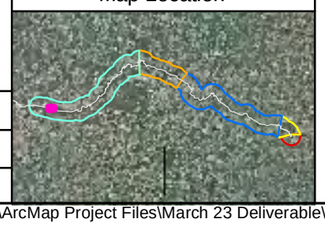
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 12, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 12, 2011

MP 39.15 - MP 39.85

SHEET 56 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr12_2011.mxd

Aerial Photography Date: November 2011

Figure 6-25

Riverine Grid: Velocity

April 16, 2011

Sheets 1 through 56

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

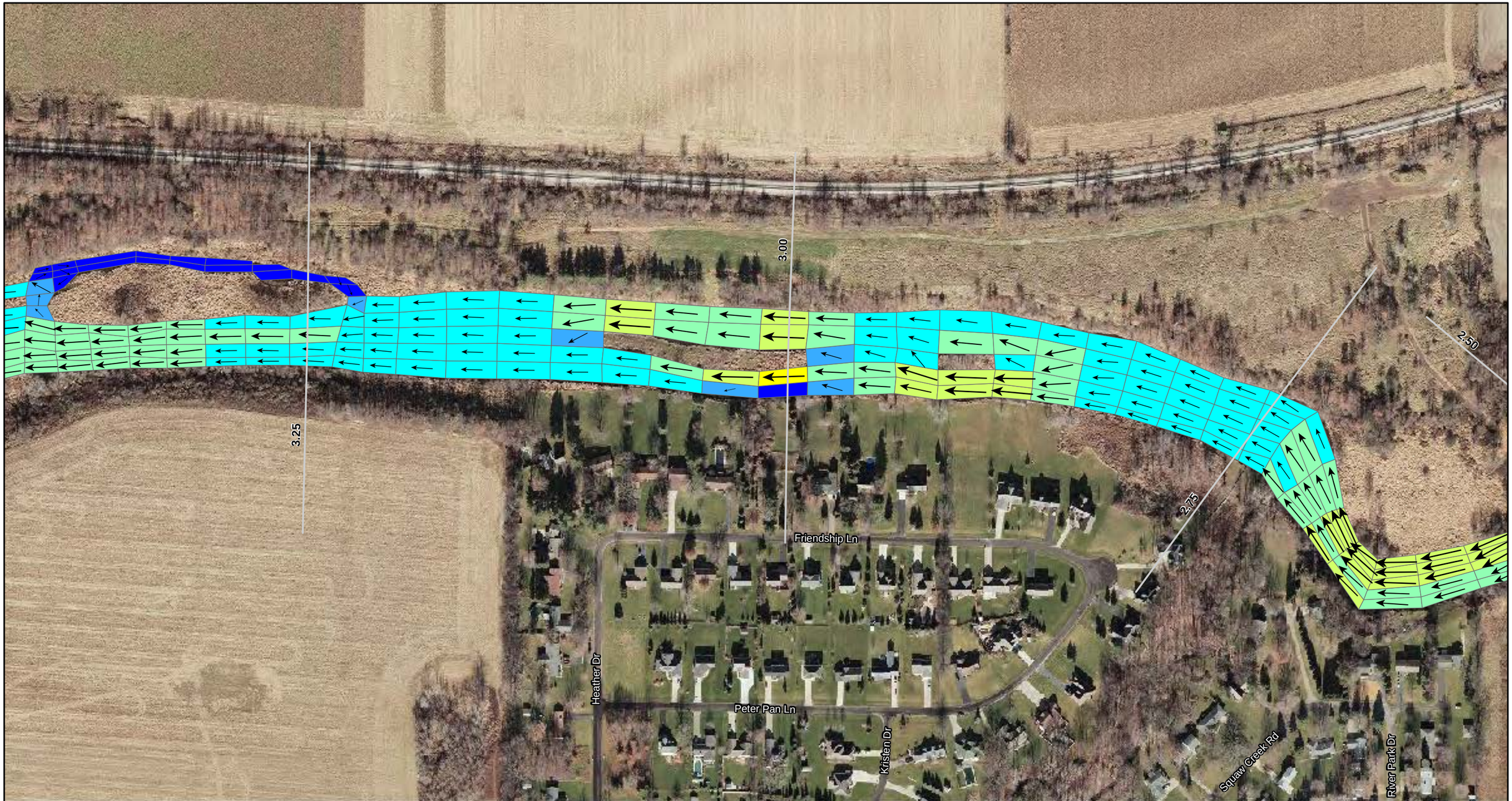
MP 01.95 - MP 02.75

SHEET 1 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

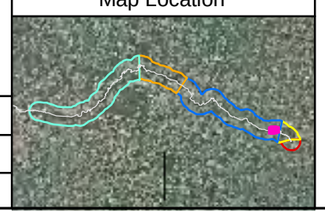
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 02.60 - MP 03.40

SHEET 2 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

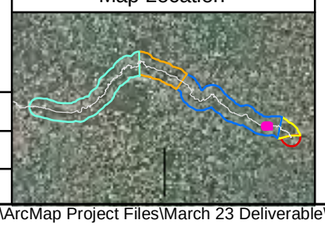
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

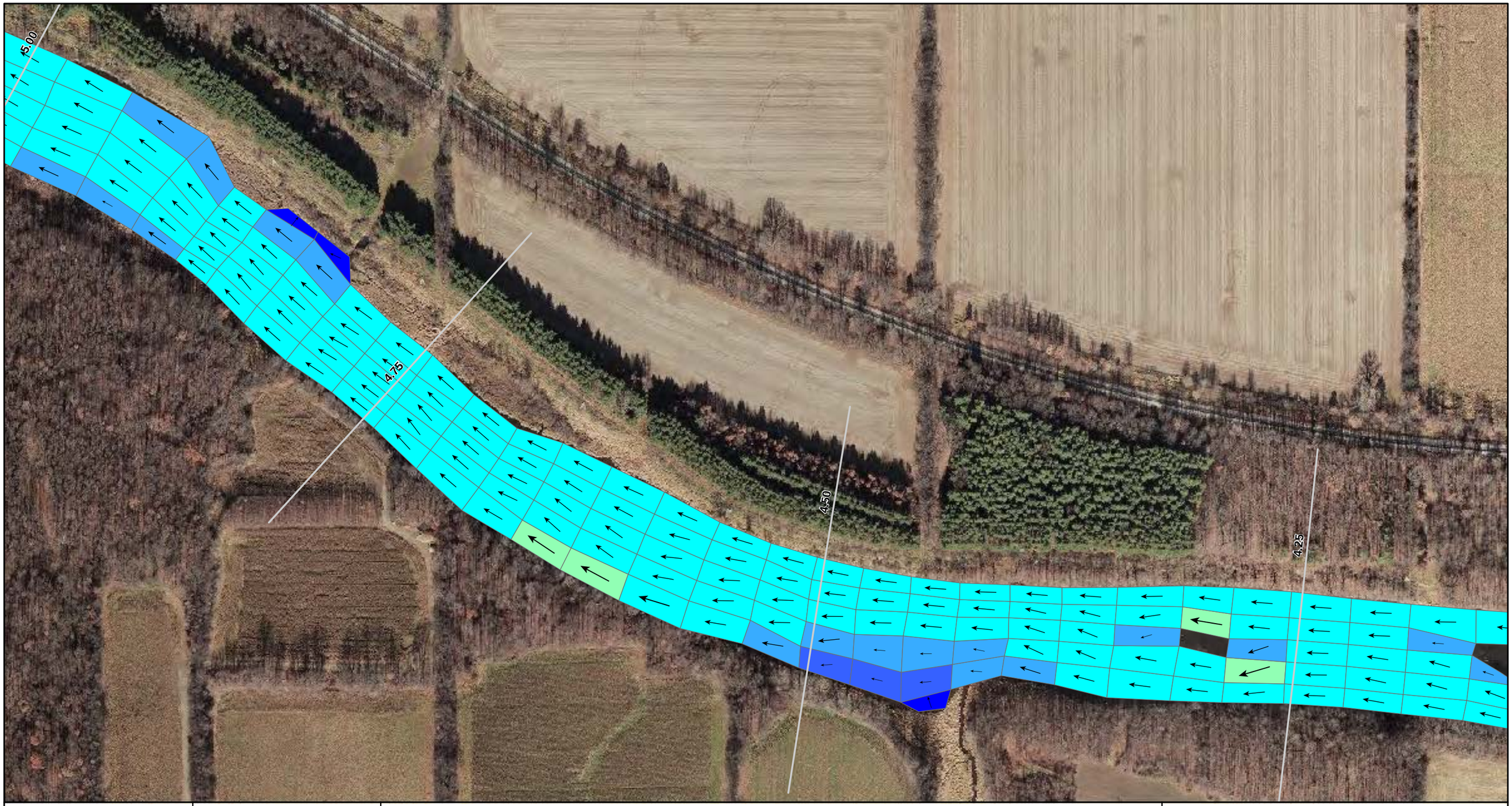
MP 03.40 - MP 04.20

SHEET 3 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

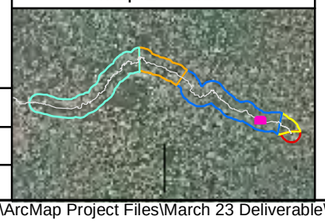
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

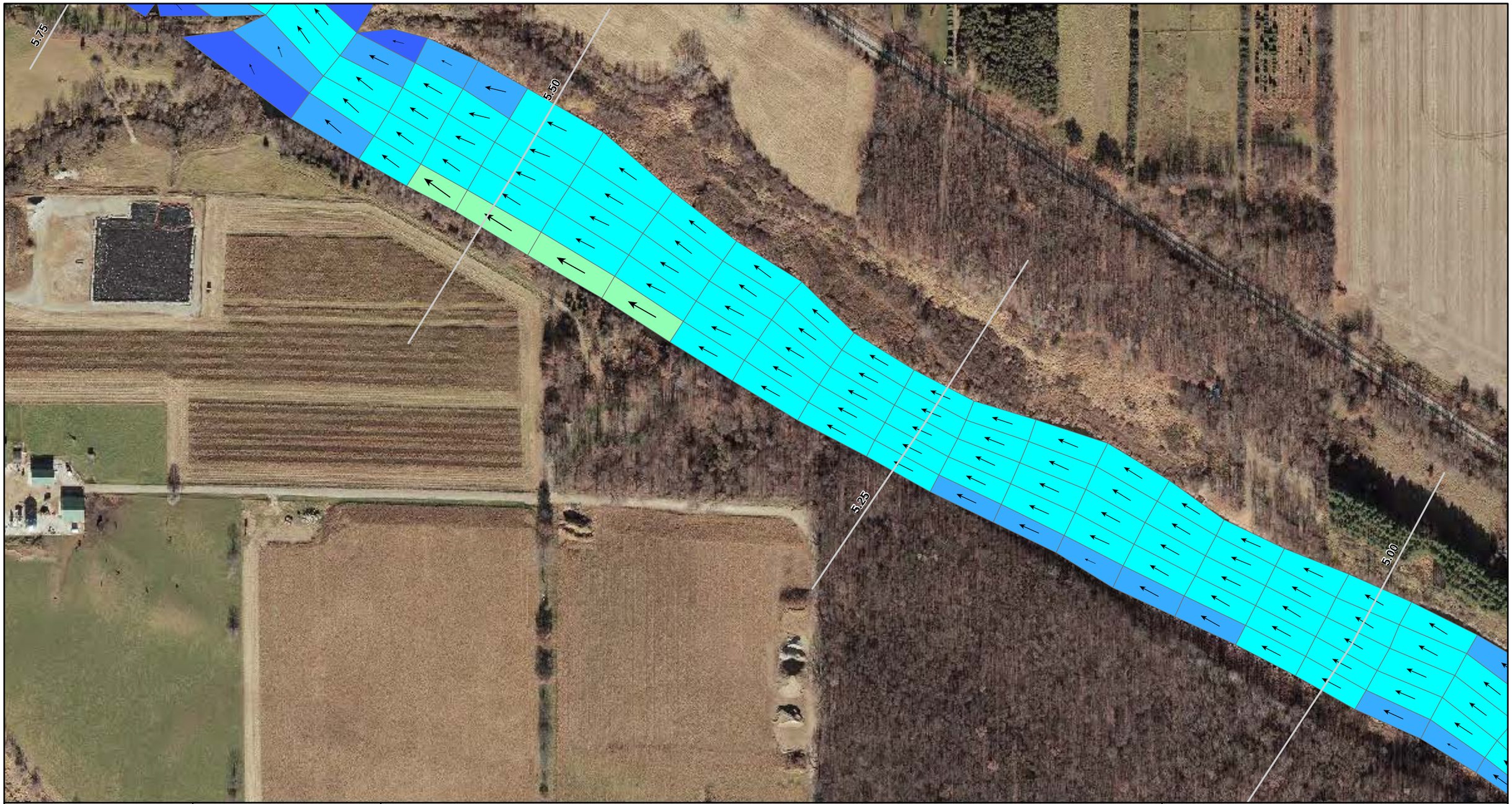
MP 04.15 - MP 05.00

SHEET 4 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

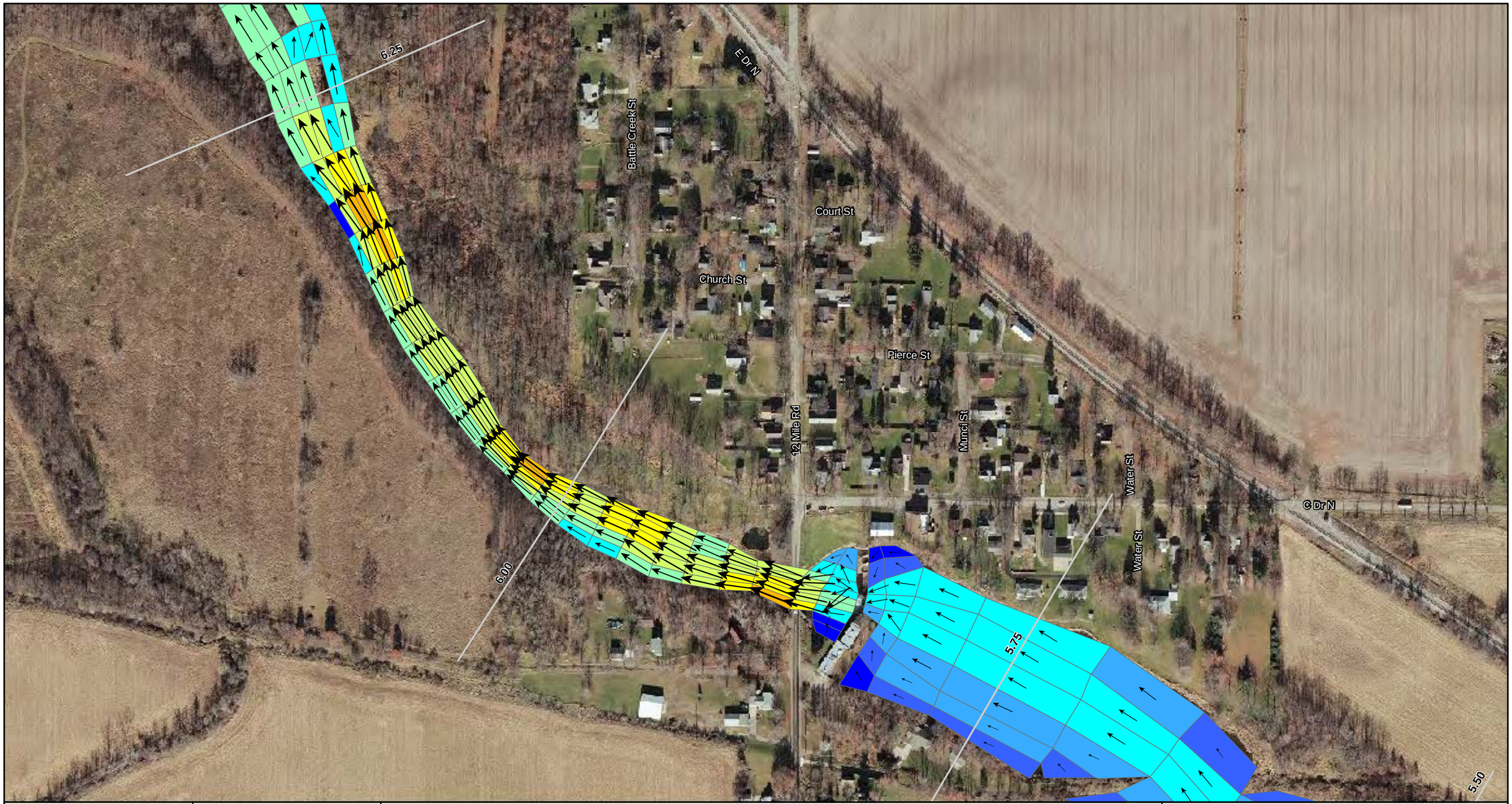
MP 04.90 - MP 05.65

SHEET 5 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

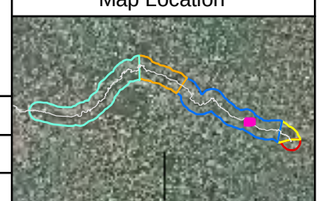
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

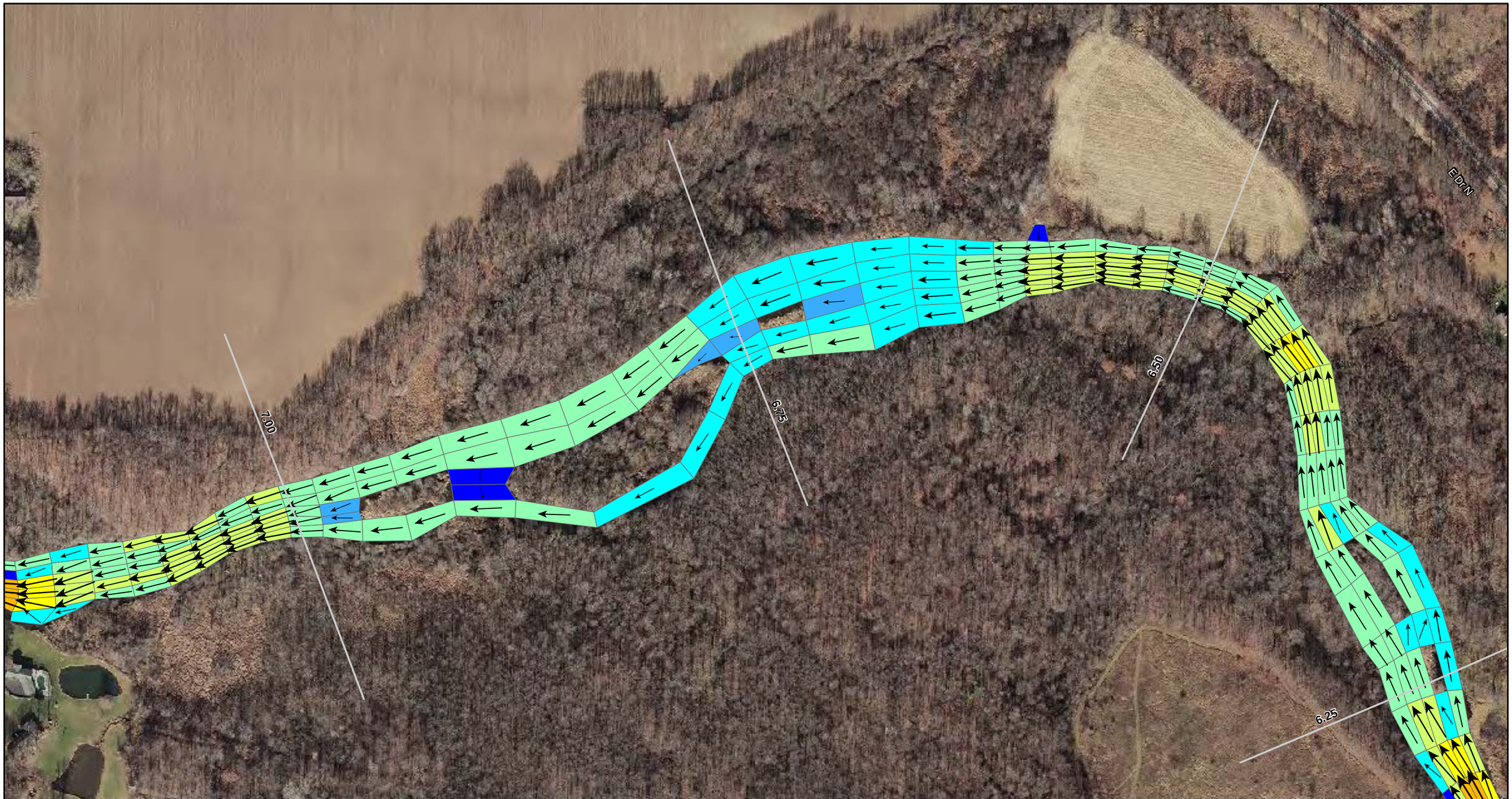
MP 05.65 - MP 06.30

SHEET 6 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 06.20 - MP 07.15

SHEET 7 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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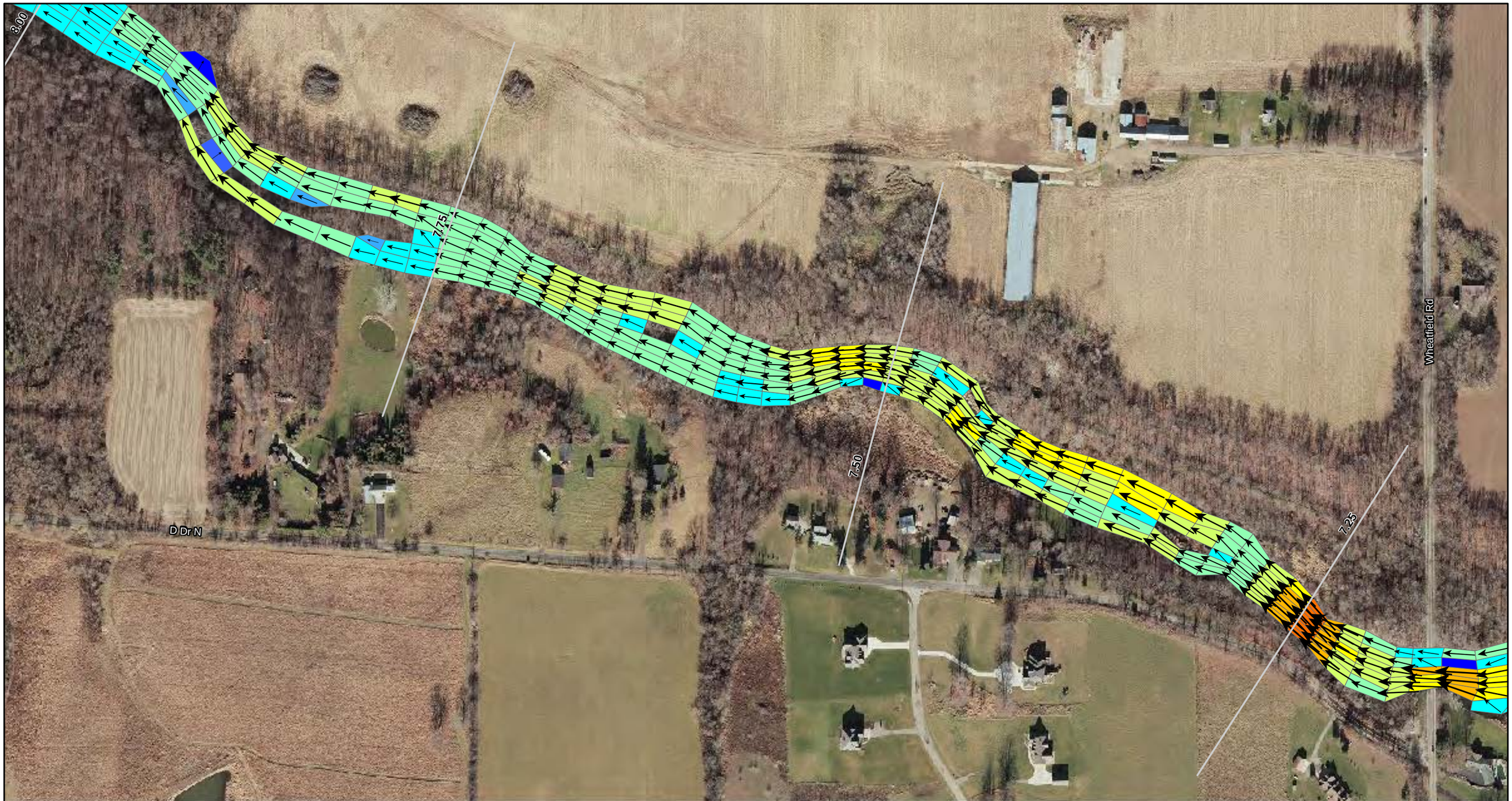
Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 07.15 - MP 07.95

SHEET 8 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

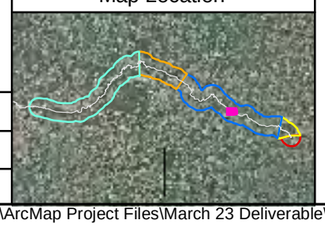
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 07.90 - MP 08.75

SHEET 9 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

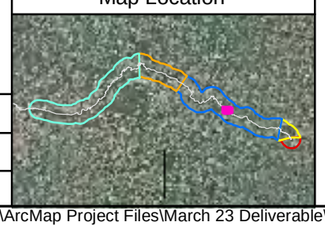
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

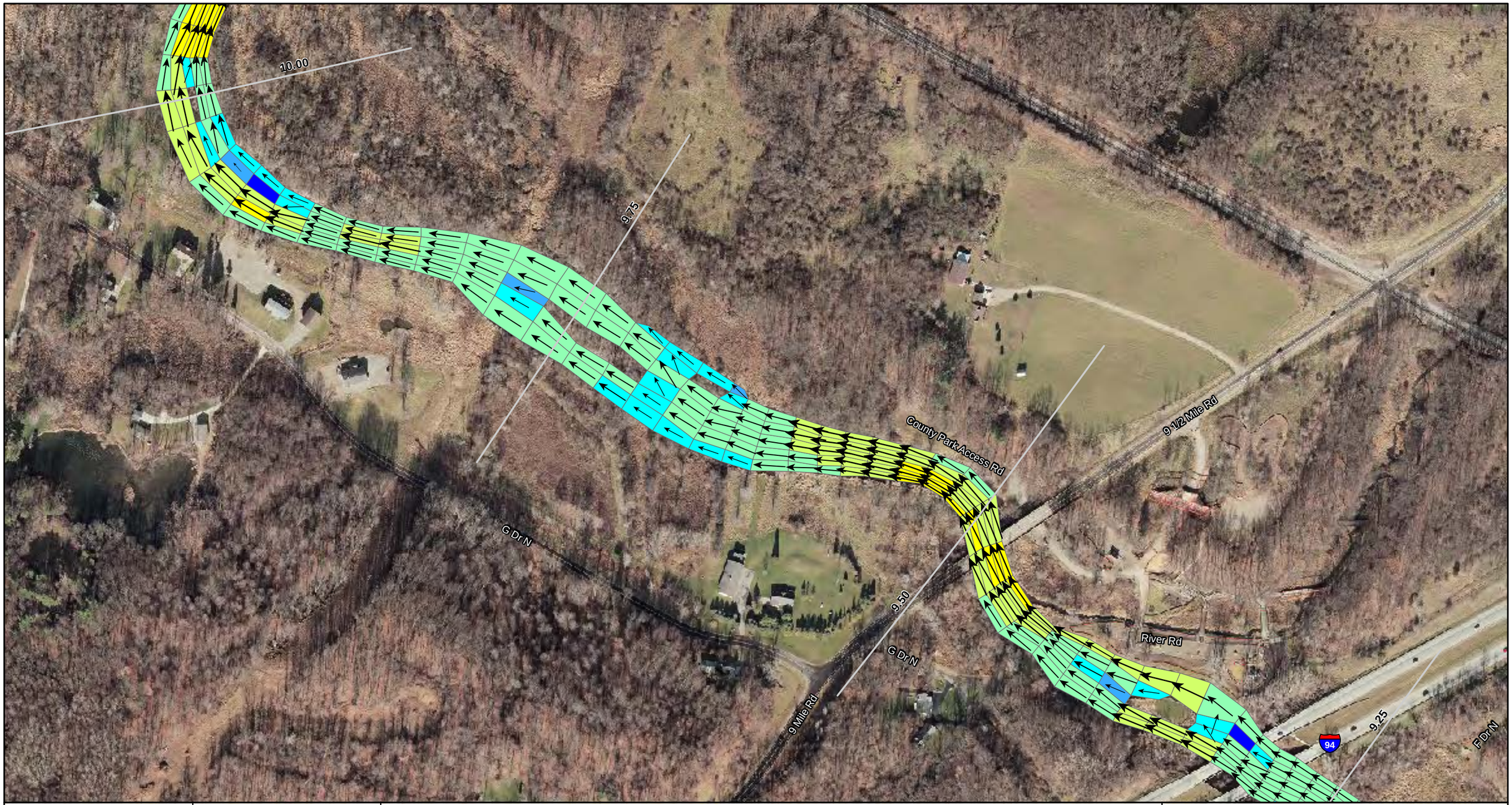
MP 08.70 - MP 09.30

SHEET 10 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

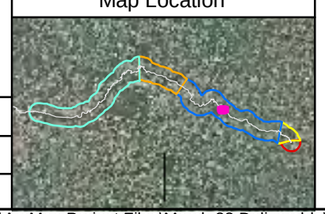
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 09.25 - MP 10.05

SHEET 11 OF 56

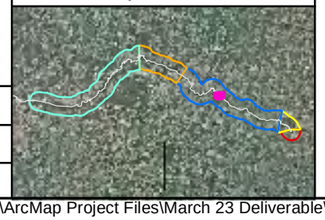
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 10.00 - MP 10.65

SHEET 12 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

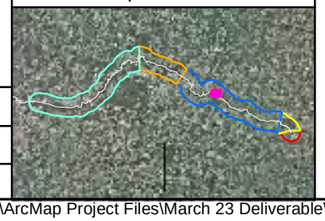
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

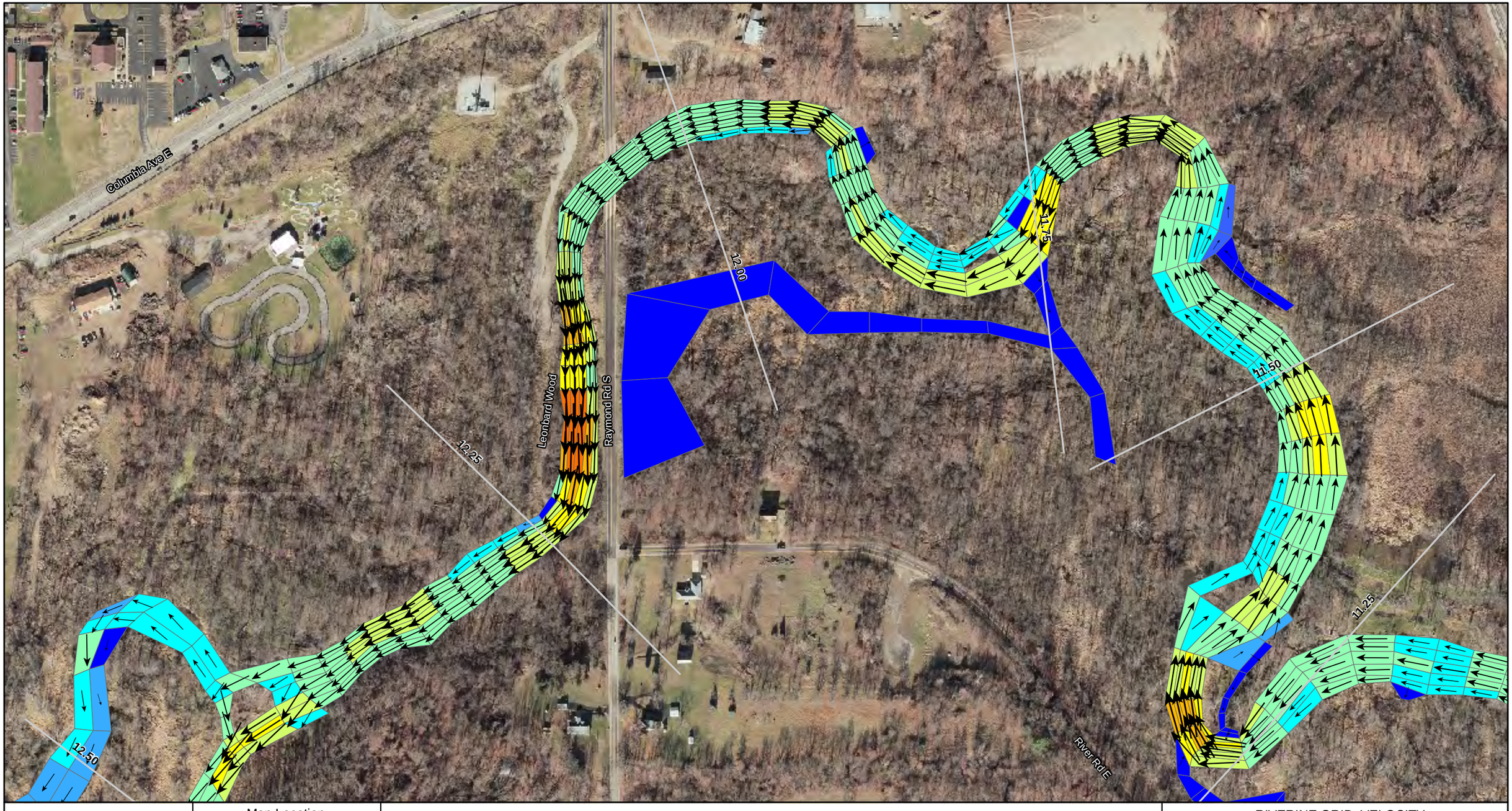
MP 10.60 - MP 11.40

SHEET 13 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

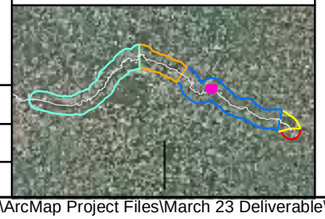
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

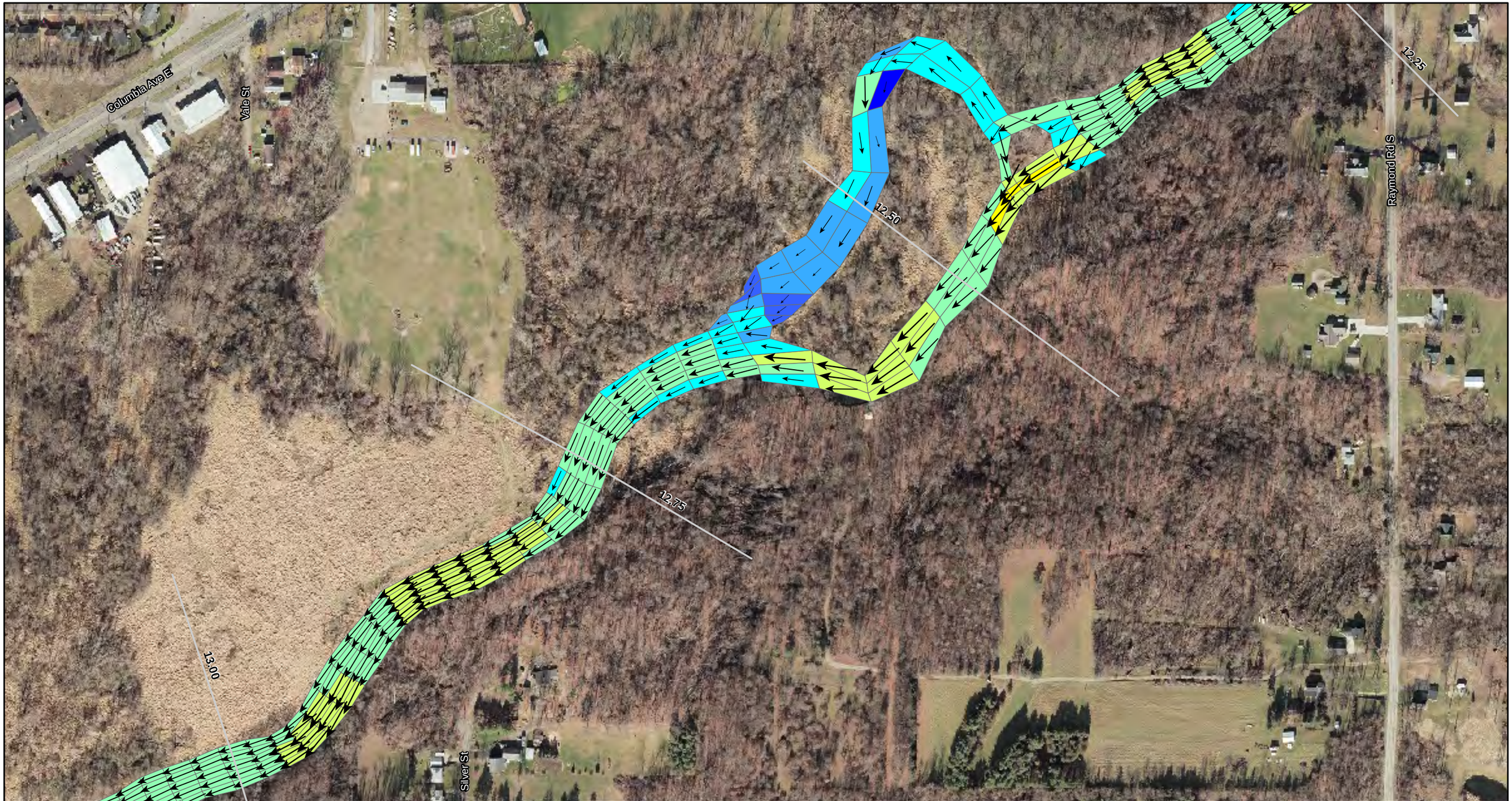
MP 11.10 - MP 12.45

SHEET 14 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

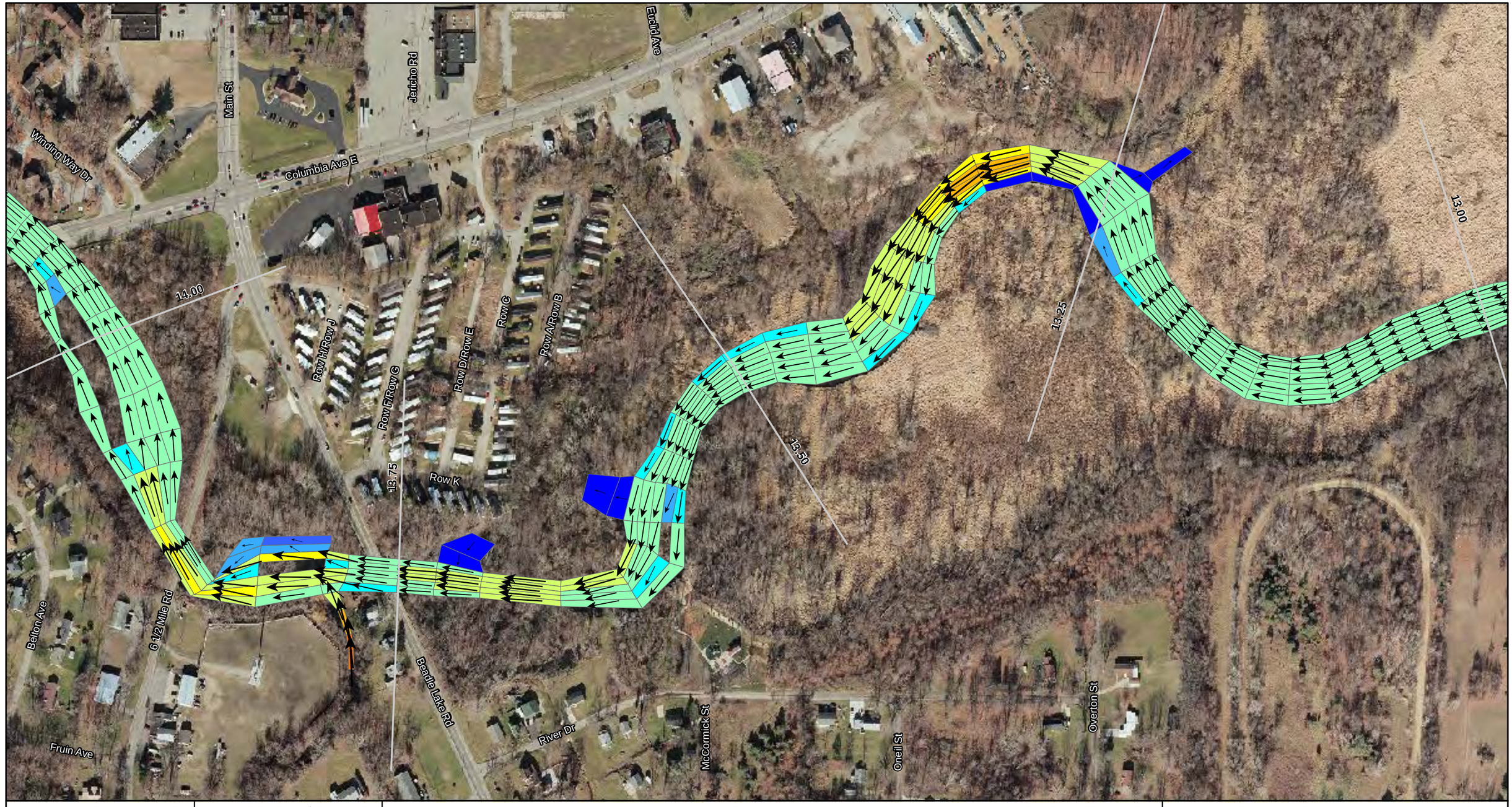
MP 12.30 - MP 13.05

SHEET 15 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

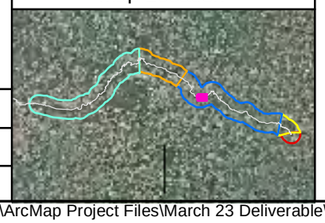
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 13.00 - MP 14.10

SHEET 16 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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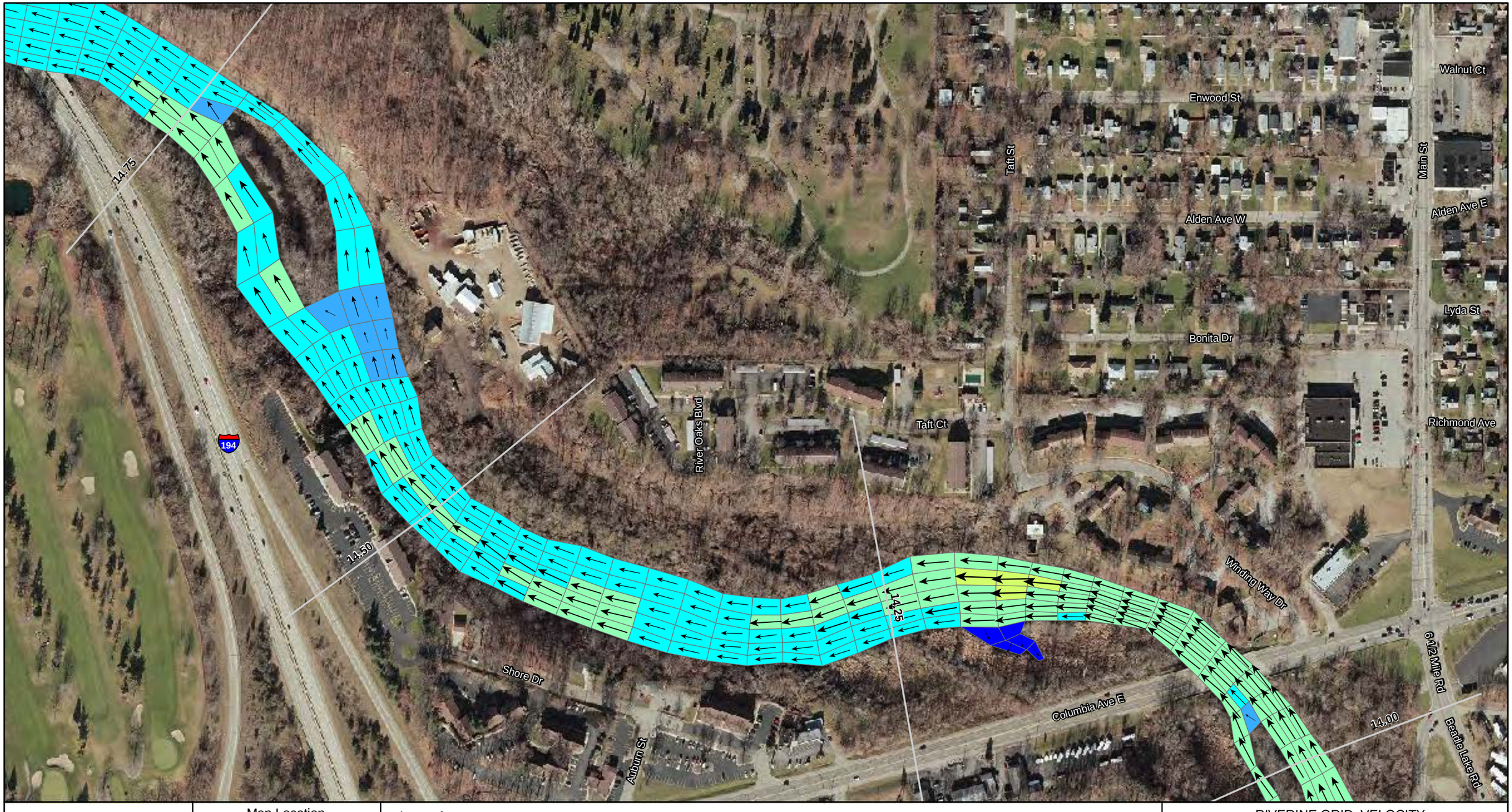
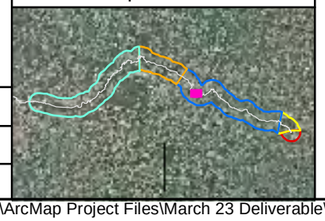
Aerial Photography Date: November 2011



Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: VELOCITY
APRIL 16, 2011

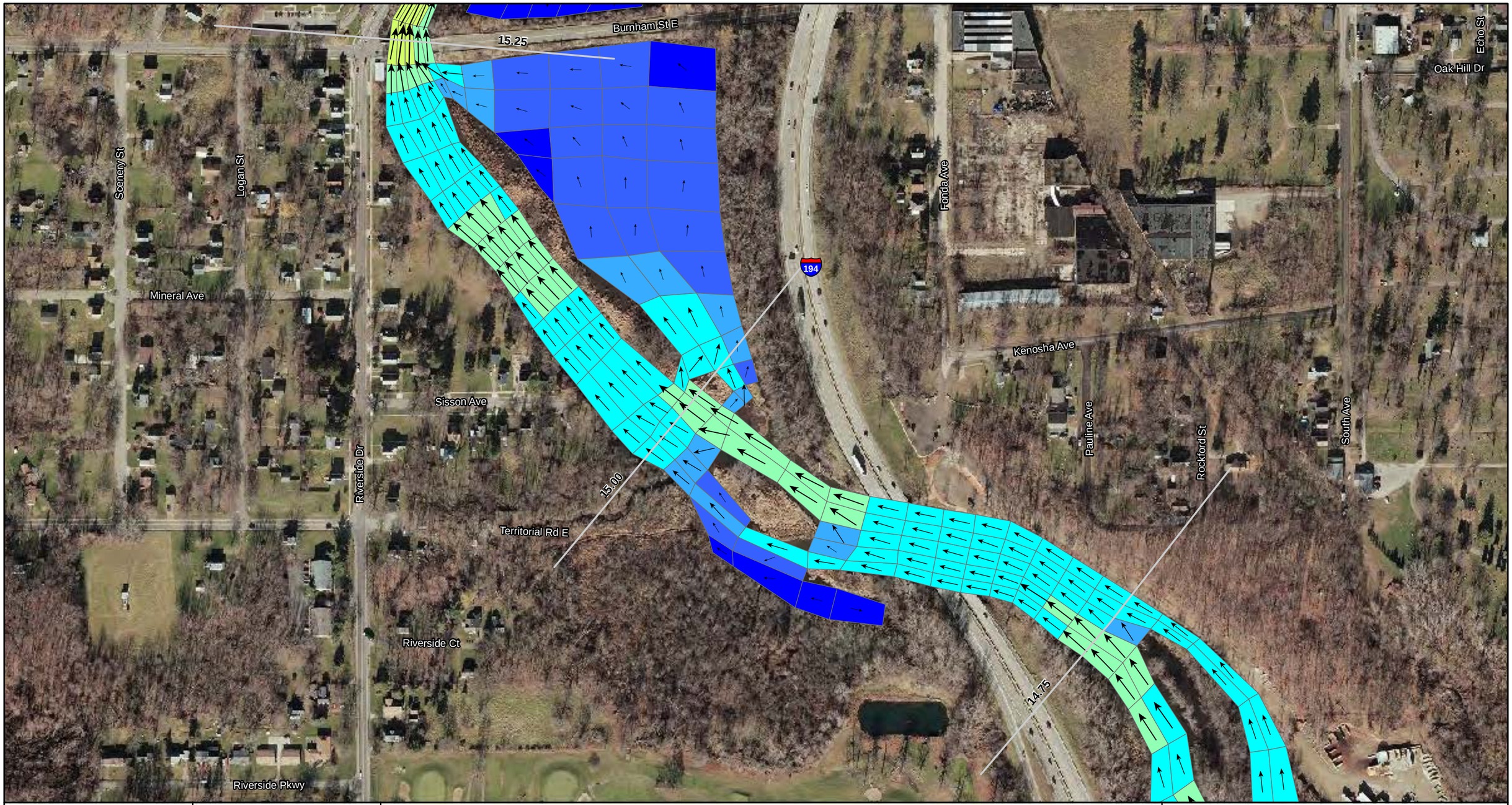
MP 14.00 - MP 14.85

SHEET 17 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

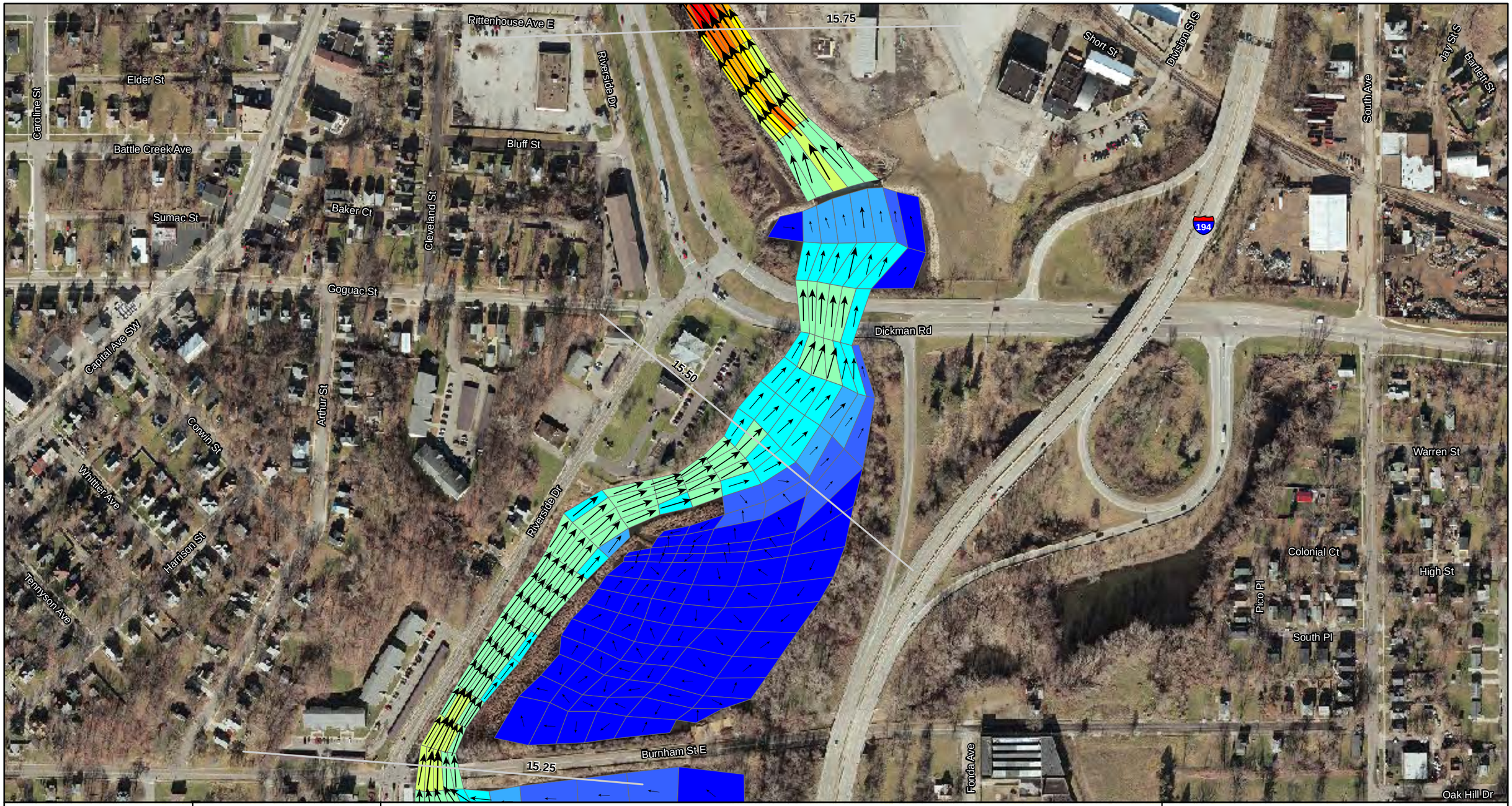
MP 14.65 - MP 15.25

SHEET 18 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

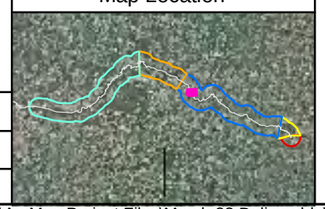
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 15.25 - MP 15.75

SHEET 19 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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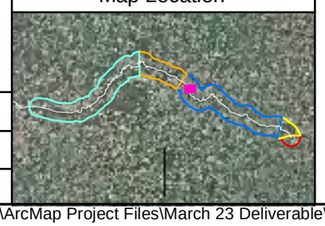
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 15.75 - MP 16.30

SHEET 20 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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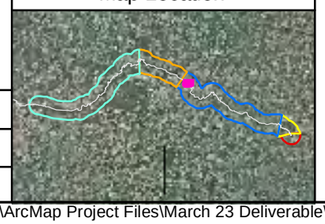
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 16.30 - MP 16.95

SHEET 21 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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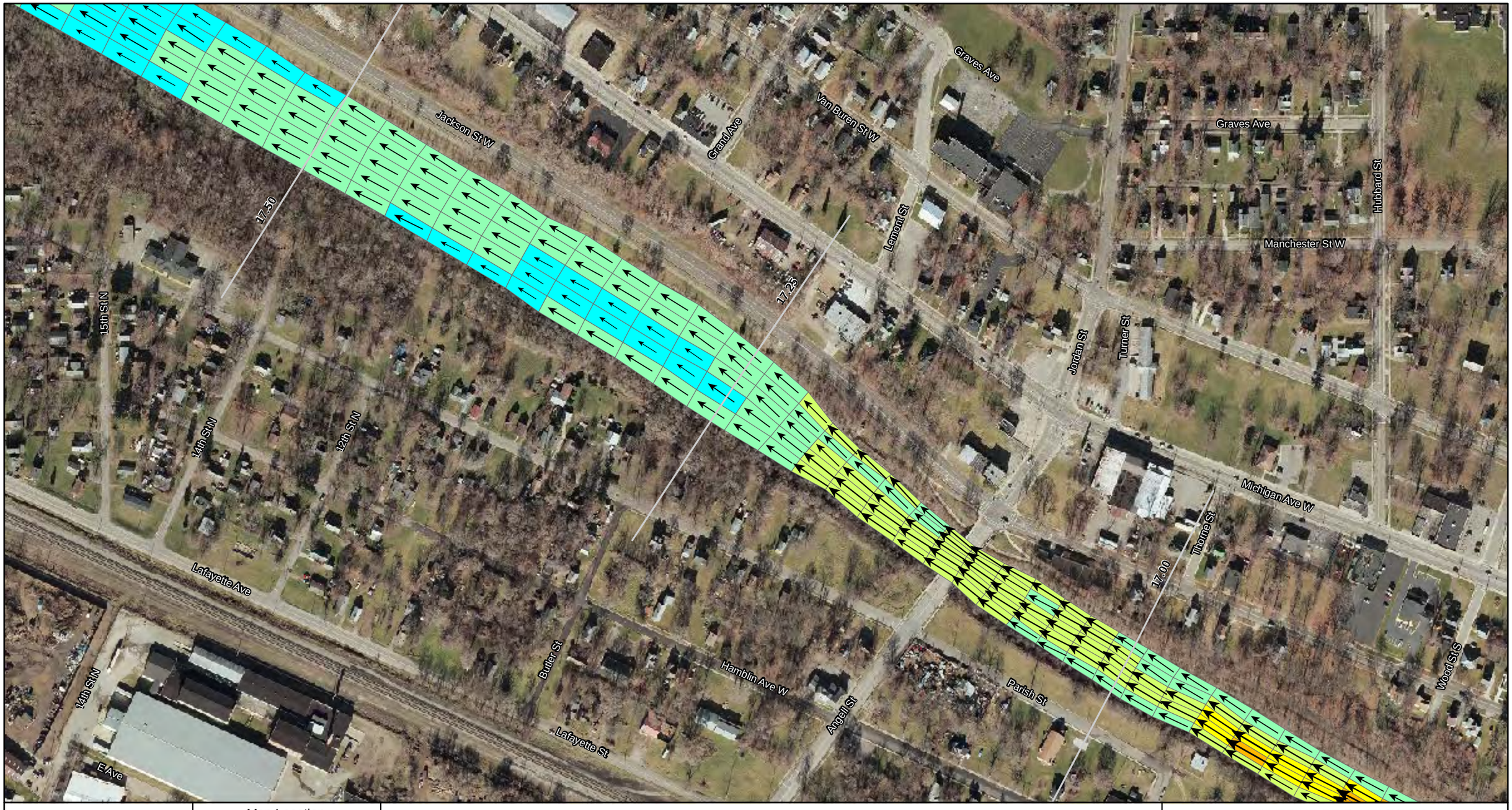
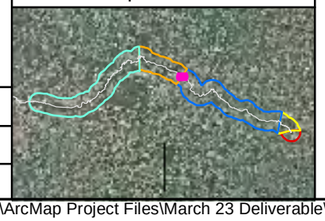
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

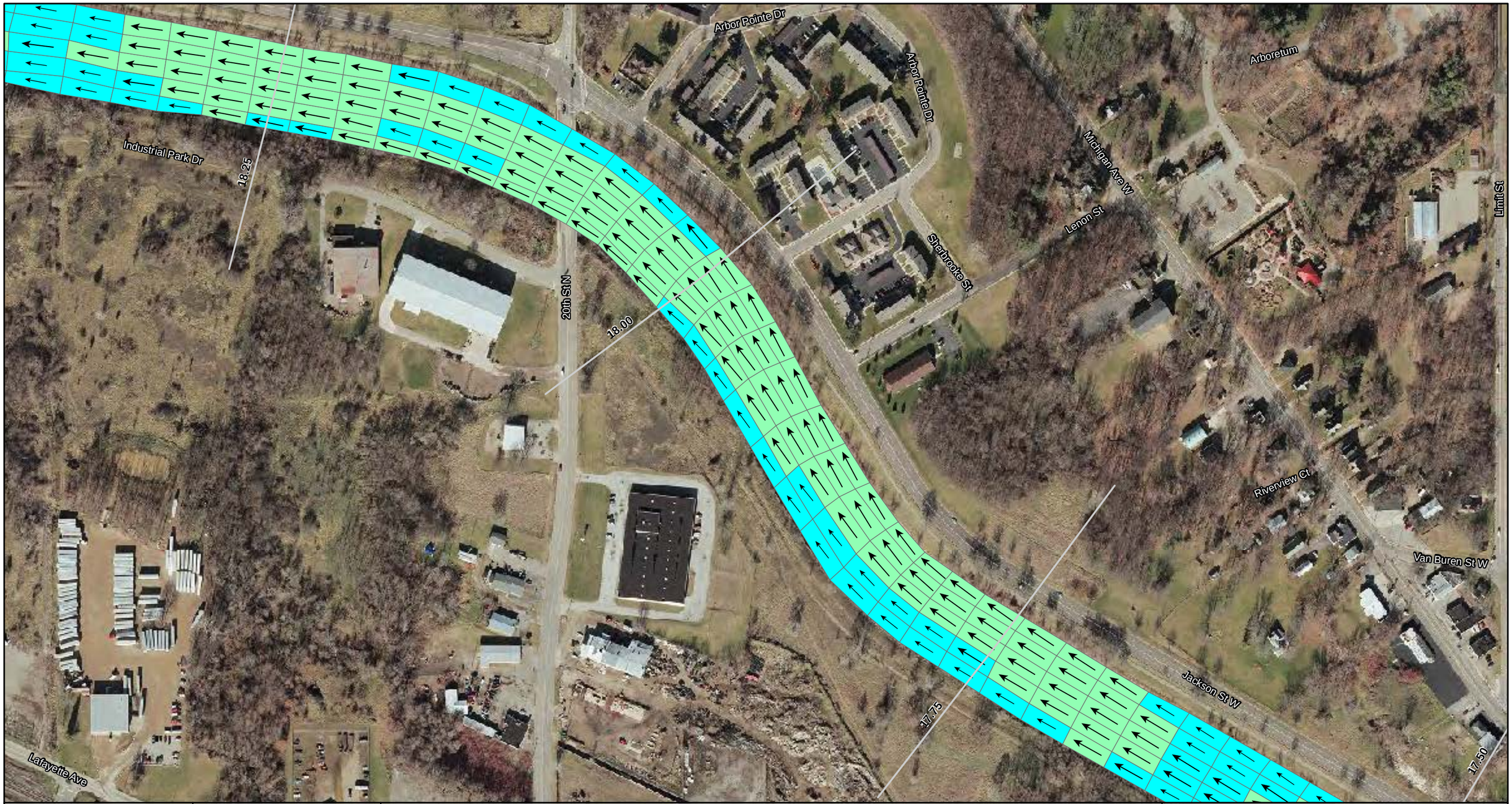
MP 16.85 - MP 17.60

SHEET 22 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

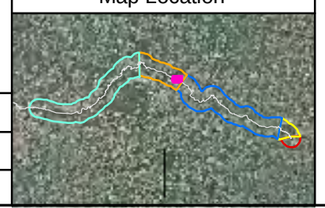
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 17.60 - MP 18.40

SHEET 23 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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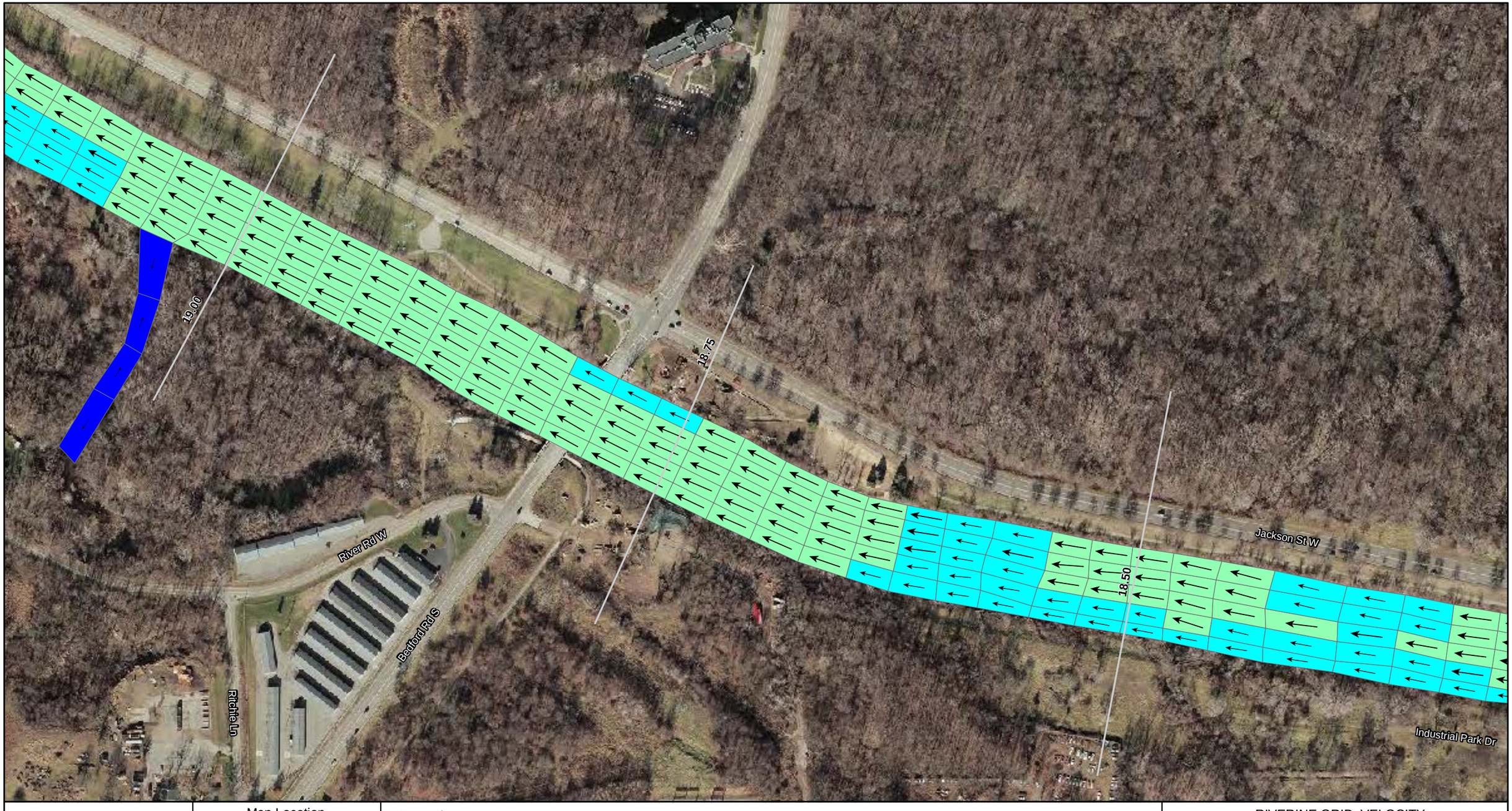
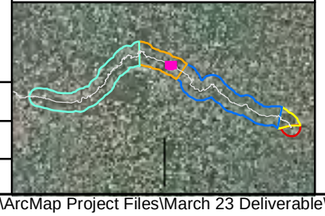
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

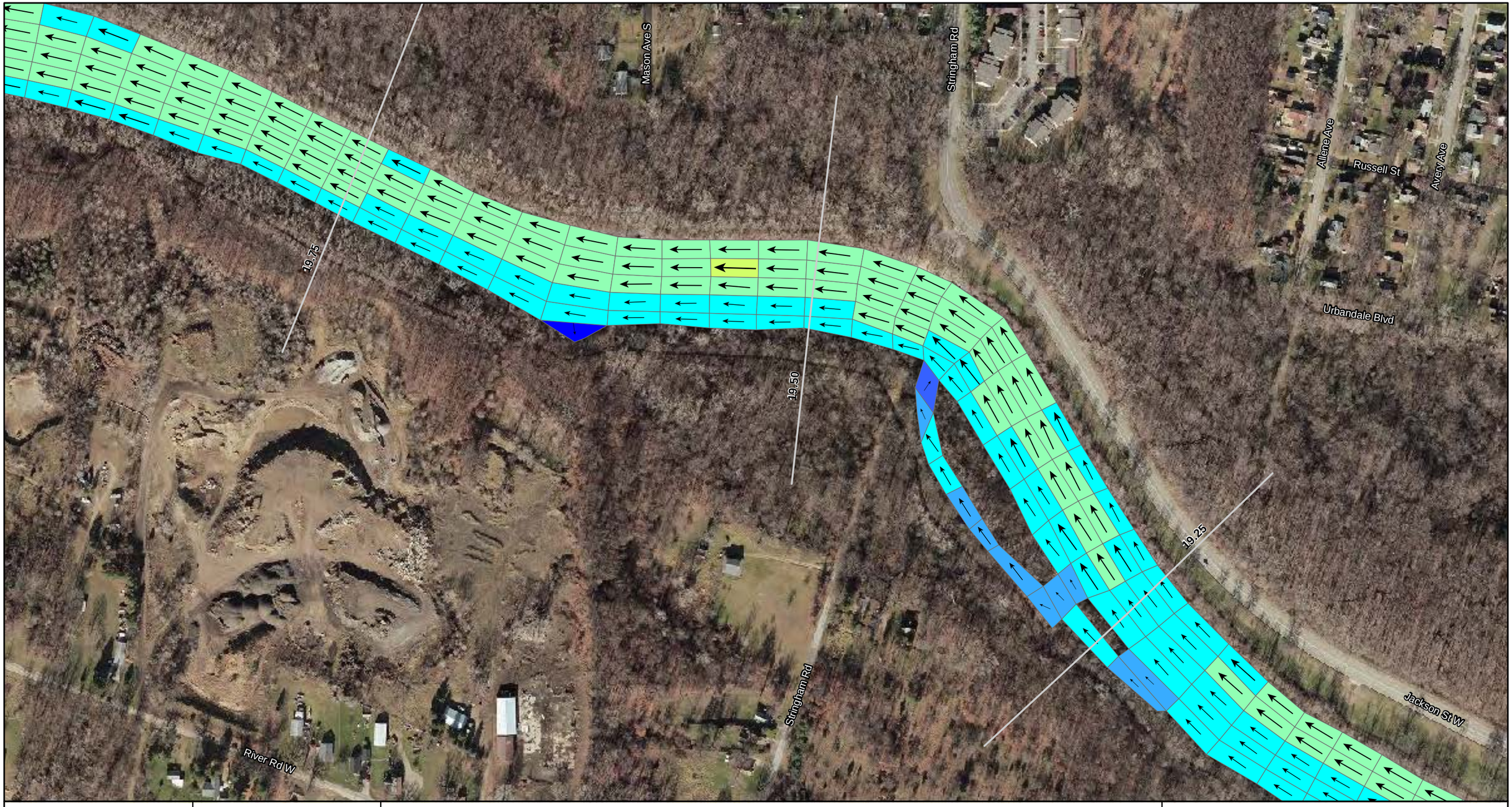
MP 18.30 - MP 19.15

SHEET 24 OF 56

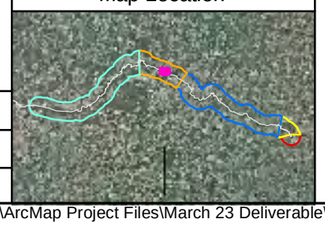
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: VELOCITY
APRIL 16, 2011

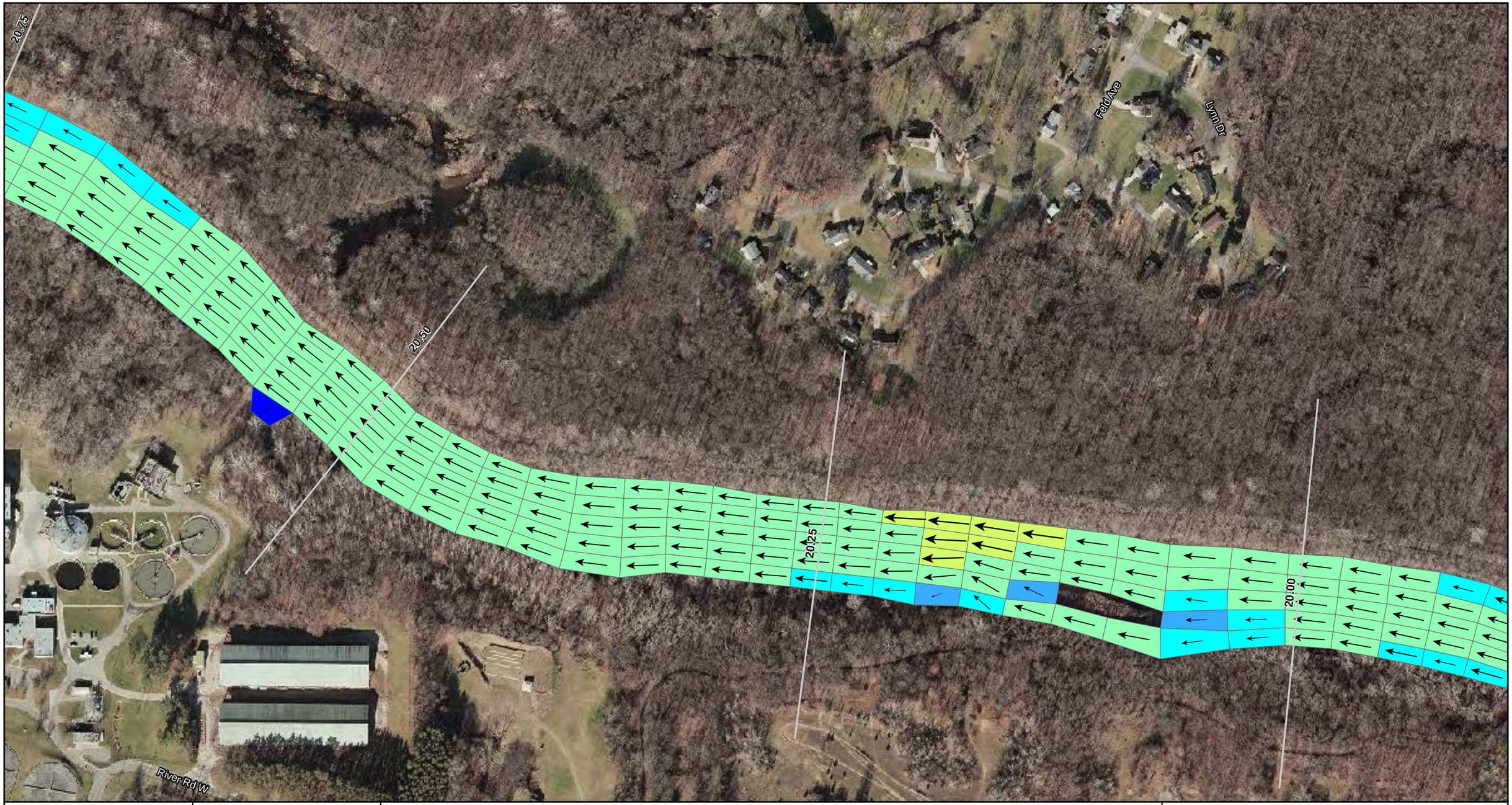
MP 19.10 - MP 19.95

SHEET 25 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

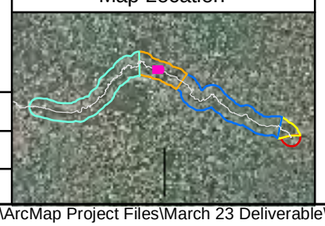
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

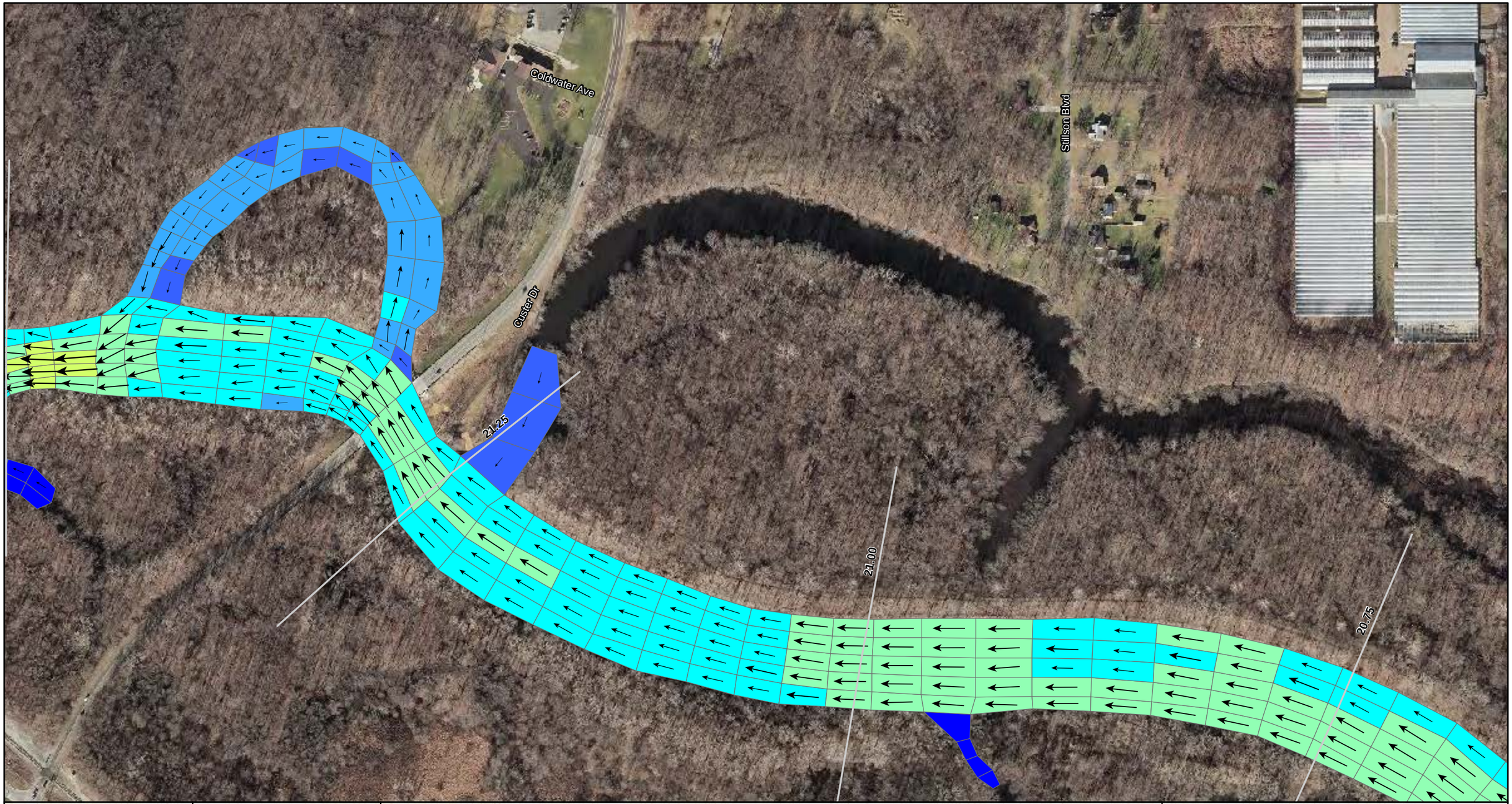
MP 19.90 - MP 20.75

SHEET 26 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

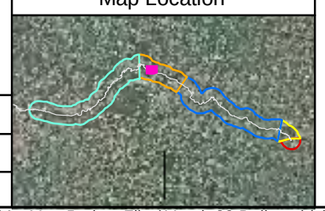
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 20.70 - MP 21.50

SHEET 27 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

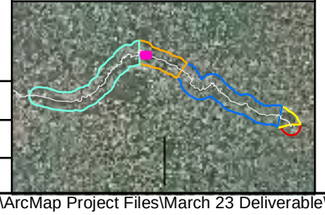
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

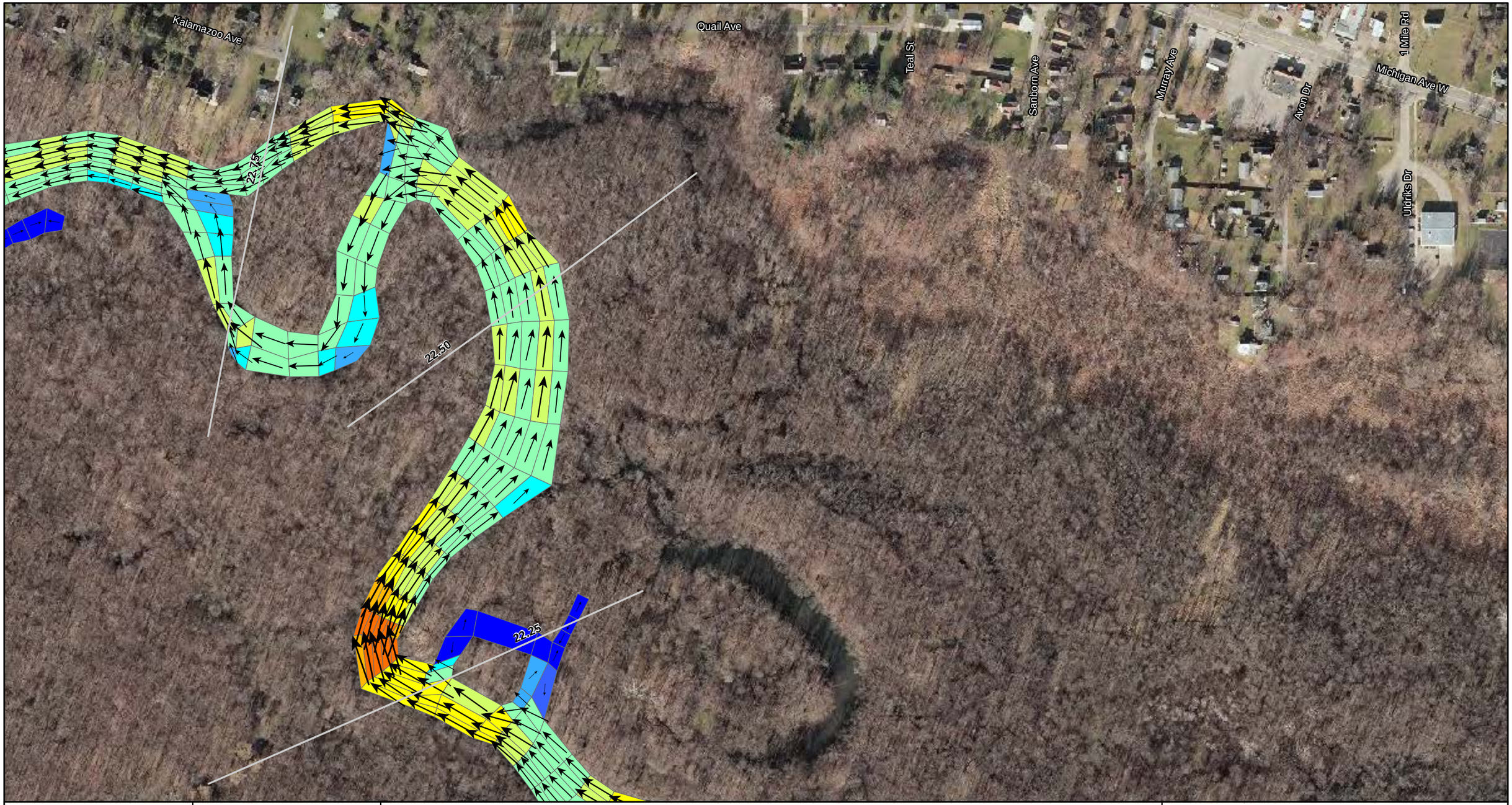
MP 21.35 - MP 22.15

SHEET 28 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

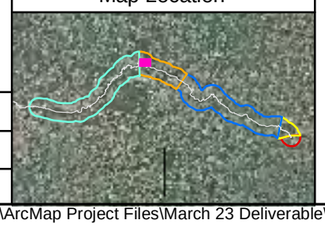
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

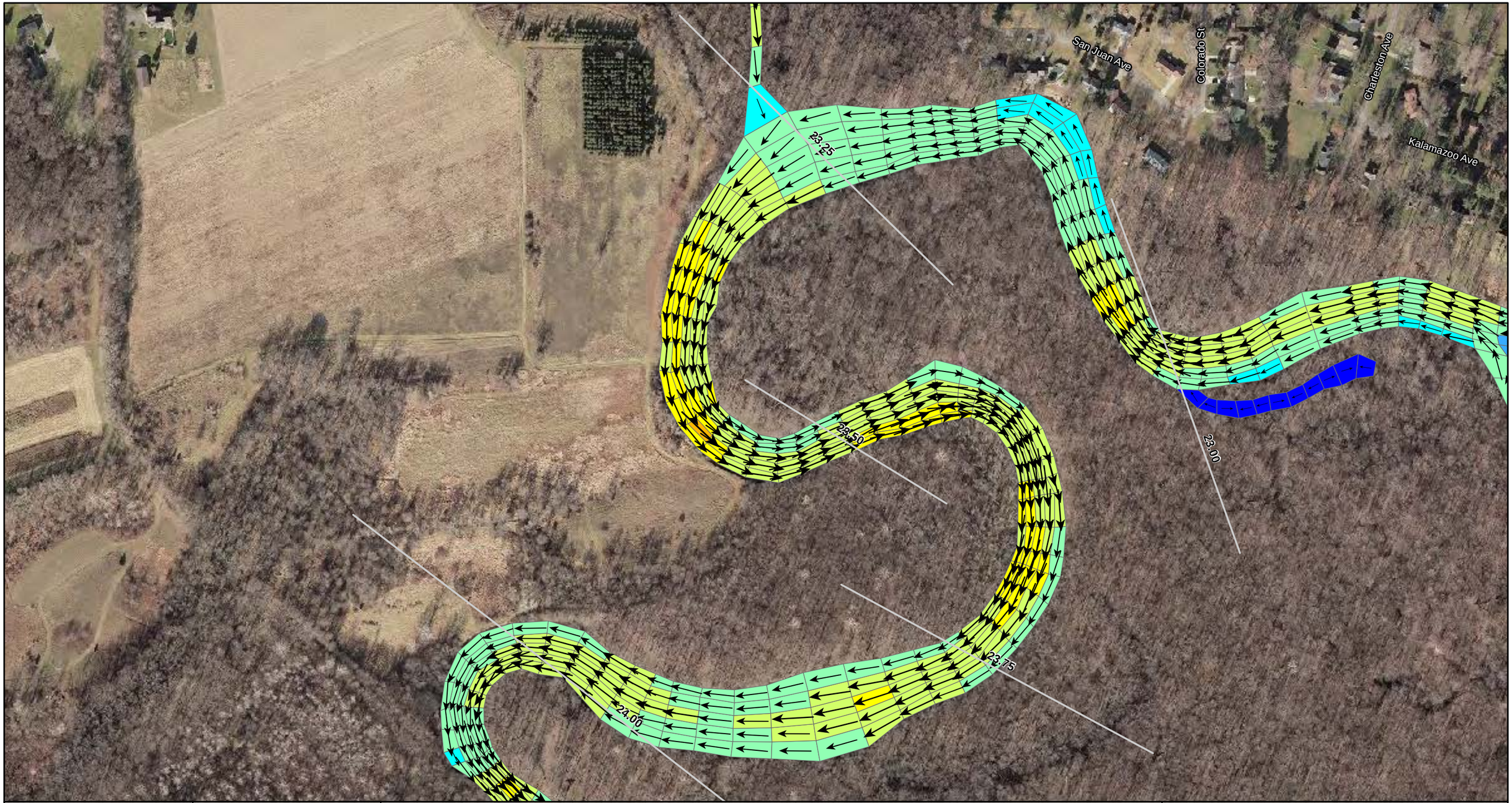
MP 22.15 - MP 22.90

SHEET 29 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 22.80 - MP 24.10

SHEET 30 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

24.00
24.25
24.50
24.75
River Rd W
Fort Custer Dr
County Line Rd

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 24.10 - MP 24.85

SHEET 31 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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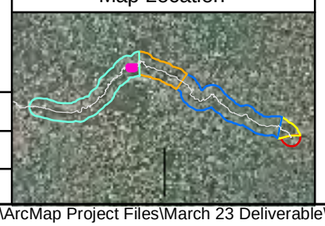
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

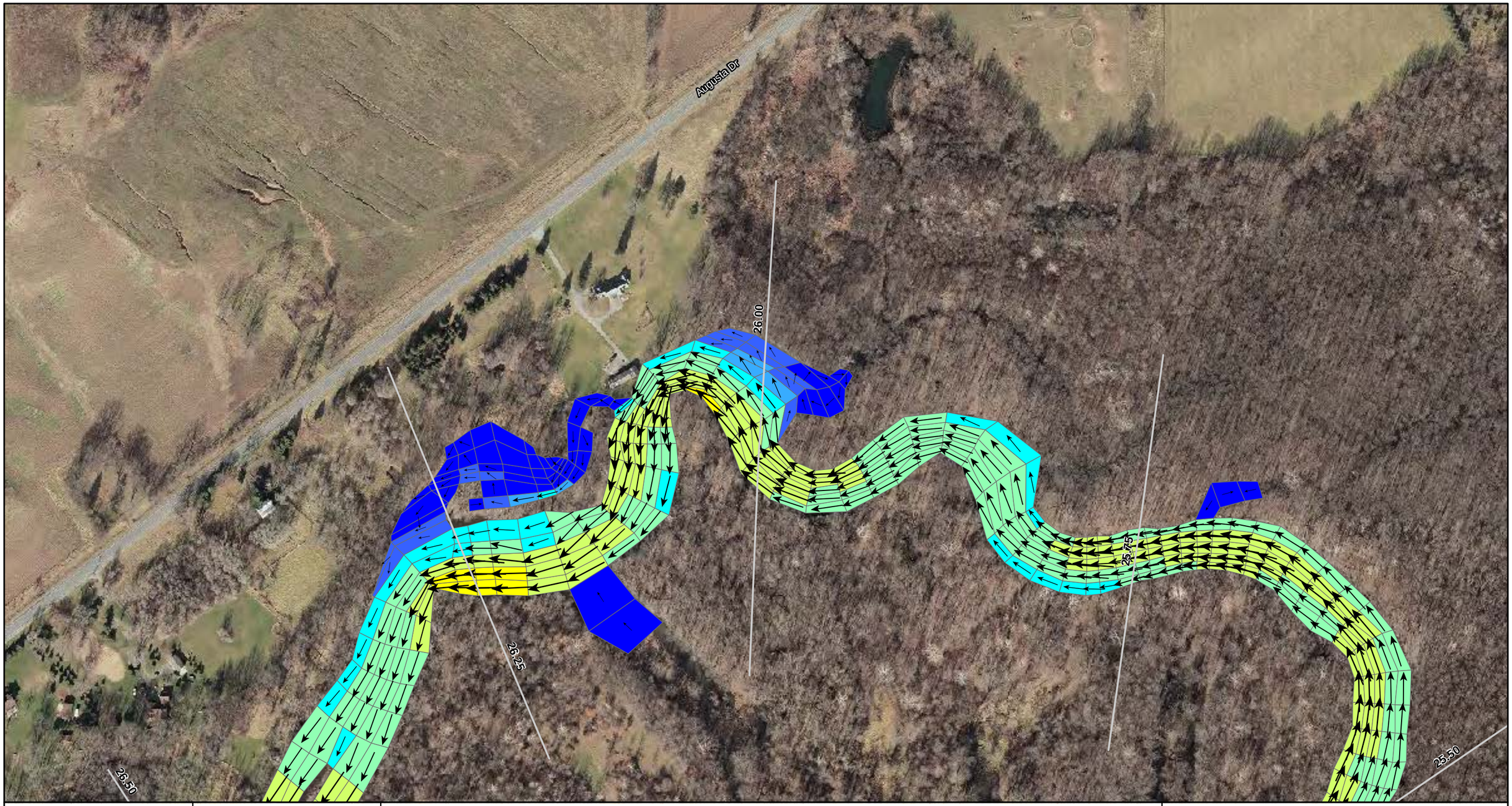
MP 24.80 - MP 25.65

SHEET 32 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

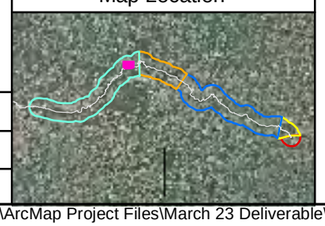
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 25.55 - MP 26.40

SHEET 33 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 26.40 - MP 27.45

SHEET 34 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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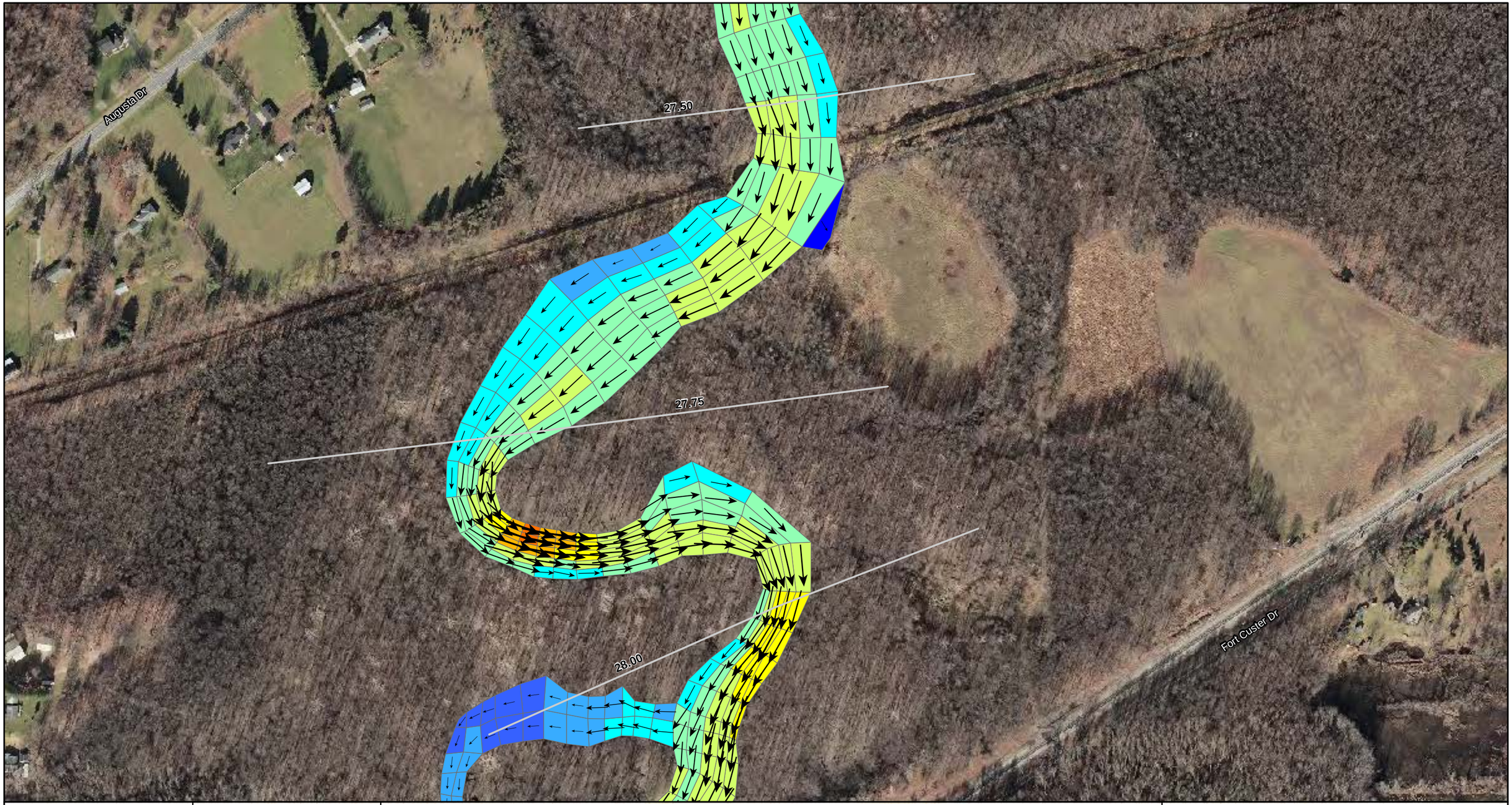
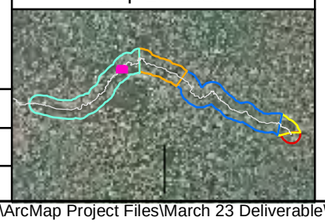
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

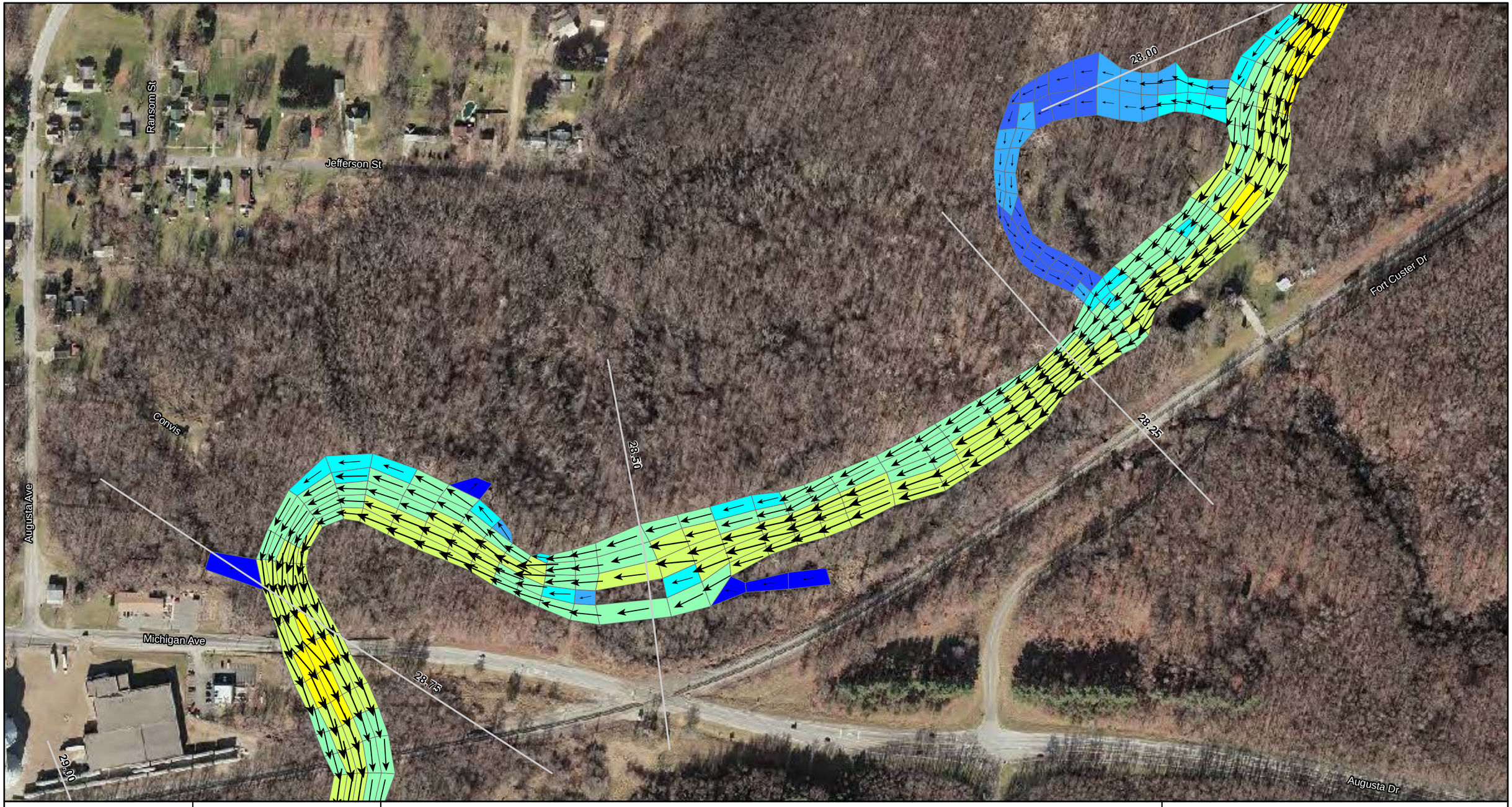
MP 27.45 - MP 28.10

SHEET 35 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

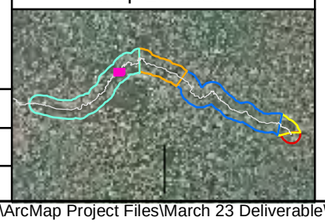
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

⟵ Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 28.05 - MP 28.85

SHEET 36 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Clinton St
Clinton St
Chestnut St
Webster St
Church St
Fayette St
Cass St
Cherry St
Lincoln St
28.75
29.00
29.25
29.50
Augusta Climax Rd
Fort Custer Rec Area Access

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

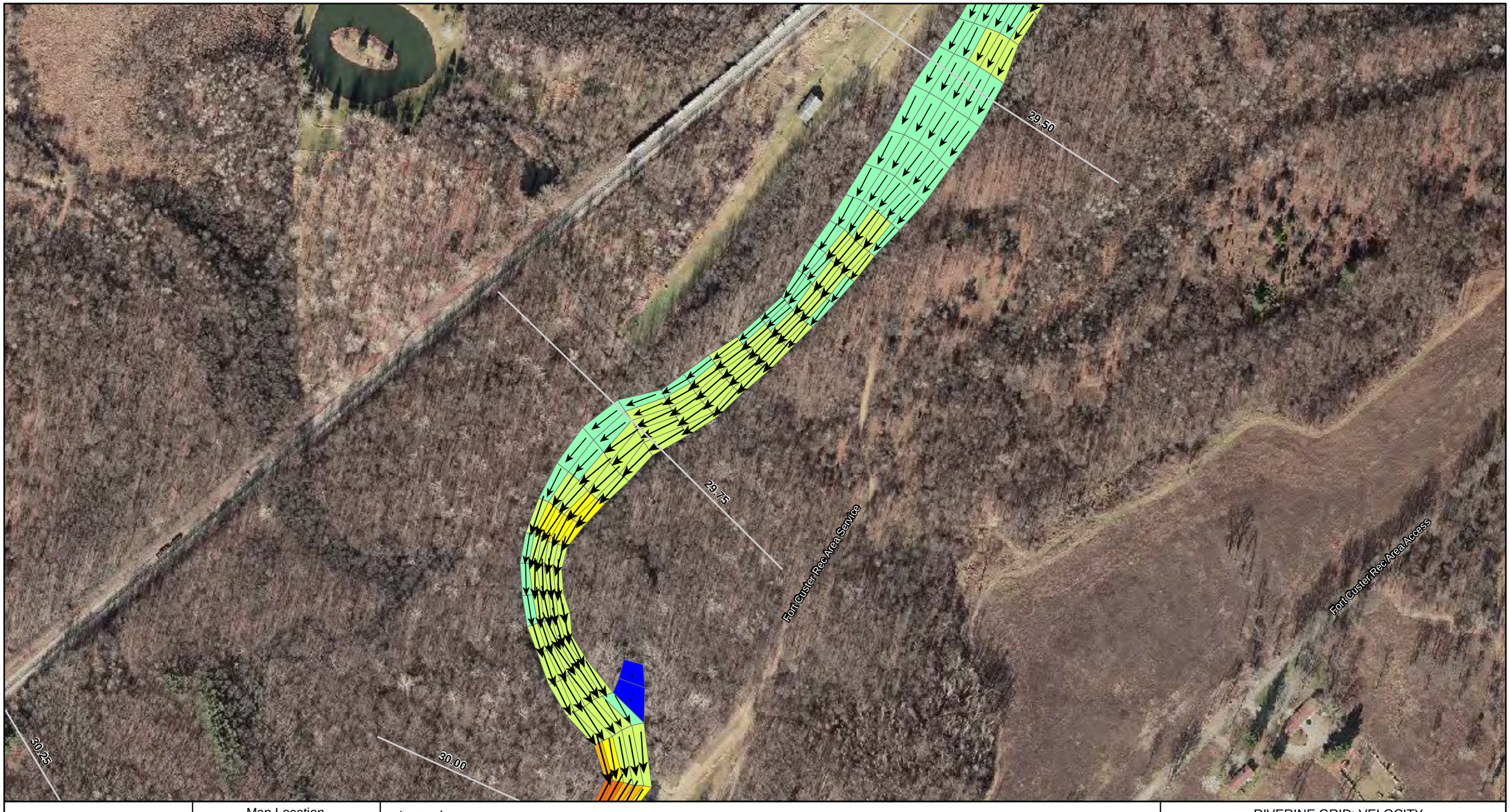
MP 28.85 - MP29.55

SHEET 37 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

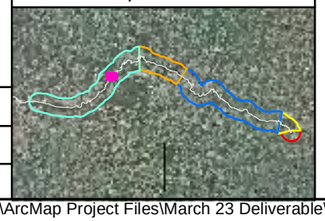
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 29.50 - MP29.95

SHEET 38 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 29.95 - MP 30.80

SHEET 39 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

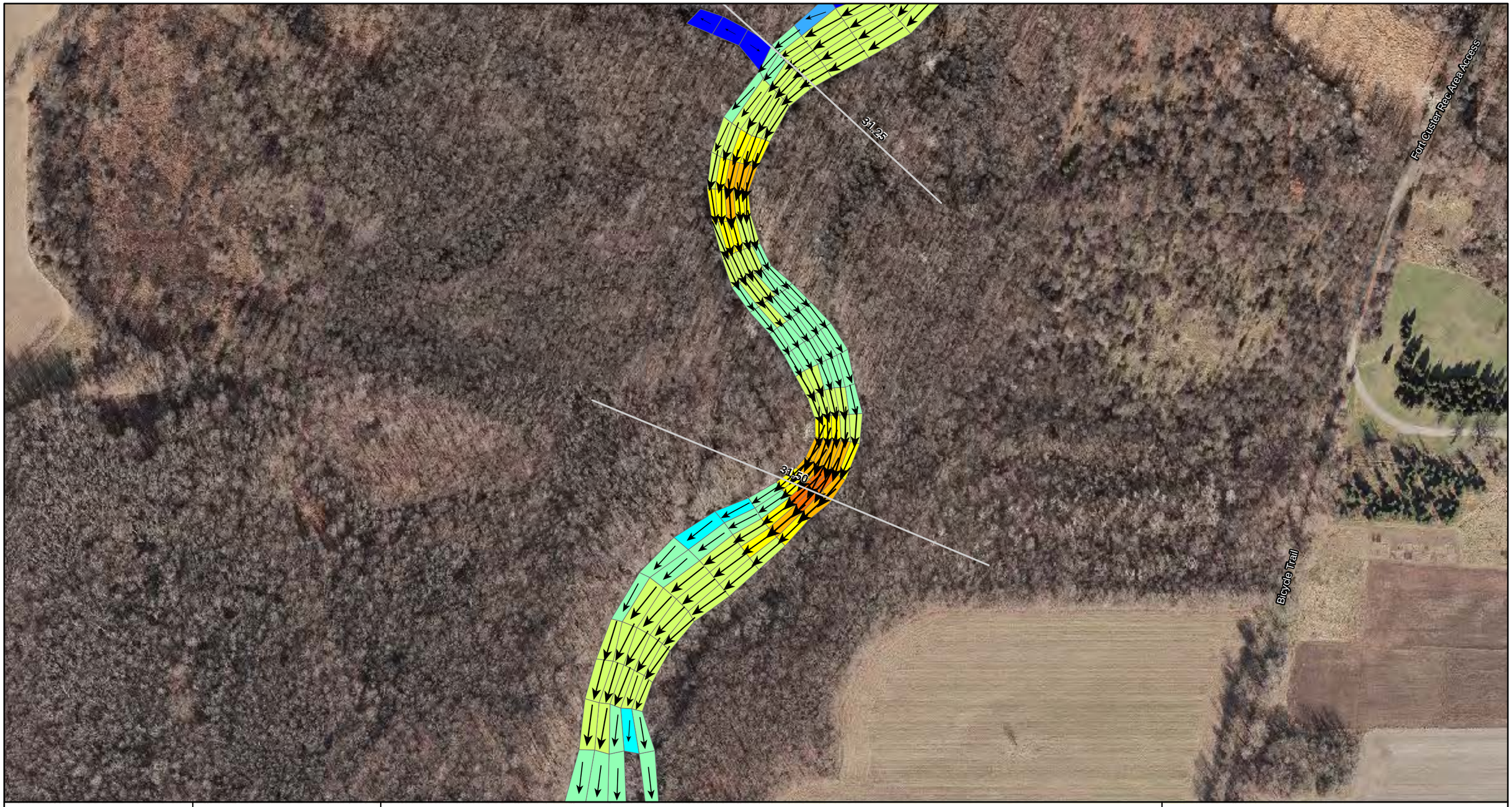
MP 30.75 - MP 31.25

SHEET 40 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

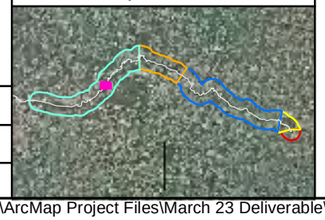
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

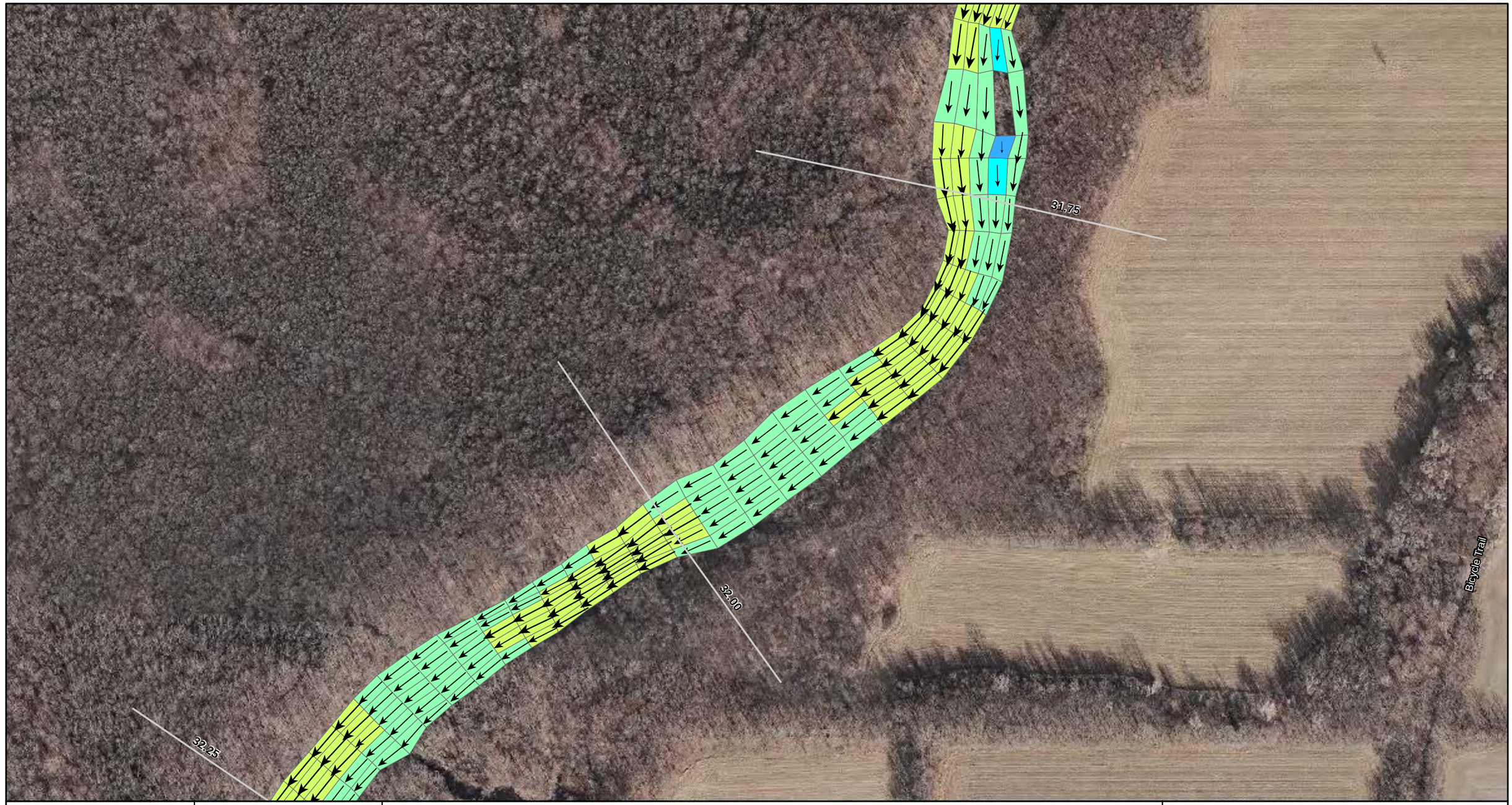
MP 31.25 - MP 31.70

SHEET 41 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

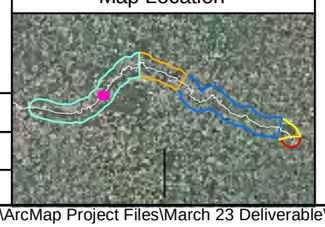
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

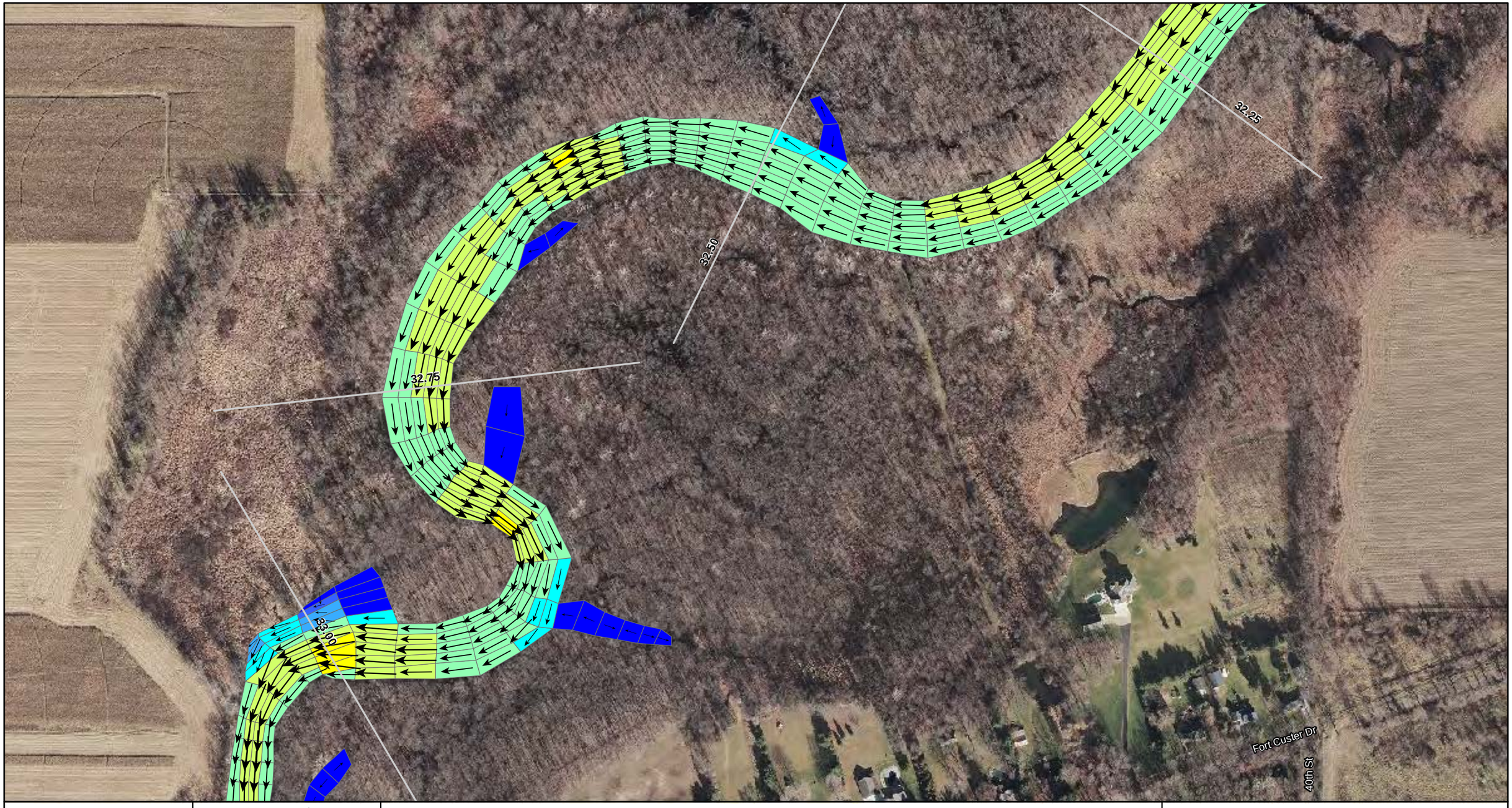
MP 31.65 - MP 32.25

SHEET 42 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

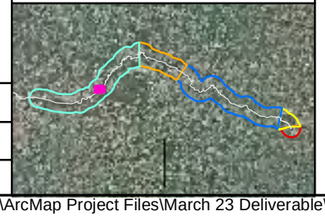
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

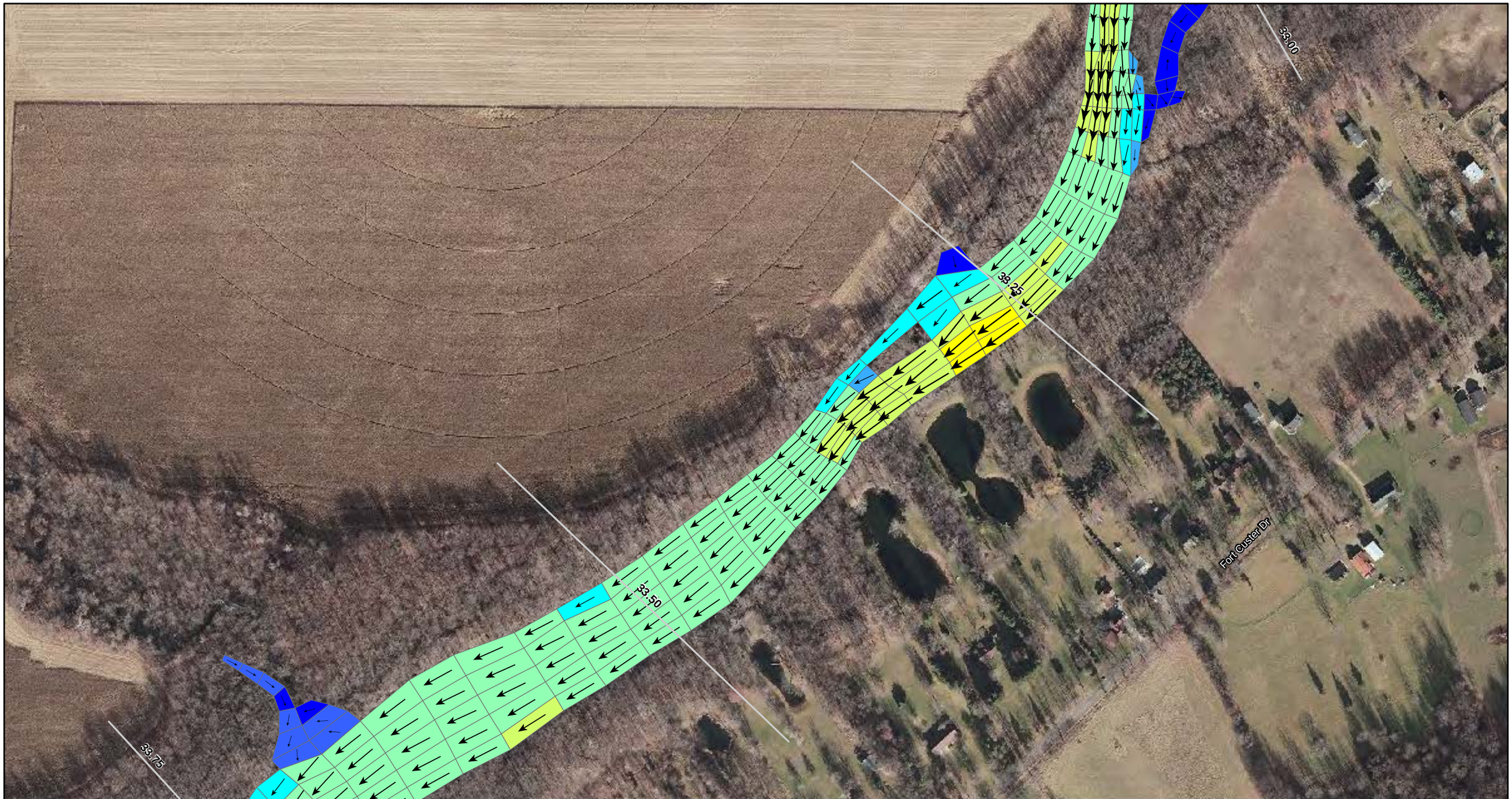
MP 32.25 - MP 33.10

SHEET 43 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

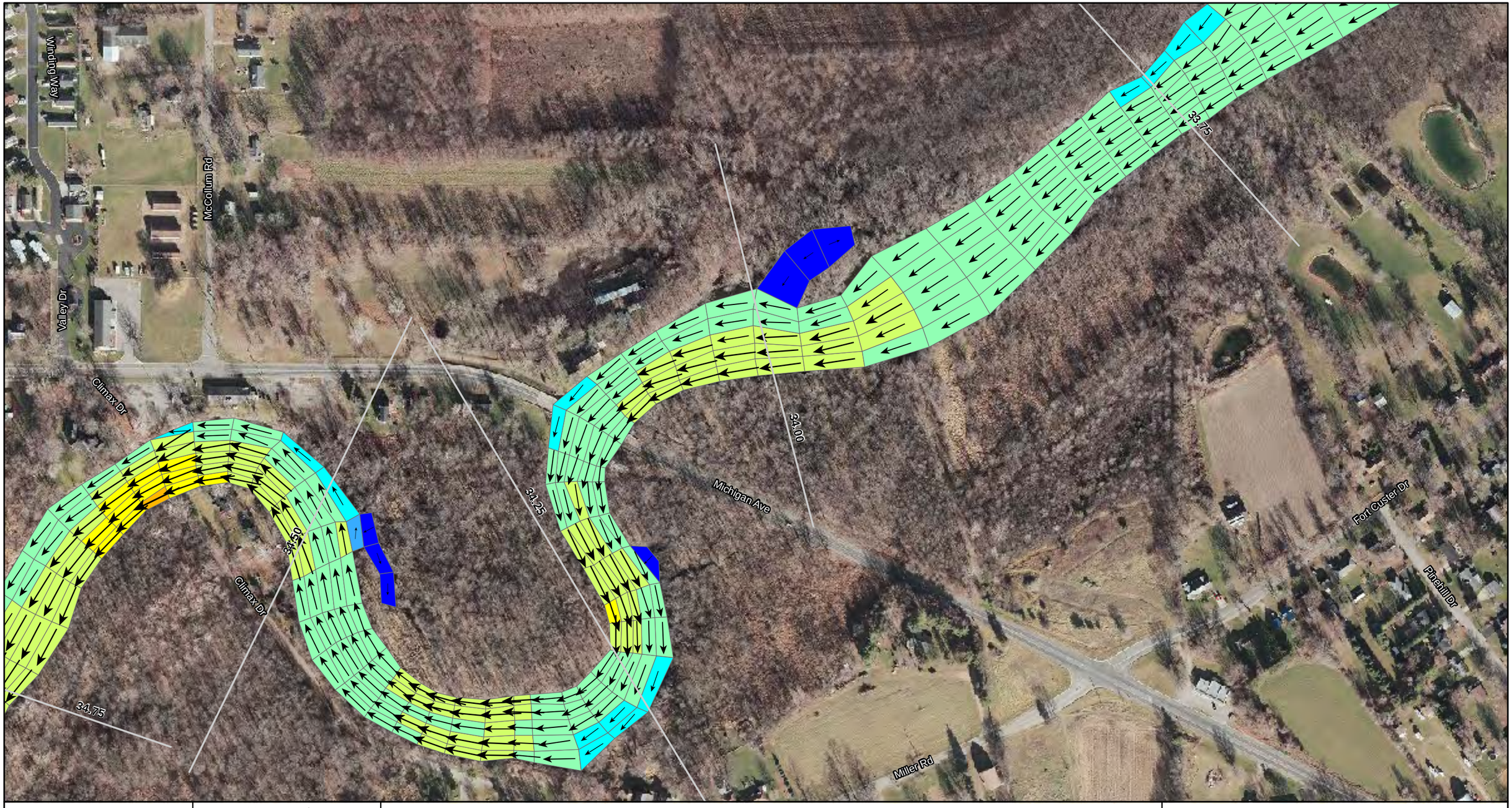
MP 33.10 - MP 33.70

SHEET 44 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

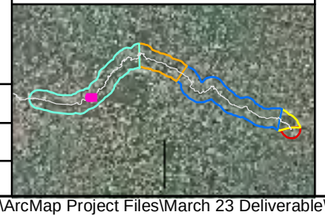
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 33.70 - MP 34.70

SHEET 45 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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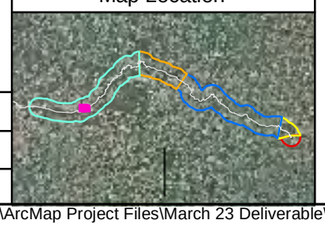
Aerial Photography Date: November 2011

ENBRIDGE	
Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 34.70 - MP 35.75

SHEET 46 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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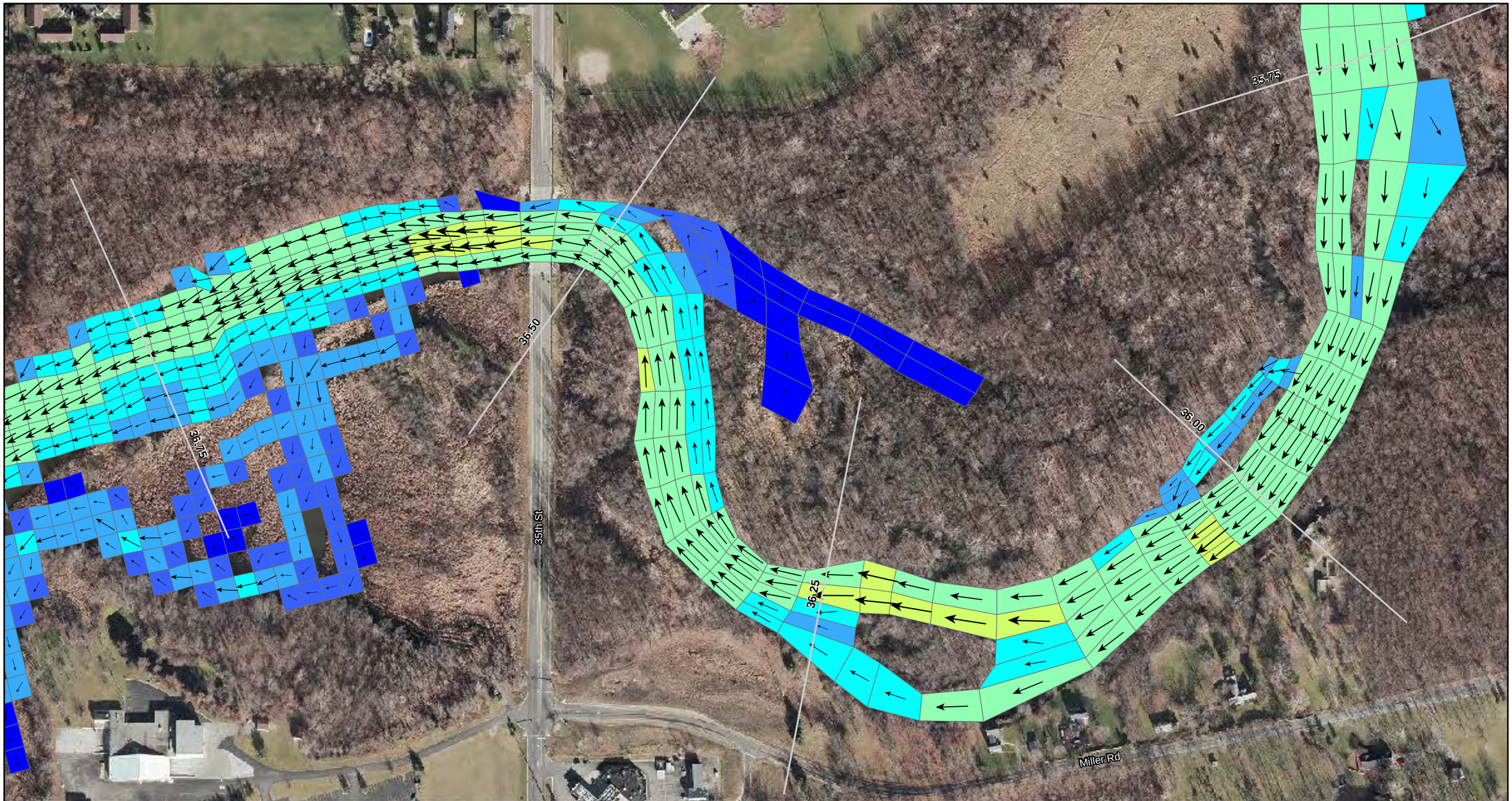
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 35.75 - MP 36.80

SHEET 47 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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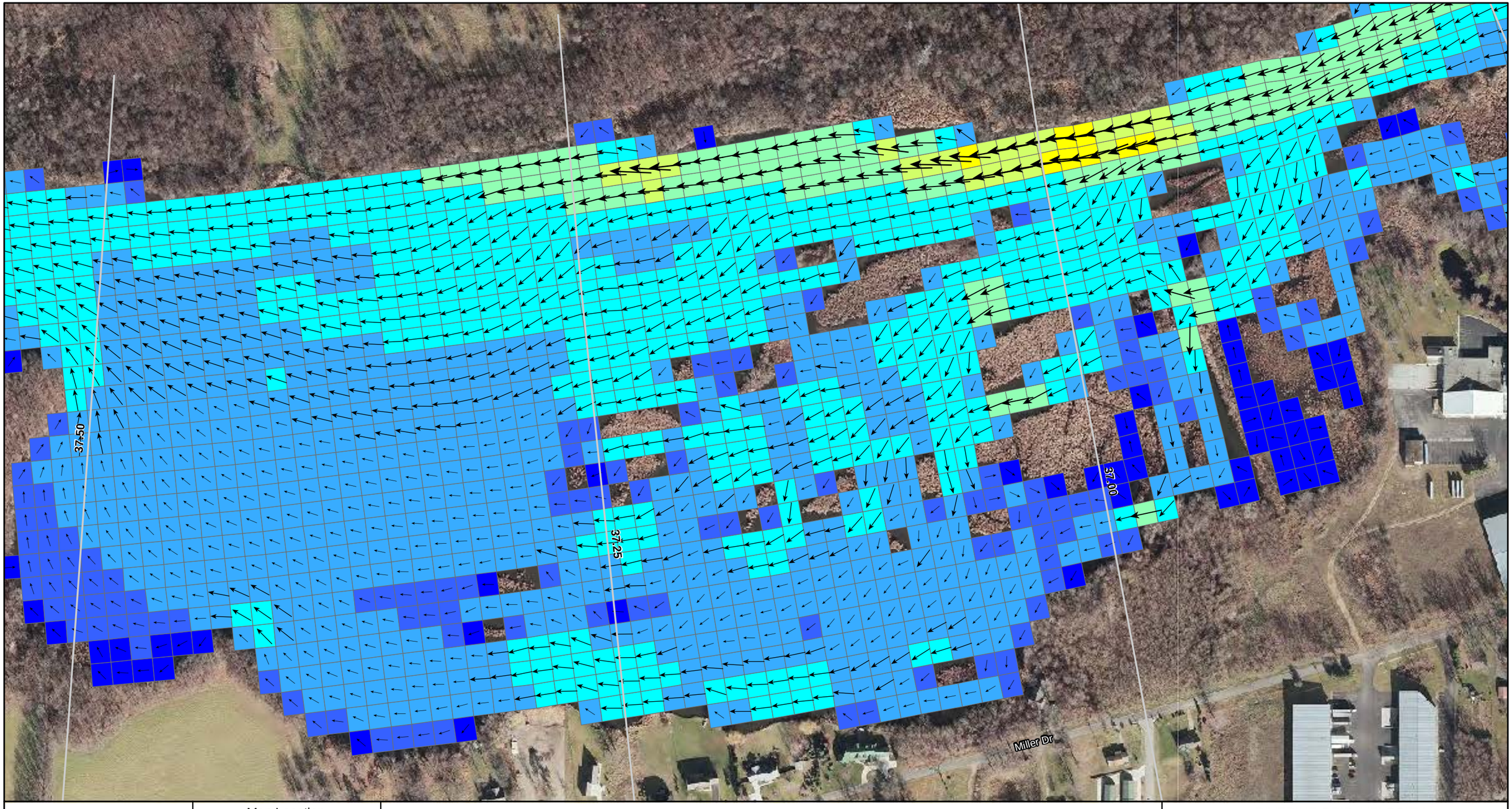
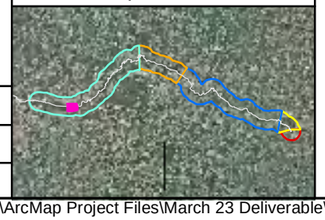
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 36.80 - MP 37.55

SHEET 48 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

38.25

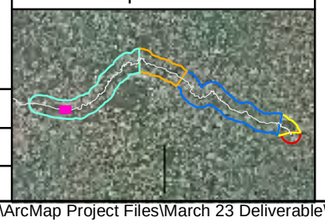
38.00

37.75

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

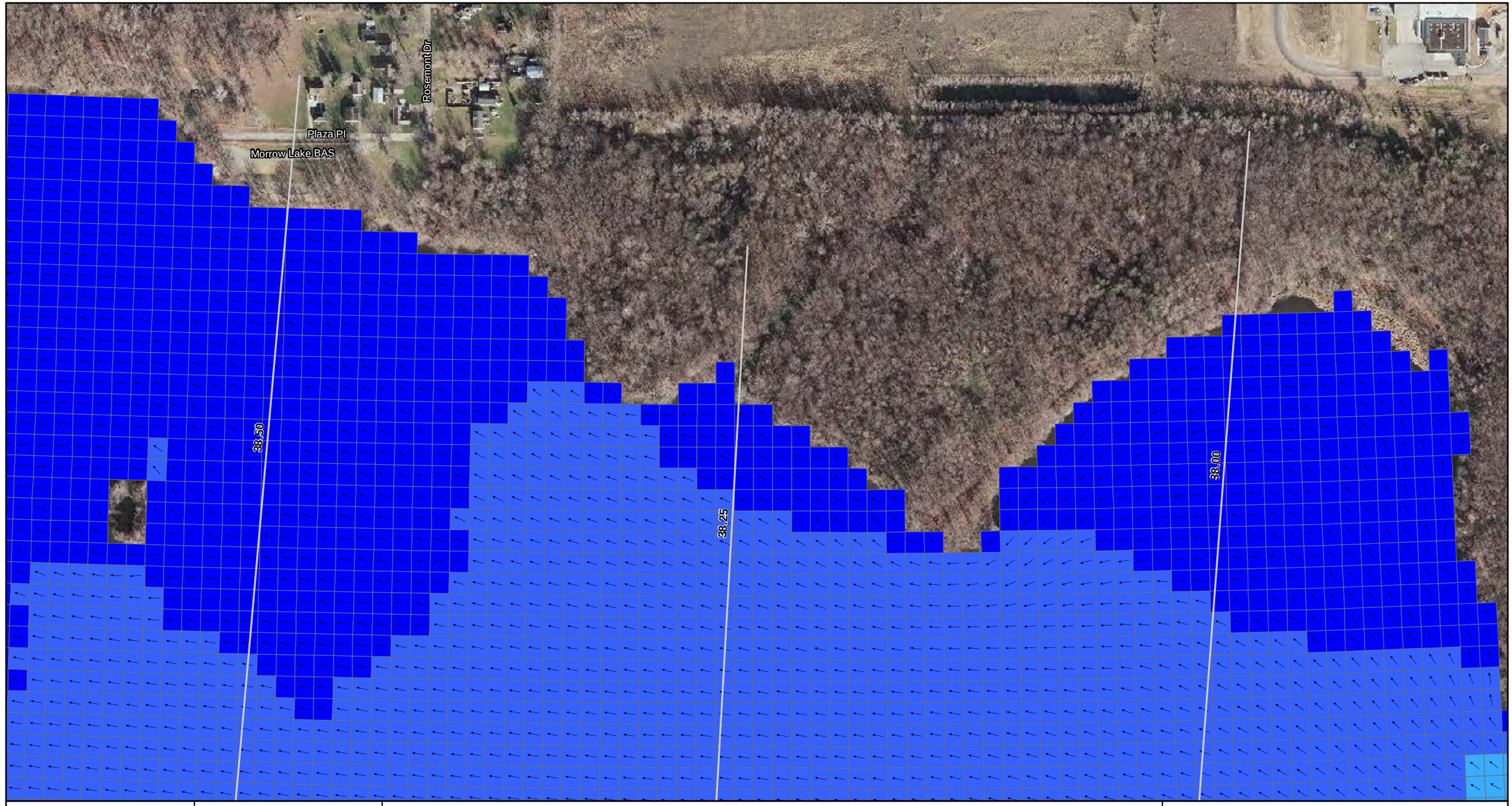
MP 37.55 - MP 38.30

SHEET 49 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

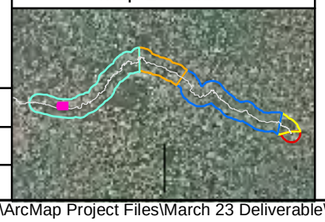
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 37.80 - MP 38.60N

SHEET 50 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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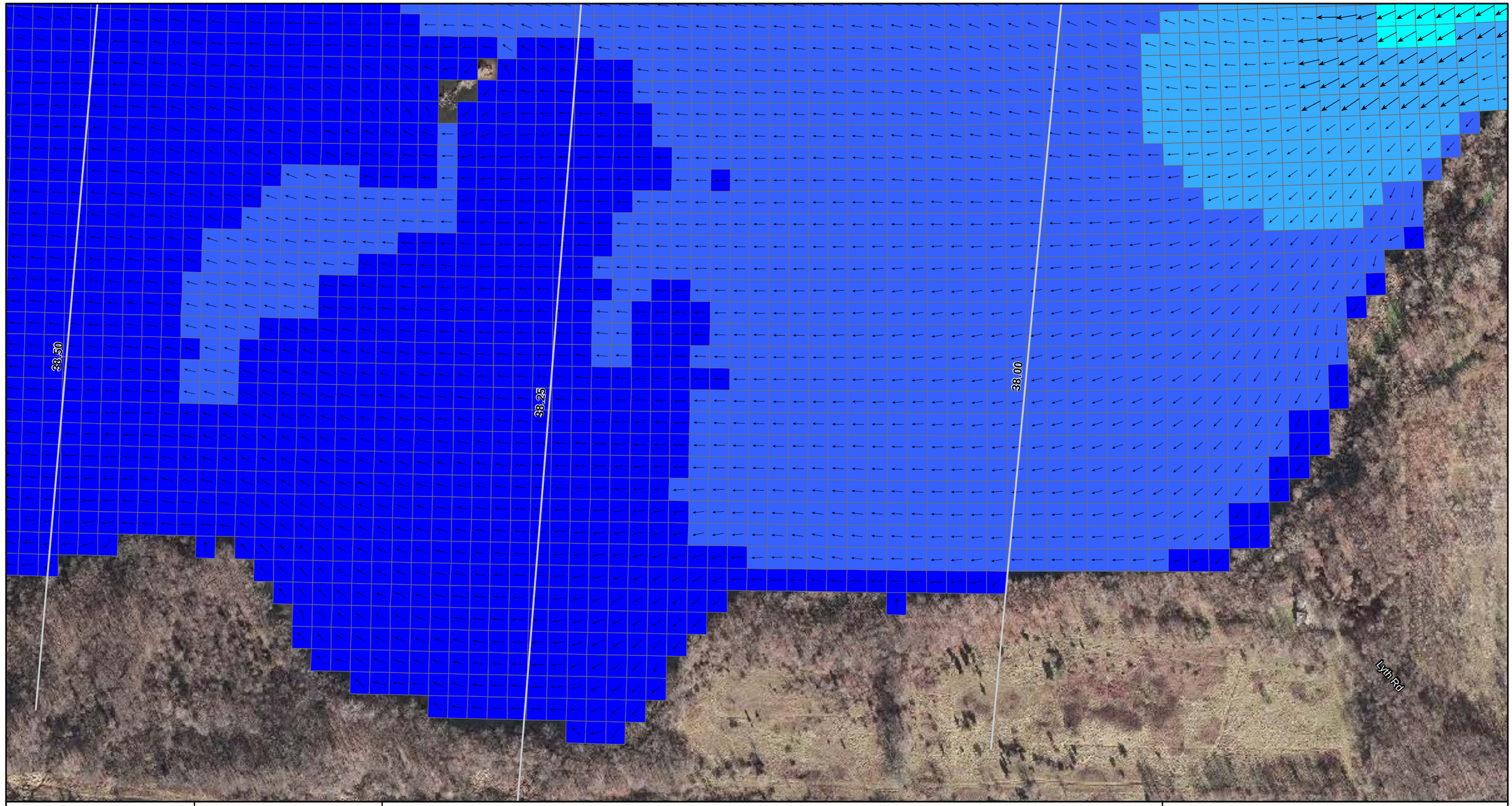
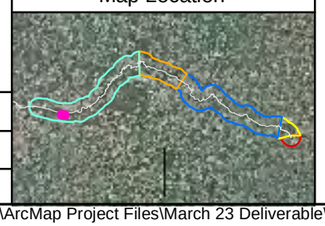
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 37.80 - MP 38.60S

SHEET 51 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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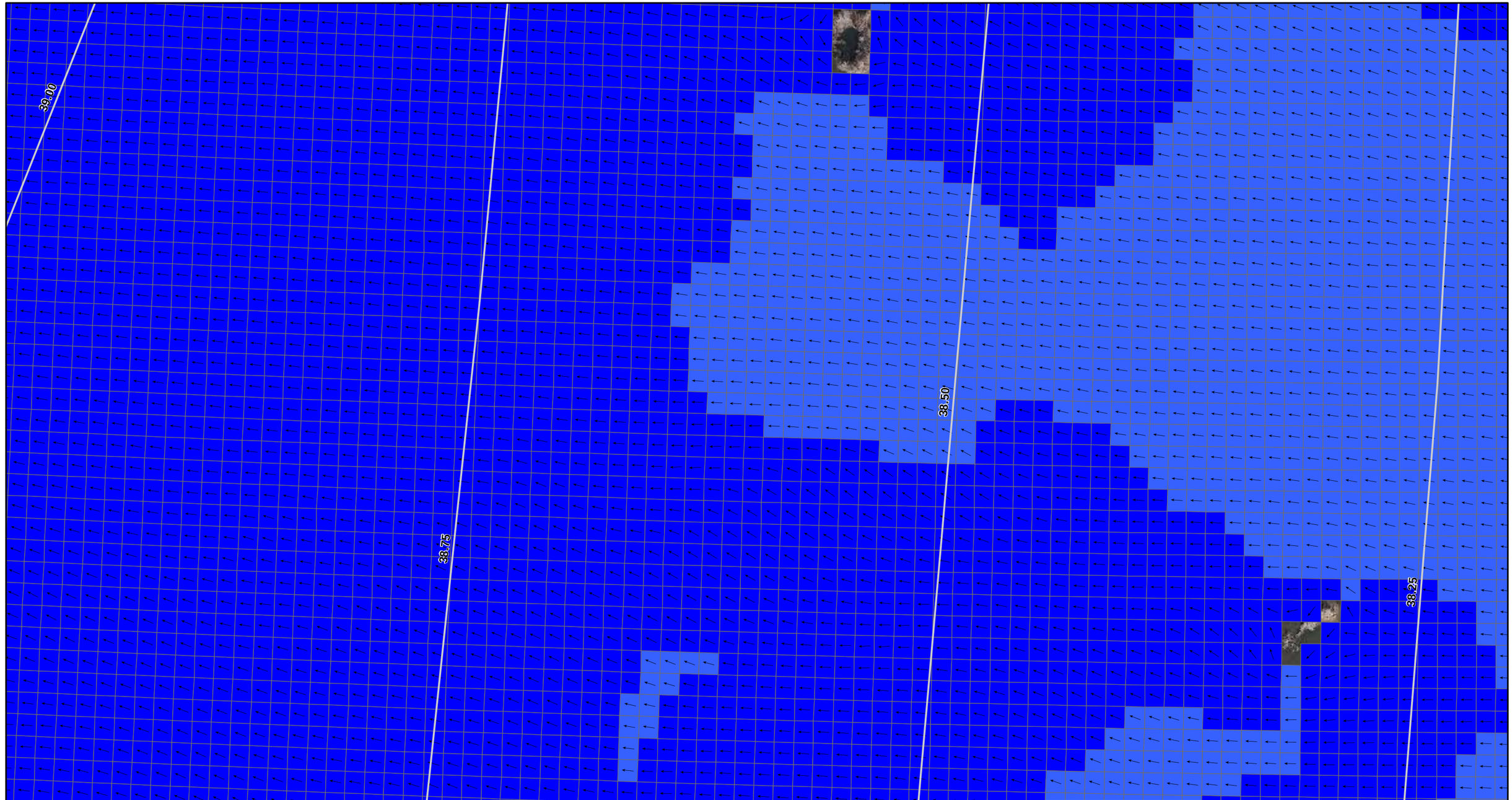
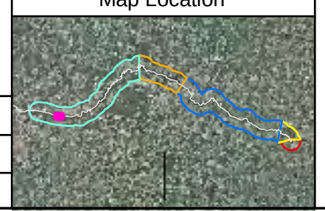
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

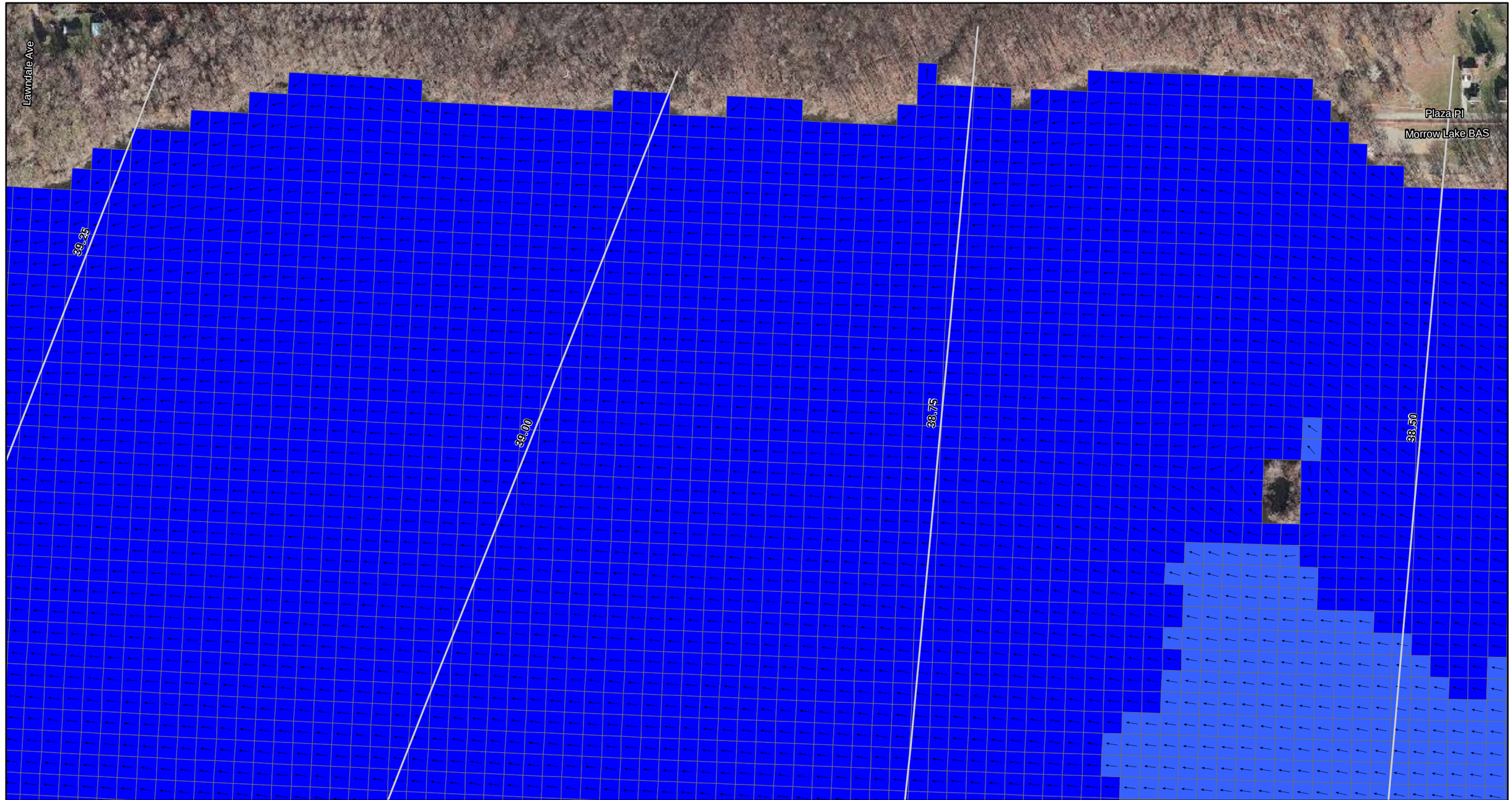
MP 38.25 - MP 39.00C

SHEET 52 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

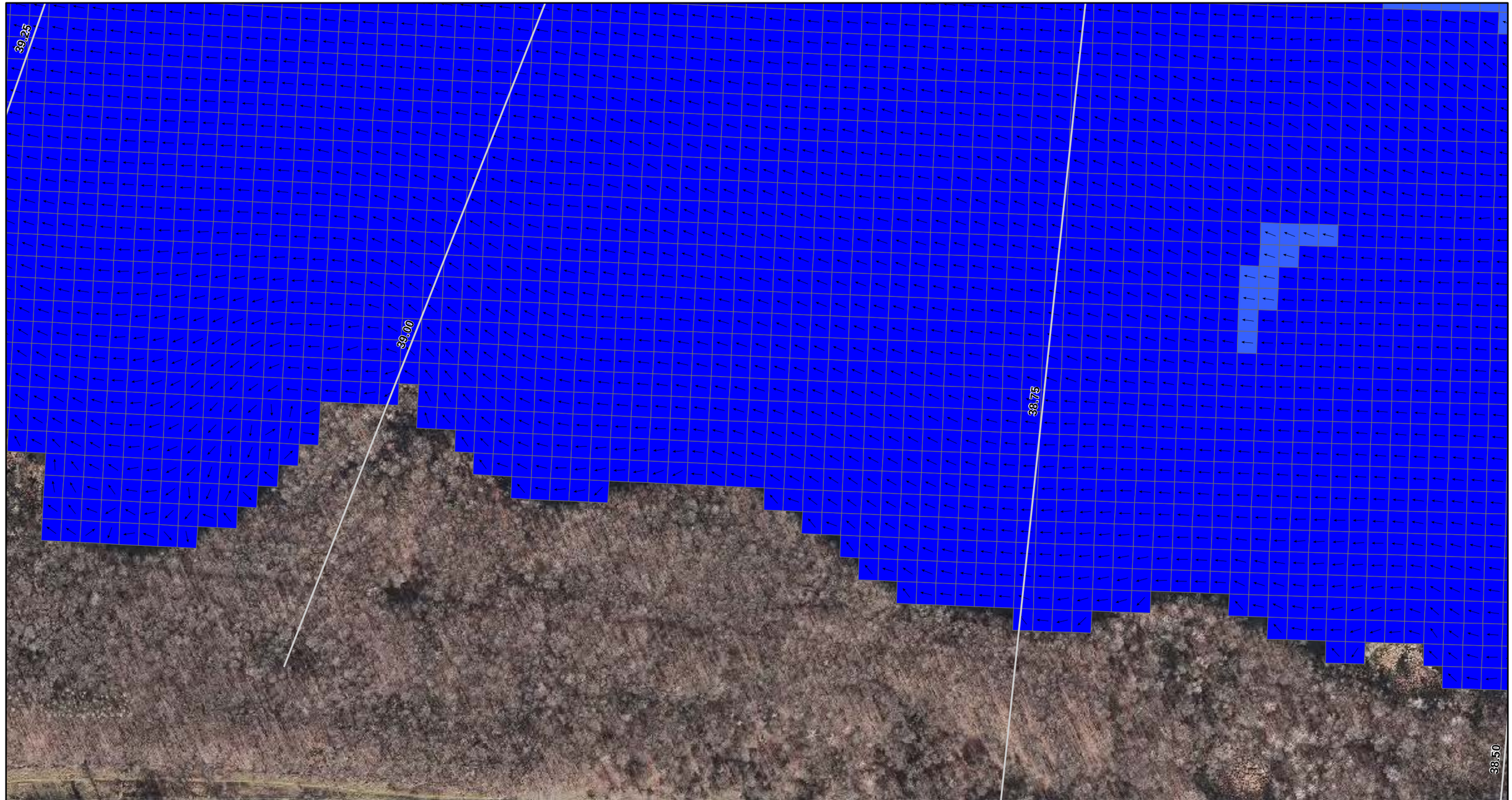
MP 38.50 - MP 39.25N

SHEET 53 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

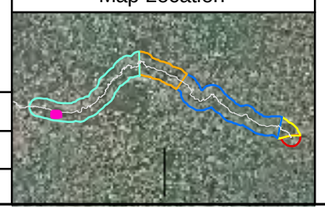
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

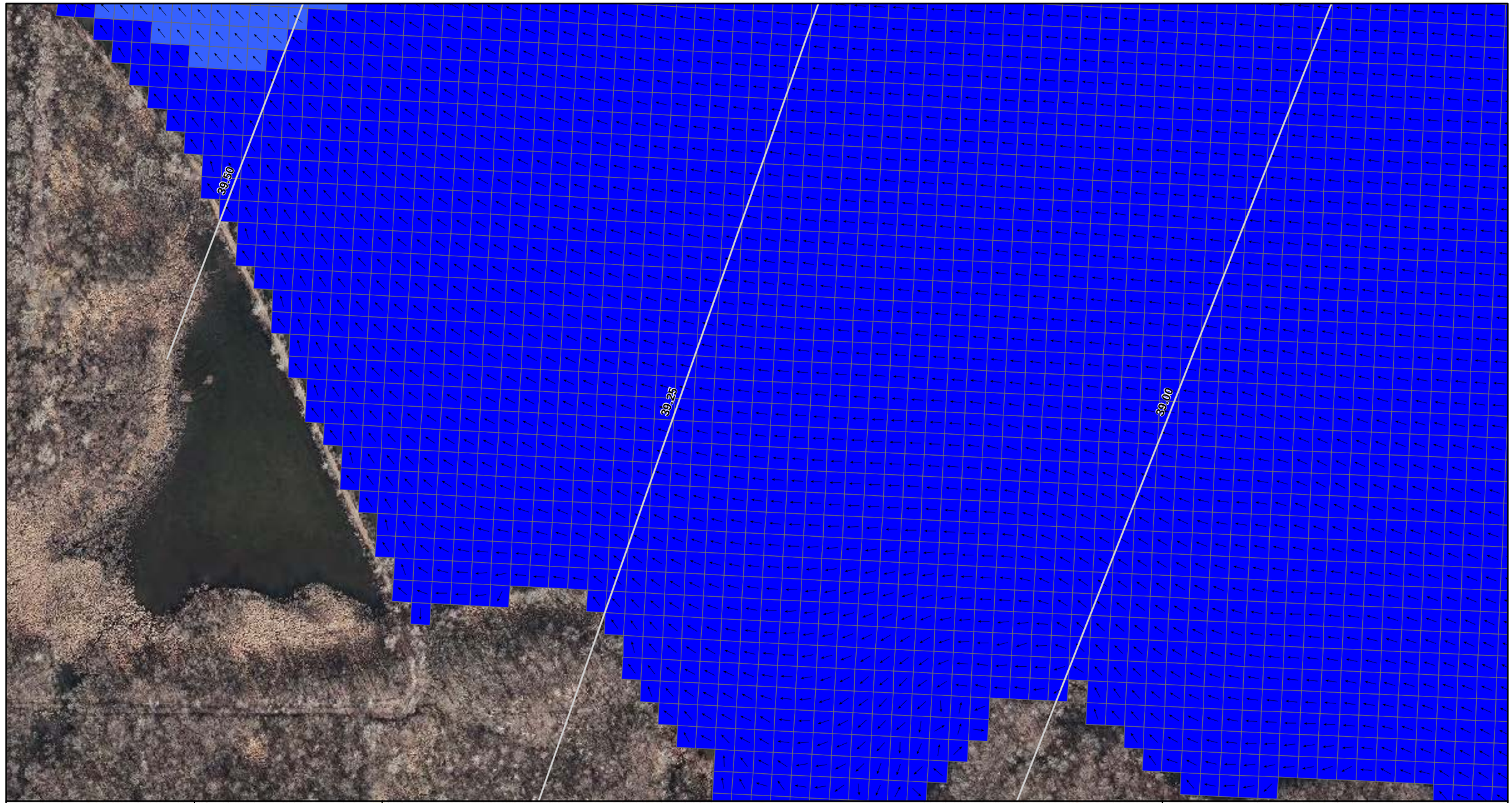
MP 38.50 - MP 39.25S

SHEET 54 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

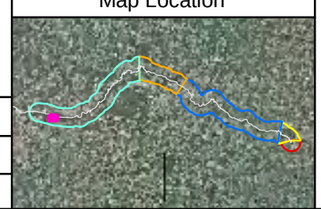
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

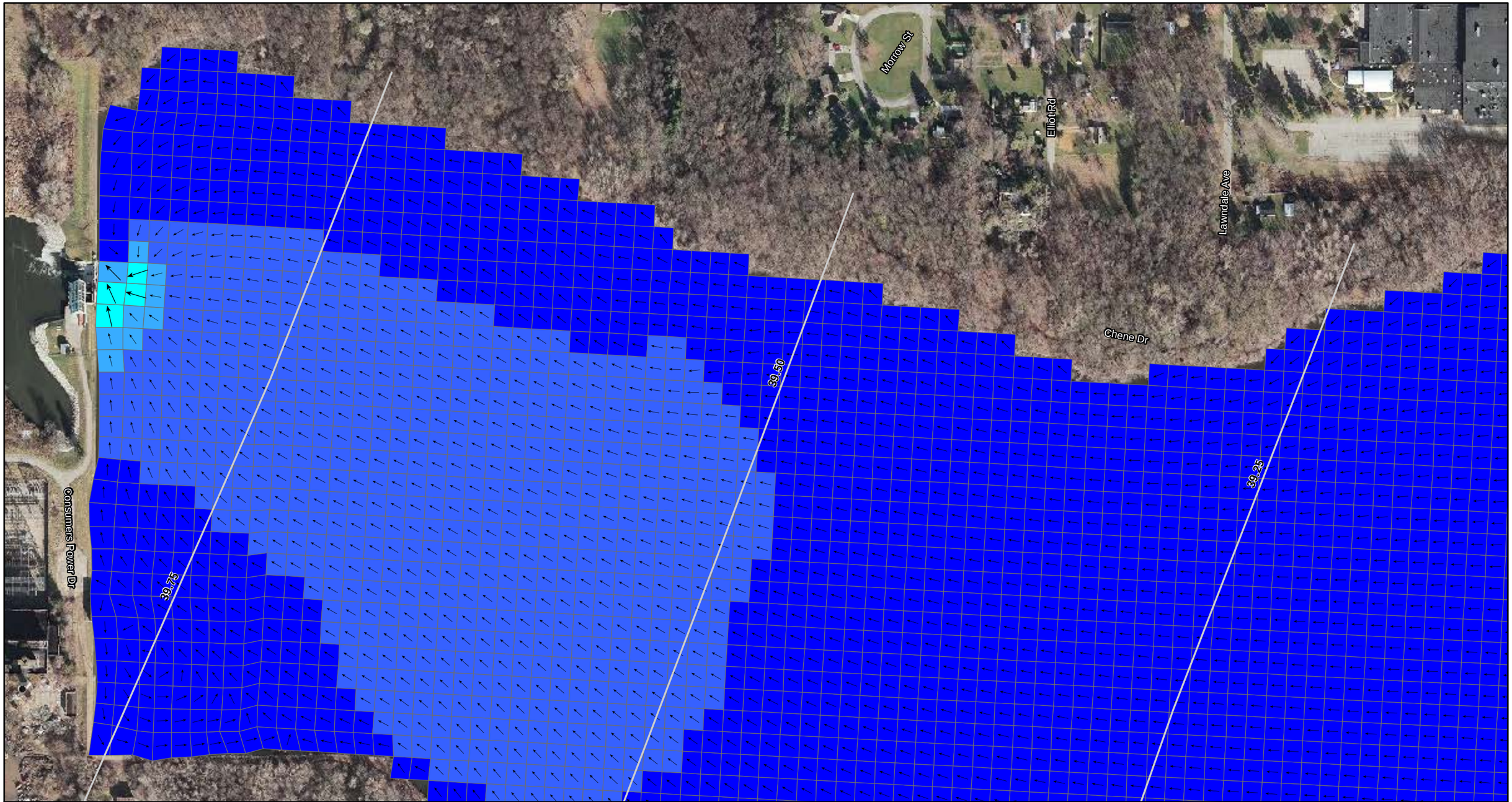
MP 38.90 - MP 39.60S

SHEET 55 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Velocity (ft/sec) - April 16, 2011

- < 0.1 ft/sec
- 0.1 - 0.25 ft/sec
- 0.25 - 0.5 ft/sec
- 0.5 - 1.0 ft/sec
- 1.0 - 1.5 ft/sec
- 1.5 - 2.0 ft/sec
- 2.0 - 2.5 ft/sec
- 2.5 - 3.0 ft/sec
- 3.0 - 4.0 ft/sec
- > 4.0 ft/sec

← Flow Direction and Relative Magnitude

Quarter Mile Grid Segment

ft/sec = Feet Per Second
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: VELOCITY
APRIL 16, 2011

MP 39.15 - MP 39.85

SHEET 56 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Velocity_Apr16_2011.mxd

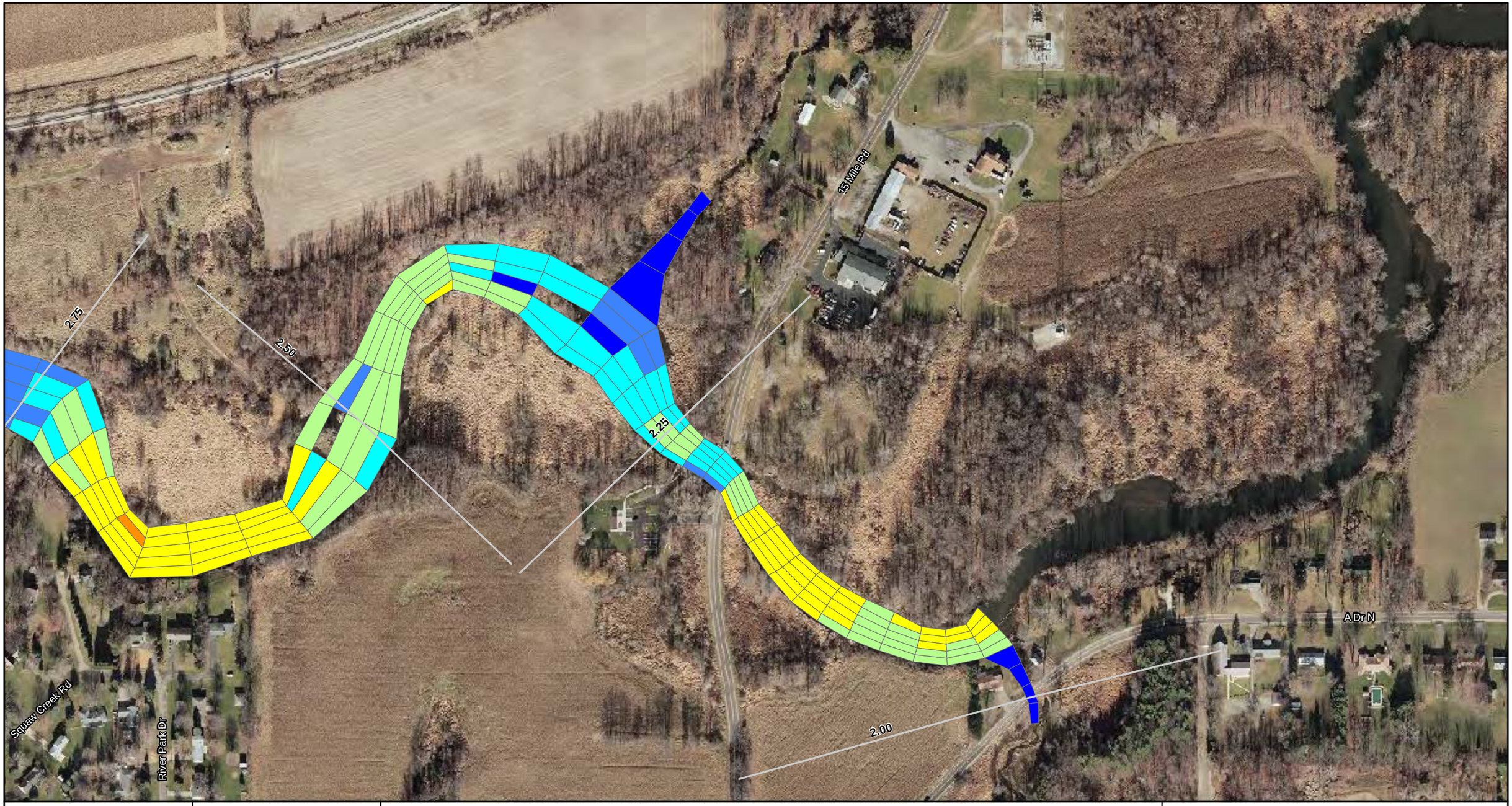
Aerial Photography Date: November 2011

Figure 6-26

Riverine Grid: Bed Shear Stress

April 9, 2011

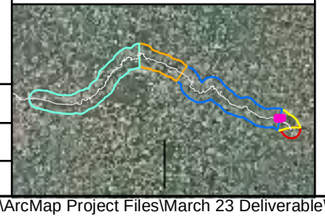
Sheets 1 through 56



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

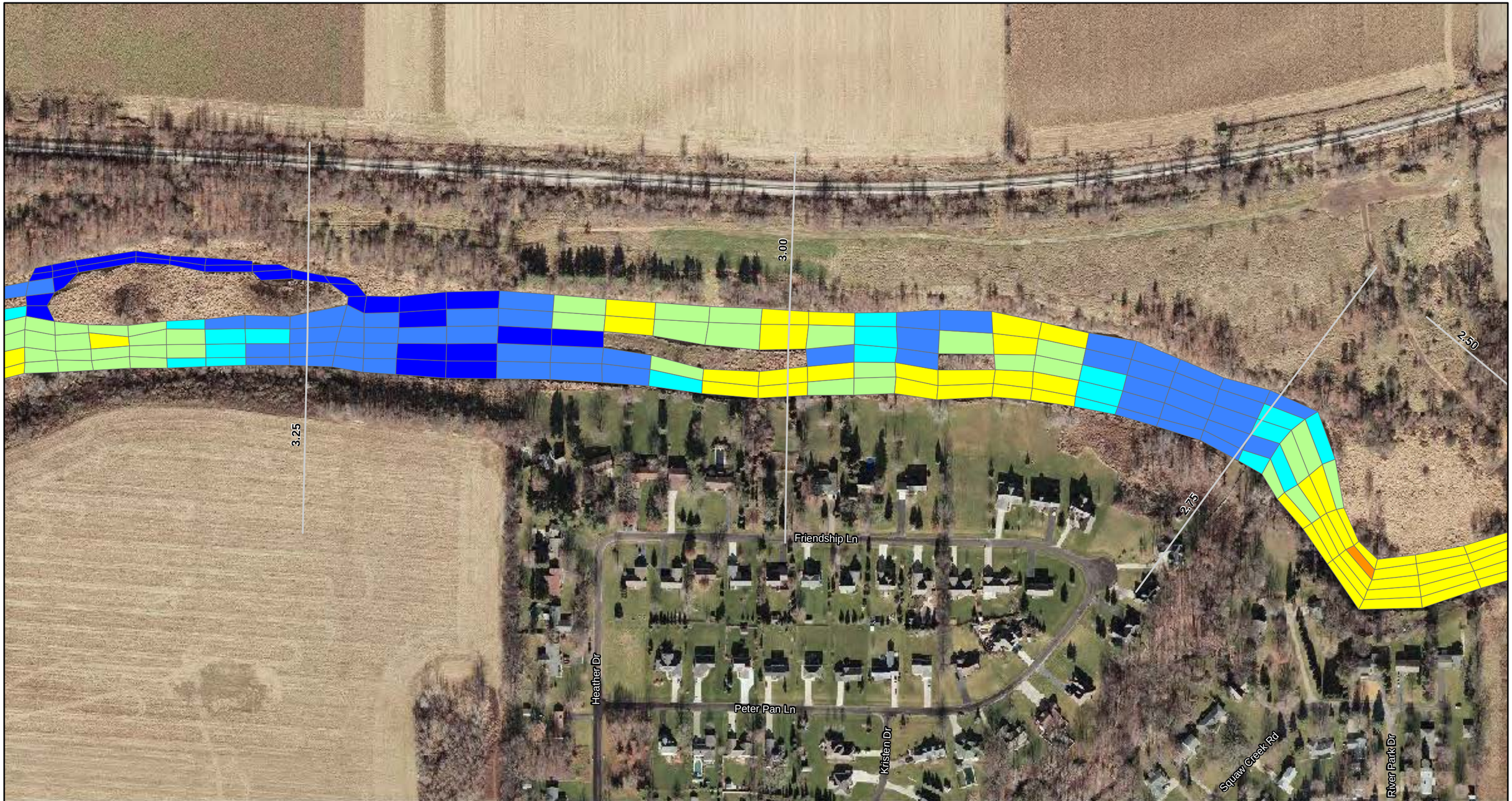
MP 01.95 - MP 02.75

SHEET 1 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

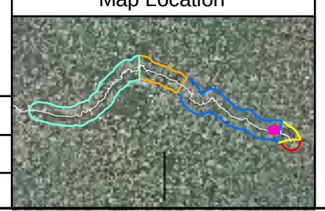
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 02.60 - MP 03.40

SHEET 2 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

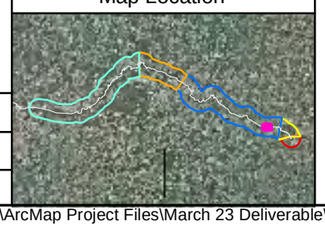
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

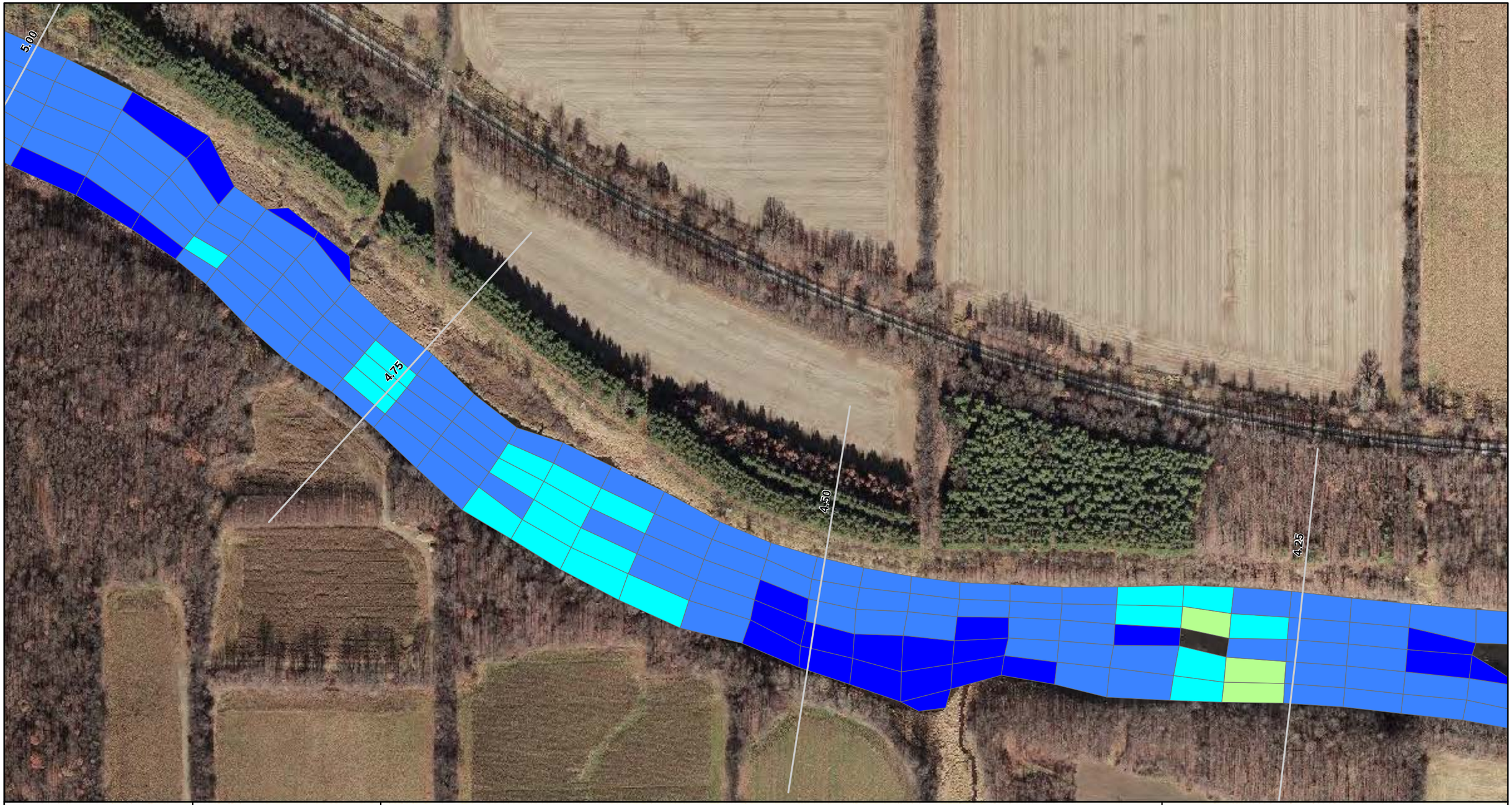
MP 03.40 - MP 04.20

SHEET 3 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

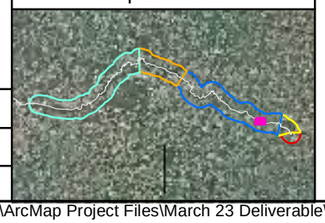
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 04.15 - MP 05.00

SHEET 4 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

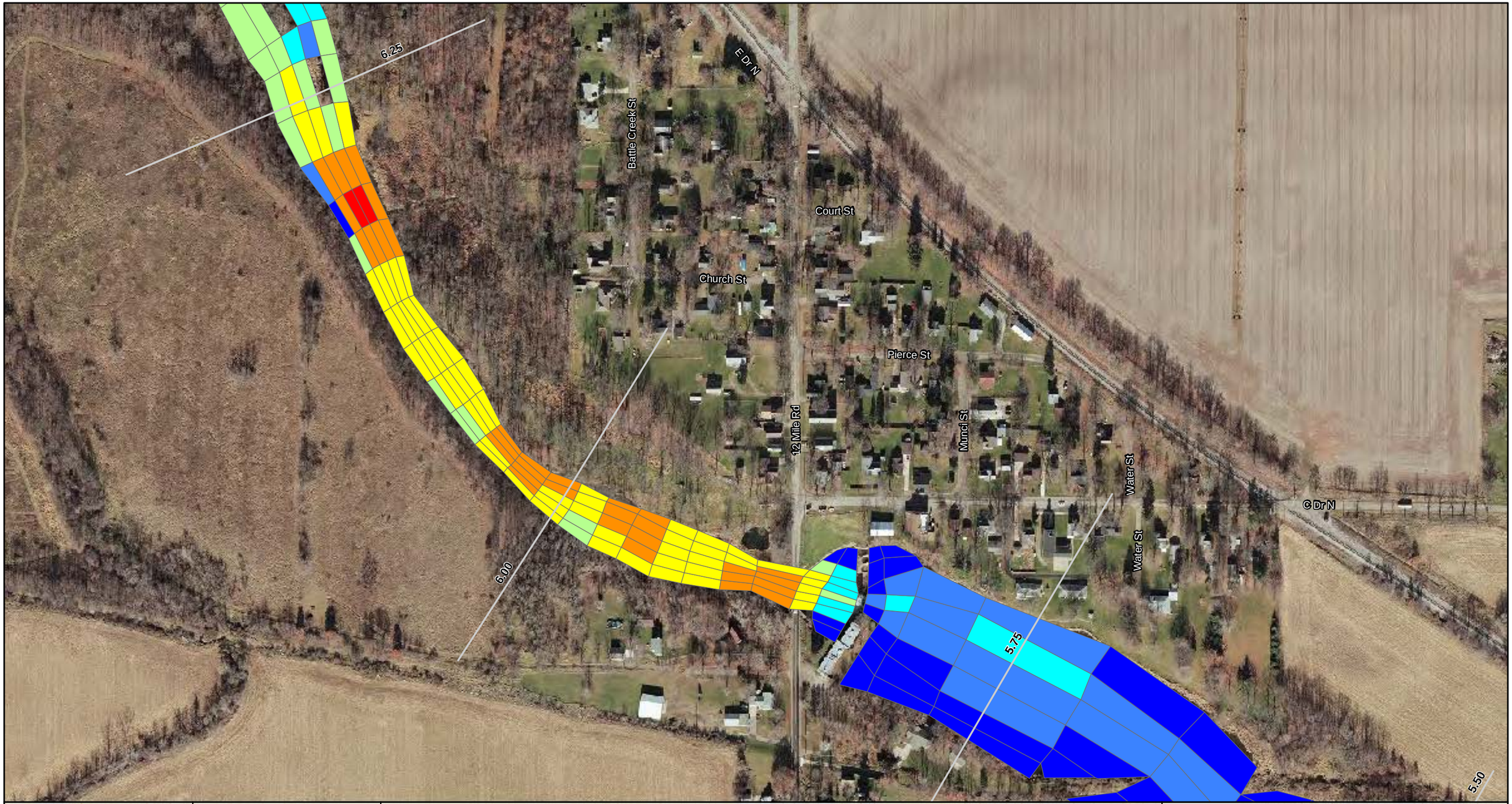
MP 04.90 - MP 05.65

SHEET 5 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

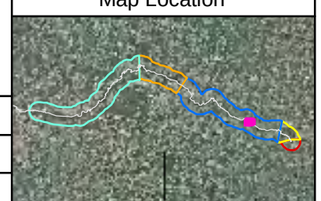
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals

cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

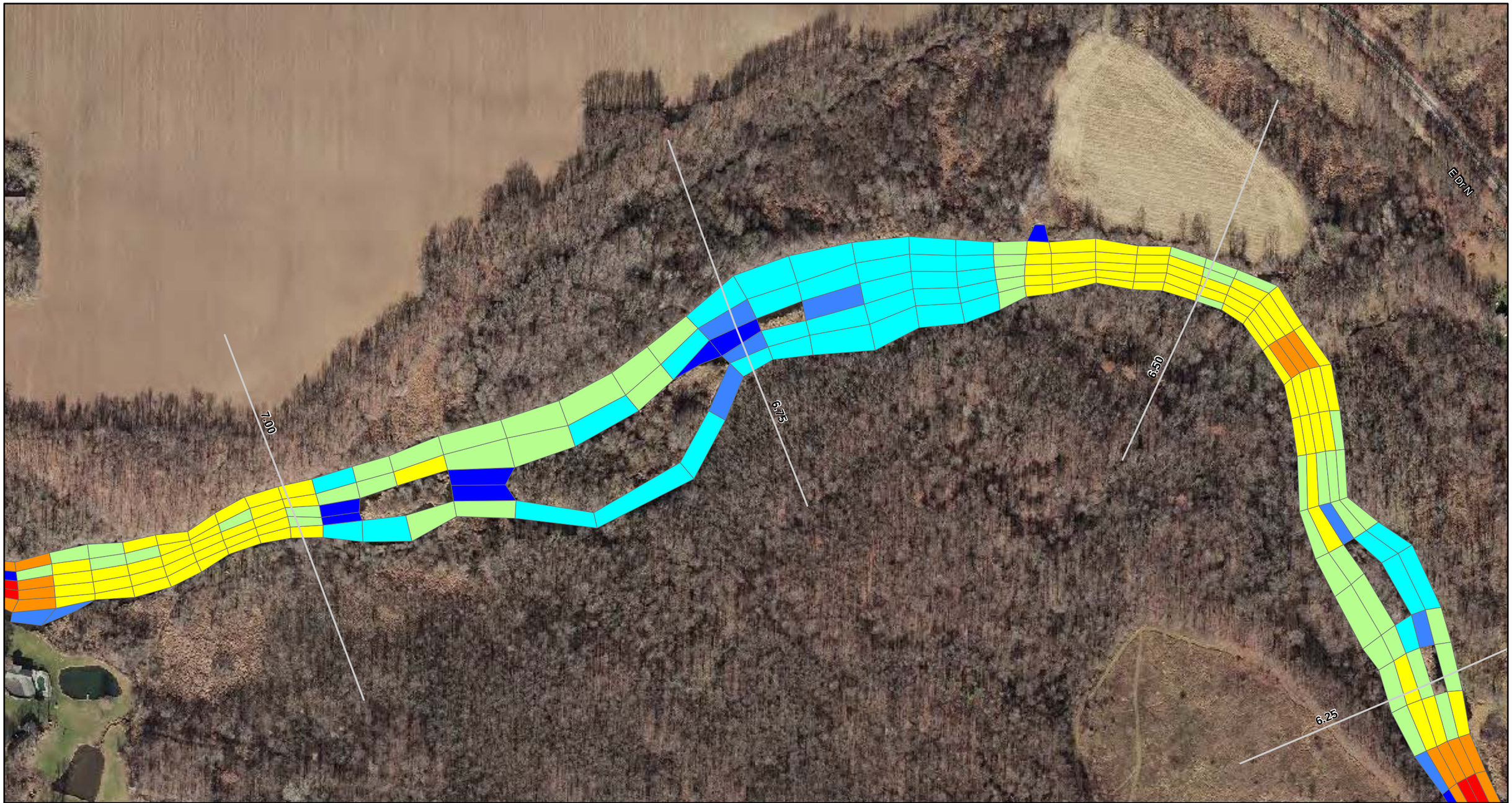
MP 05.65 - MP 06.30

SHEET 6 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

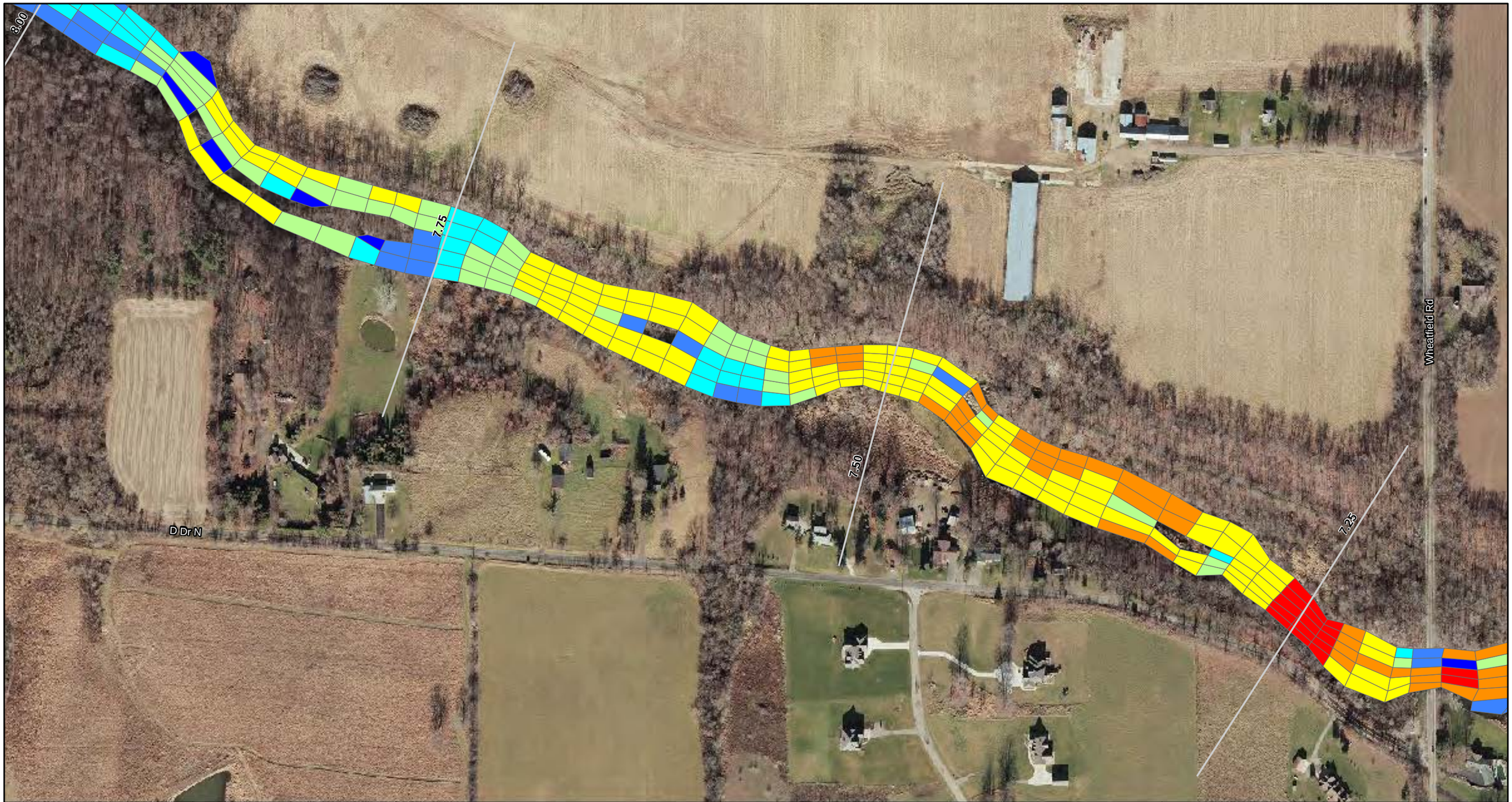
MP 06.20 - MP 07.15

SHEET 7 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

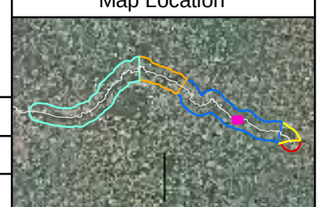
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 07.15 - MP 07.95

SHEET 8 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011

8.75

8.50

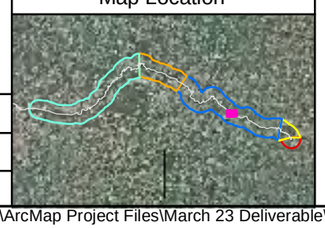
8.25

8.00

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 07.90 - MP 08.75

SHEET 9 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

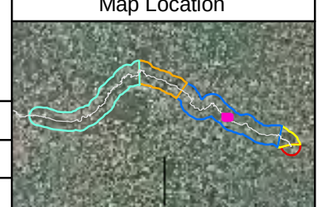
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 08.70 - MP 09.30

SHEET 10 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals

cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

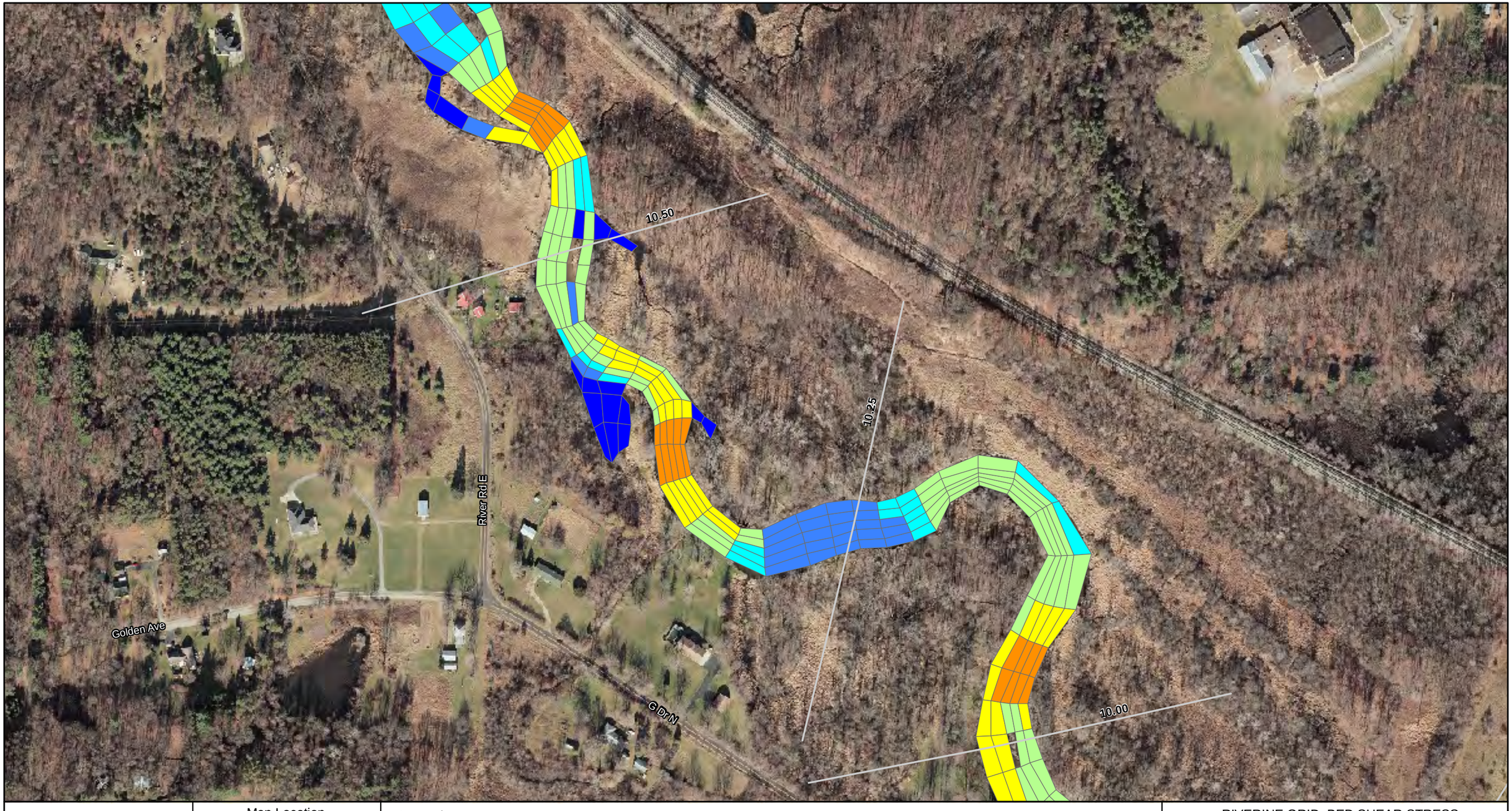
MP 09.25 - MP 10.05

SHEET 11 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

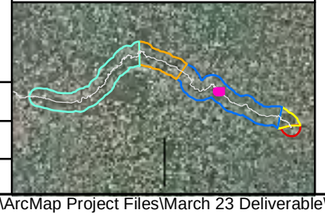
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

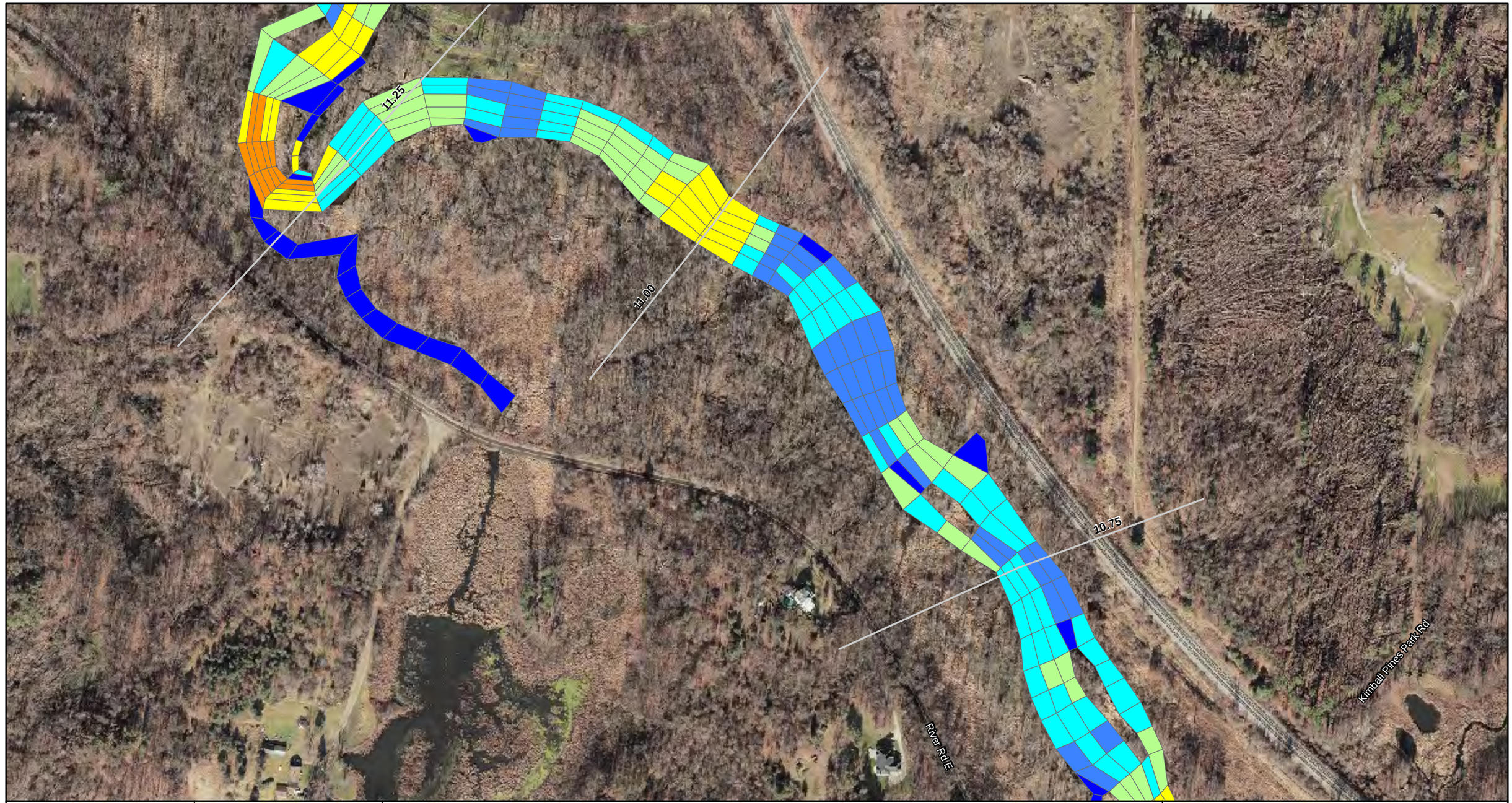
MP 10.00 - MP 10.65

SHEET 12 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

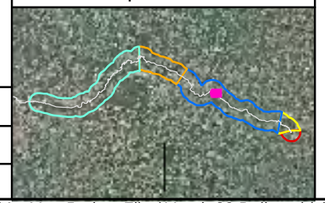
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

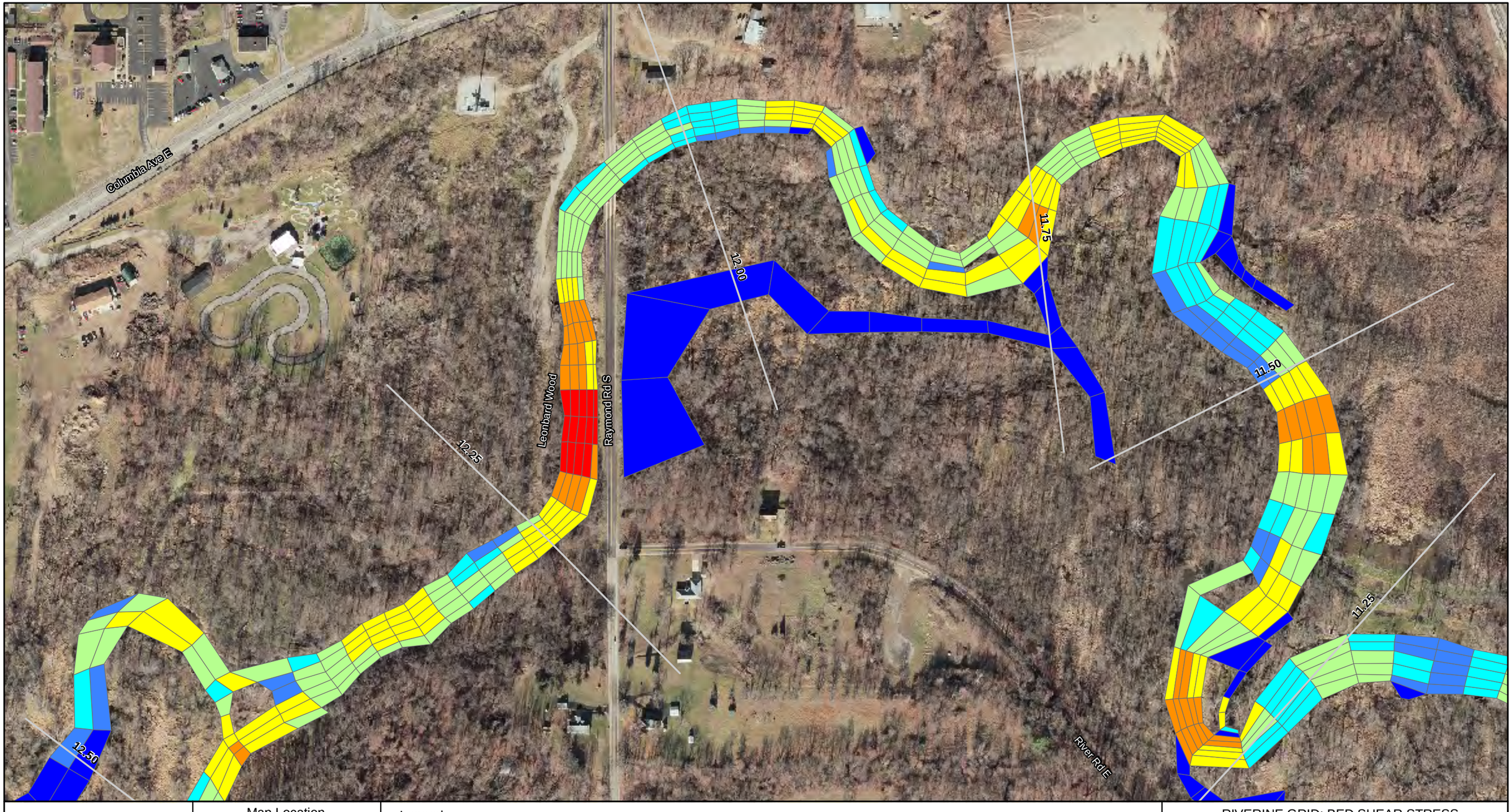
MP 10.60 - MP 11.40

SHEET 13 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

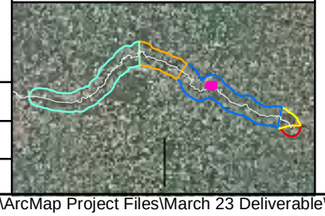
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

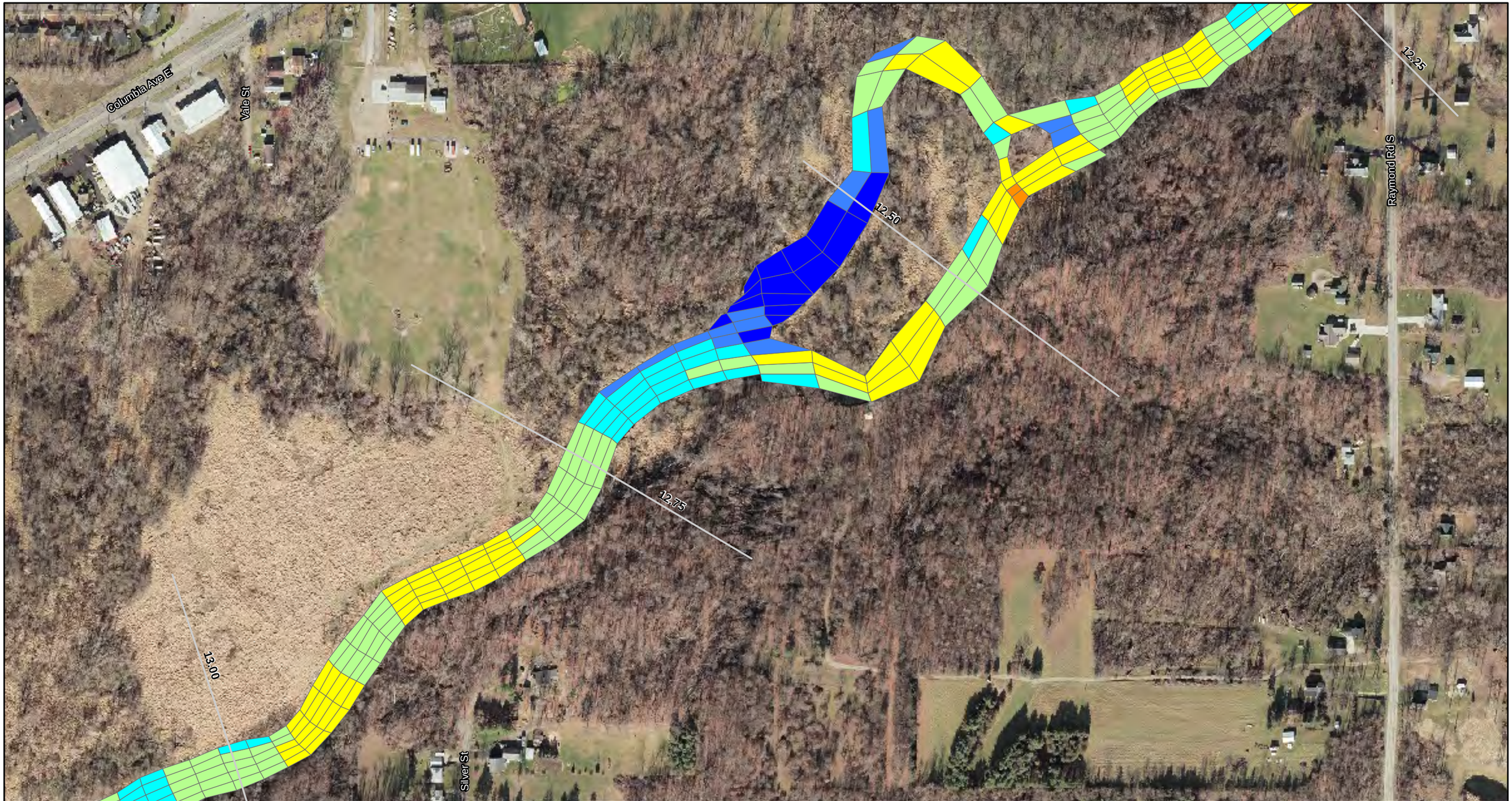
MP 11.10 - MP 12.45

SHEET 14 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 12.30 - MP 13.05

SHEET 15 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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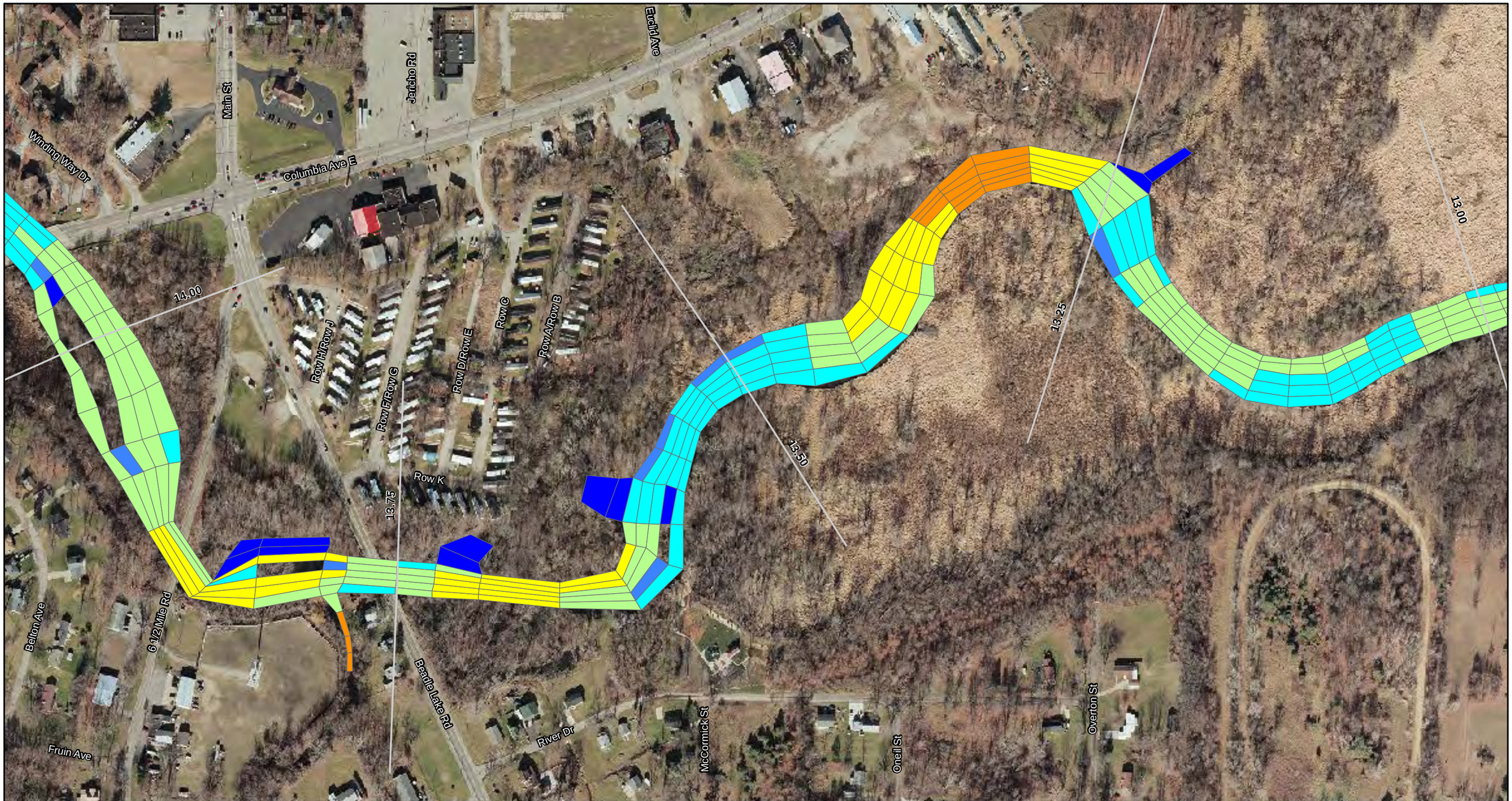
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

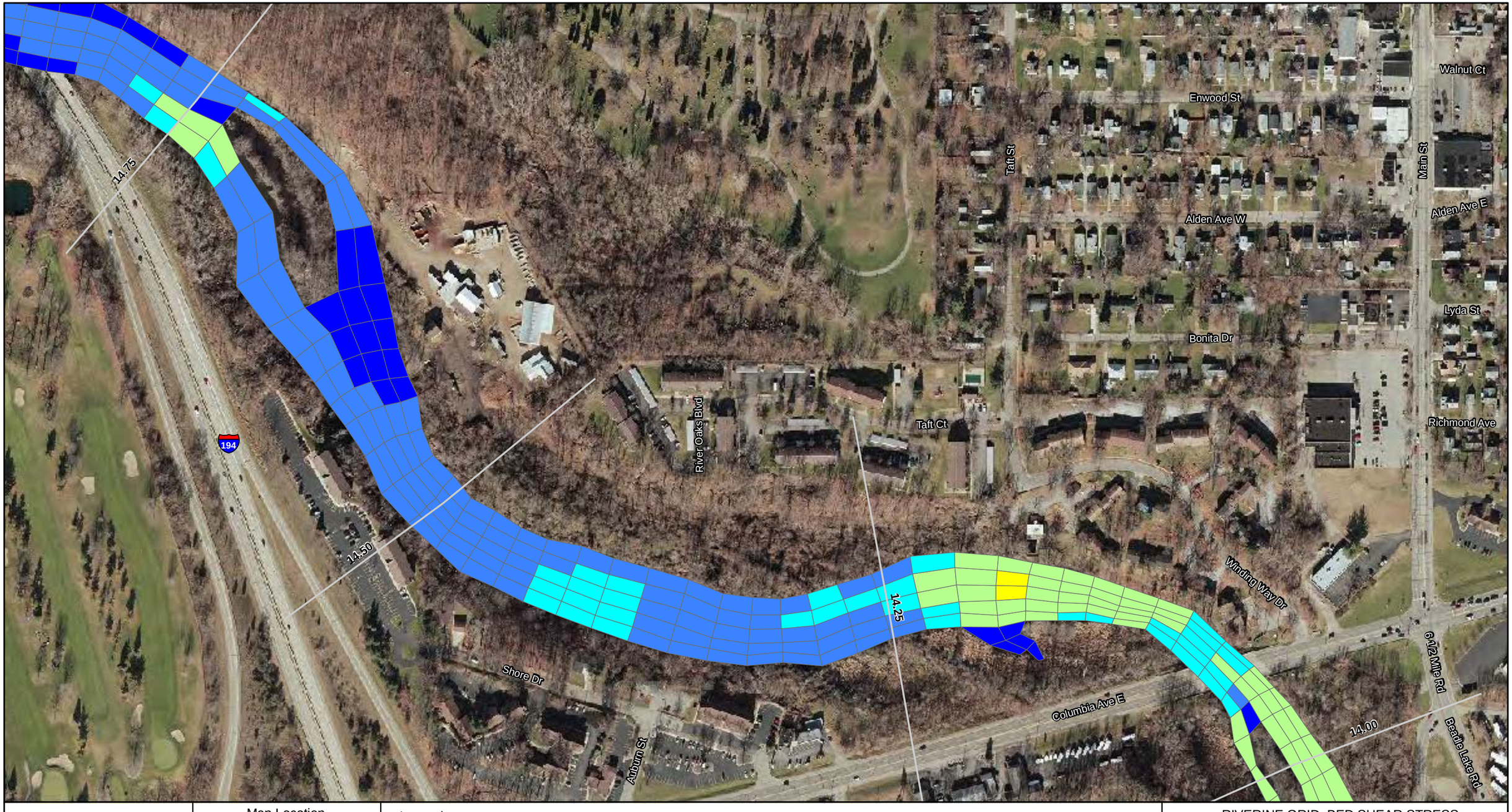
MP 13.00 - MP 14.10

SHEET 16 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

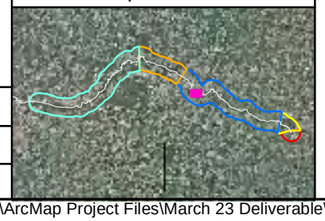
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

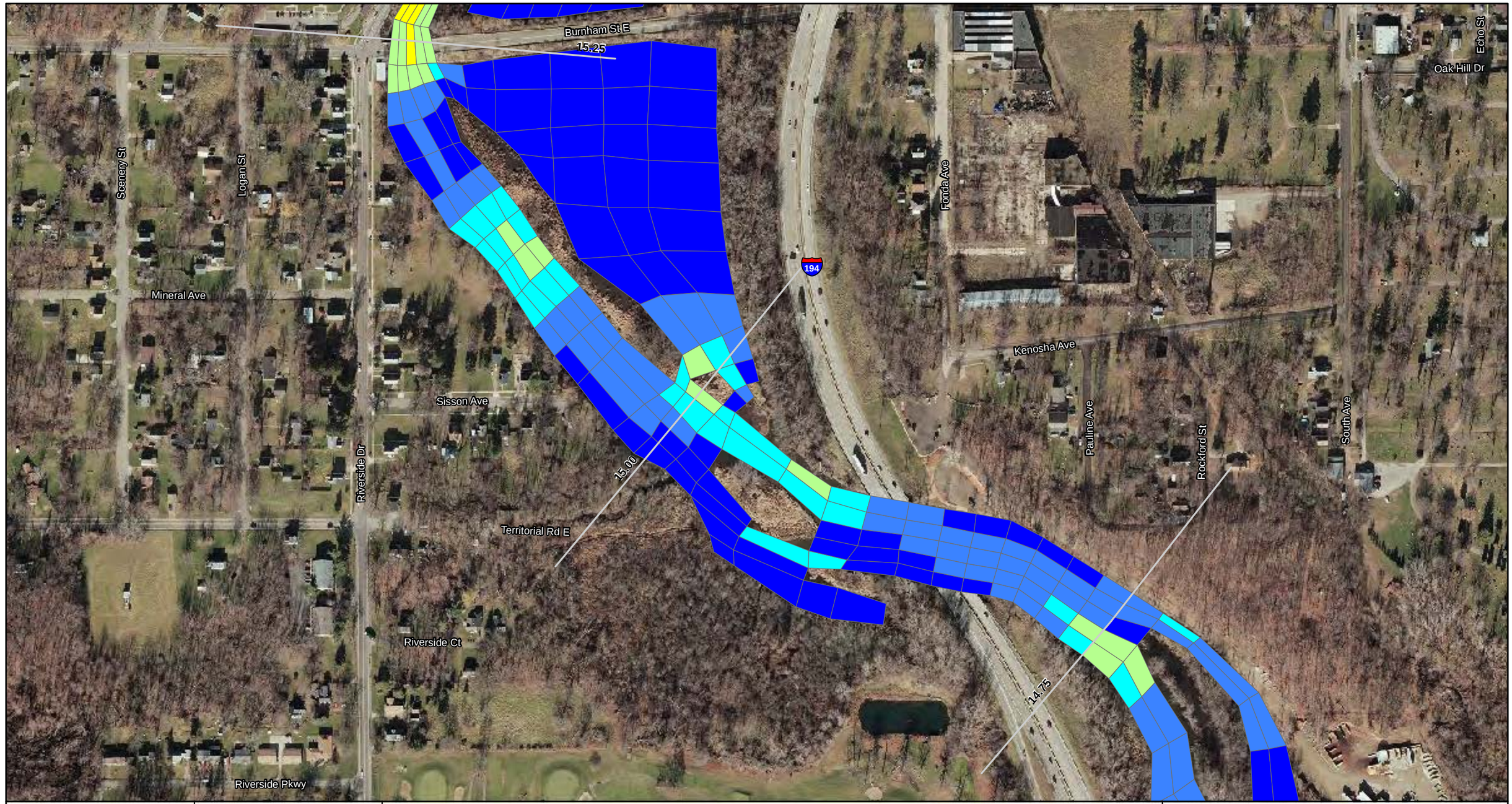
MP 14.00 - MP 14.85

SHEET 17 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

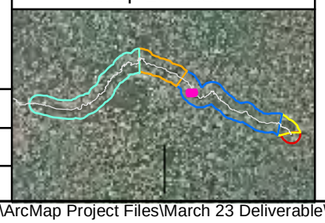
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

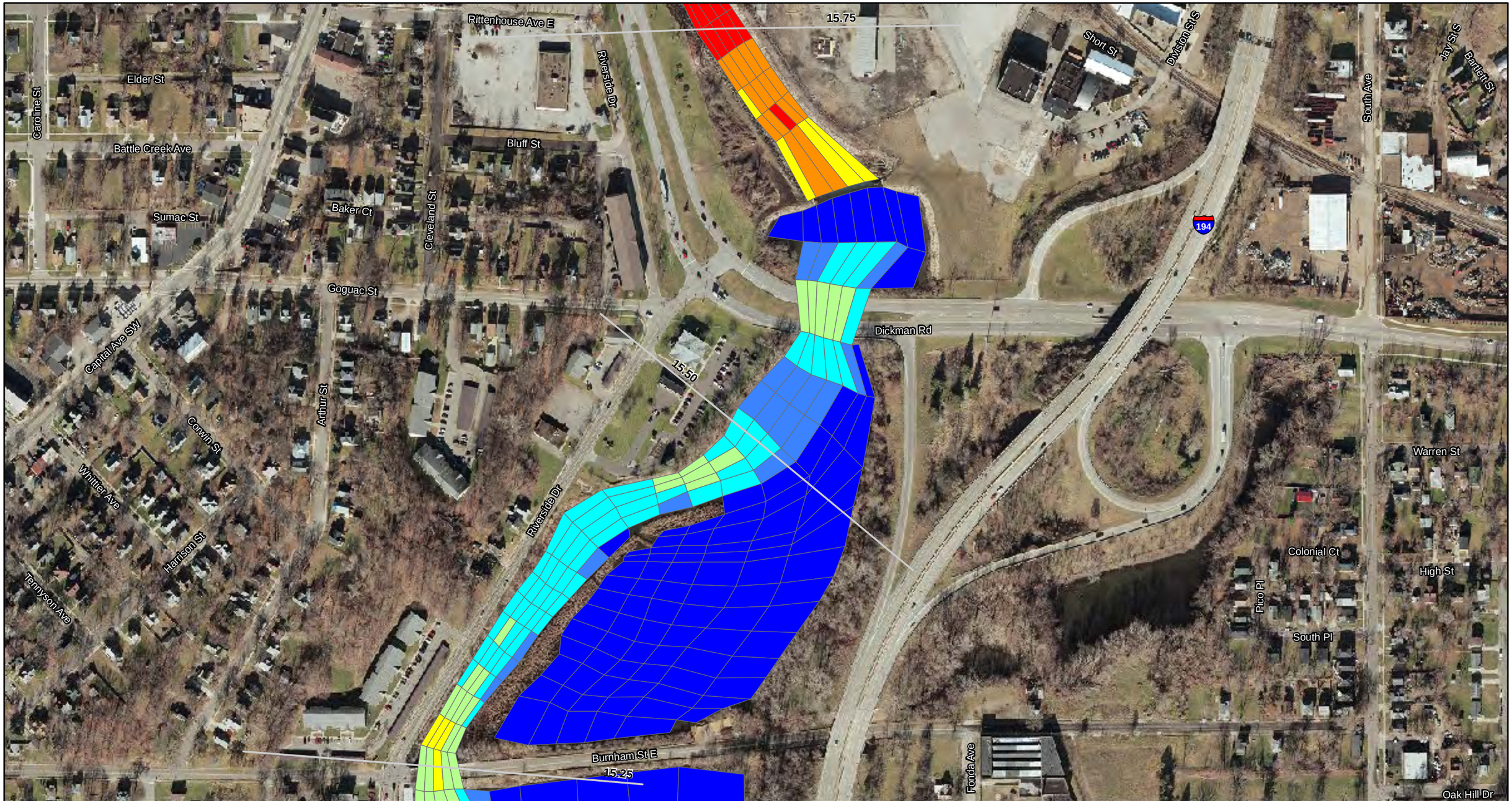
MP 14.65 - MP 15.25

SHEET 18 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

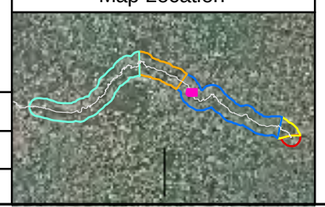
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals

cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 15.25 - MP 15.75

SHEET 19 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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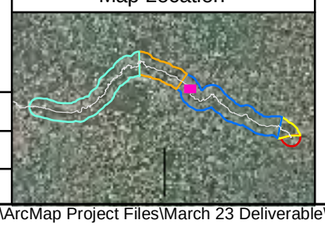
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 15.75 - MP 16.30

SHEET 20 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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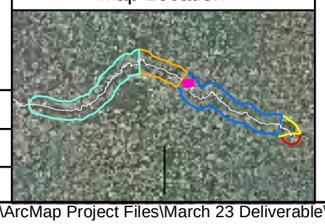
Aerial Photography Date: November 2011

Cass St N
Champion St
Brook St
Michigan Ave W
Washington Ave N
Cass St S
Could St
Van Buren St W
Archer Ct
Jackson St W
Service St
Hamblin Ave W
16.75
Barney St
Washington Ave S
16.30
Lafayette St
Kendall St S
Putnam St
Page St
Louise St
Carlyle St
Houston St
Grand Trunk Ave
Dickman Rd
16.25

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 16.30 - MP 16.95

SHEET 21 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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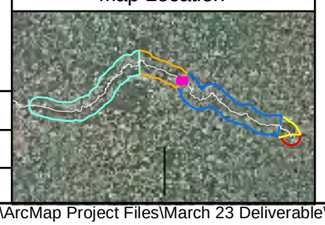
Aerial Photography Date: November 2011

Jackson St W
Grand Ave
Van Buren St W
Graves Ave
Graves Ave
Lemont St
Hubbard St
Manchester St W
17.30
17.25
15th St N
14th St N
12th St N
Jordan St
Turner St
Michigan Ave W
Thorne St
17.00
Wood St S
Lafayette Ave
14th St N
Butler St
Hamblin Ave W
Parish St
Angell St
Lafayette St
E Ave

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 16.85 - MP 17.60

SHEET 22 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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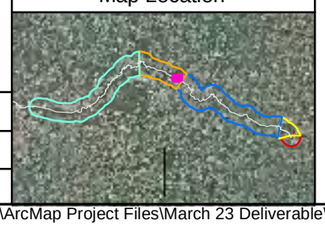
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 17.60 - MP 18.40

SHEET 23 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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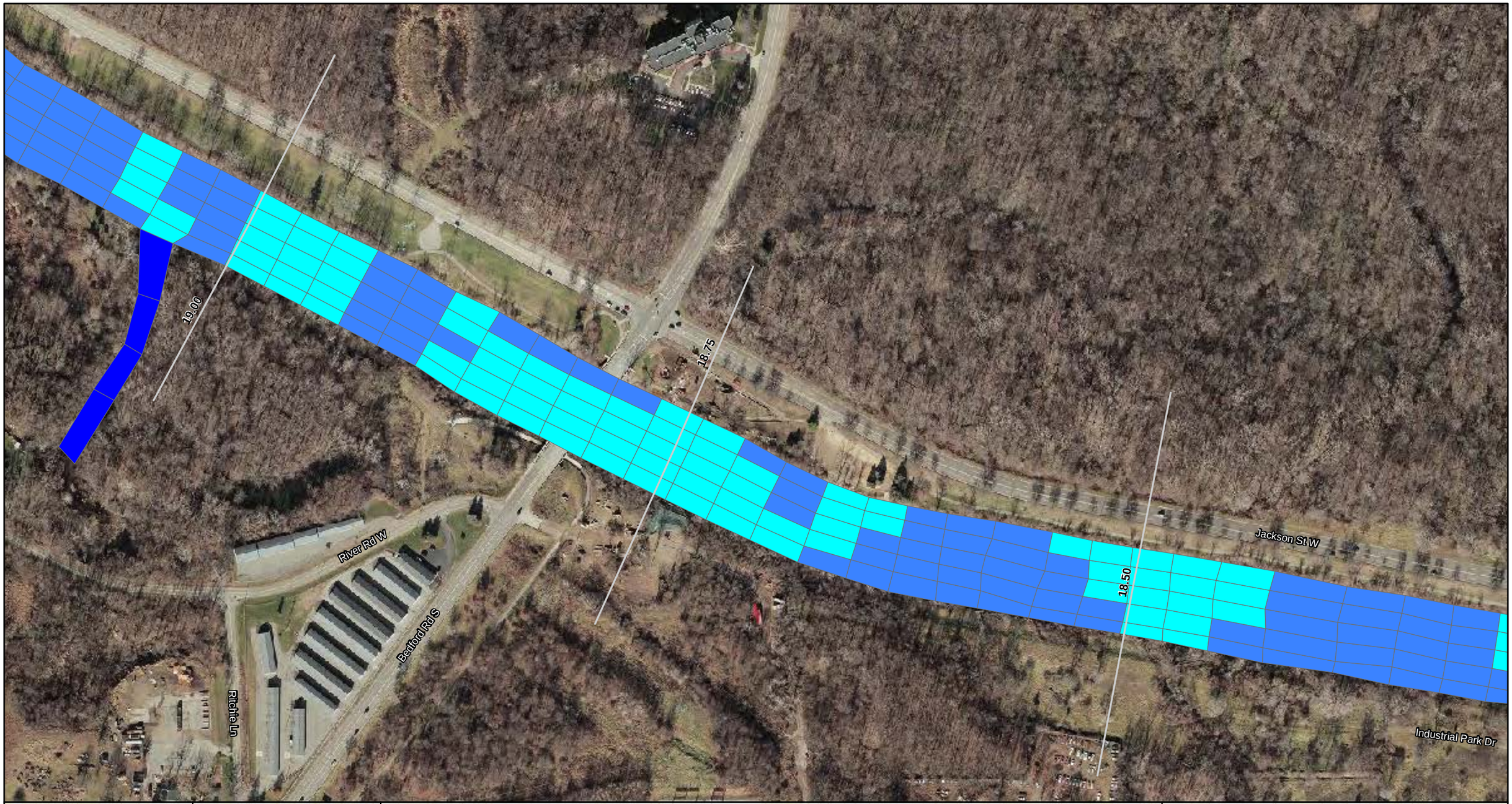
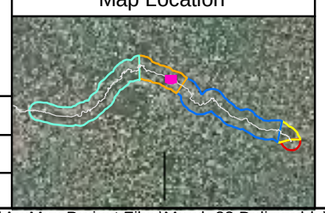
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 18.30 - MP 19.15

SHEET 24 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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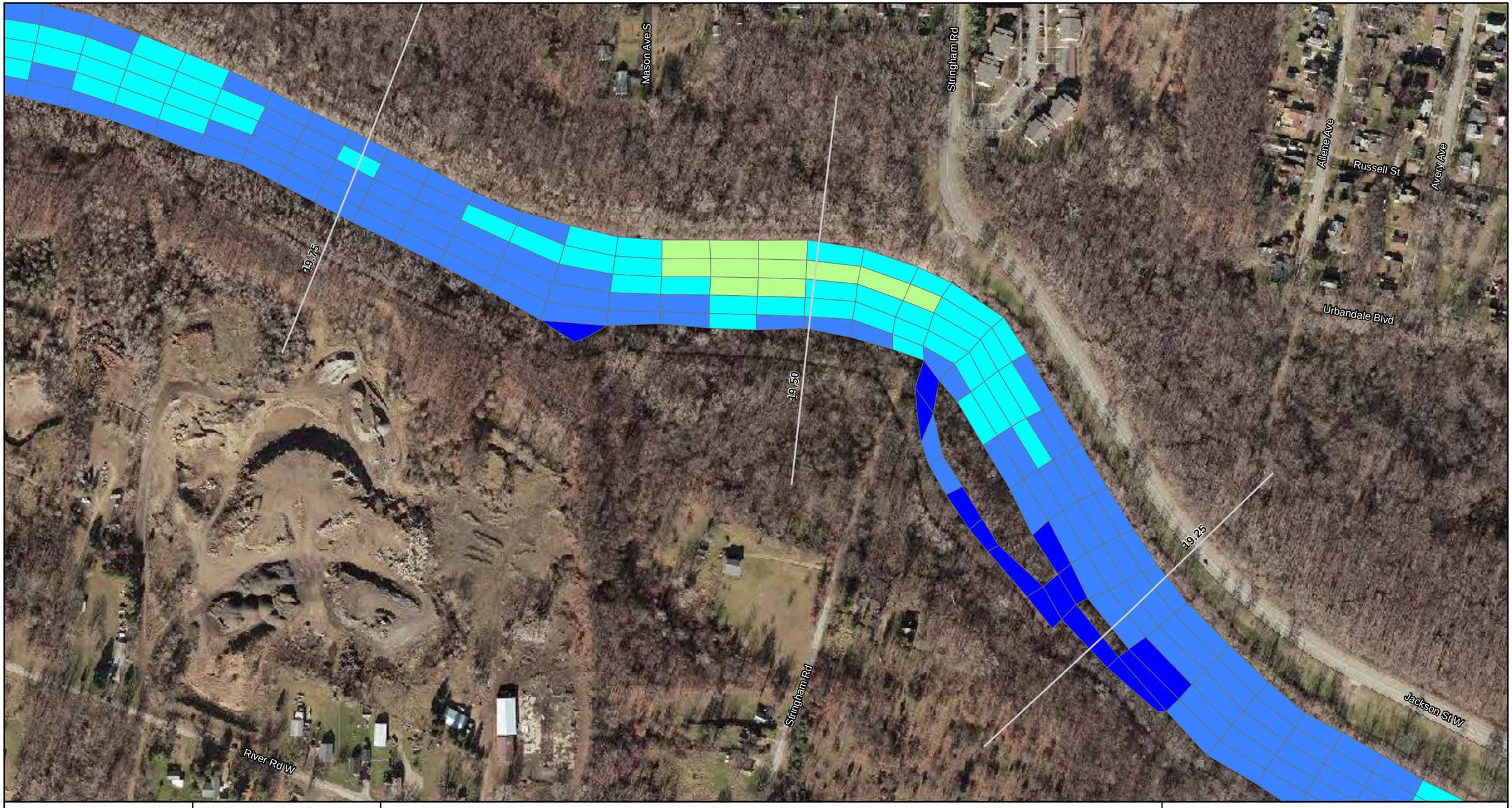
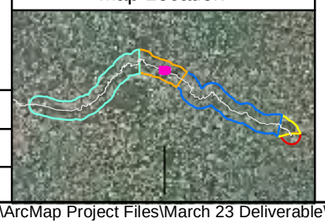
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 19.10 - MP 19.95

SHEET 25 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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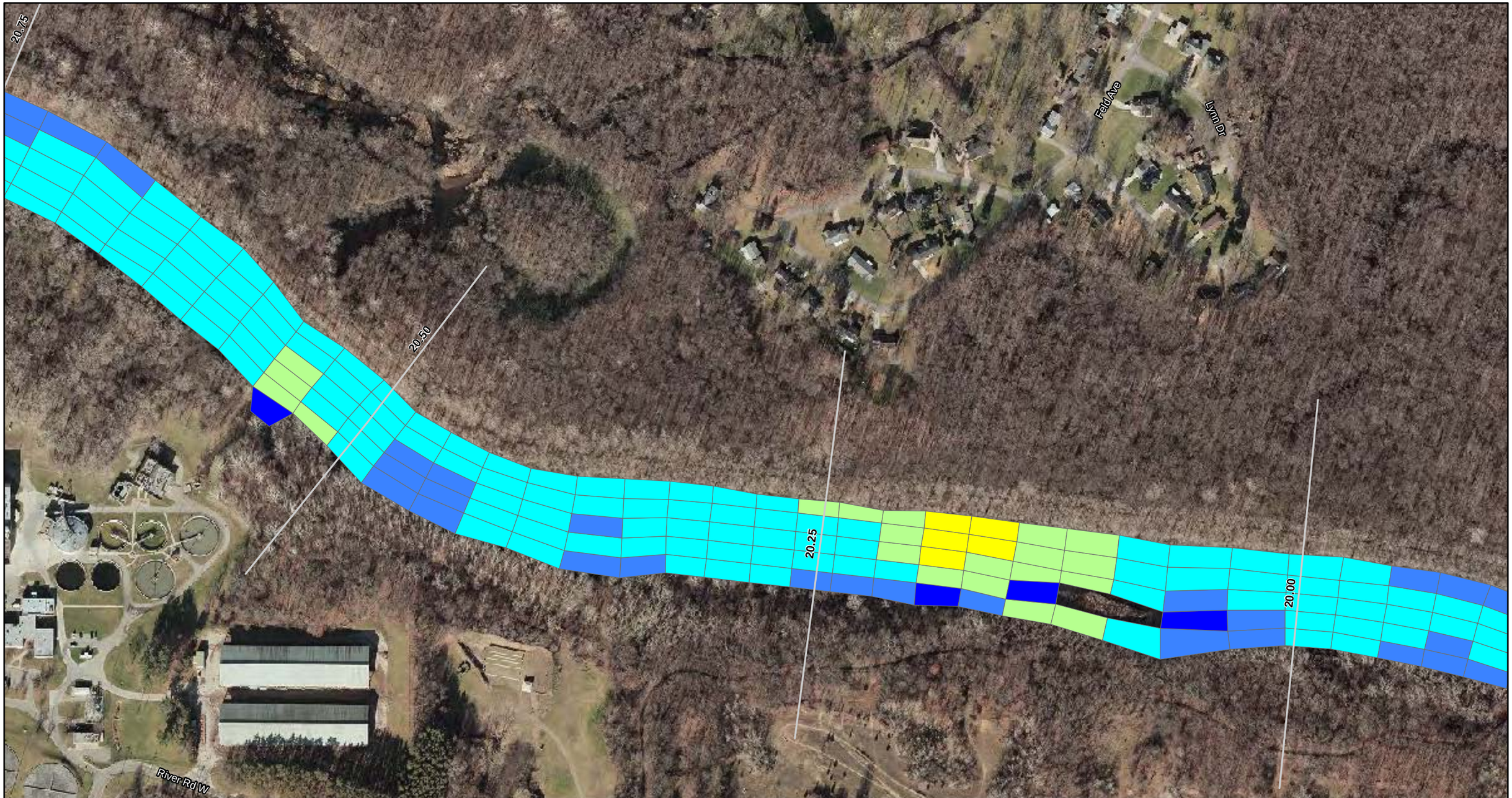
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

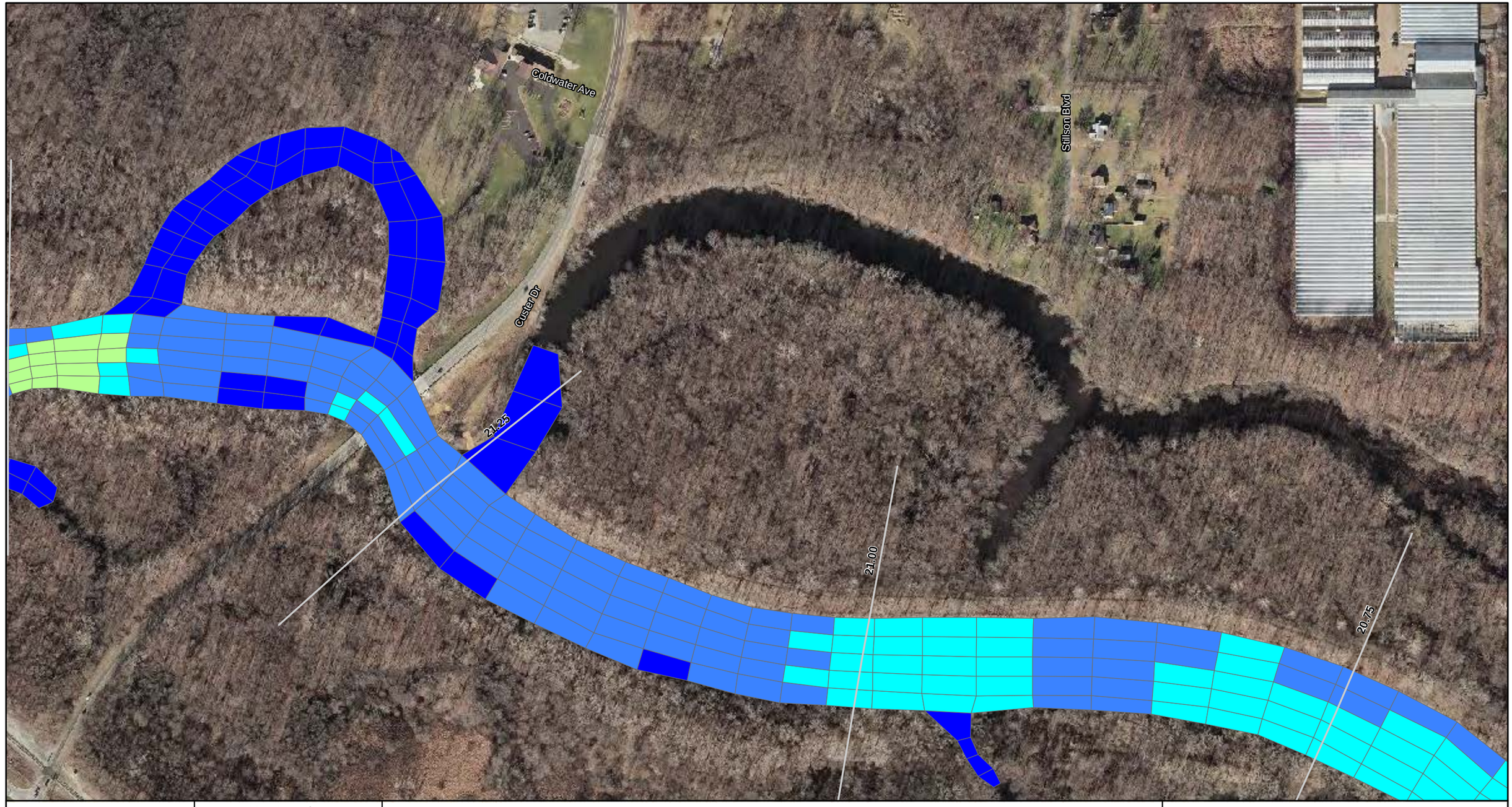
MP 19.90 - MP 20.75

SHEET 26 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

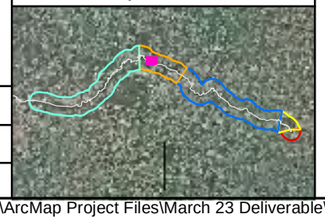
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

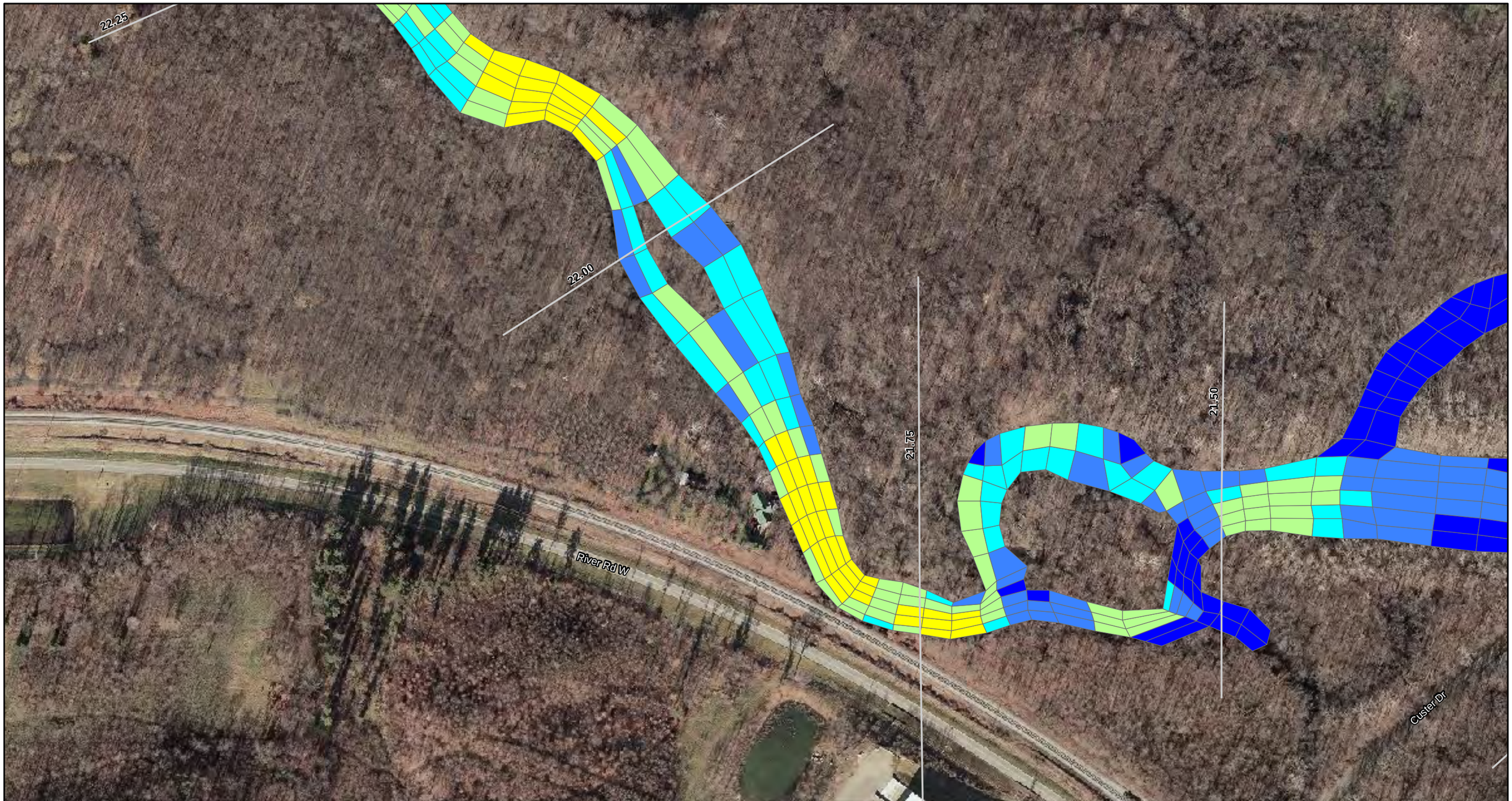
MP 20.70 - MP 21.50

SHEET 27 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

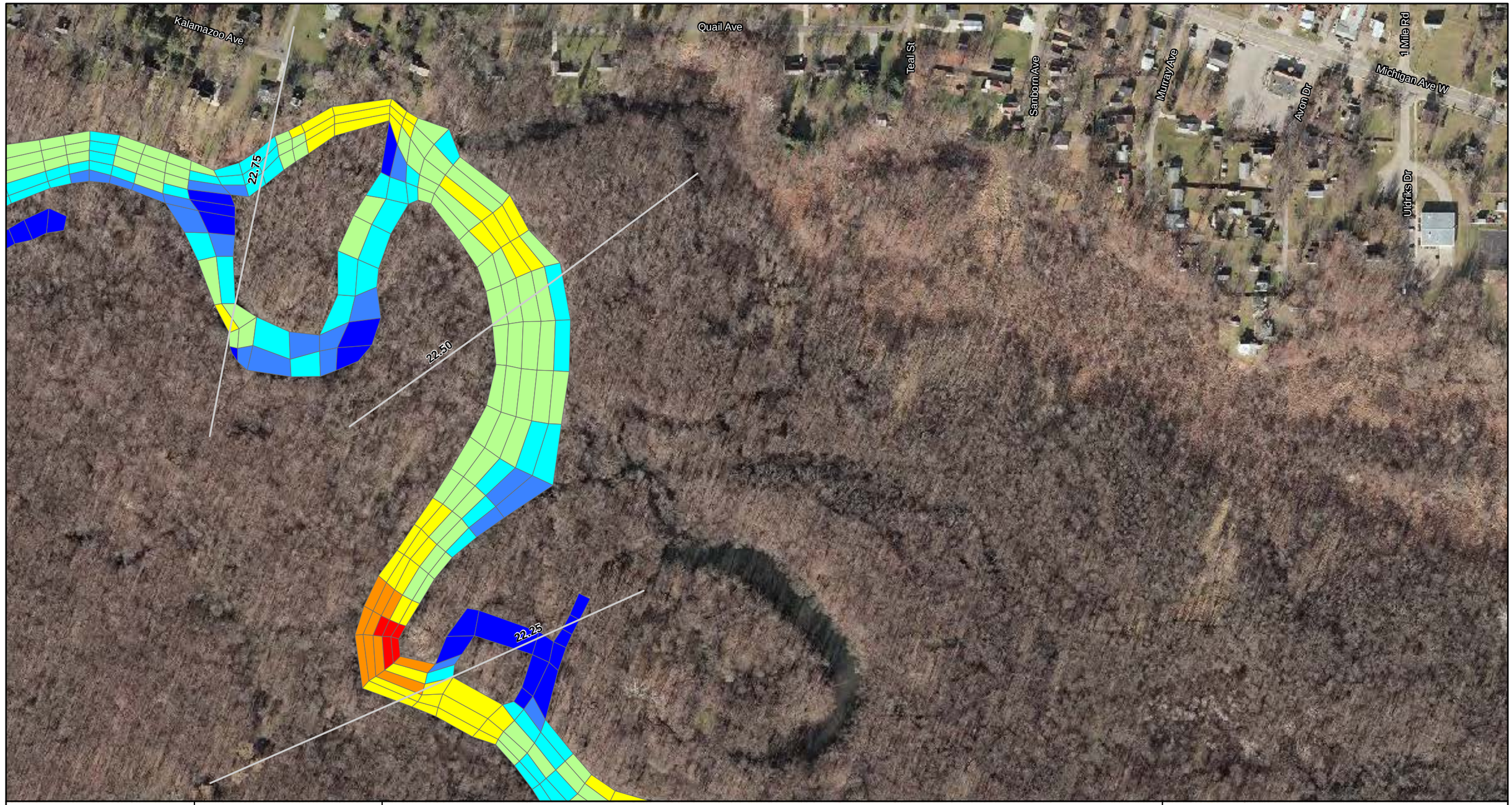
MP 21.35 - MP 22.15

SHEET 28 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

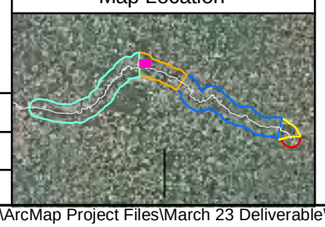
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

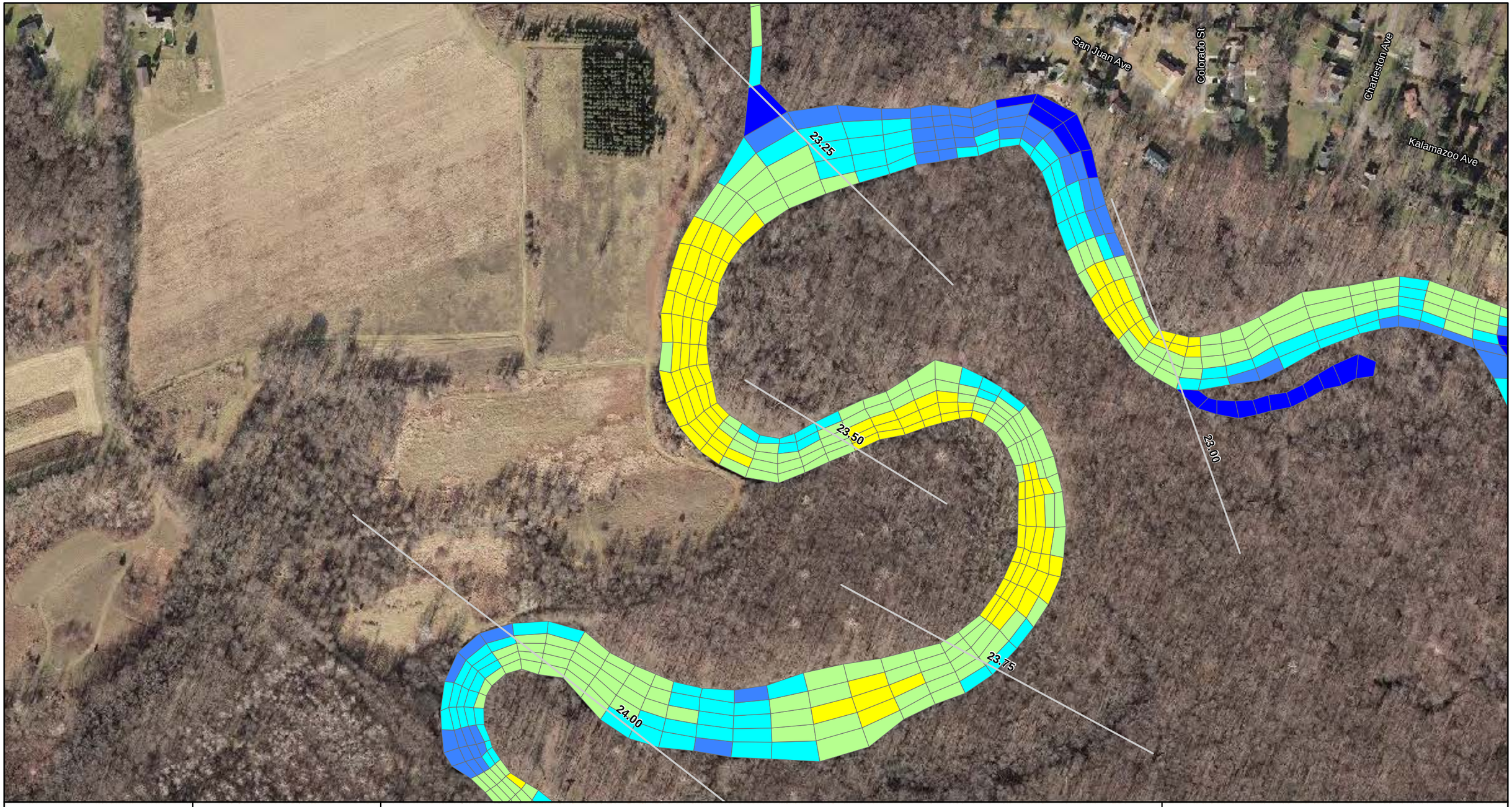
MP 22.15 - MP 22.90

SHEET 29 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

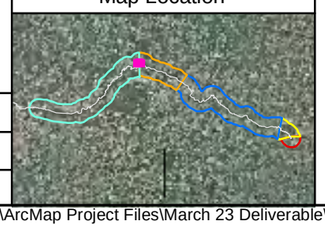
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 22.80 - MP 24.10

SHEET 30 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 24.10 - MP 24.85

SHEET 31 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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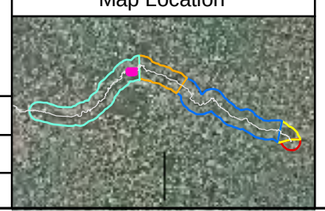
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

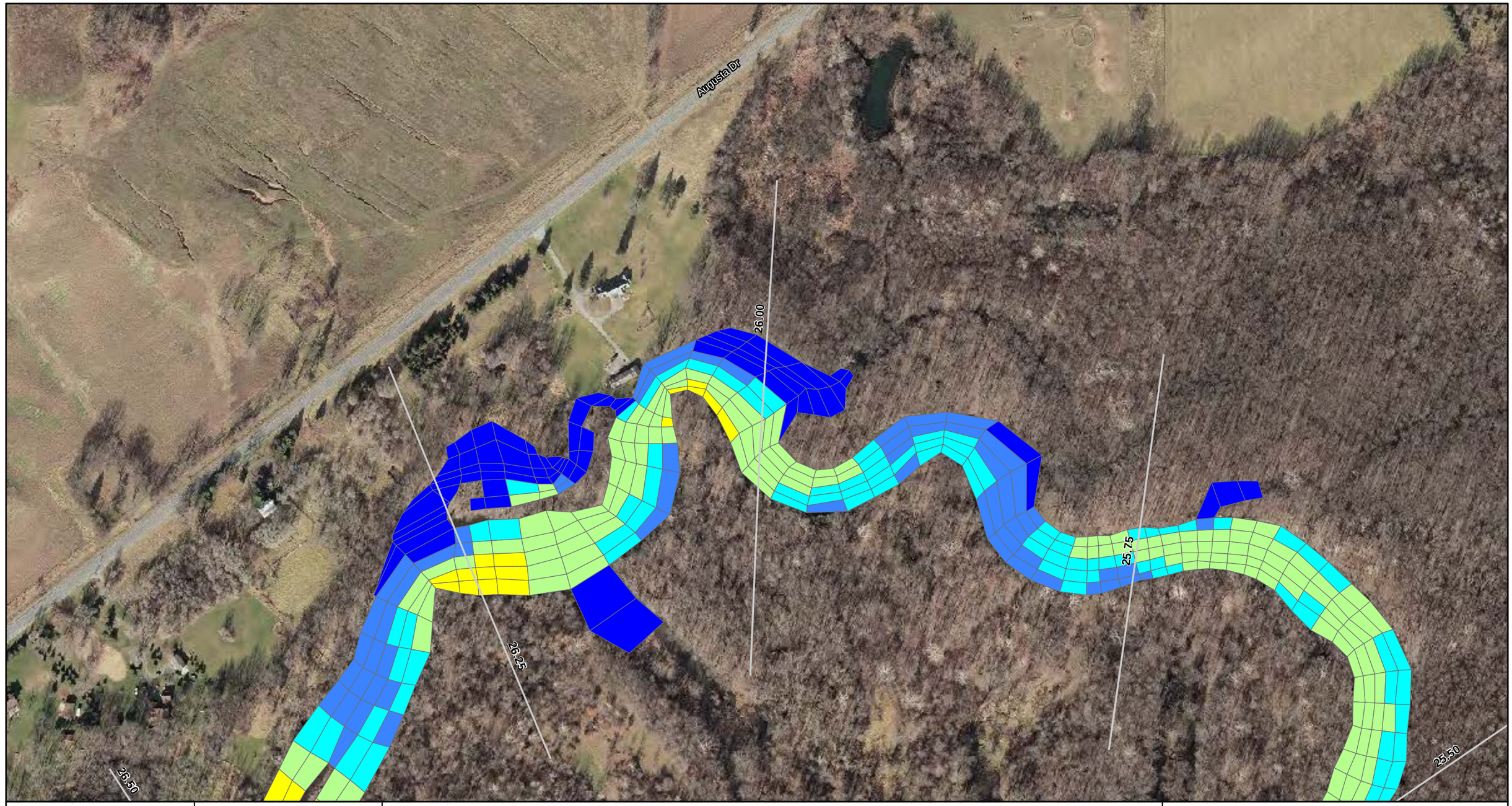
MP 24.80 - MP 25.65

SHEET 32 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

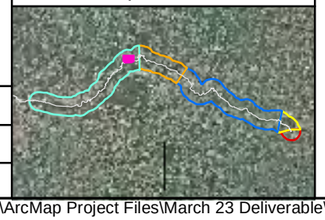
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

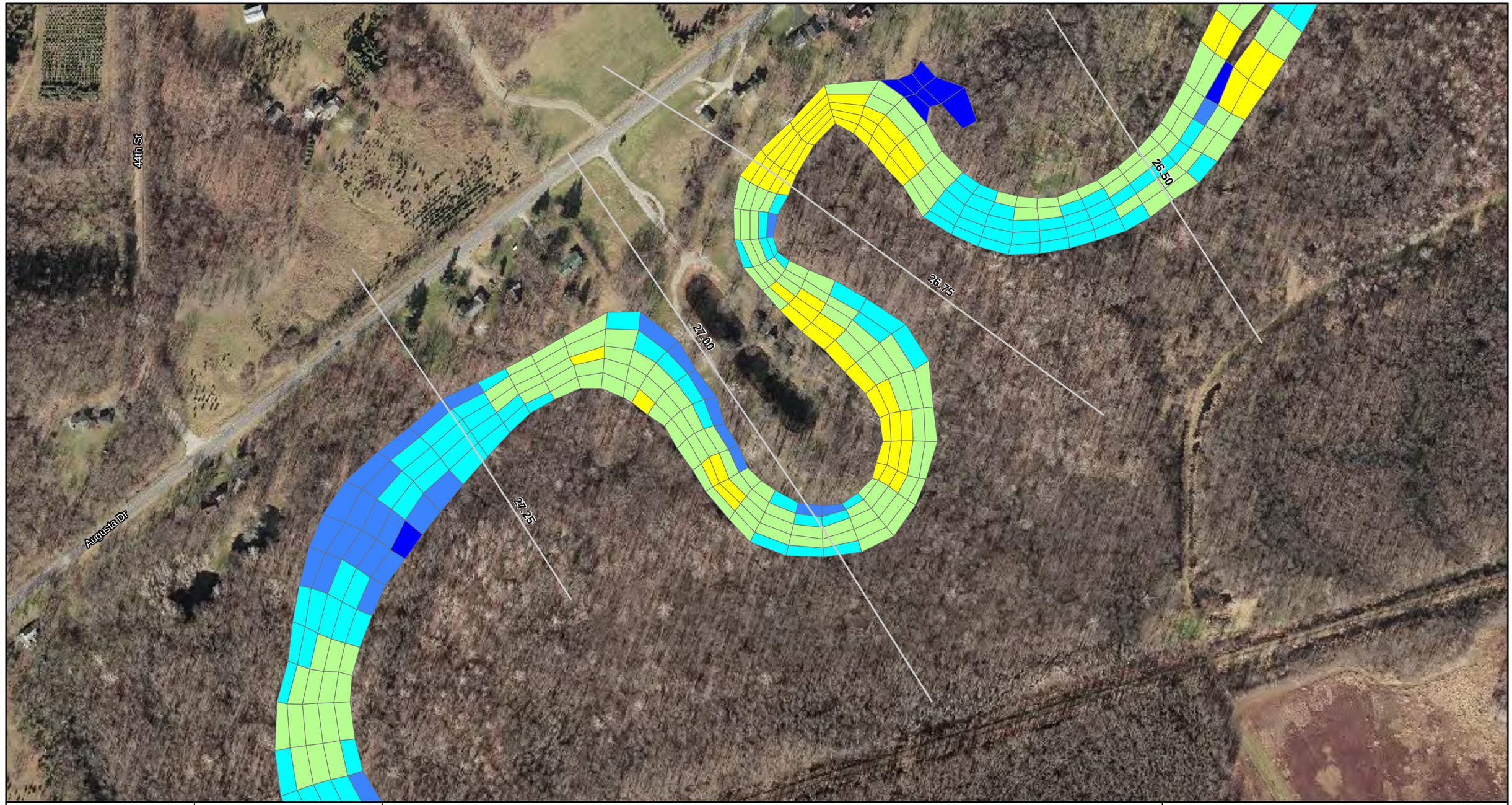
MP 25.55 - MP 26.40

SHEET 33 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

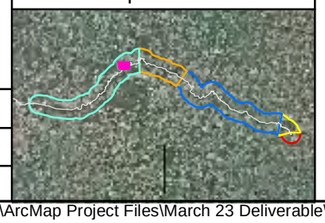
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 26.40 - MP 27.45

SHEET 34 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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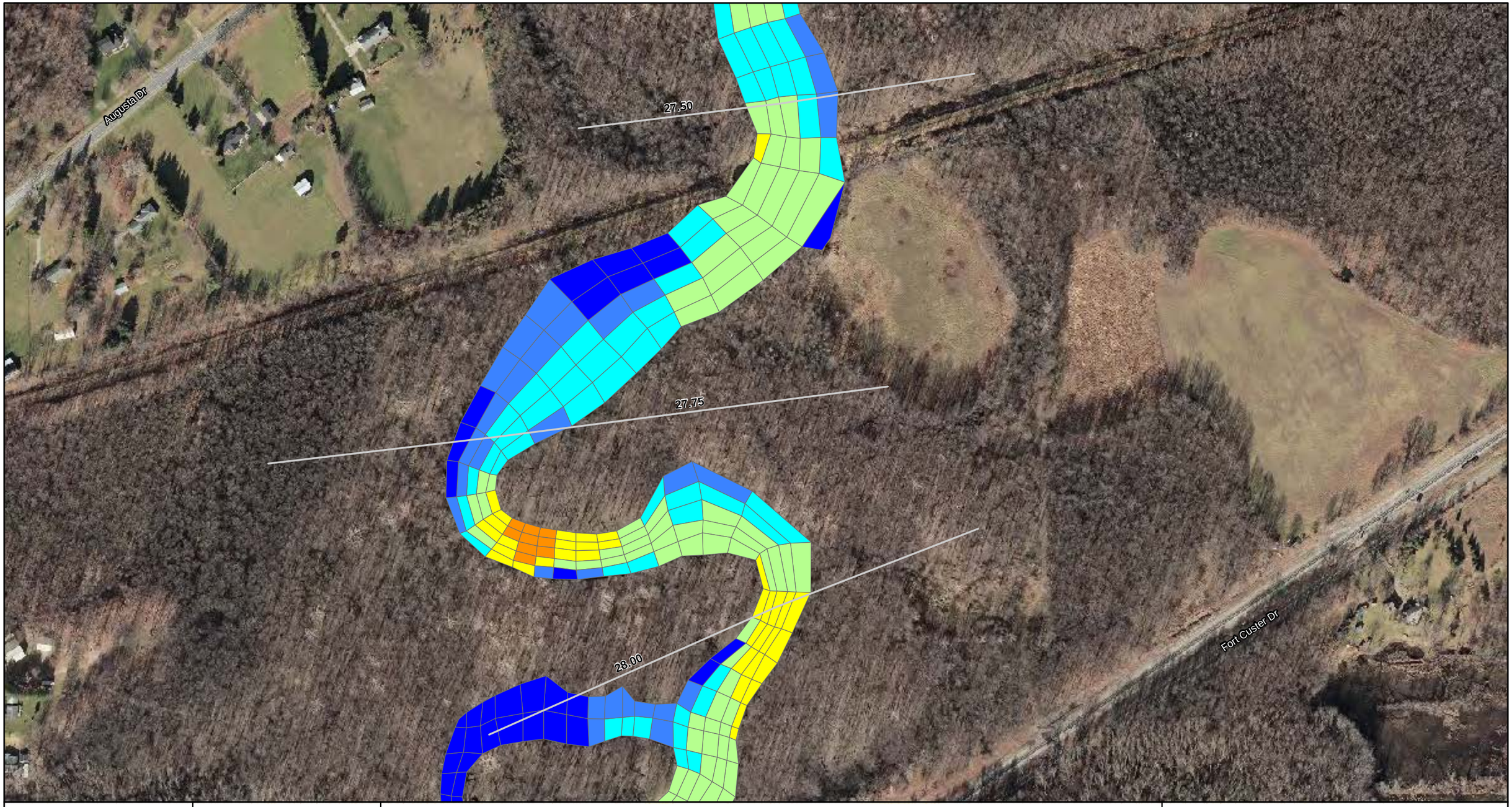
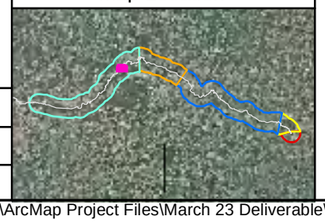
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

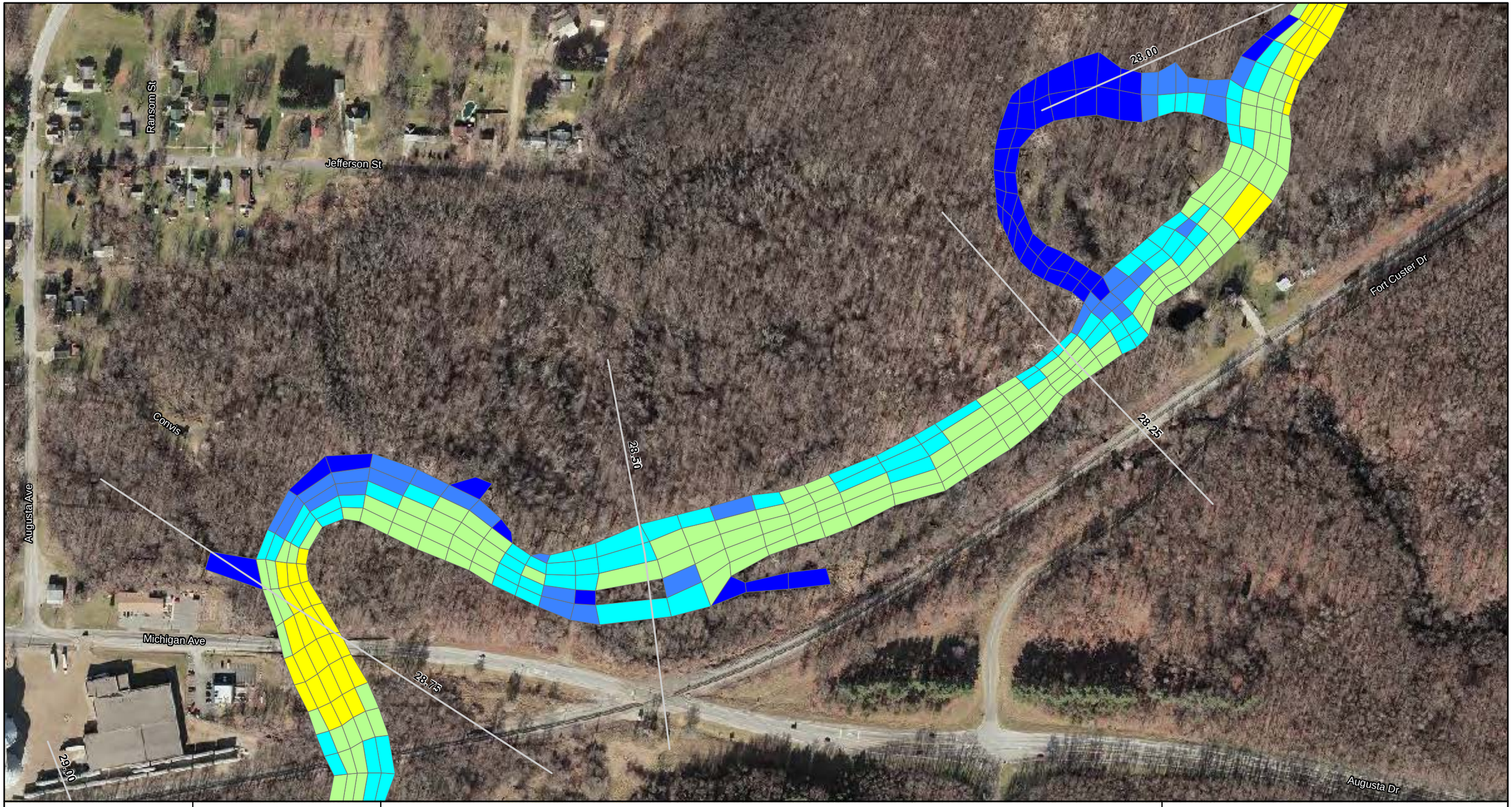
MP 27.45 - MP 28.10

SHEET 35 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

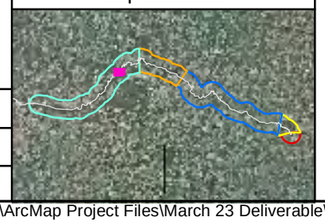
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 28.05 - MP 28.85

SHEET 36 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Clinton St
Clinton St
Chestnut St
Webster St
Church St
Fayette St
Cass St
Cherry St
Lincoln St
28.75
29.00
29.25
29.50
Augusta Climax Rd
Fort Custer Rec Area Access

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 28.85 - MP29.55

SHEET 37 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

29.50

29.75

Fort Custer Rec Area Service

Fort Custer Rec Area Access

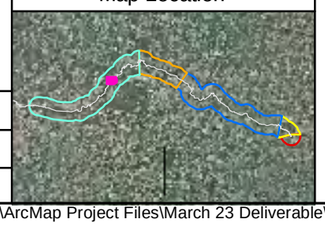
30.25

30.00

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 29.50 - MP29.95

SHEET 38 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals

cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

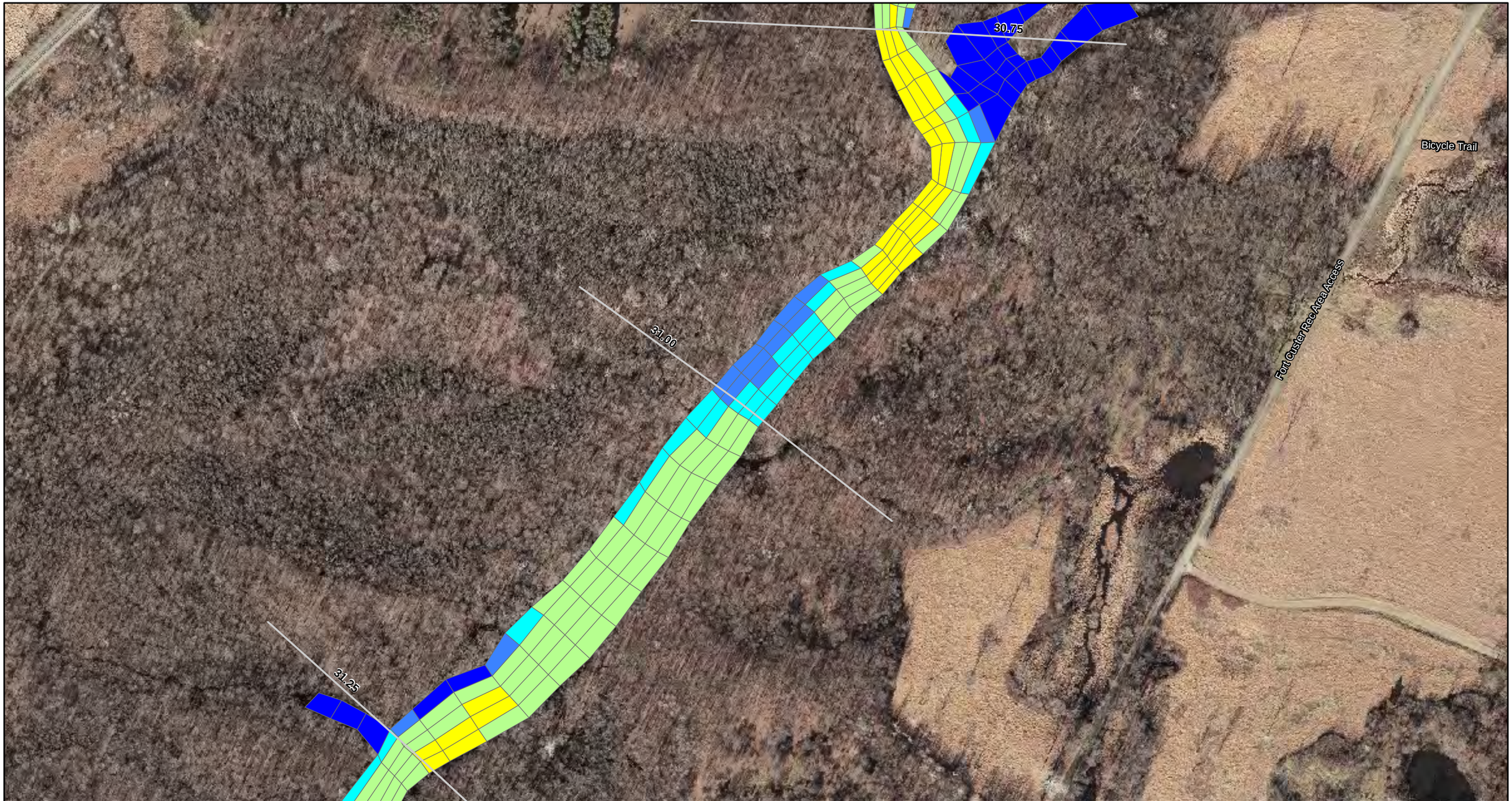
MP 29.95 - MP 30.80

SHEET 39 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

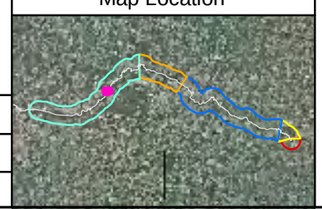
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 30.75 - MP 31.25

SHEET 40 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 31.25 - MP 31.70

SHEET 41 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

31.75

32.00

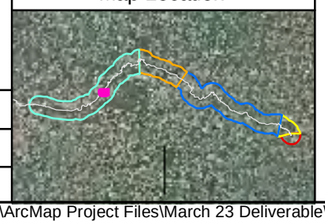
32.25

Bicycle Trail

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals

cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

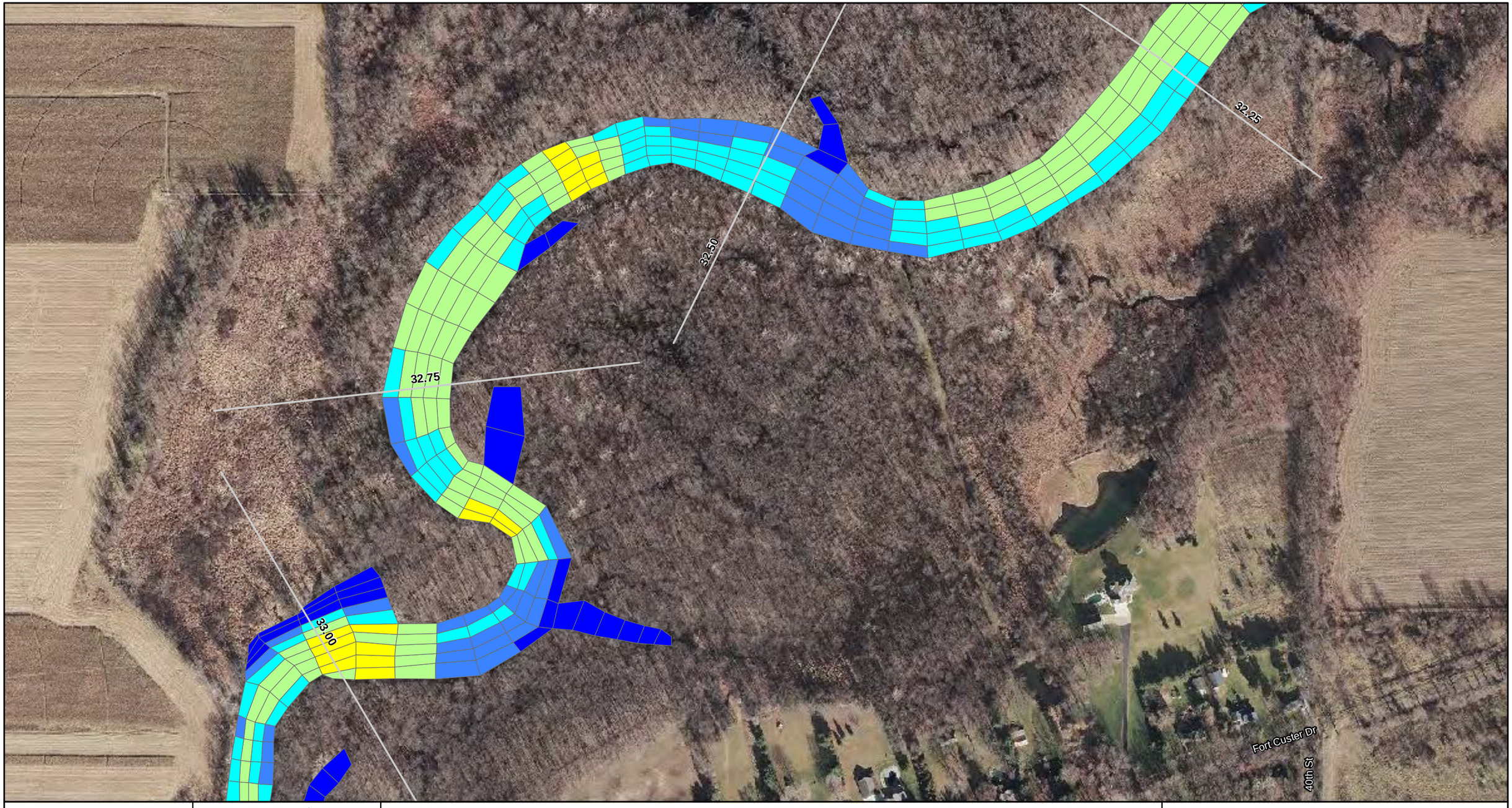
MP 31.65 - MP 32.25

SHEET 42 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

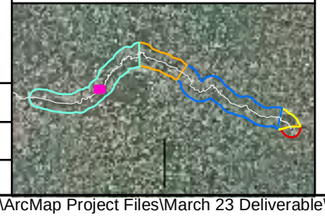
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 32.25 - MP 33.10

SHEET 43 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

33.00

33.25

33.50

33.75

Fort Custer Dr

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

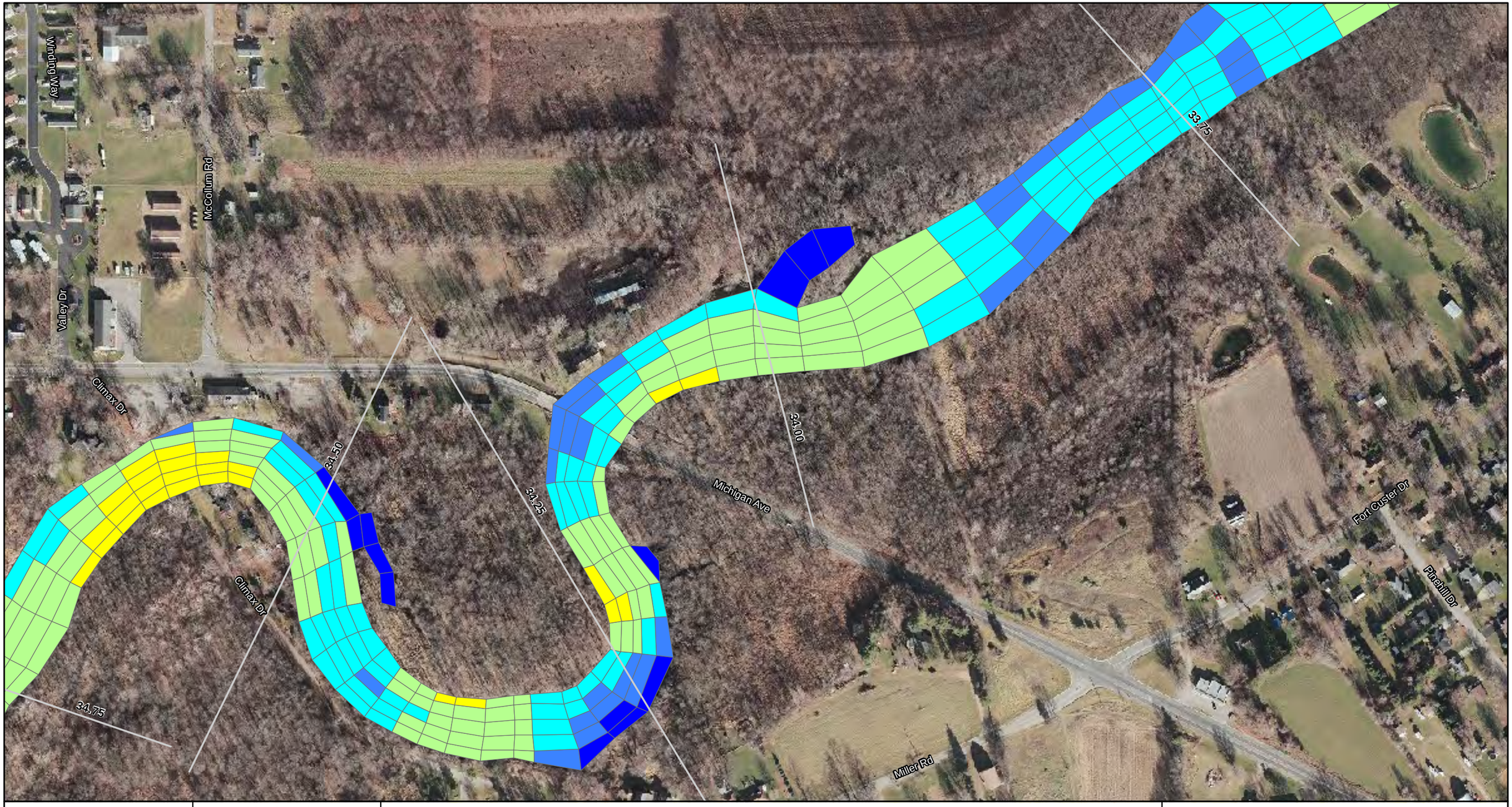
MP 33.10 - MP 33.70

SHEET 44 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

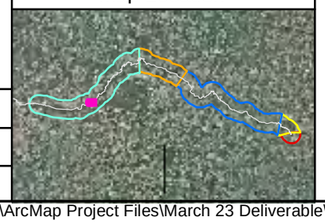
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

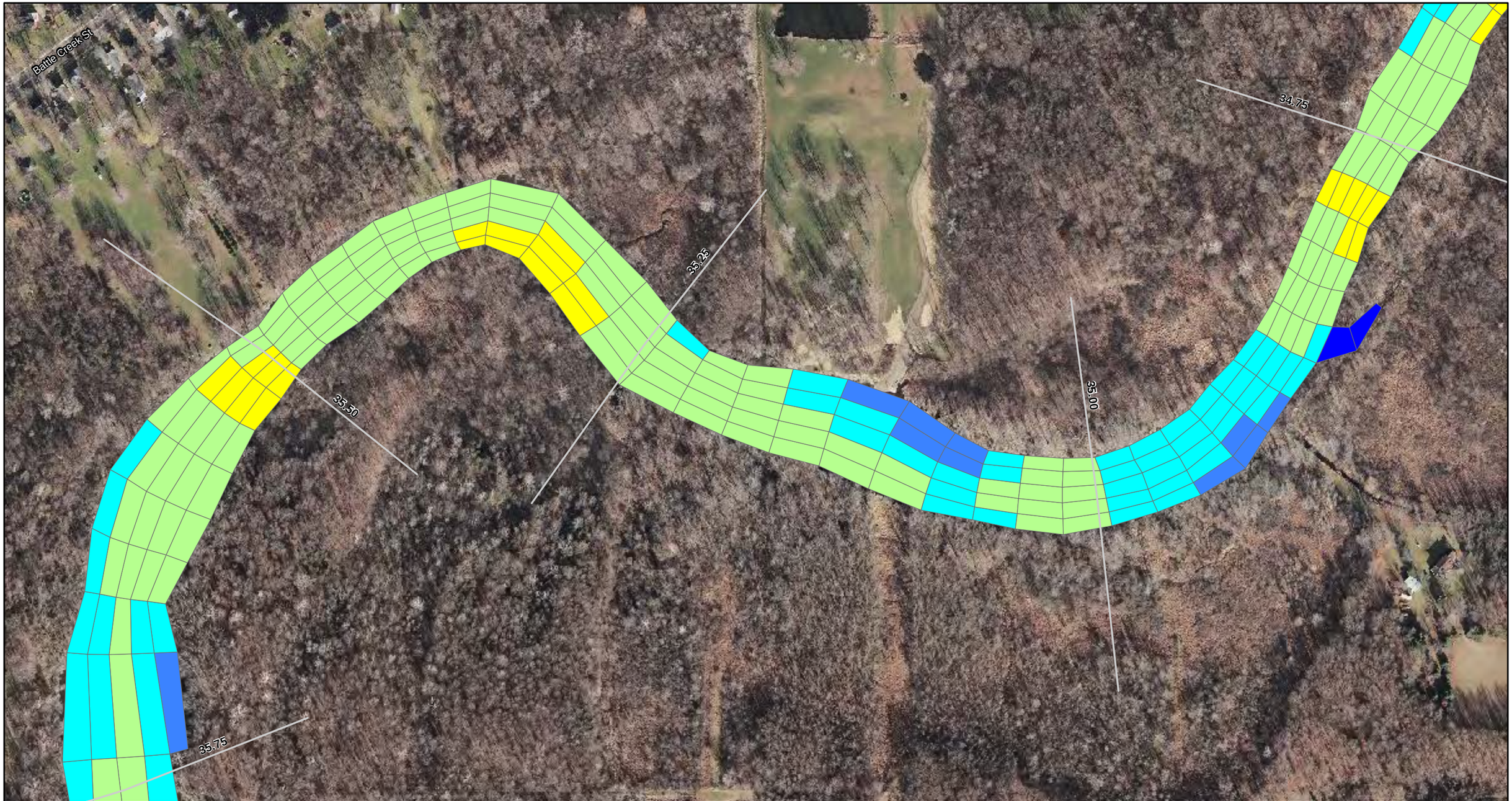
MP 33.70 - MP 34.70

SHEET 45 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

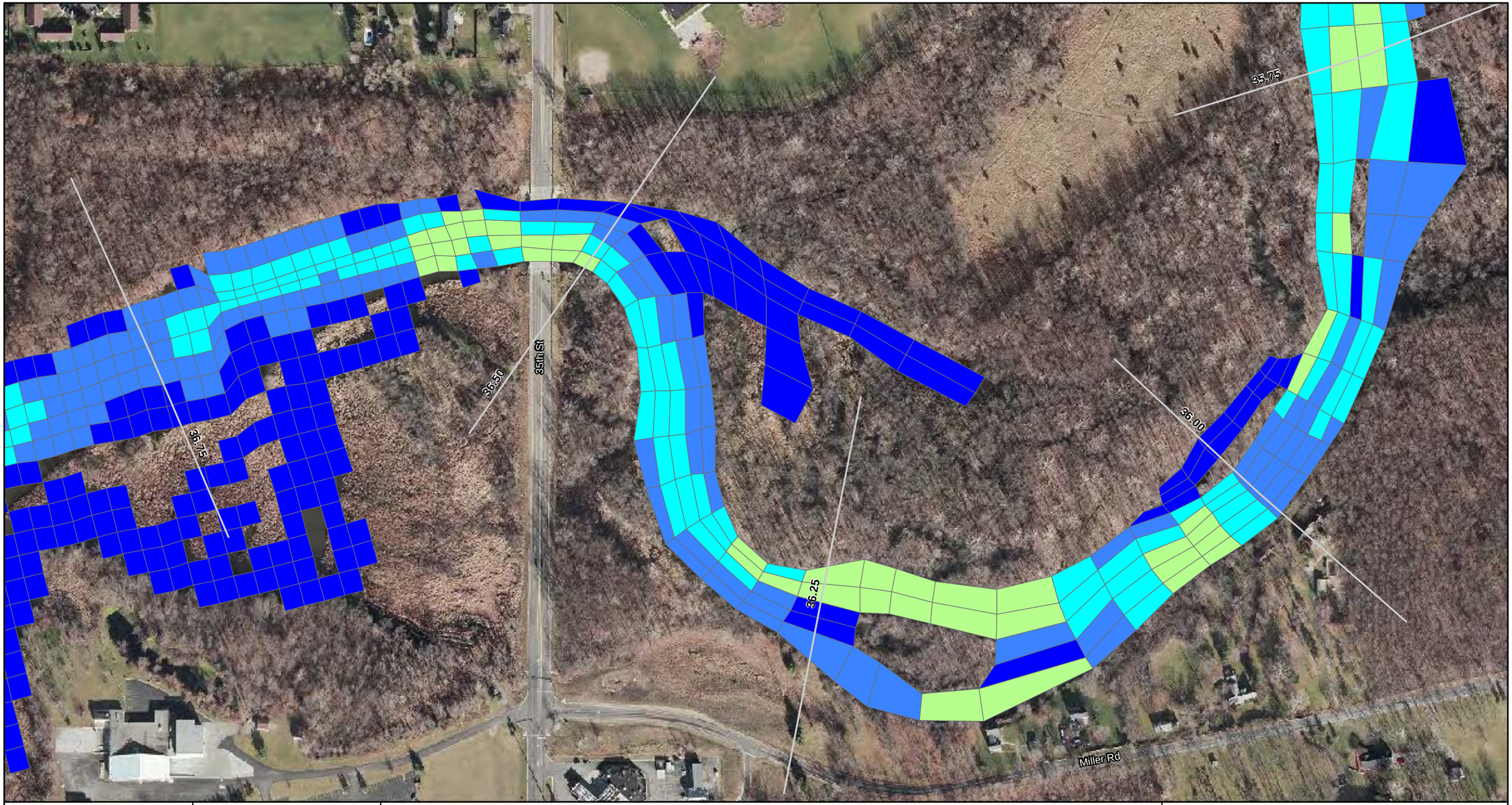
MP 34.70 - MP 35.75

SHEET 46 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

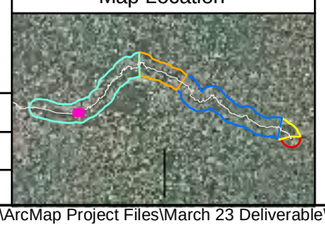
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

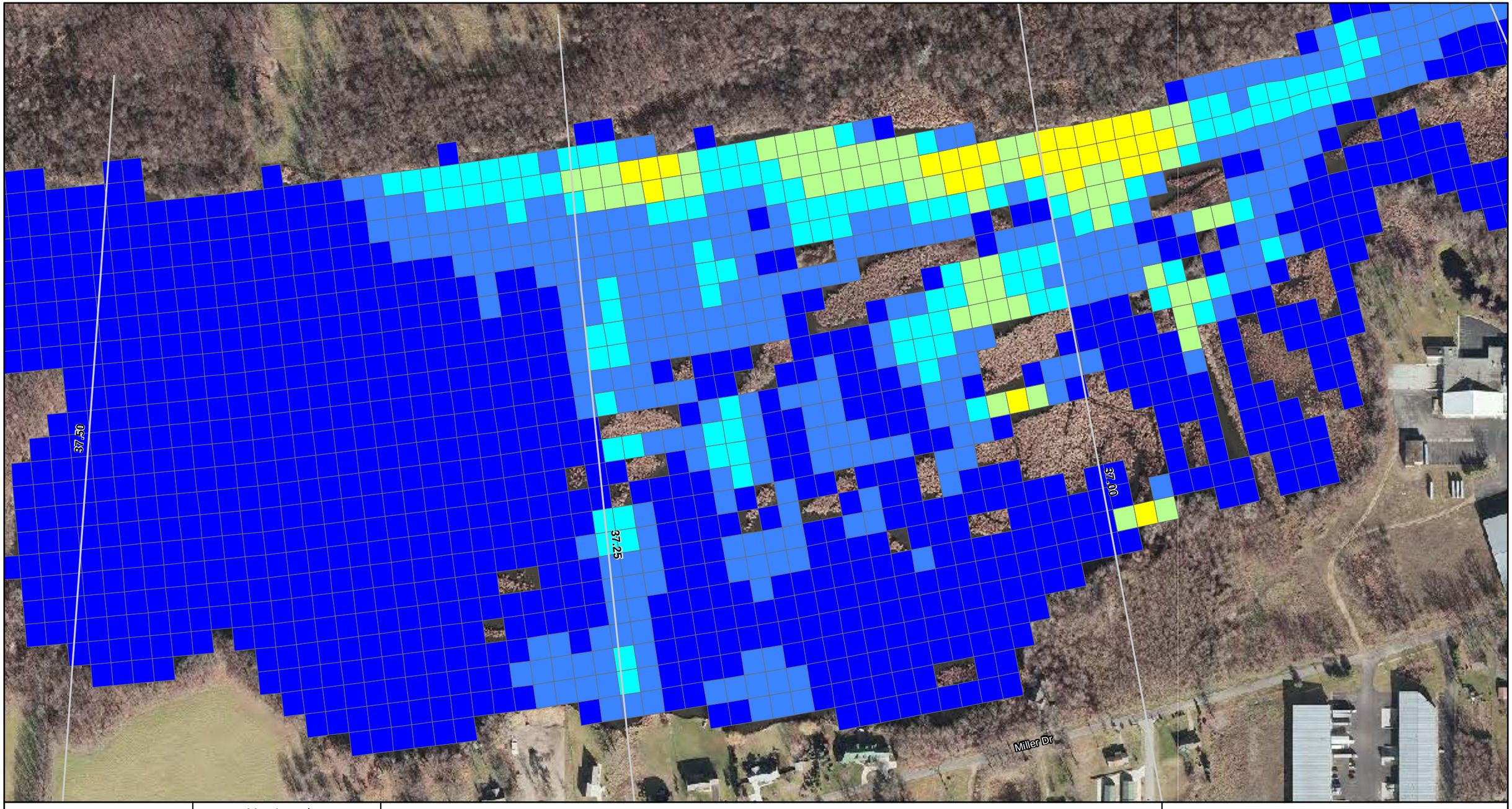
MP 35.75 - MP 36.80

SHEET 47 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

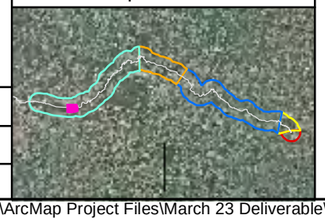
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

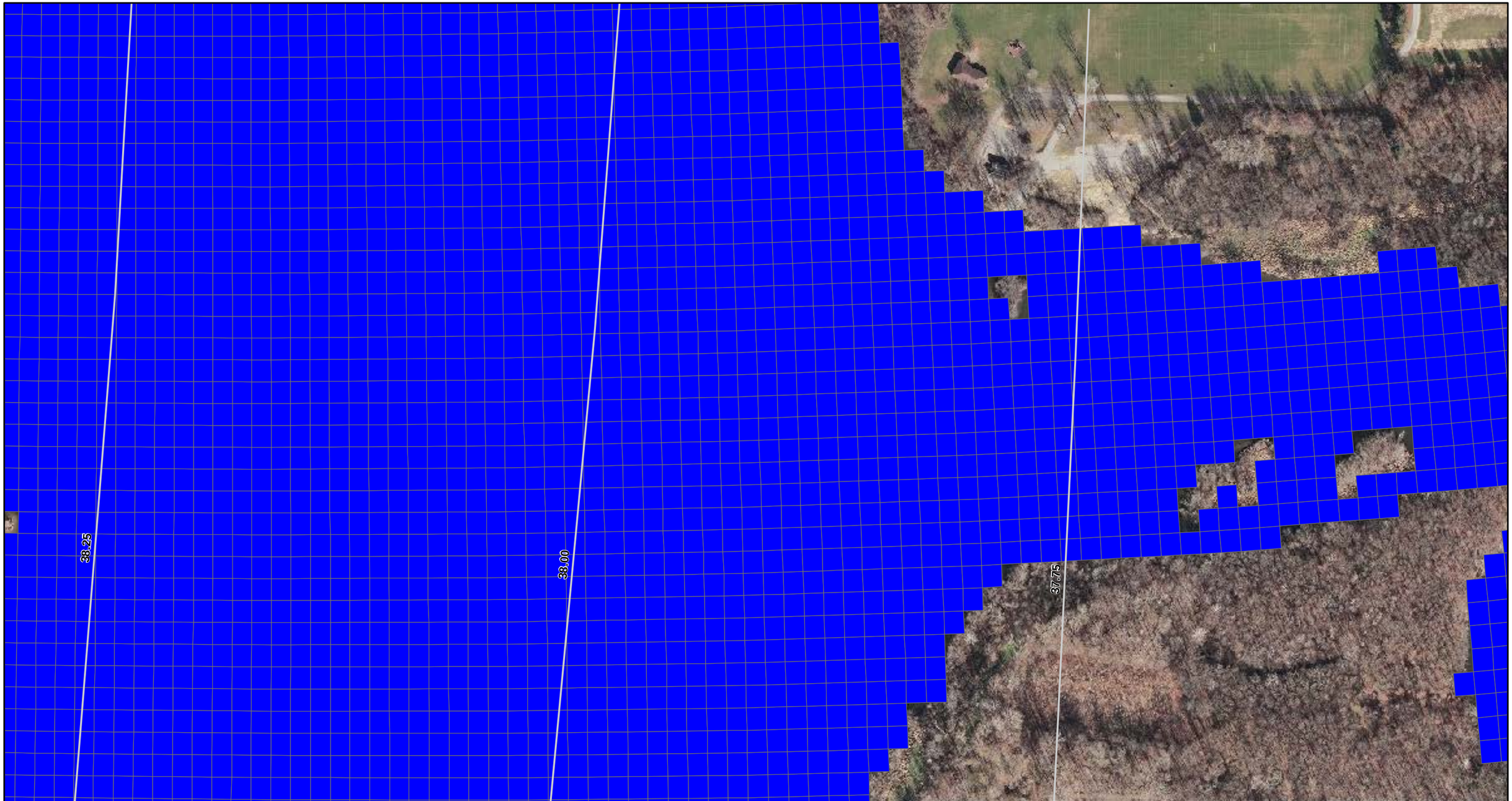
MP 36.80 - MP 37.55

SHEET 48 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

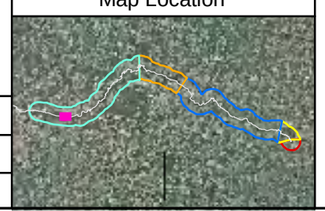
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

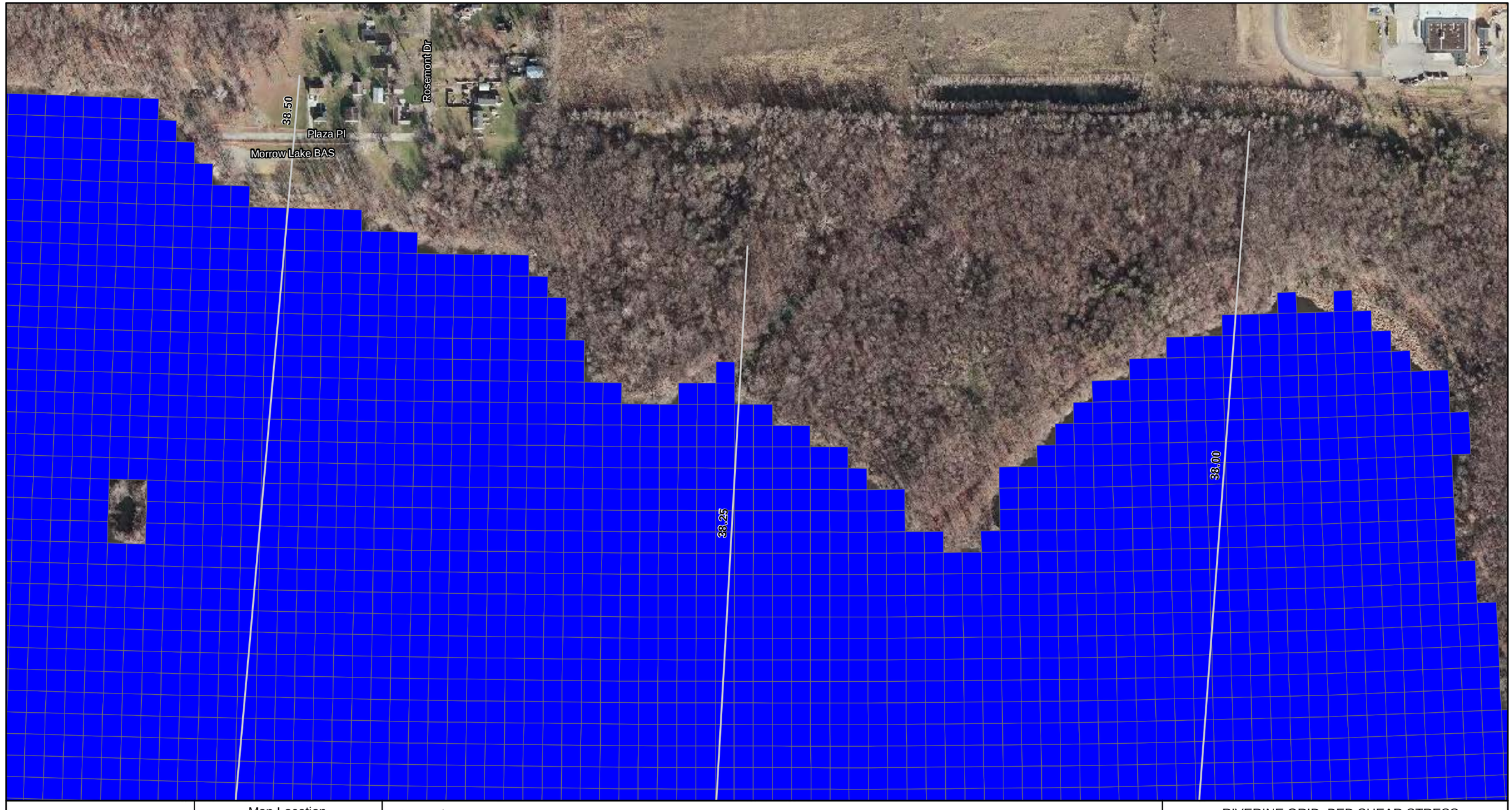
MP 37.55 - MP 38.30

SHEET 49 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

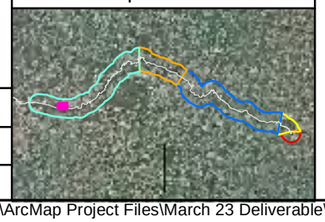
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

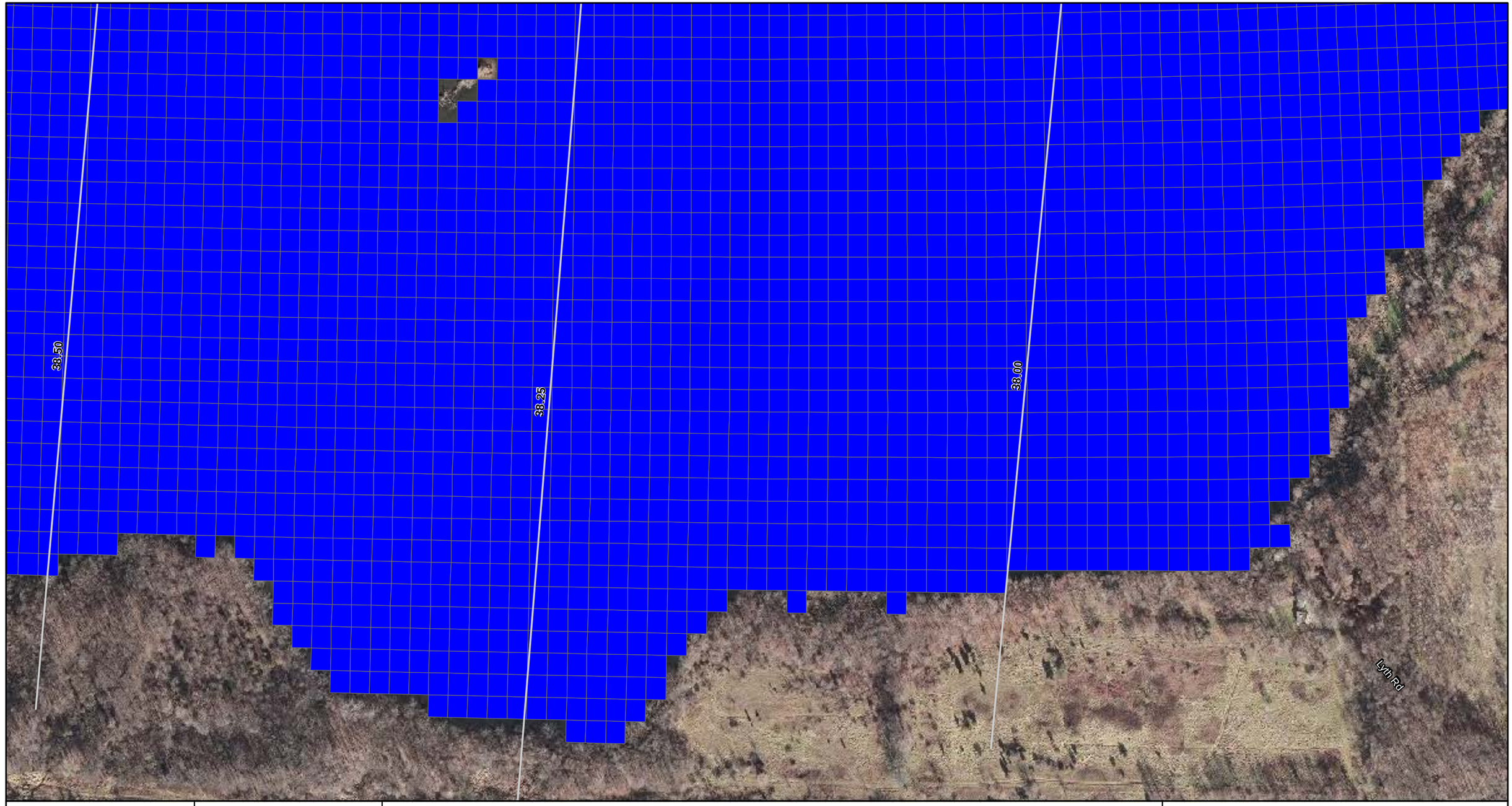
MP 37.80 - MP 38.60N

SHEET 50 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

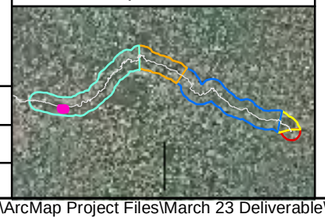
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 37.80 - MP 38.60S

SHEET 51 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

39.00

38.75

38.50

38.25

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals

cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

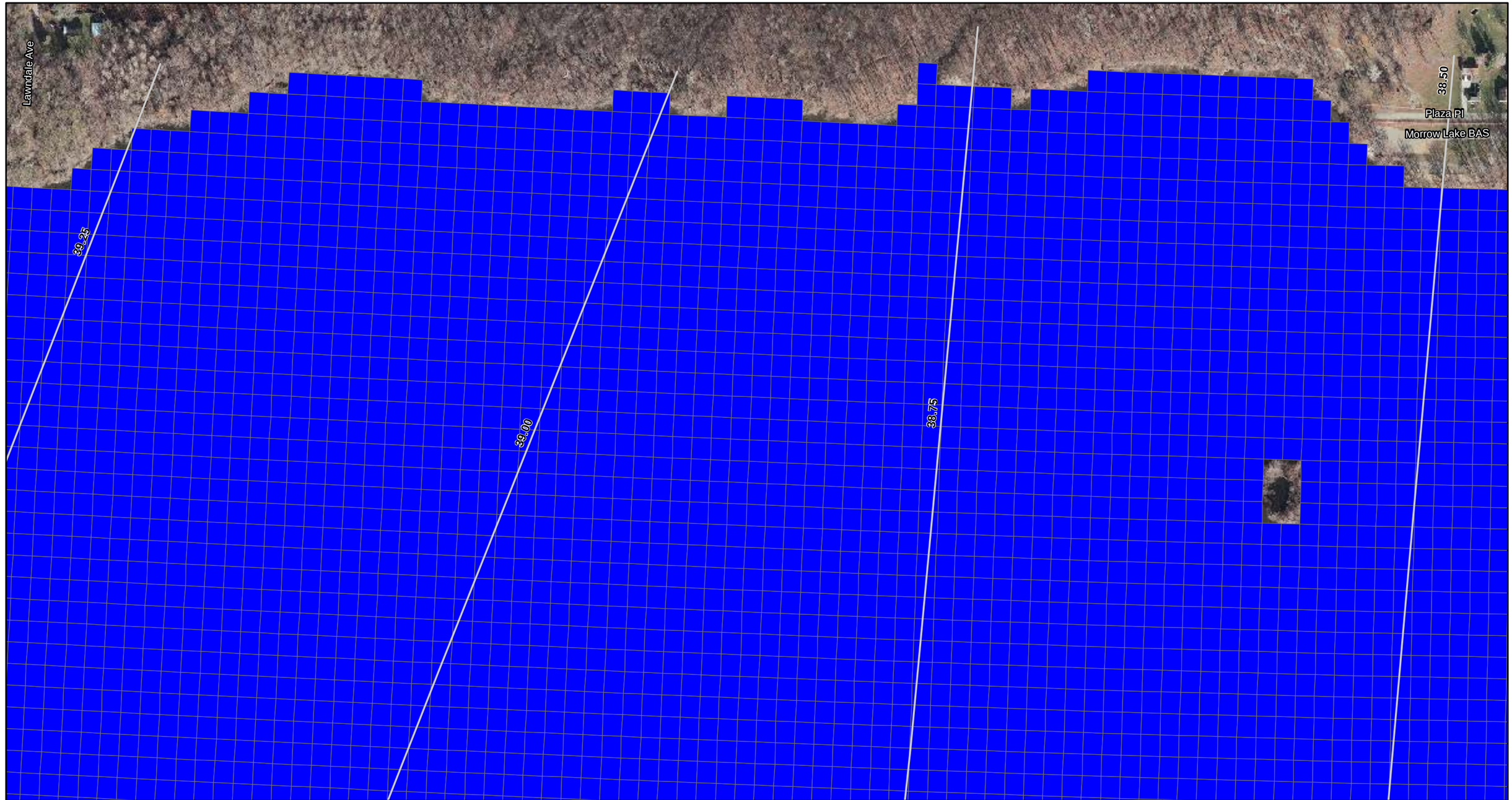
MP 38.25 - MP 39.00C

SHEET 52 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals

cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

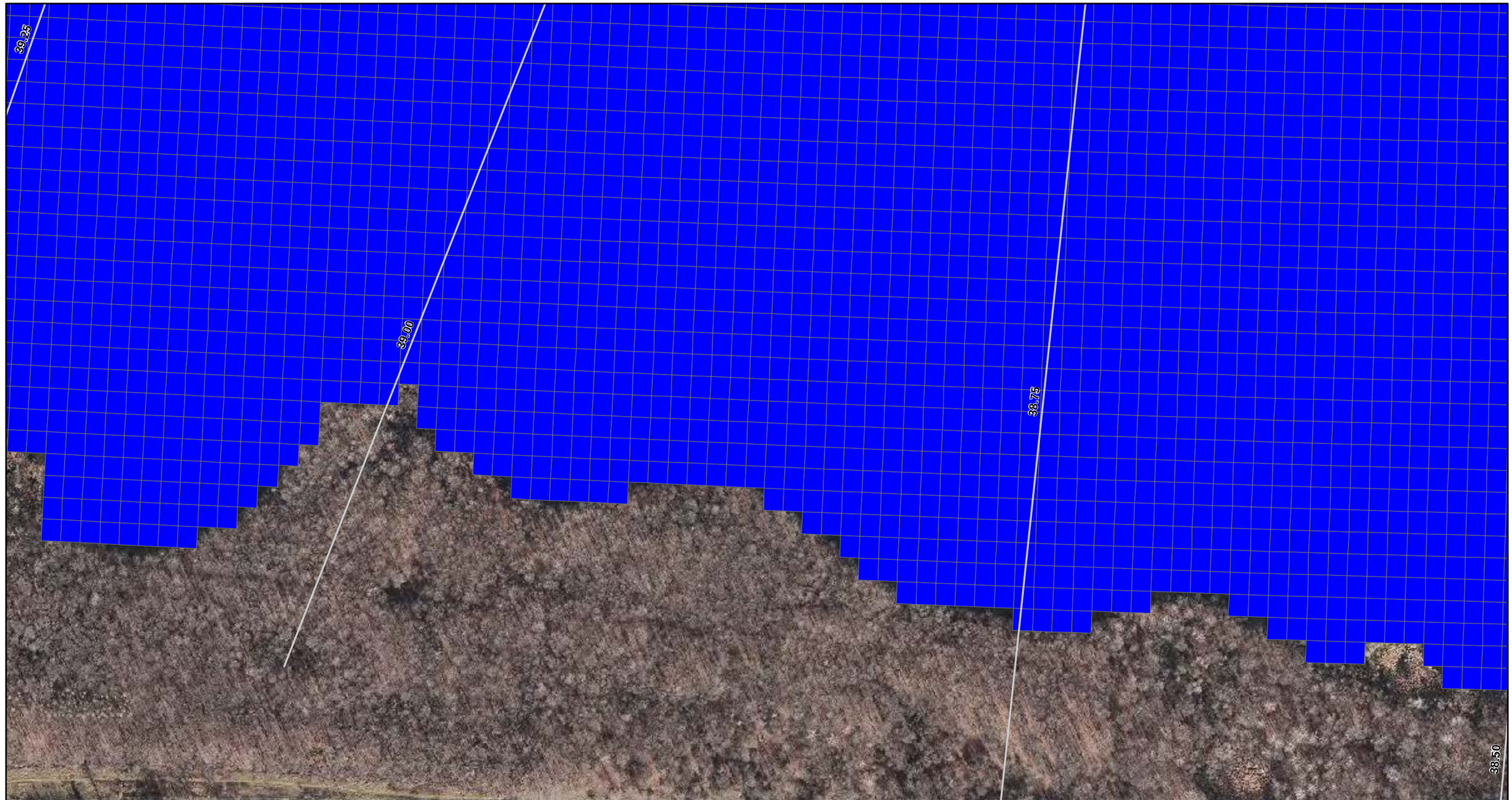
MP 38.50 - MP 39.25N

SHEET 53 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

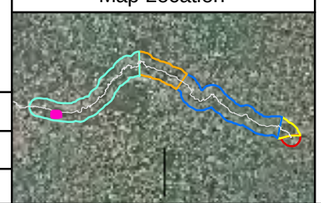
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

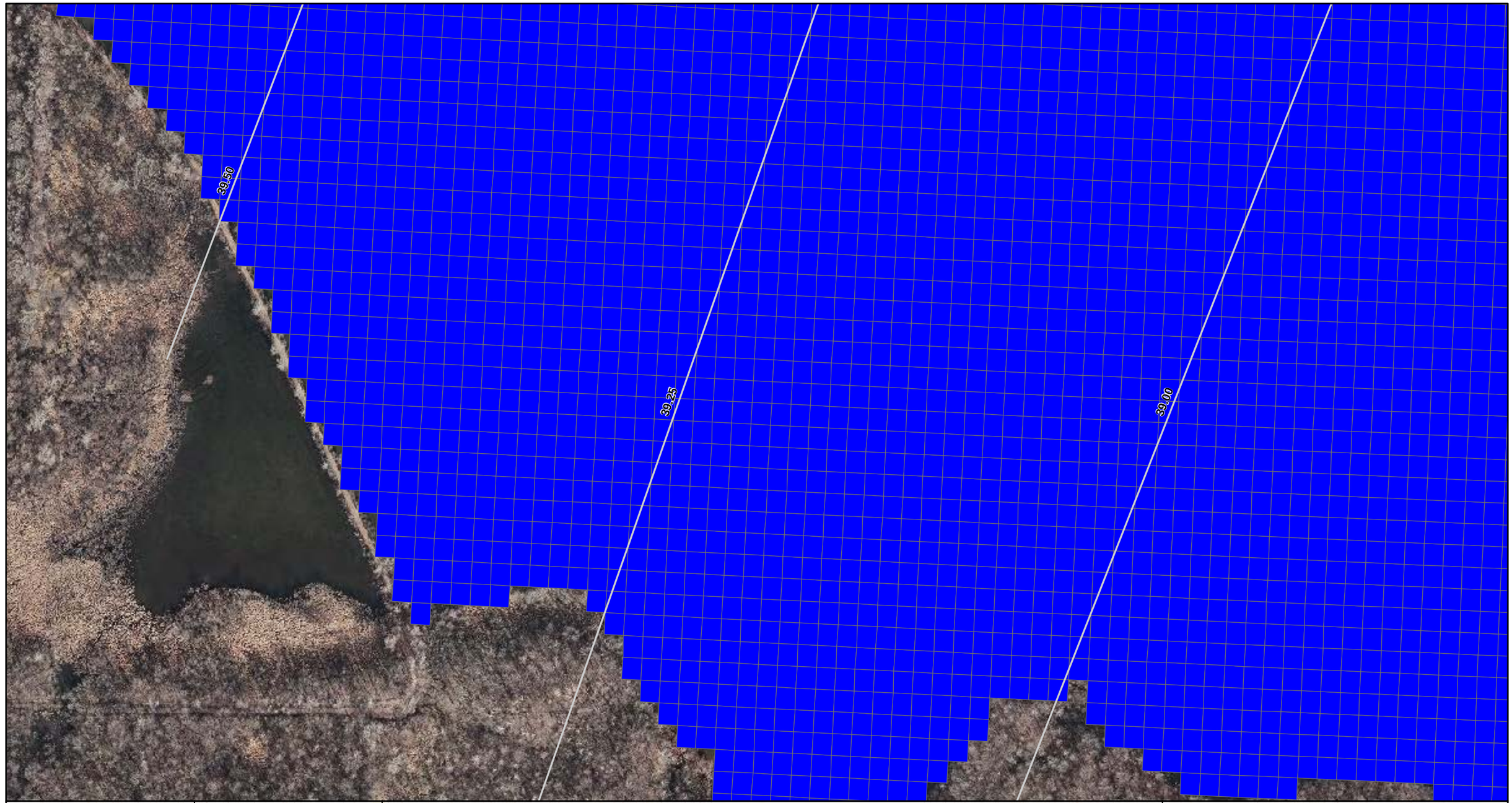
MP 38.50 - MP 39.25S

SHEET 54 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

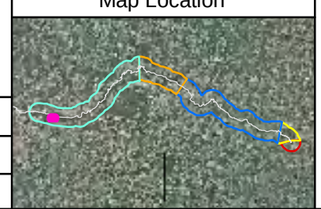
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

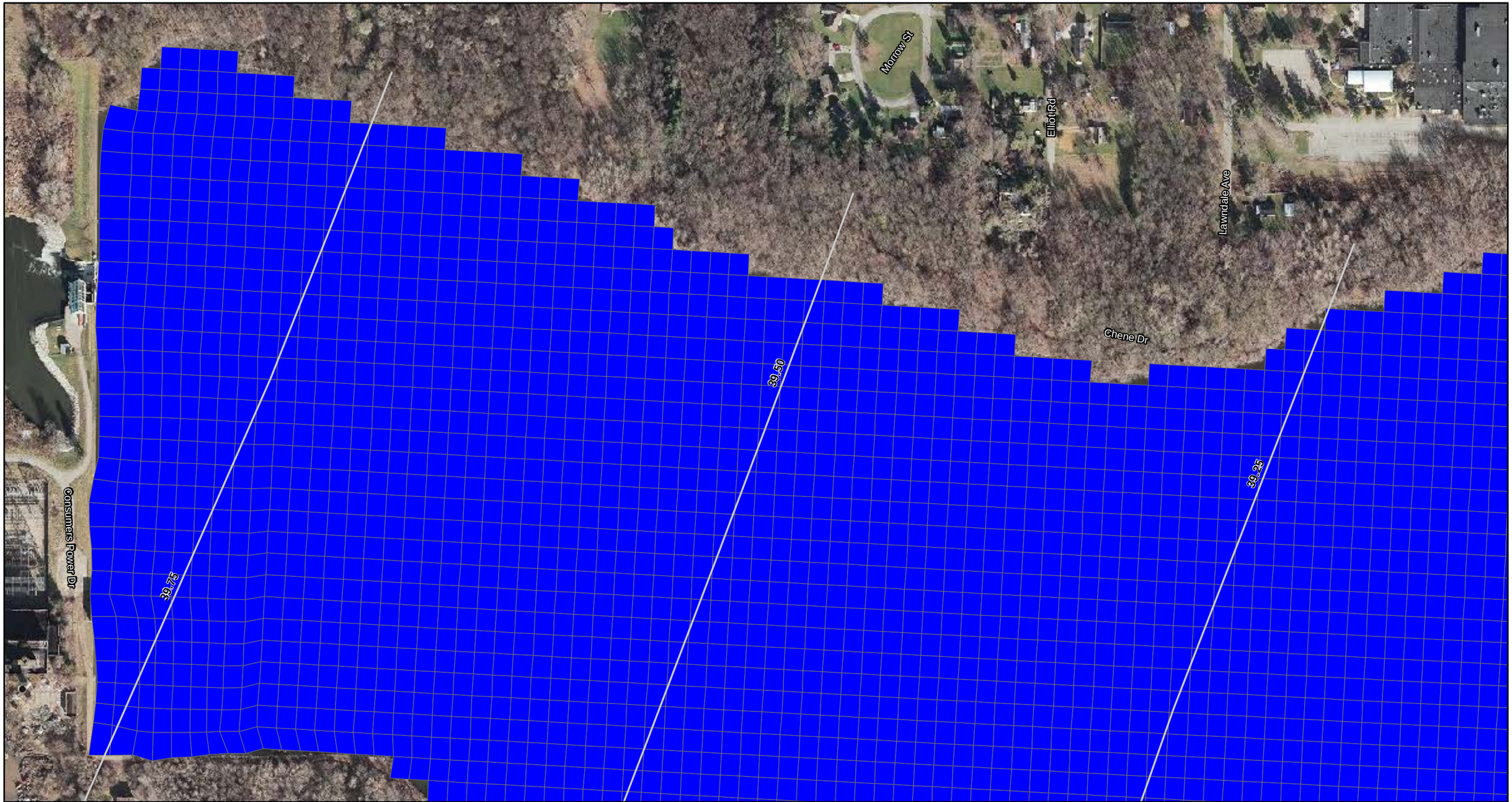
MP 38.90 - MP 39.60S

SHEET 55 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr9_2011.mxd

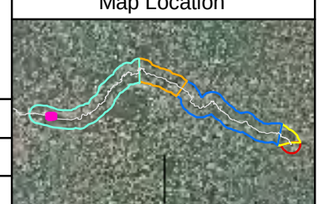
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 9, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascals

cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,080 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 9, 2011

MP 39.15 - MP 39.85

SHEET 56 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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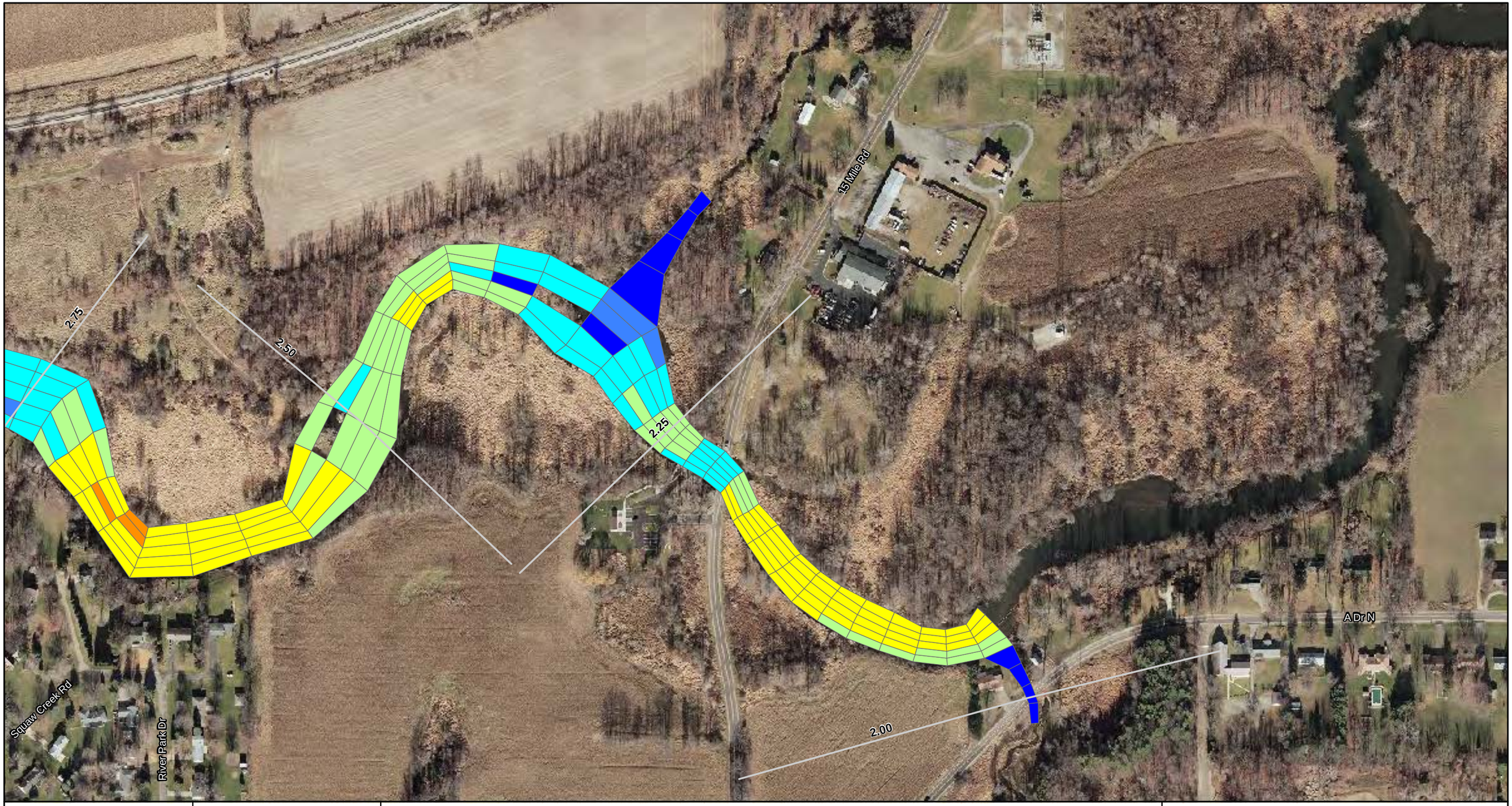
Aerial Photography Date: November 2011

Figure 6-27

Riverine Grid: Bed Shear Stress

April 12, 2011

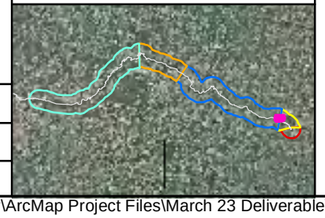
Sheets 1 through 56



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

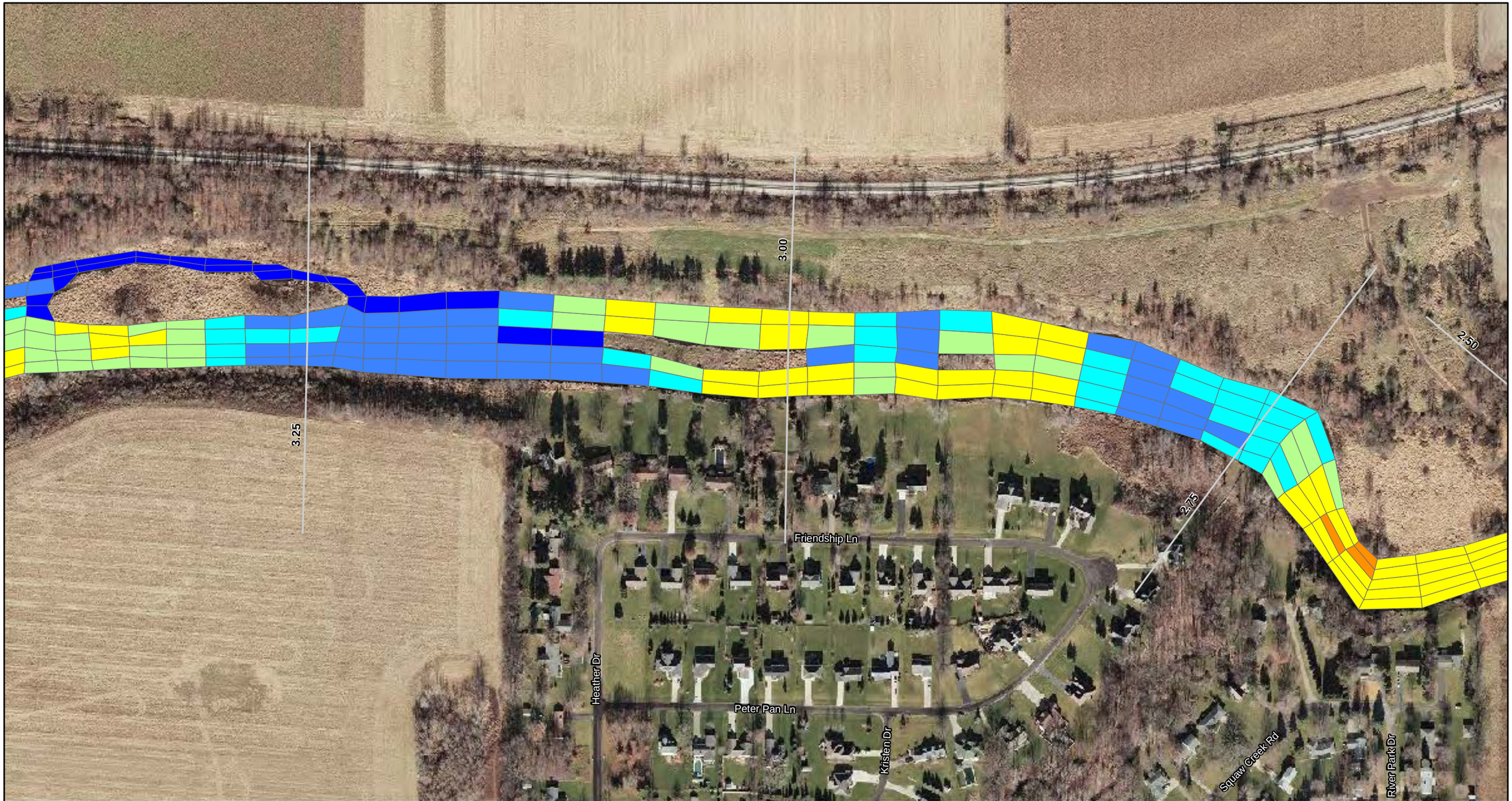
MP 01.95 - MP 02.75

SHEET 1 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

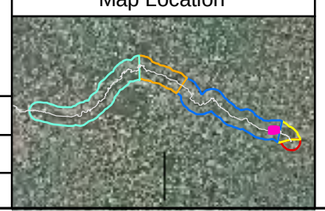
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 02.60 - MP 03.40

SHEET 2 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

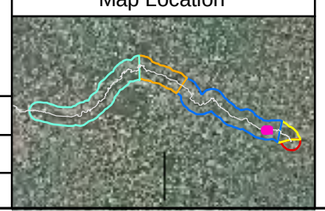
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 03.40 - MP 04.20

SHEET 3 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

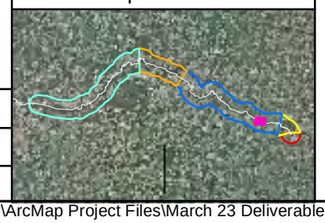
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 04.15 - MP 05.00

SHEET 4 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

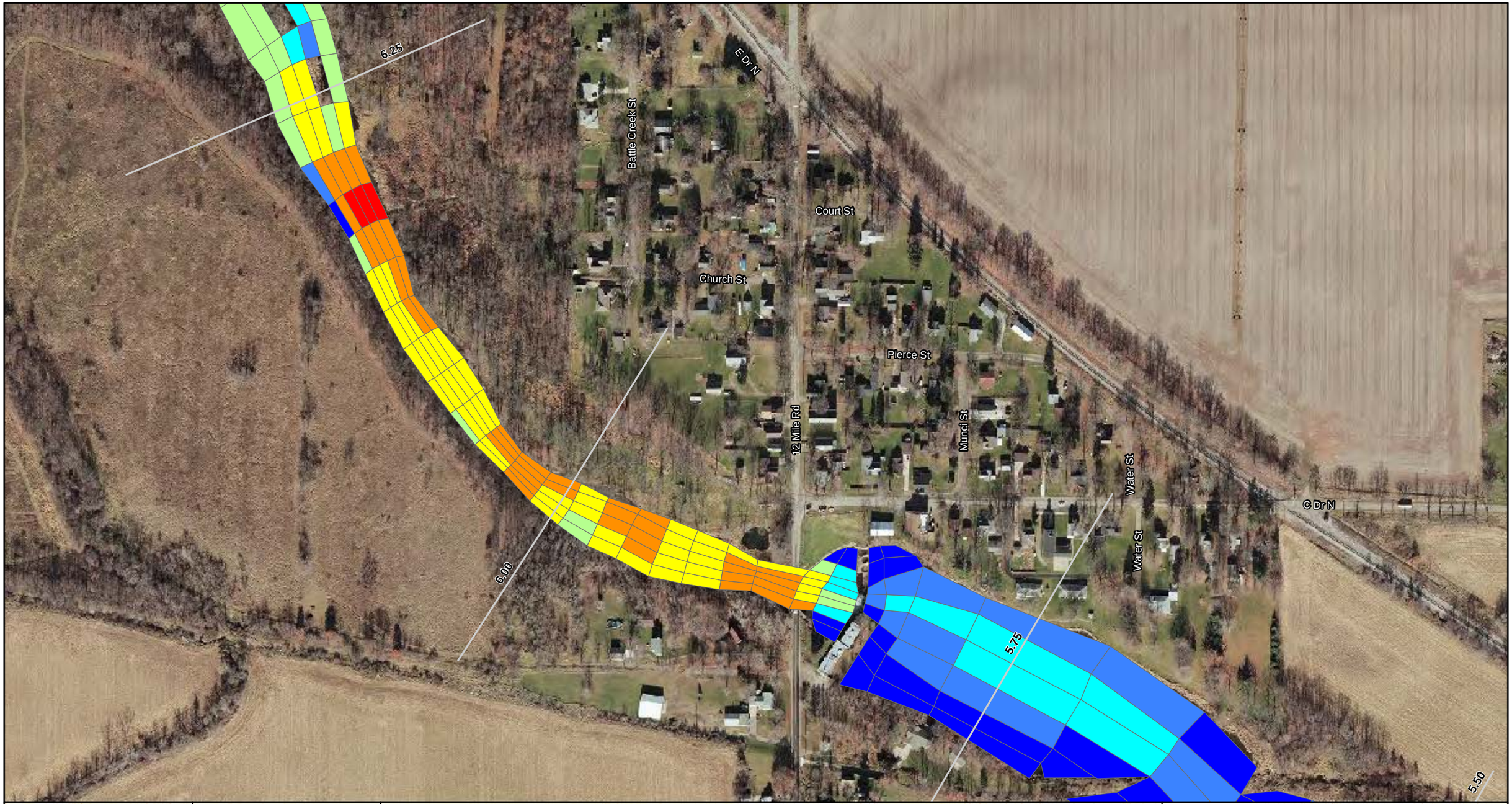
MP 04.90 - MP 05.65

SHEET 5 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

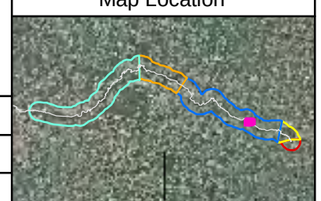
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

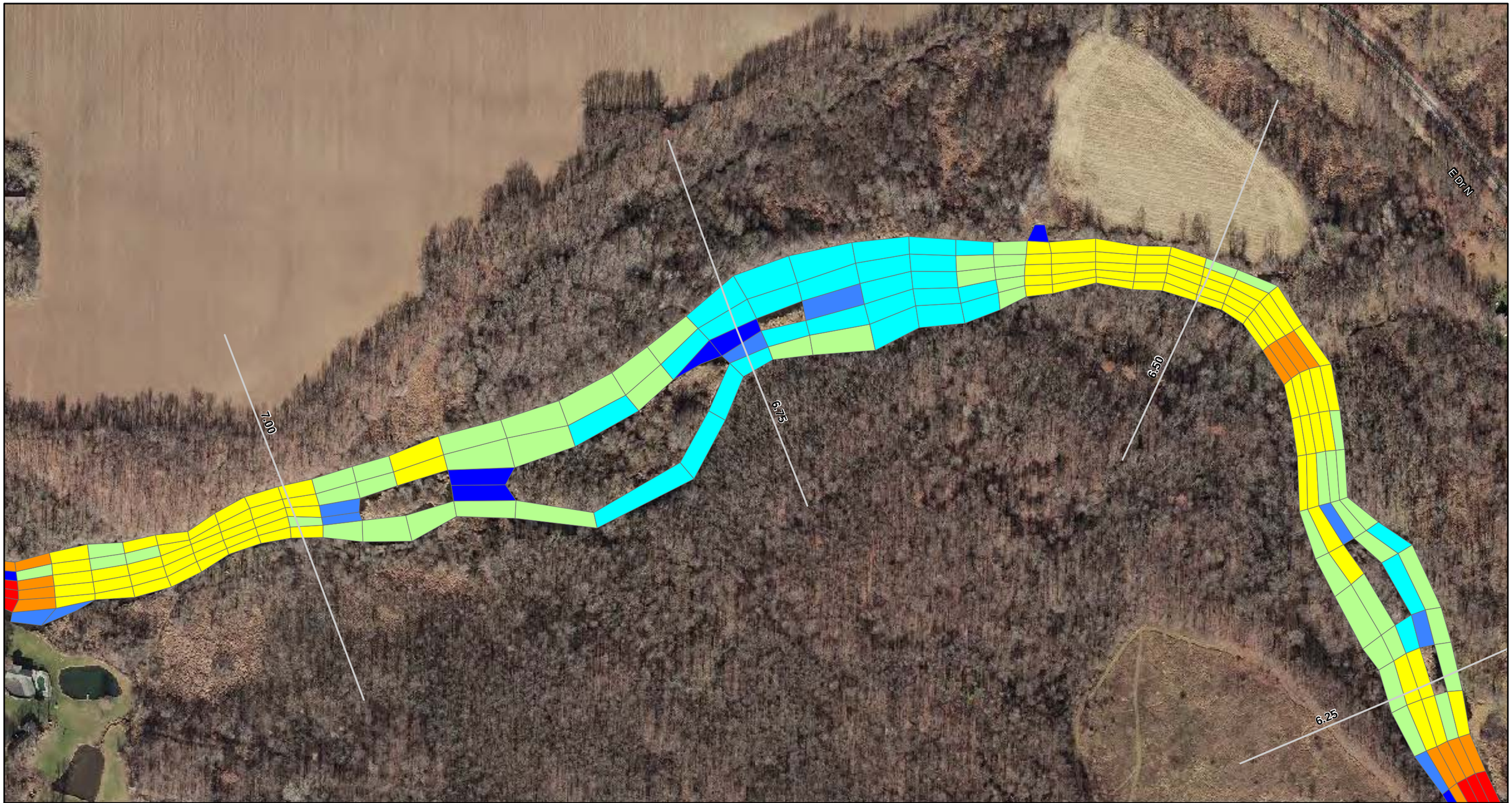
MP 05.65 - MP 06.30

SHEET 6 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 06.20 - MP 07.15

SHEET 7 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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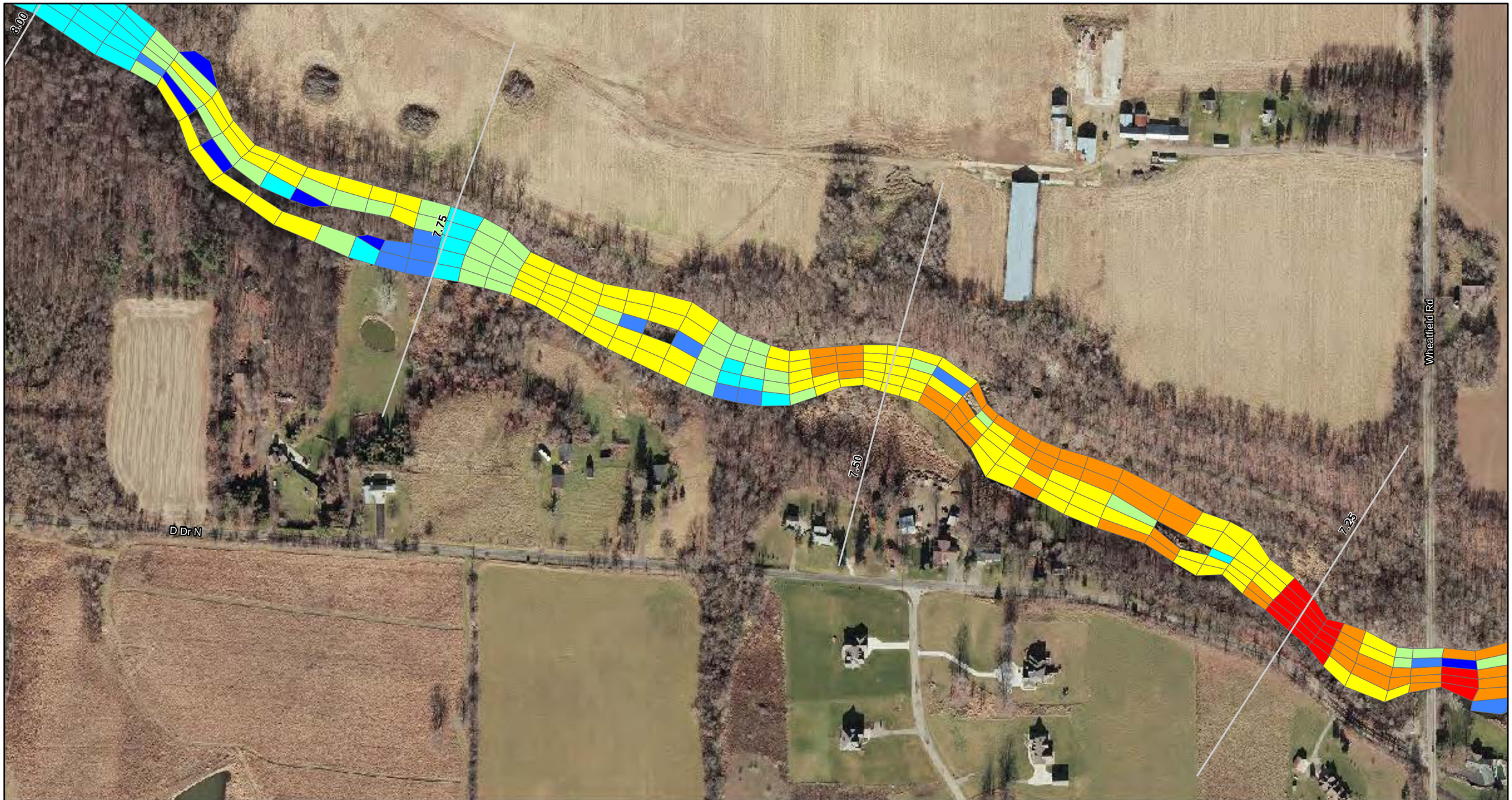
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 07.15 - MP 07.95

SHEET 8 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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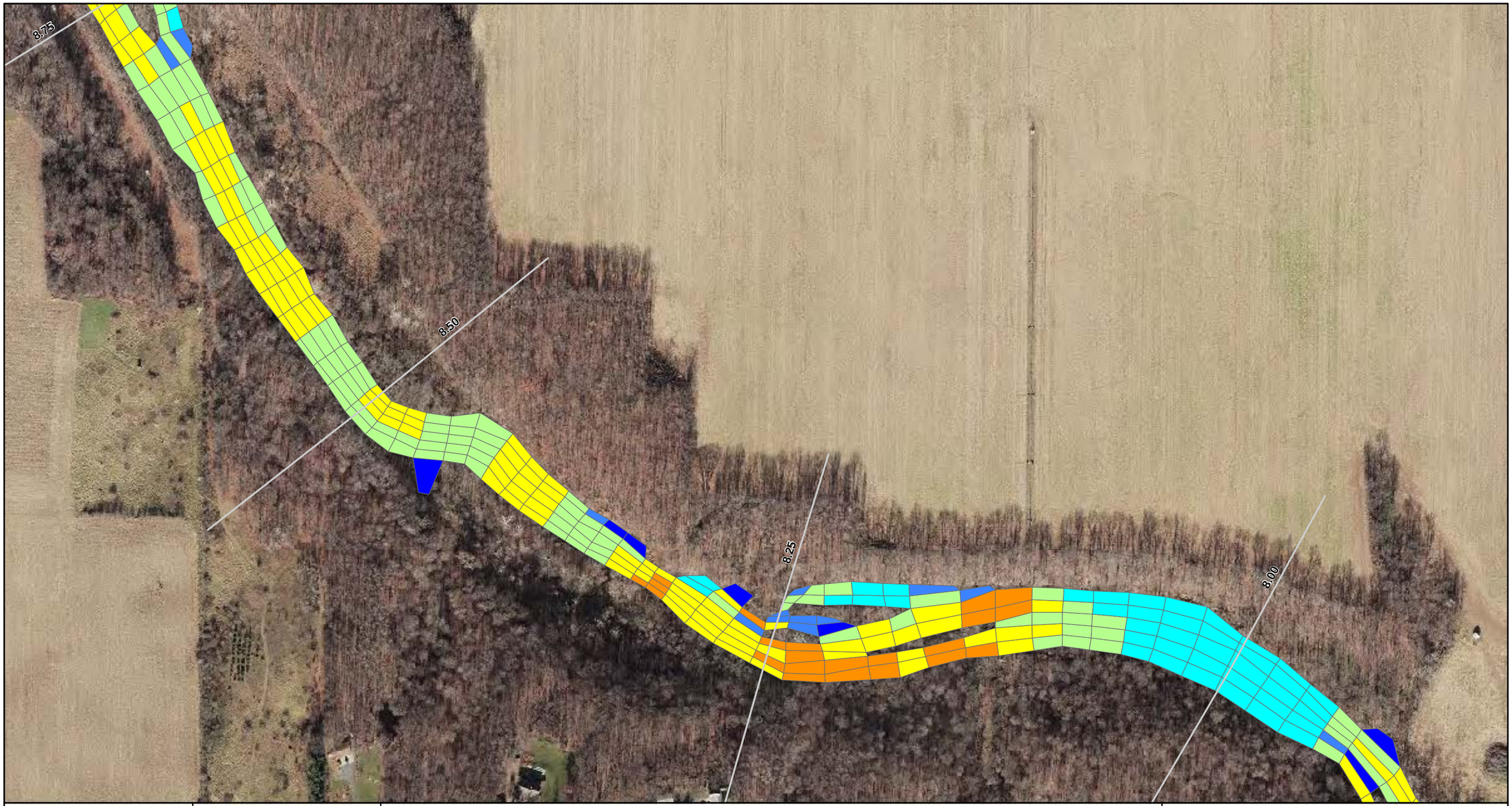
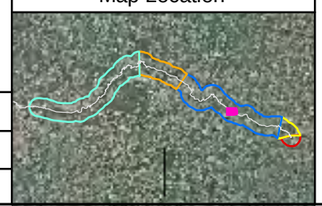
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 07.90 - MP 08.75

SHEET 9 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 08.70 - MP 09.30

SHEET 10 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

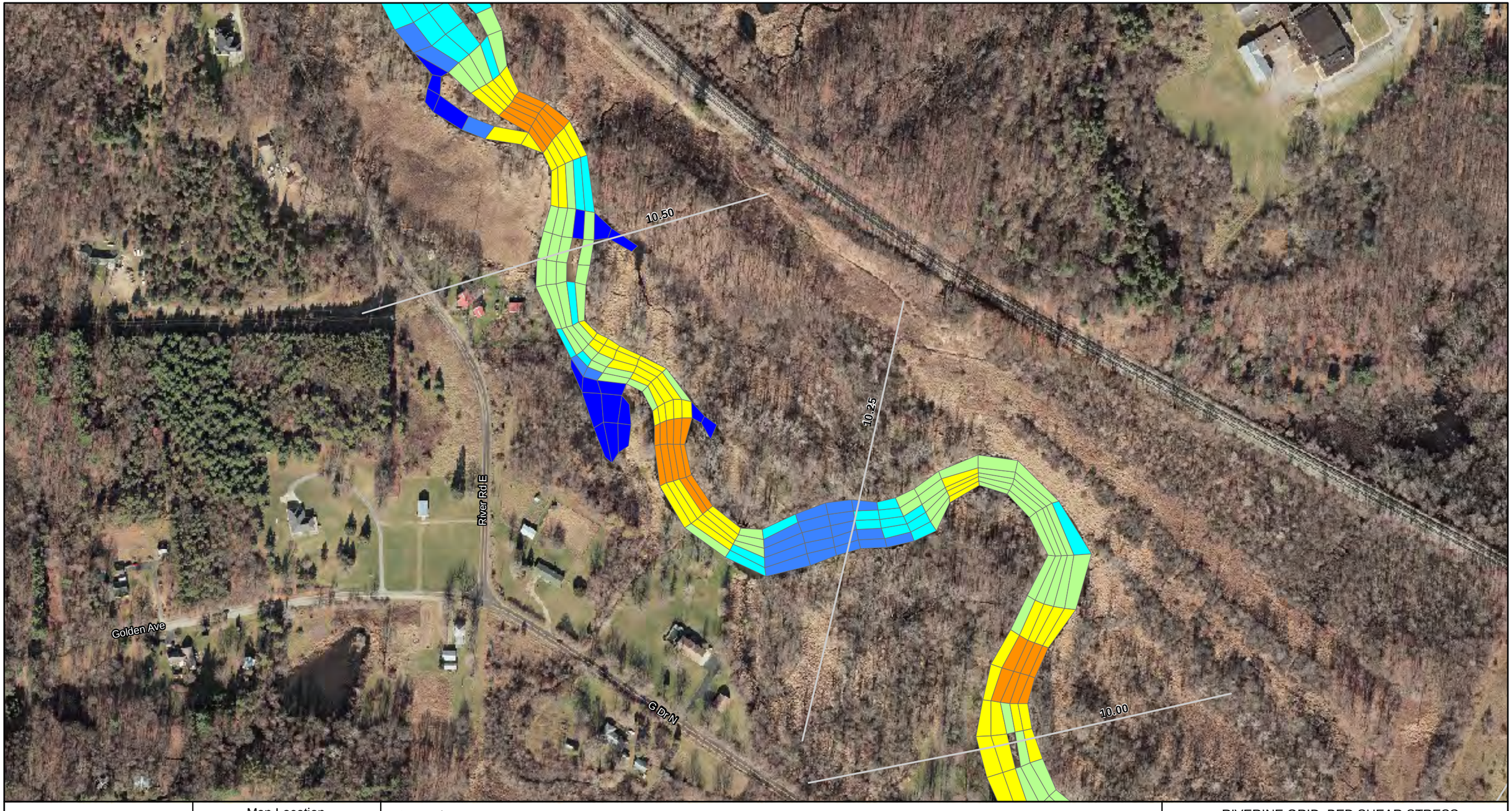
MP 09.25 - MP 10.05

SHEET 11 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

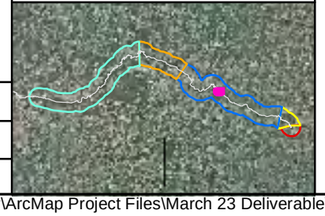
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

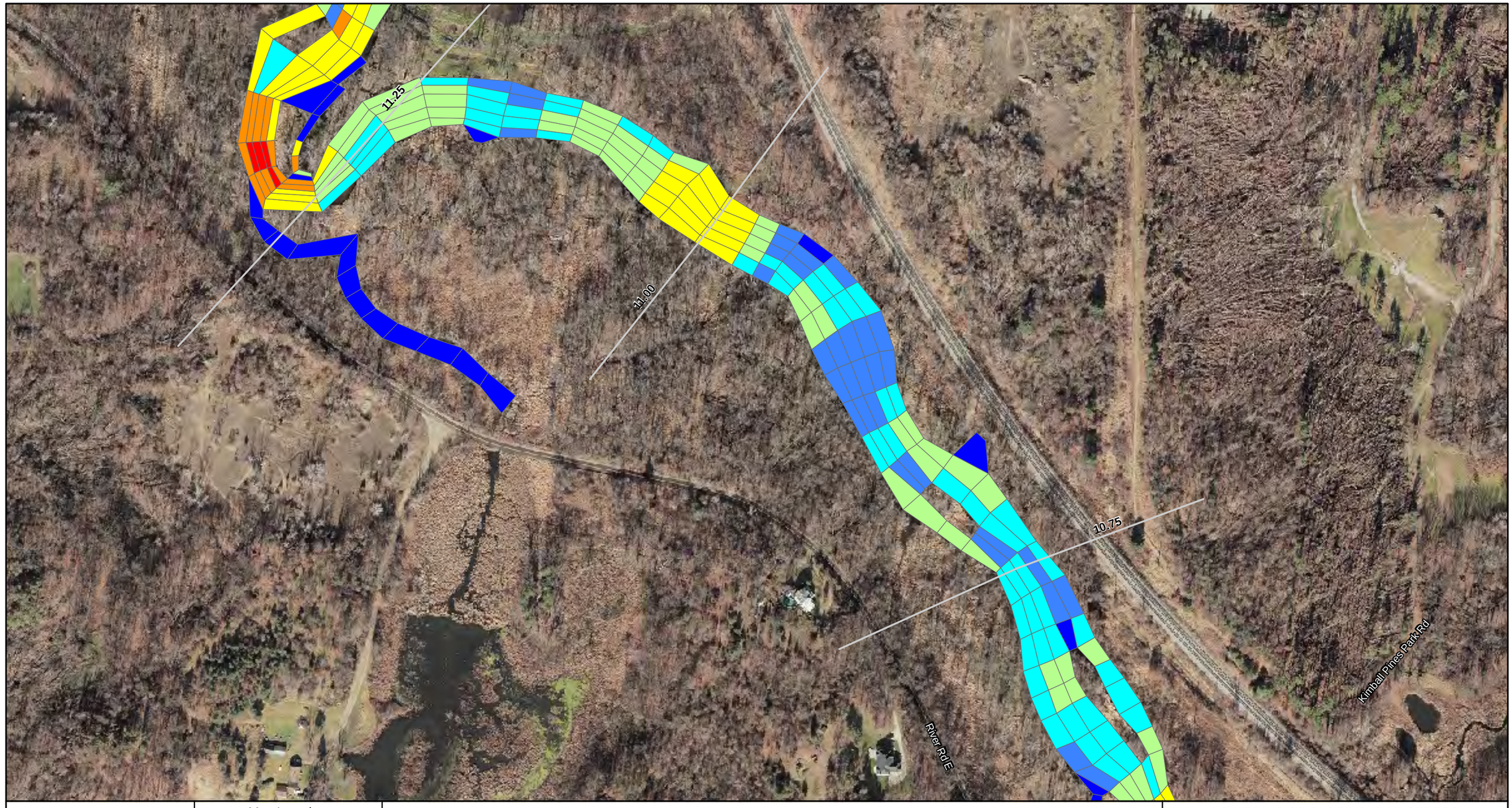
MP 10.00 - MP 10.65

SHEET 12 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

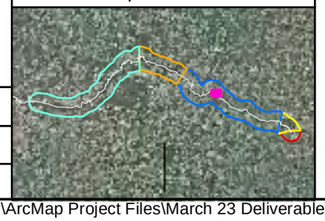
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 10.60 - MP 11.40

SHEET 13 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Columbia Ave E

Leonard Wood

Raymond Rd S

River Rd E

12.25

12.00

11.75

11.50

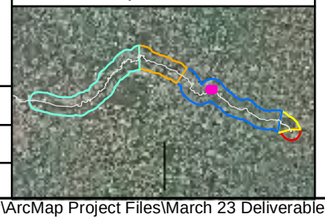
11.25

12.50

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 11.10 - MP 12.45

SHEET 14 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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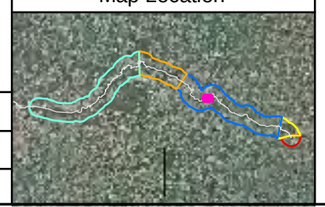
Aerial Photography Date: November 2011

Columbia Ave E
Vale St
Raymond Rd S
Silver St
12.25
12.50
12.75
13.00

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

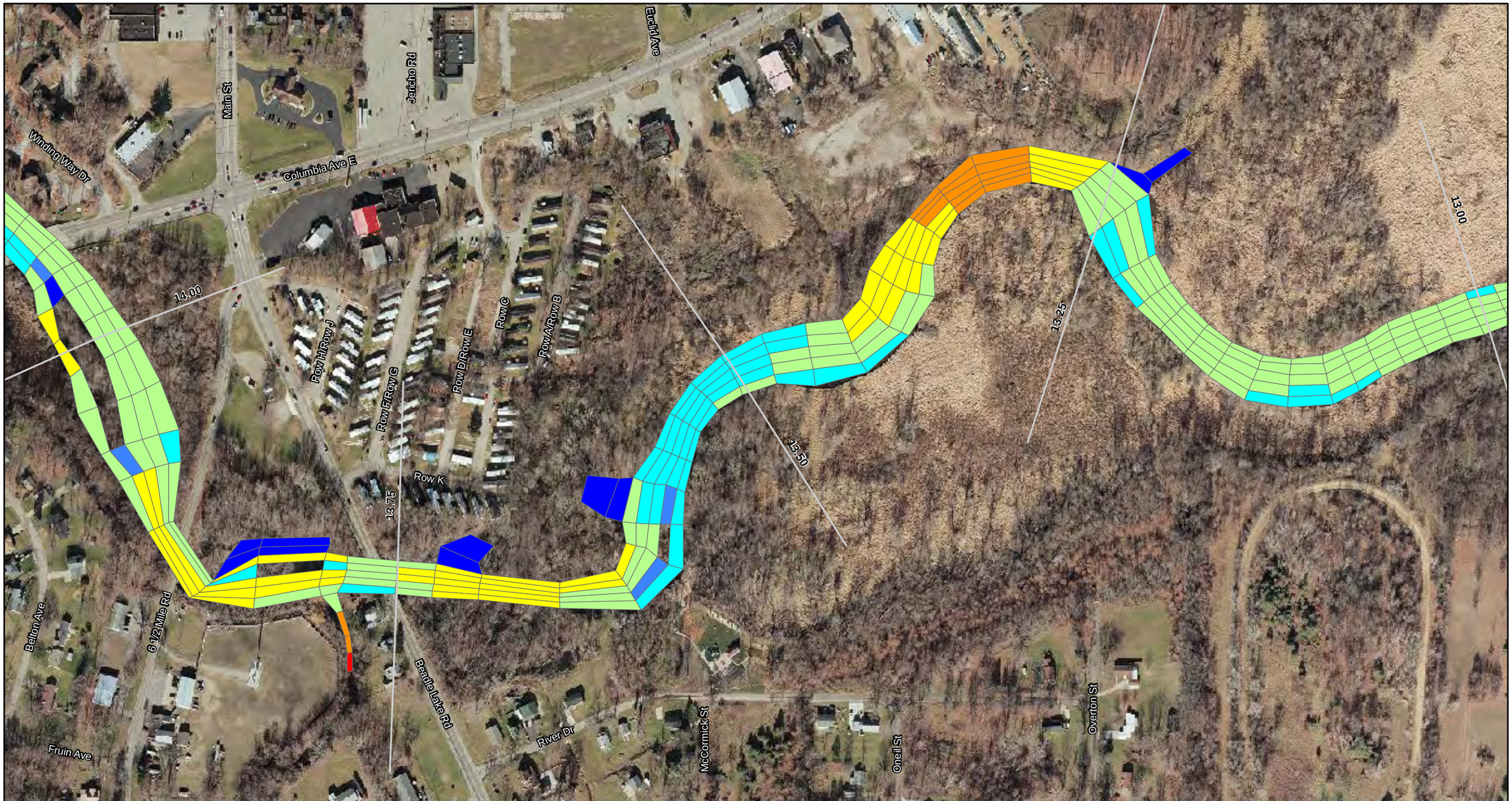
MP 12.30 - MP 13.05

SHEET 15 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

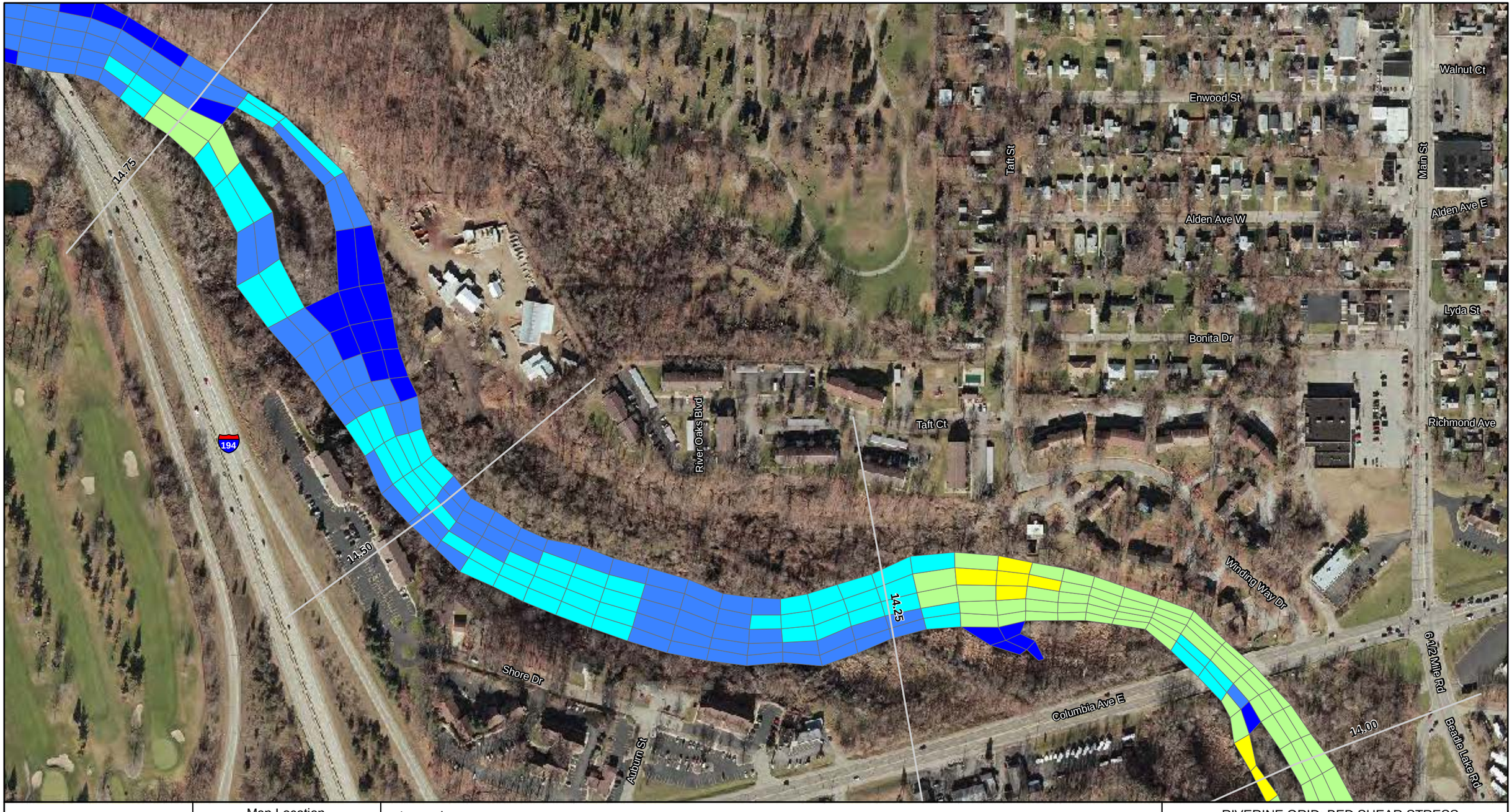
MP 13.00 - MP 14.10

SHEET 16 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

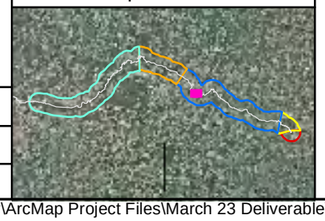
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

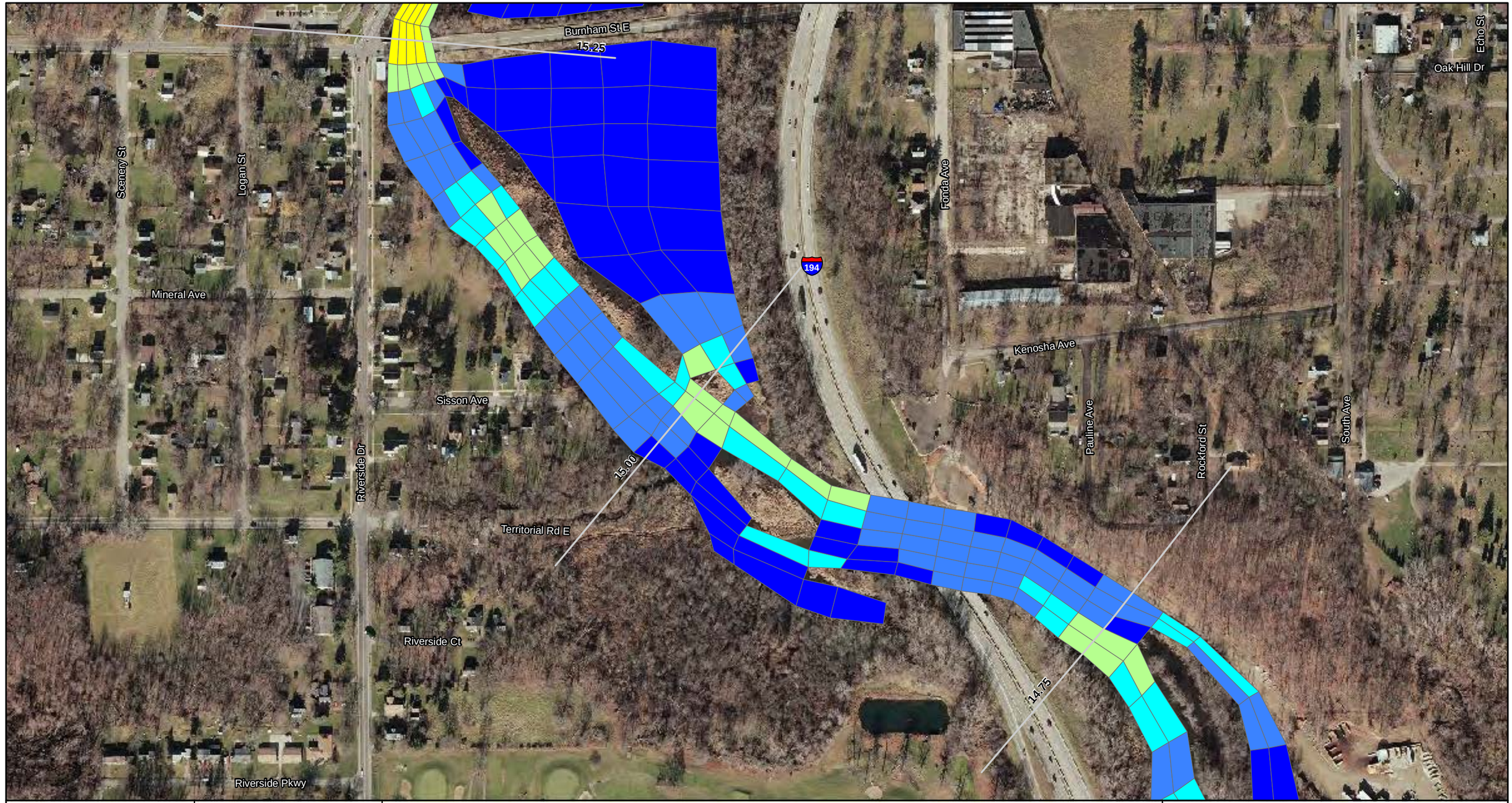
MP 14.00 - MP 14.85

SHEET 17 OF 56

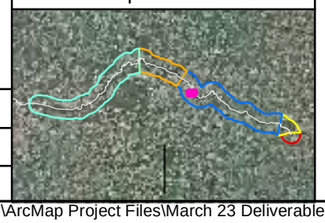
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

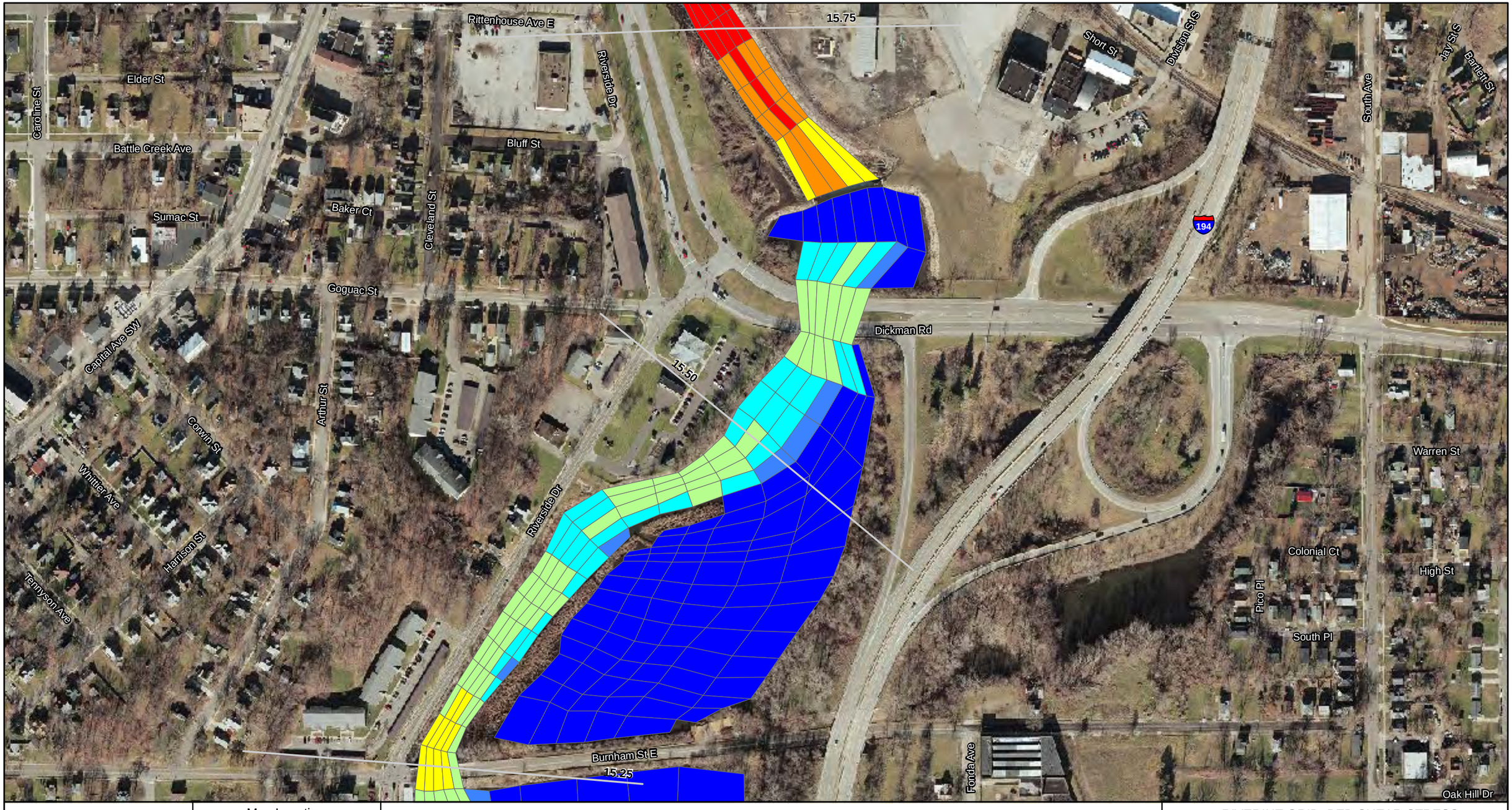
MP 14.65 - MP 15.25

SHEET 18 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

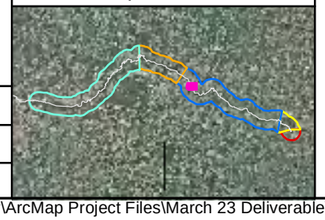
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 15.25 - MP 15.75

SHEET 19 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

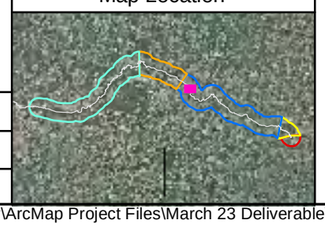
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

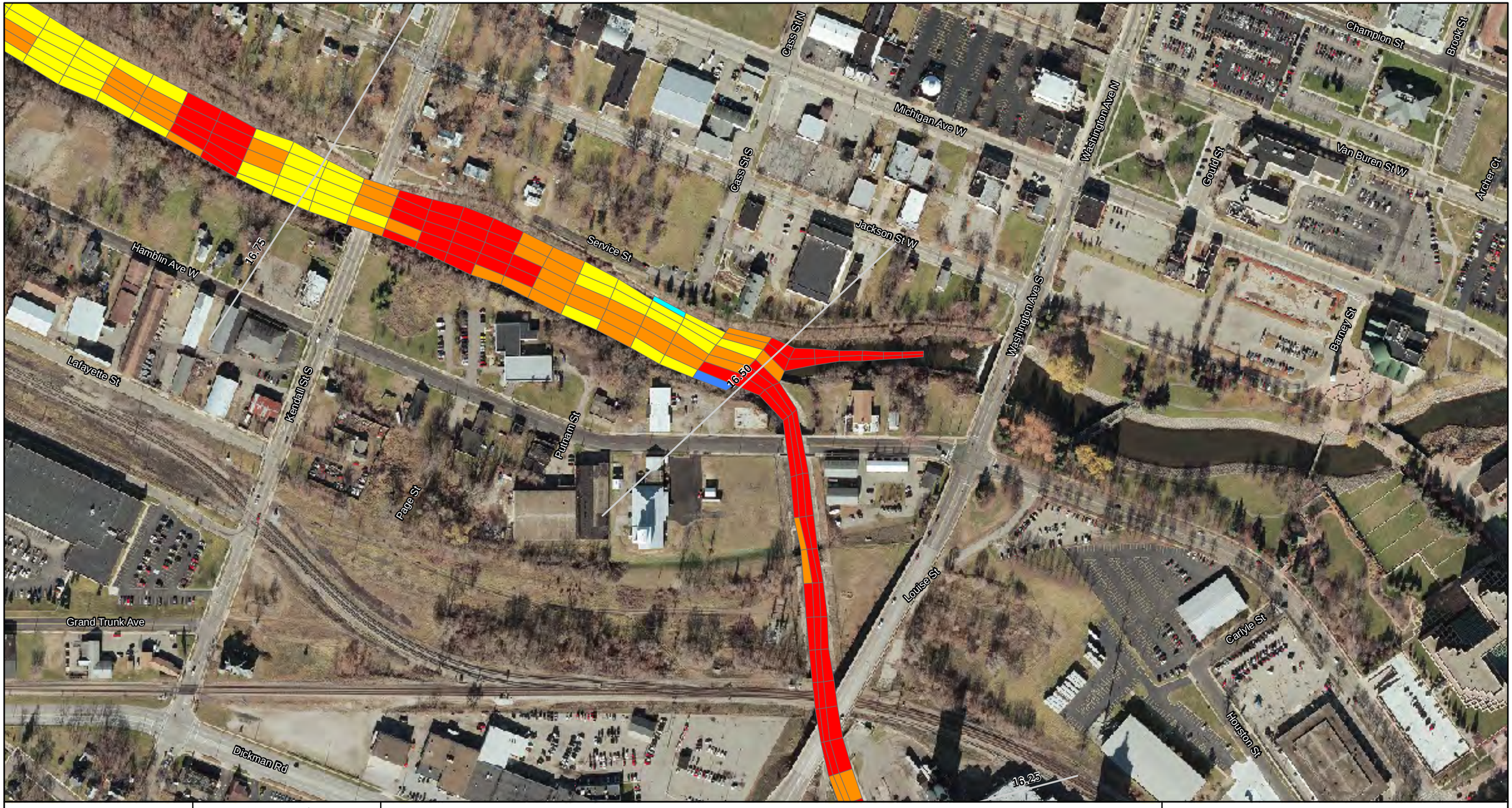
MP 15.75 - MP 16.30

SHEET 20 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

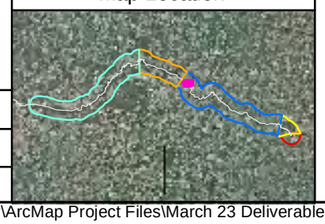
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

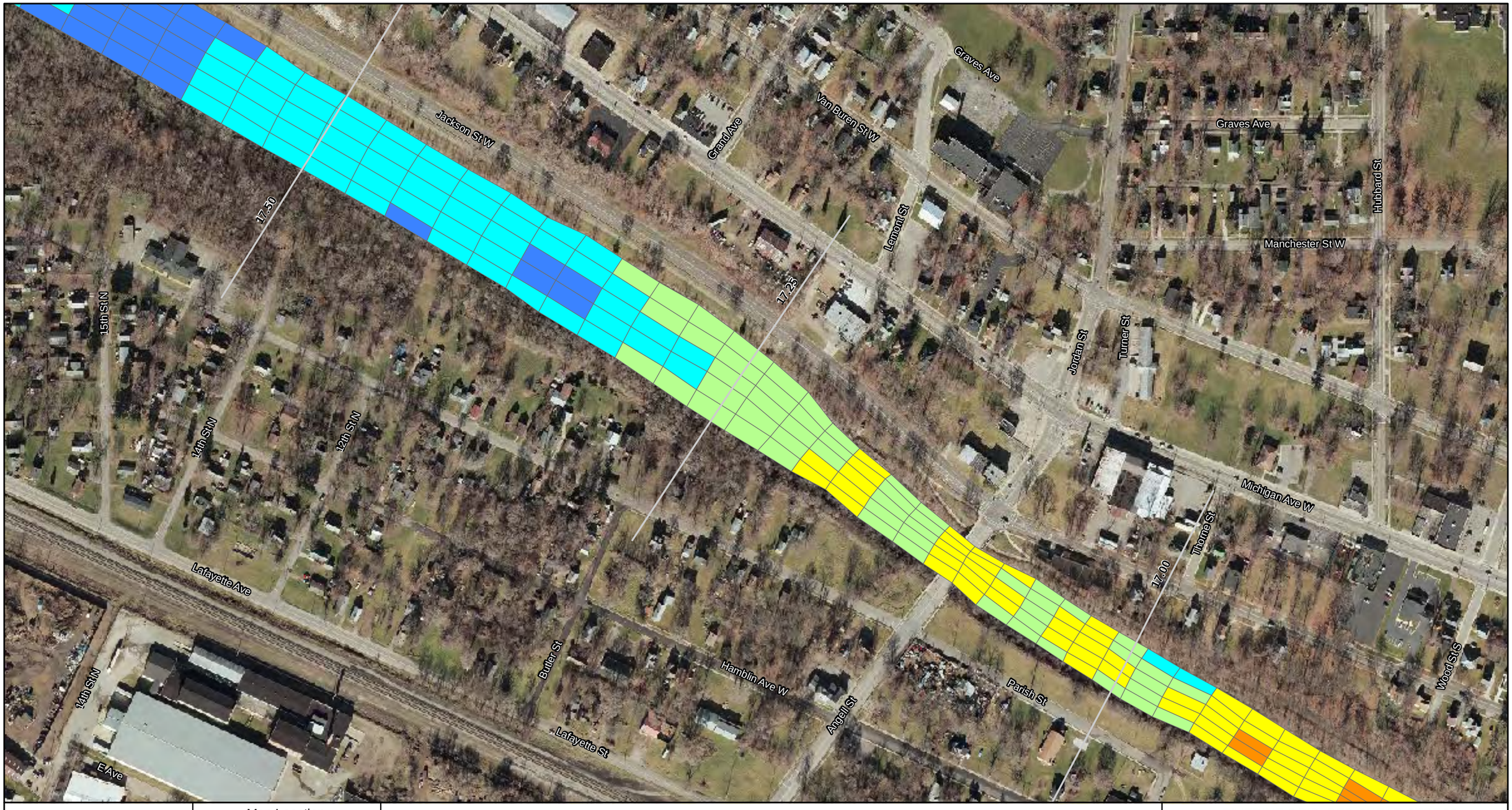
MP 16.30 - MP 16.95

SHEET 21 OF 56

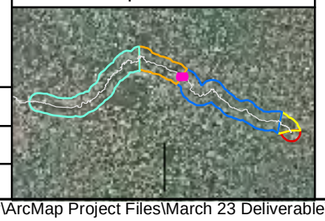
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 16.85 - MP 17.60

SHEET 22 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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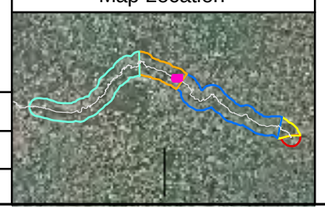
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

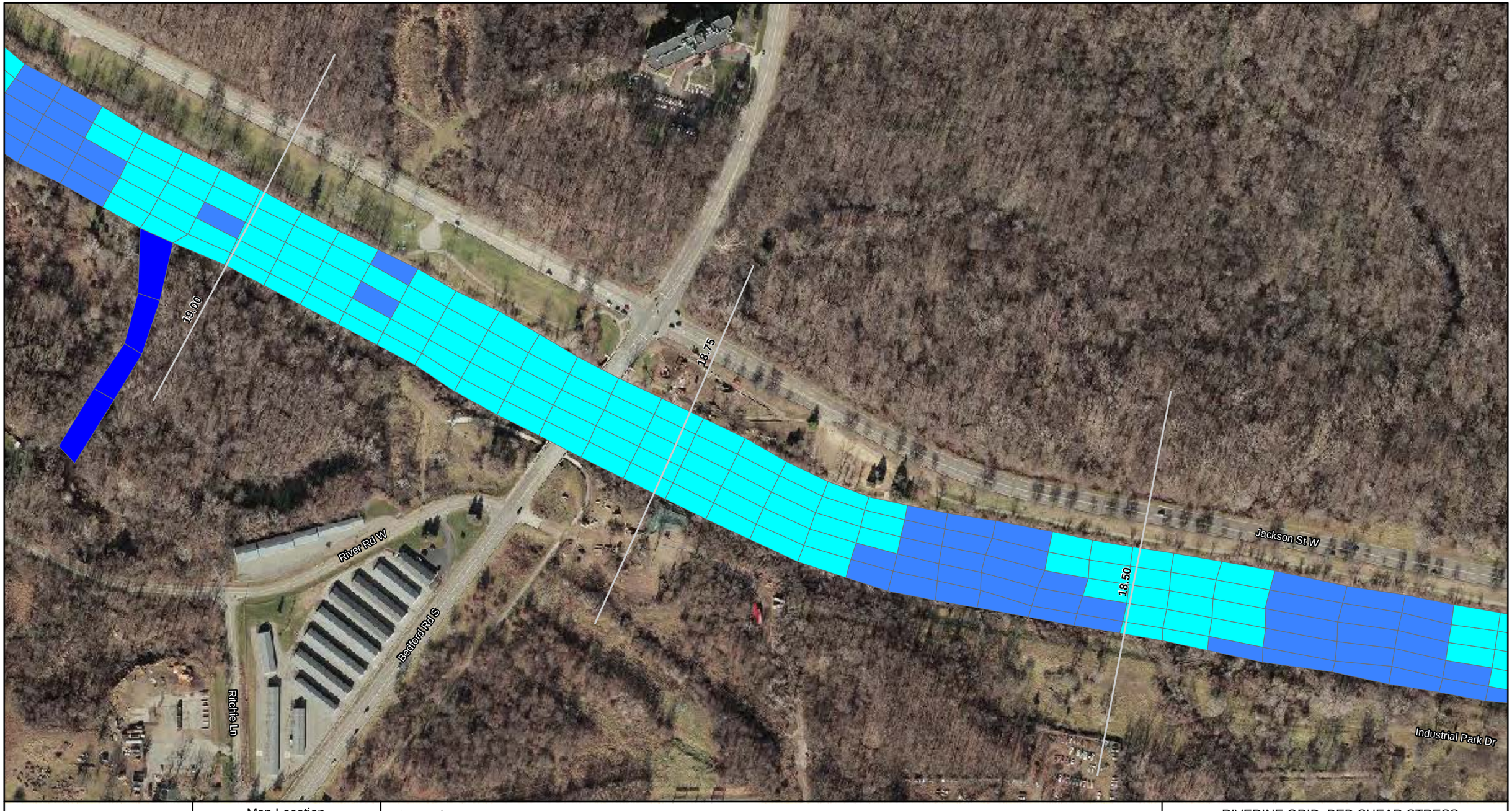
MP 17.60 - MP 18.40

SHEET 23 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

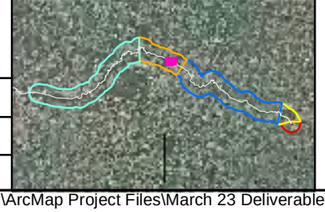
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

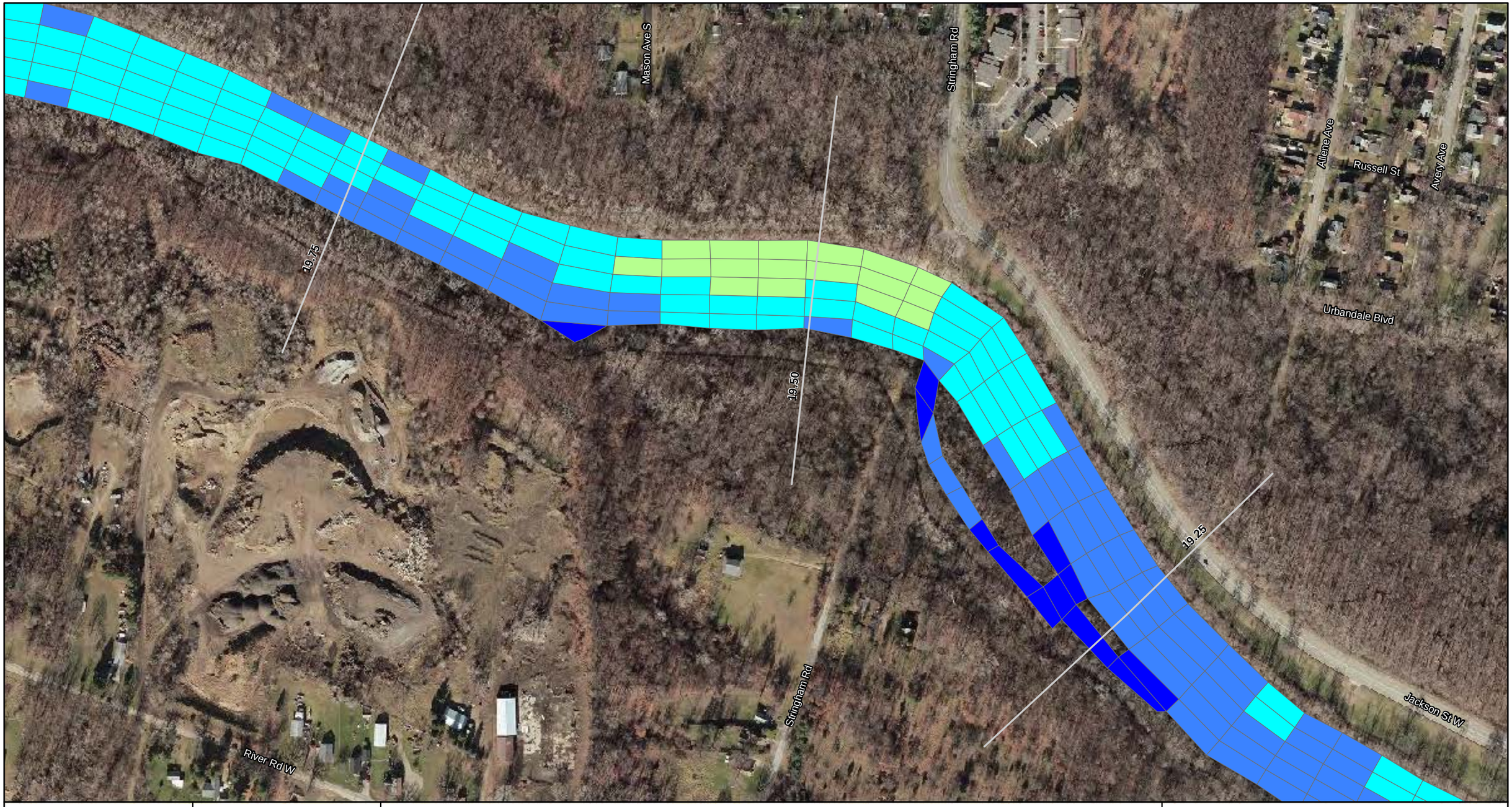
MP 18.30 - MP 19.15

SHEET 24 OF 56

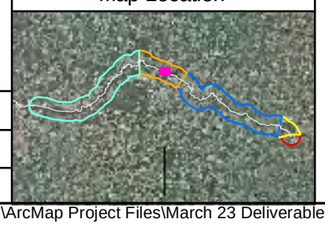
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

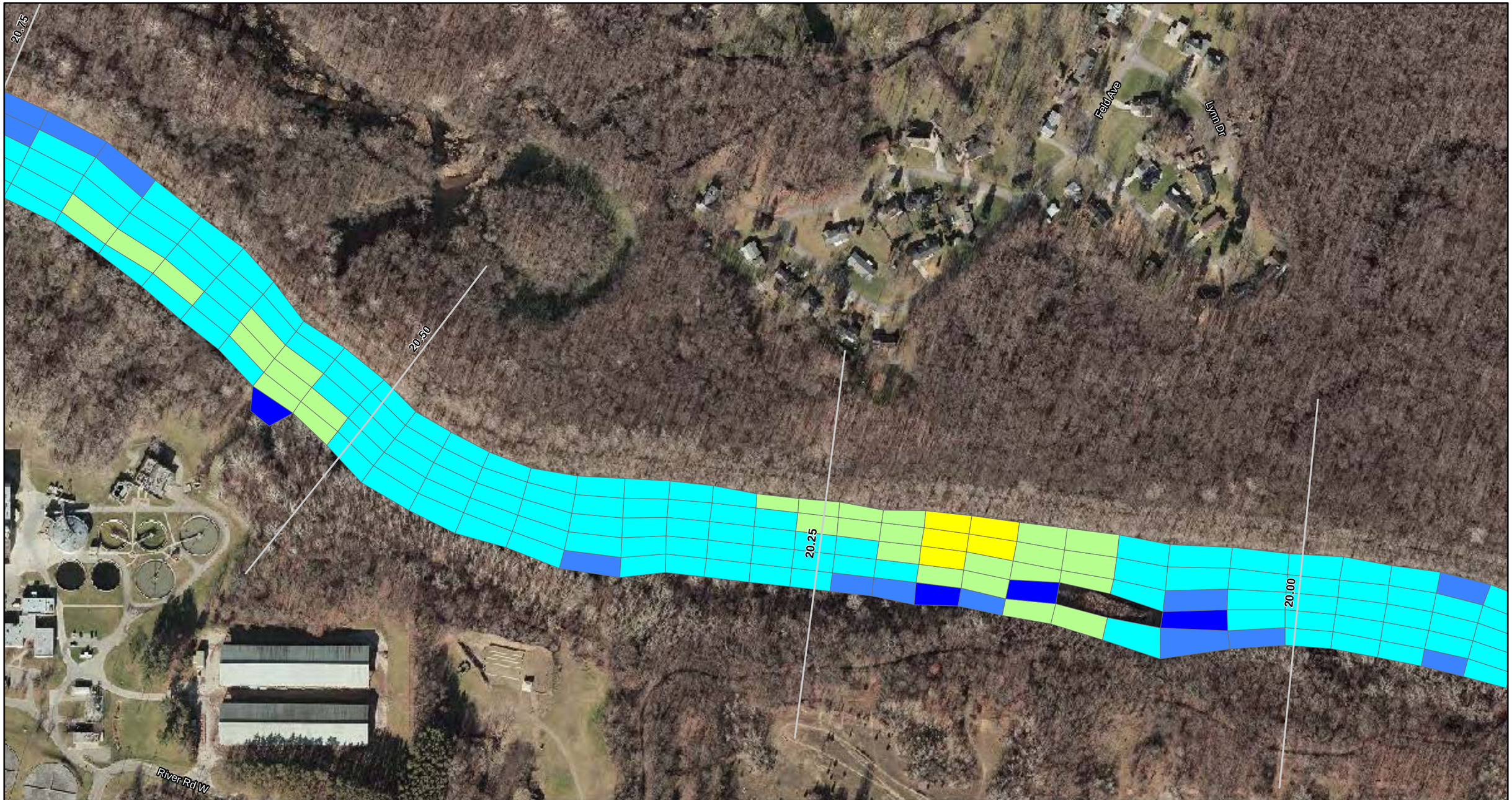
MP 19.10 - MP 19.95

SHEET 25 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

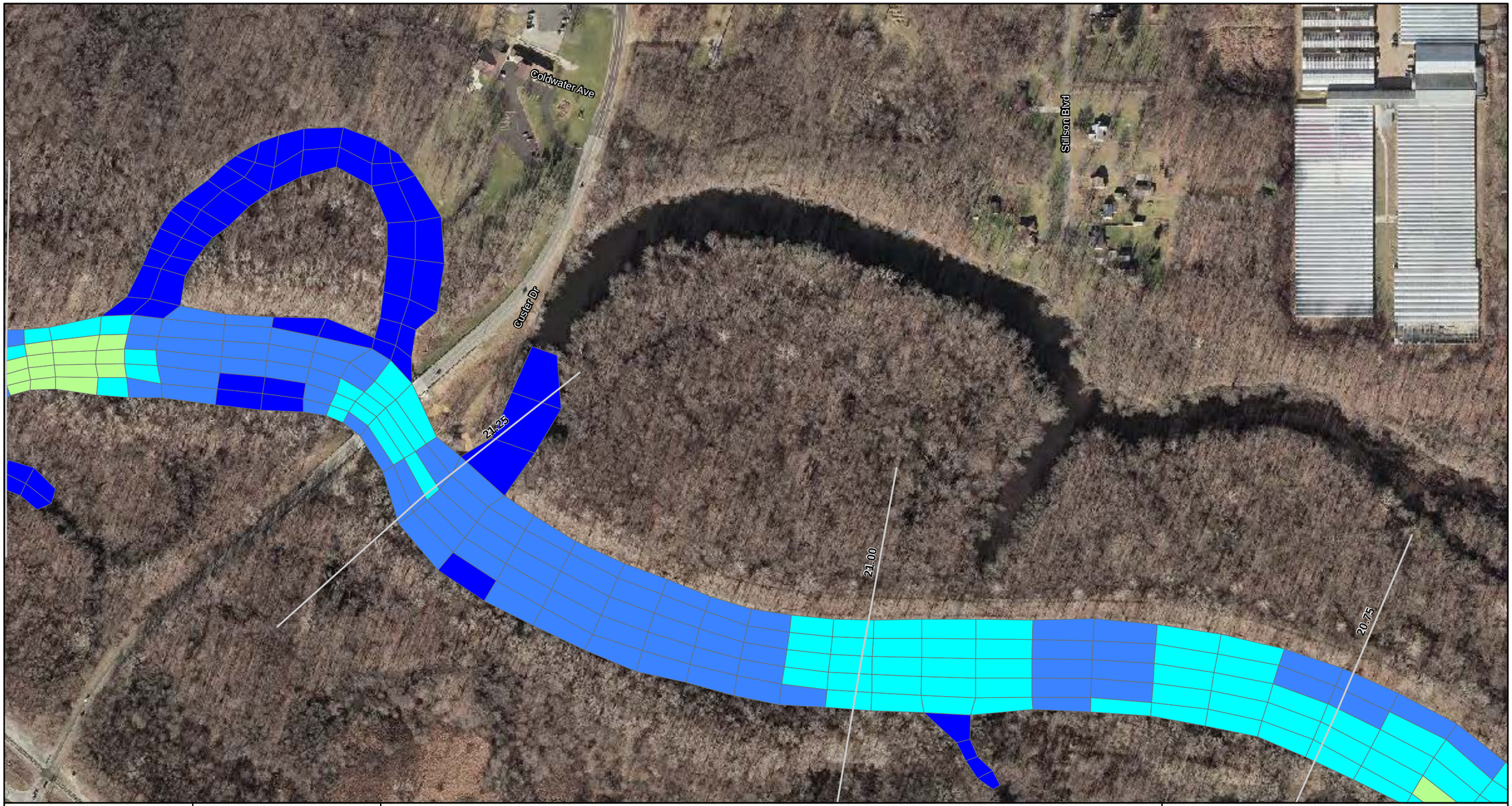
MP 19.90 - MP 20.75

SHEET 26 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

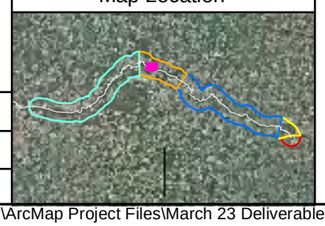
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

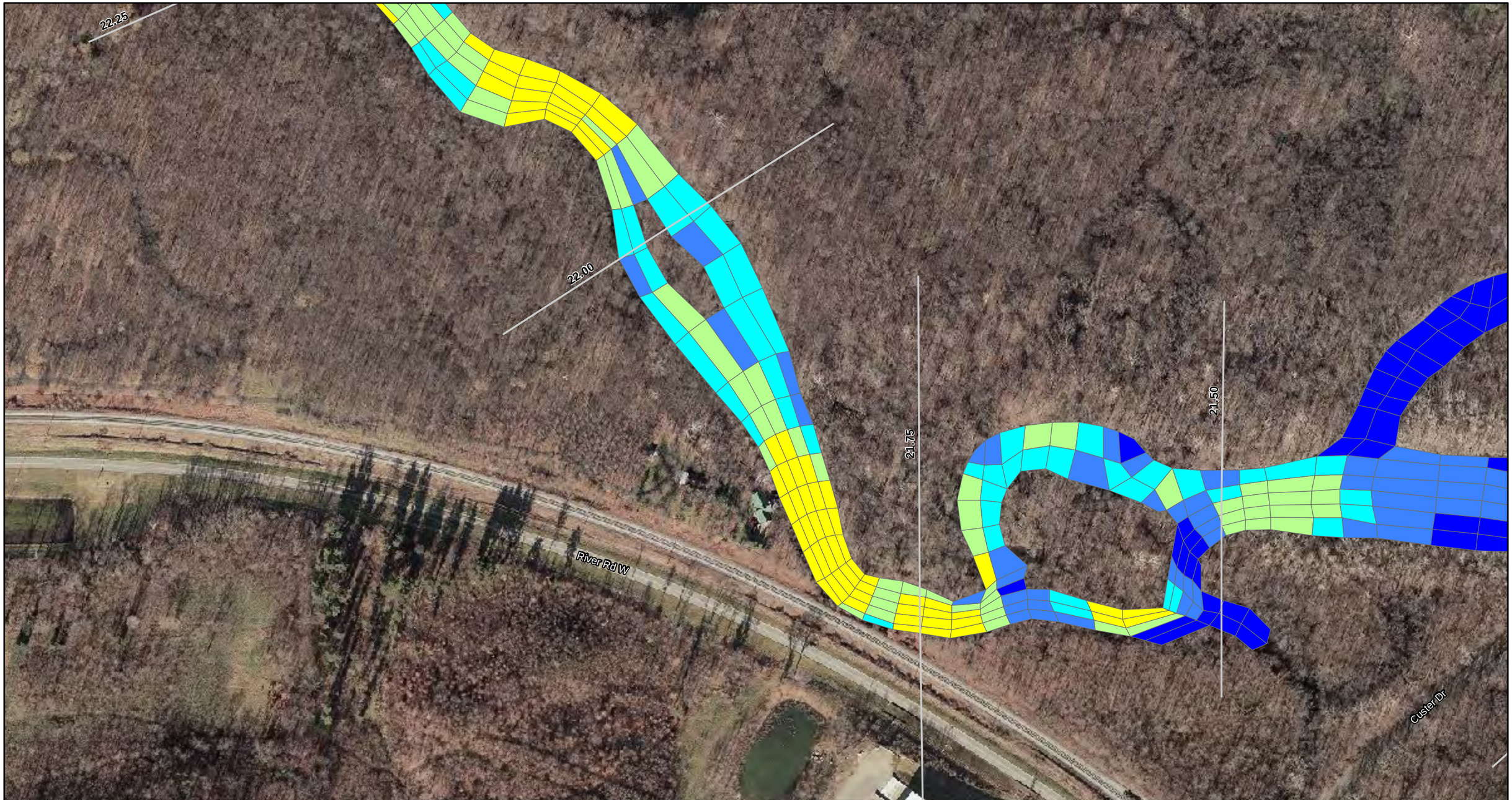
MP 20.70 - MP 21.50

SHEET 27 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

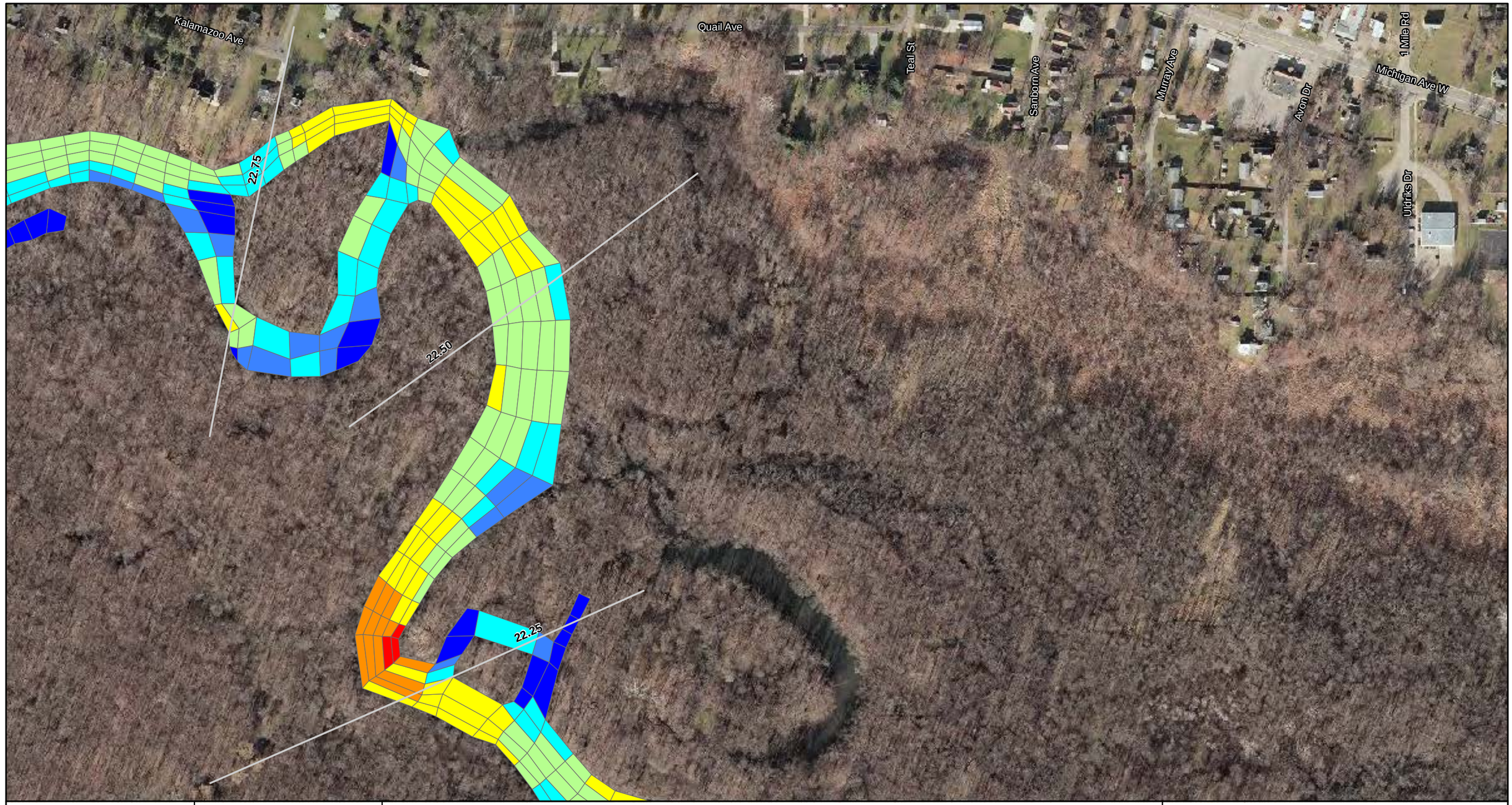
MP 21.35 - MP 22.15

SHEET 28 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

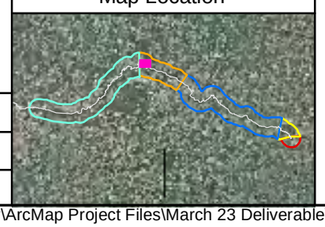
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

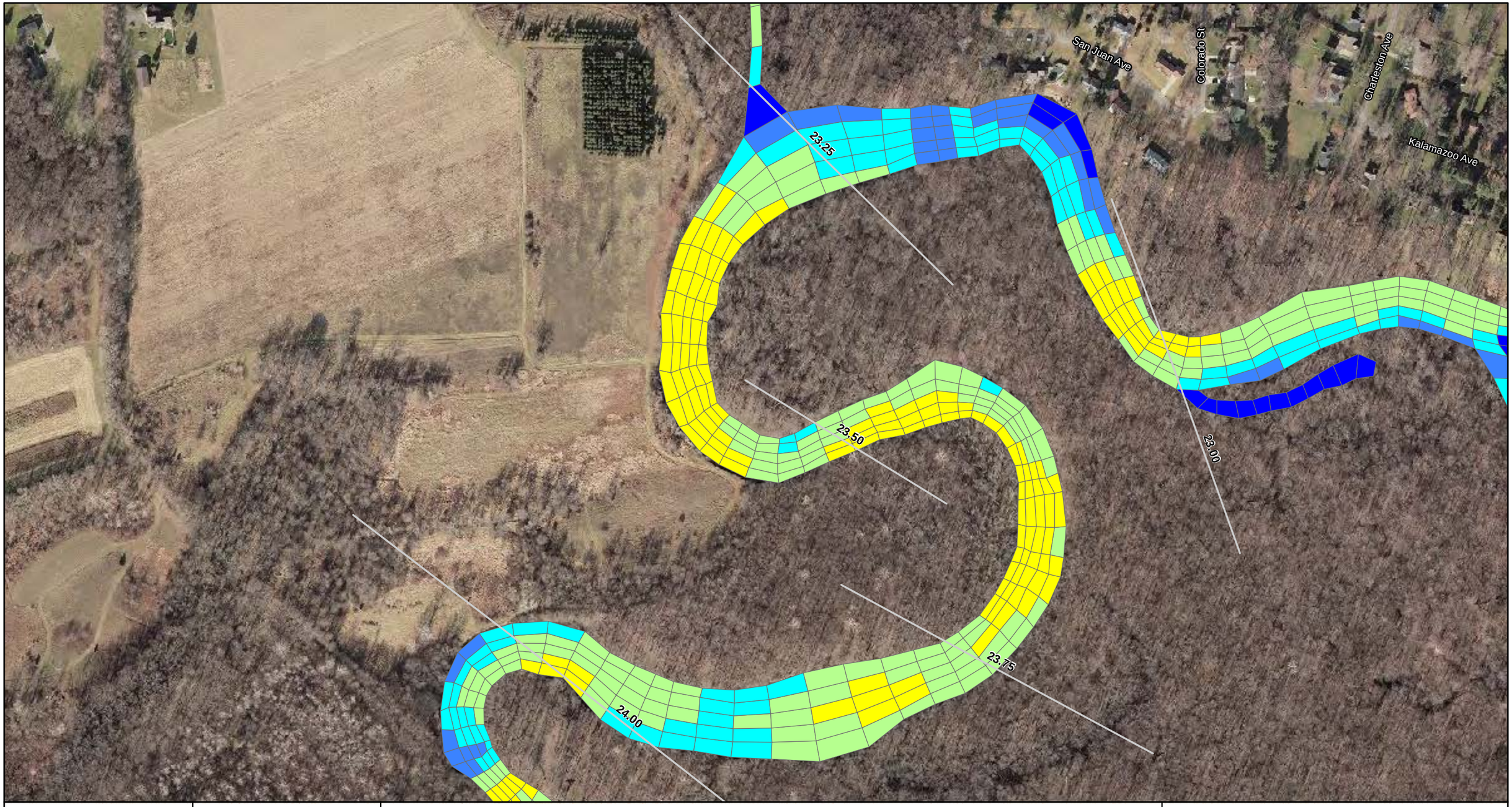
MP 22.15 - MP 22.90

SHEET 29 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

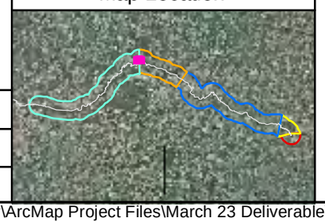
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 22.80 - MP 24.10

SHEET 30 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 24.10 - MP 24.85

SHEET 31 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

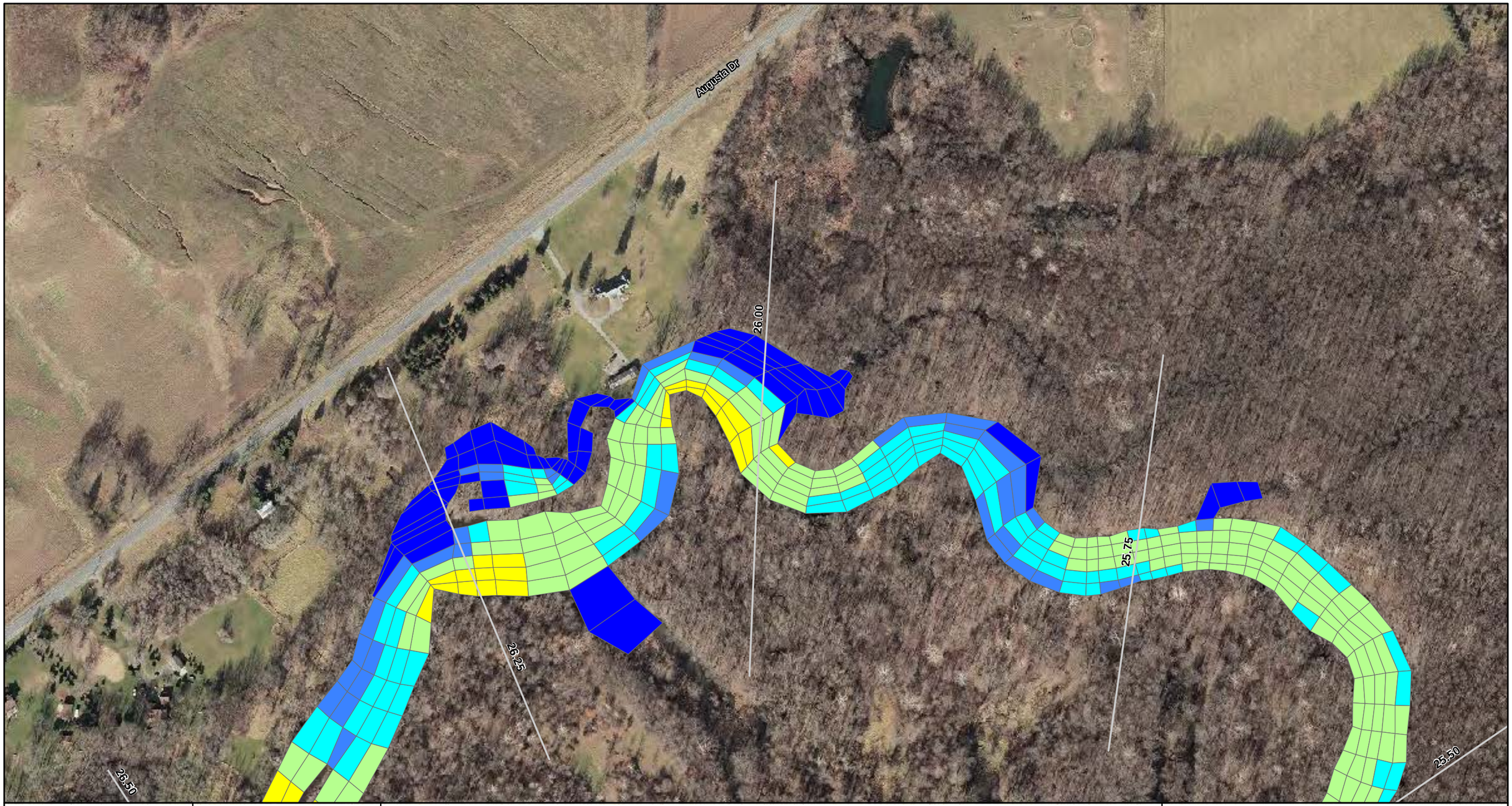
MP 24.80 - MP 25.65

SHEET 32 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

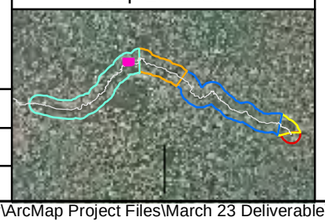
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

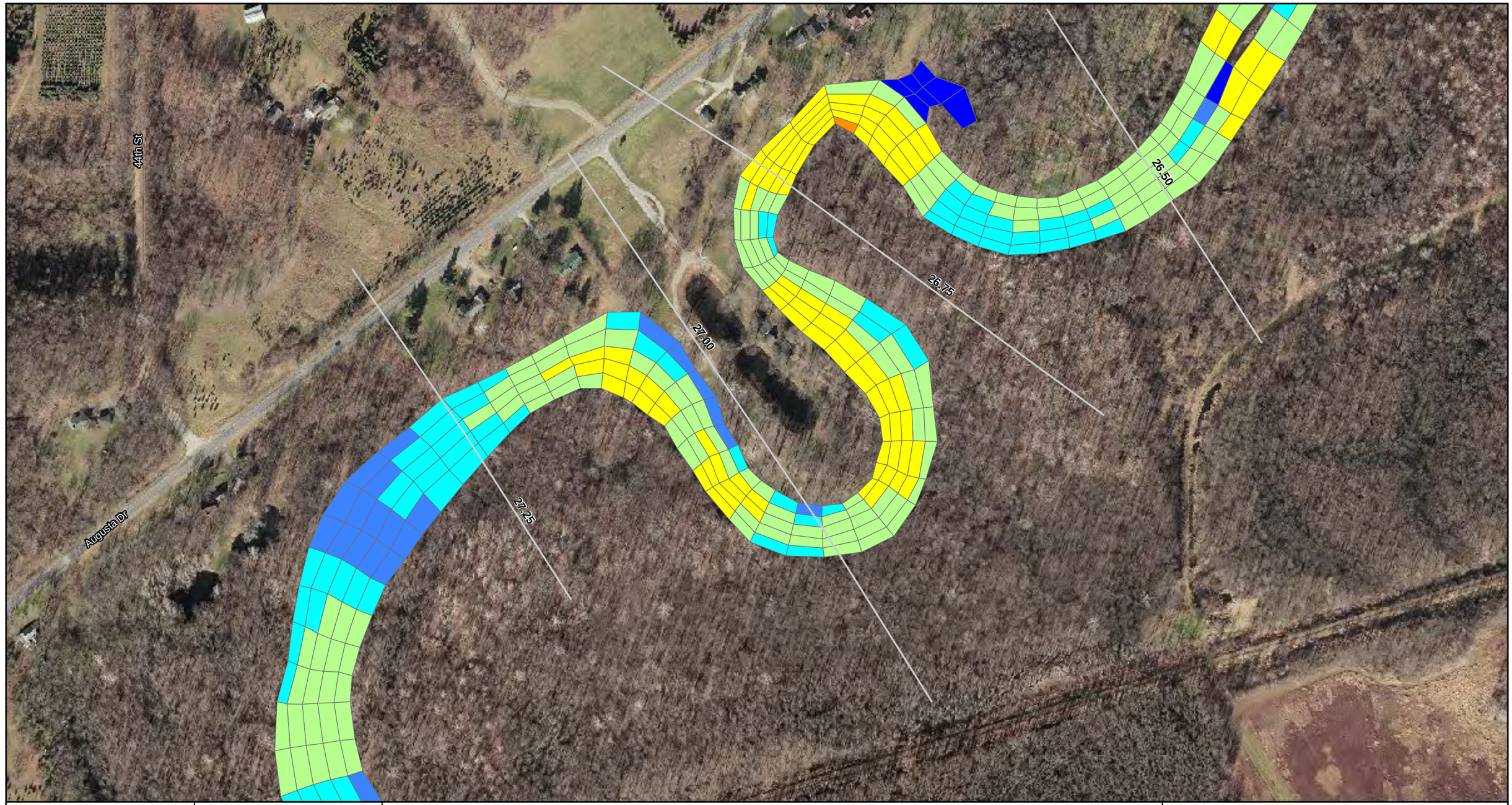
MP 25.55 - MP 26.40

SHEET 33 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

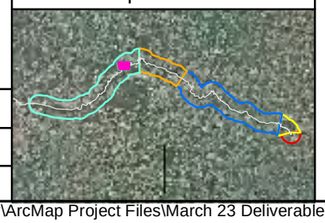
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

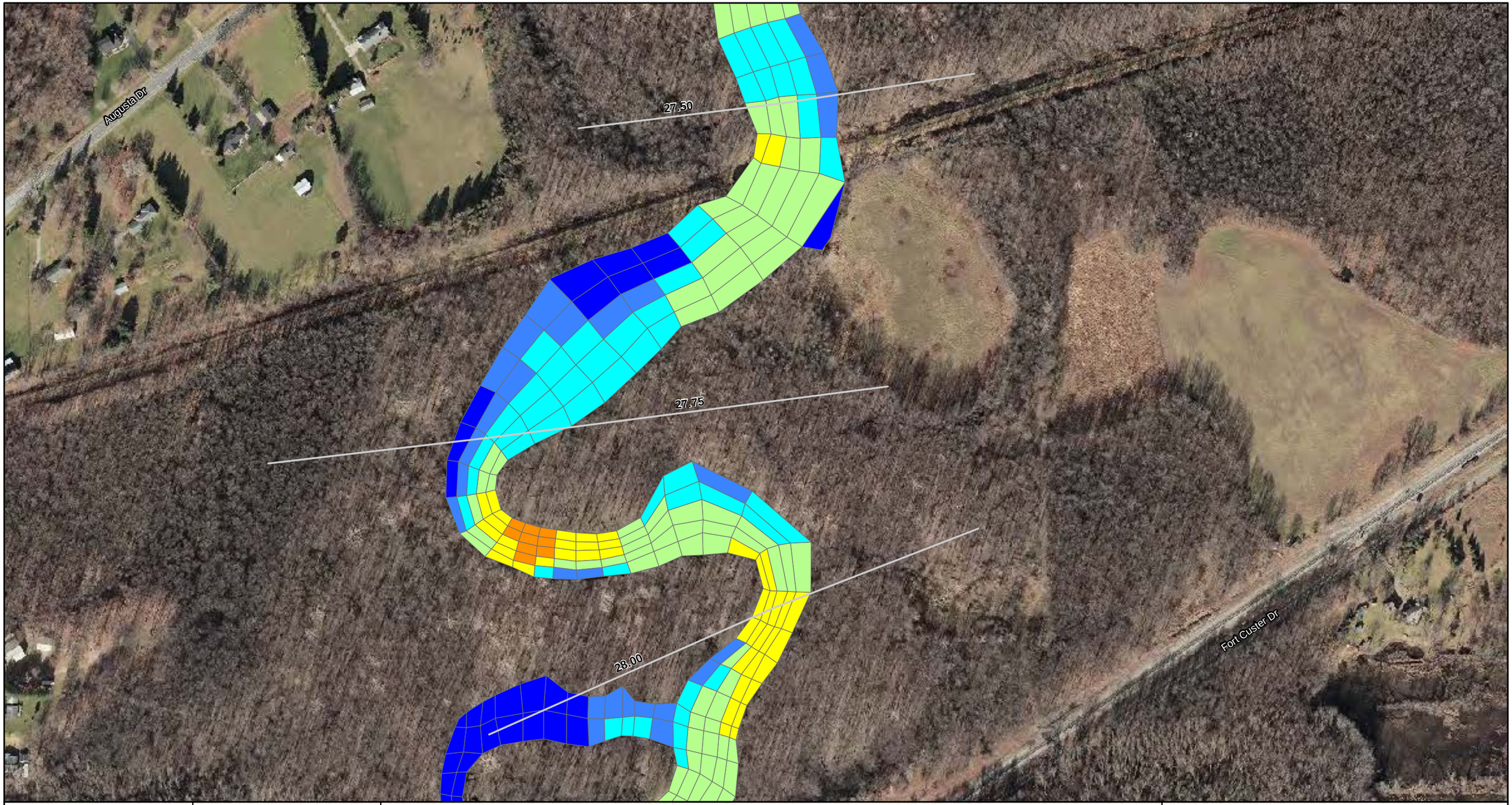
MP 26.40 - MP 27.45

SHEET 34 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

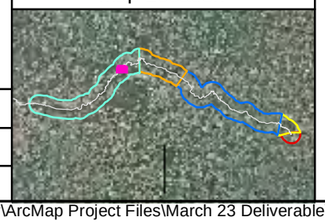
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

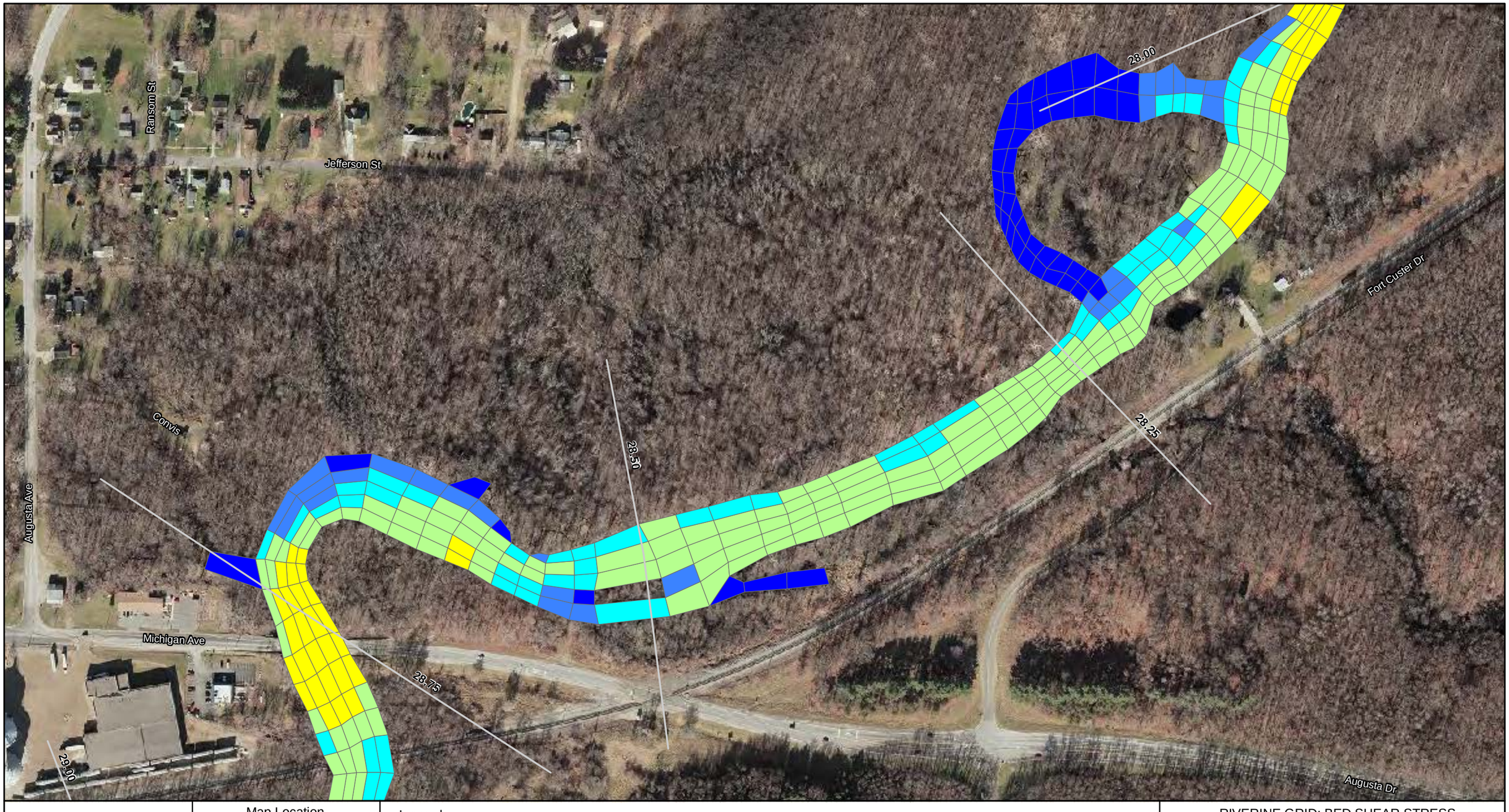
MP 27.45 - MP 28.10

SHEET 35 OF 56

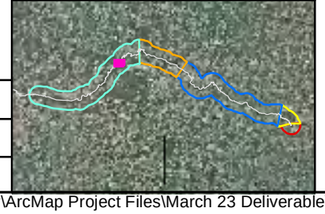
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

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Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 28.05 - MP 28.85

SHEET 36 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Clinton St
Clinton St
Chestnut St
Webster St
Church St
Fayette St
Cass St
Cherry St
Lincoln St
28.75
29.00
29.25
29.50
Augusta Climax Rd
Fort Custer Rec Area Access

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 28.85 - MP29.55

SHEET 37 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011

29.50

29.75

Fort Custer Rec Area Service

Fort Custer Rec Area Access

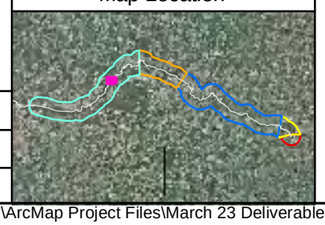
30.25

30.00

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 29.50 - MP29.95

SHEET 38 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

30.00

30.25

30.50

30.75

Fort Custer Rec Area BAS

Fort Custer Rec Area Access

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 29.95 - MP 30.80

SHEET 39 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

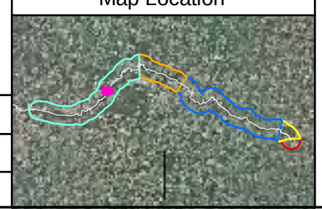
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

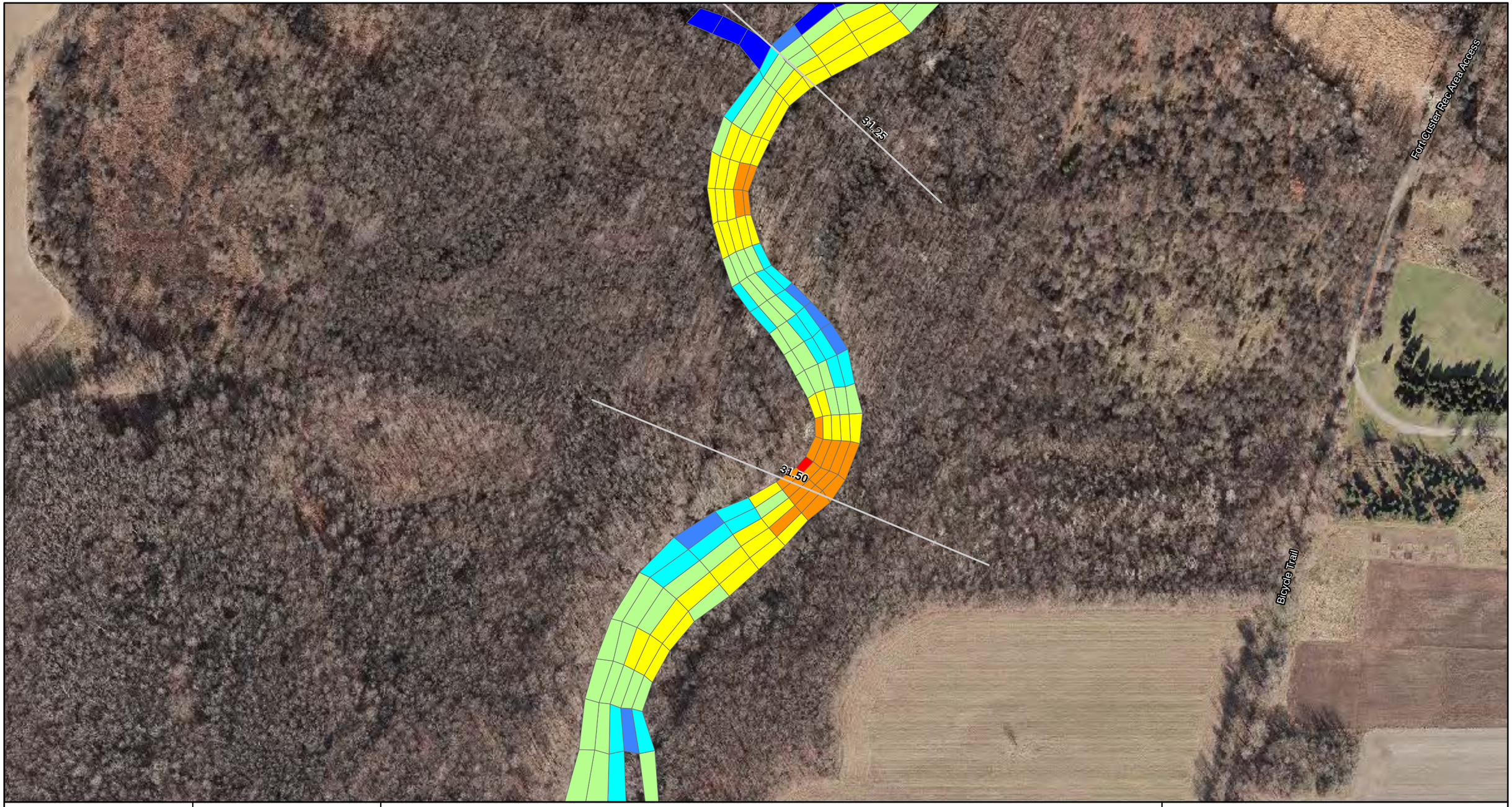
MP 30.75 - MP 31.25

SHEET 40 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

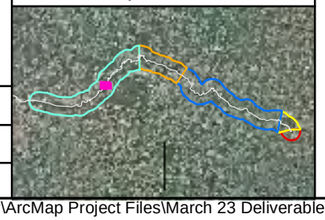
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 31.25 - MP 31.70

SHEET 41 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

31.75

32.00

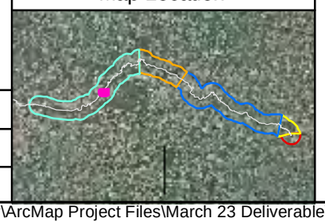
32.25

Bicycle Trail

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 31.65 - MP 32.25

SHEET 42 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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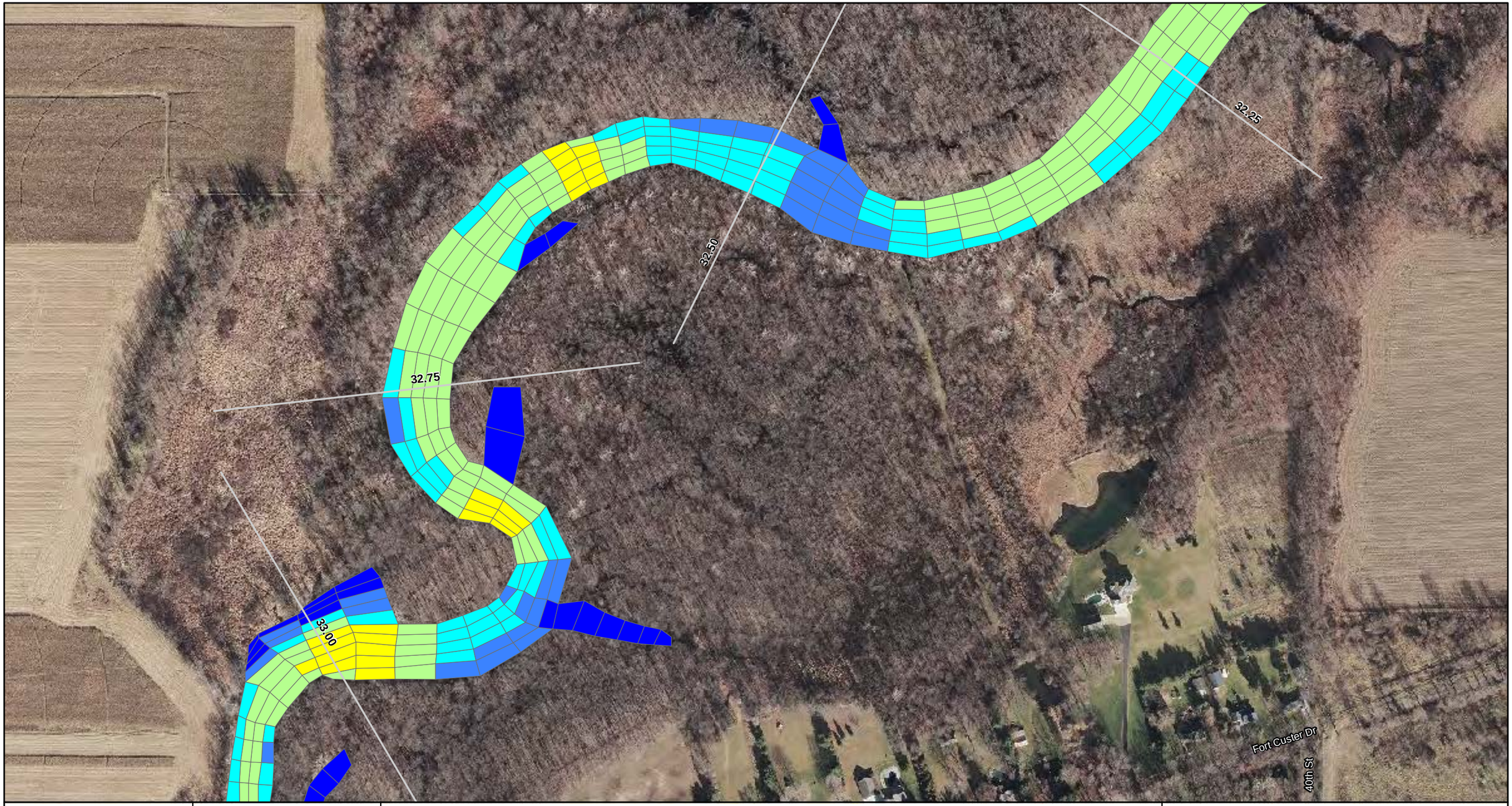
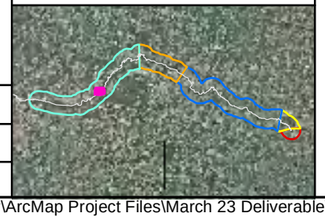
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 32.25 - MP 33.10

SHEET 43 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011

33.00

33.25

33.50

33.75

Fort Custer Dr

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 33.10 - MP 33.70

SHEET 44 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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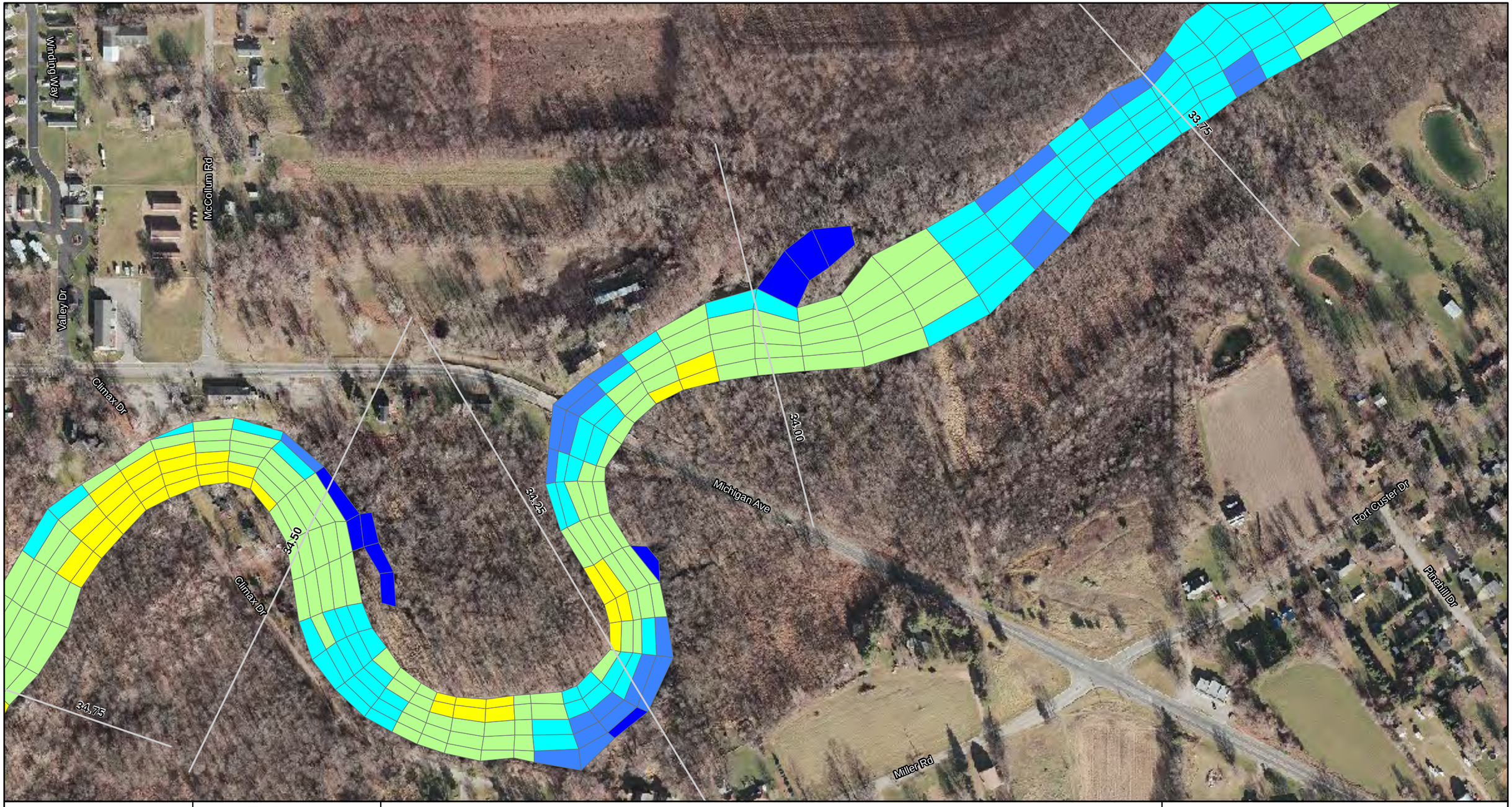
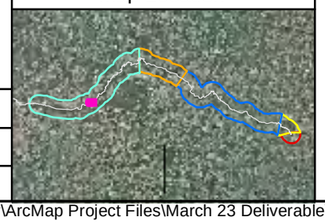
Aerial Photography Date: November 2011



Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 33.70 - MP 34.70

SHEET 45 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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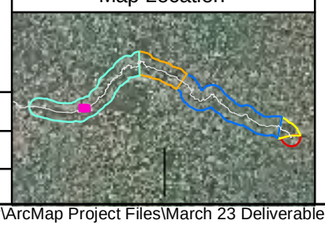
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 34.70 - MP 35.75

SHEET 46 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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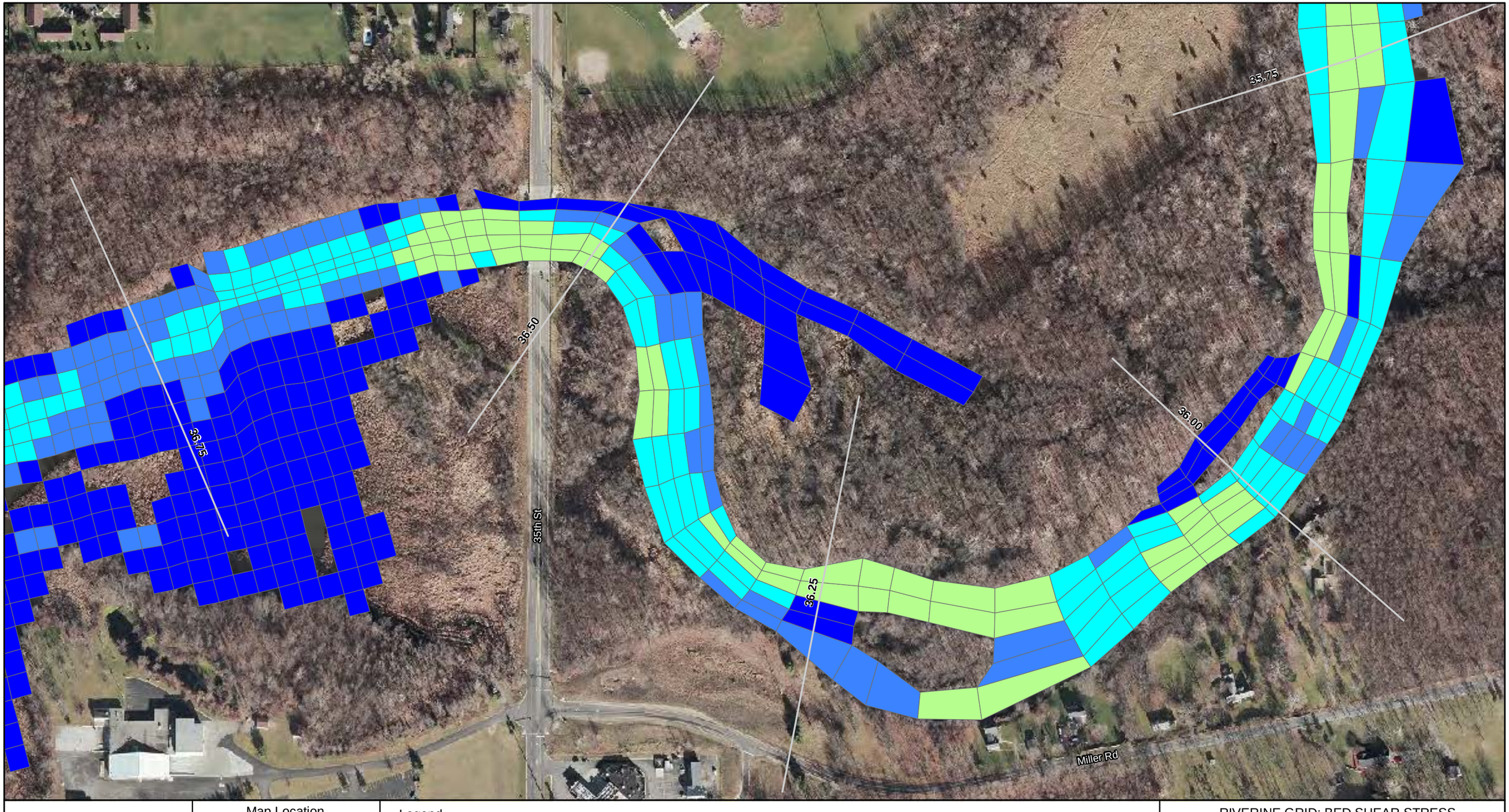
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 35.75 - MP 36.80

SHEET 47 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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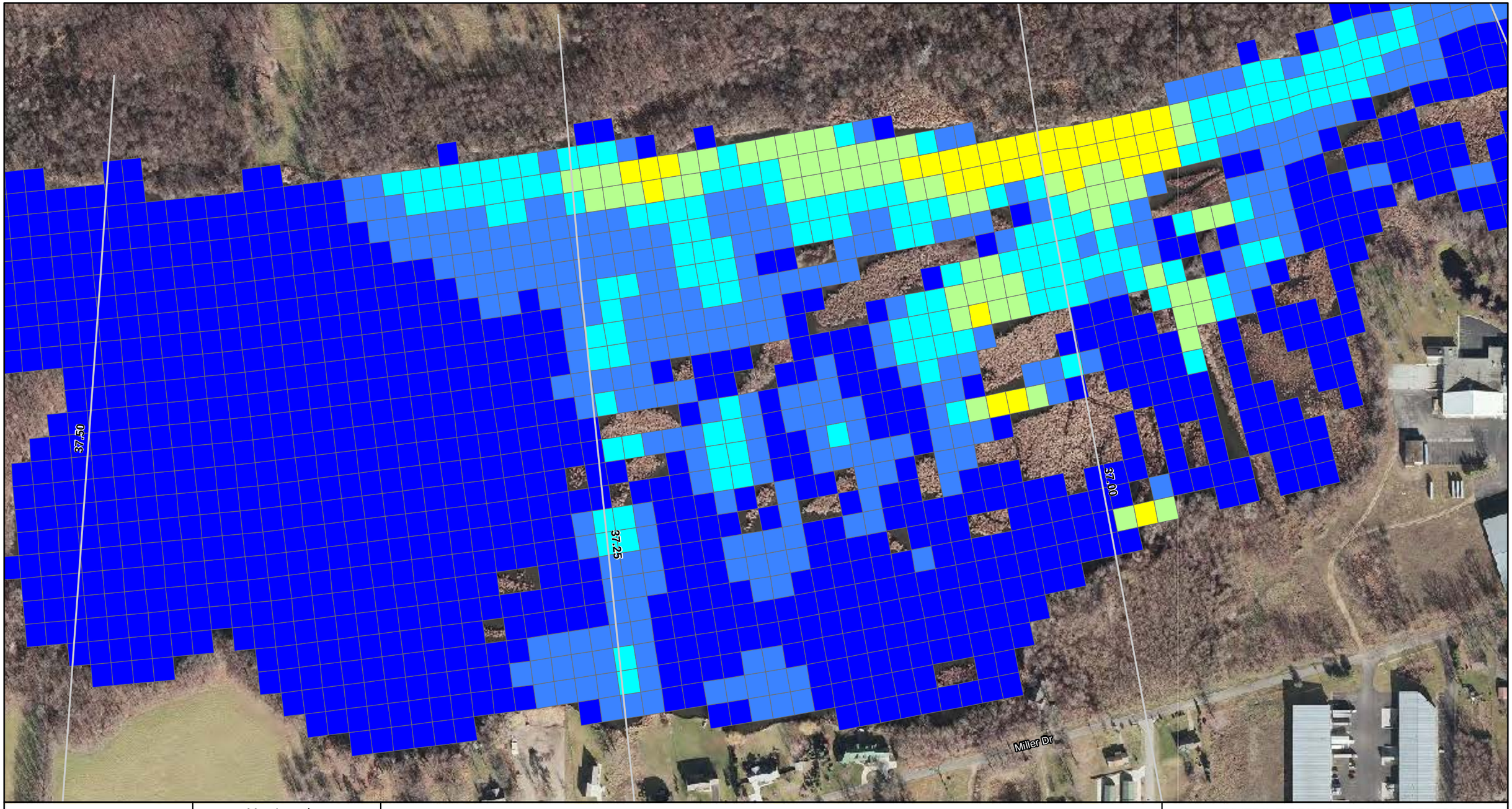
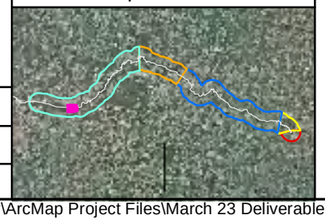
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

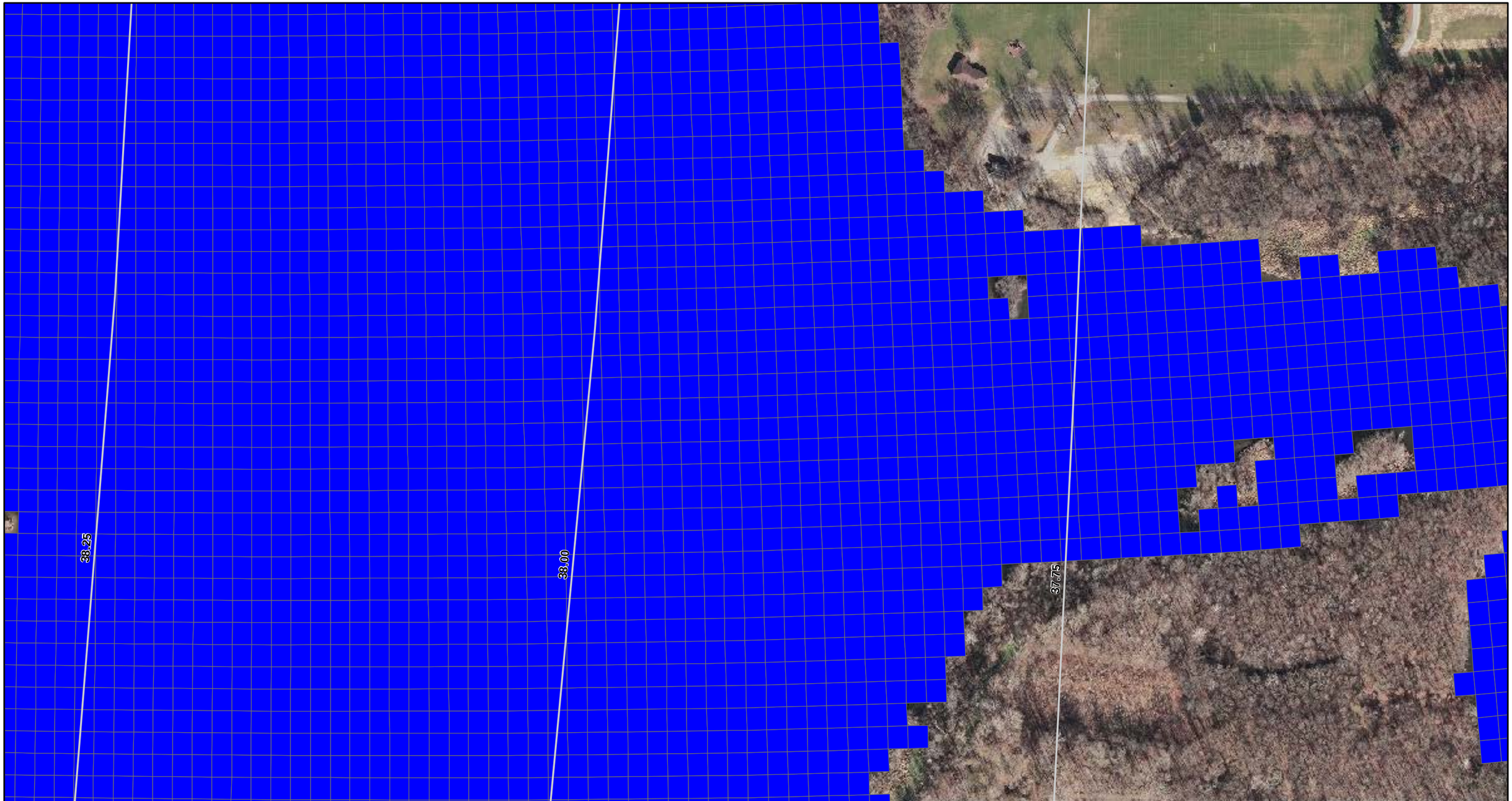
MP 36.80 - MP 37.55

SHEET 48 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

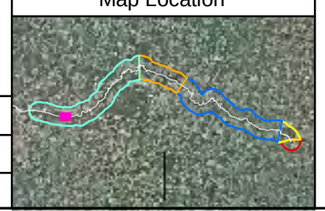
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 37.55 - MP 38.30

SHEET 49 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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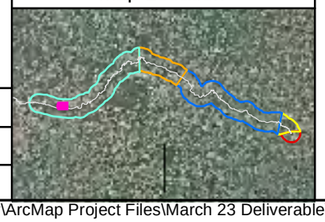
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

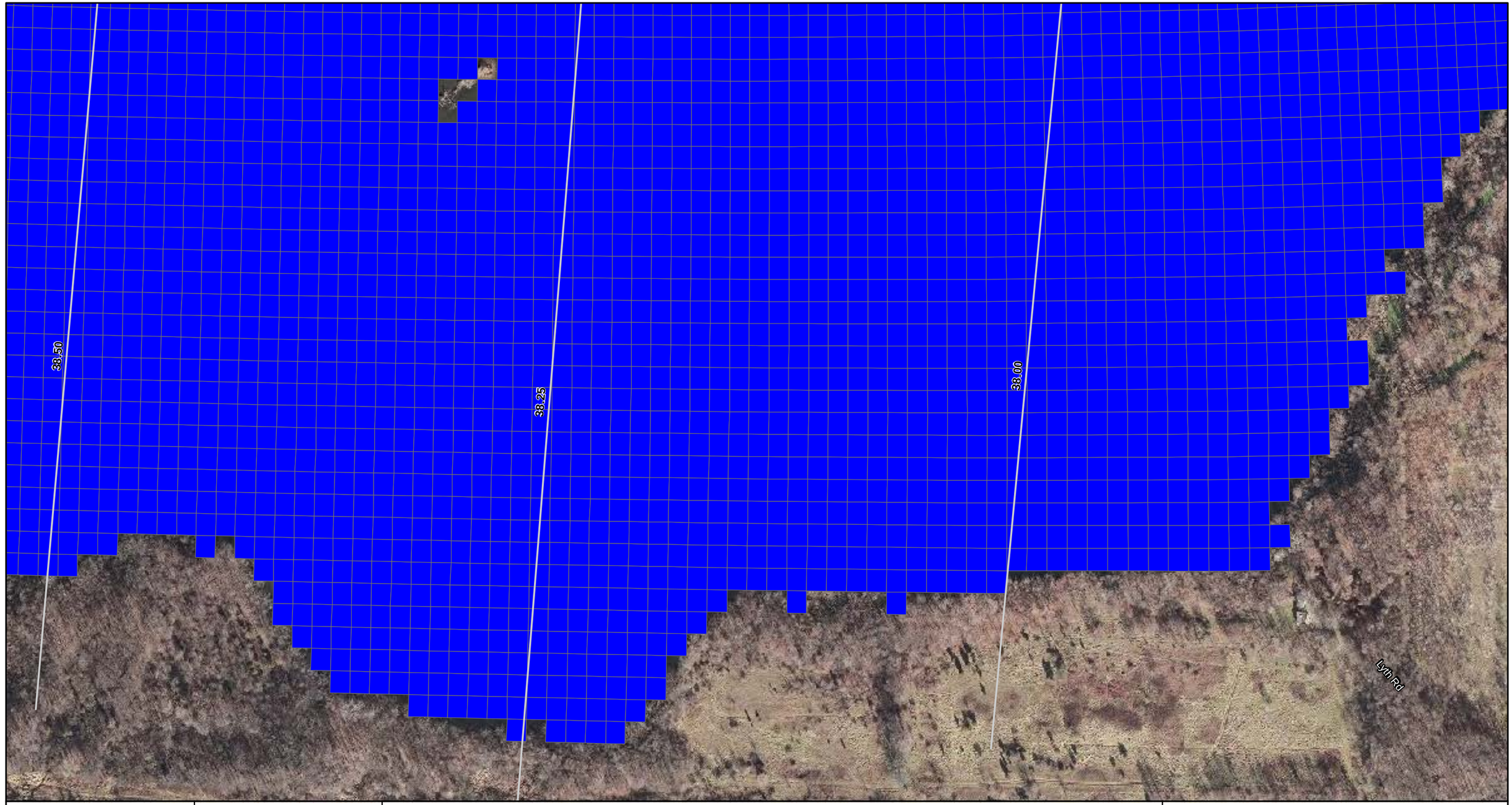
MP 37.80 - MP 38.60N

SHEET 50 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

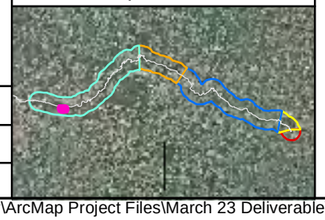
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 37.80 - MP 38.60S

SHEET 51 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011

39.00

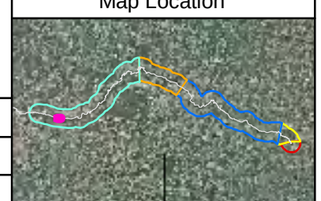
38.50

38.75

38.25

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 38.25 - MP 39.00C

SHEET 52 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011

Lawndale Ave

Plaza Pl

Morrow Lake BAS

39.25

39.00

38.75

38.50

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

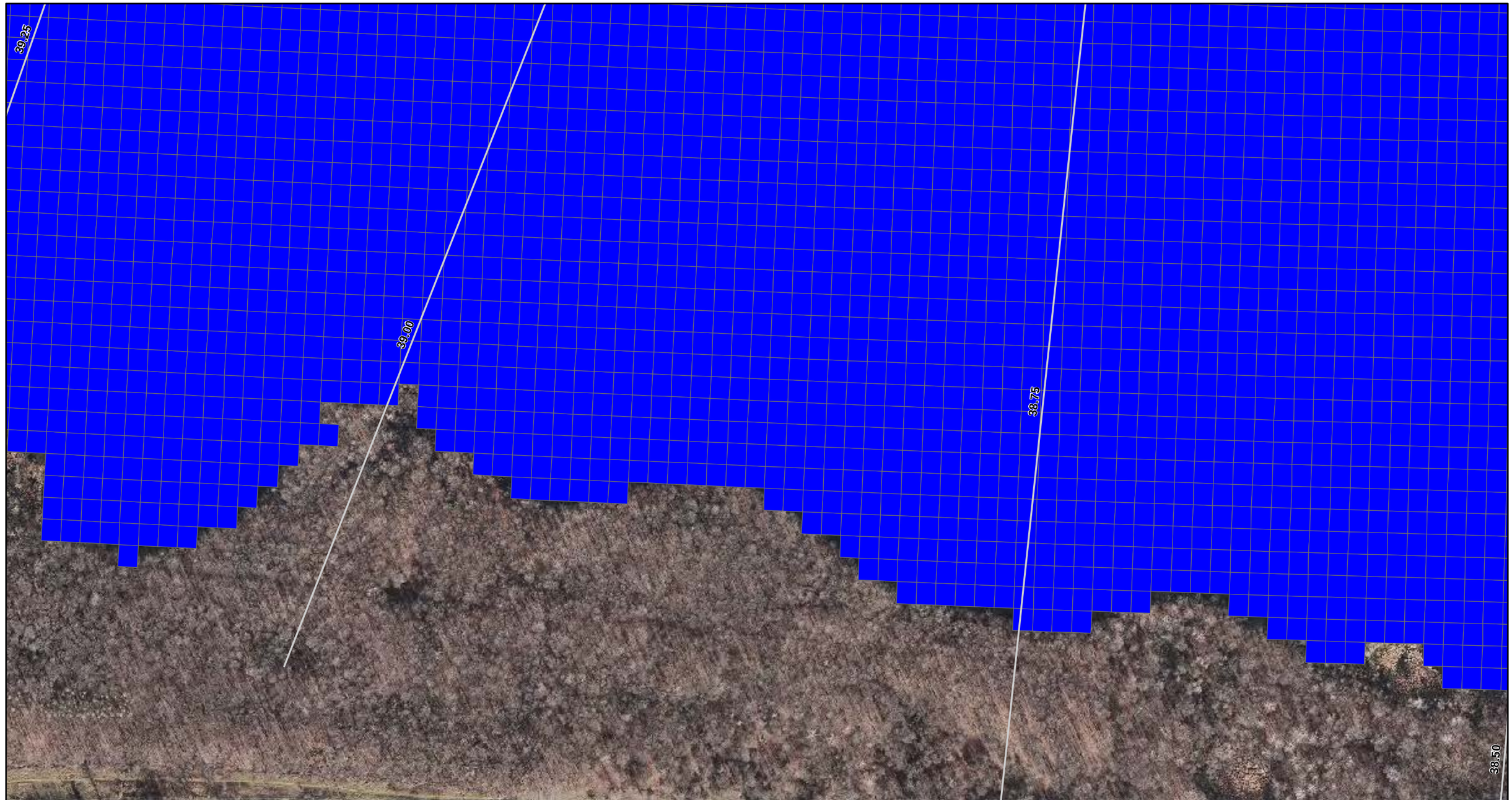
MP 38.50 - MP 39.25N

SHEET 53 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

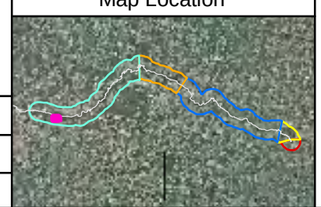
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 38.50 - MP 39.25S

SHEET 54 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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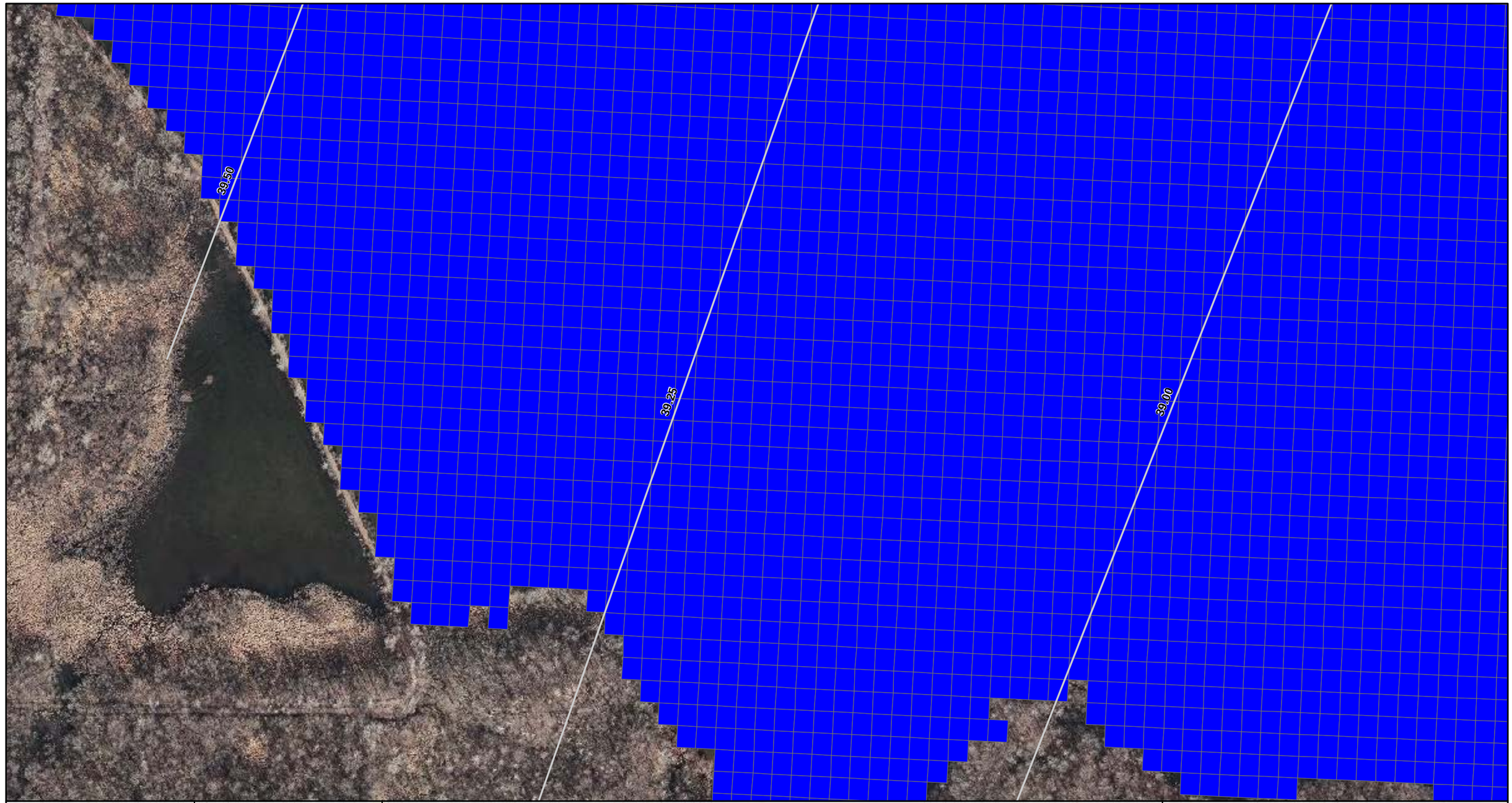
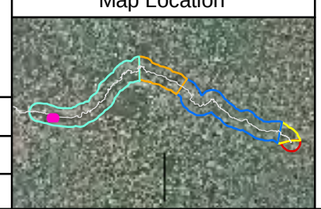
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

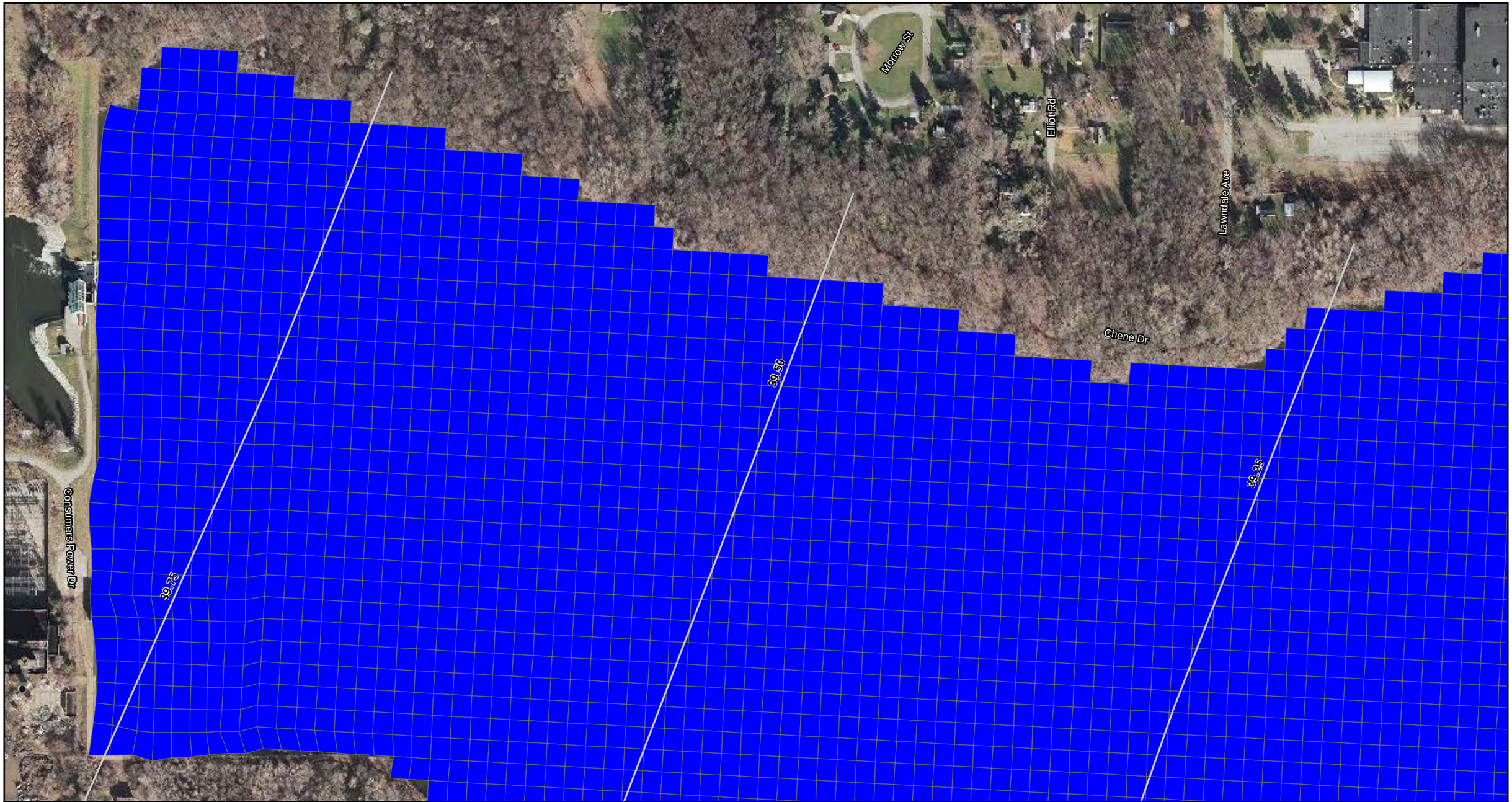
MP 38.90 - MP 39.60S

SHEET 55 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr12_2011.mxd

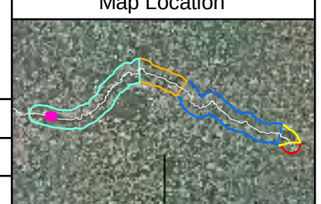
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 12, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 1,350 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 12, 2011

MP 39.15 - MP 39.85

SHEET 56 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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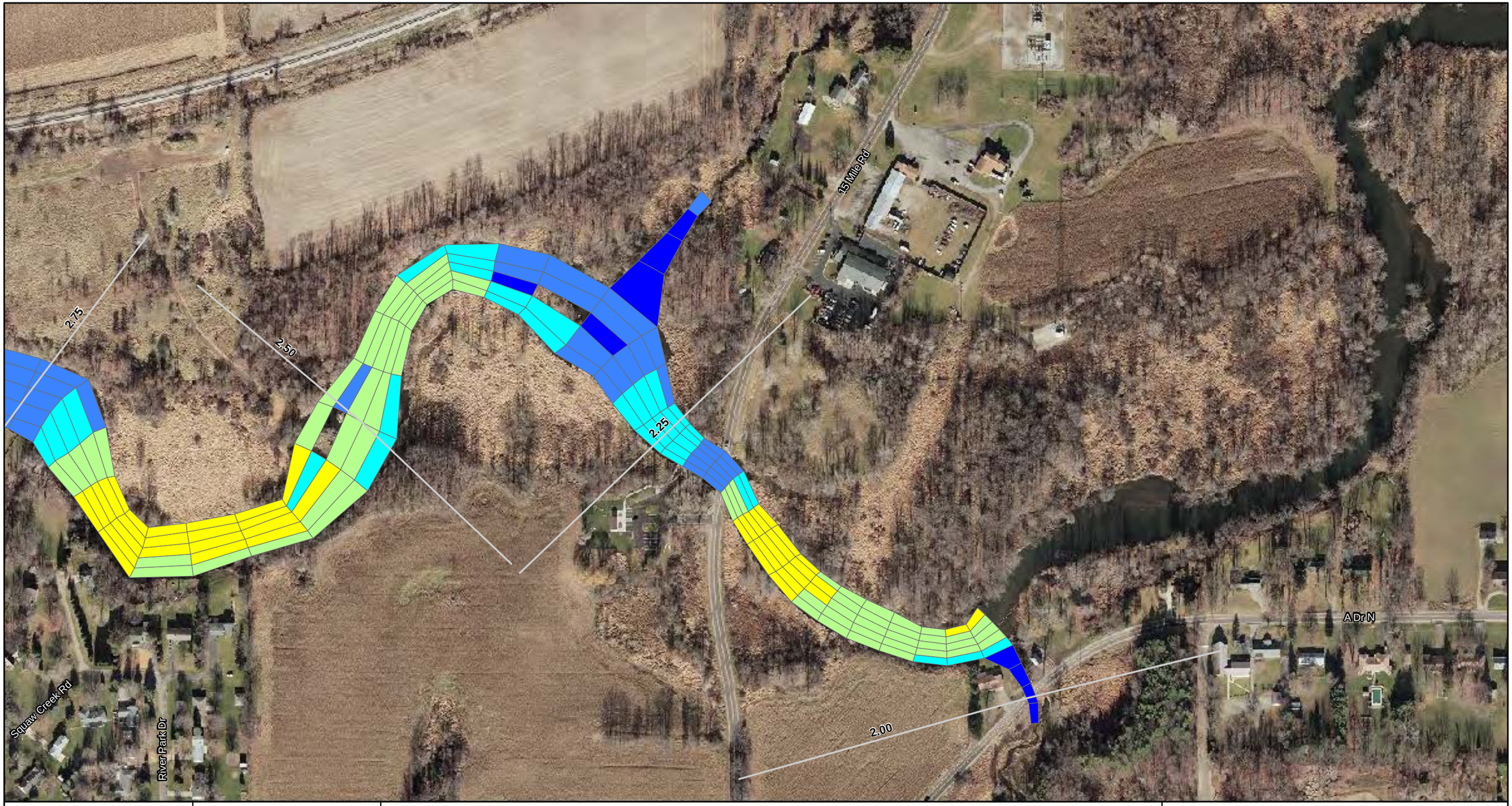
Aerial Photography Date: November 2011

Figure 6-28

Riverine Grid: Bed Shear Stress

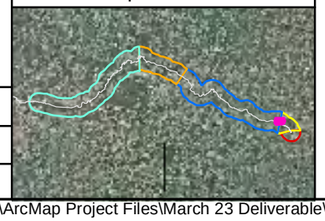
April 16, 2011

Sheets 1 through 56



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 01.95 - MP 02.75

SHEET 1 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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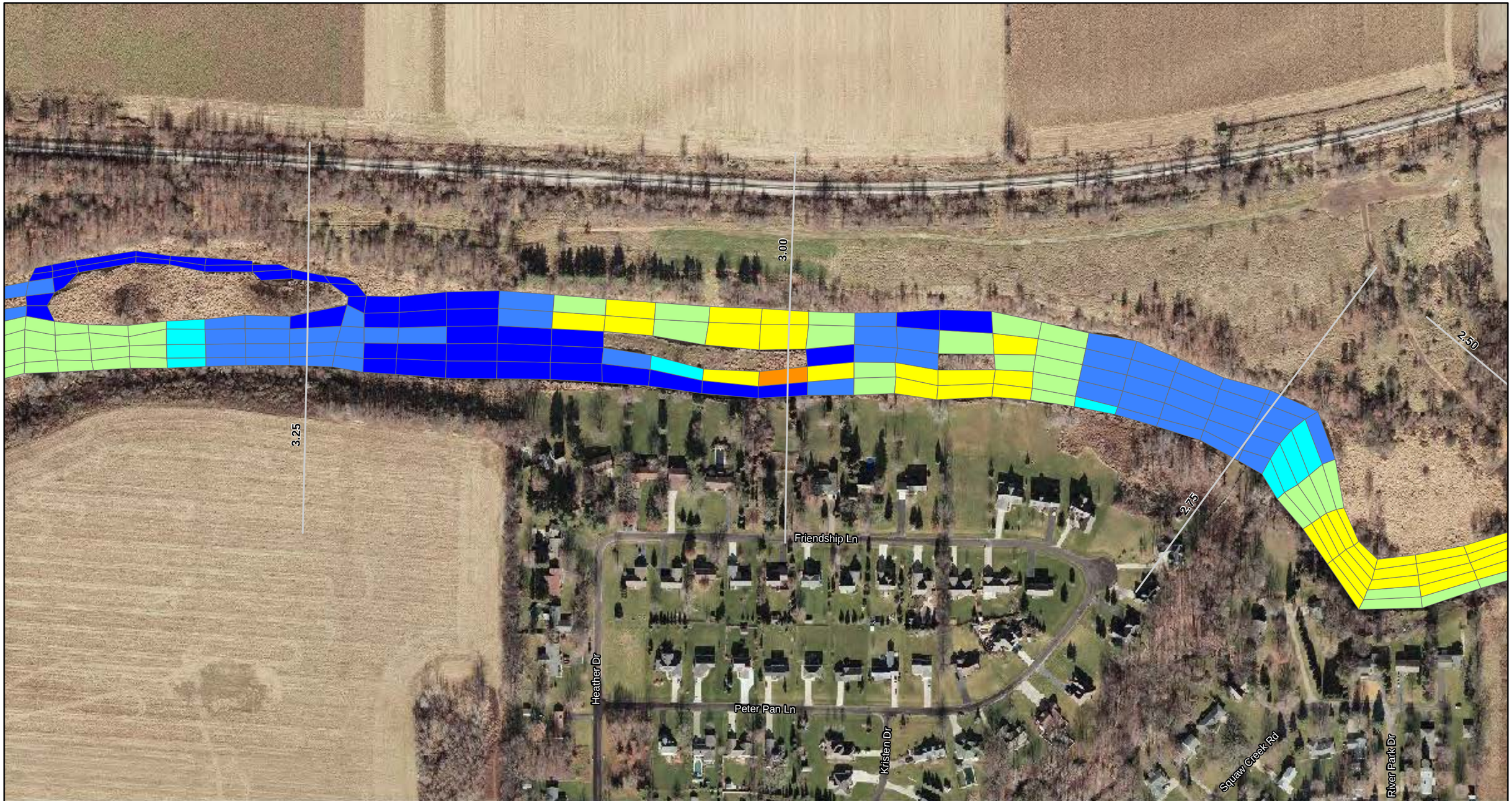
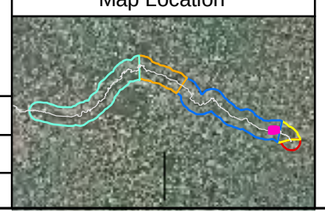
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 02.60 - MP 03.40

SHEET 2 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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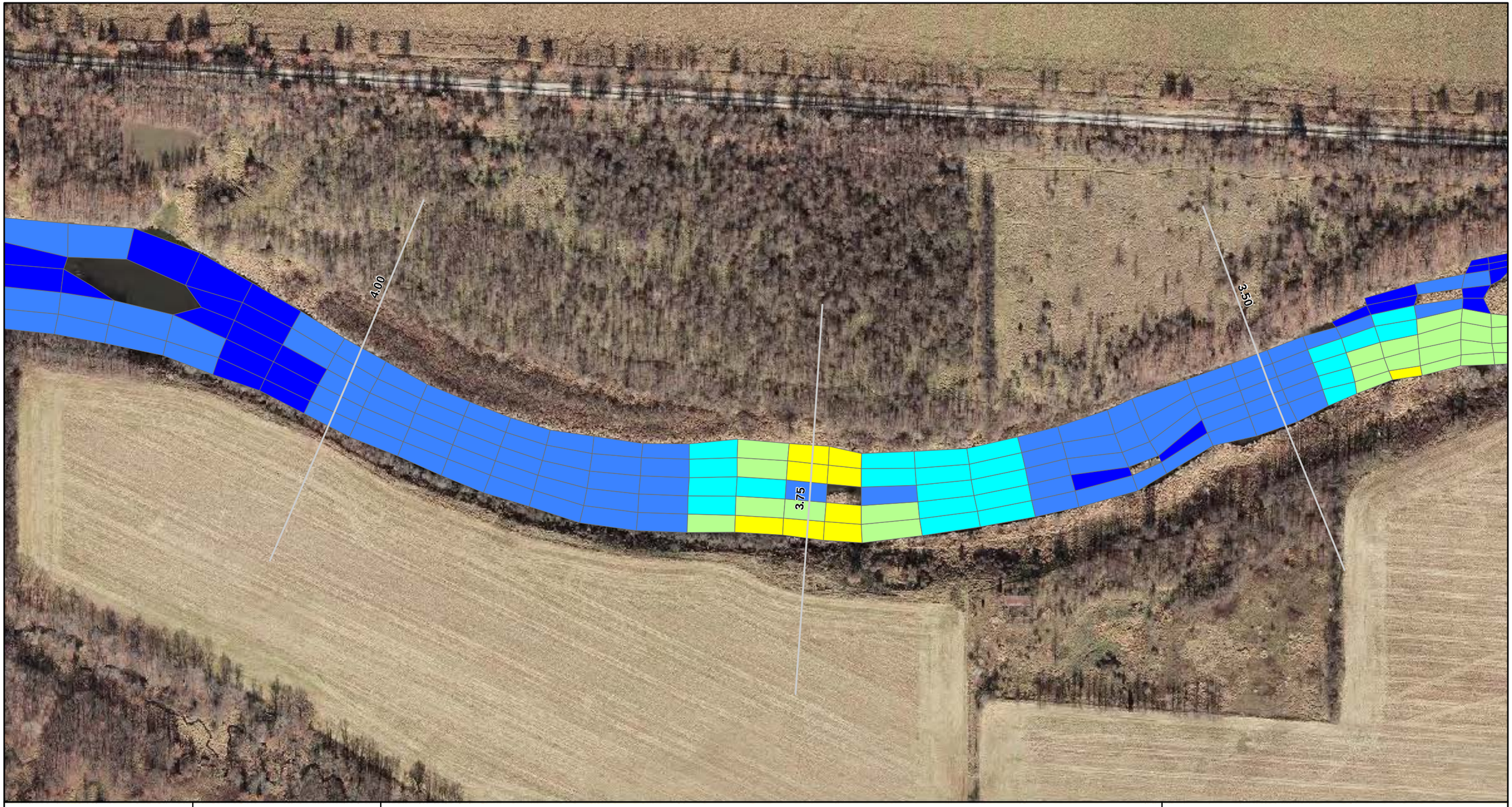
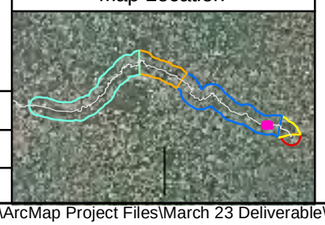
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 03.40 - MP 04.20

SHEET 3 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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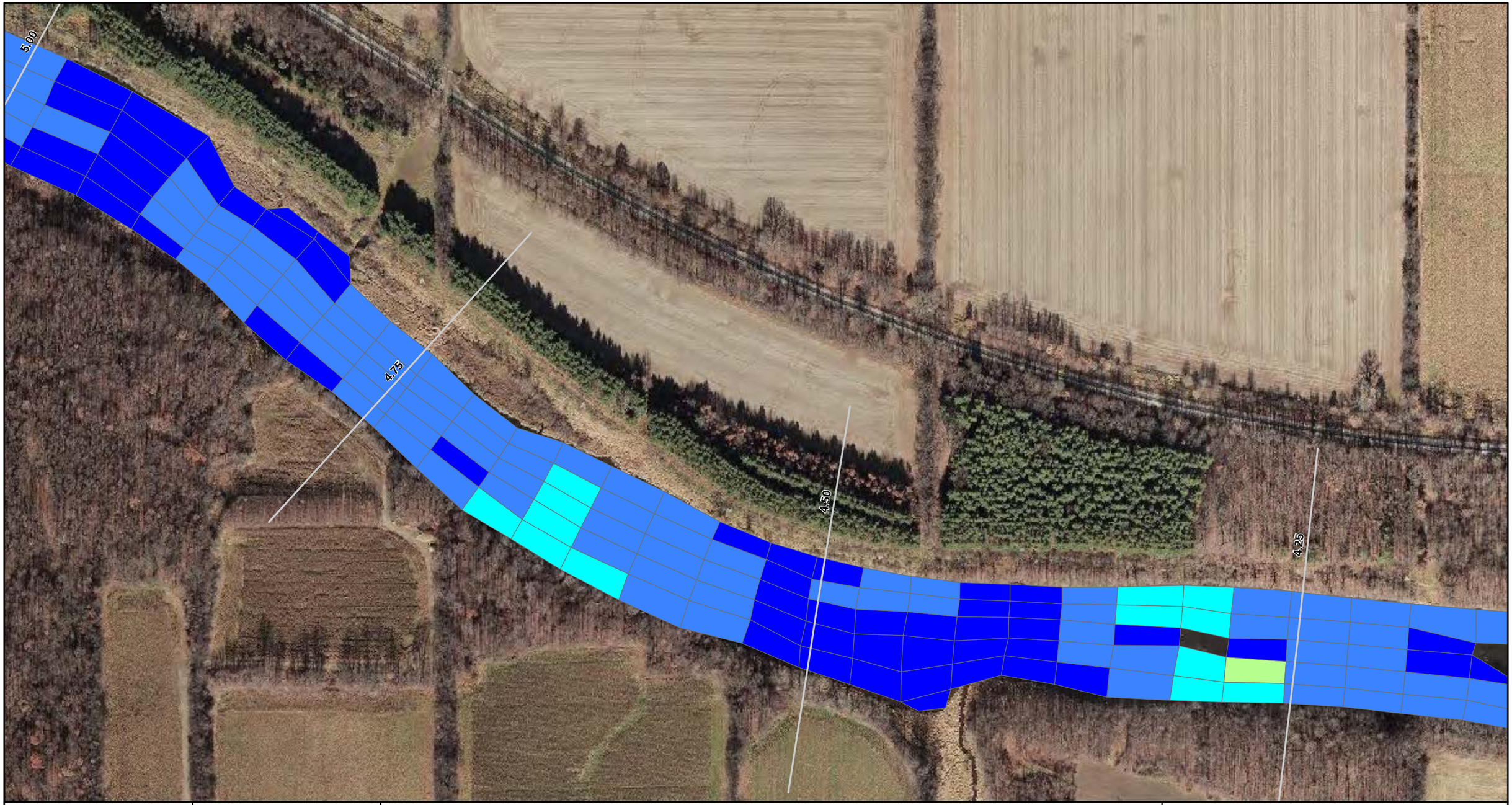
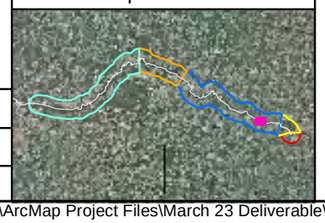
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 04.15 - MP 05.00

SHEET 4 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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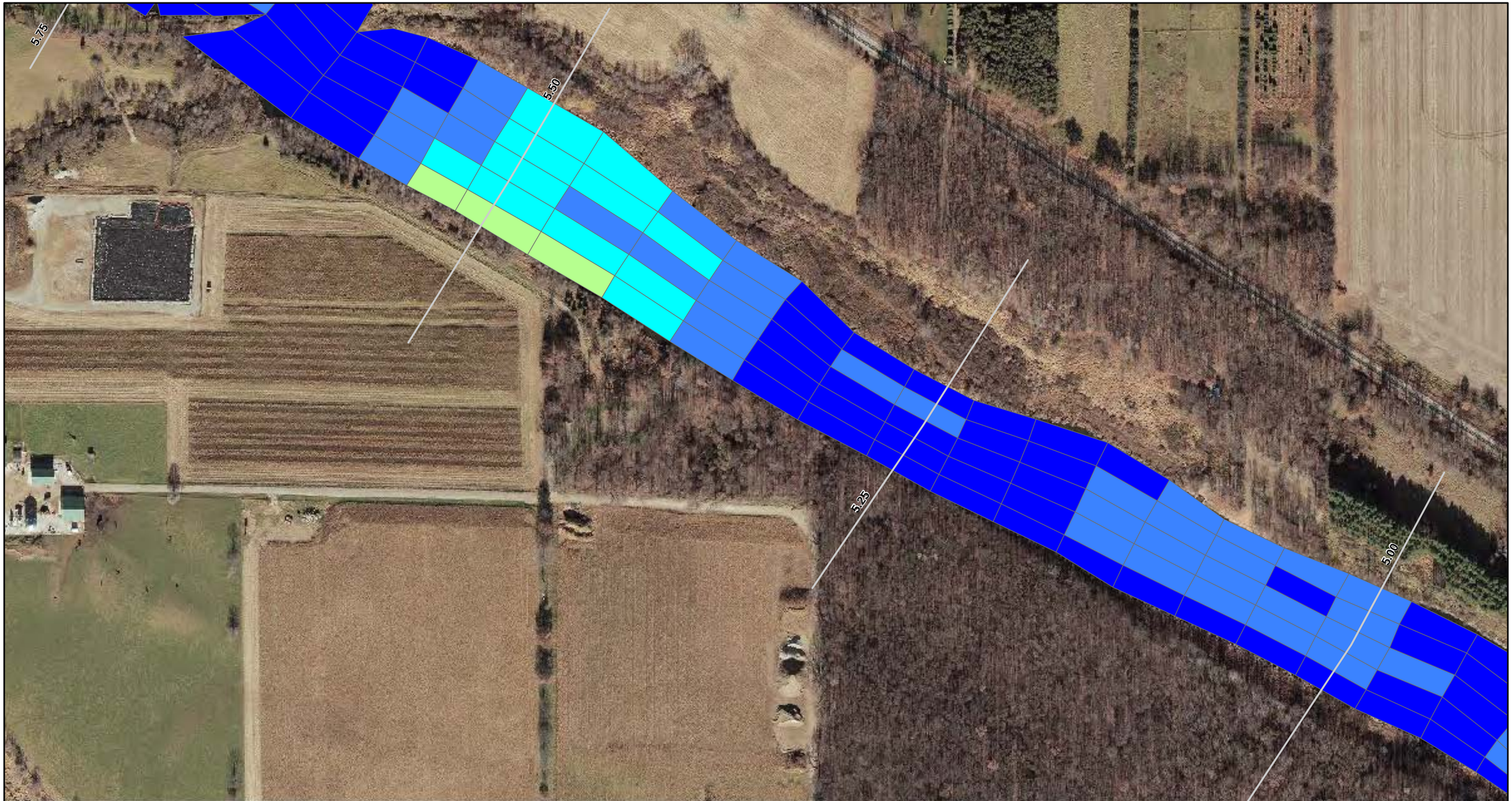
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 04.90 - MP 05.65

SHEET 5 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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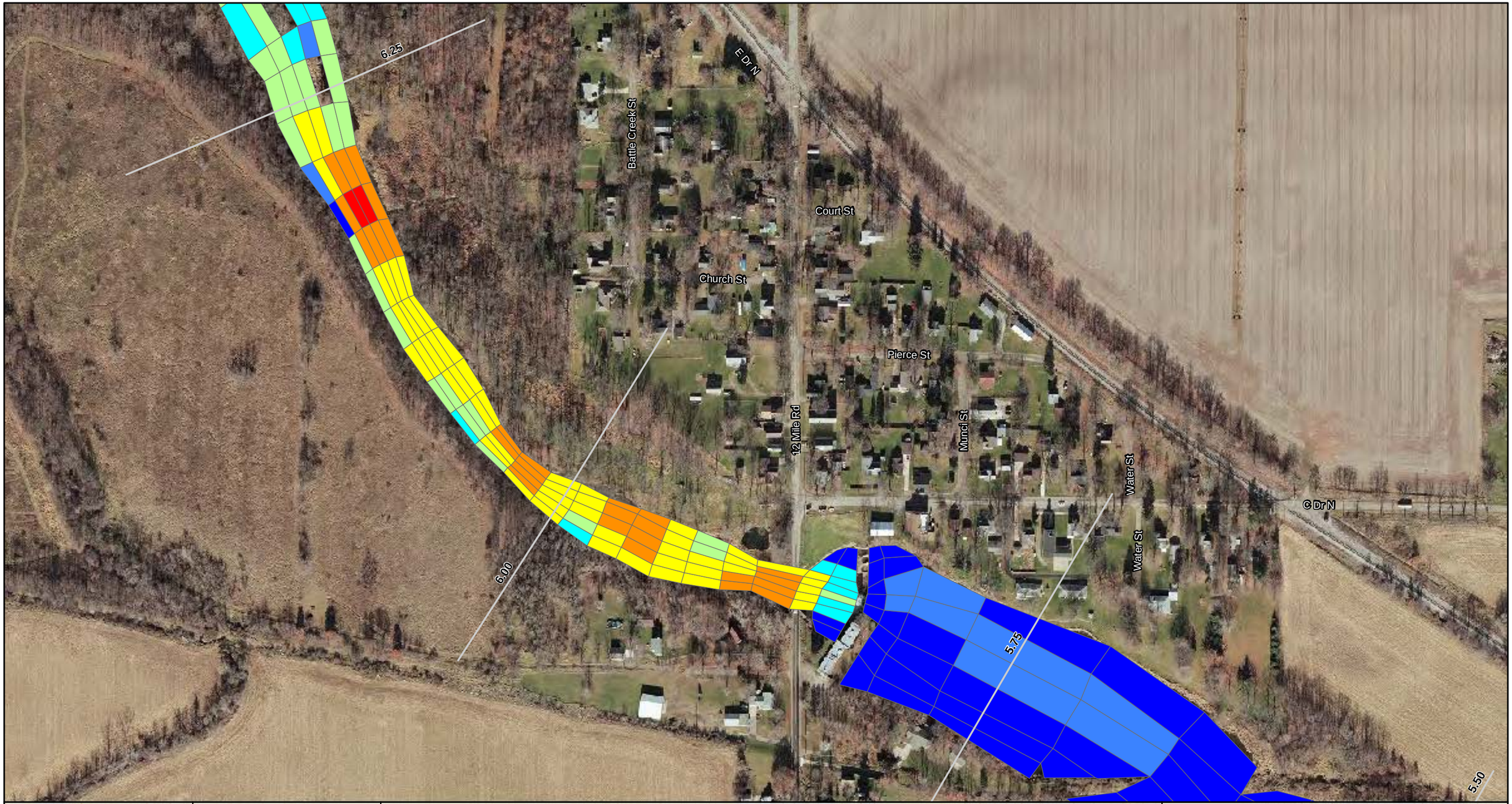
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 05.65 - MP 06.30

SHEET 6 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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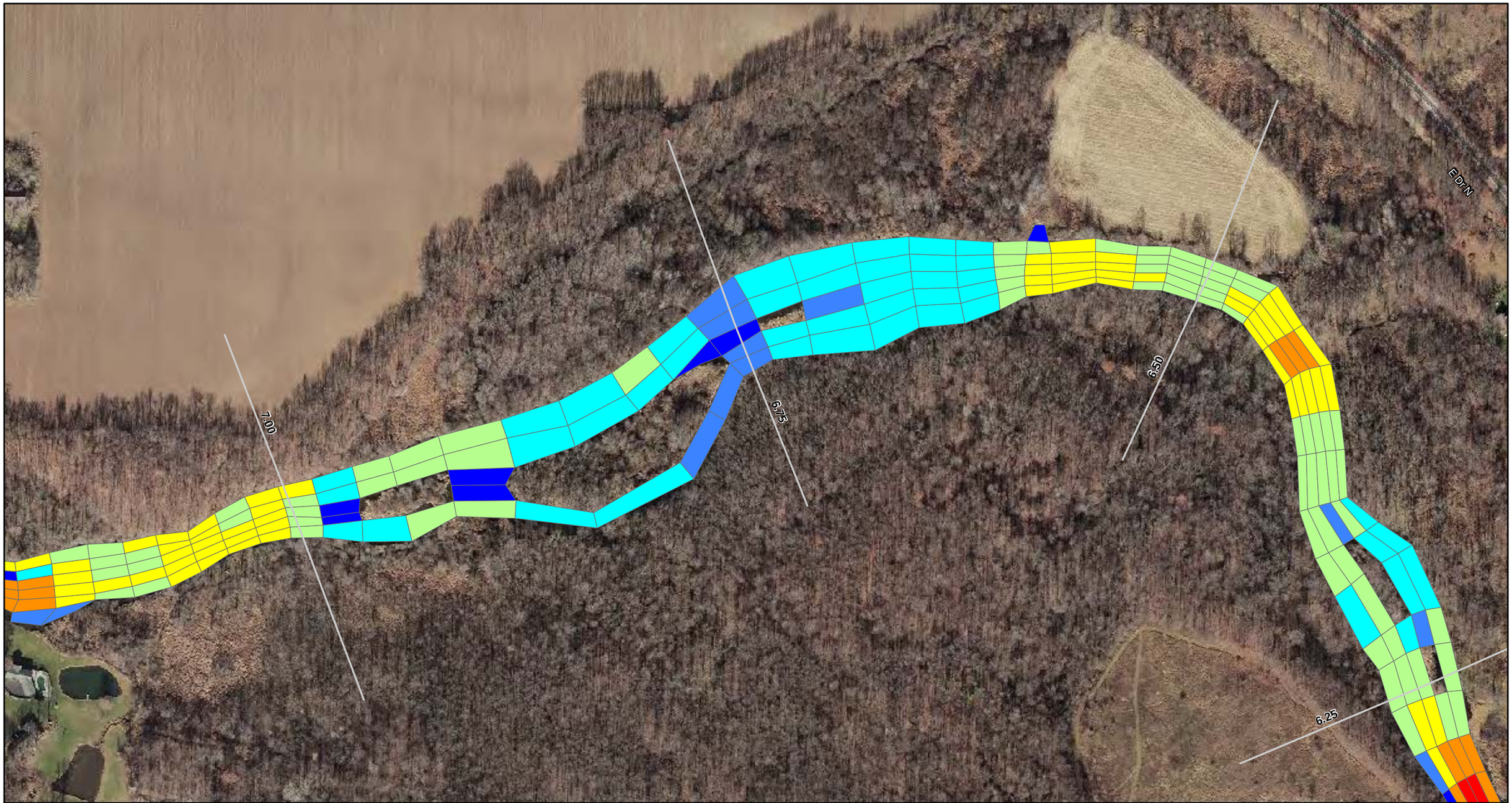
Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 06.20 - MP 07.15

SHEET 7 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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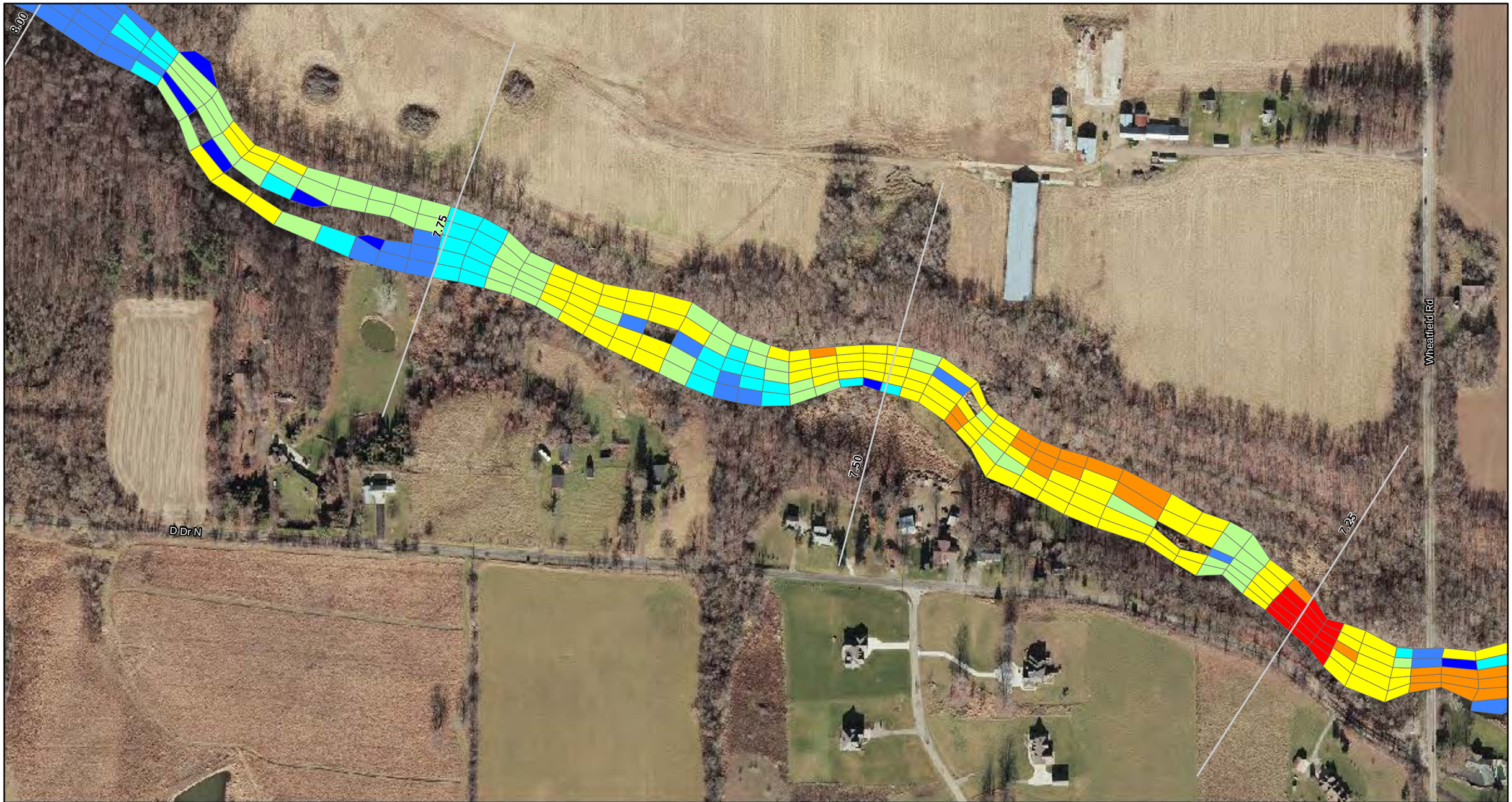
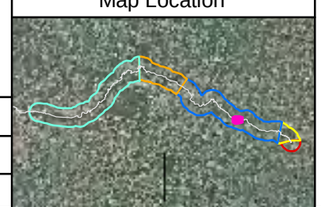
Aerial Photography Date: November 2011



Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

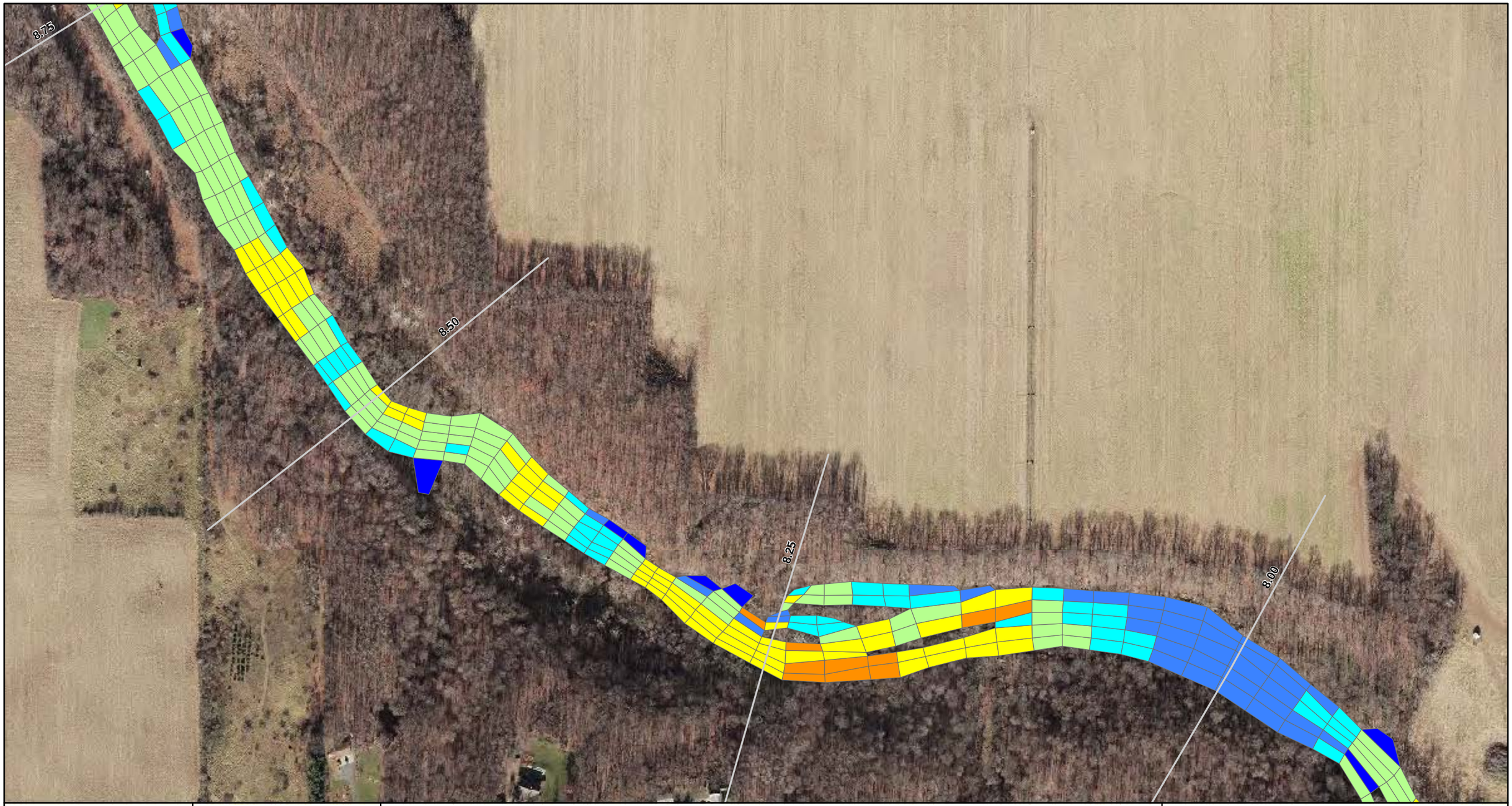
MP 07.15 - MP 07.95

SHEET 8 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

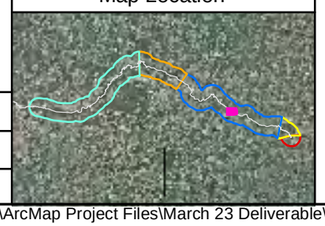
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

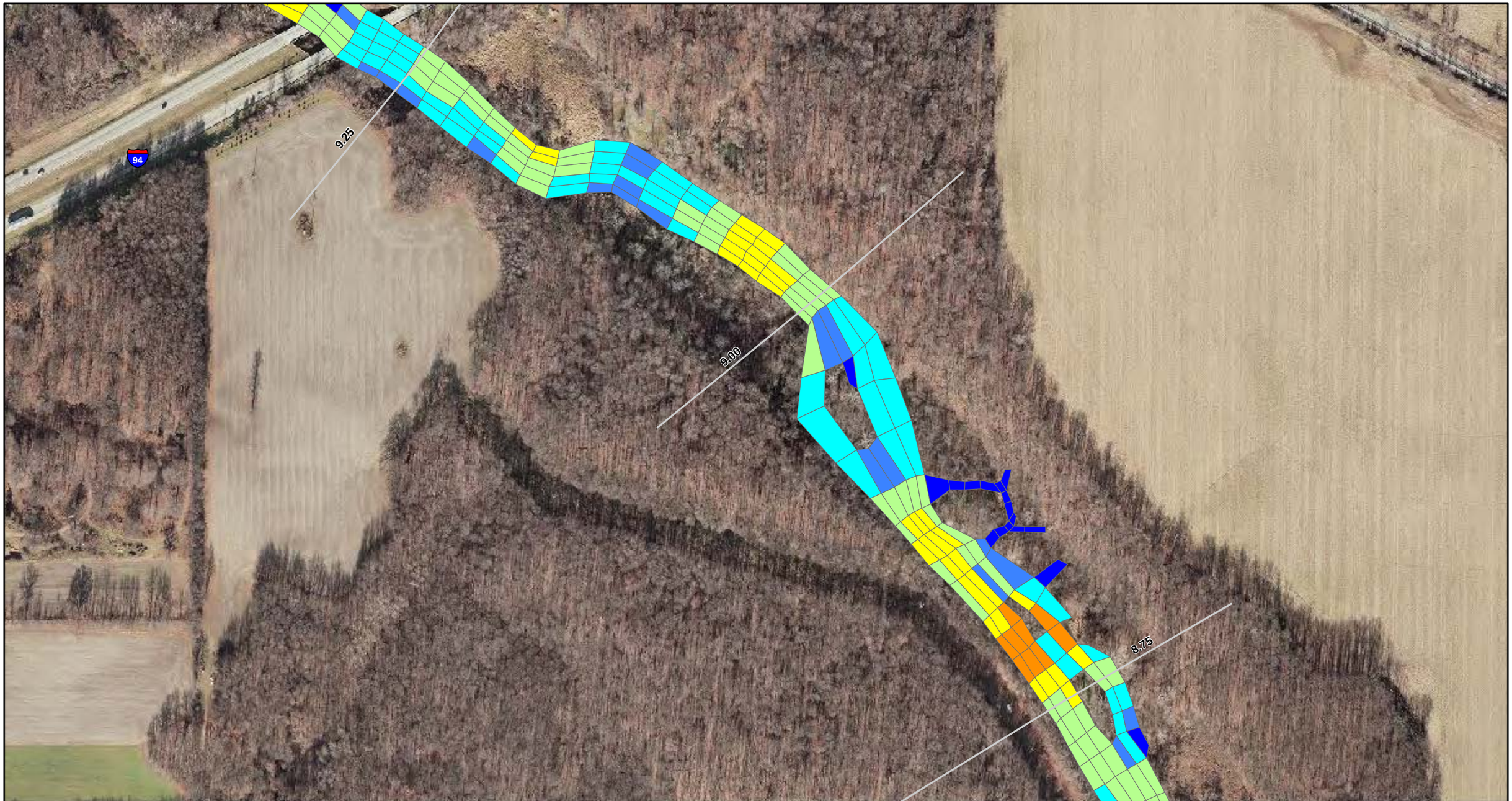
MP 07.90 - MP 08.75

SHEET 9 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 08.70 - MP 09.30

SHEET 10 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 09.25 - MP 10.05

SHEET 11 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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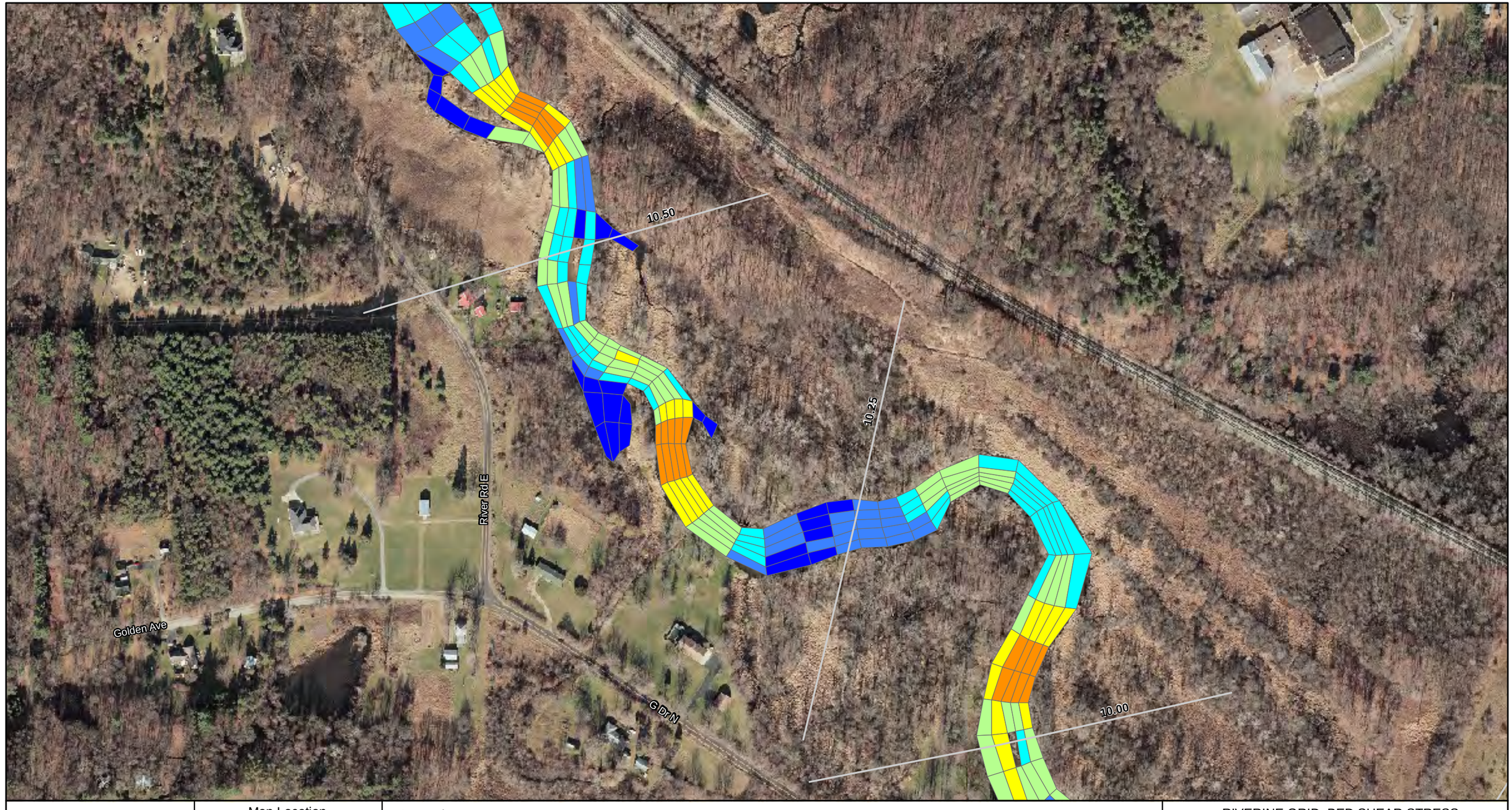
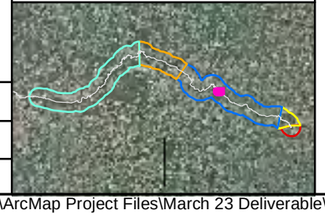
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 10.00 - MP 10.65

SHEET 12 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

11.25

11.00

10.75

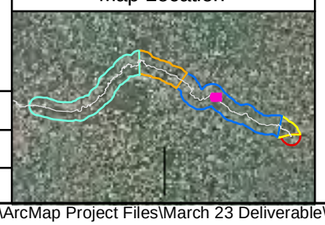
River Rd E

Kimball Pines Park Rd

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

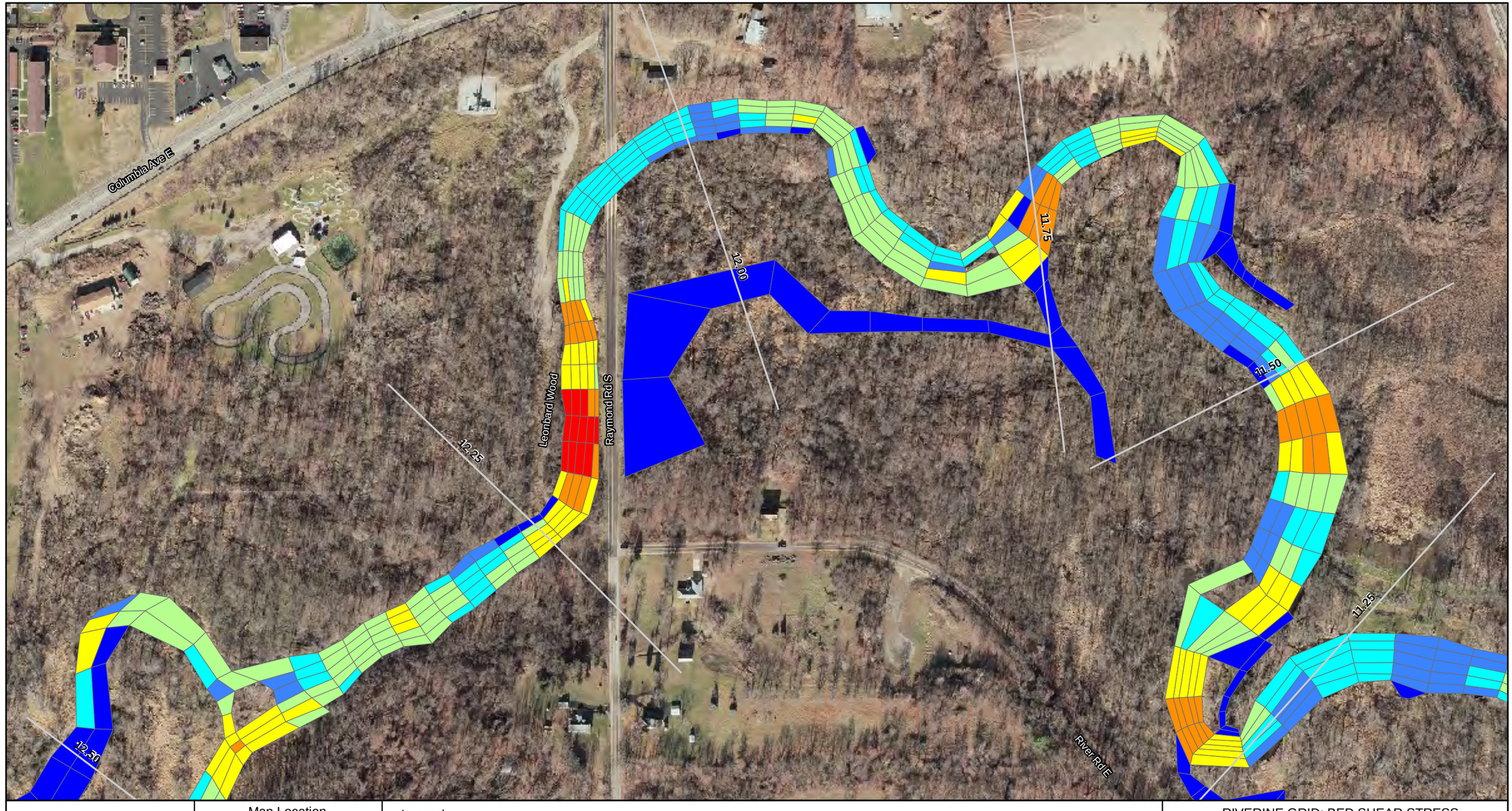
MP 10.60 - MP 11.40

SHEET 13 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

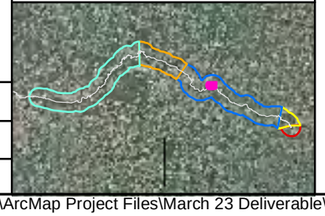
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 11.10 - MP 12.45

SHEET 14 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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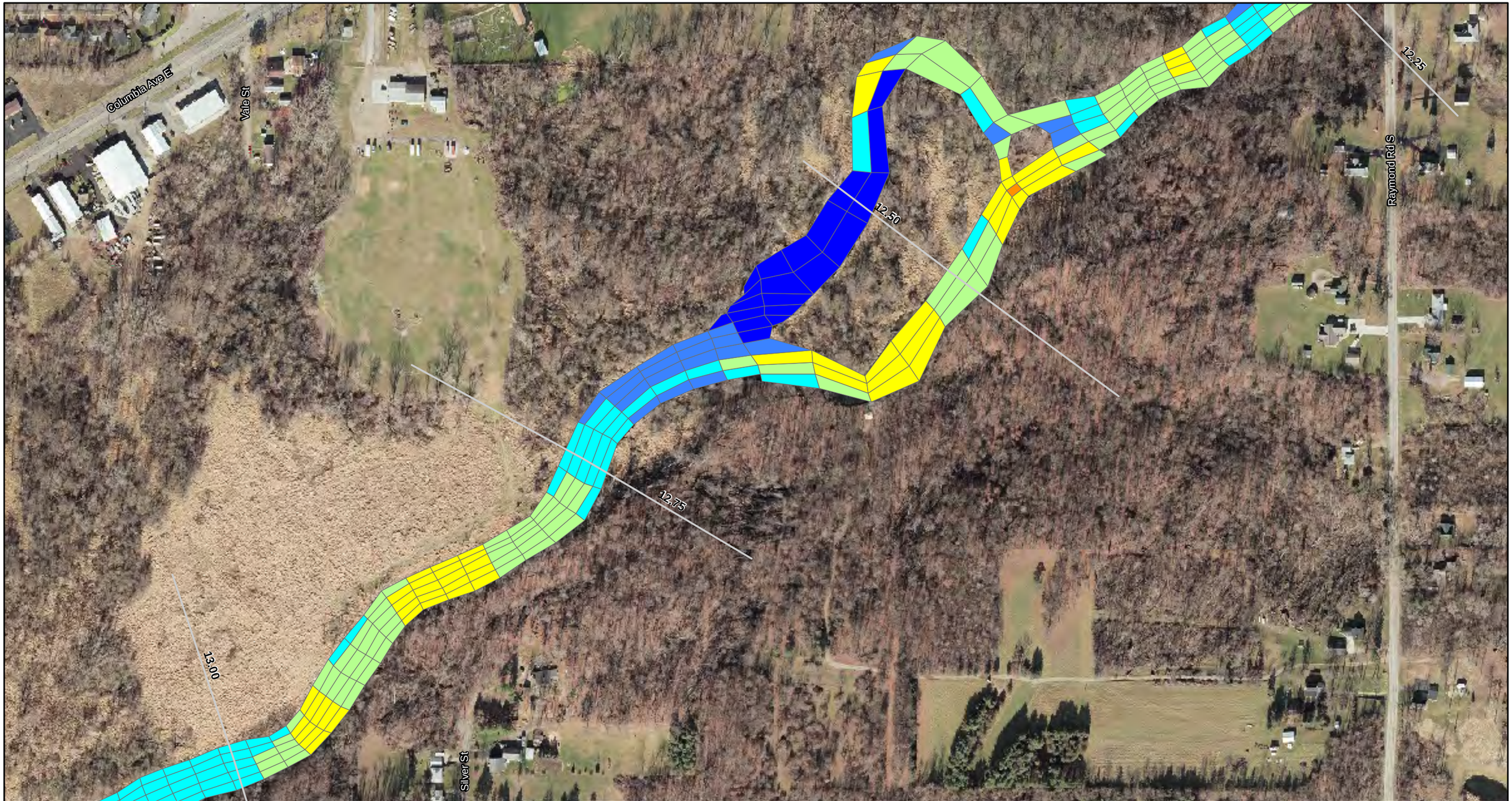
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

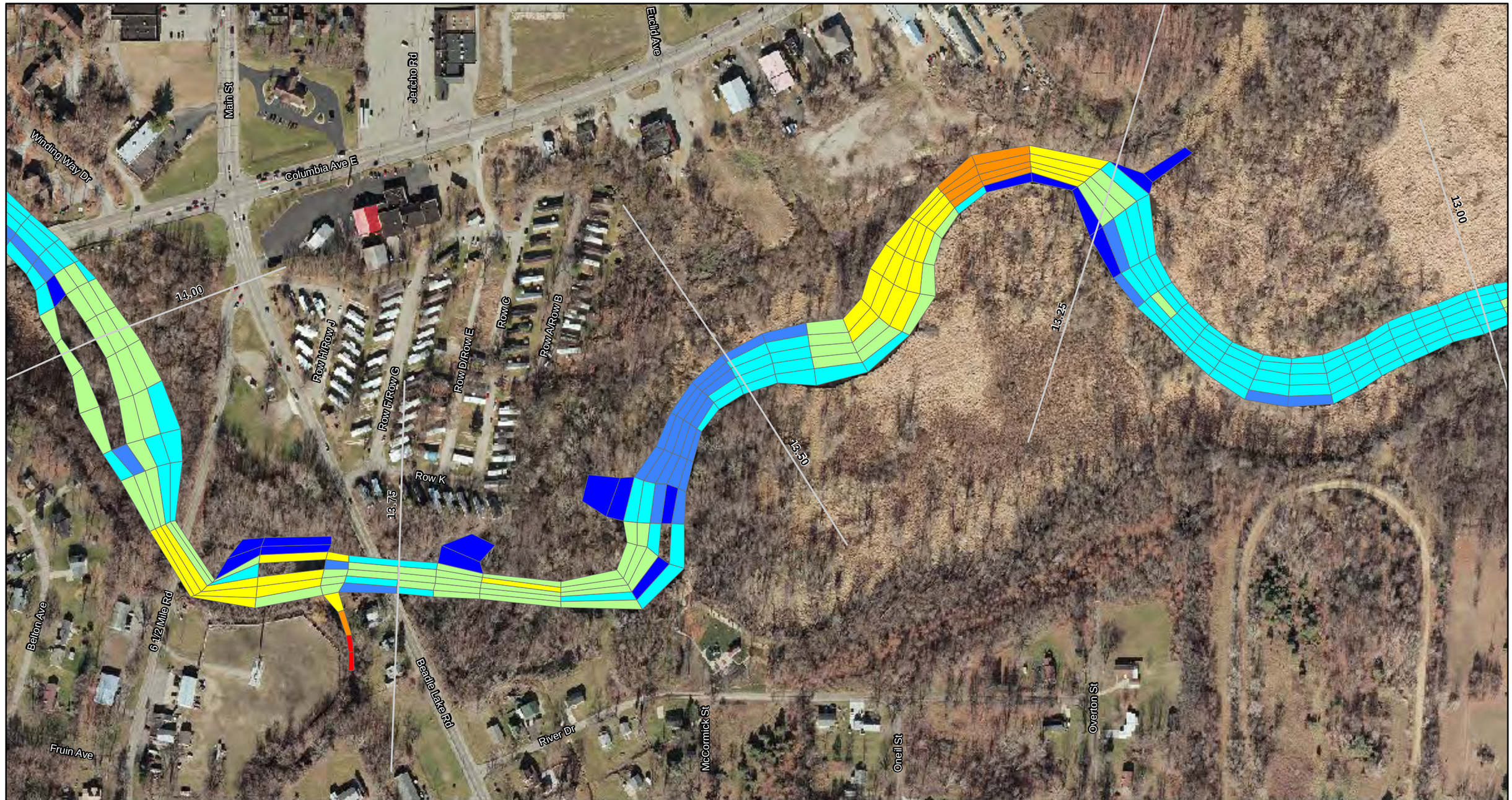
MP 12.30 - MP 13.05

SHEET 15 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

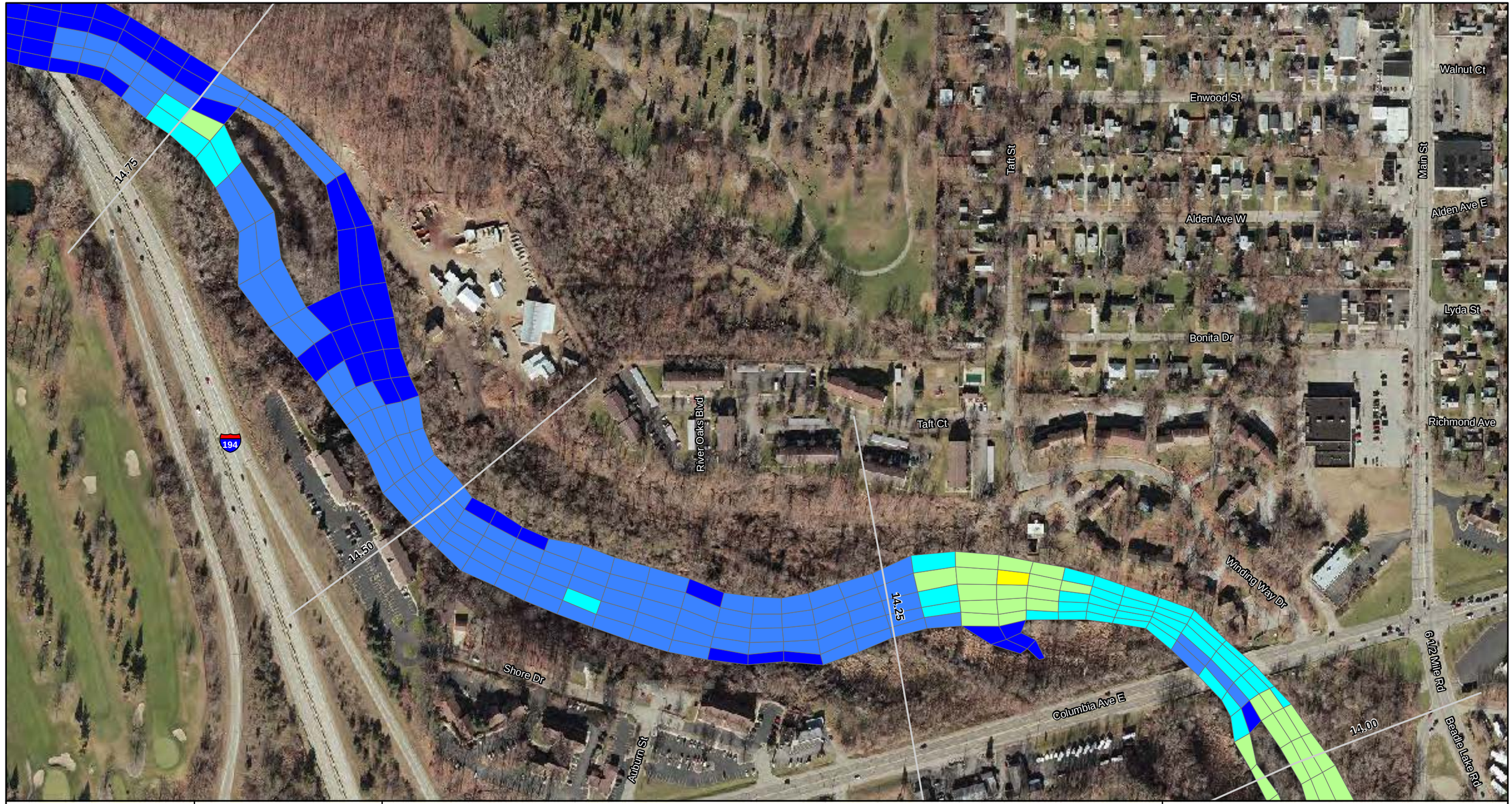
MP 13.00 - MP 14.10

SHEET 16 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

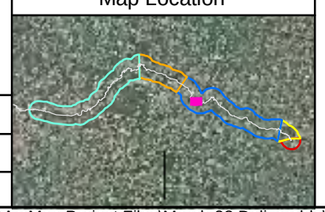
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

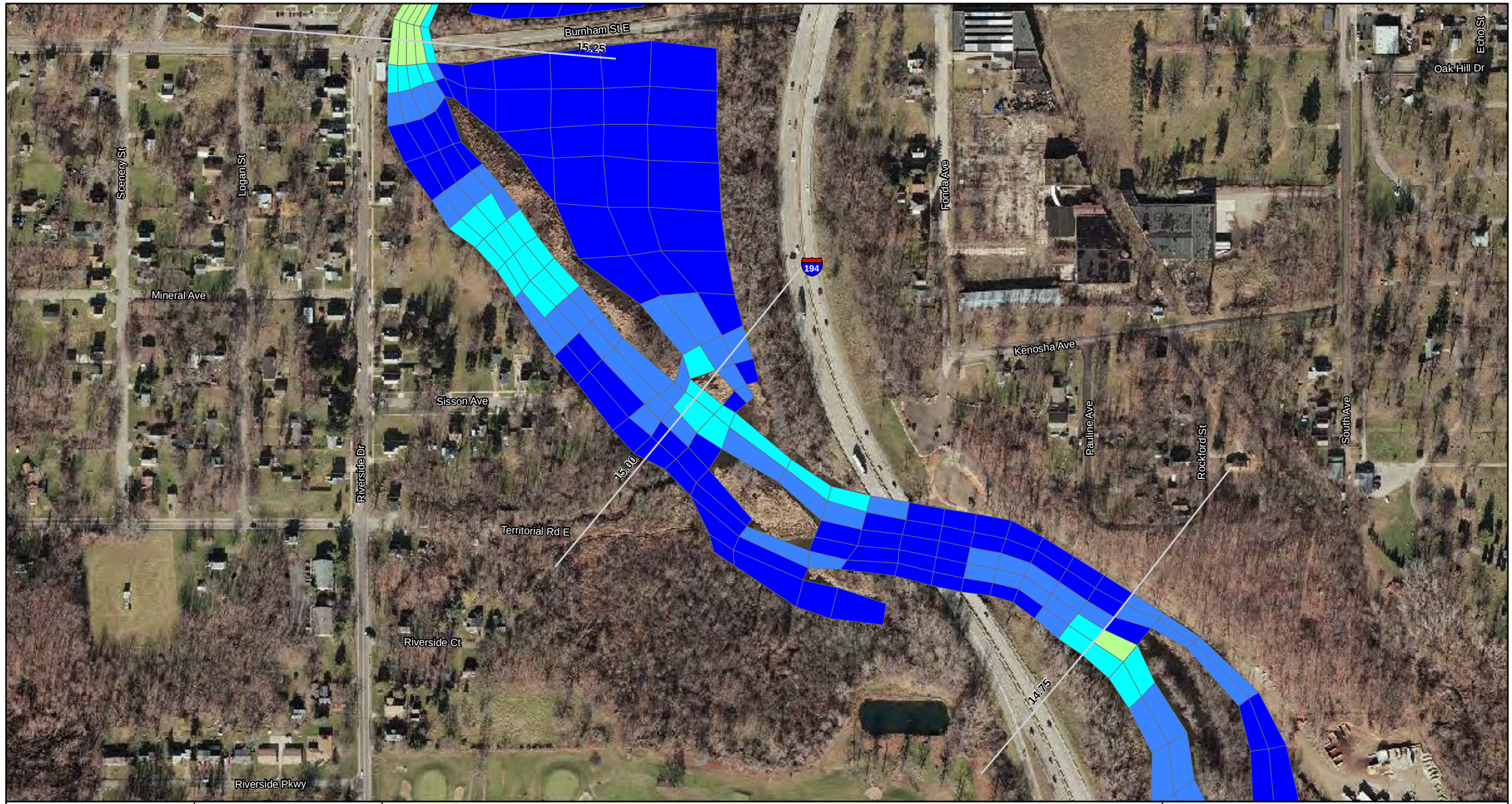
MP 14.00 - MP 14.85

SHEET 17 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

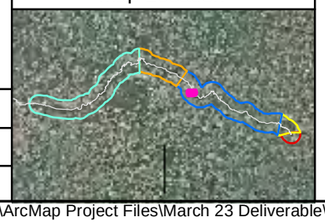
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

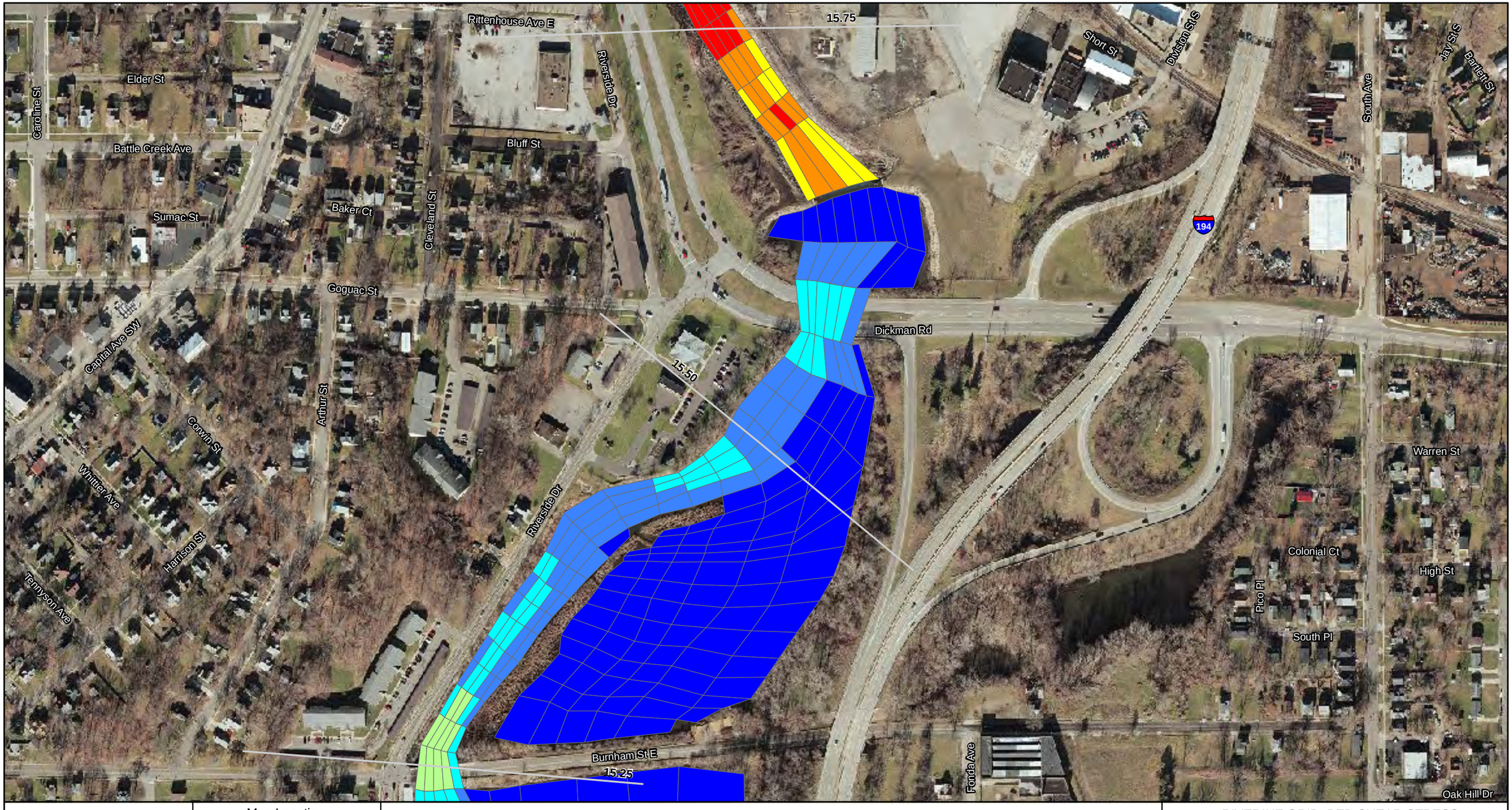
MP 14.65 - MP 15.25

SHEET 18 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

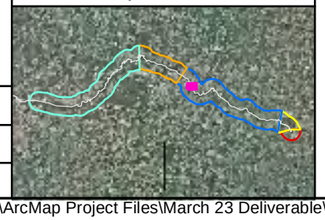
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 15.25 - MP 15.75

SHEET 19 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

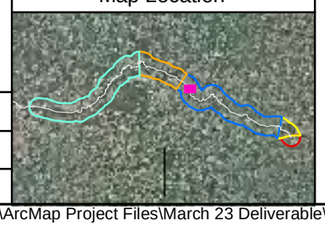
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 15.75 - MP 16.30

SHEET 20 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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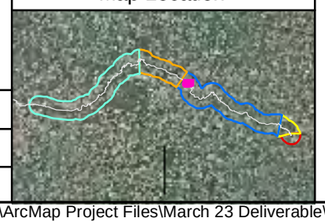
Aerial Photography Date: November 2011

Cass St N
Champion St
Brook St
Michigan Ave W
Washington Ave N
Cass St S
Could St
Van Buren St W
Archer Ct
Jackson St W
Service St
Hamblin Ave W
16.75
Barney St
Washington Ave S
16.30
Lafayette St
Kendall St S
Putnam St
Page St
Louise St
Carlyle St
Houston St
Grand Trunk Ave
Dickman Rd
16.25

Drawn:	BRS 3/23/2012
Approved:	DBR 3/23/2012
Project #:	106-4186

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 16.30 - MP 16.95

SHEET 21 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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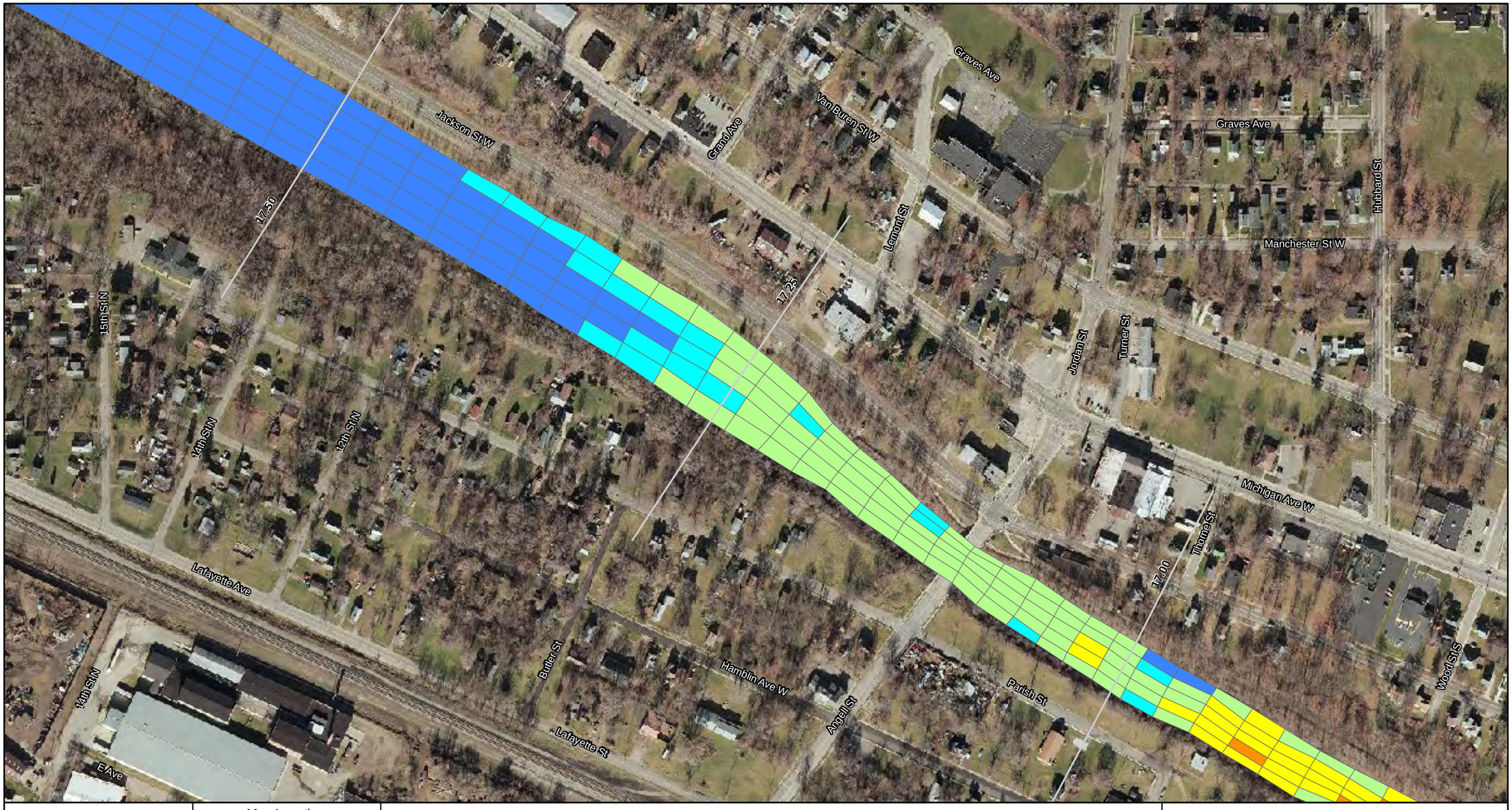
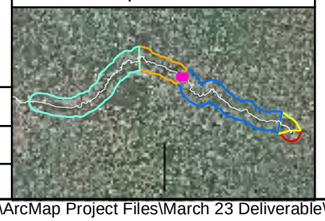
Aerial Photography Date: November 2011



Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 16.85 - MP 17.60

SHEET 22 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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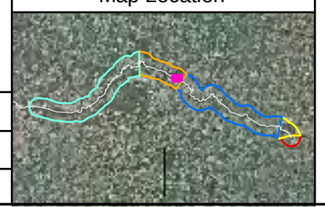
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

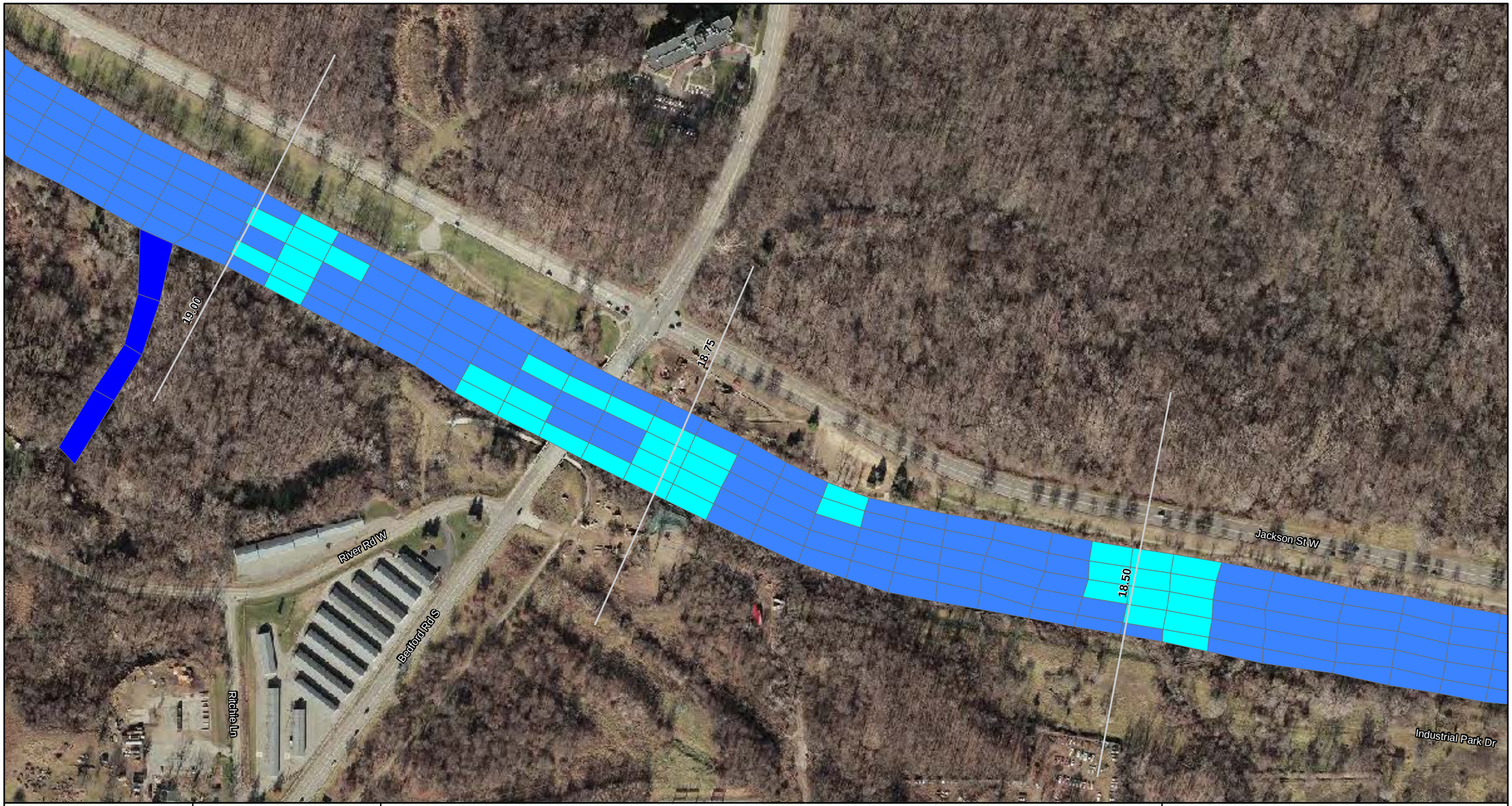
MP 17.60 - MP 18.40

SHEET 23 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

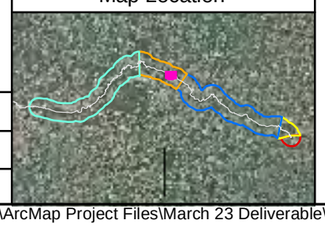
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

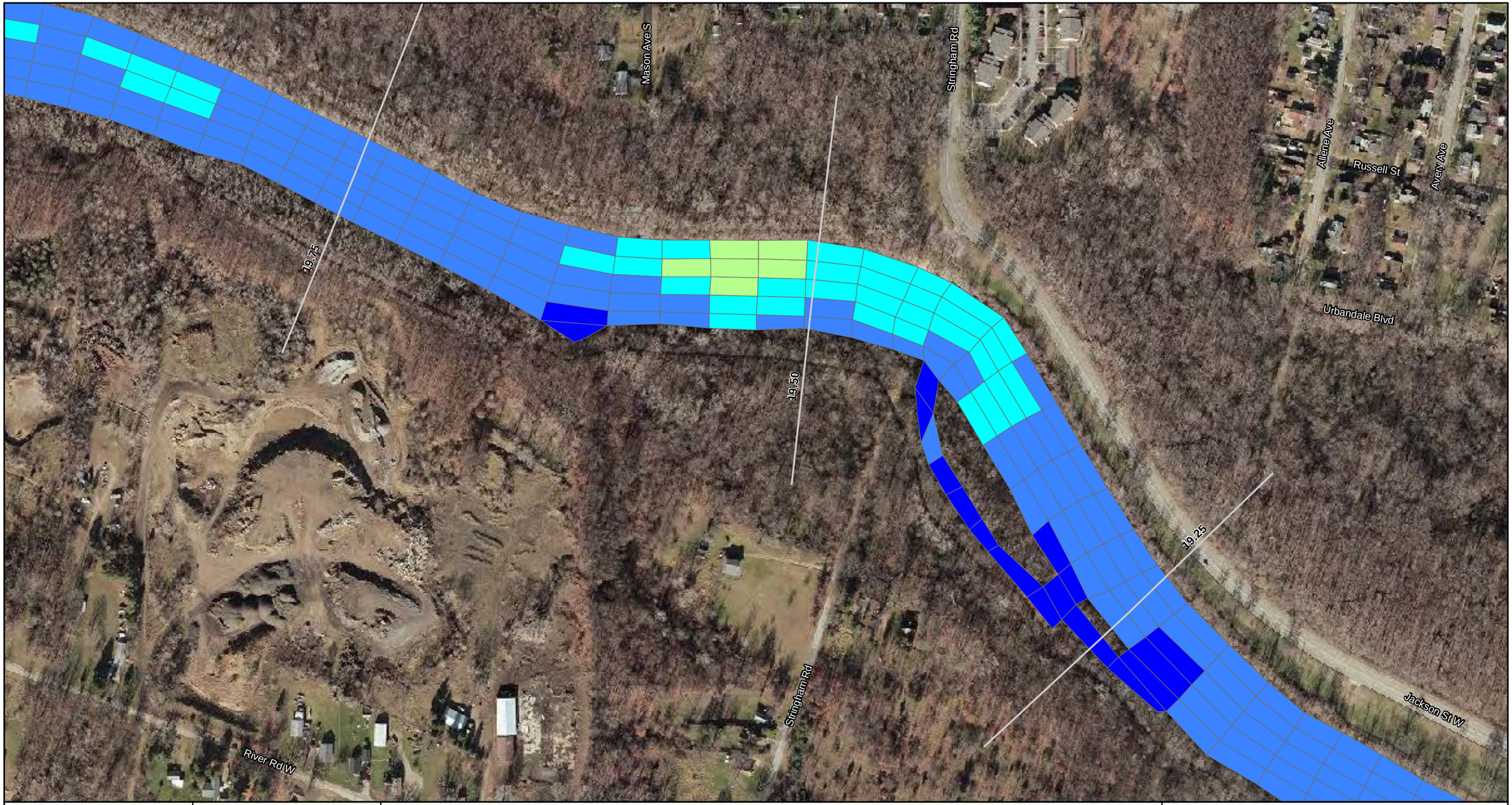
MP 18.30 - MP 19.15

SHEET 24 OF 56

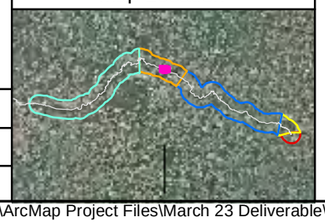
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

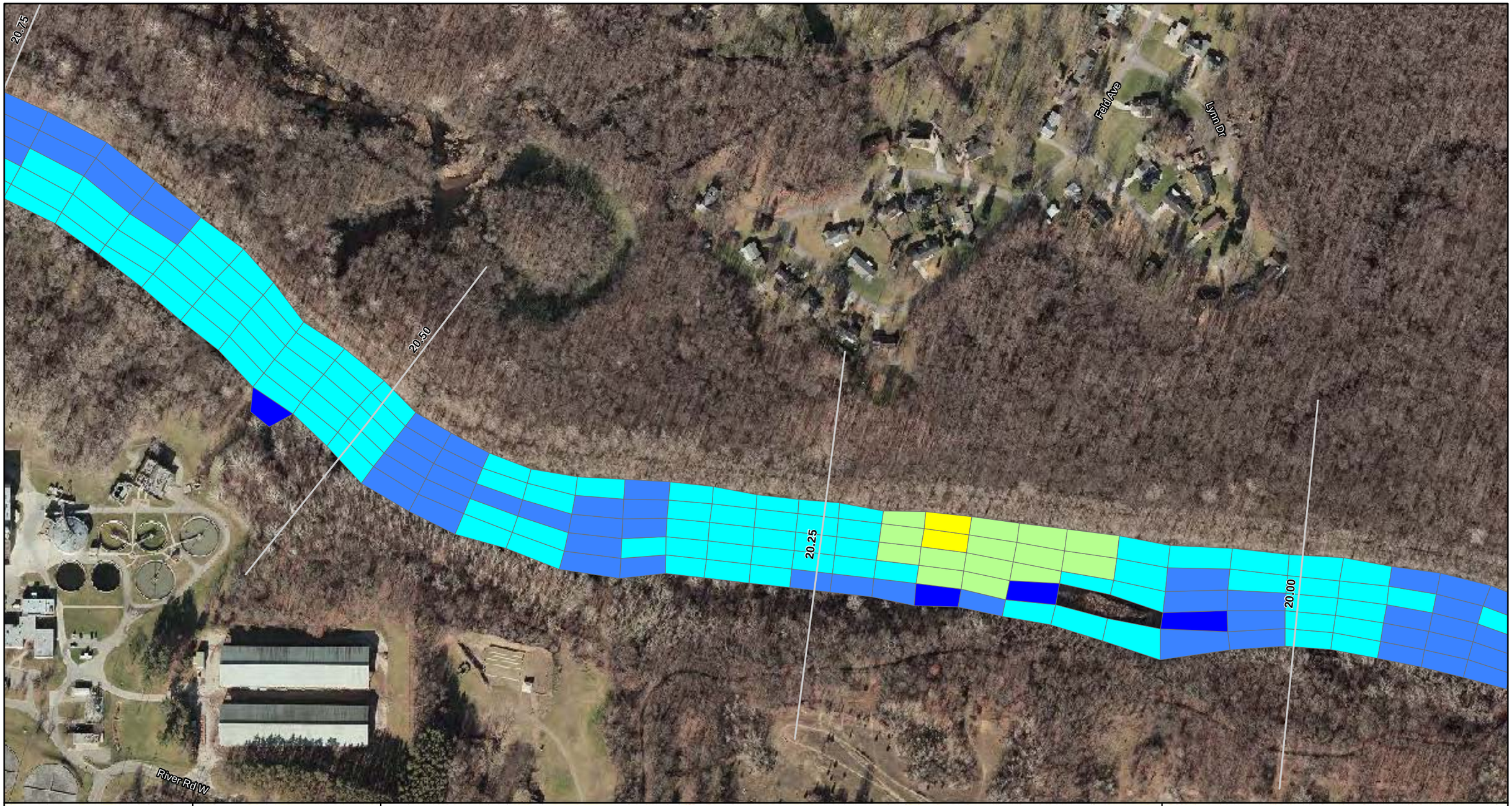
MP 19.10 - MP 19.95

SHEET 25 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

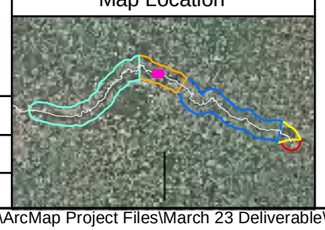
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 19.90 - MP 20.75

SHEET 26 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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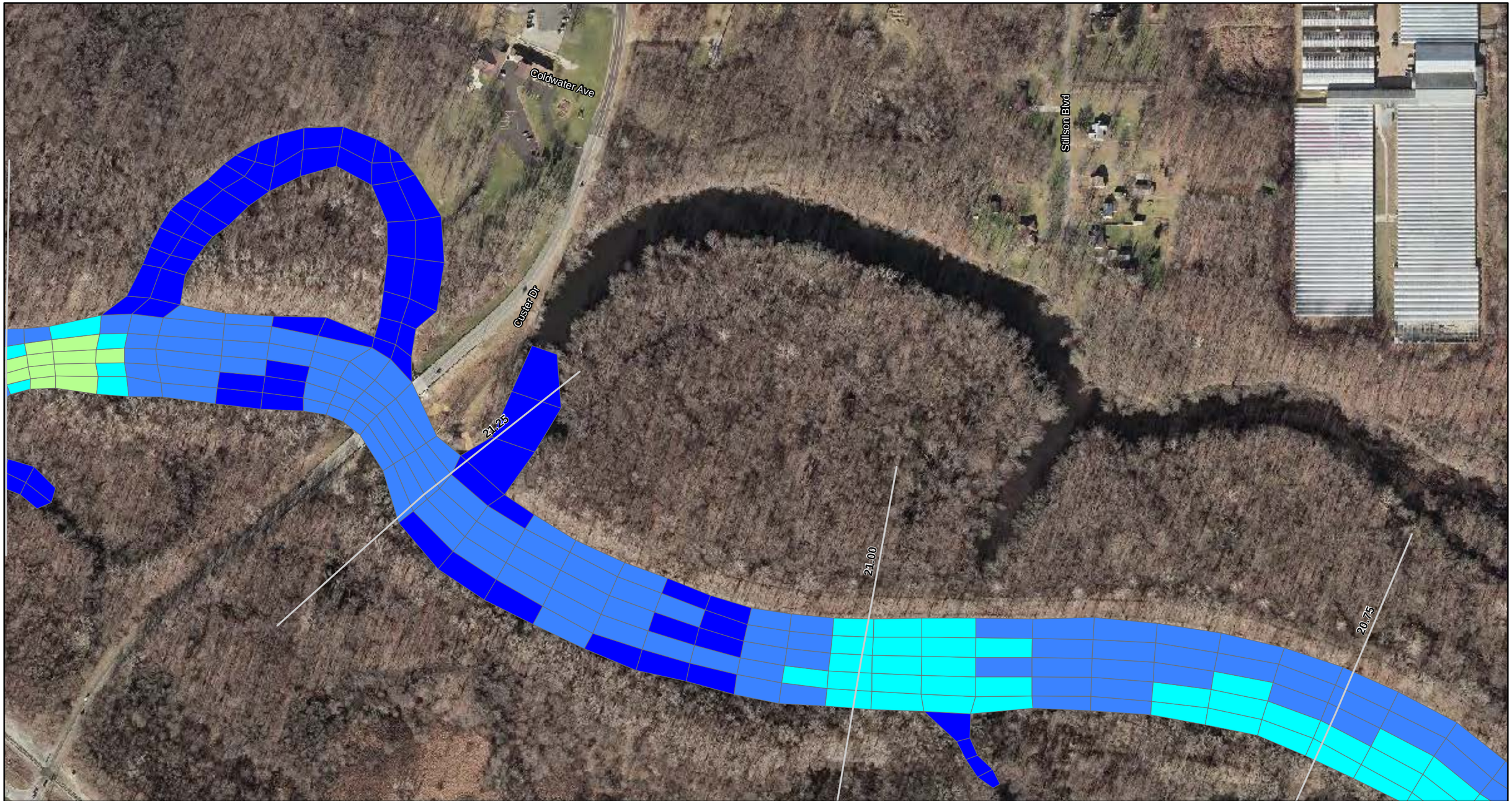
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 20.70 - MP 21.50

SHEET 27 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

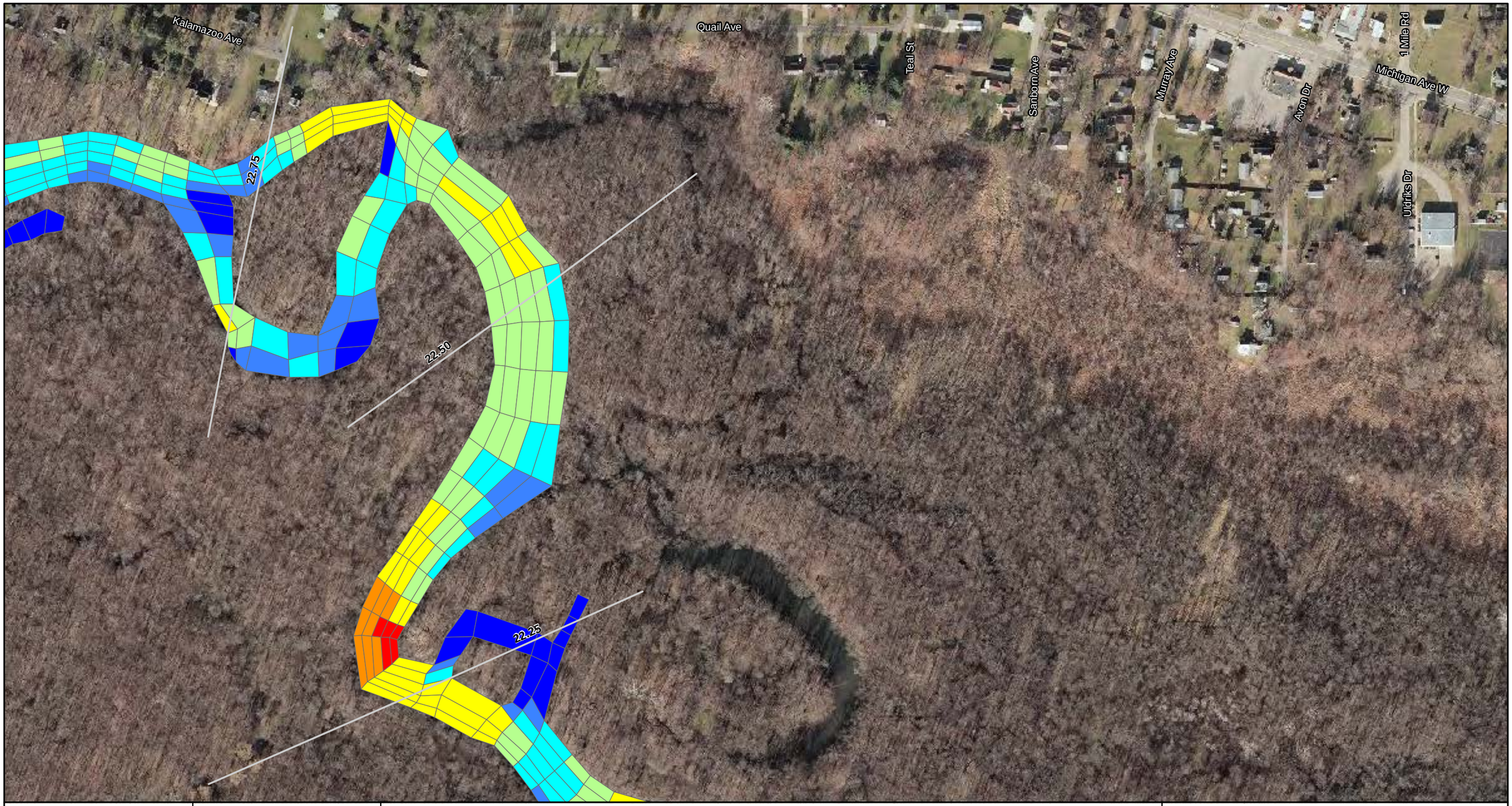
MP 21.35 - MP 22.15

SHEET 28 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

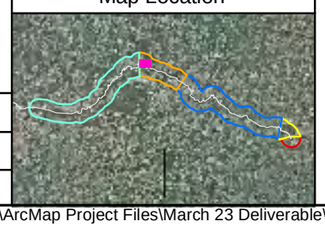
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

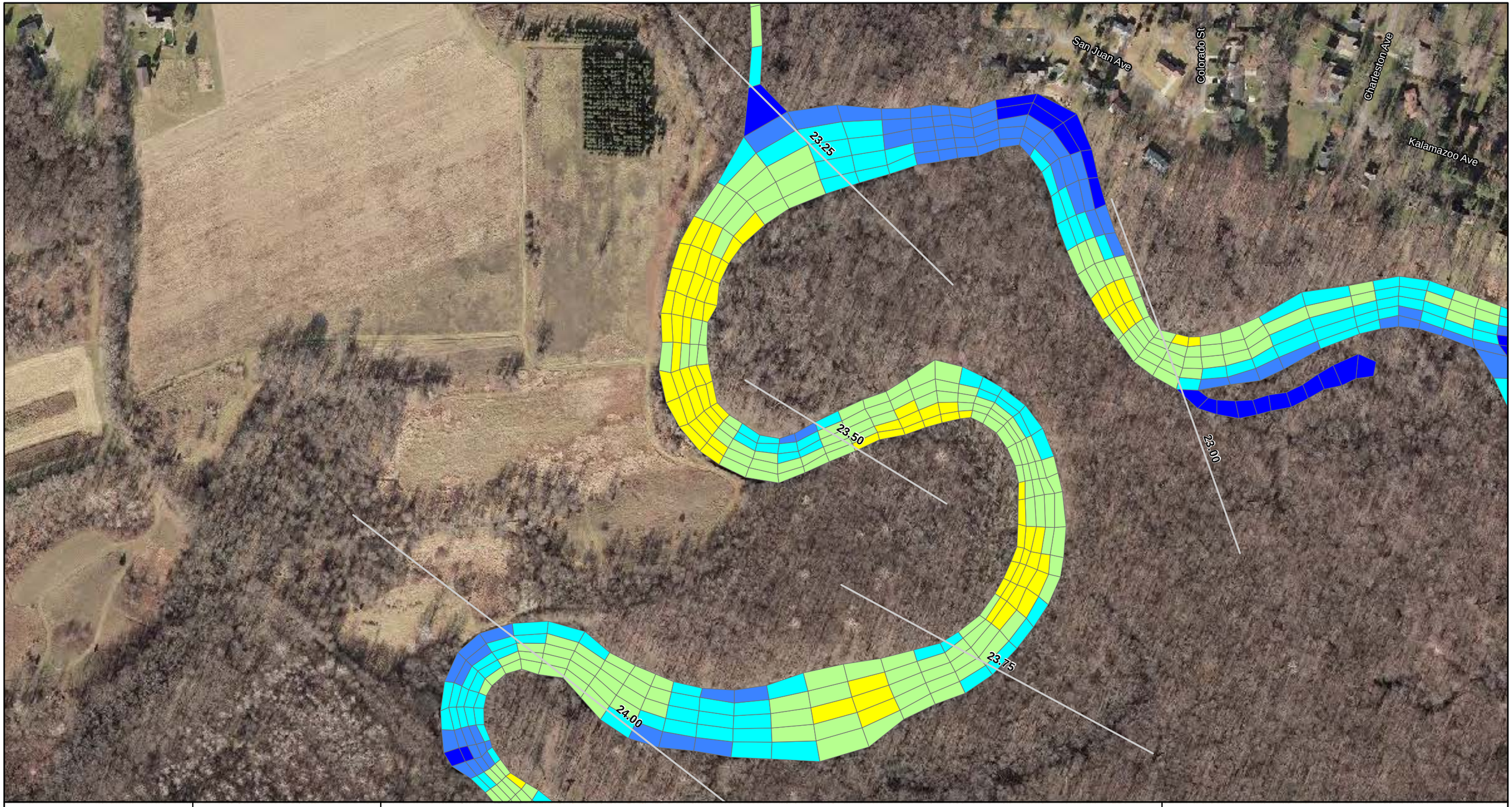
MP 22.15 - MP 22.90

SHEET 29 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

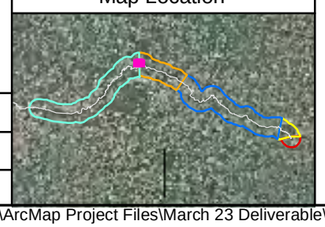
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 22.80 - MP 24.10

SHEET 30 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 24.10 - MP 24.85

SHEET 31 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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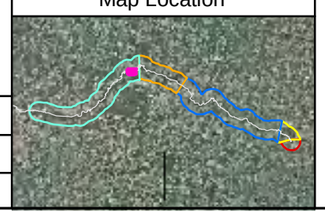
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

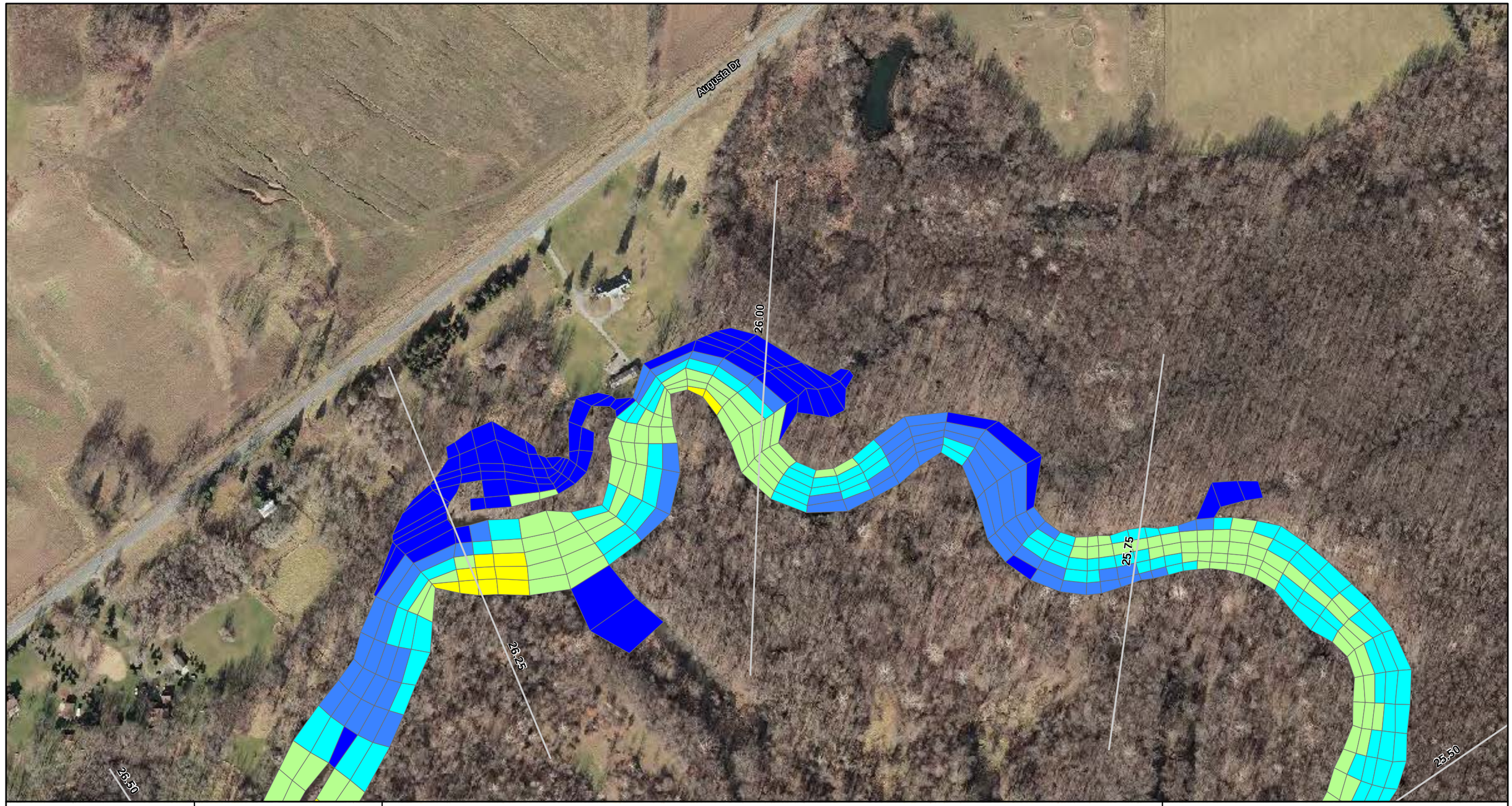
MP 24.80 - MP 25.65

SHEET 32 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

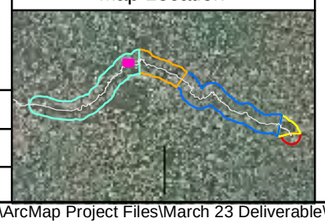
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

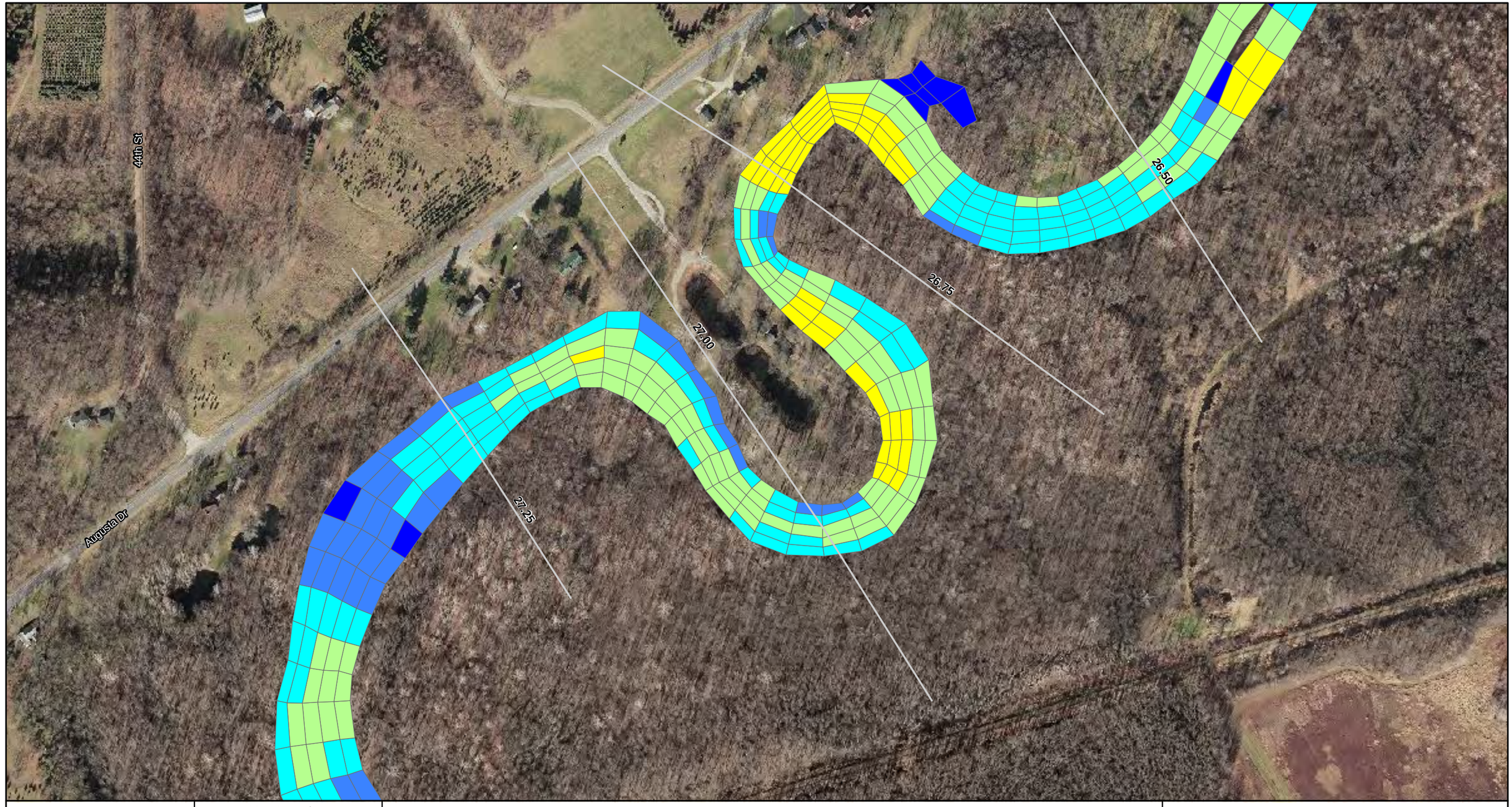
MP 25.55 - MP 26.40

SHEET 33 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

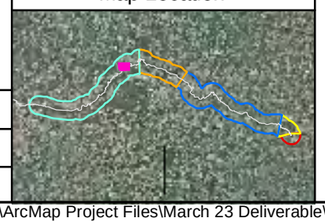
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

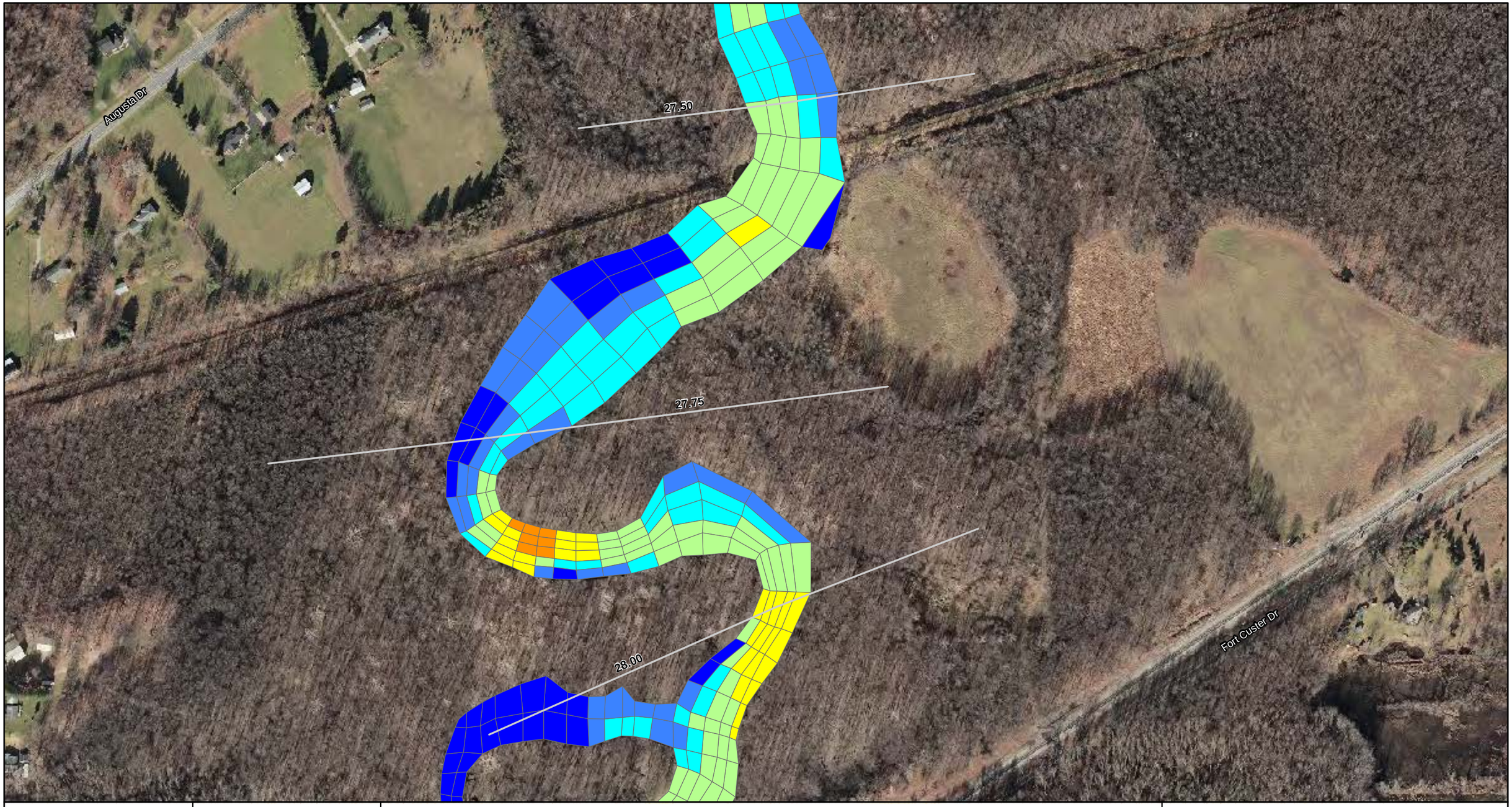
MP 26.40 - MP 27.45

SHEET 34 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

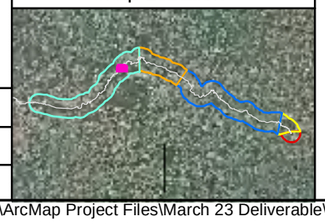
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

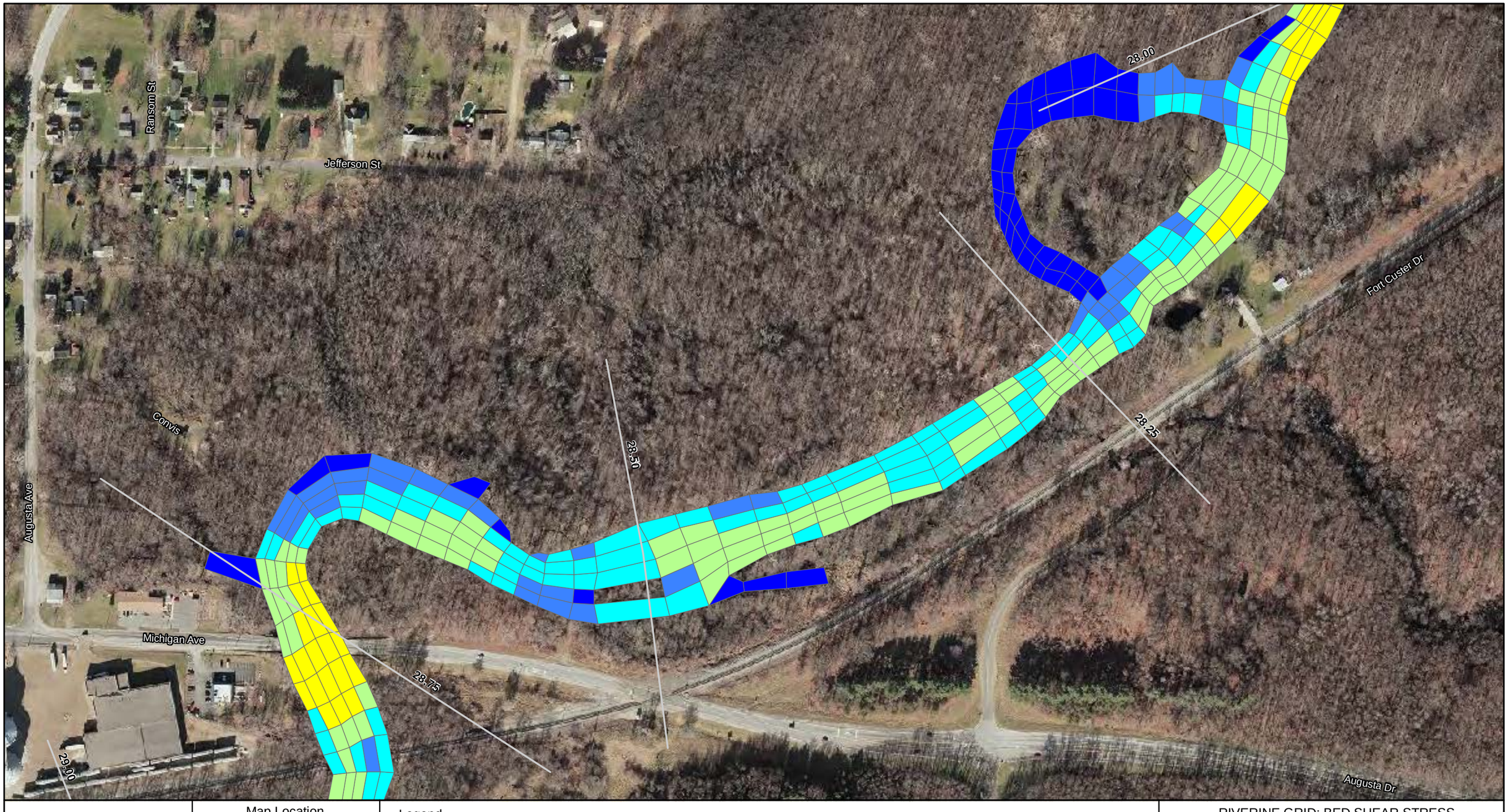
MP 27.45 - MP 28.10

SHEET 35 OF 56

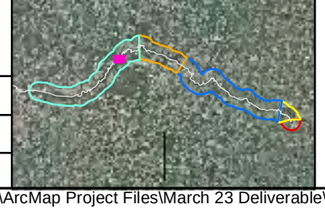
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011



Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 28.05 - MP 28.85

SHEET 36 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Clinton St
Clinton St
Chestnut St
Webster St
Church St
Fayette St
Cass St
Cherry St
Lincoln St
28.75
29.00
29.25
29.50
Augusta Climax Rd
Fort Custer Rec Area Access

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 28.85 - MP29.55

SHEET 37 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011

29.50
29.75
30.00
30.25
Fort Custer Rec Area Service
Fort Custer Rec Area Access

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 29.50 - MP29.95

SHEET 38 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

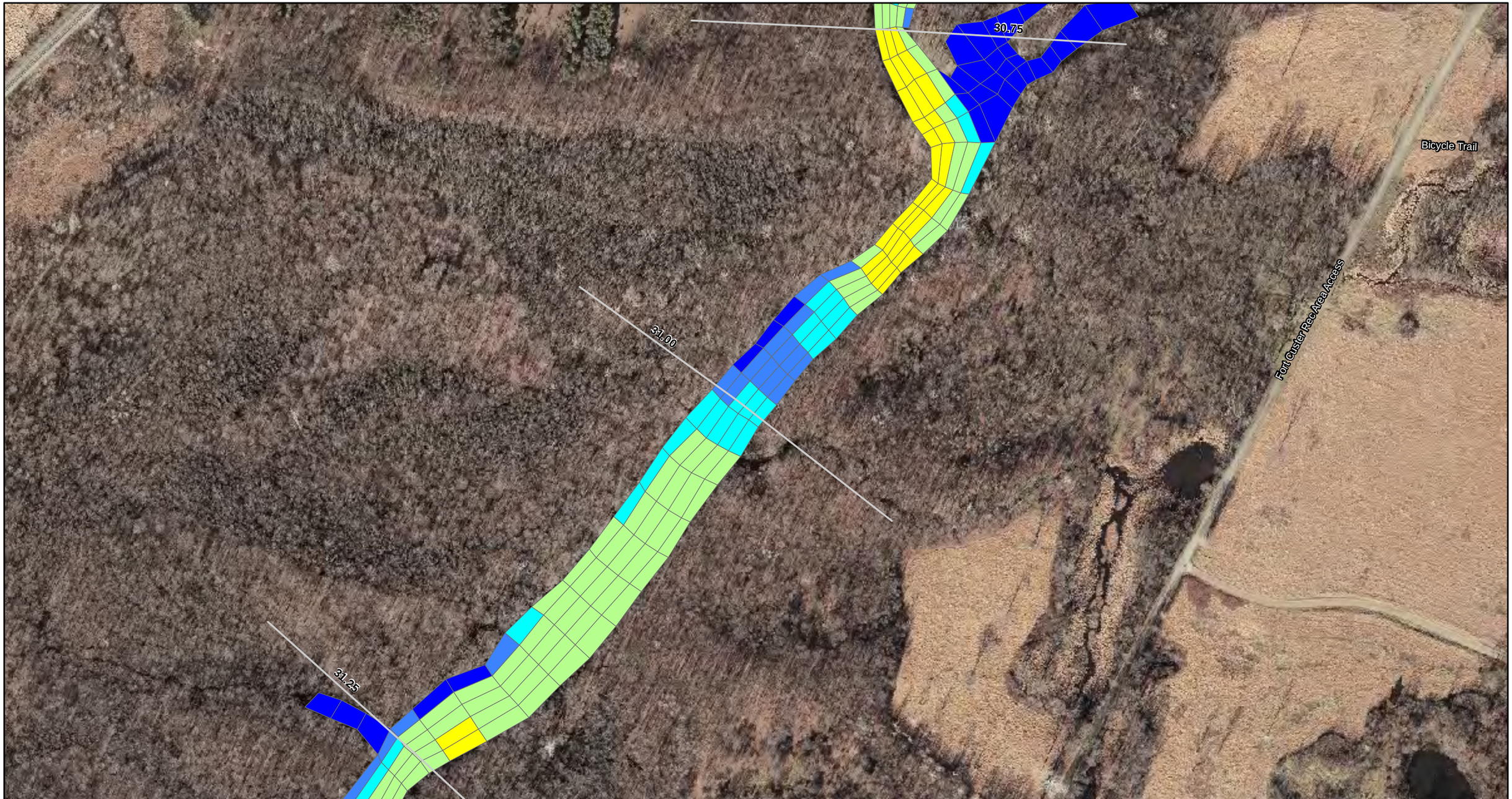
MP 29.95 - MP 30.80

SHEET 39 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 30.75 - MP 31.25

SHEET 40 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 31.25 - MP 31.70

SHEET 41 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011

31.75

32.00

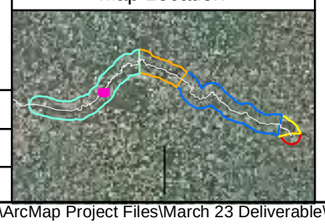
32.25

Bicycle Trail

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 31.65 - MP 32.25

SHEET 42 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

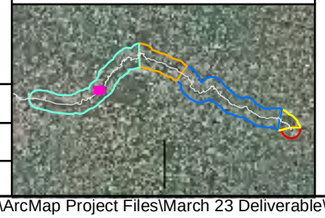
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

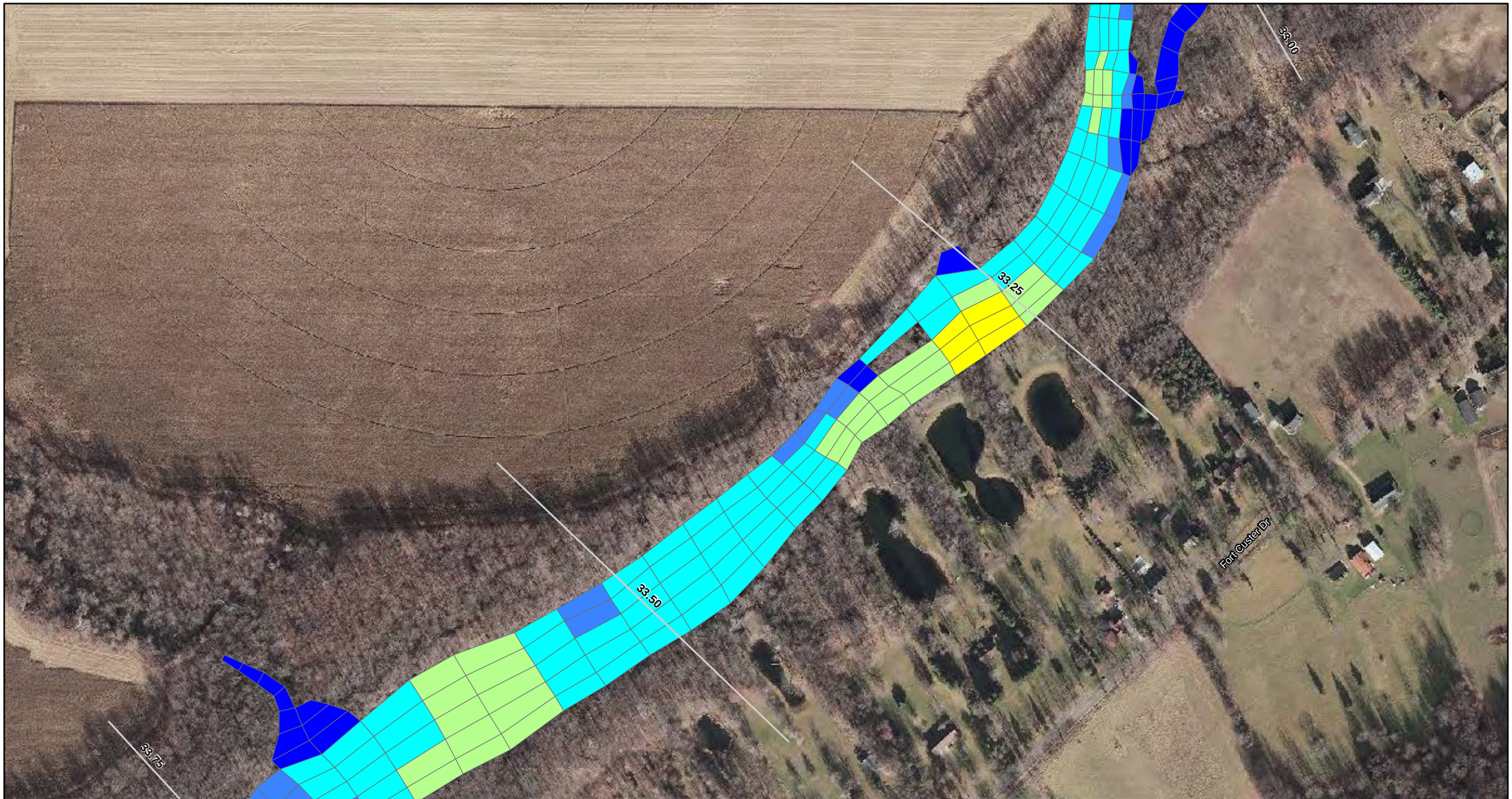
MP 32.25 - MP 33.10

SHEET 43 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 33.10 - MP 33.70

SHEET 44 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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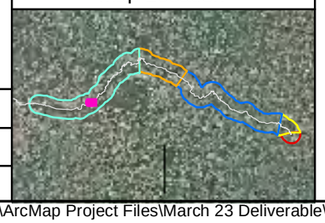
Aerial Photography Date: November 2011

Winding Way
McCollum Rd
Valley Dr
Climax Dr
34.50
34.25
34.00
33.75
34.75
Michigan Ave
Fort Custer Dr
Pheasant Dr
Miller Rd

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

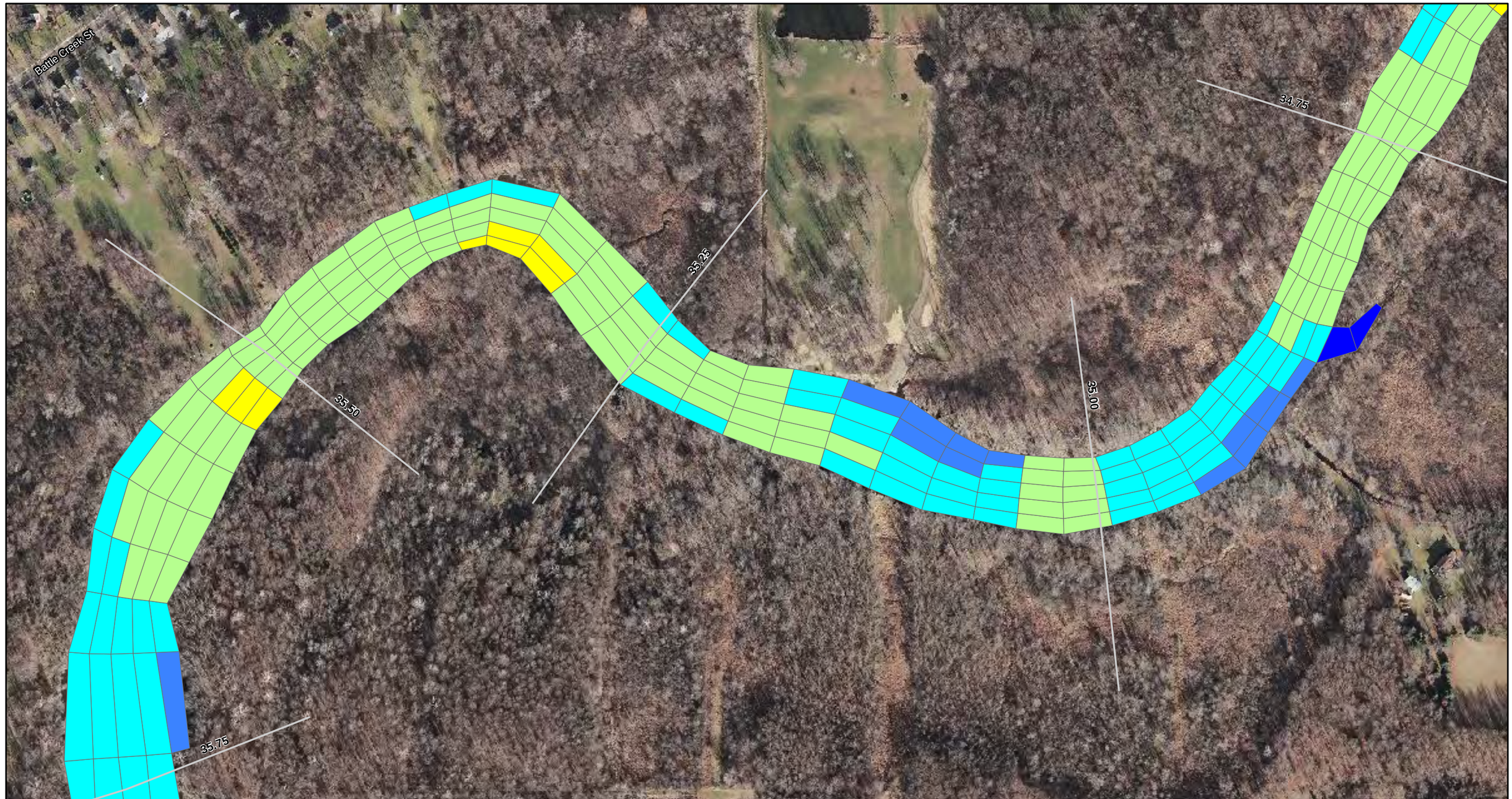
MP 33.70 - MP 34.70

SHEET 45 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

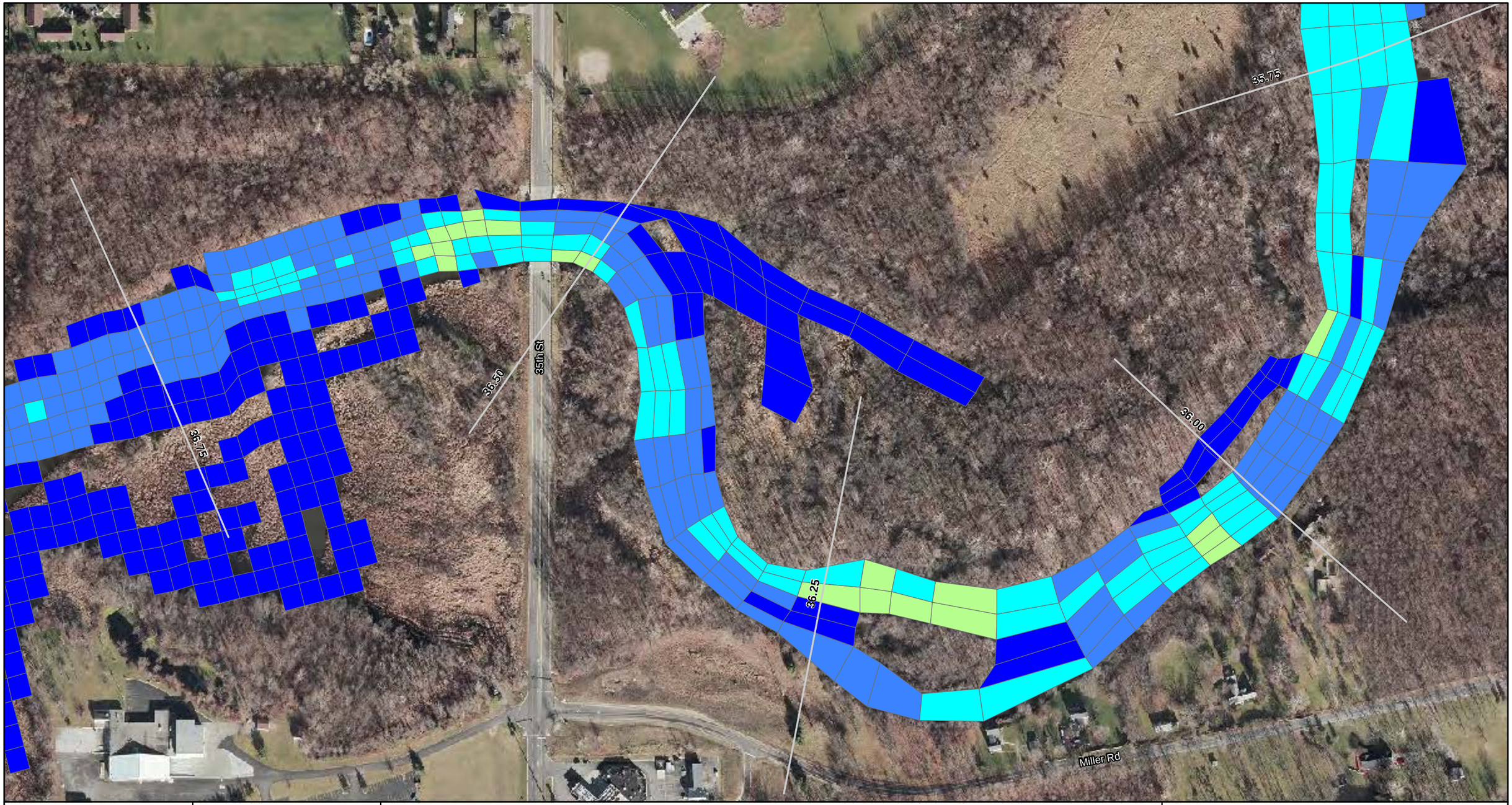
MP 34.70 - MP 35.75

SHEET 46 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

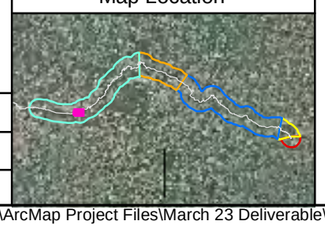
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

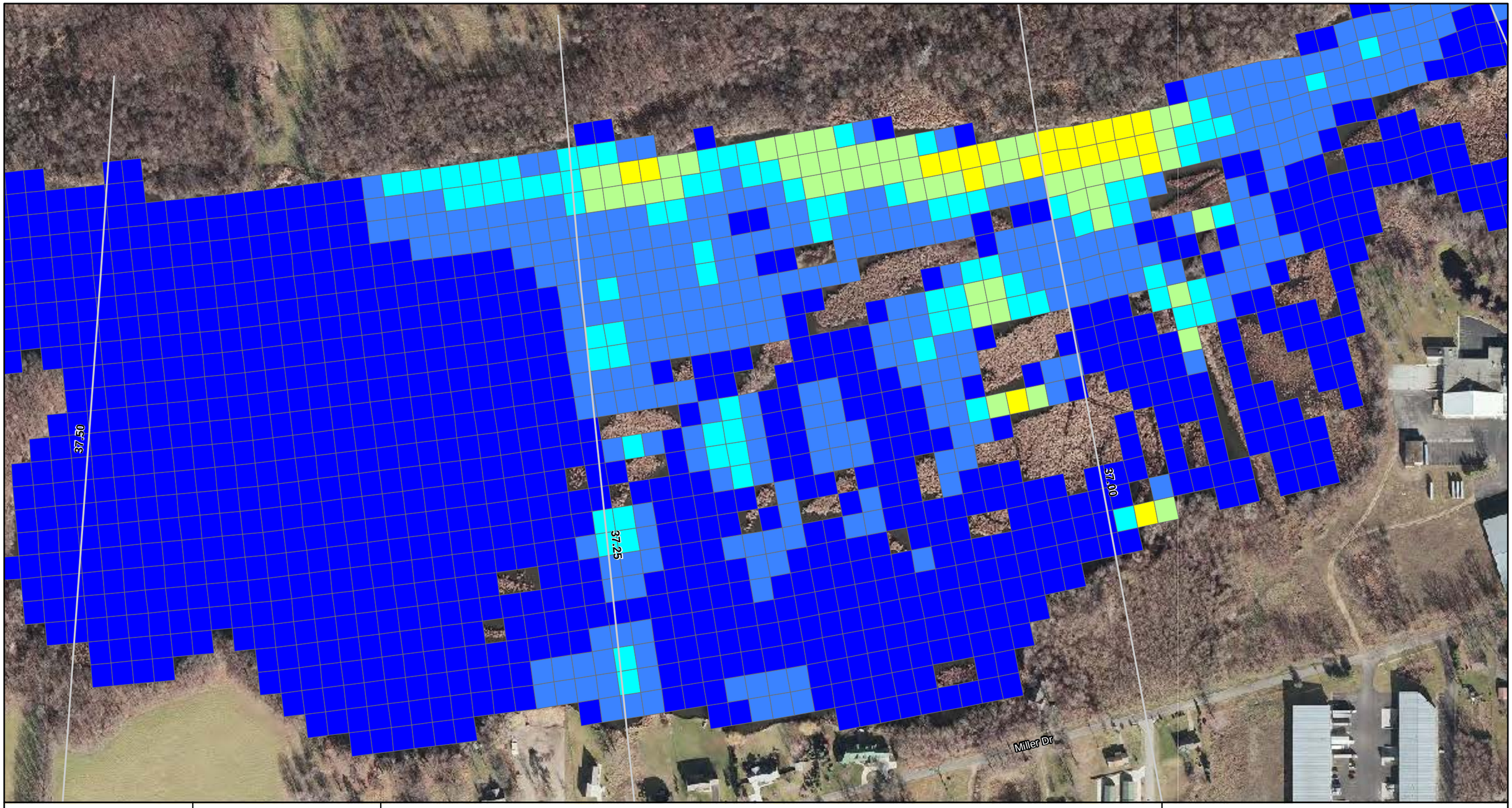
MP 35.75 - MP 36.80

SHEET 47 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

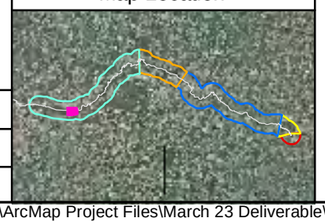
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 36.80 - MP 37.55

SHEET 48 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

38.25

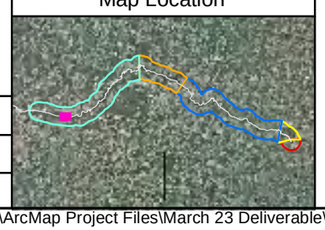
38.00

37.75

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

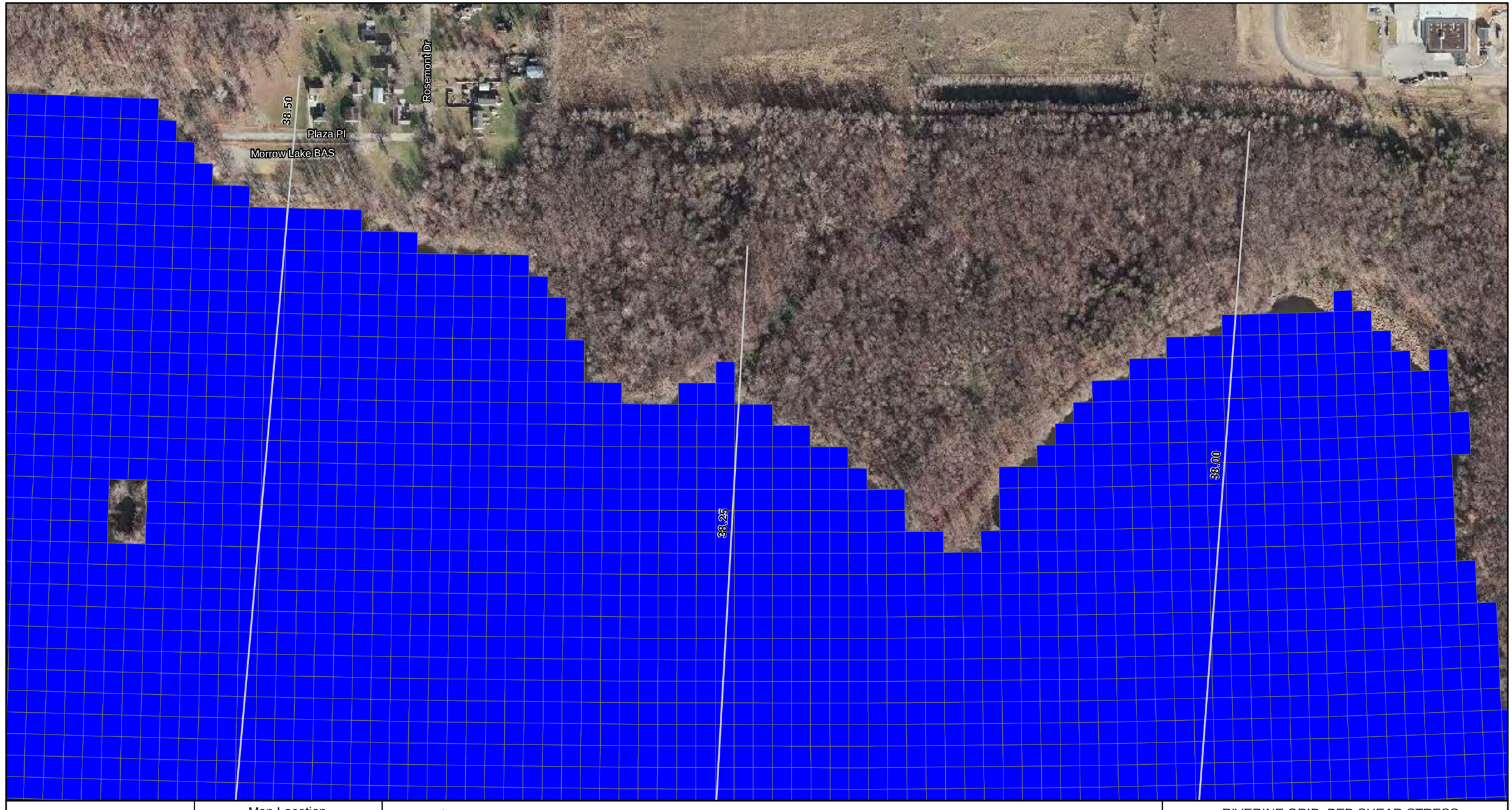
MP 37.55 - MP 38.30

SHEET 49 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

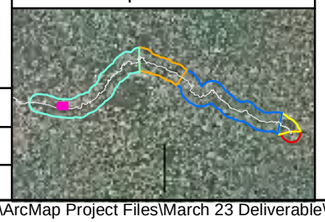
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

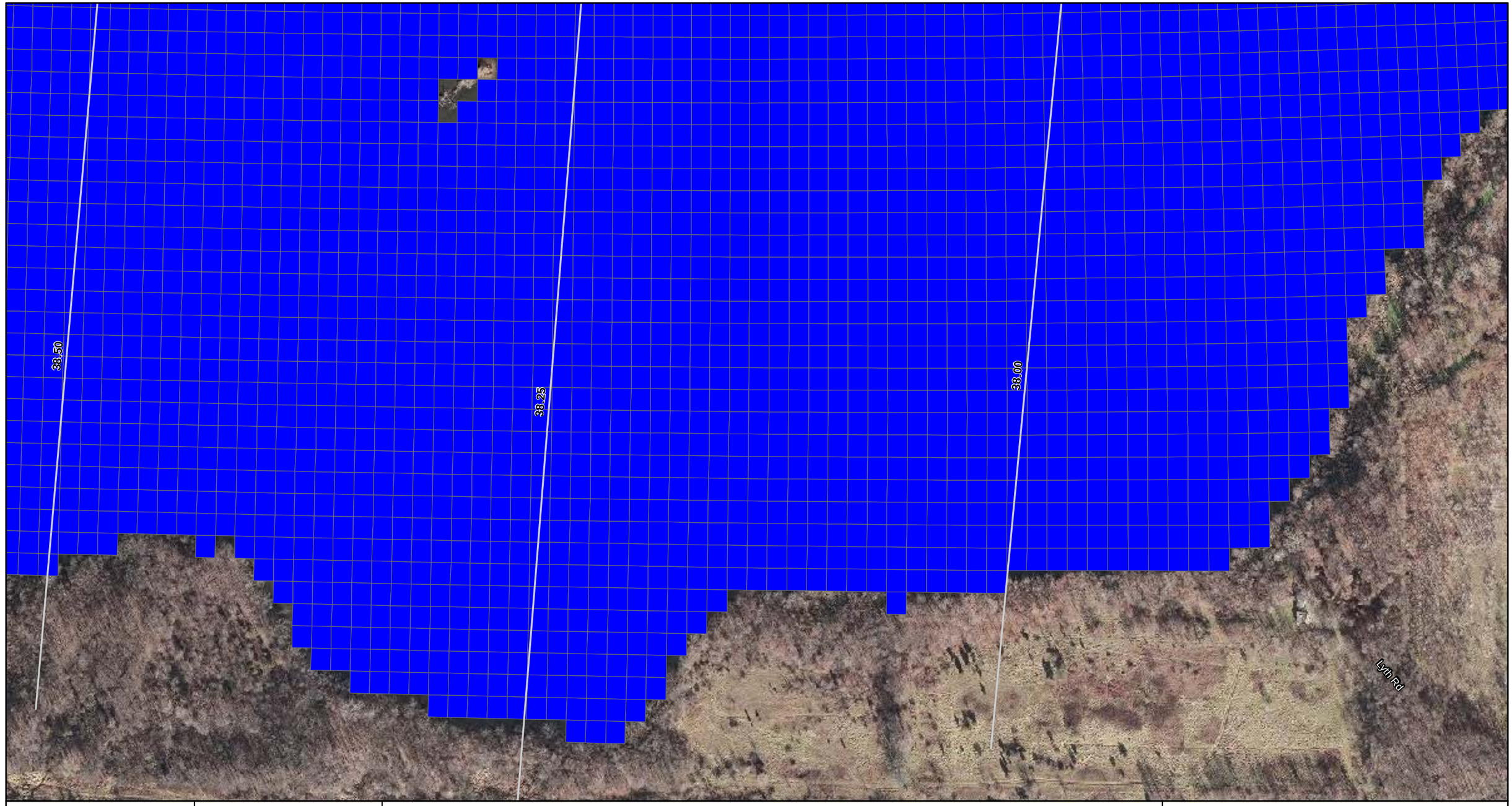
MP 37.80 - MP 38.60N

SHEET 50 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

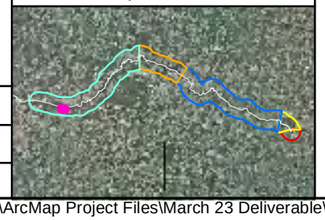
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011
- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 37.80 - MP 38.60S

SHEET 51 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011

39.00

38.75

38.50

38.25

ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500

Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

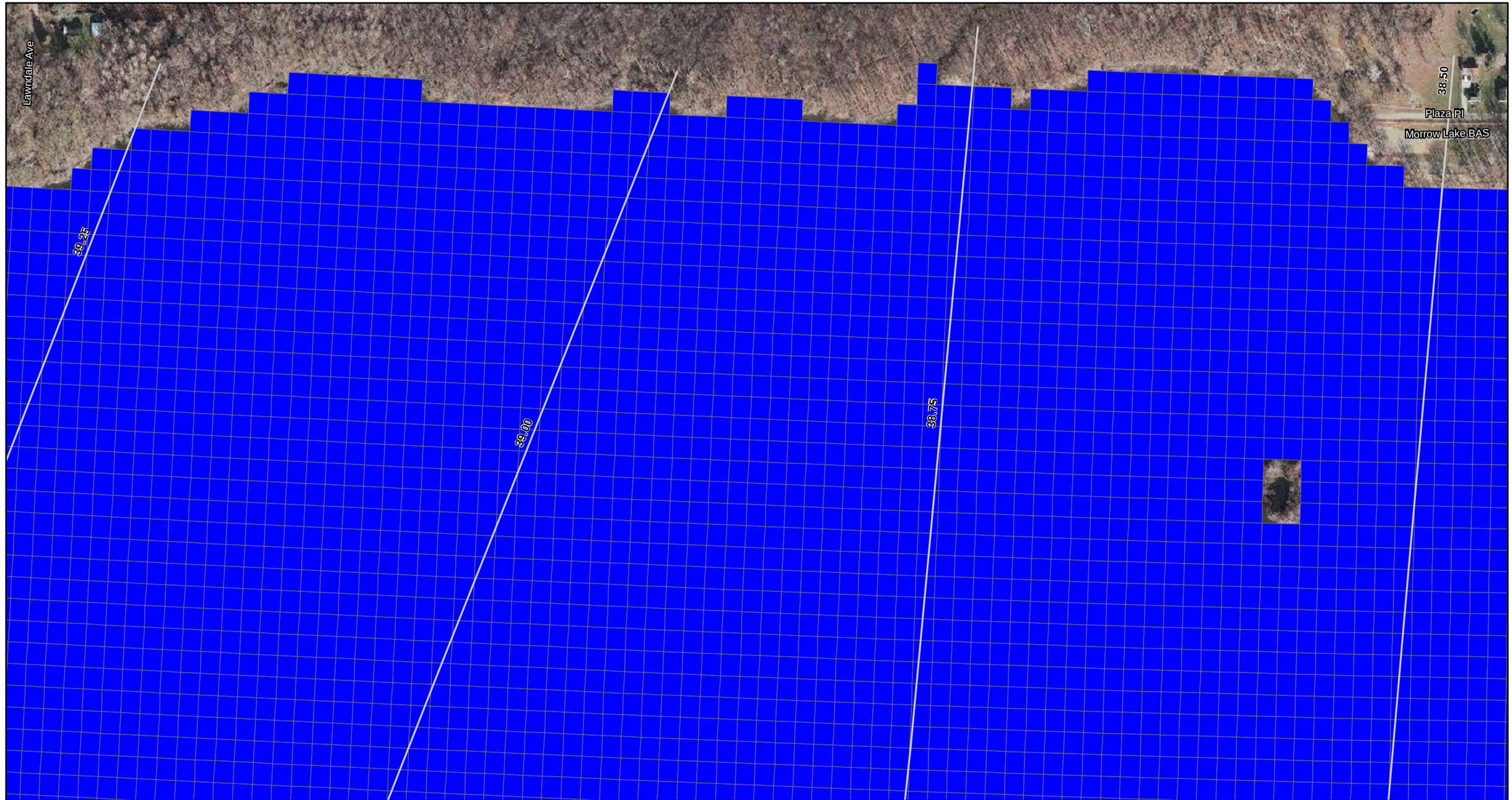
MP 38.25 - MP 39.00C

SHEET 52 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location

Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

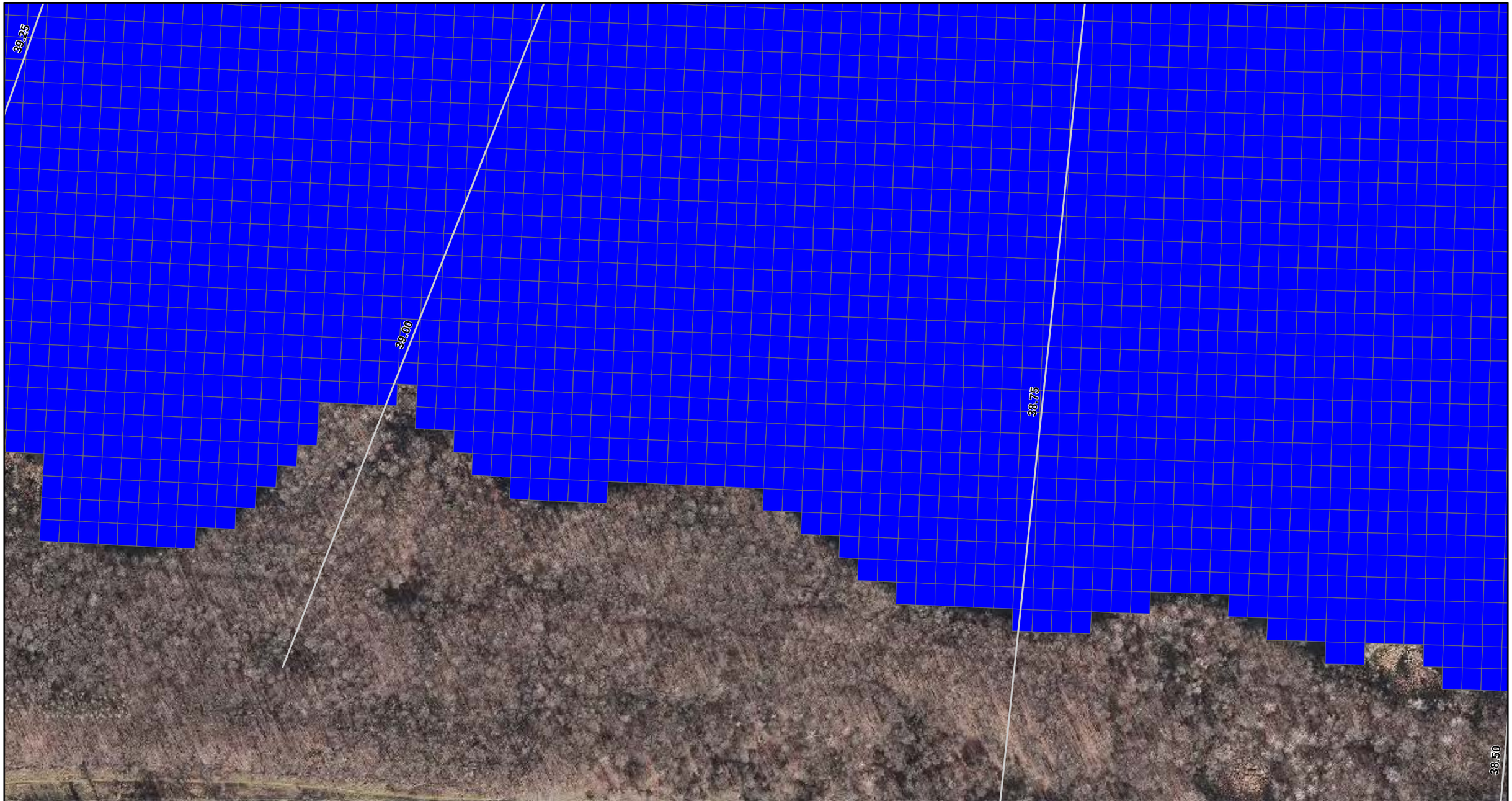
MP 38.50 - MP 39.25N

SHEET 53 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

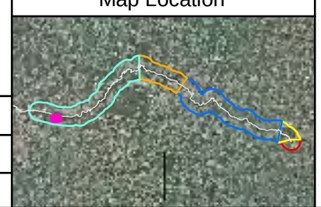
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

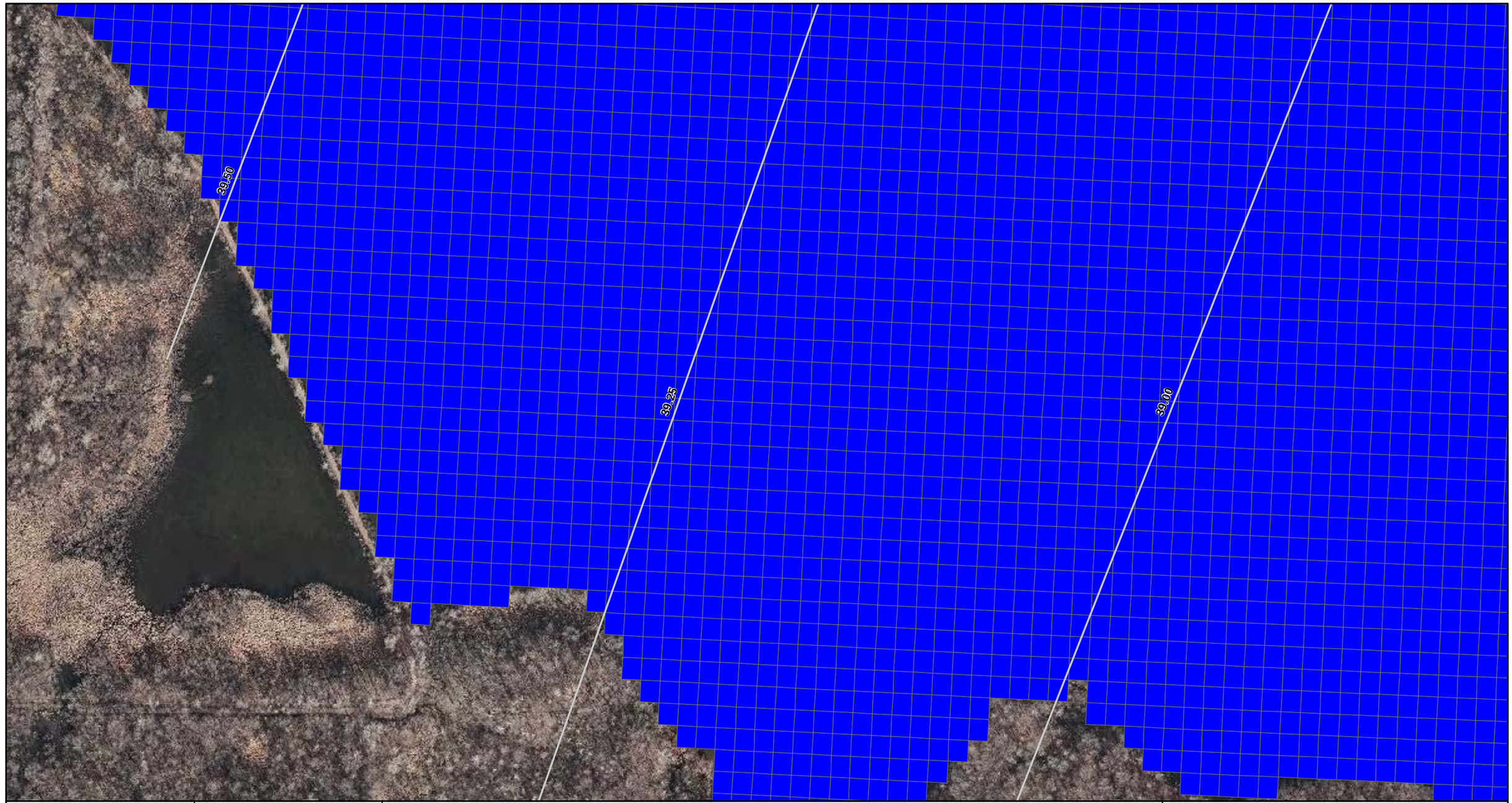
MP 38.50 - MP 39.25S

SHEET 54 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

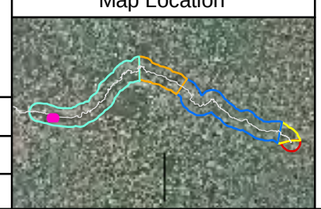
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

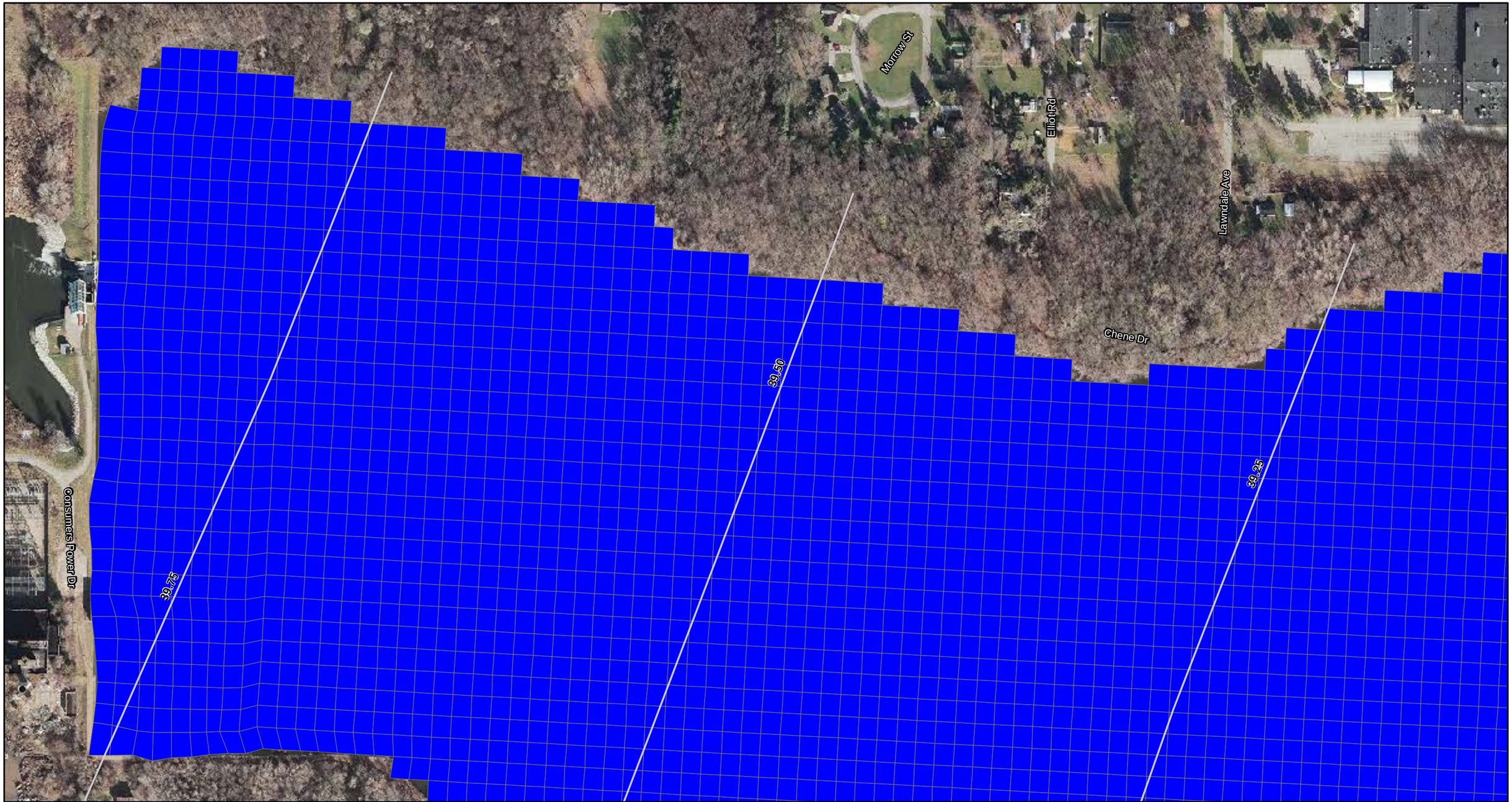
MP 38.90 - MP 39.60S

SHEET 55 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

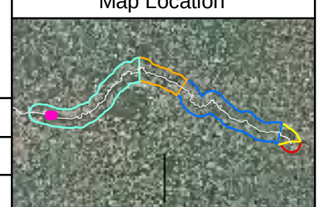
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011



Drawn:	BRS	3/23/2012
Approved:	DBR	3/23/2012
Project #:	106-4186	

Map Location



Legend

Bed Shear Stress (Pa), April 16, 2011

- < 1.000001
- 1.000001 - 2.000000
- 2.000001 - 3.000000
- 3.000001 - 5.000000
- 5.000001 - 10.000000
- 10.000001 - 20.000000
- > 20.000000

Quarter Mile Grid Segment

Pa = Pascal
cfs = Cubic Feet Per Second

Kalamazoo River near Battle Creek USGS gage daily average discharge: 989 cfs

N

0 125 250 500
Scale in Feet

RIVERINE GRID: BED SHEAR STRESS
APRIL 16, 2011

MP 39.15 - MP 39.85

SHEET 56 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Bed_Shear_Stress_Apr16_2011.mxd

Aerial Photography Date: November 2011

Figure 6-29

Riverine Grid: Sedimentation Rate

All Grid Cells

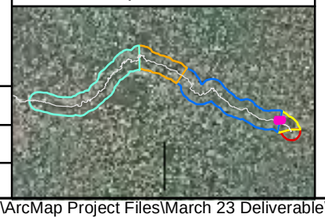
April 9 – April 16, 2011

Sheets 1 through 56

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 01.95 - MP 02.75

SHEET 1 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

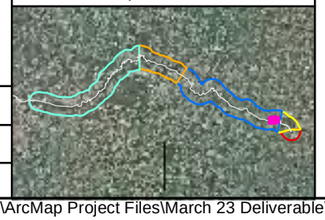
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate_Apr_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

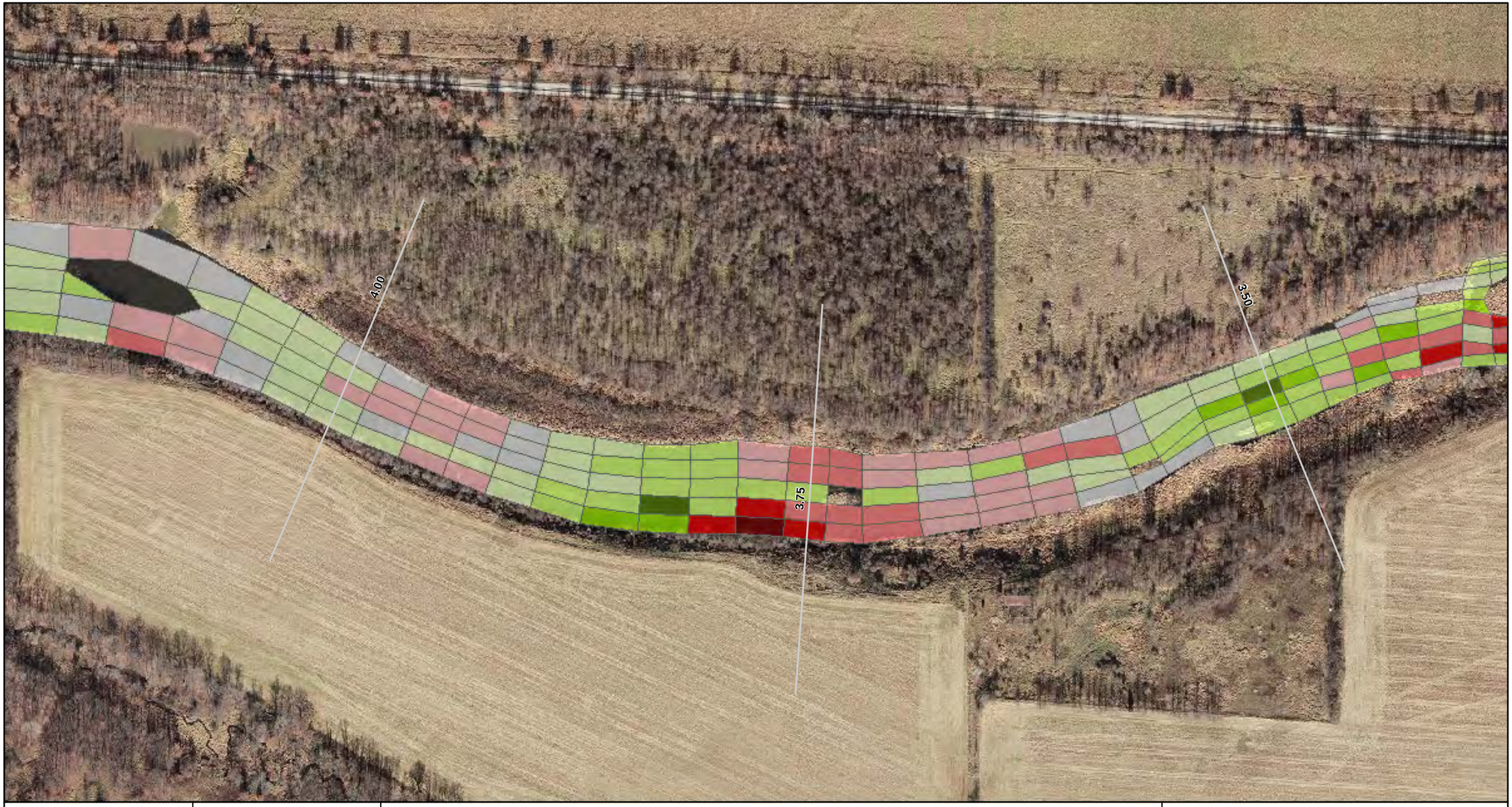
MP 02.60 - MP 03.40

SHEET 2 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate_Apr_2011.mxd

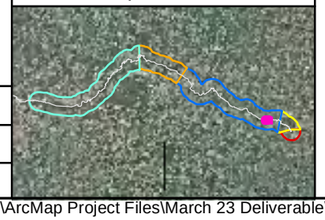
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 03.40 - MP 04.20

SHEET 3 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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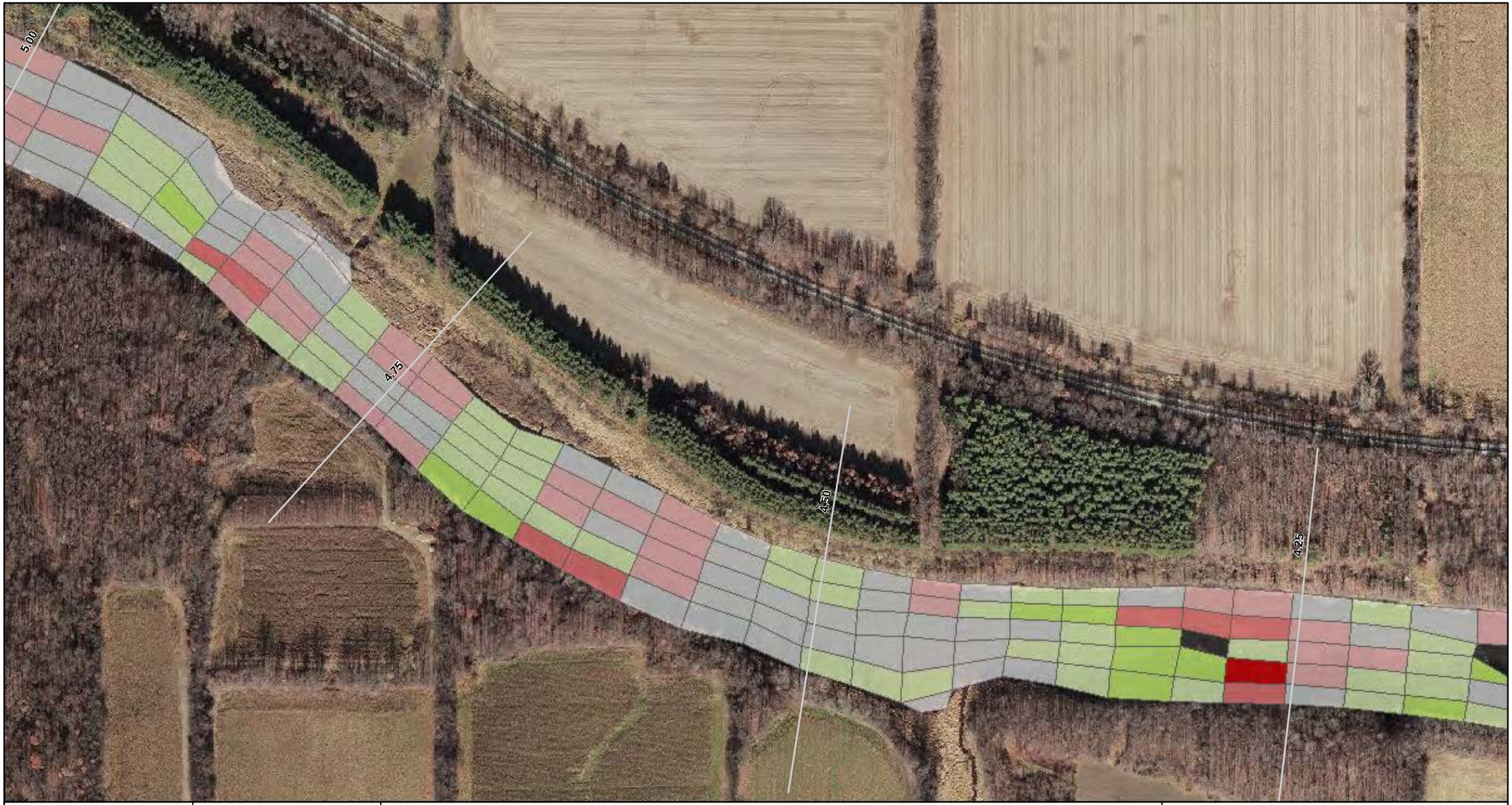
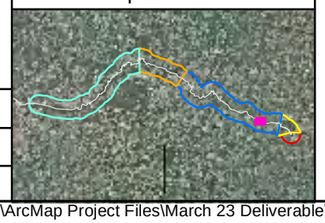
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 04.15 - MP 05.00

SHEET 4 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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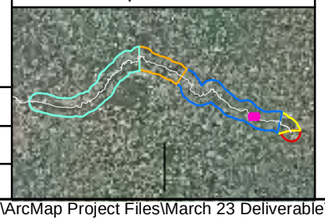
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 04.90 - MP 05.65

SHEET 5 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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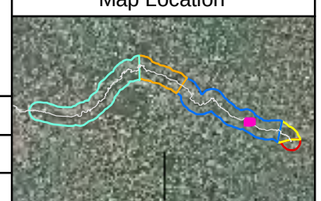
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 05.65 - MP 06.30

SHEET 6 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 06.20 - MP 07.15

SHEET 7 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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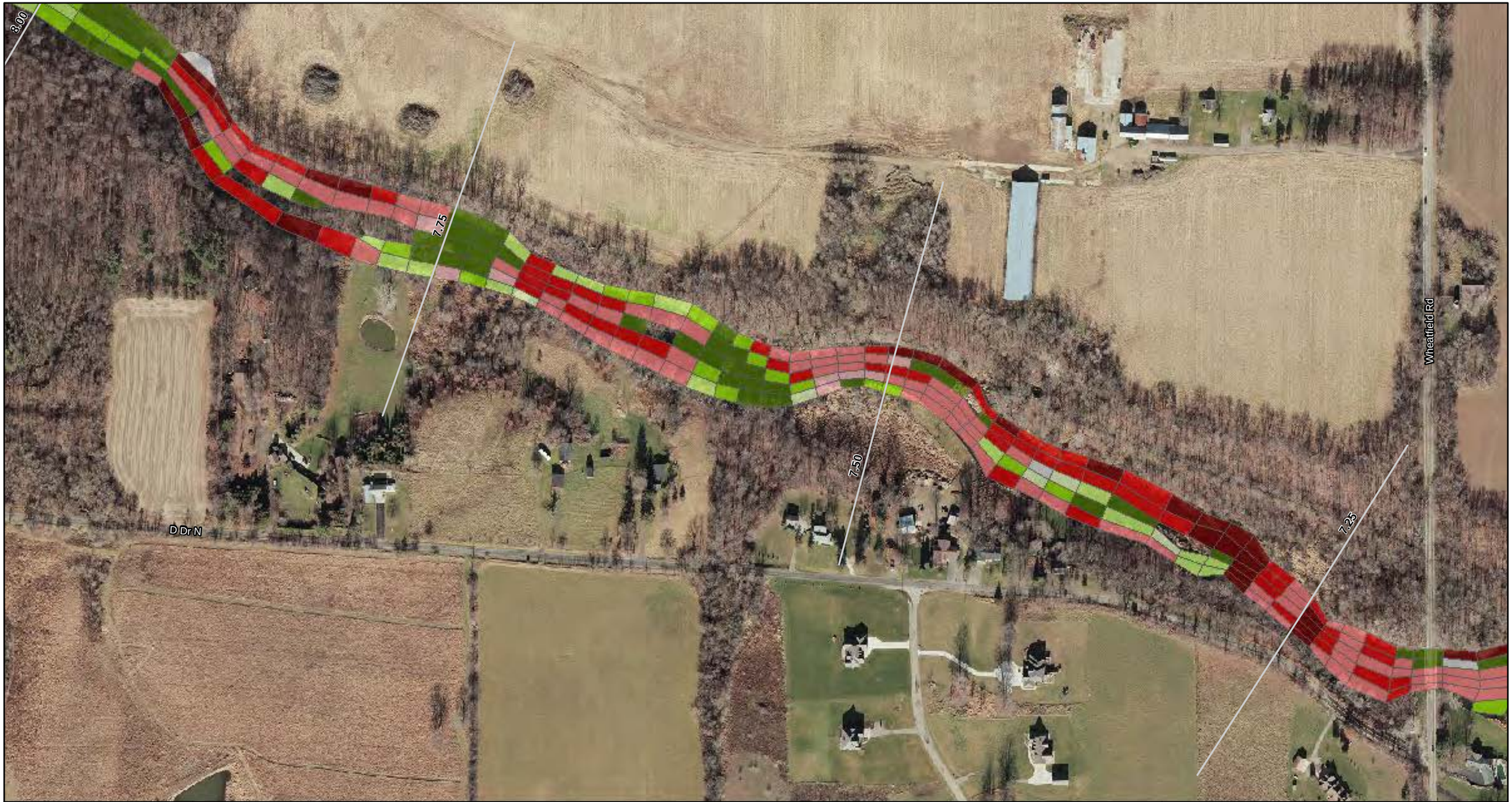
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 07.15 - MP 07.95

SHEET 8 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

8.75

8.50

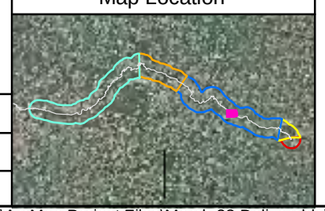
8.25

8.00

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 07.90 - MP 08.75

SHEET 9 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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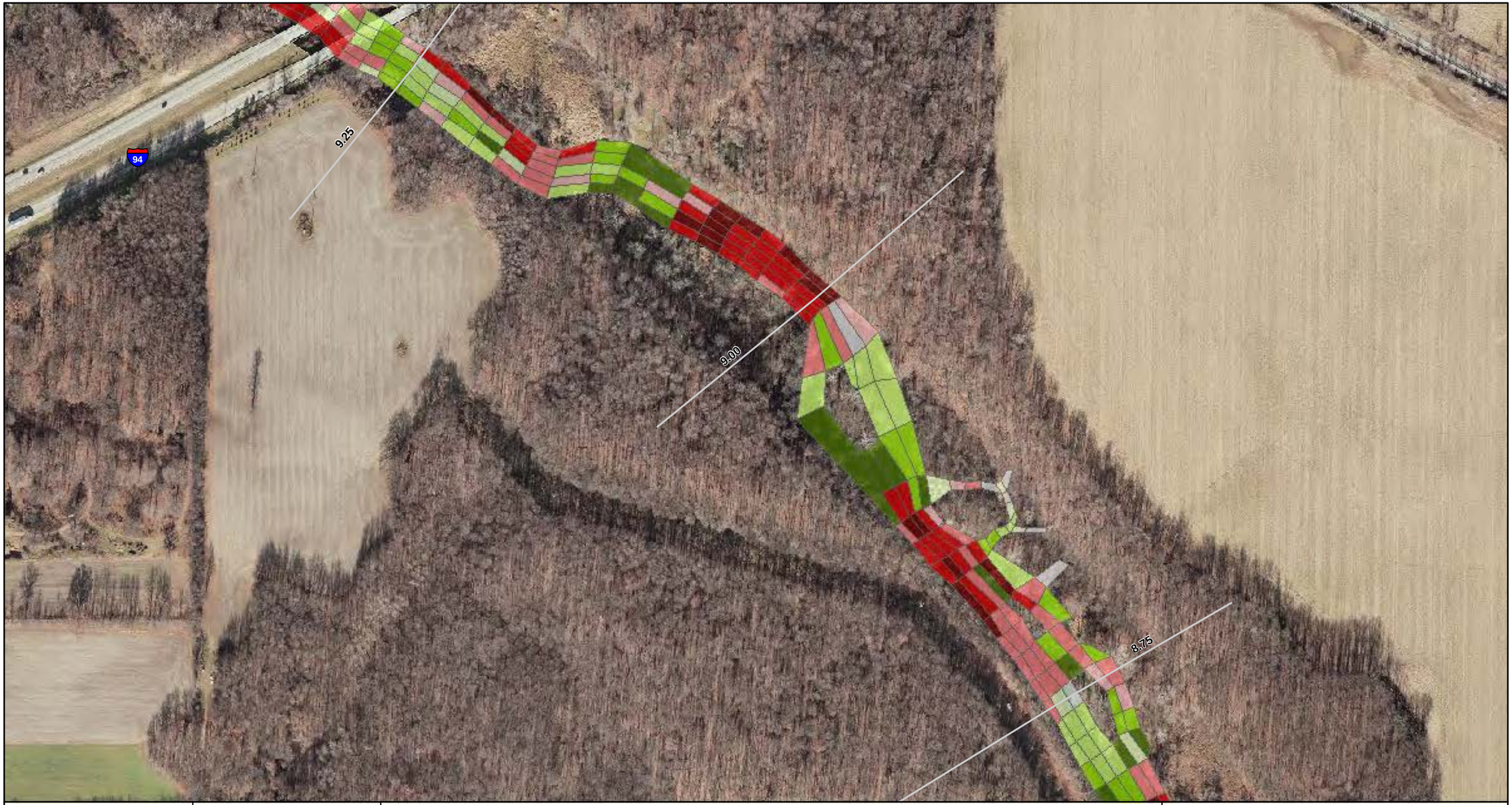
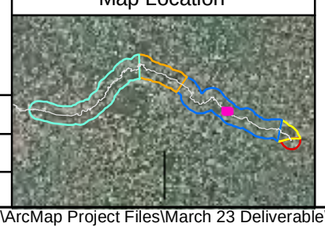
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 08.70 - MP 09.30

SHEET 10 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 09.25 - MP 10.05

SHEET 11 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 10.00 - MP 10.65

SHEET 12 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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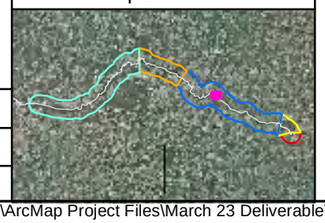
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 10.60 - MP 11.40

SHEET 13 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

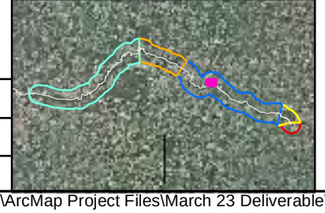
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate_Apr_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 11.10 - MP 12.45

SHEET 14 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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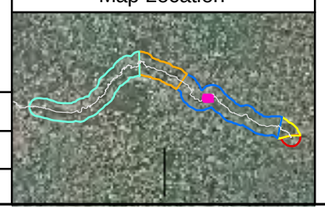
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 12.30 - MP 13.05

SHEET 15 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

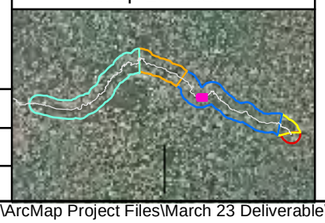
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate_Apr_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

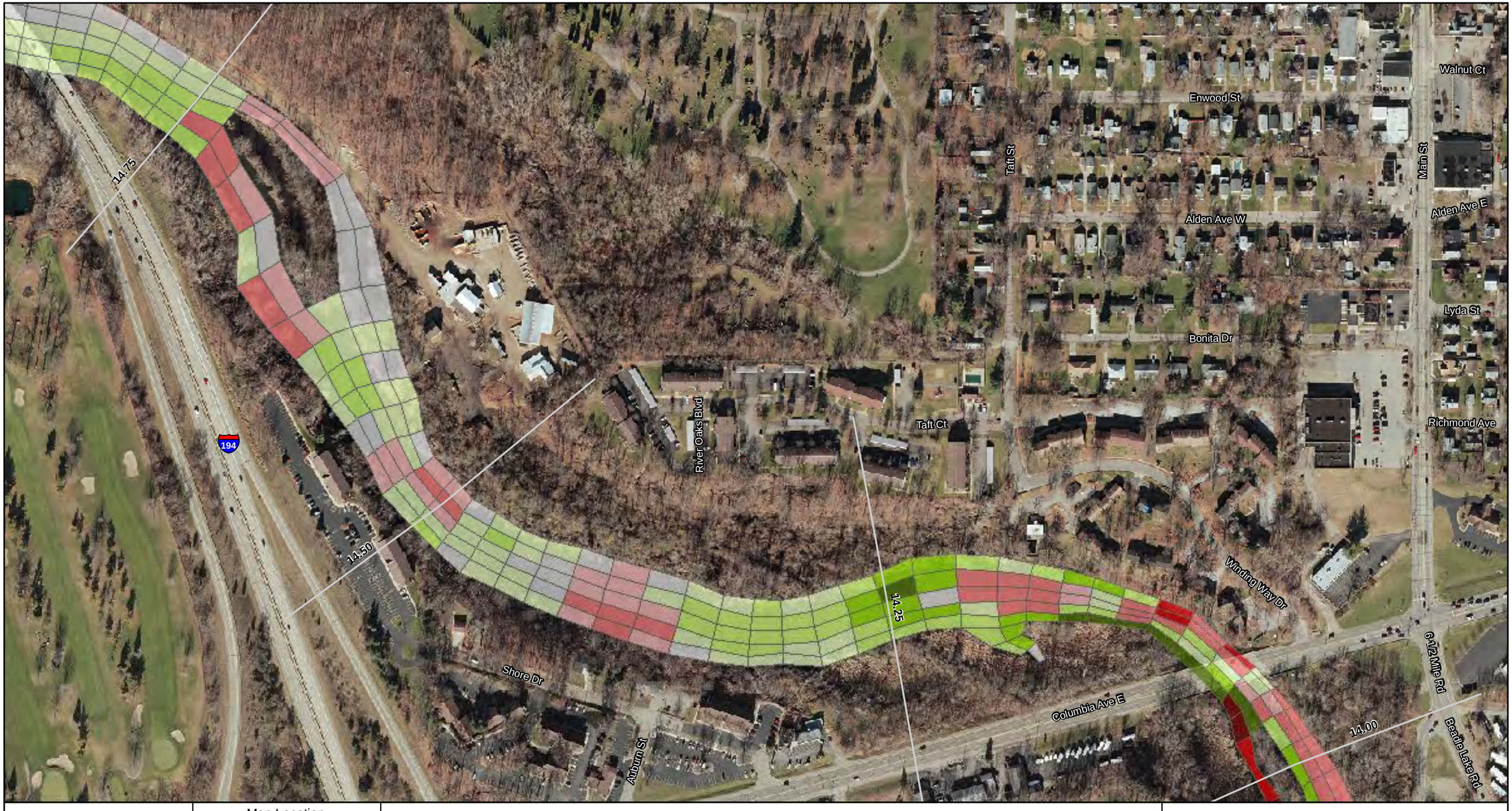
MP 13.00 - MP 14.10

SHEET 16 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate_Apr_2011.mxd

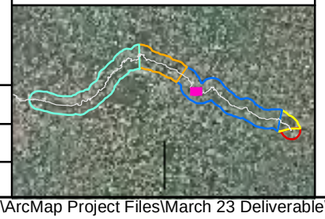
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 14.00 - MP 14.85

SHEET 17 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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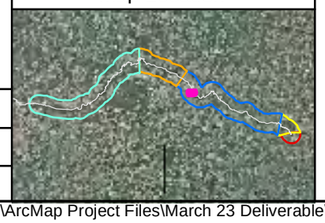
Aerial Photography Date: November 2011

Burnham St E
15.25
Scenery St
Logan St
Mineral Ave
Sisson Ave
Riverside Dr
Riverside Ct
Riverside Pkwy
Territorial Rd E
15.00
14.75
194
Fonda Ave
Kenosha Ave
Pauline Ave
Rockford St
South Ave
Oak Hill Dr
Echo St

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)
All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 14.65 - MP 15.25

SHEET 18 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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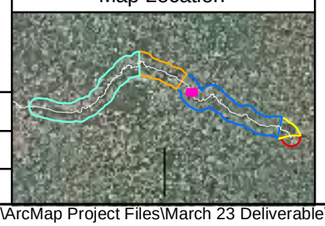
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 15.25 - MP 15.75

SHEET 19 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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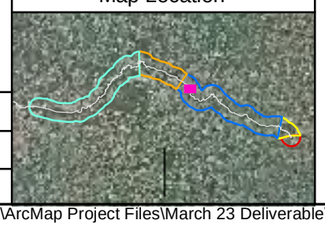
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 15.75 - MP 16.30

SHEET 20 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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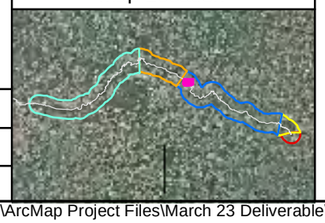
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 16.30 - MP 16.95

SHEET 21 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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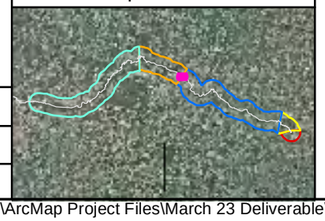
Aerial Photography Date: November 2011

Jackson St W
Grand Ave
Van Buren St W
Graves Ave
Graves Ave
Lemont St
Hubbard St
Manchester St W
17.30
17.25
15th St N
14th St N
12th St N
Jordan St
Turner St
Michigan Ave W
Thorne St
17.00
Lafayette Ave
14th St N
Butler St
Hamblin Ave W
Angell St
Parish St
Lafayette St
Wood St S
E Ave

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 16.85 - MP 17.60

SHEET 22 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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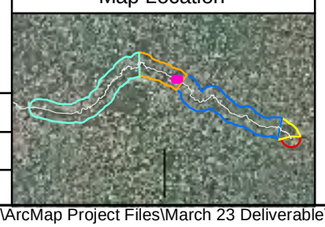
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 17.60 - MP 18.40

SHEET 23 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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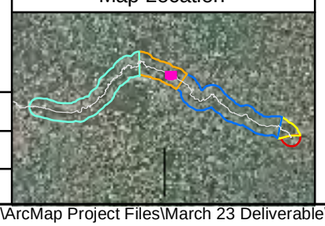
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 18.30 - MP 19.15

SHEET 24 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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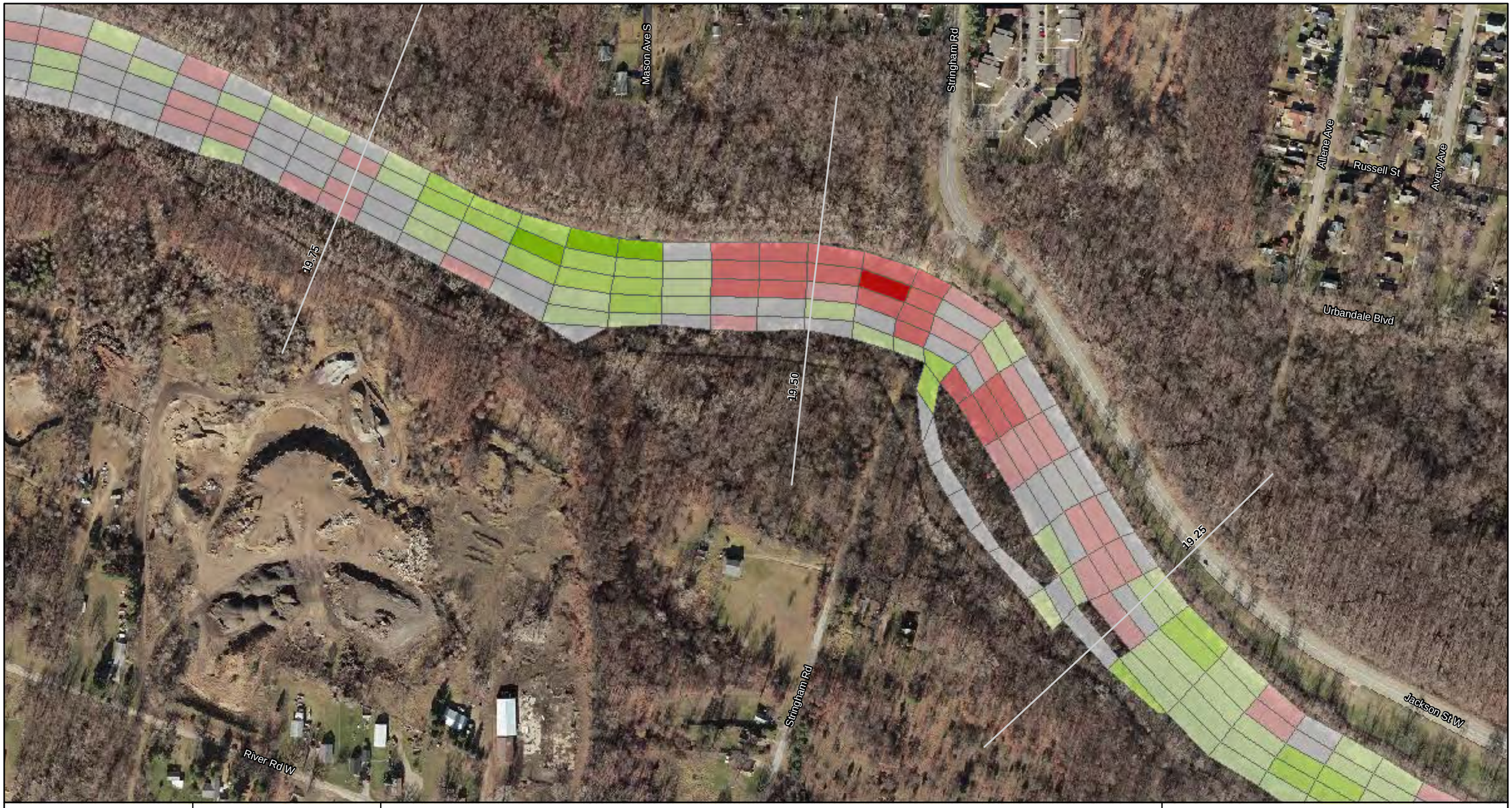
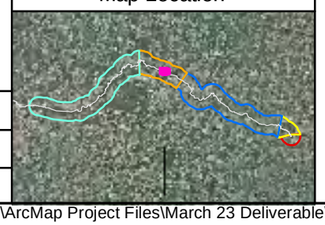
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 19.10 - MP 19.95

SHEET 25 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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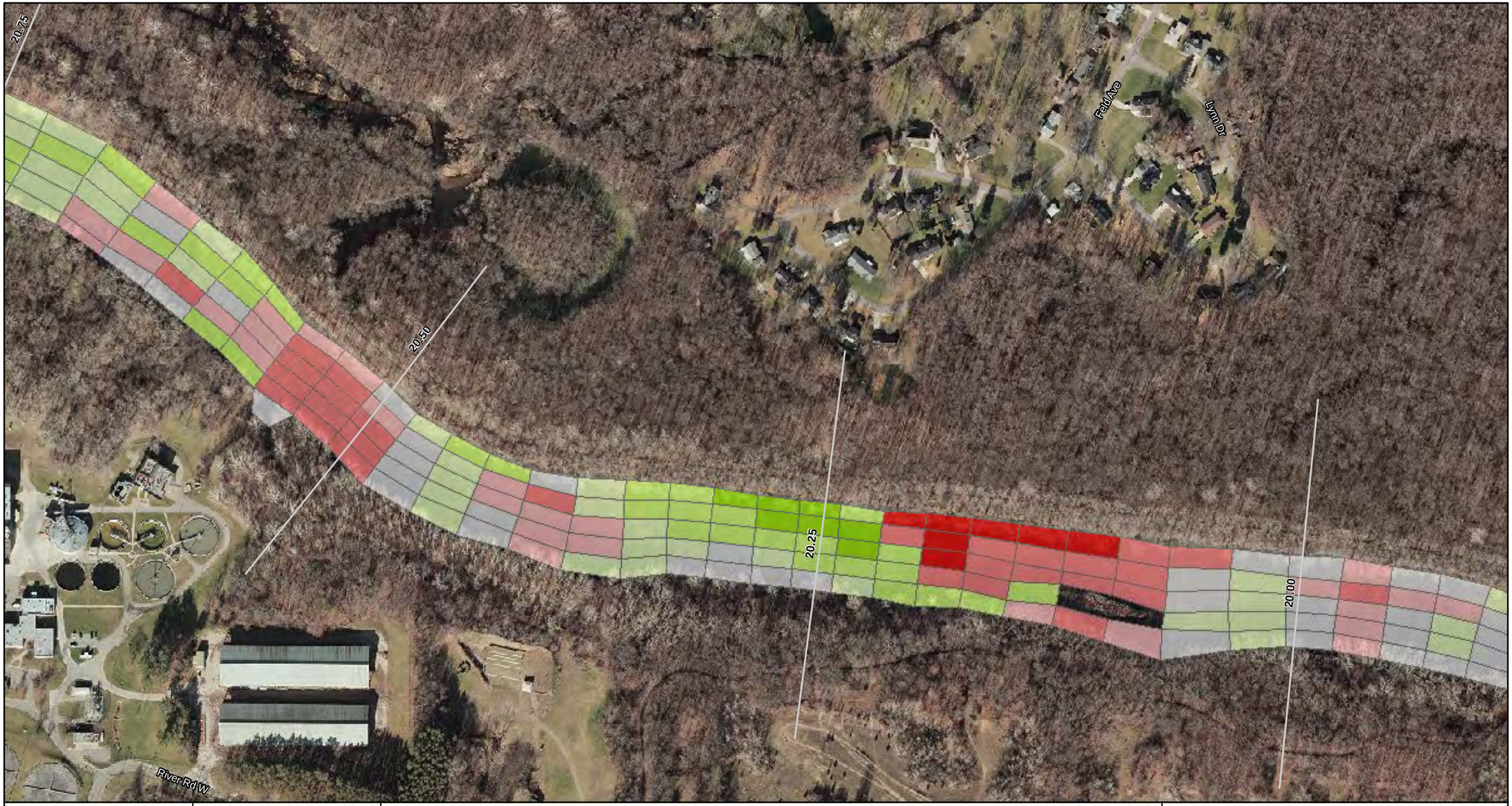
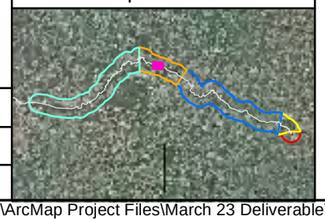
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 19.90 - MP 20.75

SHEET 26 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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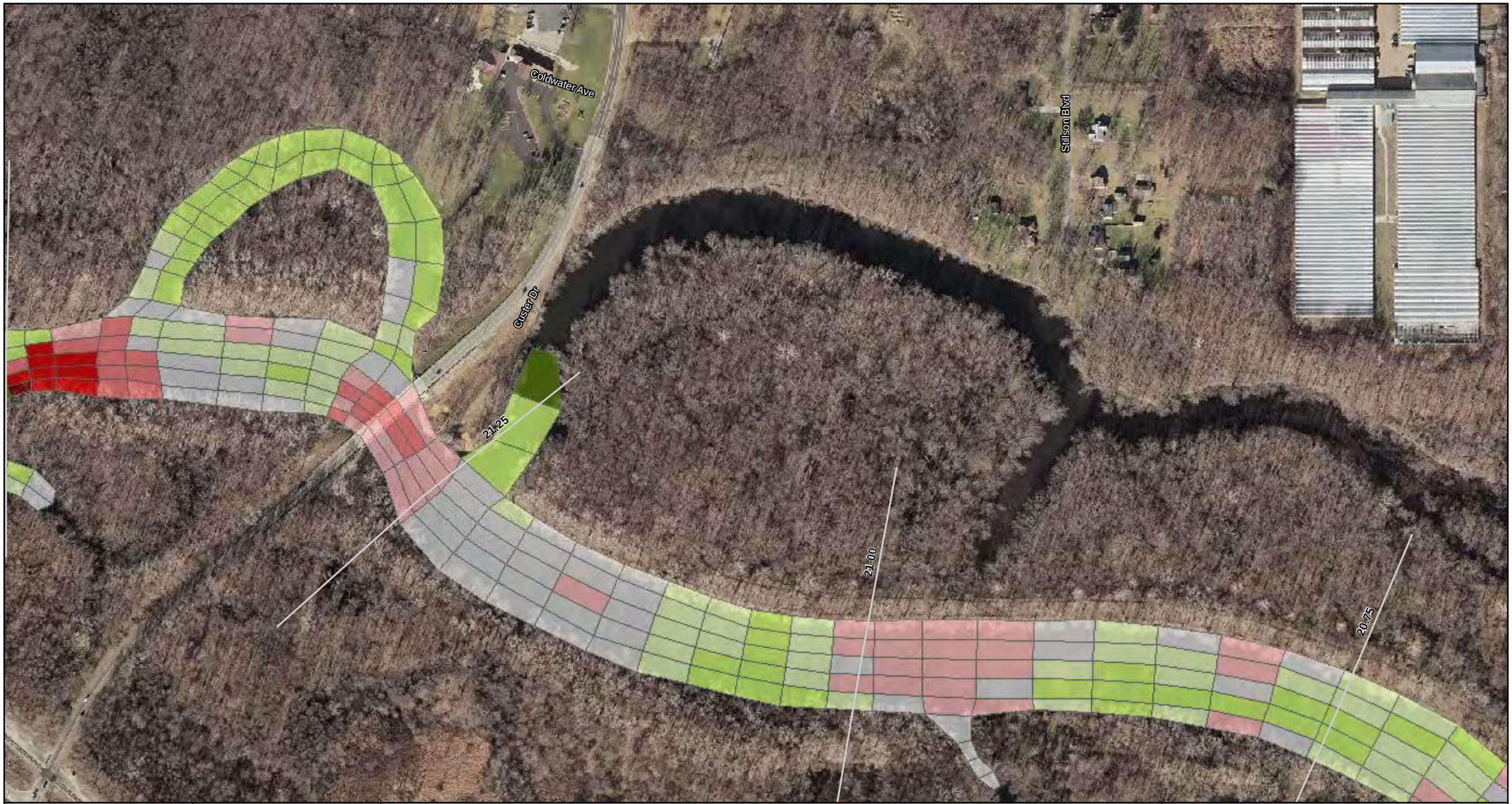
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 20.70 - MP 21.50

SHEET 27 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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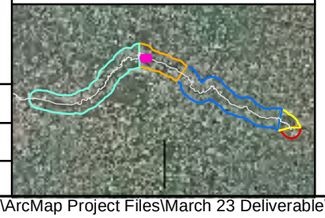
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 21.35 - MP 22.15

SHEET 28 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 22.15 - MP 22.90

SHEET 29 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 22.80 - MP 24.10

SHEET 30 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

24.00
24.25
24.50
24.75
River Rd W
Fort Custer Dr
County Line Rd

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 24.10 - MP 24.85

SHEET 31 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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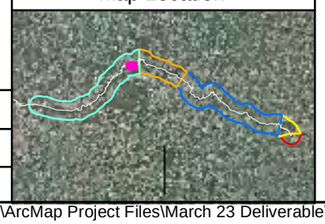
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

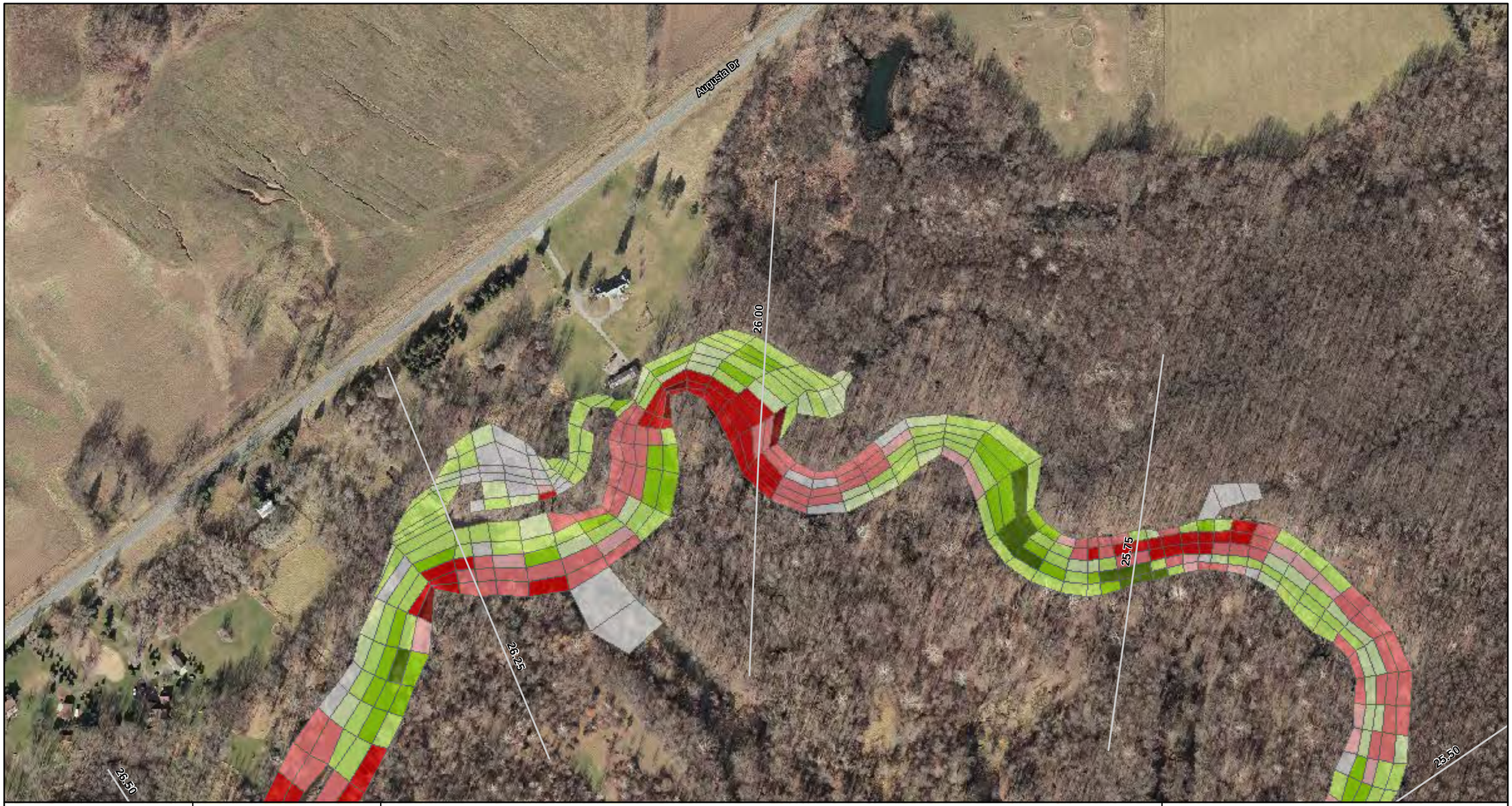
MP 24.80 - MP 25.65

SHEET 32 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate_Apr_2011.mxd

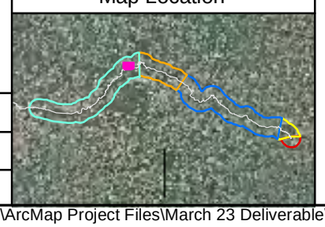
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 25.55 - MP 26.40

SHEET 33 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 26.40 - MP 27.45

SHEET 34 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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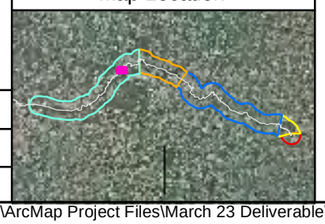
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 27.45 - MP 28.10

SHEET 35 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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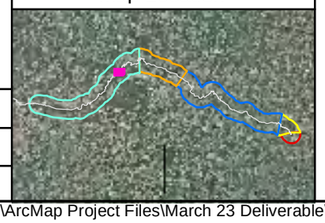
Aerial Photography Date: November 2011

Ransom St
Jefferson St
Convis
Augusta Ave
Michigan Ave
Fort Custer Dr
Augusta Dr
28.00
28.25
28.50
28.75
29.00

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 28.05 - MP 28.85

SHEET 36 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Clinton St
Clinton St
Chestnut St
Webster St
Church St
Fayette St
Cass St
Cherry St
Lincoln St
28.75
29.00
29.25
29.50
Augusta Climax Rd
Fort Custer Rec Area Access

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 28.85 - MP29.55

SHEET 37 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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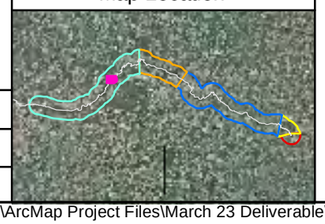
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 29.50 - MP29.95

SHEET 38 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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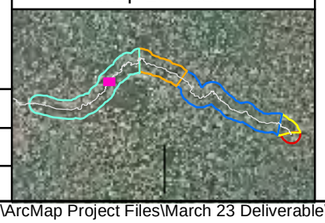
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 29.95 - MP 30.80

SHEET 39 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 30.75 - MP 31.25

SHEET 40 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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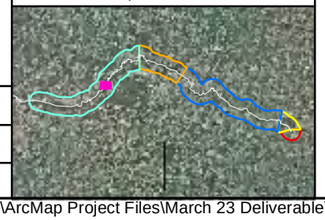
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)
All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 31.25 - MP 31.70

SHEET 41 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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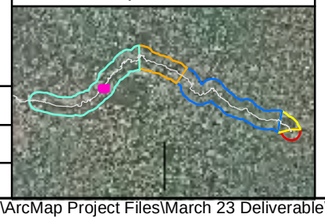
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 31.65 - MP 32.25

SHEET 42 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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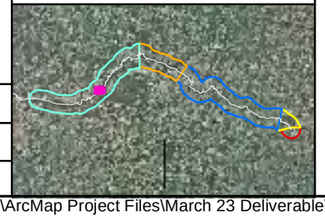
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 32.25 - MP 33.10

SHEET 43 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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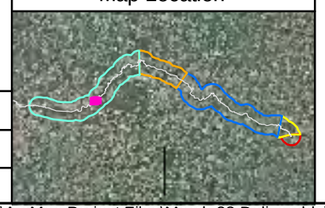
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 33.10 - MP 33.70

SHEET 44 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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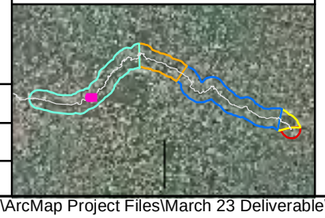
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 33.70 - MP 34.70

SHEET 45 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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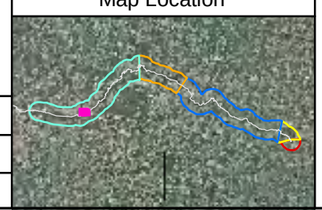
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 34.70 - MP 35.75

SHEET 46 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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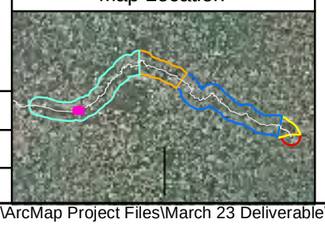
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 35.75 - MP 36.80

SHEET 47 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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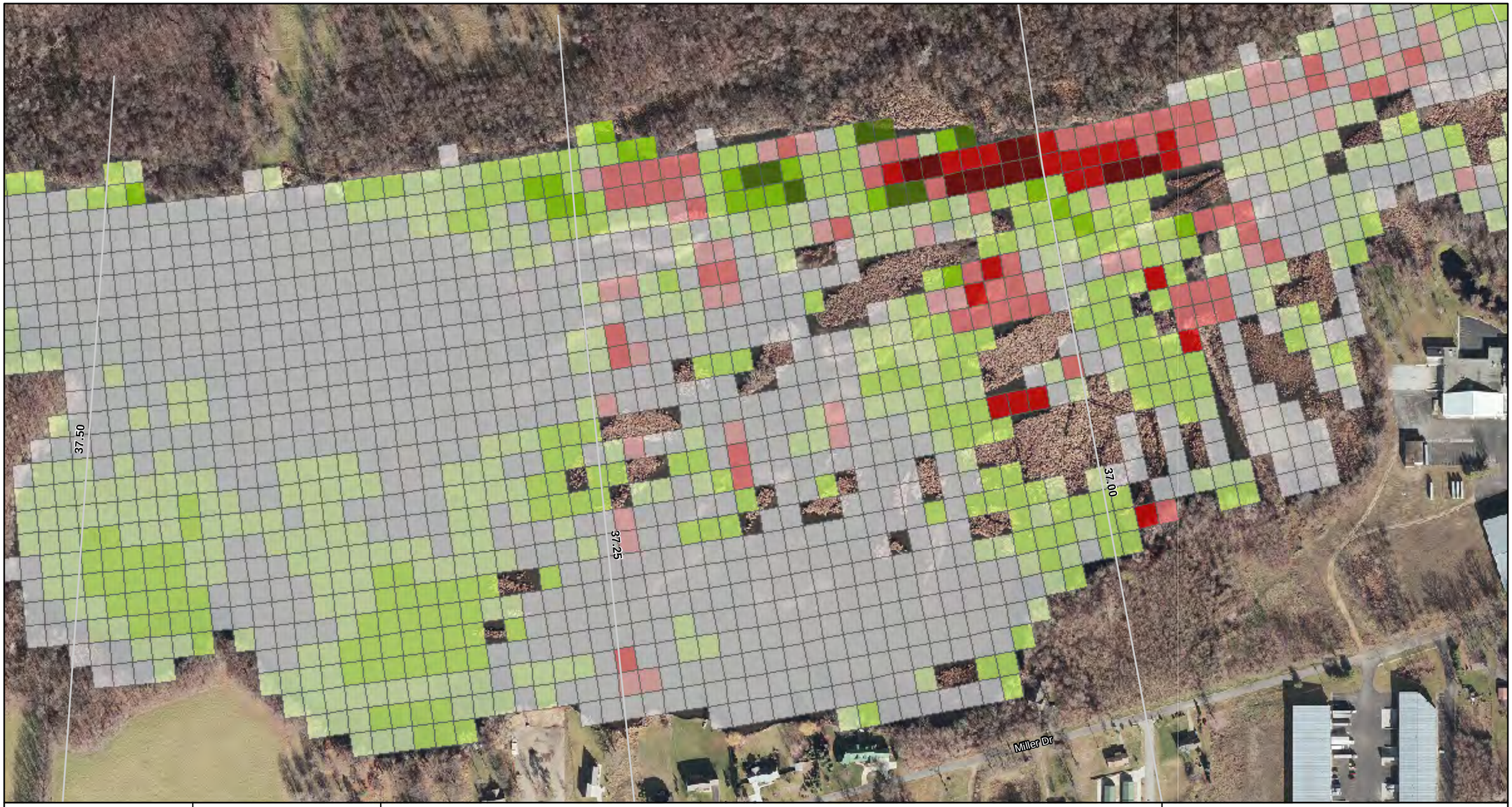
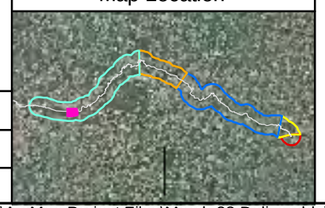
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 36.80 - MP 37.55

SHEET 48 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

38.25

38.00

37.75

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

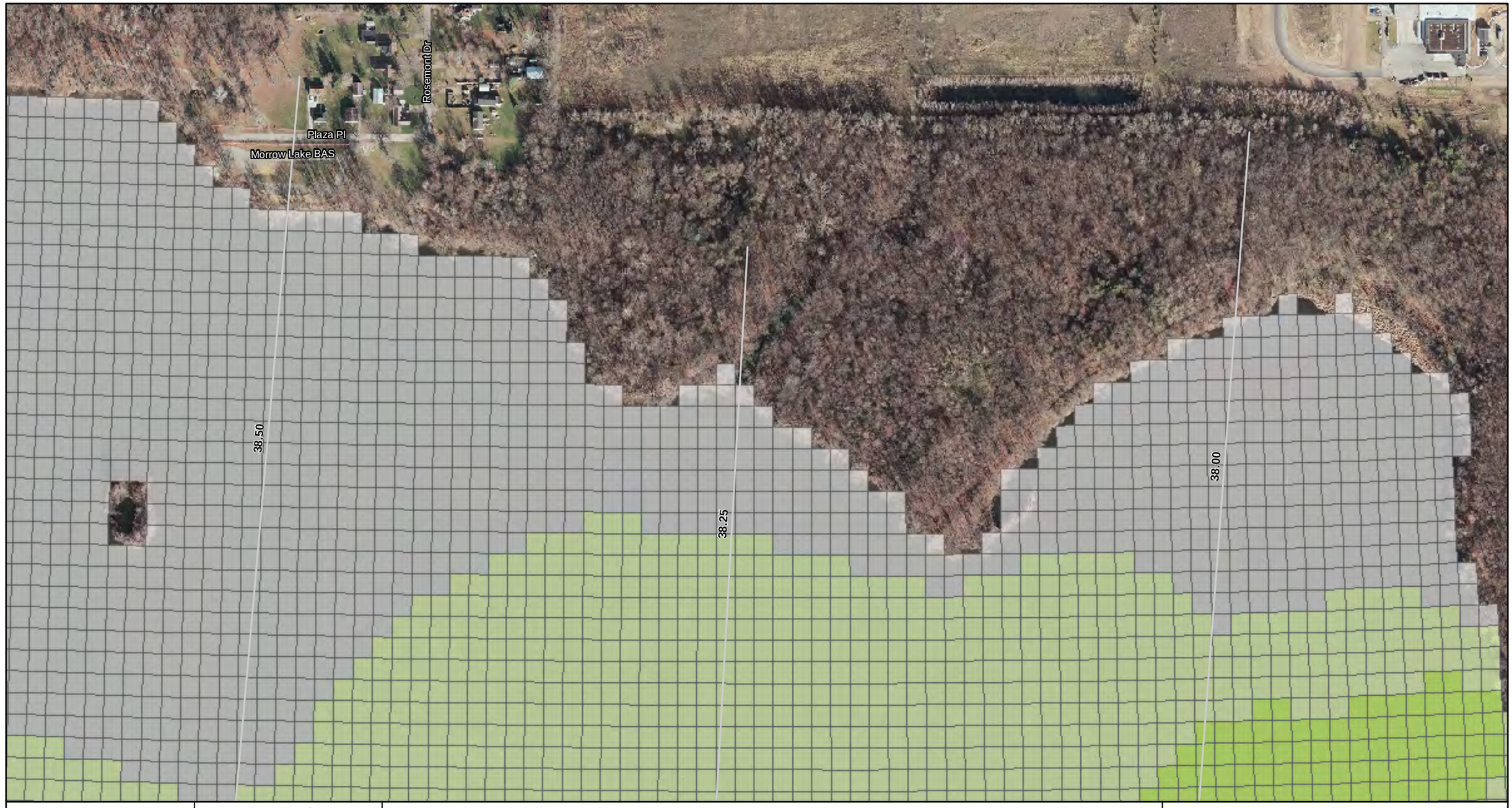
MP 37.55 - MP 38.30

SHEET 49 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate_Apr_2011.mxd

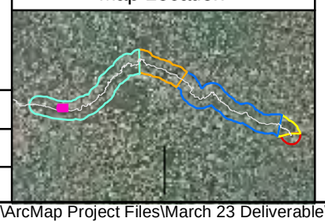
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

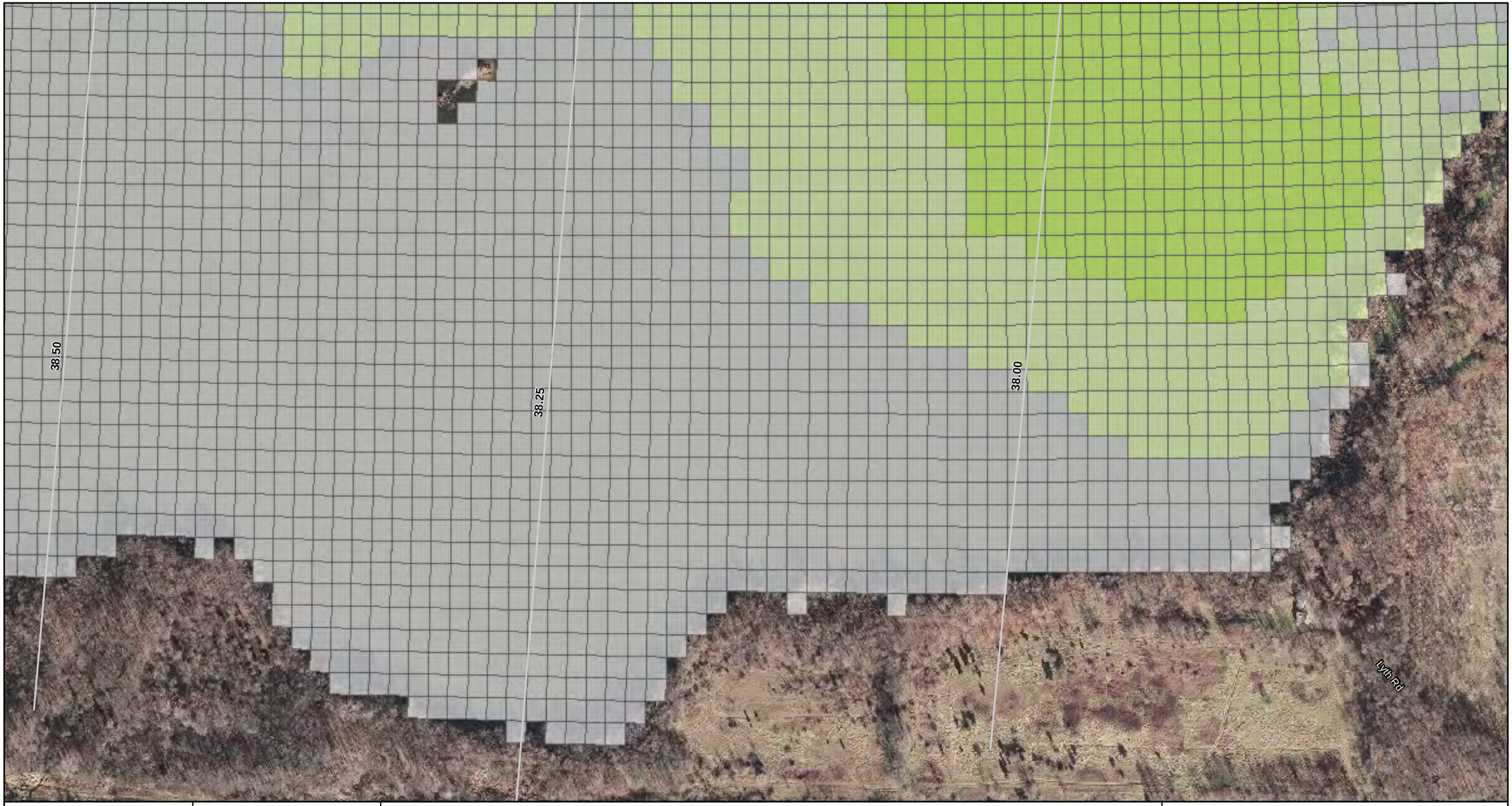
MP 37.80 - MP 38.60N

SHEET 50 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate_Apr_2011.mxd

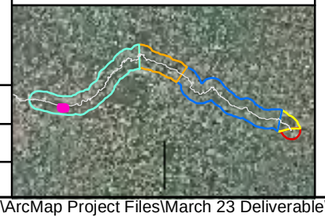
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 37.80 - MP 38.60S

SHEET 51 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

39.00

38.50

38.75

38.25

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 38.25 - MP 39.00C

SHEET 52 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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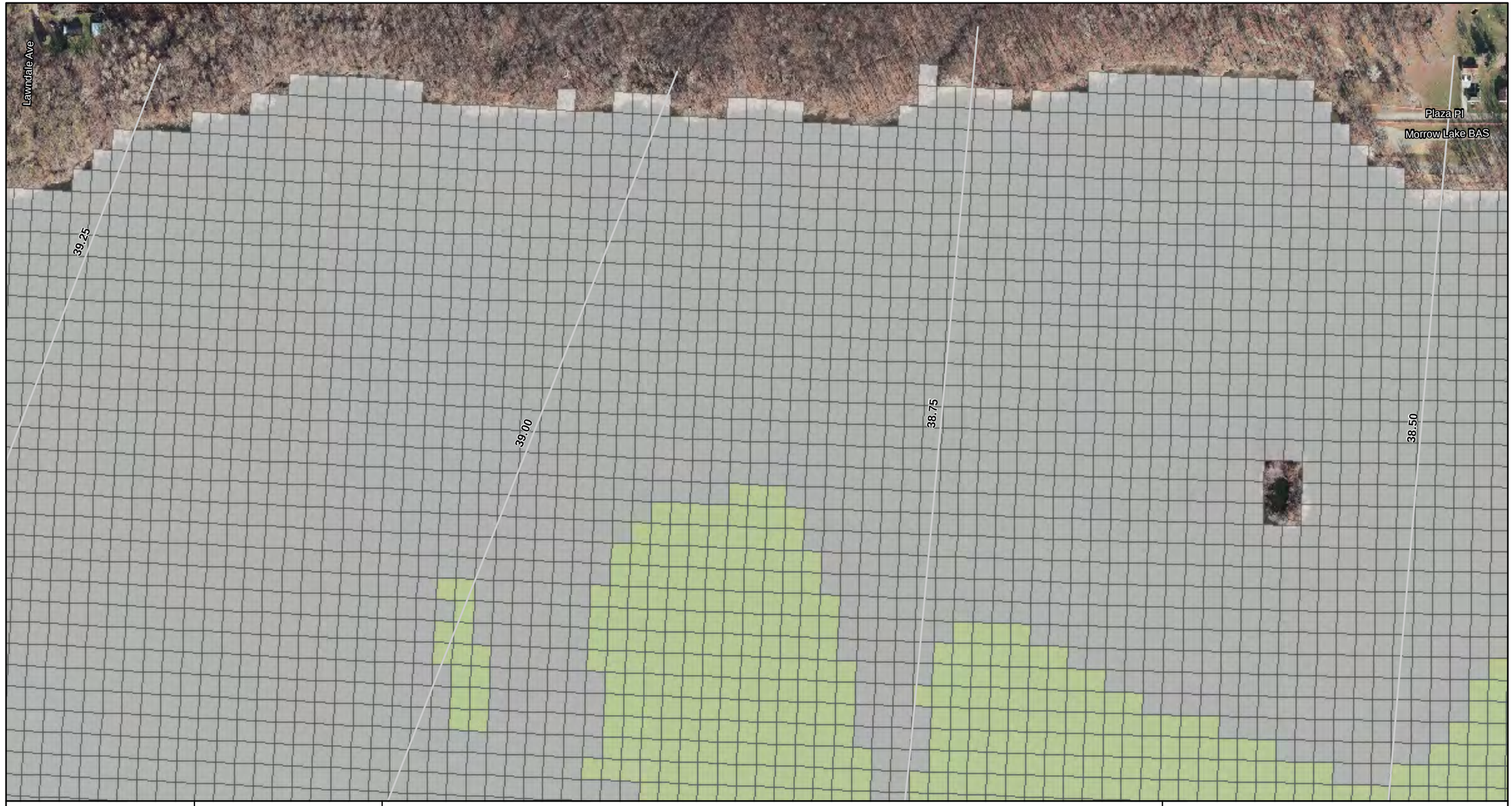
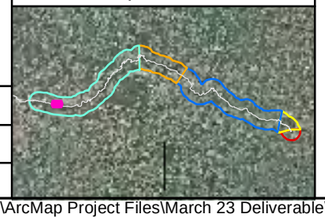
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 38.50 - MP 39.25N

SHEET 53 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

39.25

39.00

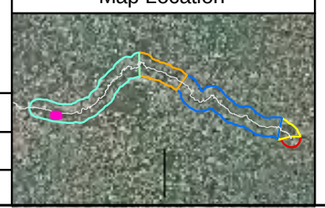
38.75

38.50

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 38.50 - MP 39.25S

SHEET 54 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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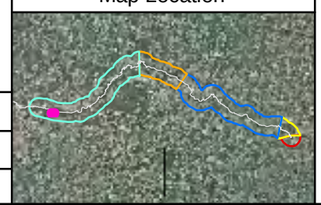
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 38.90 - MP 39.60S

SHEET 55 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

All Grid Cells

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
ALL GRID CELLS
APRIL 9 - APRIL 16, 2011

MP 39.15 - MP 39.85

SHEET 56 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Figure 6-30

Riverine Grid: Sedimentation Rate

Cells with Net Change in Silt or Clay Mass

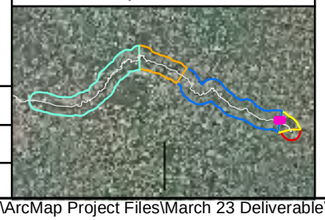
April 9 – April 16, 2011

Sheets 1 through 56

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 01.95 - MP 02.75

SHEET 1 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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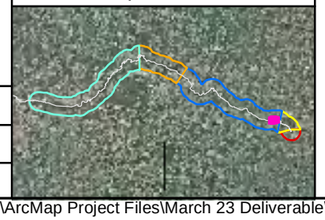
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 02.60 - MP 03.40

SHEET 2 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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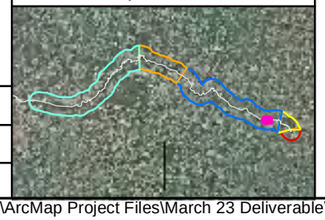
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 03.40 - MP 04.20

SHEET 3 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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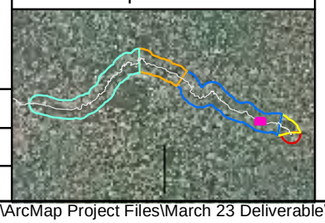
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 04.15 - MP 05.00

SHEET 4 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

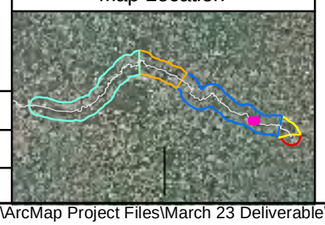
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Apr_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 04.90 - MP 05.65

SHEET 5 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 05.65 - MP 06.30

SHEET 6 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 06.20 - MP 07.15

SHEET 7 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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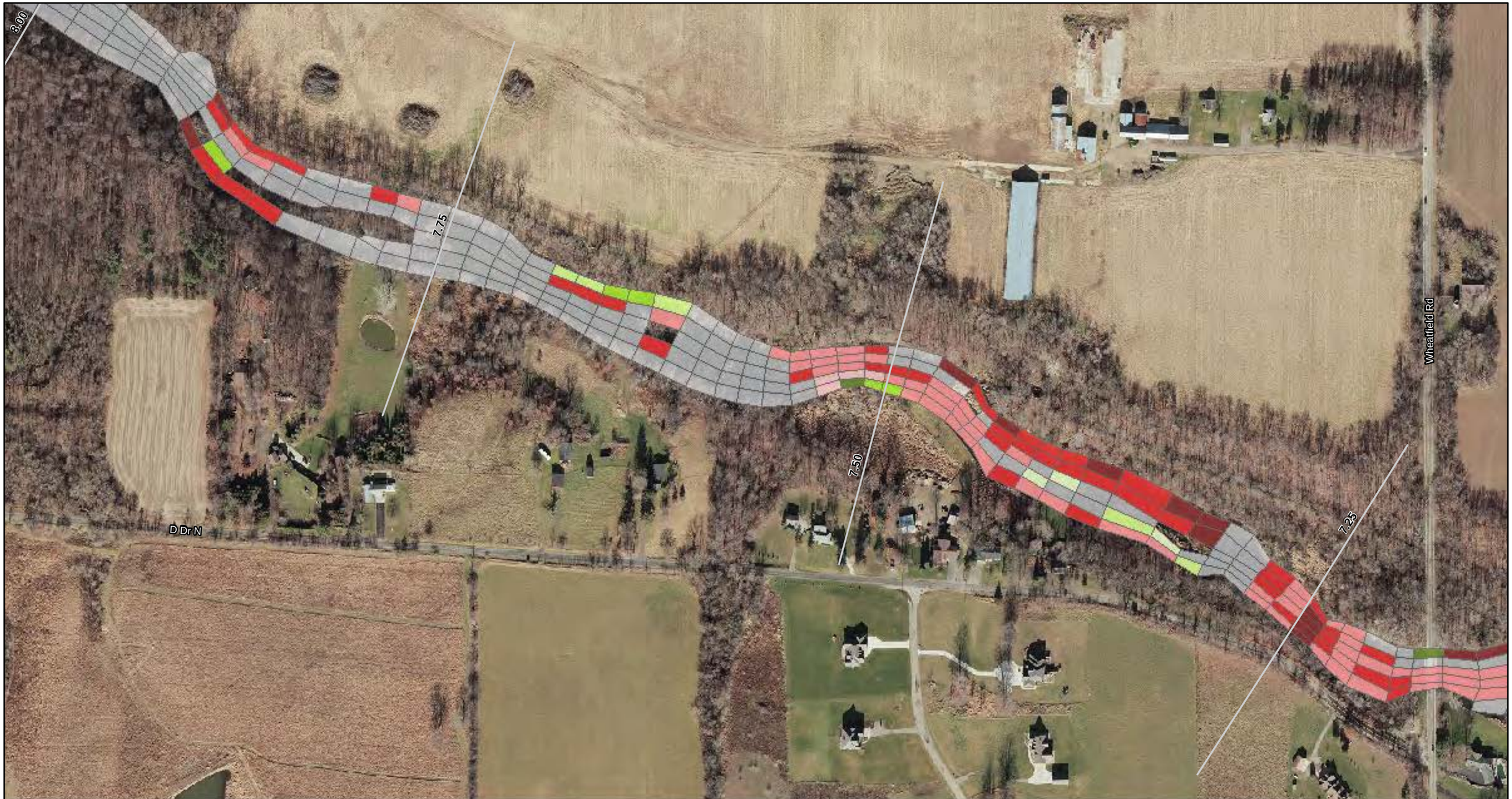
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 07.15 - MP 07.95

SHEET 8 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

8.75

8.50

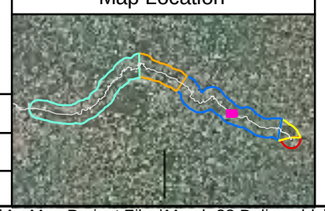
8.25

8.00

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 07.90 - MP 08.75

SHEET 9 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Apr_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 08.70 - MP 09.30

SHEET 10 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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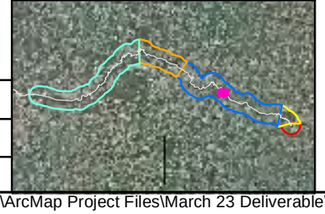
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 09.25 - MP 10.05

SHEET 11 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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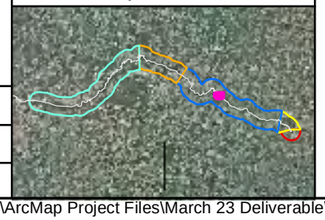
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 10.00 - MP 10.65

SHEET 12 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

11.25

11.00

10.75

River Rd E

Kimball Pines Park Rd

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 10.60 - MP 11.40

SHEET 13 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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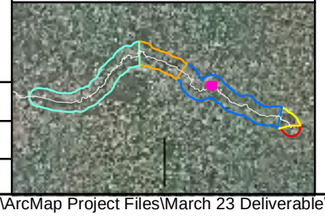
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 11.10 - MP 12.45

SHEET 14 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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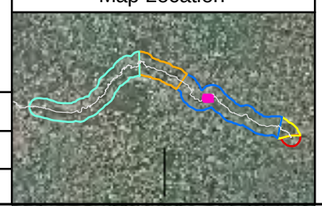
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 12.30 - MP 13.05

SHEET 15 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 13.00 - MP 14.10

SHEET 16 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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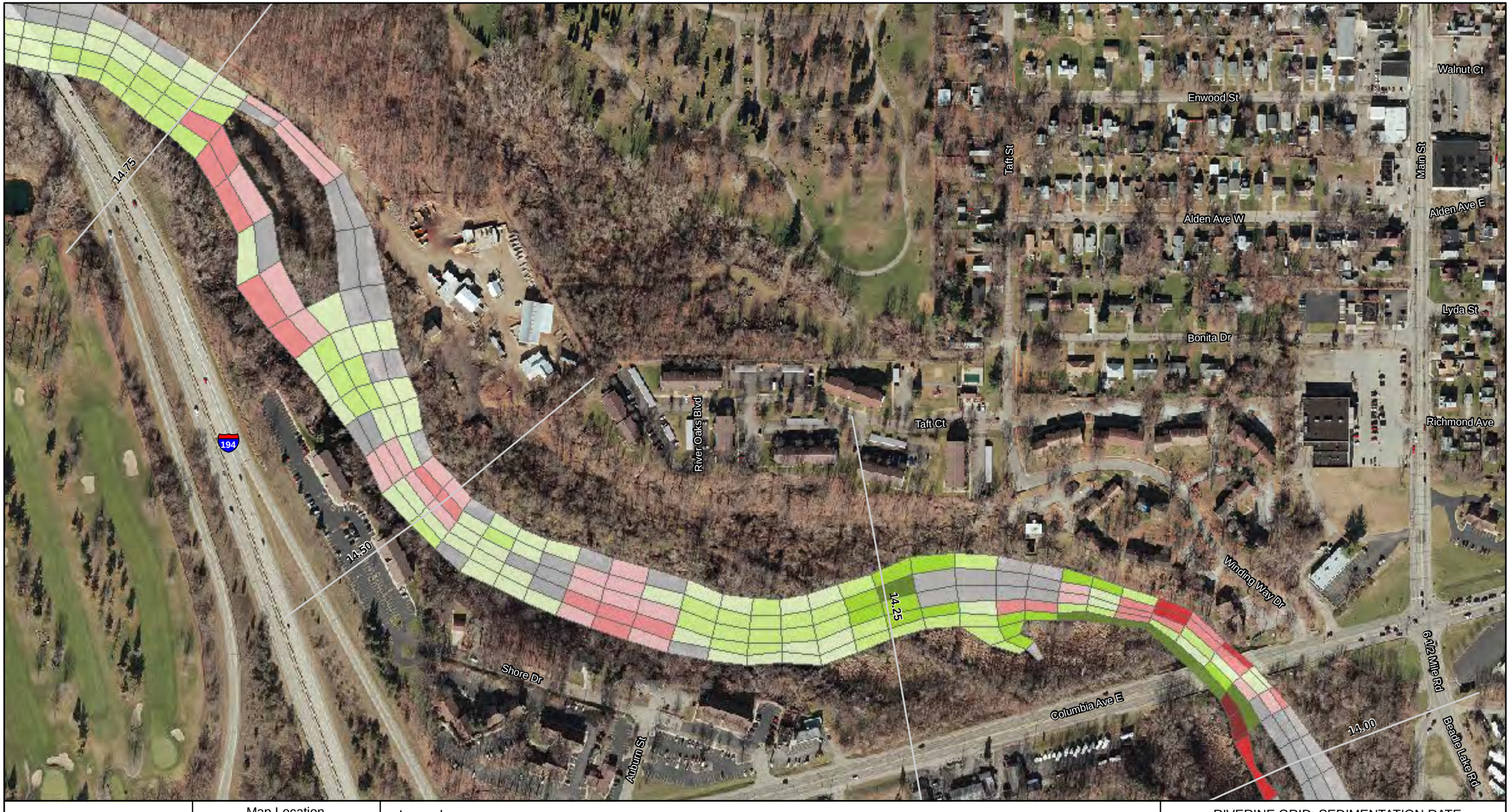
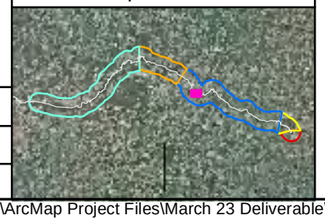
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 14.00 - MP 14.85

SHEET 17 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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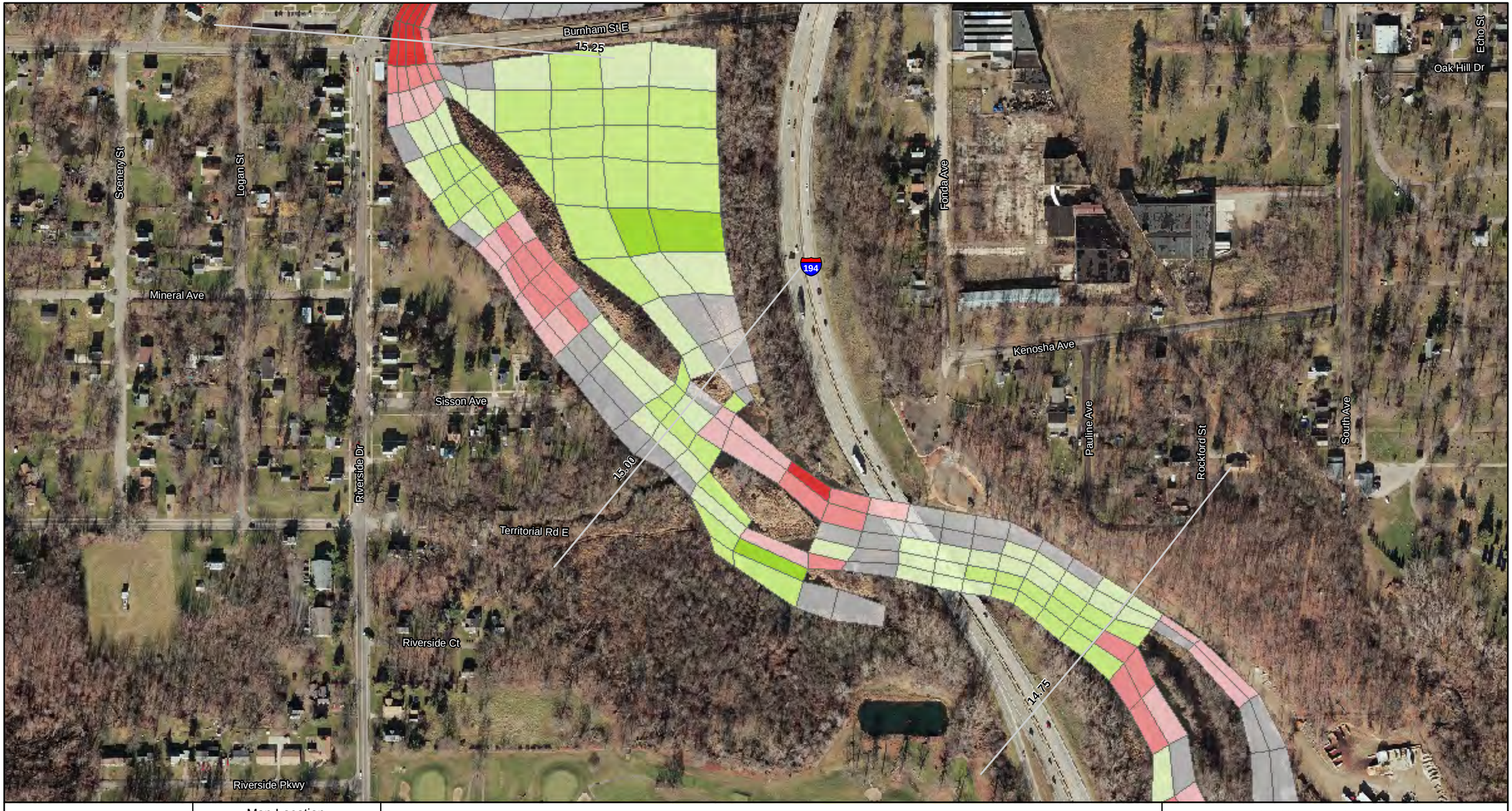
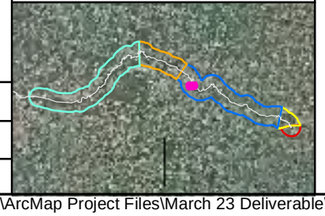
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 14.65 - MP 15.25

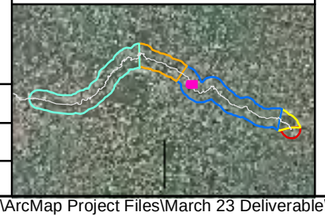
SHEET 18 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Apr_2011.mxd

Aerial Photography Date: November 2011

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 15.25 - MP 15.75

SHEET 19 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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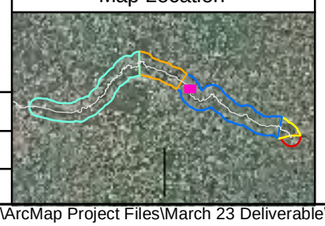
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 15.75 - MP 16.30

SHEET 20 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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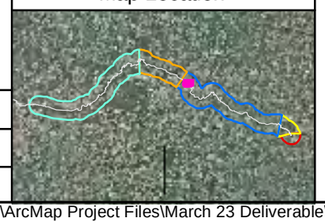
Aerial Photography Date: November 2011

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 16.30 - MP 16.95

SHEET 21 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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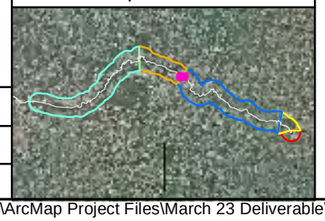
Aerial Photography Date: November 2011

Jackson St W
Grand Ave
Van Buren St W
Graves Ave
Graves Ave
Lemont St
Hubbard St
Manchester St W
17.30
17.25
15th St N
14th St N
12th St N
Jordan St
Turner St
Michigan Ave W
Thorne St
17.00
Wood St S
Lafayette Ave
14th St N
Butler St
Hamblin Ave W
Angell St
Parish St
Lafayette St
E Ave

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 16.85 - MP 17.60

SHEET 22 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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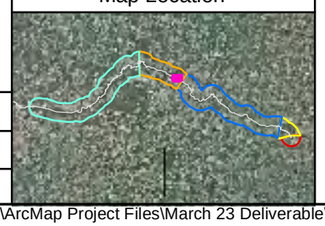
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 17.60 - MP 18.40

SHEET 23 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

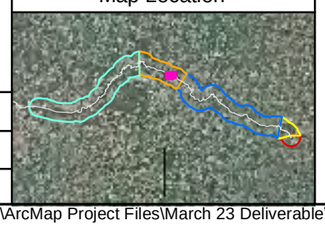
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Apr_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 18.30 - MP 19.15

SHEET 24 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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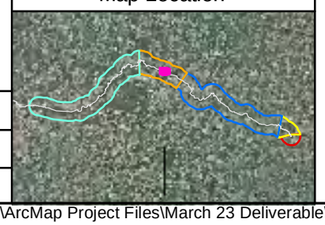
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 19.10 - MP 19.95

SHEET 25 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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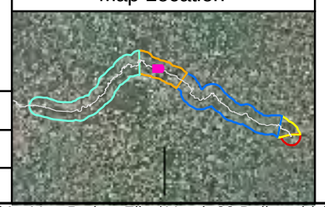
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 19.90 - MP 20.75

SHEET 26 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 20.70 - MP 21.50

SHEET 27 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

22.25

22.00

21.75

21.50

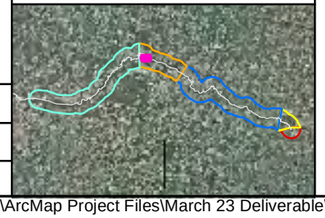
River Rd W

Custer Dr

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 21.35 - MP 22.15

SHEET 28 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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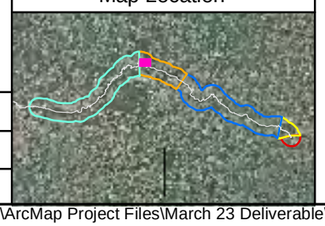
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 22.15 - MP 22.90

SHEET 29 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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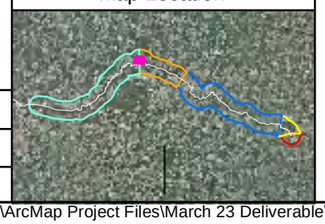
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 22.80 - MP 24.10

SHEET 30 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

24.00
24.25
24.50
24.75
River Rd W
Fort Custer Dr
County Line Rd

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 24.10 - MP 24.85

SHEET 31 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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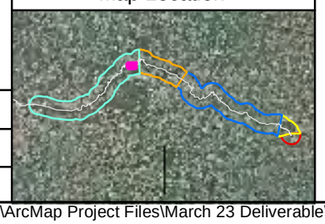
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 24.80 - MP 25.65

SHEET 32 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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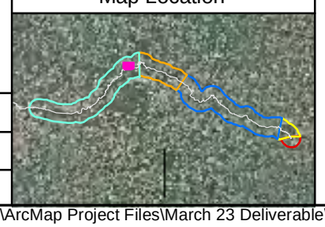
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 25.55 - MP 26.40

SHEET 33 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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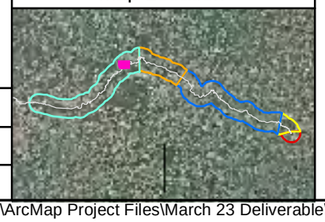
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 26.40 - MP 27.45

SHEET 34 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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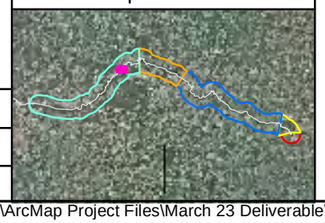
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 27.45 - MP 28.10

SHEET 35 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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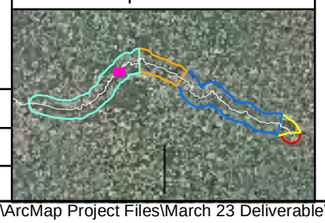
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 28.05 - MP 28.85

SHEET 36 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Clinton St
Clinton St
Chestnut St
Webster St
Church St
Fayette St
Cass St
Cherry St
Lincoln St
28.75
29.00
29.25
29.50
Augusta Climax Rd
Fort Custer Rec Area Access

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 28.85 - MP29.55

SHEET 37 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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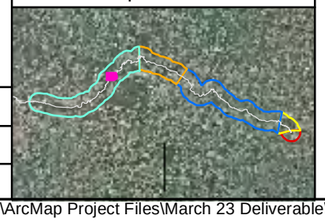
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 29.50 - MP29.95

SHEET 38 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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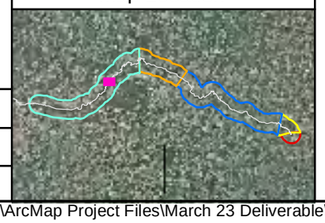
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 29.95 - MP 30.80

SHEET 39 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 30.75 - MP 31.25

SHEET 40 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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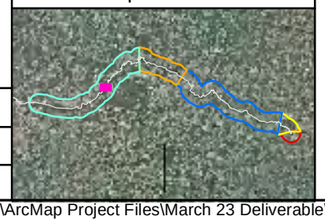
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 31.25 - MP 31.70

SHEET 41 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

31.75

32.00

32.25

Bicycle Trail

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 31.65 - MP 32.25

SHEET 42 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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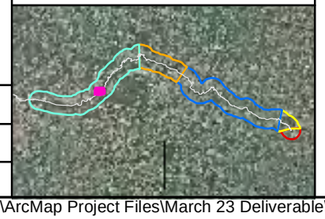
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 32.25 - MP 33.10

SHEET 43 OF 56

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 33.10 - MP 33.70

SHEET 44 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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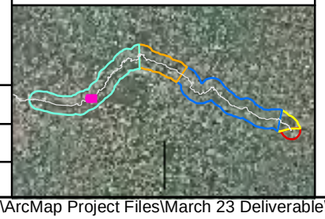
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 33.70 - MP 34.70

SHEET 45 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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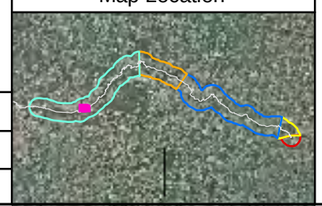
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 34.70 - MP 35.75

SHEET 46 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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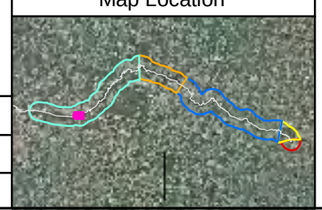
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 35.75 - MP 36.80

SHEET 47 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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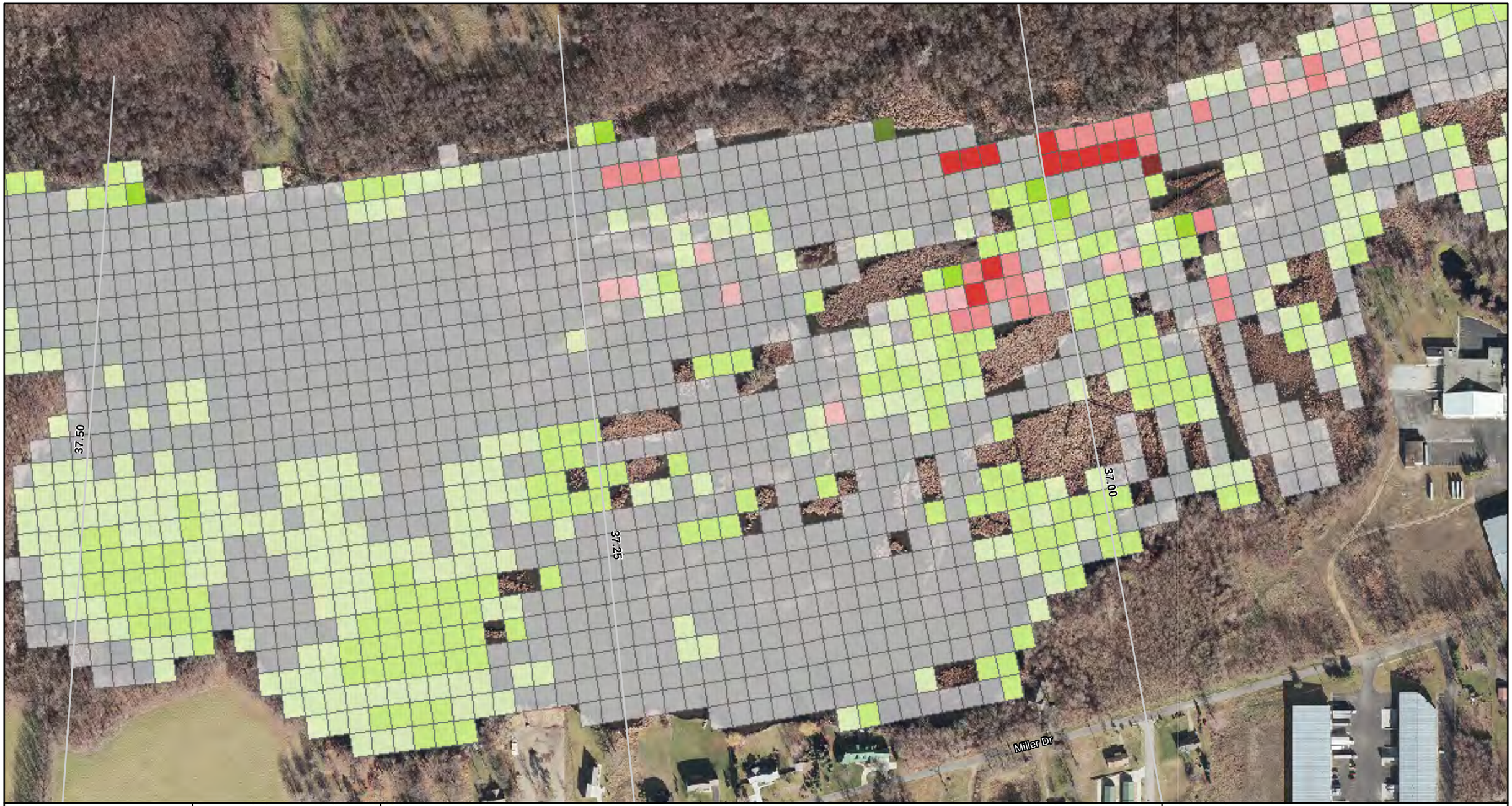
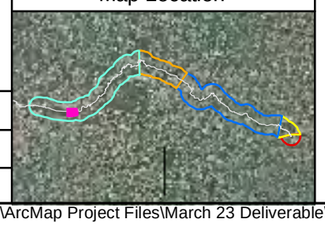
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 36.80 - MP 37.55

SHEET 48 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

38.25

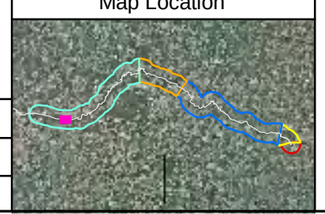
38.00

37.75

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 37.55 - MP 38.30

SHEET 49 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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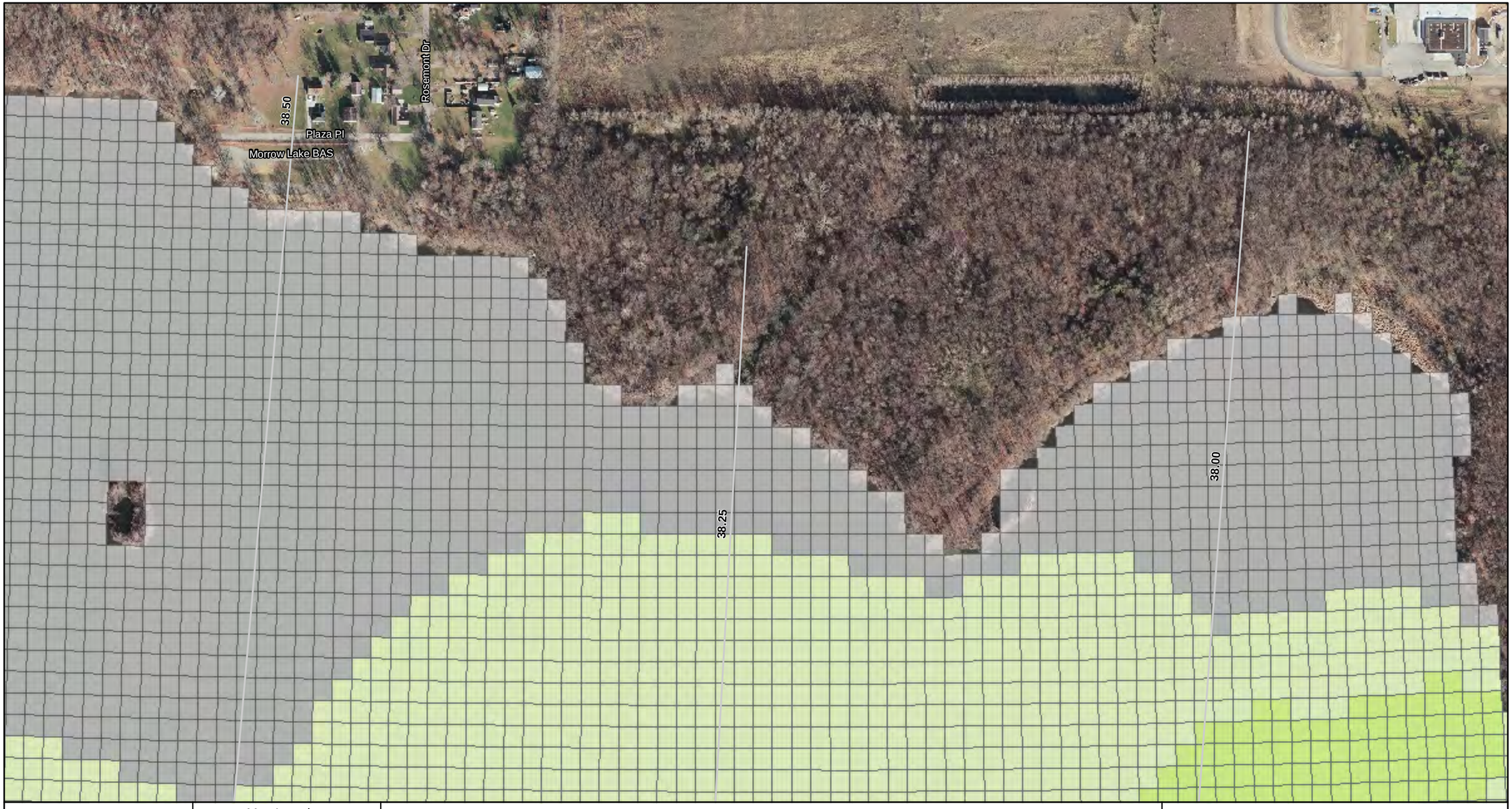
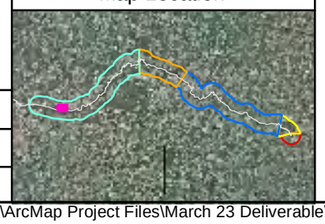
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 37.80 - MP 38.60N

SHEET 50 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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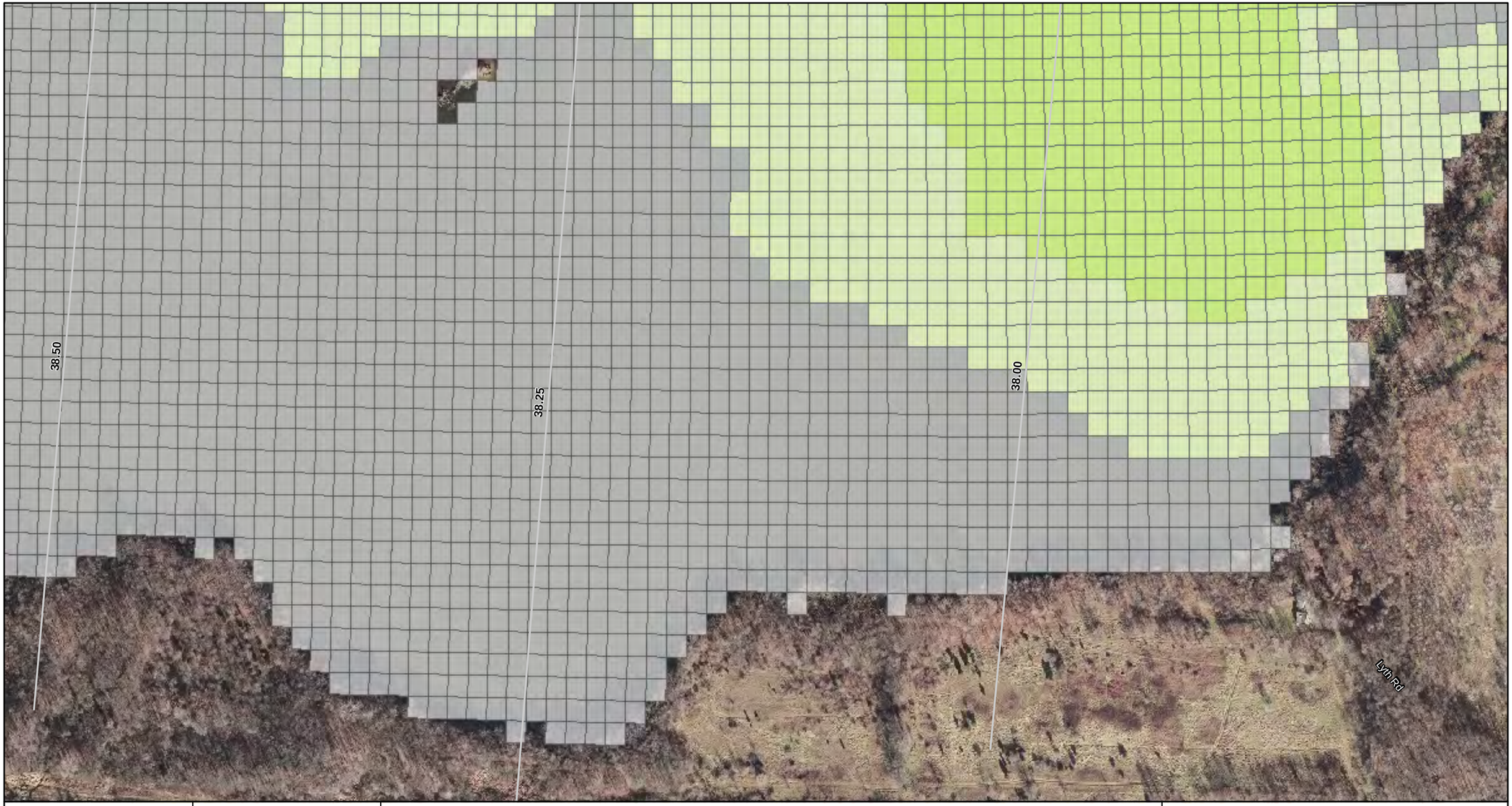
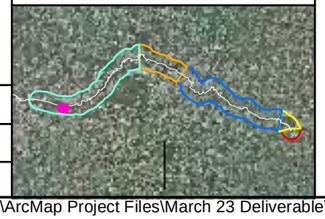
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 37.80 - MP 38.60S

SHEET 51 OF 56

ENBRIDGE LINE 6B MP 608
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ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

39.00

38.50

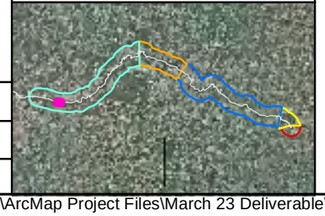
38.75

38.25

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 38.25 - MP 39.00C

SHEET 52 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Lawndale Ave

39.25

39.00

38.75

38.50

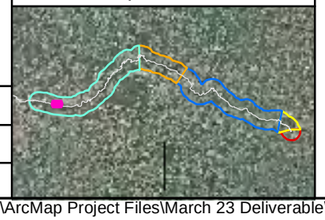
Plaza Pl

Morrow Lake BAS

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 38.50 - MP 39.25N

SHEET 53 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

39.25

39.00

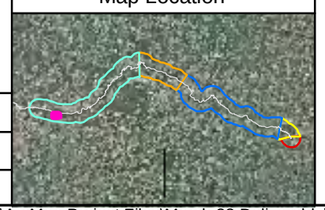
38.75

38.50

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 38.50 - MP 39.25S

SHEET 54 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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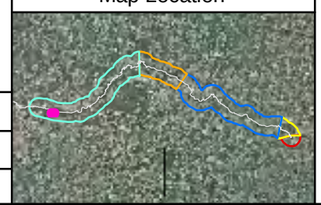
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 38.90 - MP 39.60S

SHEET 55 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/2/2012
Approved:	DBR	4/2/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
APRIL 9 - APRIL 16, 2011

MP 39.15 - MP 39.85

SHEET 56 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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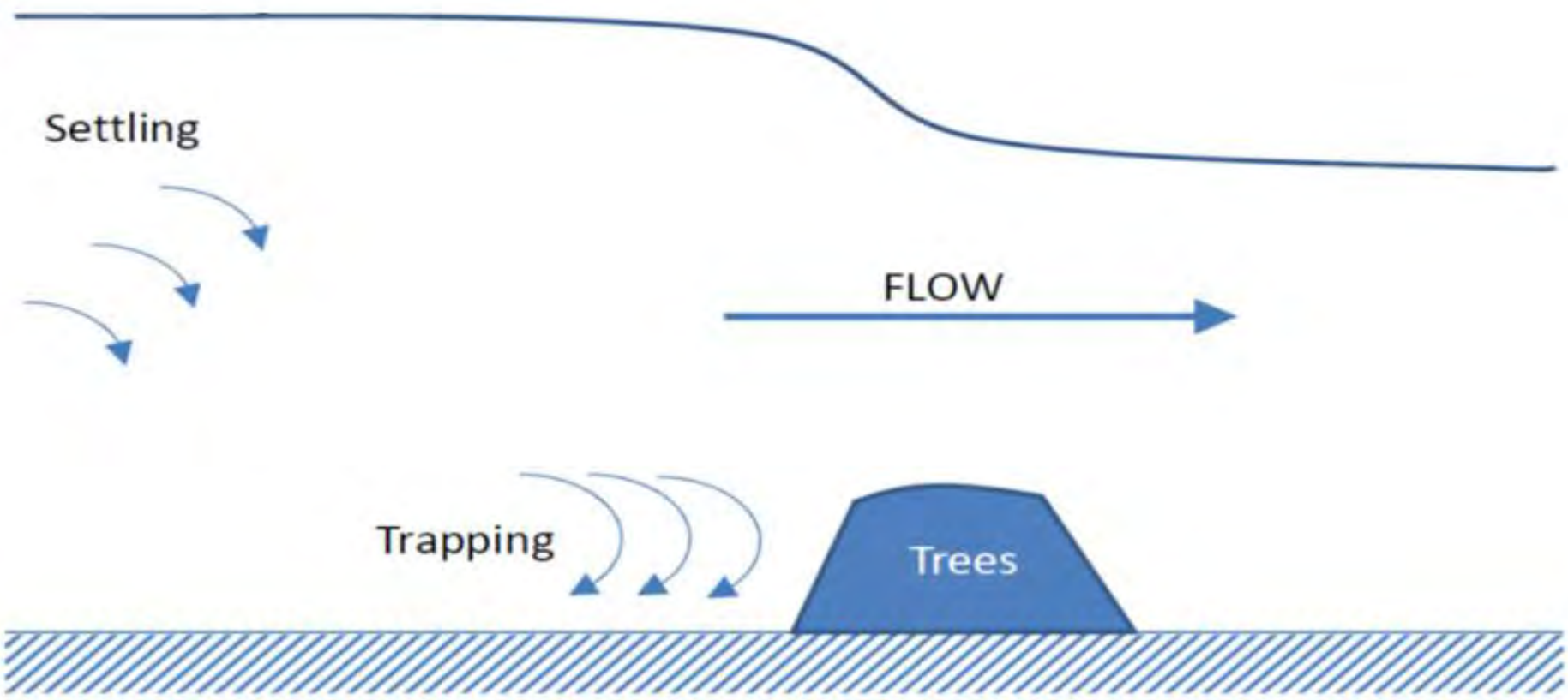
Aerial Photography Date: November 2011

Figure 7-1

Sediment Trap Diagram



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	JLH 4/17/2012
Project #:	106-4186

SEDIMENT TRAP DIAGRAM

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 7-2

Change in Sedimentation Rate Between No Structure and 99% Structure, October 31 – November 7, 2011

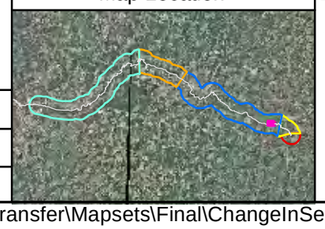
Sheets 1 through 16

No Structures	
Average Velocity (Feet Per Second)	0.05
Average Shear Stress (Pascals)	0.16
99% Structure	
Average Velocity (Feet Per Second)	0.05
Average Shear Stress (Pascals)	0.12

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

3.25 R1

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

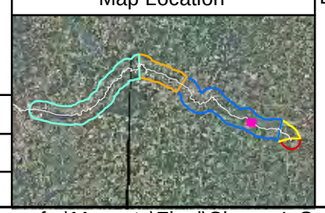
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.36
Average Shear Stress (Pascals)	0.44
99% Structure	
Average Velocity (Feet Per Second)	0.35
Average Shear Stress (Pascals)	0.43

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 55 110 220

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

CERESCO

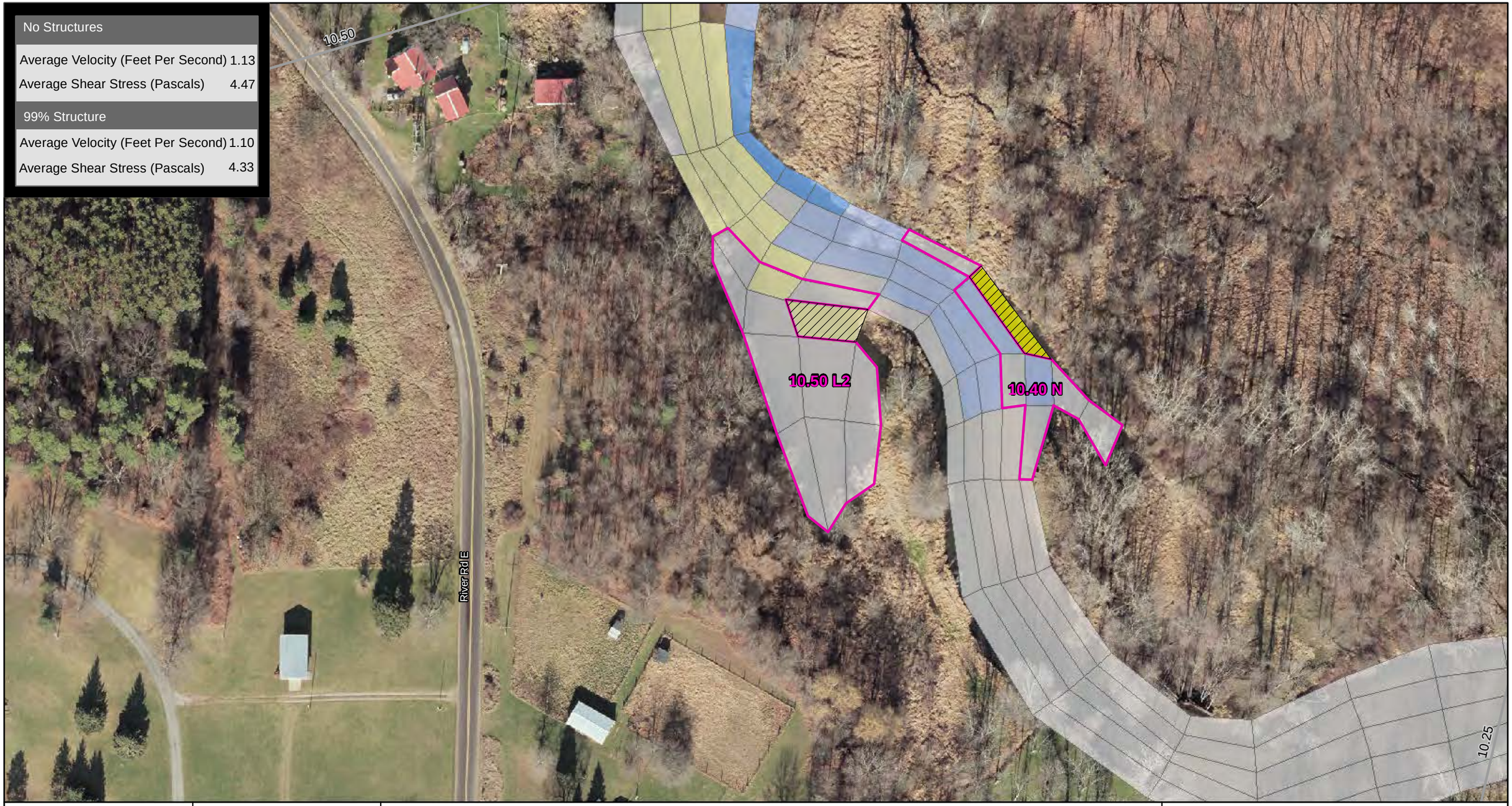
SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

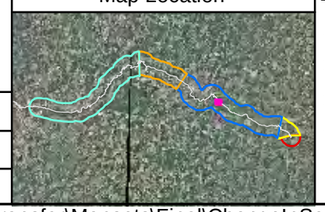
No Structures	
Average Velocity (Feet Per Second)	1.13
Average Shear Stress (Pascals)	4.47
99% Structure	
Average Velocity (Feet Per Second)	1.10
Average Shear Stress (Pascals)	4.33



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

10.40 N

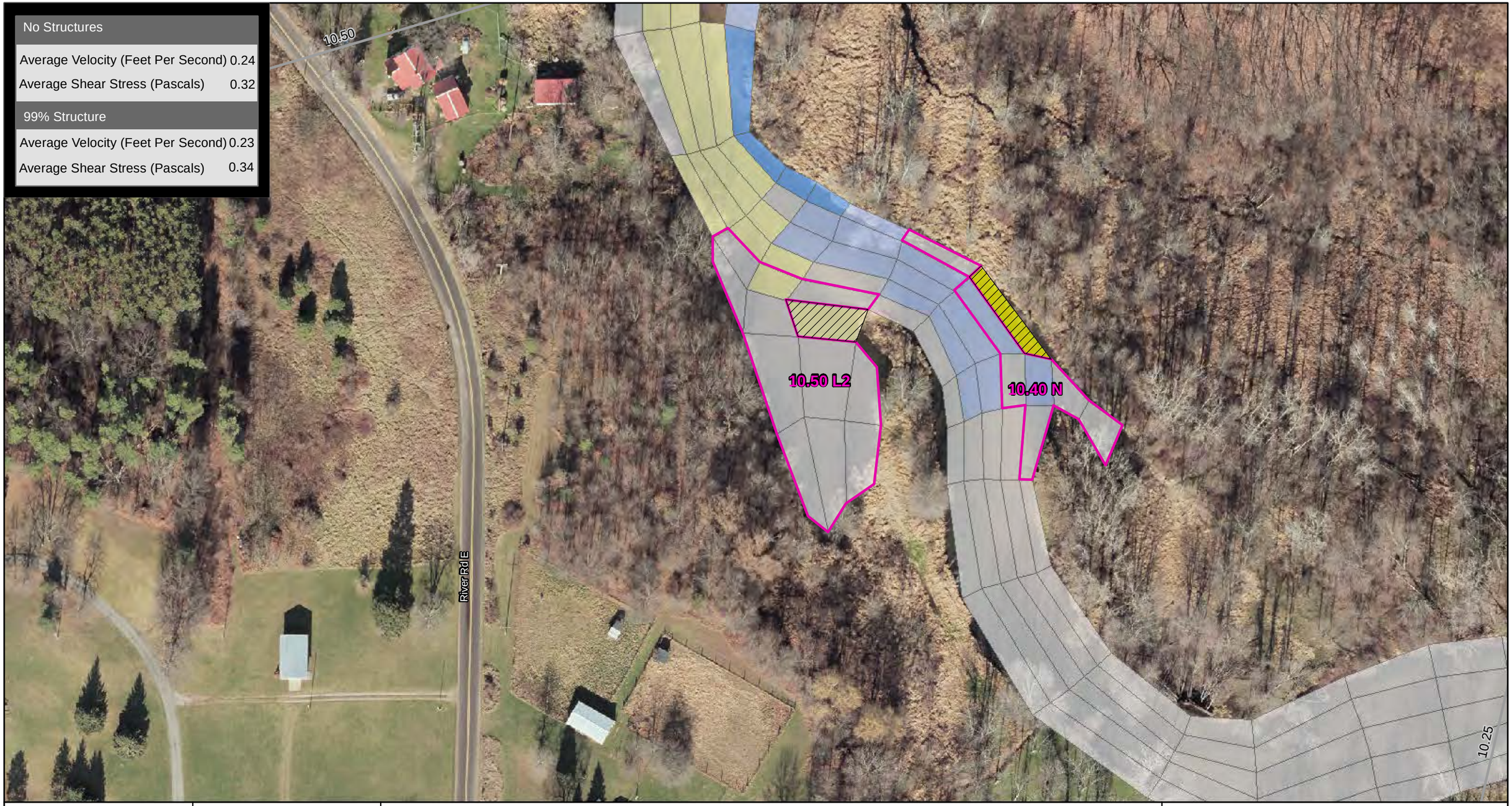
SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

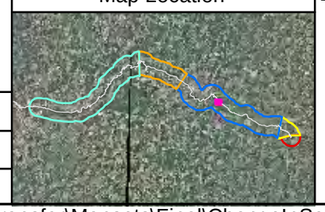
No Structures	
Average Velocity (Feet Per Second)	0.24
Average Shear Stress (Pascals)	0.32
99% Structure	
Average Velocity (Feet Per Second)	0.23
Average Shear Stress (Pascals)	0.34



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

10.50 L2

SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00
99% Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00

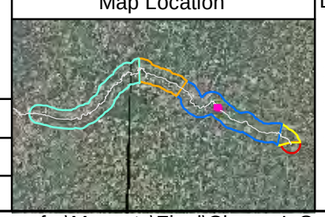
River Rd E

10.75 LDB

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

10.75 LDB

SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.46
Average Shear Stress (Pascals)	0.55
99% Structure	
Average Velocity (Feet Per Second)	0.44
Average Shear Stress (Pascals)	0.51

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

14.75 RDB

SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.09
Average Shear Stress (Pascals)	0.09
99% Structure	
Average Velocity (Feet Per Second)	0.09
Average Shear Stress (Pascals)	0.08

ENBRIDGE

Drawn: MB 4/17/2012

Approved: BRS 4/17/2012

Project #: 106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

19.25 LDB

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

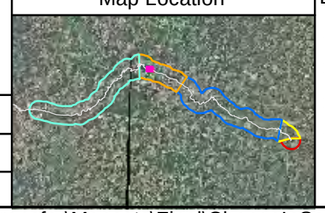
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.26
Average Shear Stress (Pascals)	0.18
99% Structure	
Average Velocity (Feet Per Second)	0.26
Average Shear Stress (Pascals)	0.17

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

21.50 RDB

SHEET 8 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.31
Average Shear Stress (Pascals)	0.49
99% Structure	
Average Velocity (Feet Per Second)	0.31
Average Shear Stress (Pascals)	0.46

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

26.00 RDB

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

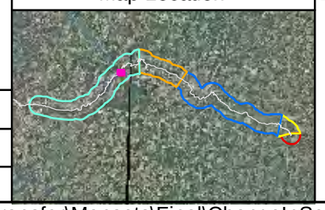
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.05
Average Shear Stress (Pascals)	0.09
99% Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

28.25 RDB

SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.05
Average Shear Stress (Pascals)	0.03
99% Structure	
Average Velocity (Feet Per Second)	0.04
Average Shear Stress (Pascals)	0.02

30.75

30.80 LDB

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

30.80 LDB

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

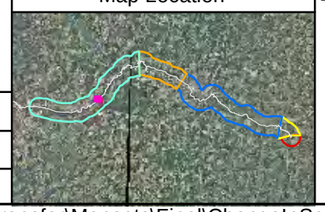
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.33
Average Shear Stress (Pascals)	0.56
99% Structure	
Average Velocity (Feet Per Second)	0.33
Average Shear Stress (Pascals)	0.55

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

33.00 A

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.27
Average Shear Stress (Pascals)	0.33
99% Structure	
Average Velocity (Feet Per Second)	0.26
Average Shear Stress (Pascals)	0.32

33.00

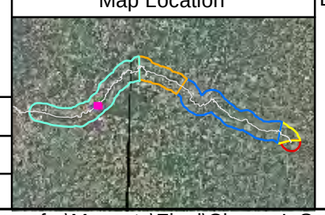
33.00 B

33.25

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

33.00 B

SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

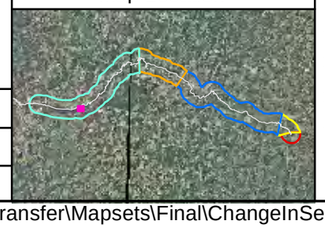
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.42
Average Shear Stress (Pascals)	0.39
99% Structure	
Average Velocity (Feet Per Second)	0.42
Average Shear Stress (Pascals)	0.38

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

36.10 NW

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

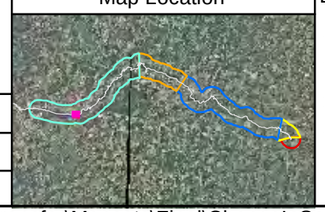
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.24
Average Shear Stress (Pascals)	0.23
99% Structure	
Average Velocity (Feet Per Second)	0.24
Average Shear Stress (Pascals)	0.22

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

DELTA A

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.06
Average Shear Stress (Pascals)	0.04
99% Structure	
Average Velocity (Feet Per Second)	0.06
Average Shear Stress (Pascals)	0.04

37.75

37.75 Islands

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

37.75 ISLANDS

SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc99.mxd

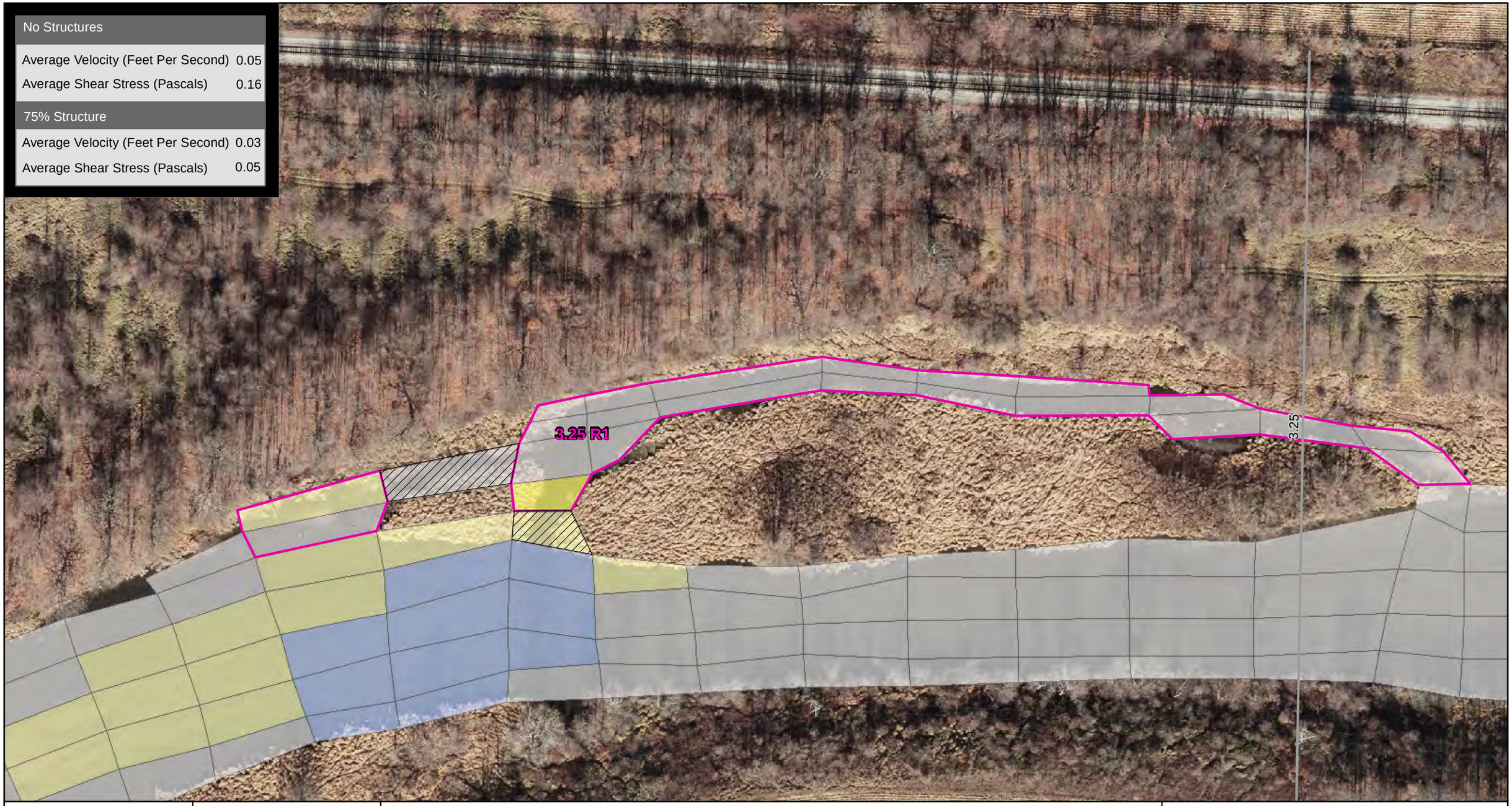
Aerial Photography Date: November 2011

Figure 7-3

Change in Sedimentation Rate Between No Structure and 75% Structure, October 31 – November 7, 2011

Sheets 1 through 16

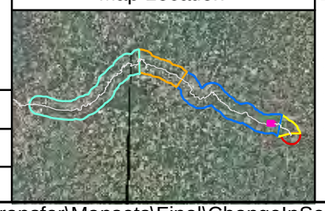
No Structures	
Average Velocity (Feet Per Second)	0.05
Average Shear Stress (Pascals)	0.16
75% Structure	
Average Velocity (Feet Per Second)	0.03
Average Shear Stress (Pascals)	0.05



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

3.25 R1

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

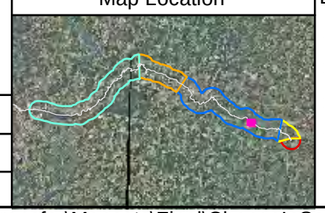
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.36
Average Shear Stress (Pascals)	0.44
75% Structure	
Average Velocity (Feet Per Second)	0.35
Average Shear Stress (Pascals)	0.44

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 55 110 220

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

CERESCO

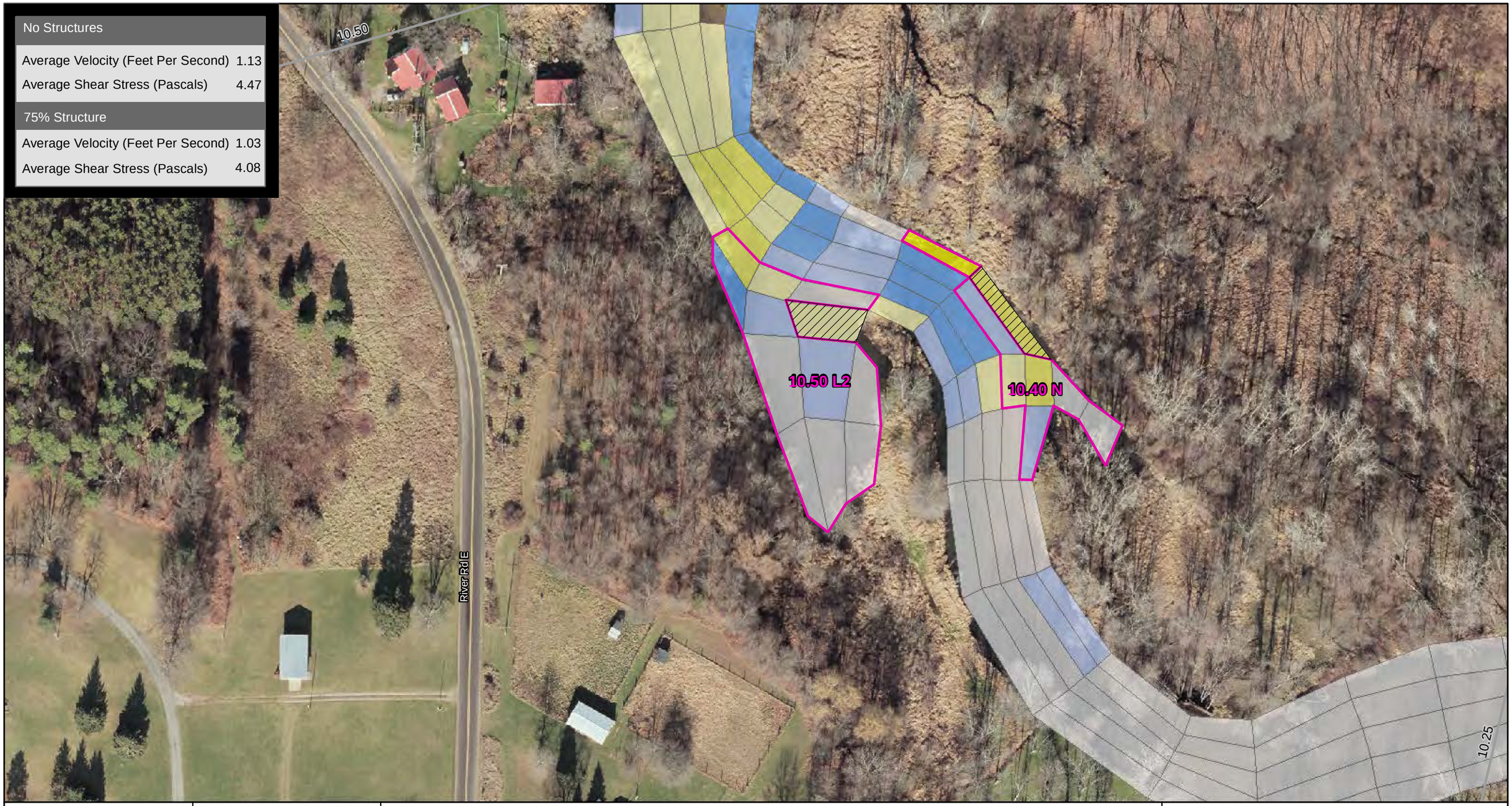
SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

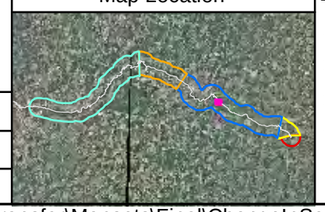
No Structures	
Average Velocity (Feet Per Second)	1.13
Average Shear Stress (Pascals)	4.47
75% Structure	
Average Velocity (Feet Per Second)	1.03
Average Shear Stress (Pascals)	4.08



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

10.40 N

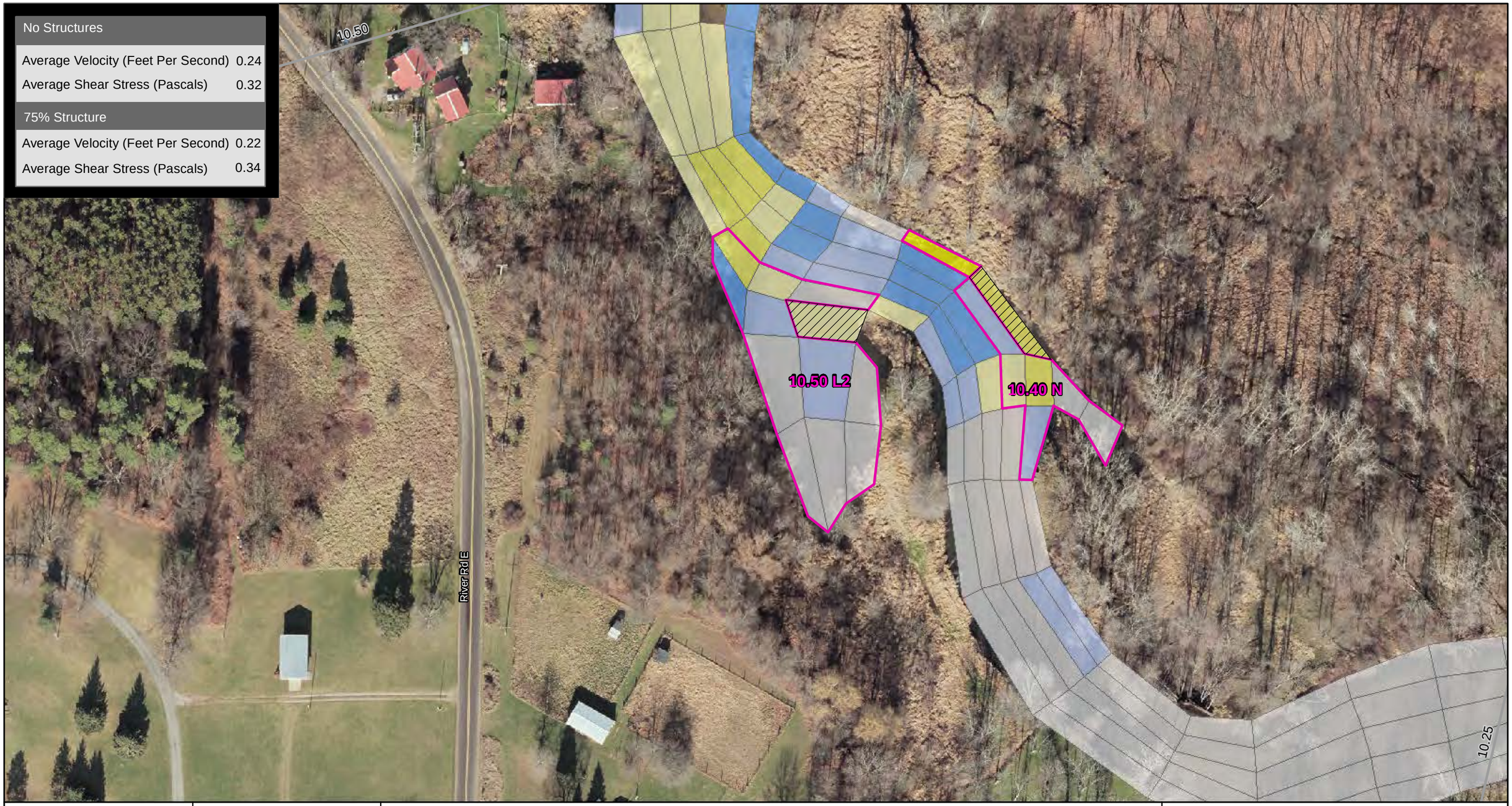
SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

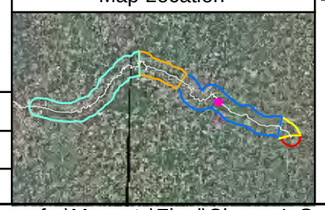
No Structures	
Average Velocity (Feet Per Second)	0.24
Average Shear Stress (Pascals)	0.32
75% Structure	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.34



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

10.50 L2

SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

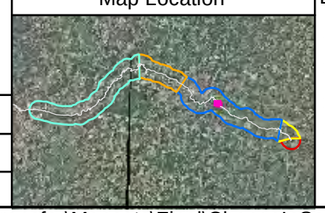
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00
75% Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

10.75 LDB

SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

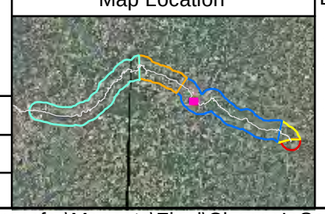
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.46
Average Shear Stress (Pascals)	0.55
75% Structure	
Average Velocity (Feet Per Second)	0.35
Average Shear Stress (Pascals)	0.31

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

14.75 RDB

SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.09
Average Shear Stress (Pascals)	0.09
75% Structure	
Average Velocity (Feet Per Second)	0.07
Average Shear Stress (Pascals)	0.05

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

19.25 LDB

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.26
Average Shear Stress (Pascals)	0.18
75% Structure	
Average Velocity (Feet Per Second)	0.20
Average Shear Stress (Pascals)	0.10

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

21.50 RDB

SHEET 8 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.31
Average Shear Stress (Pascals)	0.49
75% Structure	
Average Velocity (Feet Per Second)	0.30
Average Shear Stress (Pascals)	0.44

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

26.00 RDB

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

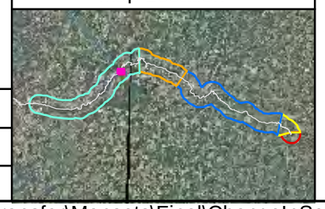
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.05
Average Shear Stress (Pascals)	0.09
75% Structure	
Average Velocity (Feet Per Second)	0.05
Average Shear Stress (Pascals)	0.09

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

28.25 RDB

SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.05
Average Shear Stress (Pascals)	0.03
75% Structure	
Average Velocity (Feet Per Second)	0.04
Average Shear Stress (Pascals)	0.01

30.75

30.80 LDB

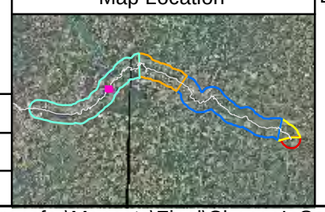
ENBRIDGE

Drawn: MB 4/17/2012

Approved: BRS 4/17/2012

Project #: 106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

30.80 LDB

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

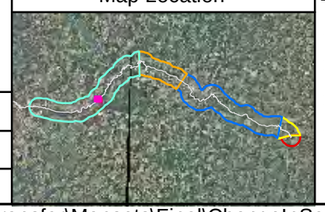
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.33
Average Shear Stress (Pascals)	0.56
75% Structure	
Average Velocity (Feet Per Second)	0.31
Average Shear Stress (Pascals)	0.51

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

33.00 A

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.27
Average Shear Stress (Pascals)	0.33
75% Structure	
Average Velocity (Feet Per Second)	0.25
Average Shear Stress (Pascals)	0.30

33.00

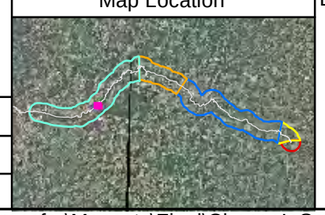
33.00 B

33.25

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

33.00 B

SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

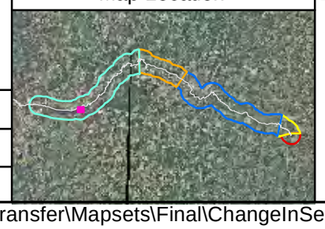
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.42
Average Shear Stress (Pascals)	0.39
75% Structure	
Average Velocity (Feet Per Second)	0.34
Average Shear Stress (Pascals)	0.26

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

36.10 NW

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

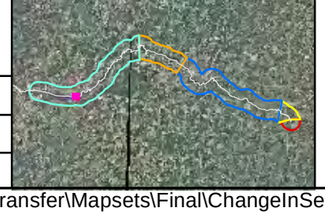
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.24
Average Shear Stress (Pascals)	0.23
75% Structure	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.19

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

DELTA A

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.06
Average Shear Stress (Pascals)	0.04
75% Structure	
Average Velocity (Feet Per Second)	0.06
Average Shear Stress (Pascals)	0.04

37.75

37.75 Islands

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

37.75 ISLANDS

SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateOct-Nov 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

Figure 7-4

Change in Sedimentation Rate Between No Structure and Coir Log Structure, October 31 – November 7, 2011

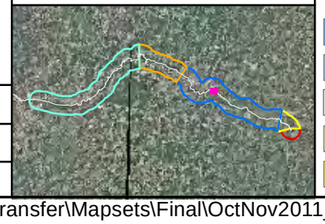
Sheets 1 through 3

No Structures	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

MP 11.21

SHEET 1 OF 3

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\OctNov2011_CoirLog.mxd

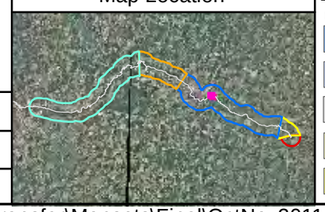
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

MP 11.78

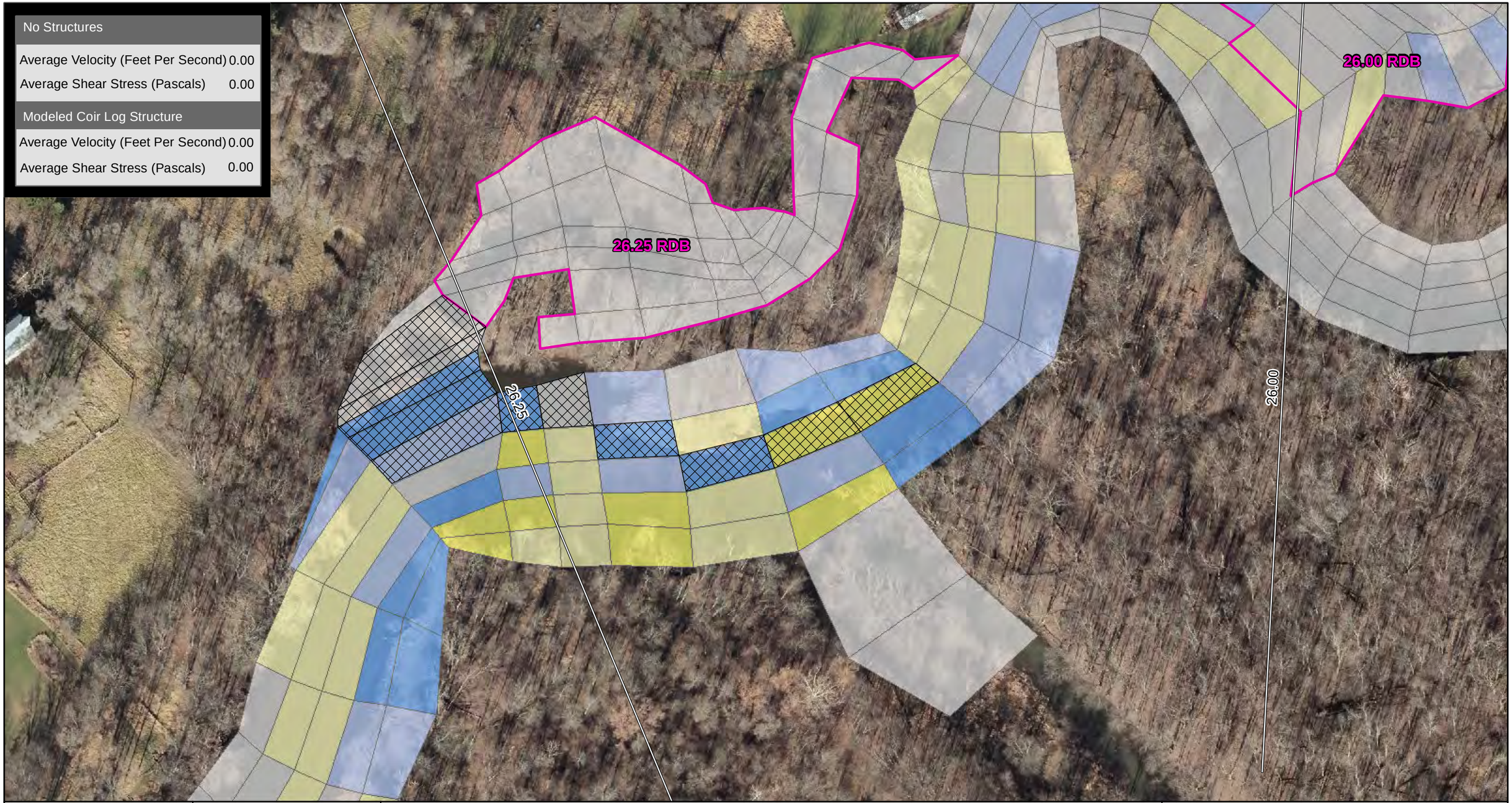
SHEET 2 OF 3

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\OctNov2011_CoirLog.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
OCTOBER 31 - NOVEMBER 7, 2011

26.25 RDB

SHEET 3 OF 3

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\OctNov2011_CoirLog.mxd

Aerial Photography Date: November 2011

Figure 7-5

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, October 31 – November 7, 2011

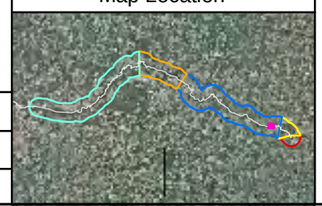
99% vs. No Structures

Sheets 1 through 19

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
3.25 R1

SHEET 1 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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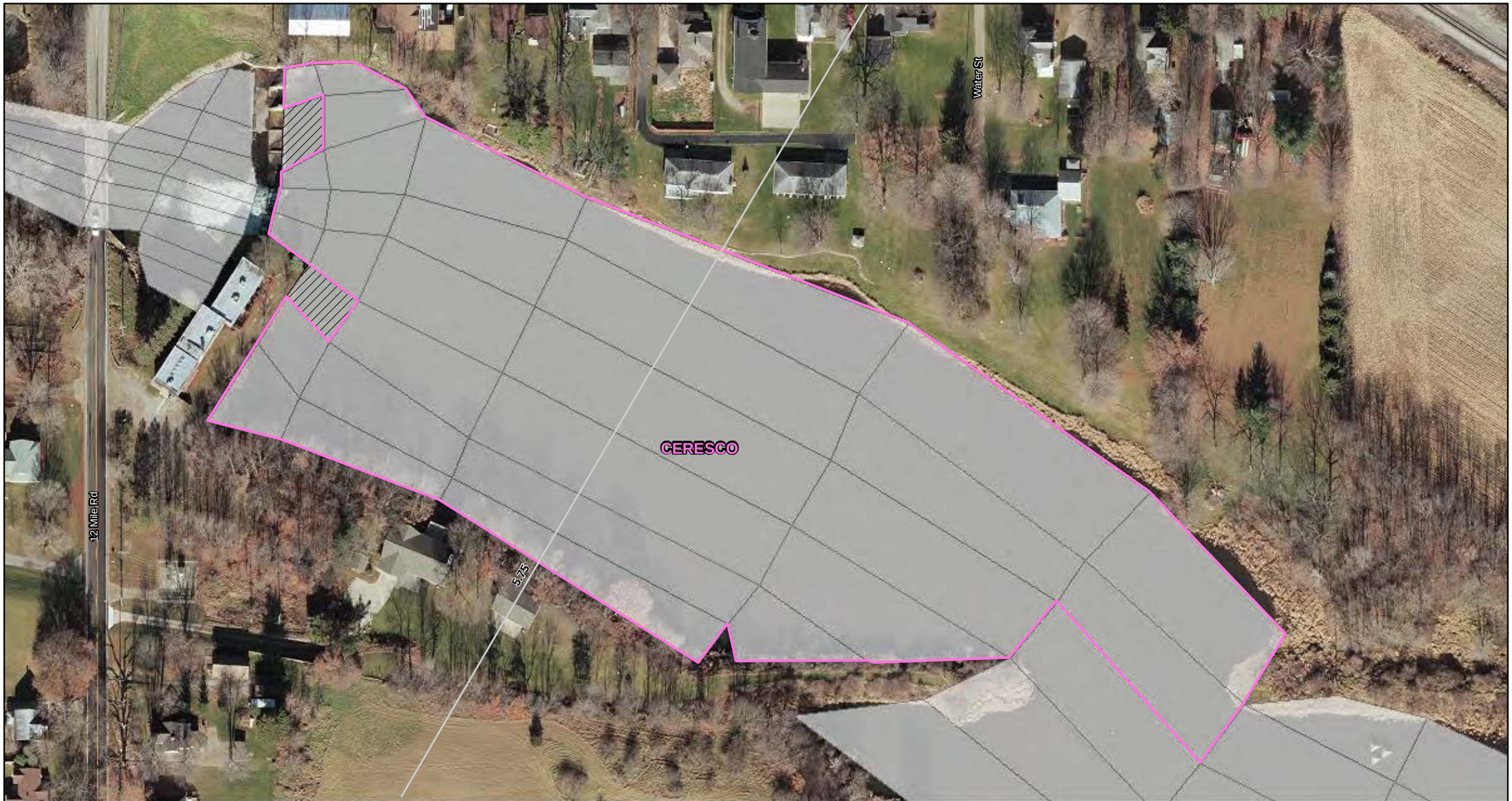
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
CERESCO

SHEET 2 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsA1-A2_Oct-Nov_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
10.40 N & 10.50 L2

SHEET 3 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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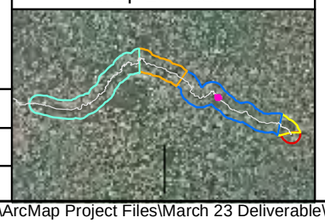
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
10.75 LDB

SHEET 4 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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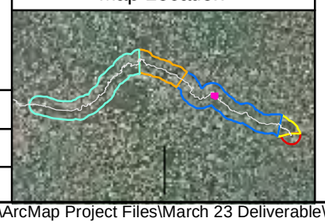
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
MP 11.21

SHEET 5 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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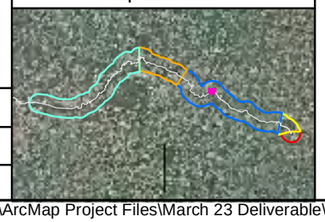
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
MP 11.78

SHEET 6 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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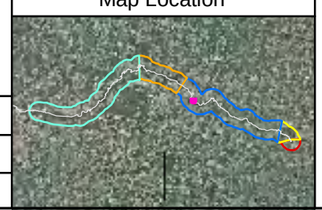
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
14.75 RDB North

SHEET 7 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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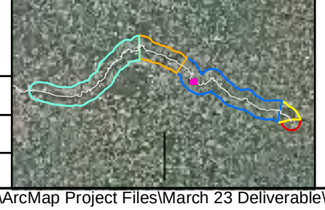
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
14.75 RDB South

SHEET 8 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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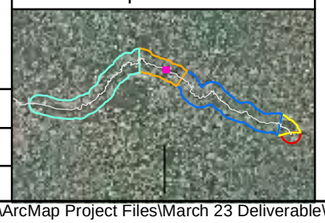
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
19.25 LDB North

SHEET 9 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
19.25 LDB South
SHEET 10 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
21.50 RDB

SHEET 11 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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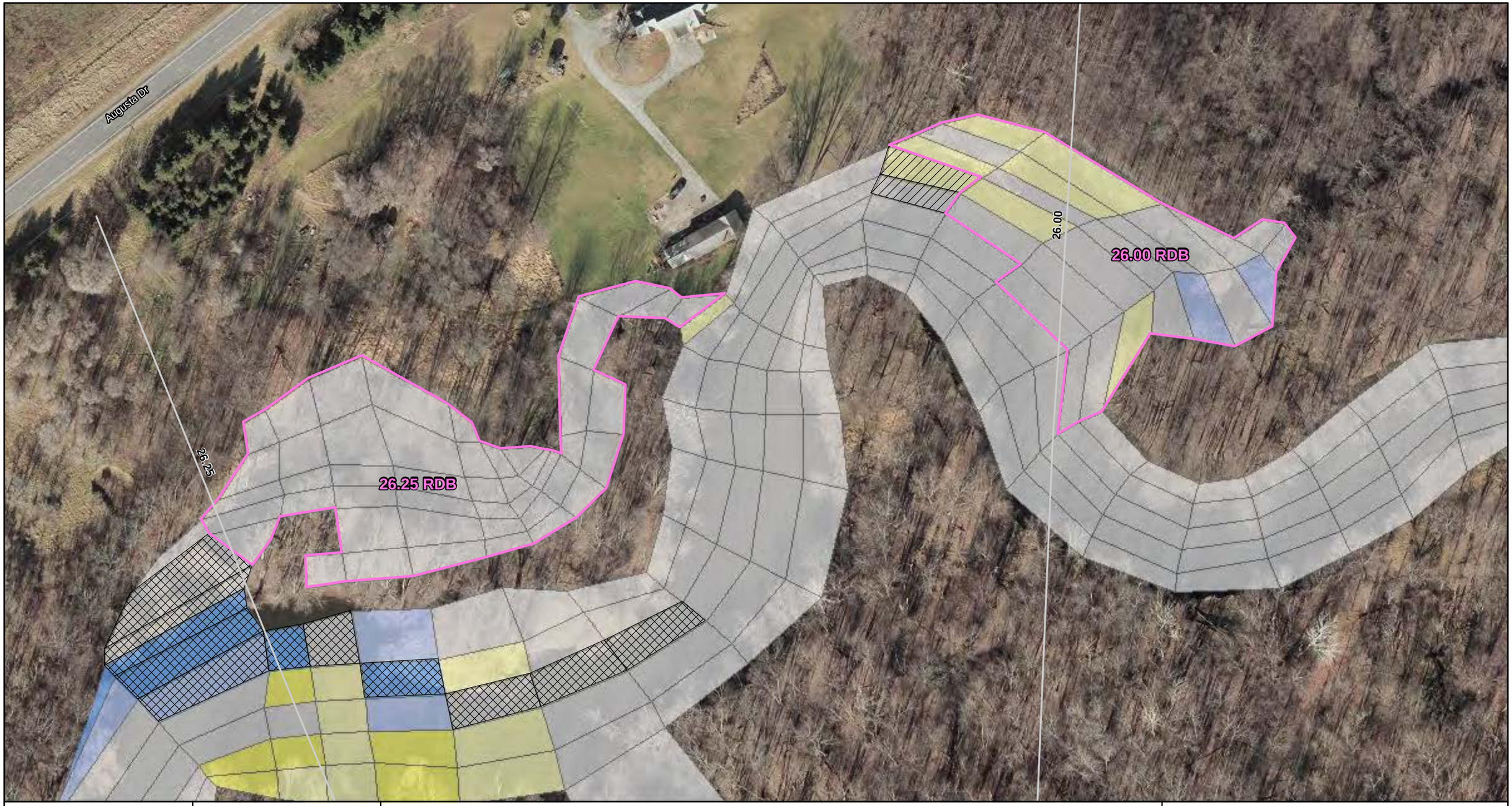
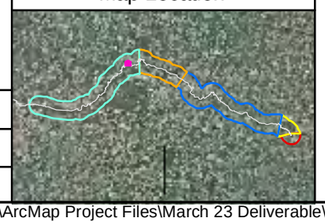
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
26.00 RDB & 26.25 RDB

SHEET 12 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

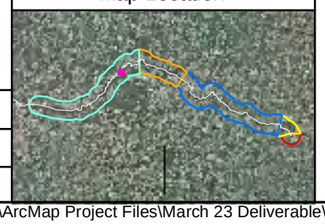
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsA1-A2_Oct-Nov_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
28.25 RDB

SHEET 13 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
30.80 LDB
SHEET 14 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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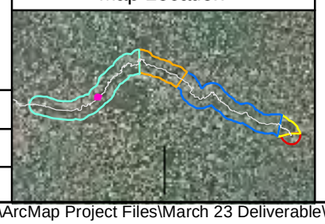
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
33.00 A

SHEET 15 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

33.00

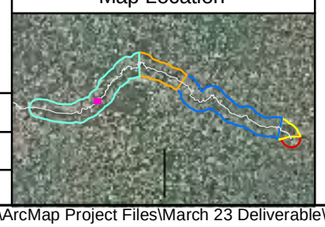
33.00 B

33.25

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
33.00 B

SHEET 16 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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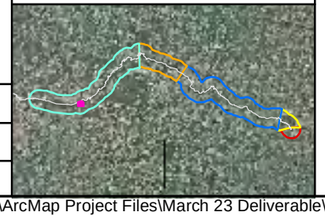
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
36.10 NW

SHEET 17 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
DELTA A

SHEET 18 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

37.75

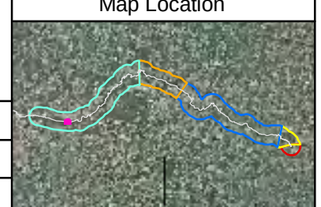
37.75 ISLANDS

37.50

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% VS. NO STRUCTURES
37.75 ISLANDS

SHEET 19 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

Figure 7-6

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, October 31 – November 7, 2011

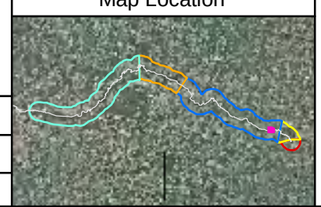
75% vs. No Structures

Sheets 1 through 19

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
3.25 R1
SHEET 1 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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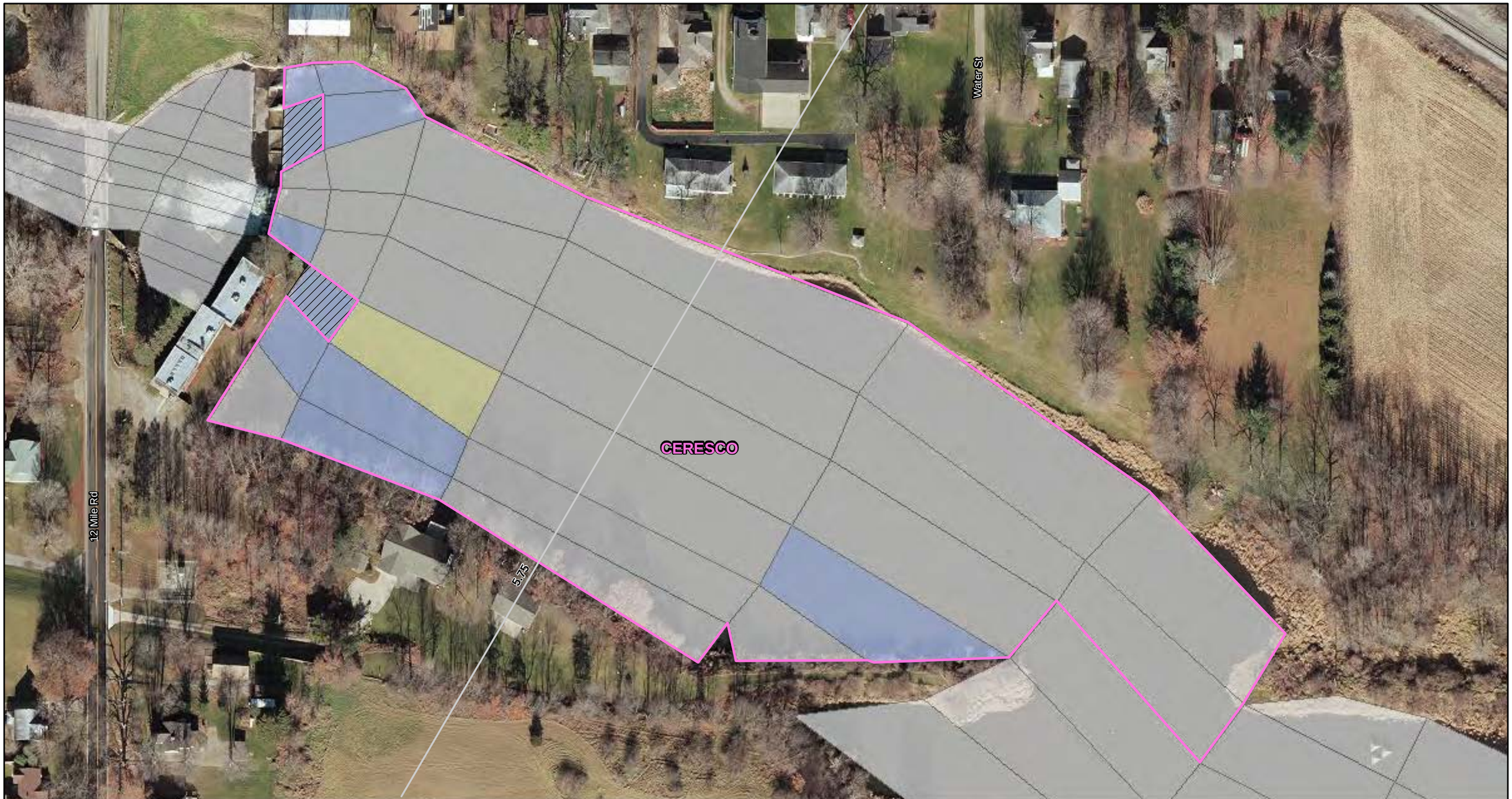
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
CERESCO
SHEET 2 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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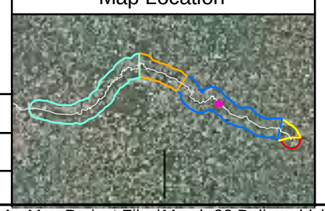
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
10.40 N & 10.50 L2
SHEET 3 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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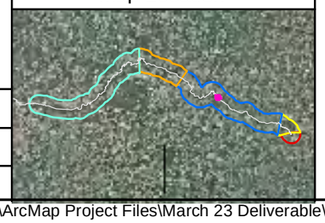
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
10.75 LDB
SHEET 4 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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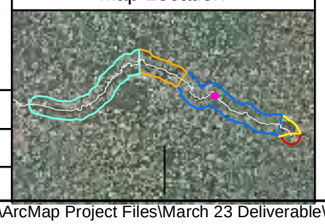
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
MP 11.21
SHEET 5 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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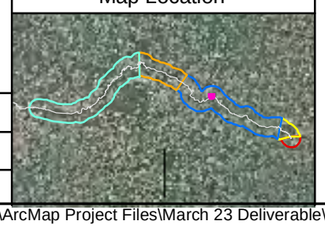
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
MP 11.78
SHEET 6 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
14.75 RDB North
SHEET 7 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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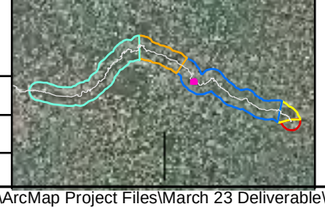
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
14.75 RDB South
SHEET 8 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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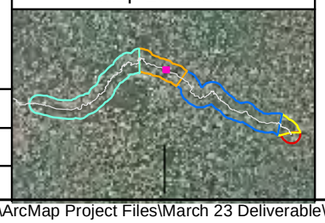
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
19.25 LDB North
SHEET 9 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsA1-A3_Oct-Nov_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

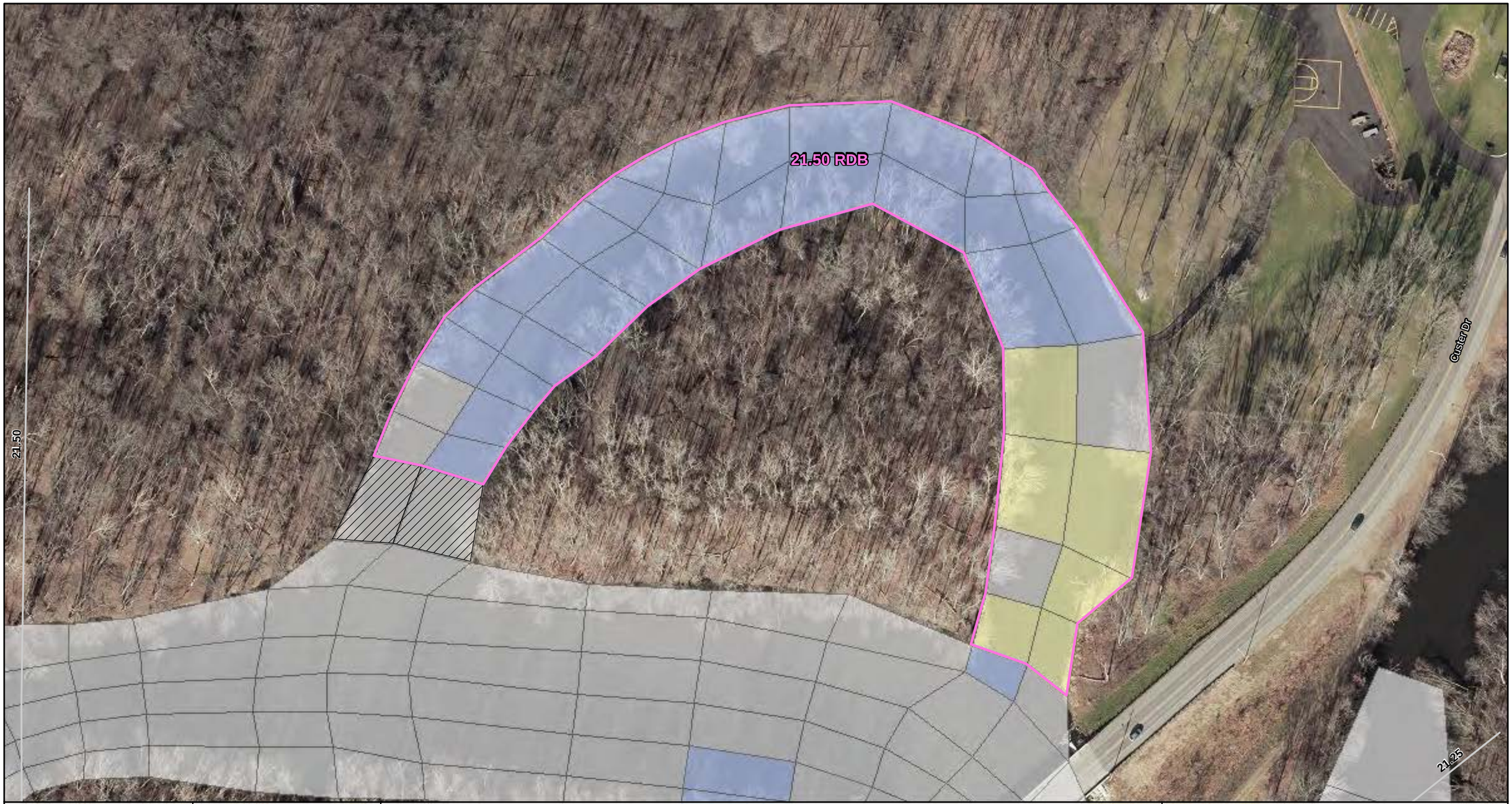
0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
19.25 LDB South
SHEET 10 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsA1-A3_Oct-Nov_2011.mxd

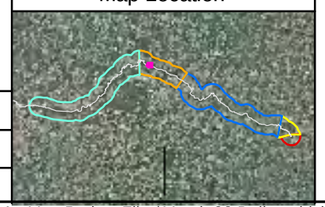
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
21.50 RDB
SHEET 11 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Augusta Dr

26.25

26.25 RDB

26.00

26.00 RDB

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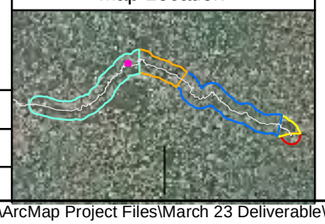
Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
26.00 RDB & 26.25 RDB
SHEET 12 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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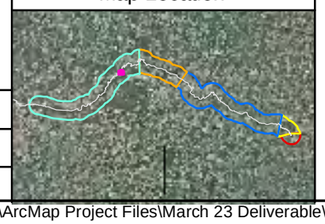
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
28.25 RDB
SHEET 13 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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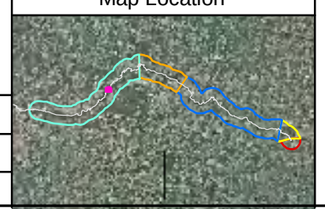
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
30.80 LDB
SHEET 14 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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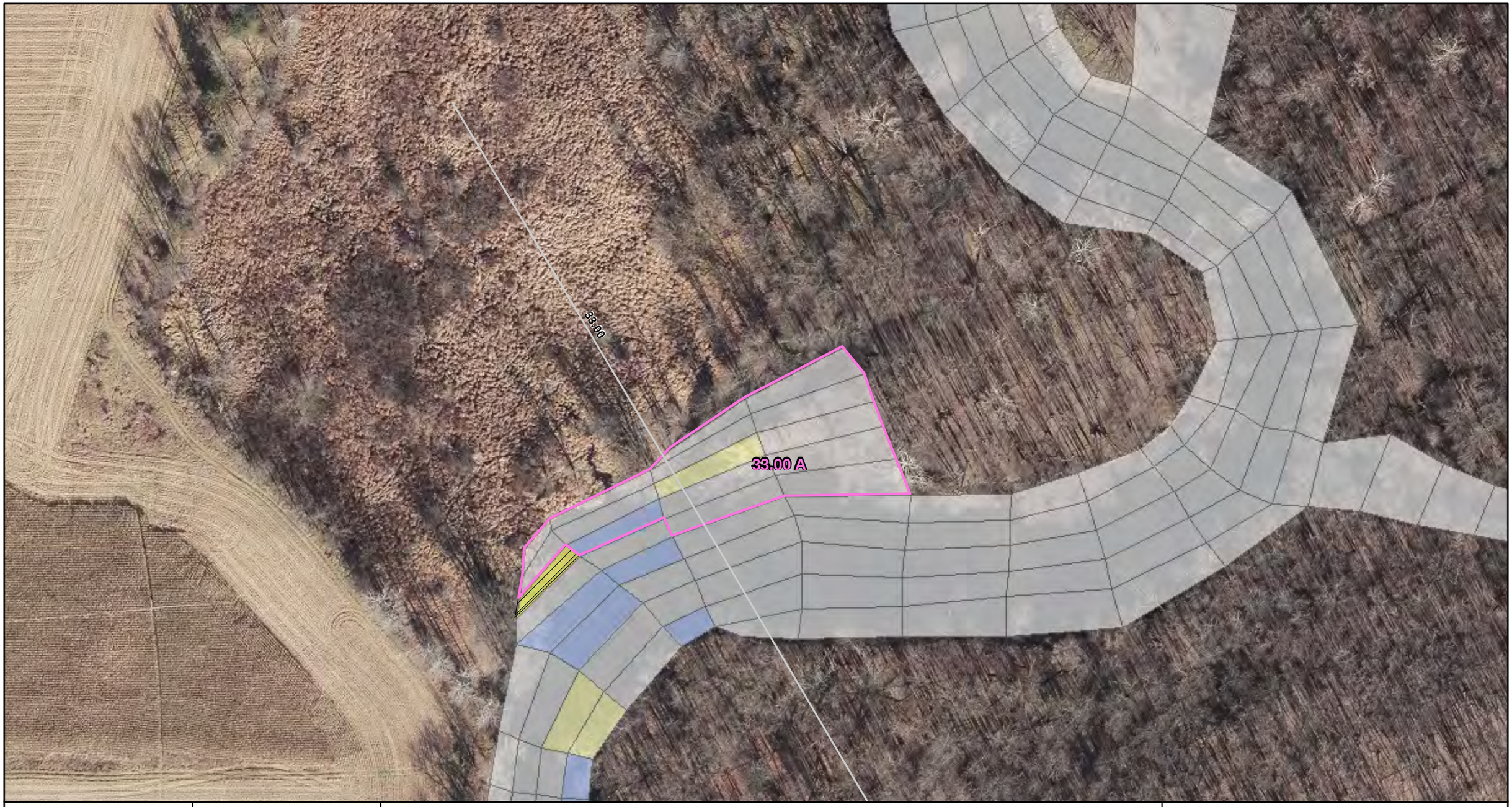
Aerial Photography Date: November 2011



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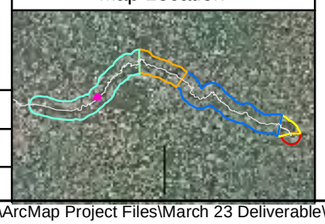
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
33.00 A
SHEET 15 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

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Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
33.00 B
SHEET 16 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

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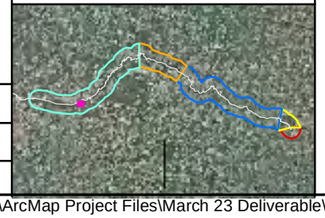
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
36.10 NW
SHEET 17 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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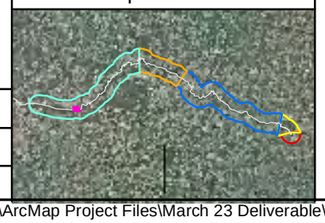
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
DELTA A
SHEET 18 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

37.75

37.75 ISLANDS

37.50

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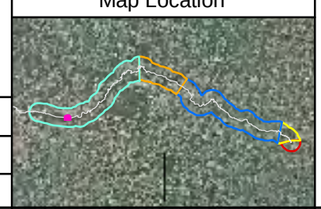
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
37.75 ISLANDS
SHEET 19 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

Figure 7-7

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, October 31 – November 7, 2011

No Structure

Sheets 1 through 19

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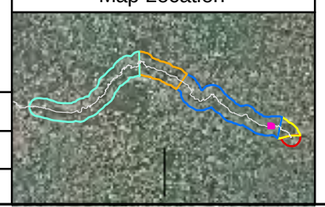
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
3.25 R1
SHEET 1 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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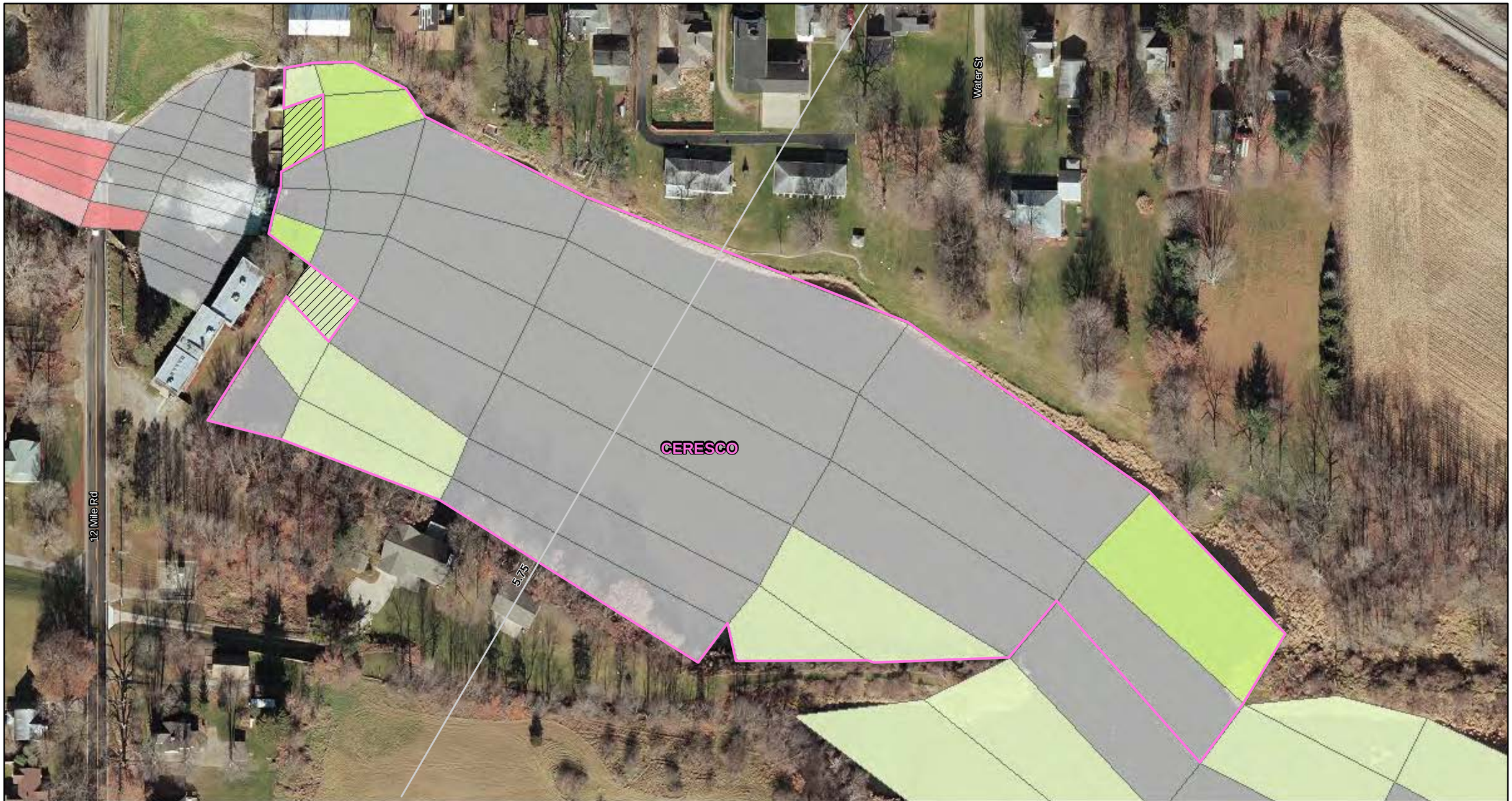
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
CERESCO
SHEET 2 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

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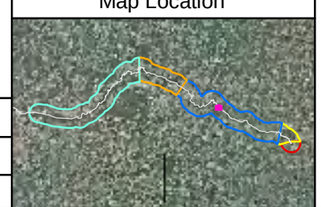
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
10.40 N & 10.50 L2
SHEET 3 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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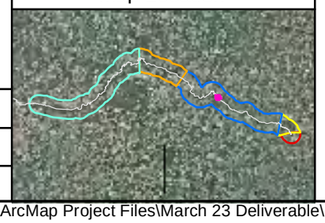
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
10.75 LDB
SHEET 4 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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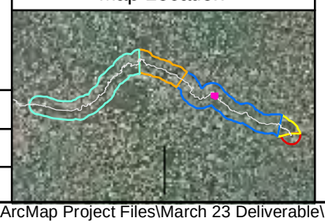
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
MP 11.21
SHEET 5 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
MP 11.78
SHEET 6 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

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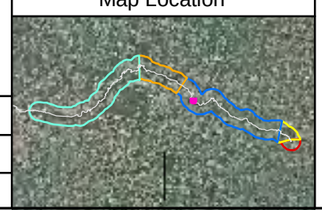
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
14.75 RDB North
SHEET 7 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

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Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
14.75 RDB South
SHEET 8 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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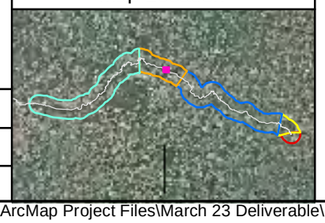
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
19.25 LDB North
SHEET 9 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
19.25 LDB South
SHEET 10 OF 19
ENBRIDGE LINE 6B MP 608
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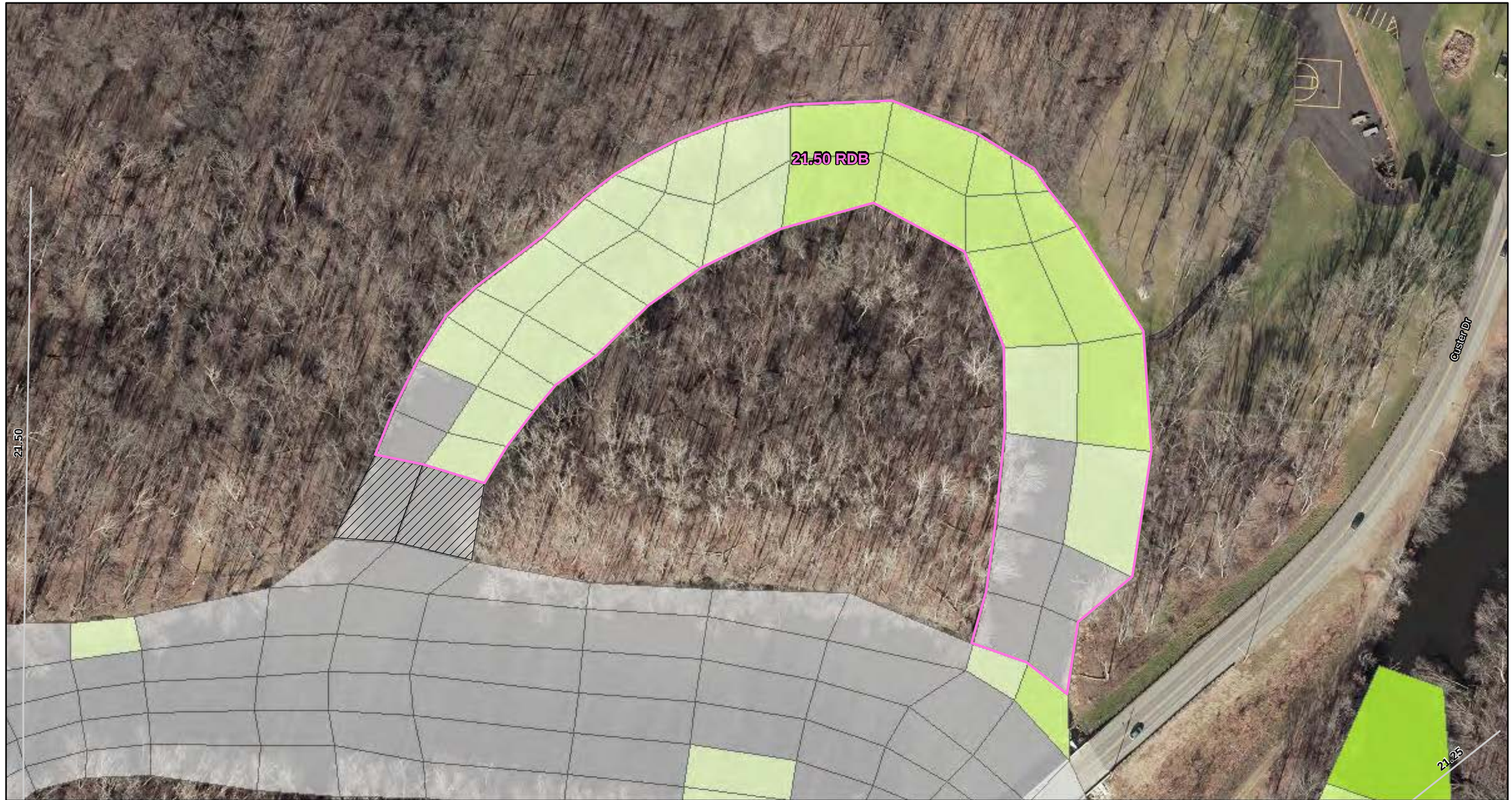
Aerial Photography Date: November 2011



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Drawn:	BRS	4/1/2012
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Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
21.50 RDB
SHEET 11 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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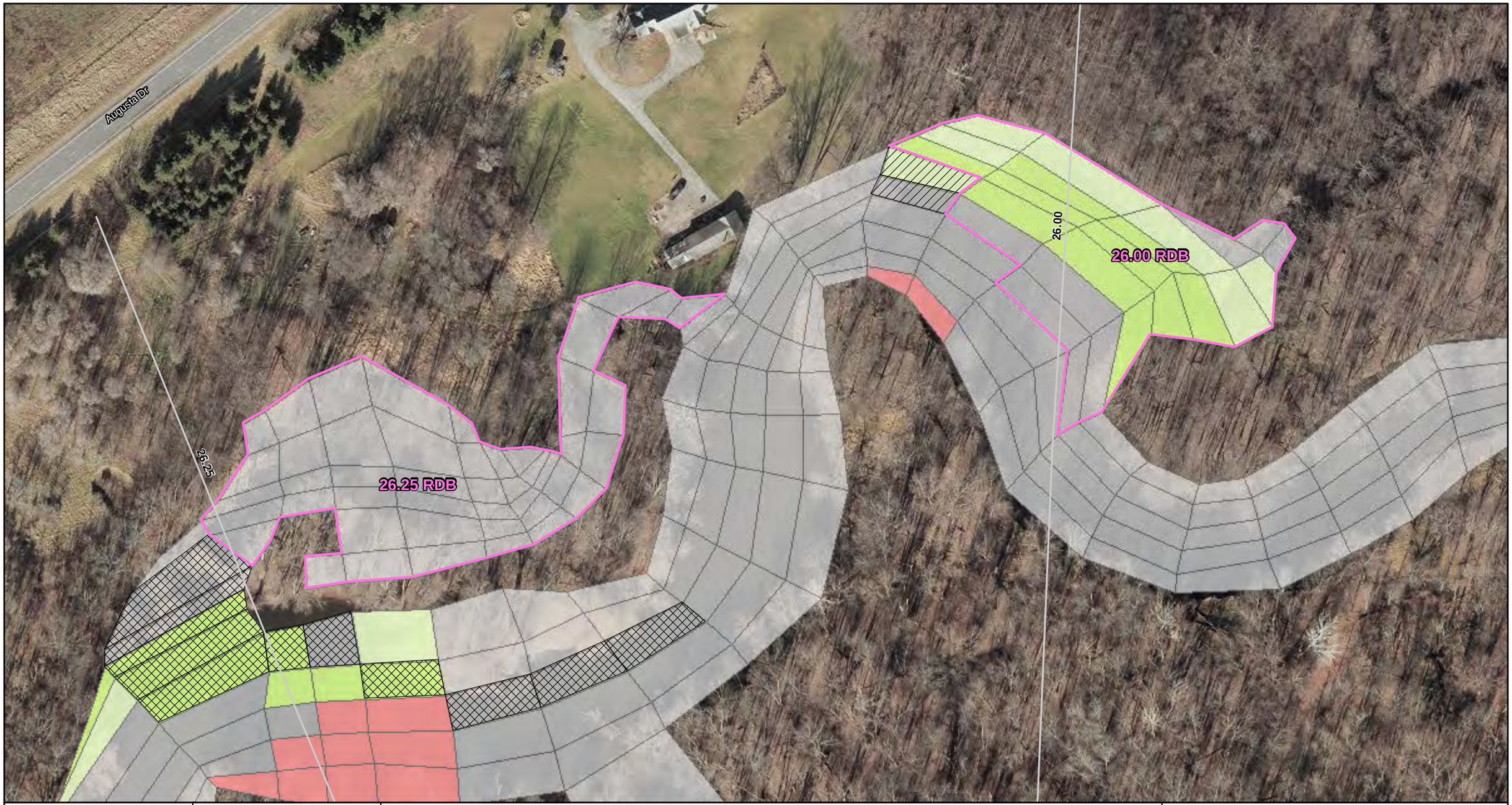
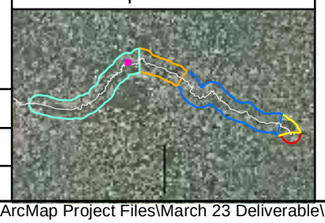
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
26.00 RDB & 26.25 RDB
SHEET 12 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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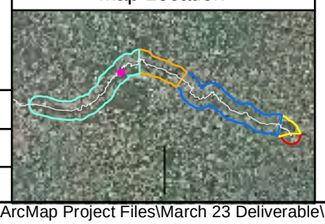
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass
- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200
Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
28.25 RDB
SHEET 13 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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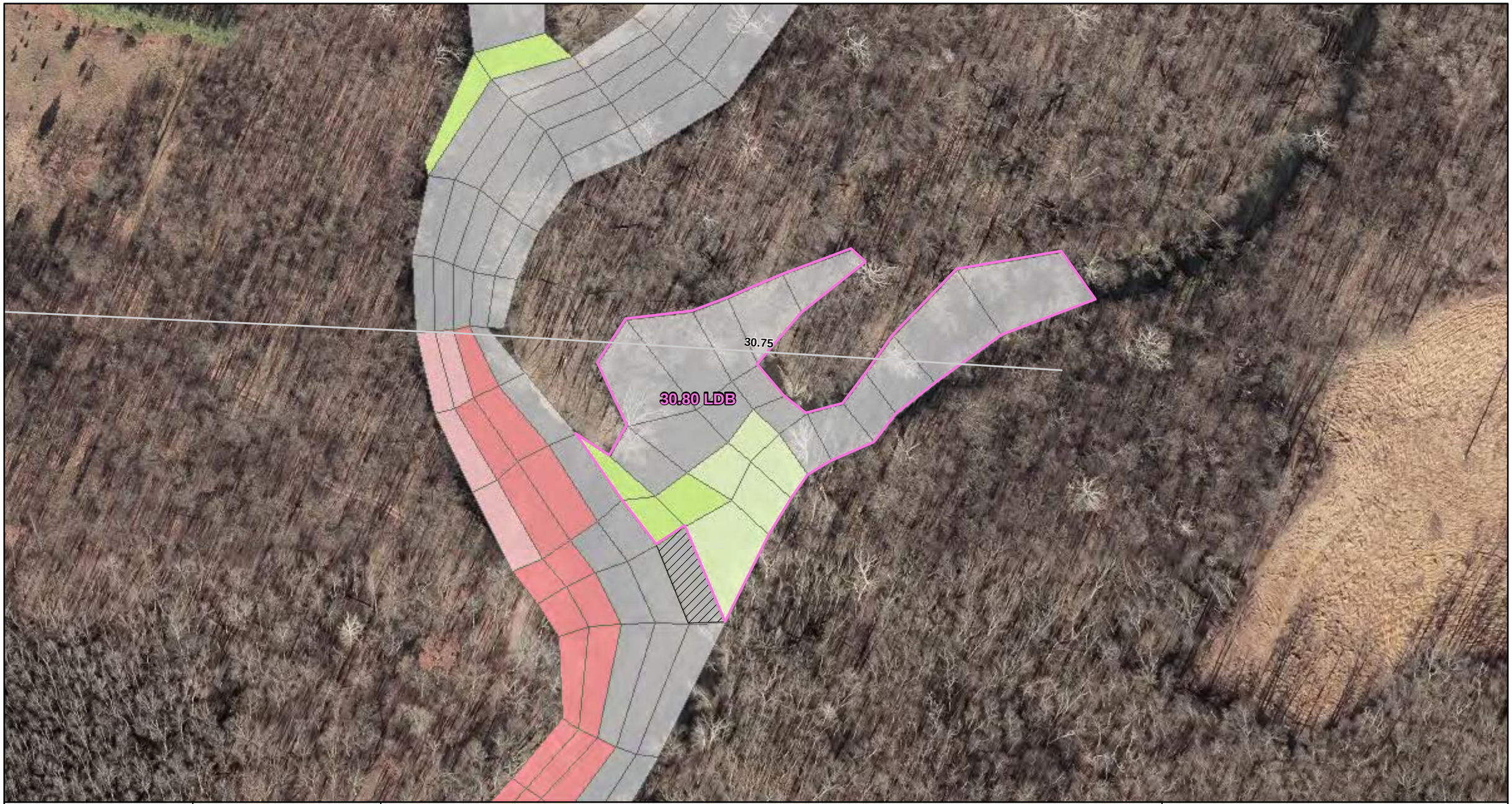
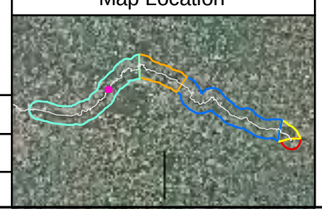
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
30.80 LDB
SHEET 14 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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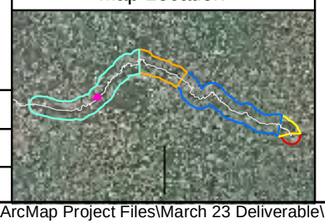
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
33.00 A
SHEET 15 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

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Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
33.00 B
SHEET 16 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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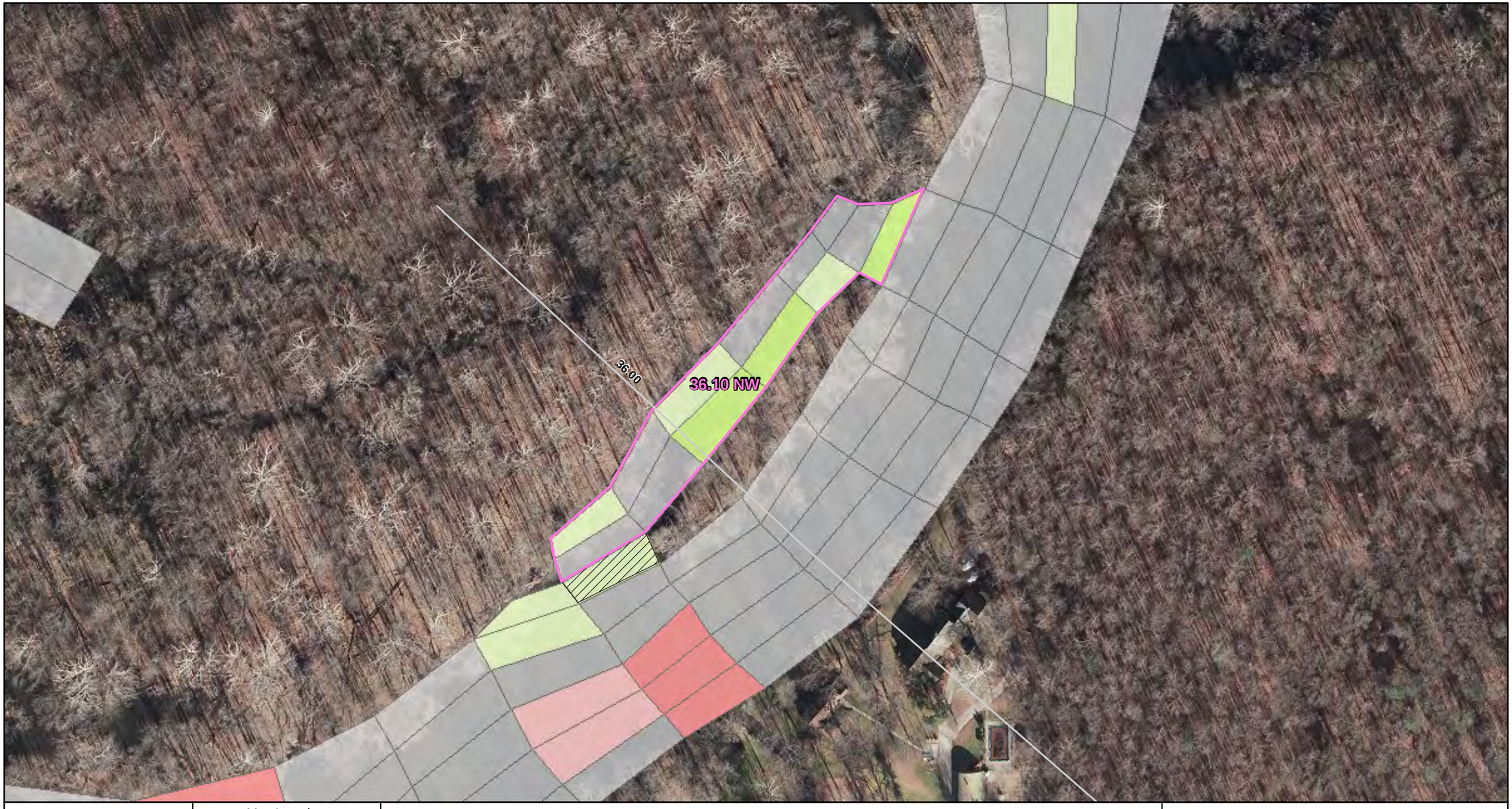
Aerial Photography Date: November 2011



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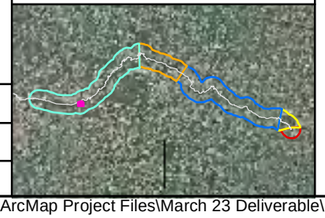
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
36.10 NW
SHEET 17 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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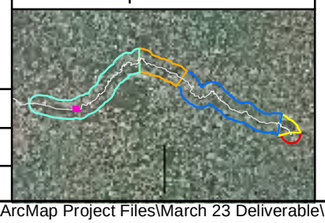
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
DELTA A
SHEET 18 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

37.75

37.75 ISLANDS

37.50

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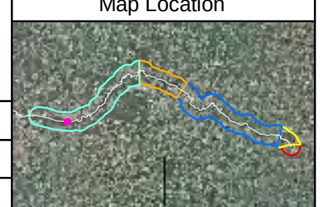
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
NO STRUCTURE
37.75 ISLANDS
SHEET 19 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

Figure 7-8

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, October 31 – November 7, 2011

99% Structure

Sheets 1 through 19

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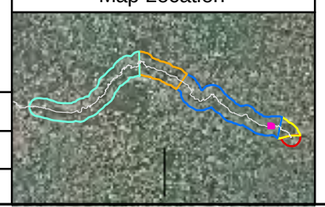
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
3.25 R1
SHEET 1 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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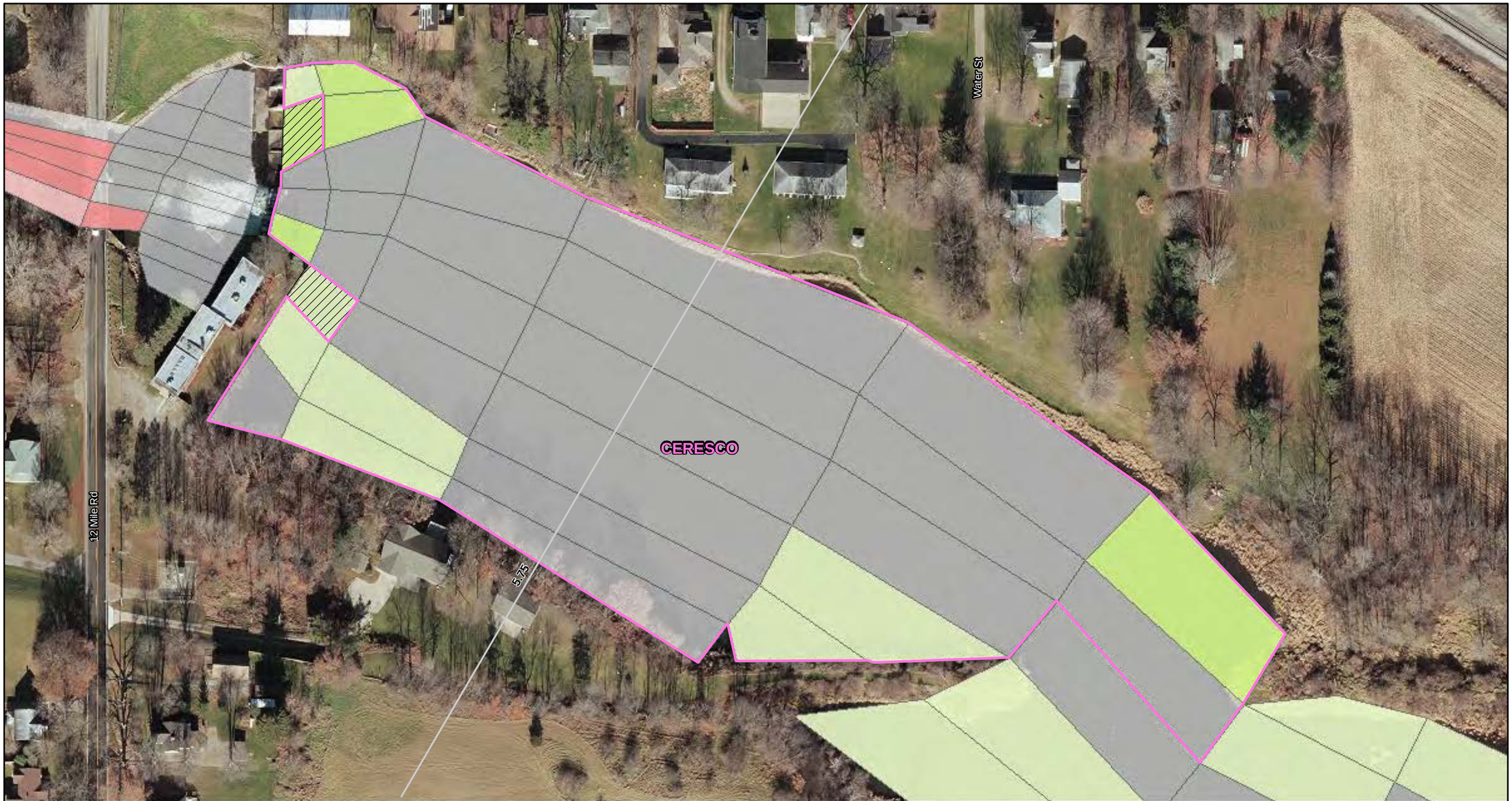
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
CERESCO
SHEET 2 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

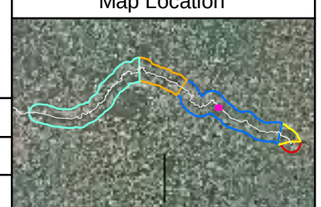
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_Traps99_Oct-Nov_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
10.40 N & 10.50 L2
SHEET 3 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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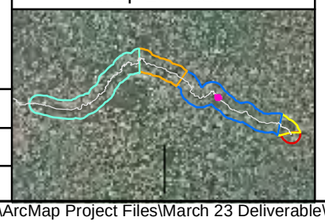
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
10.75 LDB
SHEET 4 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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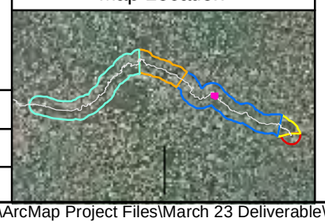
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
MP 11.21
SHEET 5 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
MP 11.78
SHEET 6 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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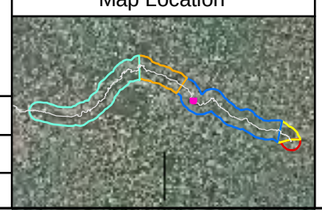
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
14.75 RDB North
SHEET 7 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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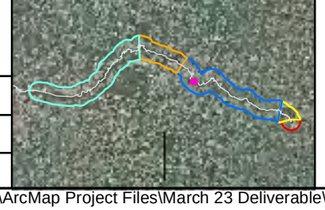
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
14.75 RDB South
SHEET 8 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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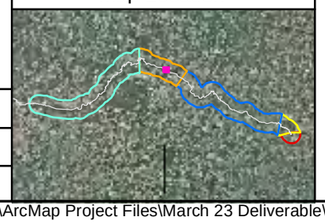
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
19.25 LDB North
SHEET 9 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
19.25 LDB South
SHEET 10 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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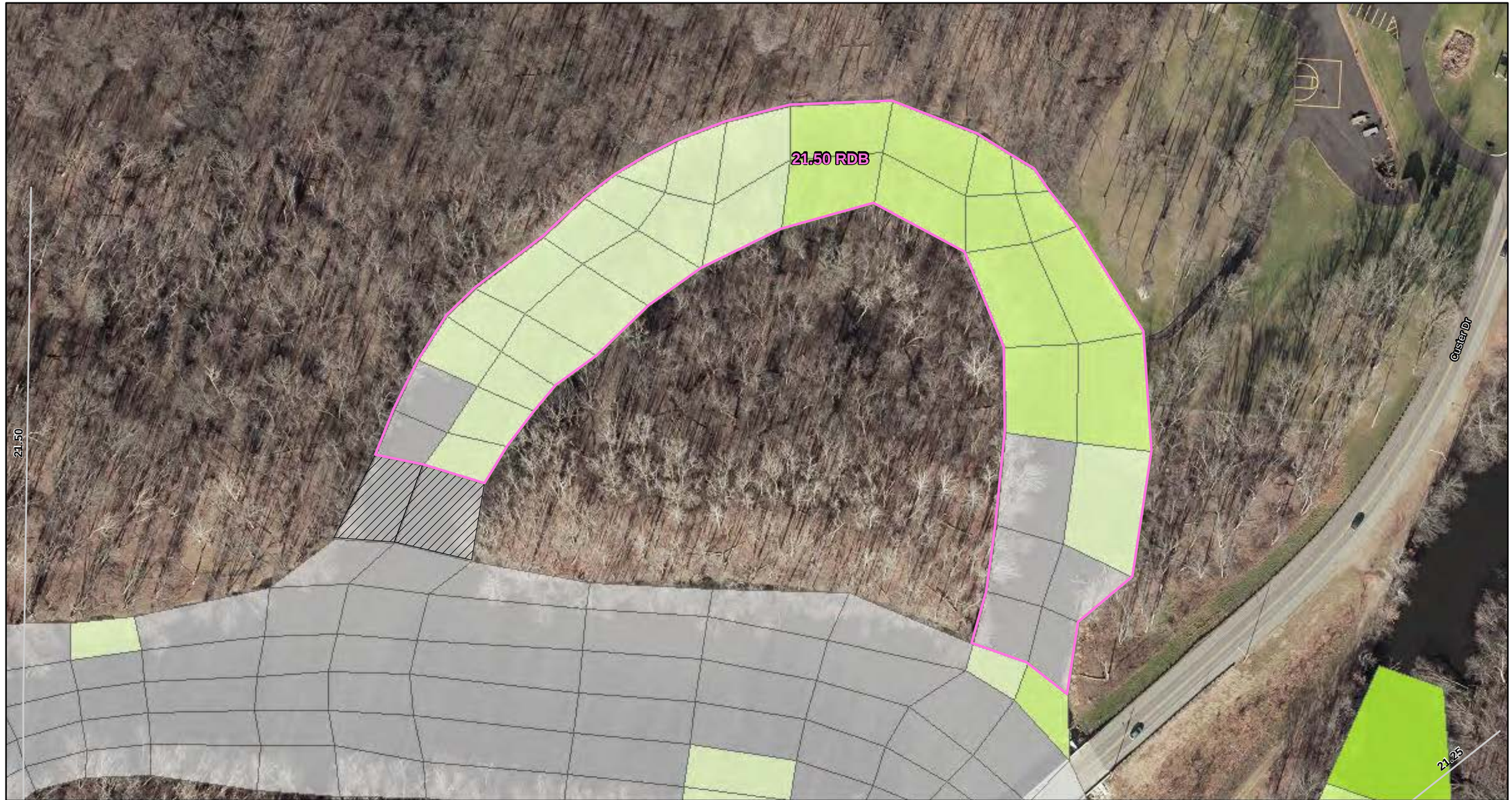
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
21.50 RDB
SHEET 11 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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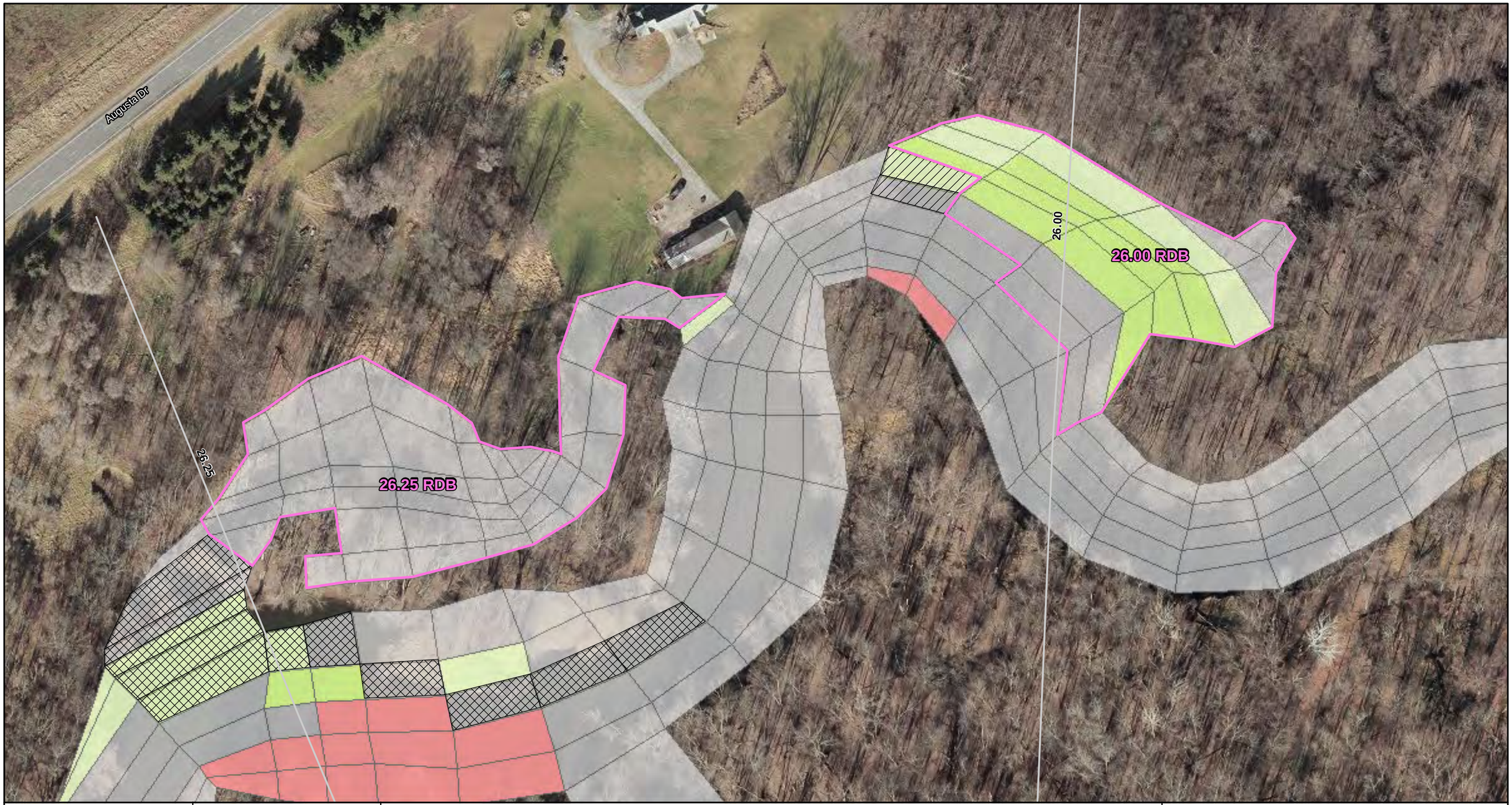
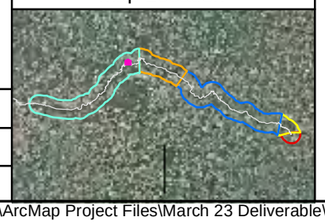
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
26.00 RDB & 26.25 RDB
SHEET 12 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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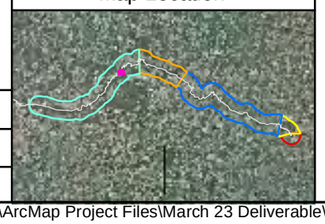
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass
- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200
Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
28.25 RDB
SHEET 13 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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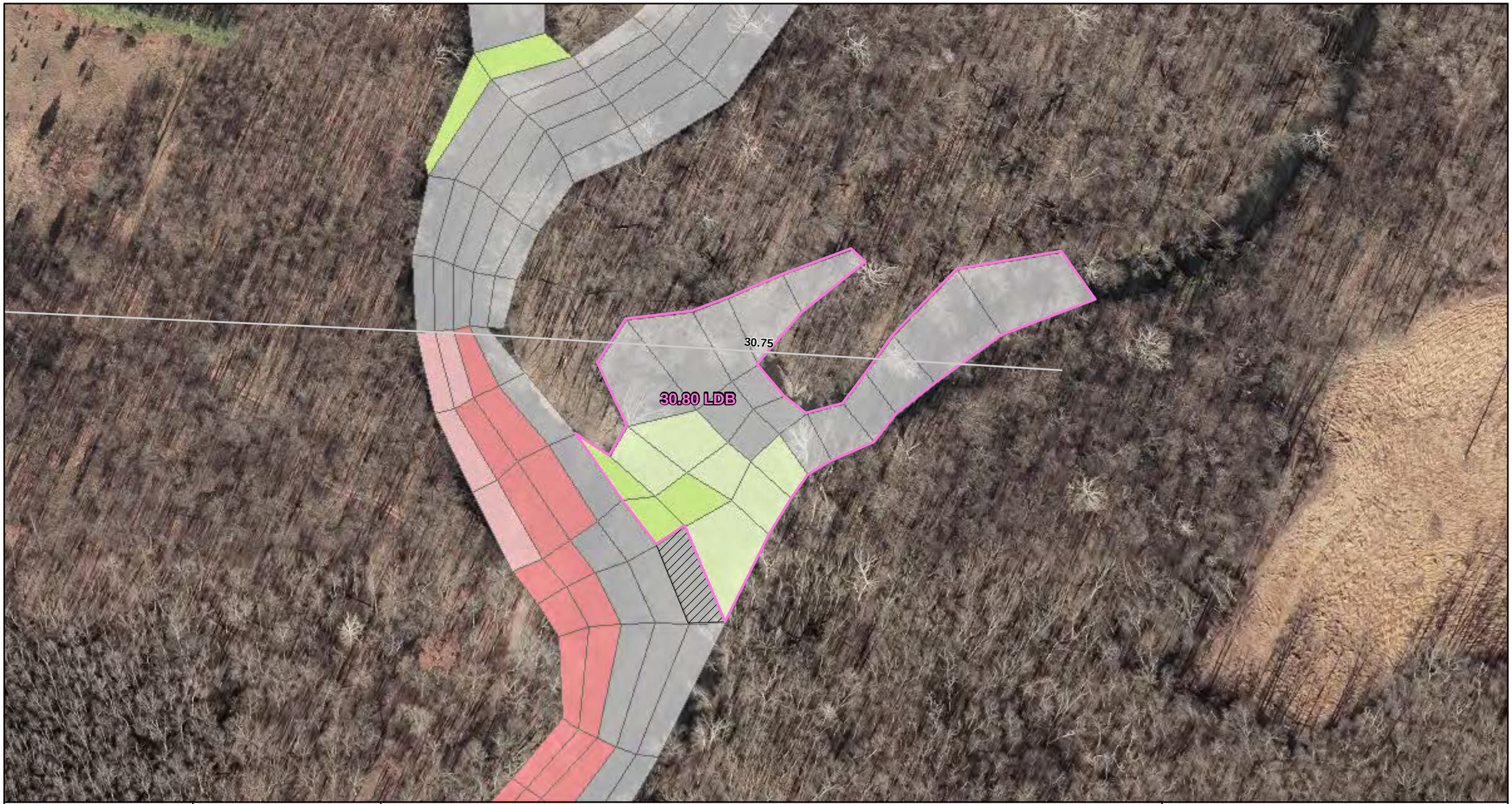
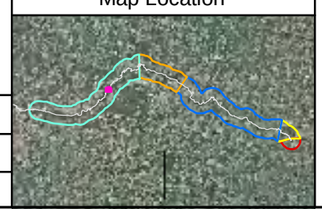
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
30.80 LDB
SHEET 14 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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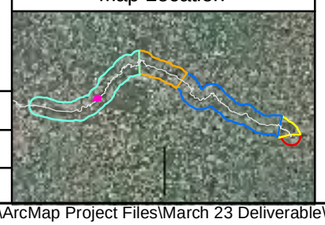
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
33.00 A
SHEET 15 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
33.00 B
SHEET 16 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
36.10 NW
SHEET 17 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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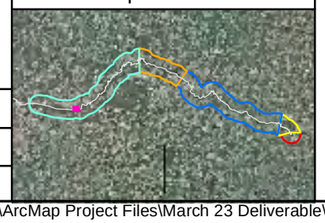
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
DELTA A
SHEET 18 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

37.75

37.75 ISLANDS

37.50

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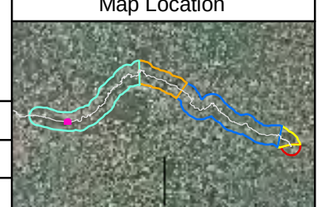
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
99% STRUCTURE
37.75 ISLANDS
SHEET 19 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

Figure 7-9

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, October 31 – November 7, 2011

75% Structure

Sheets 1 through 19

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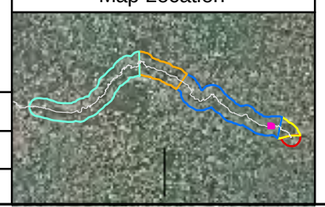
Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
3.25 R1
SHEET 1 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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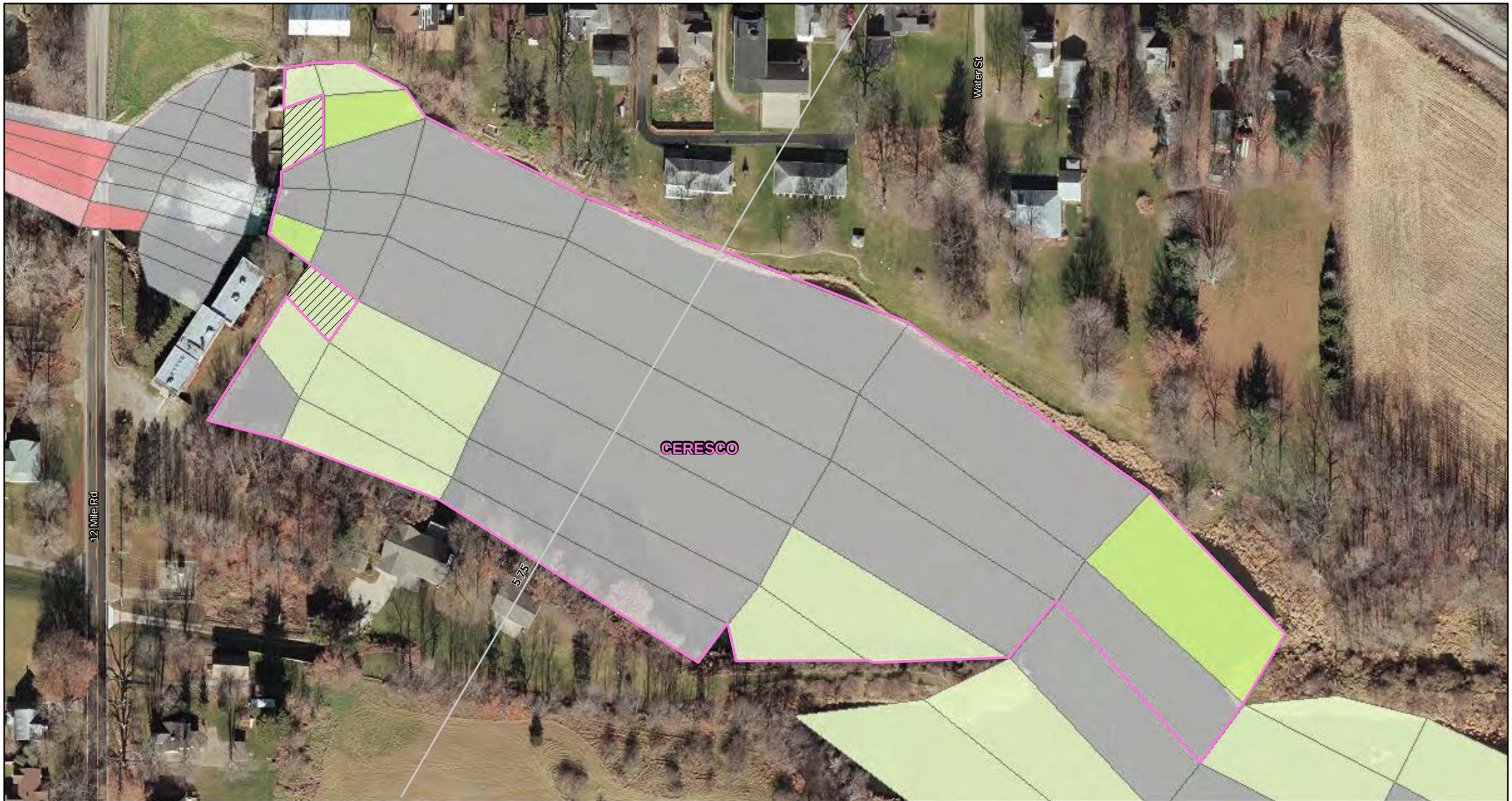
Aerial Photography Date: November 2011



ENBRIDGE

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Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
CERESCO
SHEET 2 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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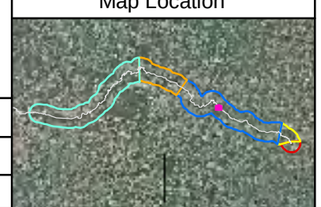
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
10.40 N & 10.50 L2
SHEET 3 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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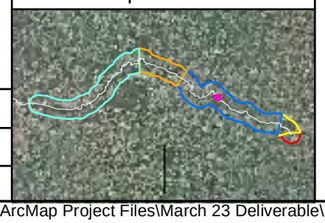
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
10.75 LDB
SHEET 4 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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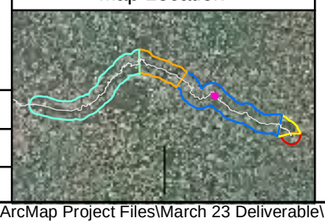
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
MP 11.21
SHEET 5 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
MP 11.78
SHEET 6 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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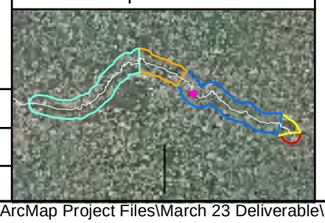
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
14.75 RDB North
SHEET 7 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
14.75 RDB South
SHEET 8 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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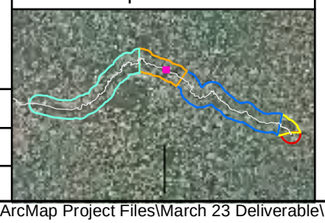
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
19.25 LDB North
SHEET 9 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
19.25 LDB South
SHEET 10 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

21.50 RDB

21.50

Custer Dr

21.25

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Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
21.50 RDB
SHEET 11 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

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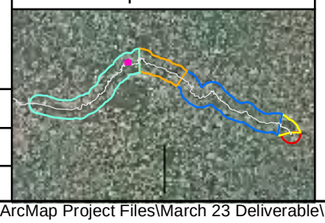
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
26.00 RDB & 26.25 RDB
SHEET 12 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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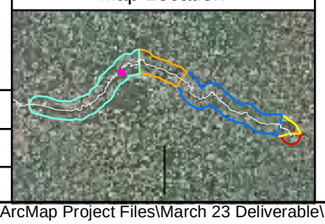
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
28.25 RDB
SHEET 13 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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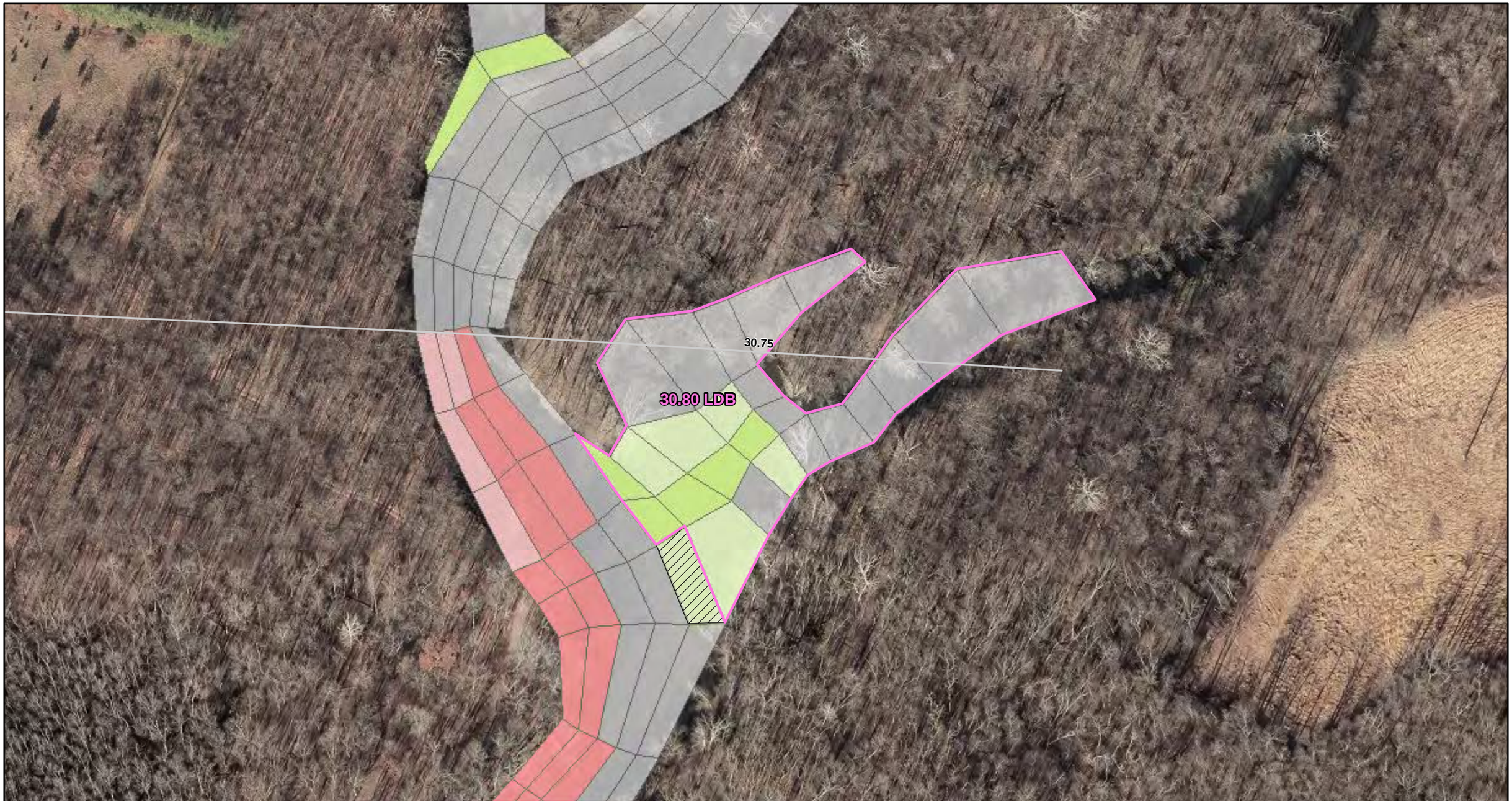
Aerial Photography Date: November 2011



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Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
30.80 LDB
SHEET 14 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

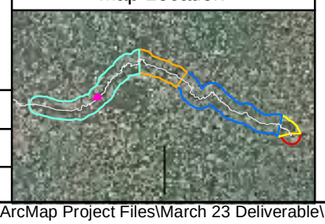
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_Traps75_Oct-Nov_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
33.00 A
SHEET 15 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
33.00 B
SHEET 16 OF 19
ENBRIDGE LINE 6B MP 608
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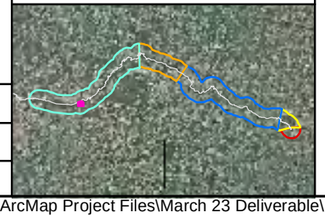
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
36.10 NW
SHEET 17 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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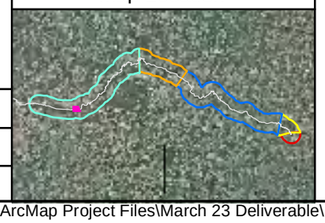
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
DELTA A
SHEET 18 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

37.75

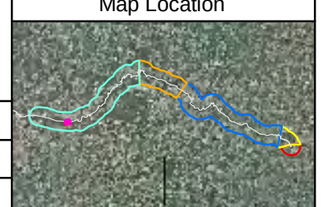
37.75 ISLANDS

37.50

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% STRUCTURE
37.75 ISLANDS
SHEET 19 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

Figure 7-10

Change in Sedimentation Rate Between No Structure and 99% Structure

May 16 – May 23, 2011

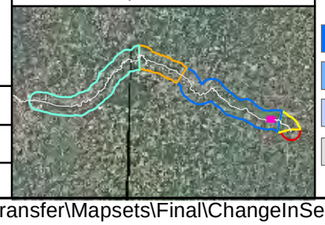
Sheets 1 through 16

No Structures	
Average Velocity (Feet Per Second)	0.08
Average Shear Stress (Pascals)	0.15
99% Structure	
Average Velocity (Feet Per Second)	0.08
Average Shear Stress (Pascals)	0.13

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

3.25 R1

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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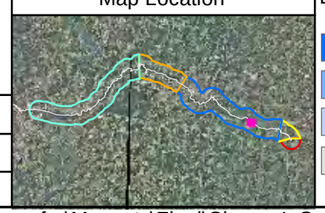
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.55
Average Shear Stress (Pascals)	0.90
99% Structure	
Average Velocity (Feet Per Second)	0.55
Average Shear Stress (Pascals)	0.90

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 55 110 220

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

CERESCO

SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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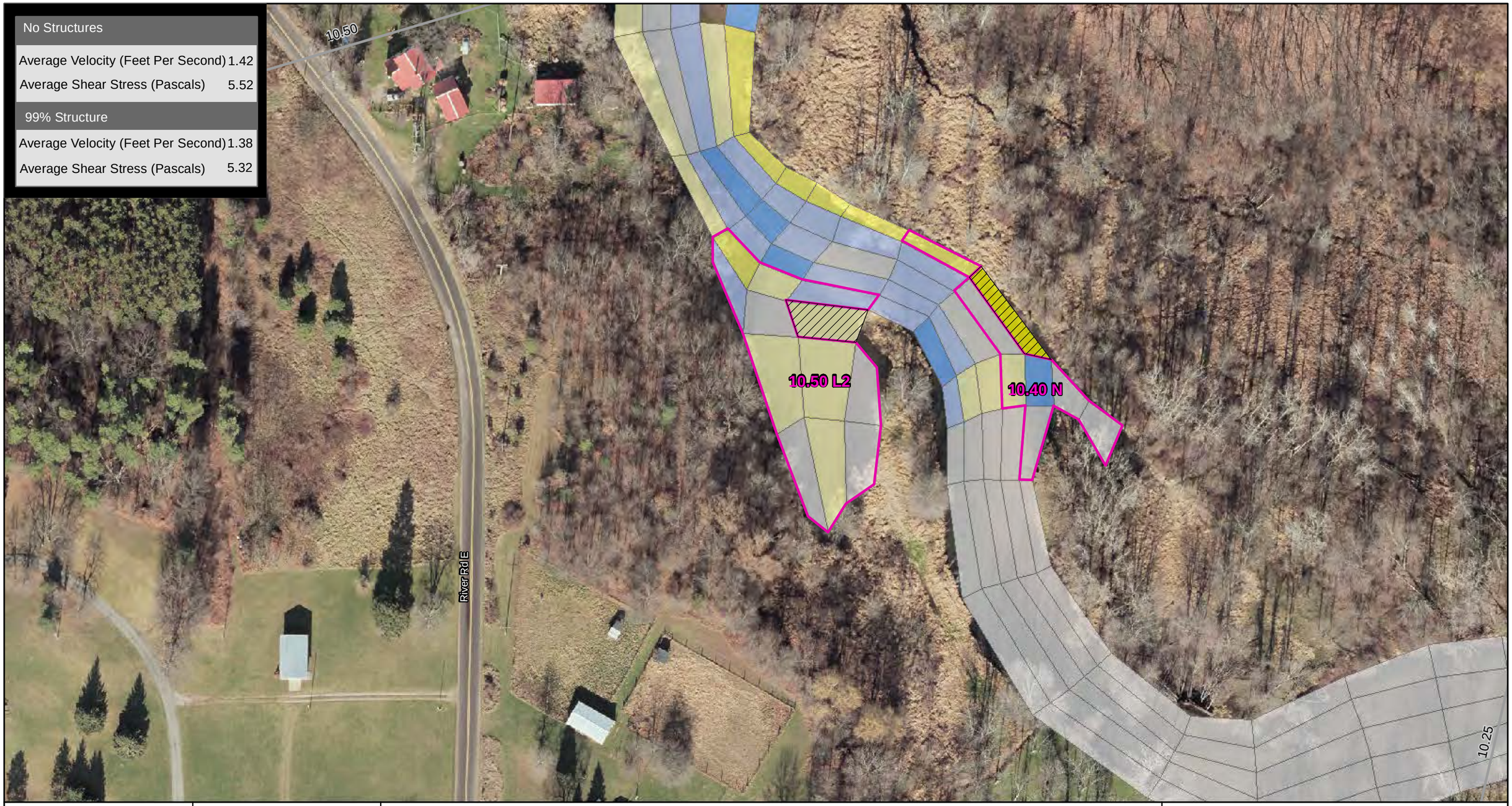
Aerial Photography Date: November 2011

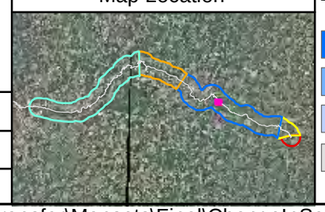
No Structures	
Average Velocity (Feet Per Second)	1.42
Average Shear Stress (Pascals)	5.52
99% Structure	
Average Velocity (Feet Per Second)	1.38
Average Shear Stress (Pascals)	5.32



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

10.40 N

SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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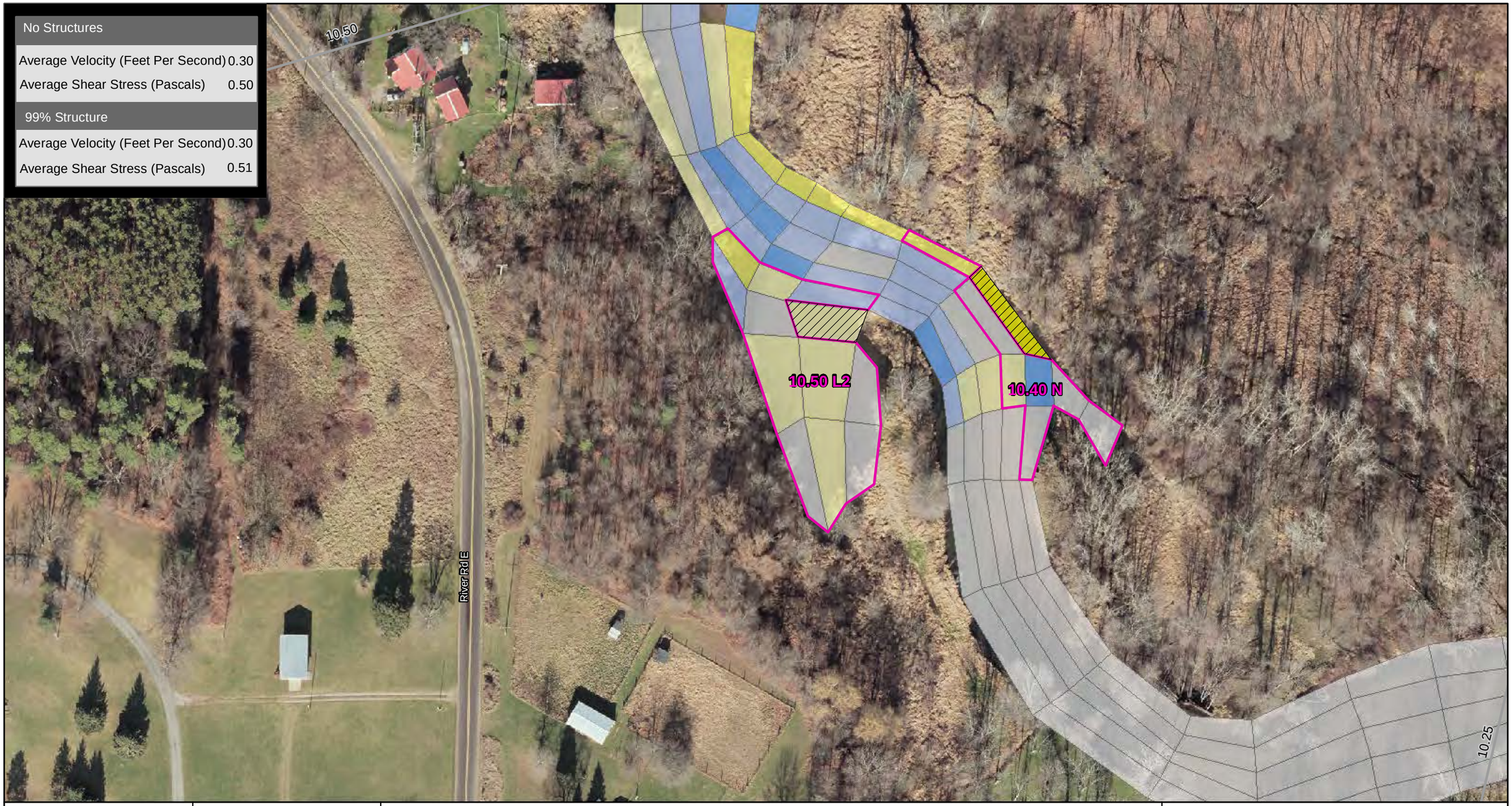
Aerial Photography Date: November 2011

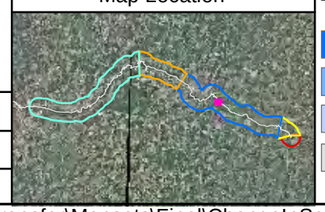
No Structures	
Average Velocity (Feet Per Second)	0.30
Average Shear Stress (Pascals)	0.50
99% Structure	
Average Velocity (Feet Per Second)	0.30
Average Shear Stress (Pascals)	0.51



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

10.50 L2

SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.59
Average Shear Stress (Pascals)	2.08
99% Structure	
Average Velocity (Feet Per Second)	0.57
Average Shear Stress (Pascals)	2.07

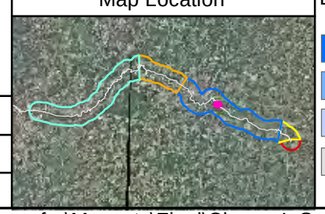
River Rd E

10.75 LDB

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

10.75 LDB

SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.74
Average Shear Stress (Pascals)	1.15
99% Structure	
Average Velocity (Feet Per Second)	0.70
Average Shear Stress (Pascals)	1.05

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

14.75 RDB

SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.66
Average Shear Stress (Pascals)	0.96
99% Structure	
Average Velocity (Feet Per Second)	0.63
Average Shear Stress (Pascals)	0.94

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Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

19.25 LDB

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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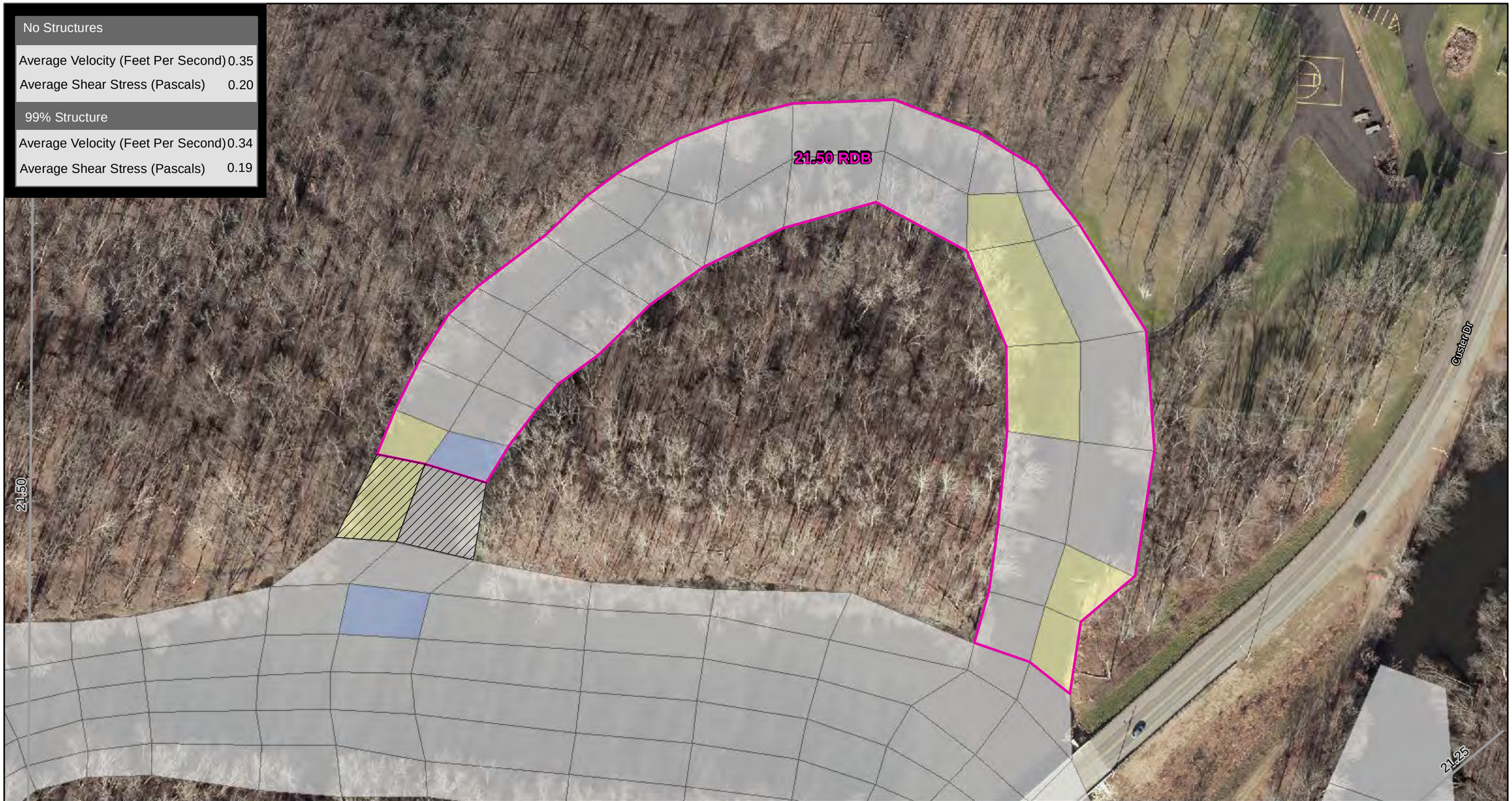
Aerial Photography Date: November 2011

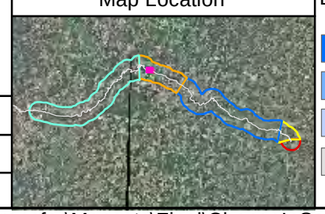
No Structures	
Average Velocity (Feet Per Second)	0.35
Average Shear Stress (Pascals)	0.20
99% Structure	
Average Velocity (Feet Per Second)	0.34
Average Shear Stress (Pascals)	0.19



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

21.50 RDB

SHEET 8 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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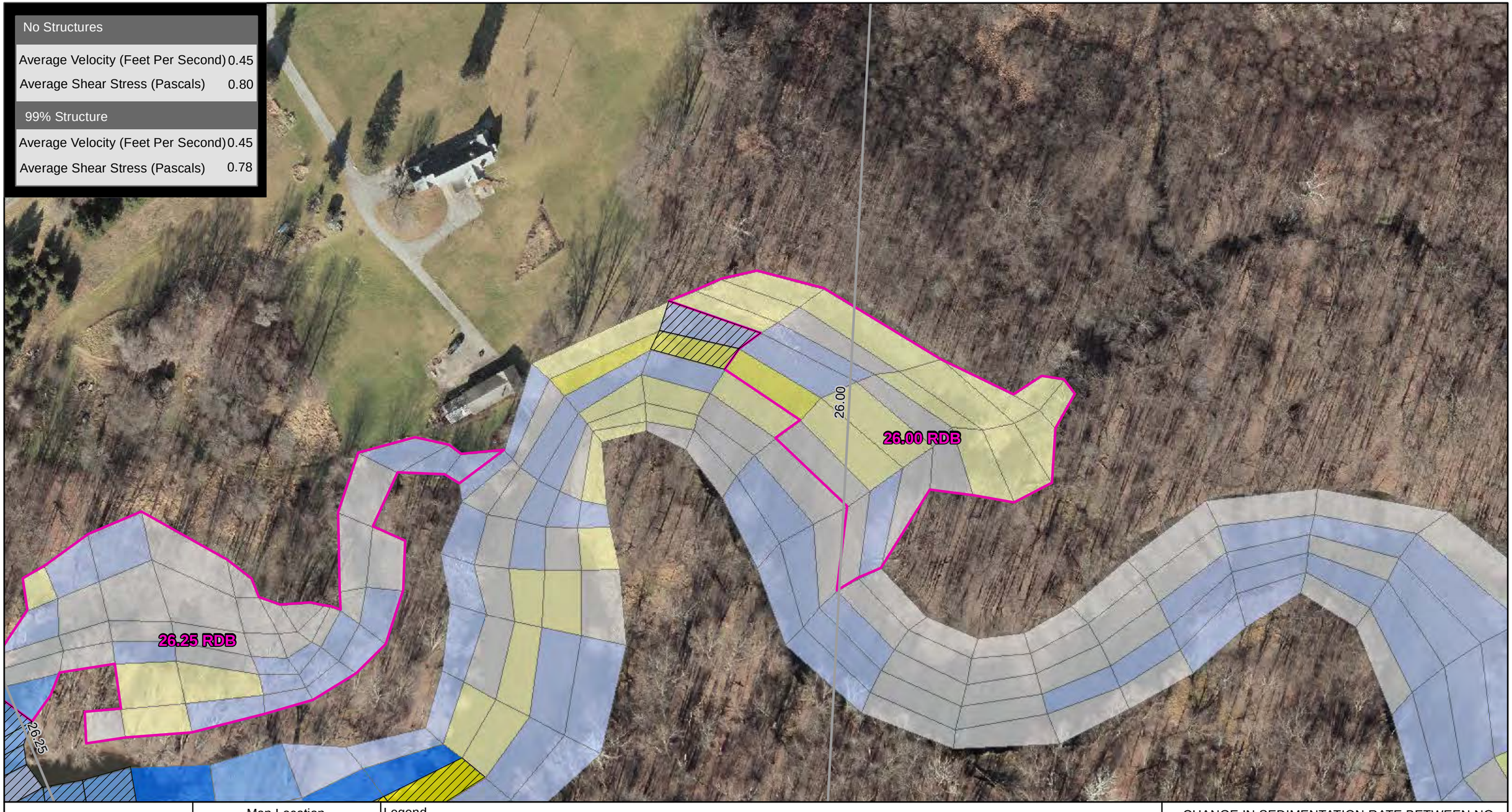
Aerial Photography Date: November 2011

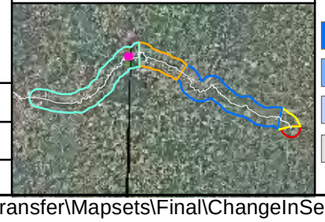
No Structures	
Average Velocity (Feet Per Second)	0.45
Average Shear Stress (Pascals)	0.80
99% Structure	
Average Velocity (Feet Per Second)	0.45
Average Shear Stress (Pascals)	0.78



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

26.00 RDB

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.55
Average Shear Stress (Pascals)	0.70
99% Structure	
Average Velocity (Feet Per Second)	0.54
Average Shear Stress (Pascals)	0.69

28.00

28.25 RDB

28.25

Fort Custer Dr

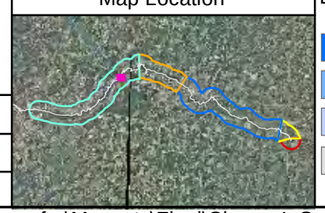
ENBRIDGE

Drawn: MB 4/17/2012

Approved: BRS 4/17/2012

Project #: 106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

28.25 RDB

SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.10
Average Shear Stress (Pascals)	0.04
99% Structure	
Average Velocity (Feet Per Second)	0.09
Average Shear Stress (Pascals)	0.03

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

30.80 LDB

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc99.mxd

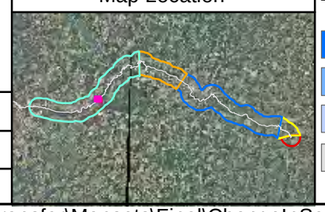
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.69
Average Shear Stress (Pascals)	1.22
99% Structure	
Average Velocity (Feet Per Second)	0.68
Average Shear Stress (Pascals)	1.21

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

33.00 A

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.36
Average Shear Stress (Pascals)	0.49
99% Structure	
Average Velocity (Feet Per Second)	0.36
Average Shear Stress (Pascals)	0.48

33.00

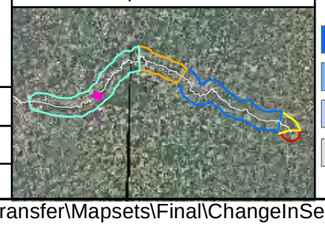
33.00 B

33.25

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

33.00 B

SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc99.mxd

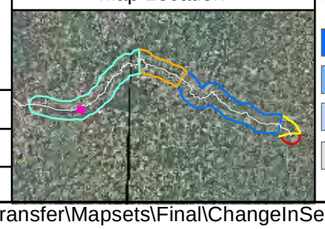
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.60
Average Shear Stress (Pascals)	0.63
99% Structure	
Average Velocity (Feet Per Second)	0.59
Average Shear Stress (Pascals)	0.62

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

36.10 NW

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc99.mxd

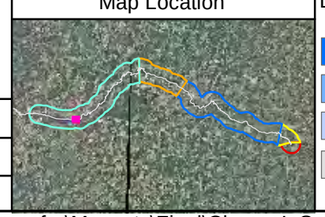
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.46
Average Shear Stress (Pascals)	0.59
99% Structure	
Average Velocity (Feet Per Second)	0.45
Average Shear Stress (Pascals)	0.56

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011

DELTA A

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.10
Average Shear Stress (Pascals)	0.13
99% Structure	
Average Velocity (Feet Per Second)	0.16
Average Shear Stress (Pascals)	0.13

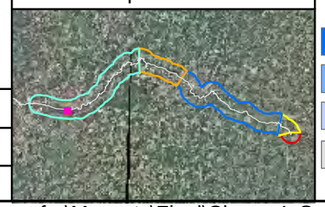
37.75

37.75 Islands

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
MAY 16 - MAY 23, 2011
37.75 ISLANDS
SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc99.mxd

Aerial Photography Date: November 2011

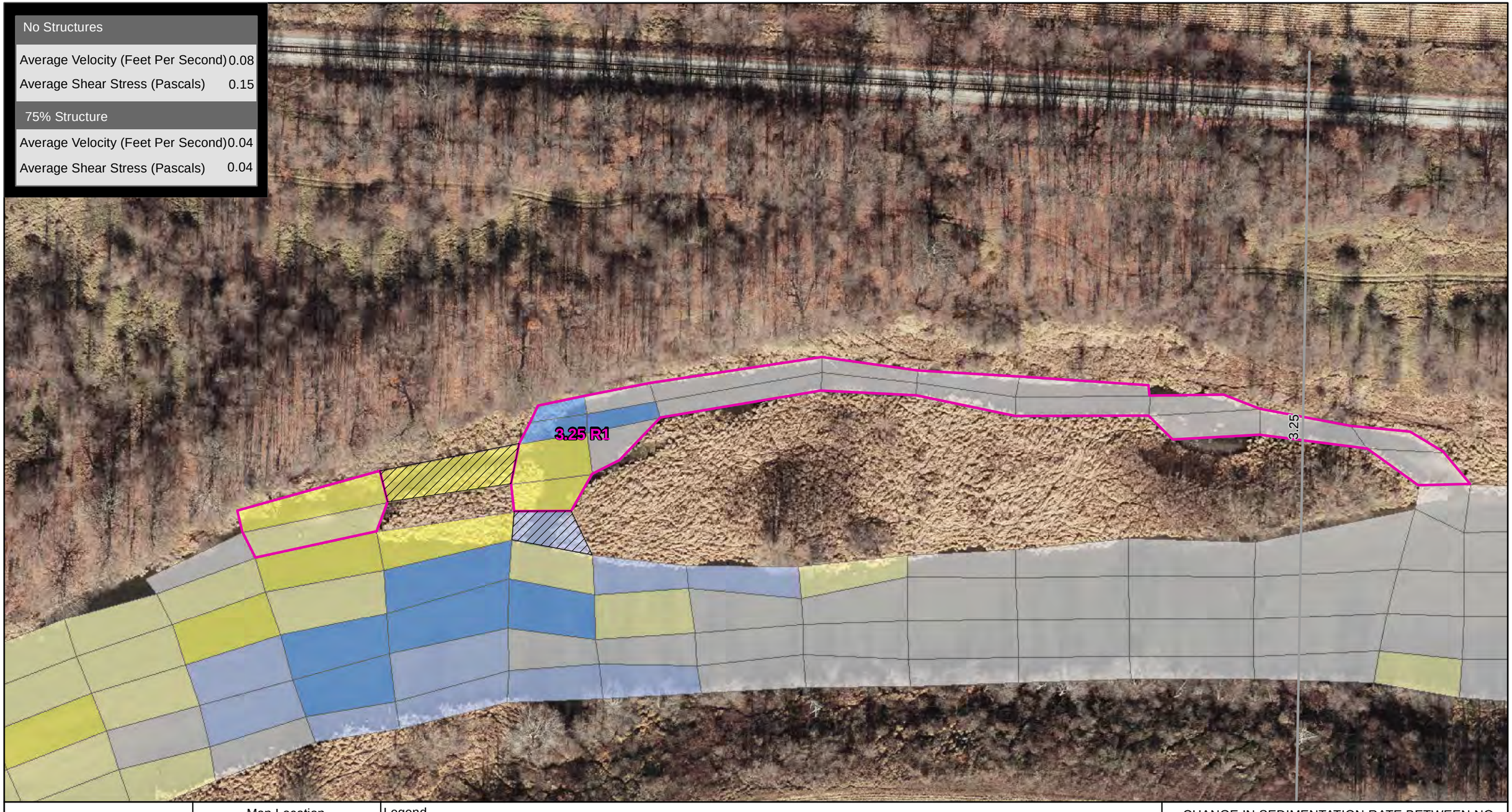
Figure 7-11

Change in Sedimentation Rate Between No Structure and 75% Structure

May 16 – May 23, 2011

Sheets 1 through 16

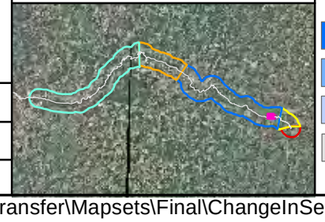
No Structures	
Average Velocity (Feet Per Second)	0.08
Average Shear Stress (Pascals)	0.15
75% Structure	
Average Velocity (Feet Per Second)	0.04
Average Shear Stress (Pascals)	0.04



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

3.25 R1

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

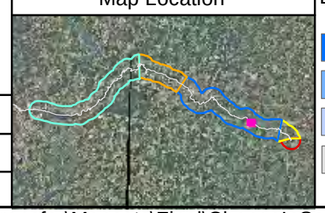
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.55
Average Shear Stress (Pascals)	0.90
75% Structure	
Average Velocity (Feet Per Second)	0.54
Average Shear Stress (Pascals)	0.91

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 55 110 220

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

CERESCO

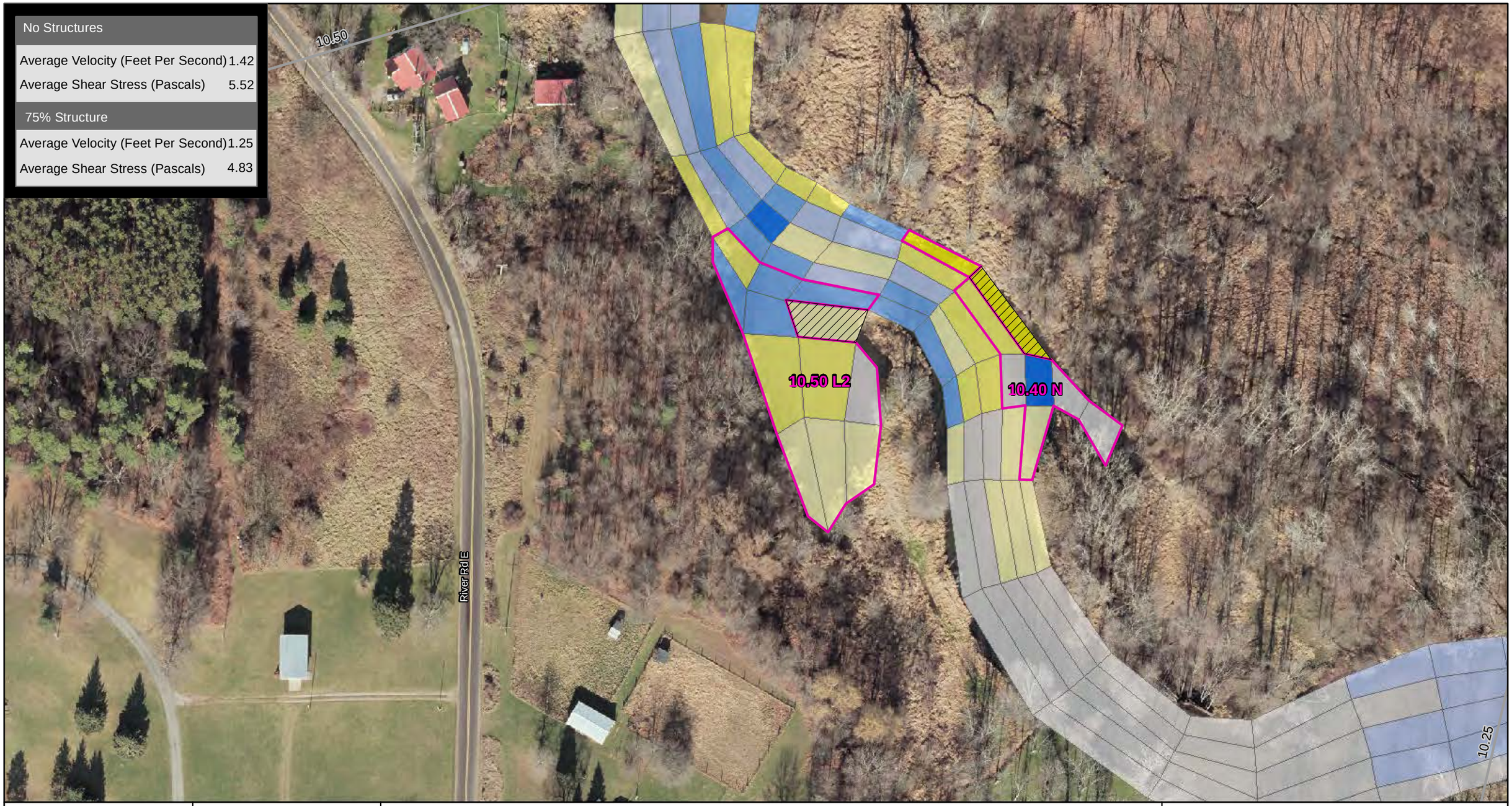
SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

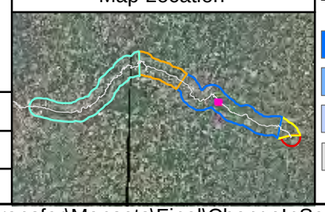
No Structures	
Average Velocity (Feet Per Second)	1.42
Average Shear Stress (Pascals)	5.52
75% Structure	
Average Velocity (Feet Per Second)	1.25
Average Shear Stress (Pascals)	4.83



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

10.40 N

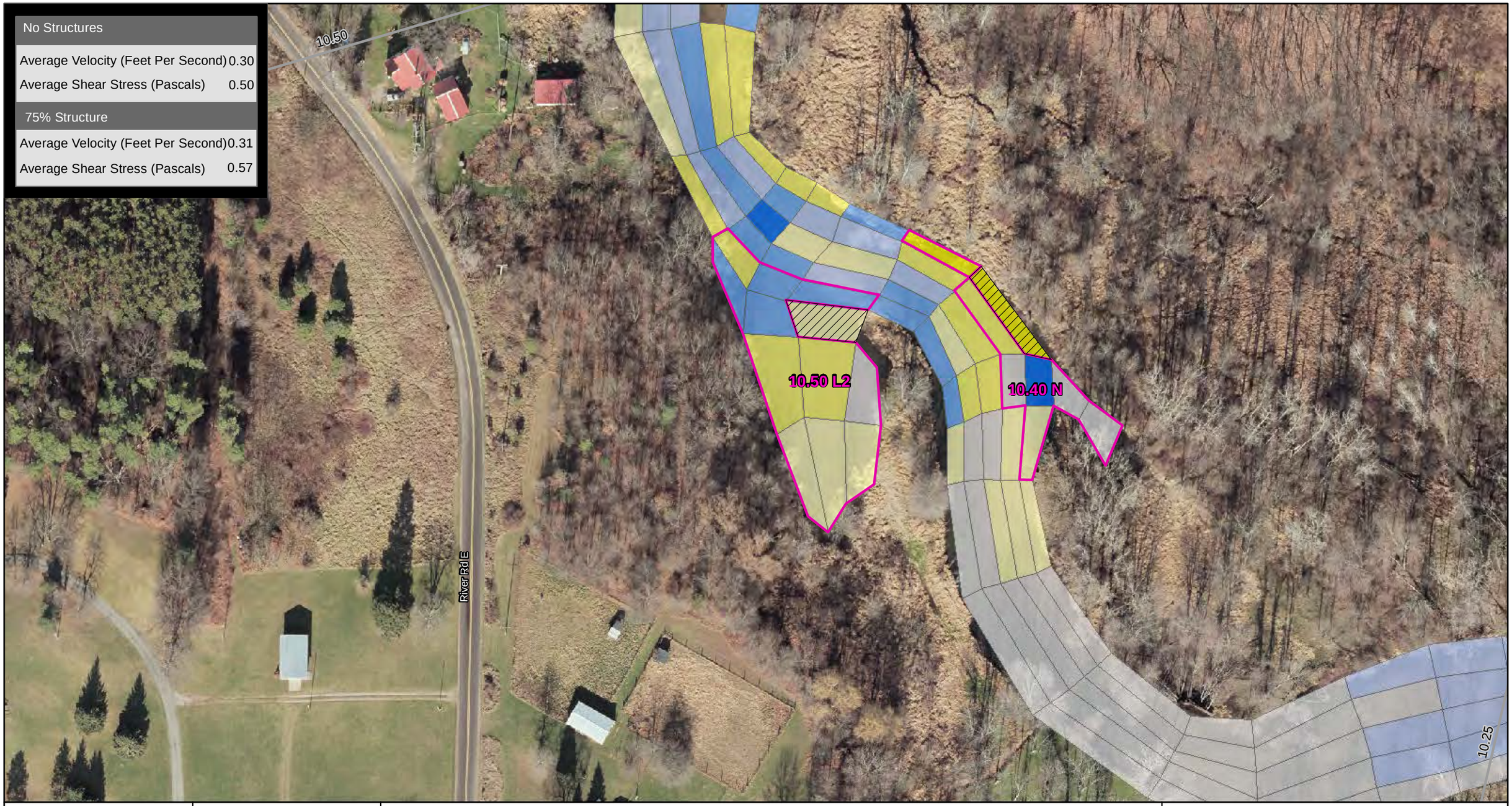
SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

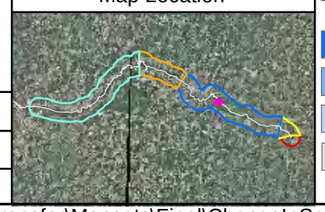
No Structures	
Average Velocity (Feet Per Second)	0.30
Average Shear Stress (Pascals)	0.50
75% Structure	
Average Velocity (Feet Per Second)	0.31
Average Shear Stress (Pascals)	0.57



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

10.50 L2

SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.59
Average Shear Stress (Pascals)	2.08
75% Structure	
Average Velocity (Feet Per Second)	0.56
Average Shear Stress (Pascals)	1.94

River Rd E

10.75 LDB

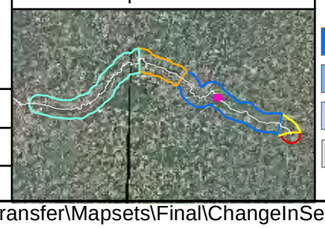
ENBRIDGE

Drawn: MB 4/17/2012

Approved: BRS 4/17/2012

Project #: 106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

10.75 LDB

SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.74
Average Shear Stress (Pascals)	1.15
75% Structure	
Average Velocity (Feet Per Second)	0.51
Average Shear Stress (Pascals)	0.55

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

14.75 RDB

SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.66
Average Shear Stress (Pascals)	0.96
75% Structure	
Average Velocity (Feet Per Second)	0.49
Average Shear Stress (Pascals)	0.56

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

19.25 LDB

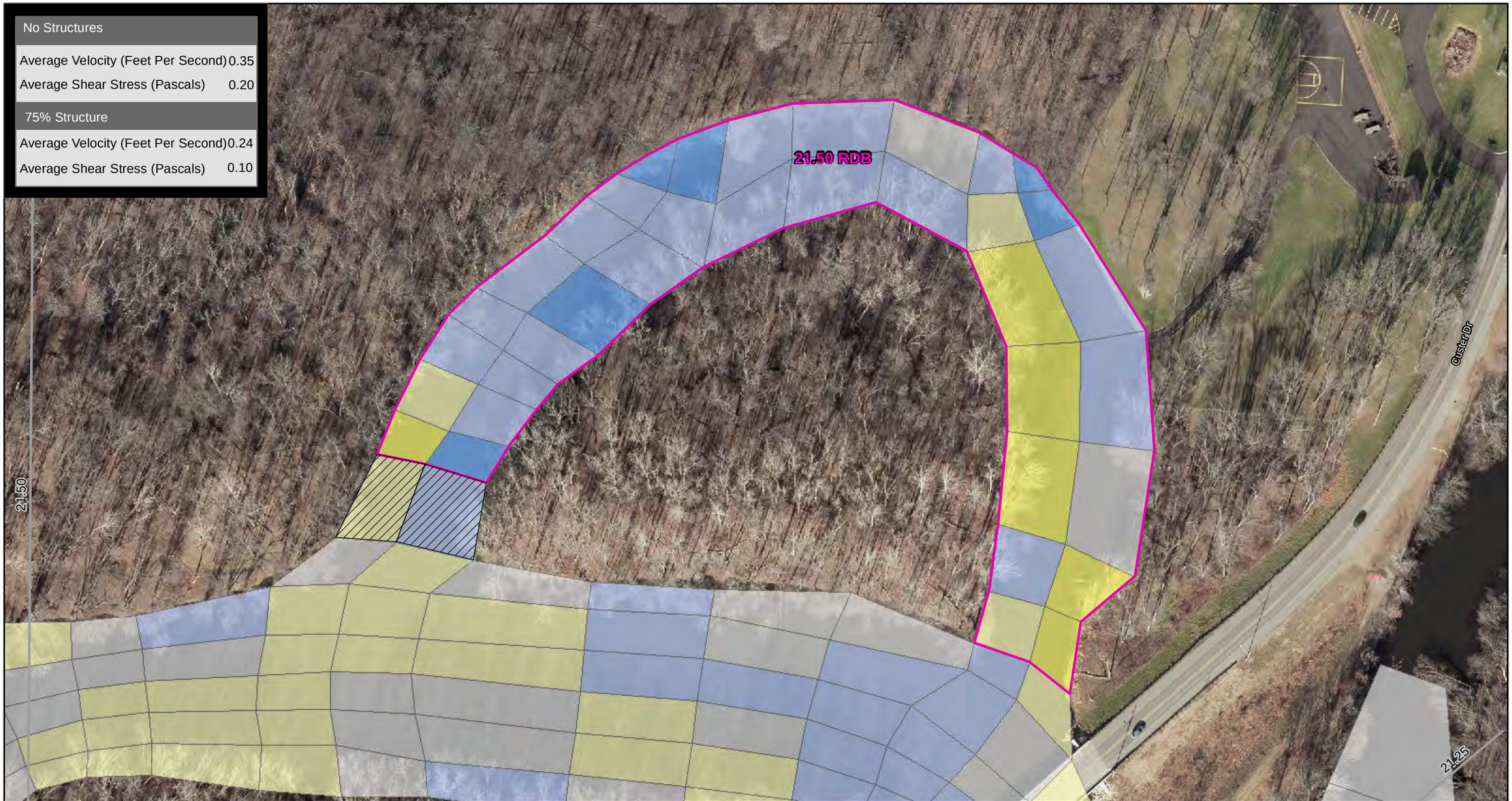
SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

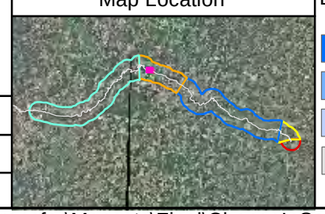
No Structures	
Average Velocity (Feet Per Second)	0.35
Average Shear Stress (Pascals)	0.20
75% Structure	
Average Velocity (Feet Per Second)	0.24
Average Shear Stress (Pascals)	0.10



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

21.50 RDB

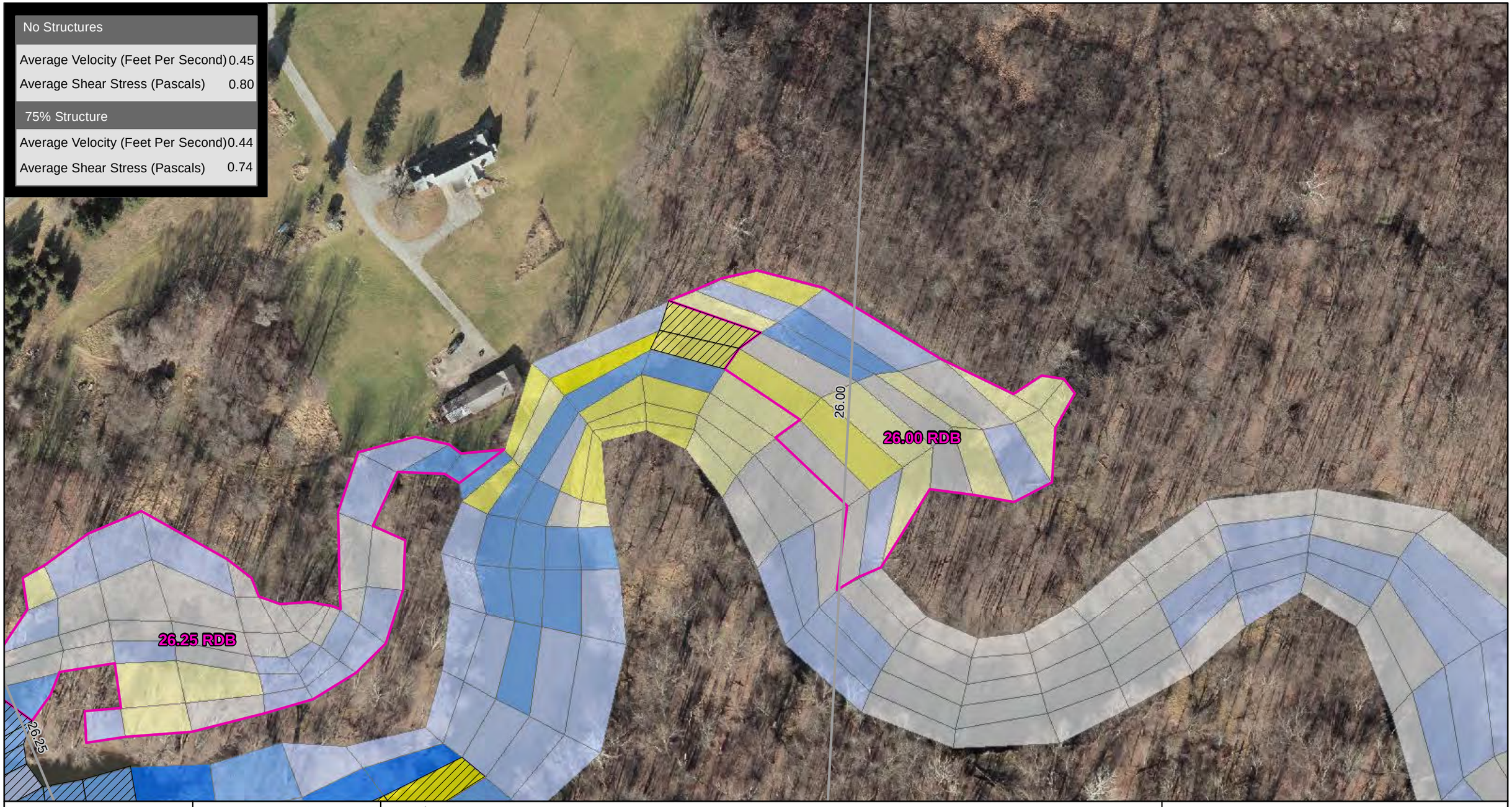
SHEET 8 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

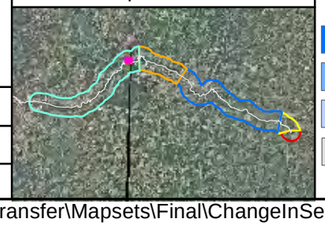
No Structures	
Average Velocity (Feet Per Second)	0.45
Average Shear Stress (Pascals)	0.80
75% Structure	
Average Velocity (Feet Per Second)	0.44
Average Shear Stress (Pascals)	0.74



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

26.00 RDB

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

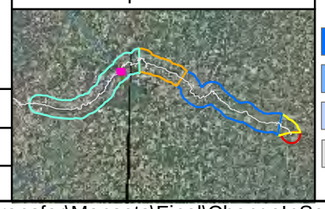
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.55
Average Shear Stress (Pascals)	0.70
75% Structure	
Average Velocity (Feet Per Second)	0.50
Average Shear Stress (Pascals)	0.57

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

28.25 RDB

SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.10
Average Shear Stress (Pascals)	0.04
75% Structure	
Average Velocity (Feet Per Second)	0.05
Average Shear Stress (Pascals)	0.01

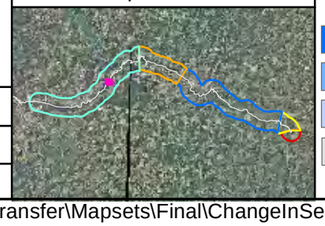
30.75

30.80 LDB

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

30.80 LDB

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.69
Average Shear Stress (Pascals)	1.22
75% Structure	
Average Velocity (Feet Per Second)	0.66
Average Shear Stress (Pascals)	1.12

33.00

33.00 A

ENBRIDGE

Drawn: MB 4/17/2012

Approved: BRS 4/17/2012

Project #: 106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

33.00 A

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

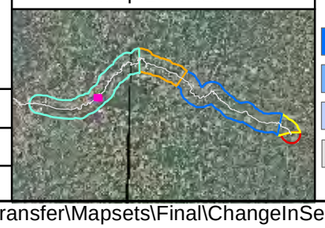
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.36
Average Shear Stress (Pascals)	0.49
75% Structure	
Average Velocity (Feet Per Second)	0.34
Average Shear Stress (Pascals)	0.44

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

33.00 B

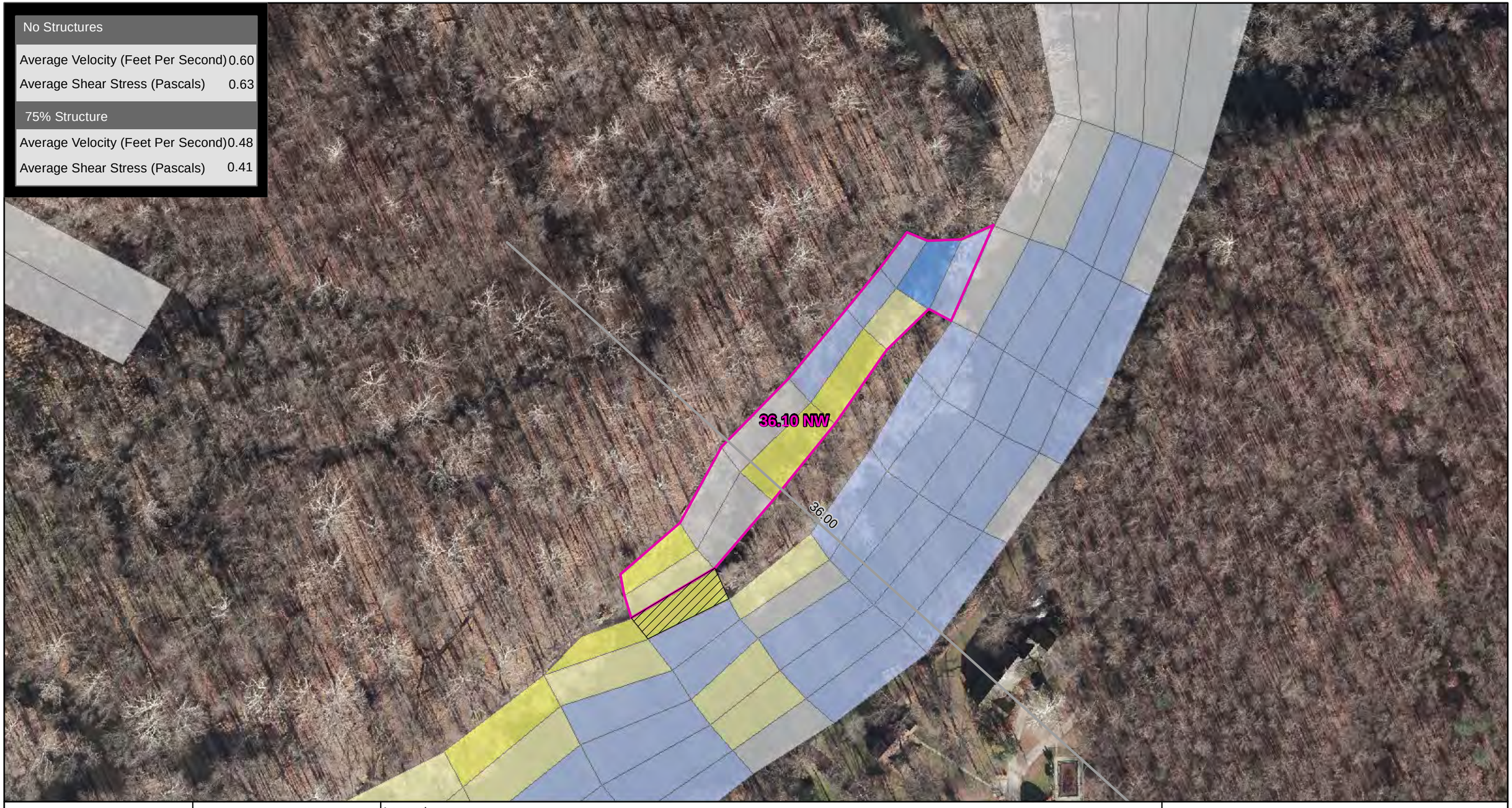
SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

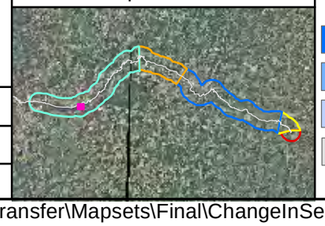
No Structures	
Average Velocity (Feet Per Second)	0.60
Average Shear Stress (Pascals)	0.63
75% Structure	
Average Velocity (Feet Per Second)	0.48
Average Shear Stress (Pascals)	0.41



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

36.10 NW

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

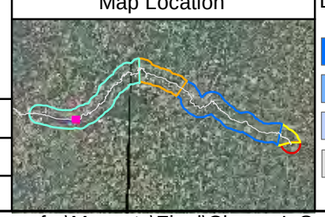
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.46
Average Shear Stress (Pascals)	0.59
75% Structure	
Average Velocity (Feet Per Second)	0.36
Average Shear Stress (Pascals)	0.34

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011

DELTA A

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.10
Average Shear Stress (Pascals)	0.13
75% Structure	
Average Velocity (Feet Per Second)	0.15
Average Shear Stress (Pascals)	0.12

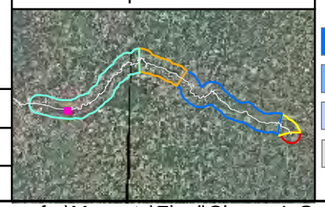
37.75

37.75 Islands

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 5.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- > 5.00 Increase In Sedimentation
- Christmas Tree Structure Cell
- Quarter Mile Grid Segment
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
MAY 16 - MAY 23, 2011
37.75 ISLANDS
SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateMay 2011_NoStruc75.mxd

Aerial Photography Date: November 2011

Figure 7-12

Change in Sedimentation Rate Between No Structure and Coir Log Structure

May 16 – May 23, 2011

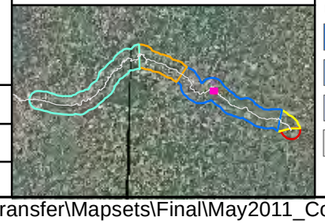
Sheets 1 through 3

No Structures	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
MAY 16 - MAY 23, 2011

MP 11.21

SHEET 1 OF 3

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\May2011_CoirLog.mxd

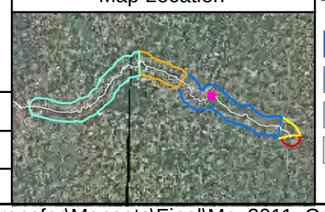
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
MAY 16 - MAY 23, 2011

MP 11.78

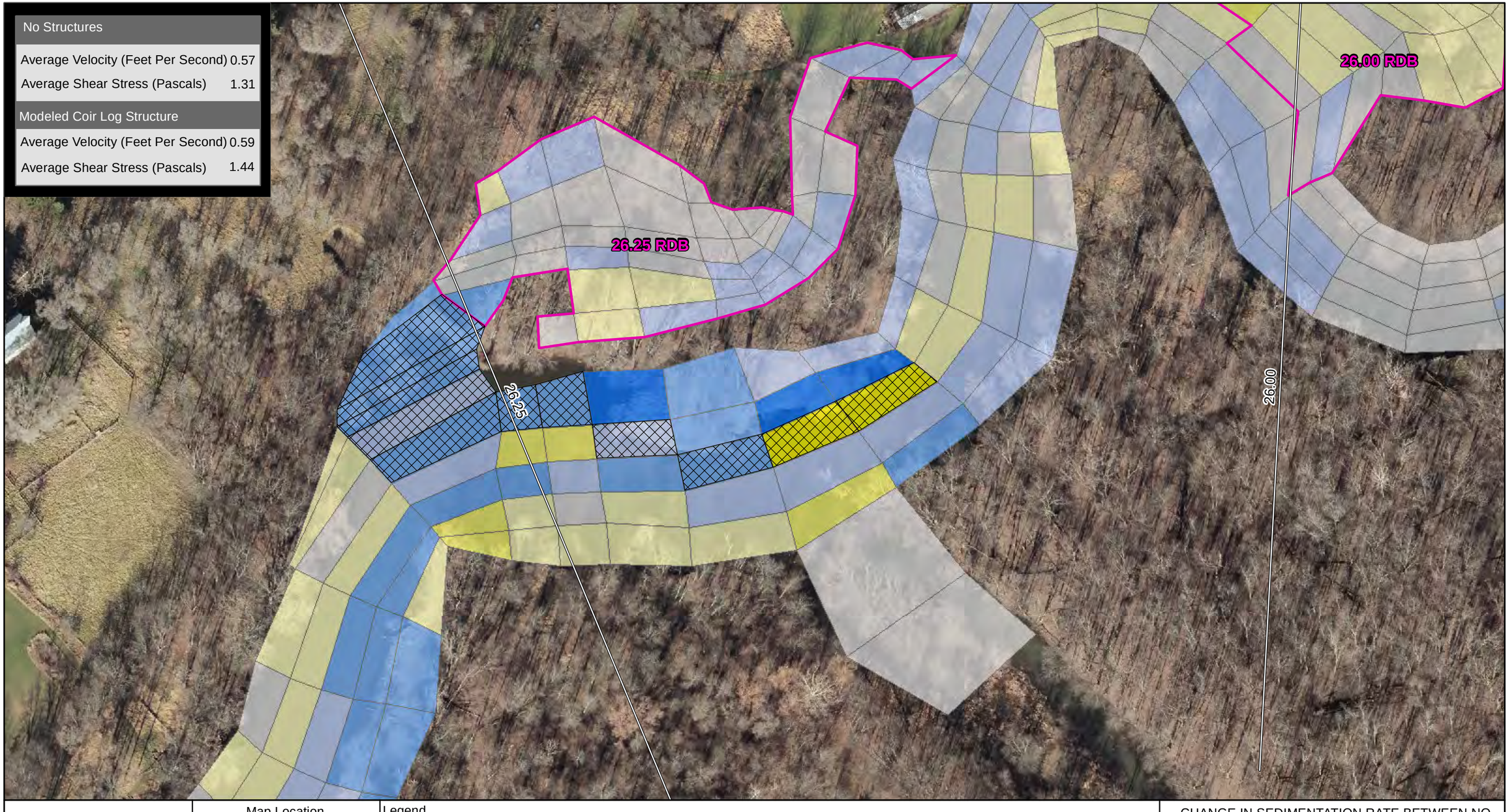
SHEET 2 OF 3

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\May2011_CoirLog.mxd

Aerial Photography Date: November 2011

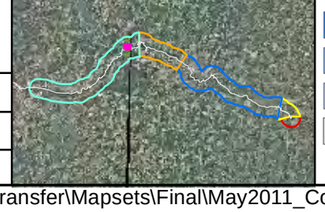
No Structures	
Average Velocity (Feet Per Second)	0.57
Average Shear Stress (Pascals)	1.31
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.59
Average Shear Stress (Pascals)	1.44



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
MAY 16 - MAY 23, 2011

26.25 RDB

SHEET 3 OF 3

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\May2011_CoirLog.mxd

Aerial Photography Date: November 2011

Figure 7-13

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, May 16 – May 23, 2011

99% vs. No Structures

Sheets 1 through 19

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

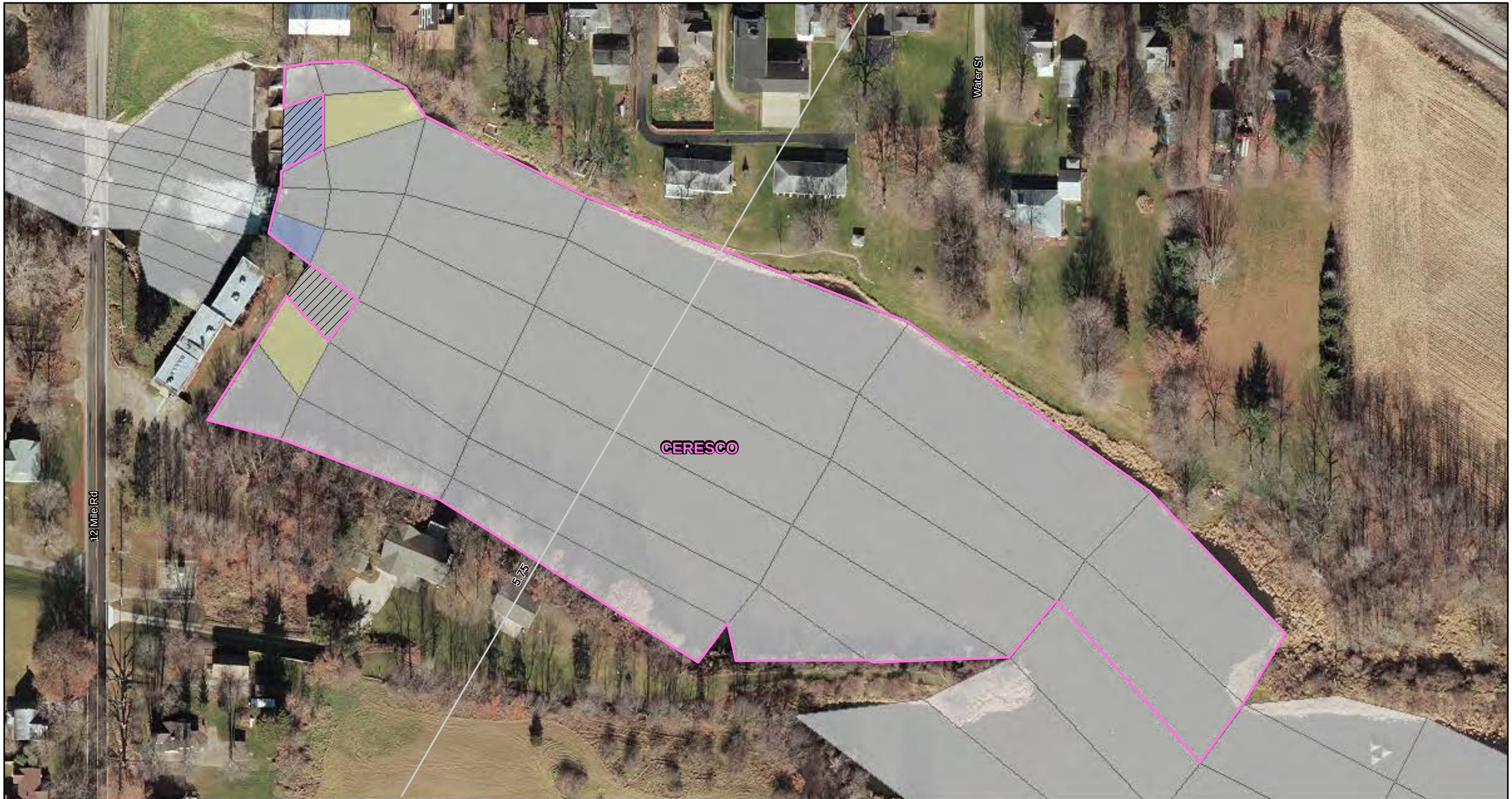
3.25 R1

SHEET 1 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsB1-B2_May_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

CERESCO

SHEET 2 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

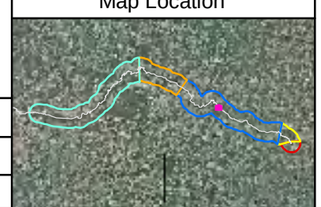
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsB1-B2_May_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

10.40 N & 10.50 L2

SHEET 3 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

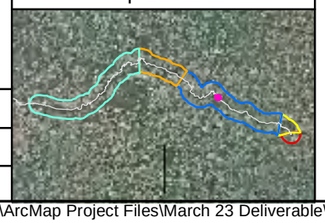
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsB1-B2_May_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

10.75 LDB

SHEET 4 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

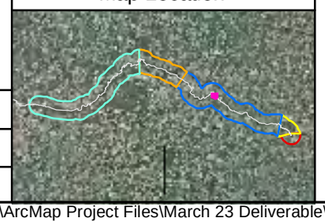
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsB1-B2_May_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

MP 11.21

SHEET 5 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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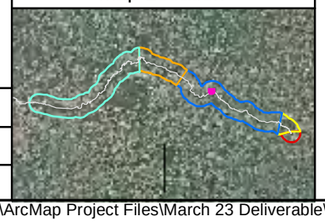
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

MP 11.78

SHEET 6 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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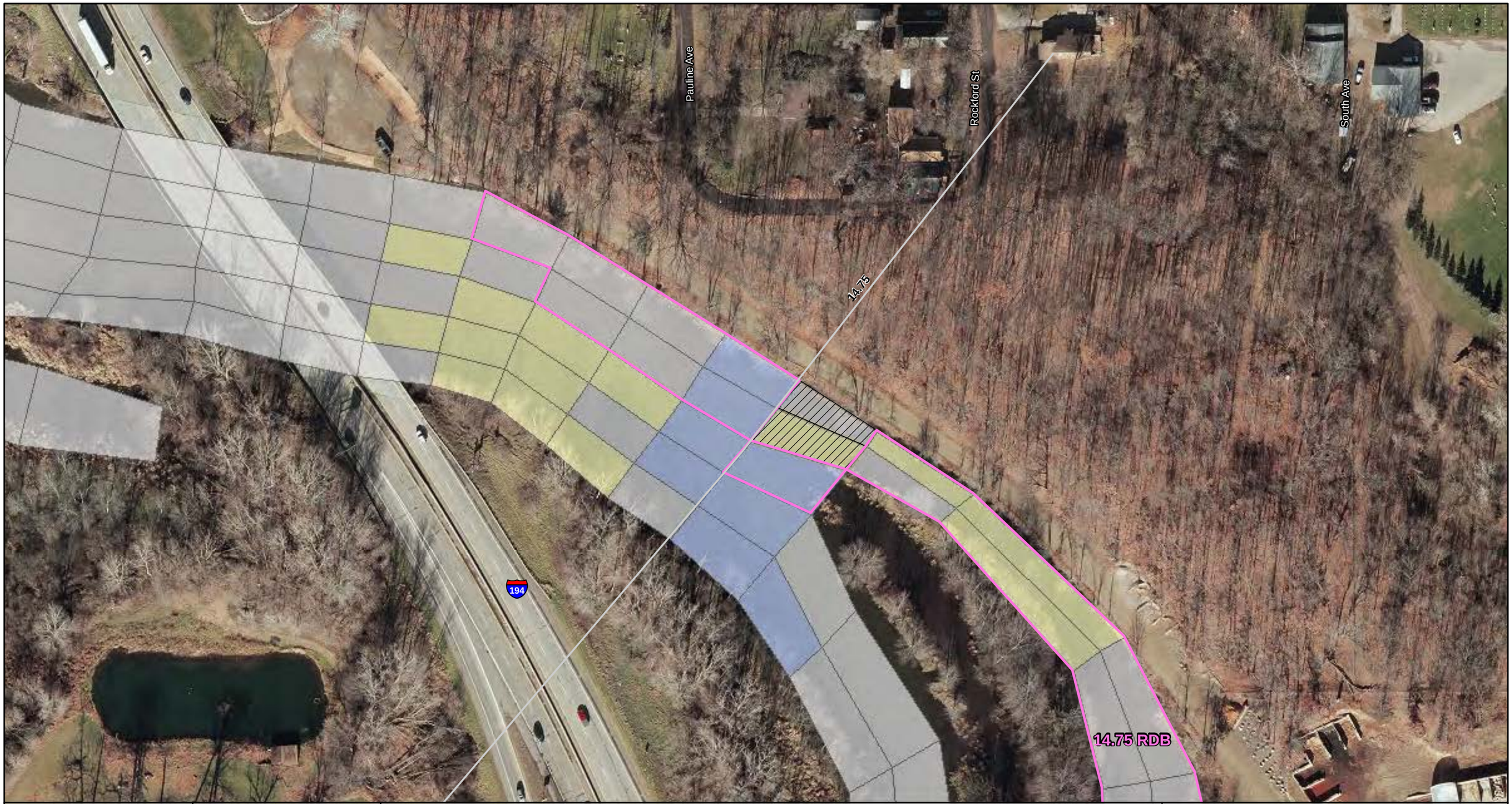
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

14.75 RDB North

SHEET 7 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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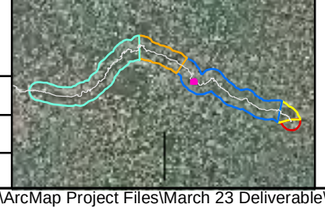
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

14.75 RDB South

SHEET 8 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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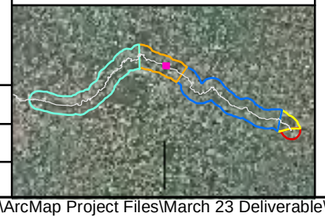
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200
Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

19.25 LDB North

SHEET 9 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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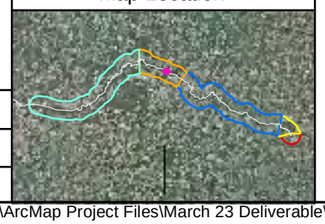
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

19.25 LDB South

SHEET 10 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

21.50 RDB

SHEET 11 OF 19

ENBRIDGE LINE 6B MP 608
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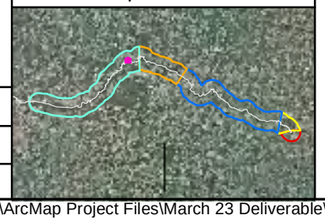
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

26.00 RDB & 26.25 RDB

SHEET 12 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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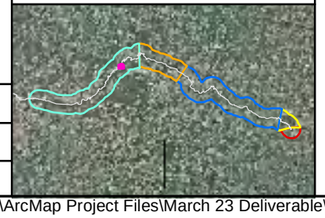
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200
Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

28.25 RDB

SHEET 13 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200
Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

30.80 LDB

SHEET 14 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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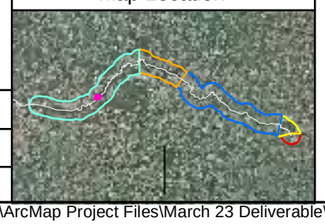
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

33.00 A

SHEET 15 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

33.00 B

SHEET 16 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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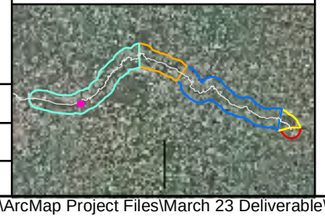
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200
Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

36.10 NW

SHEET 17 OF 19

ENBRIDGE LINE 6B MP 608
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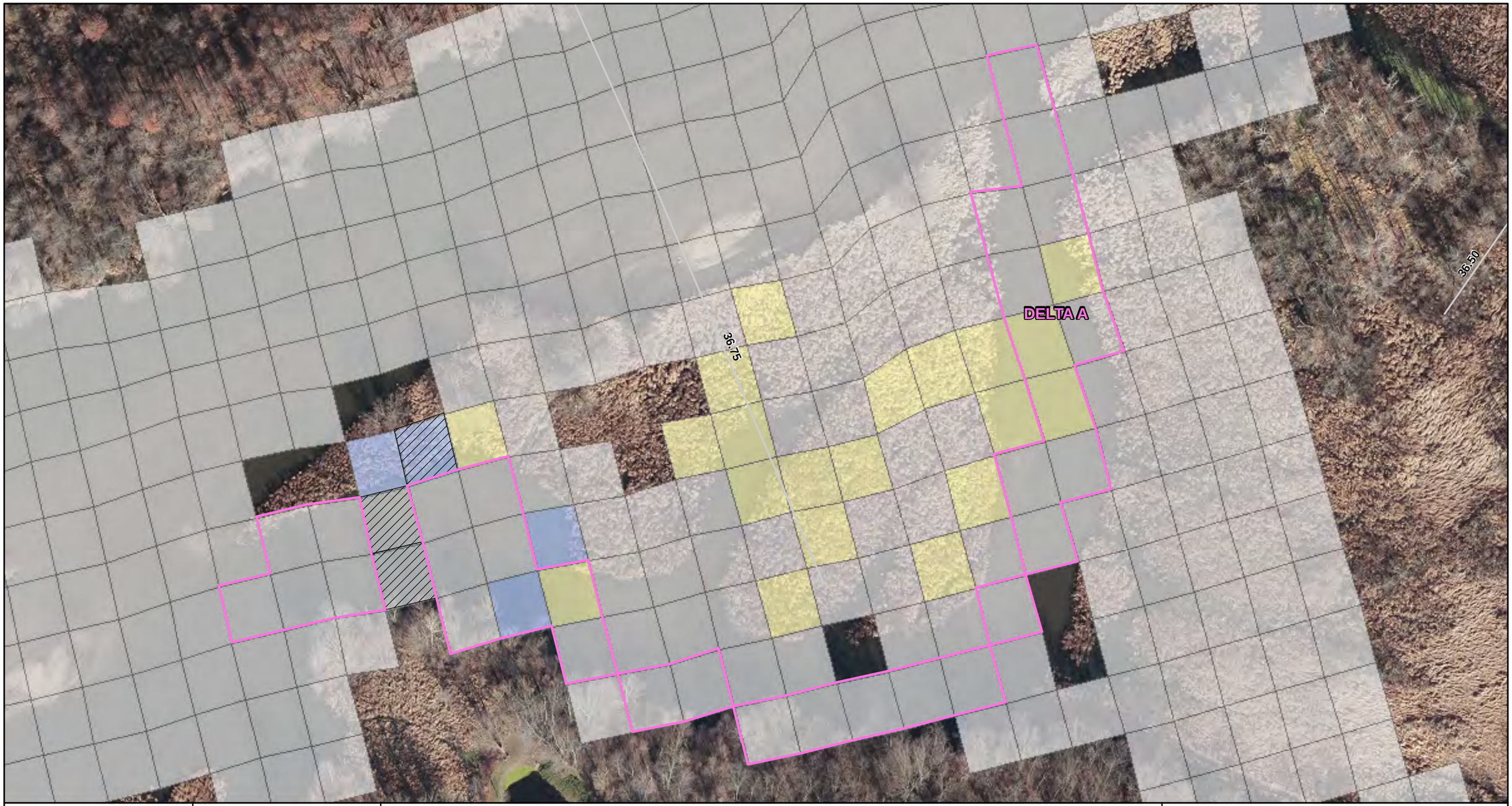
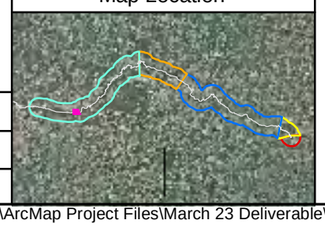
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

DELTA A

SHEET 18 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

37.75

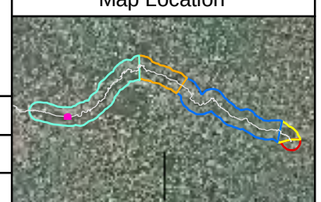
37.75 ISLANDS

37.50

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- > 5.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- >5.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% VS. NO STRUCTURES

37.75 ISLANDS

SHEET 19 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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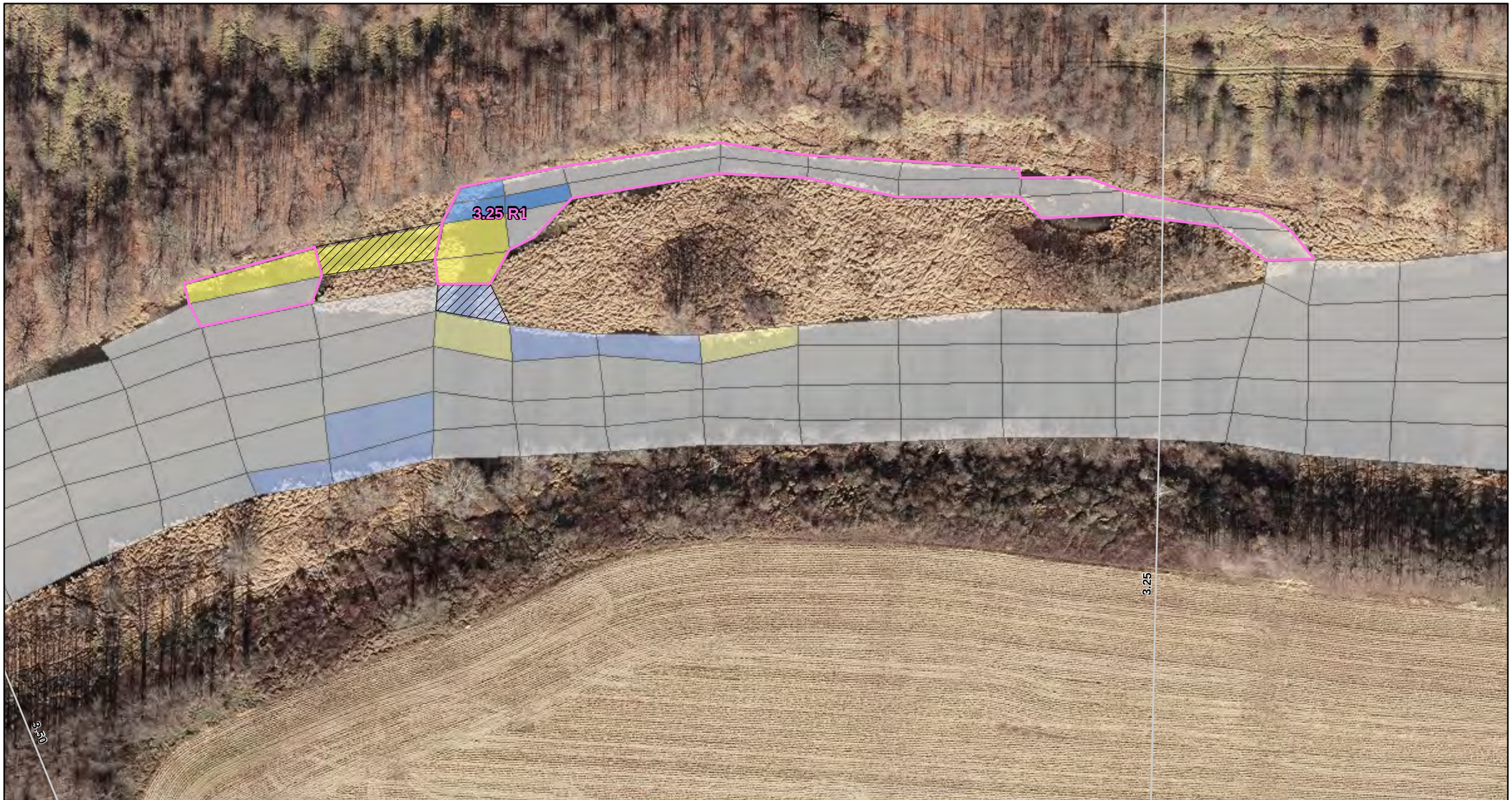
Aerial Photography Date: November 2011

Figure 7-14

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, May 16 – May 23, 2011

75% vs. No Structures

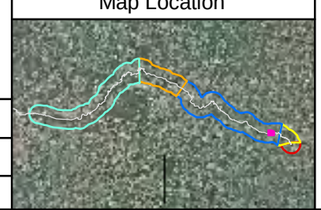
Sheets 1 through 19



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

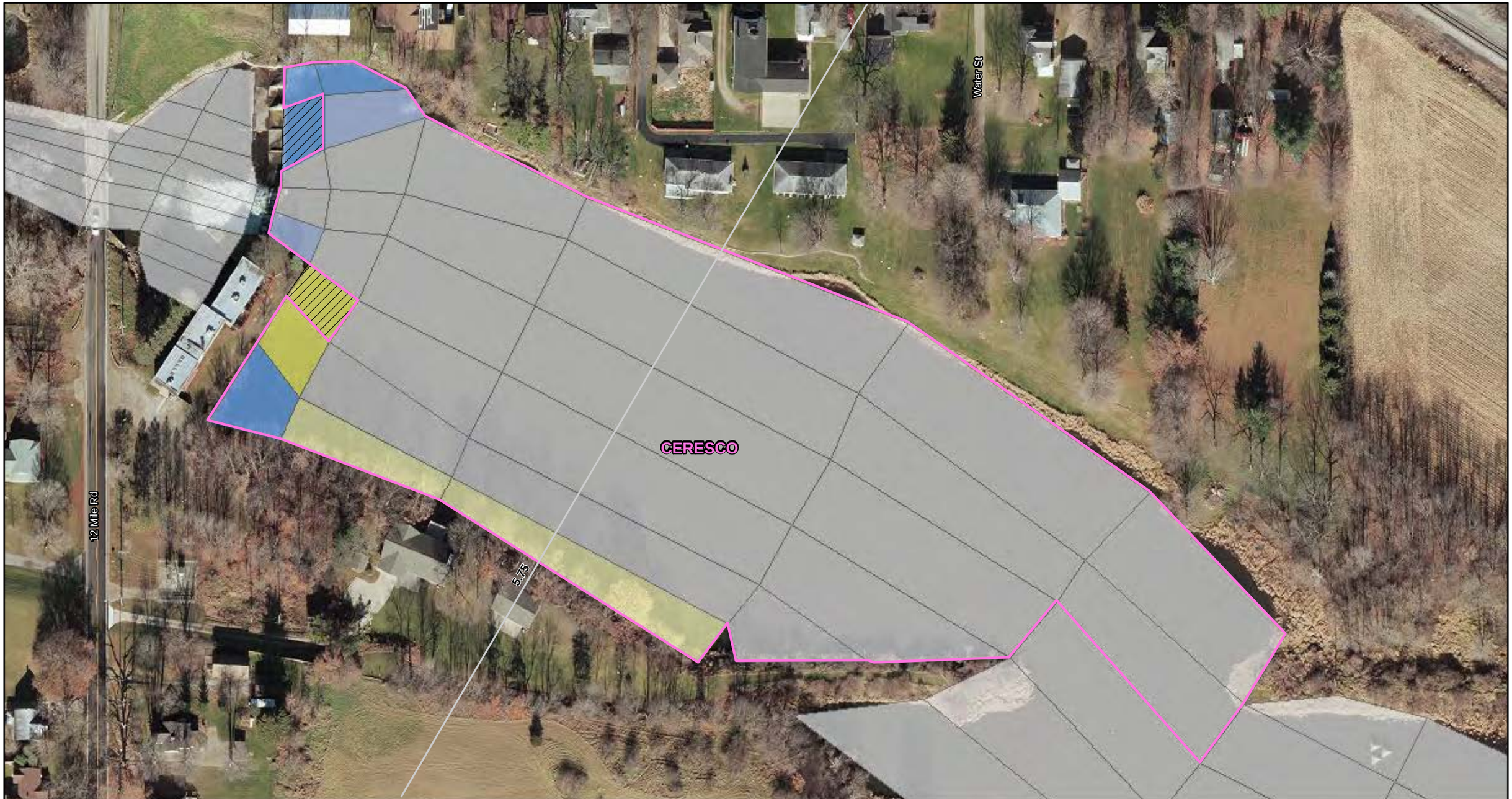
3.25 R1

SHEET 1 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsB1-B3_May_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

CERESCO

SHEET 2 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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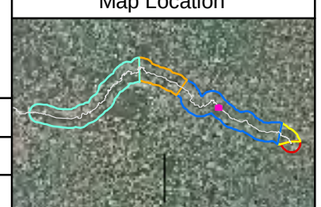
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

10.40 N & 10.50 L2

SHEET 3 OF 19

ENBRIDGE LINE 6B MP 608
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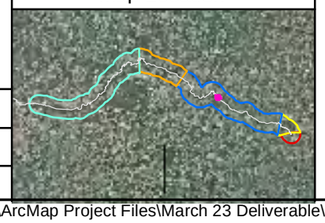
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

10.75 LDB

SHEET 4 OF 19

ENBRIDGE LINE 6B MP 608
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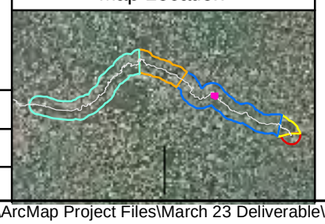
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

MP 11.21

SHEET 5 OF 19

ENBRIDGE LINE 6B MP 608
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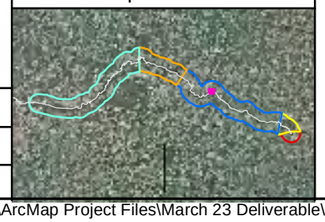
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

MP 11.78

SHEET 6 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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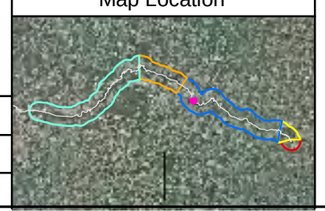
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

14.75 RDB North

SHEET 7 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

14.75 RDB South

SHEET 8 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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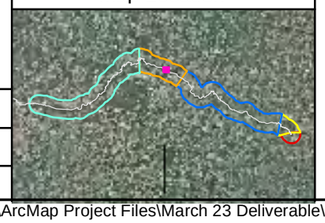
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

19.25 LDB North

SHEET 9 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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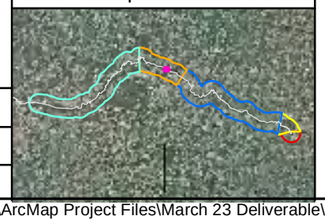
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

19.25 LDB South

SHEET 10 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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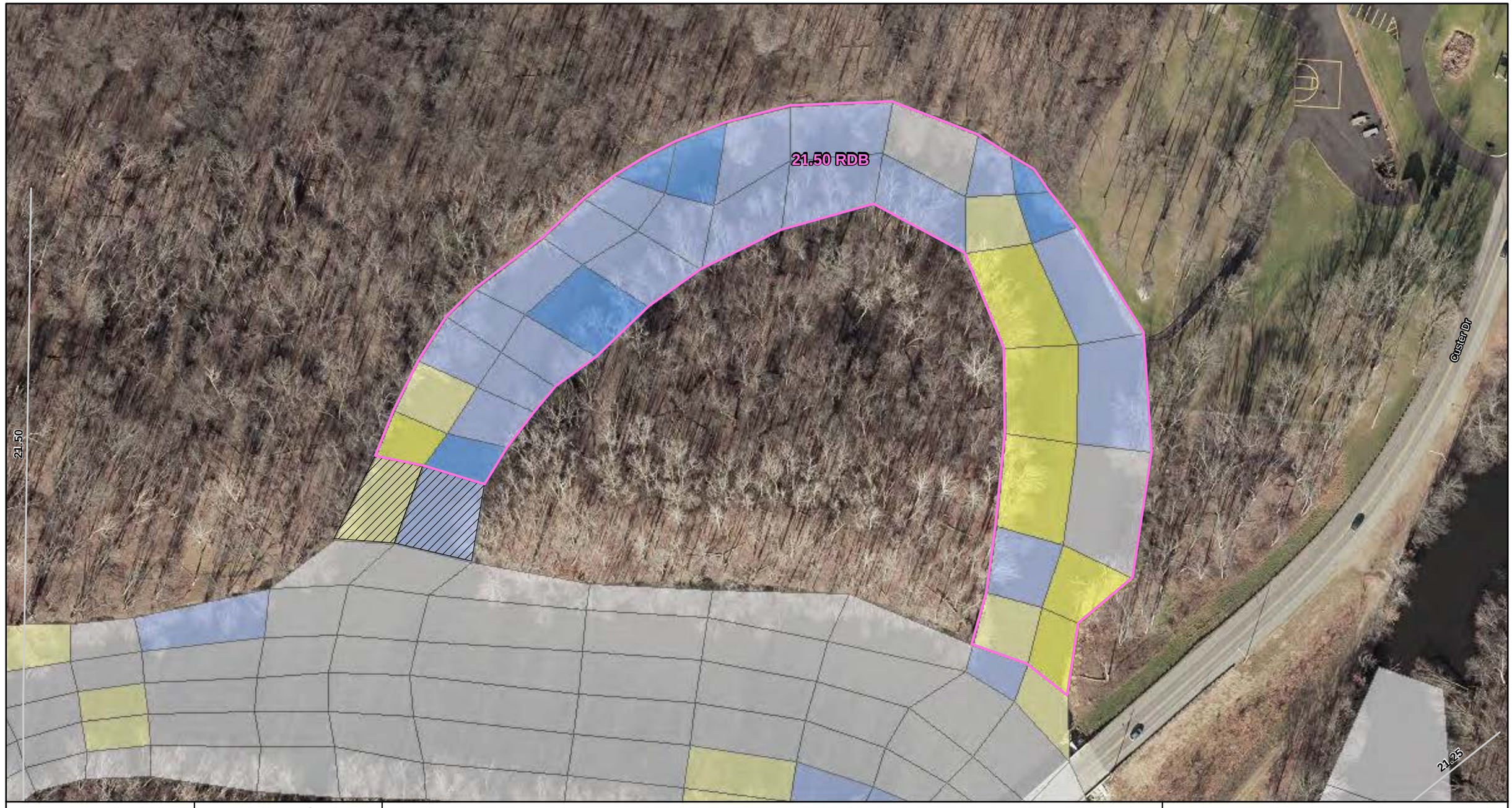
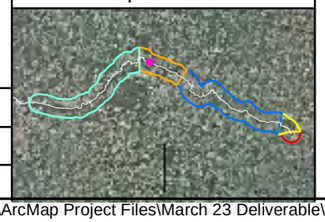
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

21.50 RDB

SHEET 11 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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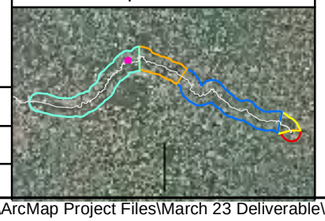
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

26.00 RDB & 26.25 RDB

SHEET 12 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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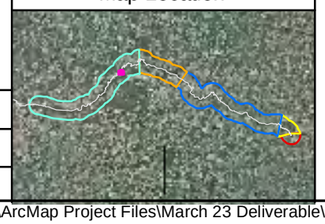
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

28.25 RDB

SHEET 13 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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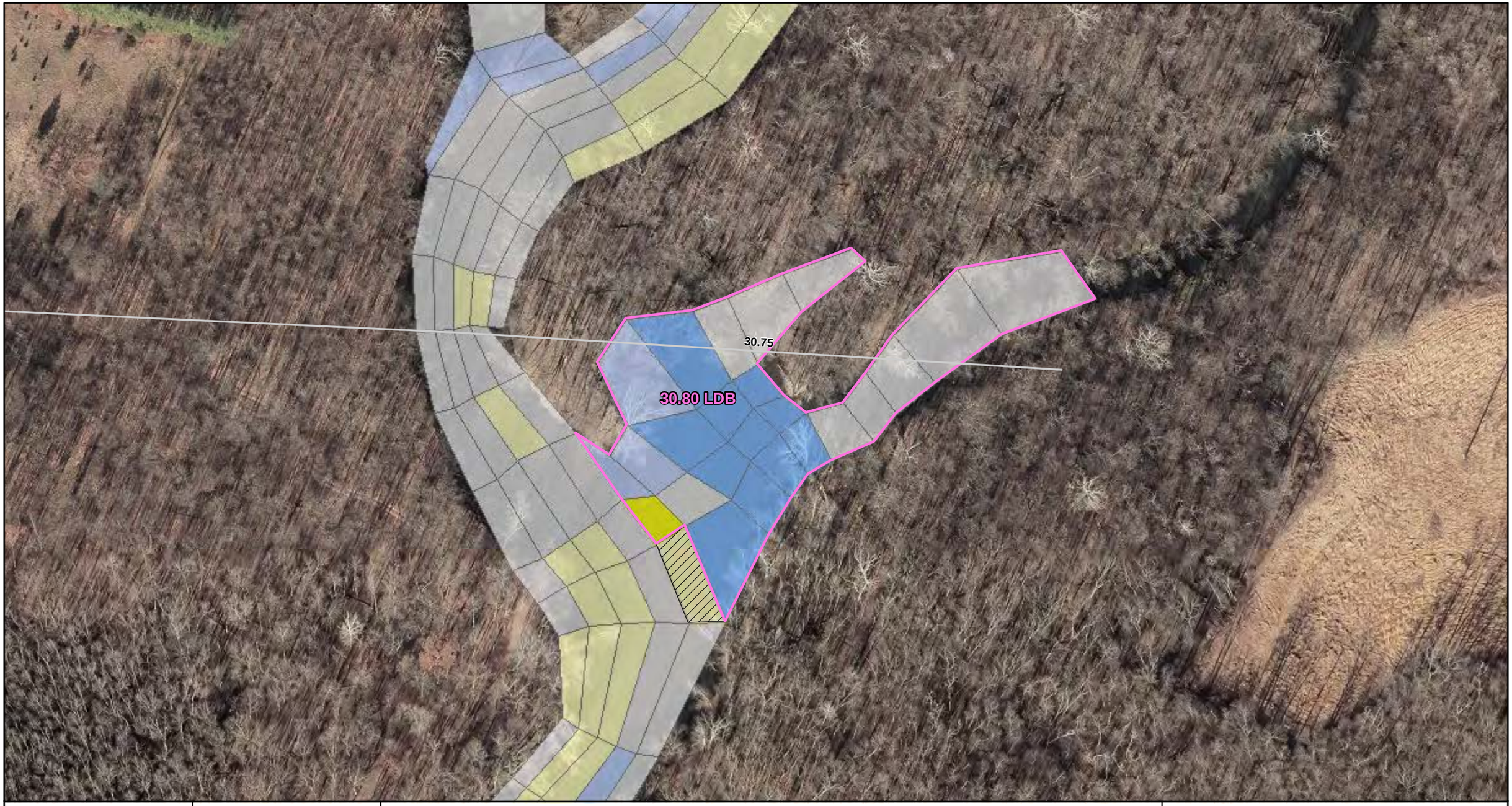
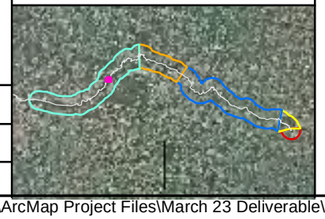
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

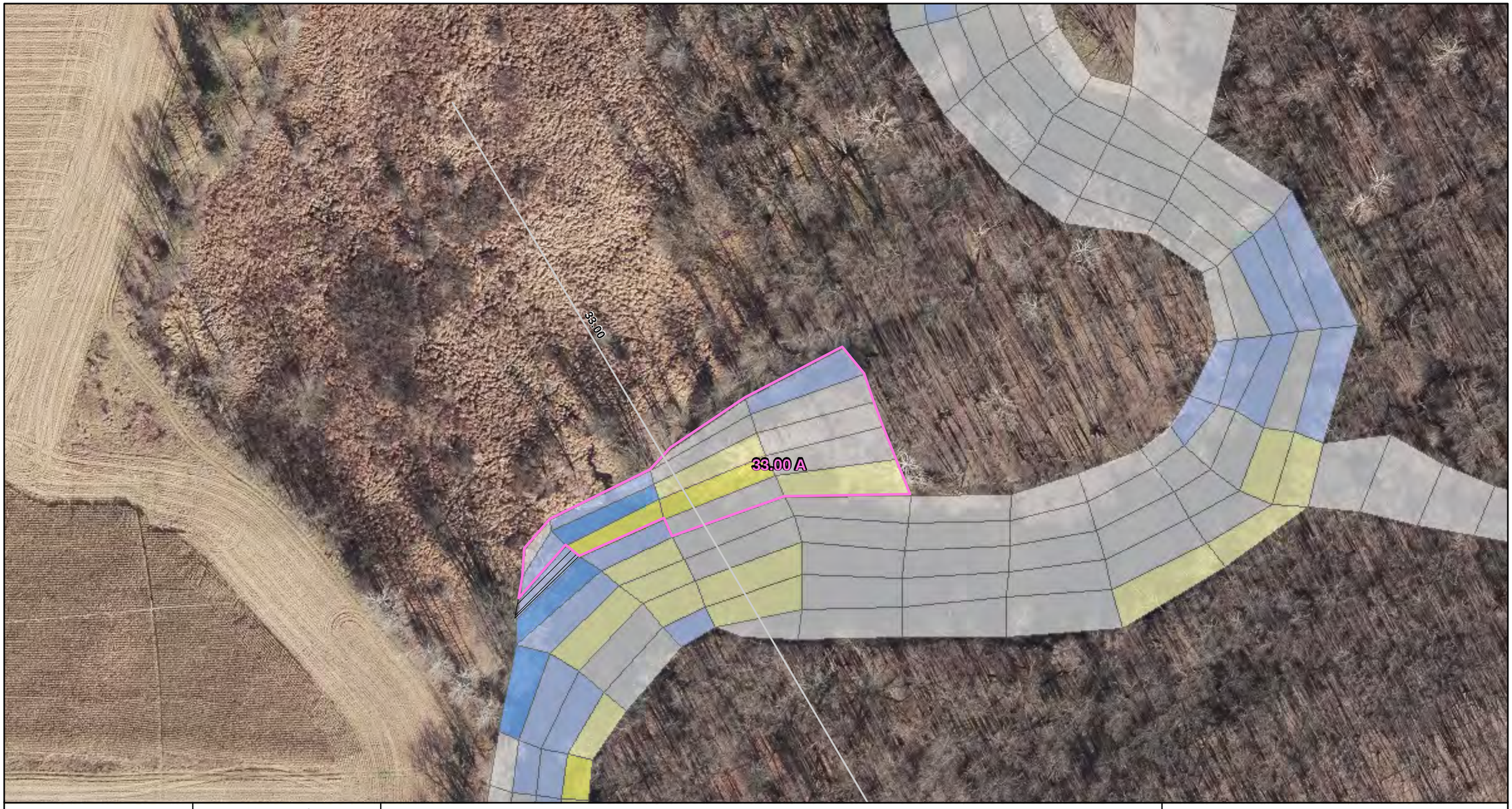
30.80 LDB

SHEET 14 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsB1-B3_May_2011.mxd

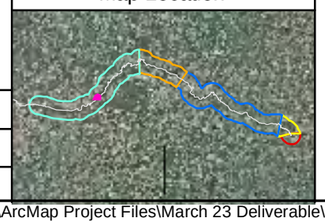
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

33.00 A

SHEET 15 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_TrapsB1-B3_May_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

33.00 B

SHEET 16 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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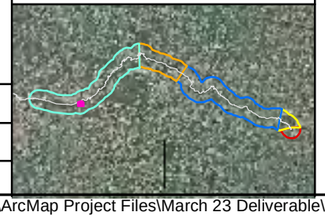
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

36.10 NW

SHEET 17 OF 19

ENBRIDGE LINE 6B MP 608
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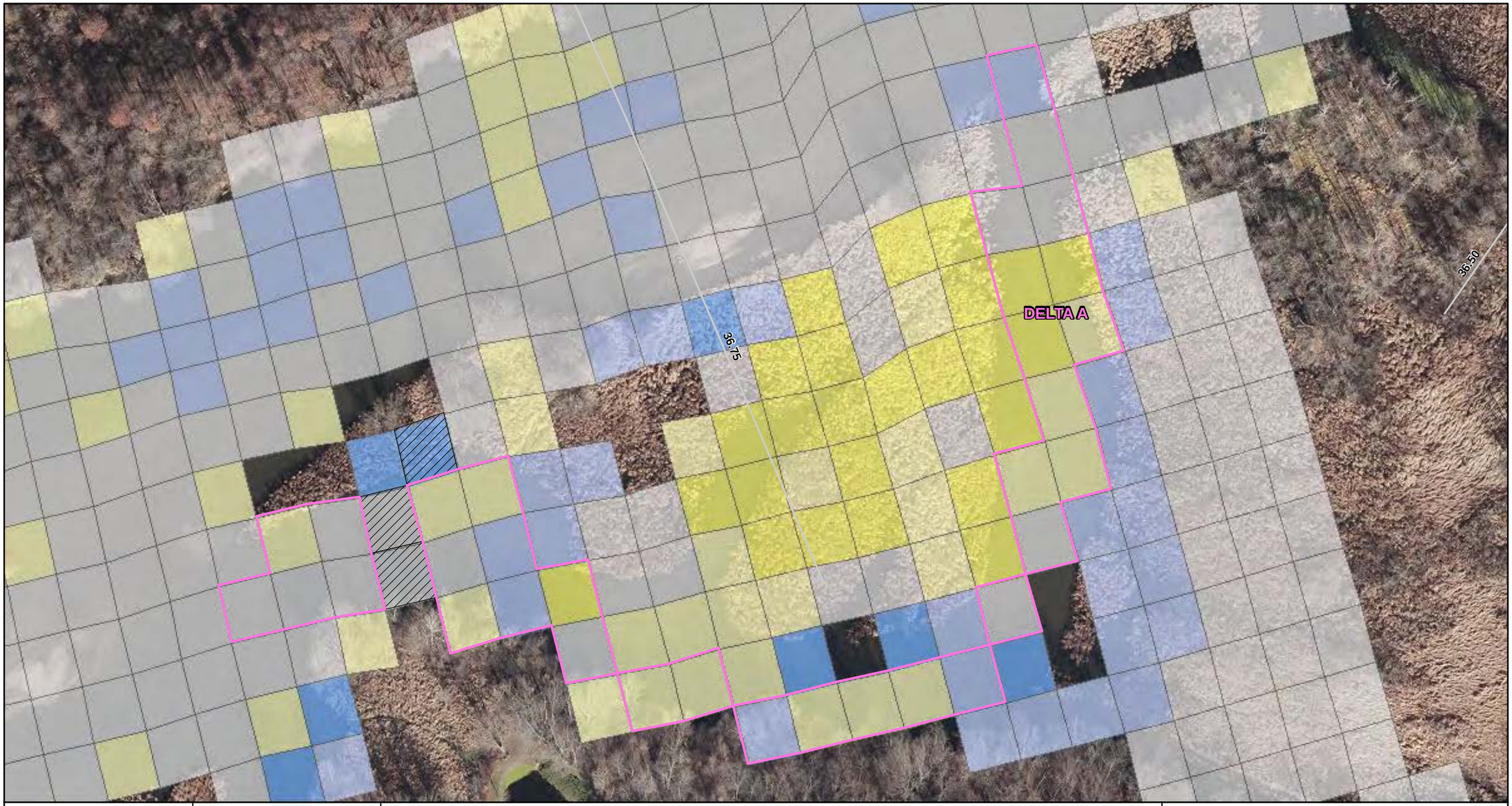
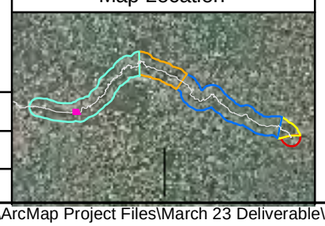
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

DELTA A

SHEET 18 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

37.75

37.75 ISLANDS

37.50

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

37.75 ISLANDS

SHEET 19 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

Figure 7-15

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, May 16 – May 23, 2011

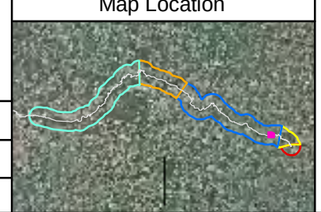
No Structure

Sheets 1 through 19

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

3.25 R1

SHEET 1 OF 19

ENBRIDGE LINE 6B MP 608
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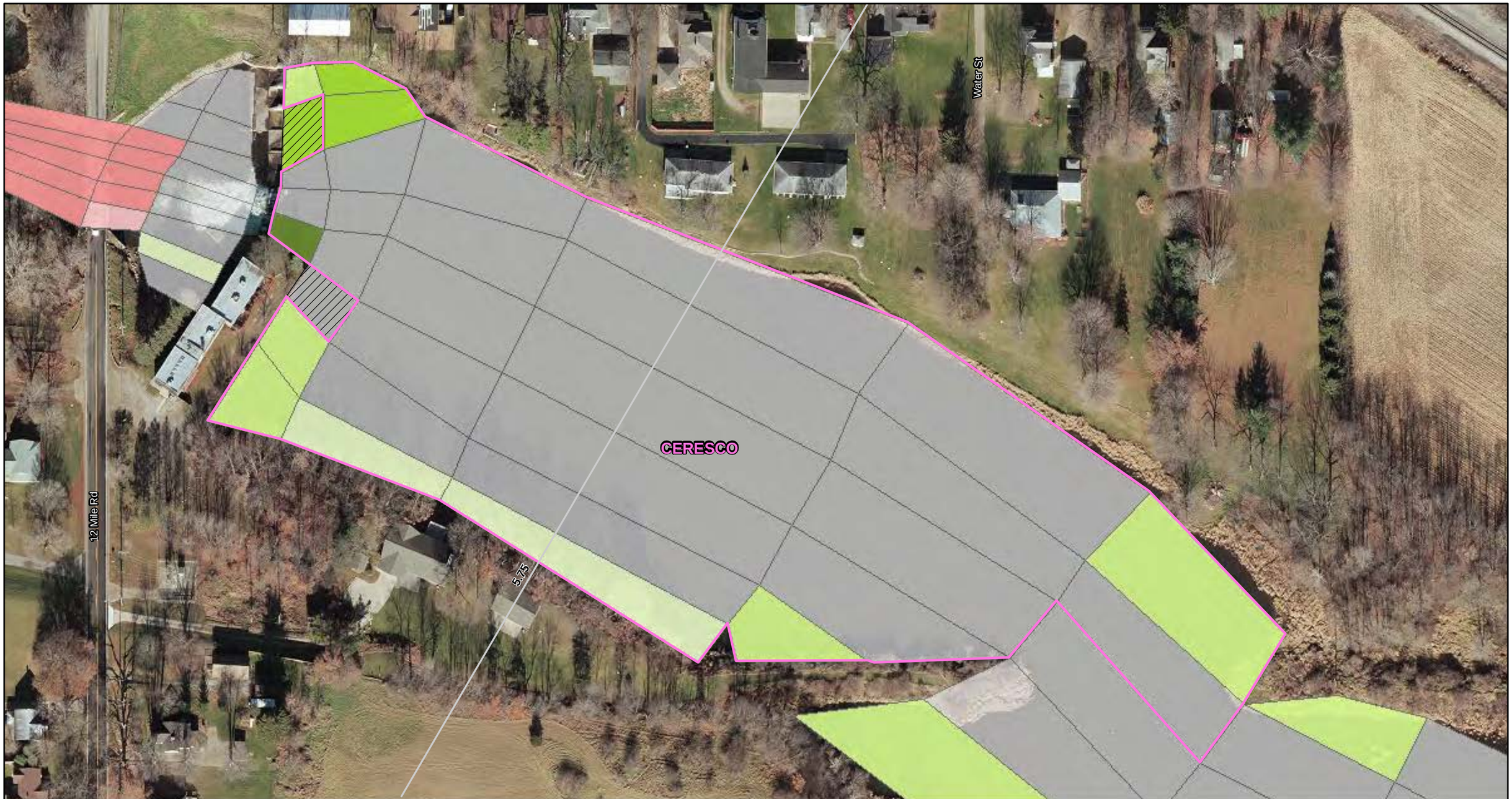
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

CERESCO

SHEET 2 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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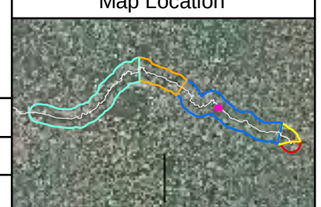
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

10.40 N & 10.50 L2

SHEET 3 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

10.75 LDB

SHEET 4 OF 19

ENBRIDGE LINE 6B MP 608
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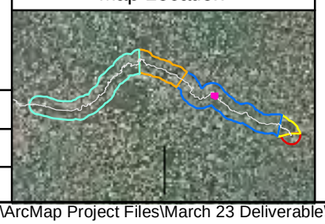
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

MP 11.21

SHEET 5 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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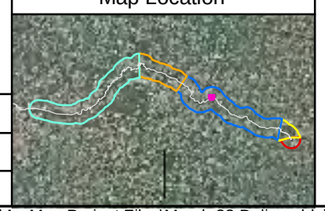
Aerial Photography Date: November 2011

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

MP 11.78

SHEET 6 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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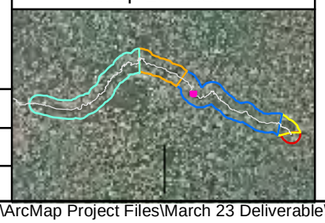
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

14.75 RDB North

SHEET 7 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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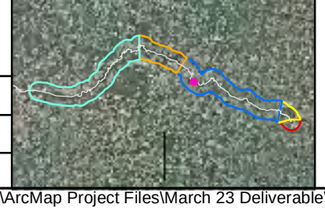
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

14.75 RDB South

SHEET 8 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

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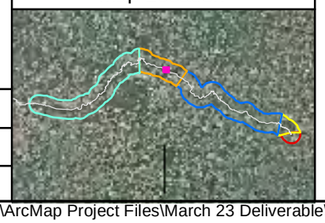
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

19.25 LDB North

SHEET 9 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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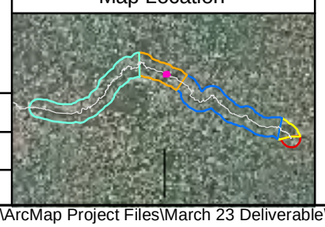
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

19.25 LDB South

SHEET 10 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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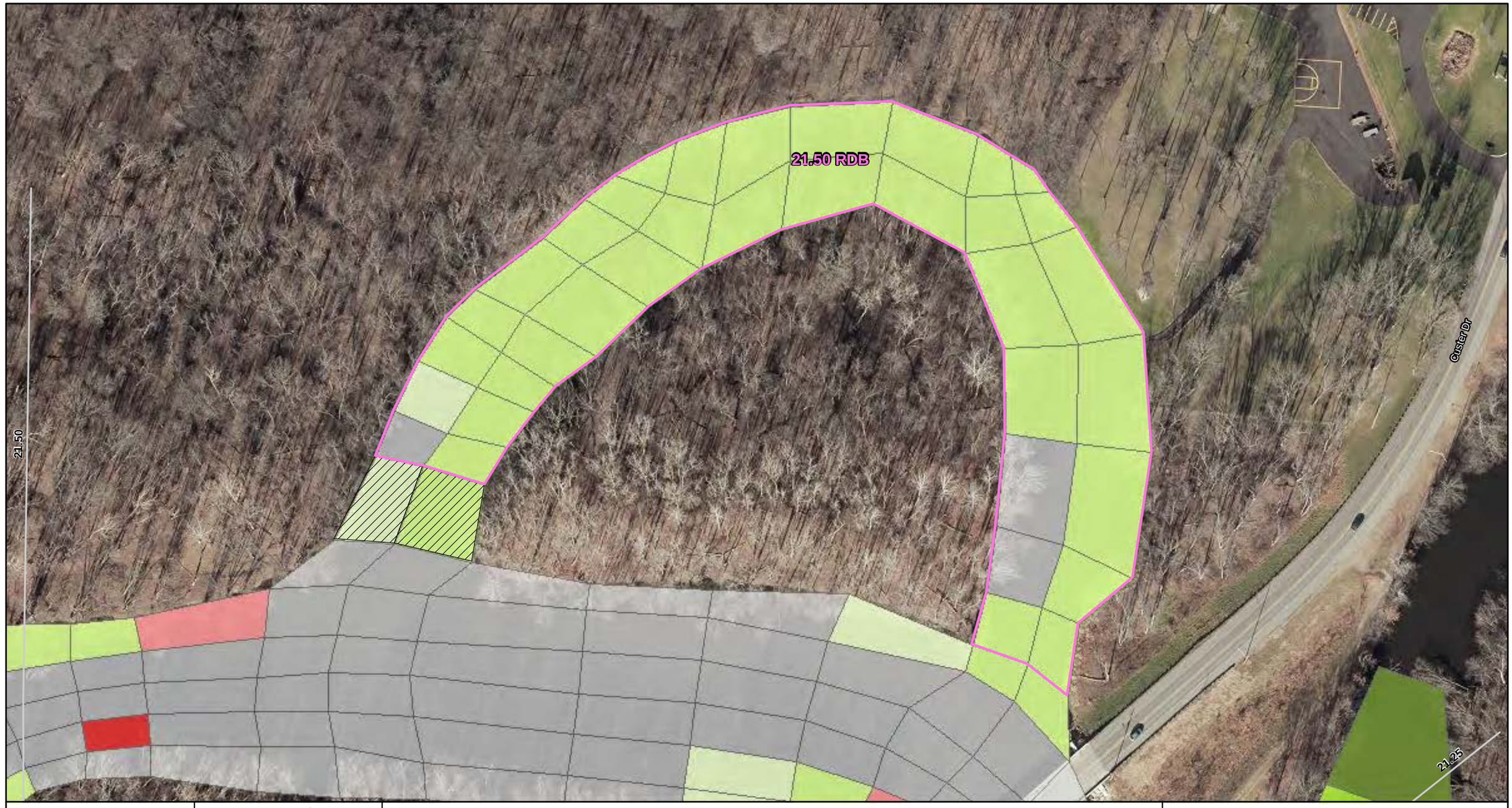
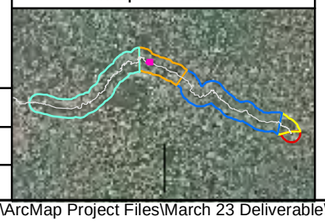
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

21.50 RDB

SHEET 11 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

Augusta Dr

26.25

26.25 RDB

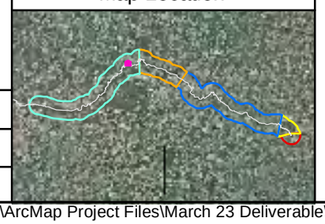
26.00

26.00 RDB

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

26.00 RDB & 26.25 RDB

SHEET 12 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

28.00

28.25 RDB

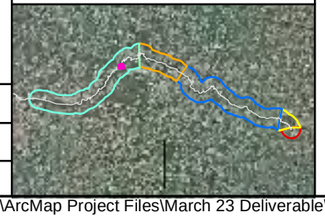
28.25

Fort Custer Dr

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

28.25 RDB

SHEET 13 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

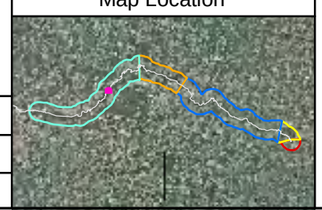
30.75

30.80 LDB

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

30.80 LDB

SHEET 14 OF 19

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Aerial Photography Date: November 2011

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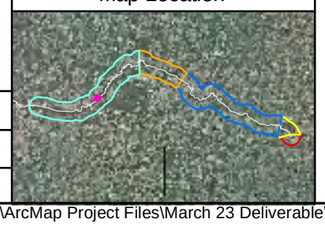
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

33.00 A

SHEET 15 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

33.00 B

SHEET 16 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

36.10 NW

SHEET 17 OF 19

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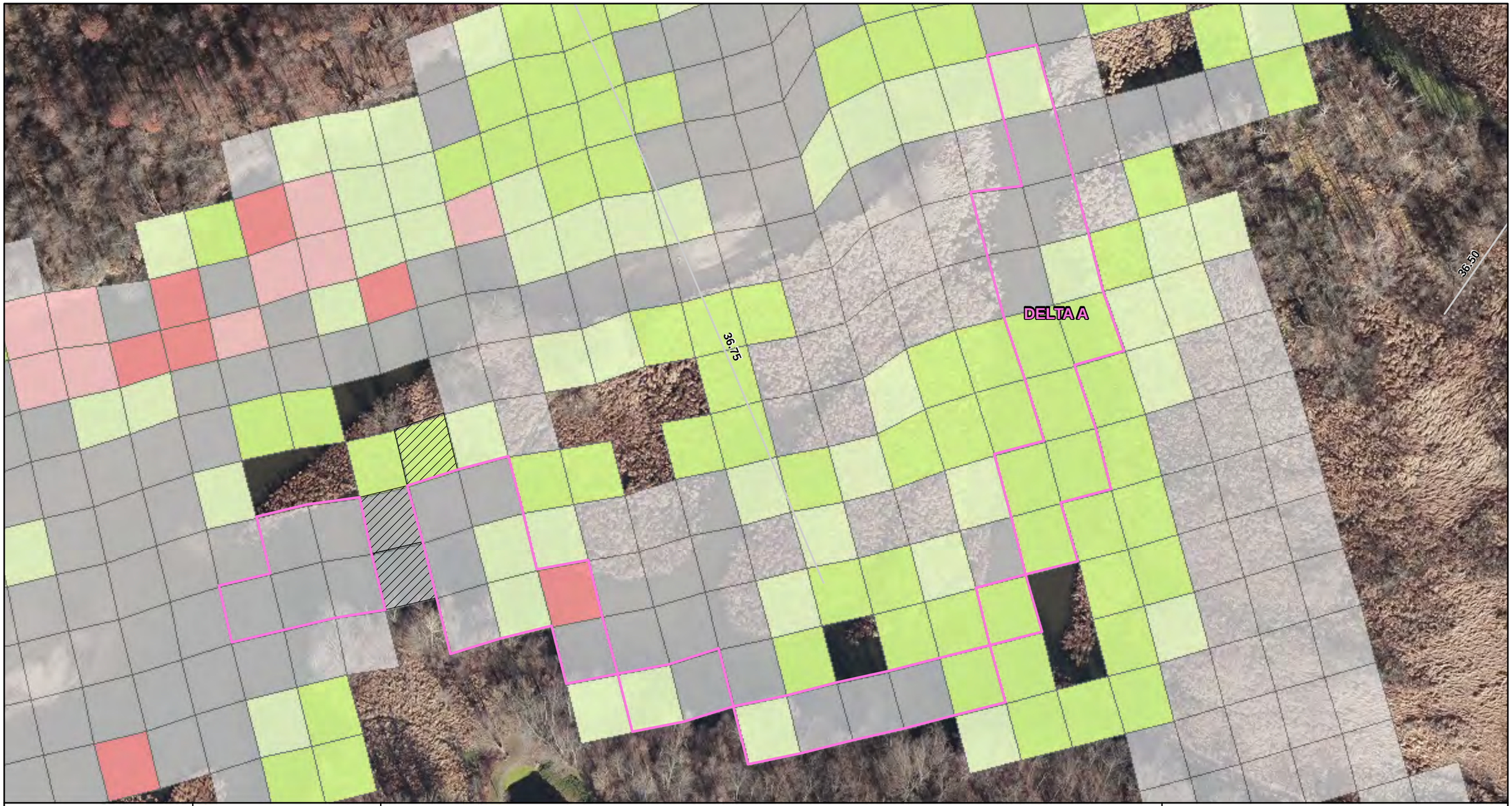
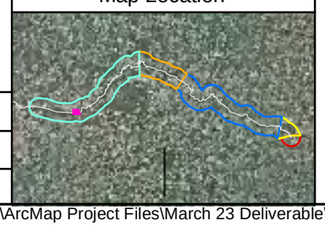
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

DELTA A

SHEET 18 OF 19

ENBRIDGE LINE 6B MP 608
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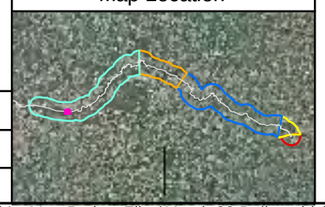
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- NO STRUCTURE

37.75 ISLANDS

SHEET 19 OF 19

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Aerial Photography Date: November 2011

Figure 7-16

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, May 16 – May 23, 2011

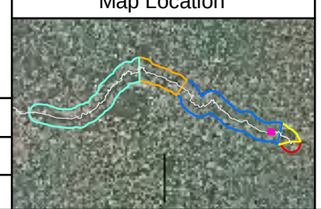
99% Structure

Sheets 1 through 19

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

3.25 R1

SHEET 1 OF 19

ENBRIDGE LINE 6B MP 608
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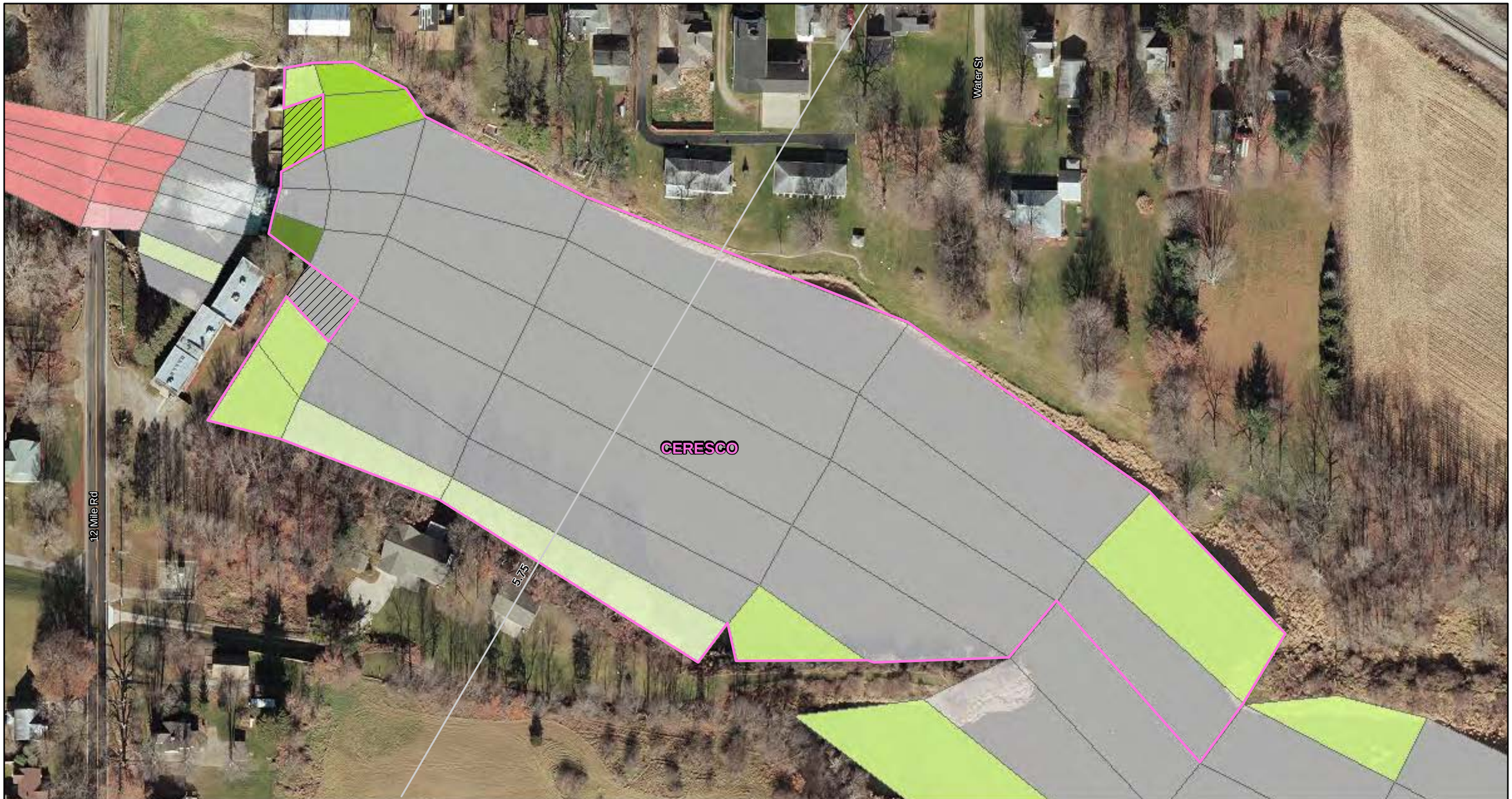
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

CERESCO

SHEET 2 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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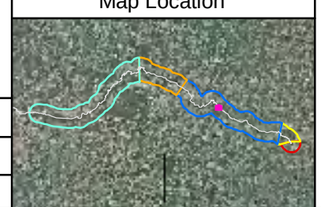
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

10.40 N & 10.50 L2

SHEET 3 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

10.75 LDB

SHEET 4 OF 19

ENBRIDGE LINE 6B MP 608
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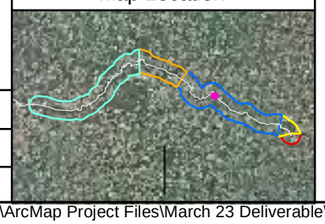
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

MP 11.21

SHEET 5 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

MP 11.78

SHEET 6 OF 19

ENBRIDGE LINE 6B MP 608
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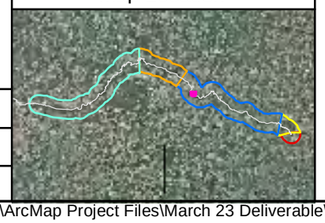
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

14.75 RDB North

SHEET 7 OF 19

ENBRIDGE LINE 6B MP 608
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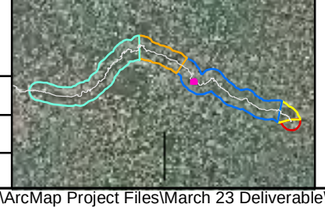
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

14.75 RDB South

SHEET 8 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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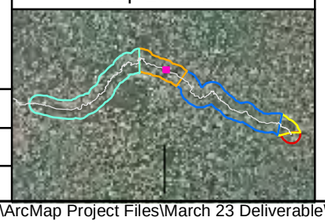
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

19.25 LDB North

SHEET 9 OF 19

ENBRIDGE LINE 6B MP 608
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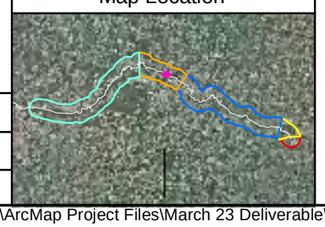
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

19.25 LDB South

SHEET 10 OF 19

ENBRIDGE LINE 6B MP 608
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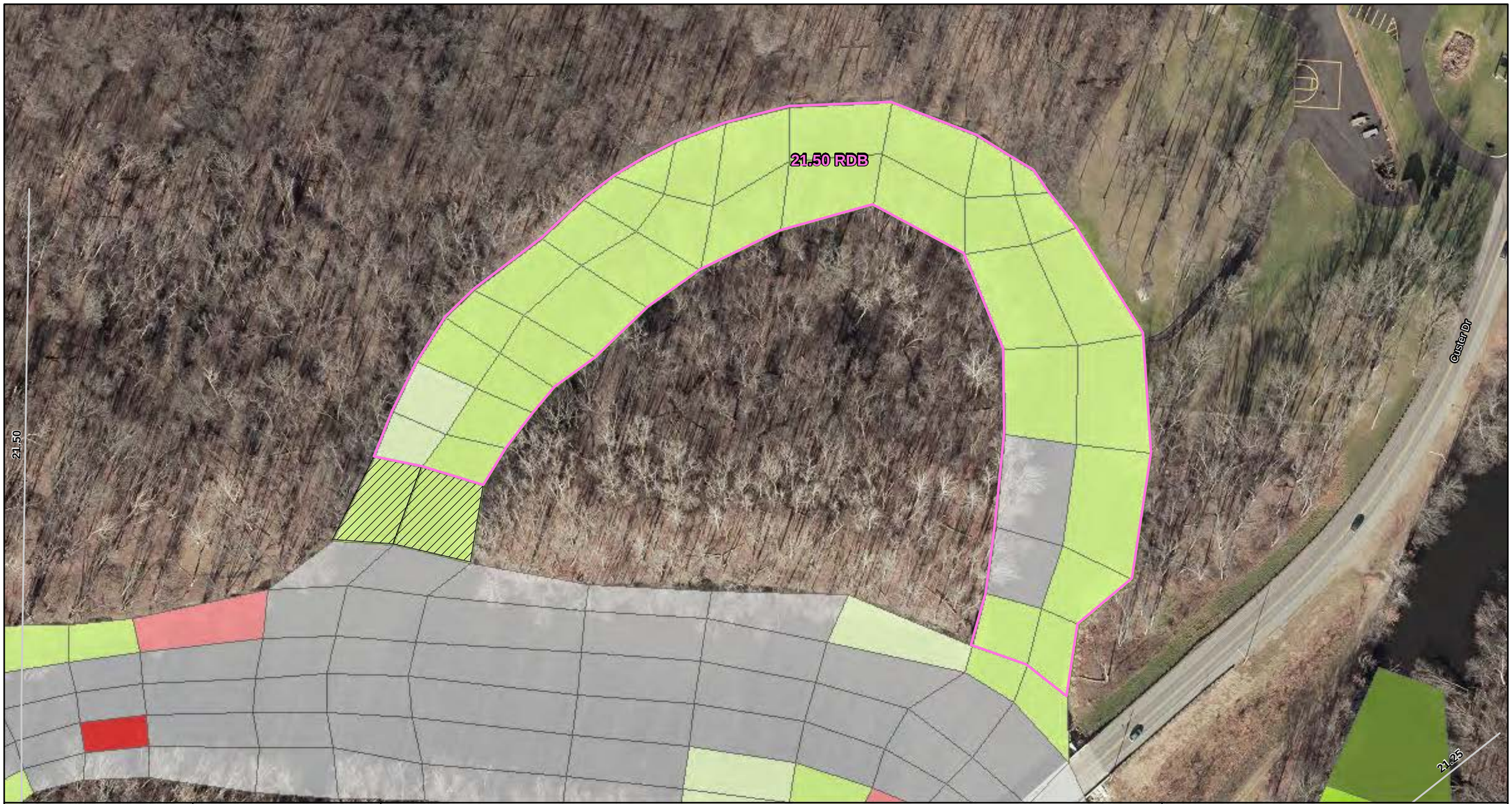
Aerial Photography Date: November 2011



ENBRIDGE

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Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

21.50 RDB

SHEET 11 OF 19

ENBRIDGE LINE 6B MP 608
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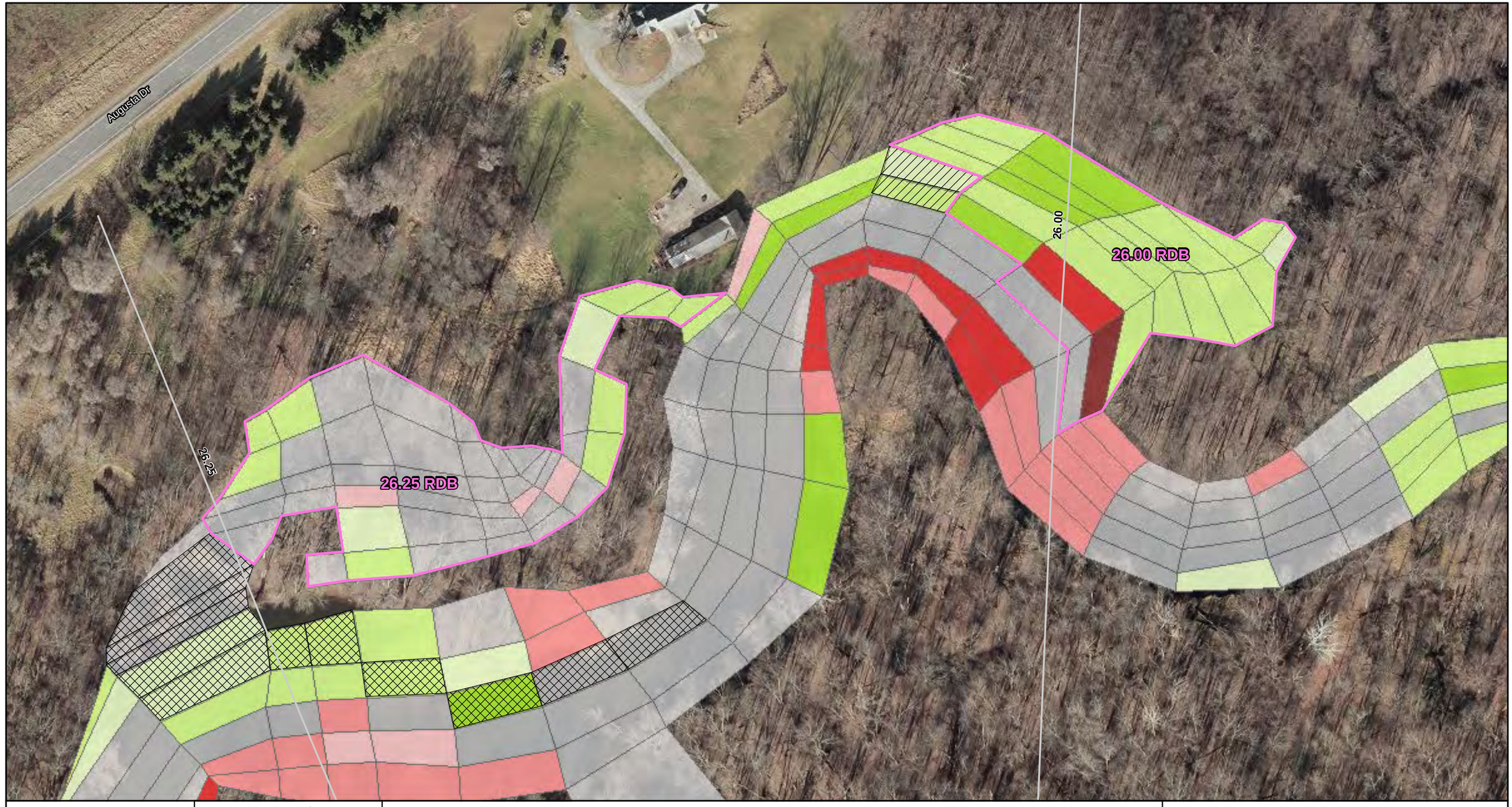
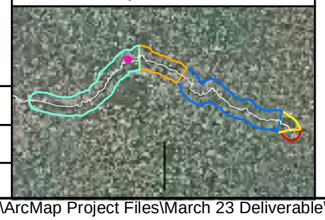
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

26.00 RDB & 26.25 RDB

SHEET 12 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

28.00

28.25 RDB

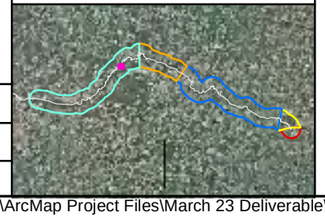
28.25

Fort Custer Dr

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

28.25 RDB

SHEET 13 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

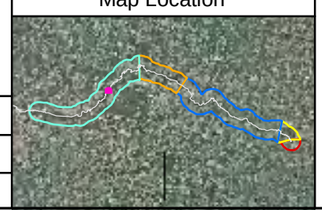
30.75

30.80 LDB

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

30.80 LDB

SHEET 14 OF 19

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Aerial Photography Date: November 2011

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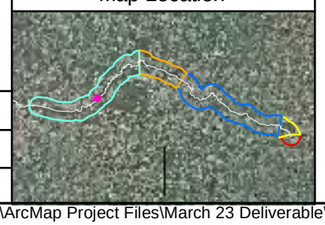
Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

33.00 A

SHEET 15 OF 19

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Aerial Photography Date: November 2011

33.00

33.00 B

33.25

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

33.00 B

SHEET 16 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

36.10 NW

SHEET 17 OF 19

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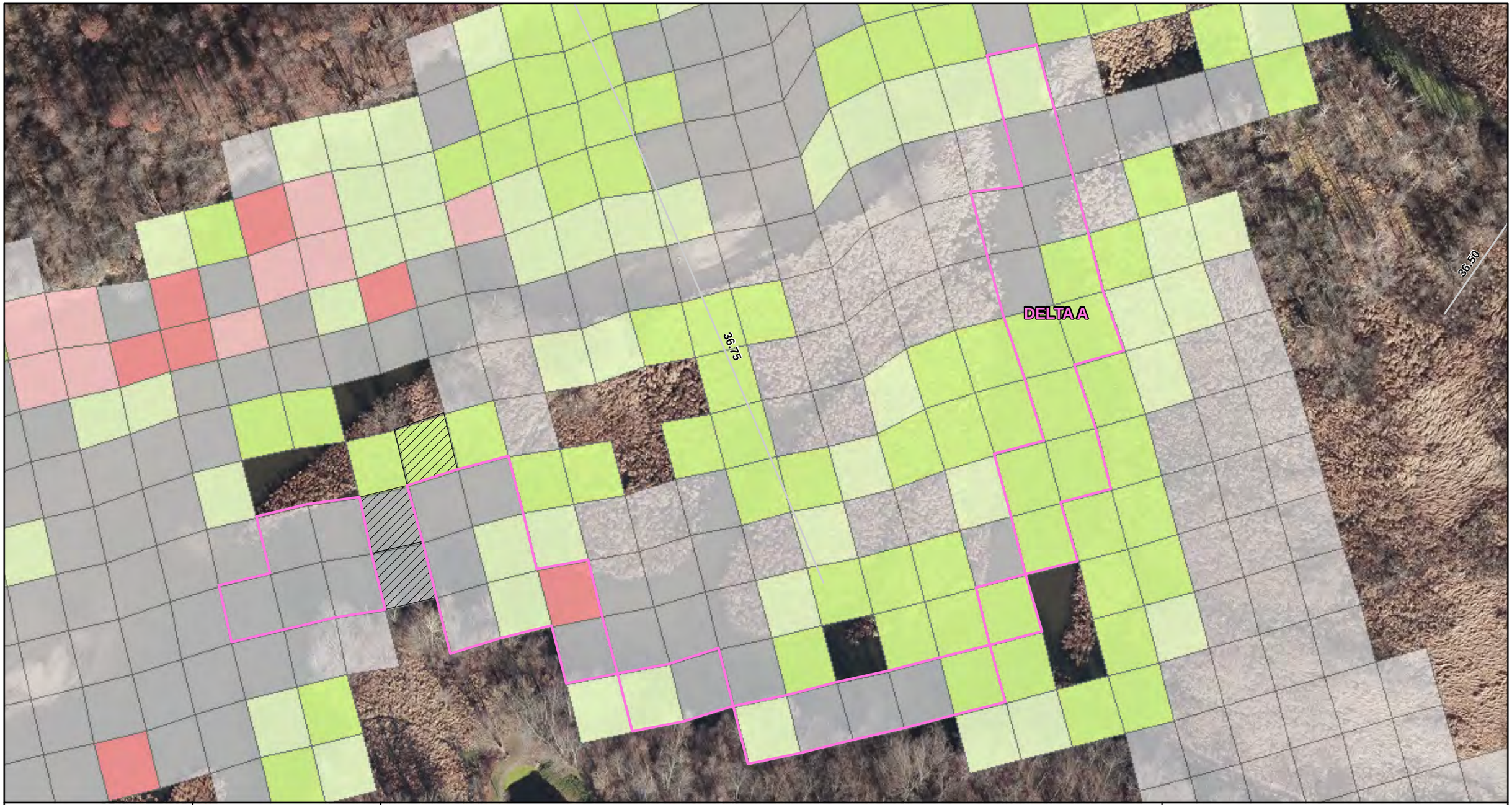
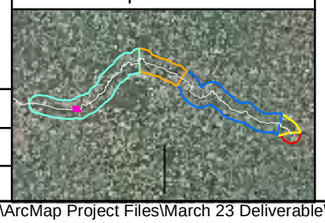
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

DELTA A

SHEET 18 OF 19

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Aerial Photography Date: November 2011

37.75

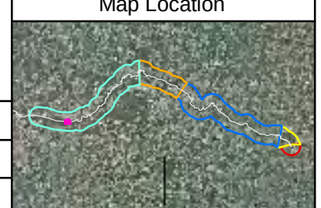
37.75 ISLANDS

37.50

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 99% STRUCTURE

37.75 ISLANDS

SHEET 19 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

Figure 7-17

Riverine Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, May 16 – May 23, 2011

75% Structure

Sheets 1 through 19

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Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

3.25 R1

SHEET 1 OF 19

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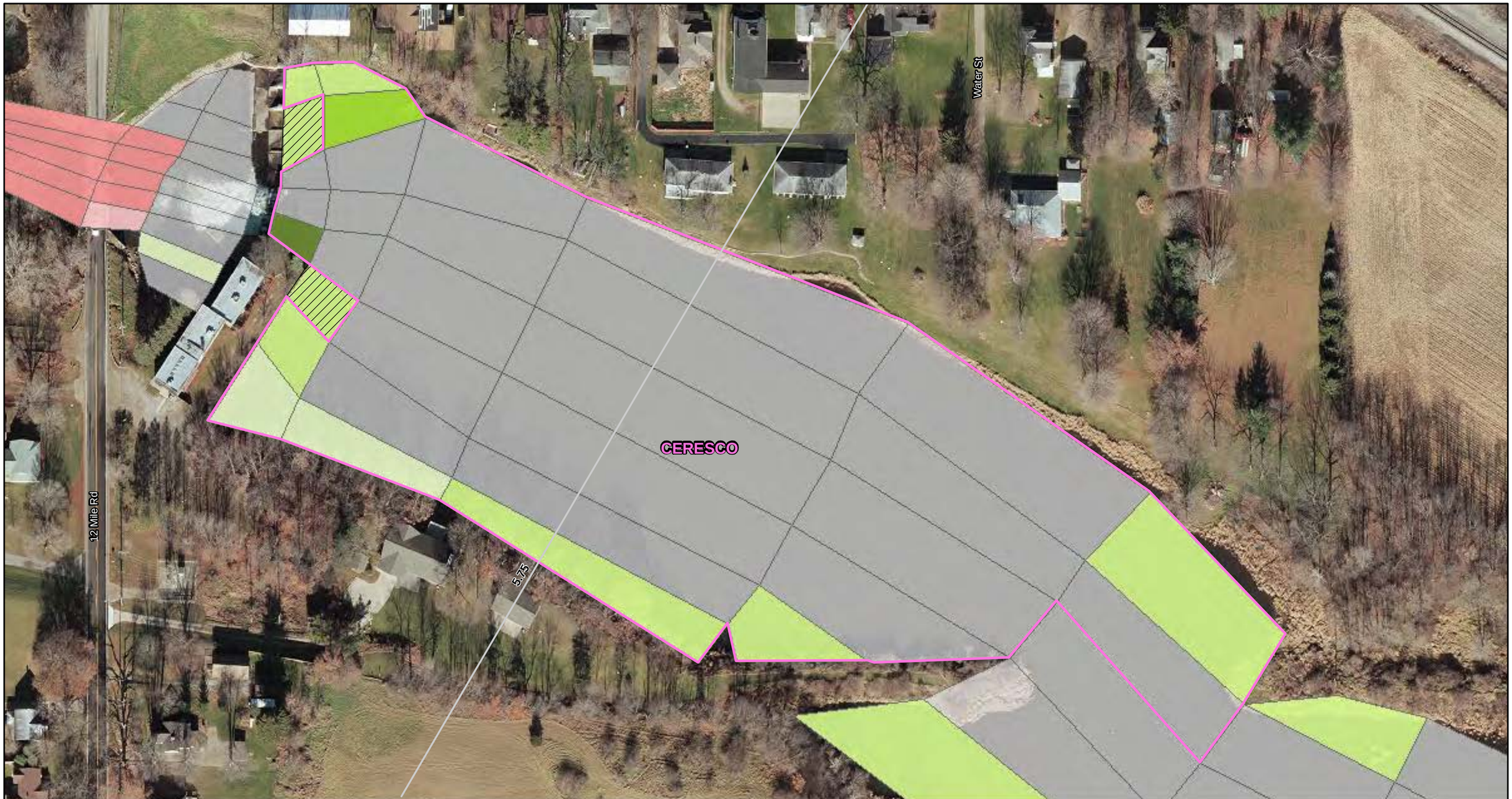
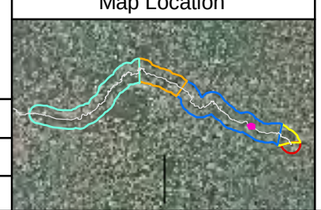
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

CERESCO

SHEET 2 OF 19

ENBRIDGE LINE 6B MP 608
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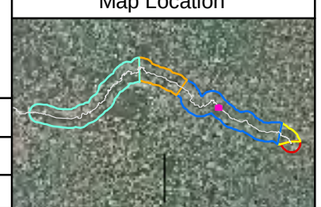
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

10.40 N & 10.50 L2

SHEET 3 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

River Rd E

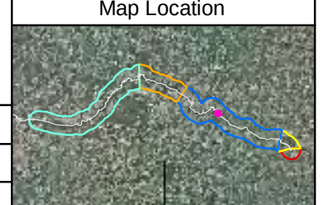
10.75 LDB

10.50

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

10.75 LDB

SHEET 4 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

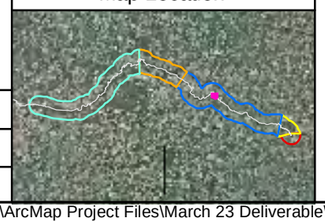
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_Traps75_May_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

MP 11.21

SHEET 5 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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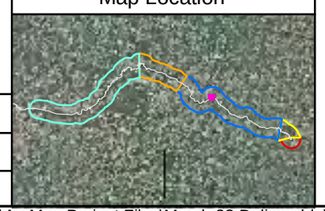
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

MP 11.78

SHEET 6 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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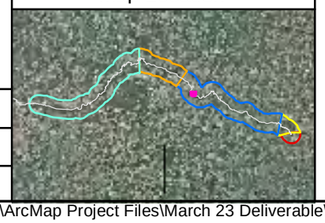
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

14.75 RDB North

SHEET 7 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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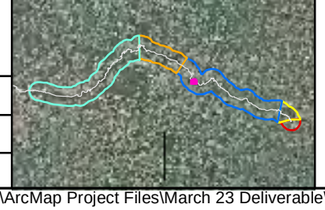
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

14.75 RDB South

SHEET 8 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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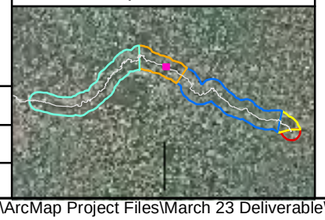
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

19.25 LDB North

SHEET 9 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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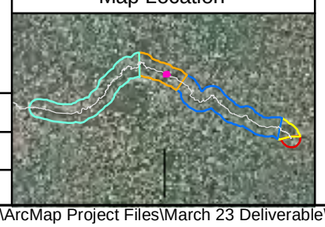
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

19.25 LDB South

SHEET 10 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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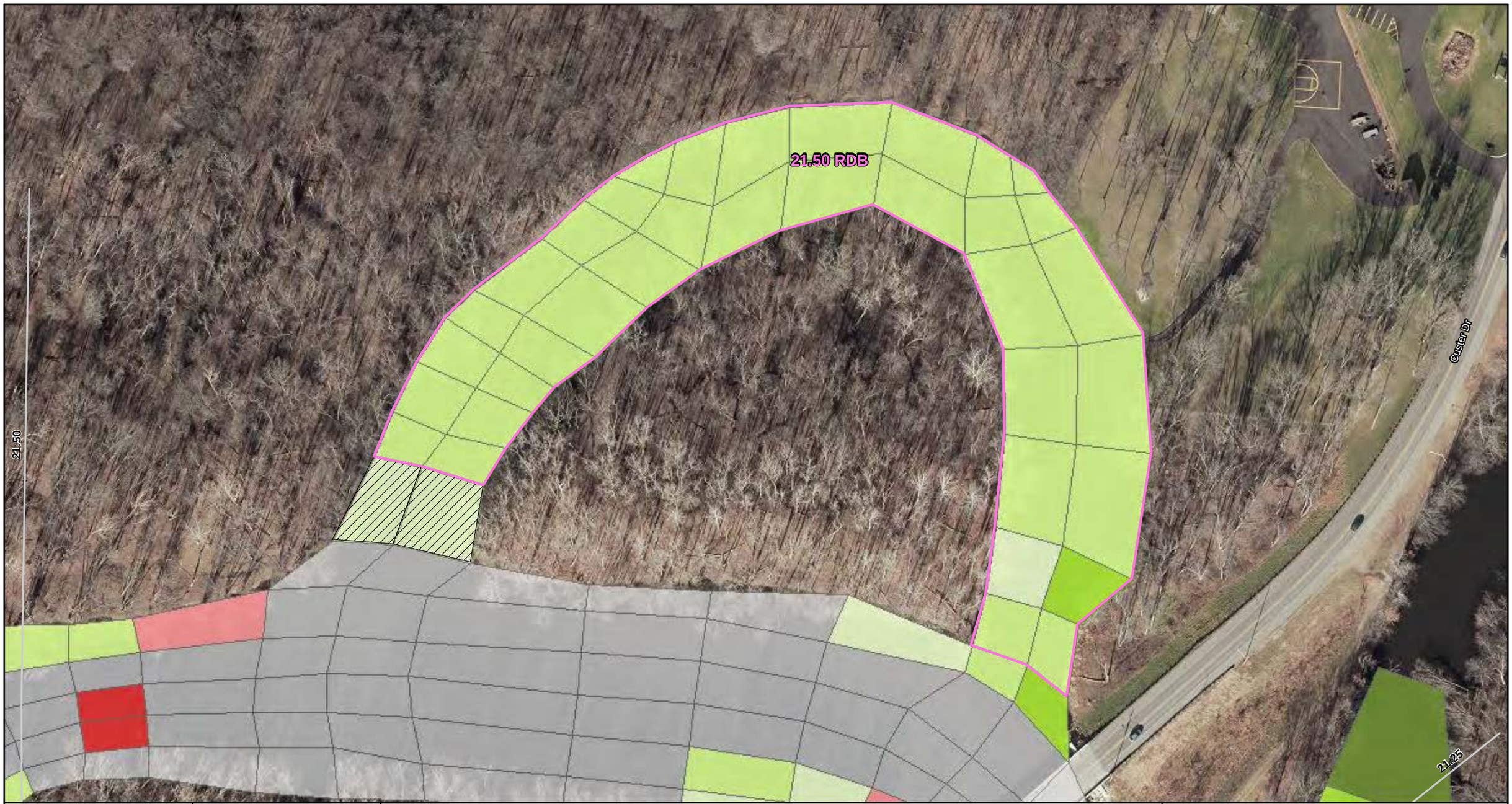
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

21.50 RDB

SHEET 11 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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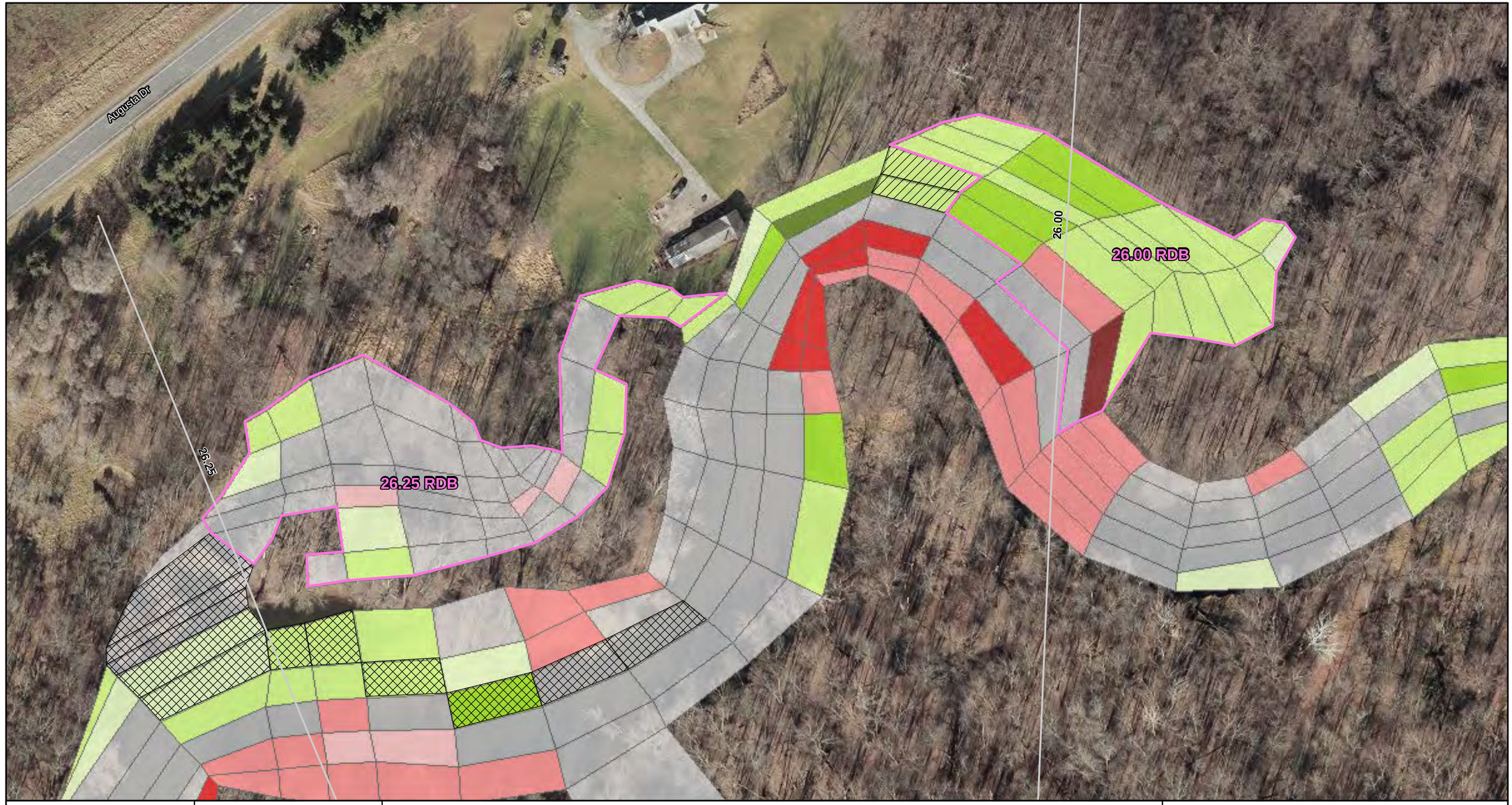
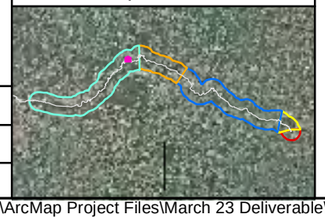
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

26.00 RDB & 26.25 RDB

SHEET 12 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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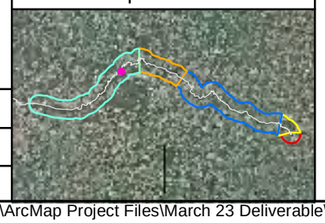
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

28.25 RDB

SHEET 13 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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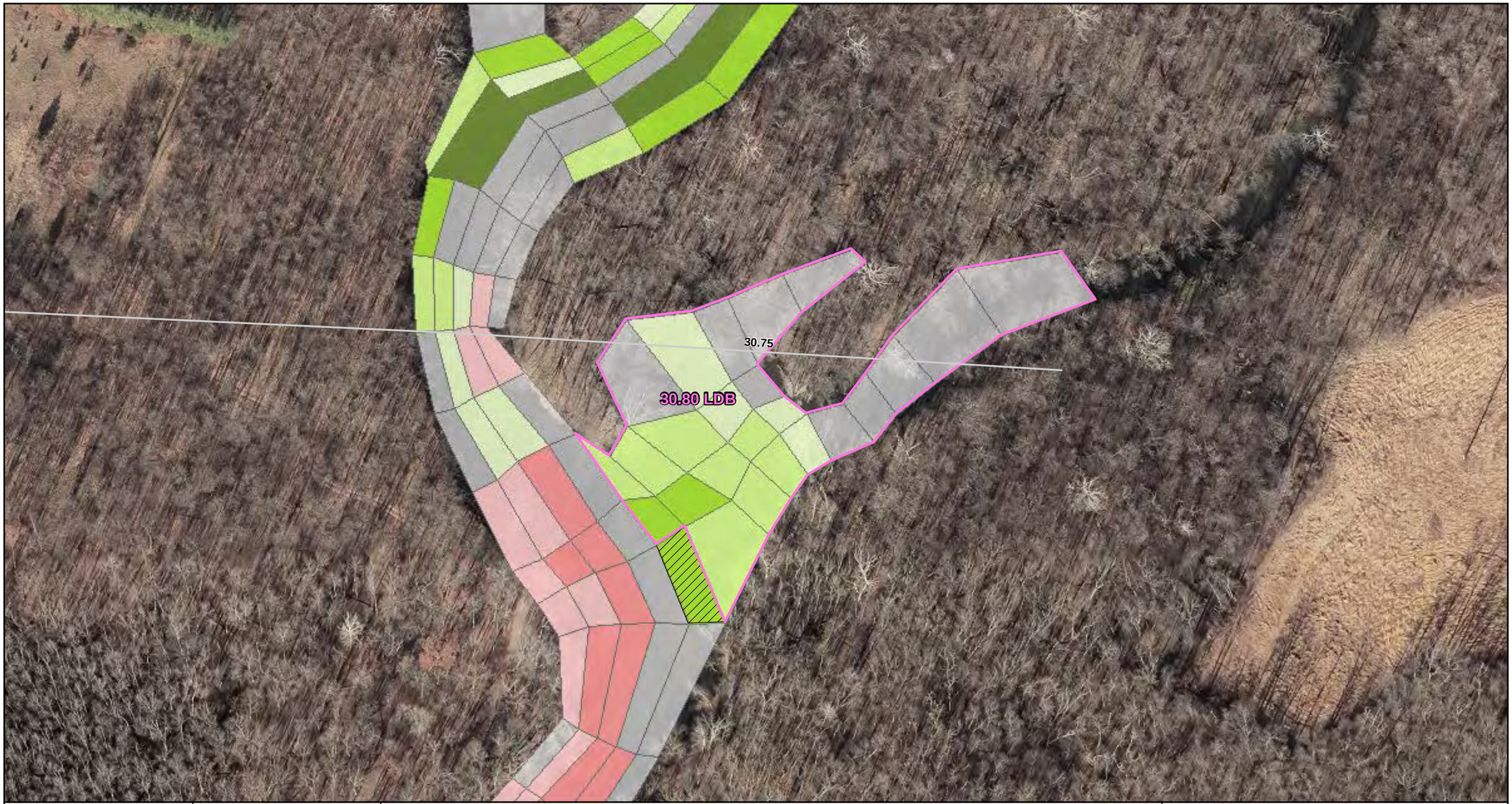
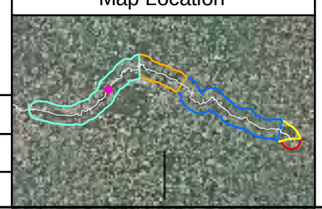
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

30.80 LDB

SHEET 14 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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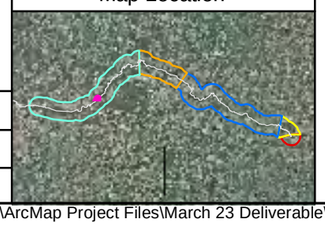
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

33.00 A

SHEET 15 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

33.00 B

SHEET 16 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

36.10 NW

SHEET 17 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location

Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

DELTA A

SHEET 18 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

37.75

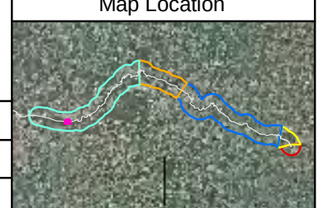
37.75 ISLANDS

37.50

ENBRIDGE

Drawn:	BRS	4/1/2012
Approved:	DBR	4/1/2012
Project #:	106-4186	

Map Location



Legend

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
MAY 16 - MAY 23, 2011 --- 75% STRUCTURE

37.75 ISLANDS

SHEET 19 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Sedimentation_Rate2_Sed_Traps75_May_2011.mxd

Aerial Photography Date: November 2011

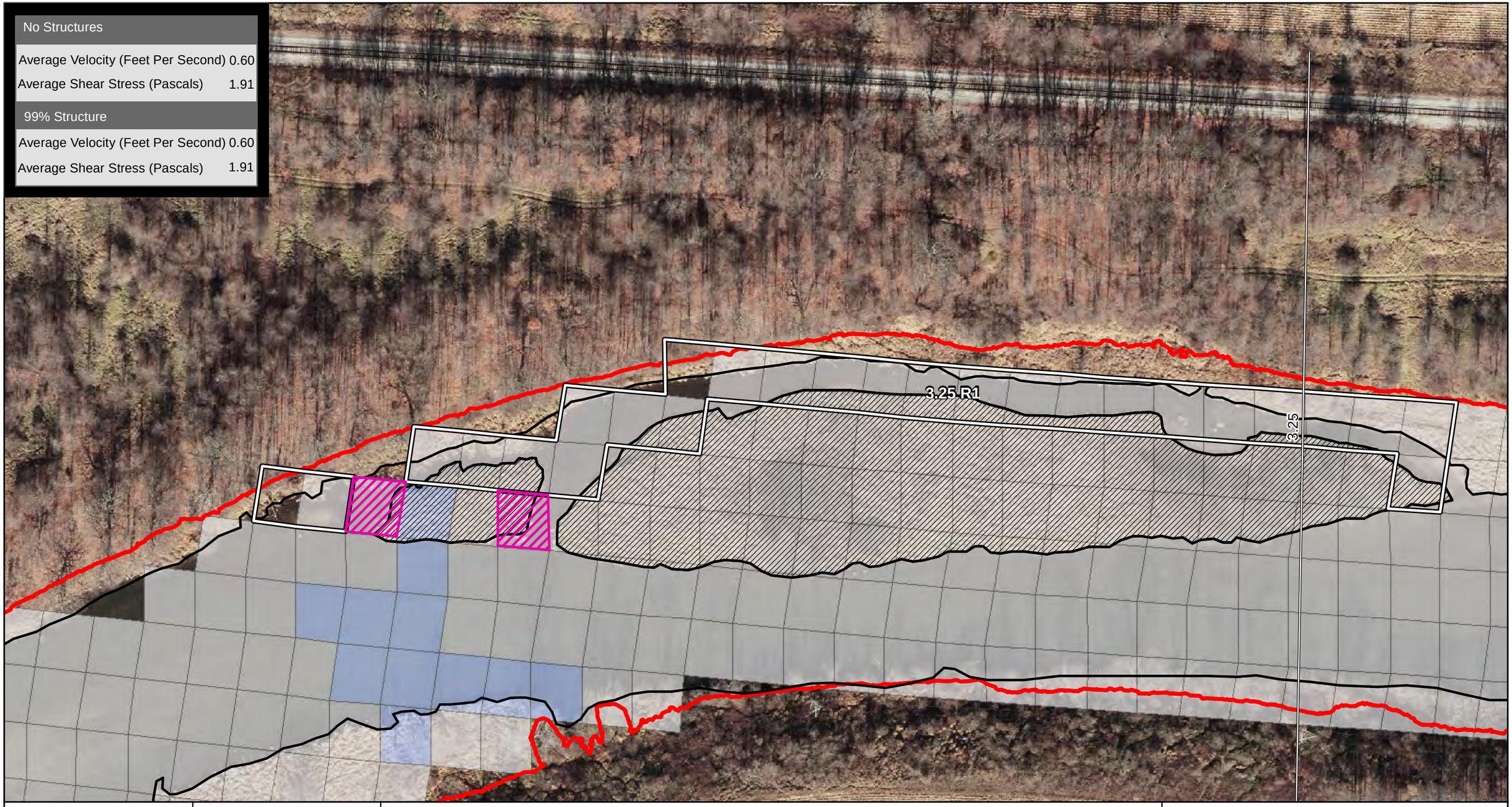
Figure 7-18

Change in Sedimentation Rate Between No Structure and 99% Structure

July 24 – July 31, 2010

Sheets 1 through 16

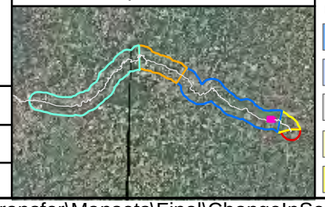
No Structures	
Average Velocity (Feet Per Second)	0.60
Average Shear Stress (Pascals)	1.91
99% Structure	
Average Velocity (Feet Per Second)	0.60
Average Shear Stress (Pascals)	1.91



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

- HEC-RAS 100-Year Floodplain

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

3.25 R1

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.59
Average Shear Stress (Pascals)	2.91
99% Structure	
Average Velocity (Feet Per Second)	0.59
Average Shear Stress (Pascals)	2.90

12 Mile Rd

Water St

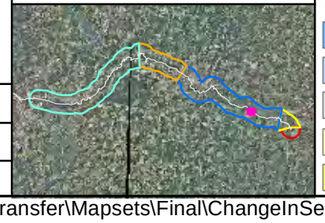
5.75

Ceresco

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 55 110 220

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

CERESCO

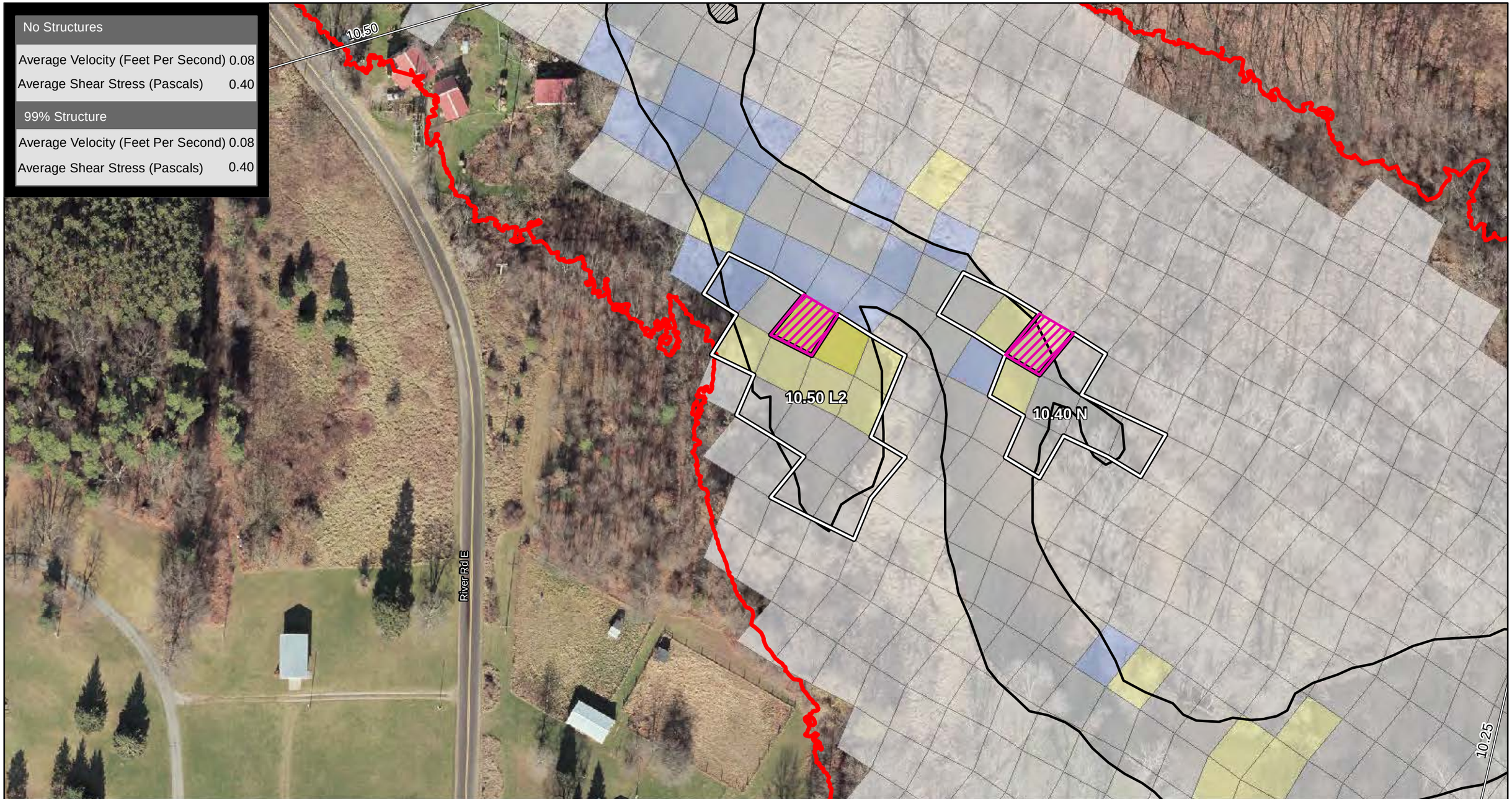
SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

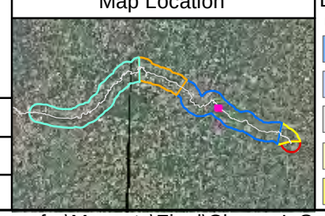
No Structures	
Average Velocity (Feet Per Second)	0.08
Average Shear Stress (Pascals)	0.40
99% Structure	
Average Velocity (Feet Per Second)	0.08
Average Shear Stress (Pascals)	0.40



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

10.40 N

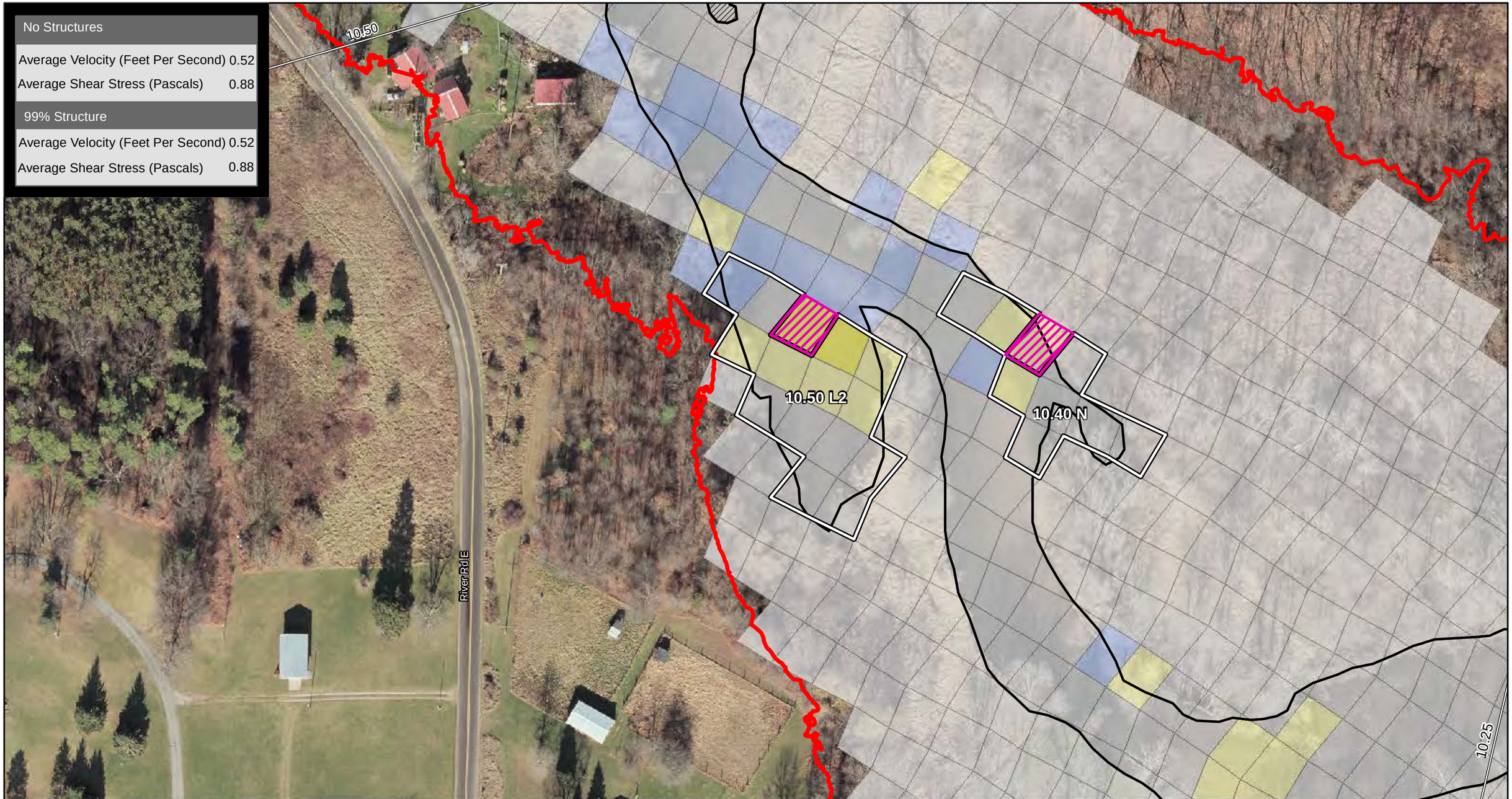
SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

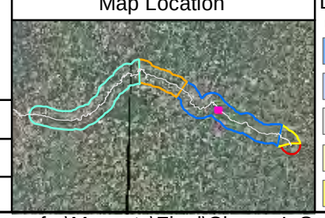
No Structures	
Average Velocity (Feet Per Second)	0.52
Average Shear Stress (Pascals)	0.88
99% Structure	
Average Velocity (Feet Per Second)	0.52
Average Shear Stress (Pascals)	0.88



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

10.50 L2

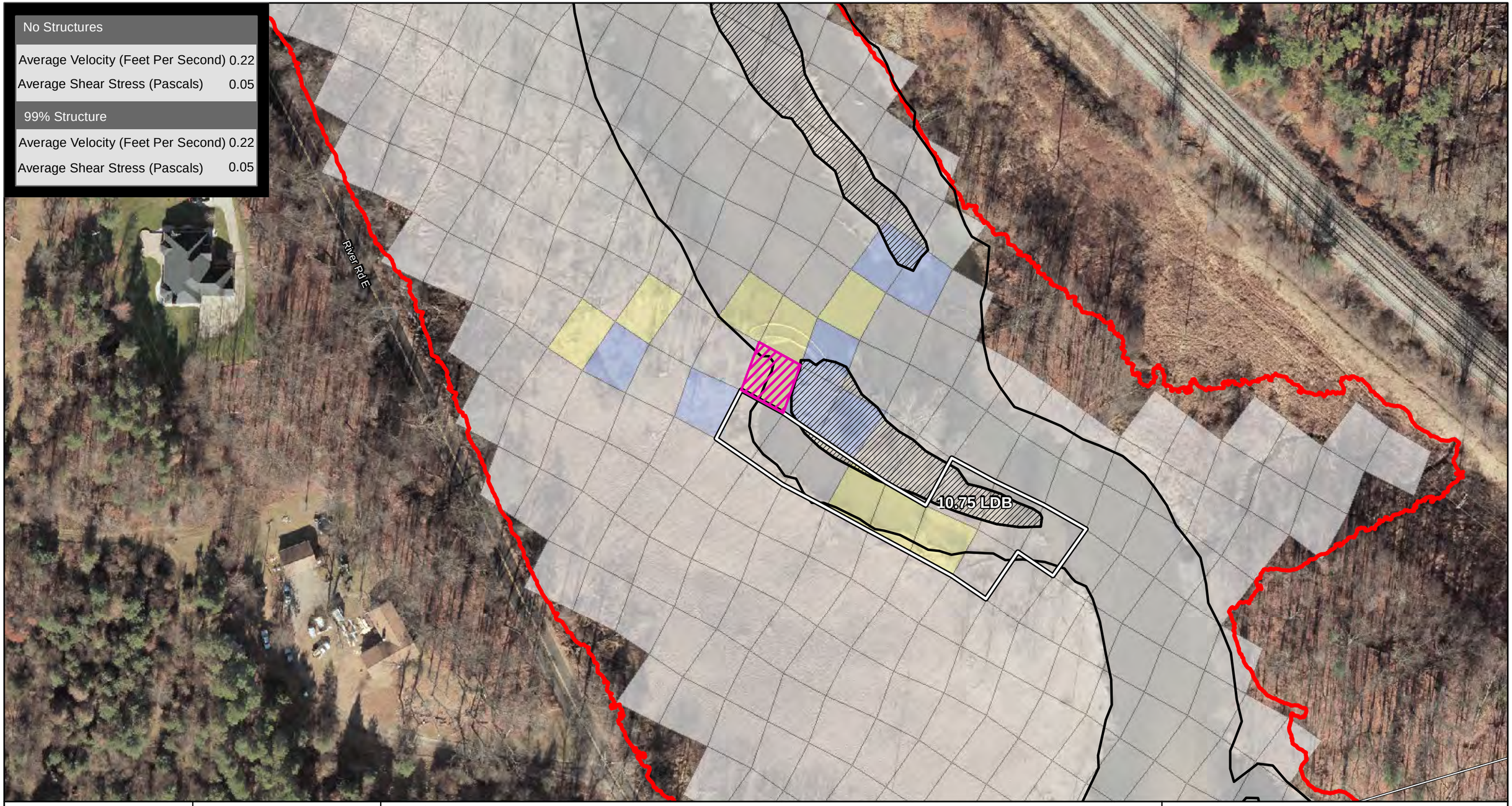
SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.05
99% Structure	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.05



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

10.75 LDB

SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.03
Average Shear Stress (Pascals)	0.08
99% Structure	
Average Velocity (Feet Per Second)	0.03
Average Shear Stress (Pascals)	0.08

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

- HEC-RAS 100-Year Floodplain

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

14.75 RDB

SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

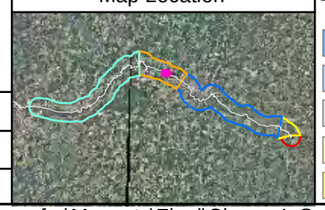
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.20
Average Shear Stress (Pascals)	0.04
99% Structure	
Average Velocity (Feet Per Second)	0.20
Average Shear Stress (Pascals)	0.04

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

- HEC-RAS 100-Year Floodplain

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

19.25 LDB

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.84
Average Shear Stress (Pascals)	3.17
99% Structure	
Average Velocity (Feet Per Second)	0.84
Average Shear Stress (Pascals)	3.17

21.50 RDB

21.50

Custer Dr

21.25

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 45 90 180

Scale in Feet

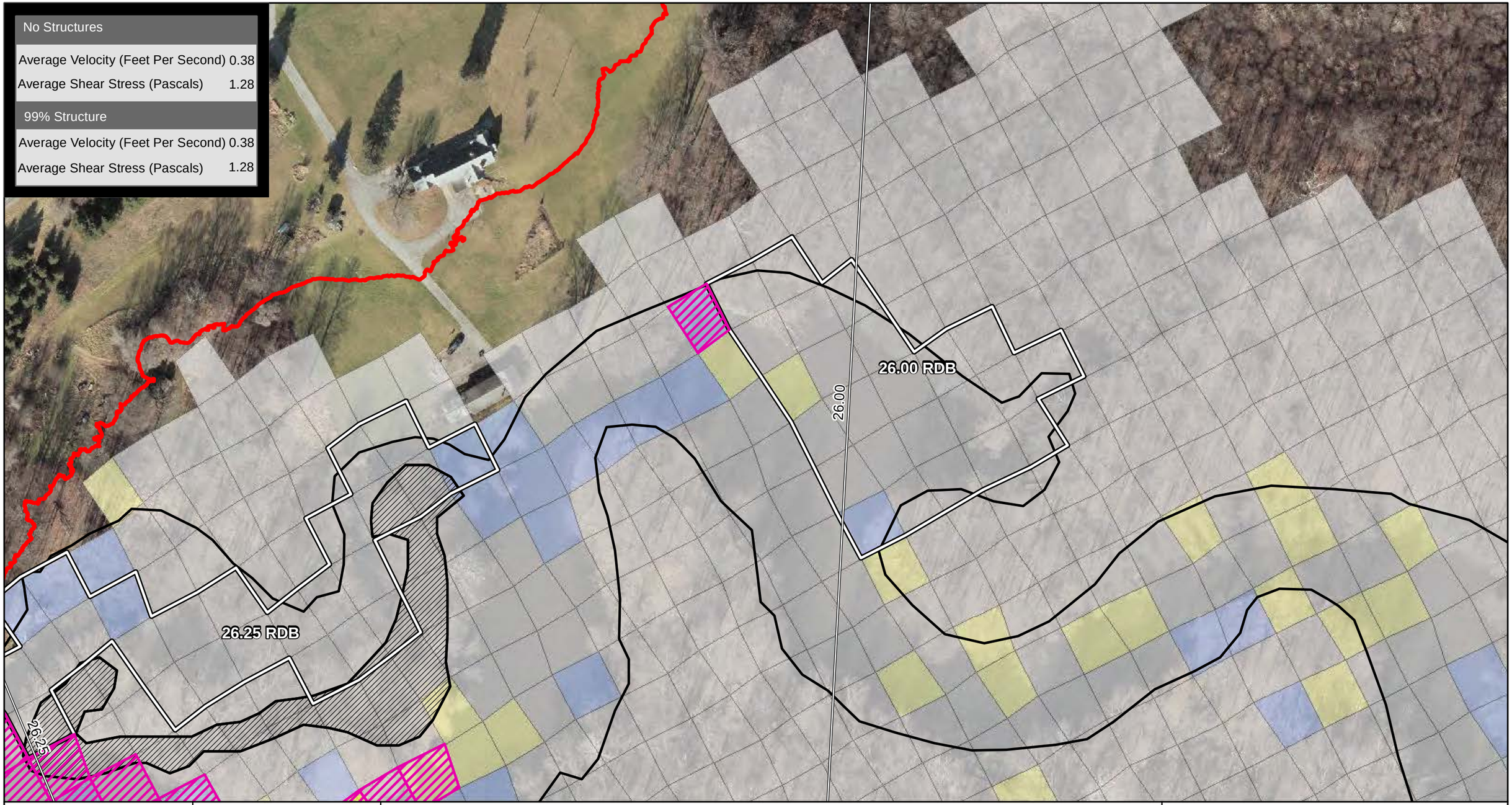
CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010
21.50 RDB
SHEET 8 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.38
Average Shear Stress (Pascals)	1.28
99% Structure	
Average Velocity (Feet Per Second)	0.38
Average Shear Stress (Pascals)	1.28



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

26.00 RDB

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.50
Average Shear Stress (Pascals)	2.06
99% Structure	
Average Velocity (Feet Per Second)	0.50
Average Shear Stress (Pascals)	2.06

28.00

28.25 RDB

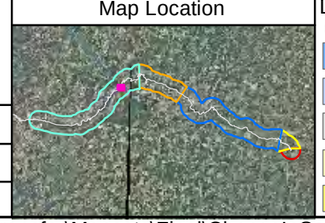
28.25

Fort Custer Dr

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

28.25 RDB

SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.14
Average Shear Stress (Pascals)	0.03
99% Structure	
Average Velocity (Feet Per Second)	0.14
Average Shear Stress (Pascals)	0.03

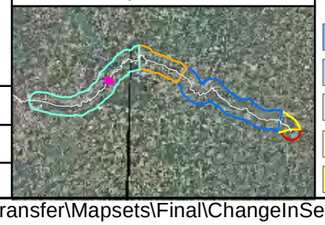
30.75

30.80 LDB

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

30.80 LDB

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.49
Average Shear Stress (Pascals)	2.94
99% Structure	
Average Velocity (Feet Per Second)	0.49
Average Shear Stress (Pascals)	2.94

33.00

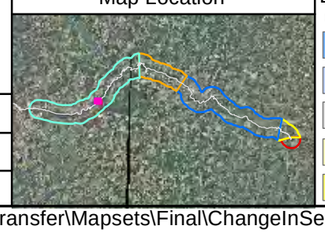
33.00 A

33.00 B

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

33.00 A

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.19
Average Shear Stress (Pascals)	0.04
99% Structure	
Average Velocity (Feet Per Second)	0.19
Average Shear Stress (Pascals)	0.04

33.00

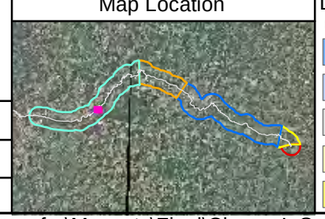
33.00 B

33.25

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

33.00 B

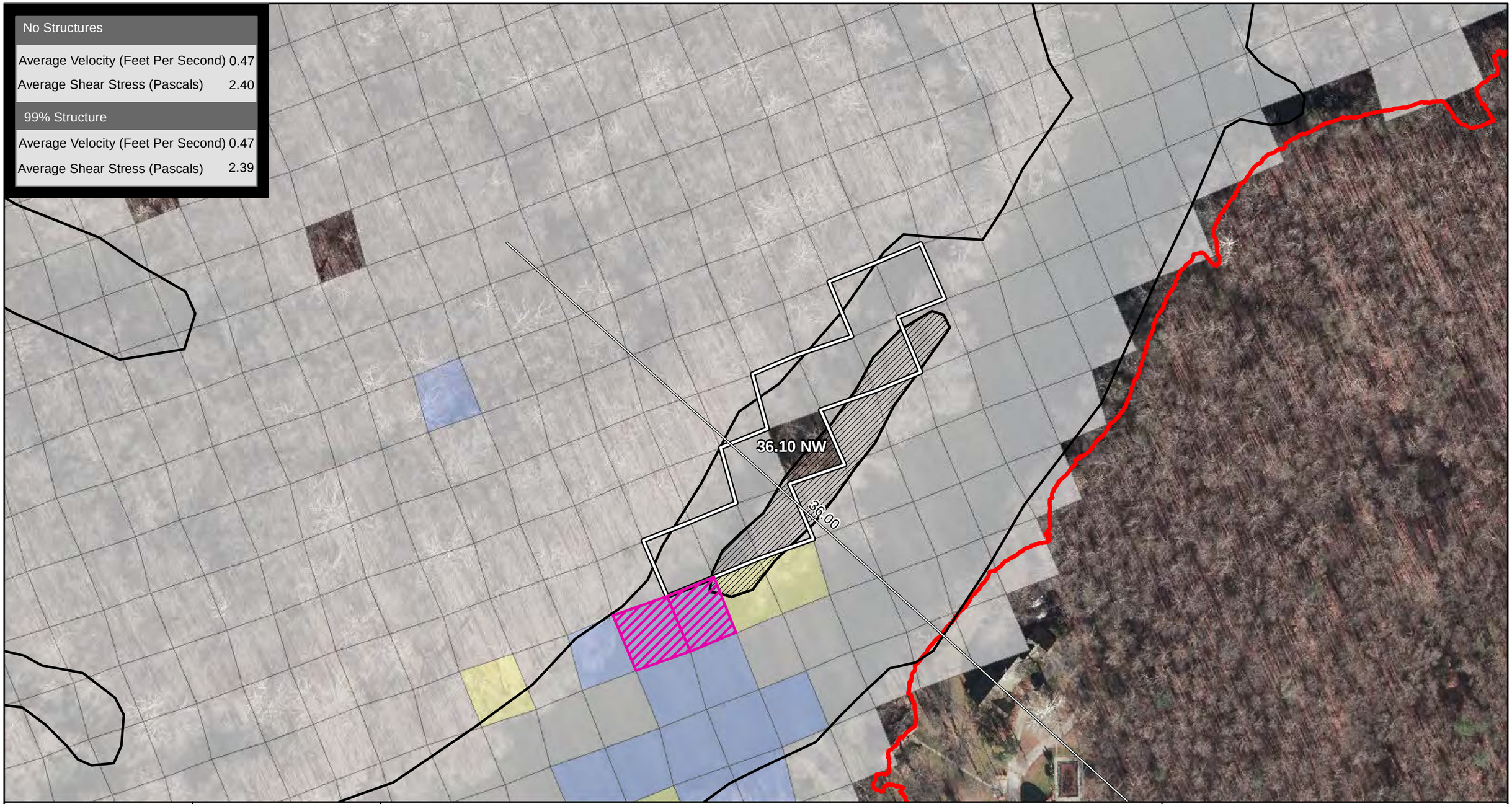
SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

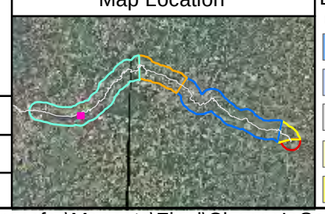
No Structures	
Average Velocity (Feet Per Second)	0.47
Average Shear Stress (Pascals)	2.40
99% Structure	
Average Velocity (Feet Per Second)	0.47
Average Shear Stress (Pascals)	2.39



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

36.10 NW

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.17
Average Shear Stress (Pascals)	0.09
99% Structure	
Average Velocity (Feet Per Second)	0.17
Average Shear Stress (Pascals)	0.09

Delta A

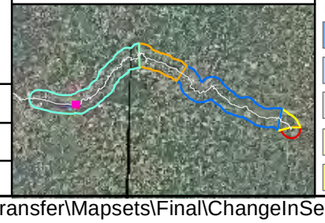
36.75

36.50

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

- HEC-RAS 100-Year Floodplain

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010

DELTA A

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.09
99% Structure	
Average Velocity (Feet Per Second)	0.21
Average Shear Stress (Pascals)	0.09

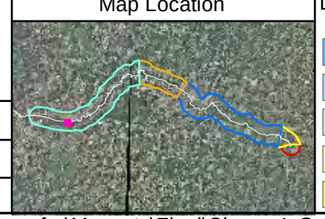
37.75

37.75 Islands

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area
- HEC-RAS 100-Year Floodplain

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
JULY 24 - JULY 31, 2010
37.75 ISLANDS
SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc99.mxd

Aerial Photography Date: November 2011

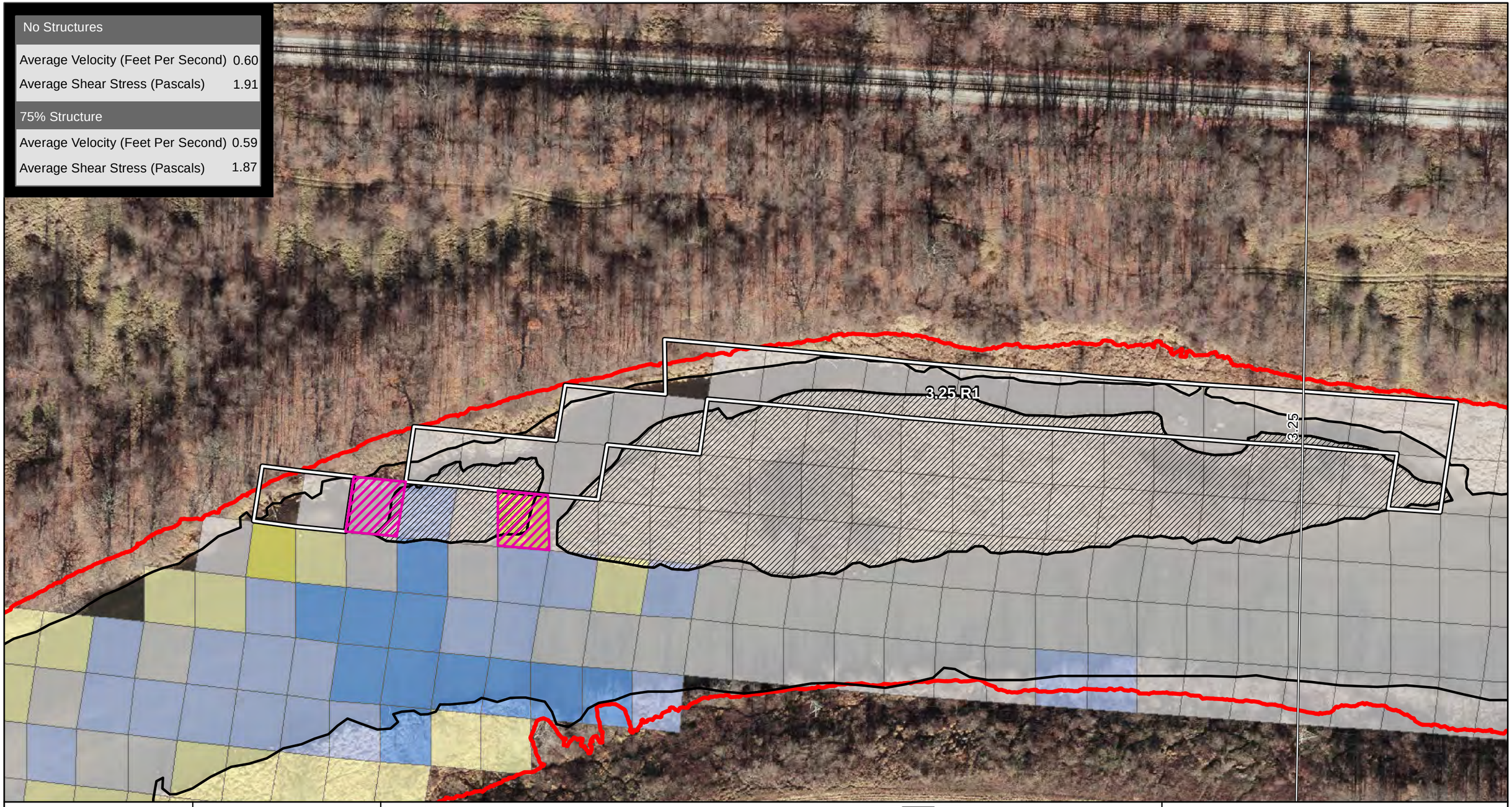
Figure 7-19

Change in Sedimentation Rate Between No Structure and 75% Structure

July 24 – July 31, 2010

Sheets 1 through 16

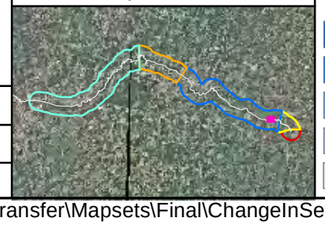
No Structures	
Average Velocity (Feet Per Second)	0.60
Average Shear Stress (Pascals)	1.91
75% Structure	
Average Velocity (Feet Per Second)	0.59
Average Shear Stress (Pascals)	1.87



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 37.5 75 150

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

3.25 R1

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.59
Average Shear Stress (Pascals)	2.91
75% Structure	
Average Velocity (Feet Per Second)	0.58
Average Shear Stress (Pascals)	2.88

12 Mile Rd

Water St

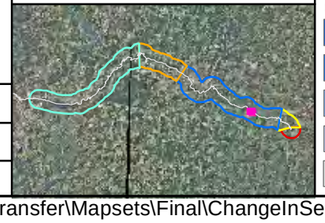
5.75

Ceresco

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 50 100 200

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

CERESCO

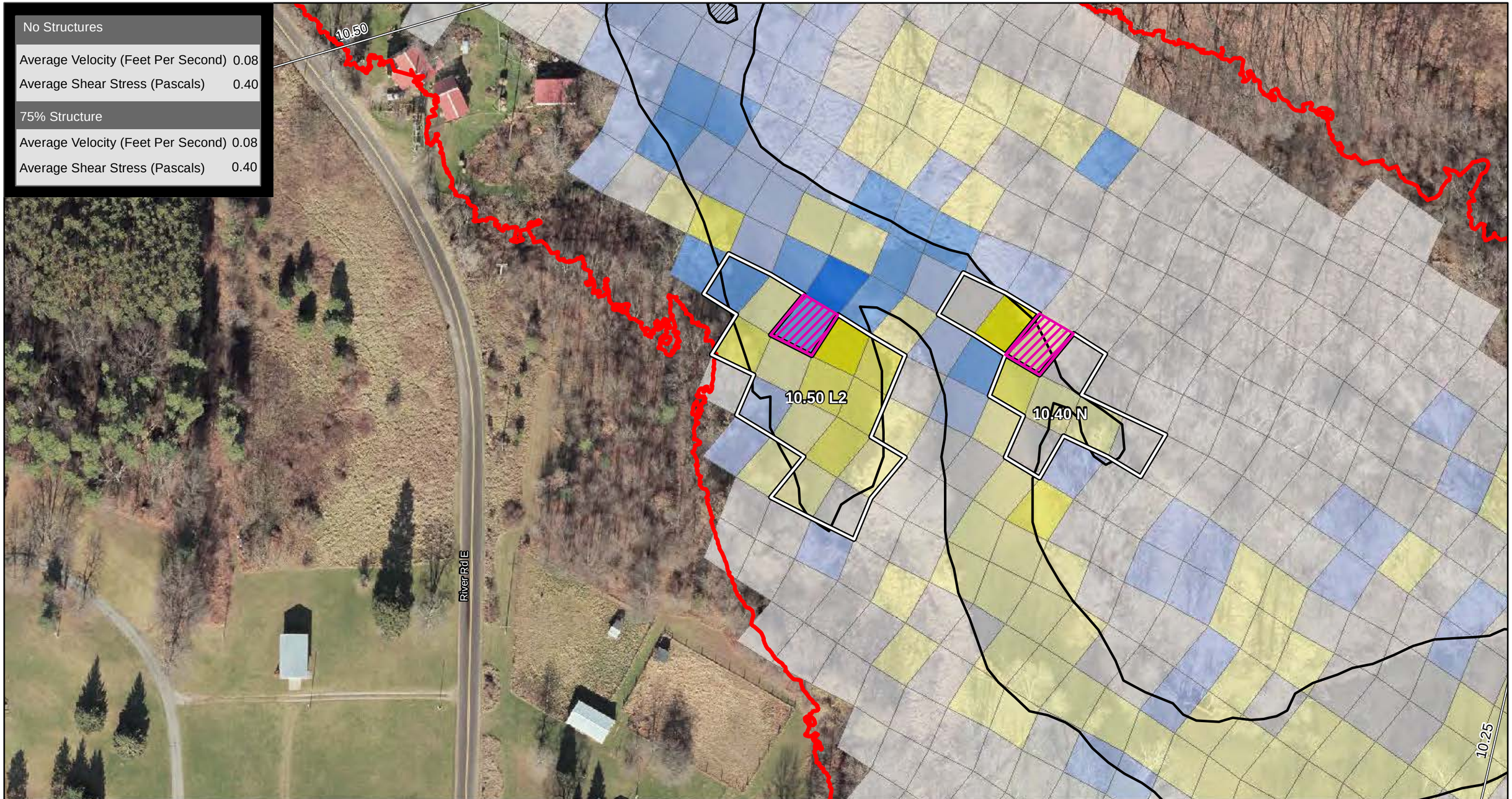
SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

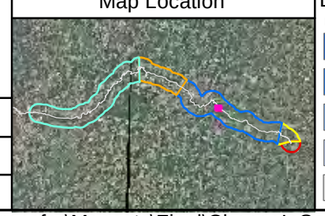
No Structures	
Average Velocity (Feet Per Second)	0.08
Average Shear Stress (Pascals)	0.40
75% Structure	
Average Velocity (Feet Per Second)	0.08
Average Shear Stress (Pascals)	0.40



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 37.5 75 150

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

10.40 N

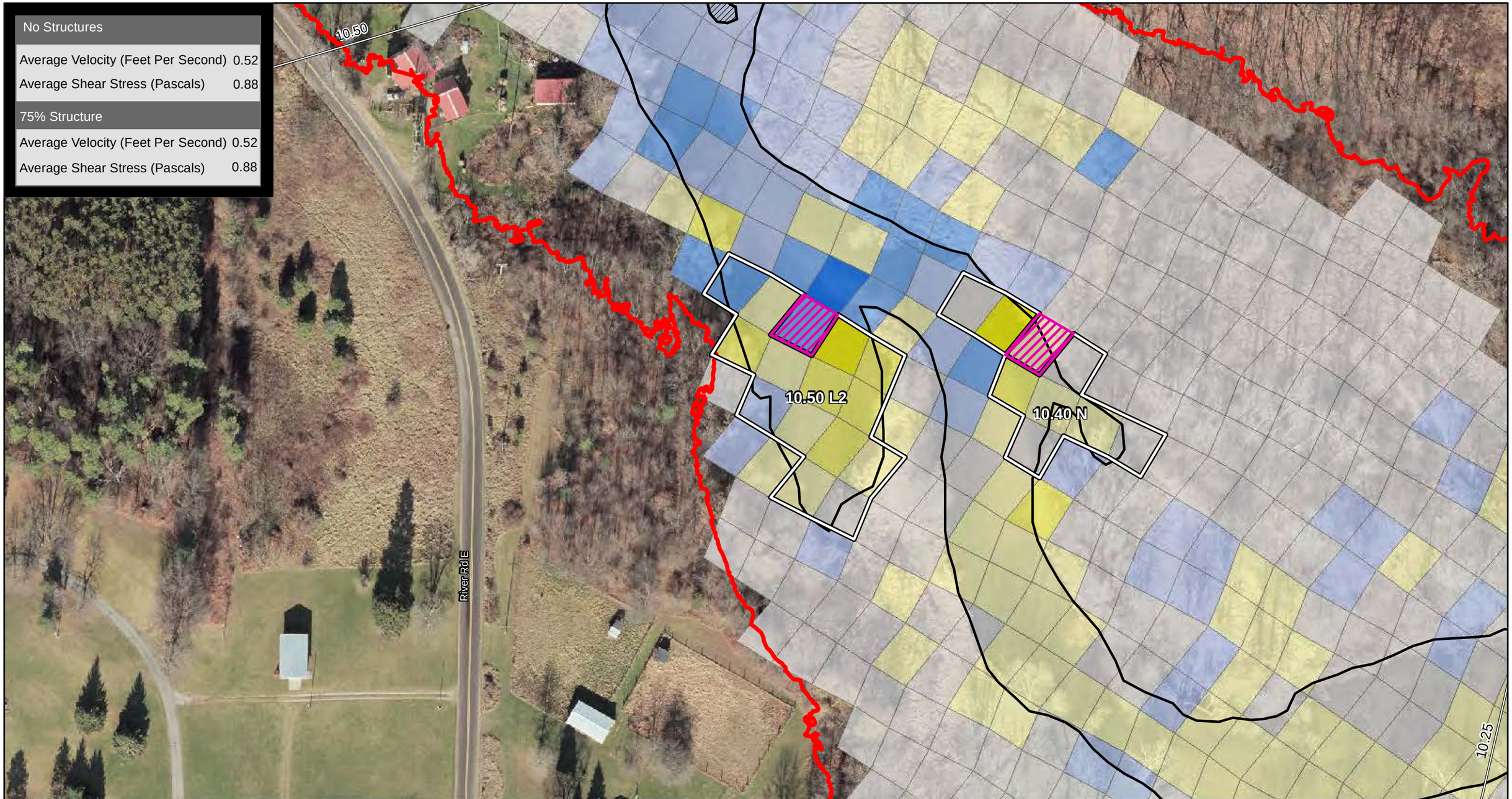
SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

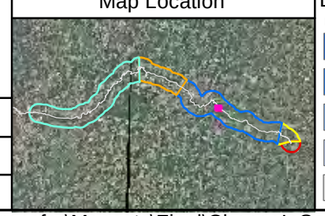
No Structures	
Average Velocity (Feet Per Second)	0.52
Average Shear Stress (Pascals)	0.88
75% Structure	
Average Velocity (Feet Per Second)	0.52
Average Shear Stress (Pascals)	0.88



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 37.5 75 150

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

10.50 L2

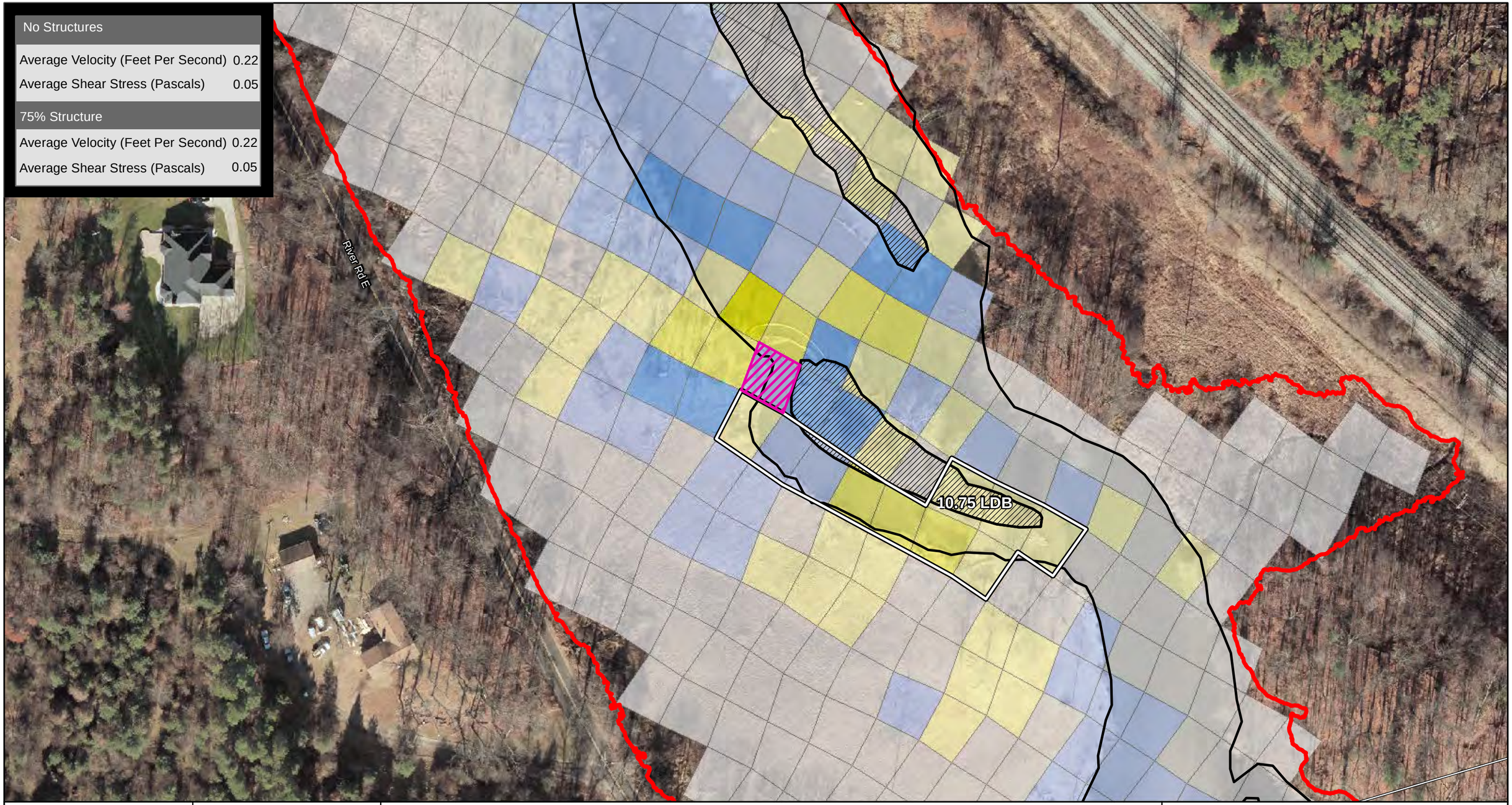
SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

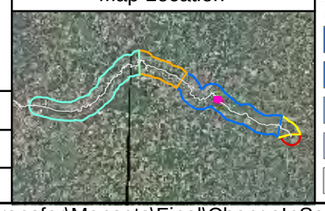
No Structures	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.05
75% Structure	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.05



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 37.5 75 150

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

10.75 LDB

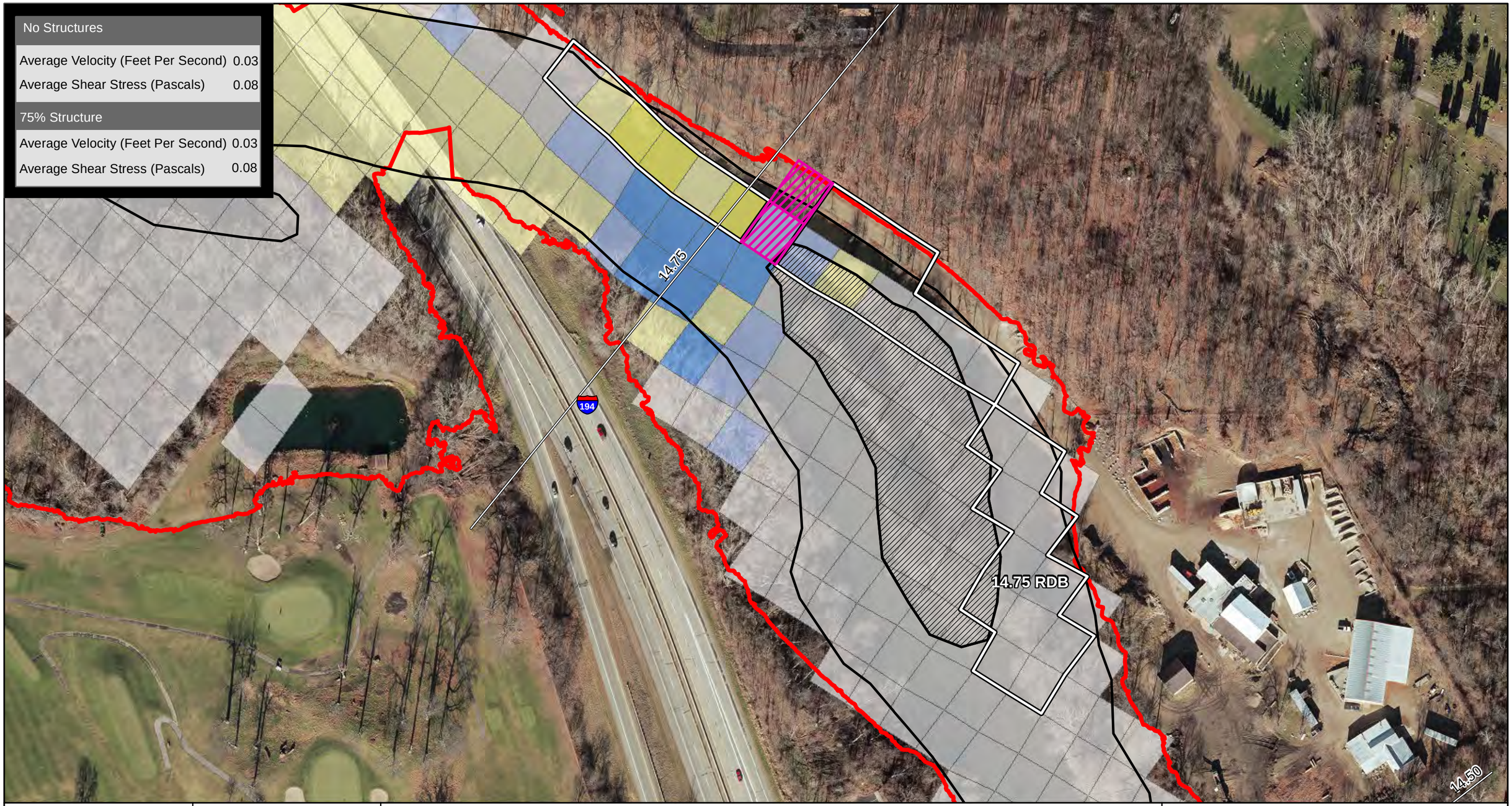
SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.03
Average Shear Stress (Pascals)	0.08
75% Structure	
Average Velocity (Feet Per Second)	0.03
Average Shear Stress (Pascals)	0.08



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 55 110 220

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

14.75 RDB

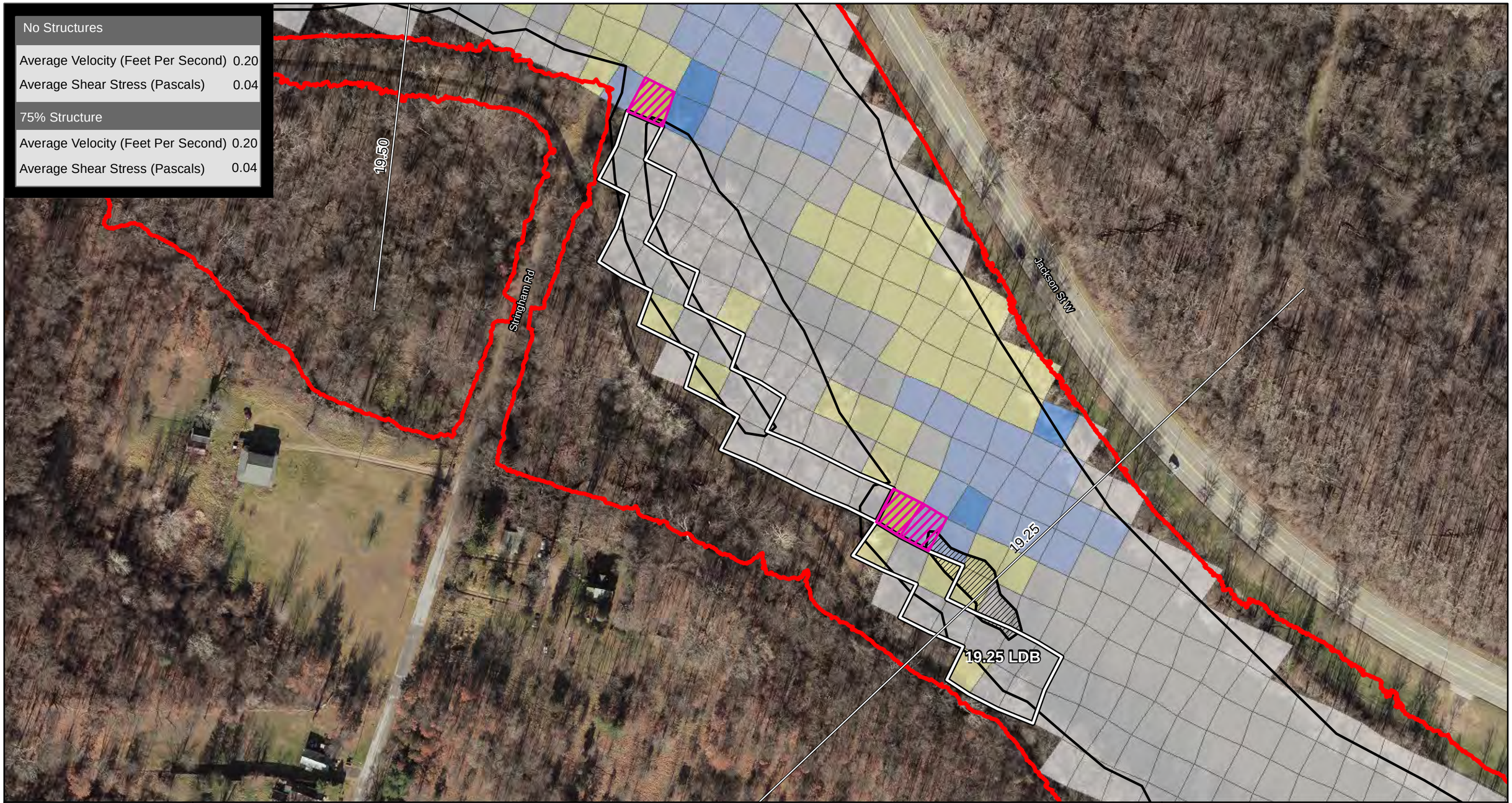
SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

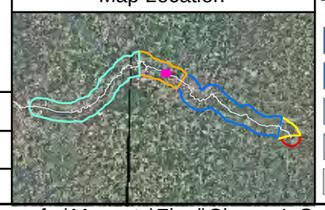
No Structures	
Average Velocity (Feet Per Second)	0.20
Average Shear Stress (Pascals)	0.04
75% Structure	
Average Velocity (Feet Per Second)	0.20
Average Shear Stress (Pascals)	0.04



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 55 110 220

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

19.25 LDB

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.84
Average Shear Stress (Pascals)	3.17
75% Structure	
Average Velocity (Feet Per Second)	0.84
Average Shear Stress (Pascals)	3.14

21.50 RDB

21.50

Custer Dr

21.25

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

21.50 RDB

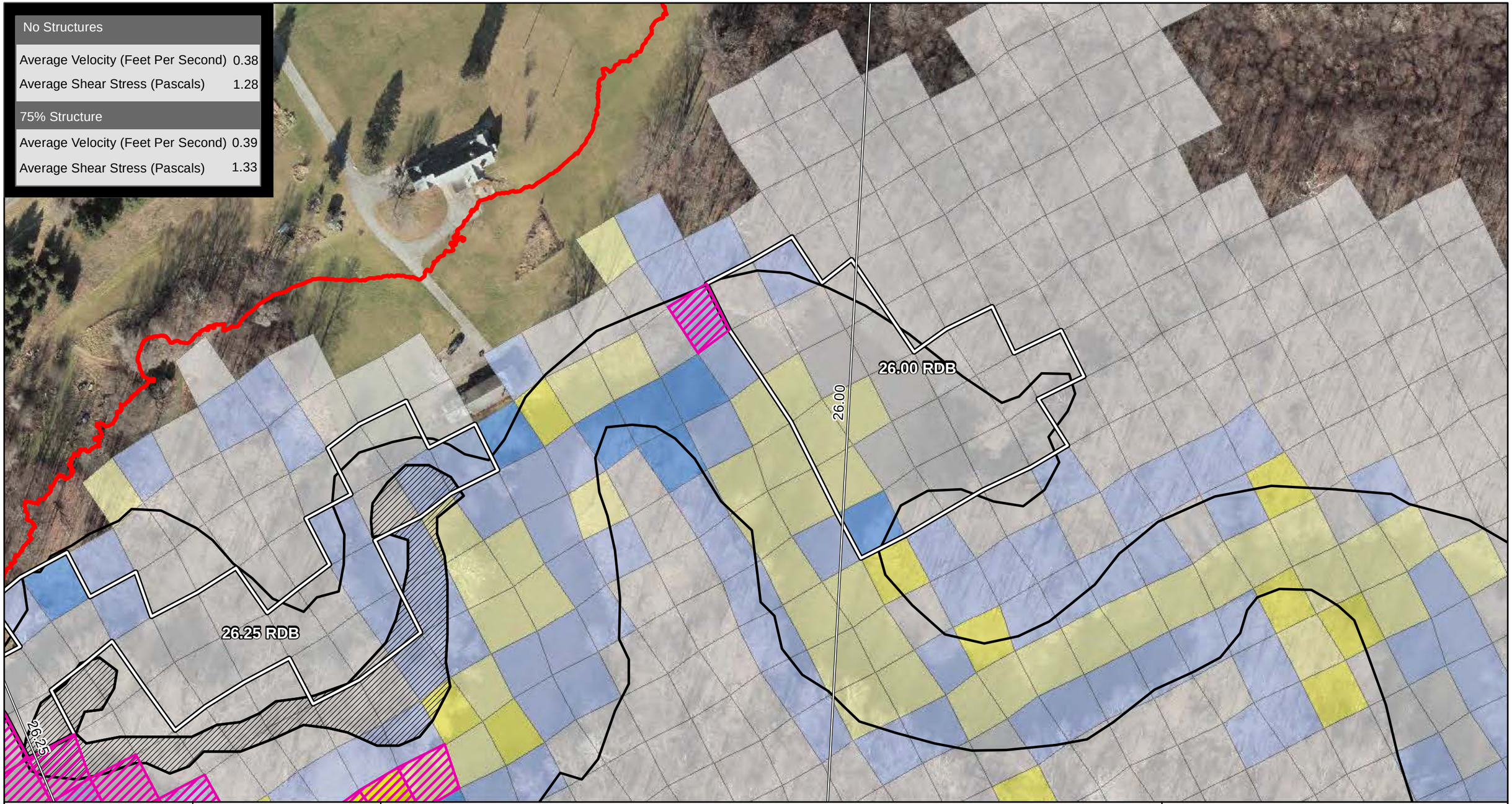
SHEET 8 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.38
Average Shear Stress (Pascals)	1.28
75% Structure	
Average Velocity (Feet Per Second)	0.39
Average Shear Stress (Pascals)	1.33



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

26.00 RDB

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.50
Average Shear Stress (Pascals)	2.06
75% Structure	
Average Velocity (Feet Per Second)	0.49
Average Shear Stress (Pascals)	2.04

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

28.25 RDB

SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.14
Average Shear Stress (Pascals)	0.03
75% Structure	
Average Velocity (Feet Per Second)	0.14
Average Shear Stress (Pascals)	0.03

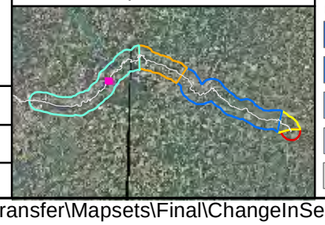
30.75

30.80 LDB

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

30.80 LDB

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.49
Average Shear Stress (Pascals)	2.94
75% Structure	
Average Velocity (Feet Per Second)	0.49
Average Shear Stress (Pascals)	2.92

33.00

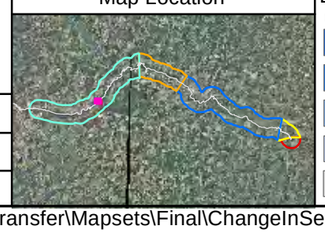
33.00 A

33.00 B

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

33.00 A

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.19
Average Shear Stress (Pascals)	0.04
75% Structure	
Average Velocity (Feet Per Second)	0.19
Average Shear Stress (Pascals)	0.04

33.00

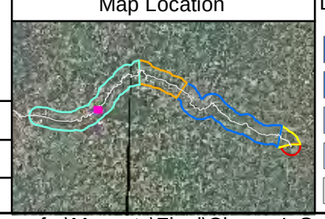
33.00 B

33.25

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

33.00 B

SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.47
Average Shear Stress (Pascals)	2.40
75% Structure	
Average Velocity (Feet Per Second)	0.47
Average Shear Stress (Pascals)	2.38

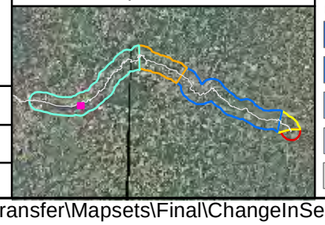
36.10 NW

36.00

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

36.10 NW

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

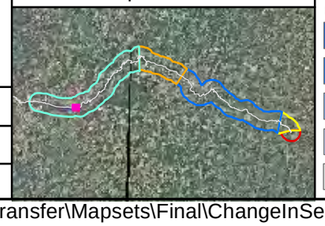
Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.17
Average Shear Stress (Pascals)	0.09
75% Structure	
Average Velocity (Feet Per Second)	0.17
Average Shear Stress (Pascals)	0.10

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010

DELTA A

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.09
75% Structure	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.09

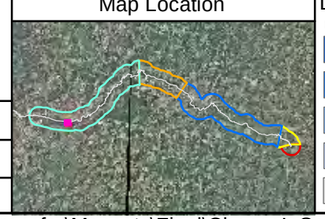
37.75

37.75 Islands

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
JULY 24 - JULY 31, 2010
37.75 ISLANDS
SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRateJuly2010Flood_NoStruc75.mxd

Aerial Photography Date: November 2011

Figure 7-20

Change in Sedimentation Rate Between No Structure and Coir Log Structure

July 24 – July 31, 2010

Sheets 1 through 4

No Structures	
Average Velocity (Feet Per Second)	0.04
Average Shear Stress (Pascals)	0.01
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00

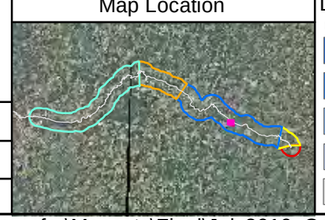
OB 8.48 LDB

8.25

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change in Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Coir Log Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

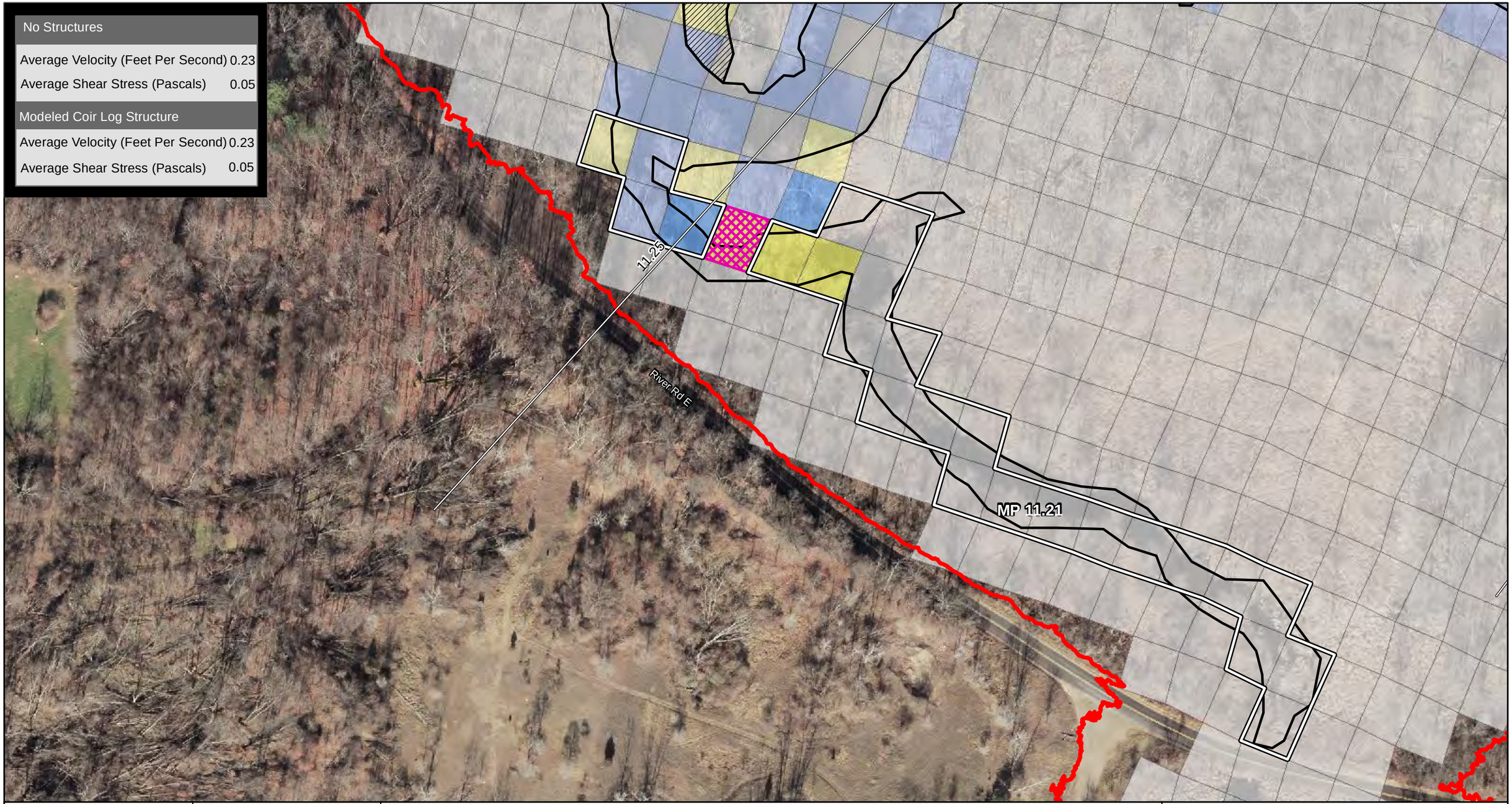
CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
JULY 24 - JULY 31, 2010
OB 8.48 LDB
SHEET 1 OF 4

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\July2010_CoirLog.mxd

Aerial Photography Date: November 2011

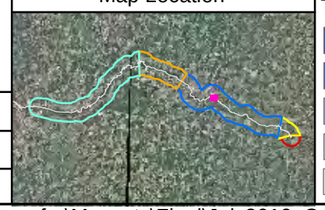
No Structures	
Average Velocity (Feet Per Second)	0.23
Average Shear Stress (Pascals)	0.05
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.23
Average Shear Stress (Pascals)	0.05



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change in Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Coir Log Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
JULY 24 - JULY 31, 2010

MP 11.21

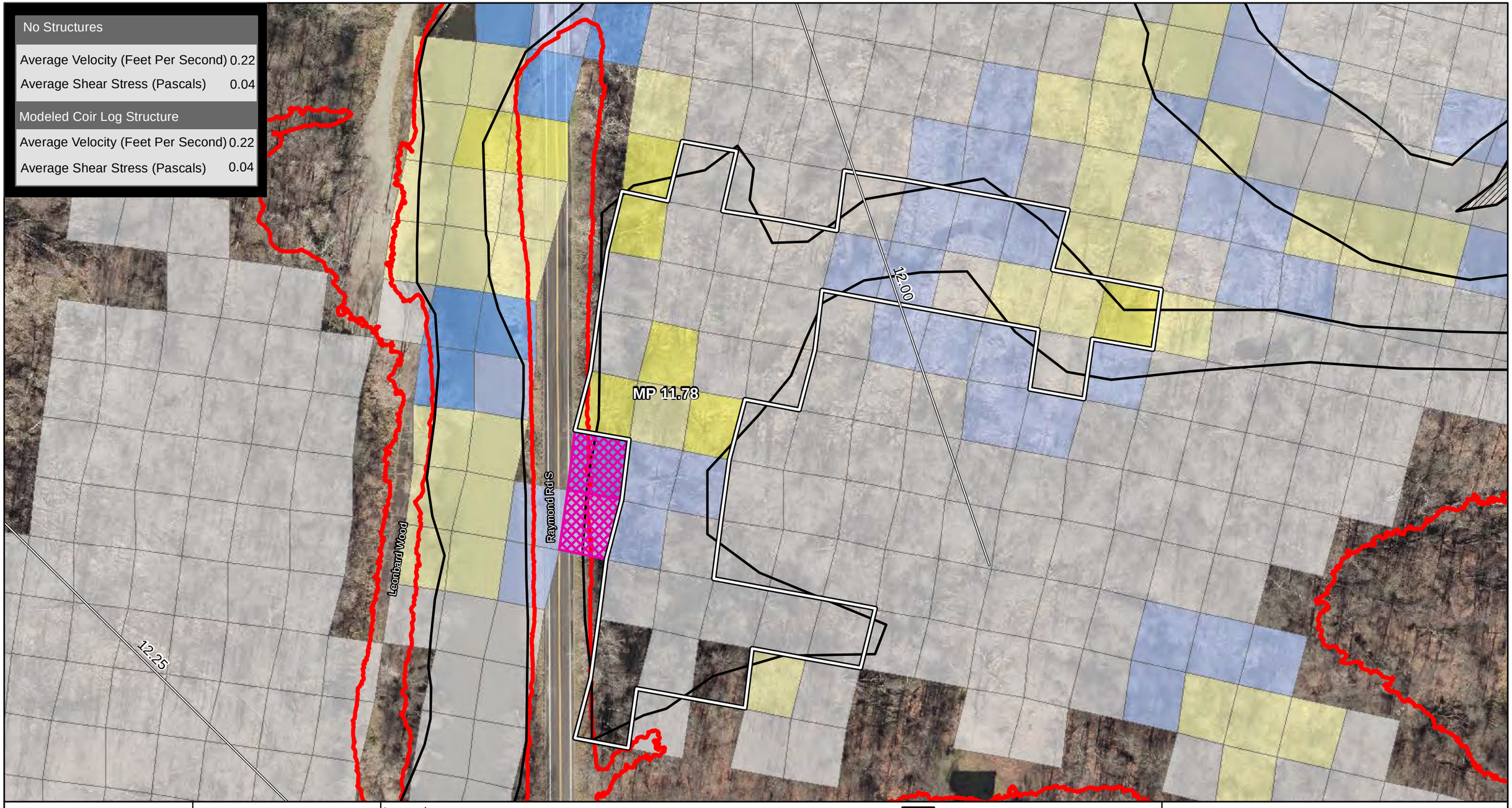
SHEET 2 OF 4

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\July2010_CoirLog.mxd

Aerial Photography Date: November 2011

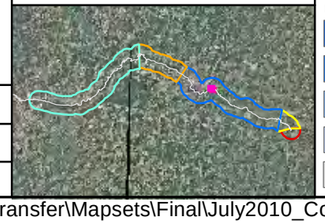
No Structures	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.04
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.22
Average Shear Stress (Pascals)	0.04



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change in Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Coir Log Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
JULY 24 - JULY 31, 2010

MP 11.78

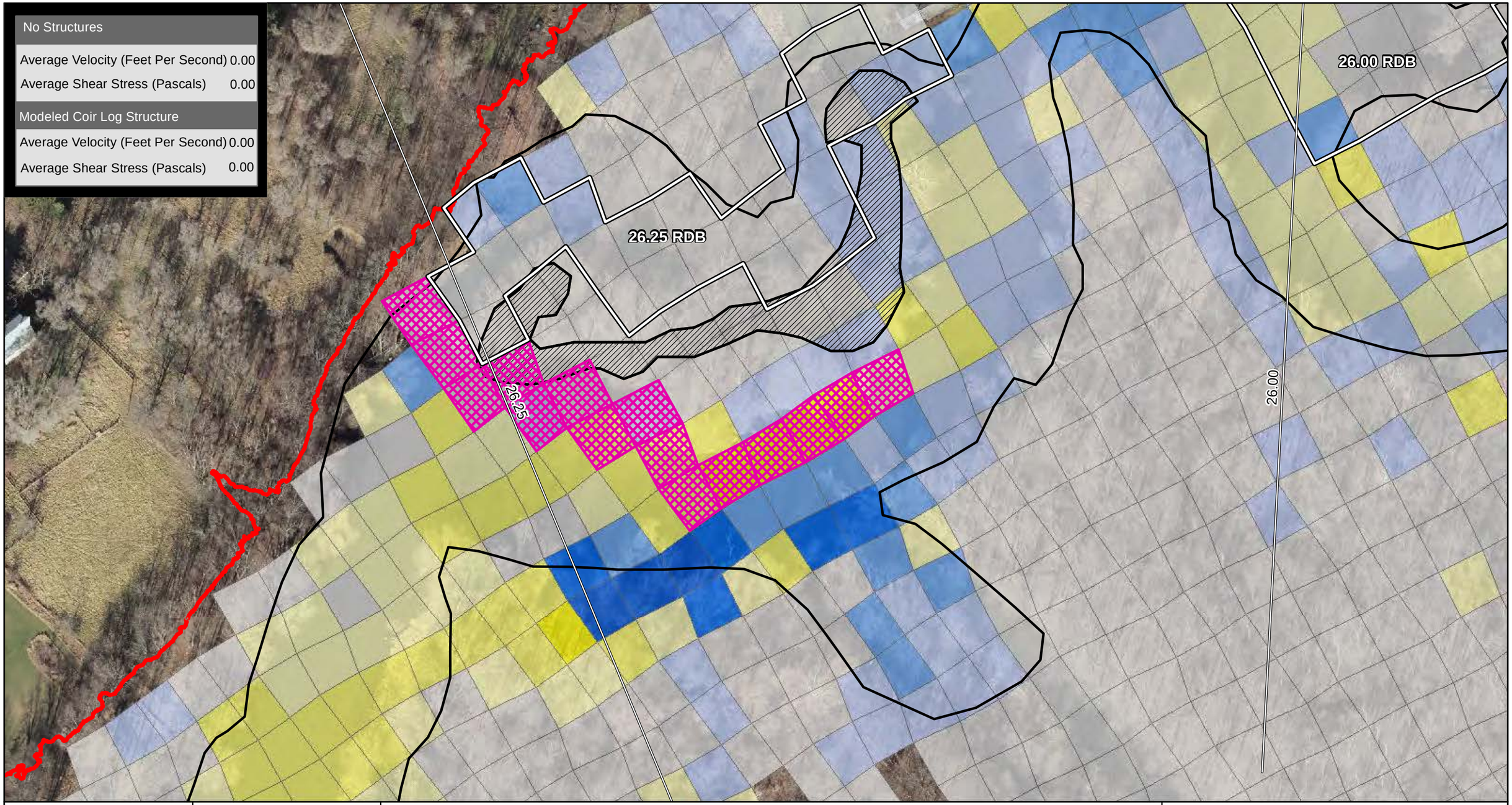
SHEET 3 OF 4

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\July2010_CoirLog.mxd

Aerial Photography Date: November 2011

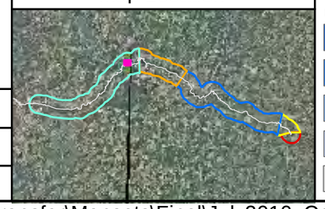
No Structures	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change in Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Coir Log Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
JULY 24 - JULY 31, 2010
26.25 RDB
SHEET 4 OF 4

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\July2010_CoirLog.mxd

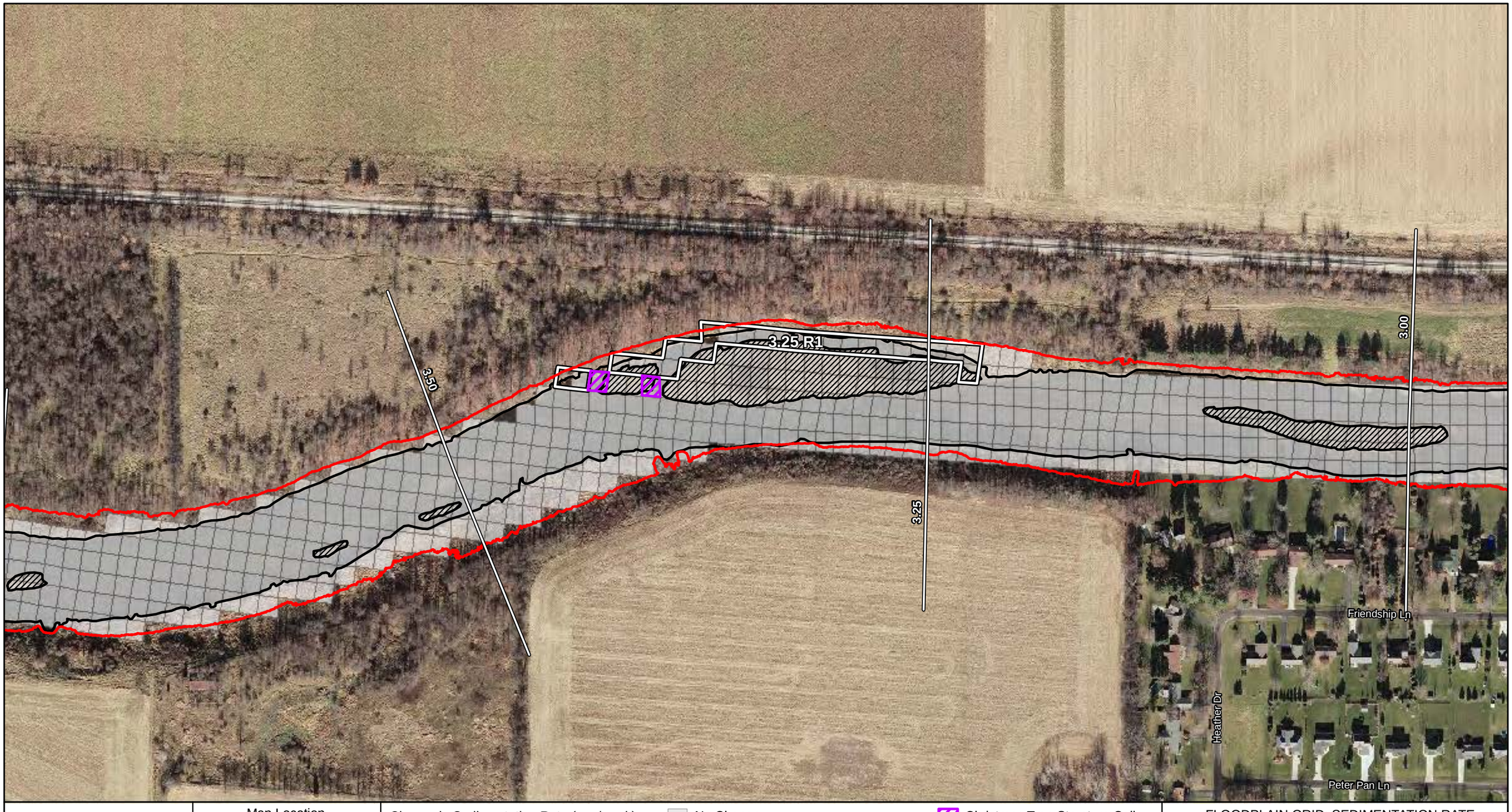
Aerial Photography Date: November 2011

Figure 7-21

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, July 24 – July 31, 2010

99% vs. No Structures

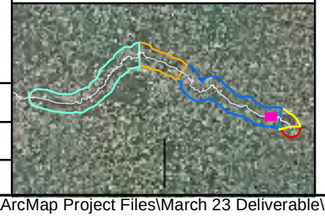
Sheets 1 through 15



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
3.25 R1

SHEET 1 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsE1_E2_July_2010.mxd

Aerial Photography Date: November 2011

Pierce St
Munci St
C Dr N
Water St
Water St
Ceresco
12 Mile Rd
6.00
5.75
5.50

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

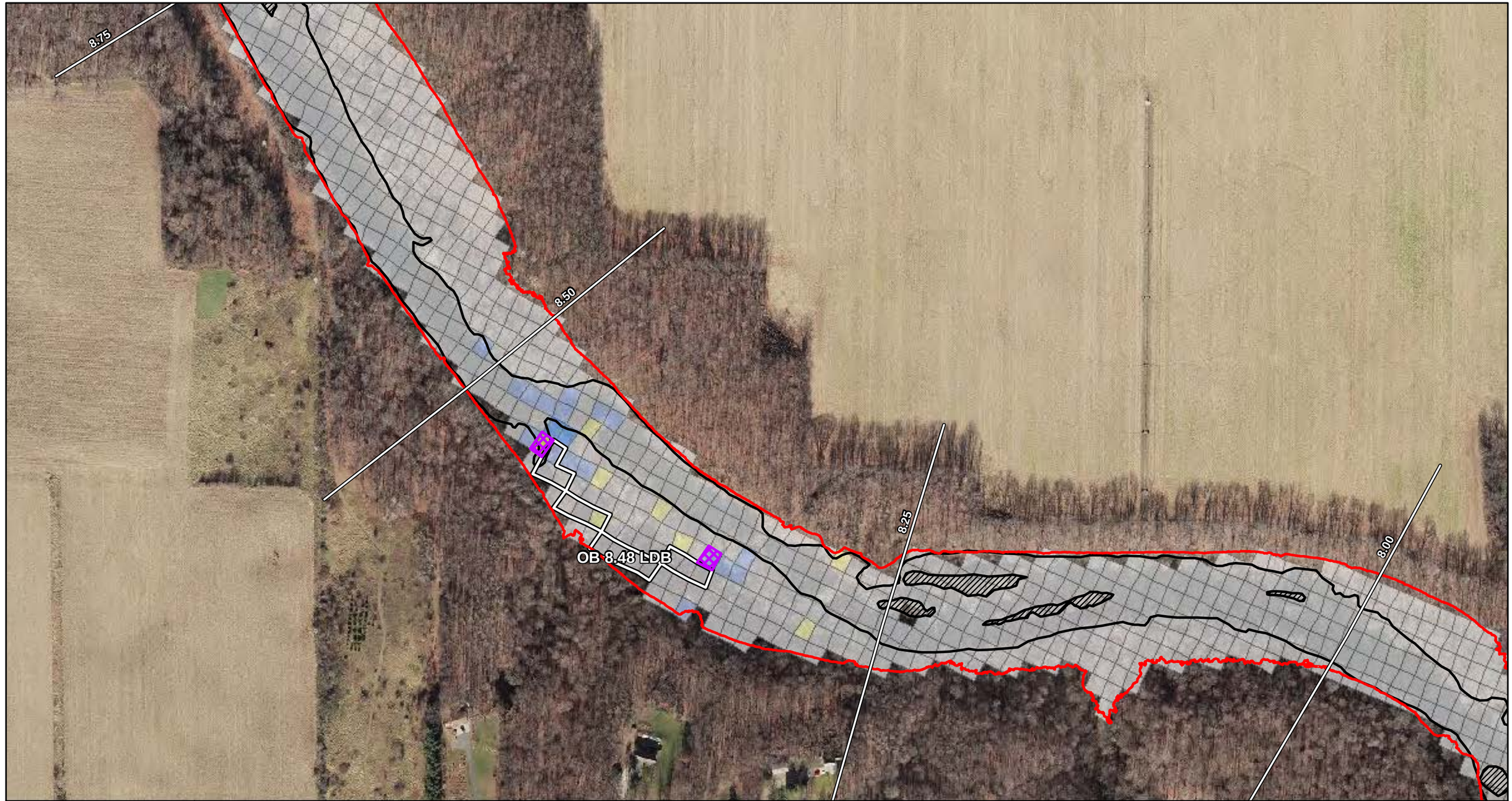
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsE1_E2_July_2010.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

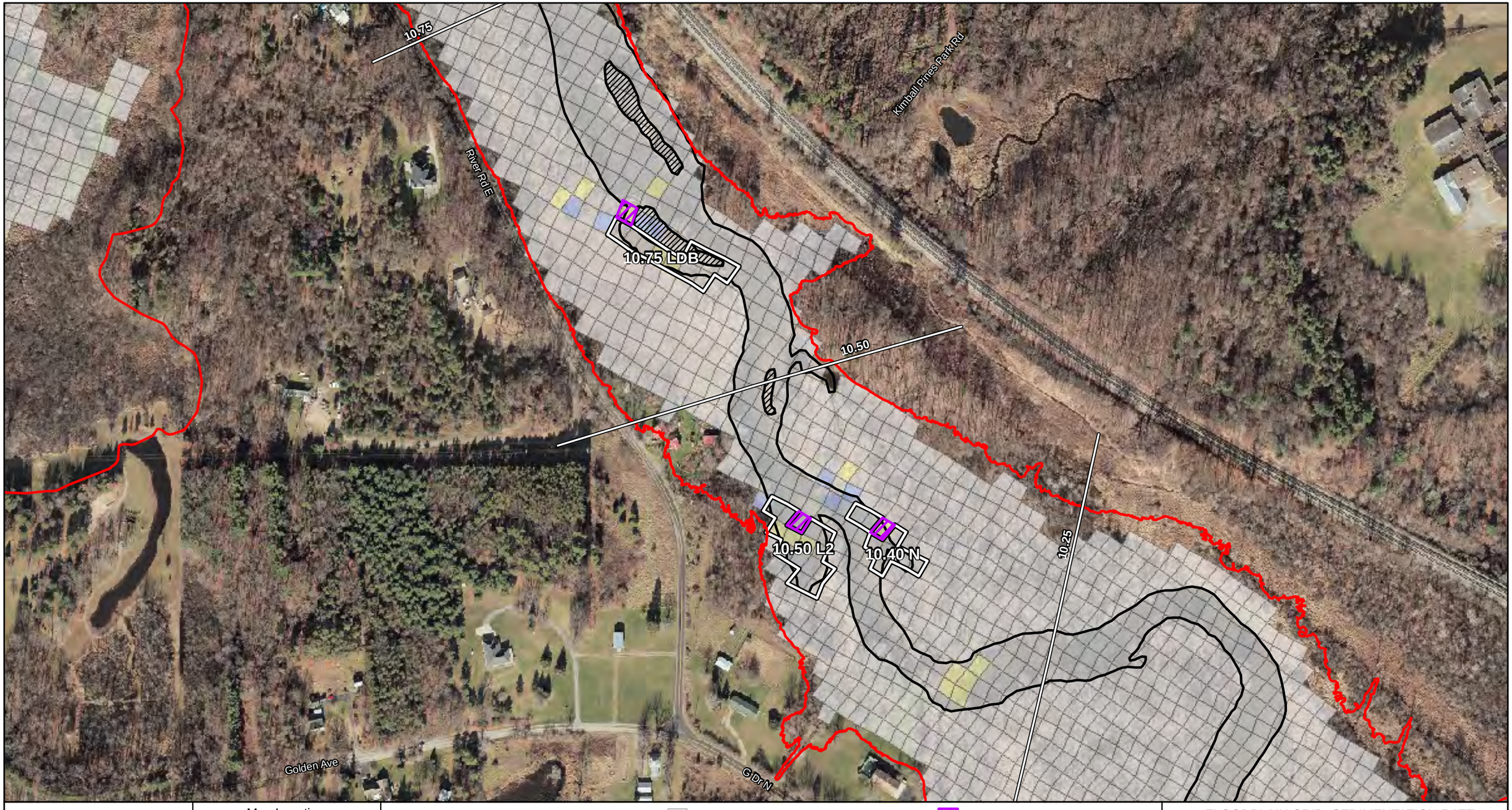
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsE1_E2_July_2010.mxd

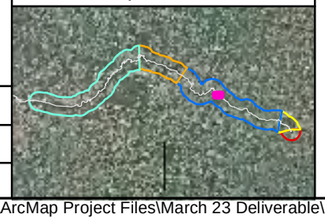
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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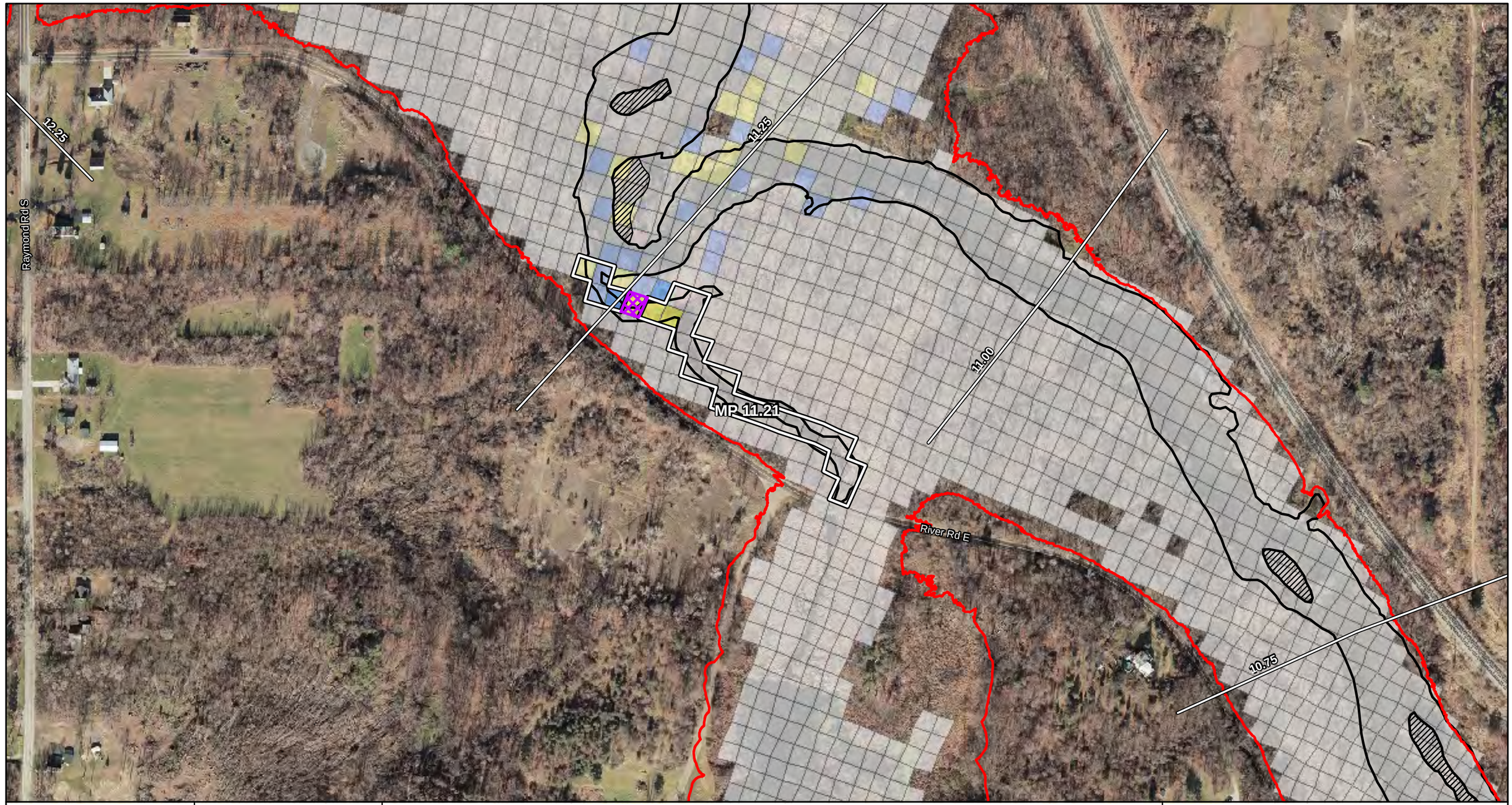
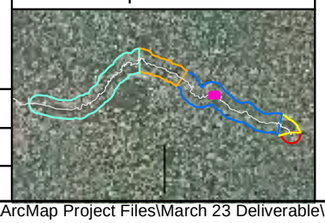
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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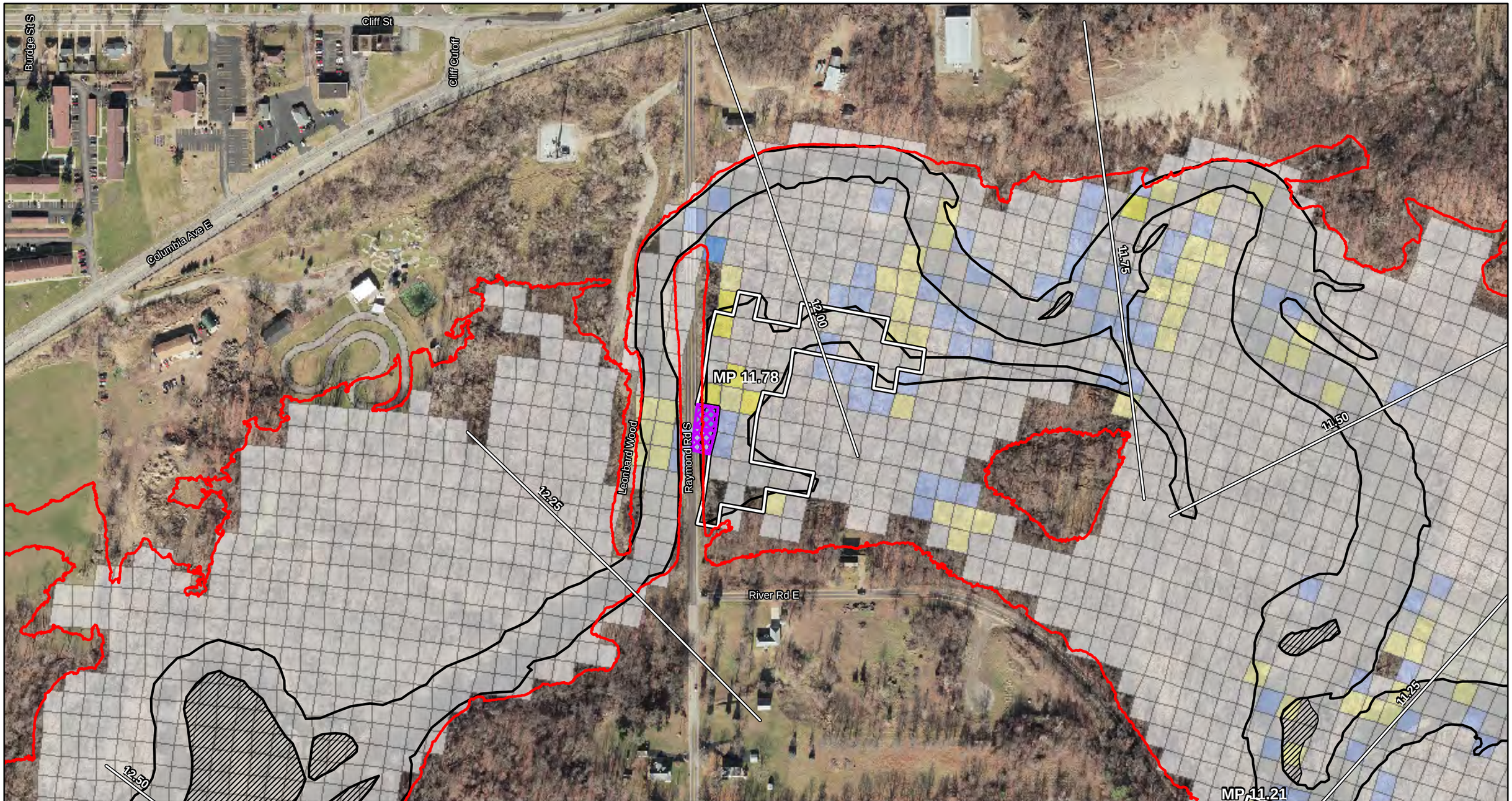
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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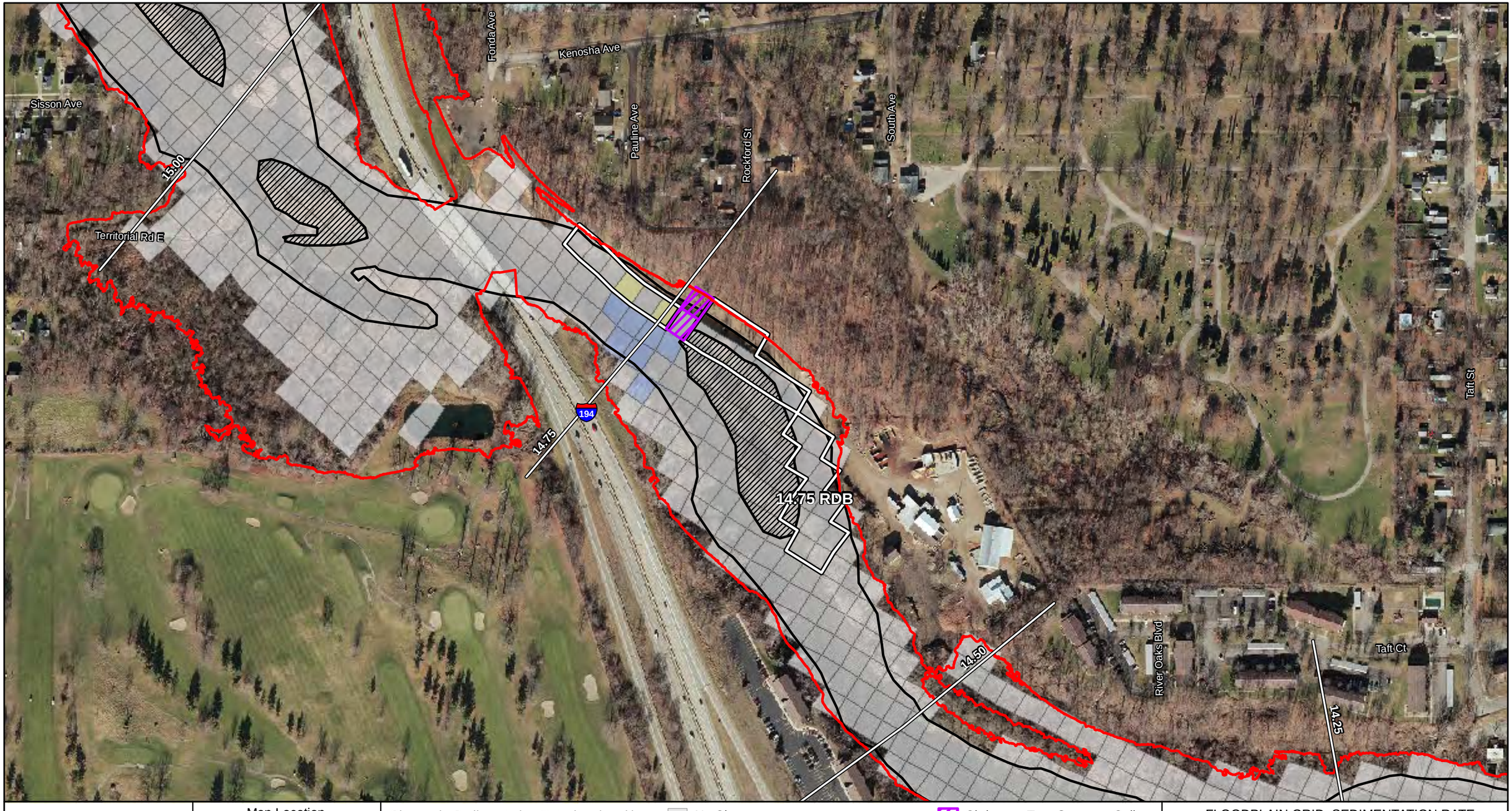
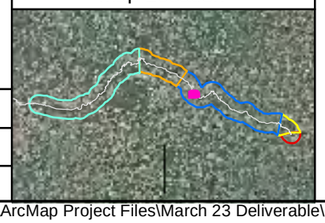
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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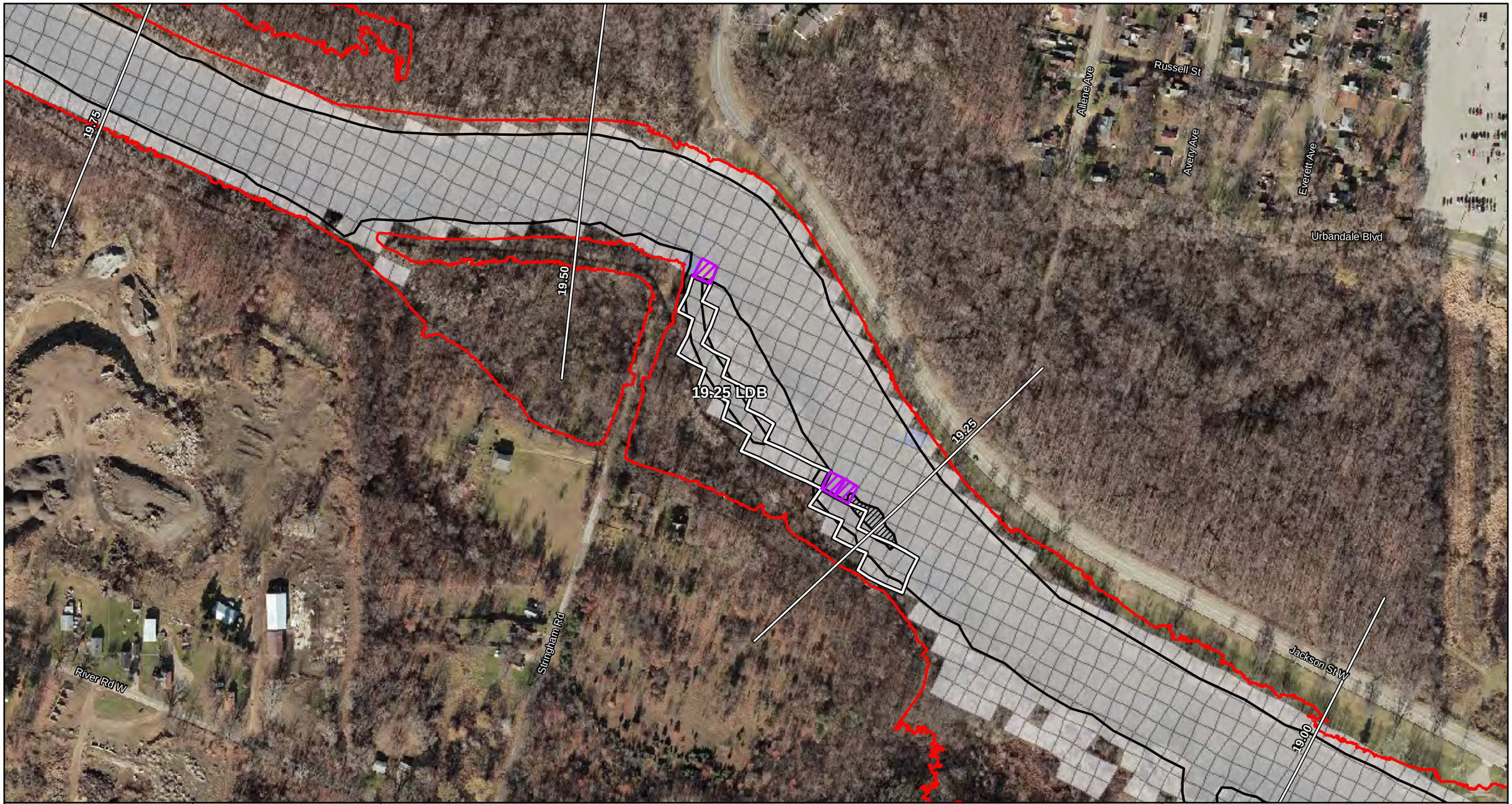
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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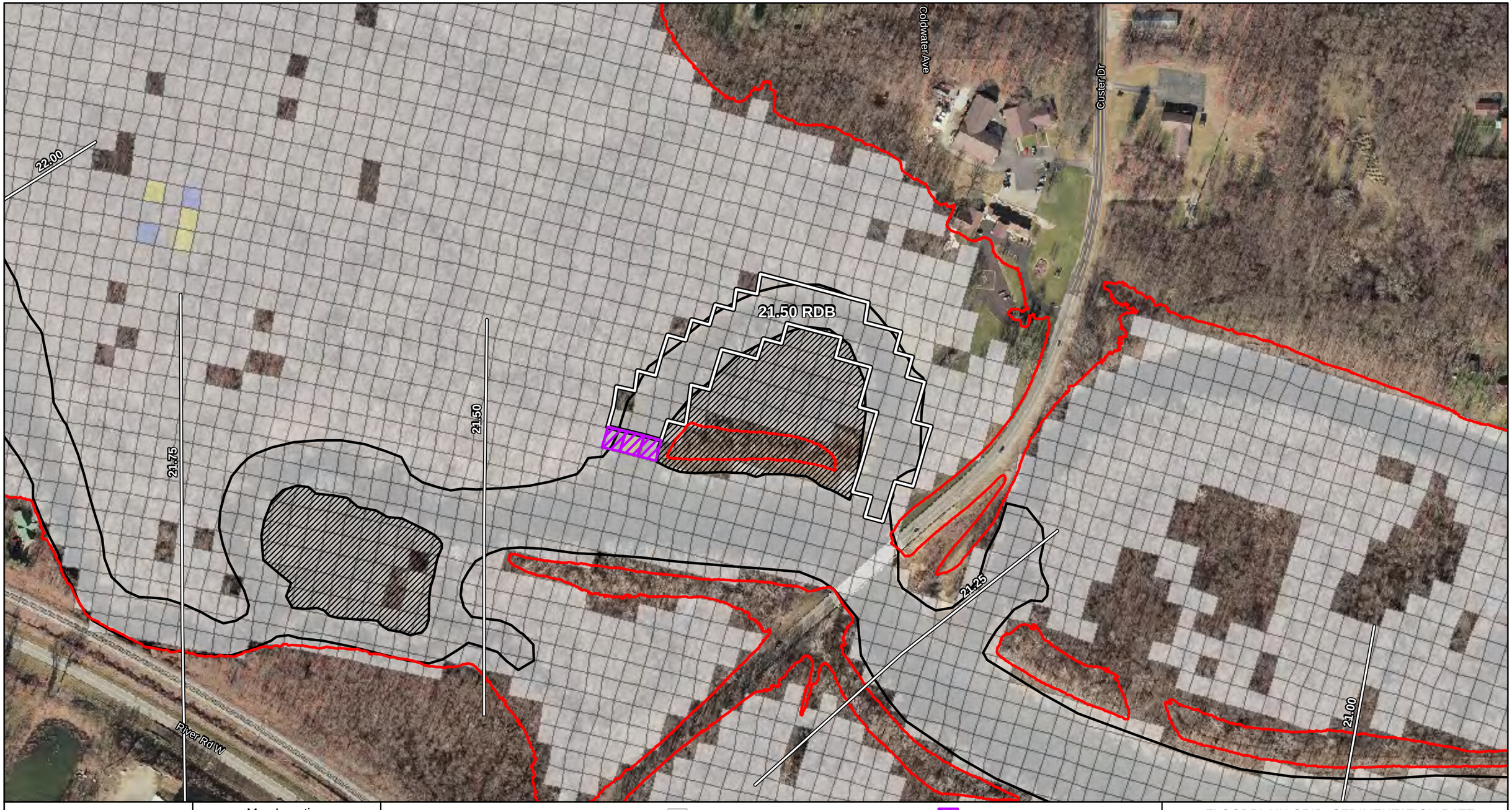
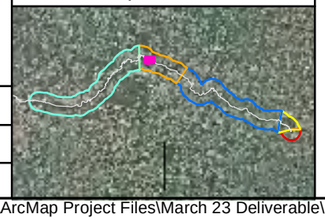
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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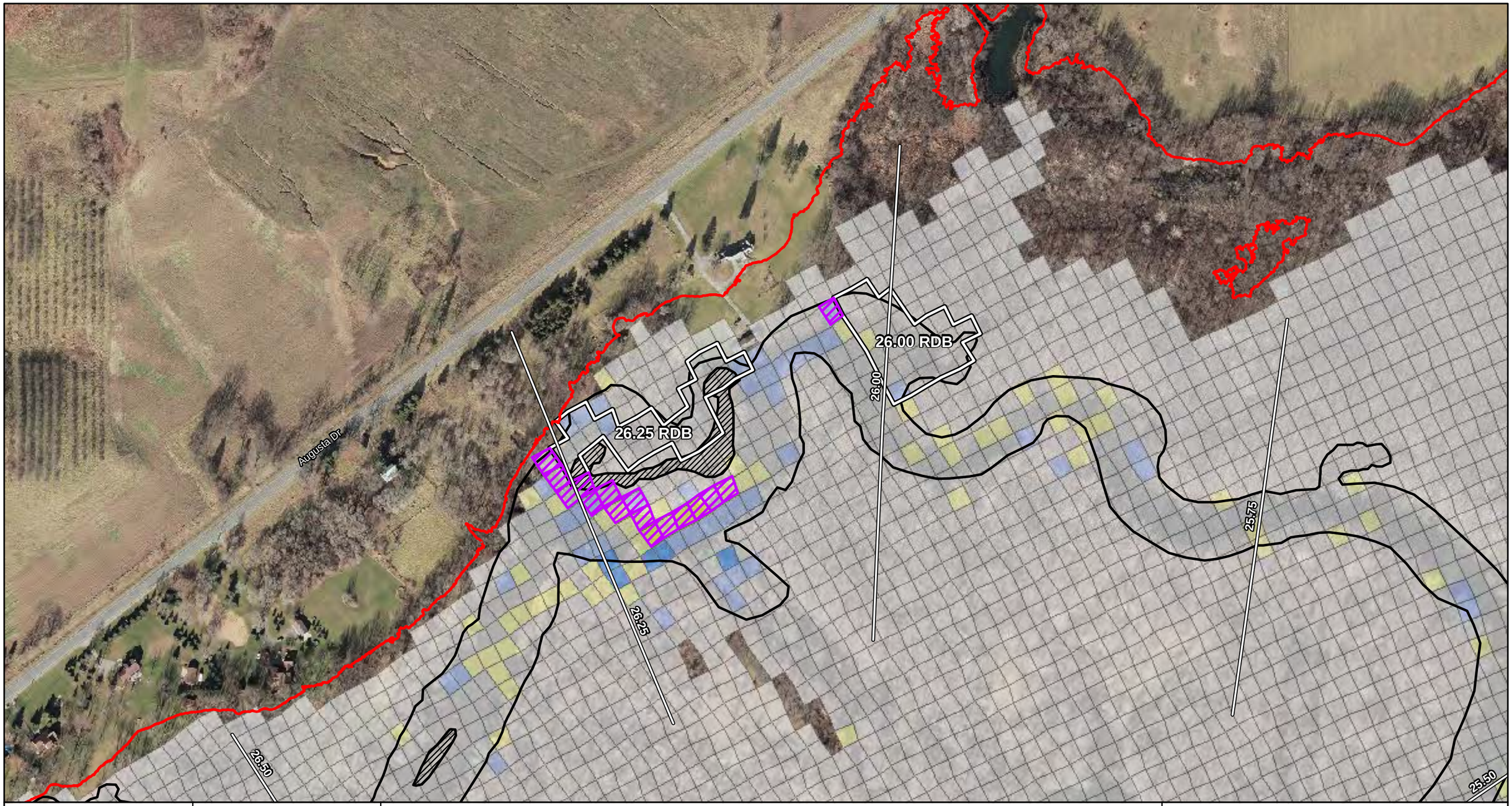
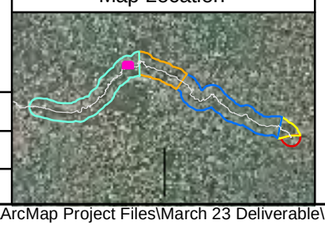
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
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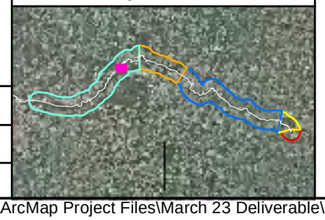
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
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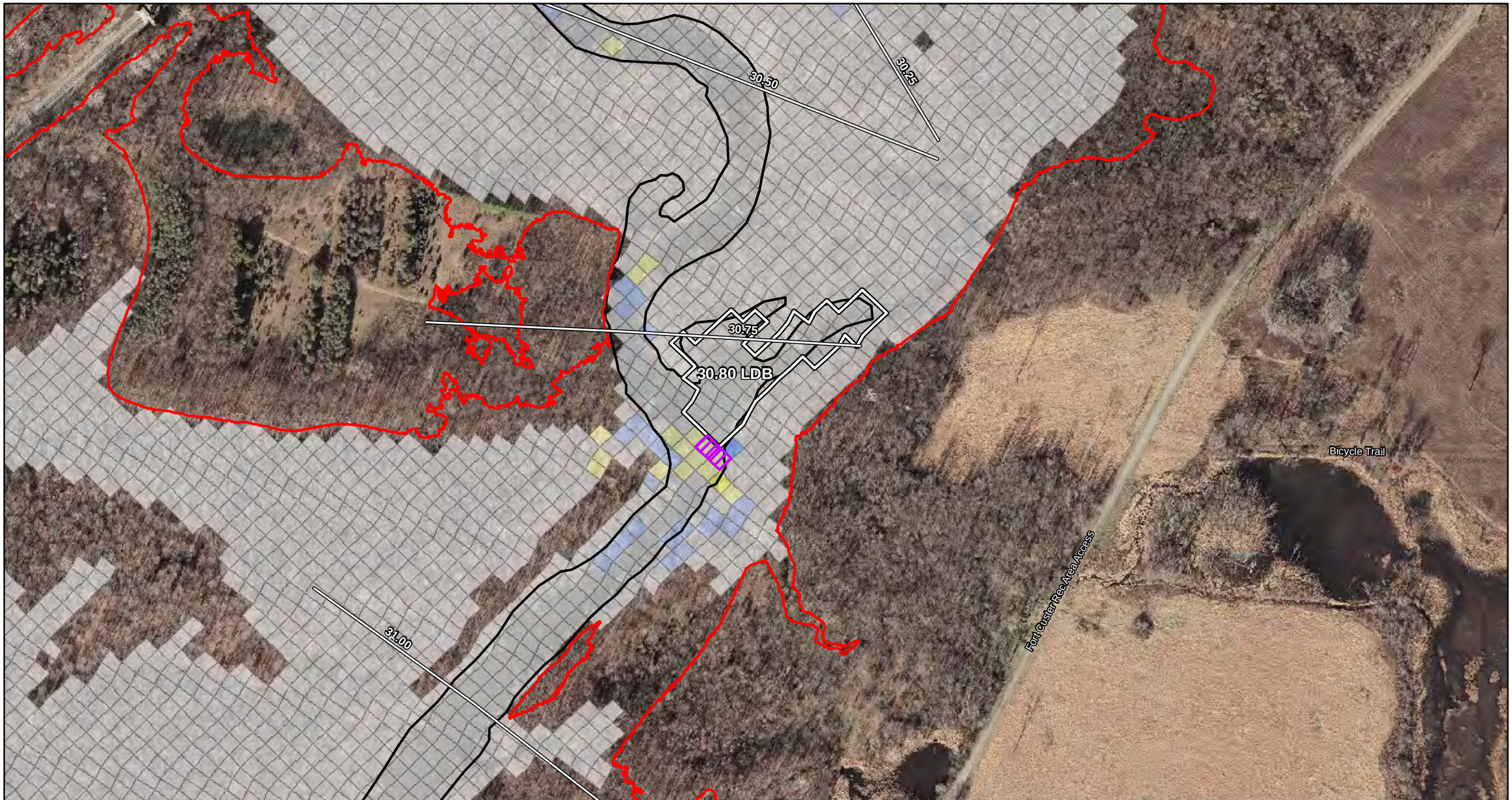
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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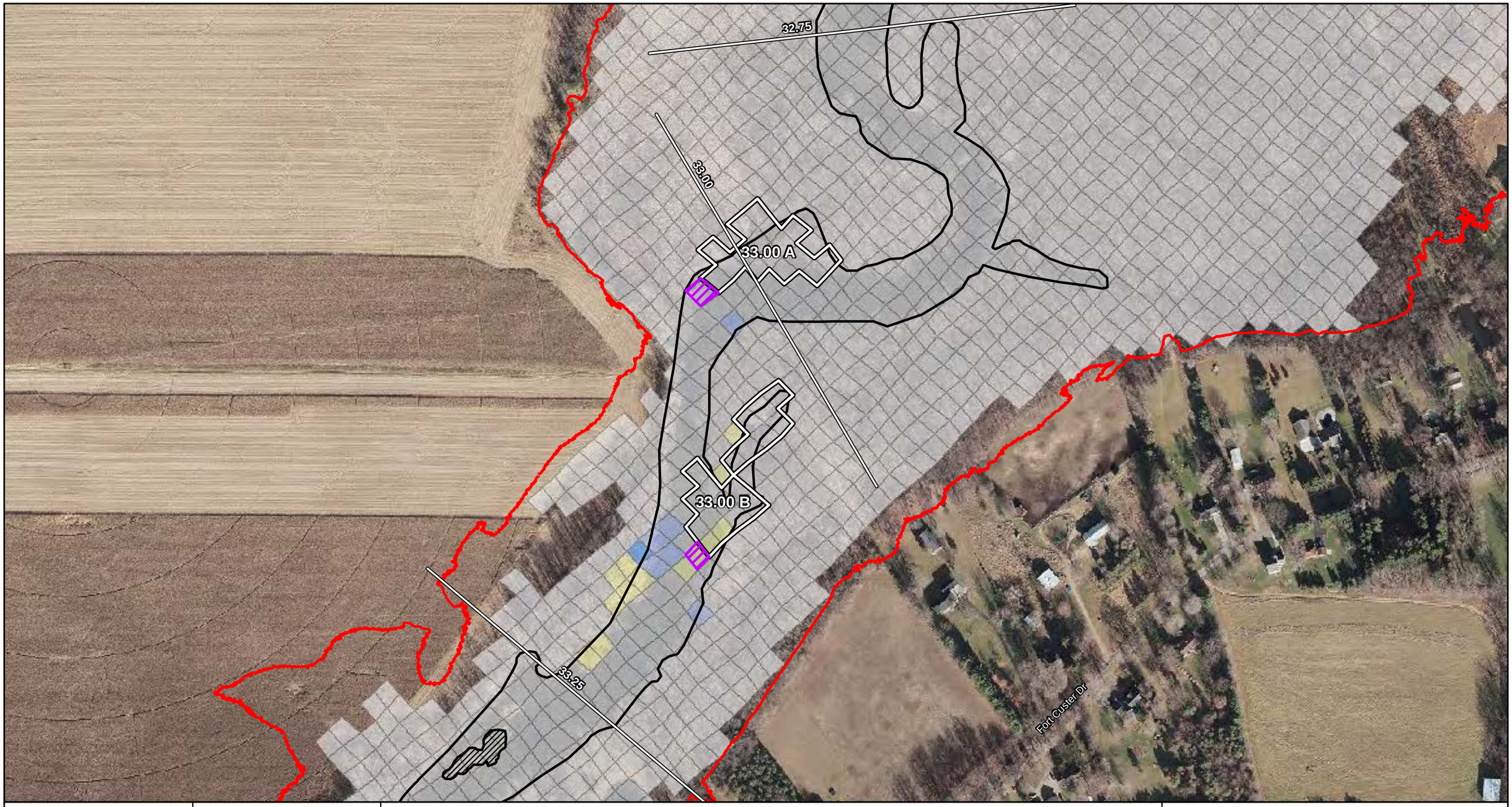
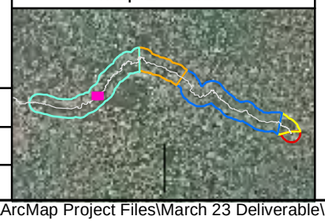
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% VS. NO STRUCTURES
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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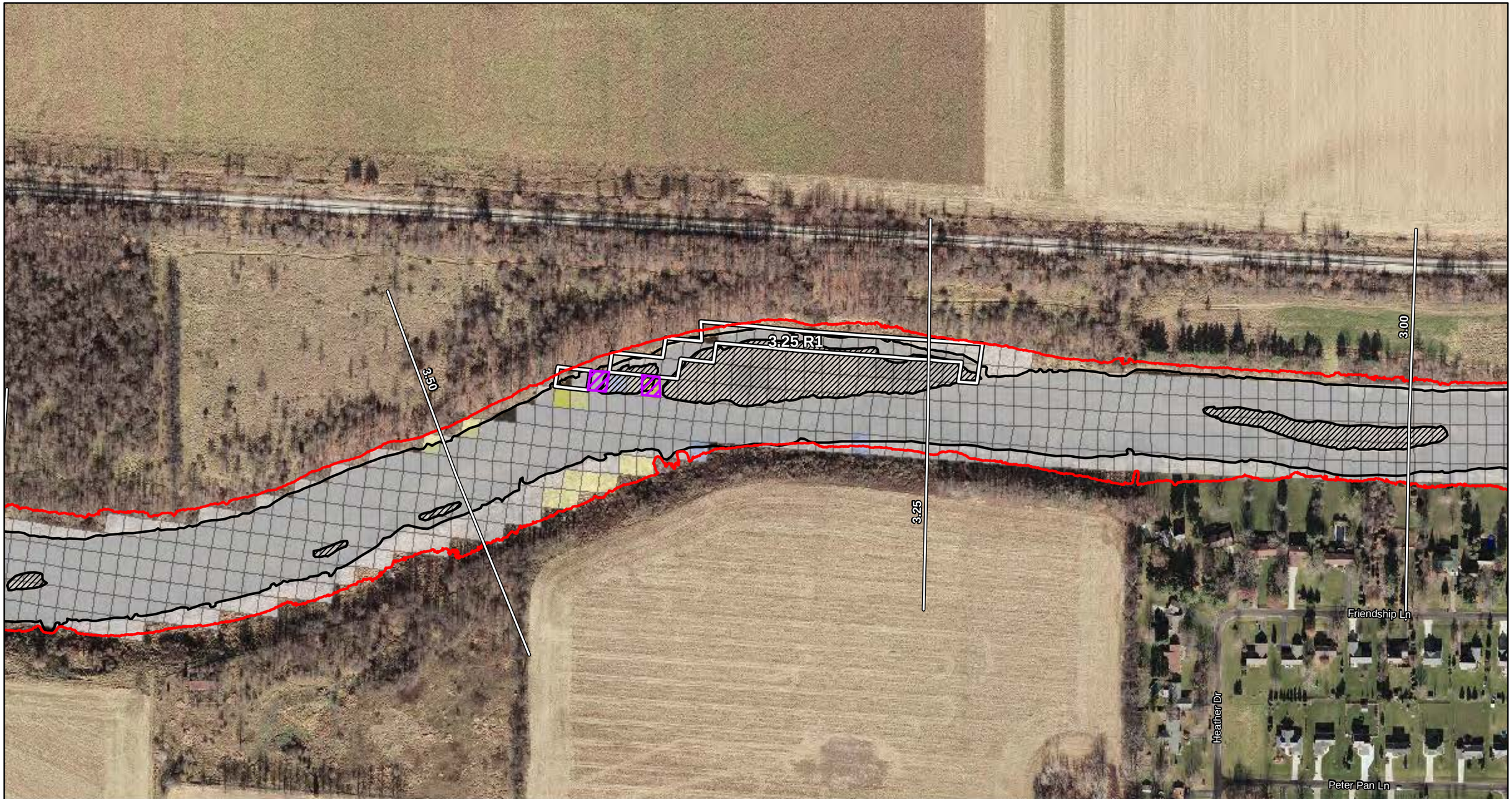
Aerial Photography Date: November 2011

Figure 7-22

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, July 24 – July 31, 2010

75% vs. No Structures

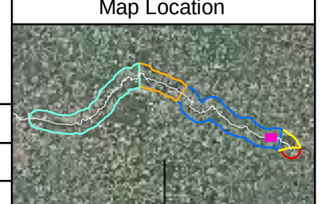
Sheets 1 through 15



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

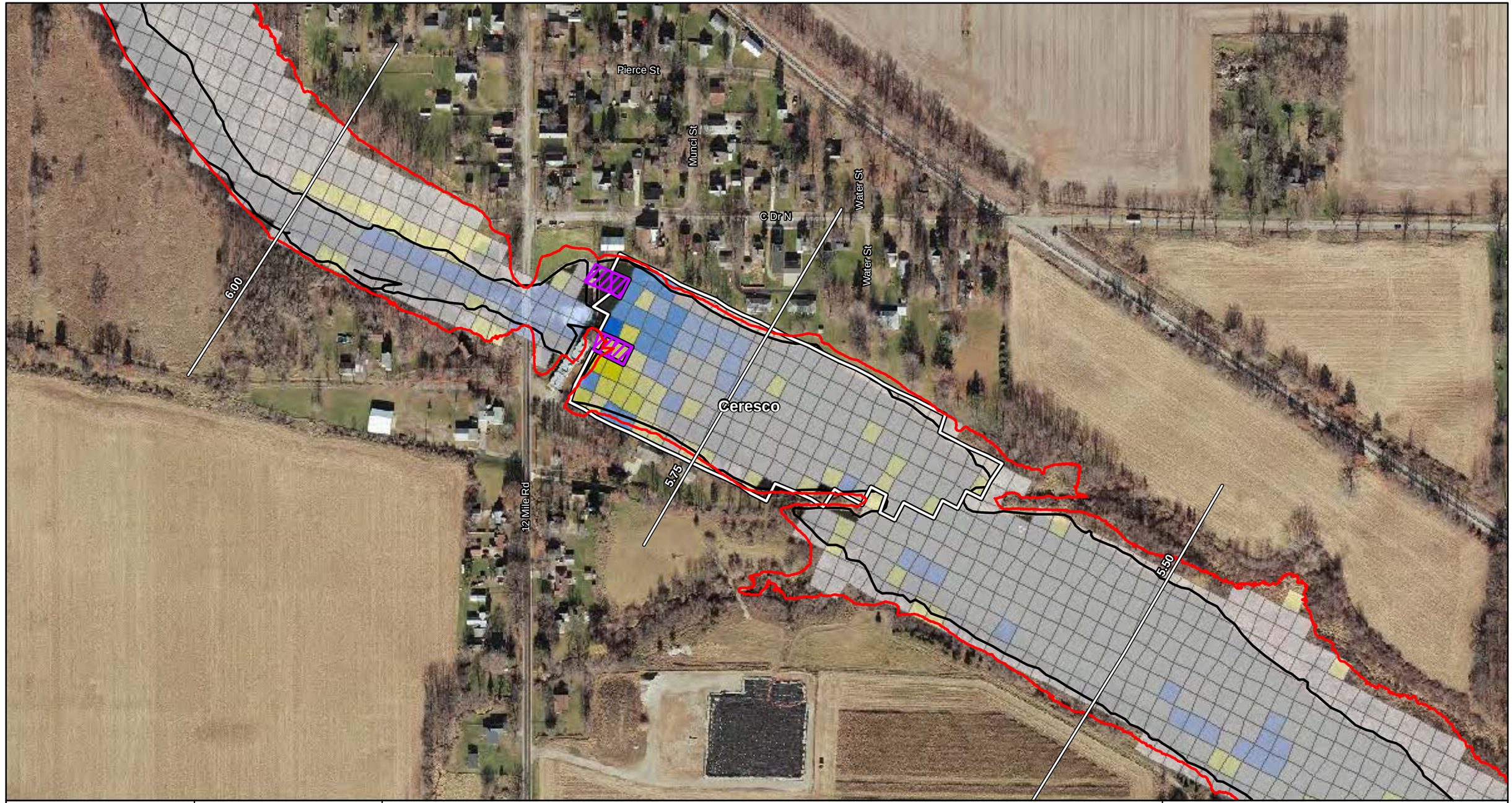
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
3.25 R1

SHEET 1 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsE1_E3_July_2010.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

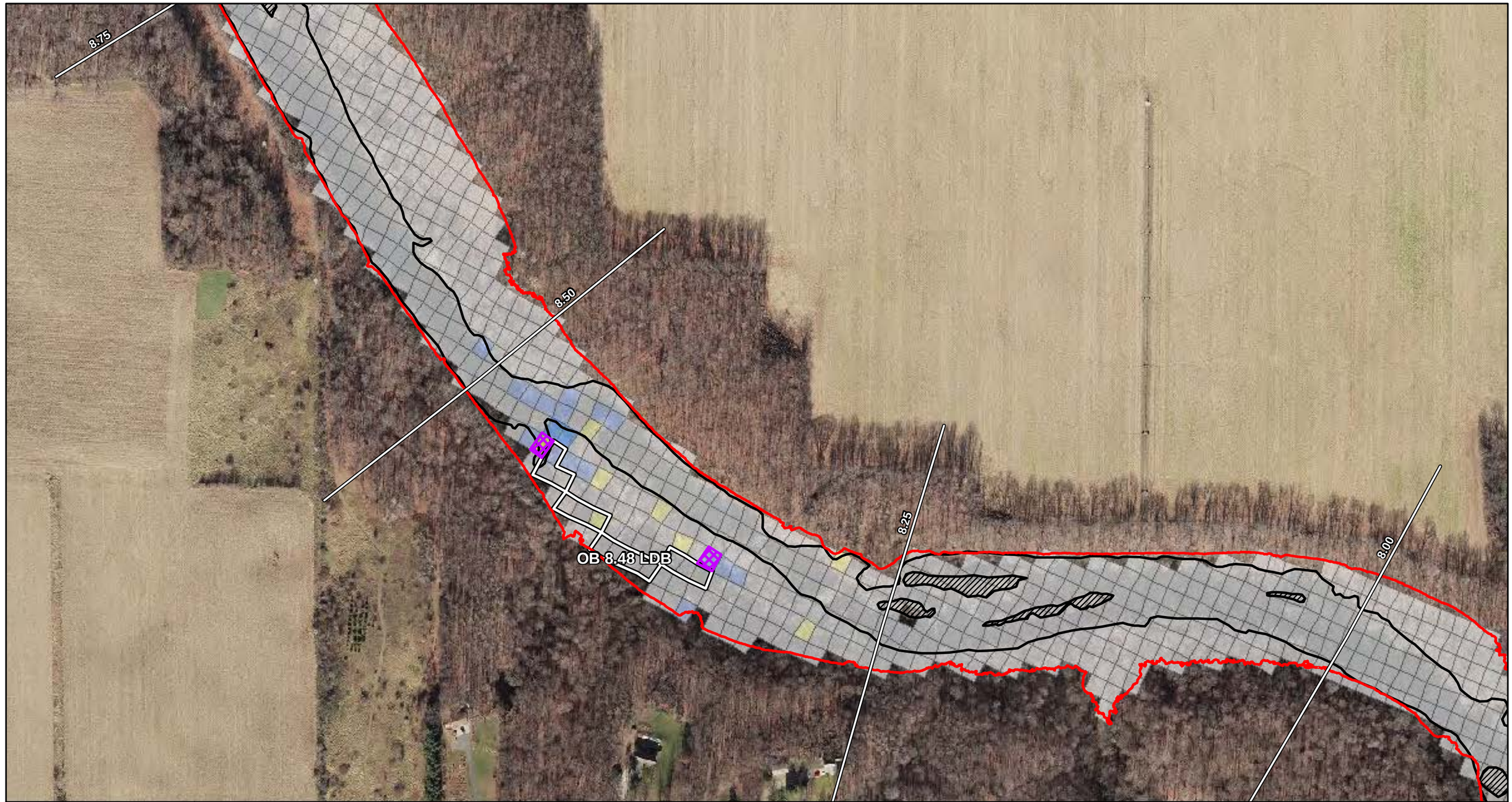
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsE1_E3_July_2010.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = millimeters per week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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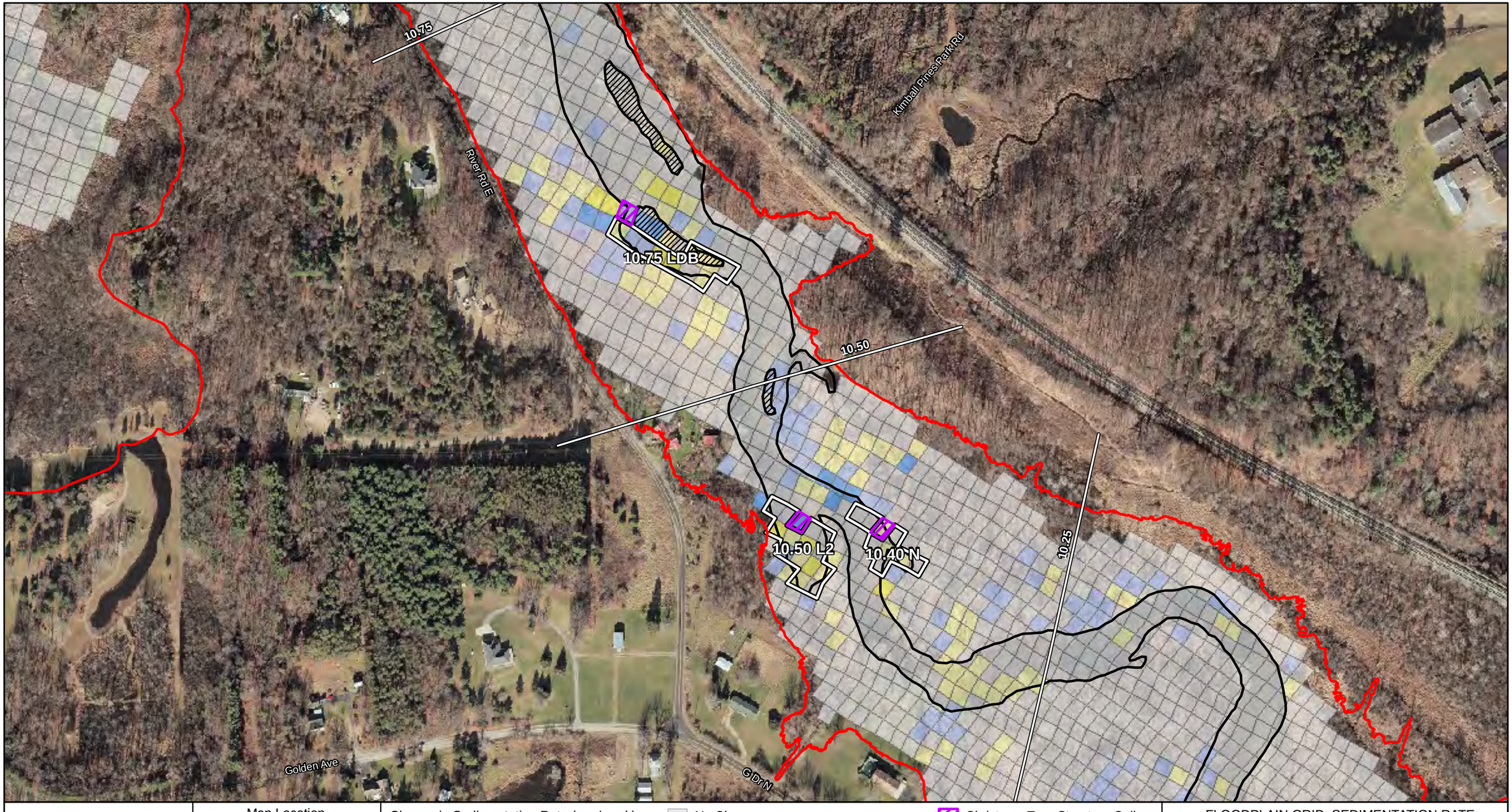
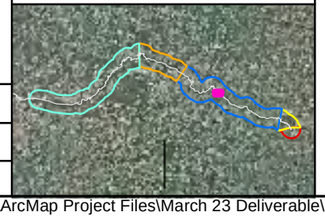
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = millimeters per week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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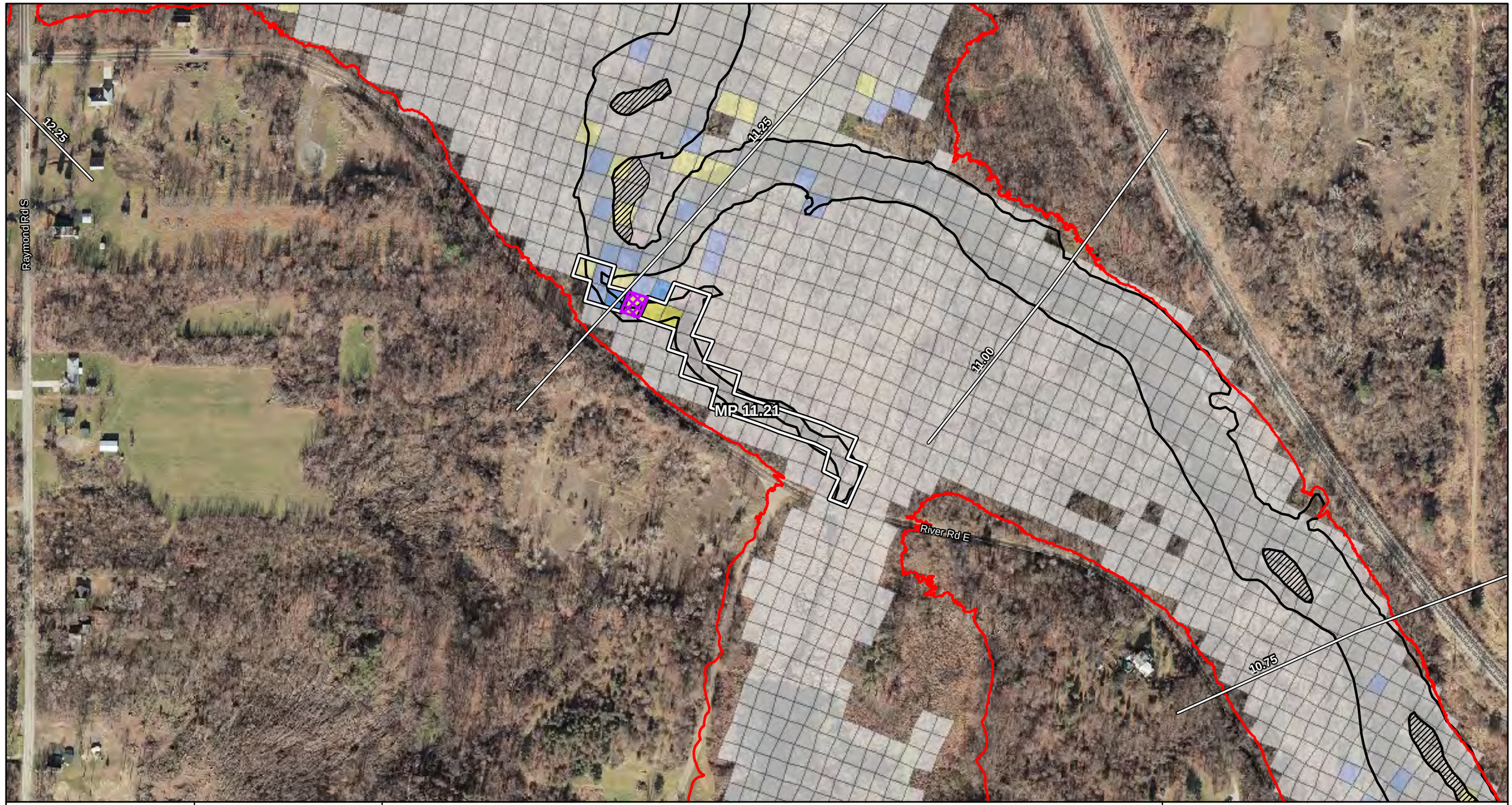
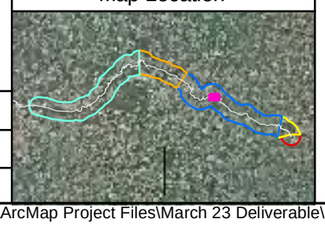
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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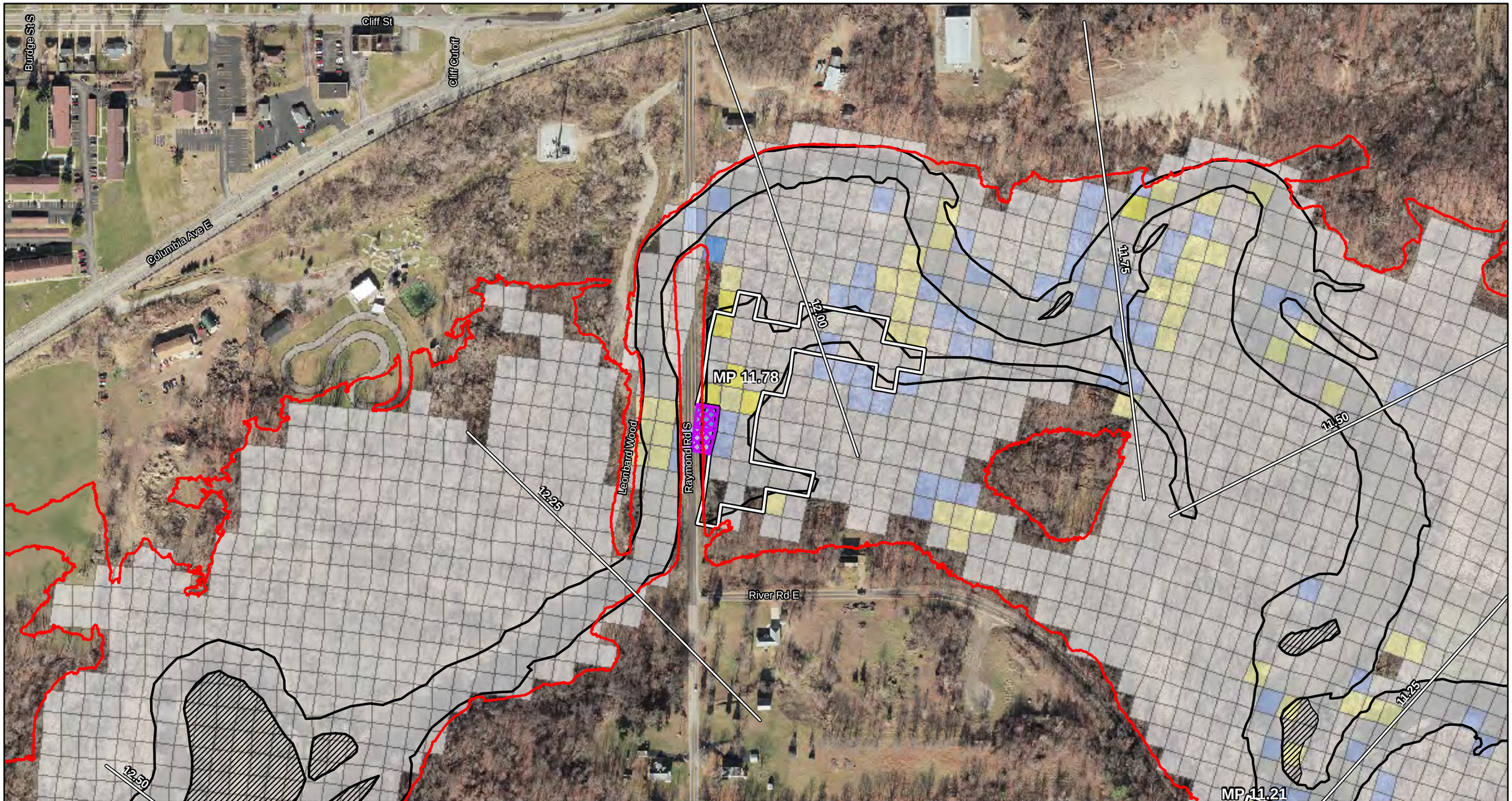
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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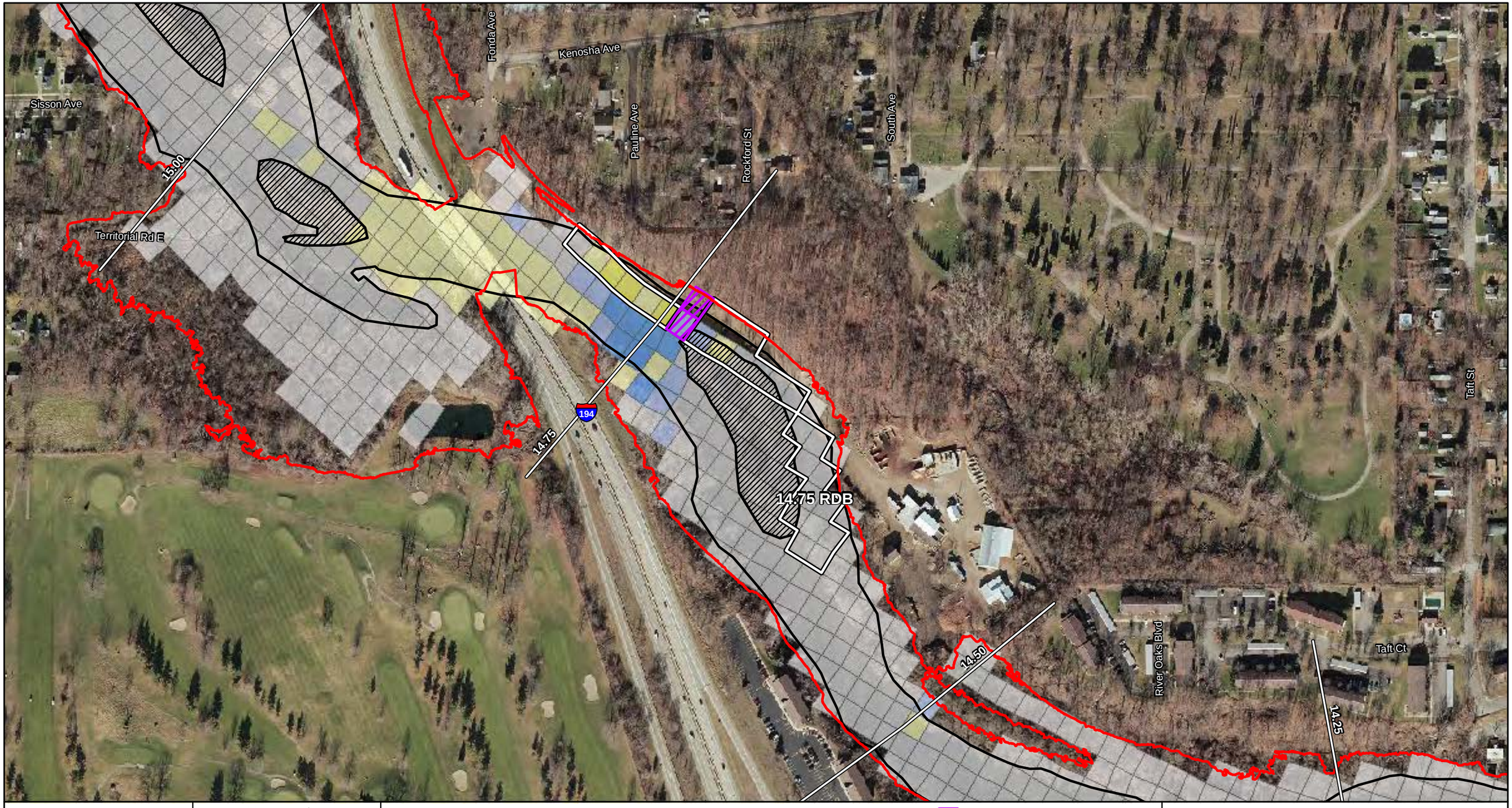
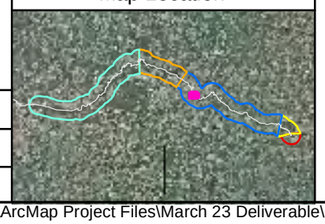
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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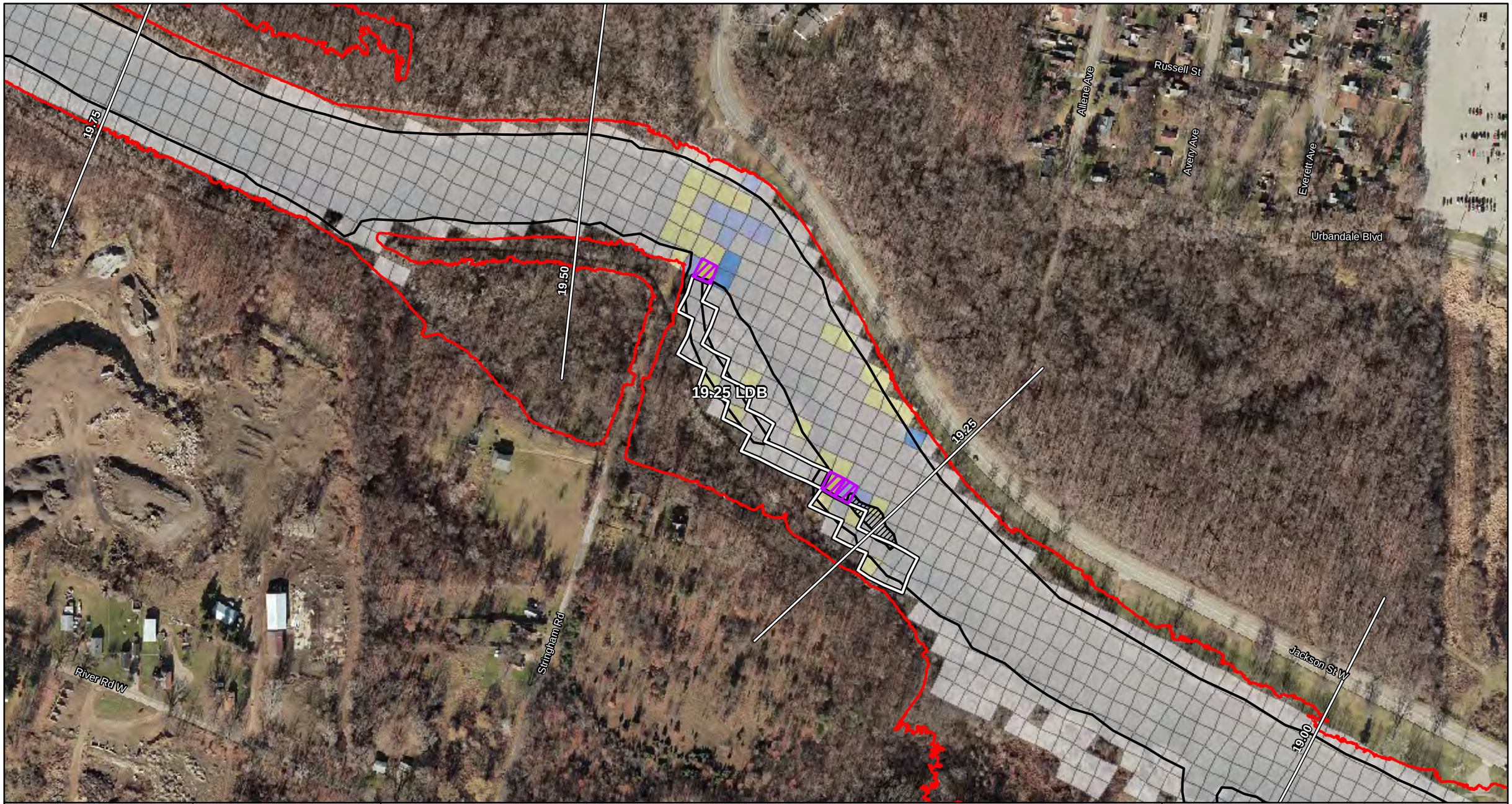
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = millimeters per week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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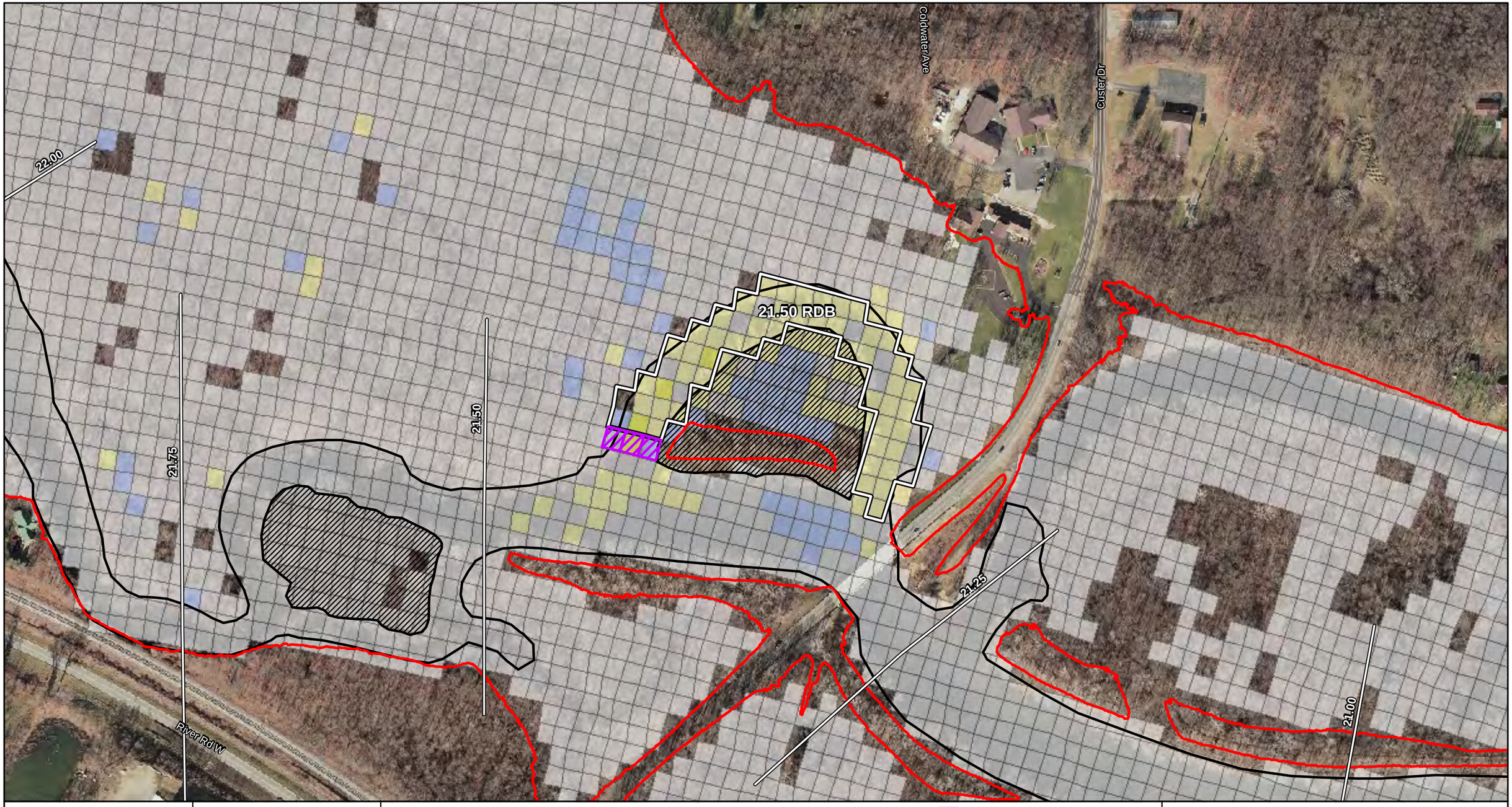
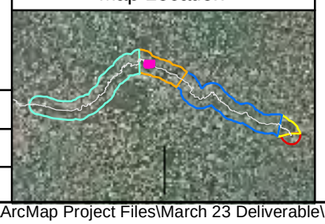
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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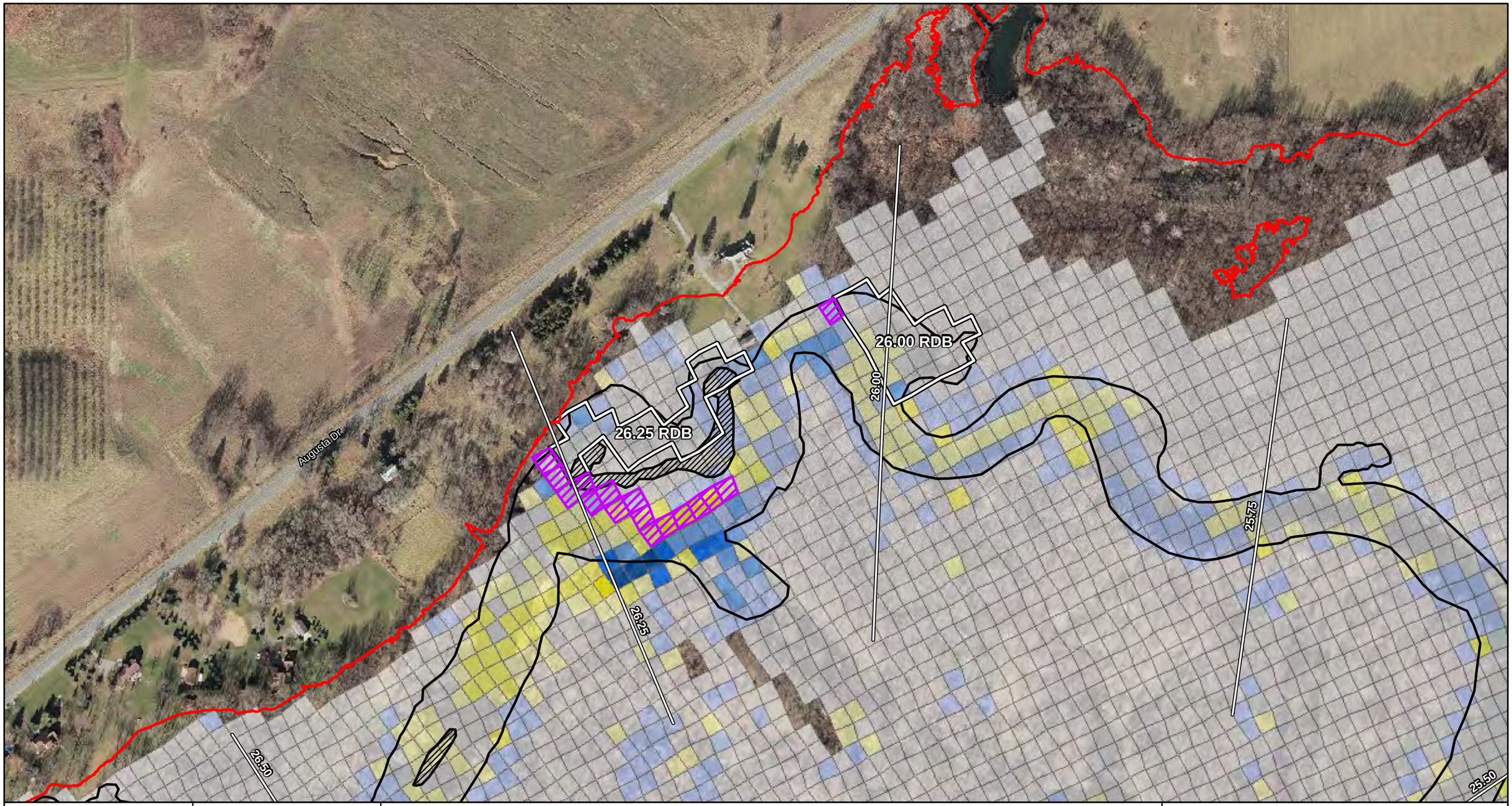
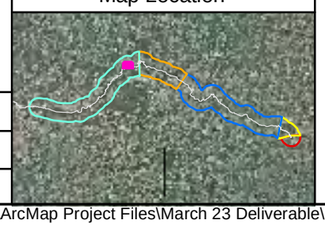
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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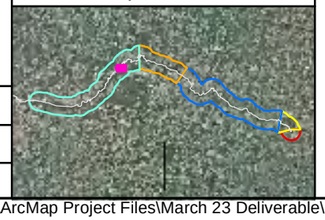
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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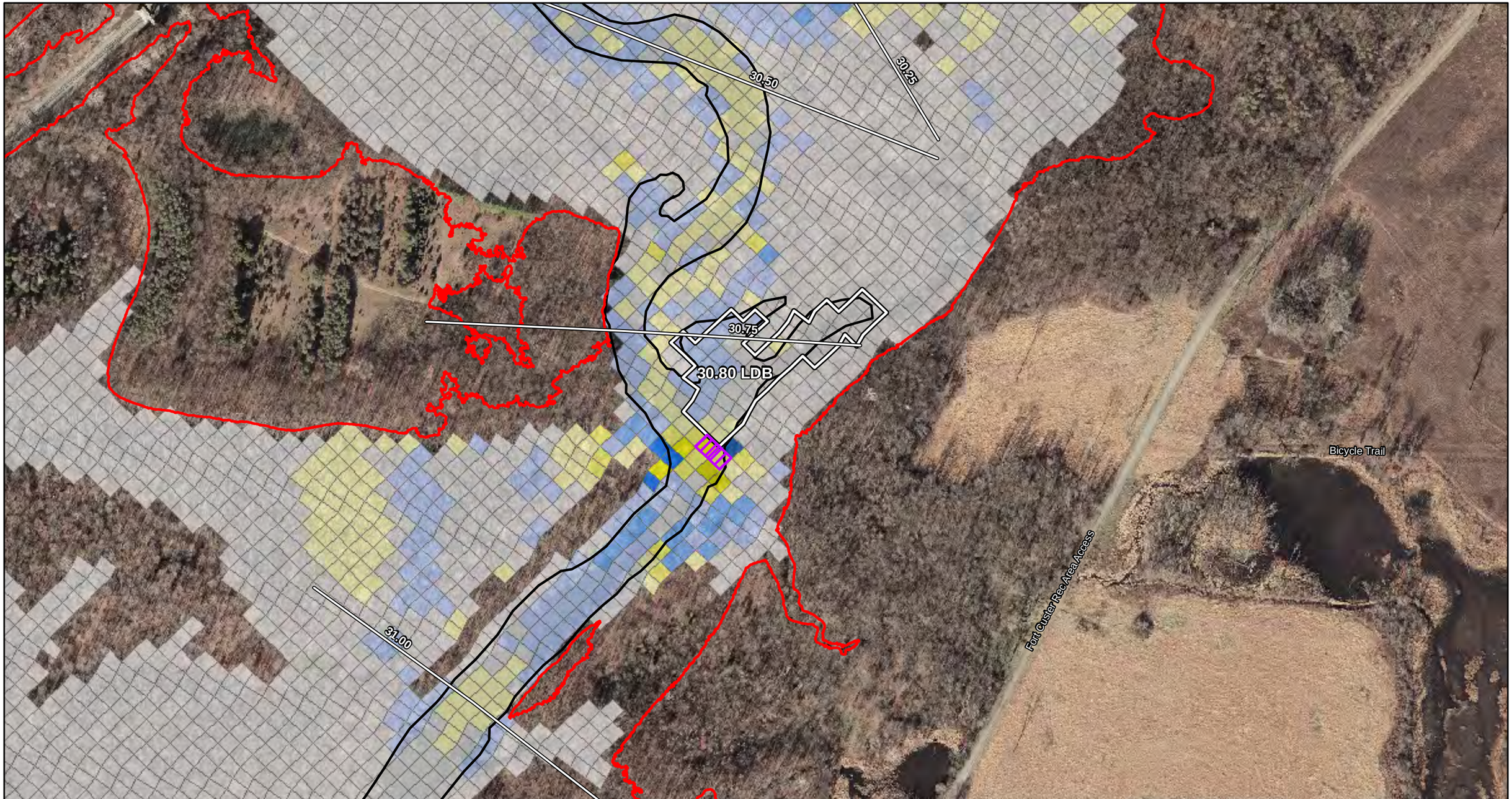
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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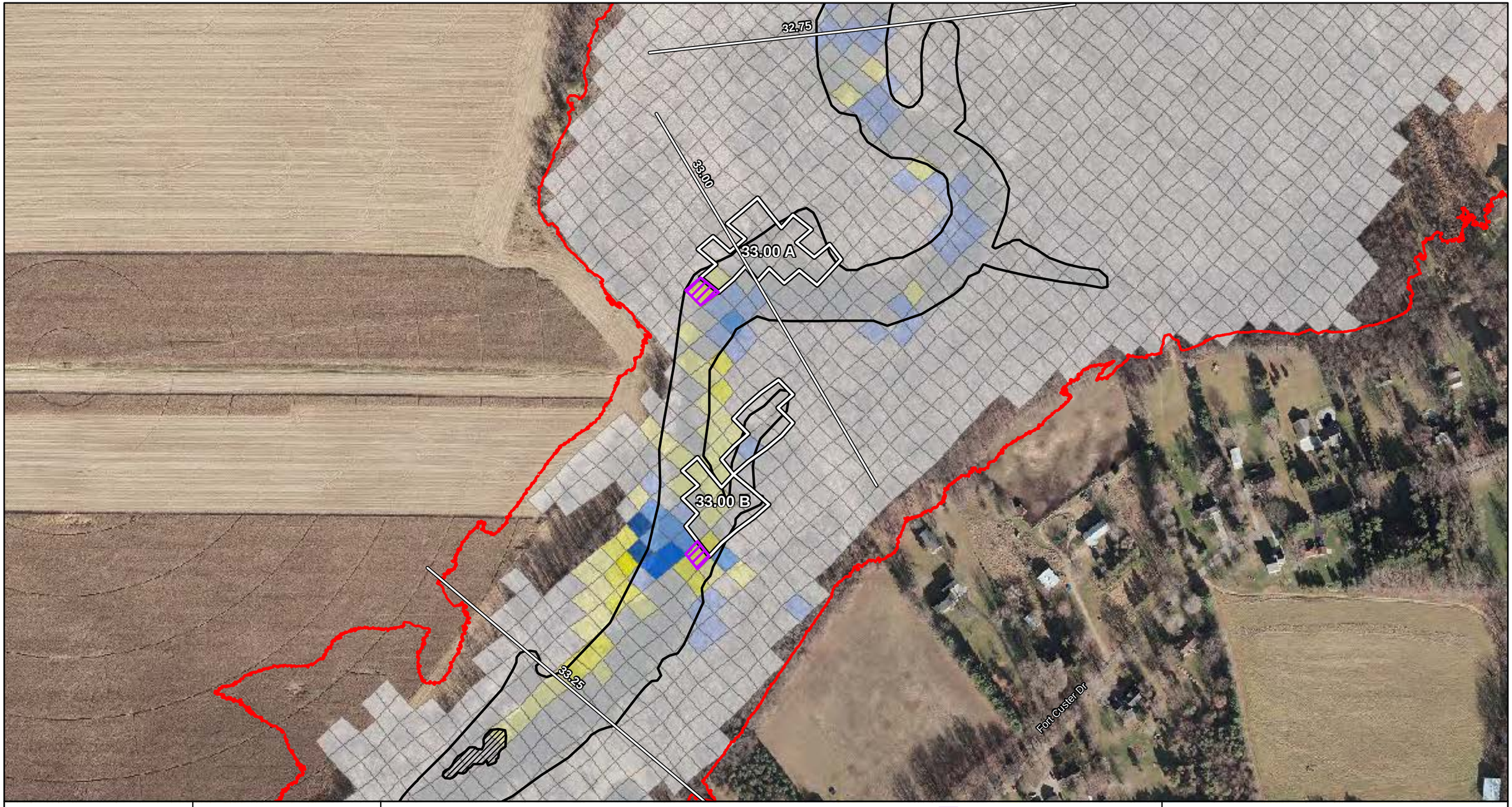
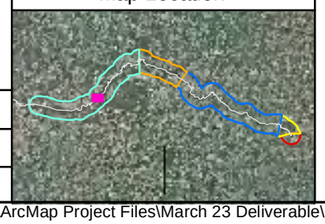
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

38.00

37.75

37.50

37.75 Islands

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Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = millimeters per week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
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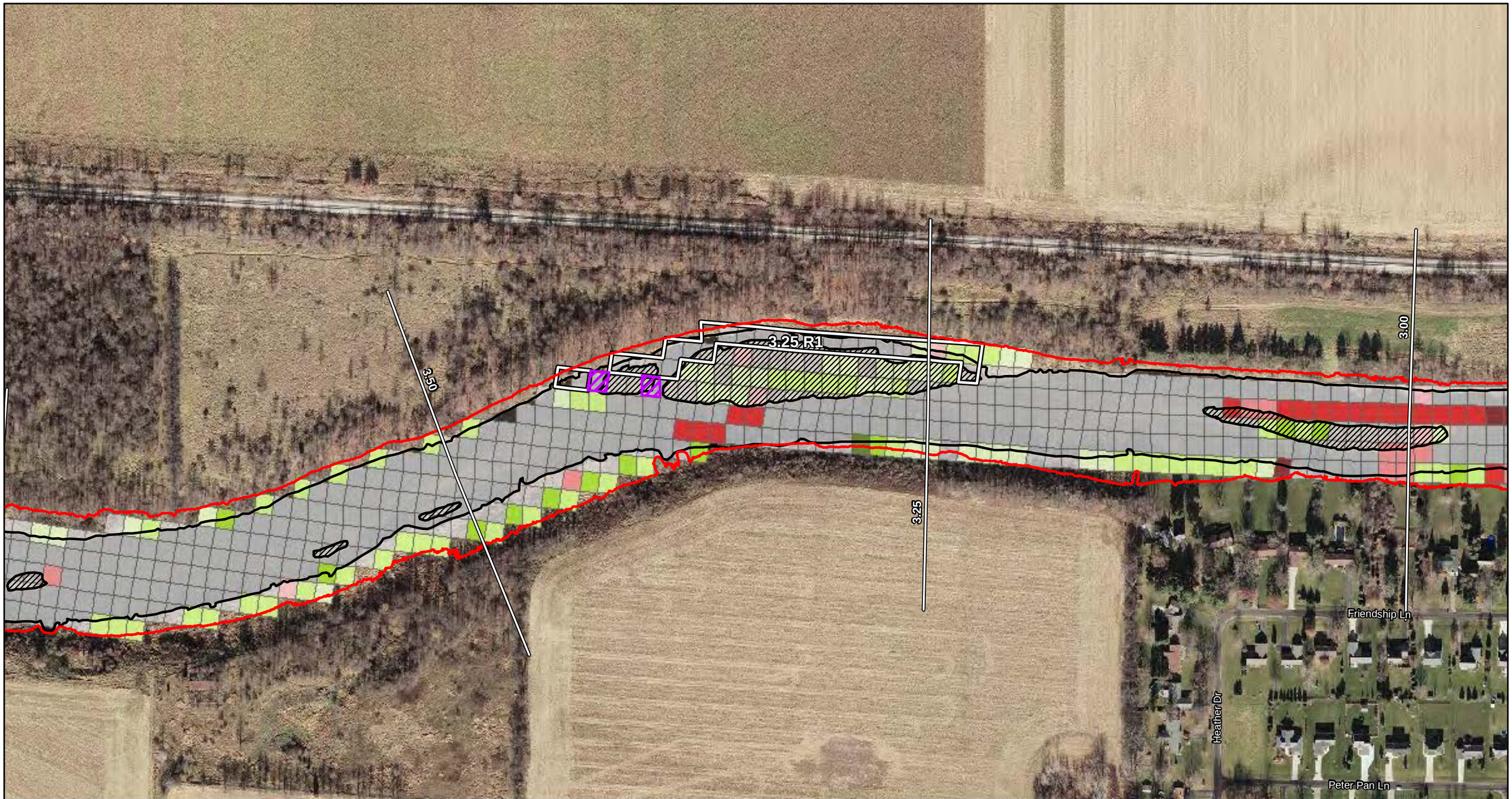
Aerial Photography Date: November 2011

Figure 7-23

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, July 24 – July 31, 2010

No Structure

Sheets 1 through 15



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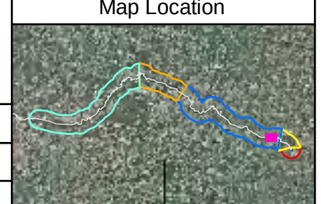
Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
3.25 R1

SHEET 1 OF 15

ENBRIDGE LINE 6B MP 608
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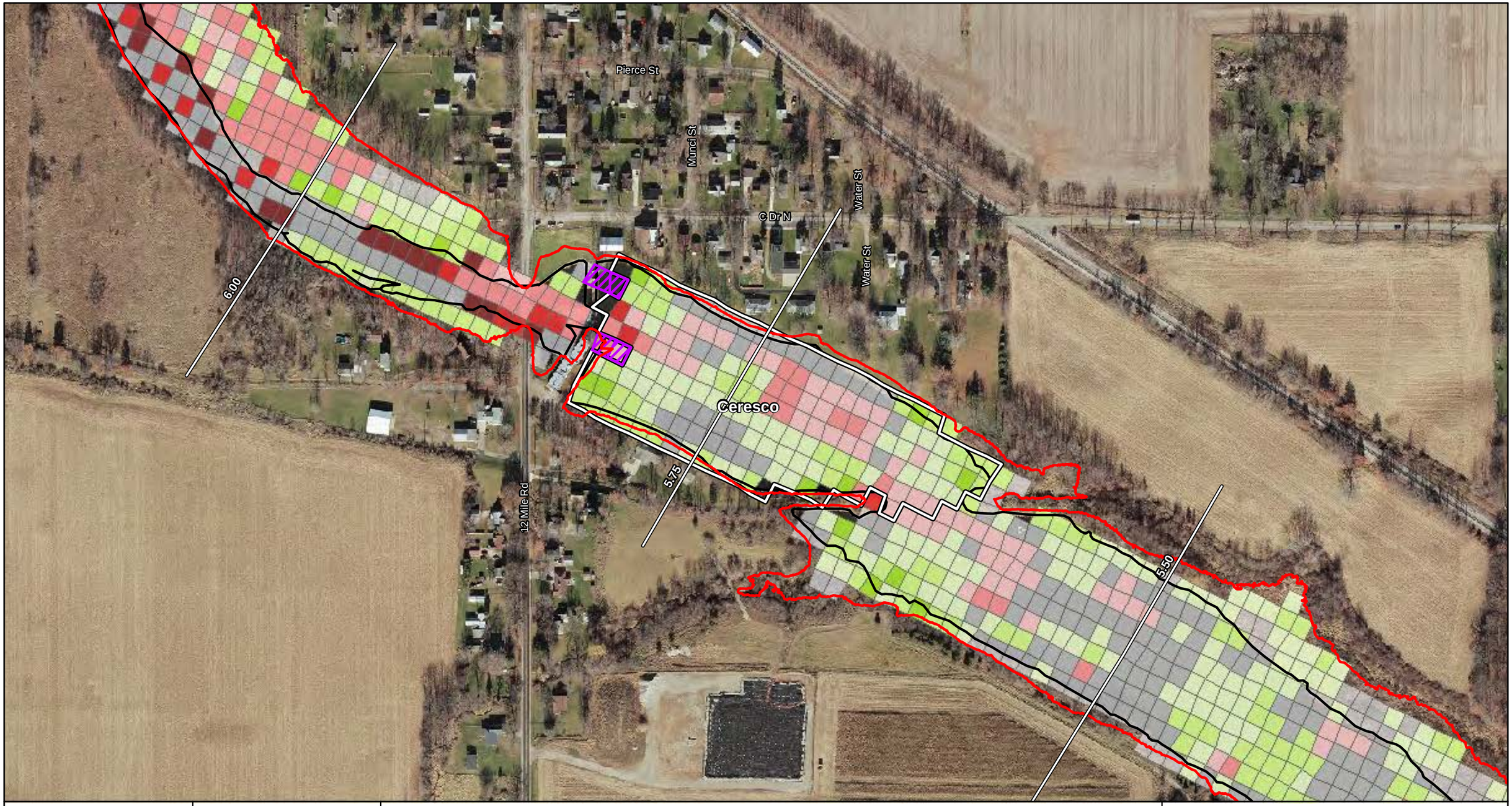
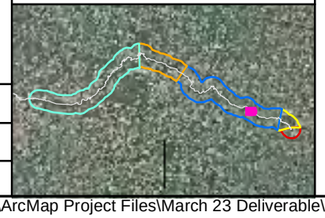
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
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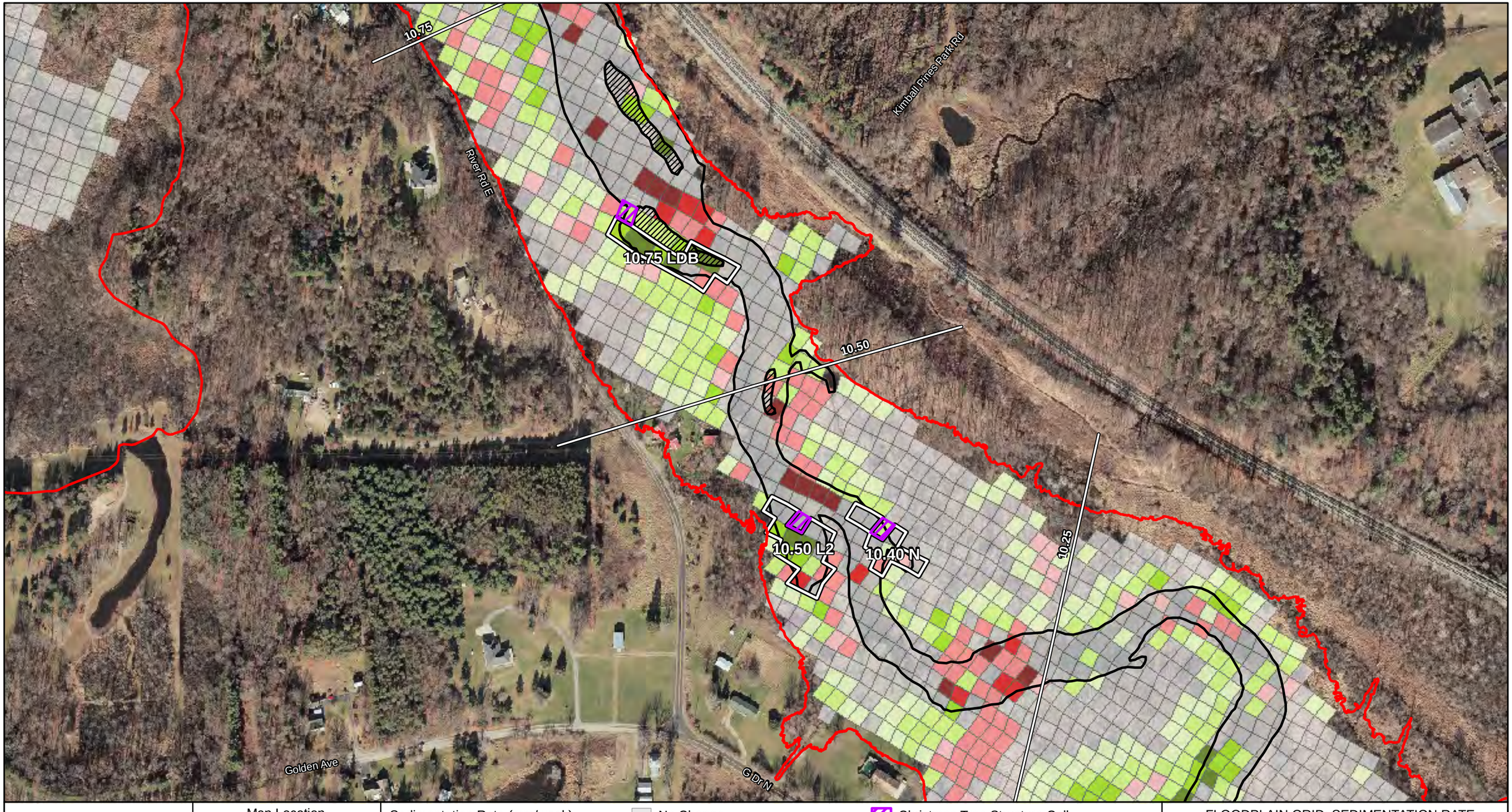
Aerial Photography Date: November 2011



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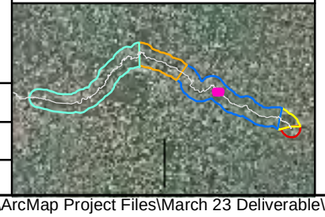

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Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
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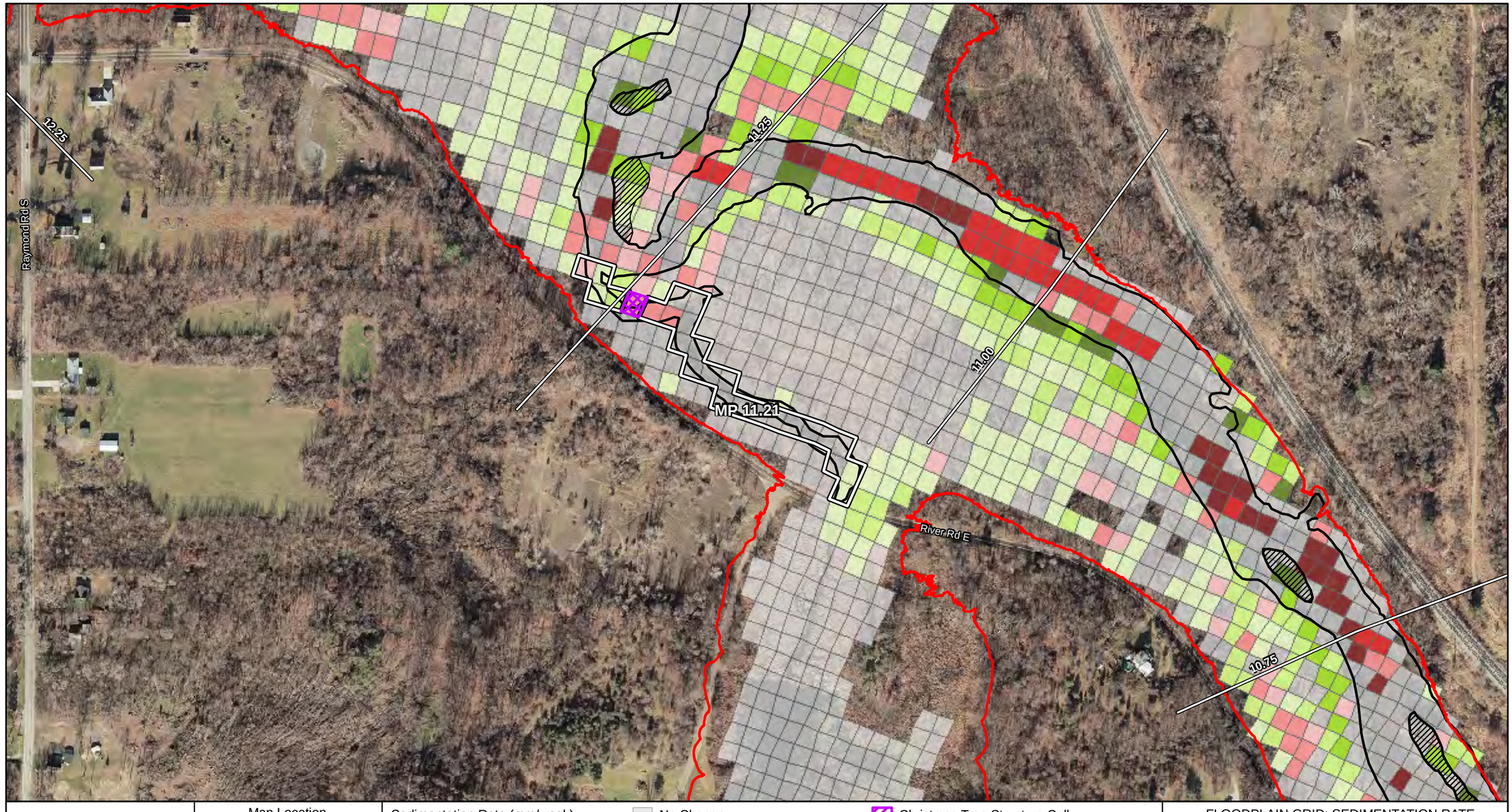
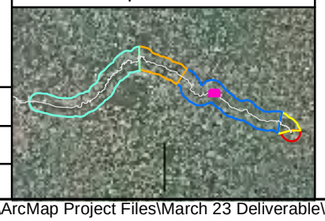
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
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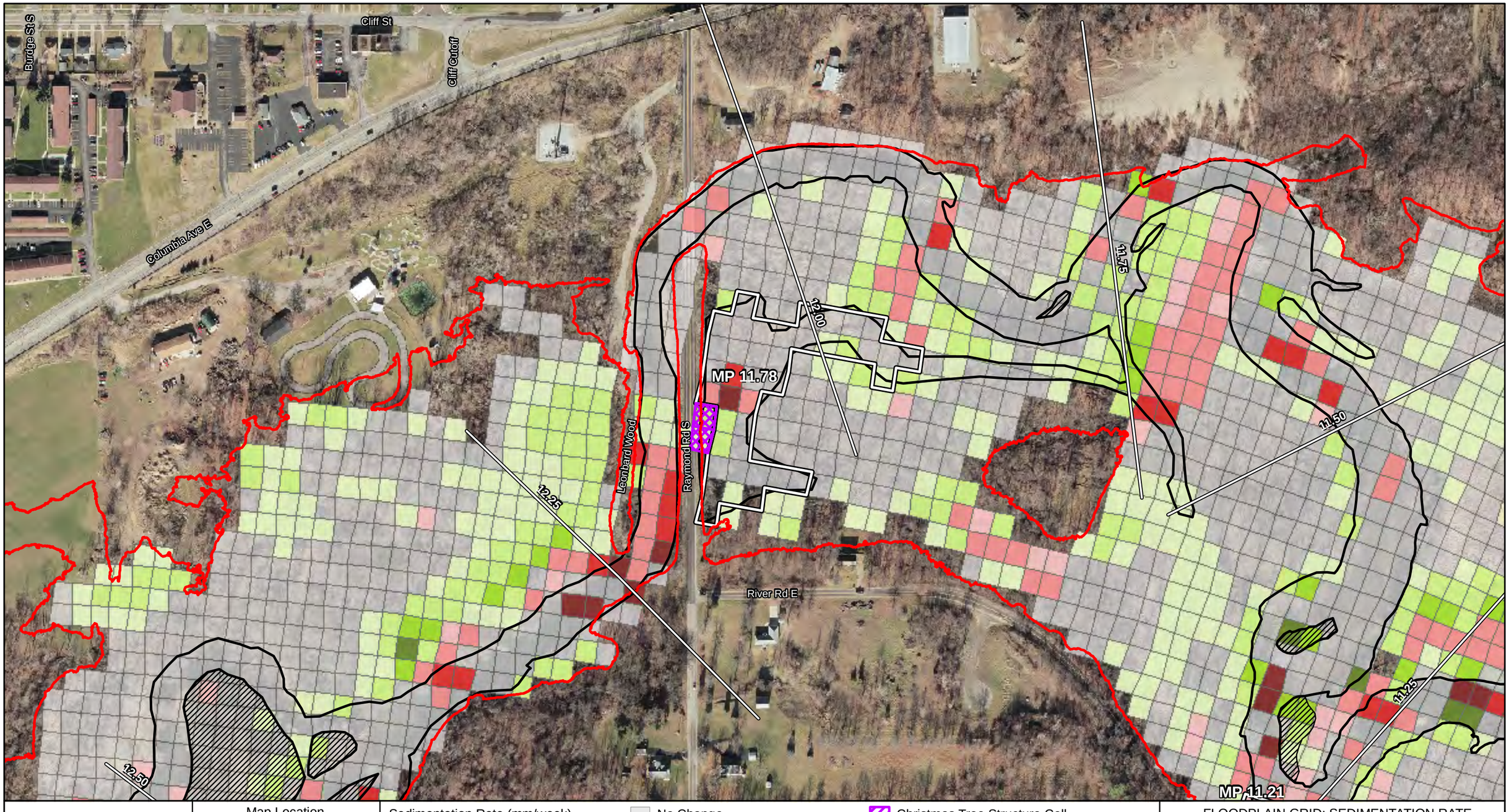
Aerial Photography Date: November 2011



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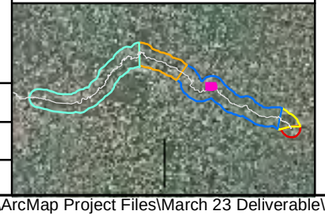

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

ENBRIDGE

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Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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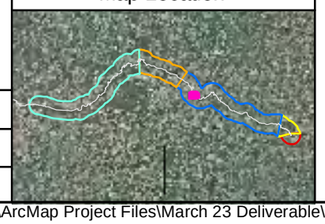
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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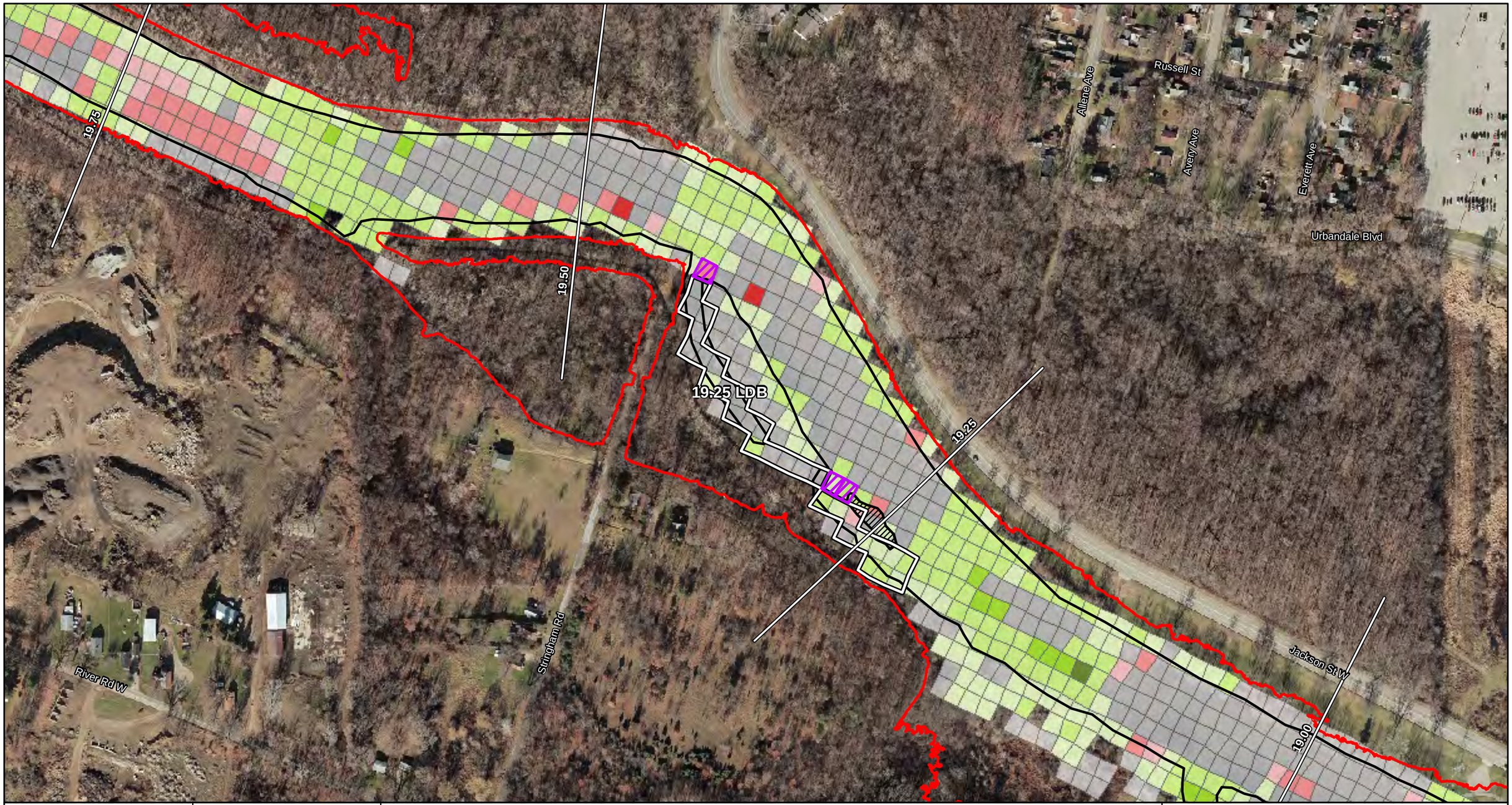
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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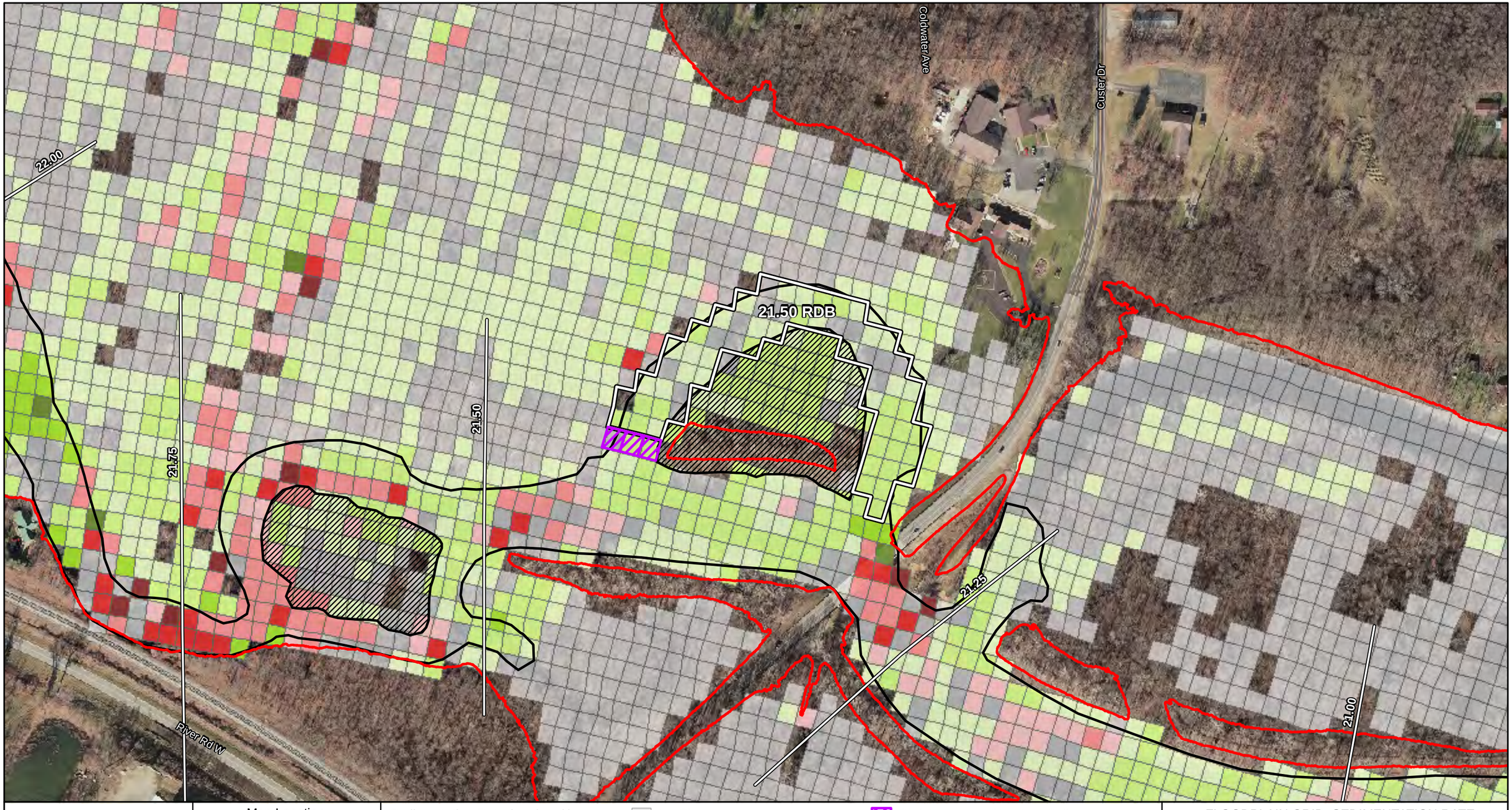
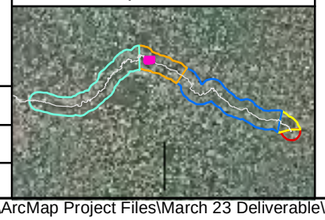
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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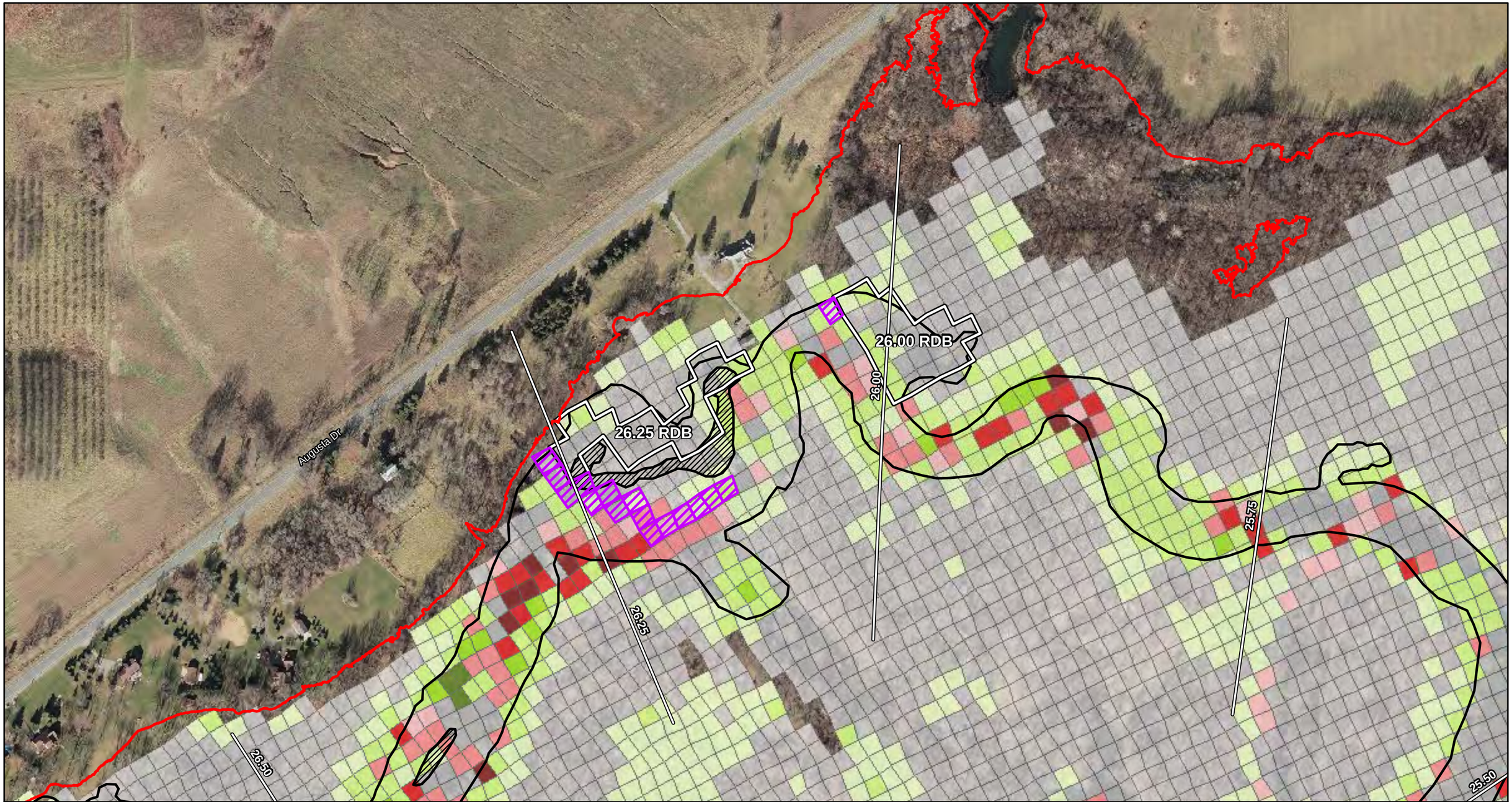
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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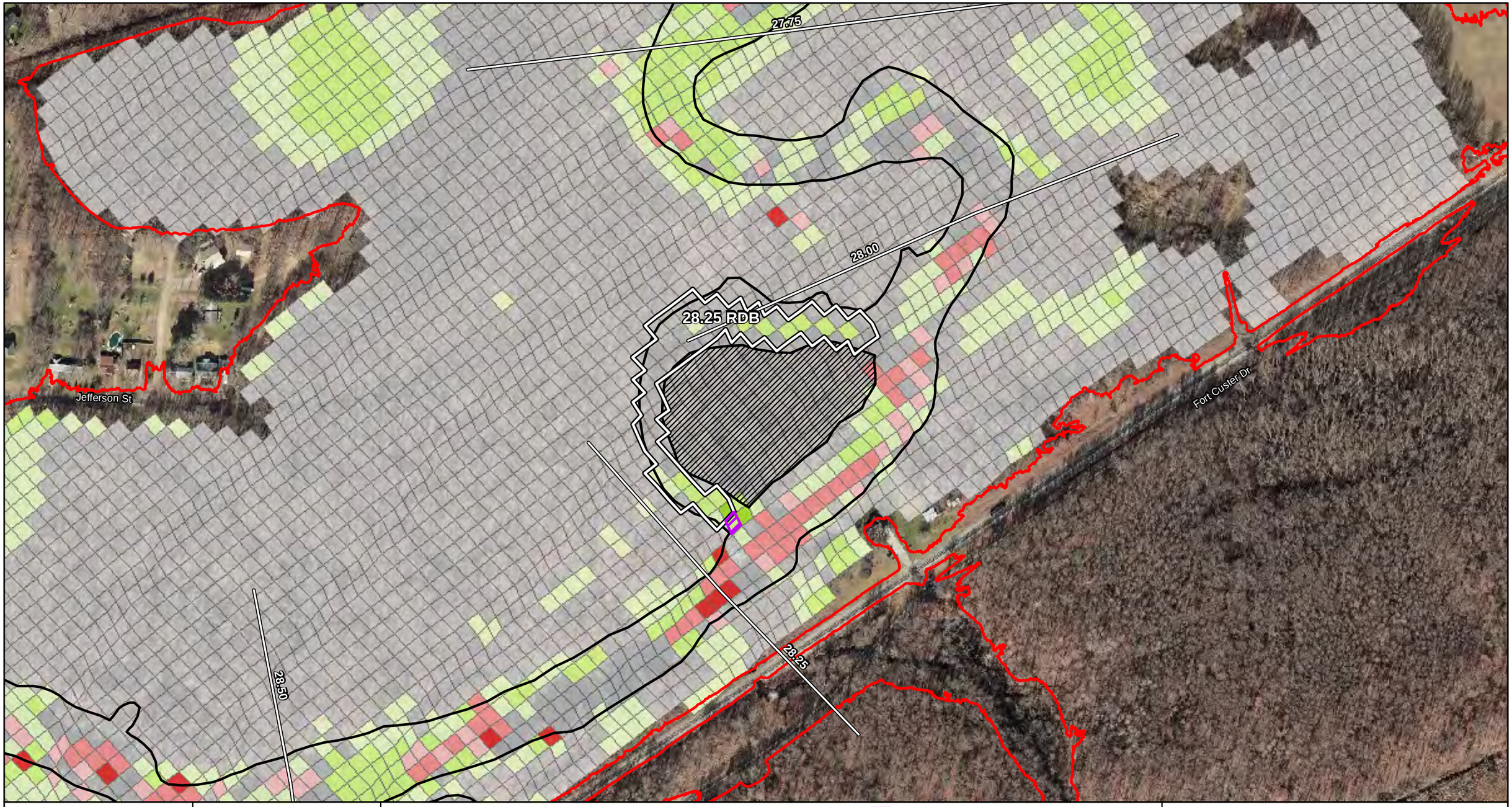
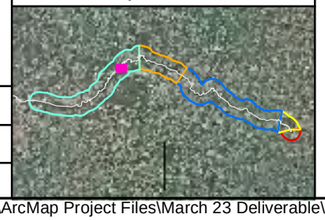
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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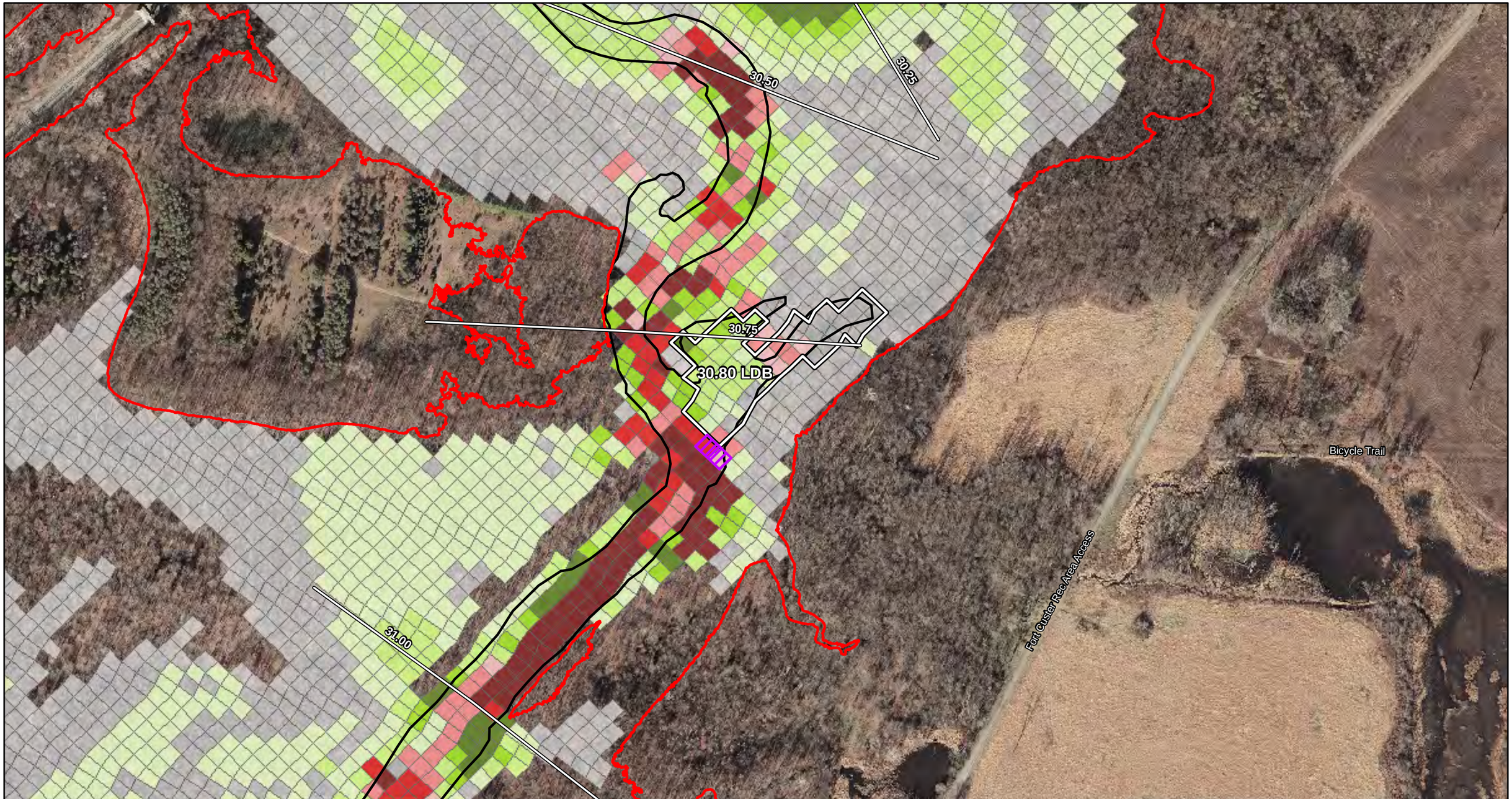
Aerial Photography Date: November 2011



Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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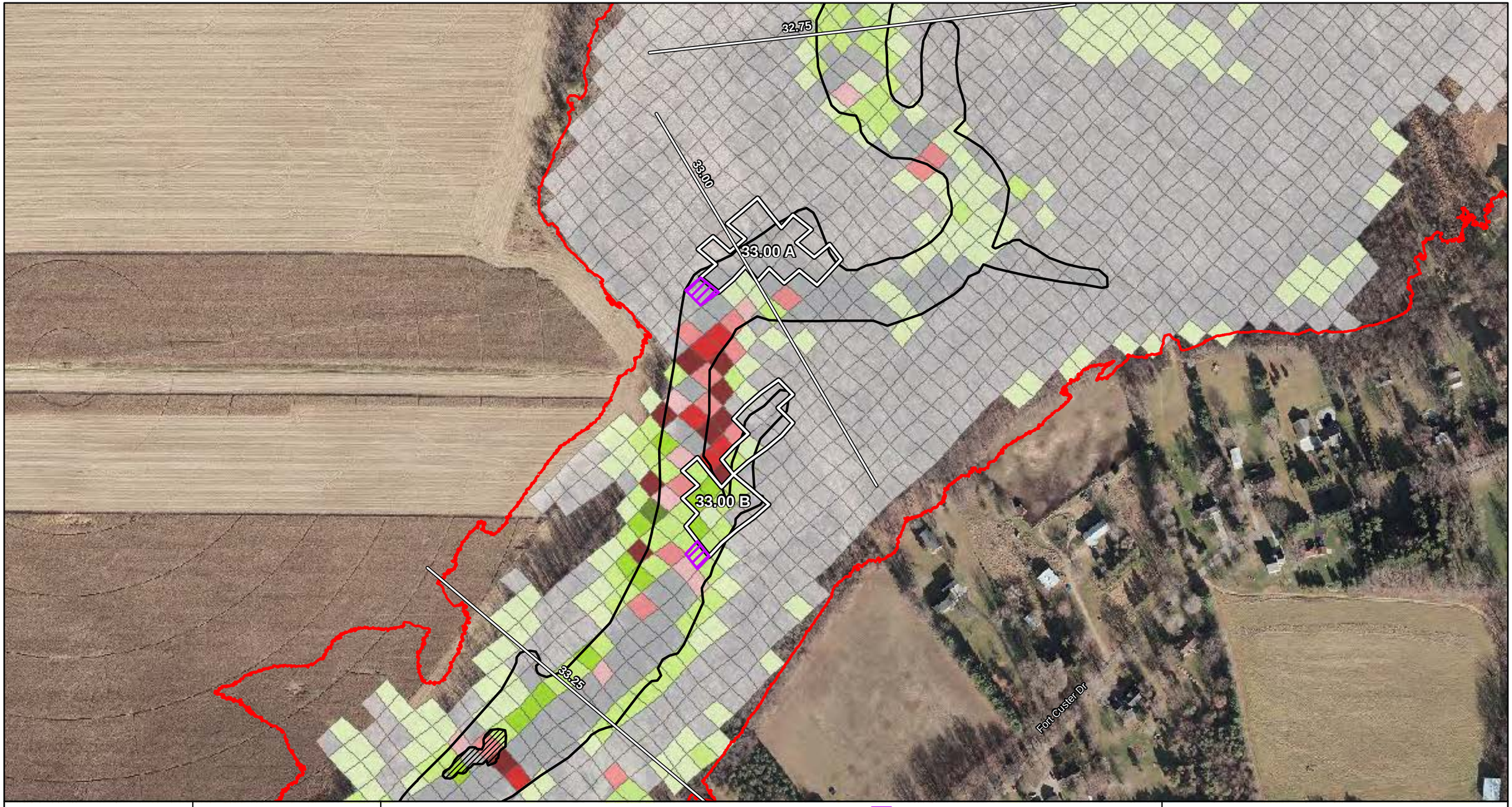
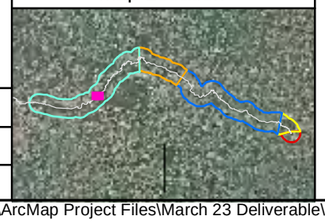
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
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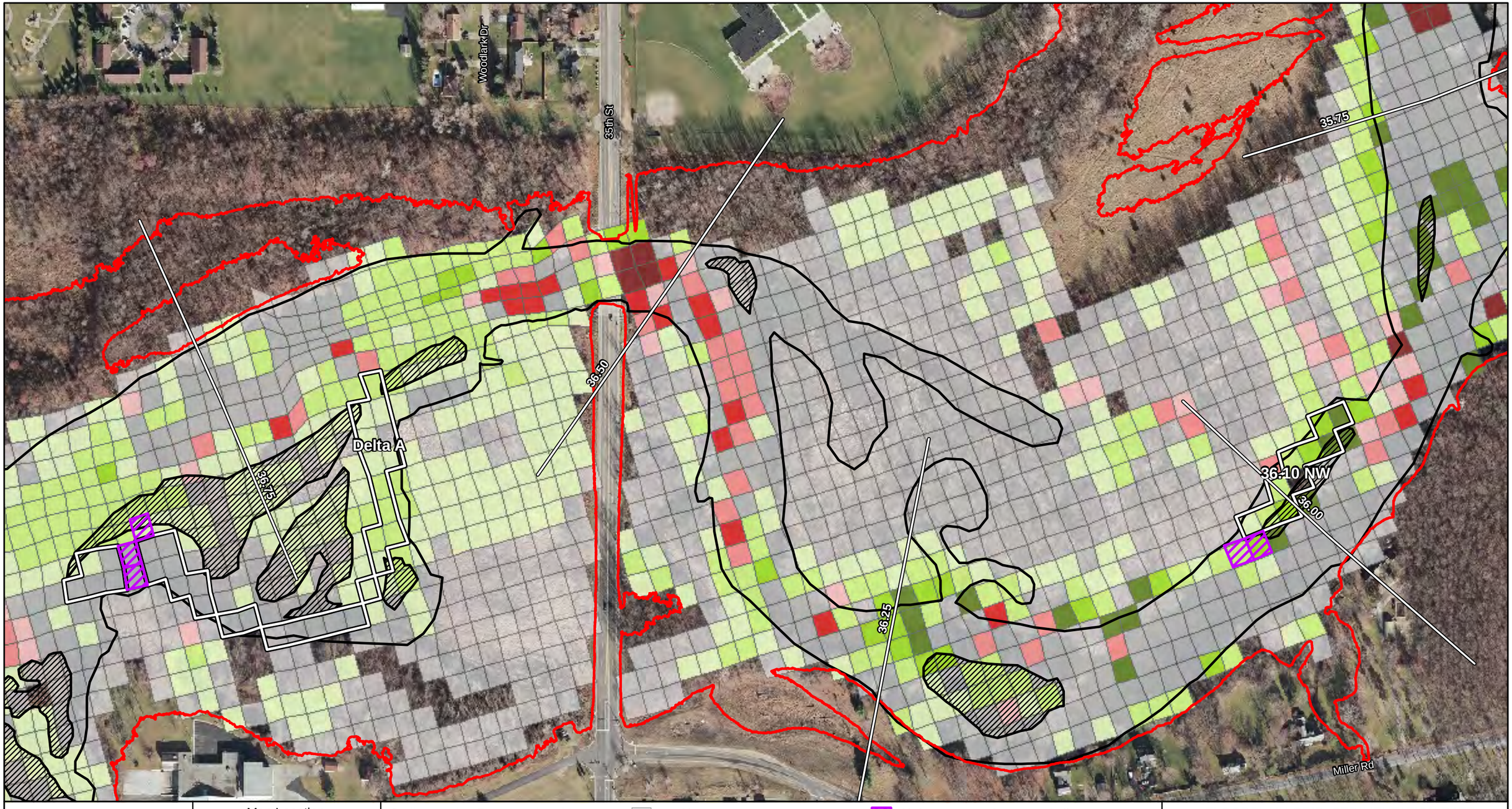
Aerial Photography Date: November 2011



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Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
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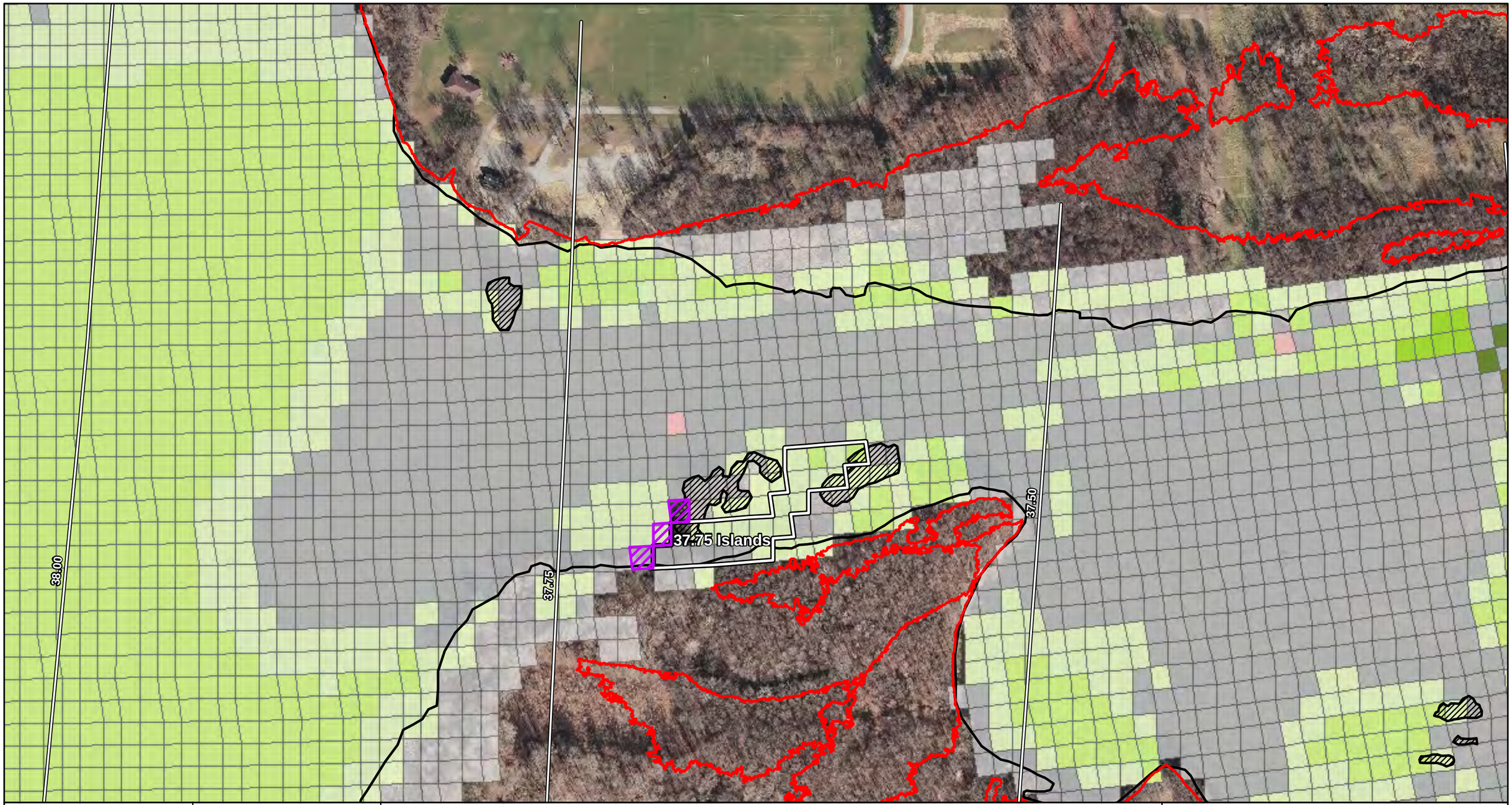
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- NO STRUCTURE
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

Figure 7-24

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, July 24 – July 31, 2010

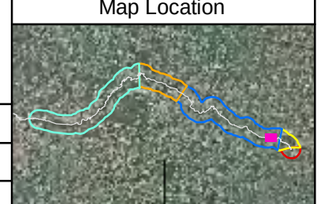
99% Structure

Sheets 1 through 15

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
3.25 R1

SHEET 1 OF 15

ENBRIDGE LINE 6B MP 608
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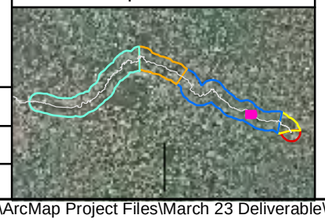
Aerial Photography Date: November 2011

Pierce St
Munci St
C Dr N
Water St
Water St
6.00
5.75
5.50
12 Mile Rd
Ceresco

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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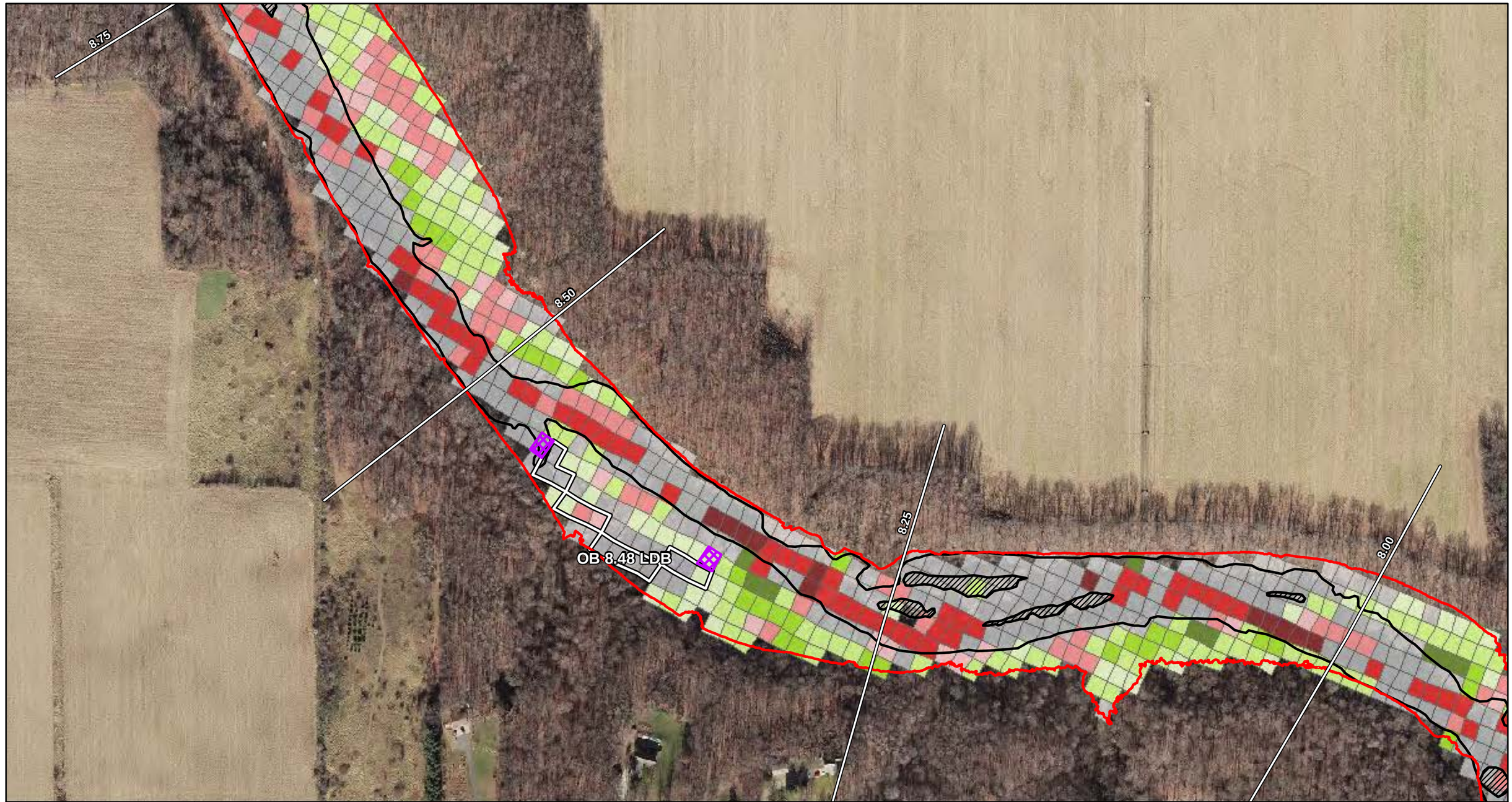
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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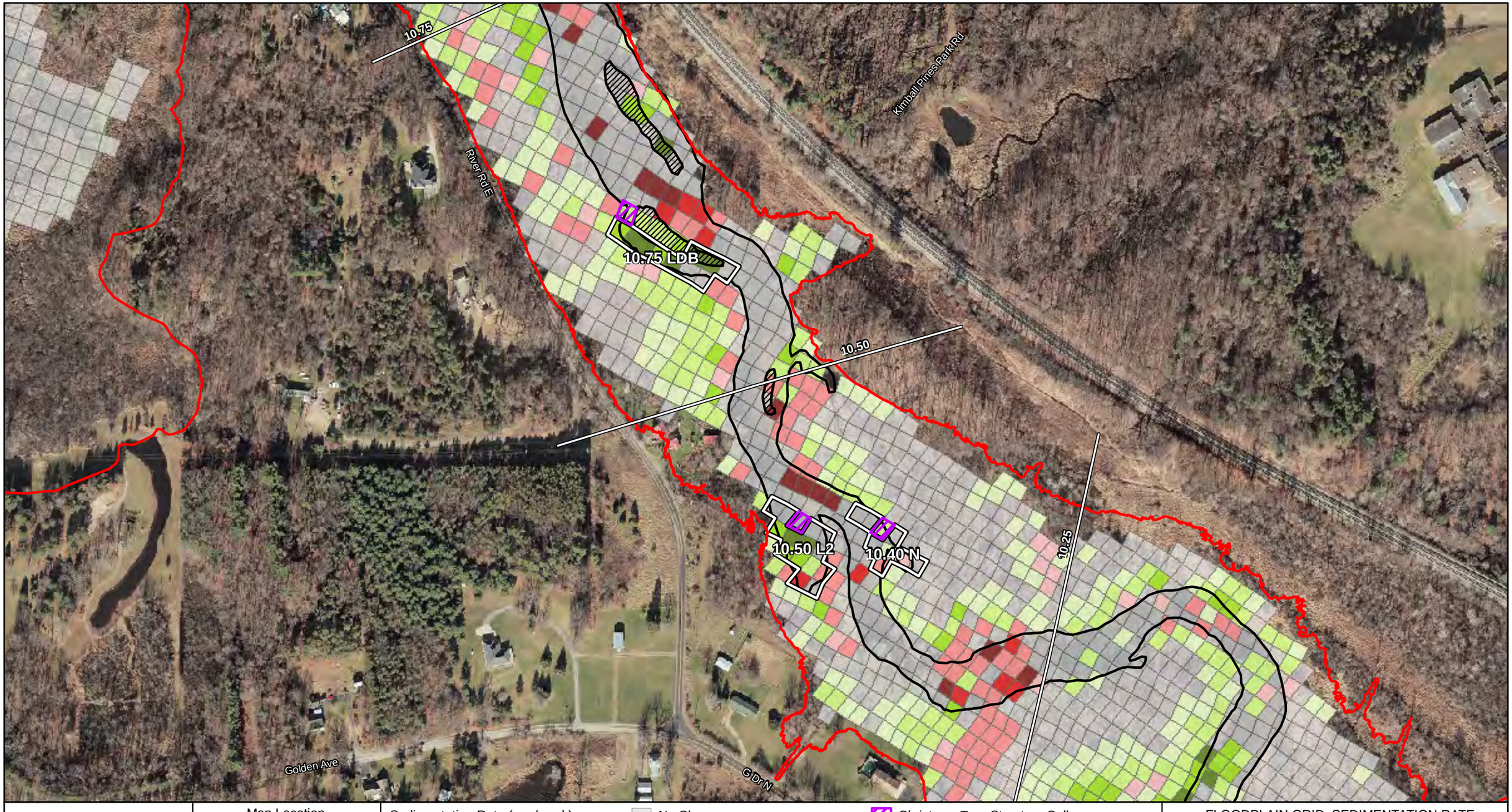
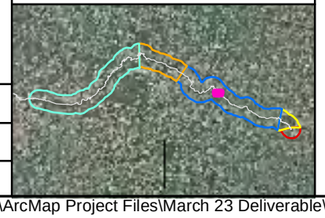
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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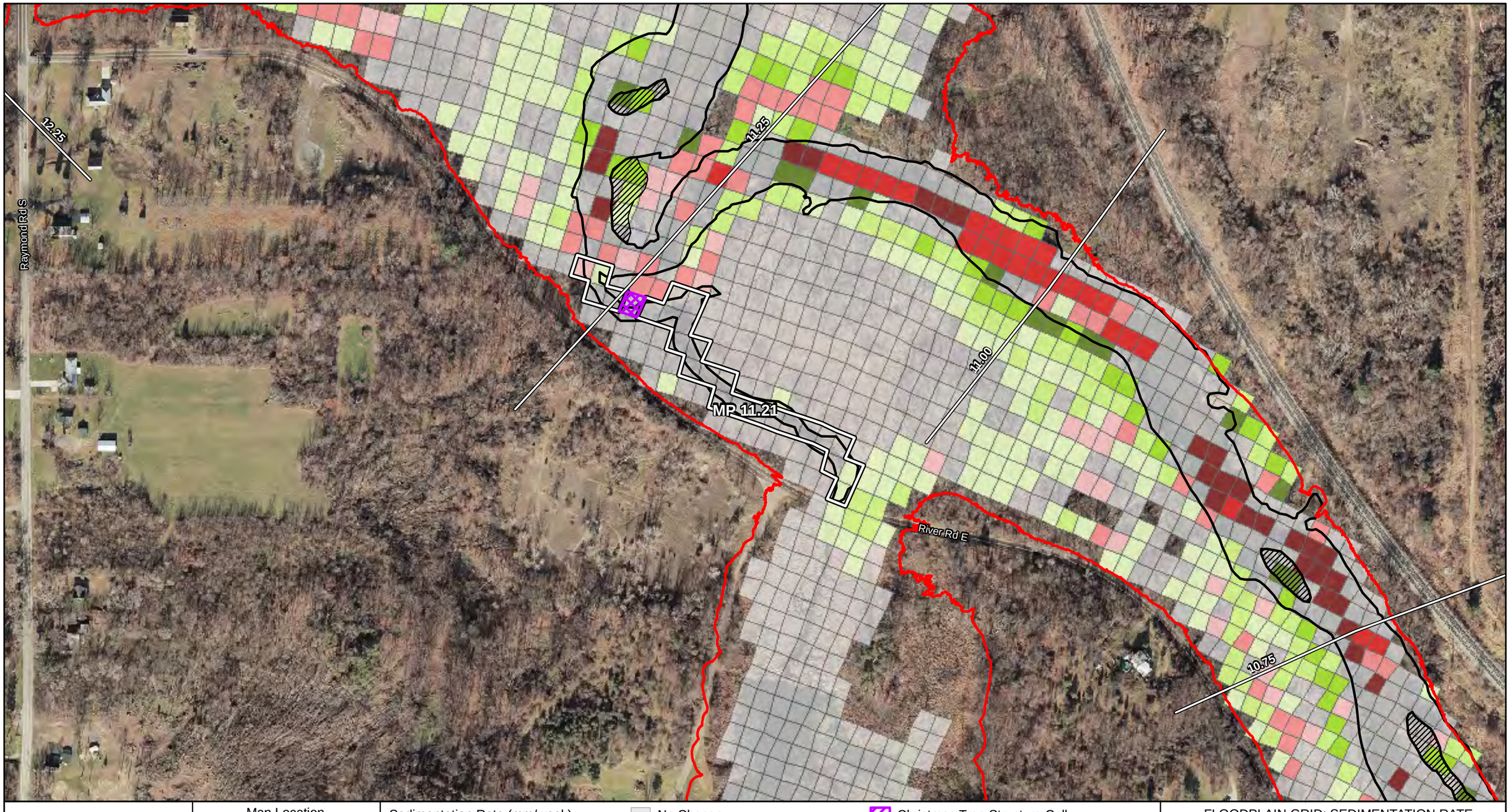
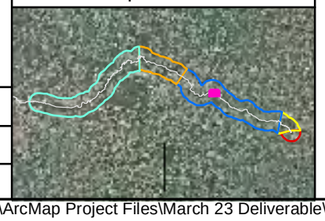
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

Burdge St S
Cliff St
Cliff Cutoff
Columbia Ave E
Leonard Wood
Raymond Rd S
River Rd E
MP 11.78
MP 11.21
12.00
11.75
11.50
12.25
12.50
11.25

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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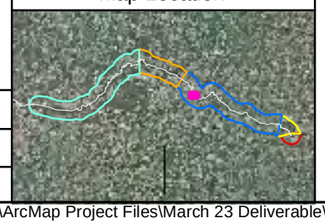
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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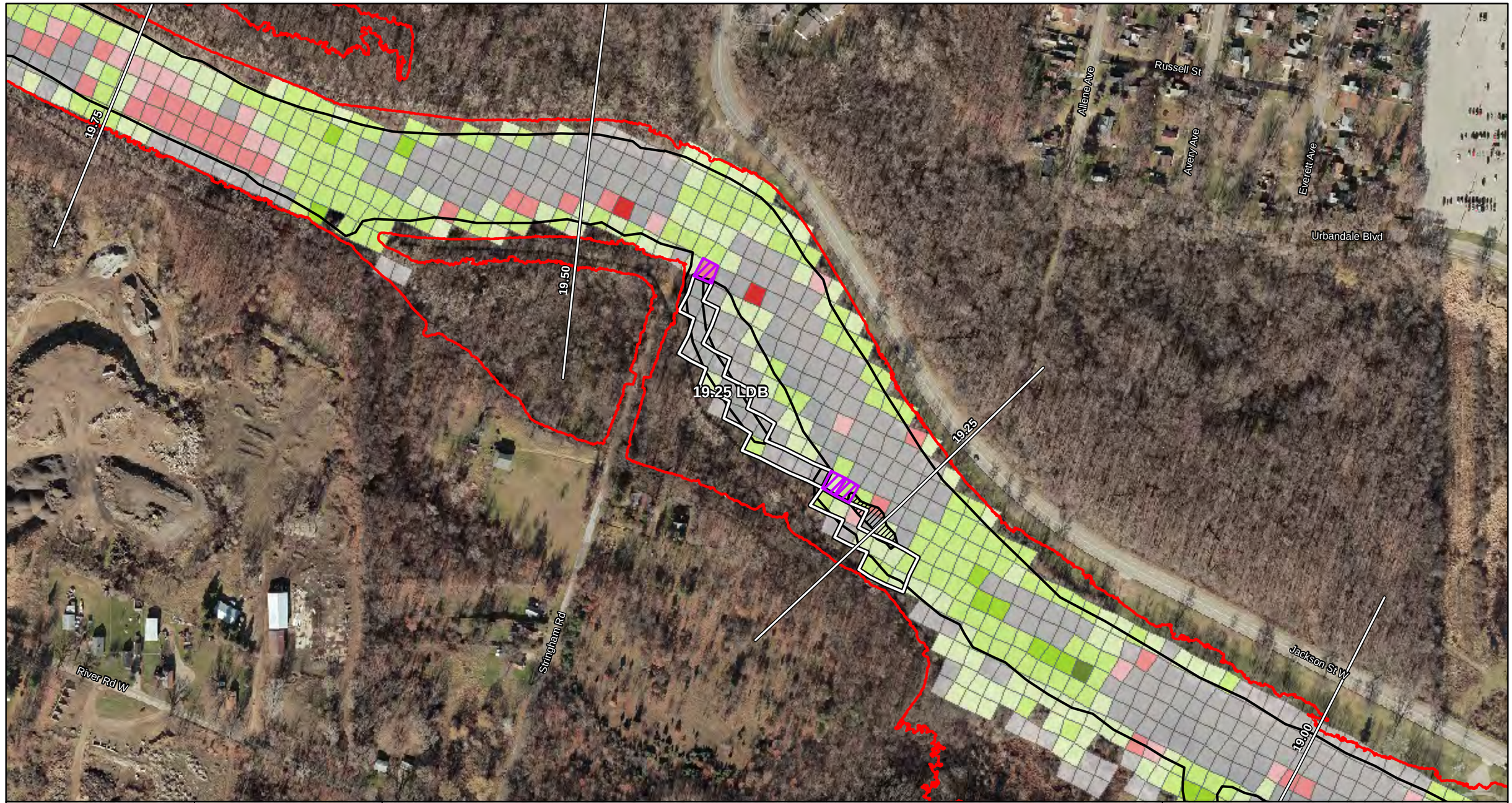
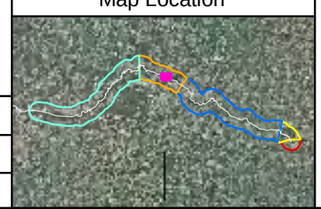
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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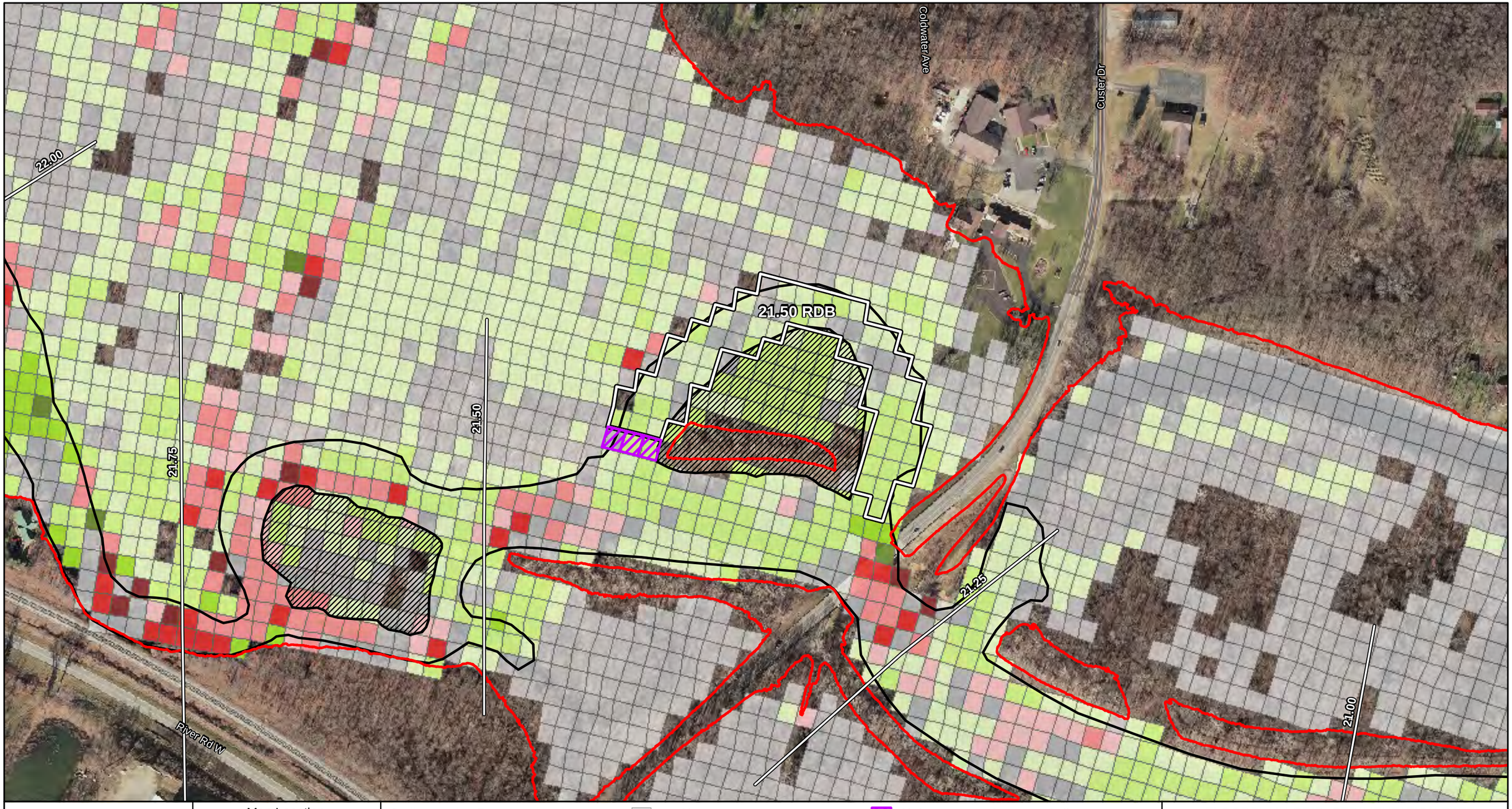
Aerial Photography Date: November 2011



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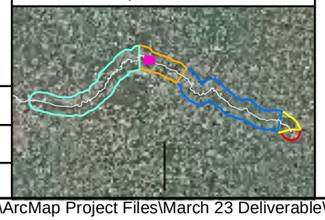
Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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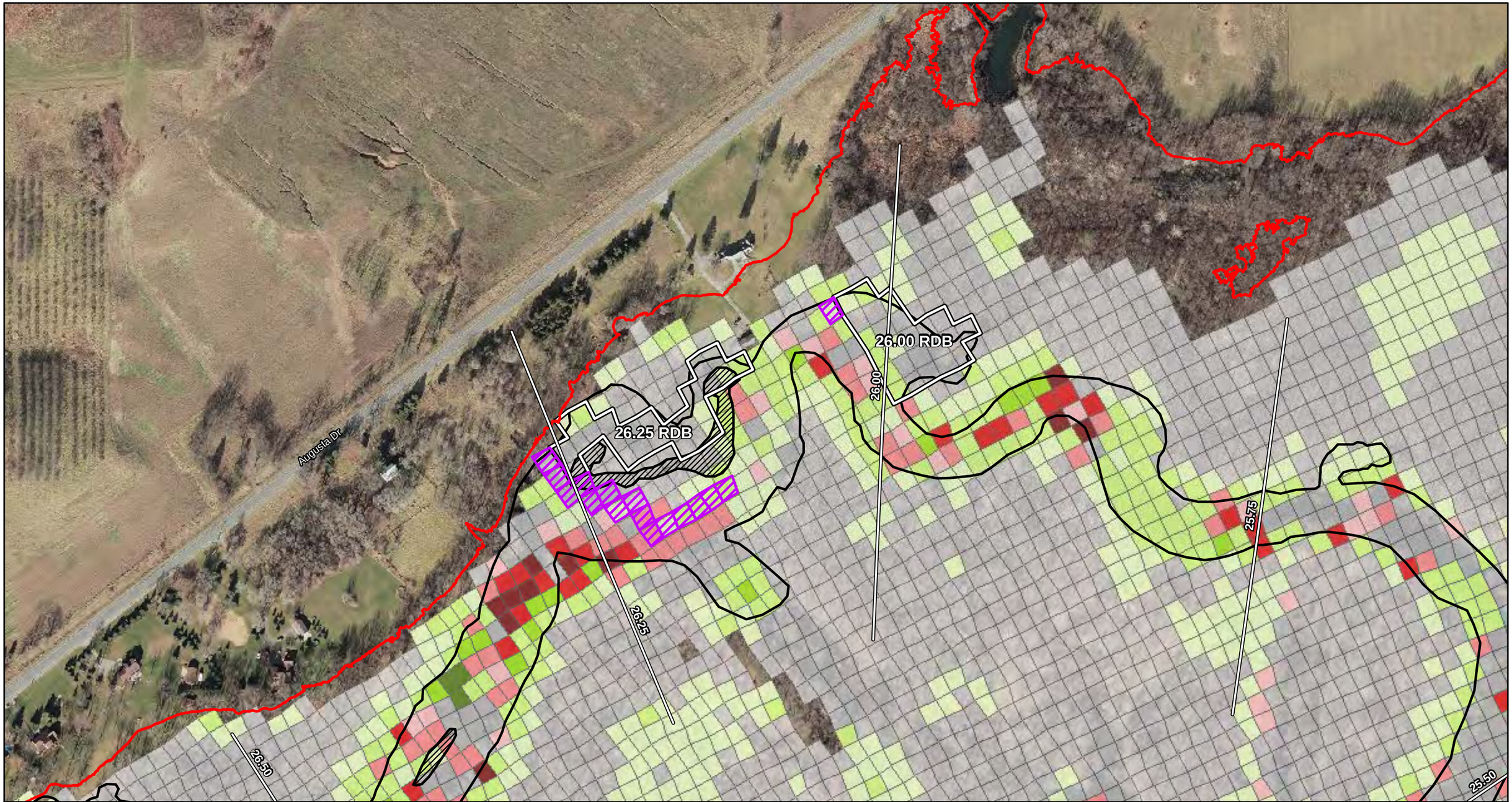
Aerial Photography Date: November 2011



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Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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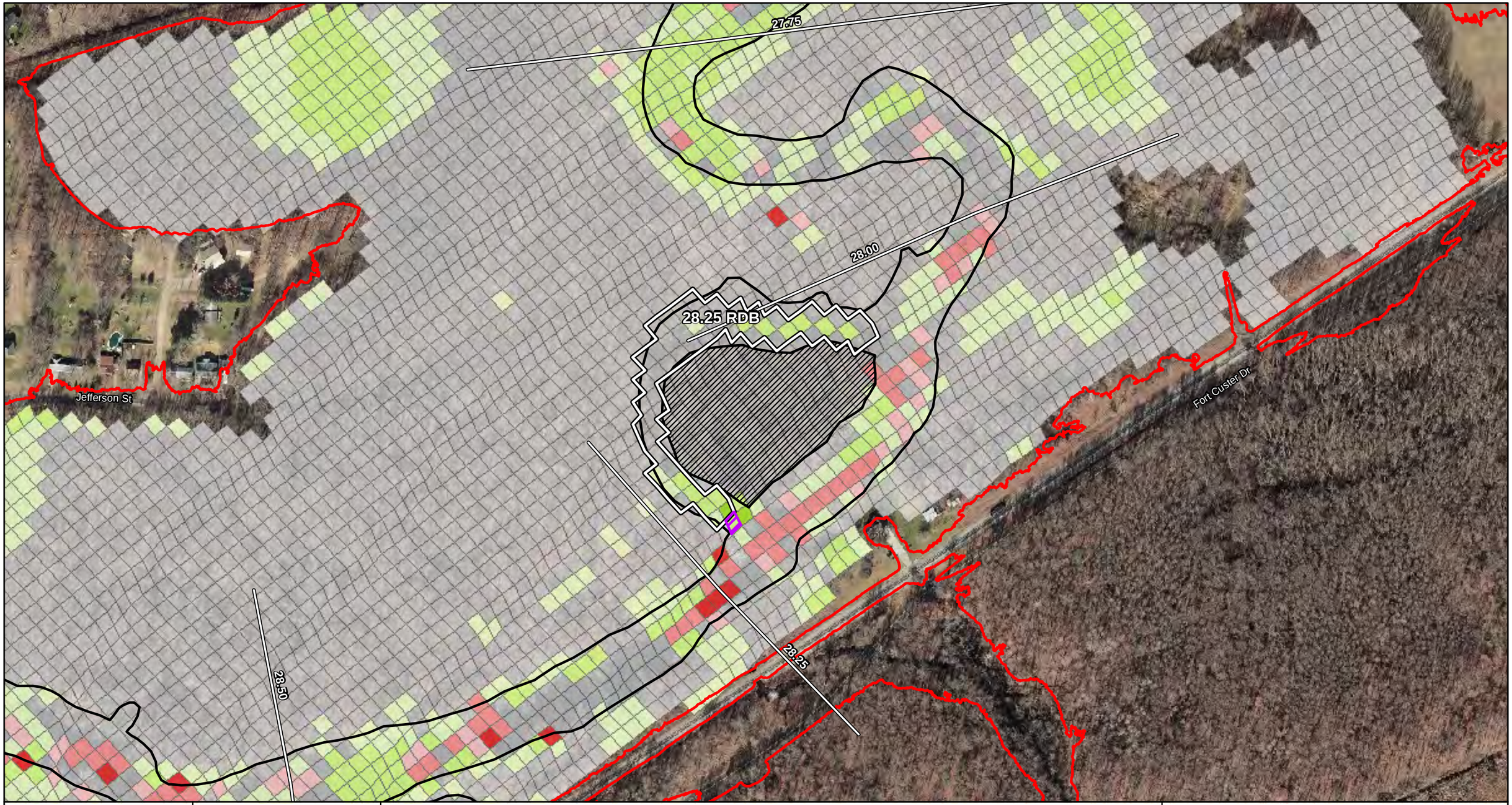
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_Traps99_July_2010.mxd

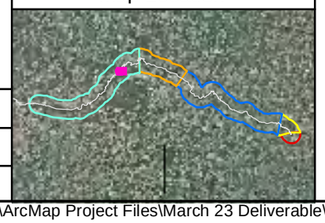
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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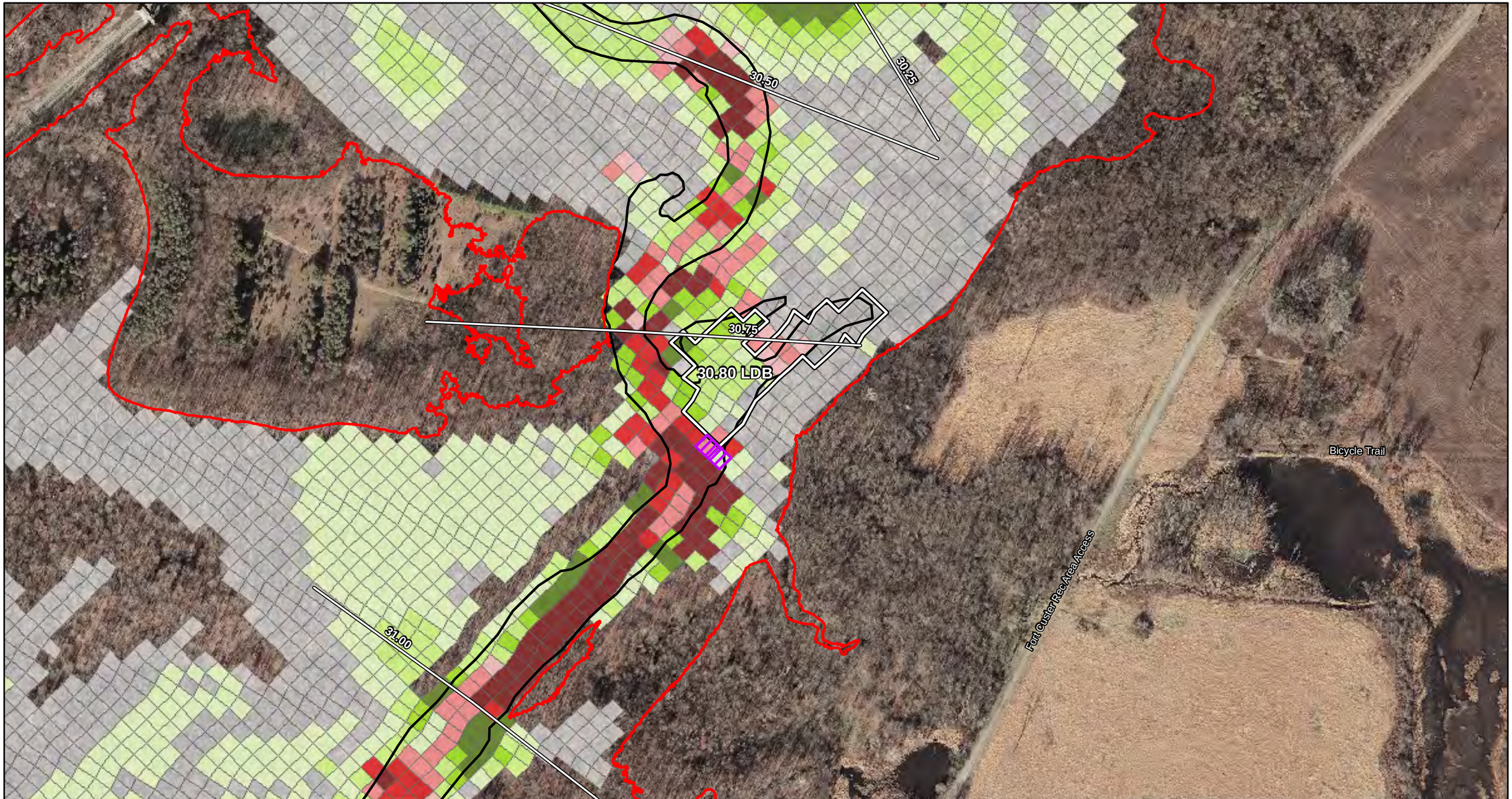
Aerial Photography Date: November 2011



Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
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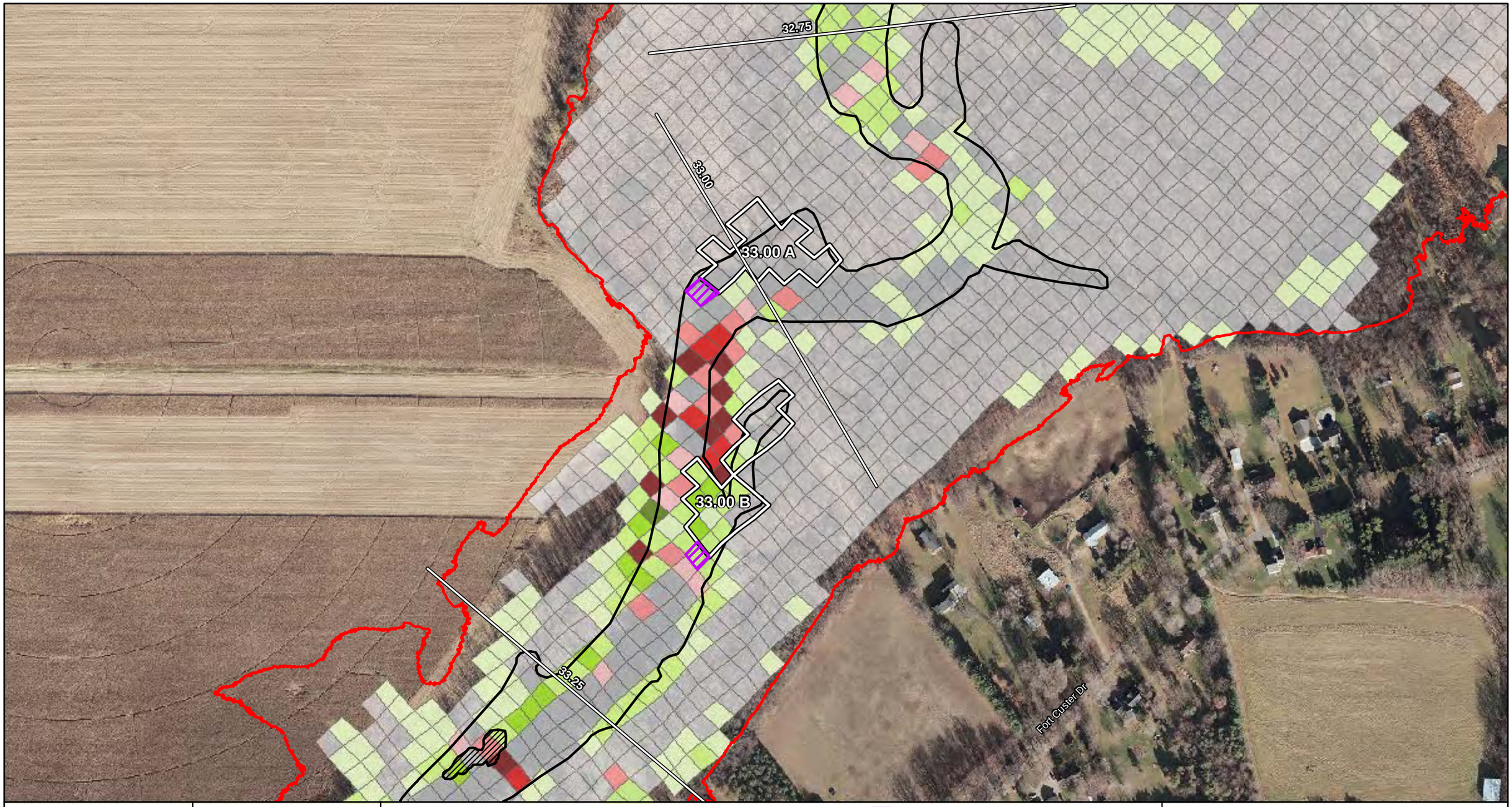
Aerial Photography Date: November 2011



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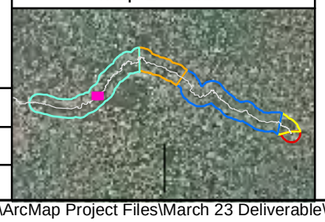
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
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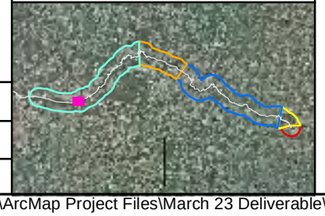
Aerial Photography Date: November 2011

Woodlark Dr
35th St
35.75
36.50
Delta A
36.75
36.10 NW
36.00
36.25
Miller Rd

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

38.00

37.75

37.50

37.75 Islands

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Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 99% STRUCTURE
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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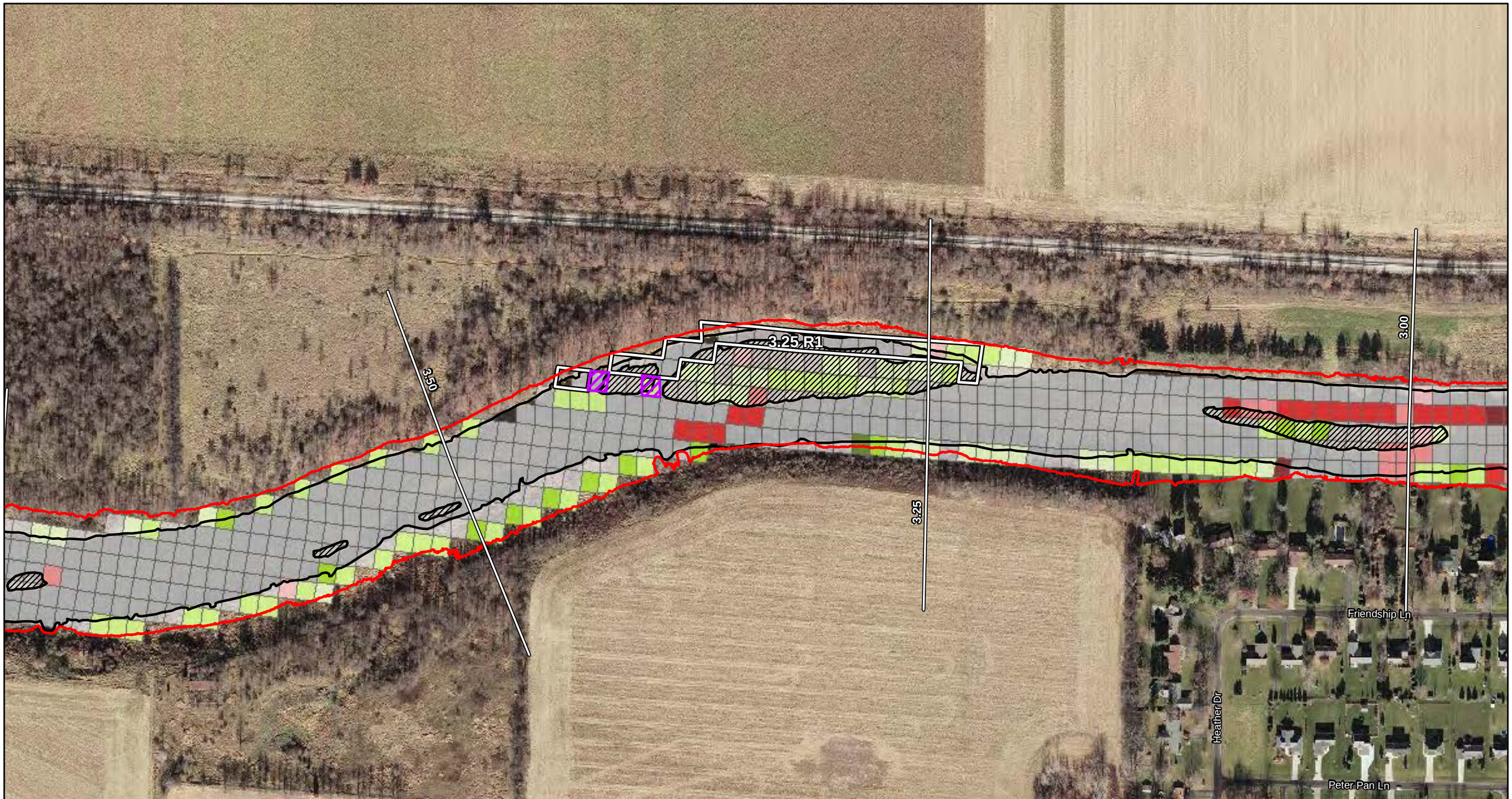
Aerial Photography Date: November 2011

Figure 7-25

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, July 24 – July 31, 2010

75% Structure

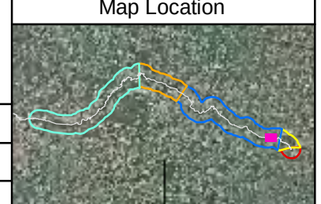
Sheets 1 through 15



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
3.25 R1

SHEET 1 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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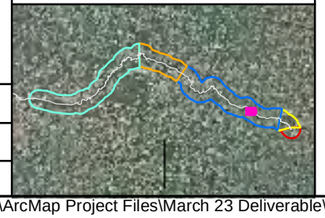
Aerial Photography Date: November 2011

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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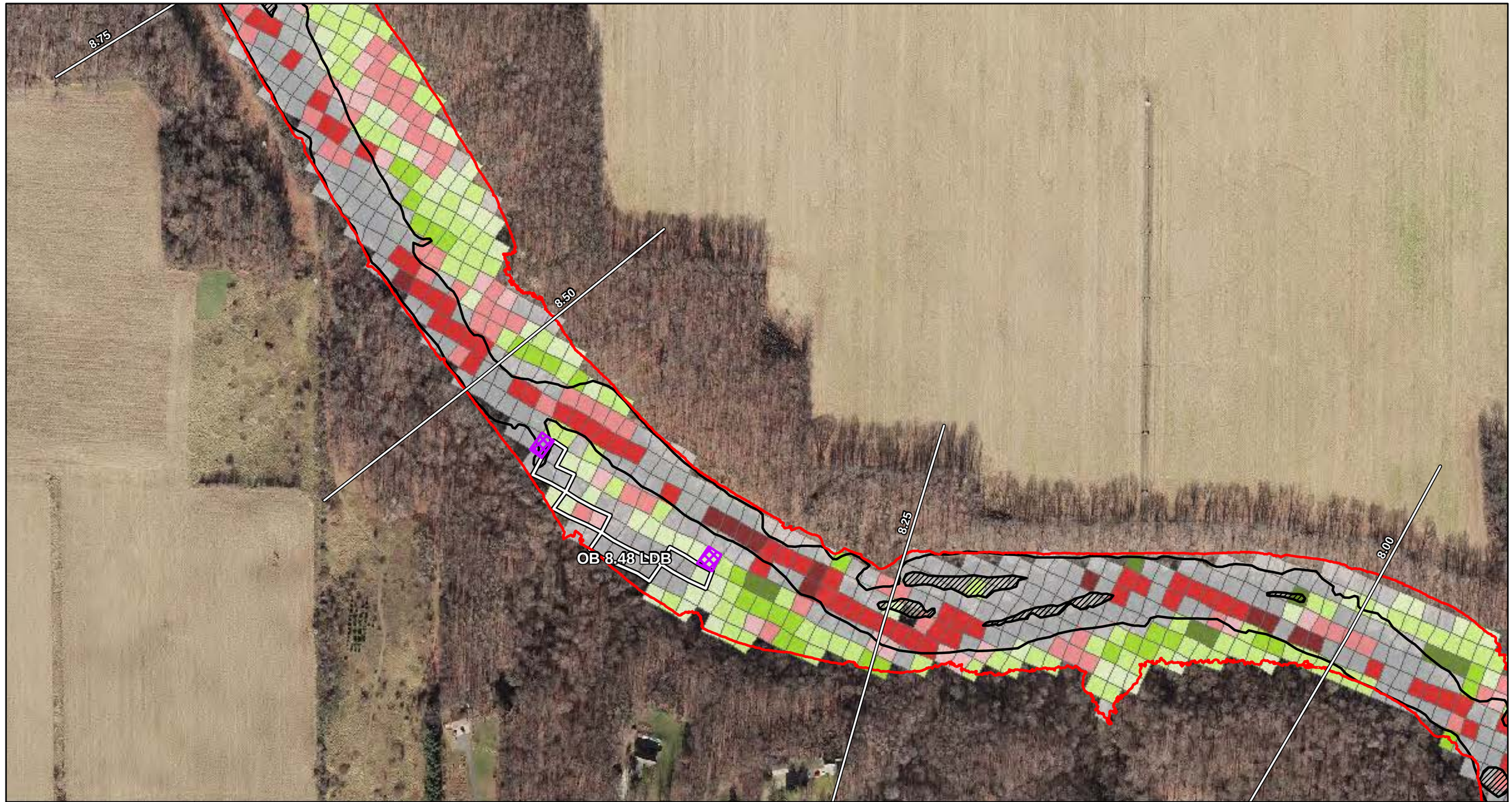
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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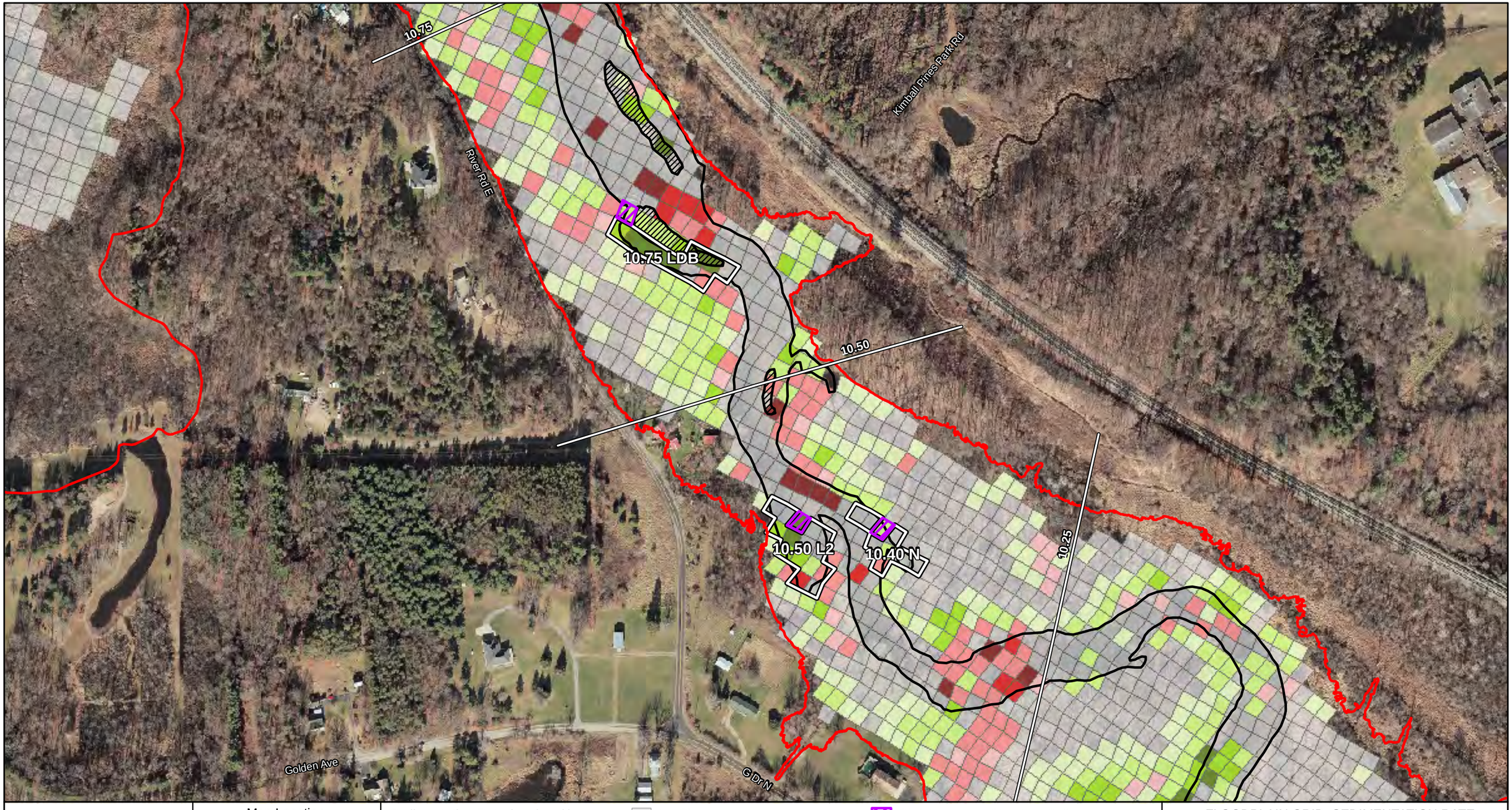
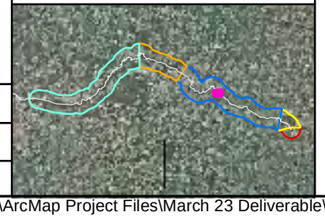
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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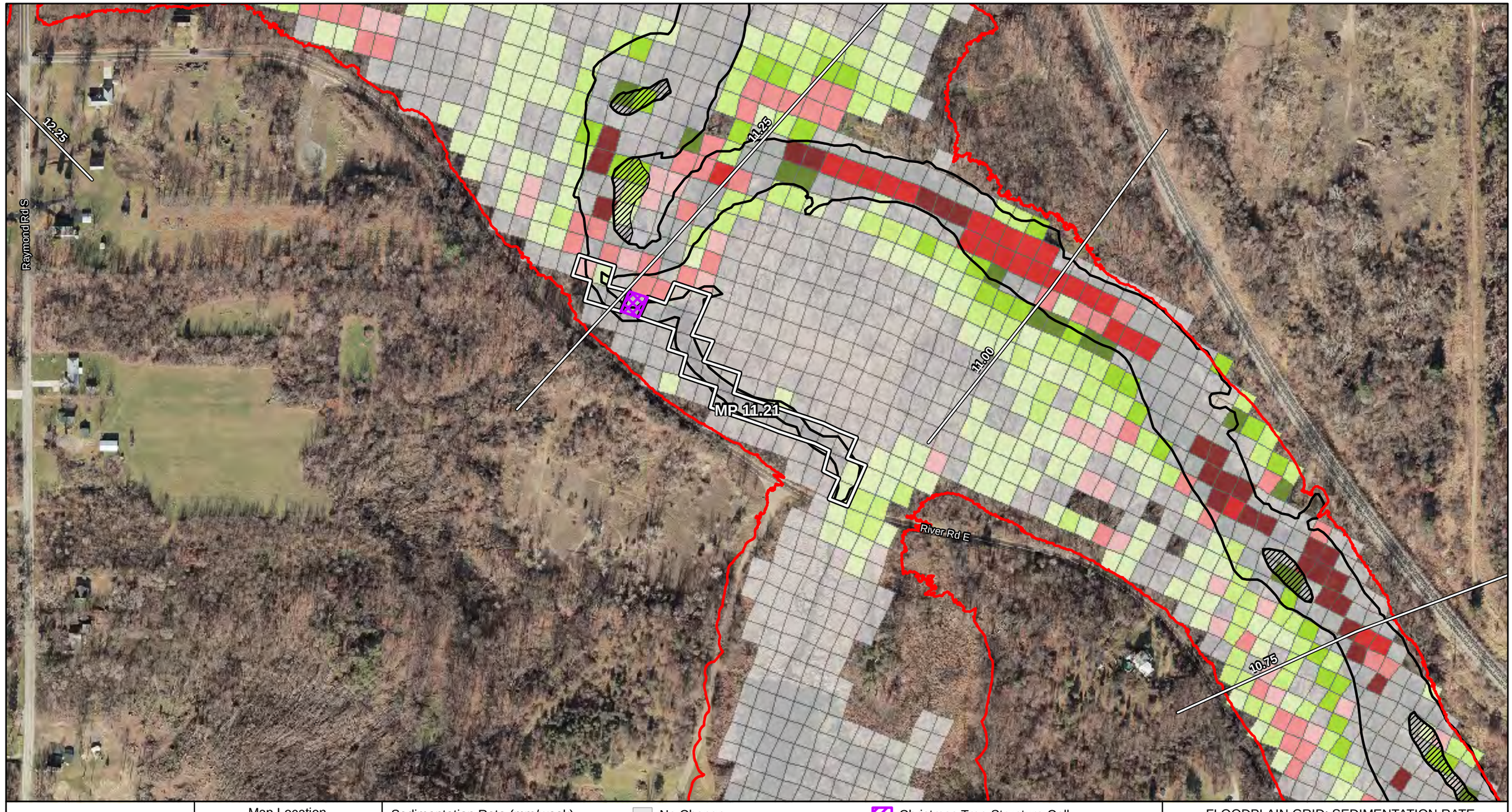
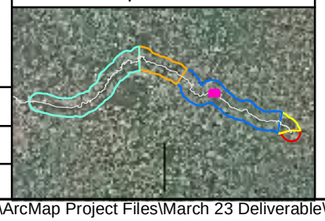
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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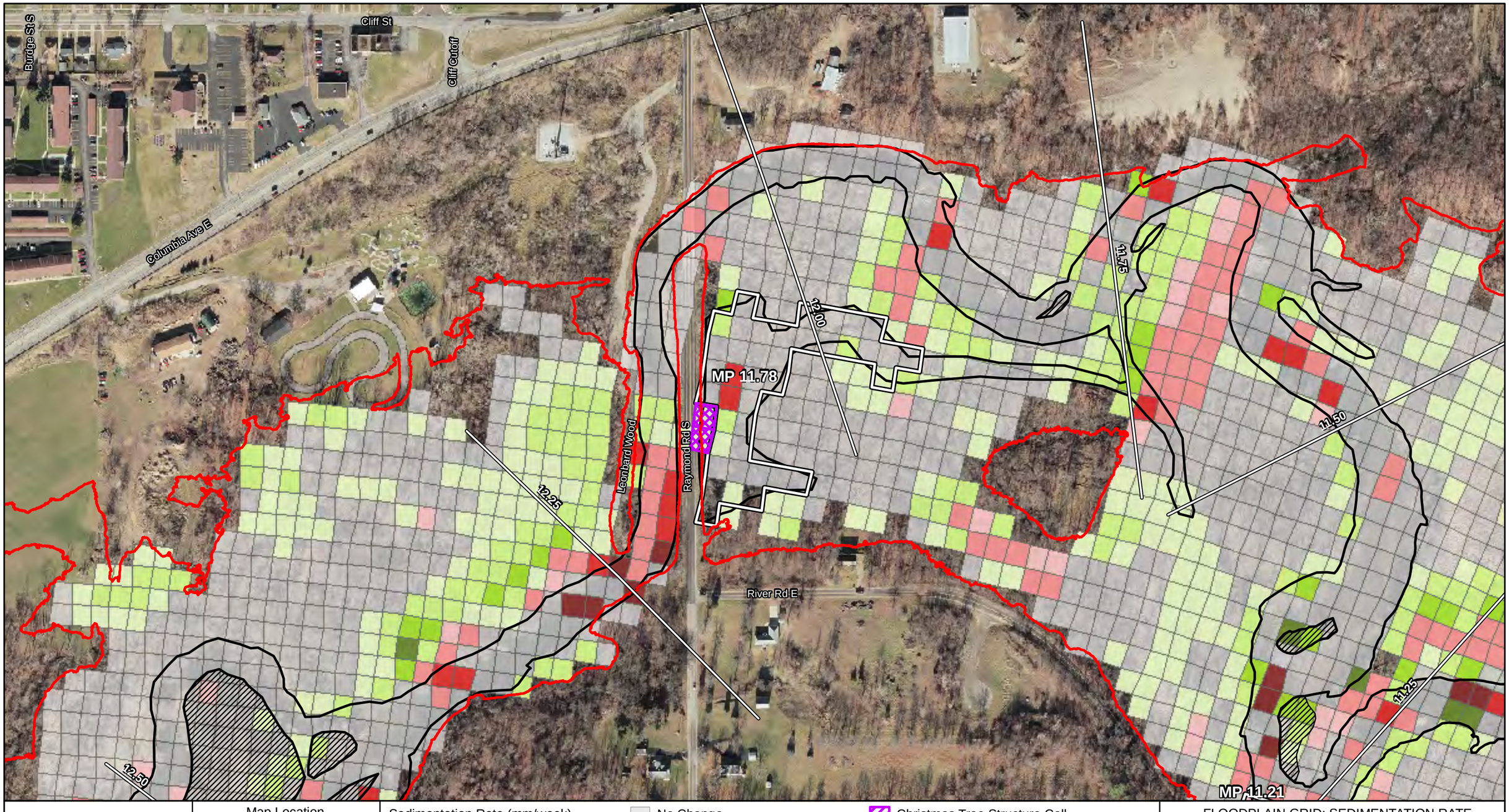
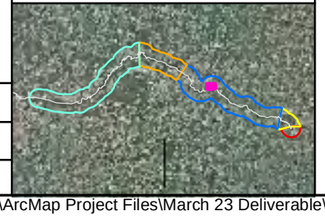
Aerial Photography Date: November 2011



Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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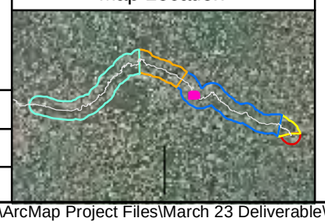
Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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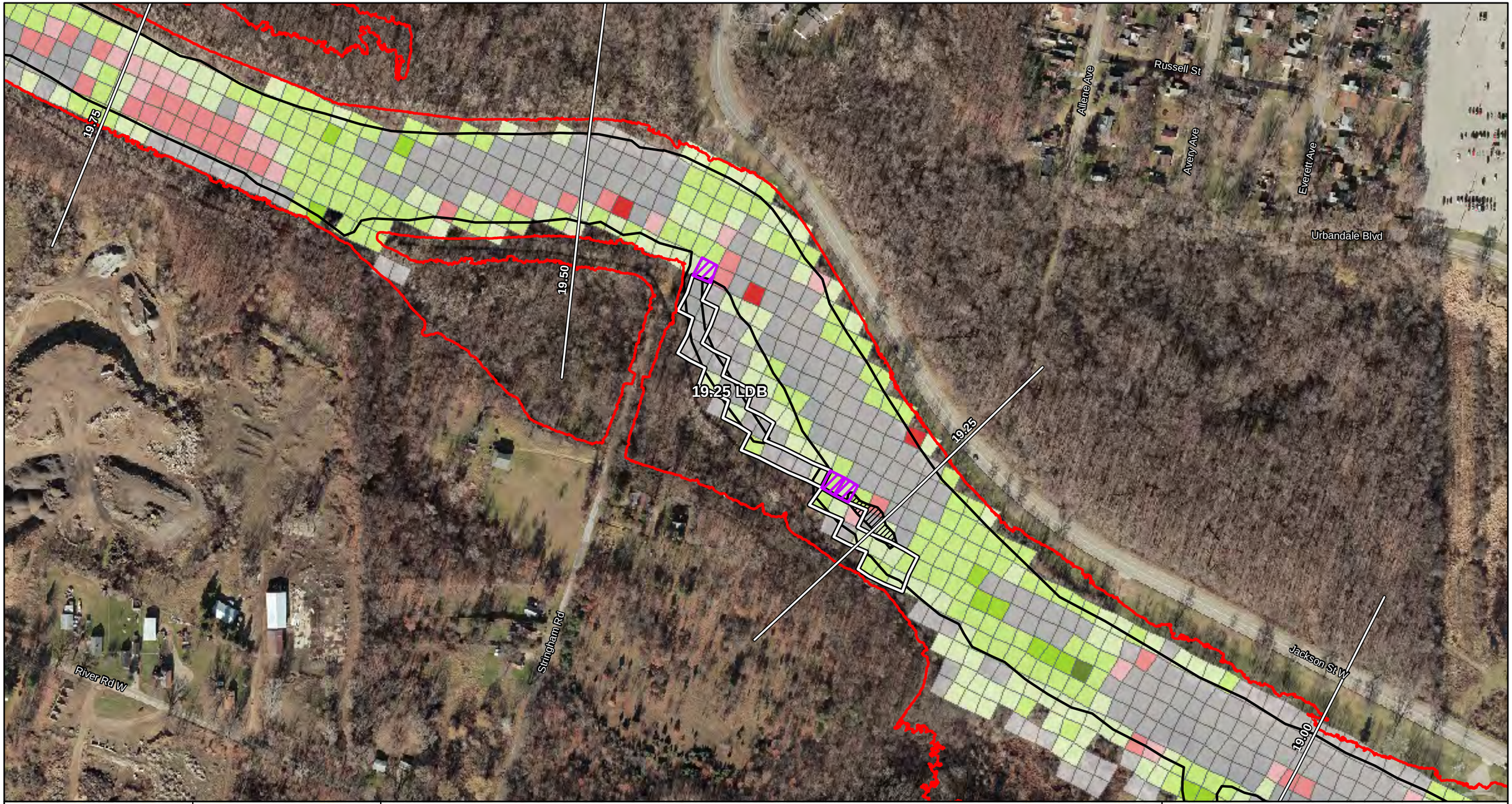
Aerial Photography Date: November 2011



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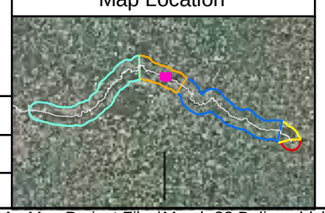
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

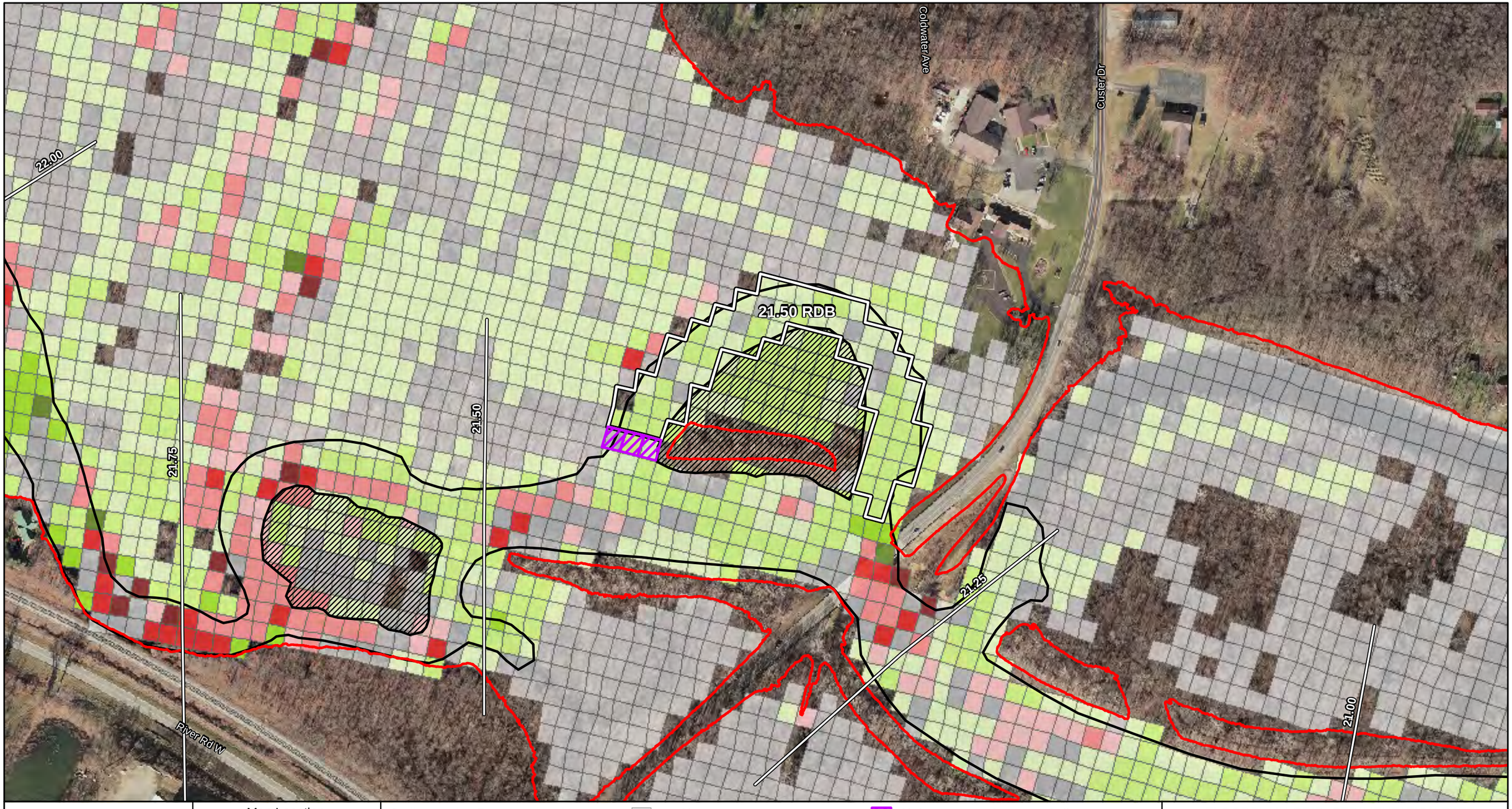
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_Traps75_July_2010.mxd

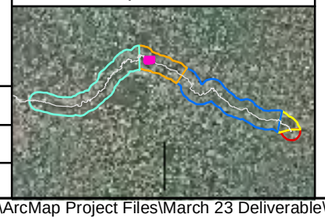
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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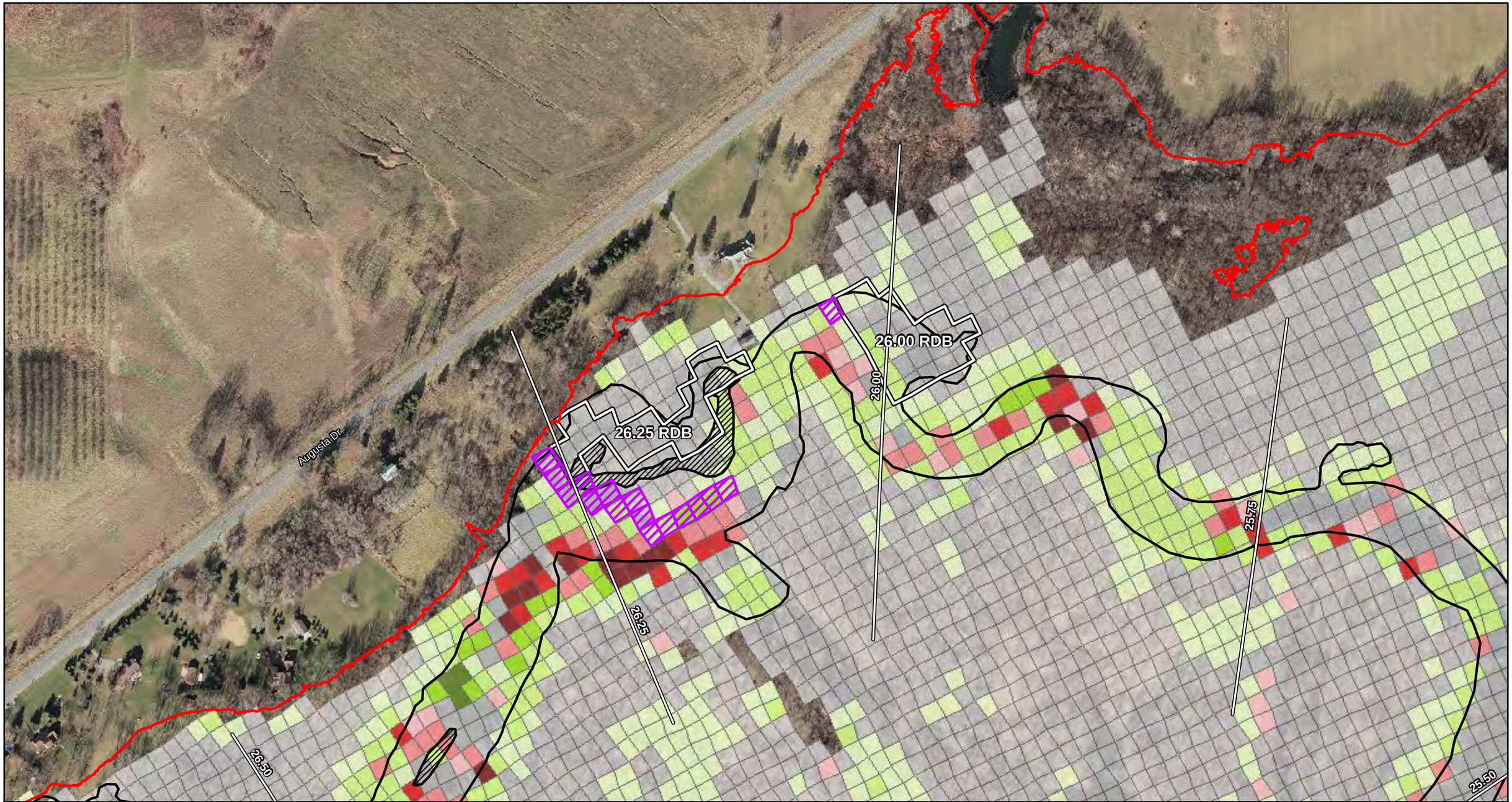
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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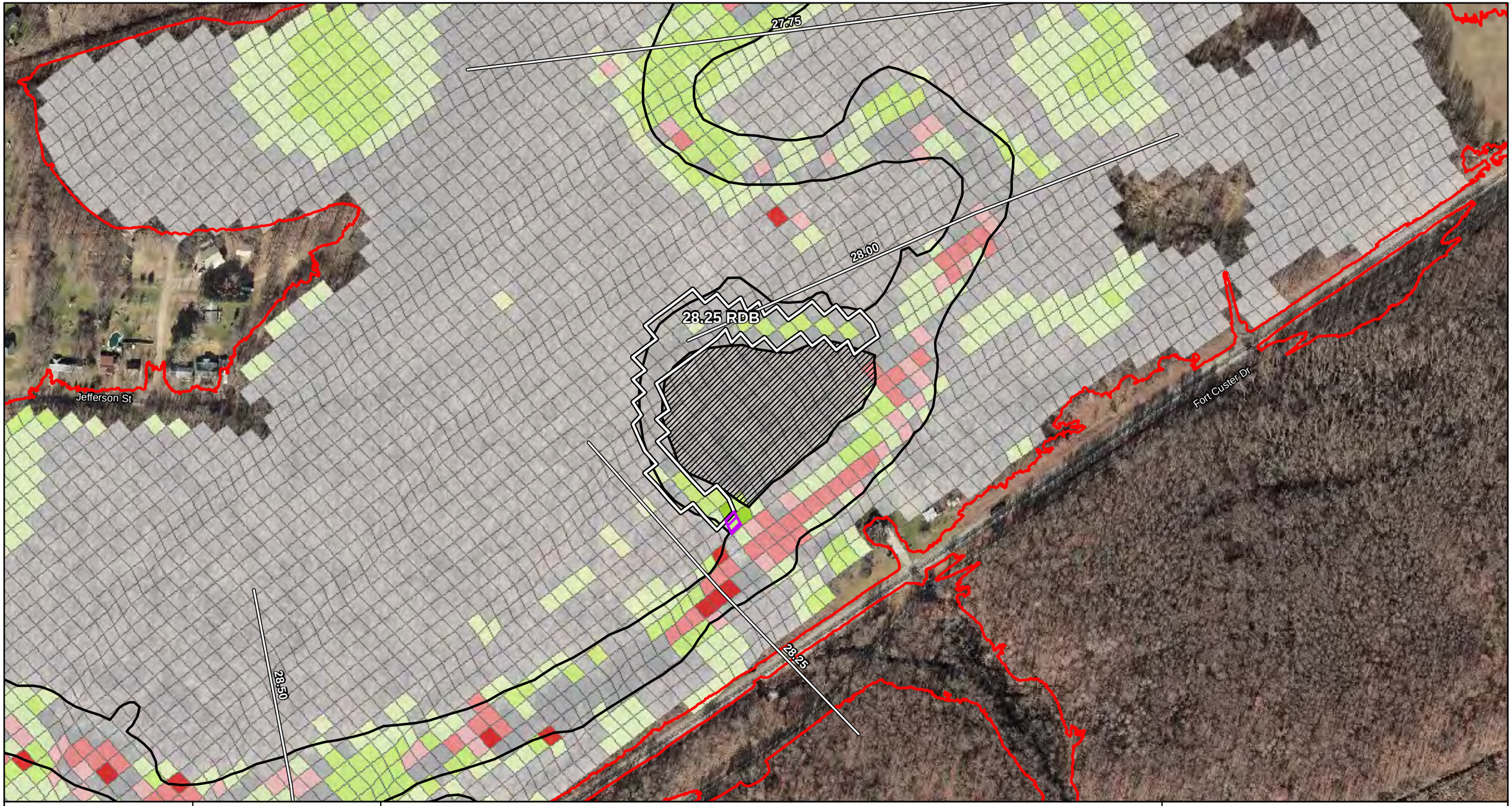
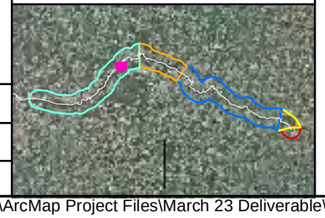
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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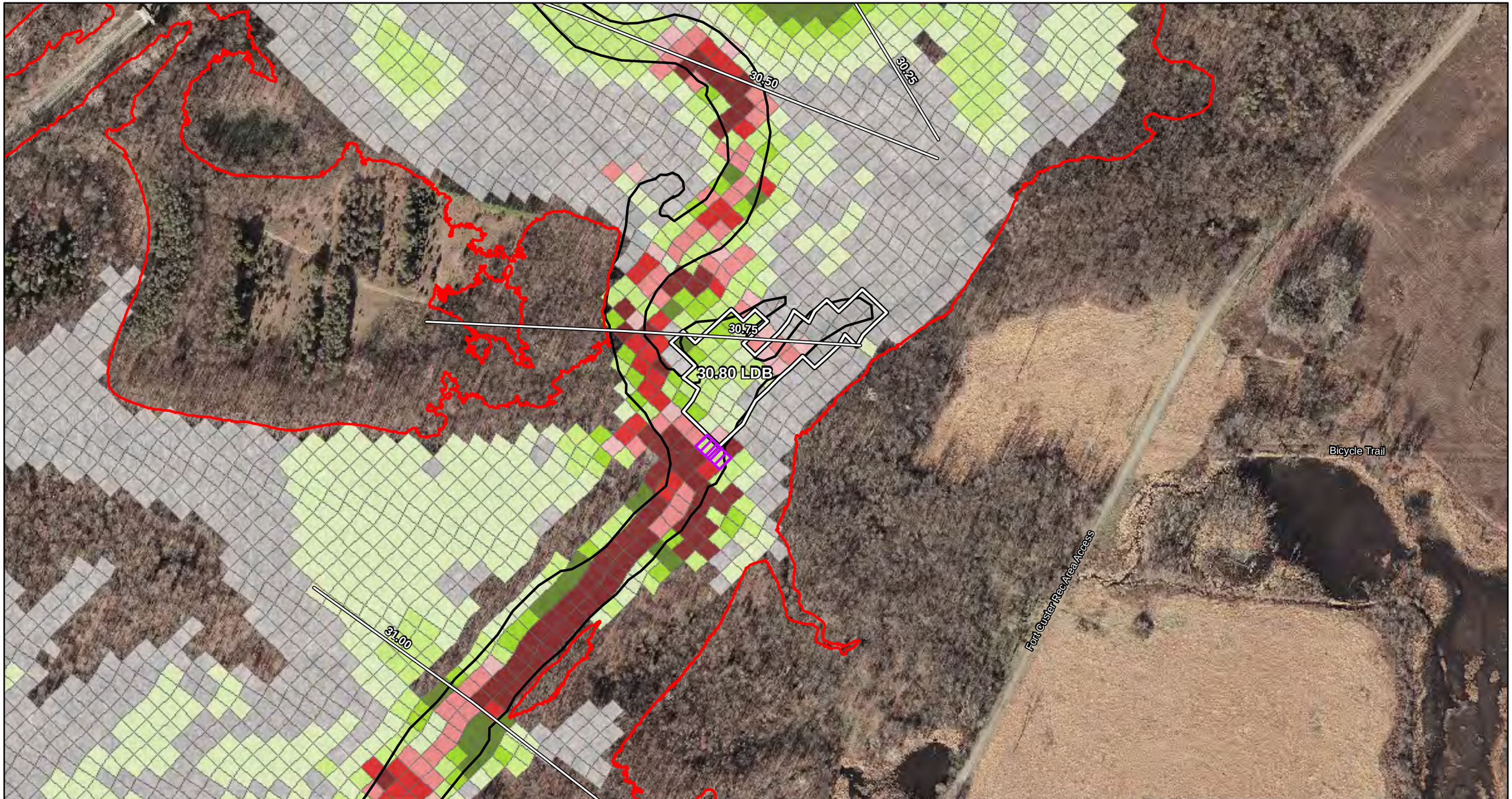
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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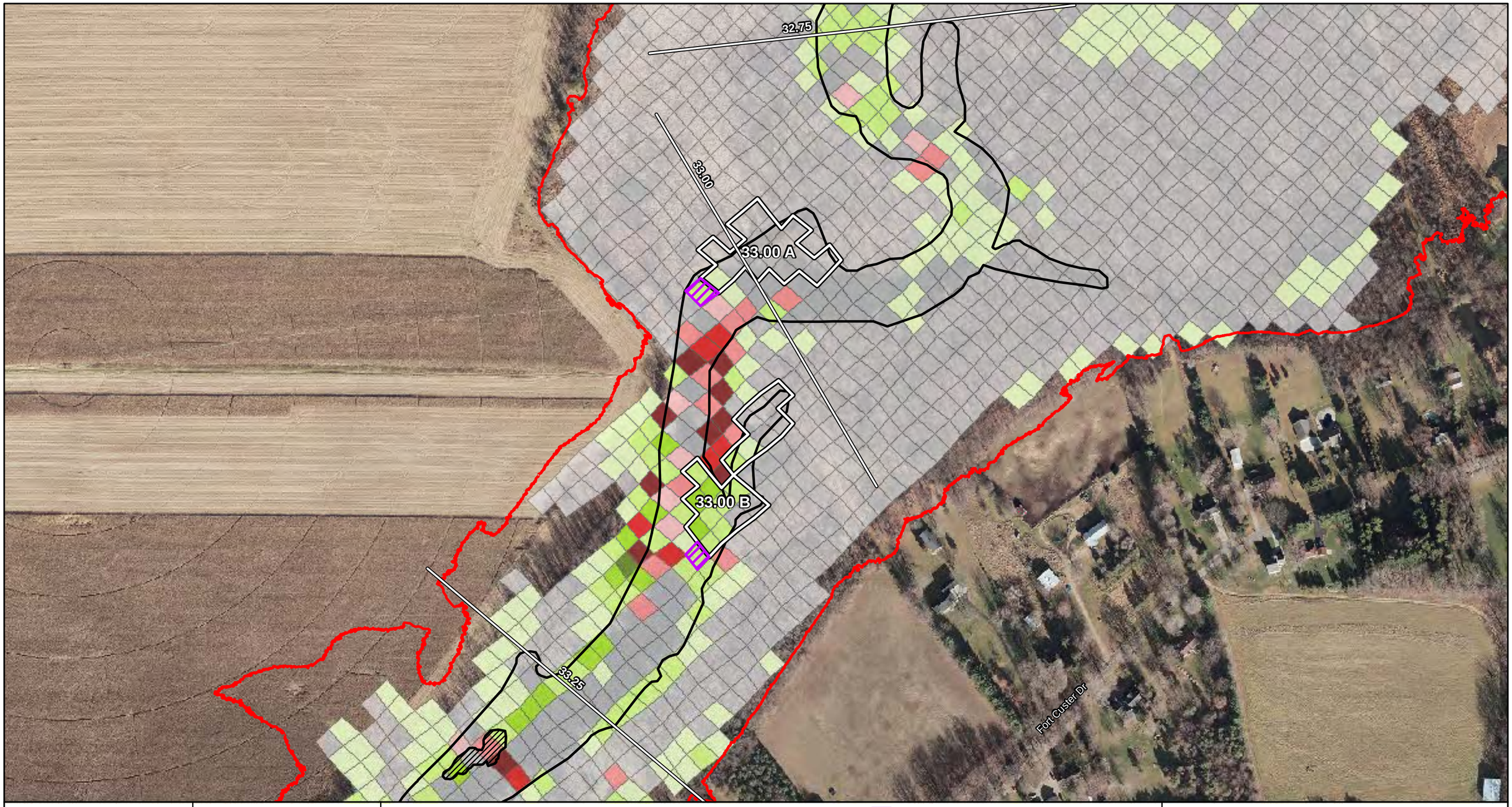
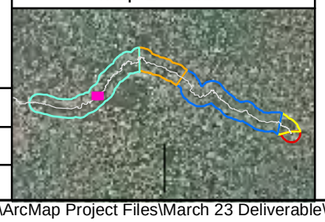
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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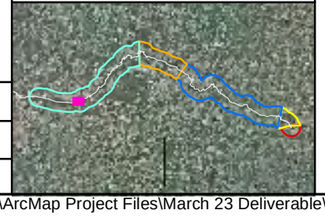
Aerial Photography Date: November 2011

Woodlark Dr
35th St
35.75
36.50
Delta A
36.75
36.10 NW
36.00
36.25
Miller Rd

ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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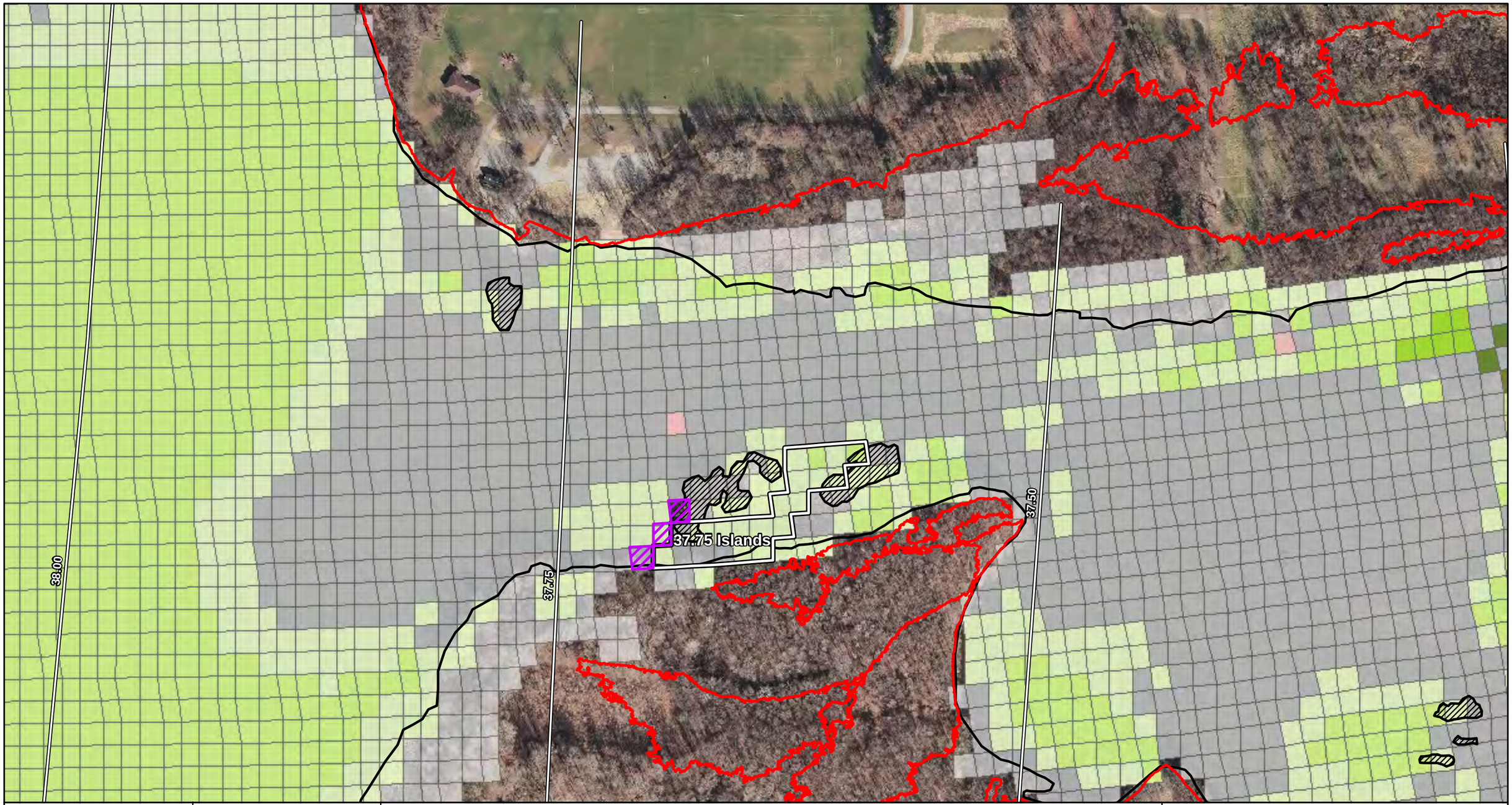
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/2/2012
Approved:	DBR 4/2/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
JULY 24 - JULY 31, 2010 --- 75% STRUCTURE
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

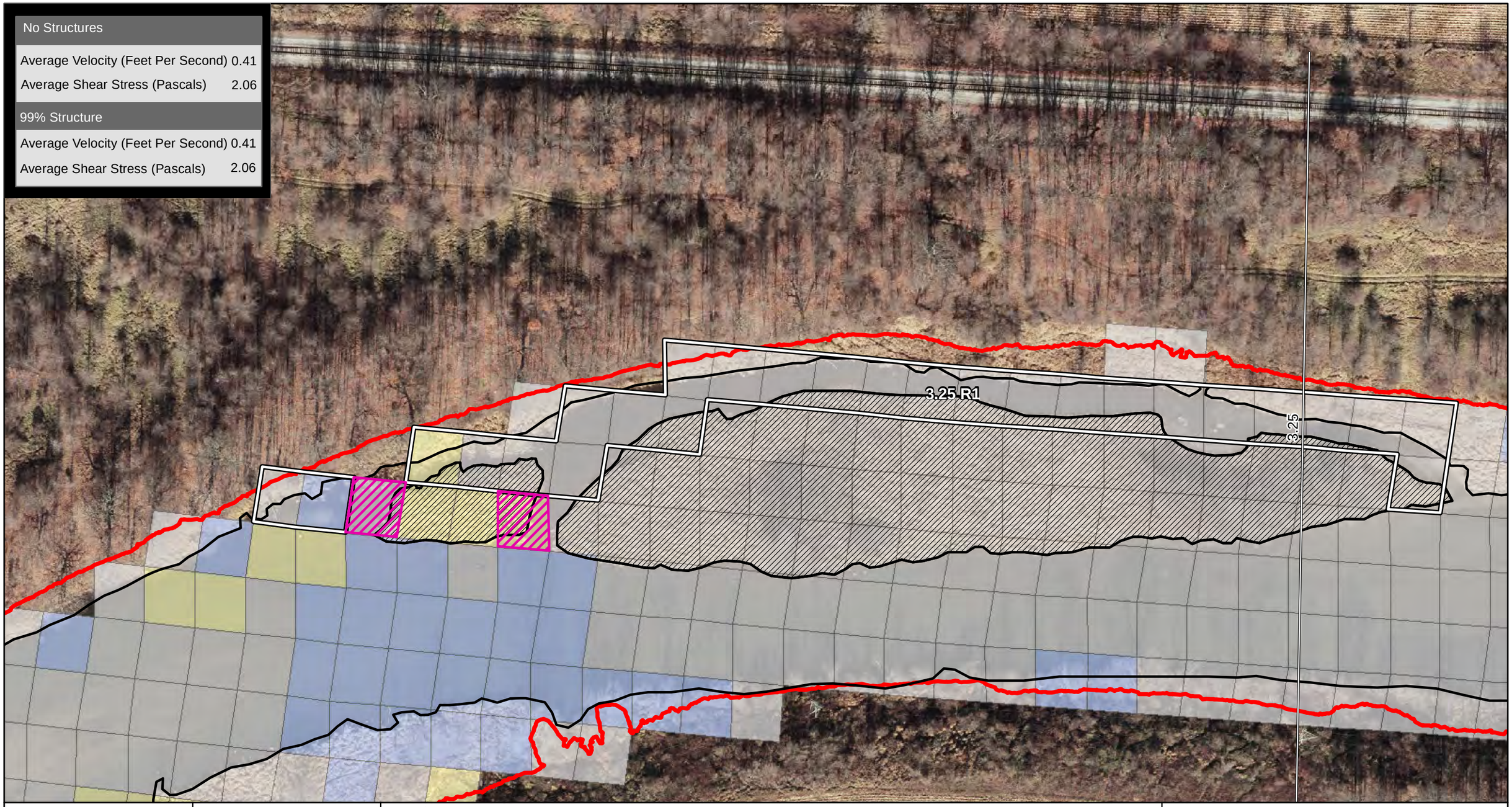
Figure 7-26

Change in Sedimentation Rate Between No Structure and 99% Structure

100-Year Flood

Sheets 1 through 16

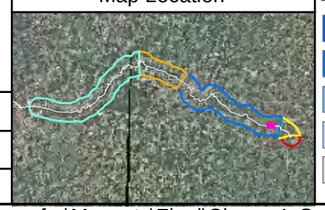
No Structures	
Average Velocity (Feet Per Second)	0.41
Average Shear Stress (Pascals)	2.06
99% Structure	
Average Velocity (Feet Per Second)	0.41
Average Shear Stress (Pascals)	2.06



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

3.25 R1

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.43
Average Shear Stress (Pascals)	2.66
99% Structure	
Average Velocity (Feet Per Second)	0.43
Average Shear Stress (Pascals)	2.65

12 Mile Rd

Water St

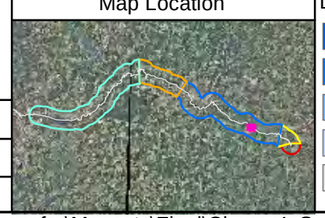
5.75

Ceresco

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 55 110 220

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

CERESCO

SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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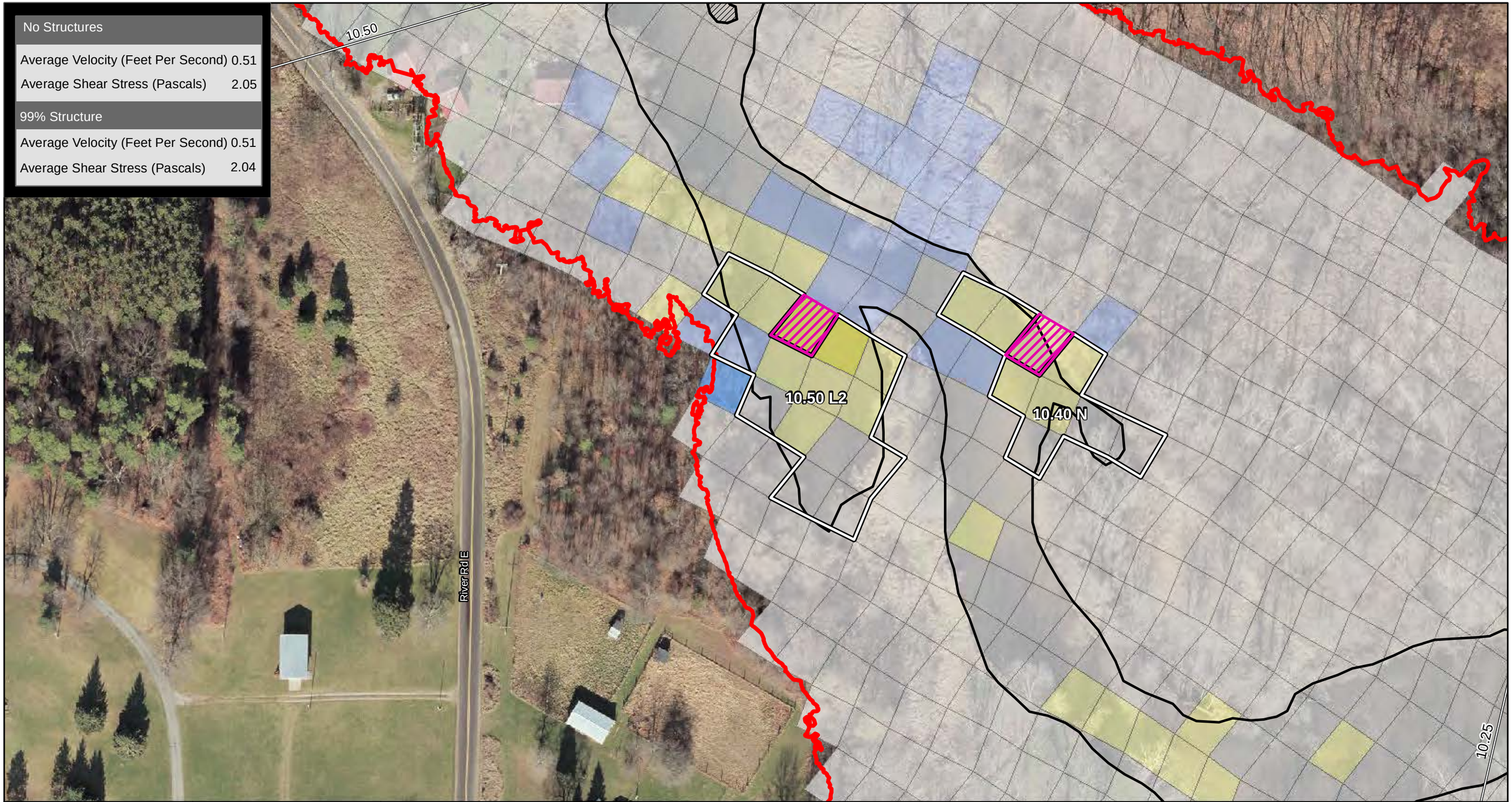
Aerial Photography Date: November 2011

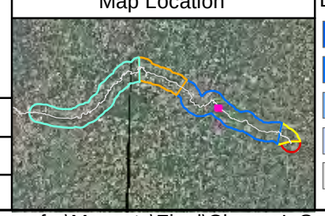
No Structures	
Average Velocity (Feet Per Second)	0.51
Average Shear Stress (Pascals)	2.05
99% Structure	
Average Velocity (Feet Per Second)	0.51
Average Shear Stress (Pascals)	2.04



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

10.40 N

SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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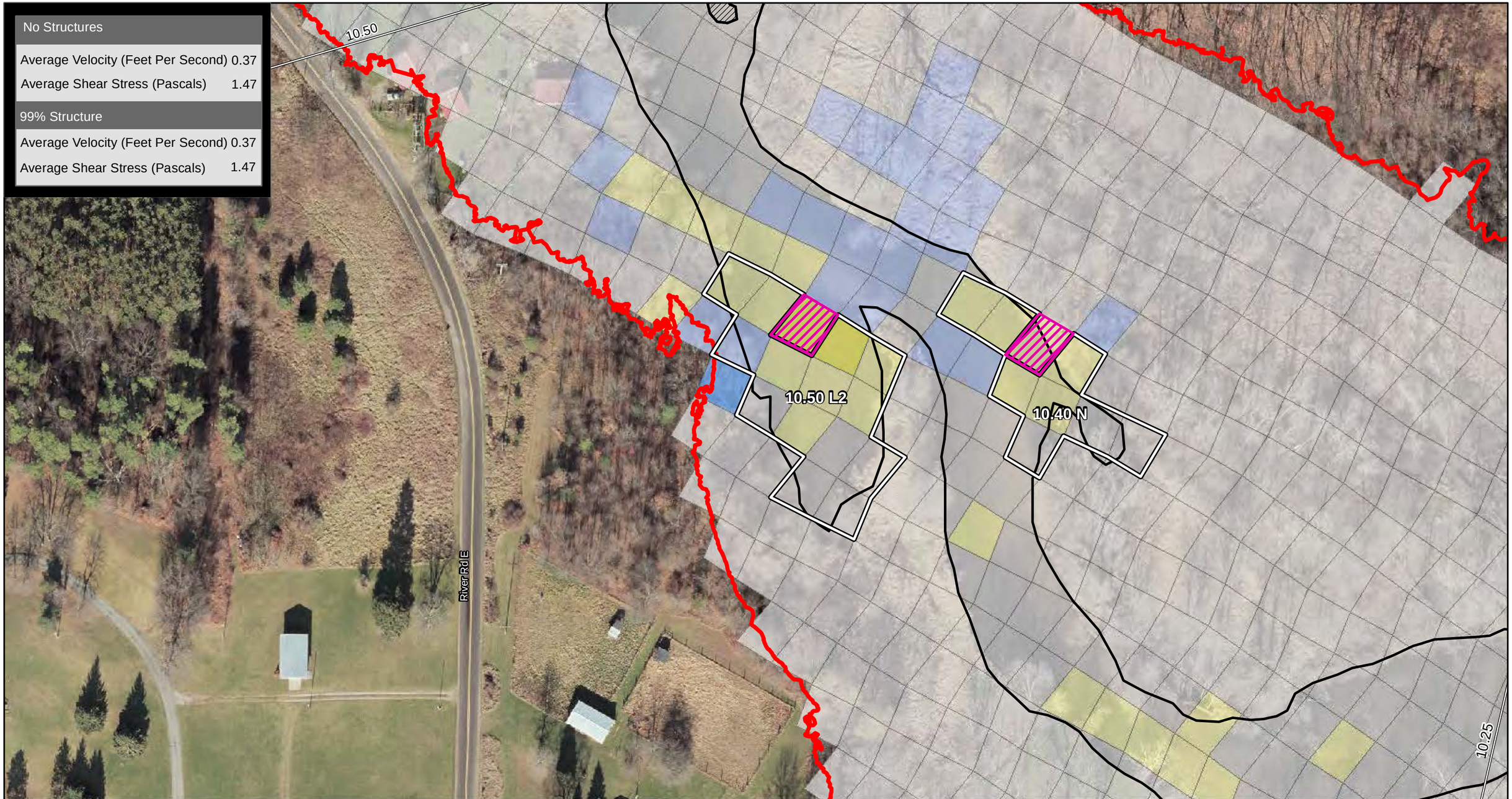
Aerial Photography Date: November 2011

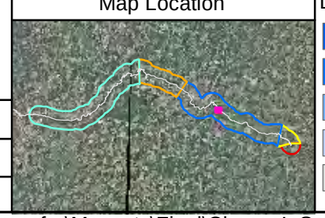
No Structures	
Average Velocity (Feet Per Second)	0.37
Average Shear Stress (Pascals)	1.47
99% Structure	
Average Velocity (Feet Per Second)	0.37
Average Shear Stress (Pascals)	1.47



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

10.50 L2

SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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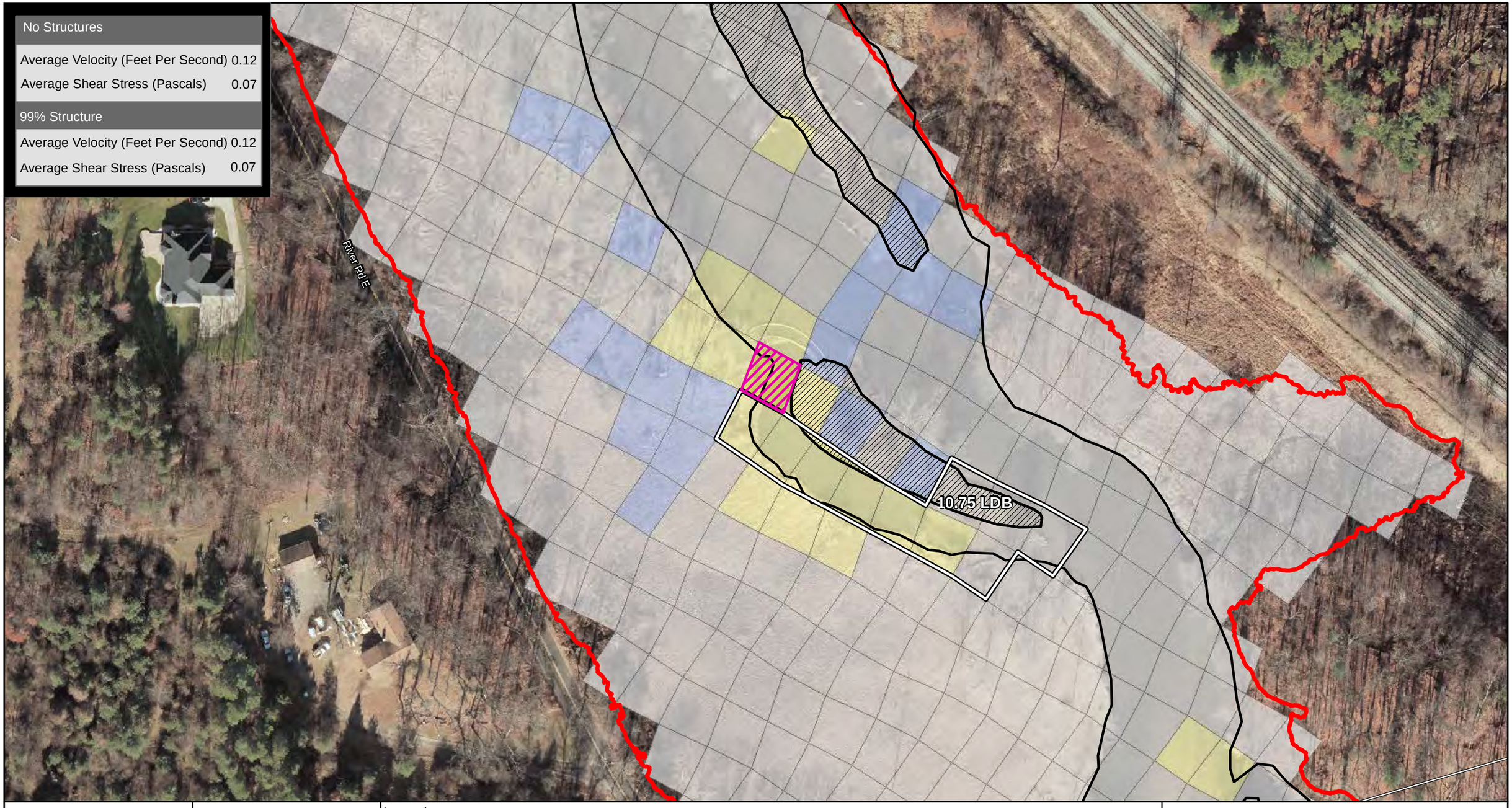
Aerial Photography Date: November 2011

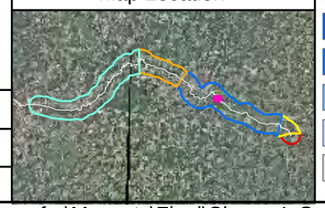
No Structures	
Average Velocity (Feet Per Second)	0.12
Average Shear Stress (Pascals)	0.07
99% Structure	
Average Velocity (Feet Per Second)	0.12
Average Shear Stress (Pascals)	0.07



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

10.75 LDB

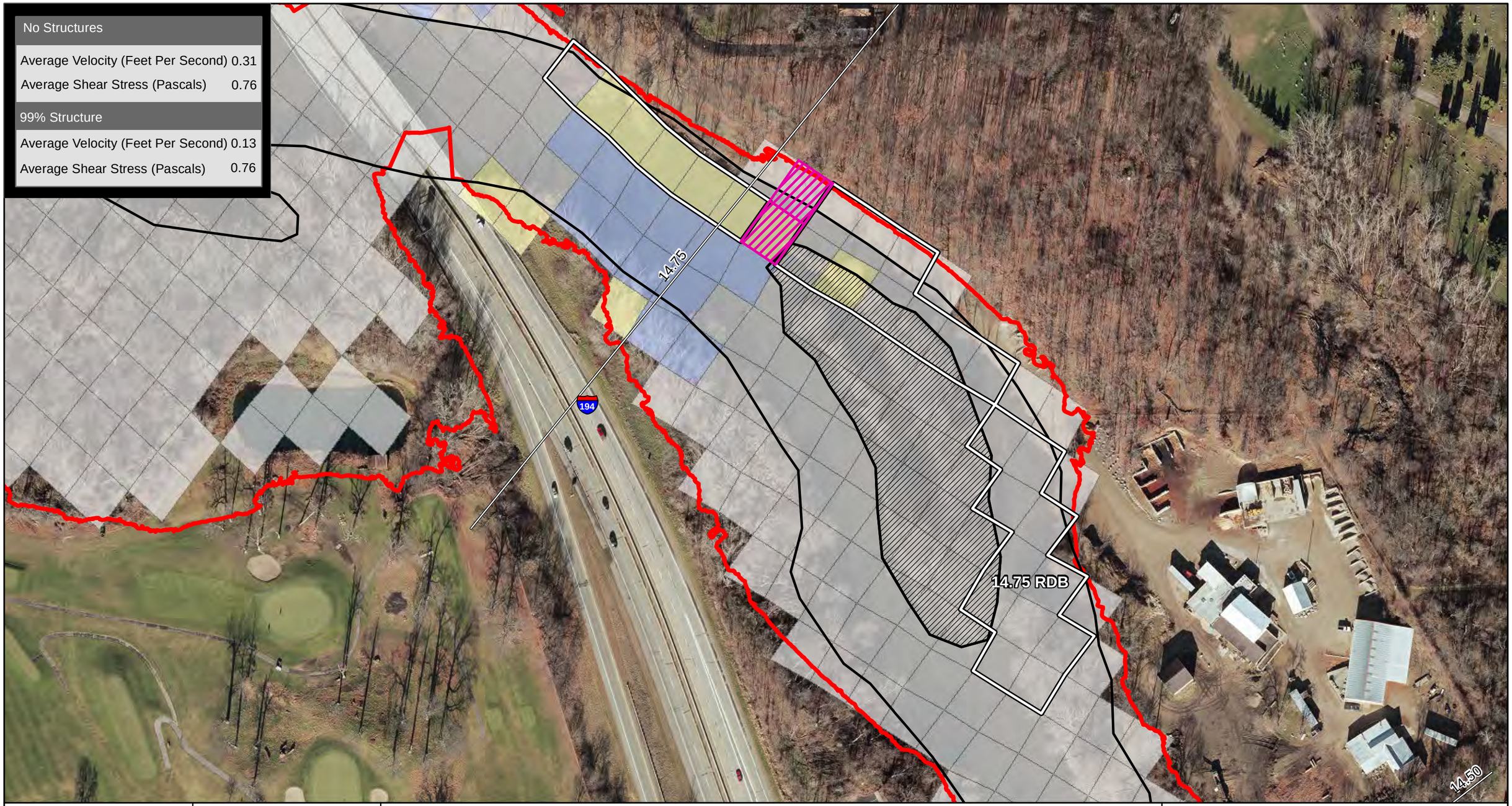
SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.31
Average Shear Stress (Pascals)	0.76
99% Structure	
Average Velocity (Feet Per Second)	0.13
Average Shear Stress (Pascals)	0.76



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

14.75 RDB

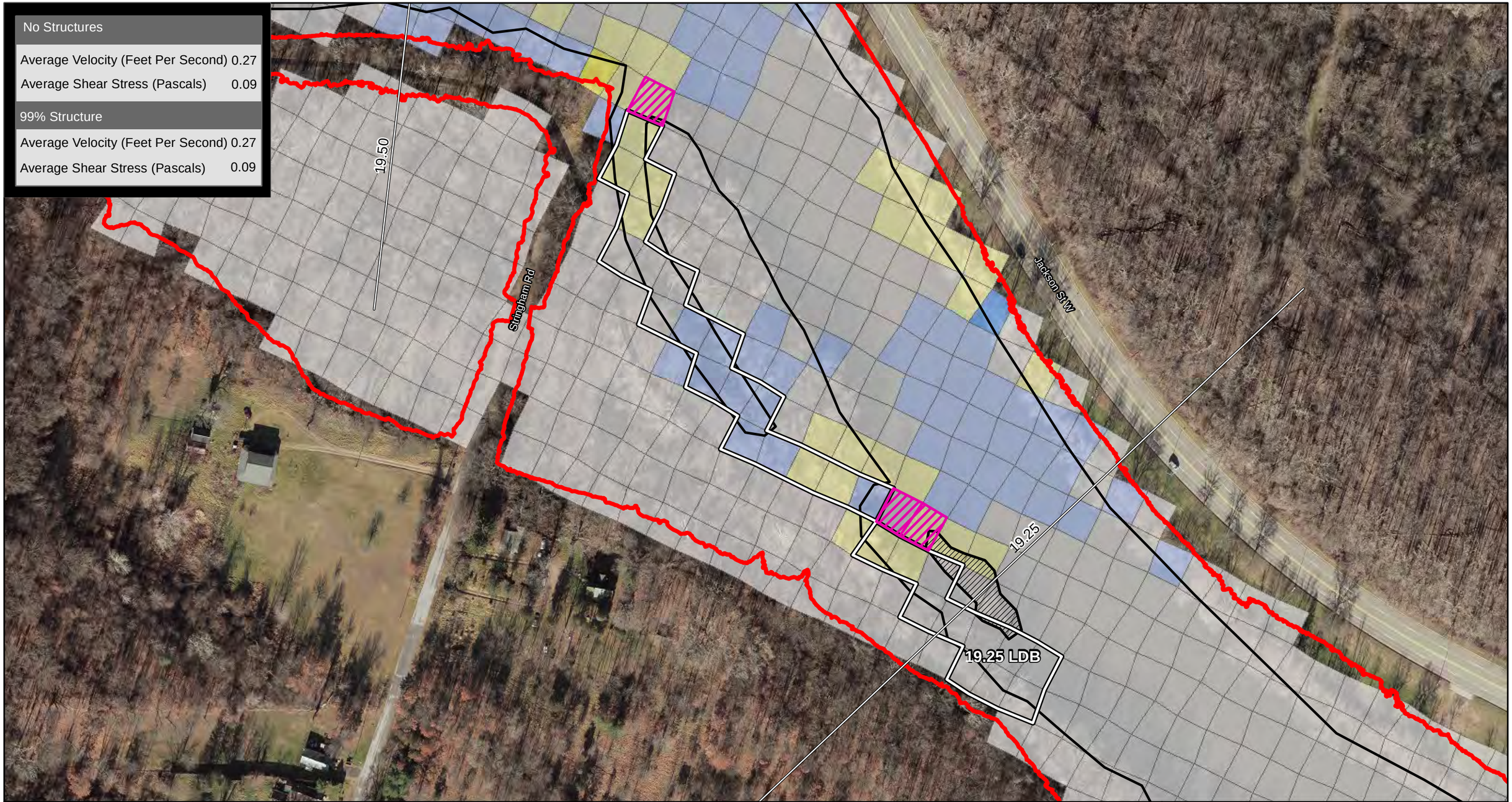
SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

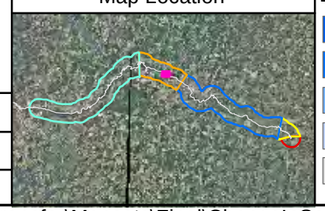
No Structures	
Average Velocity (Feet Per Second)	0.27
Average Shear Stress (Pascals)	0.09
99% Structure	
Average Velocity (Feet Per Second)	0.27
Average Shear Stress (Pascals)	0.09



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

19.25 LDB

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.50
Average Shear Stress (Pascals)	1.74
99% Structure	
Average Velocity (Feet Per Second)	0.50
Average Shear Stress (Pascals)	1.73

21.50 RDB

21.50

Custer Dr

21.25

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD
21.50 RDB
SHEET 8 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.26
Average Shear Stress (Pascals)	1.38
99% Structure	
Average Velocity (Feet Per Second)	0.26
Average Shear Stress (Pascals)	1.38

26.00 RDB

26.00

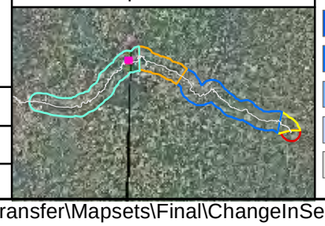
26.25 RDB

26.25

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

26.00 RDB

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.43
Average Shear Stress (Pascals)	1.73
99% Structure	
Average Velocity (Feet Per Second)	0.43
Average Shear Stress (Pascals)	1.73

28.00

28.25 RDB

28.25

Fort Custer Dr

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

28.25 RDB

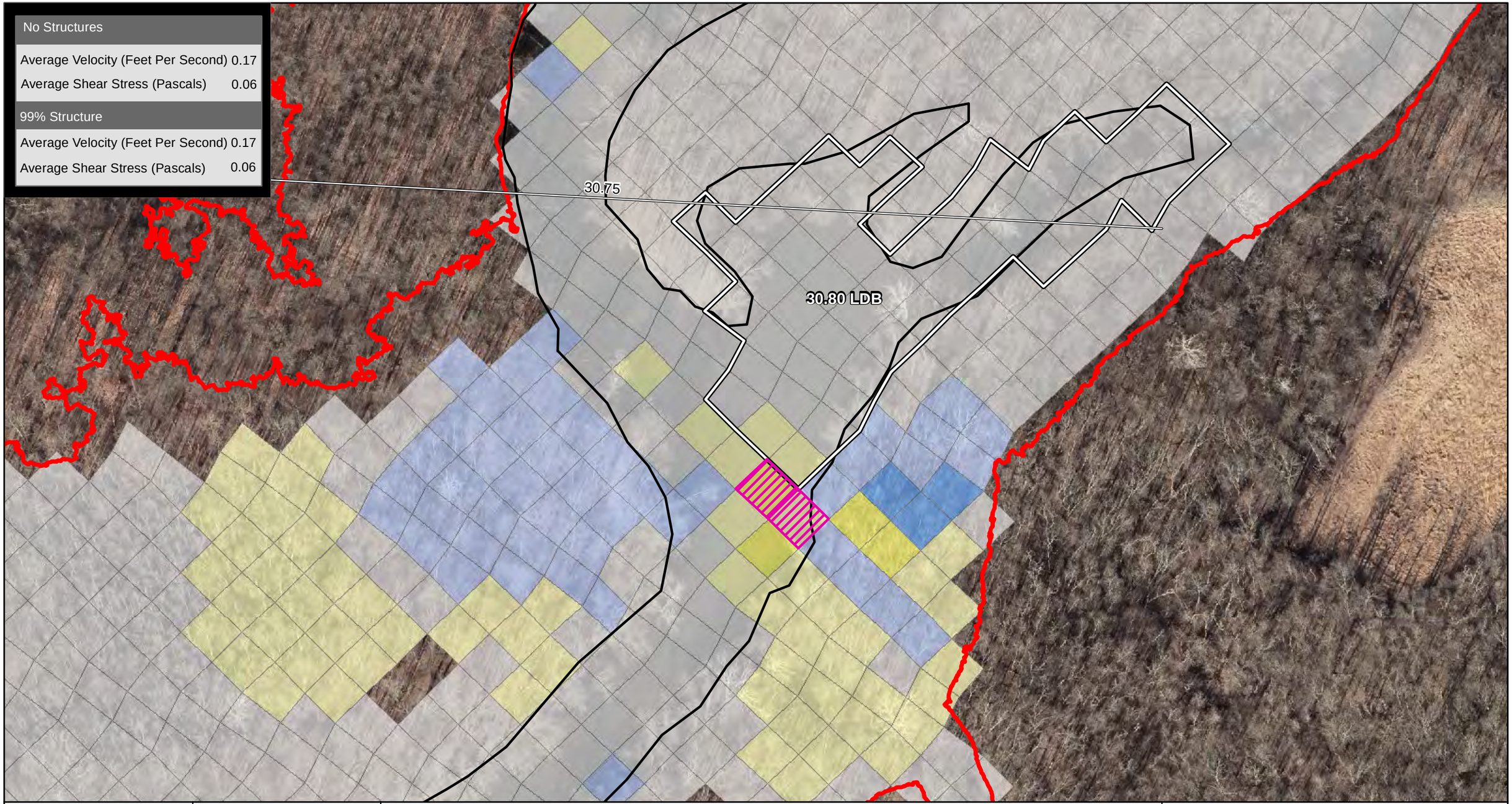
SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

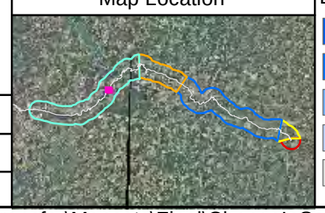
No Structures	
Average Velocity (Feet Per Second)	0.17
Average Shear Stress (Pascals)	0.06
99% Structure	
Average Velocity (Feet Per Second)	0.17
Average Shear Stress (Pascals)	0.06



ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

30.80 LDB

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.48
Average Shear Stress (Pascals)	1.99
99% Structure	
Average Velocity (Feet Per Second)	0.48
Average Shear Stress (Pascals)	1.99

33.00

33.00 A

33.00 B

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

33.00 A

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.21
Average Shear Stress (Pascals)	0.07
99% Structure	
Average Velocity (Feet Per Second)	0.21
Average Shear Stress (Pascals)	0.07

33.00

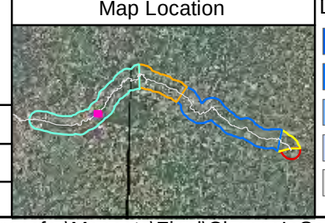
33.00 B

33.25

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

33.00 B

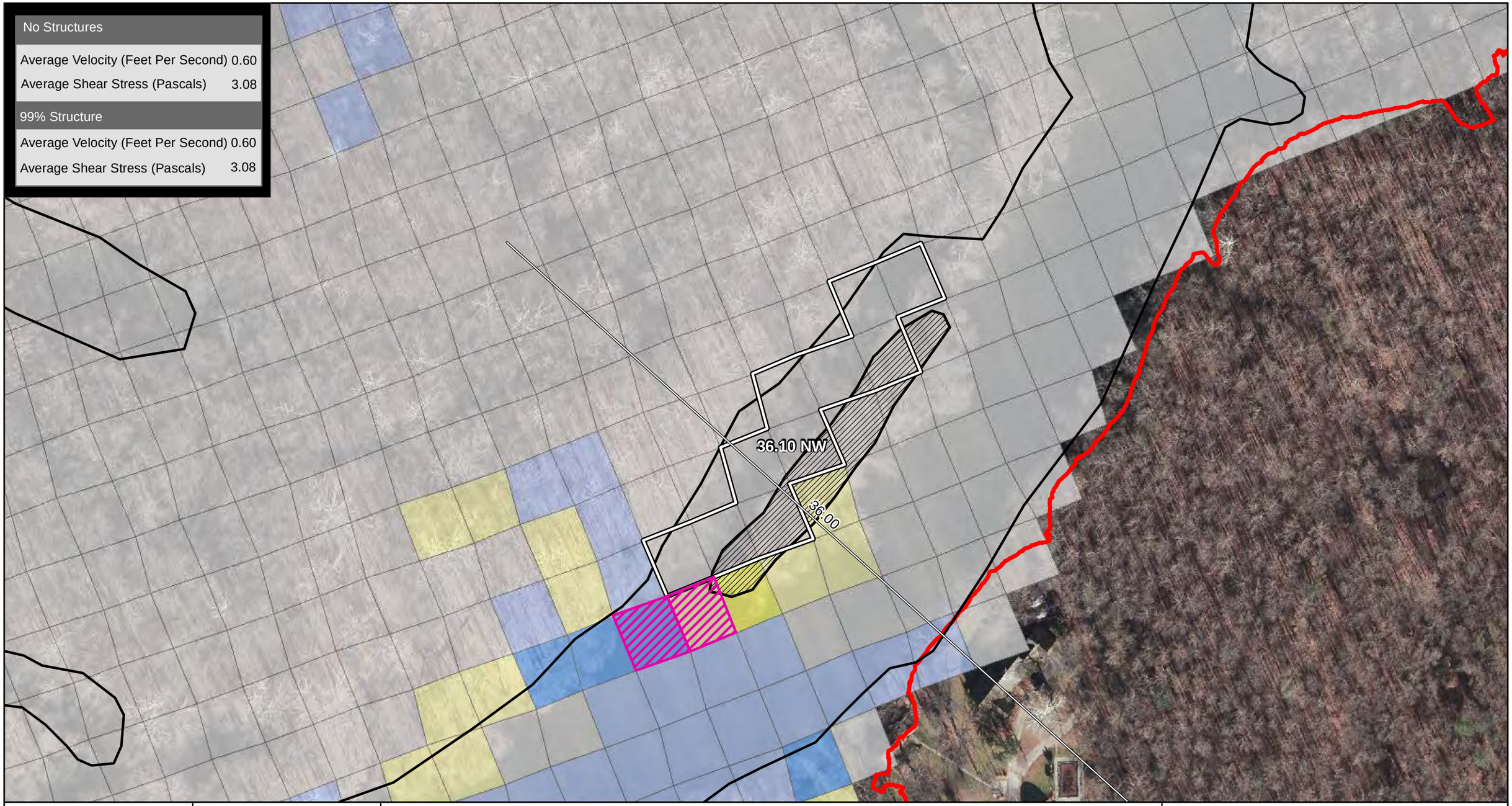
SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

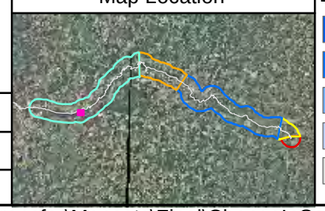
No Structures	
Average Velocity (Feet Per Second)	0.60
Average Shear Stress (Pascals)	3.08
99% Structure	
Average Velocity (Feet Per Second)	0.60
Average Shear Stress (Pascals)	3.08



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

36.10 NW

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.23
Average Shear Stress (Pascals)	0.24
99% Structure	
Average Velocity (Feet Per Second)	0.23
Average Shear Stress (Pascals)	0.24

Delta A

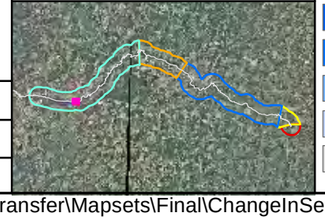
36.75

36.50

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD

DELTA A

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.35
Average Shear Stress (Pascals)	0.57
99% Structure	
Average Velocity (Feet Per Second)	0.35
Average Shear Stress (Pascals)	0.57

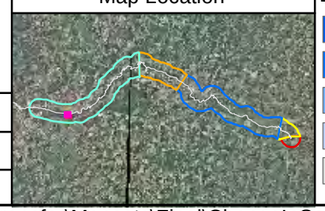
37.75

37.75 Islands

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Christmas Tree Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 99% STRUCTURE
100-YEAR FLOOD
37.75 ISLANDS
SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc99.mxd

Aerial Photography Date: November 2011

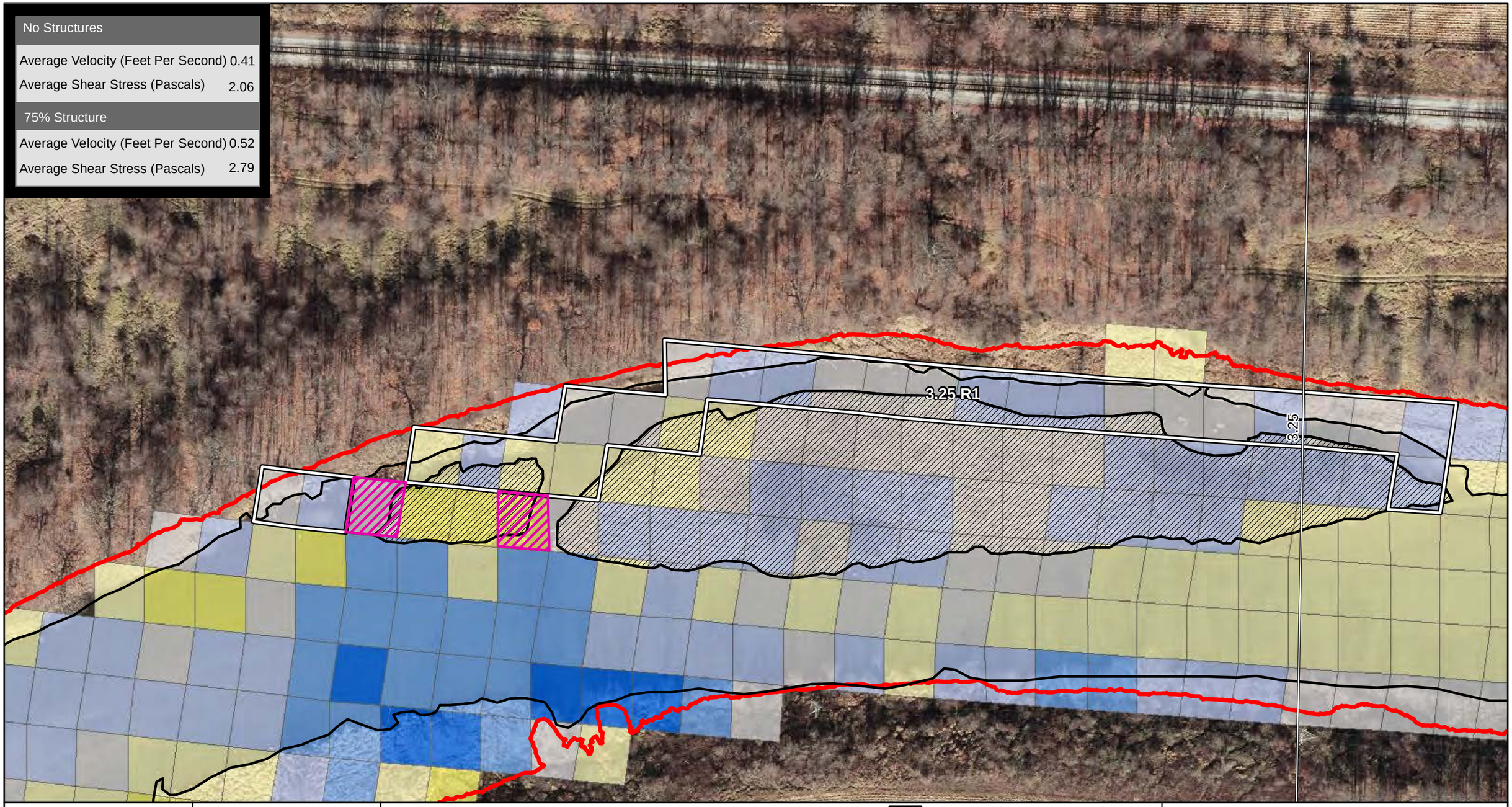
Figure 7-27

Change in Sedimentation Rate Between No Structure and 75% Structure

100-Year Flood

Sheets 1 through 16

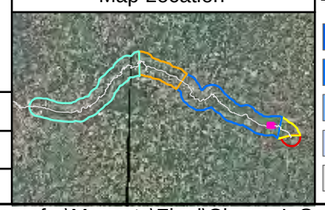
No Structures	
Average Velocity (Feet Per Second)	0.41
Average Shear Stress (Pascals)	2.06
75% Structure	
Average Velocity (Feet Per Second)	0.52
Average Shear Stress (Pascals)	2.79



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

3.25 R1

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.43
Average Shear Stress (Pascals)	2.66
75% Structure	
Average Velocity (Feet Per Second)	0.55
Average Shear Stress (Pascals)	3.73

12 Mile Rd

Water St

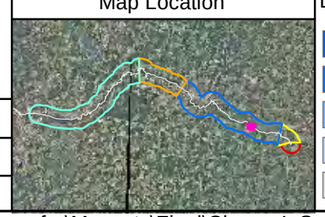
5.75

Ceresco

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 55 110 220

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

CERESCO

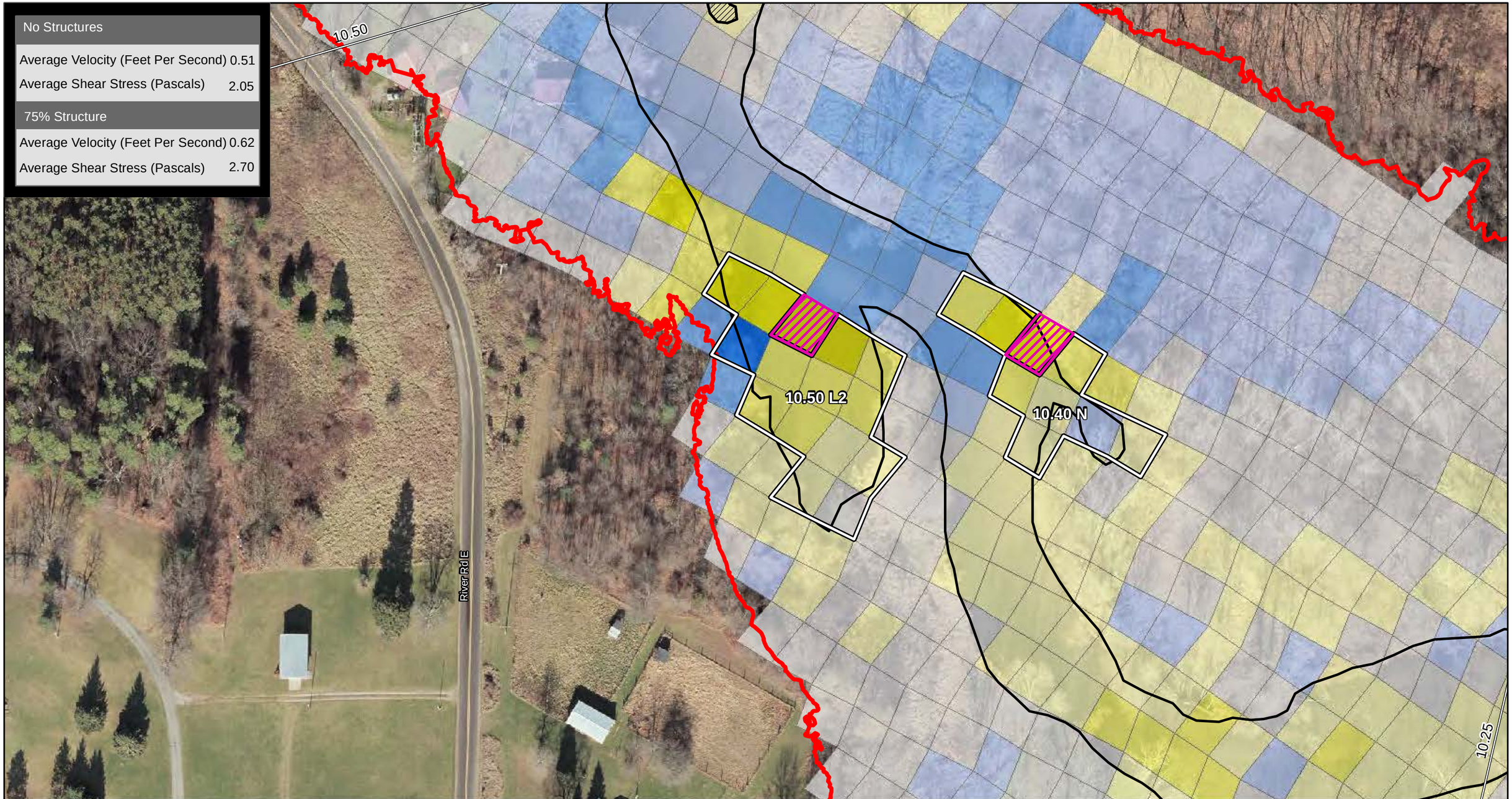
SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

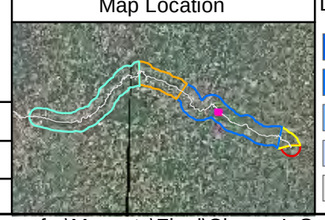
No Structures	
Average Velocity (Feet Per Second)	0.51
Average Shear Stress (Pascals)	2.05
75% Structure	
Average Velocity (Feet Per Second)	0.62
Average Shear Stress (Pascals)	2.70



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

10.40 N

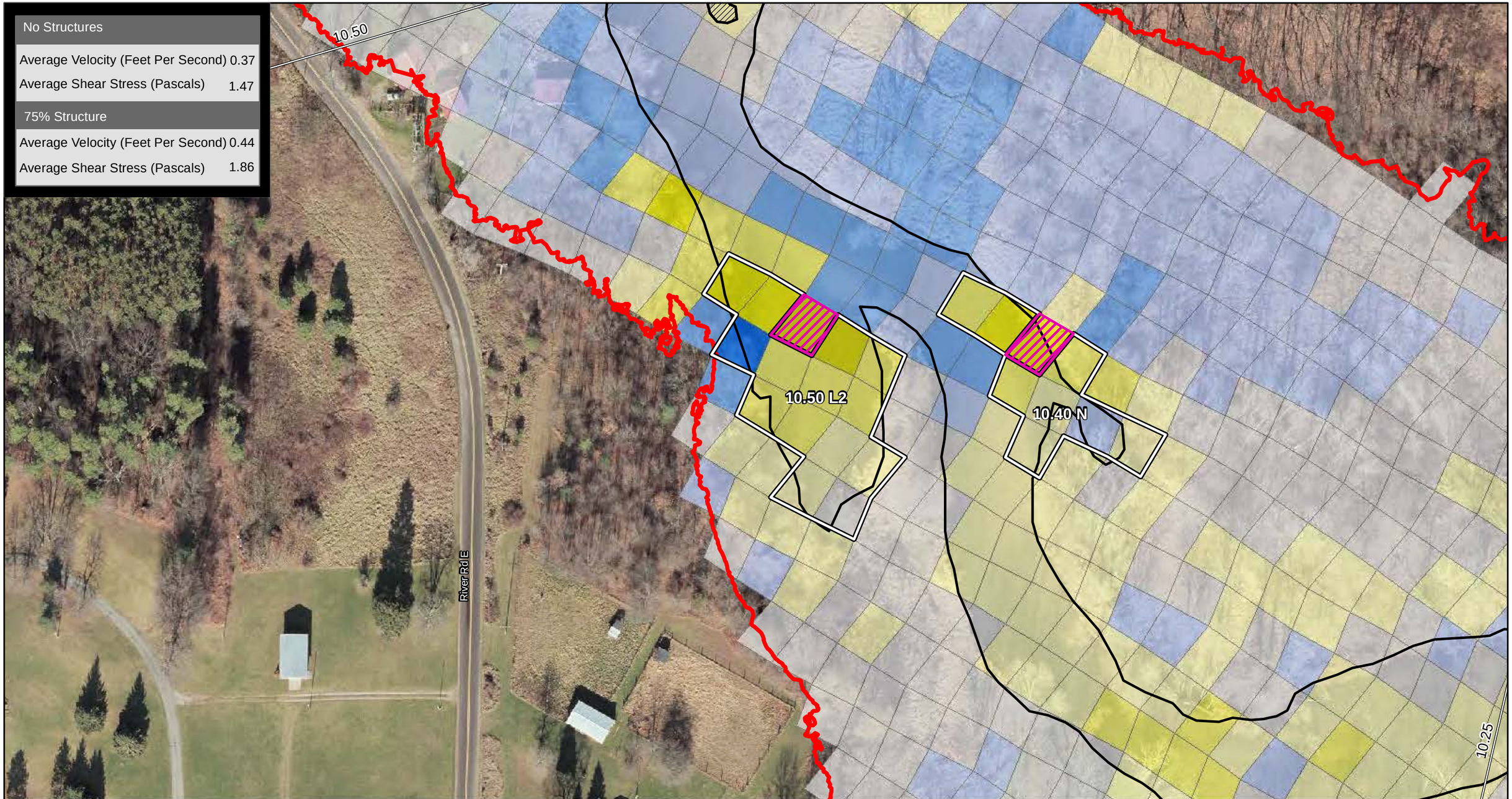
SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

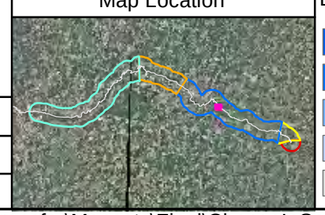
No Structures	
Average Velocity (Feet Per Second)	0.37
Average Shear Stress (Pascals)	1.47
75% Structure	
Average Velocity (Feet Per Second)	0.44
Average Shear Stress (Pascals)	1.86



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
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- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain

- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

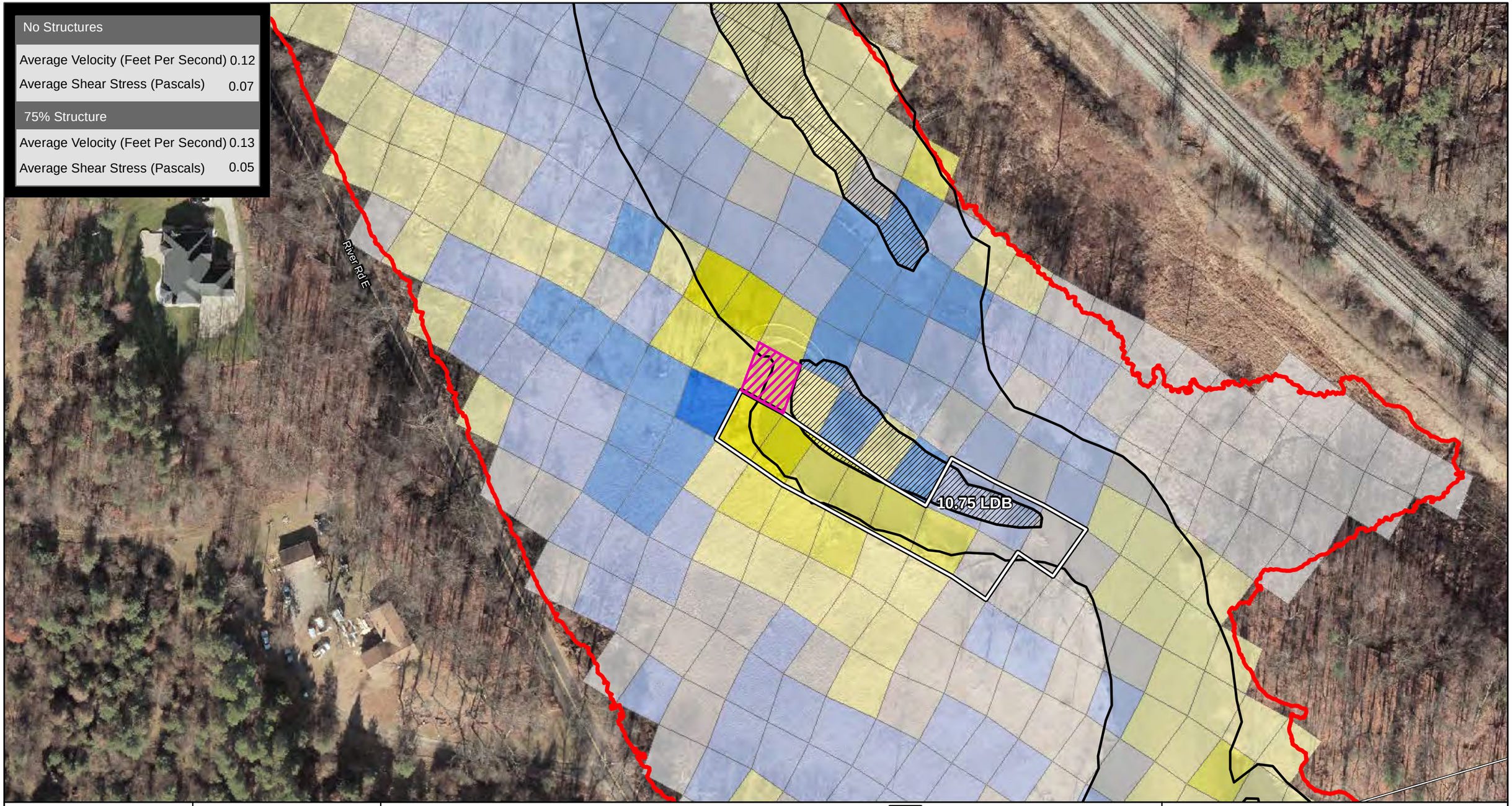
CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD
10.50 L2
SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

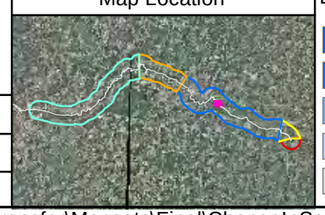
No Structures	
Average Velocity (Feet Per Second)	0.12
Average Shear Stress (Pascals)	0.07
75% Structure	
Average Velocity (Feet Per Second)	0.13
Average Shear Stress (Pascals)	0.05



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

10.75 LDB

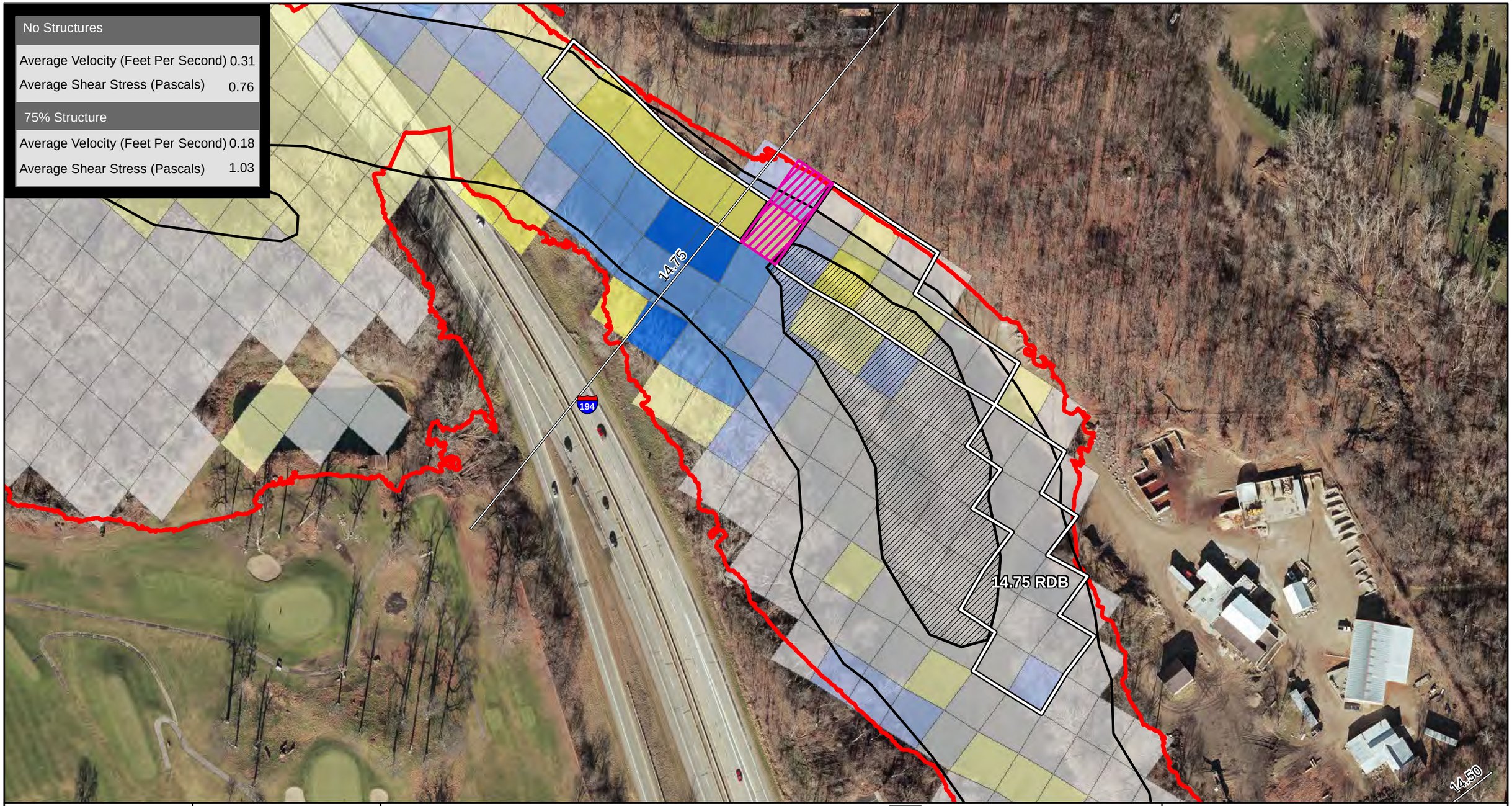
SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.31
Average Shear Stress (Pascals)	0.76
75% Structure	
Average Velocity (Feet Per Second)	0.18
Average Shear Stress (Pascals)	1.03



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

14.75 RDB

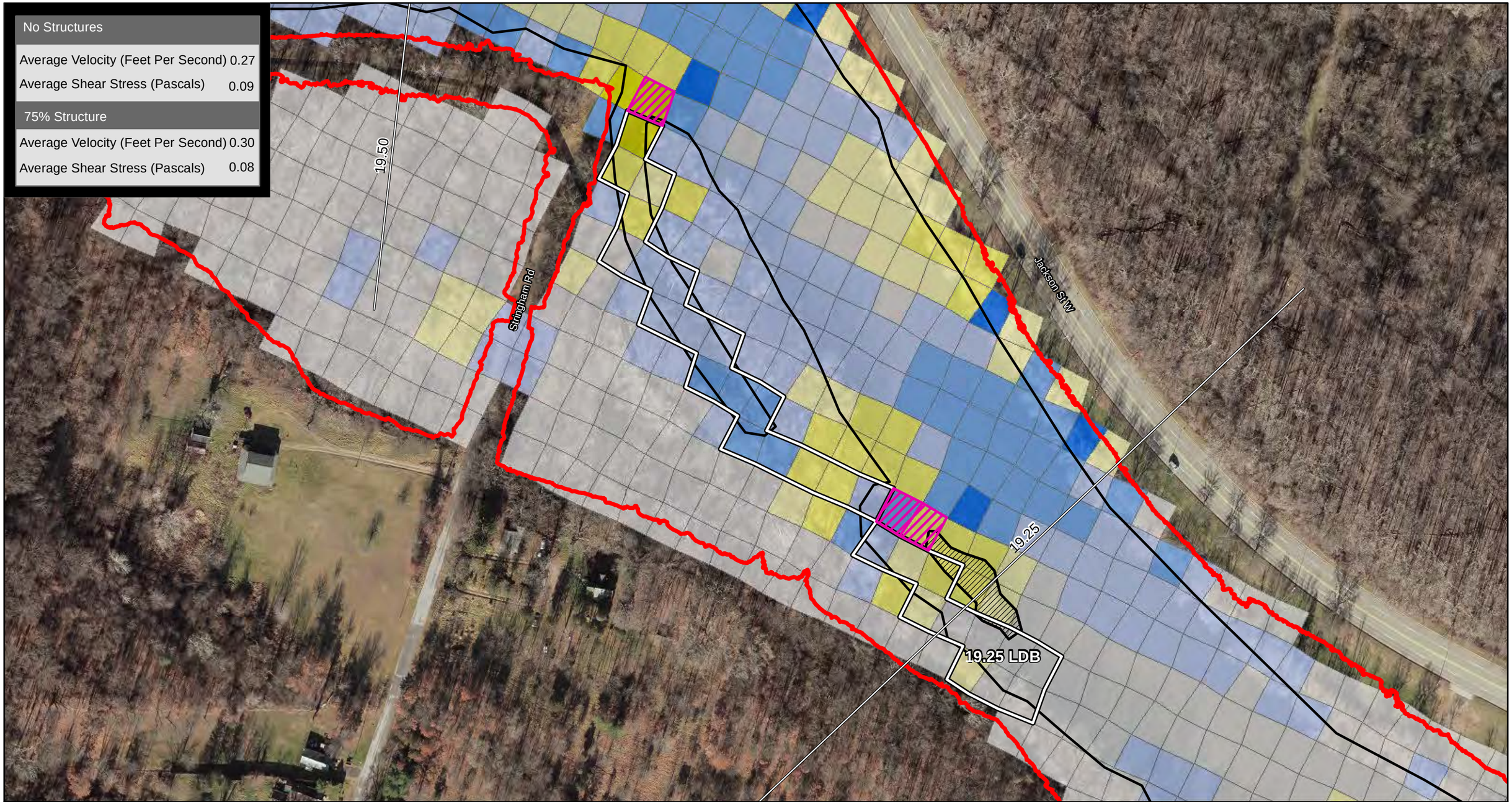
SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

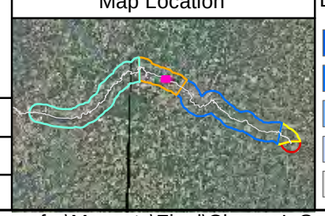
No Structures	
Average Velocity (Feet Per Second)	0.27
Average Shear Stress (Pascals)	0.09
75% Structure	
Average Velocity (Feet Per Second)	0.30
Average Shear Stress (Pascals)	0.08



ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 60 120 240

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

19.25 LDB

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.50
Average Shear Stress (Pascals)	1.74
75% Structure	
Average Velocity (Feet Per Second)	0.60
Average Shear Stress (Pascals)	2.15

21.50 RDB

21.50

Custer Dr

21.25

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location

Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD
21.50 RDB
SHEET 8 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.26
Average Shear Stress (Pascals)	1.38
75% Structure	
Average Velocity (Feet Per Second)	0.33
Average Shear Stress (Pascals)	1.78

26.00 RDB

26.00

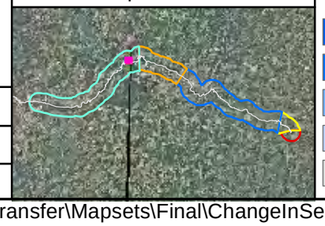
26.25 RDB

26.25

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

26.00 RDB

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.43
Average Shear Stress (Pascals)	1.73
75% Structure	
Average Velocity (Feet Per Second)	0.54
Average Shear Stress (Pascals)	2.32

28.00

28.25 RDB

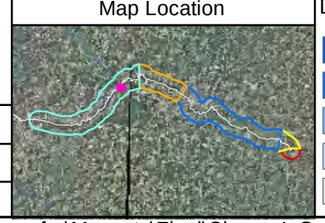
28.25

Fort Custer Dr

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

28.25 RDB

SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.17
Average Shear Stress (Pascals)	0.06
75% Structure	
Average Velocity (Feet Per Second)	0.19
Average Shear Stress (Pascals)	0.05

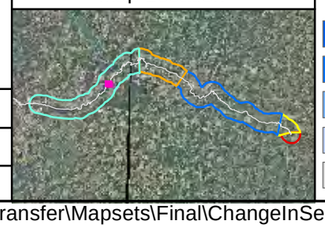
30.75

30.80 LDB

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

30.80 LDB

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.48
Average Shear Stress (Pascals)	1.99
75% Structure	
Average Velocity (Feet Per Second)	0.59
Average Shear Stress (Pascals)	2.58

33.00

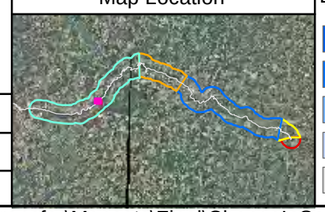
33.00 A

33.00 B

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
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- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

33.00 A

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.21
Average Shear Stress (Pascals)	0.07
75% Structure	
Average Velocity (Feet Per Second)	0.24
Average Shear Stress (Pascals)	0.06

33.00

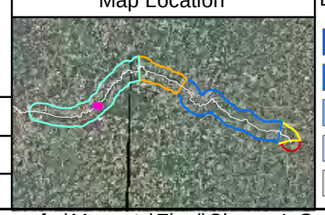
33.00 B

33.25

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

33.00 B

SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.60
Average Shear Stress (Pascals)	3.08
75% Structure	
Average Velocity (Feet Per Second)	0.77
Average Shear Stress (Pascals)	4.32

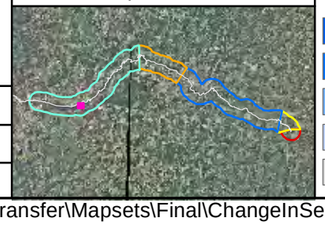
36.10 NW

36.00

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
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- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
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- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

36.10 NW

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.23
Average Shear Stress (Pascals)	0.24
75% Structure	
Average Velocity (Feet Per Second)	0.25
Average Shear Stress (Pascals)	0.18

Delta A

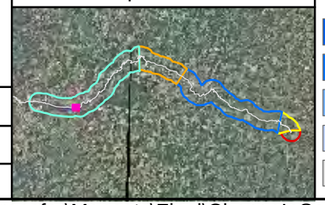
36.75

36.50

ENBRIDGE

Drawn:	MB 4/17/2012
Approved:	BRS 4/17/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD

DELTA A

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

E:\Hydrodynamic Model Data Transfer\Mapsets\Final\ChangeInSedRate100YrFlood_NoStruc75.mxd

Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.35
Average Shear Stress (Pascals)	0.57
75% Structure	
Average Velocity (Feet Per Second)	0.30
Average Shear Stress (Pascals)	0.15

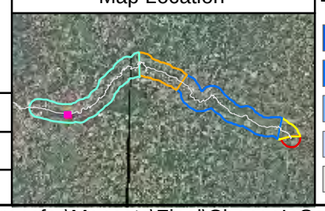
37.75

37.75 Islands

ENBRIDGE

Drawn:	MB	4/17/2012
Approved:	BRS	4/17/2012
Project #:	106-4186	

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Christmas Tree Structure Cell
- Sediment Trap Area

N

0 45 90 180

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND 75% STRUCTURE
100-YEAR FLOOD
37.75 ISLANDS
SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
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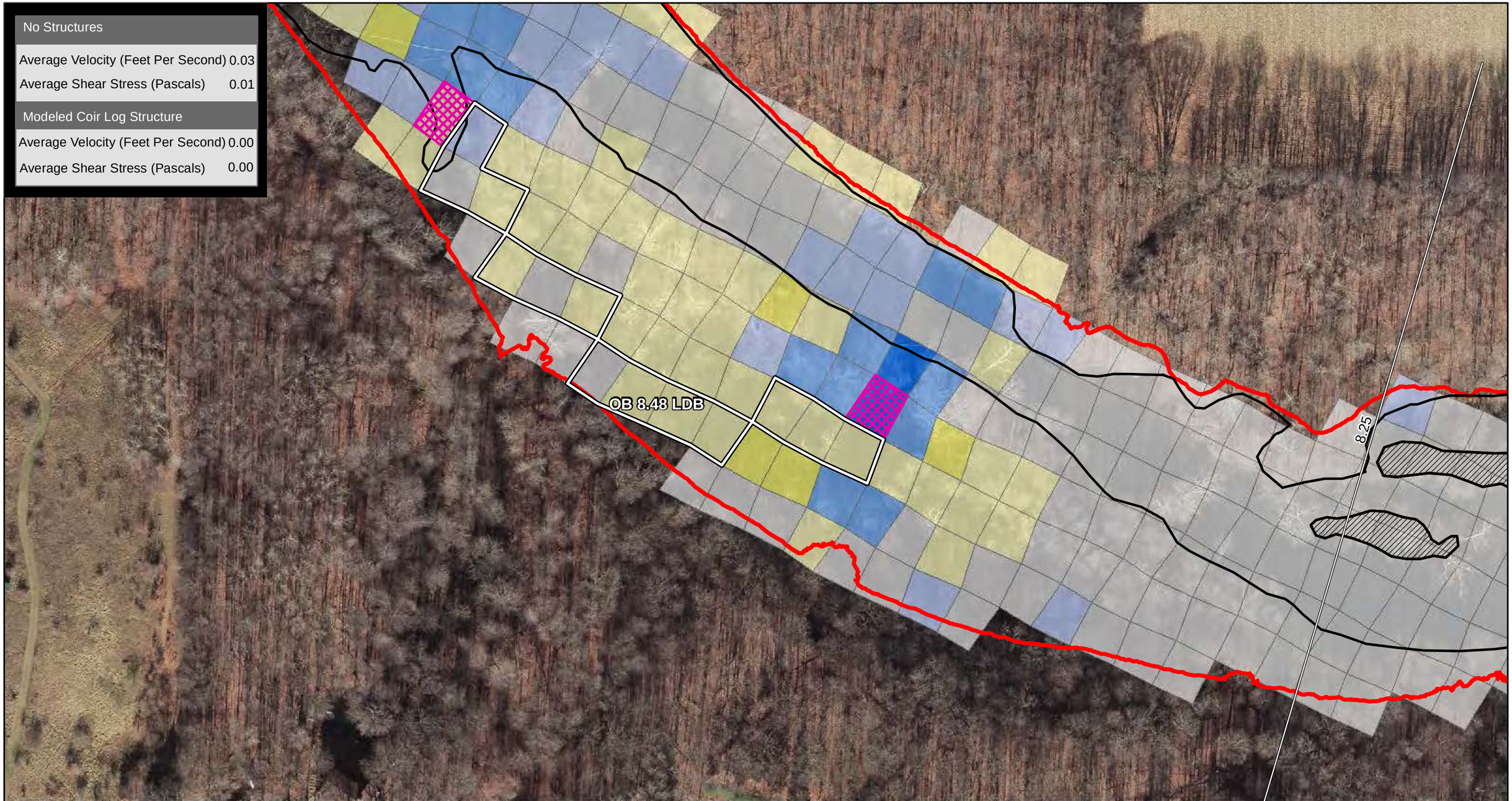
Aerial Photography Date: November 2011

Figure 7-28

Change in Sedimentation Rate Between No Structure and Coir Log Structure, 100-Year Flood

Sheets 1 through 4

No Structures	
Average Velocity (Feet Per Second)	0.03
Average Shear Stress (Pascals)	0.01
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.00
Average Shear Stress (Pascals)	0.00



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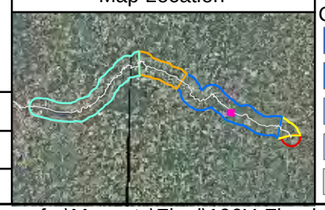
Drawn:	MB 4/16/2012
Approved:	BRS 4/16/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Coir Log Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
100-YEAR FLOOD

OB 8.48 LDB

SHEET 1 OF 4

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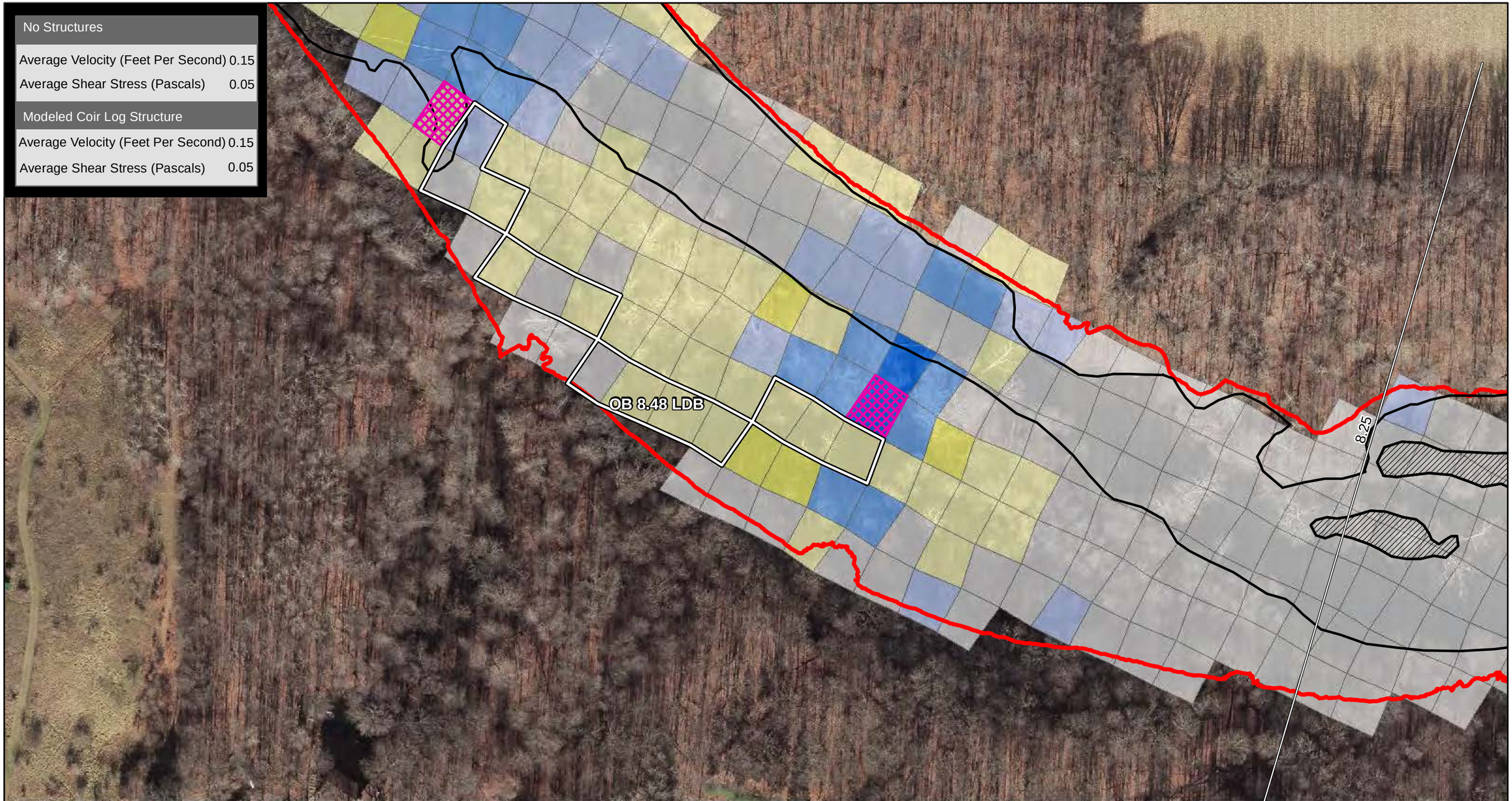
Aerial Photography Date: November 2011

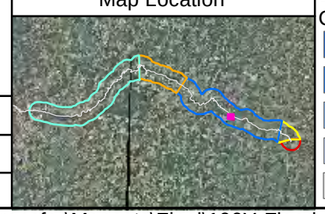
No Structures	
Average Velocity (Feet Per Second)	0.15
Average Shear Stress (Pascals)	0.05
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.15
Average Shear Stress (Pascals)	0.05



ENBRIDGE

Drawn:	MB 4/16/2012
Approved:	BRS 4/16/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Coir Log Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
100-YEAR FLOOD

MP 11.21

SHEET 2 OF 4

ENBRIDGE LINE 6B MP 608
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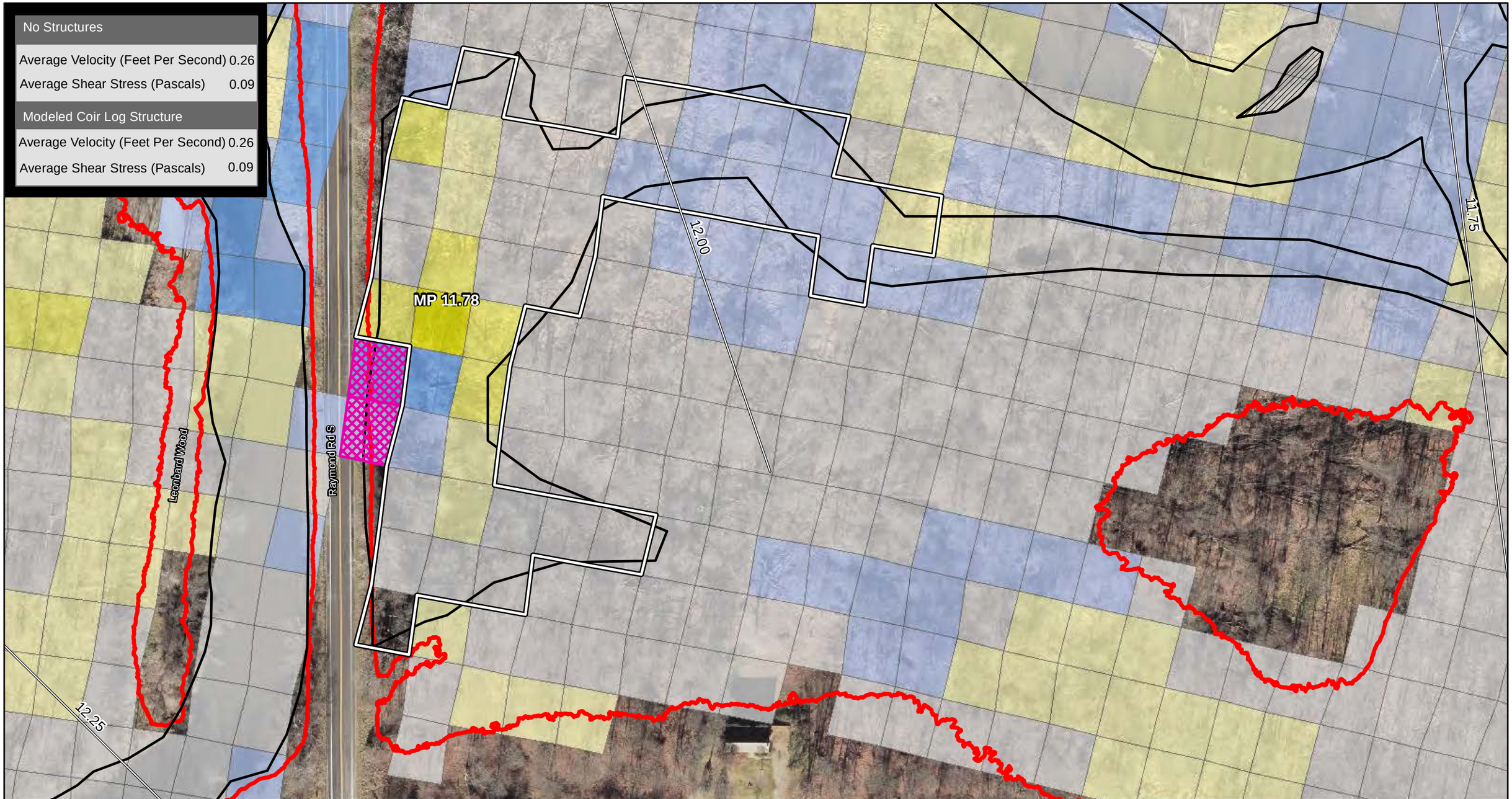
E:\Hydrodynamic Model Data Transfer\Mapsets\Final\100YrFlood_CoirLog.mxd

Aerial Photography Date: November 2011

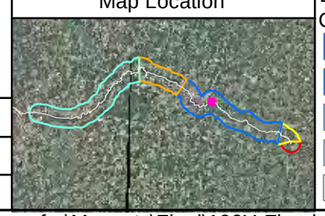
No Structures	
Average Velocity (Feet Per Second)	0.26
Average Shear Stress (Pascals)	0.09
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.26
Average Shear Stress (Pascals)	0.09



ENBRIDGE

Drawn:	MB 4/16/2012
Approved:	BRS 4/16/2012
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Coir Log Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
100-YEAR FLOOD

MP 11.78

SHEET 3 OF 4

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Aerial Photography Date: November 2011

No Structures	
Average Velocity (Feet Per Second)	0.54
Average Shear Stress (Pascals)	2.28
Modeled Coir Log Structure	
Average Velocity (Feet Per Second)	0.54
Average Shear Stress (Pascals)	6.91

26.25 RDB

26.00 RDB

26.25

26.00

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Drawn:	MB 4/16/2012
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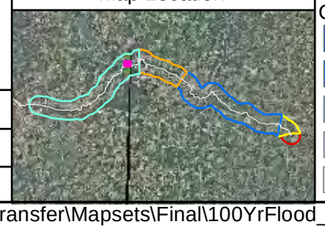
Project #:	106-4186

Map Location



Legend

Change In Sedimentation Rate (Millimeters Per Week)

- > 10.00 Decrease In Sedimentation
- 5.00 - 10.00 Decrease In Sedimentation
- 1.00 - 5.00 Decrease In Sedimentation
- 0.10 - 1.00 Decrease In Sedimentation
- No Change
- 0.10 - 1.00 Increase In Sedimentation
- 1.00 - 5.00 Increase In Sedimentation
- 5.00 - 10.00 Increase In Sedimentation
- > 10.00 Increase In Sedimentation
- HEC-RAS 100-Year Floodplain
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment
- Coir Log Structure Cell
- Sediment Trap Area

N

0 40 80 160

Scale in Feet

CHANGE IN SEDIMENTATION RATE BETWEEN NO STRUCTURE AND COIR LOG STRUCTURE
100-YEAR FLOOD

26.25 RDB

SHEET 4 OF 4

ENBRIDGE LINE 6B MP 608
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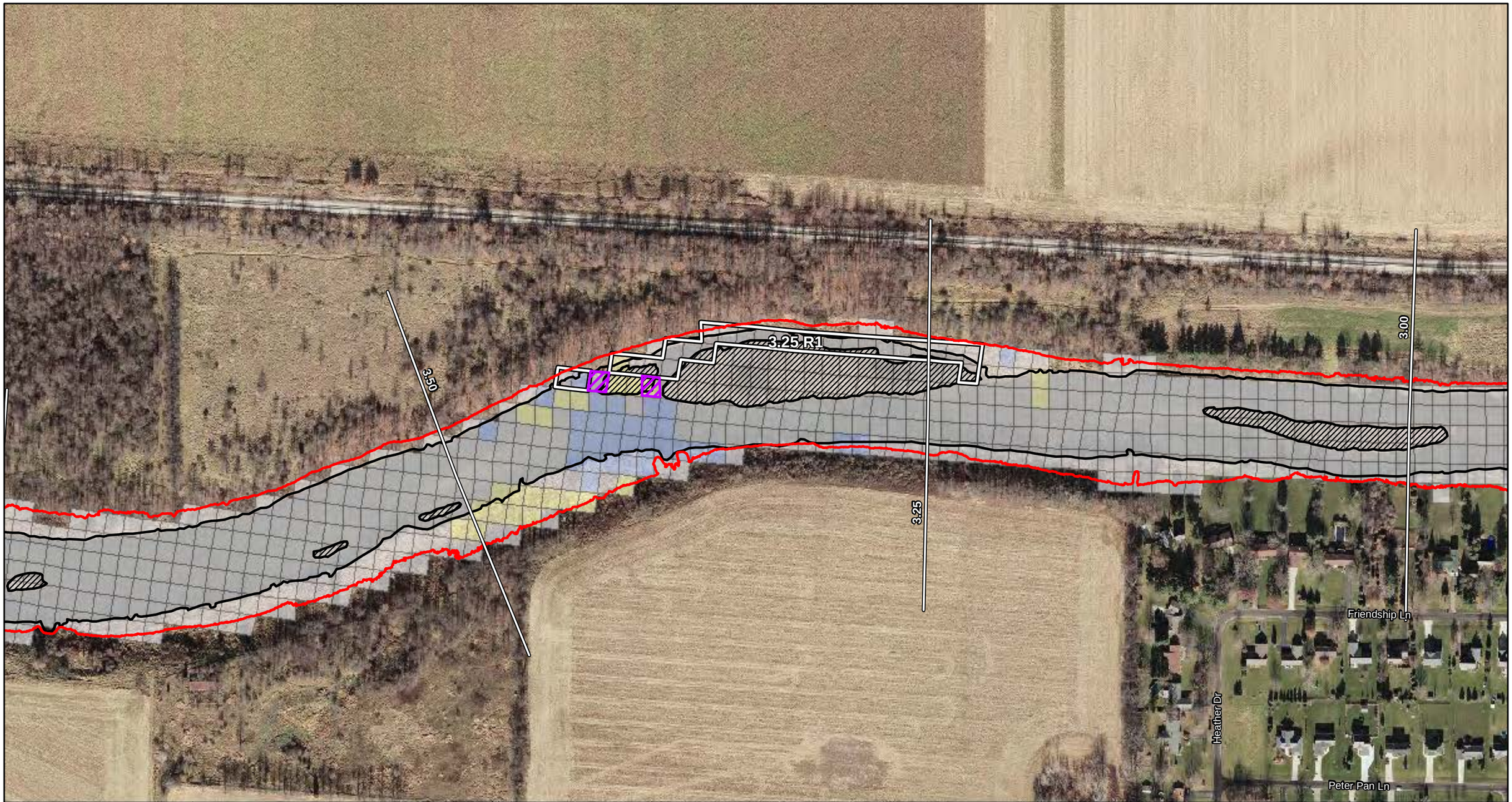
Aerial Photography Date: November 2011

Figure 7-29

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, 100-Year Flood

99% vs. No Structures

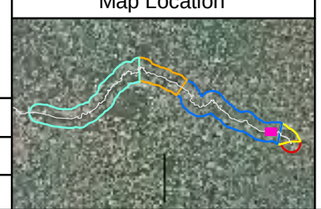
Sheets 1 through 15



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
3.25 R1

SHEET 1 OF 15

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Aerial Photography Date: November 2011

Pierce St
Munci St
C Dr N
Water St
Water St
Ceresco
12 Mile Rd
6.00
5.75
5.50

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Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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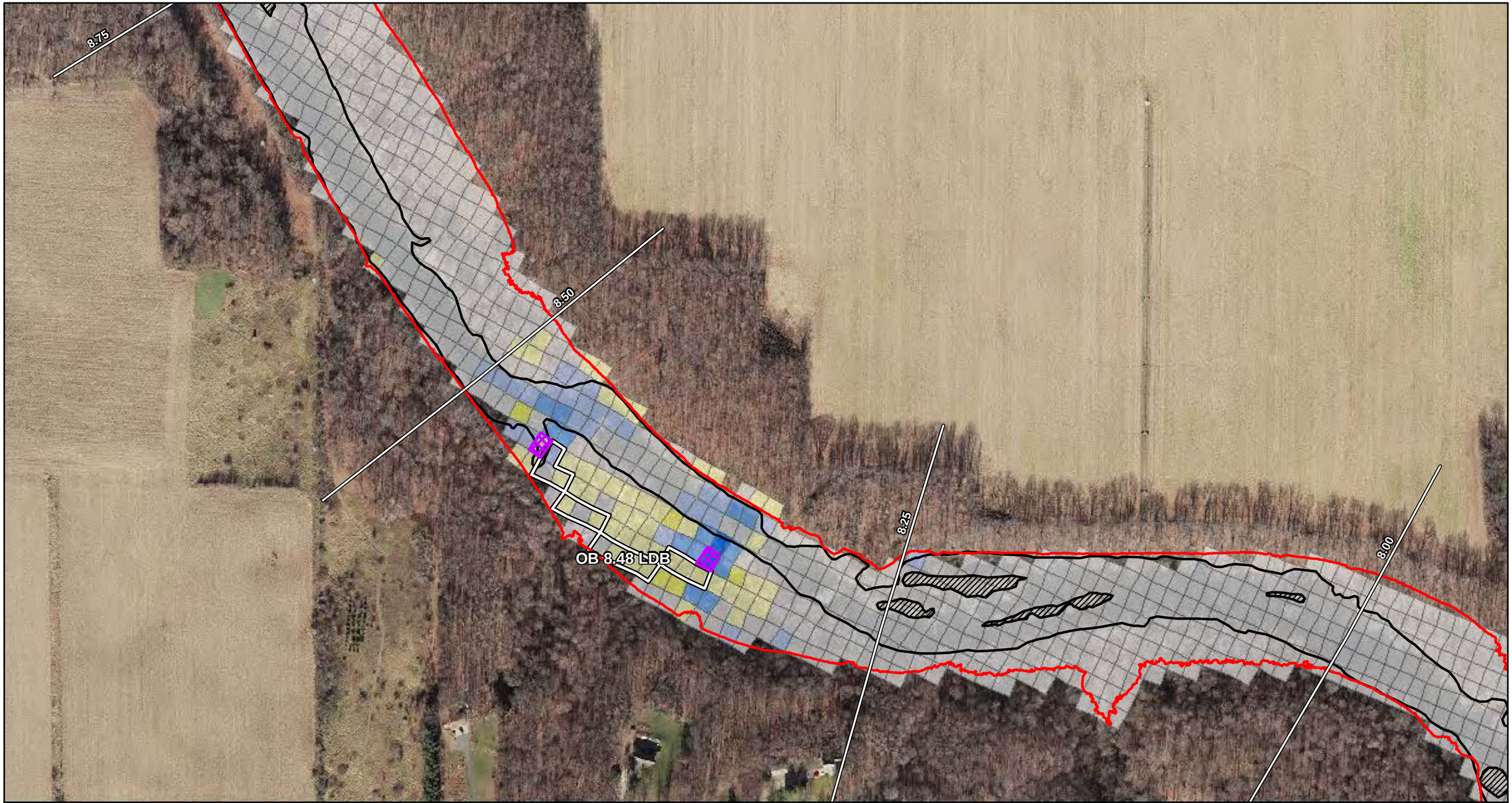
Aerial Photography Date: November 2011



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Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
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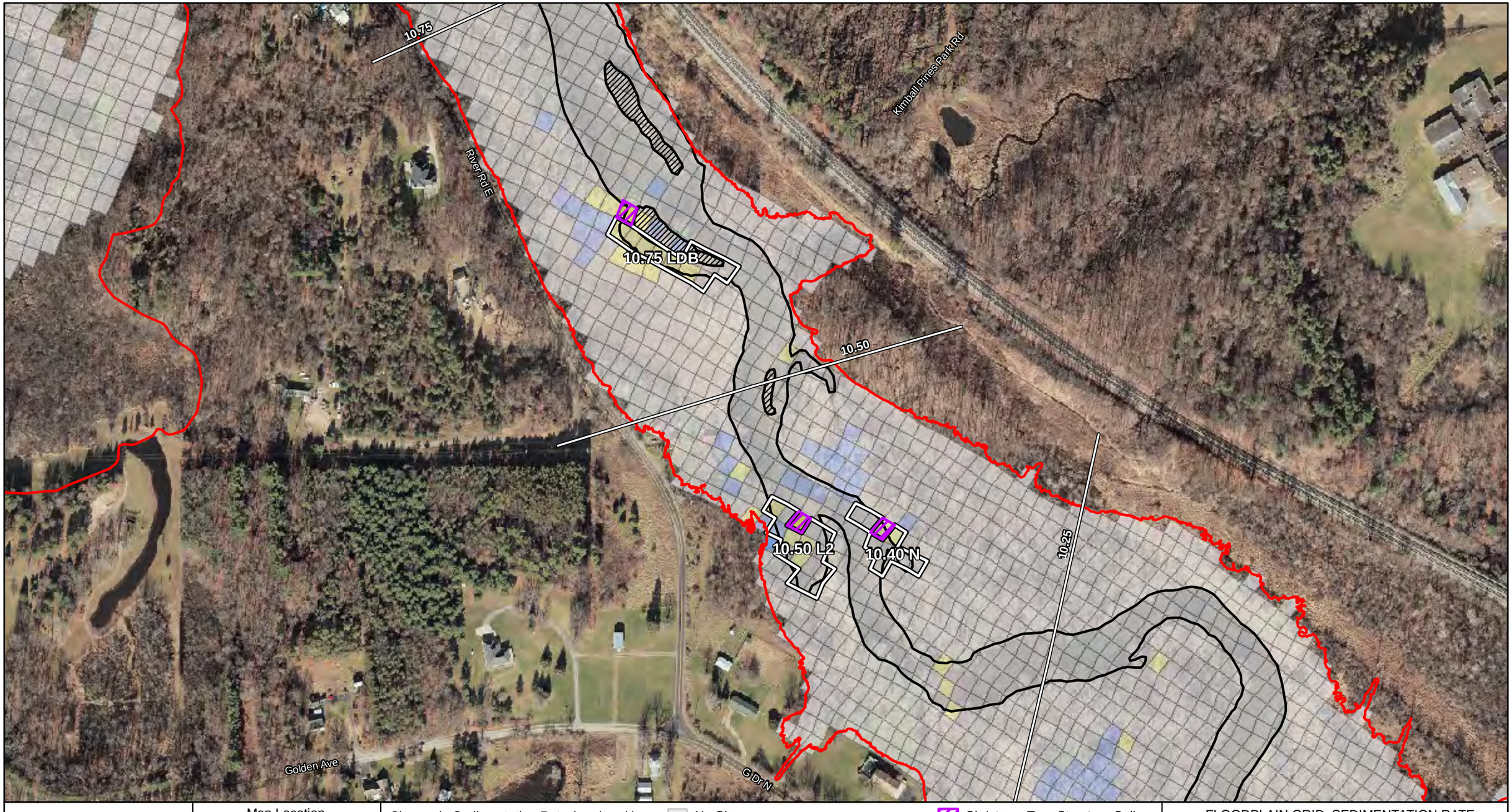
Aerial Photography Date: November 2011



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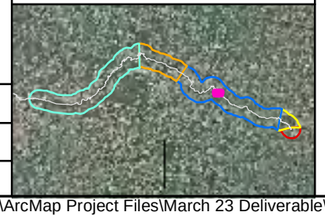
Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
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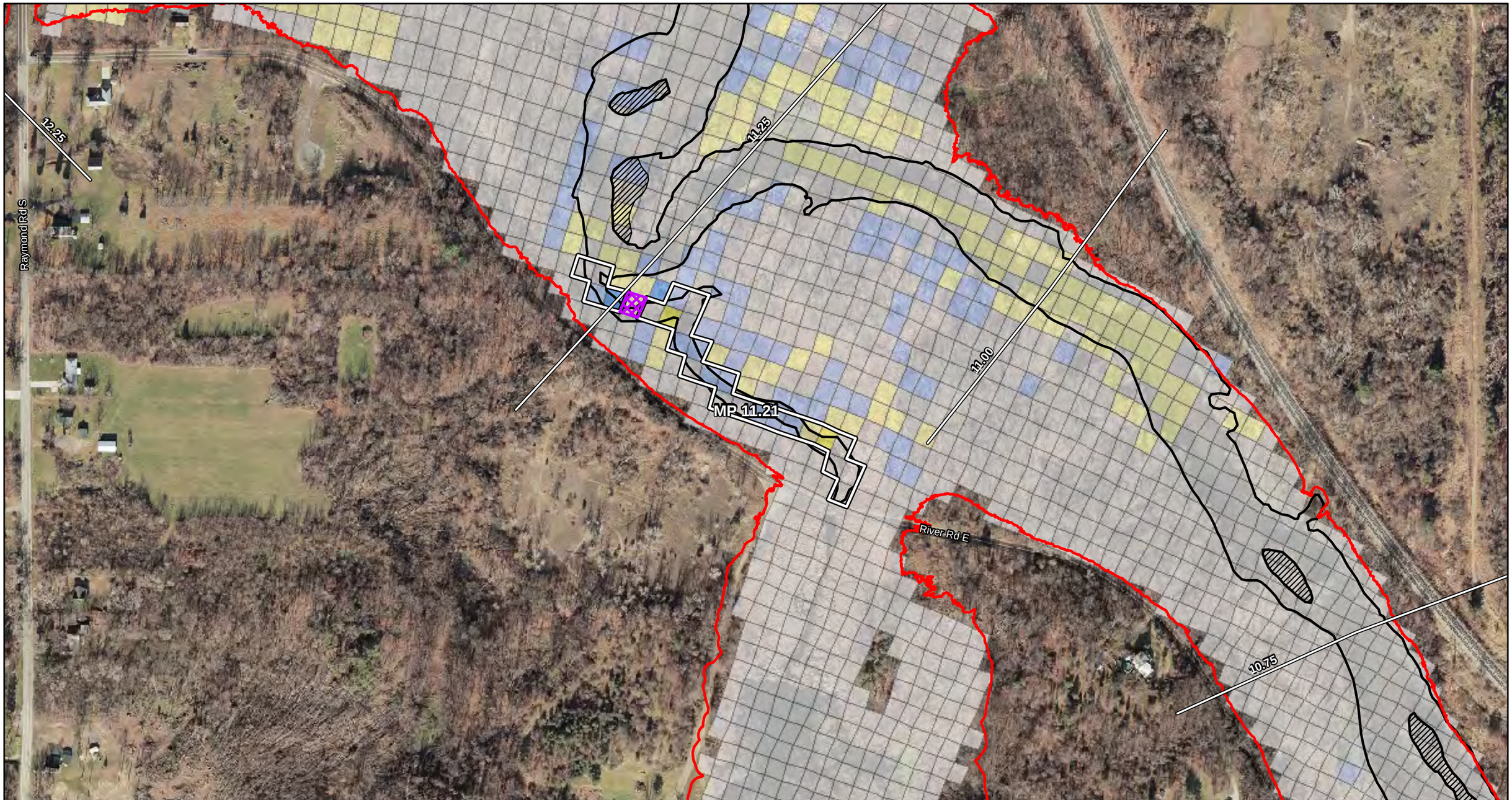
Aerial Photography Date: November 2011



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Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
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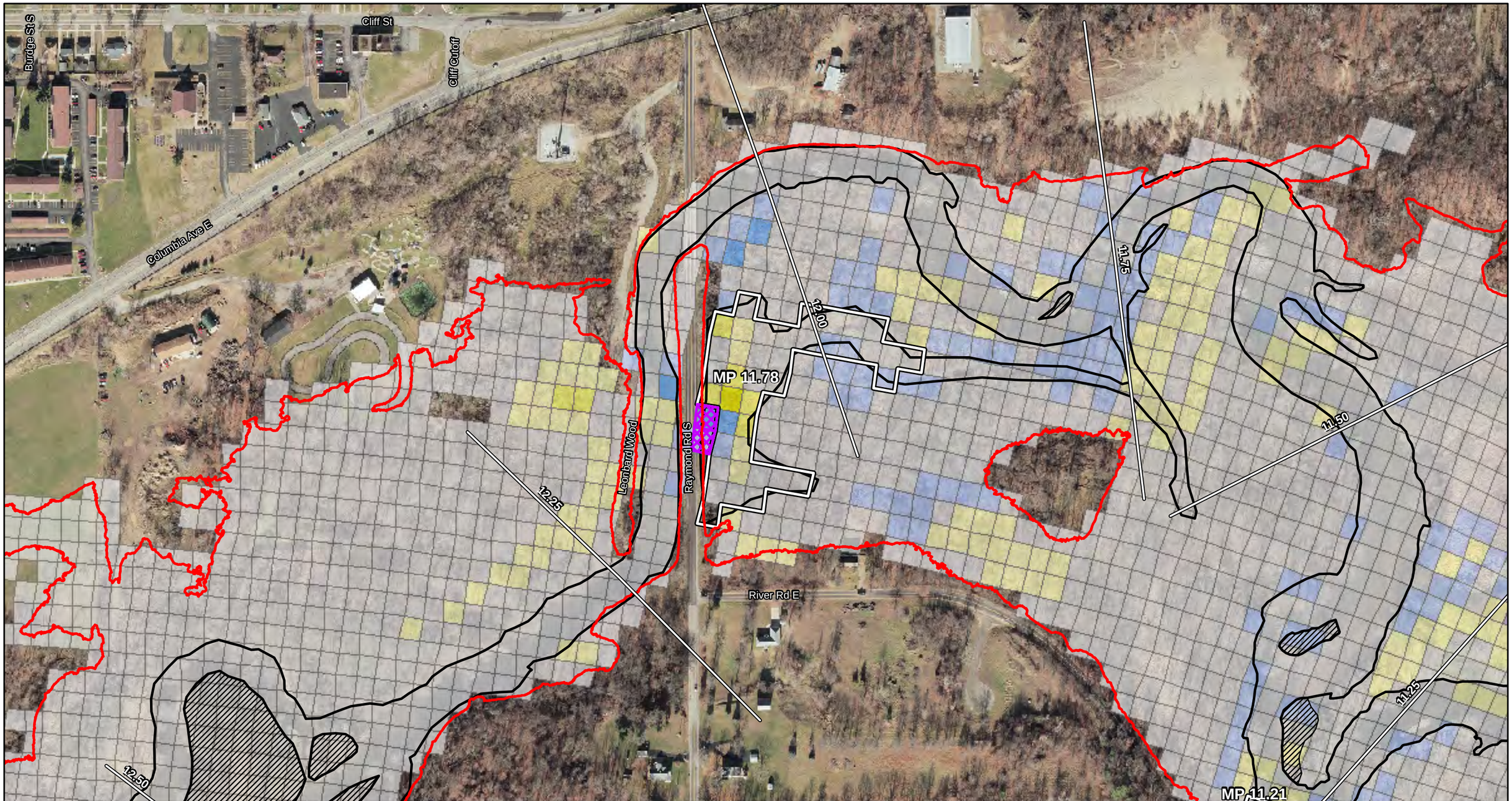
Aerial Photography Date: November 2011



Map Location

Drawn: BRS 4/1/2012

Approved: DBR 4/1/2012

Project #: 106-4186

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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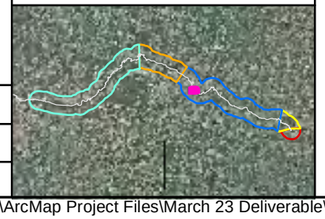
Aerial Photography Date: November 2011

Sisson Ave
15.00
Territorial Rd E
Fonda Ave
Kenosha Ave
Pauline Ave
Rockford St
South Ave
Taft St
194
14.75
14.75 RDB
14.50
River Oaks Blvd
Taft Ct
14.25

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

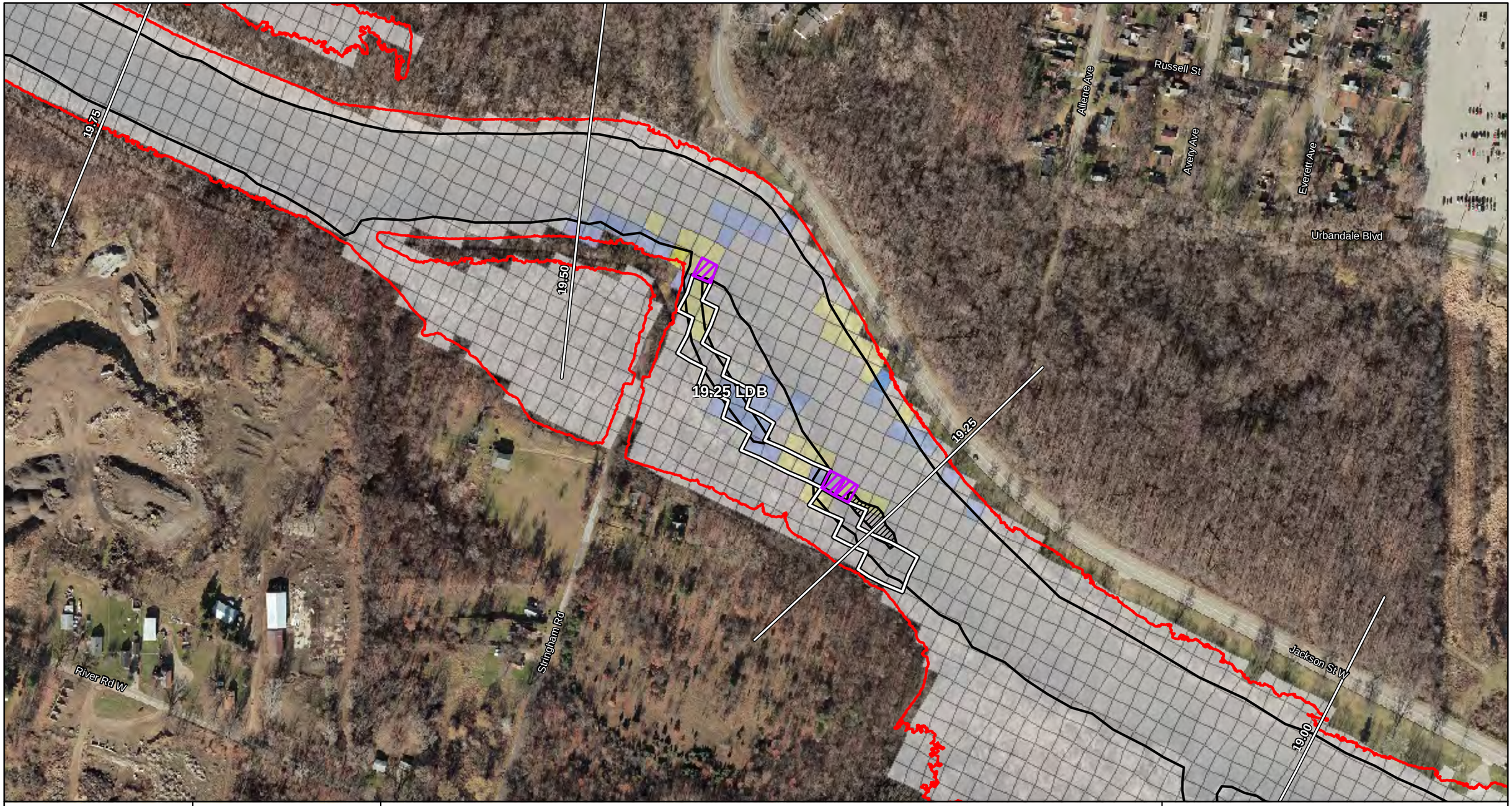
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsF1_F2_100yr.mxd

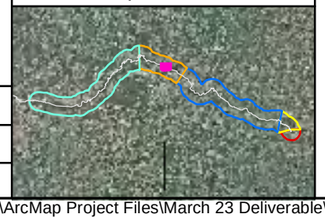
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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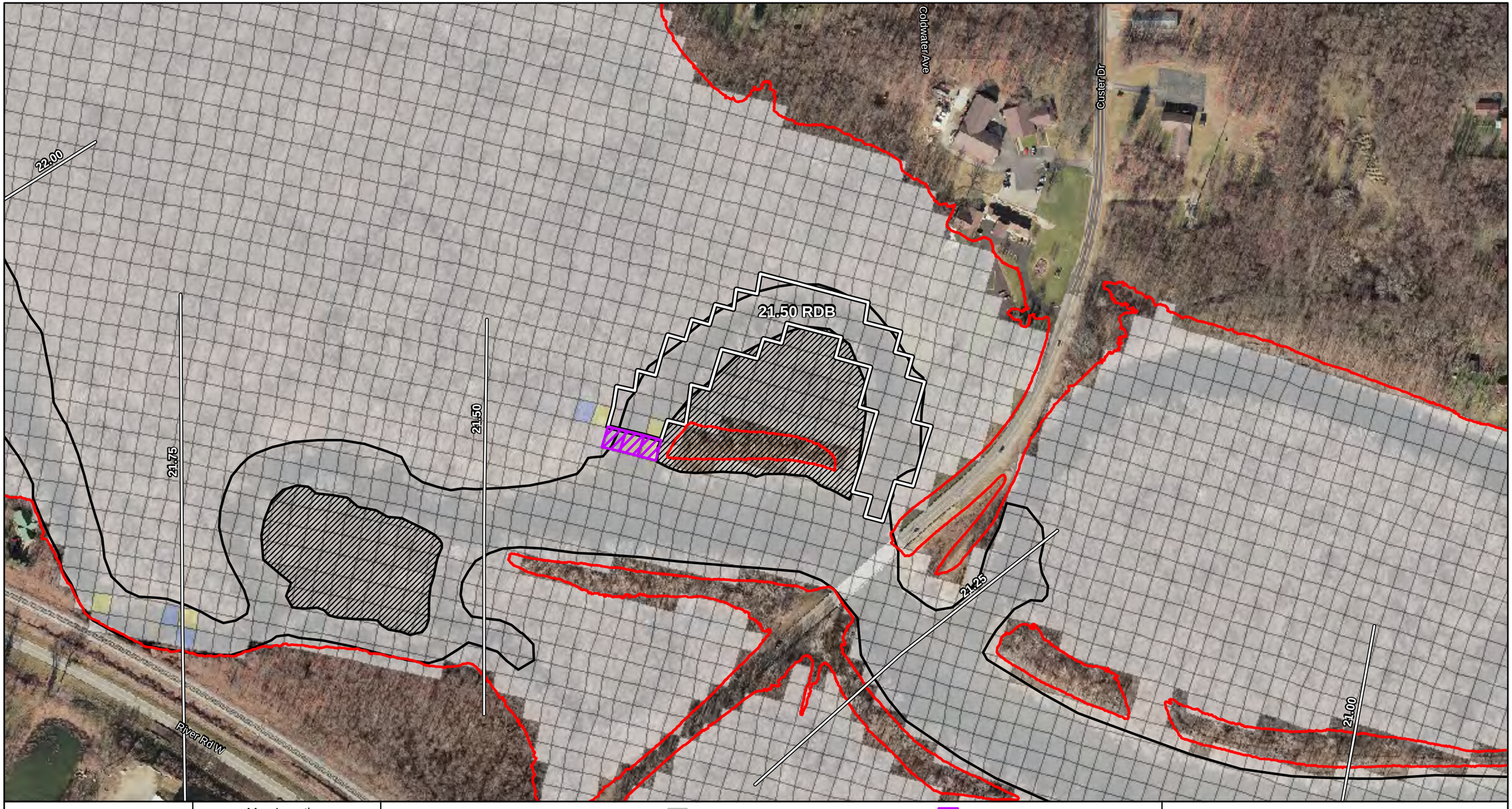
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsF1_F2_100yr.mxd

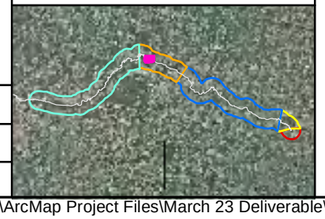
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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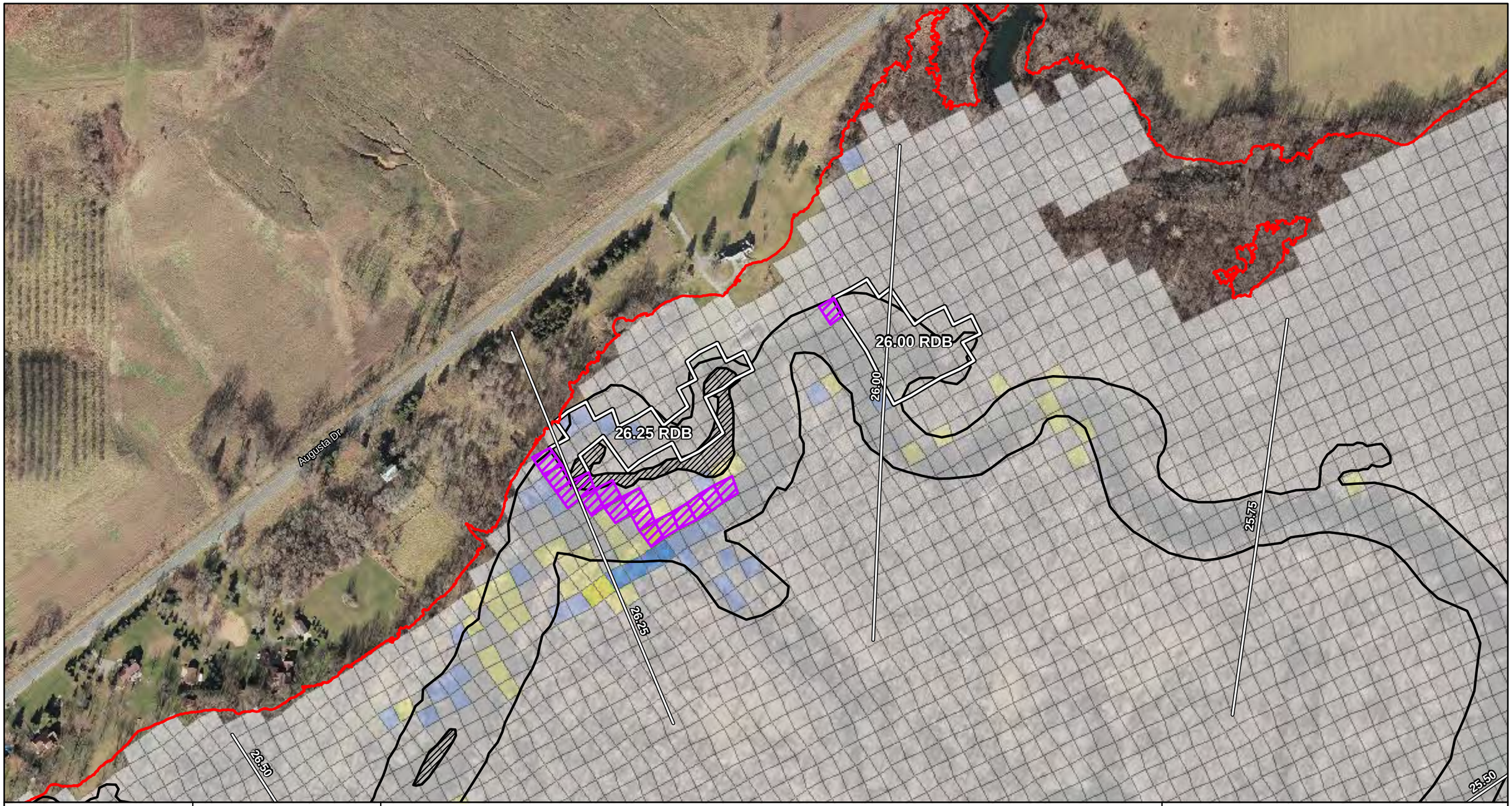
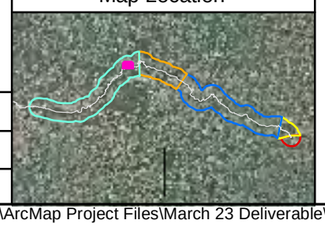
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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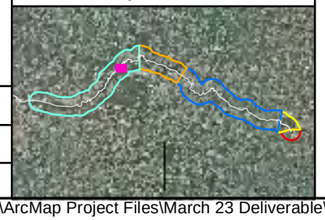
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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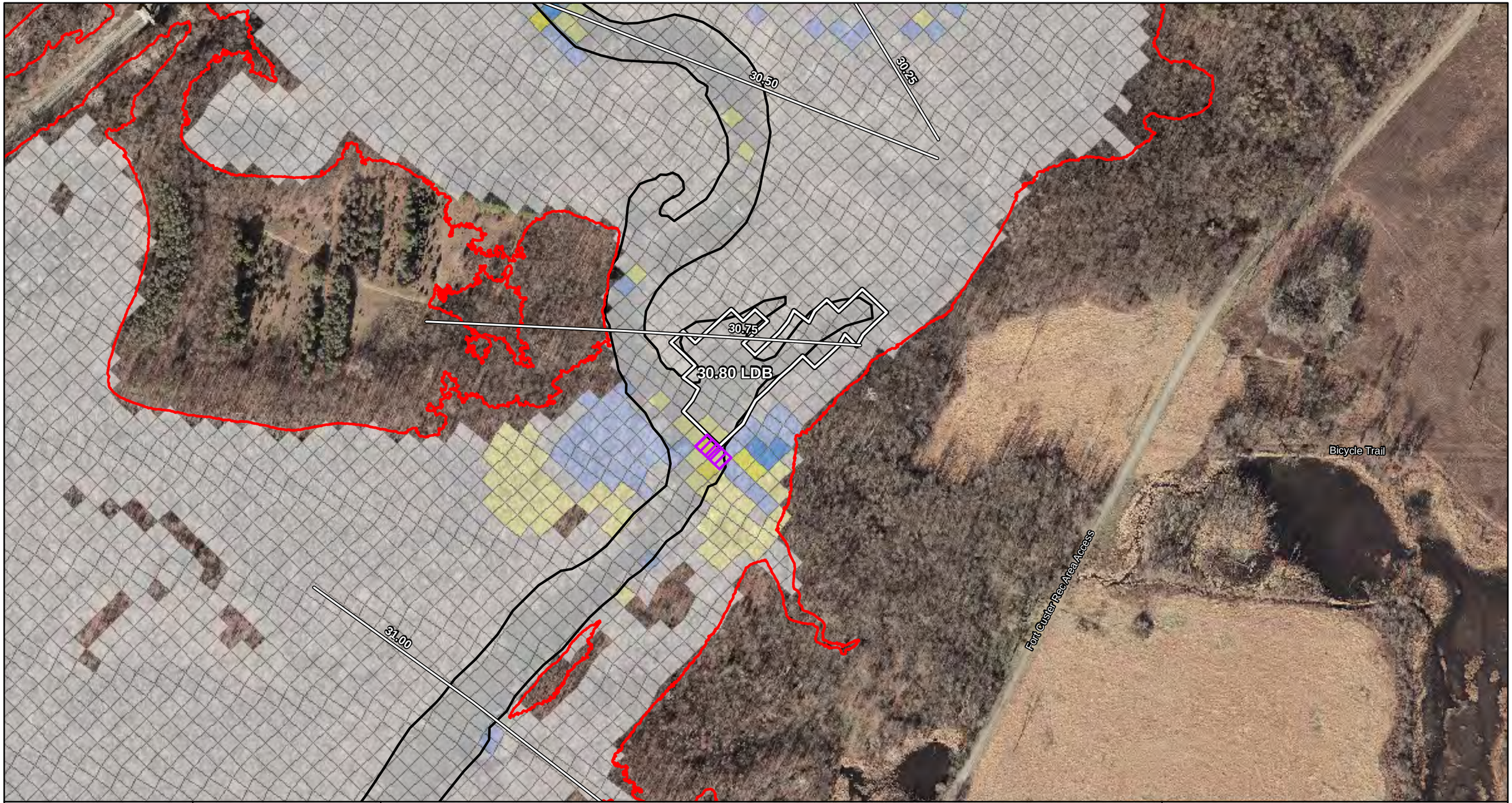
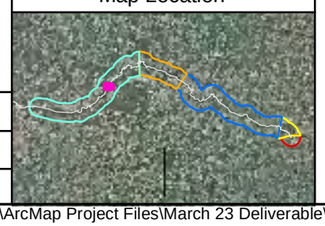
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)
99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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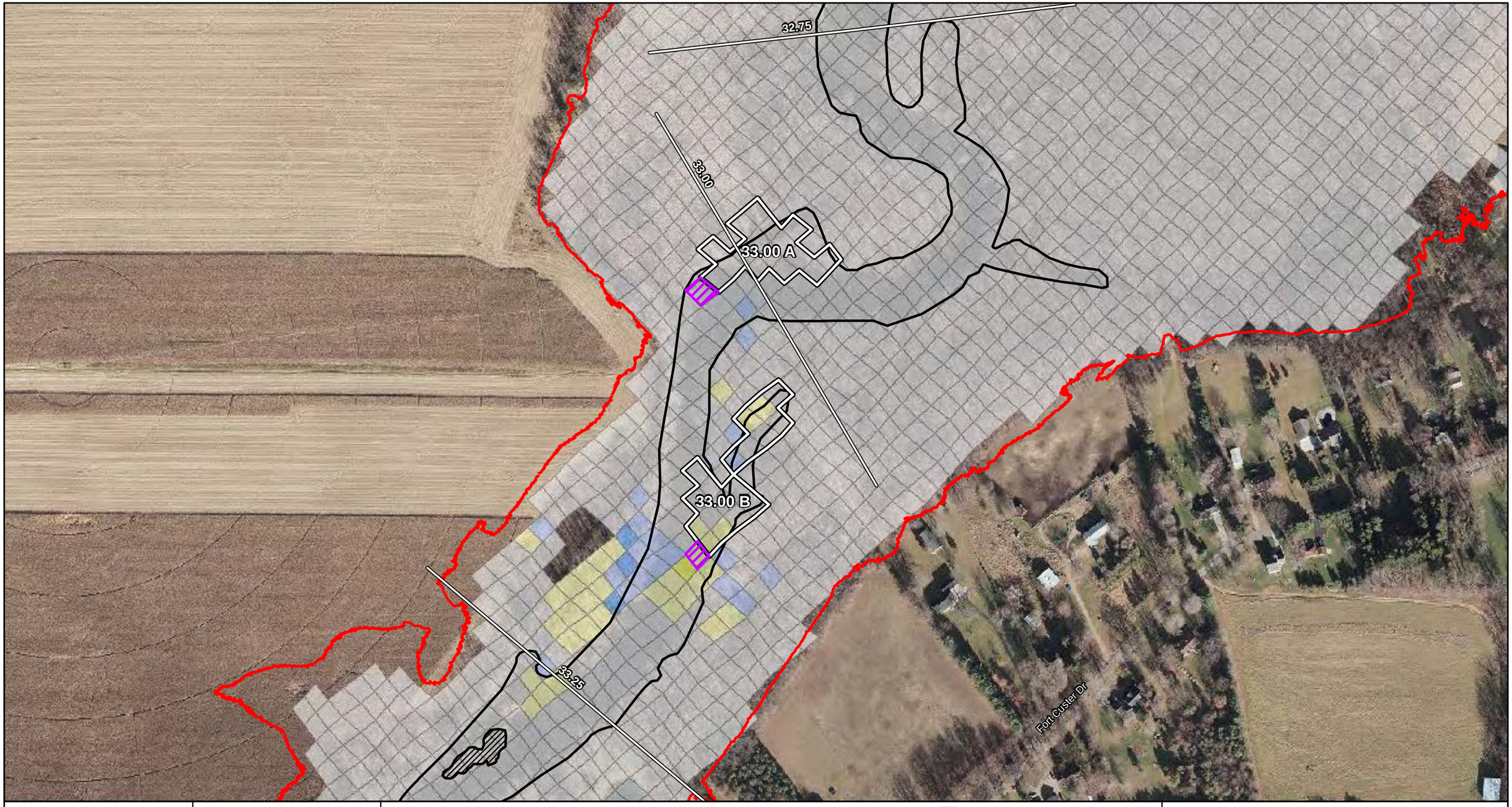
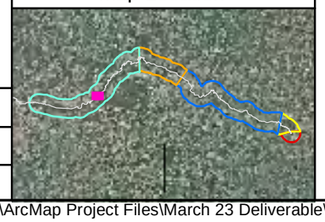
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
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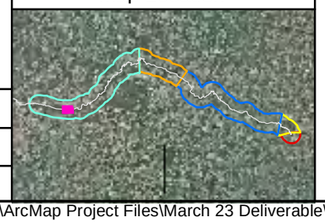
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

99% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% VS. NO STRUCTURES
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

Figure 7-30

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, 100-Year Flood

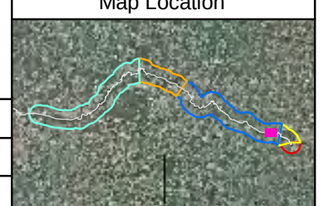
75% vs. No Structures

Sheets 1 through 15

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
3.25 R1

SHEET 1 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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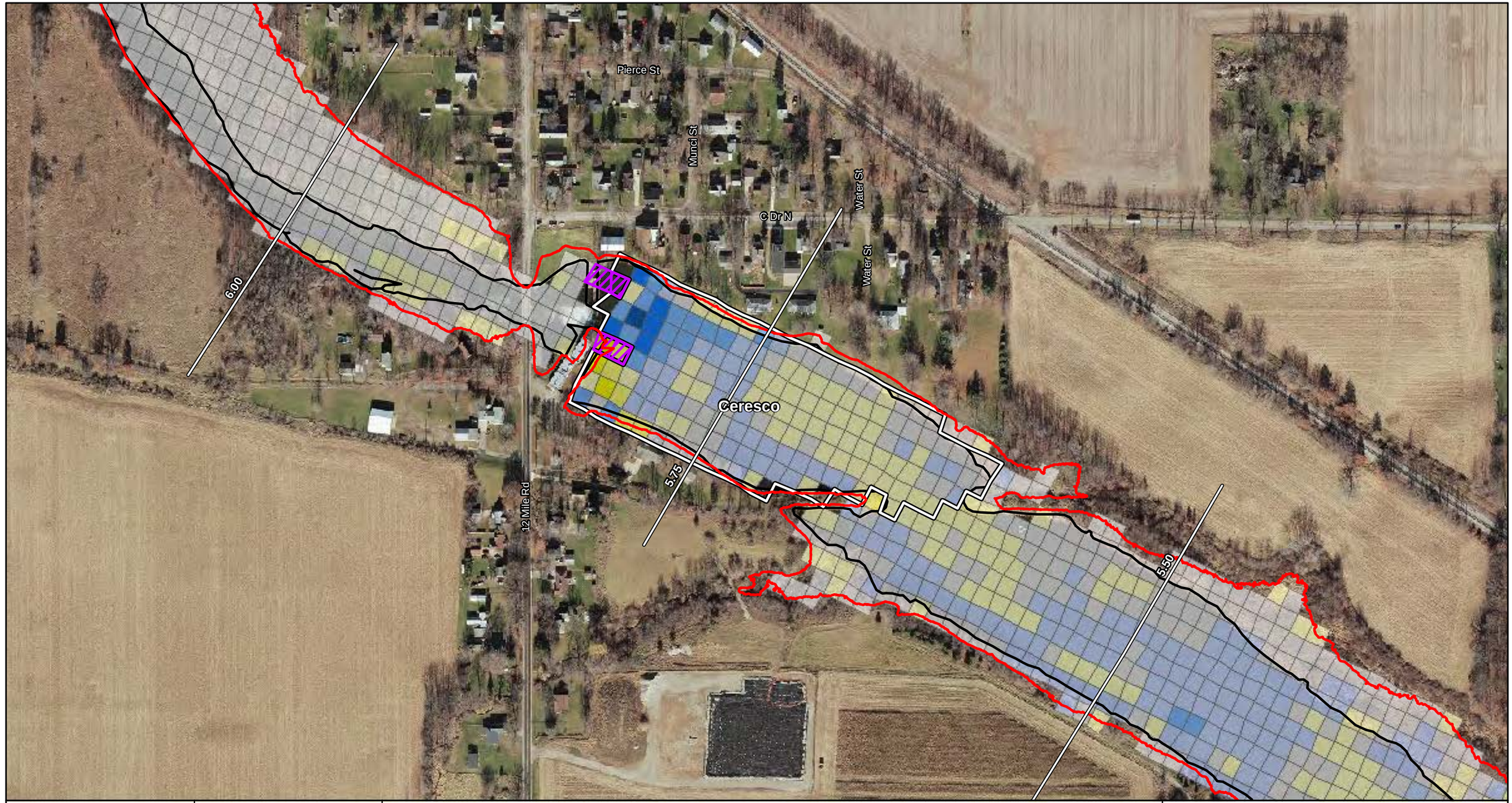
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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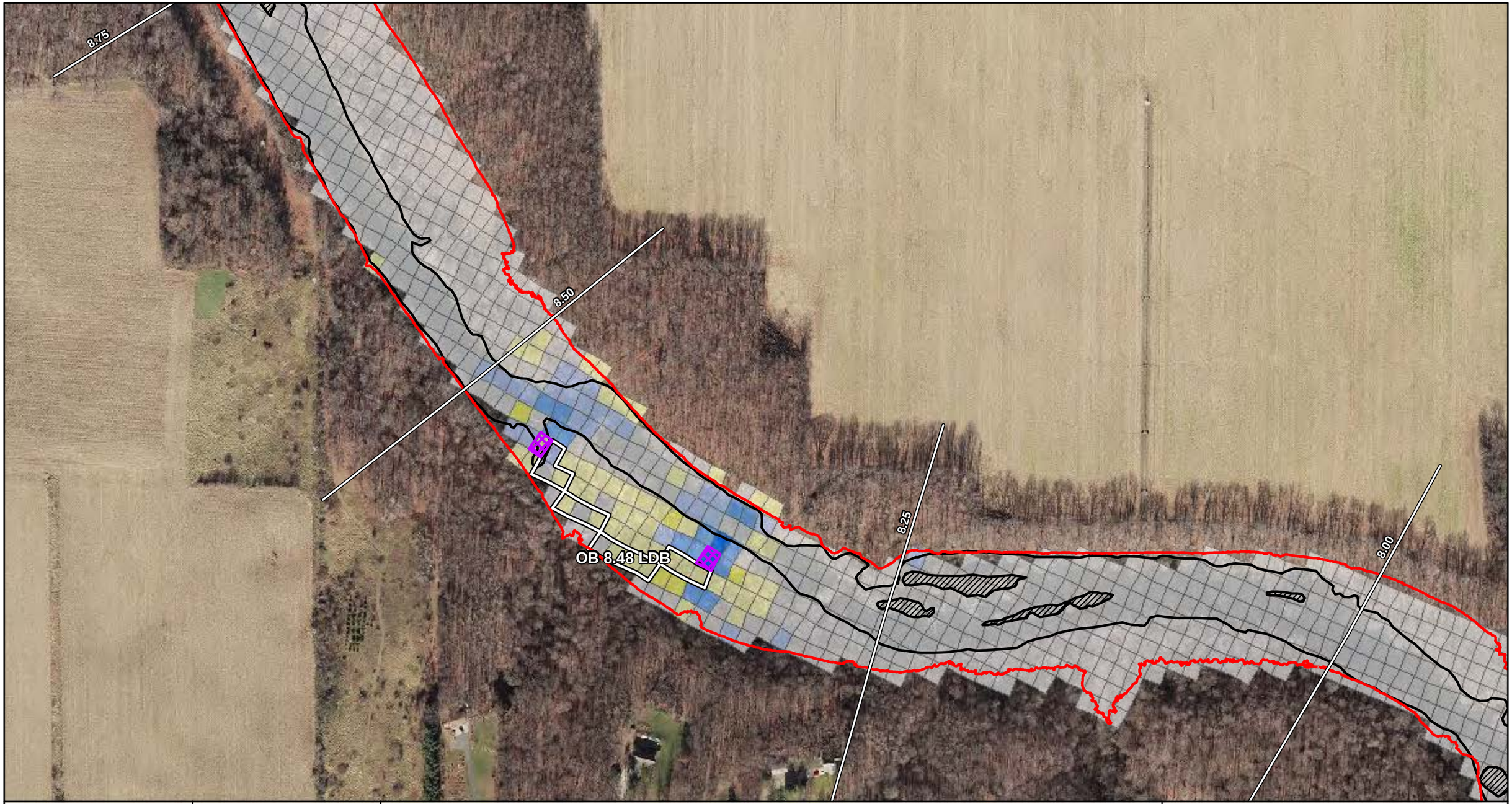
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
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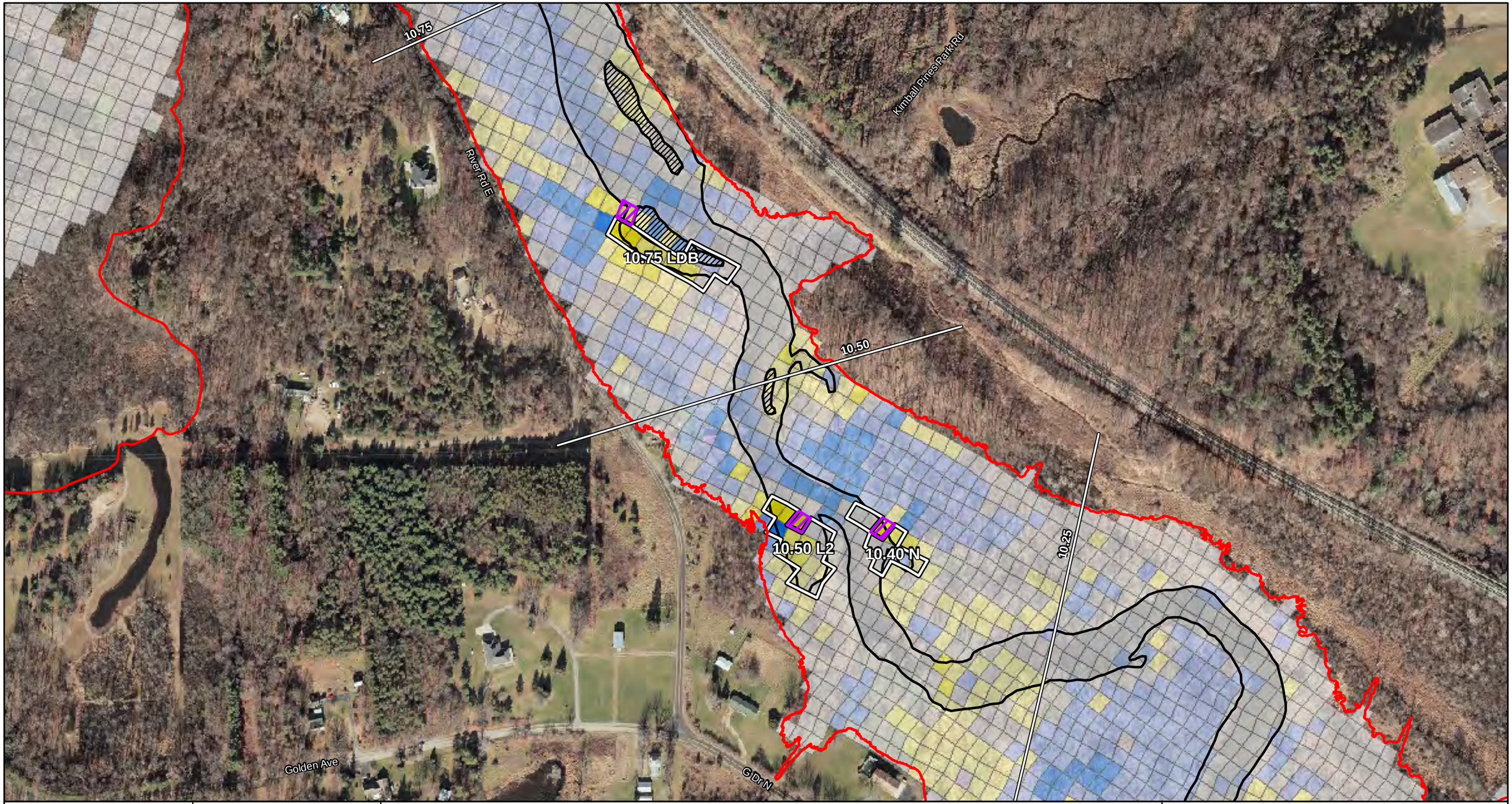
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
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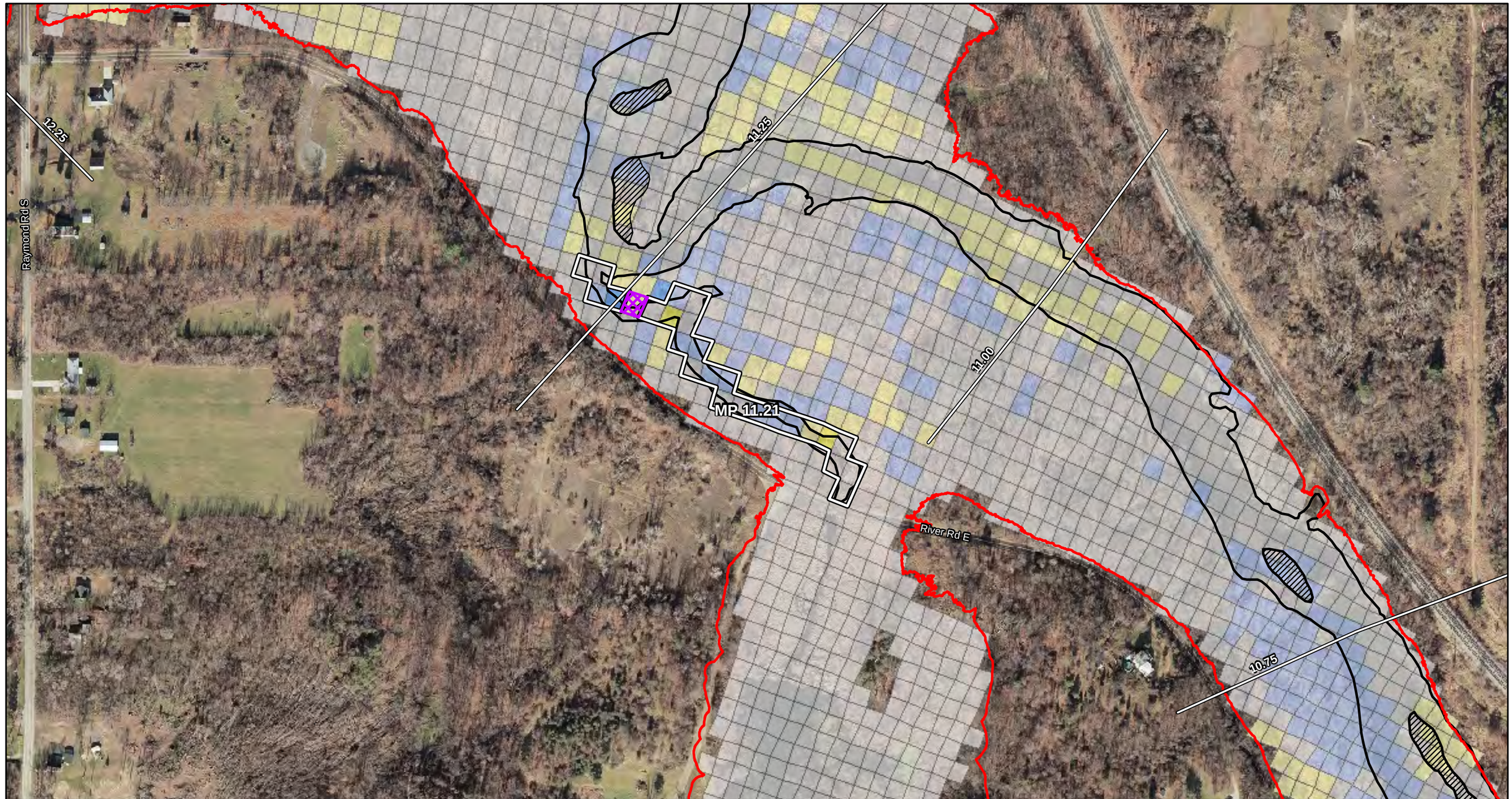
Aerial Photography Date: November 2011



Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

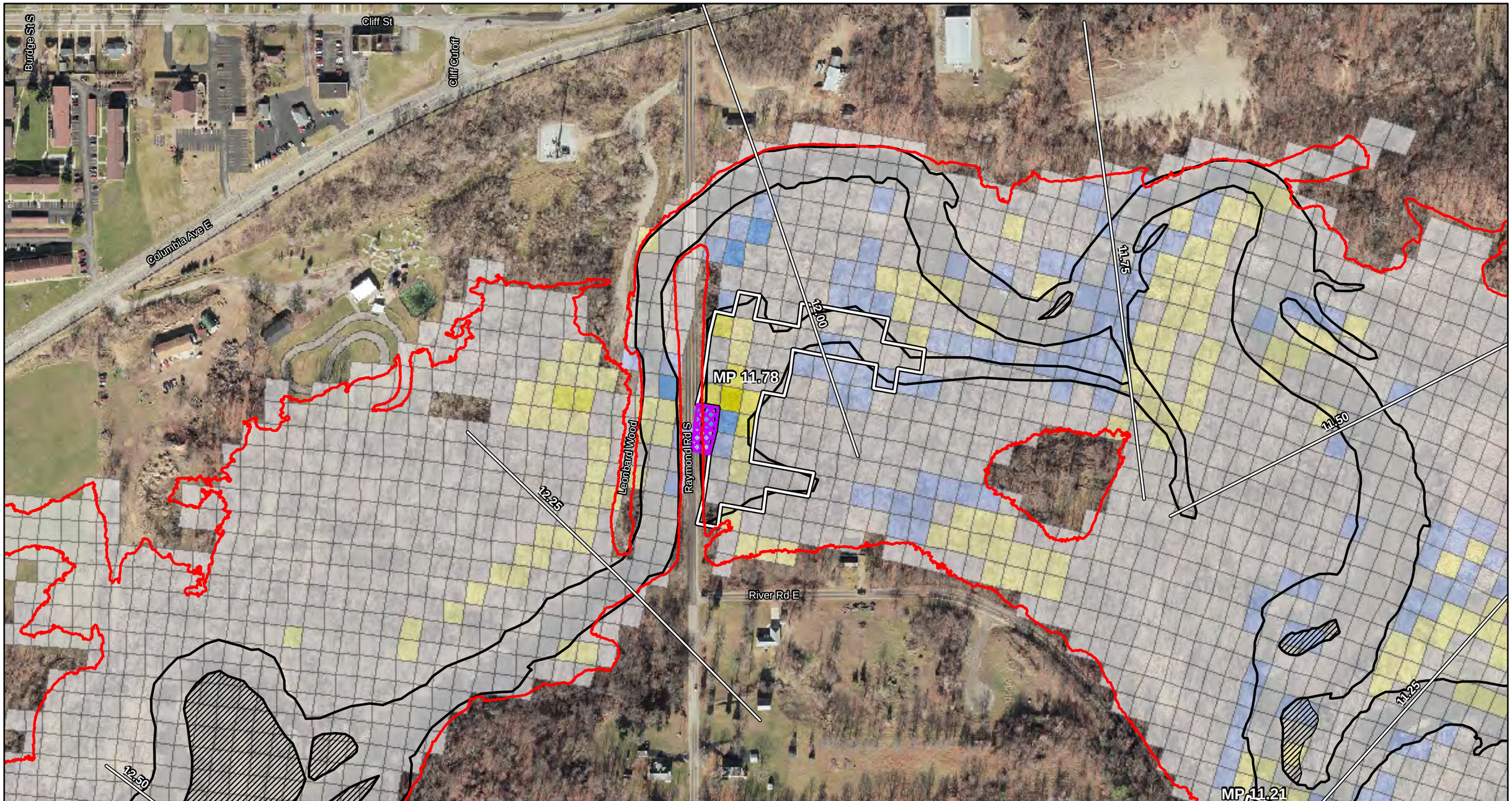
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsF1_F3_100yr.mxd

Aerial Photography Date: November 2011



Map Location

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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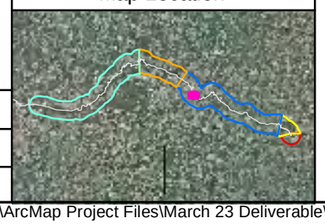
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

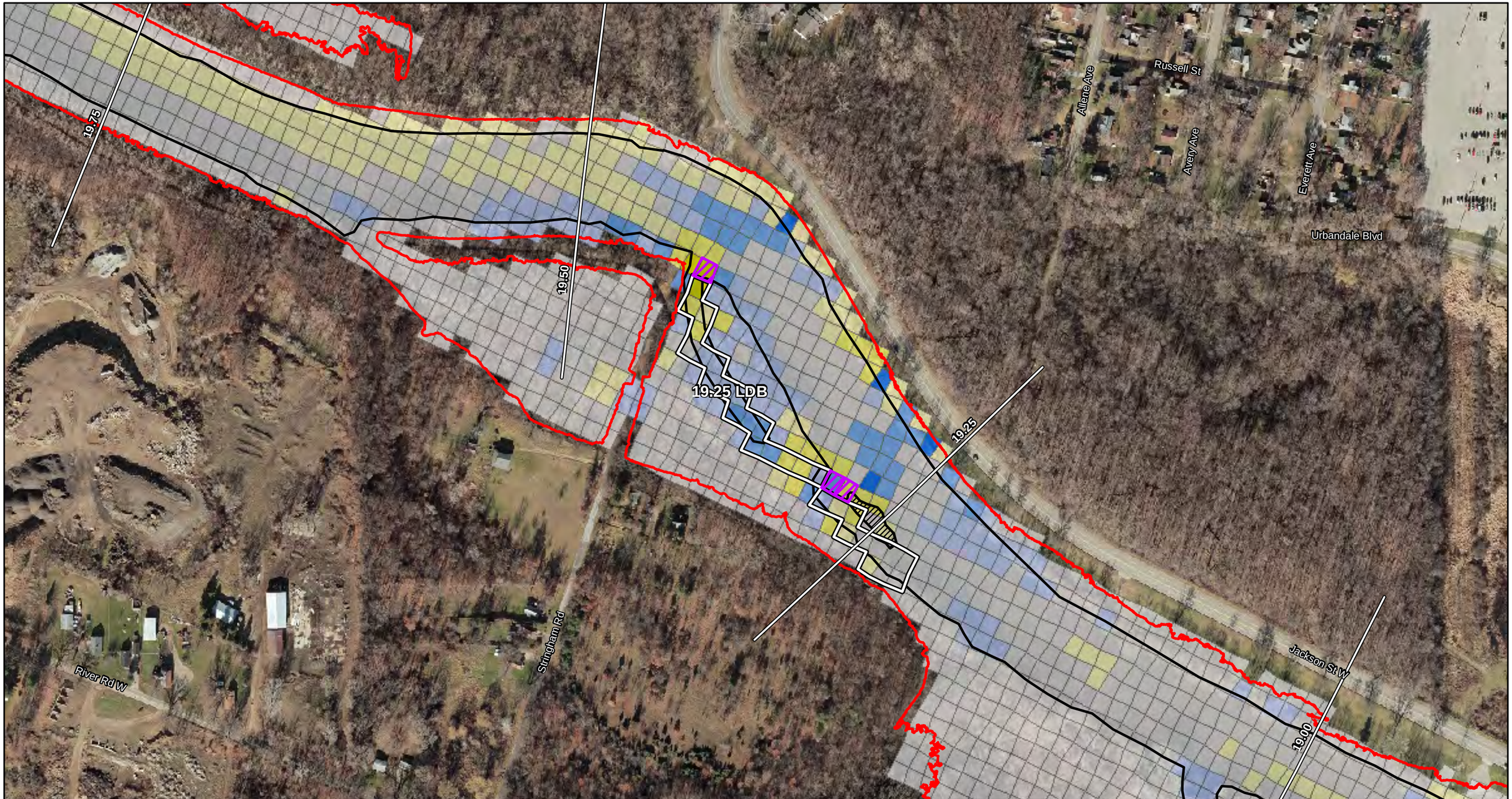
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsF1_F3_100yr.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

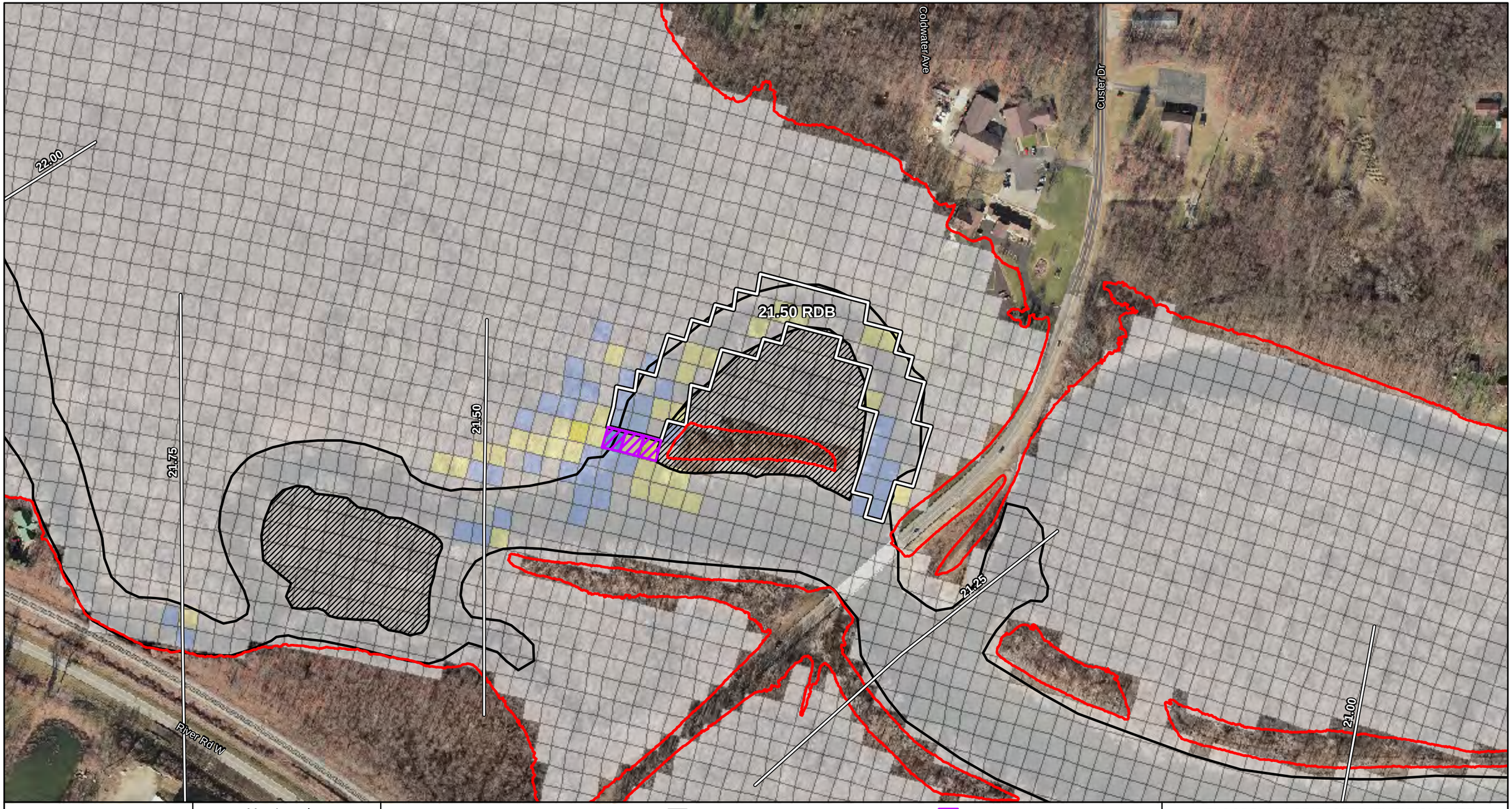
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_TrapsF1_F3_100yr.mxd

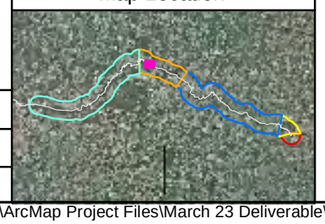
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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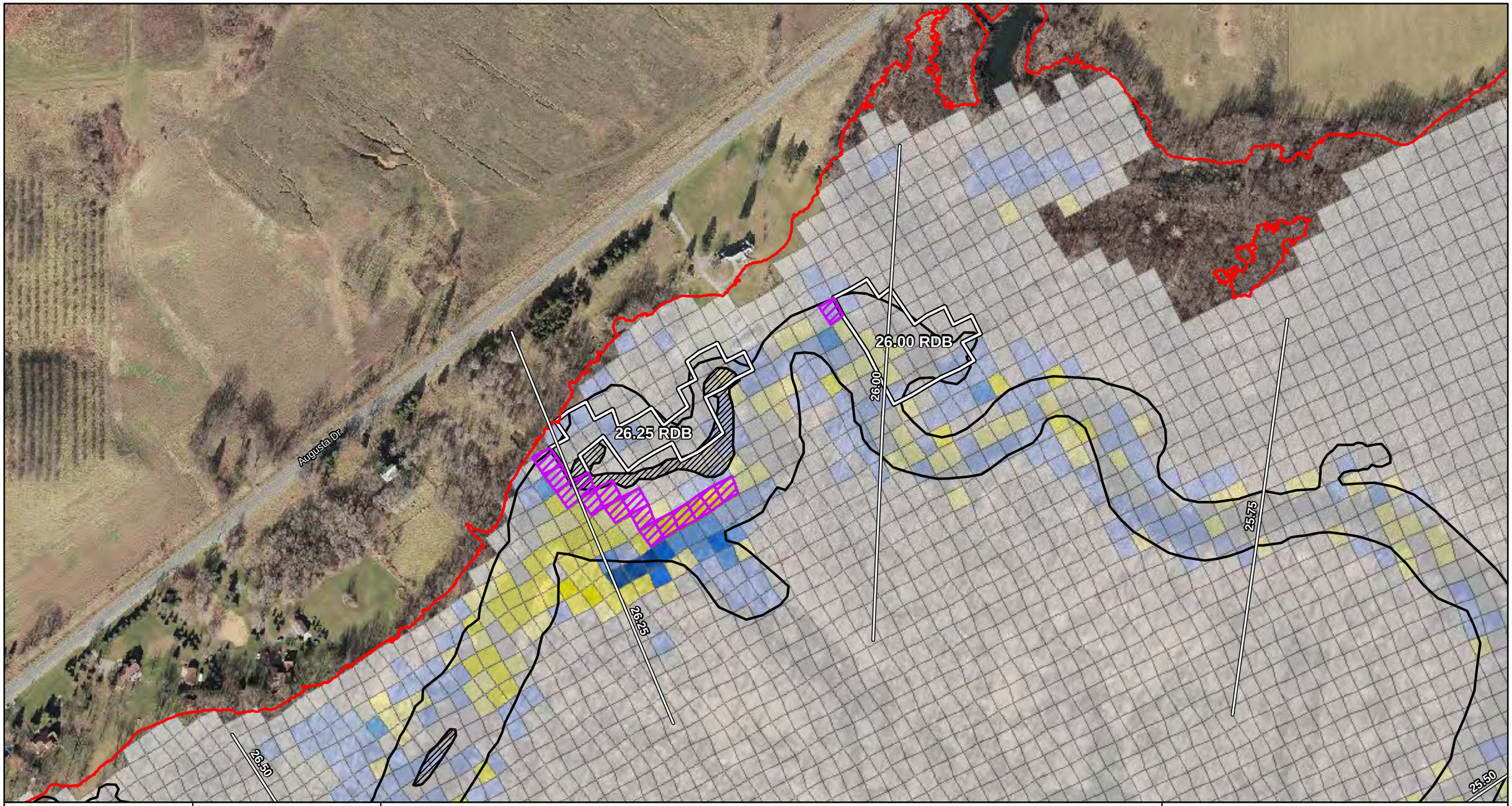
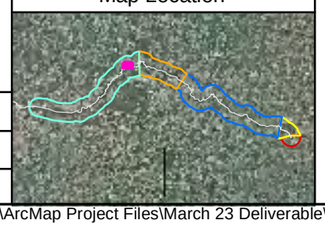
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
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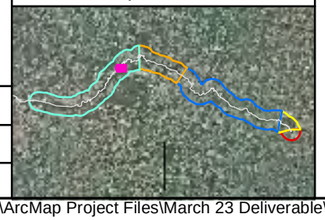
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
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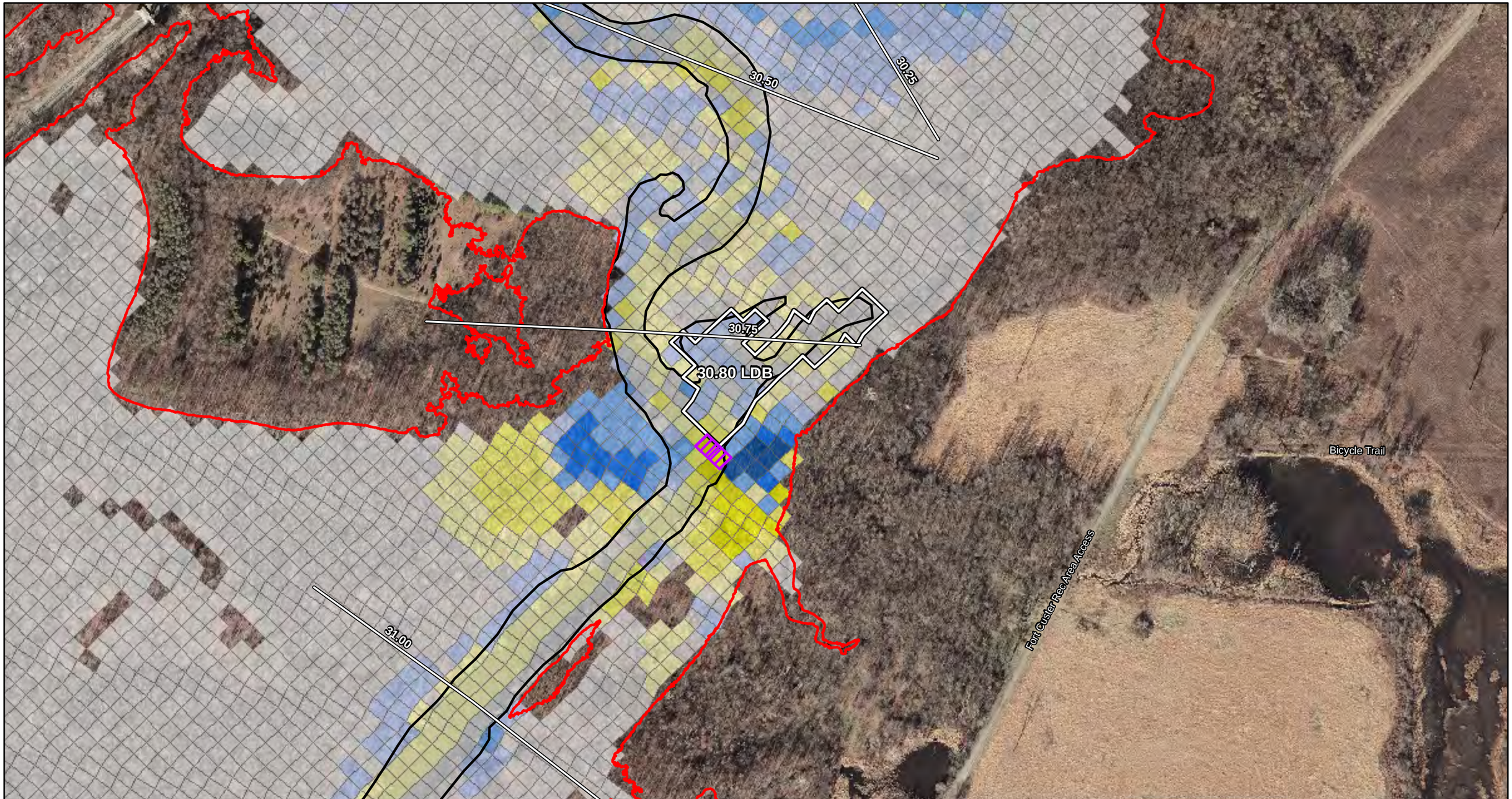
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)
75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation
- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

mm/week = Millimeters Per Week

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
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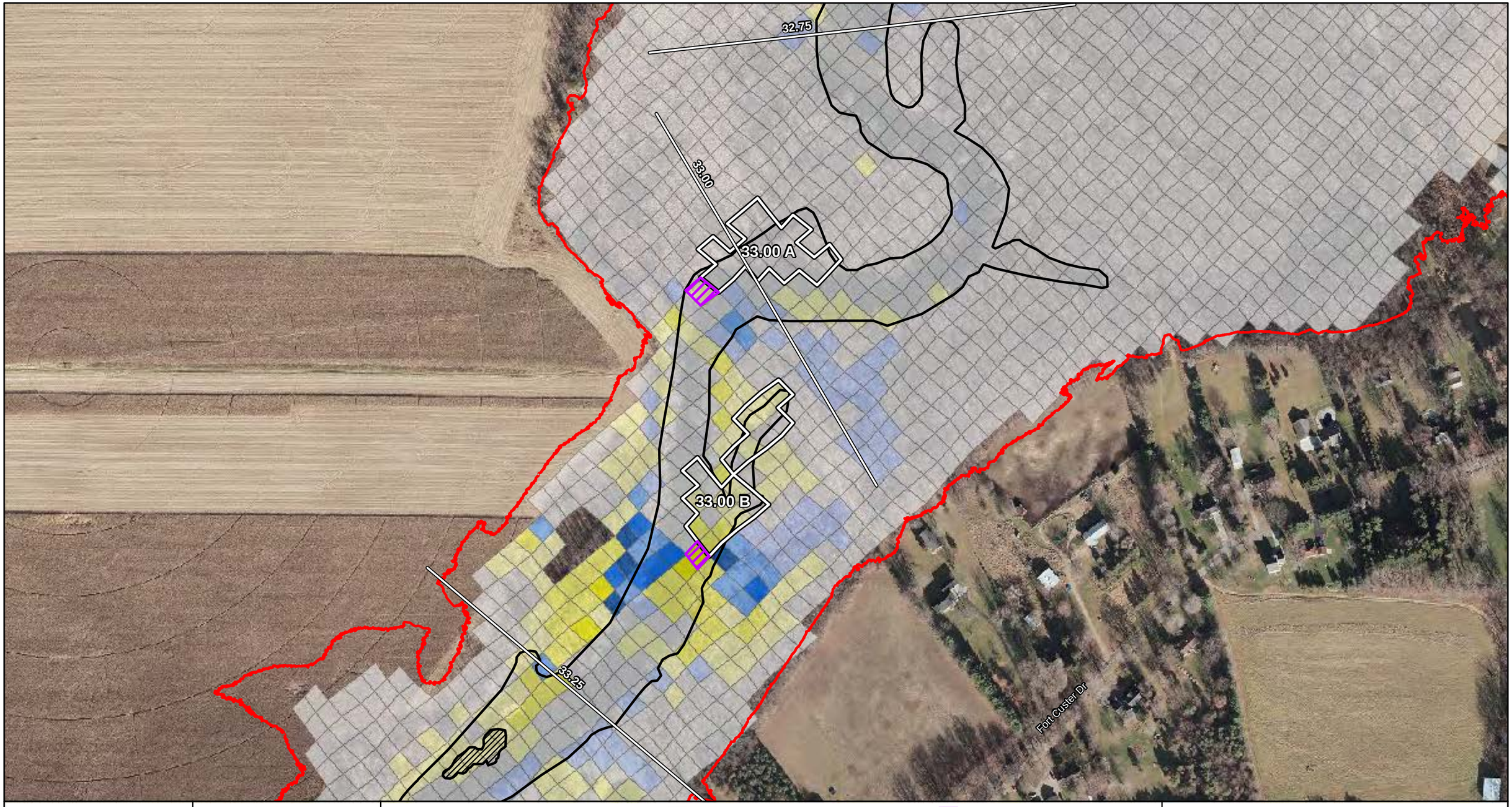
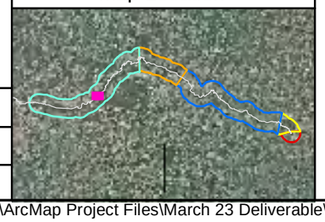
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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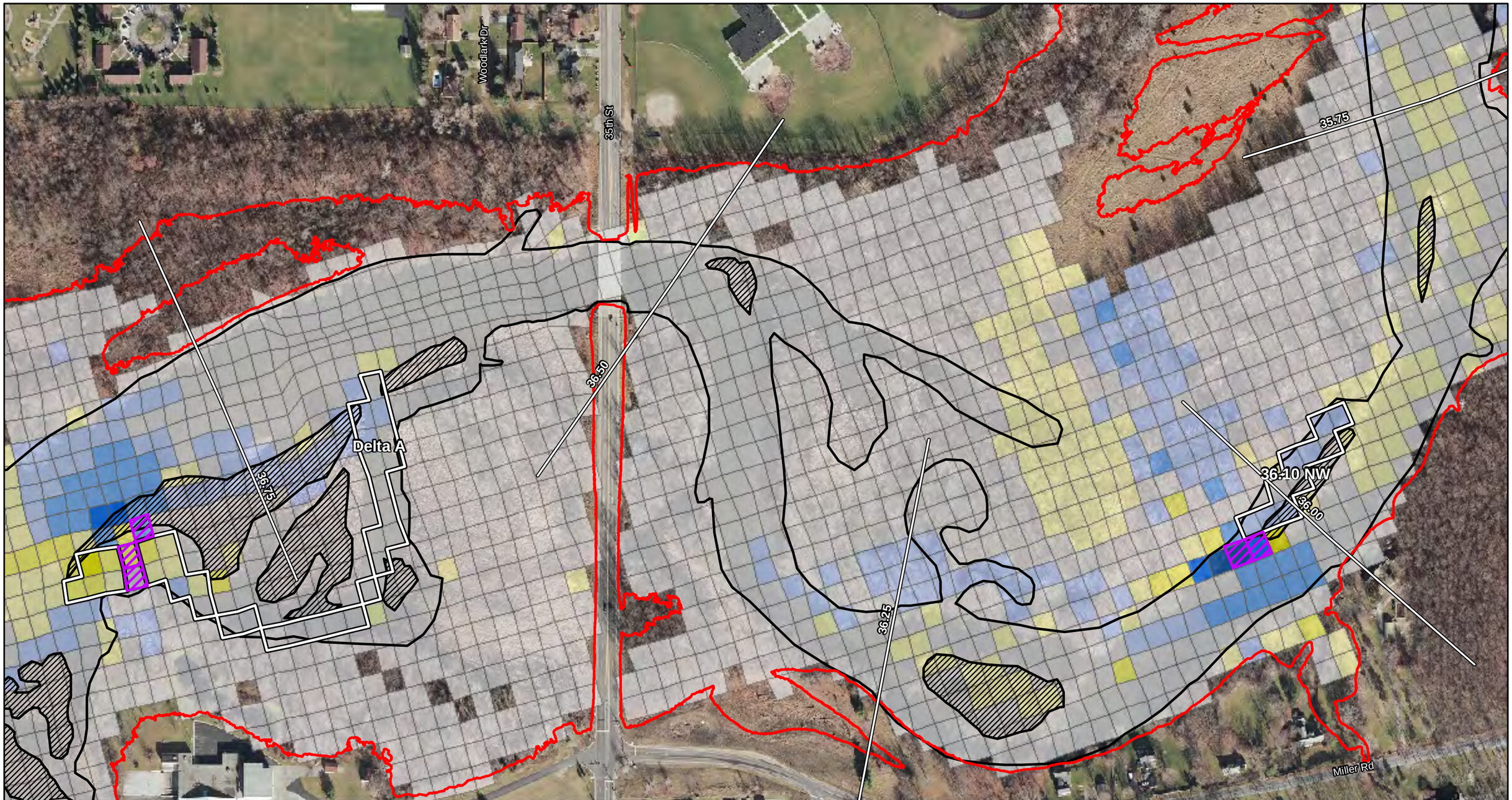
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Change in Sedimentation Rate (mm/week)

75% Structures vs. No Structures

- >10.00 decrease in sedimentation
- 5.00 - 10.00 decrease in sedimentation
- 1.00 - 5.00 decrease in sedimentation
- 0.10 - 1.00 decrease in sedimentation

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 increase in sedimentation
- 1.00 - 5.00 increase in sedimentation
- 5.00 - 10.00 increase in sedimentation
- >10.00 increase in sedimentation
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

Figure 7-31

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, 100-Year Flood

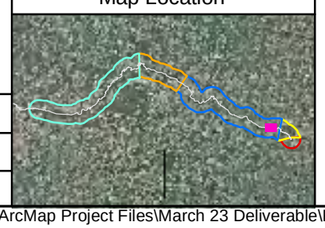
No Structure

Sheets 1 through 15

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
3.25 R1

SHEET 1 OF 15

ENBRIDGE LINE 6B MP 608
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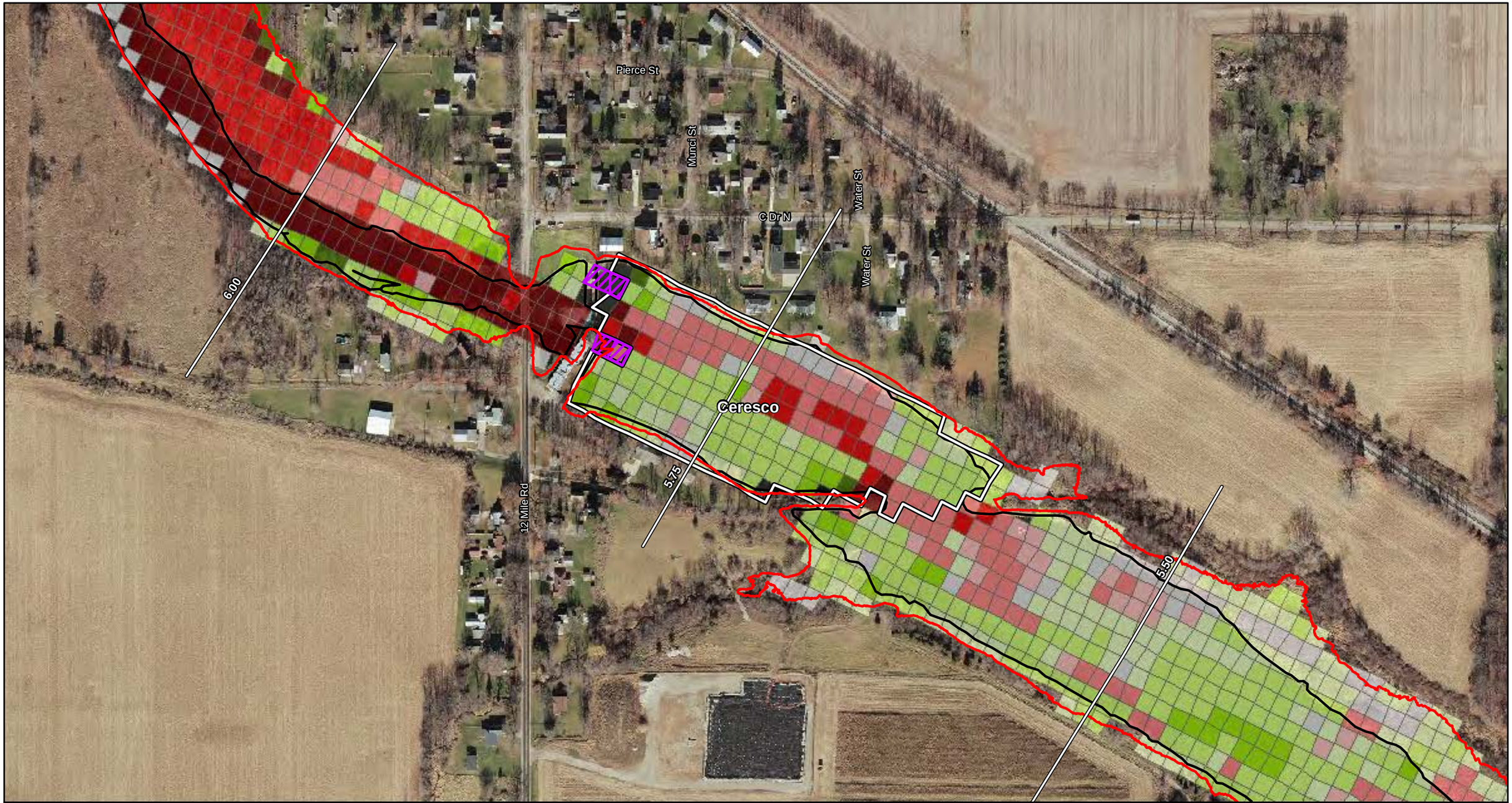
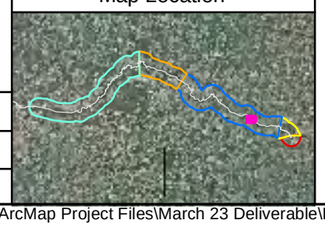
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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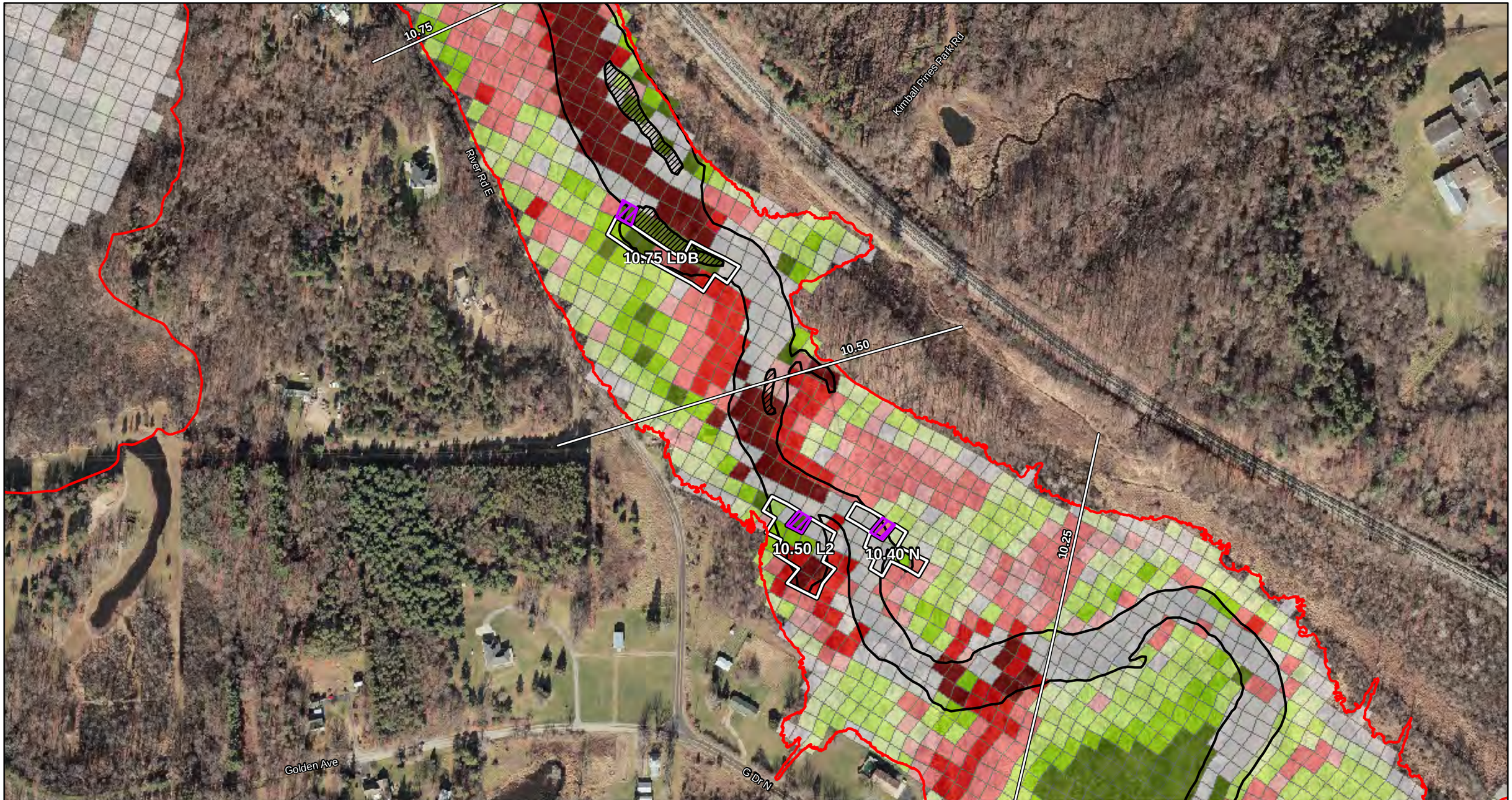
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

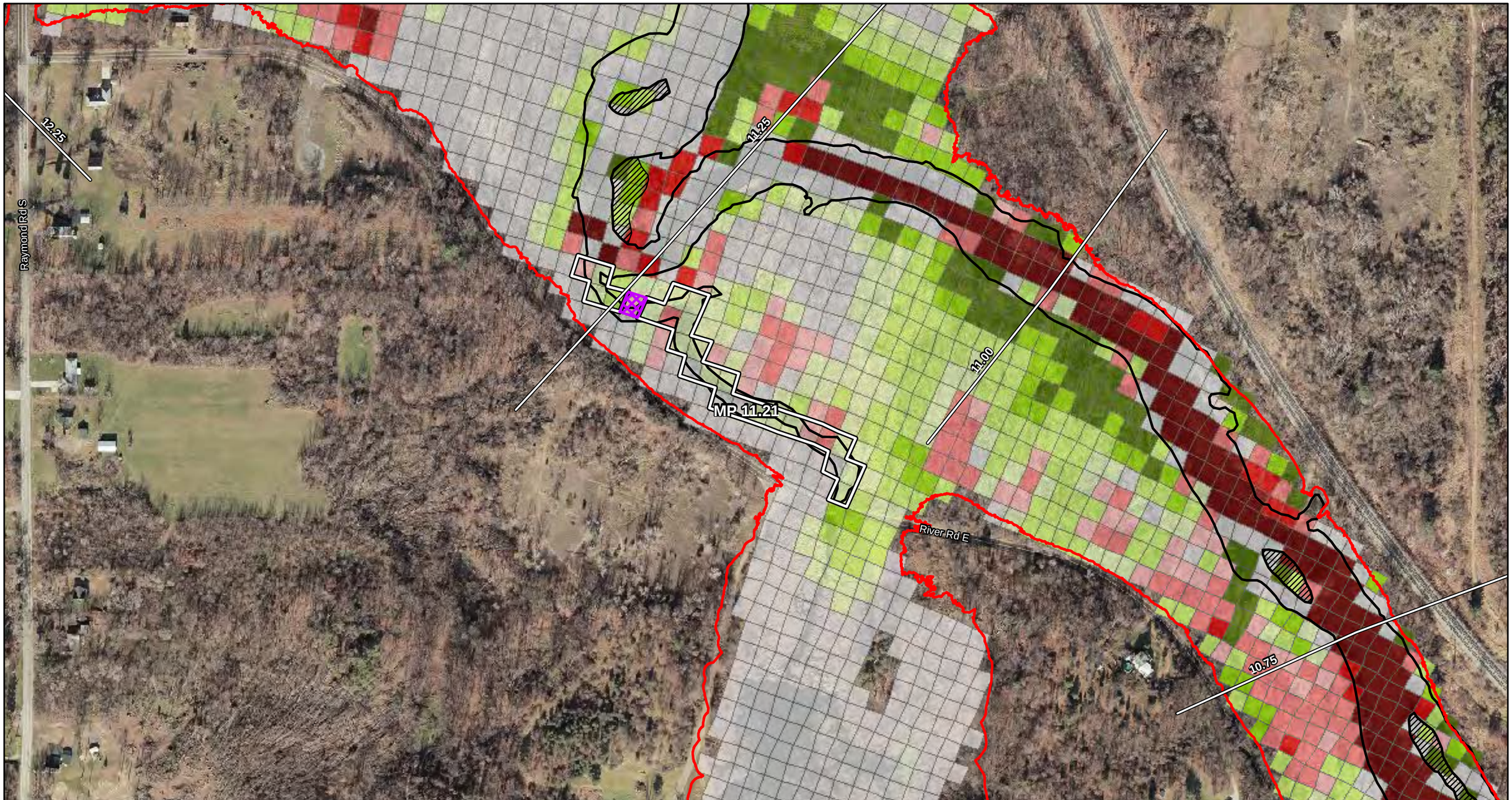
FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_Traps_100yr.mxd

Aerial Photography Date: November 2011



Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

Burdge St S
Cliff St
Cliff Cutoff
Columbia Ave E
Leonhard Wood
Raymond Rd S
River Rd E
MP 11.78
MP 11.21
12.00
11.75
12.25
11.50
12.50
11.25

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
MP 11.78

SHEET 6 OF 15

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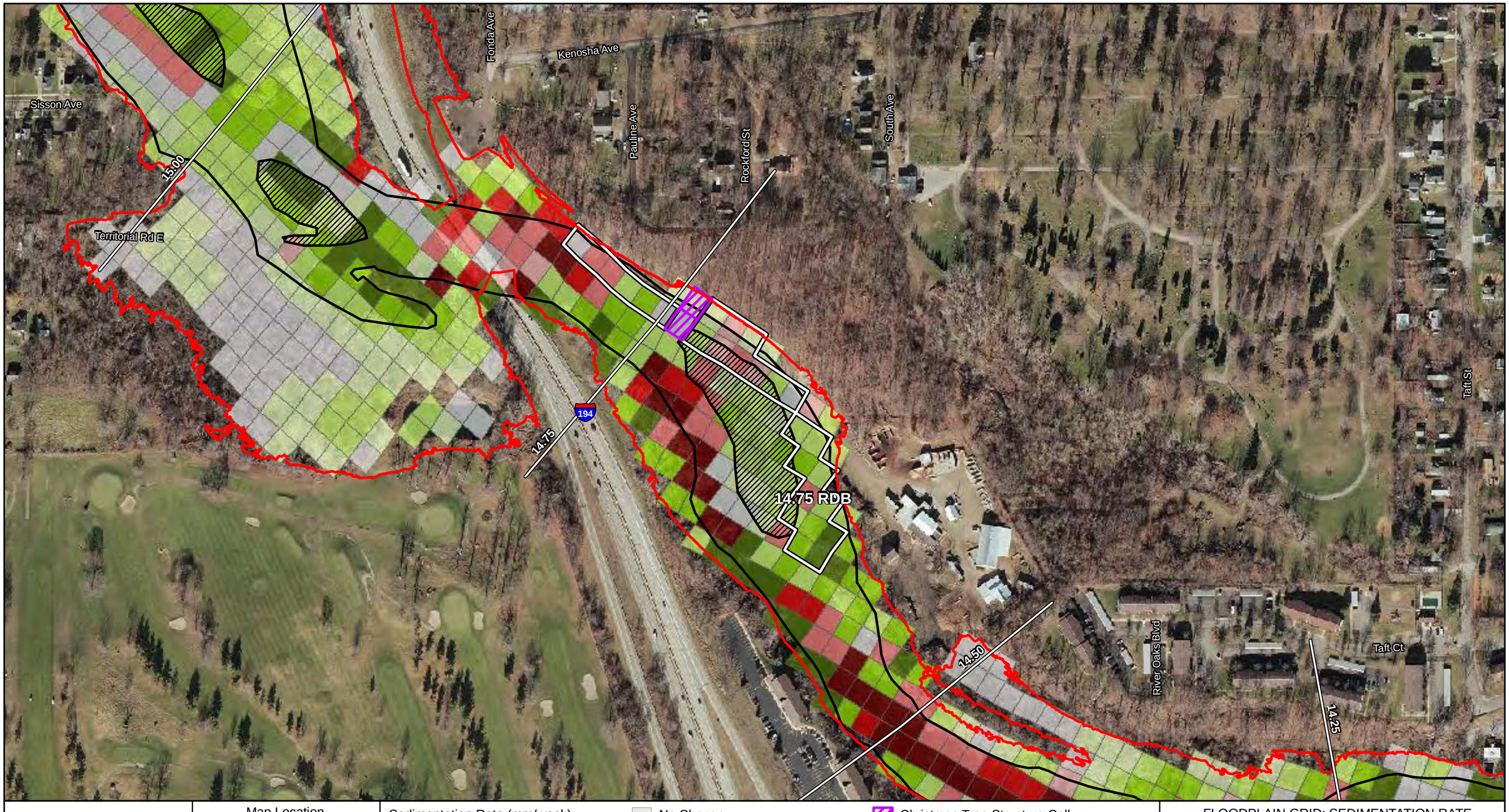
Aerial Photography Date: November 2011



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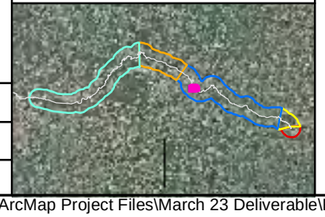
Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
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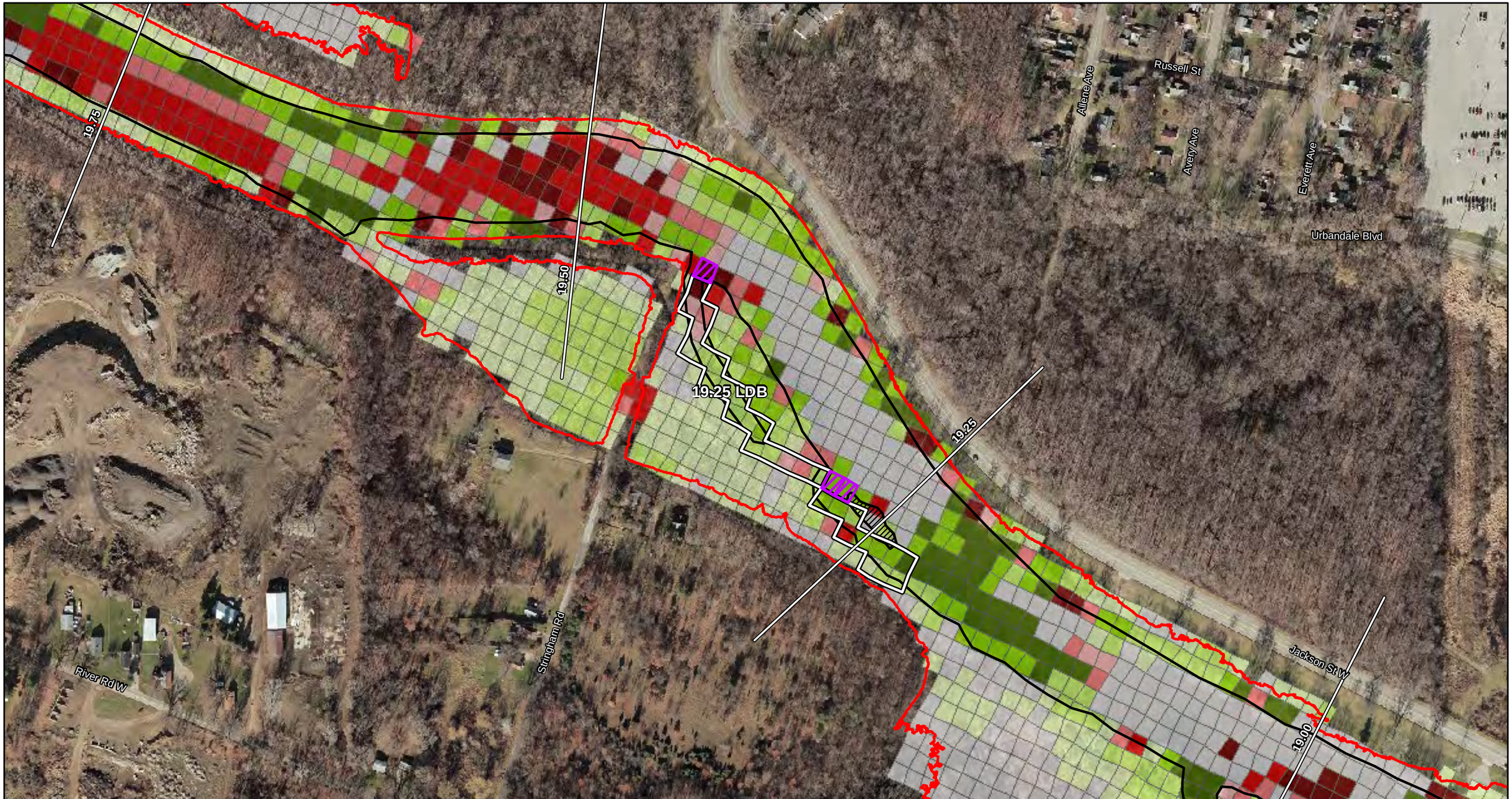
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
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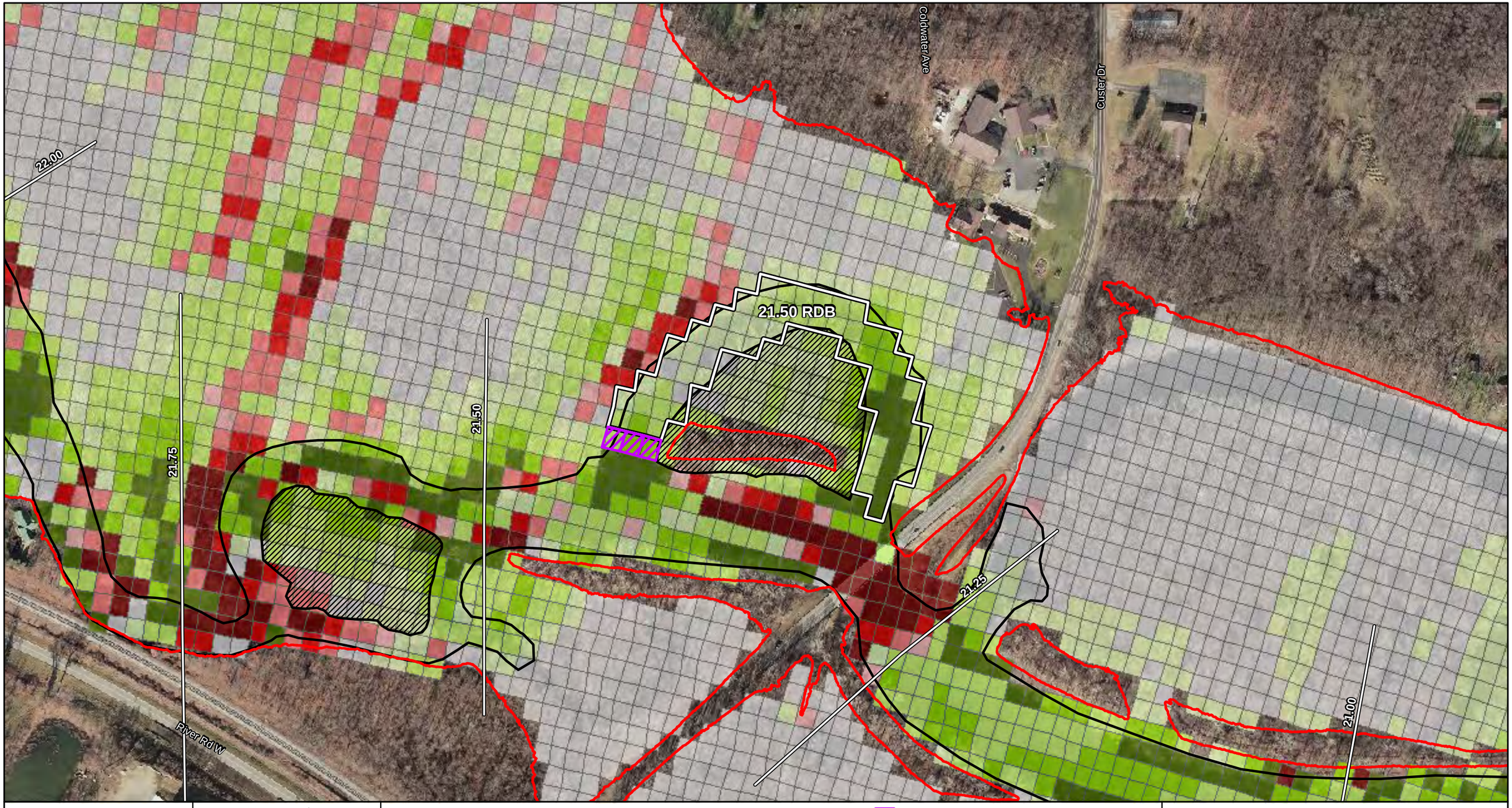
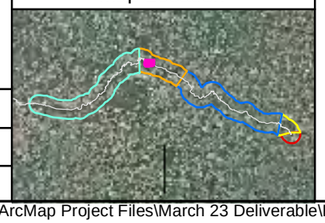
Aerial Photography Date: November 2011



Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

ENBRIDGE

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FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
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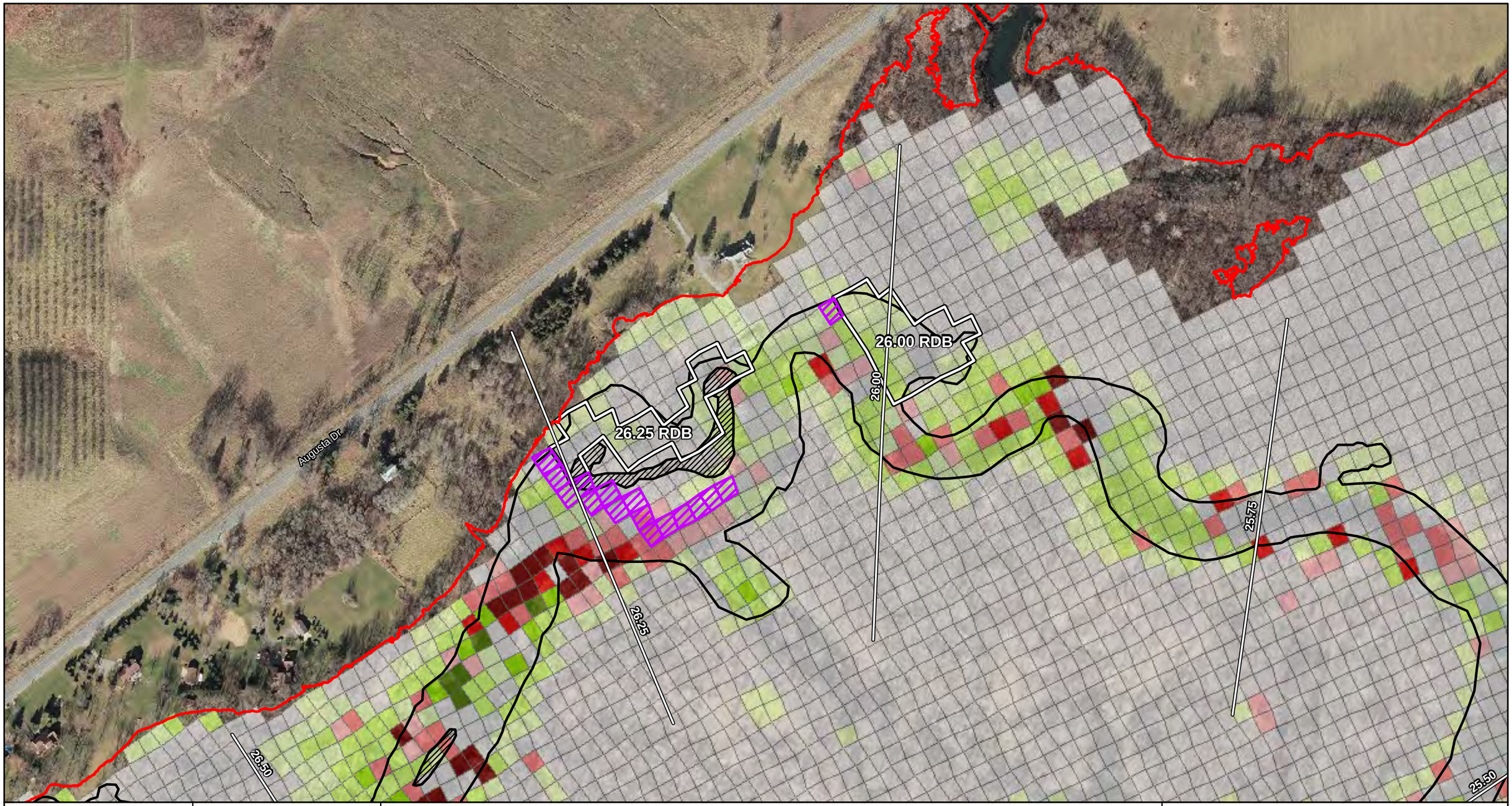
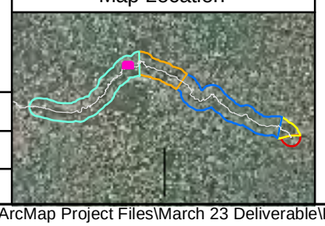
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
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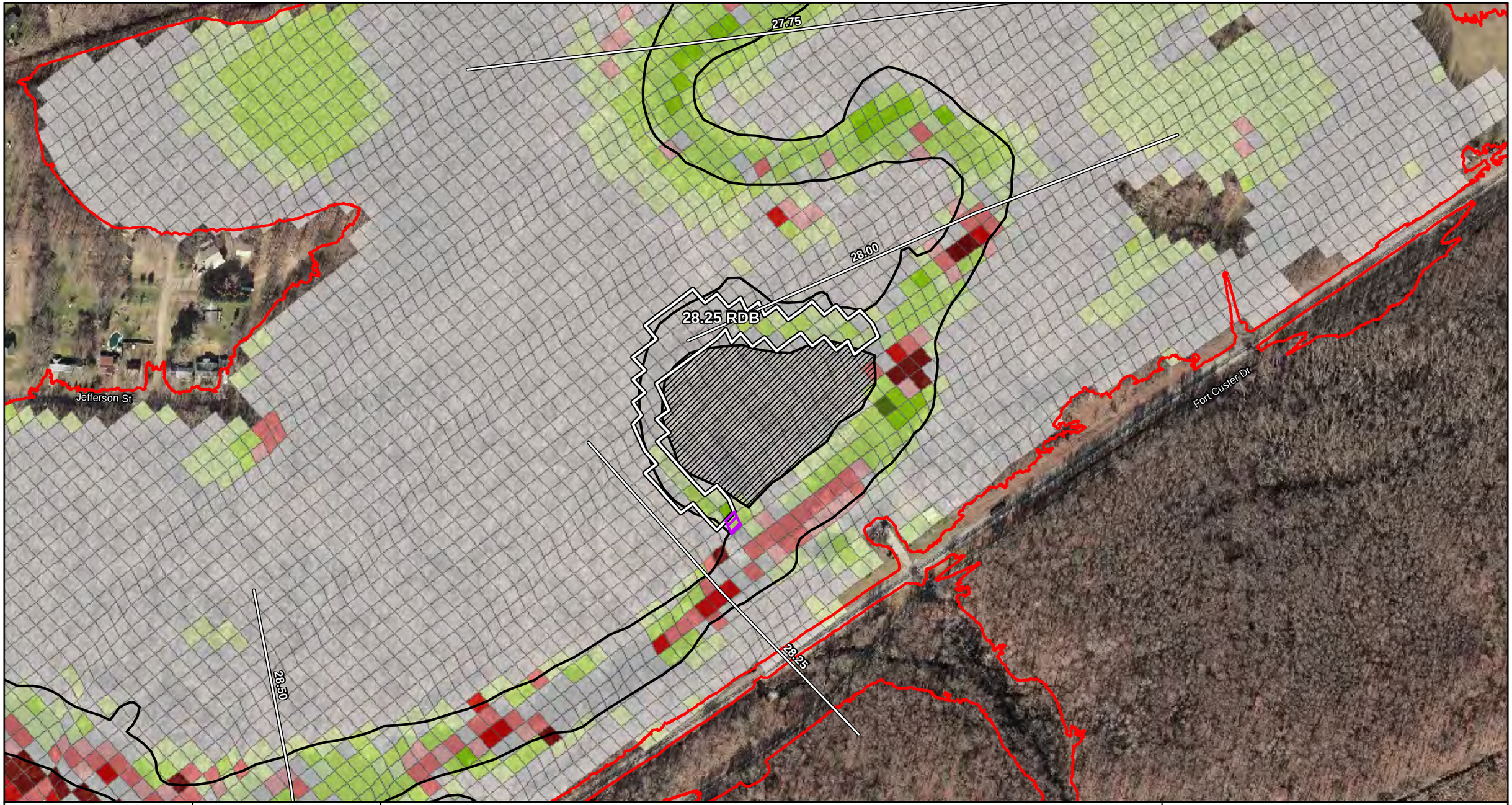
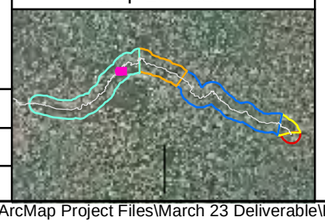
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
28.25 RDB

SHEET 11 OF 15

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Aerial Photography Date: November 2011

30.50

30.25

30.75

30.80 LDB

31.00

Bicycle Trail

Fort Custer Rec Area Access

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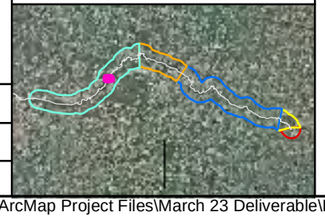
Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
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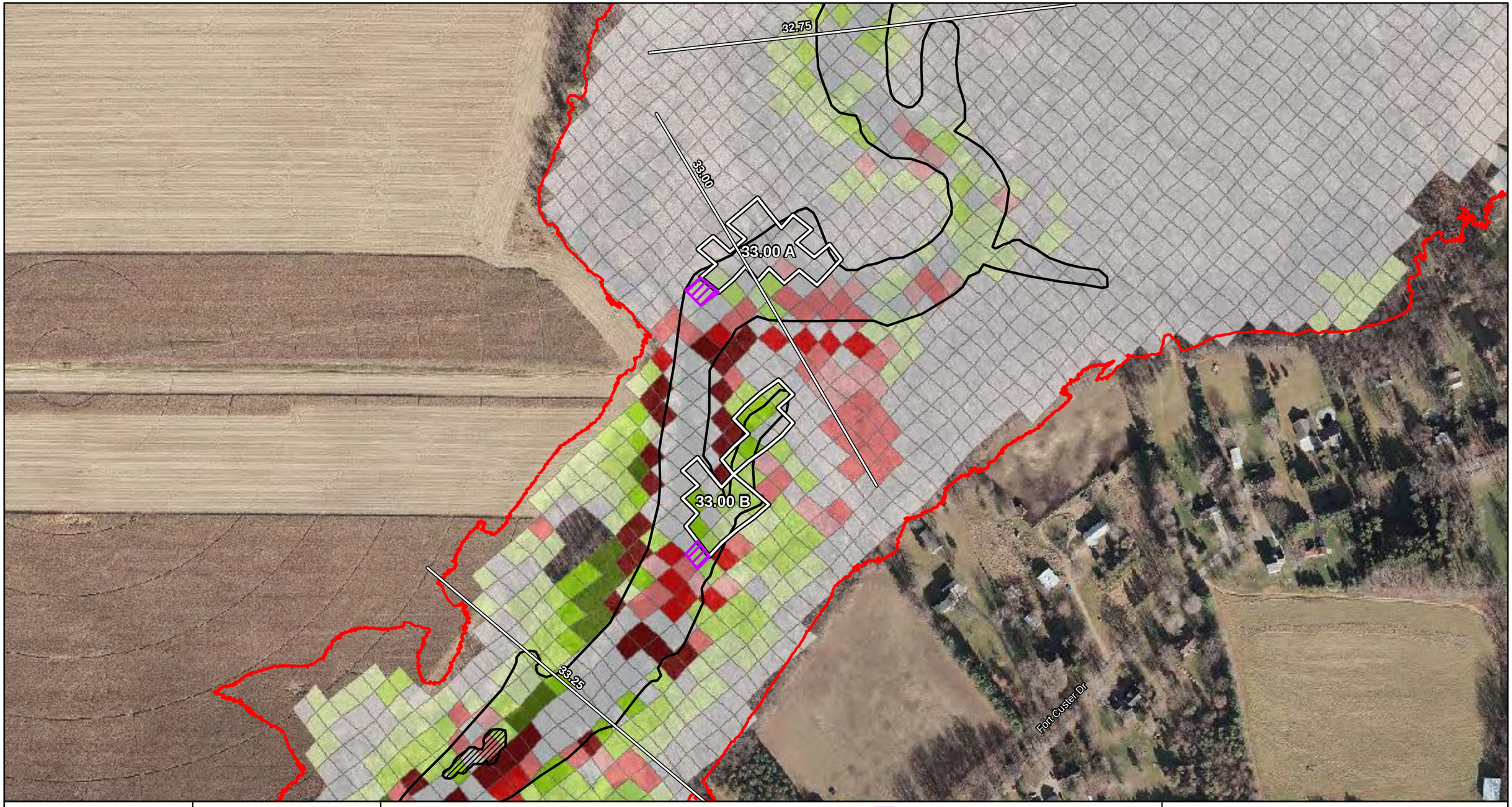
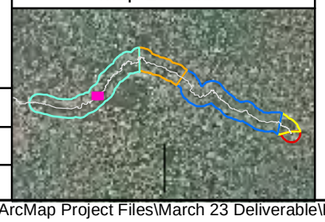
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
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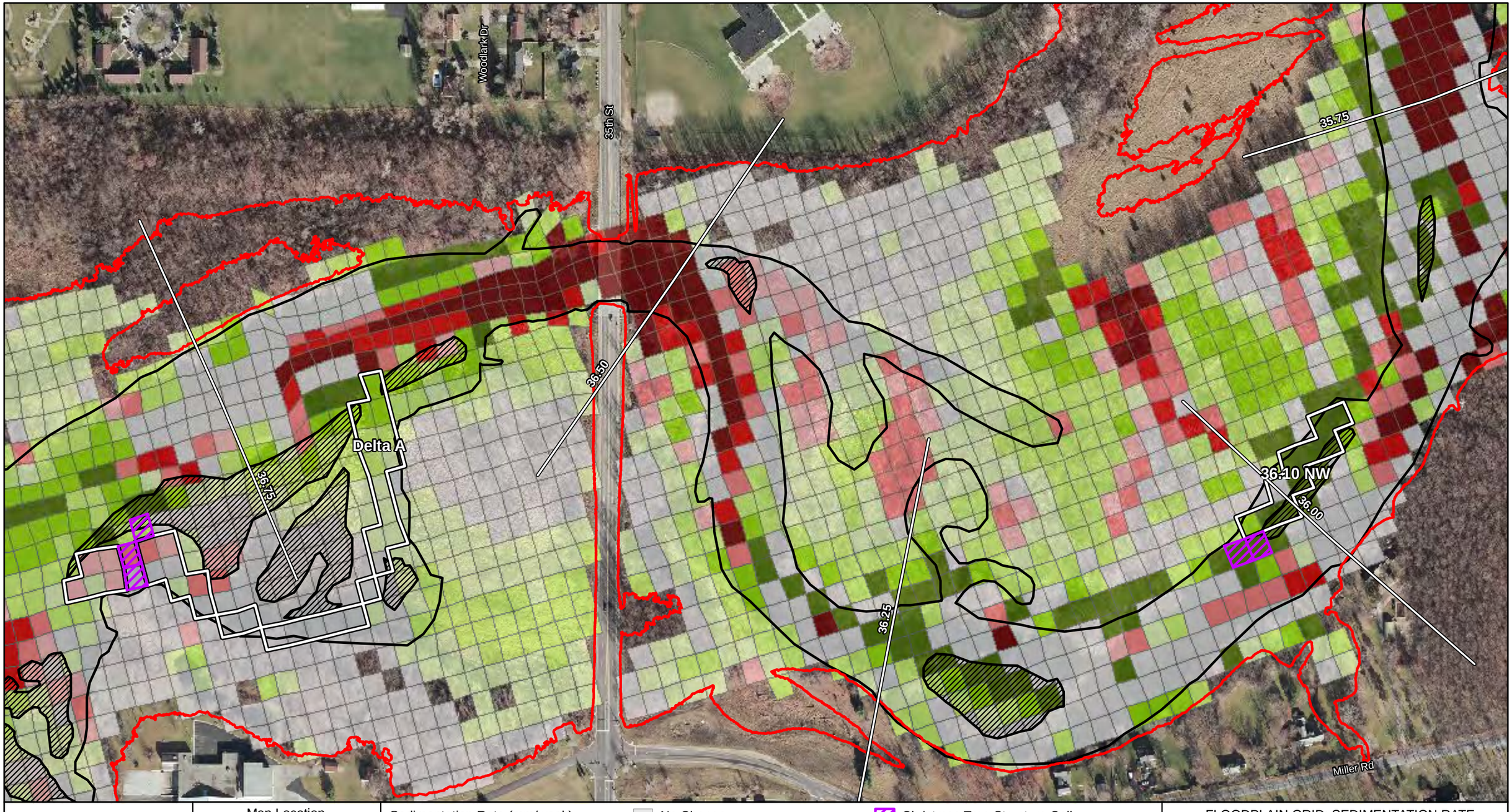
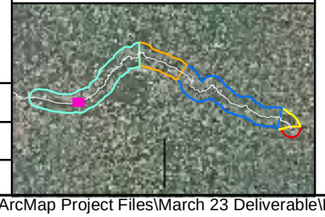
Aerial Photography Date: November 2011



Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

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Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
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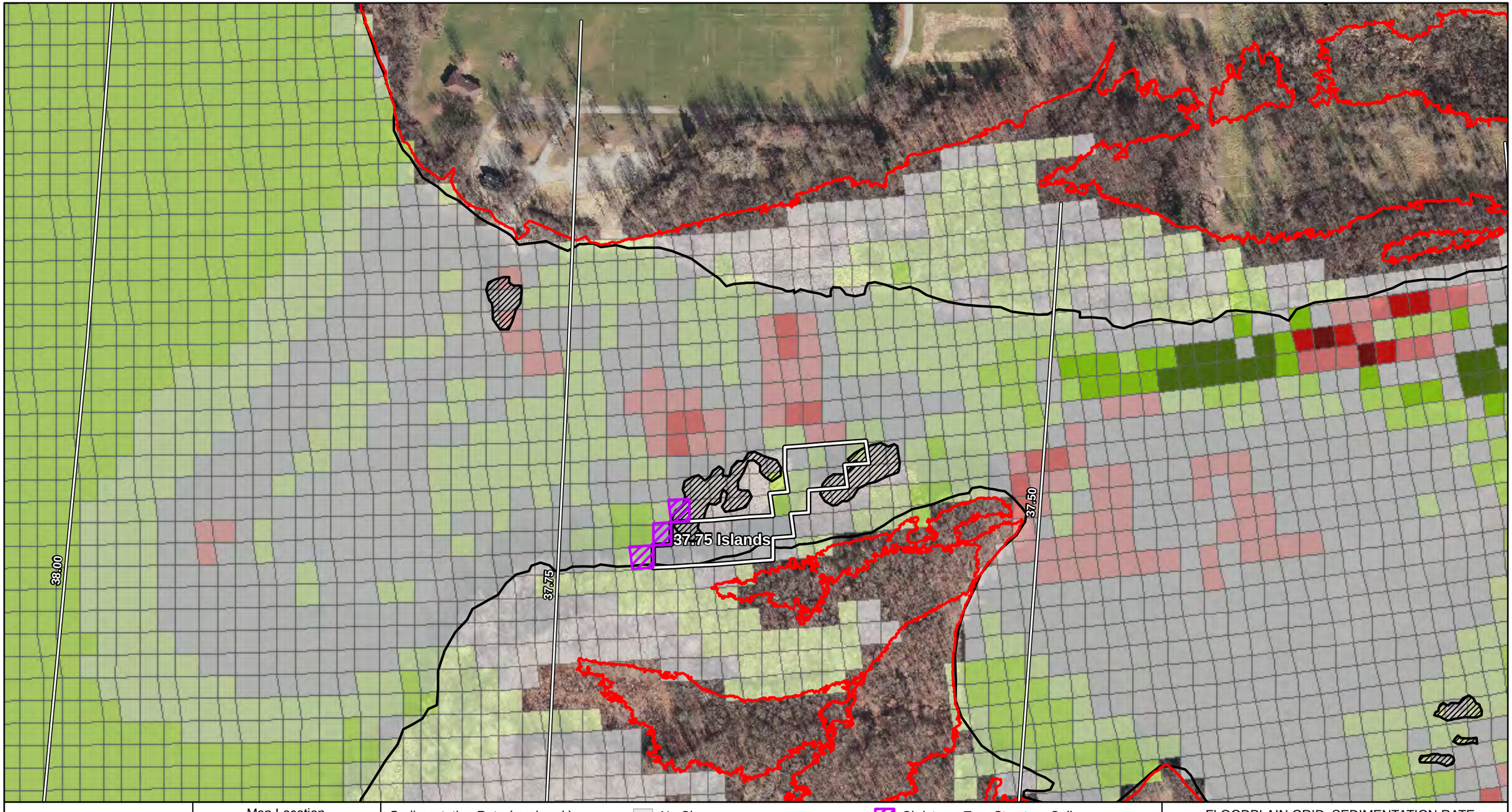
Aerial Photography Date: November 2011



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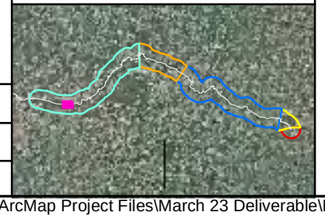
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- NO STRUCTURE

37.75 ISLANDS

SHEET 15 OF 15

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Aerial Photography Date: November 2011

Figure 7-32

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, 100-Year Flood

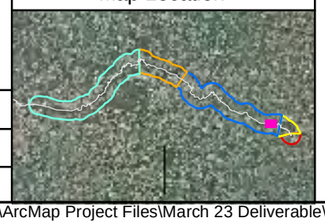
99% Structure

Sheets 1 through 15

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
3.25 R1

SHEET 1 OF 15

ENBRIDGE LINE 6B MP 608
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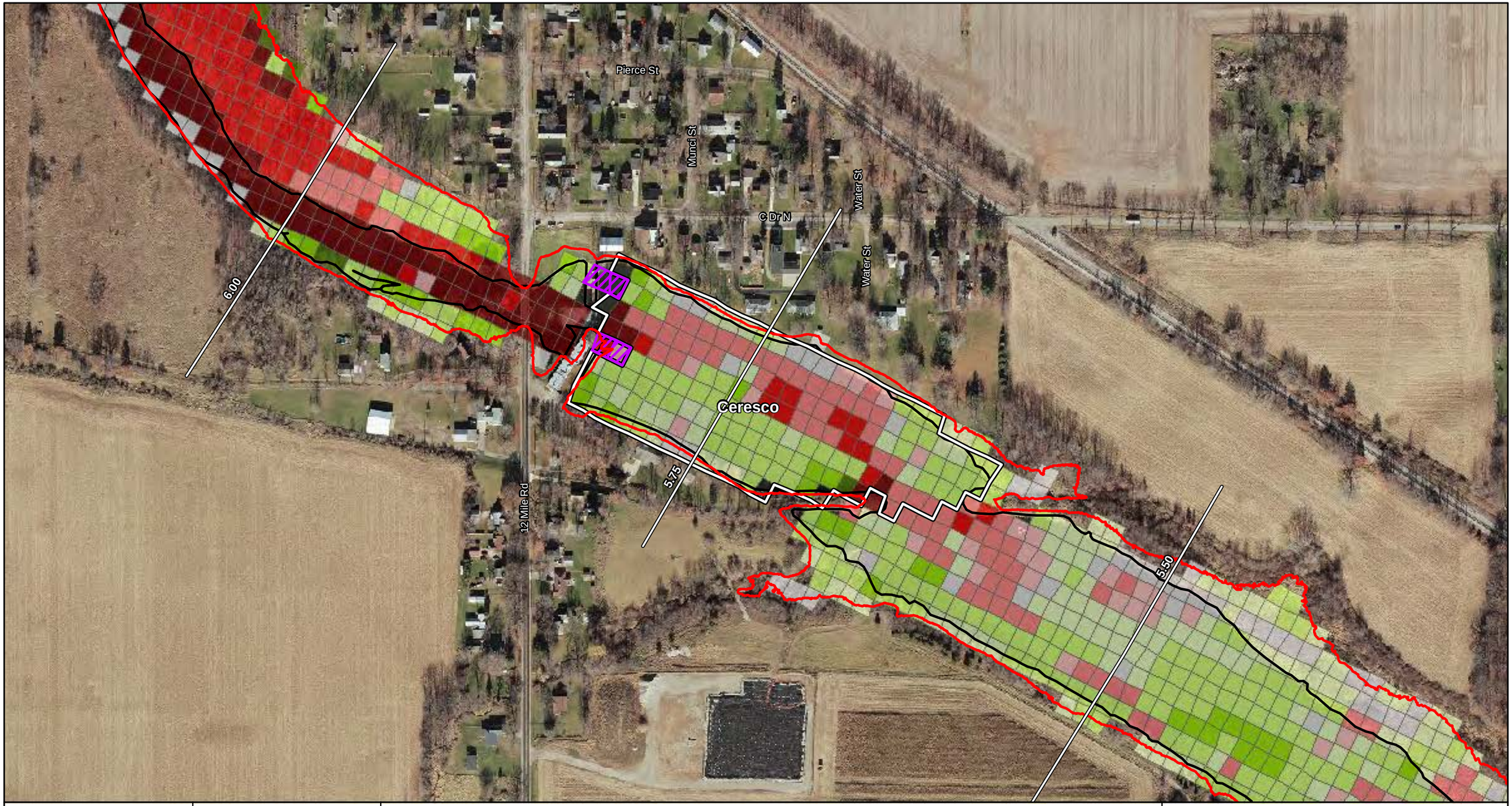
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_Traps99_100yr.mxd

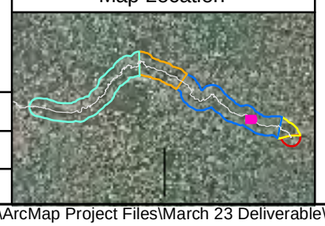
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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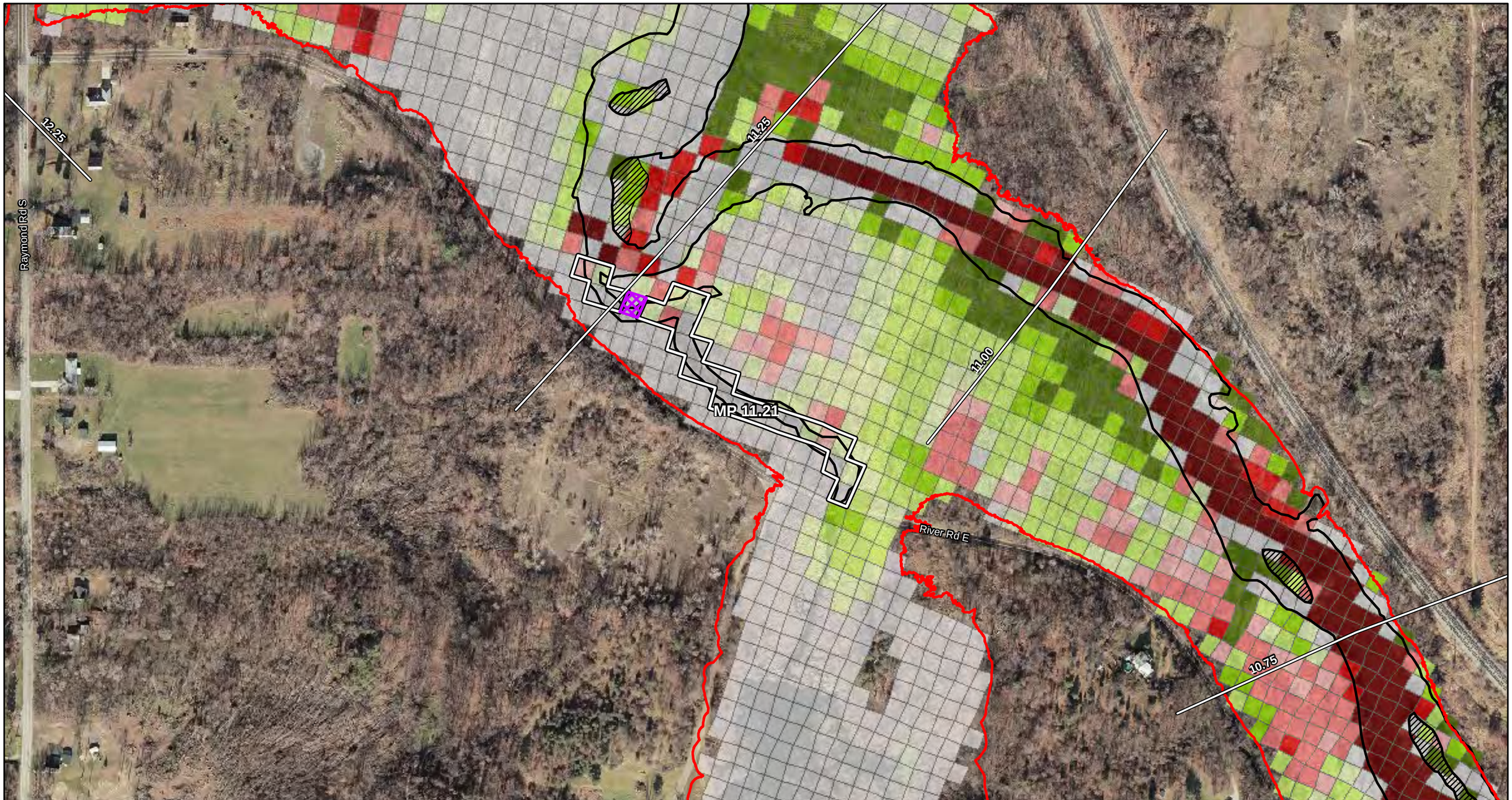
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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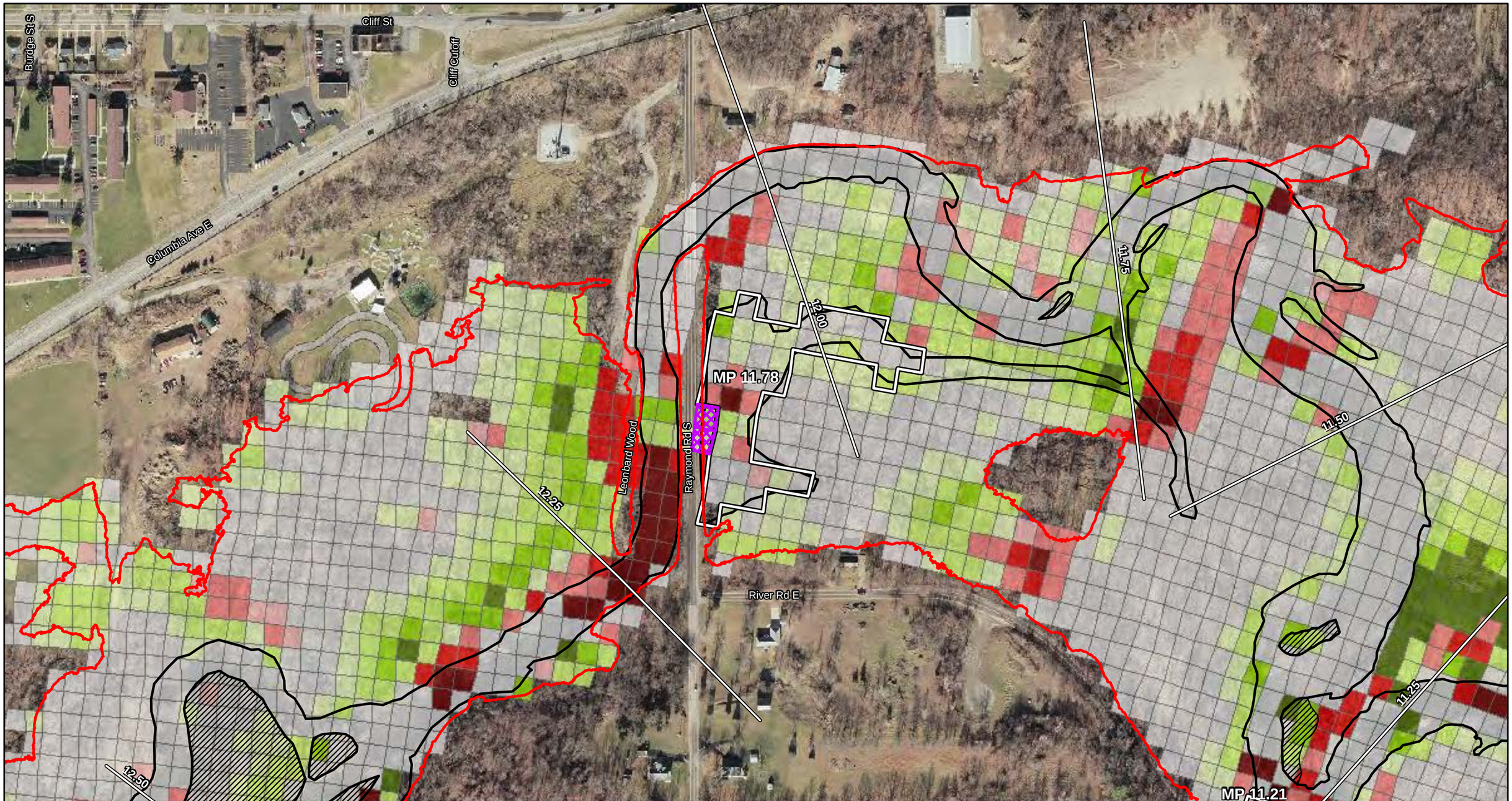
Aerial Photography Date: November 2011



Map Location

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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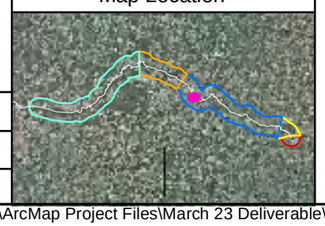
Aerial Photography Date: November 2011

Sisson Ave
Territorial Rd E
15.00
Fonda Ave
Kenosha Ave
Pauline Ave
Rockford St
South Ave
Taft St
194
14.75
14.75 RDB
14.50
River Oaks Blvd
Taft Ct
14.25

ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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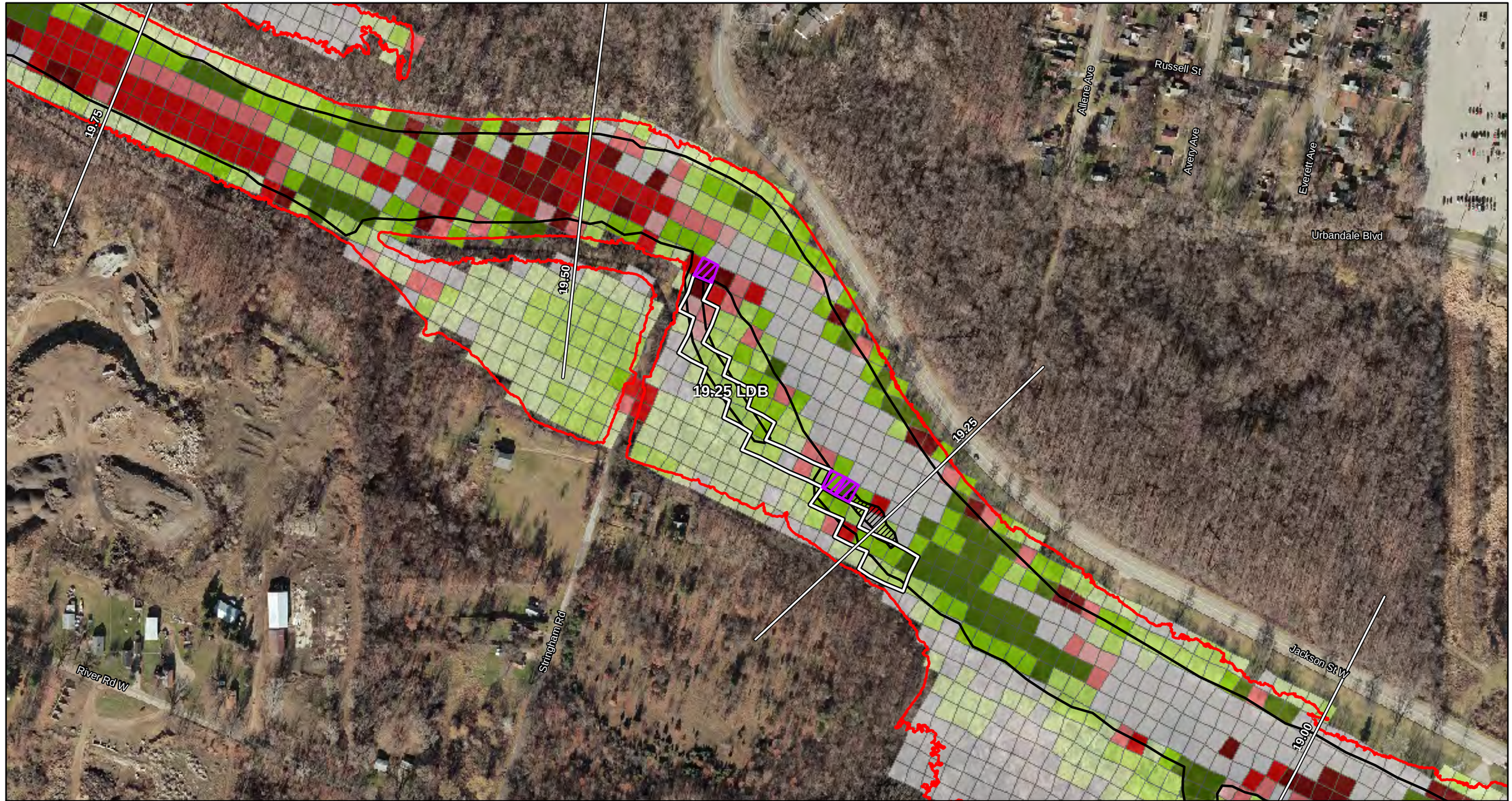
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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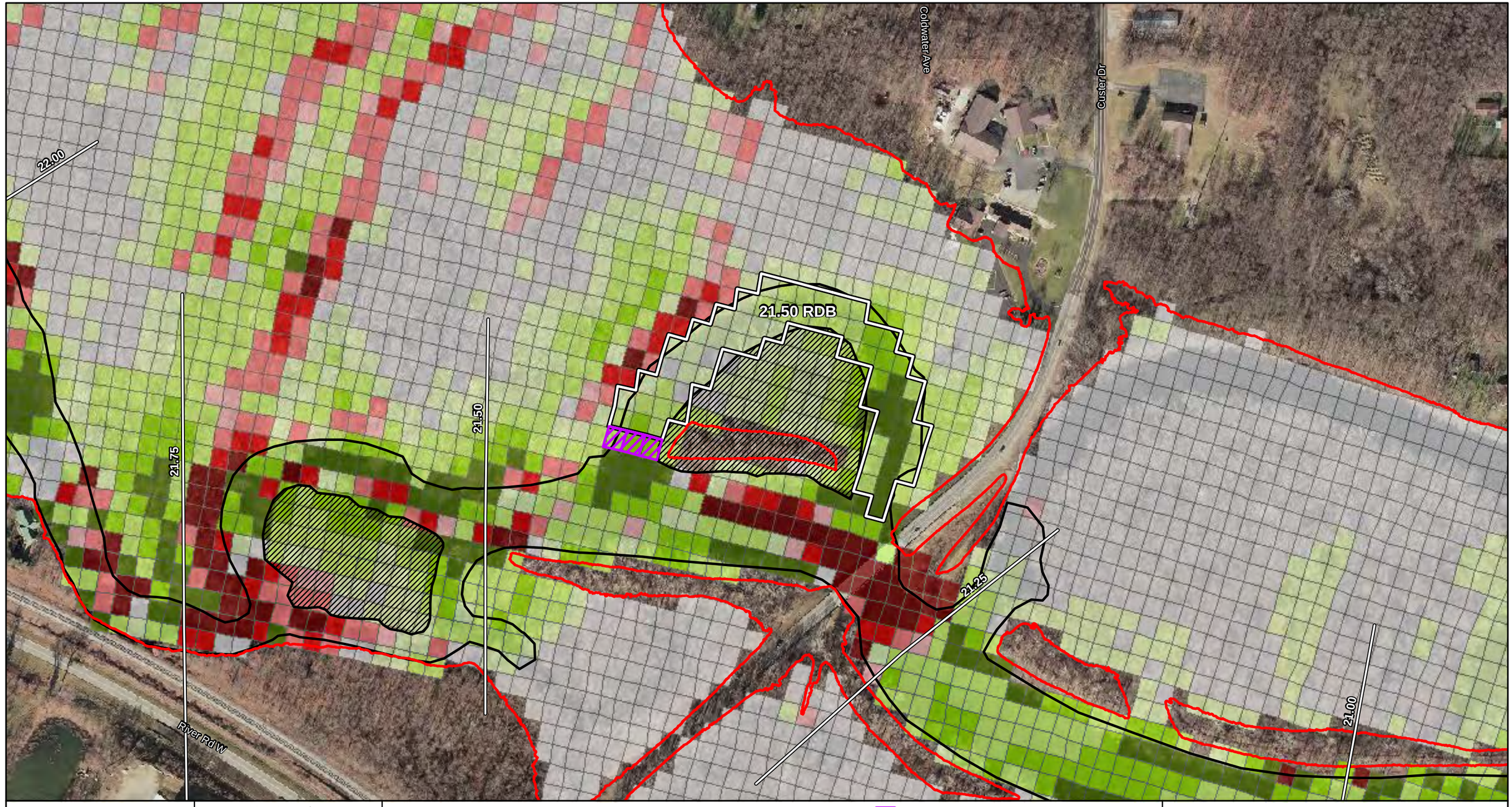
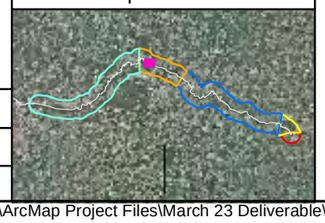
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
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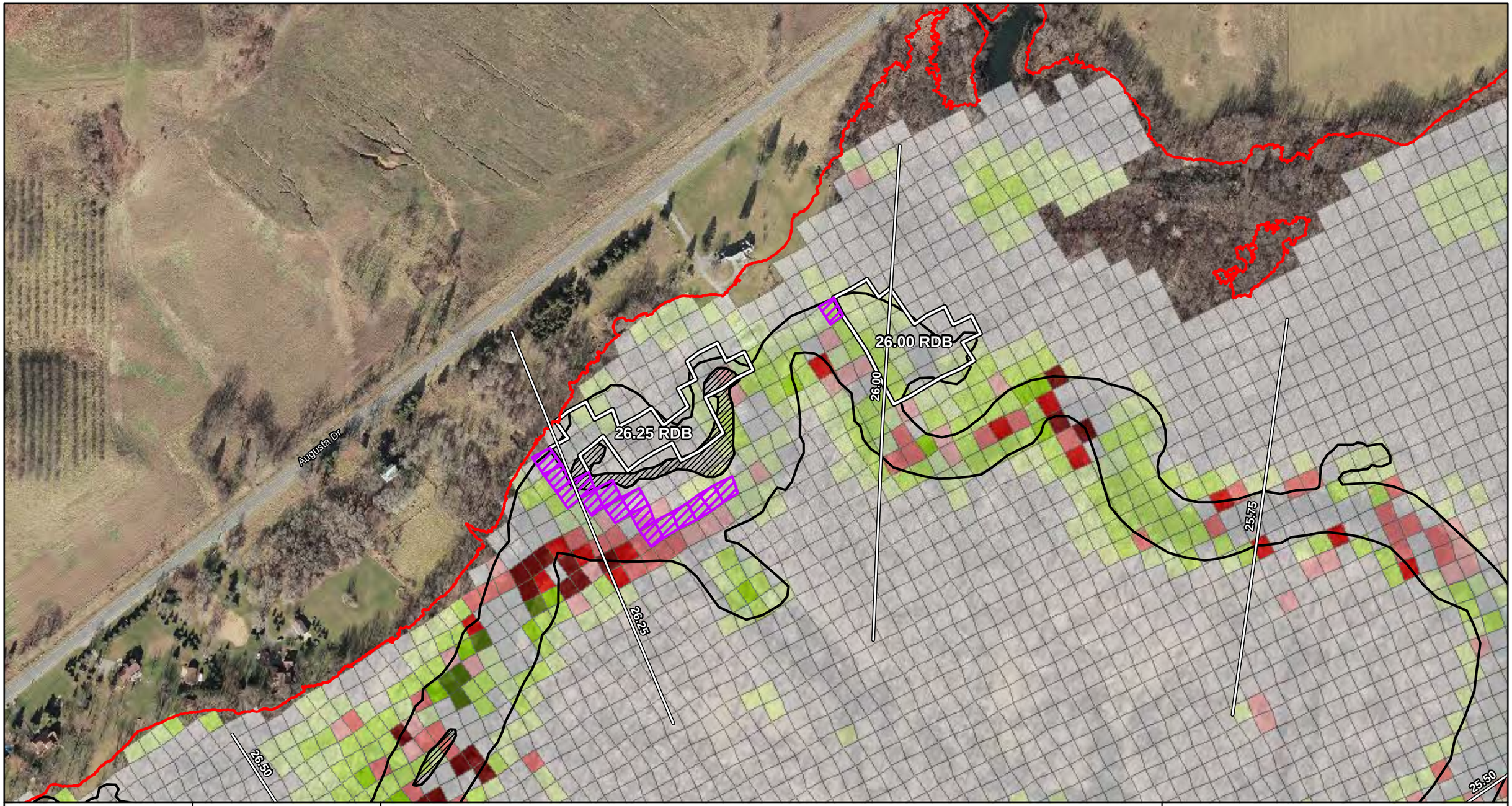
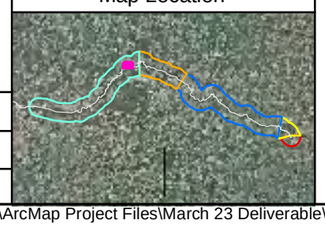
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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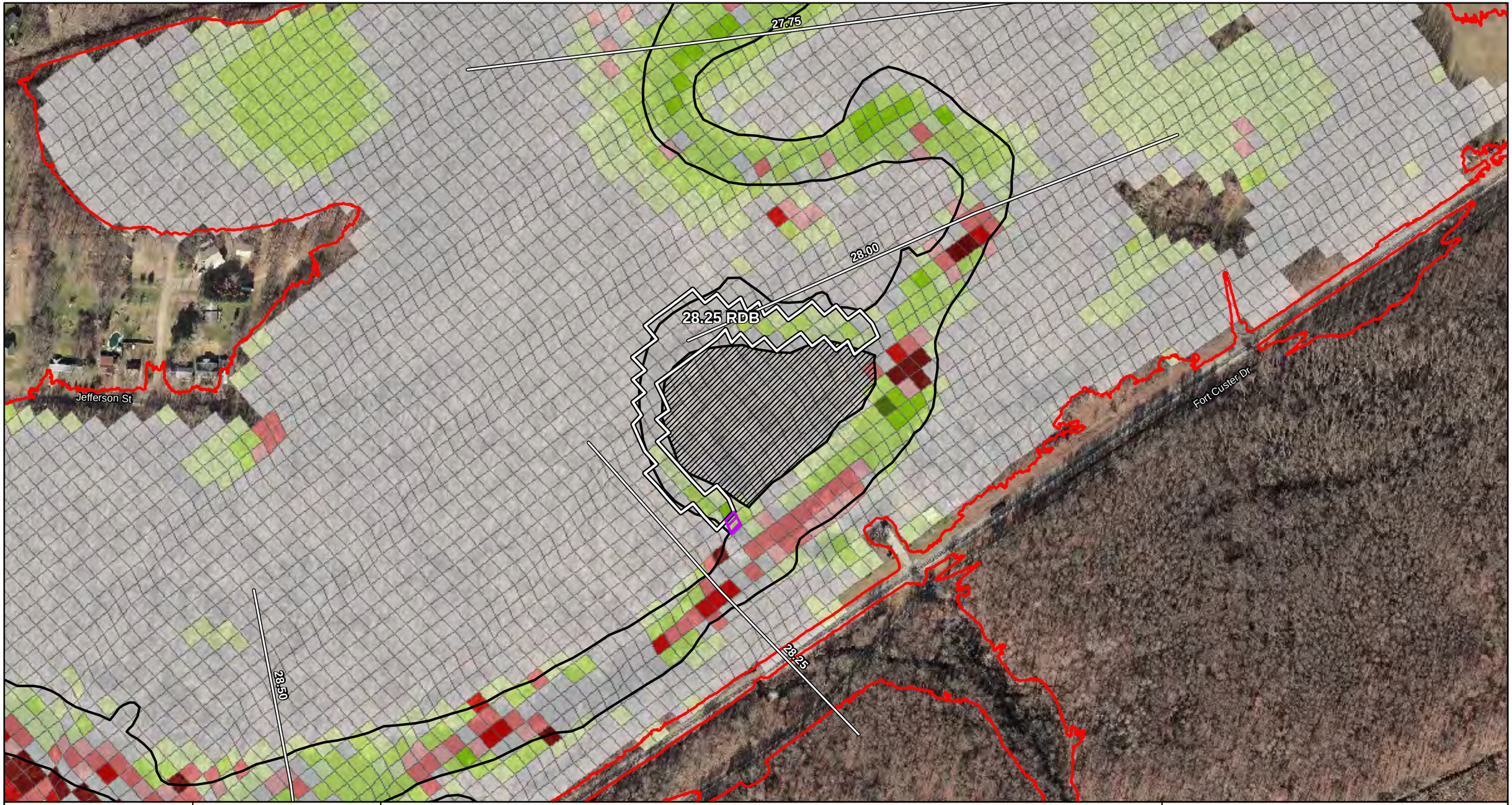
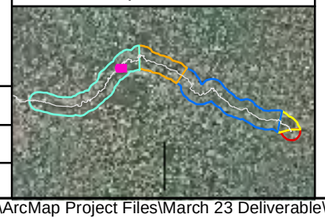
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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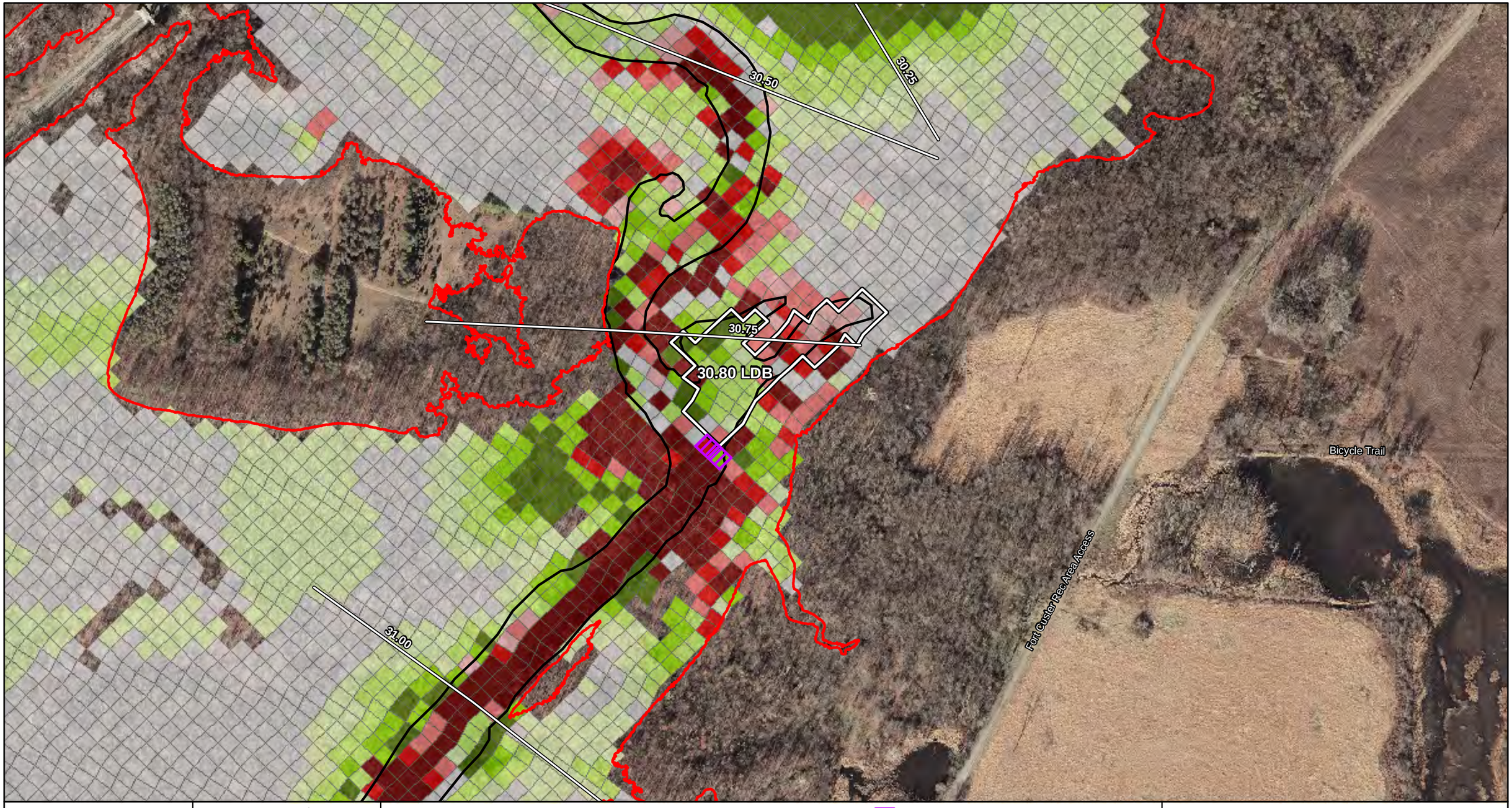
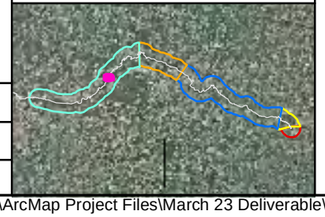
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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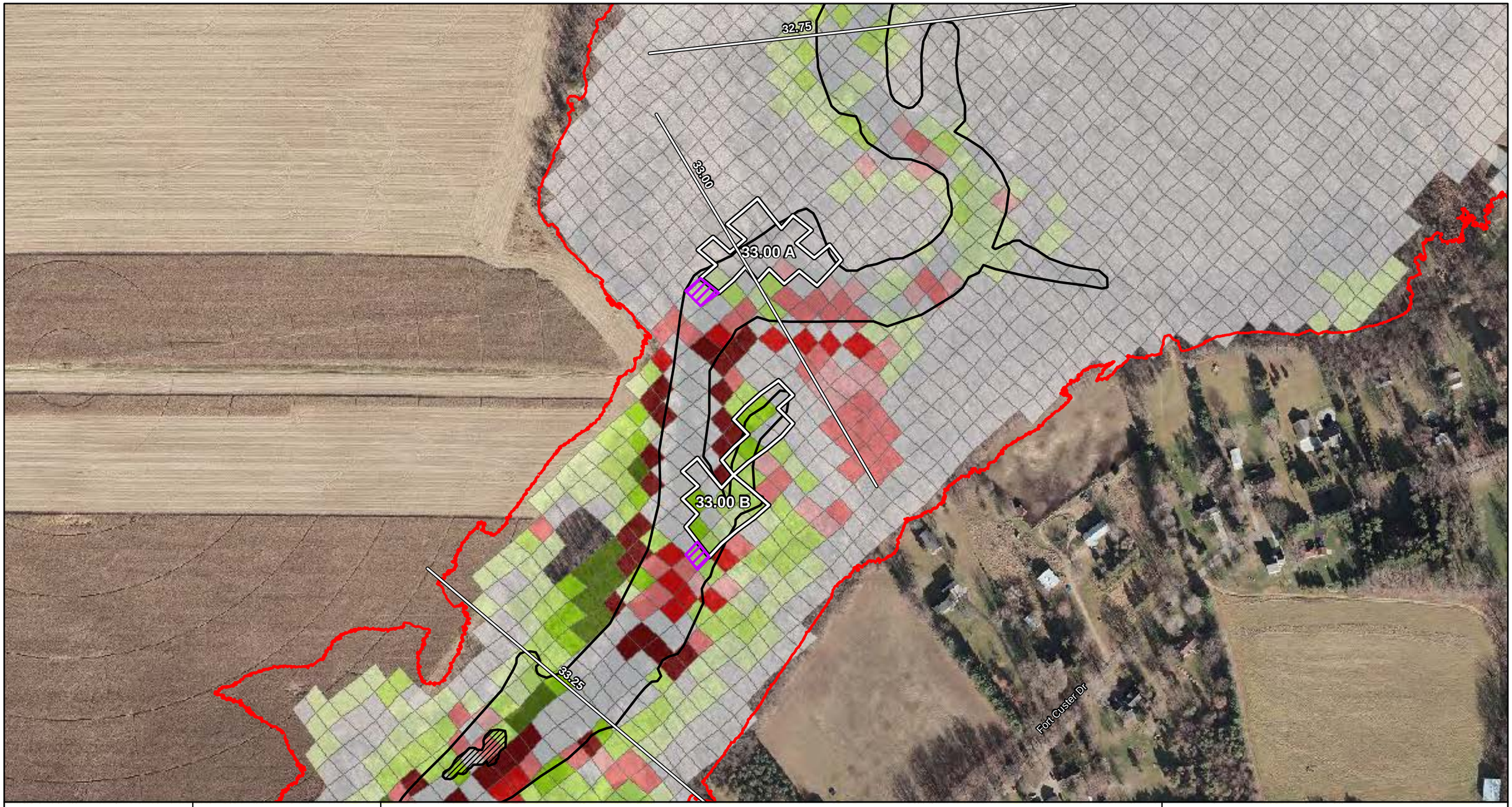
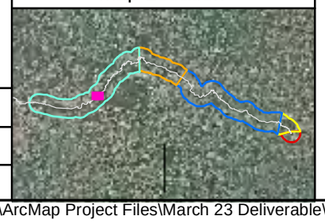
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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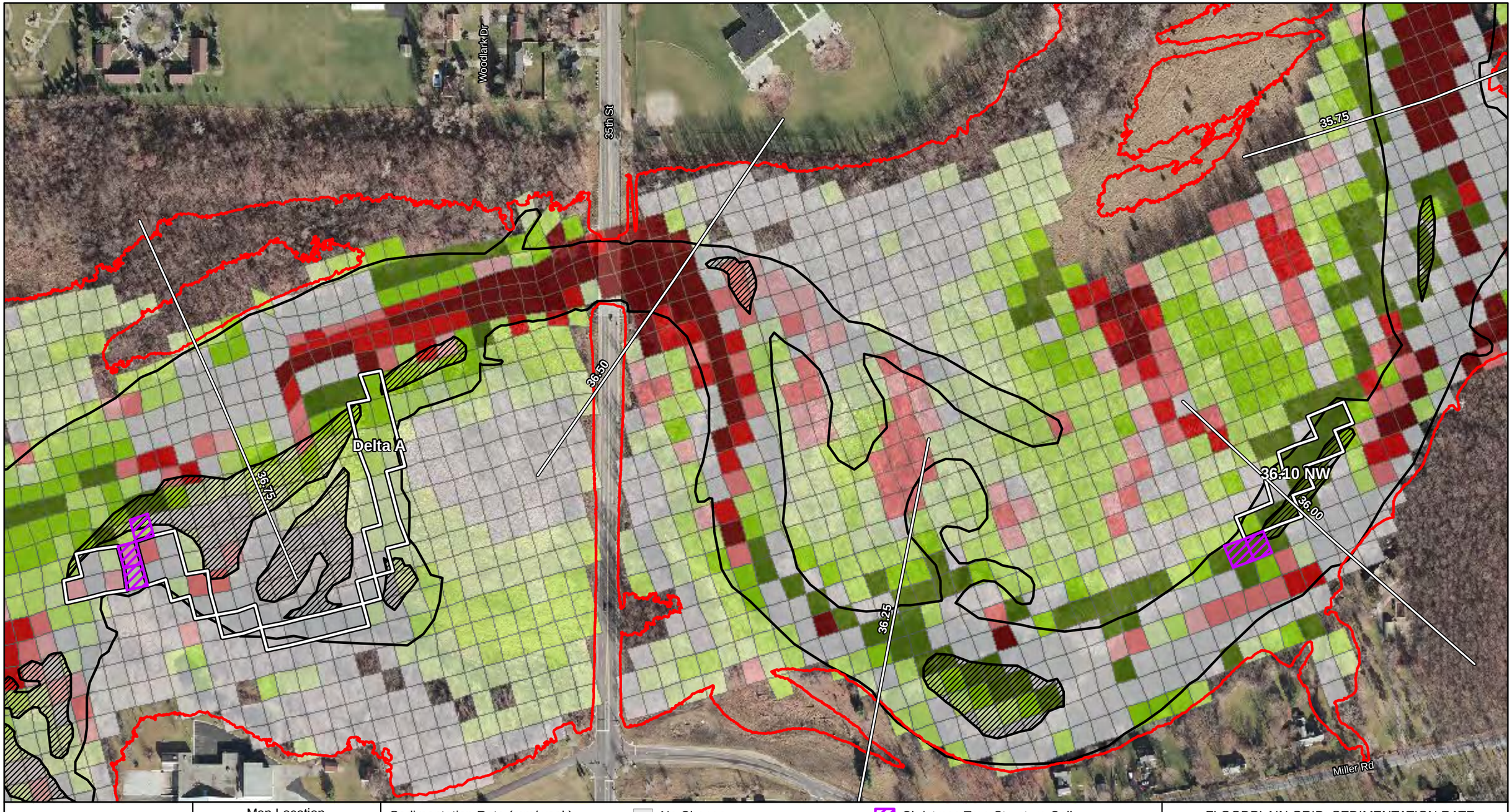
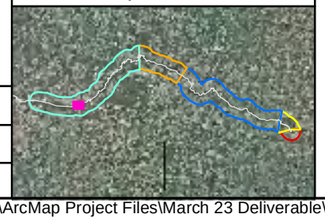
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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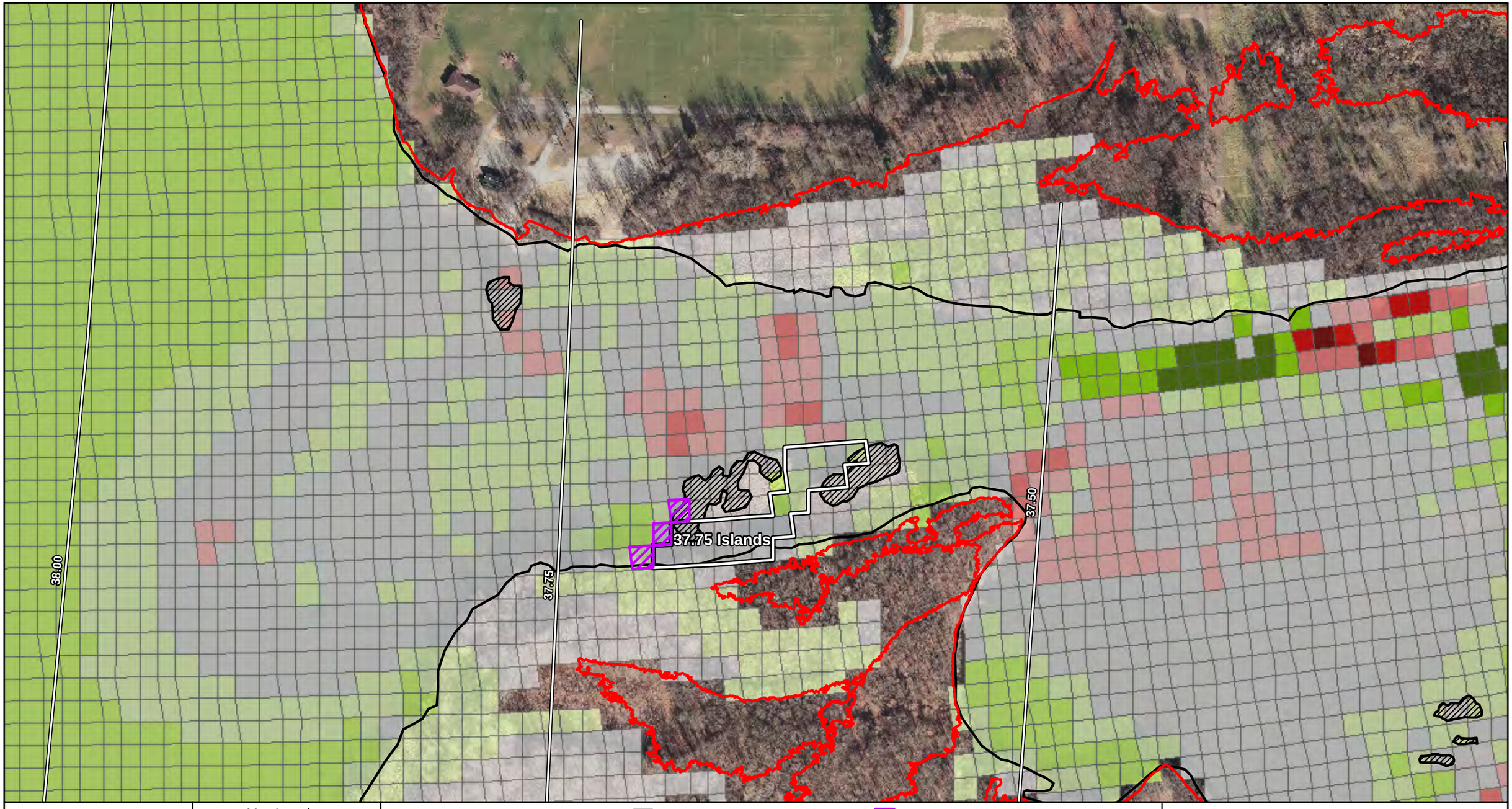
Aerial Photography Date: November 2011



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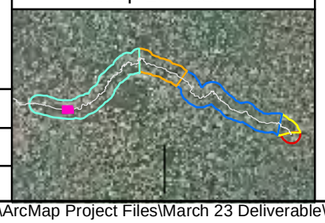
Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 99% STRUCTURE
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

Figure 7-33

Floodplain Grid: Sedimentation Rate, Cells with Net Change in Silt or Clay Mass, 100-Year Flood

75% Structure

Sheets 1 through 15

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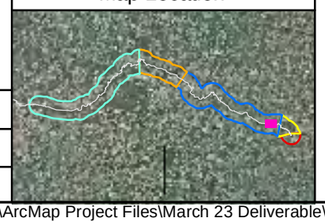
Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
3.25 R1

SHEET 1 OF 15

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Aerial Photography Date: November 2011

Pierce St
Munci St
C Dr N
Water St
Water St
6.00
5.75
5.50
12 Mile Rd
Ceresco

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
CERESCO

SHEET 2 OF 15

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Aerial Photography Date: November 2011

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Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
OB 8.48 LDB

SHEET 3 OF 15

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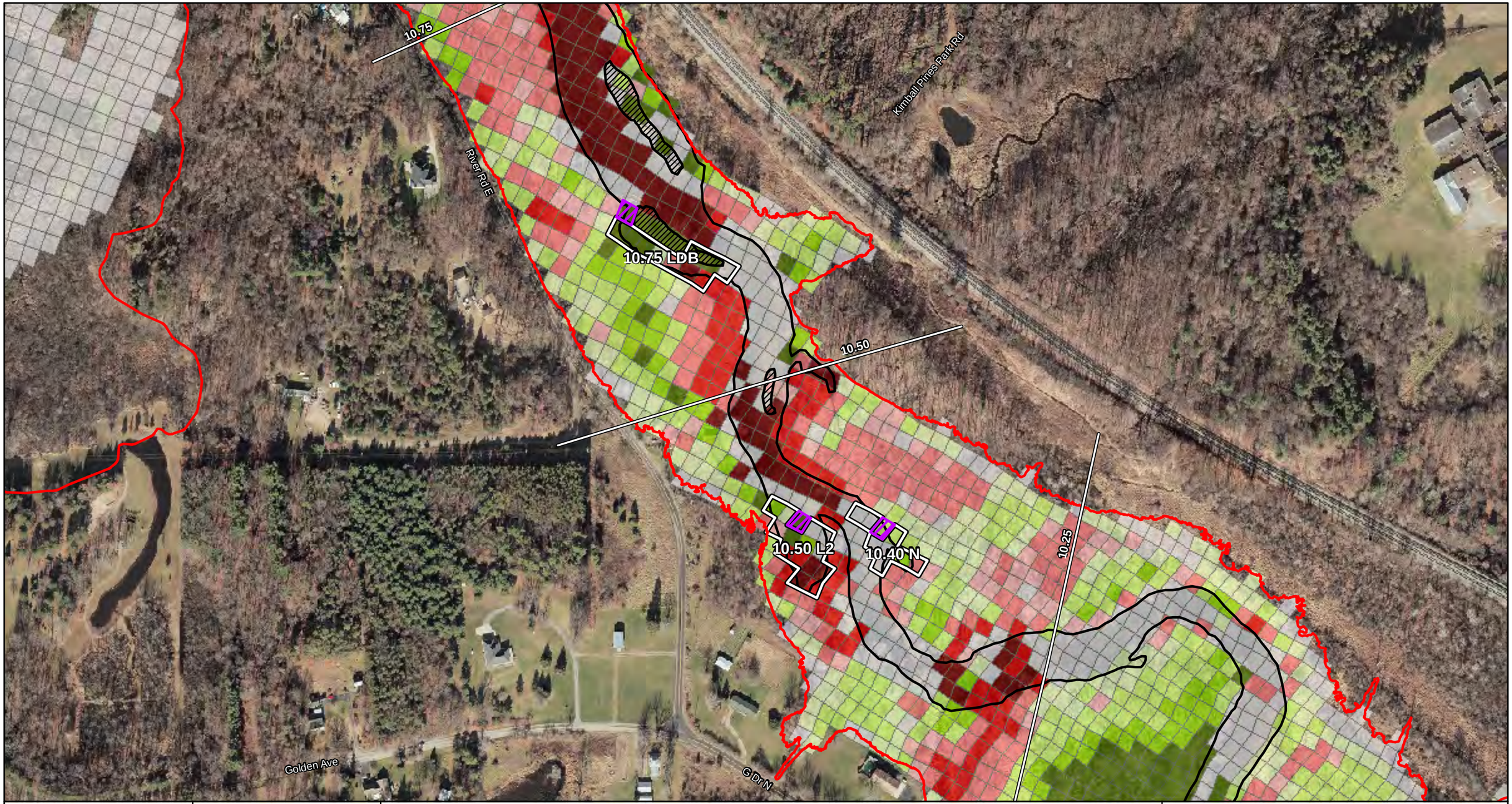
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

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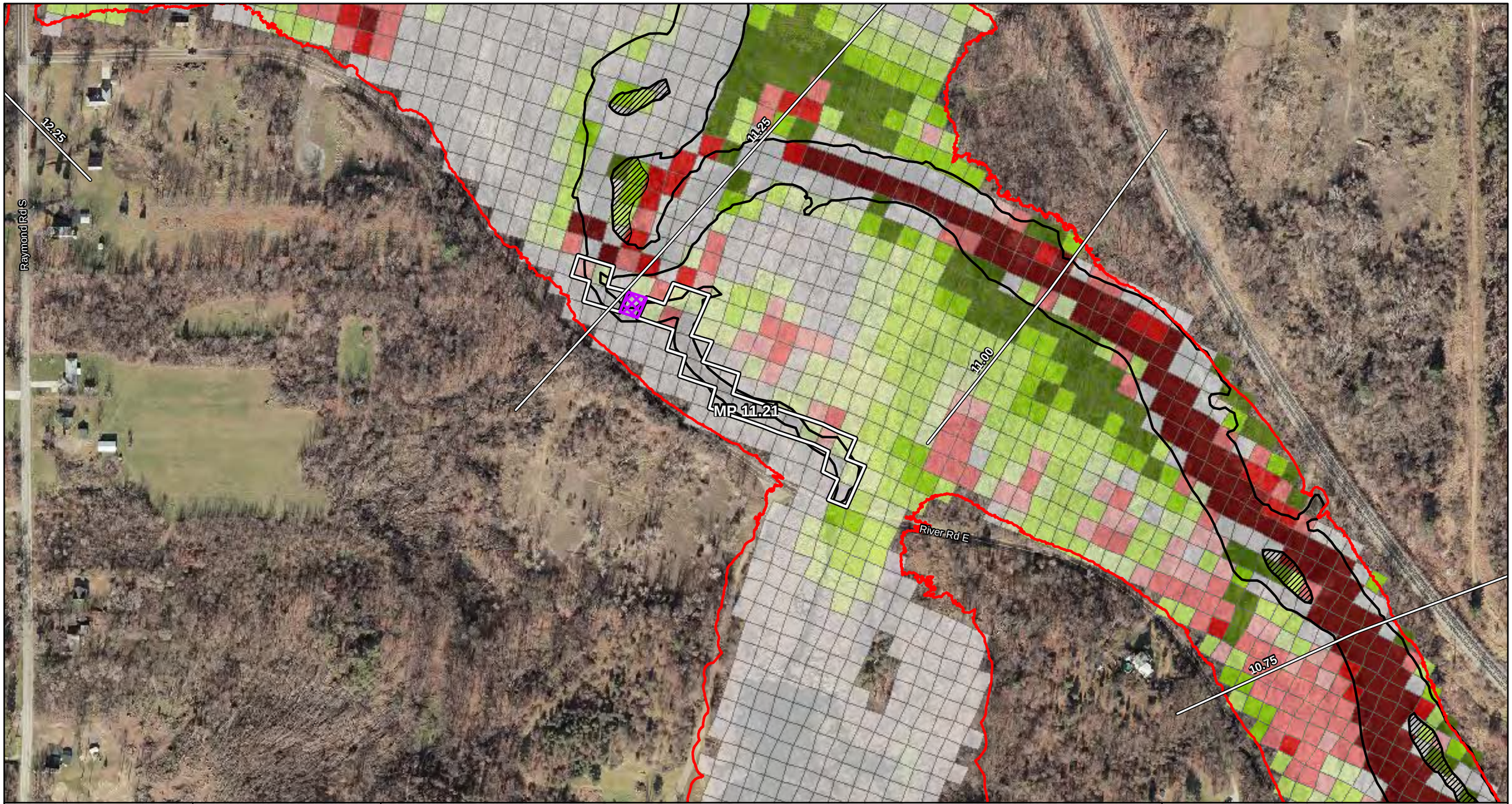
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
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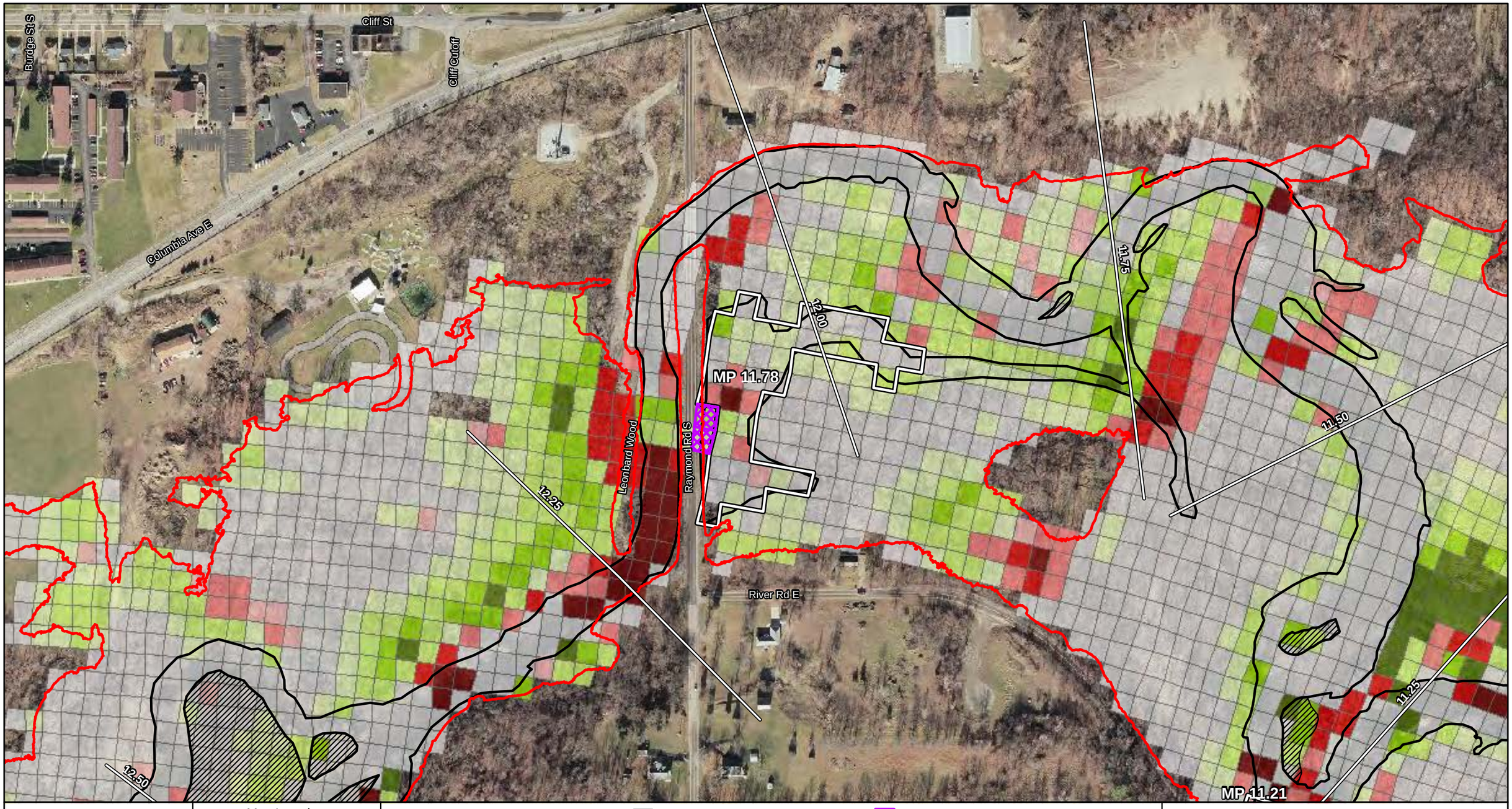
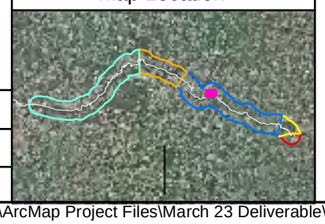
Aerial Photography Date: November 2011



Map Location



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
MP 11.78

SHEET 6 OF 15

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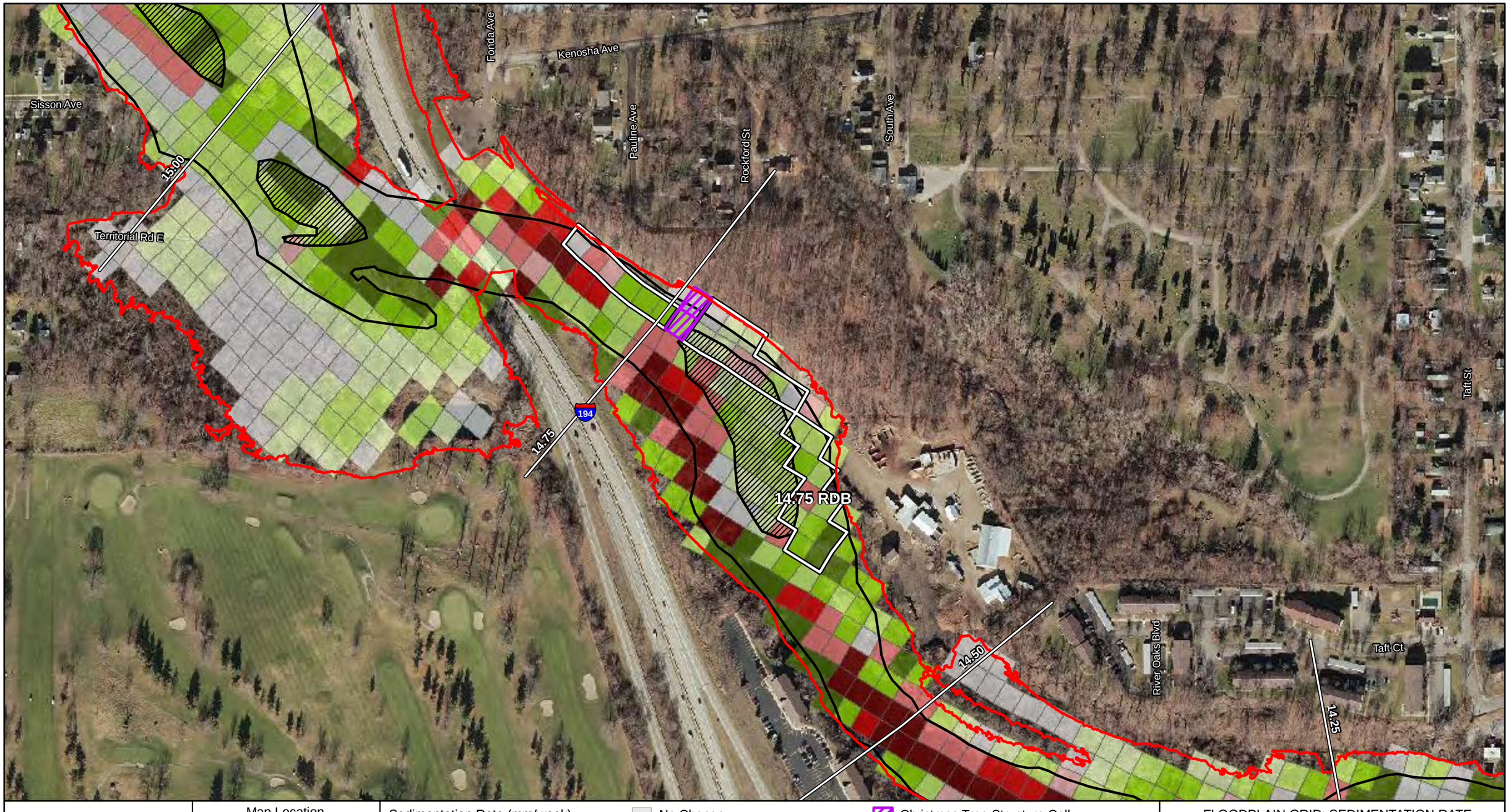
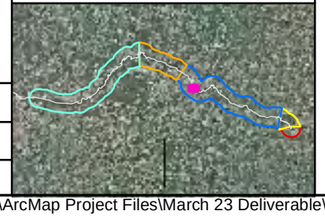
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
14.75 RDB

SHEET 7 OF 15

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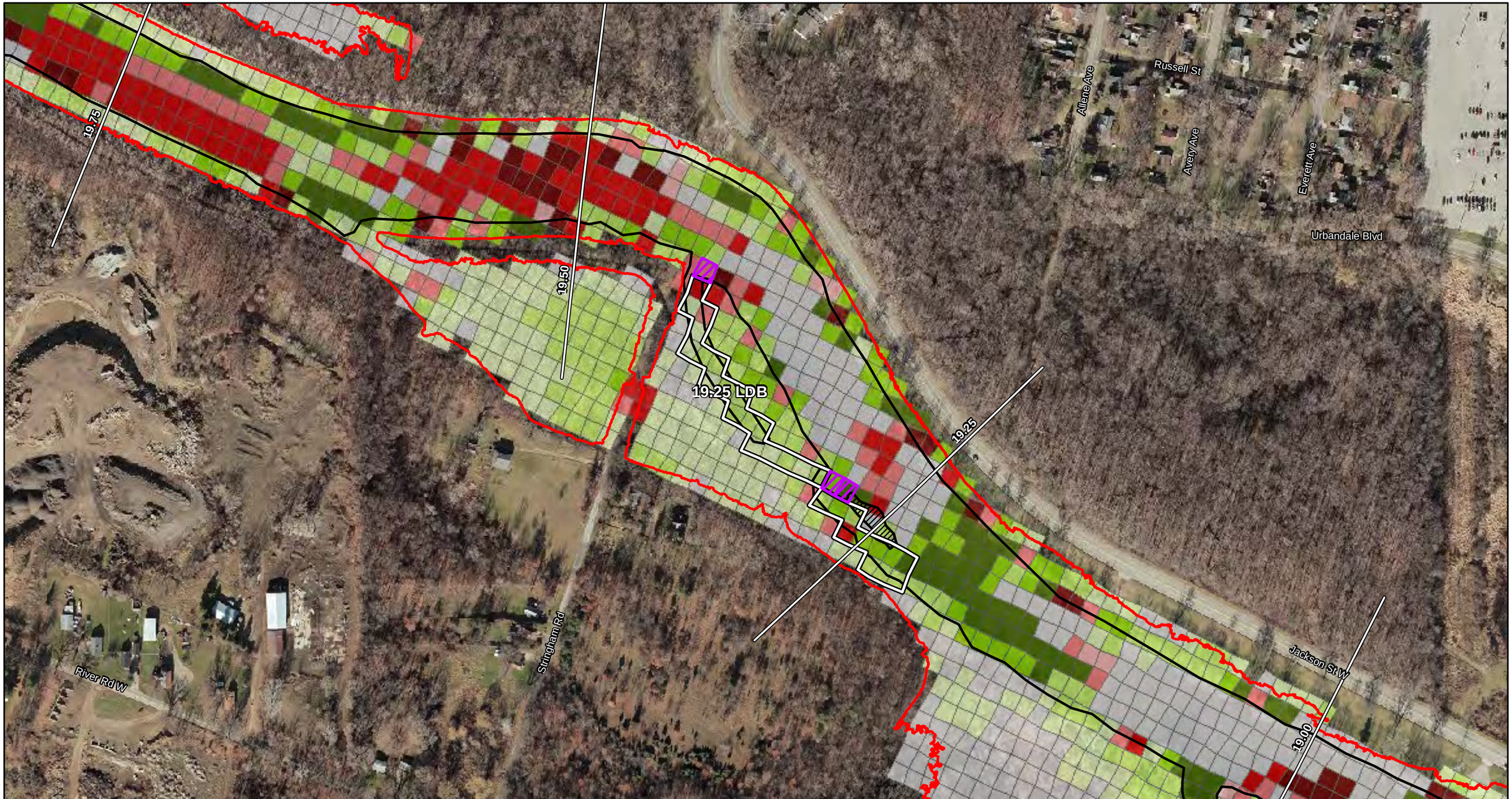
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
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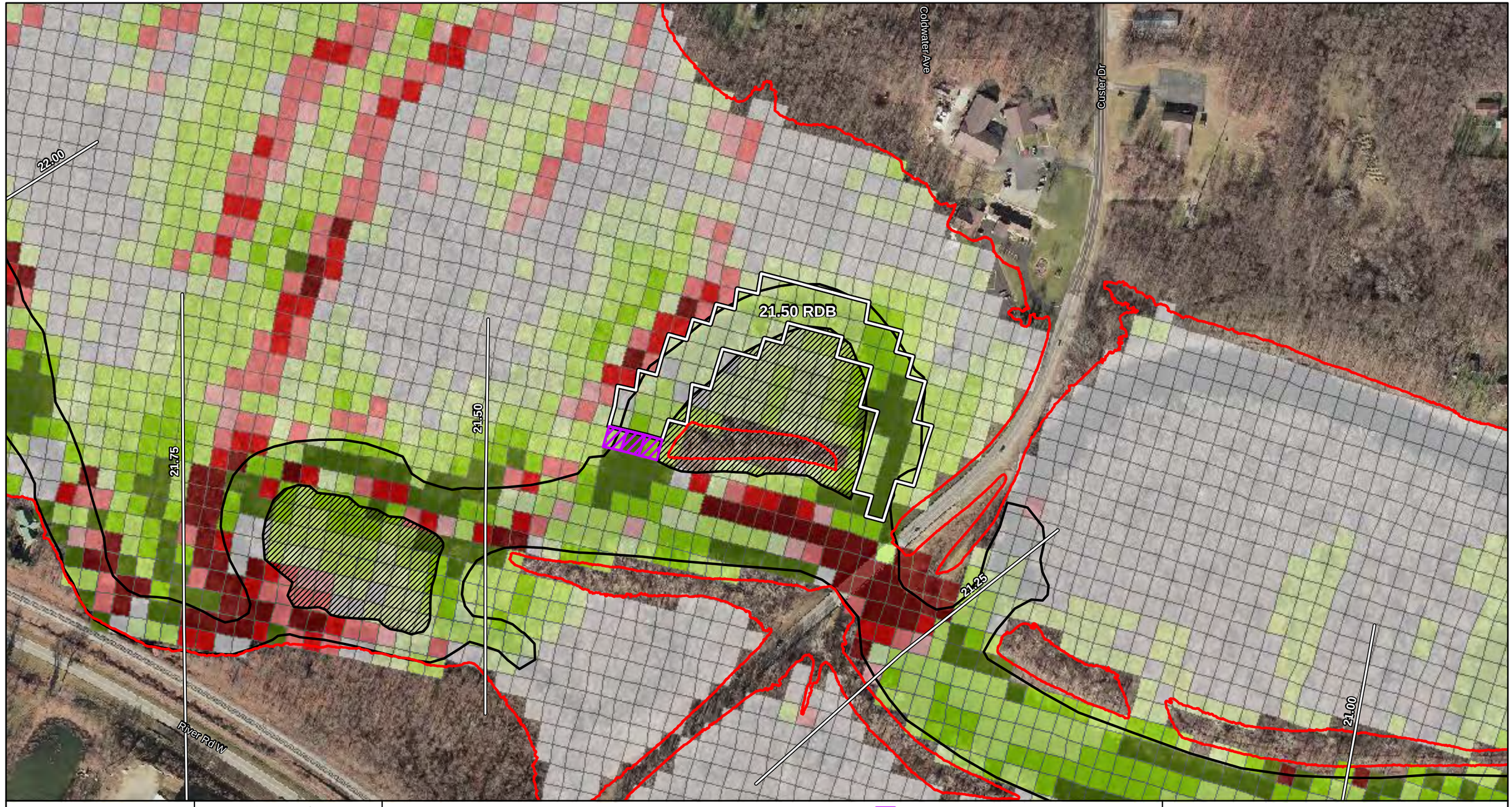
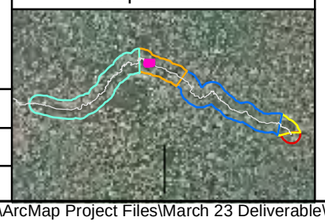
Aerial Photography Date: November 2011



Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion
- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

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Drawn:	BRS 4/1/2012
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Project #:	106-4186

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
21.50 RDB

SHEET 9 OF 15

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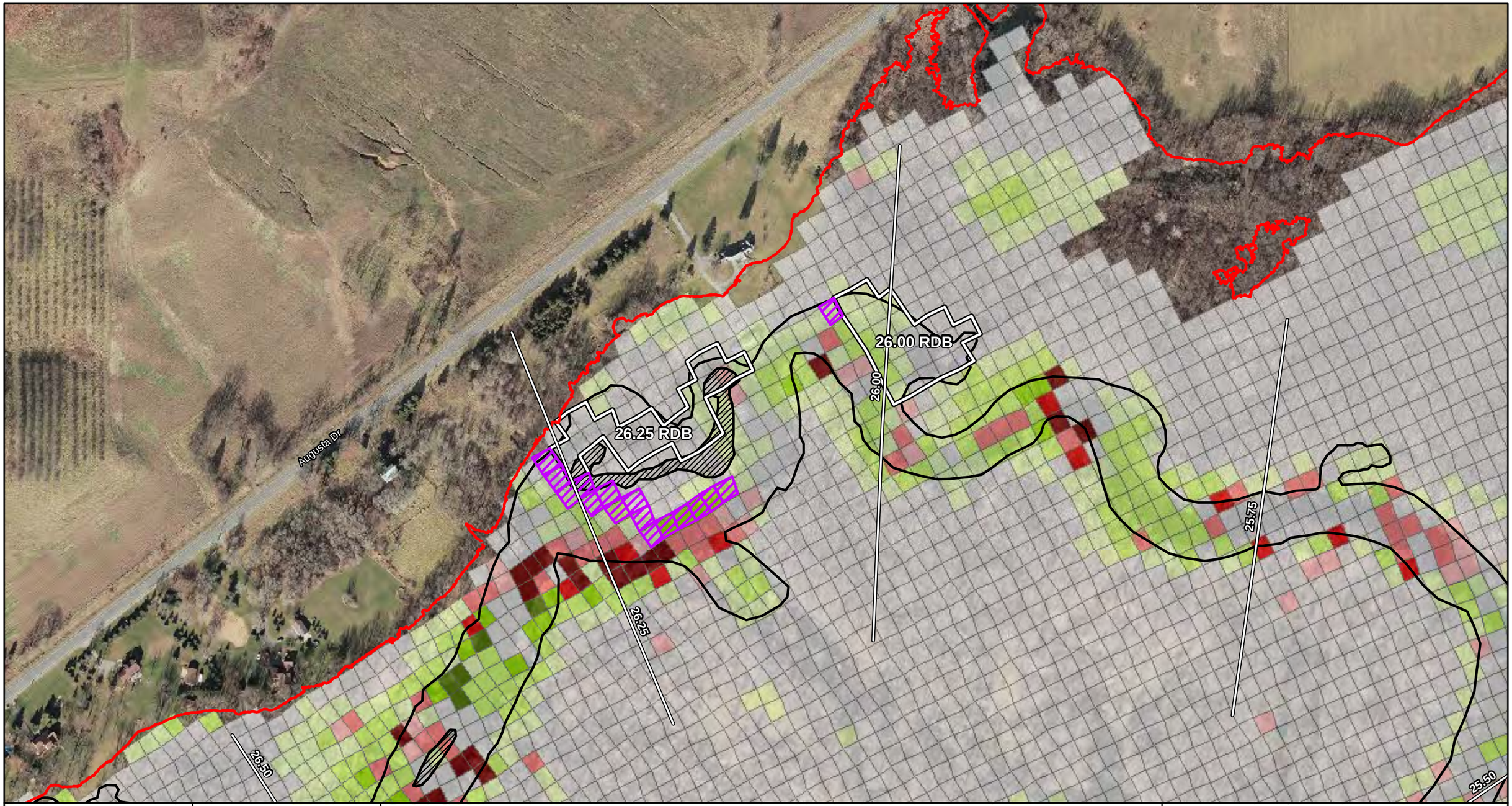
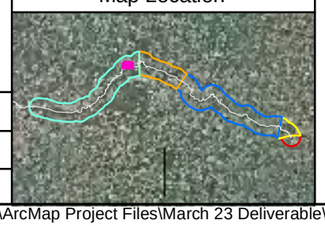
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

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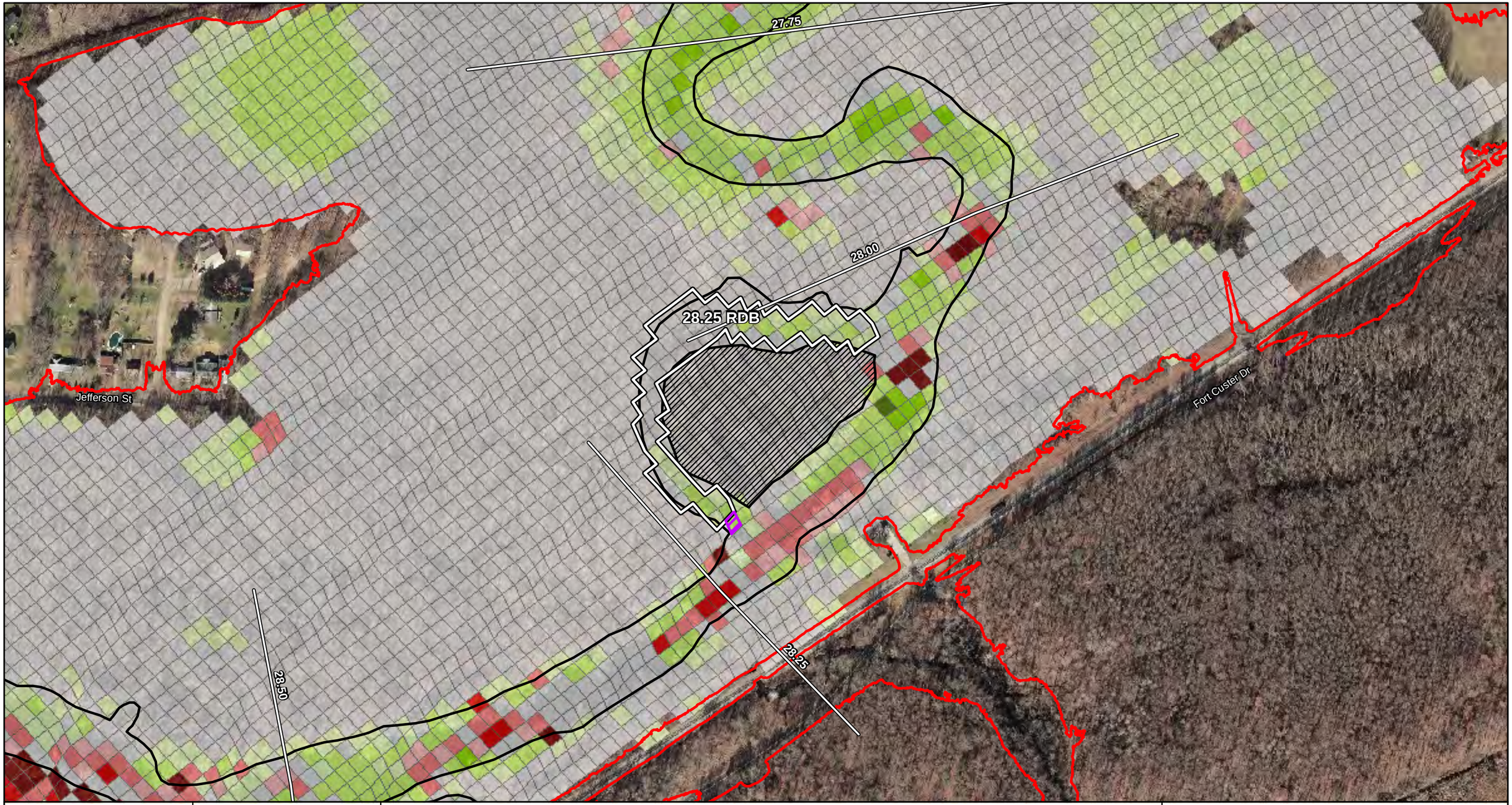
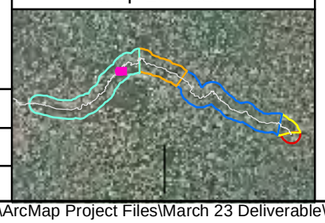
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
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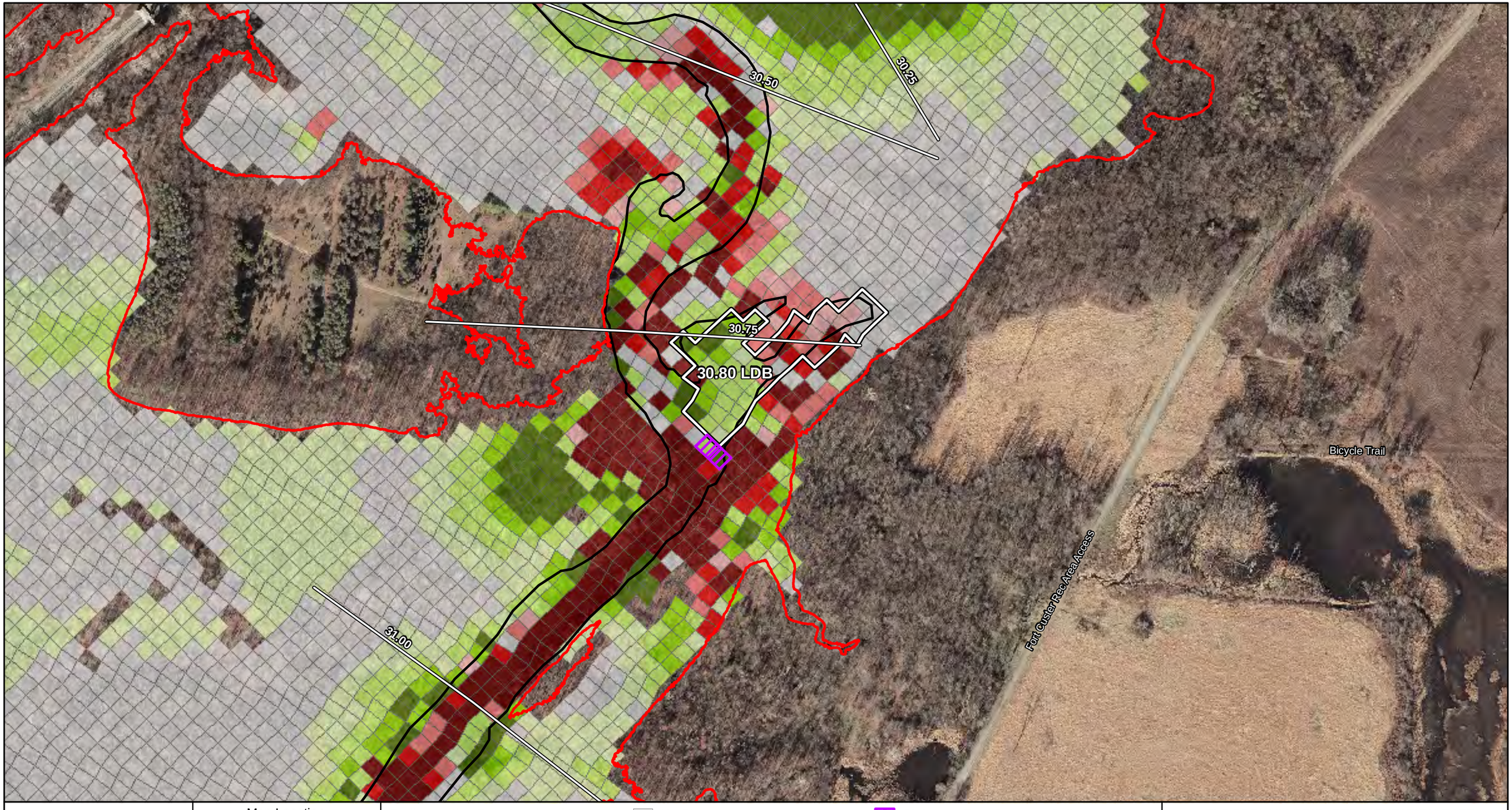
Aerial Photography Date: November 2011



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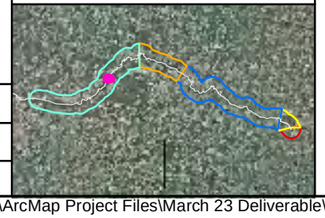

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Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
30.80 LDB

SHEET 12 OF 15

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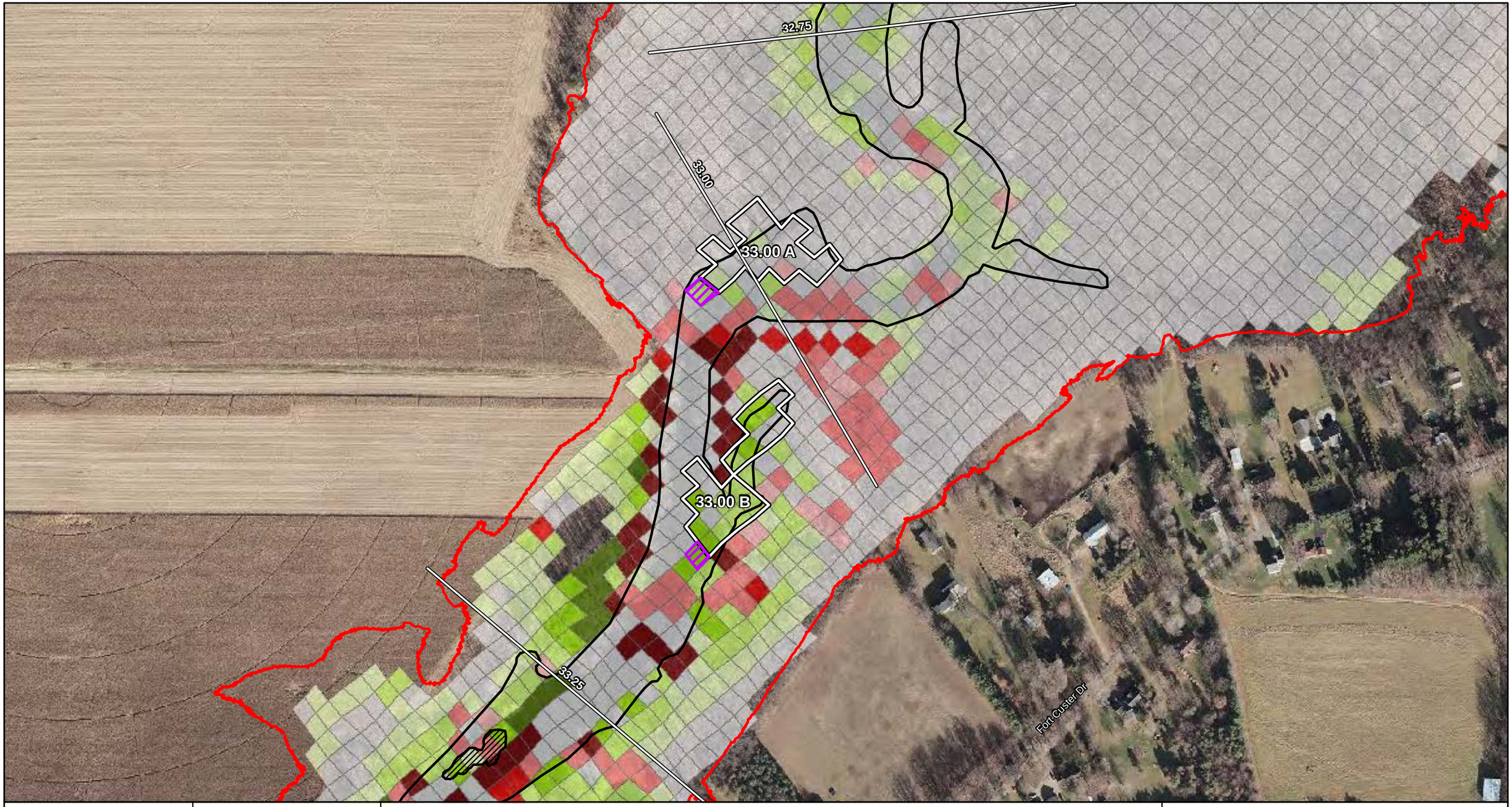
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_Traps75_100yr.mxd

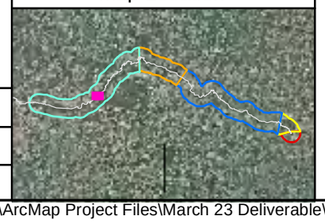
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
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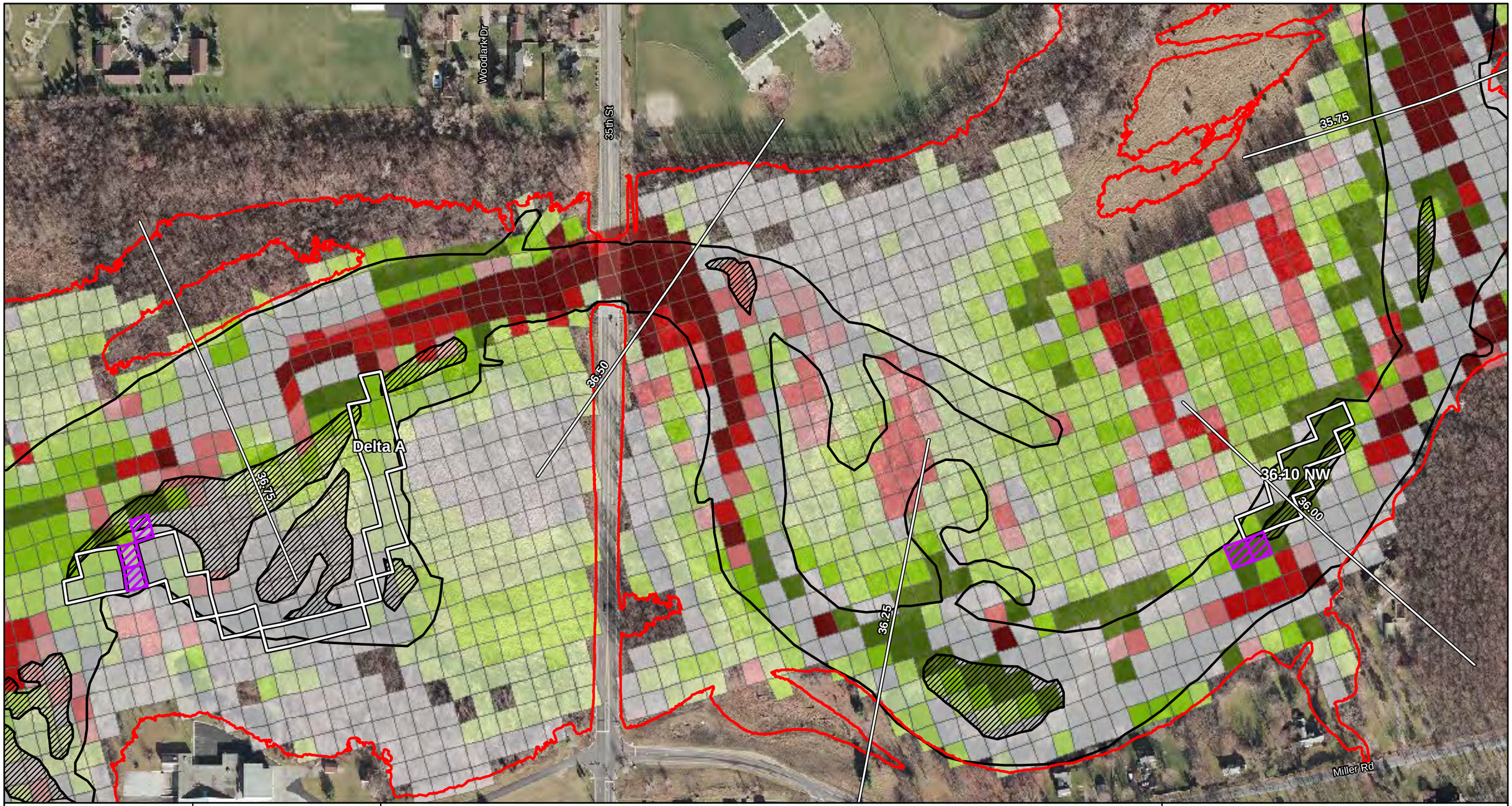
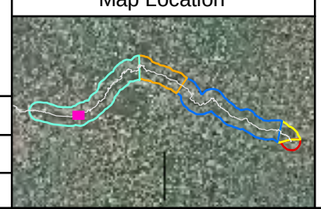
Aerial Photography Date: November 2011



Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
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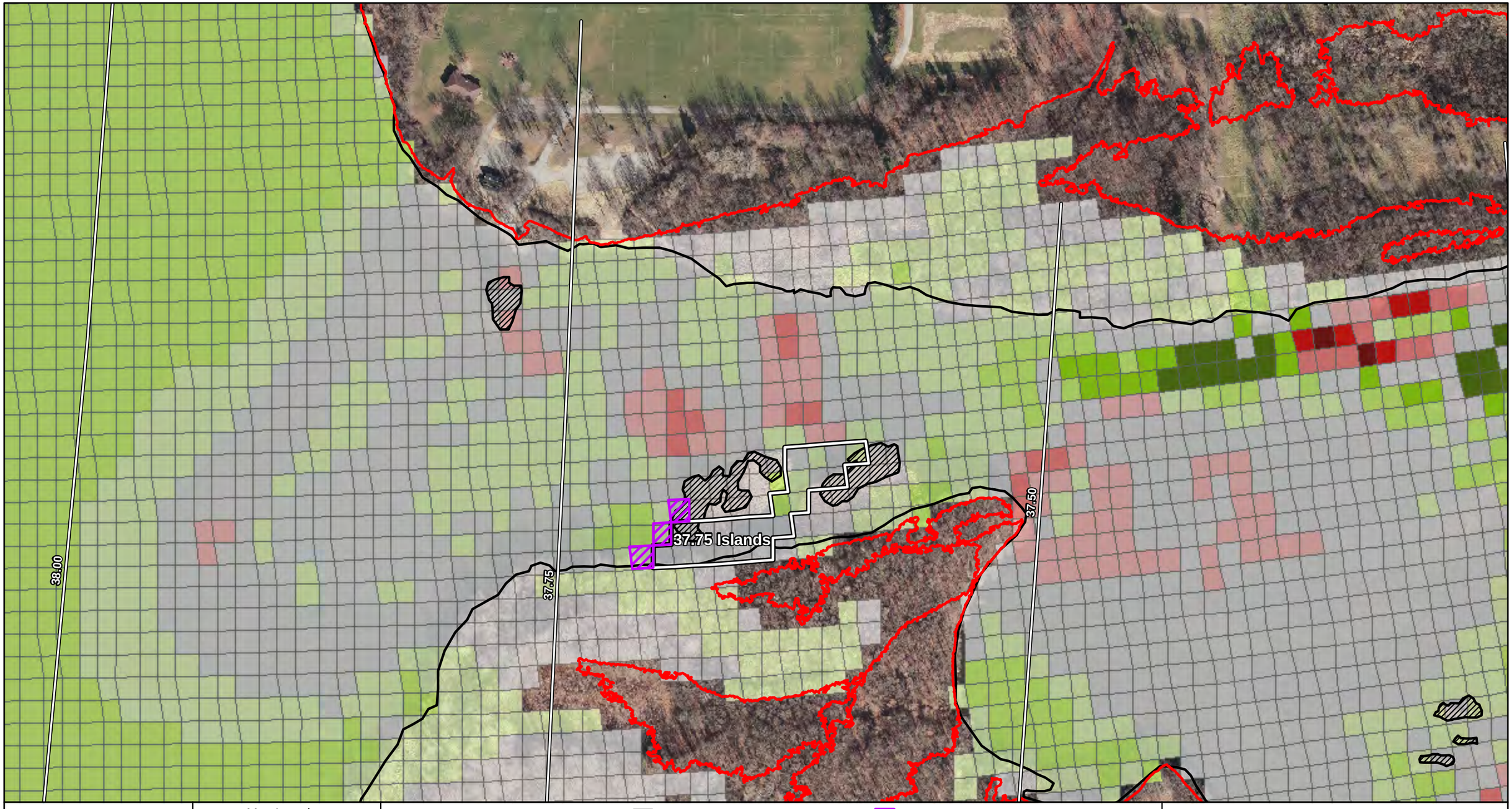
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Sedimentation_Rate2_Sed_Traps75_100yr.mxd

Aerial Photography Date: November 2011



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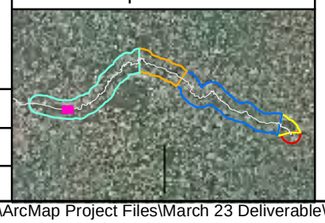
Drawn:	BRS 4/1/2012
Approved:	DBR 4/1/2012
Project #:	106-4186

Map Location



Sedimentation Rate (mm/week)

Cells with Net Change in Silt or Clay Mass

- >10.00 mm/week erosion
- 5.00 - 10.00 mm/week erosion
- 1.00 - 5.00 mm/week erosion
- 0.10 - 1.00 mm/week erosion

mm/week = Millimeters Per Week

- No Change
- 0.10 - 1.00 mm/week deposition
- 1.00 - 5.00 mm/week deposition
- 5.00 - 10.00 mm/week deposition
- >10.00 mm/week deposition
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID: SEDIMENTATION RATE
CELLS WITH NET CHANGE IN SILT OR CLAY MASS
100-YEAR FLOOD --- 75% STRUCTURE
37.75 ISLANDS

SHEET 15 OF 15

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Aerial Photography Date: November 2011

Figure 7-34

Riverine Grid: Difference in Net Change in Silt Mass, October 31 – November 7, 2011

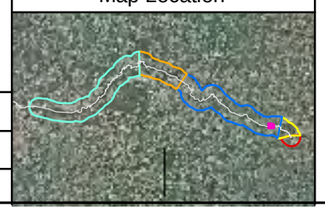
75% vs. No Structures

Sheets 1 through 19

ENBRIDGE

Drawn:	BRS 4/5/2012
Approved:	DBR 4/5/2012
Project #:	106-4186

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
3.25 R1
SHEET 1 OF 19
ENBRIDGE LINE 6B MP 608
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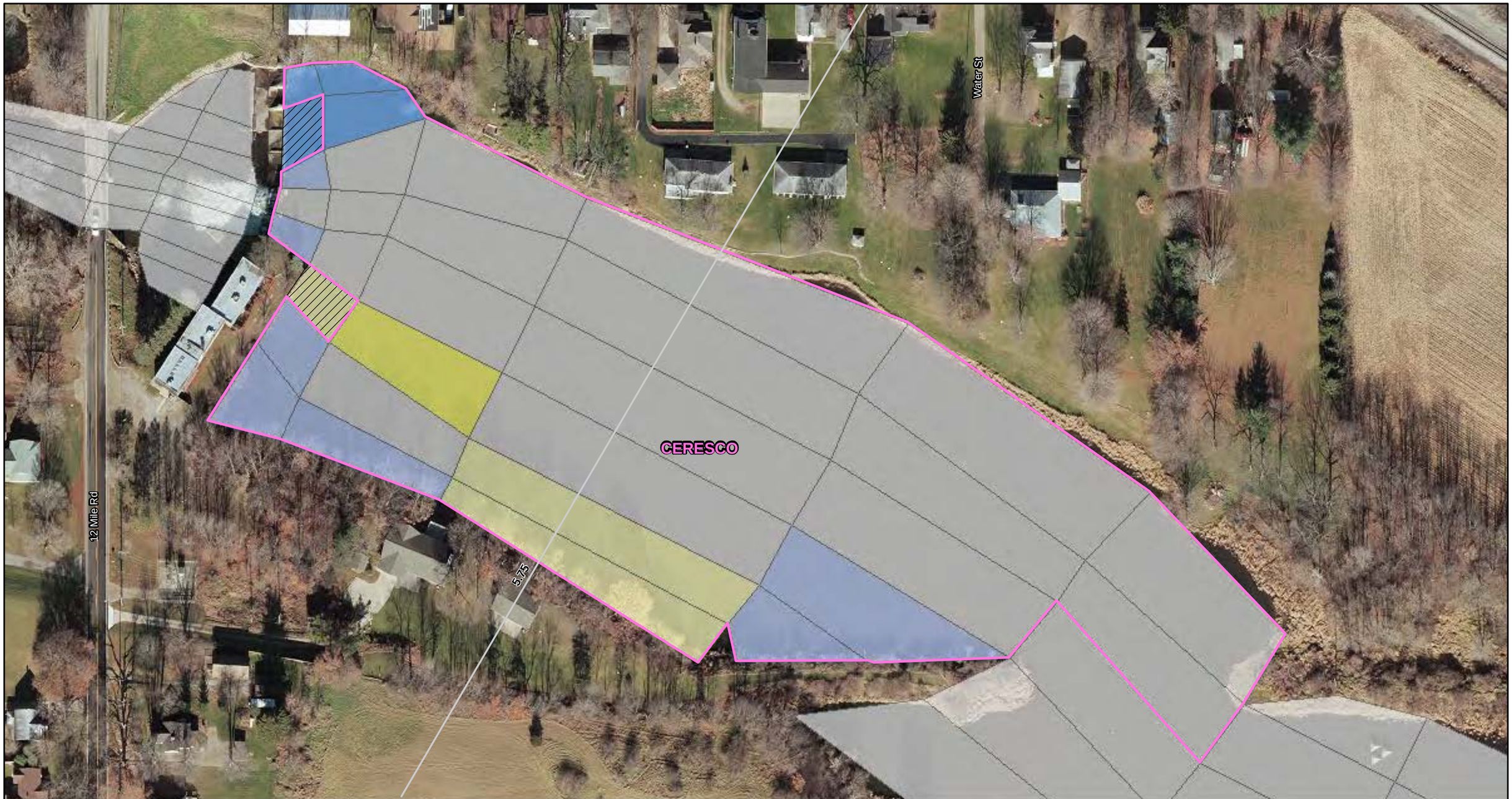
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Silt_Mass_Sed_TrapsA1-A3_Oct-Nov_2011.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
CERESCO
SHEET 2 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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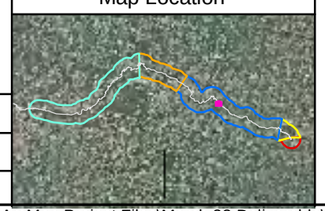
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
10.40 N & 10.50 L2
SHEET 3 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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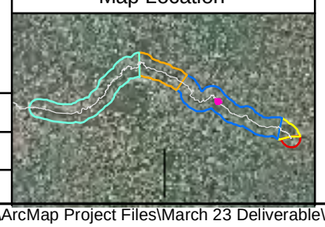
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
10.75 LDB
SHEET 4 OF 19
ENBRIDGE LINE 6B MP 608
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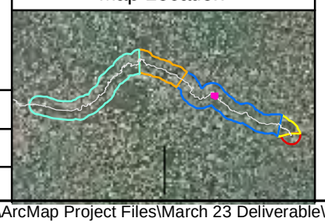
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

g/m2 = Grams Per Square Meter

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
MP 11.21
SHEET 5 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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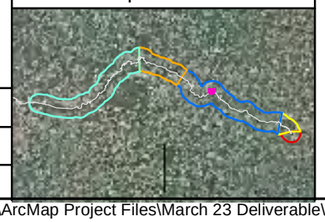
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

g/m2 = Grams Per Square Meter

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
MP 11.78
SHEET 6 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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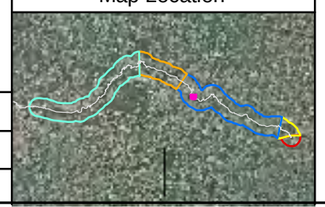
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

g/m2 = Grams Per Square Meter

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
14.75 RDB North
SHEET 7 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
14.75 RDB South
SHEET 8 OF 19
ENBRIDGE LINE 6B MP 608
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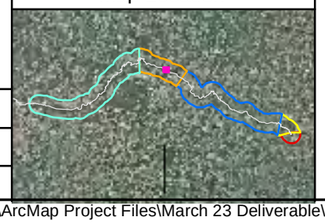
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
19.25 LDB North
SHEET 9 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

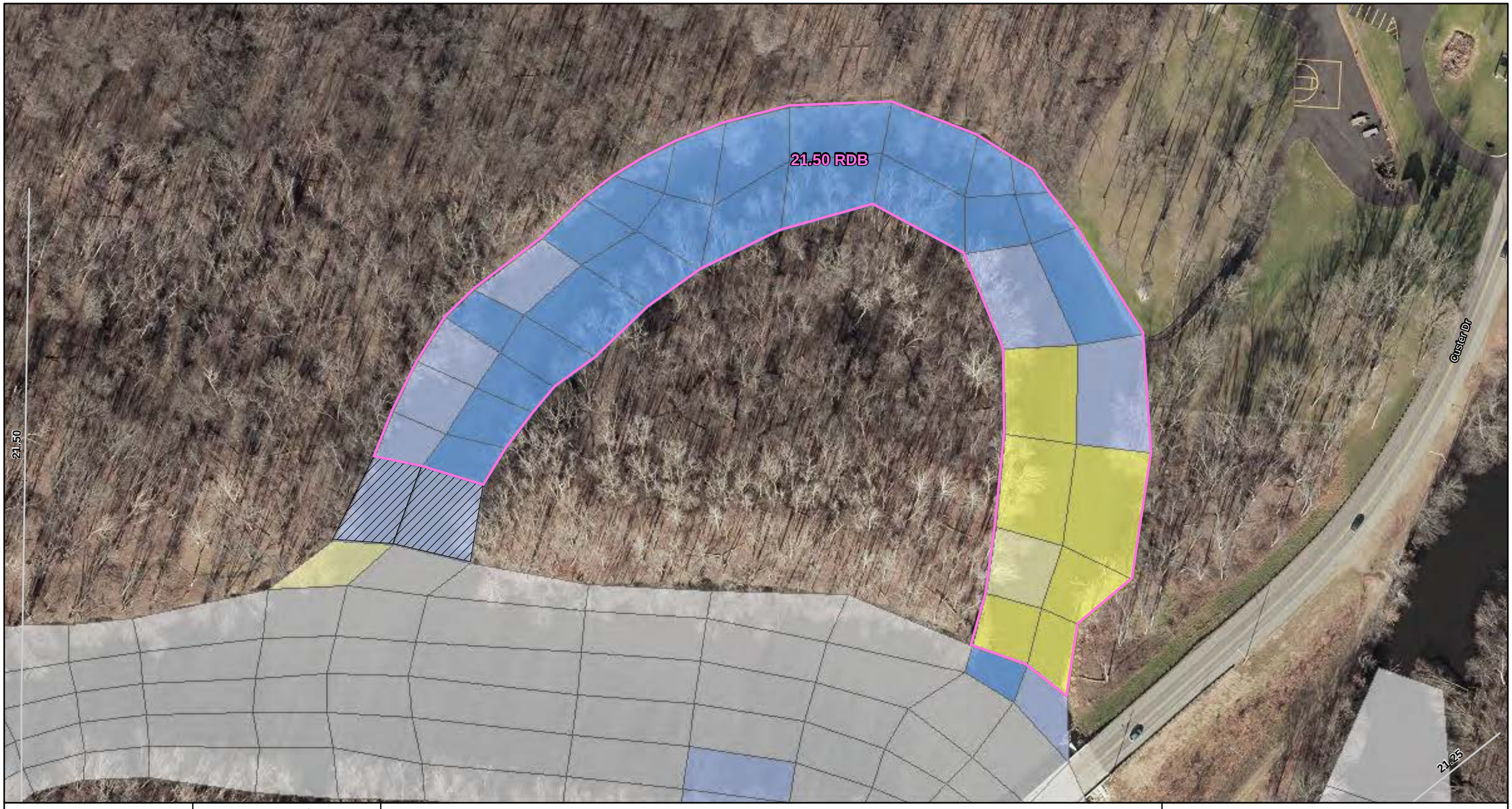
0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
19.25 LDB South
SHEET 10 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Silt_Mass_Sed_TrapsA1-A3_Oct-Nov_2011.mxd

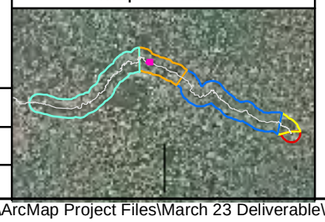
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
21.50 RDB
SHEET 11 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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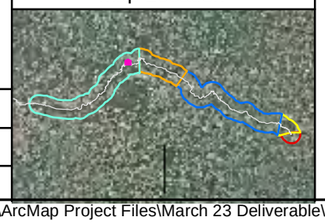
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
26.00 RDB & 26.25 RDB
SHEET 12 OF 19
ENBRIDGE LINE 6B MP 608
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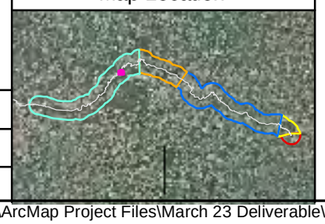
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Silt_Mass_Sed_TrapsA1-A3_Oct-Nov_2011.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
28.25 RDB
SHEET 13 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

30.75

30.80 LDB

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Project #:	106-4186

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
30.80 LDB
SHEET 14 OF 19
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Aerial Photography Date: November 2011

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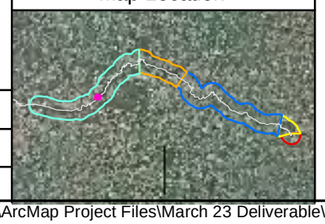
Drawn:	BRS	4/5/2012
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
33.00 A
SHEET 15 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
33.00 B
SHEET 16 OF 19
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Aerial Photography Date: November 2011

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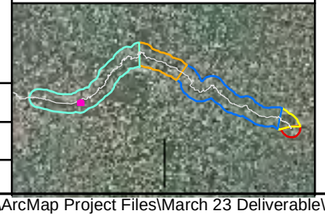
Approved:	DBR 4/5/2012
Project #:	106-4186

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
36.10 NW
SHEET 17 OF 19
ENBRIDGE LINE 6B MP 608
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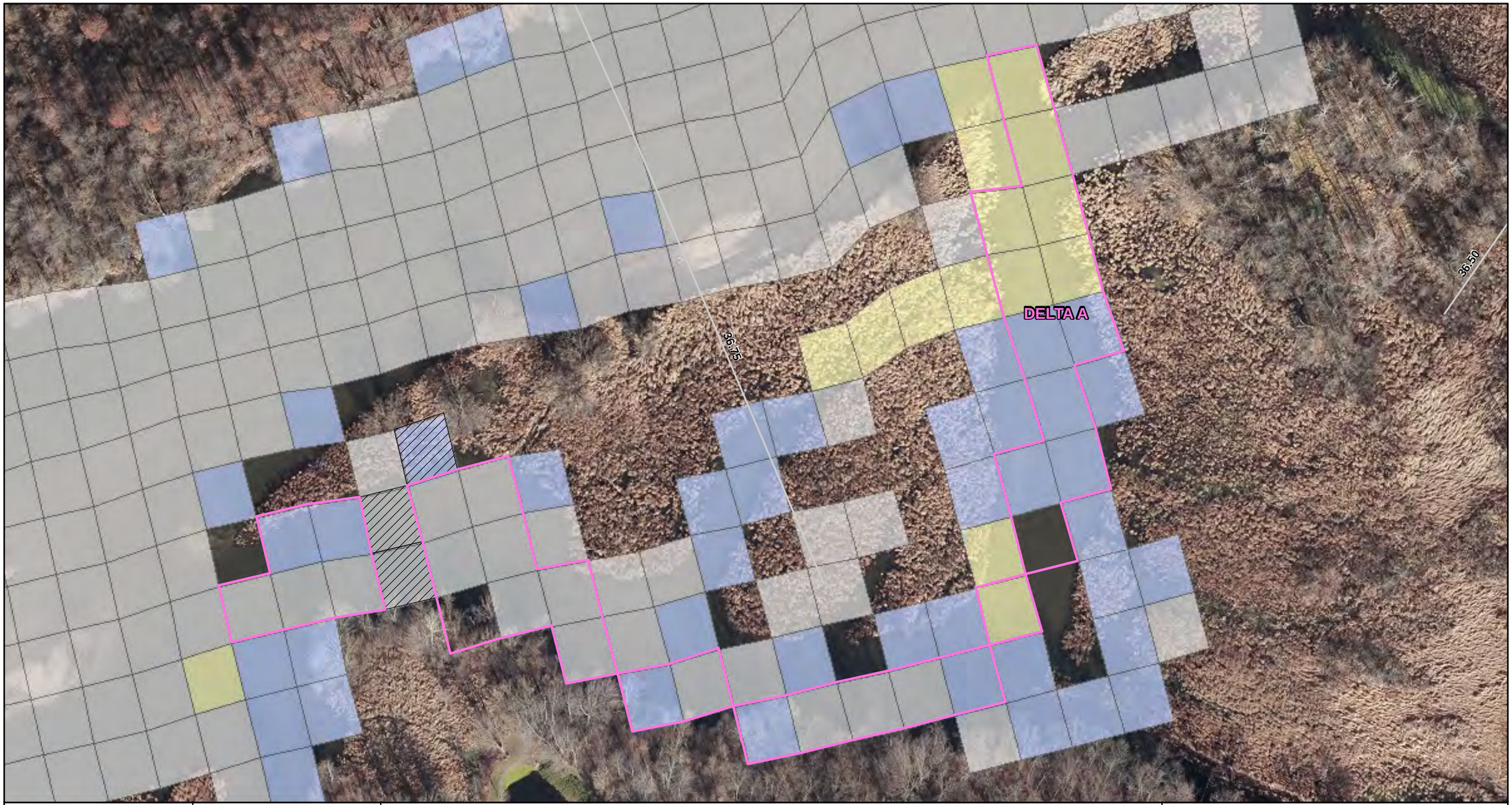
Aerial Photography Date: November 2011



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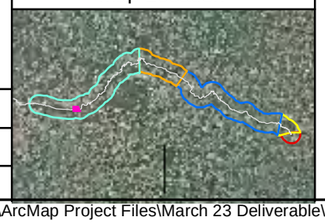
Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
DELTA A
SHEET 18 OF 19
ENBRIDGE LINE 6B MP 608
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37.75

37.75 ISLANDS

37.50

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Approved:	DBR	4/5/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- >5,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID:
DIFFERENCE IN NET CHANGE IN SILT MASS
OCTOBER 31 - NOVEMBER 7, 2011
75% VS. NO STRUCTURES
37.75 ISLANDS
SHEET 19 OF 19
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Aerial Photography Date: November 2011

Figure 7-35

Riverine Grid: Difference in Net Change in Silt Mass, May 16 – May 23, 2011

75% vs. No Structures

Sheets 1 through 19

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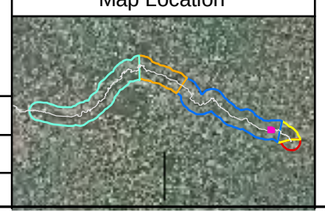
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

3.25 R1

SHEET 1 OF 19

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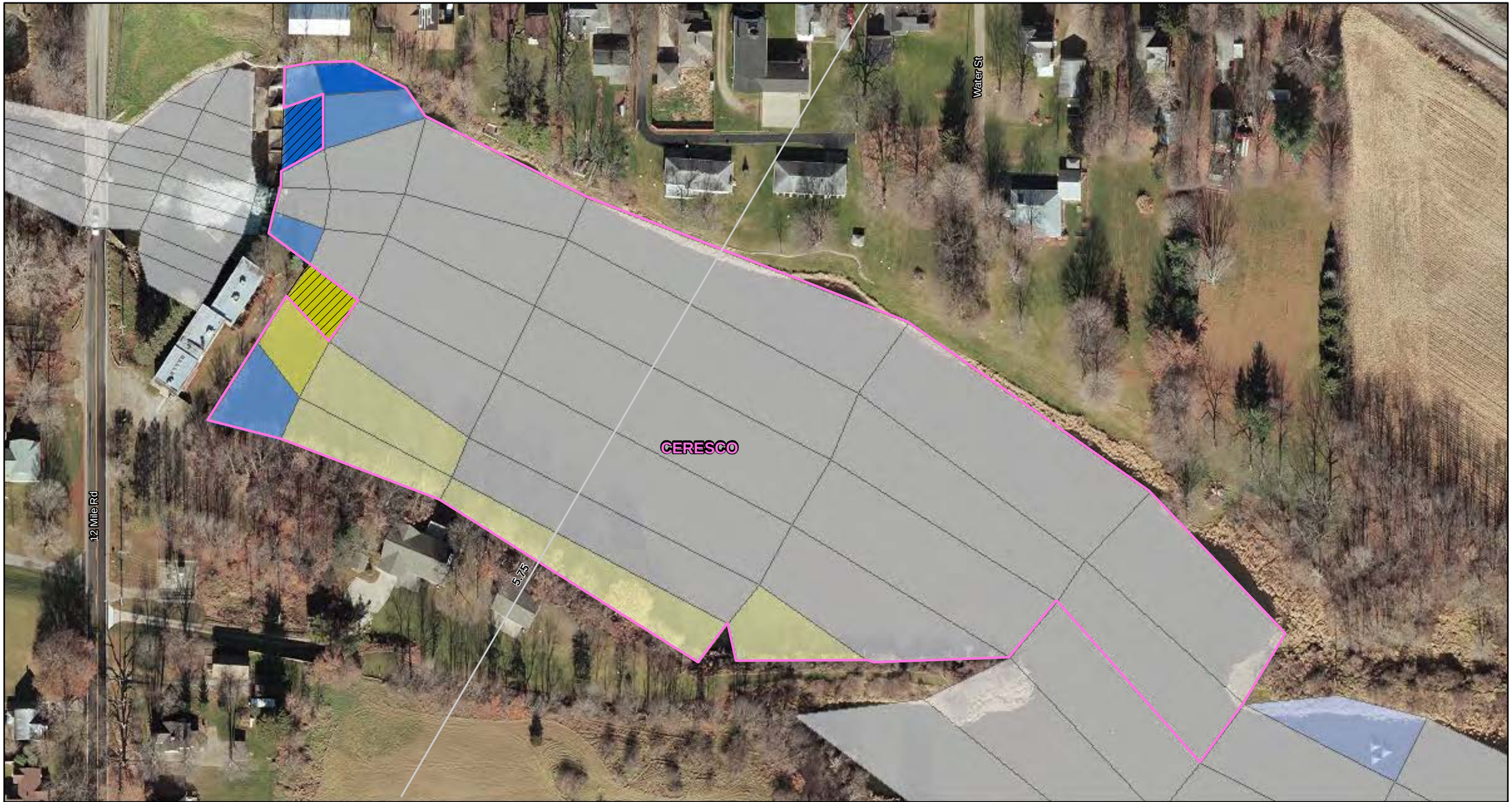
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES
CERESCO
SHEET 2 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES
10.40 N & 10.50 L2
SHEET 3 OF 19
ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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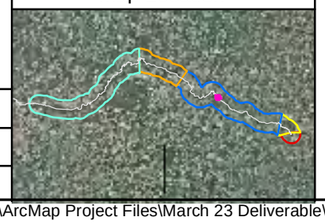
Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

g/m2 = Grams Per Square Meter

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

10.75 LDB

SHEET 4 OF 19

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Aerial Photography Date: November 2011

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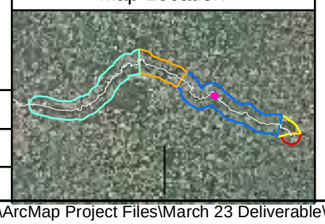
Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

MP 11.21

SHEET 5 OF 19

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Aerial Photography Date: November 2011

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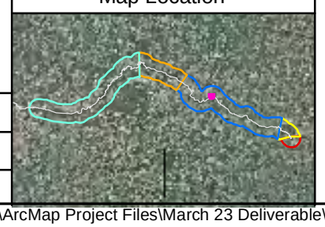
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

MP 11.78

SHEET 6 OF 19

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Aerial Photography Date: November 2011

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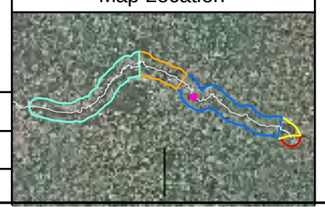
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

14.75 RDB North

SHEET 7 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

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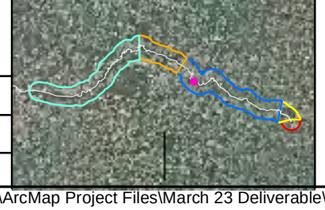
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

14.75 RDB South

SHEET 8 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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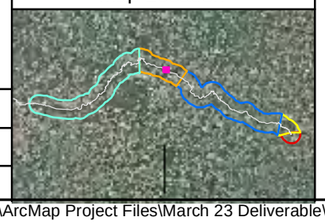
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

19.25 LDB North

SHEET 9 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

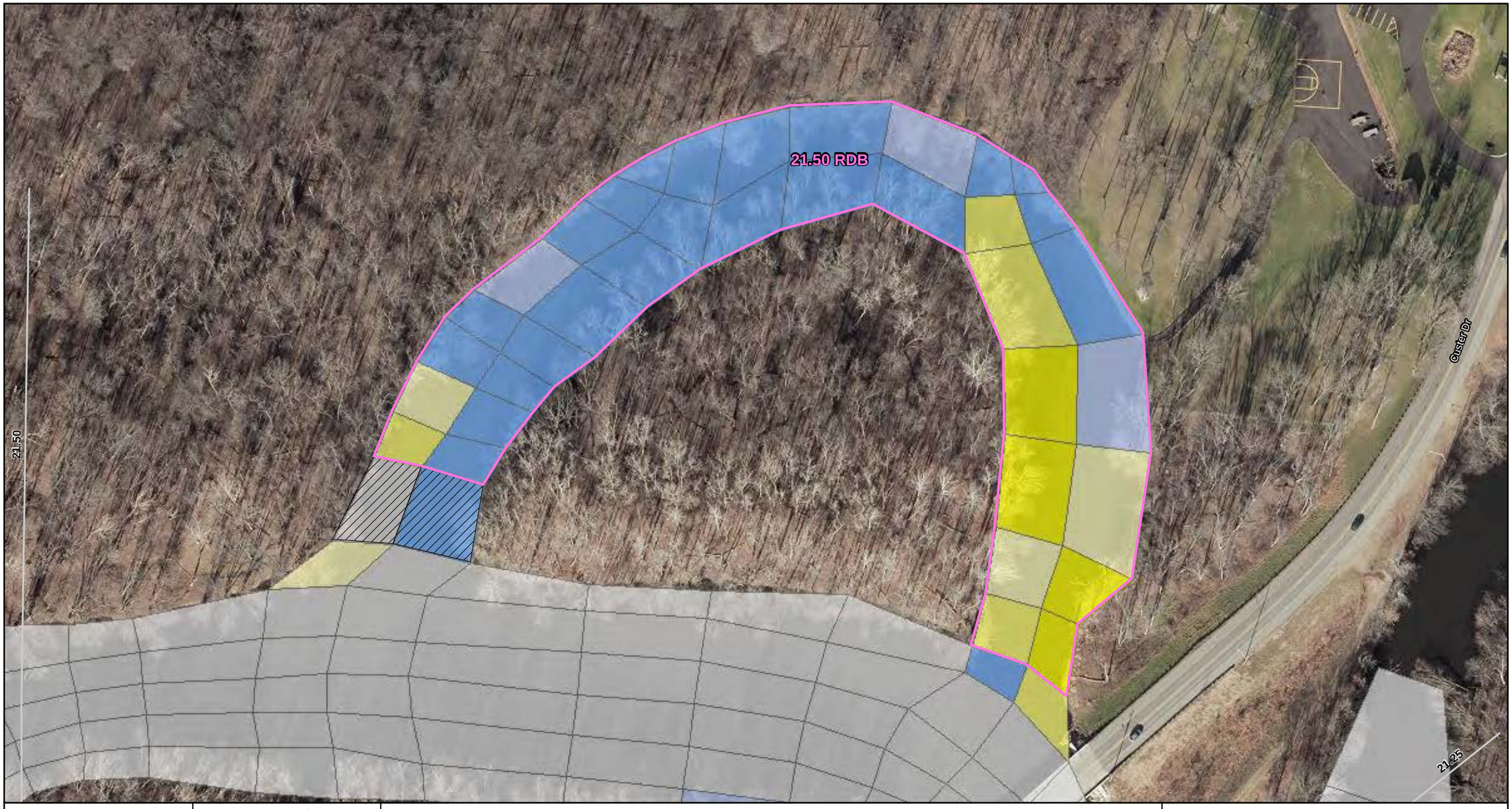
Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES
19.25 LDB South
SHEET 10 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Riverine_Silt_Mass_Sed_TrapsB1-B3_May_2011.mxd

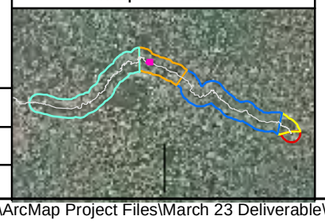
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

21.50 RDB

SHEET 11 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

Augusta Dr

26.25

26.25 RDB

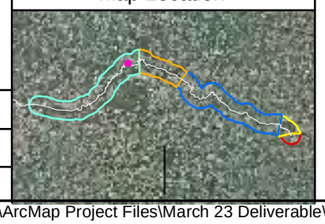
26.00

26.00 RDB

ENBRIDGE

Drawn:	BRS 4/6/2012
Approved:	DBR 4/6/2012
Project #:	106-4186

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

26.00 RDB & 26.25 RDB

SHEET 12 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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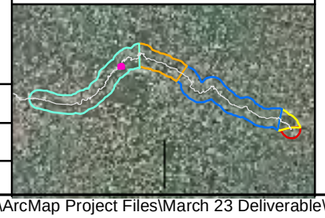
Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

28.25 RDB

SHEET 13 OF 19

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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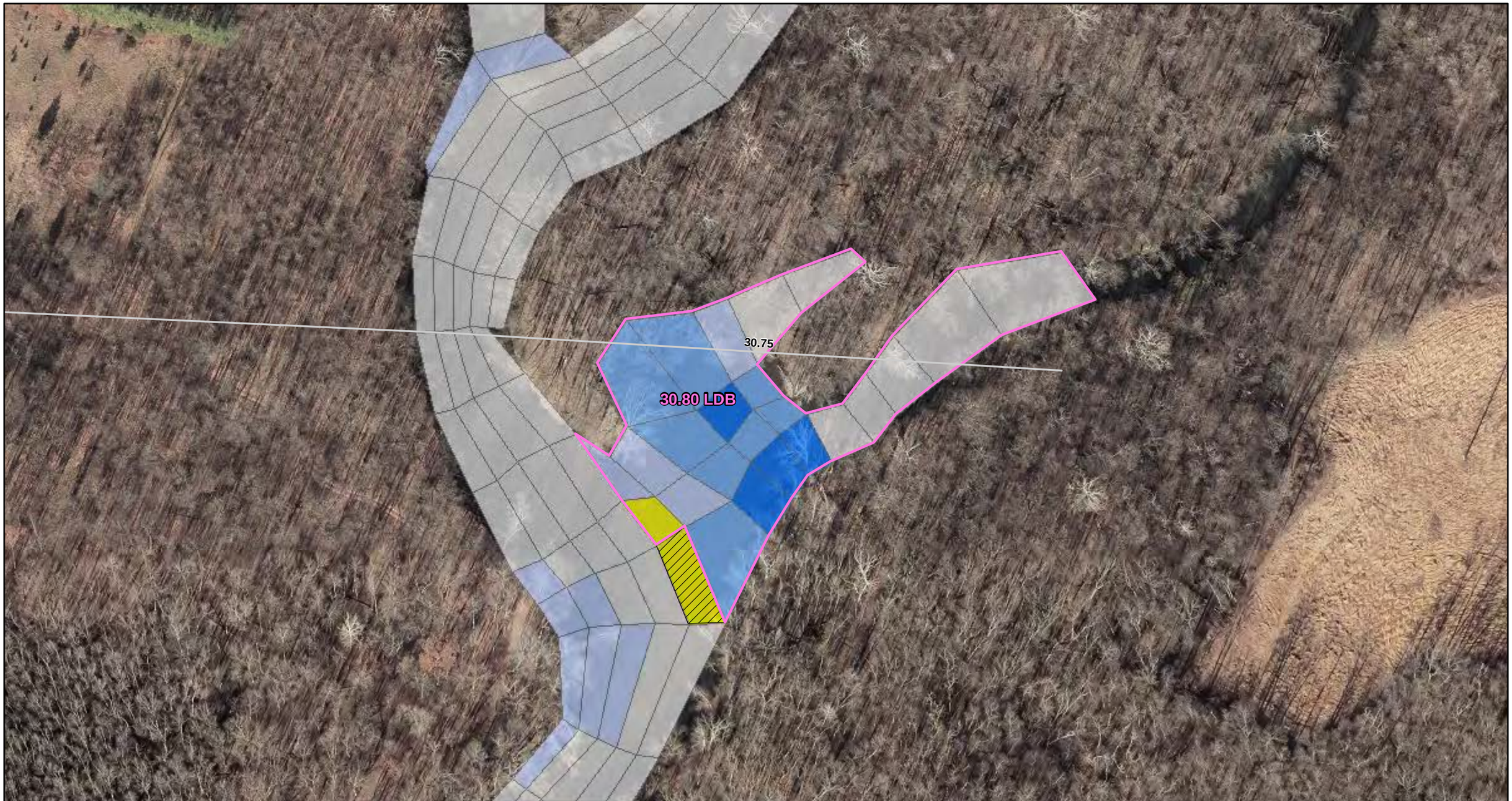
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

30.80 LDB

SHEET 14 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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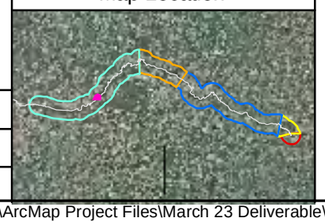
Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

33.00 A

SHEET 15 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

33.00 B

SHEET 16 OF 19

ENBRIDGE LINE 6B MP 608
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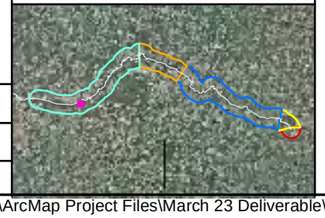
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

36.10 NW

SHEET 17 OF 19

ENBRIDGE LINE 6B MP 608
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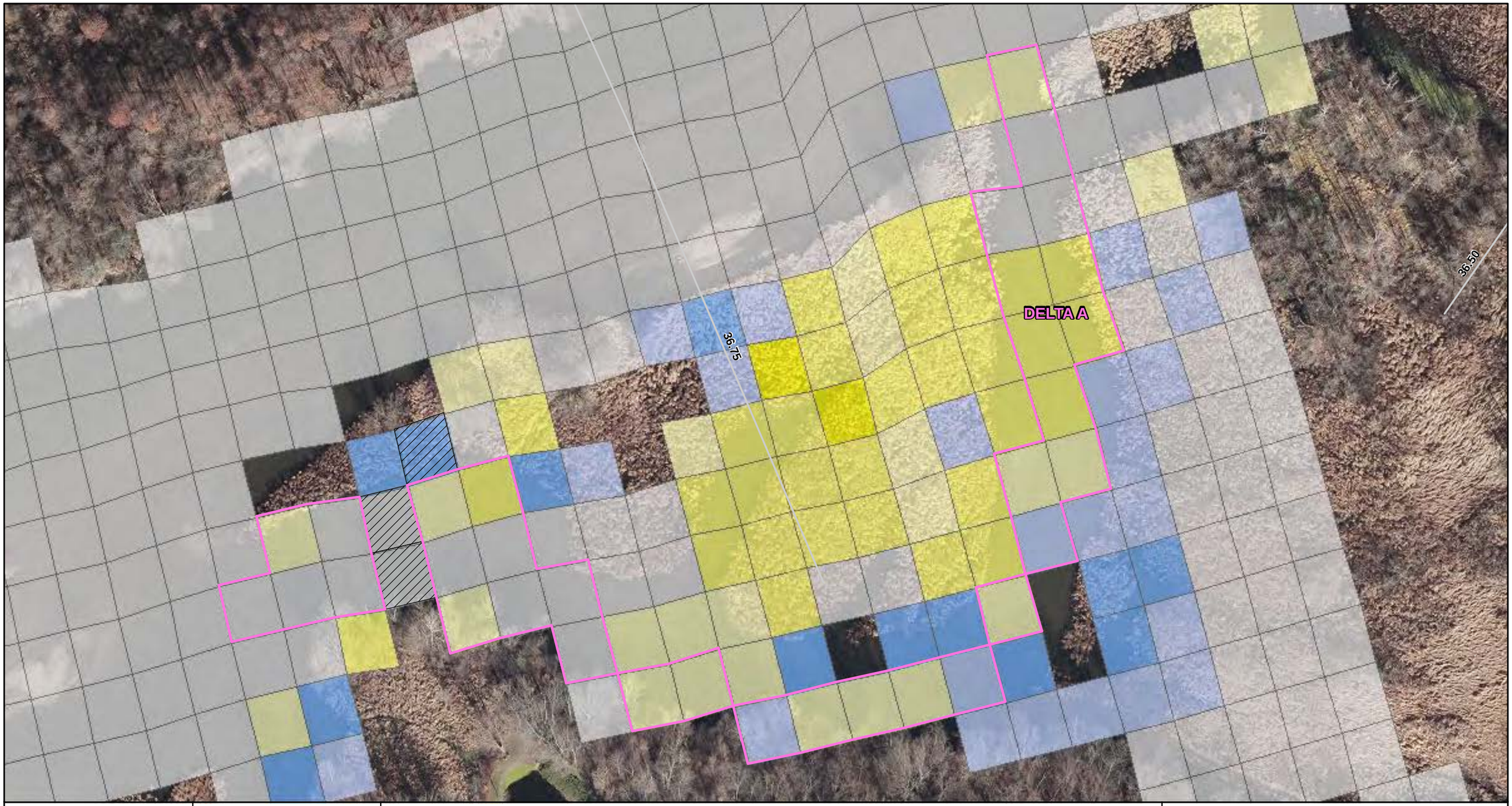
Aerial Photography Date: November 2011



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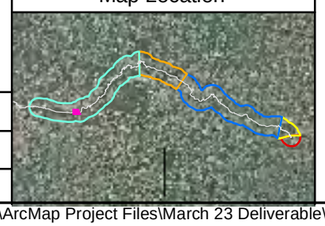
Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location



Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change
- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

g/m2 = Grams Per Square Meter

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES

DELTA A

SHEET 18 OF 19

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

37.75

37.75 ISLANDS

37.50

ENBRIDGE

Drawn:	BRS	4/6/2012
Approved:	DBR	4/6/2012
Project #:	106-4186	

Map Location

Legend

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Quarter Mile Grid Segment

N

0 50 100 200

Scale in Feet

RIVERINE GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
MAY 16 - MAY 23, 2011 --- 75% VS. NO STRUCTURES
37.75 ISLANDS
SHEET 19 OF 19
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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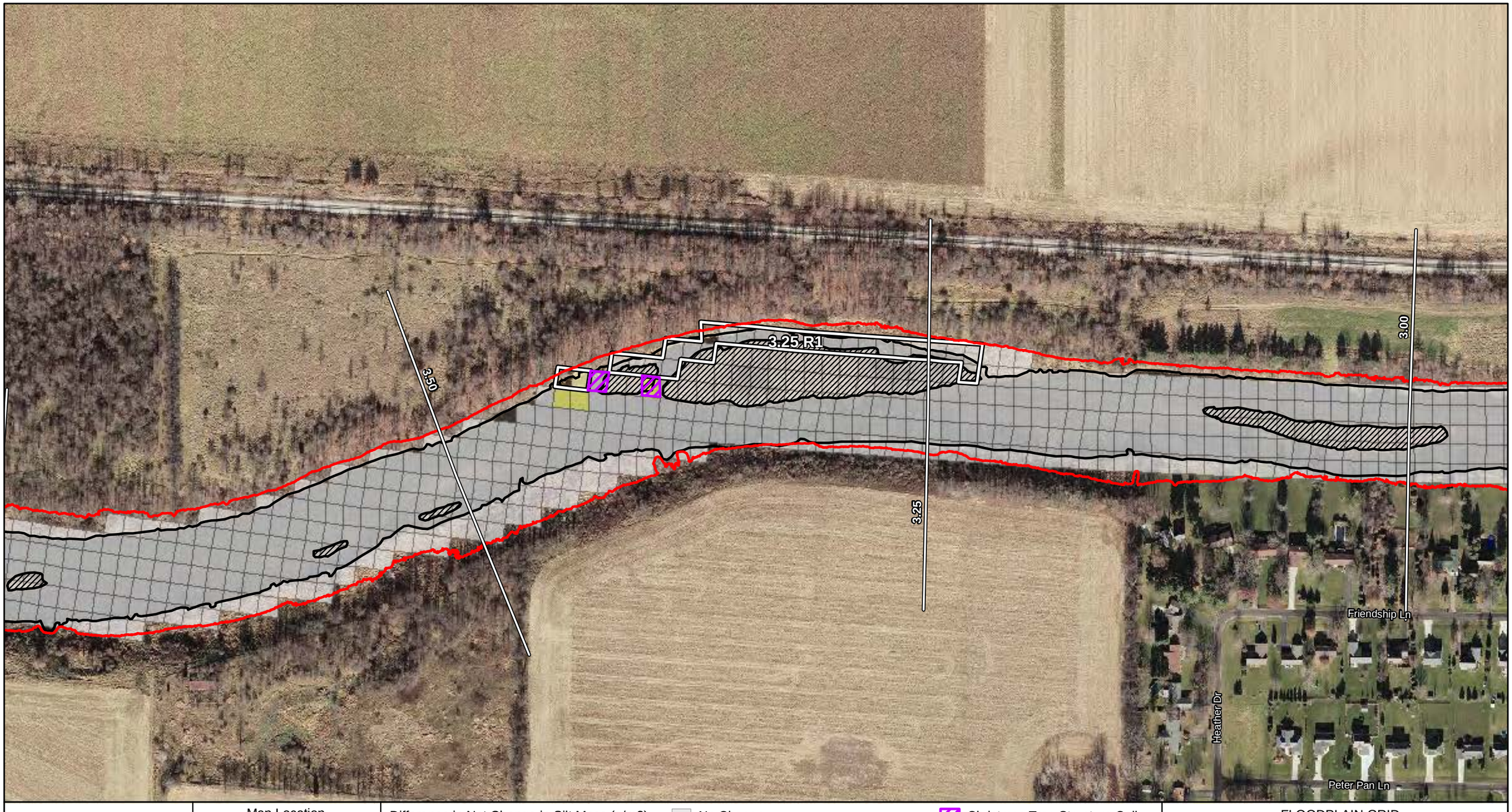
Aerial Photography Date: November 2011

Figure 7-36

Floodplain Grid: Difference in Net Change in Silt Mass, July 24 – July 31, 2010

75% vs. No Structures

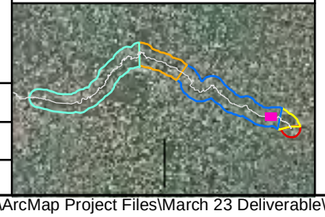
Sheets 1 through 15



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
3.25 R1

SHEET 1 OF 15

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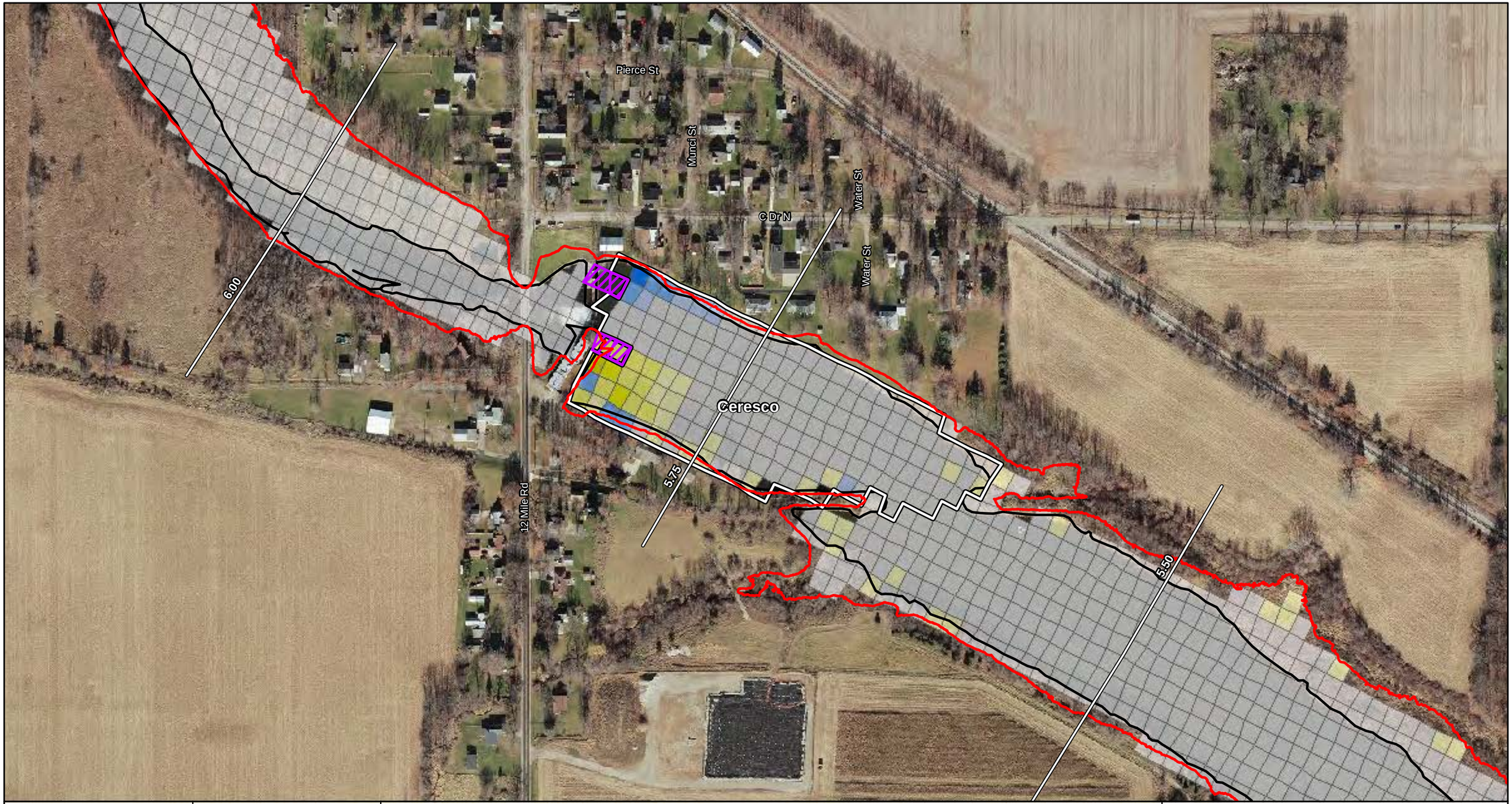
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Silt_Mass_Sed_TrapsE1_E3_July_2010.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
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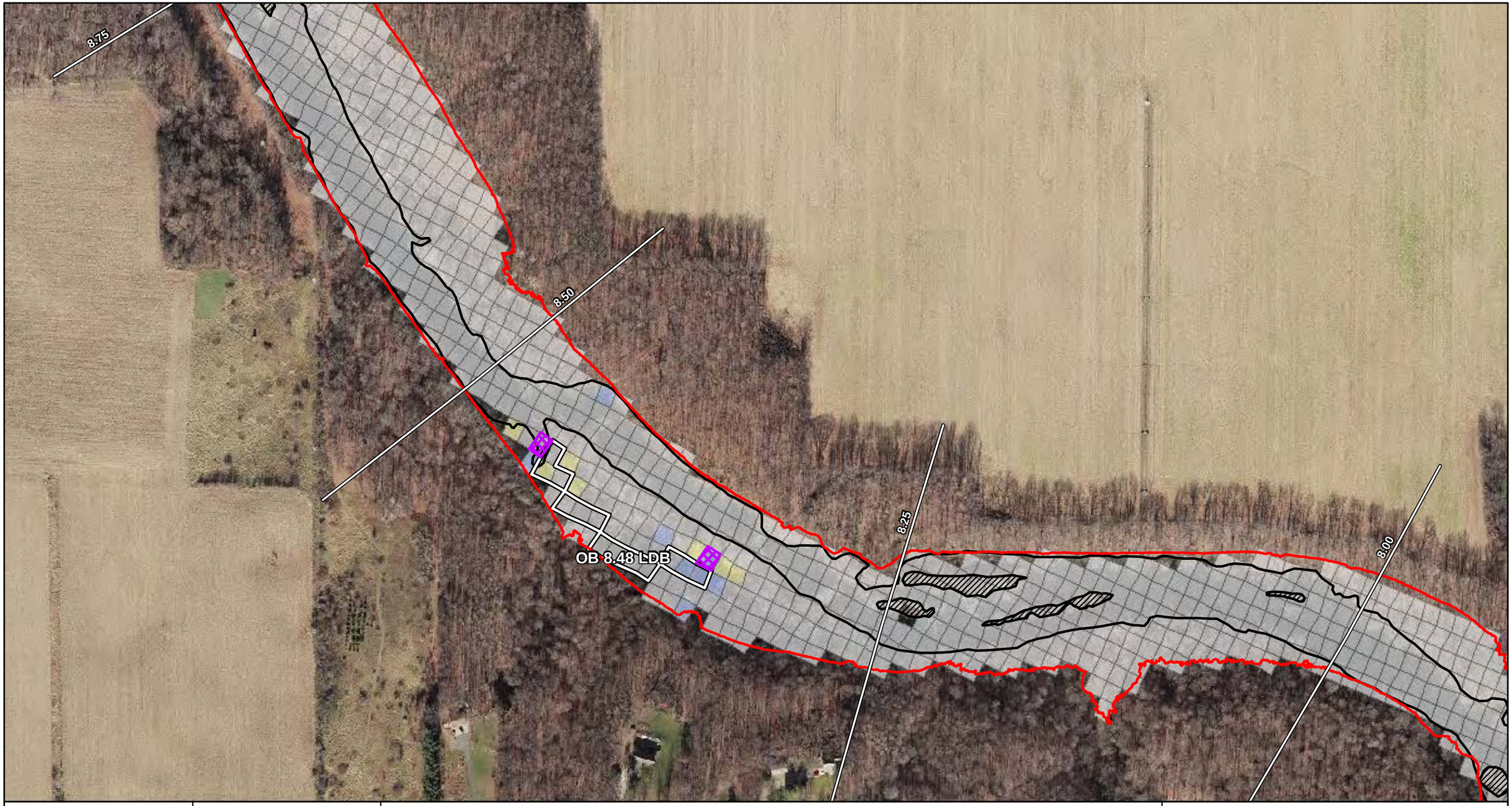
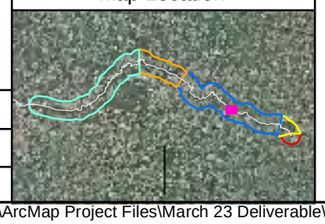
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
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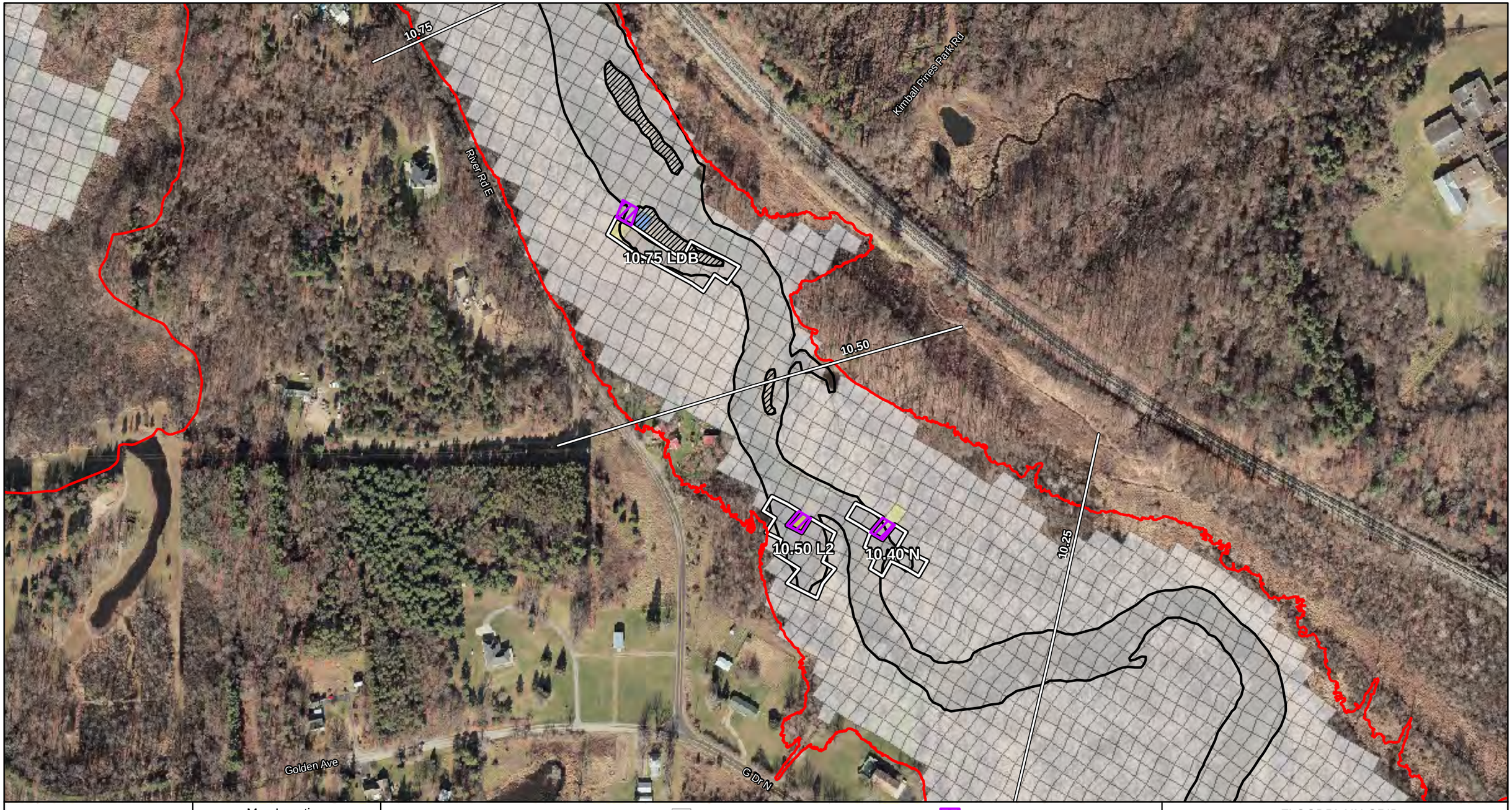
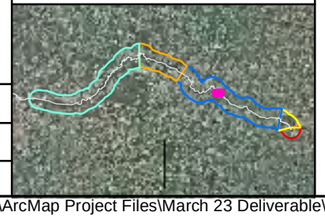
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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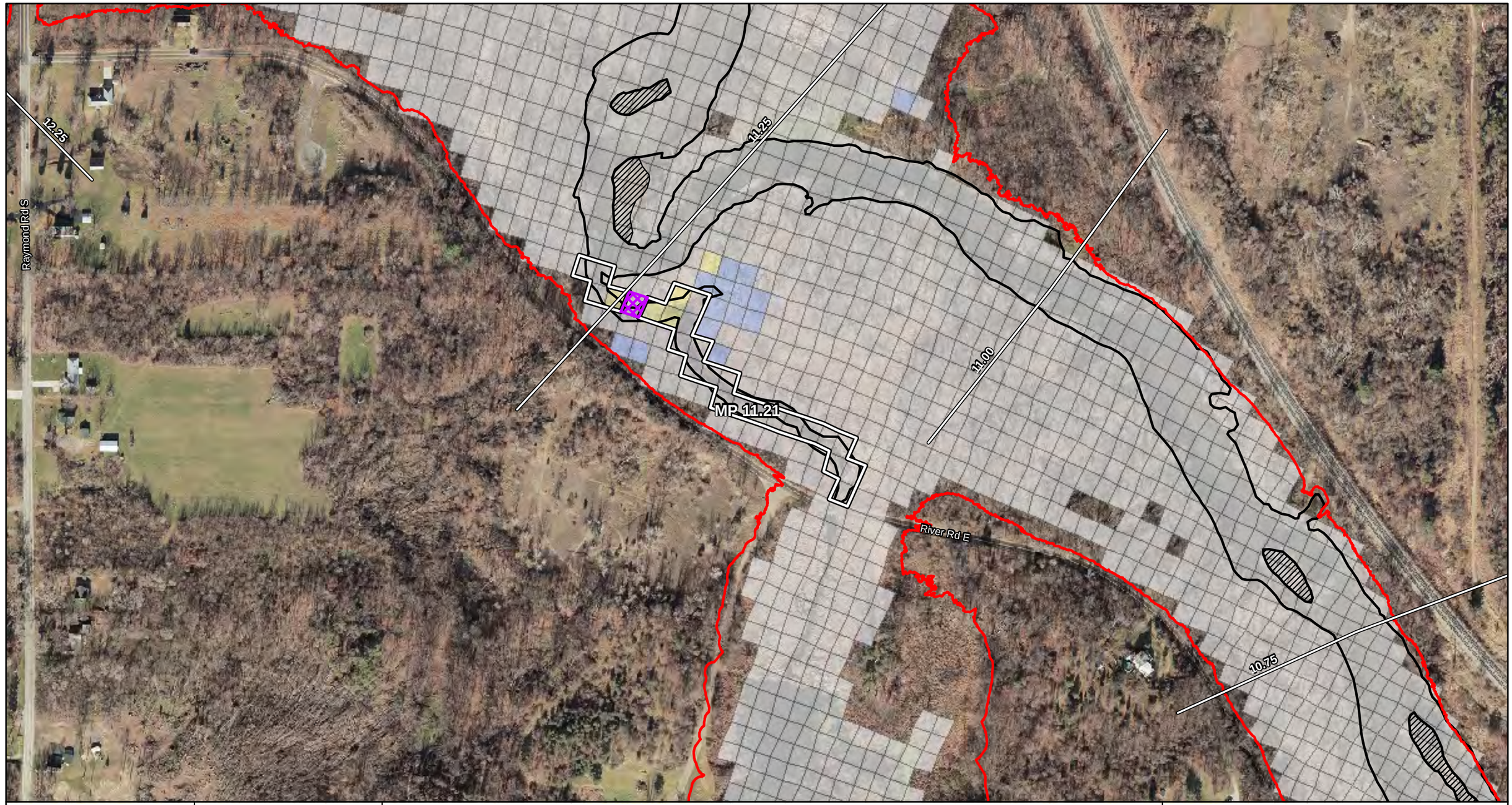
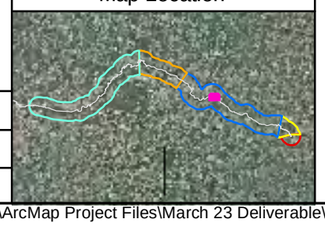
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

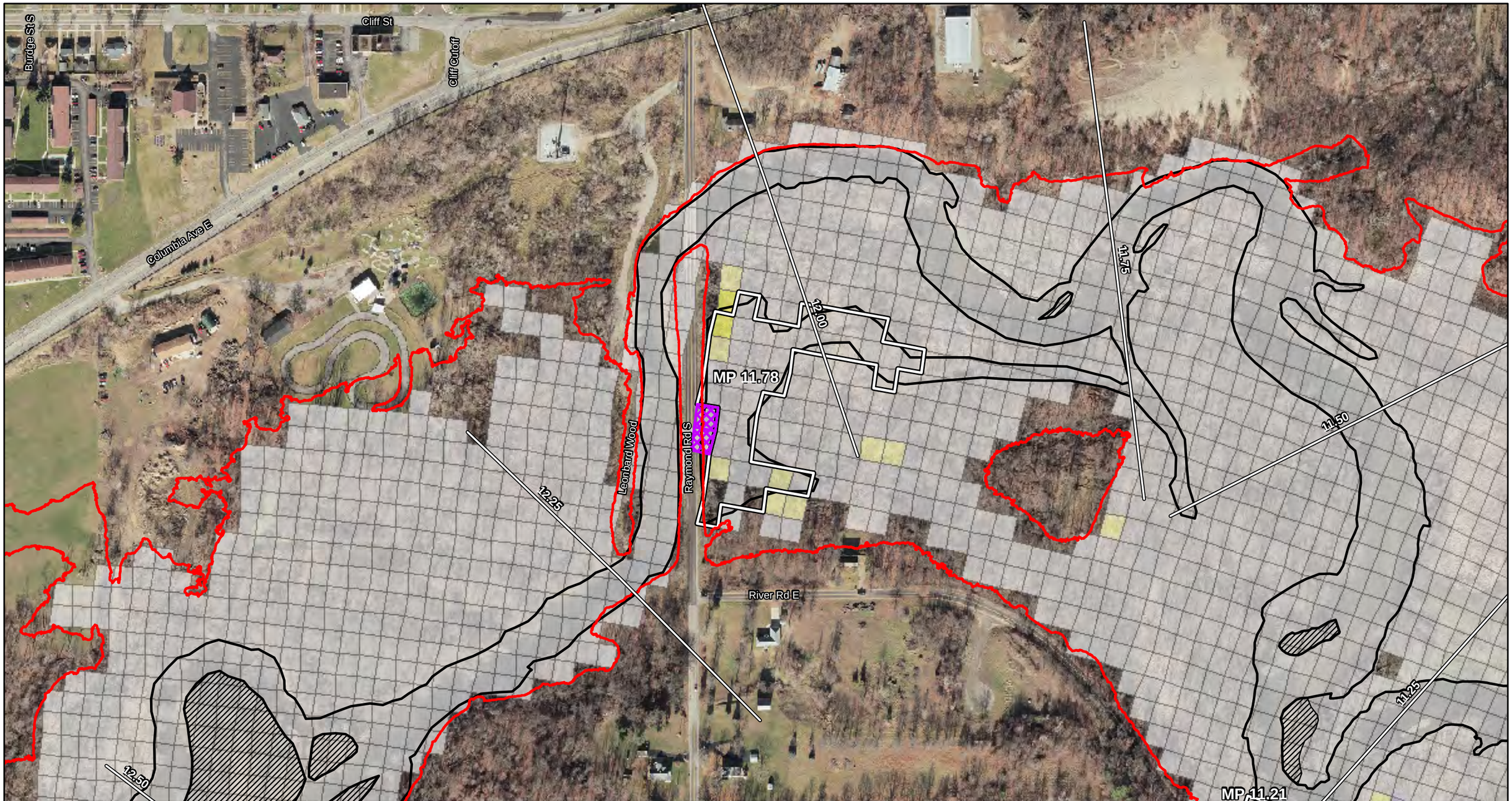
FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Silt_Mass_Sed_TrapsE1_E3_July_2010.mxd

Aerial Photography Date: November 2011



Map Location

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

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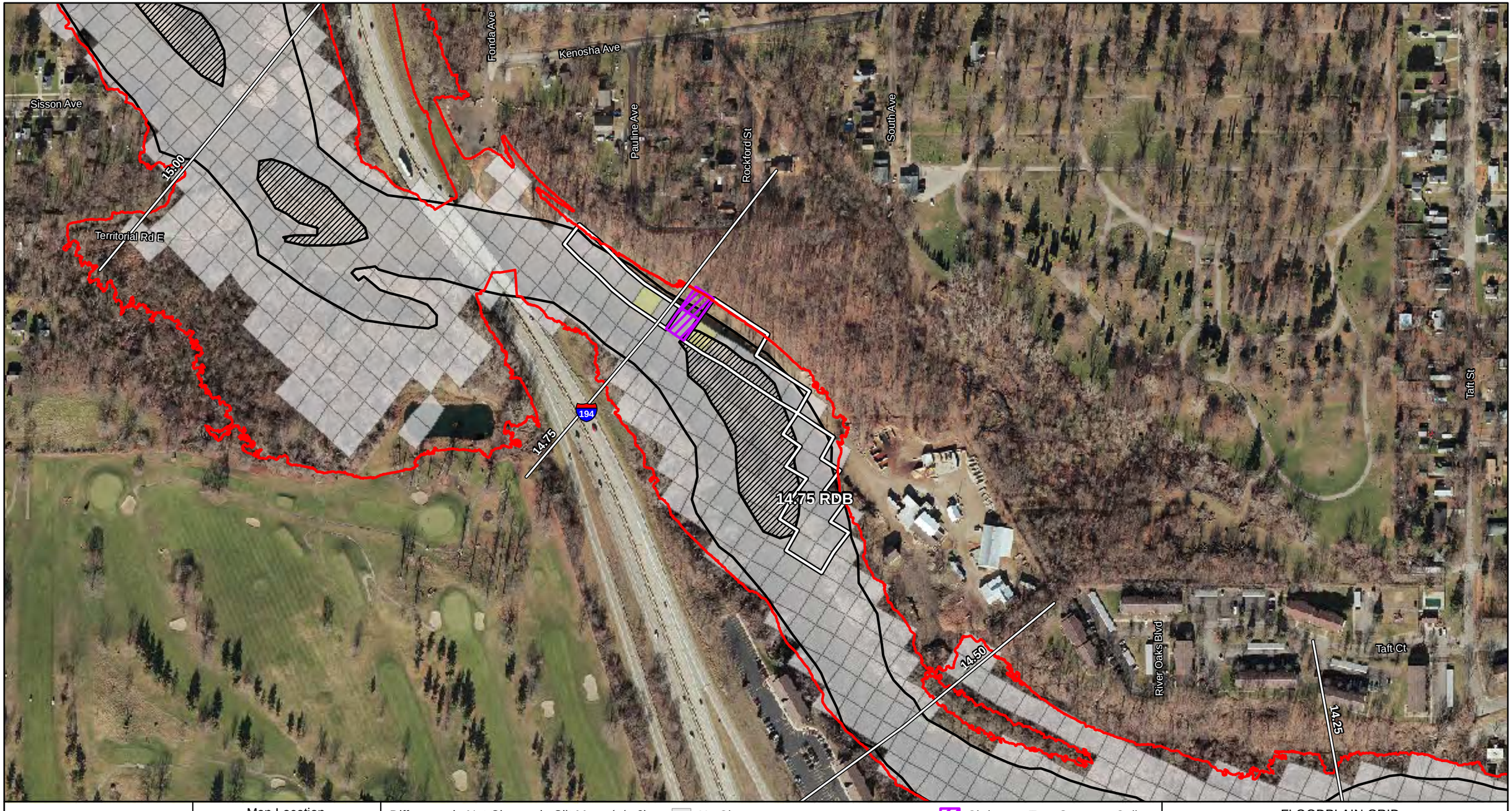
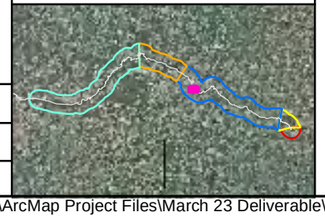
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures
- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
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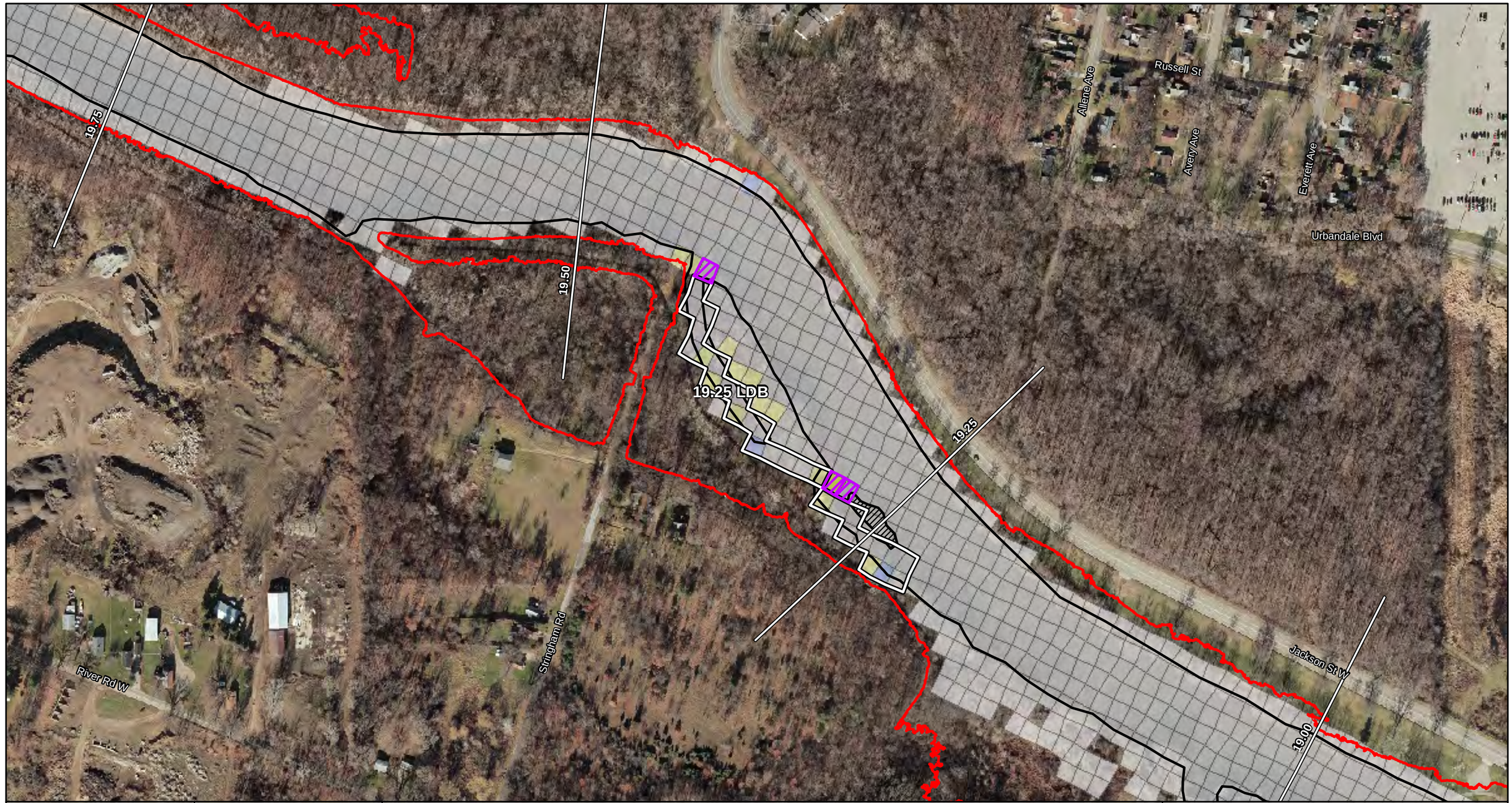
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
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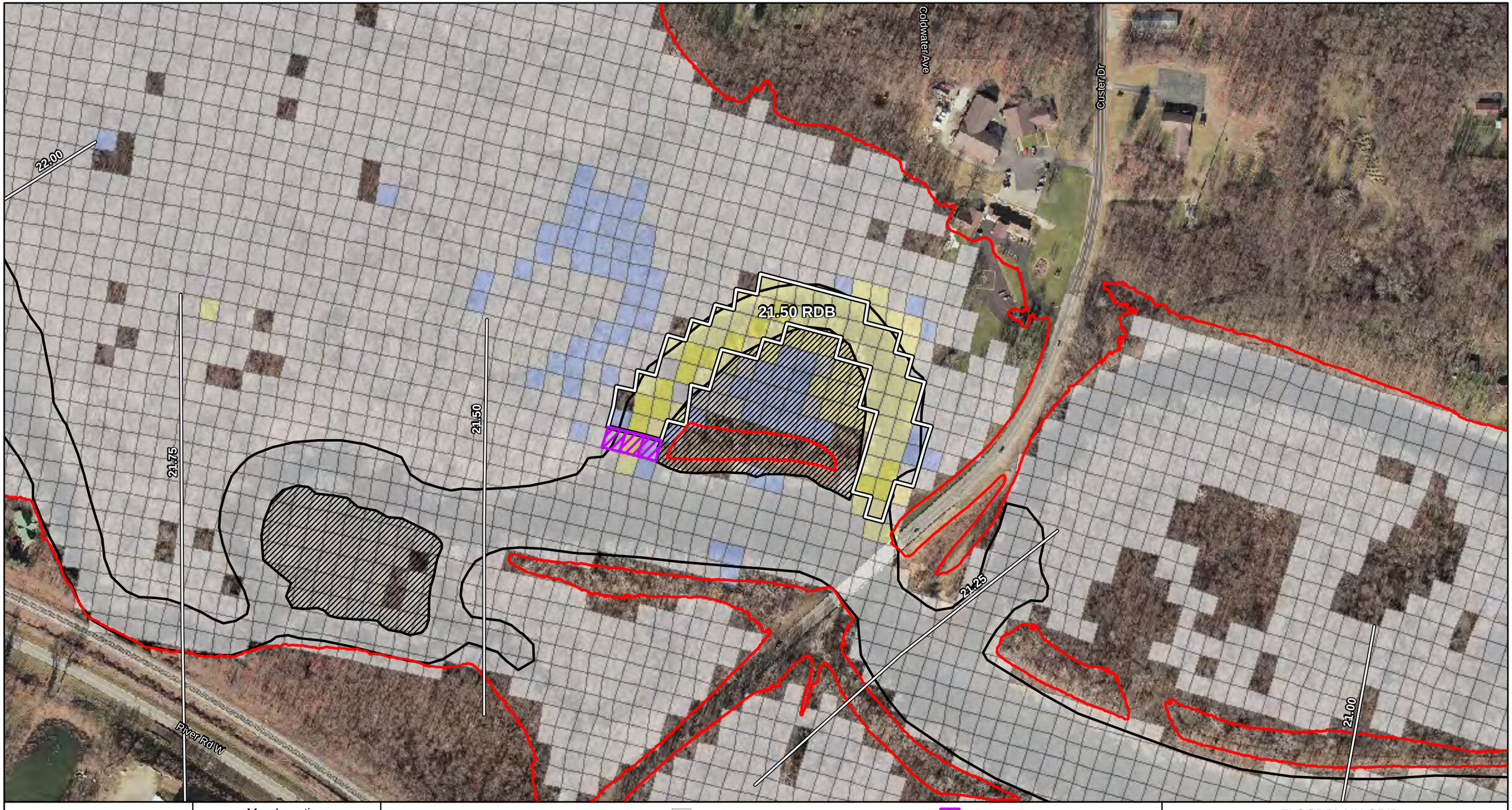
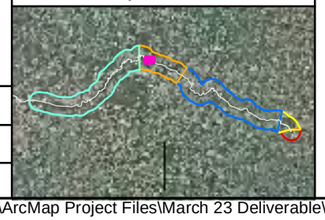
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
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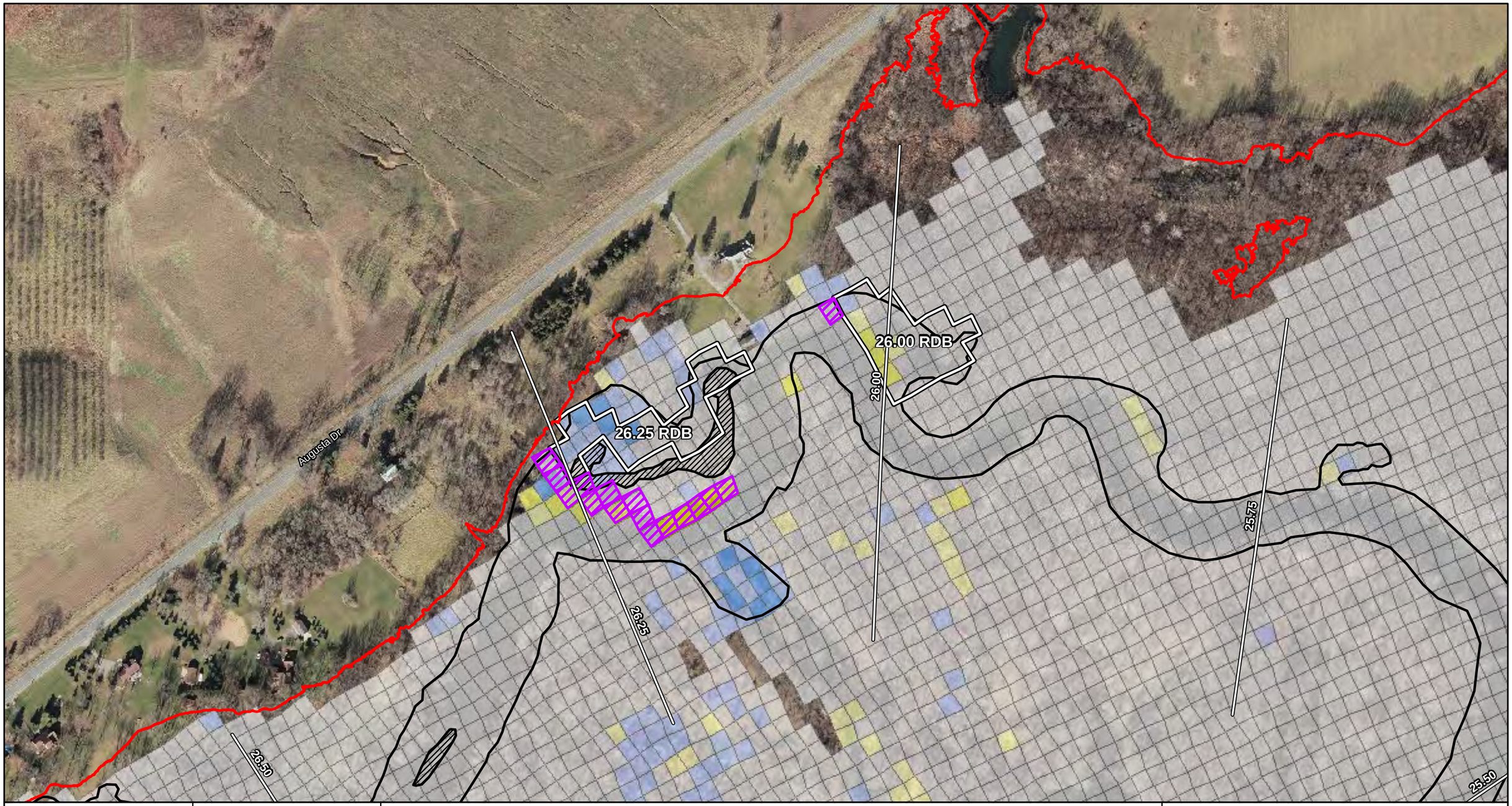
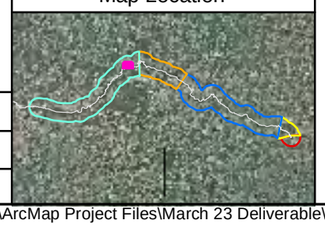
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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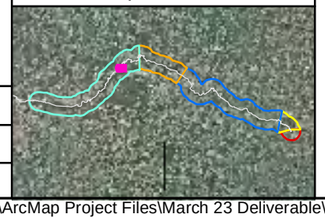
Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
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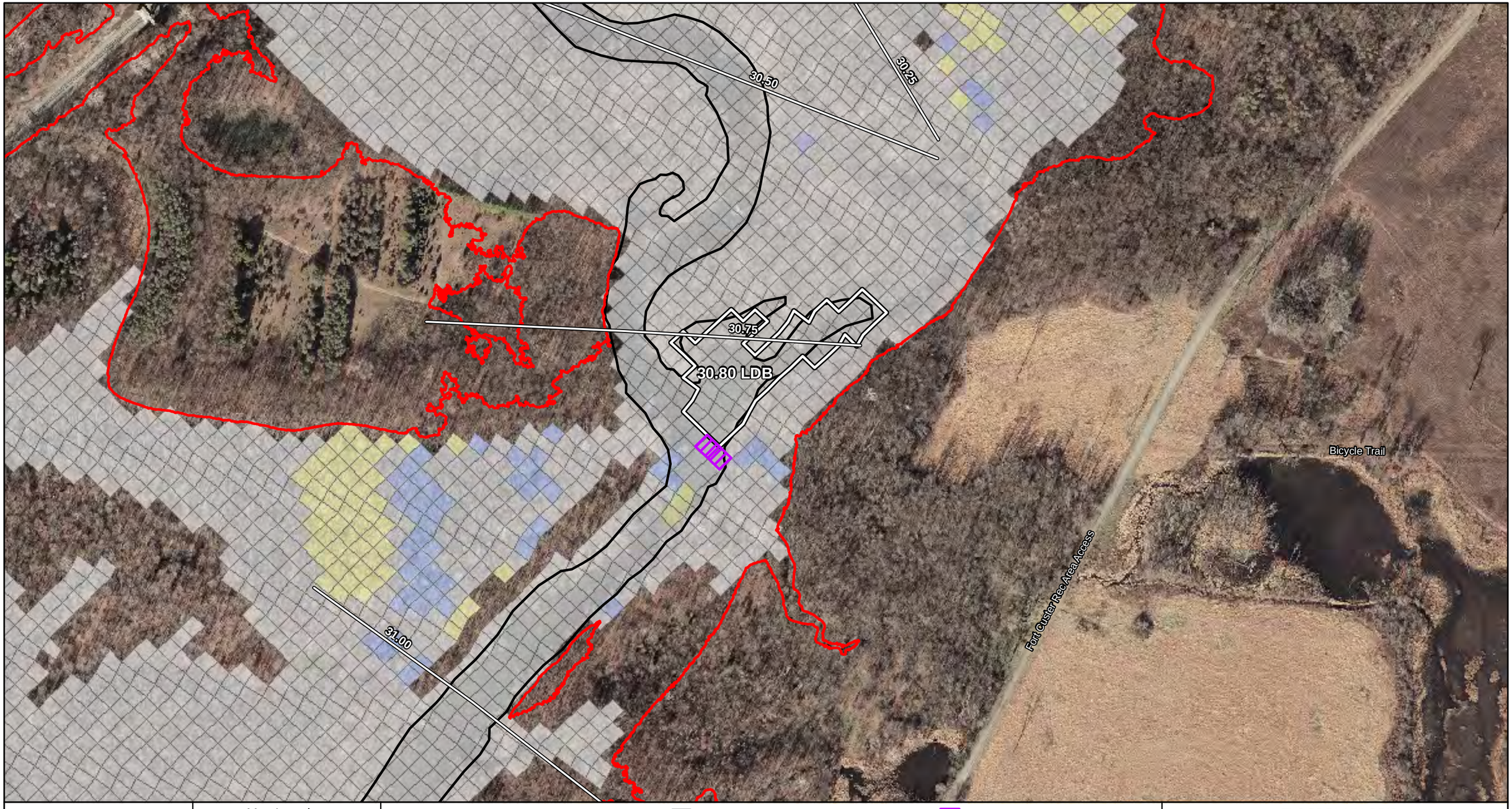
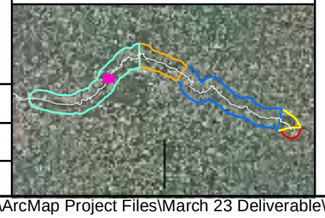
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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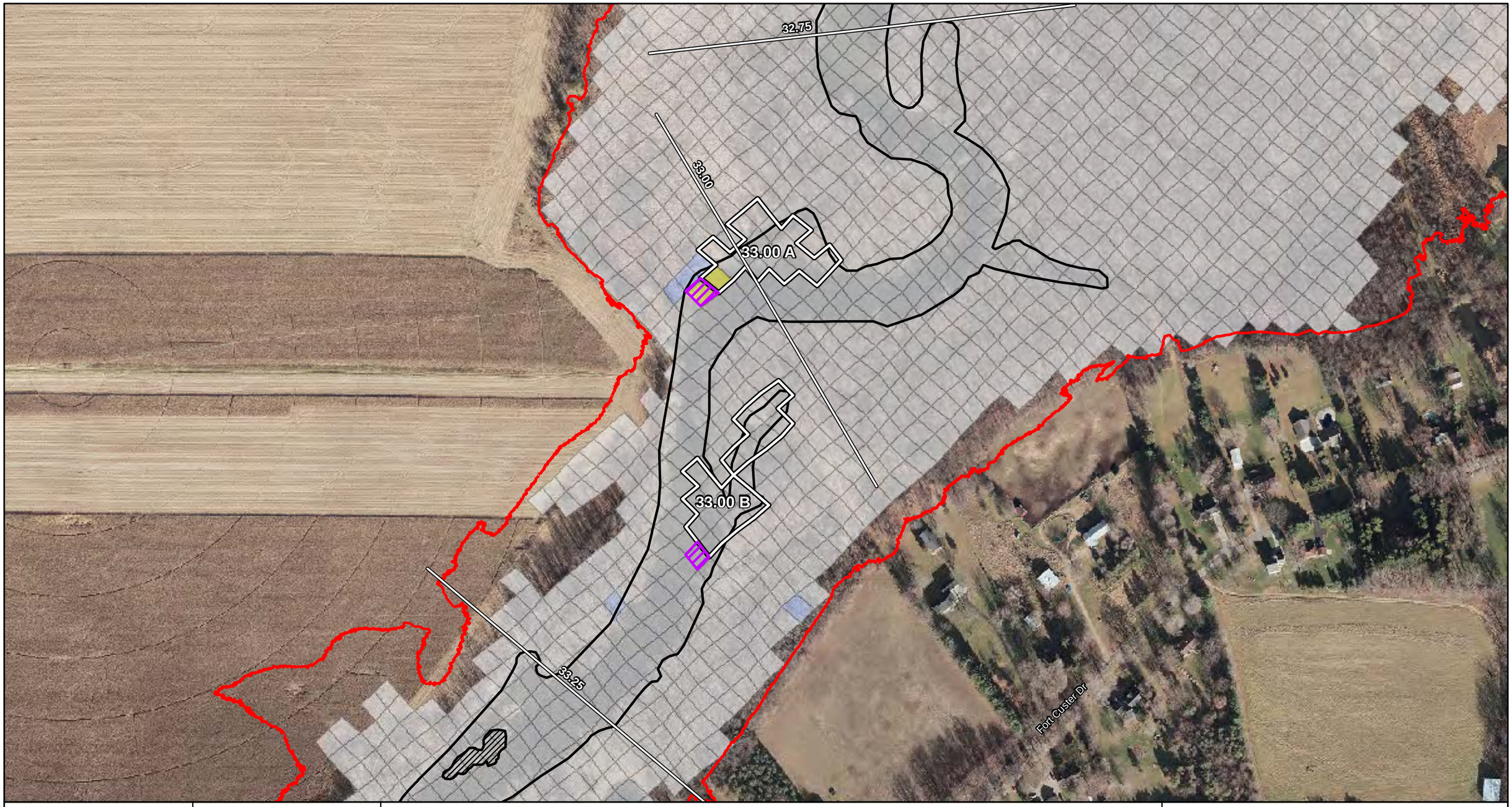
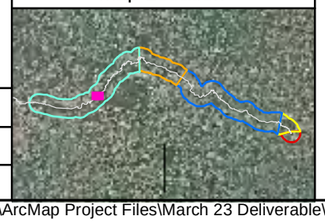
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
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Aerial Photography Date: November 2011

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Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location

Difference in Net Change in Silt Mass (g/m2)

75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500

Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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Aerial Photography Date: November 2011

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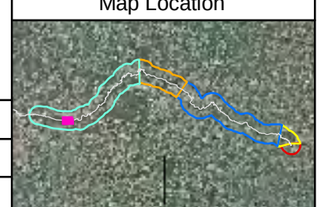
Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- >10,000 increase in net change
- HEC-RAS 100-Year Floodplain

- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
JULY 24 - JULY 31, 2010 --- 75% VS. NO STRUCTURES
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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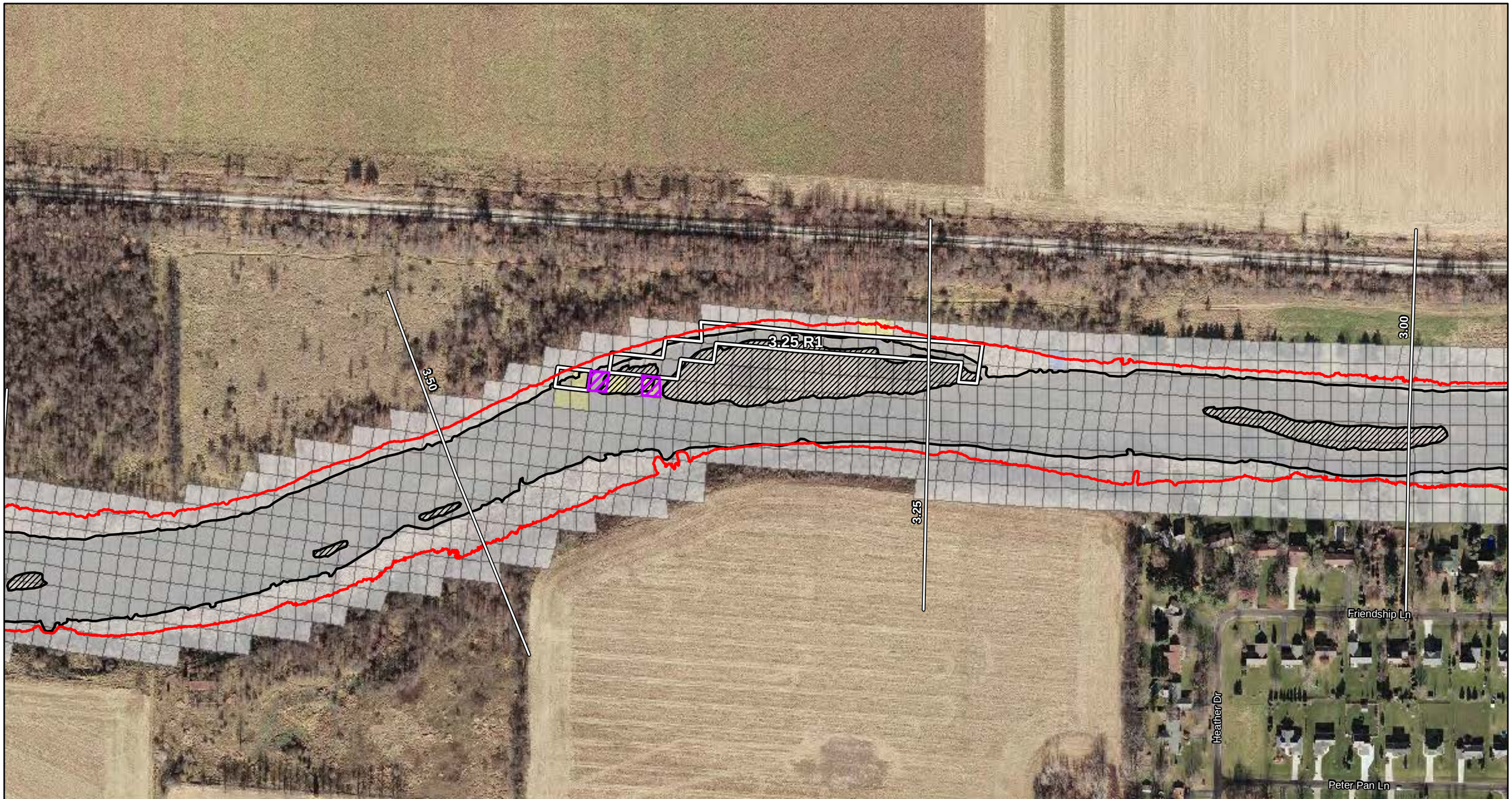
Aerial Photography Date: November 2011

Figure 7-37

Floodplain Grid: Difference in Net Change in Silt Mass, 100-Year Flood

75% vs. No Structures

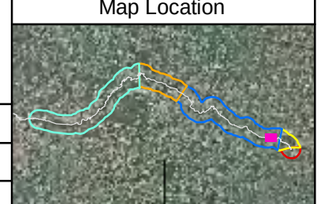
Sheets 1 through 15



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
3.25 R1

SHEET 1 OF 15

ENBRIDGE LINE 6B MP 608
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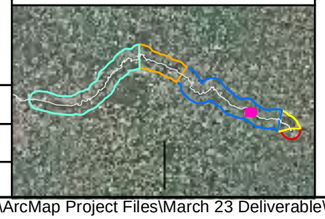
Aerial Photography Date: November 2011

Pierce St
Munci St
C Dr N
Water St
Water St
Ceresco
12 Mile Rd
6.00
5.75
5.50

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures
- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
CERESCO

SHEET 2 OF 15

ENBRIDGE LINE 6B MP 608
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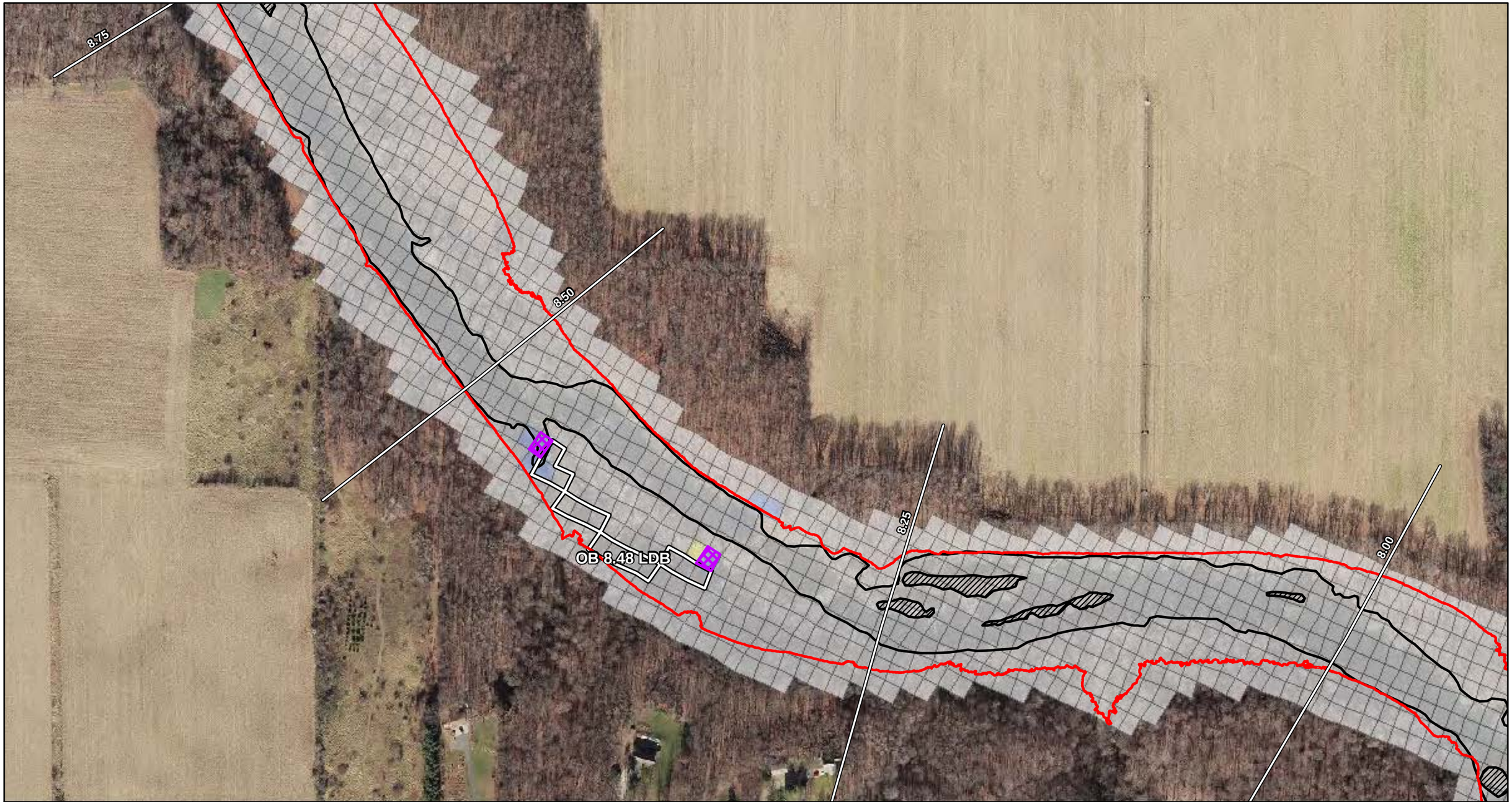
Aerial Photography Date: November 2011



Map Location

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

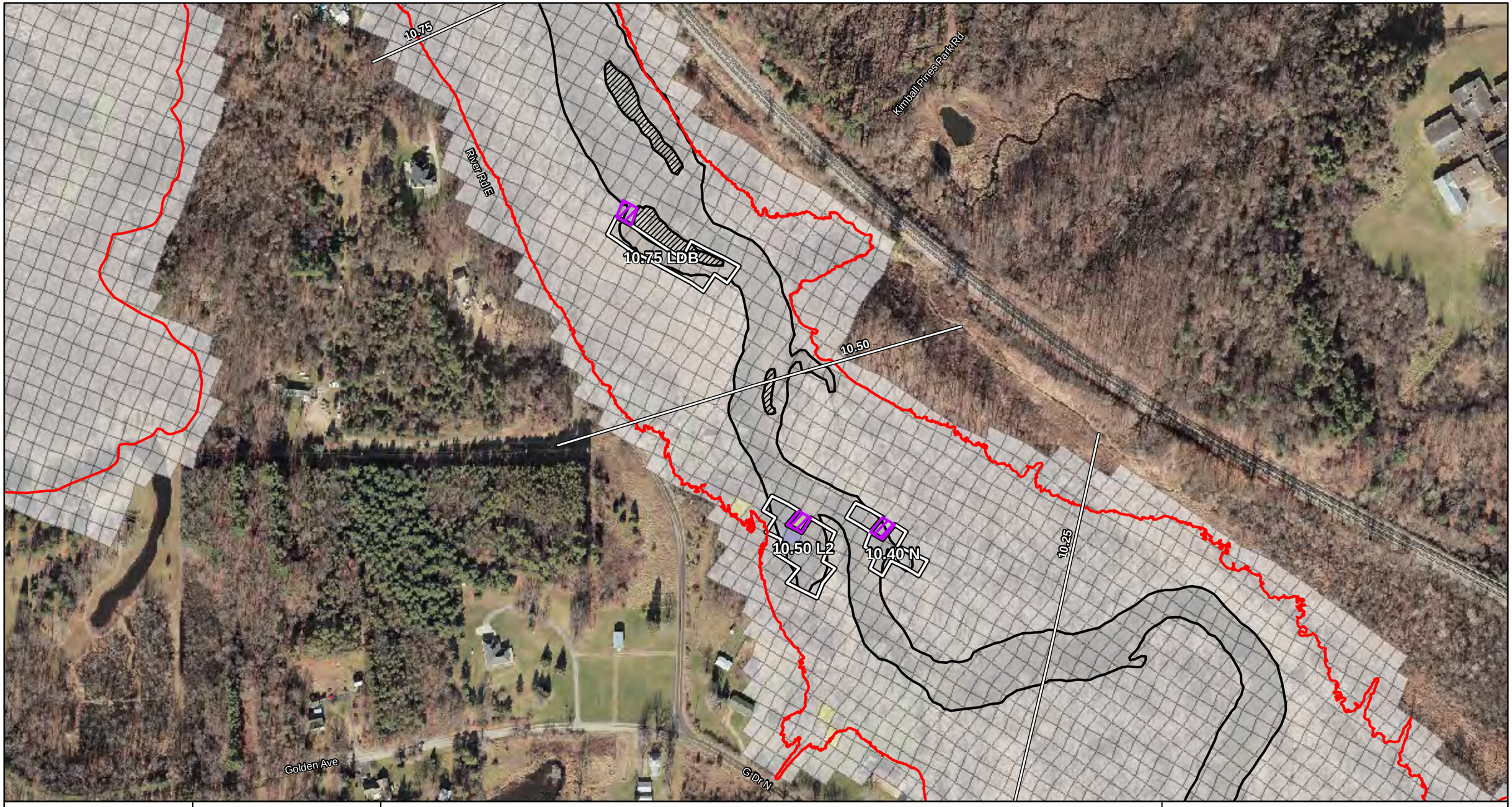
FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
OB 8.48 LDB

SHEET 3 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\March 23 Deliverable\Floodplain_Silt_Mass_Sed_TrapsF1_F3_100yr.mxd

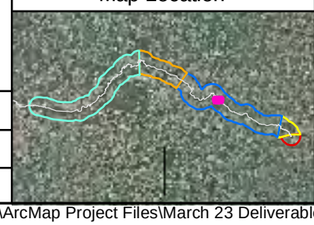
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
10.40 N, 10.50 L2 & 10.75 LDB

SHEET 4 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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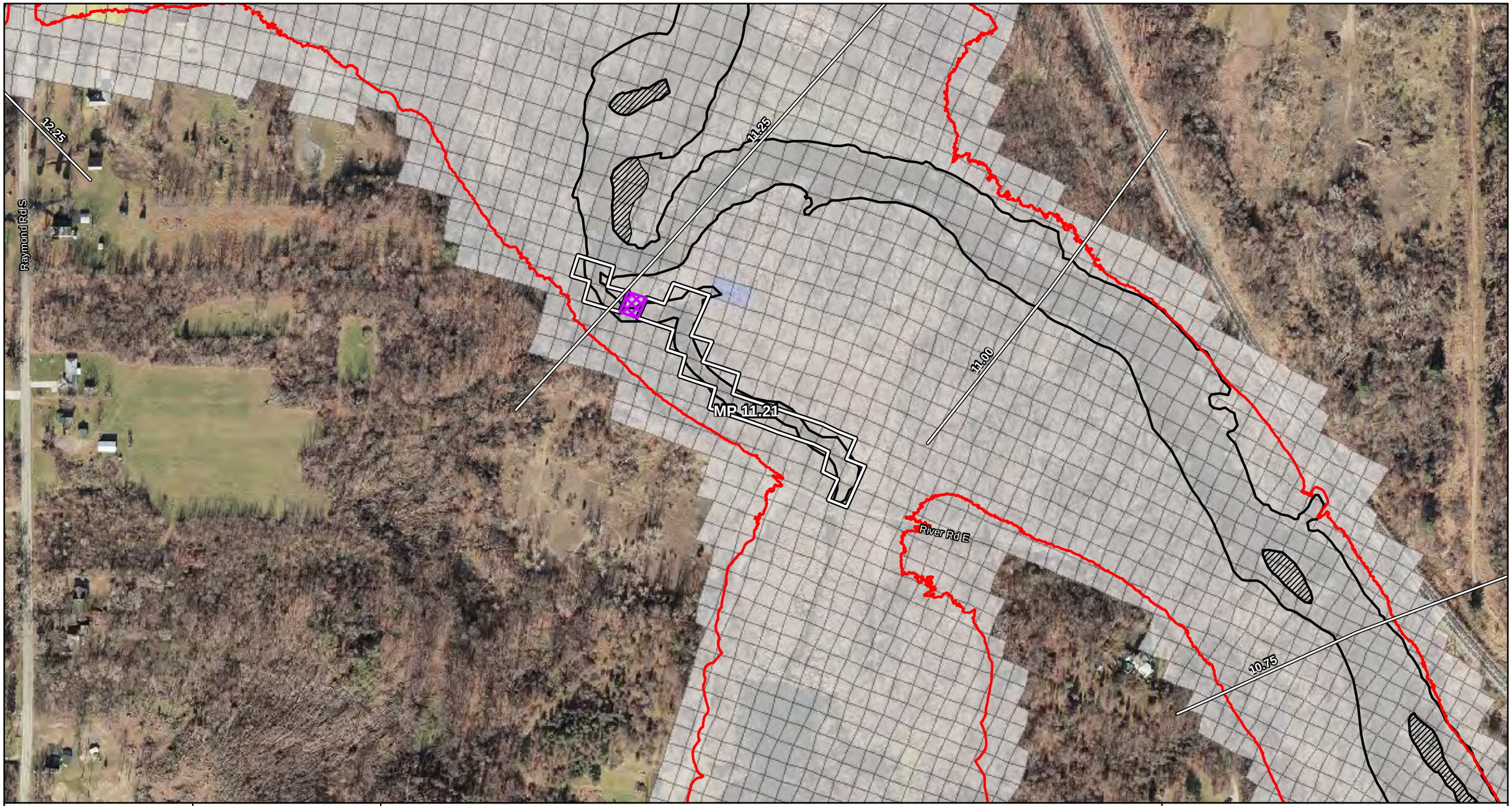
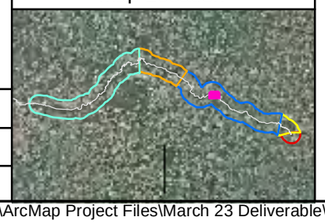
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
MP 11.21

SHEET 5 OF 15

ENBRIDGE LINE 6B MP 608
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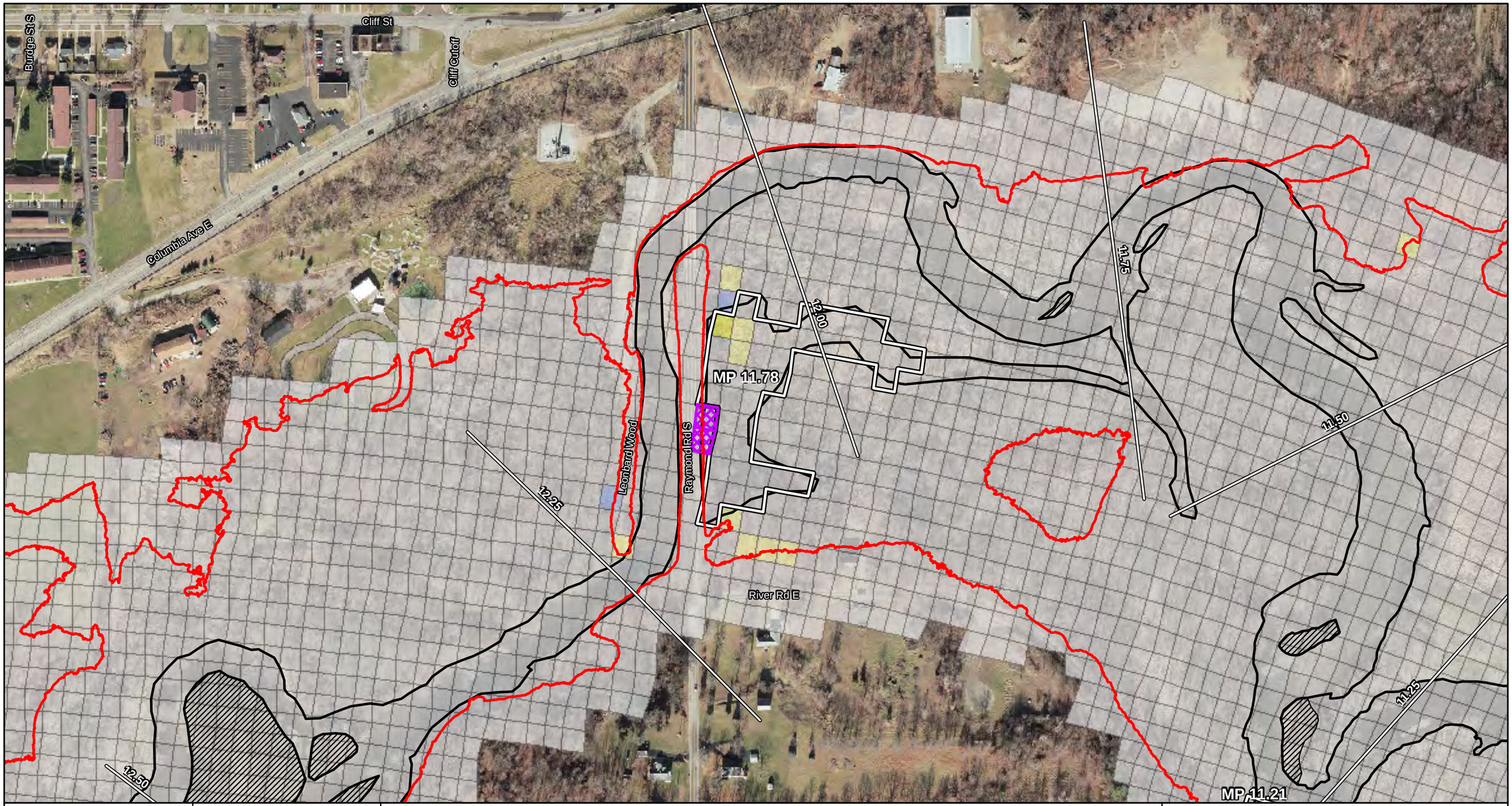
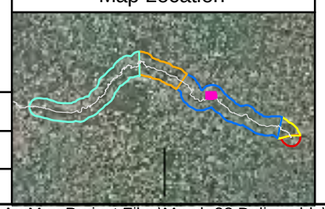
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
MP 11.78

SHEET 6 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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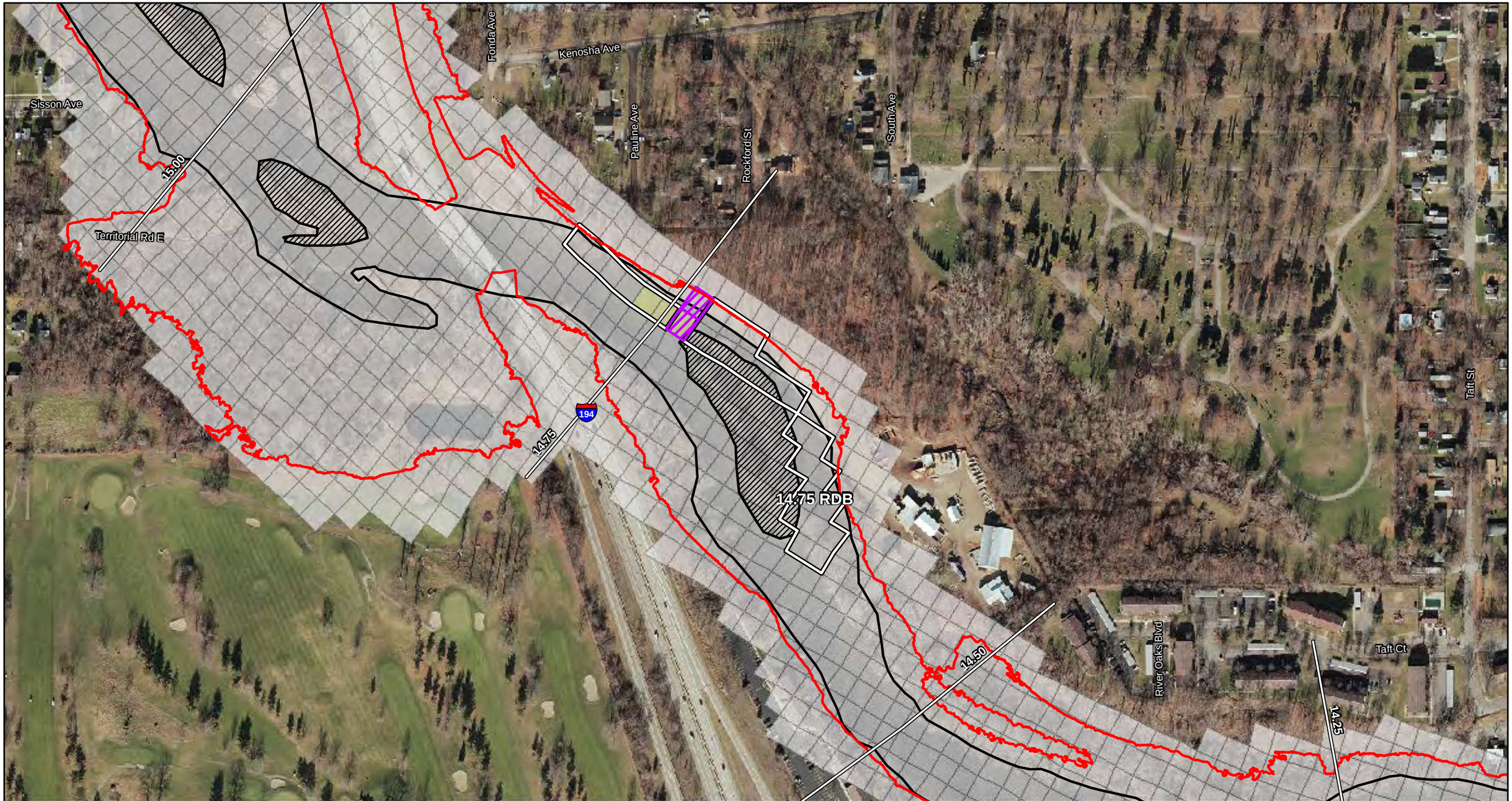
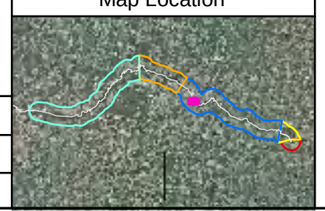
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures
- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
14.75 RDB

SHEET 7 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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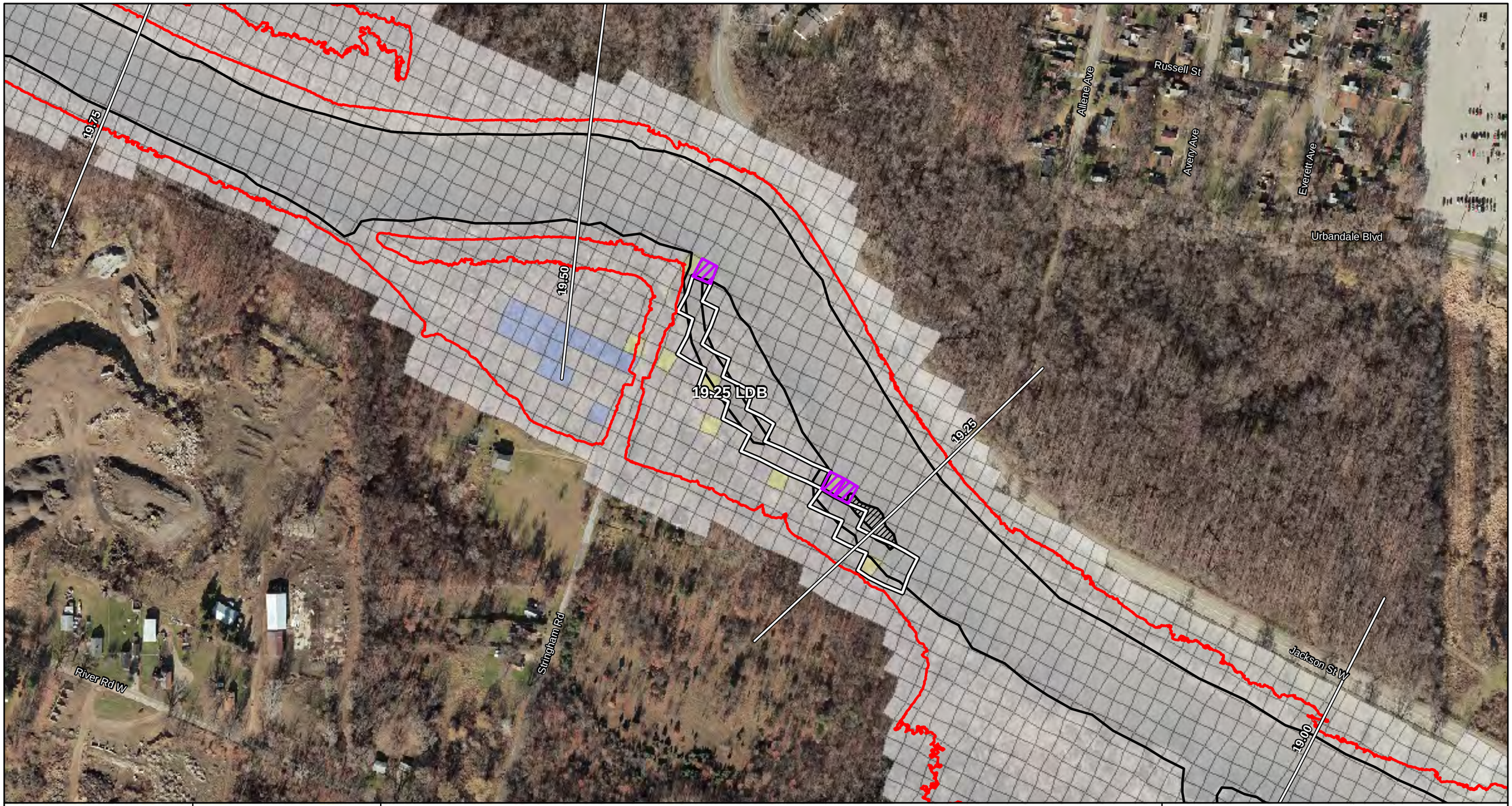
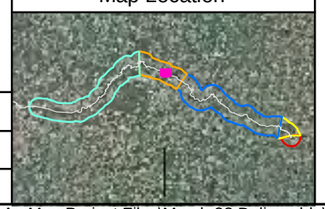
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
19.25 LDB

SHEET 8 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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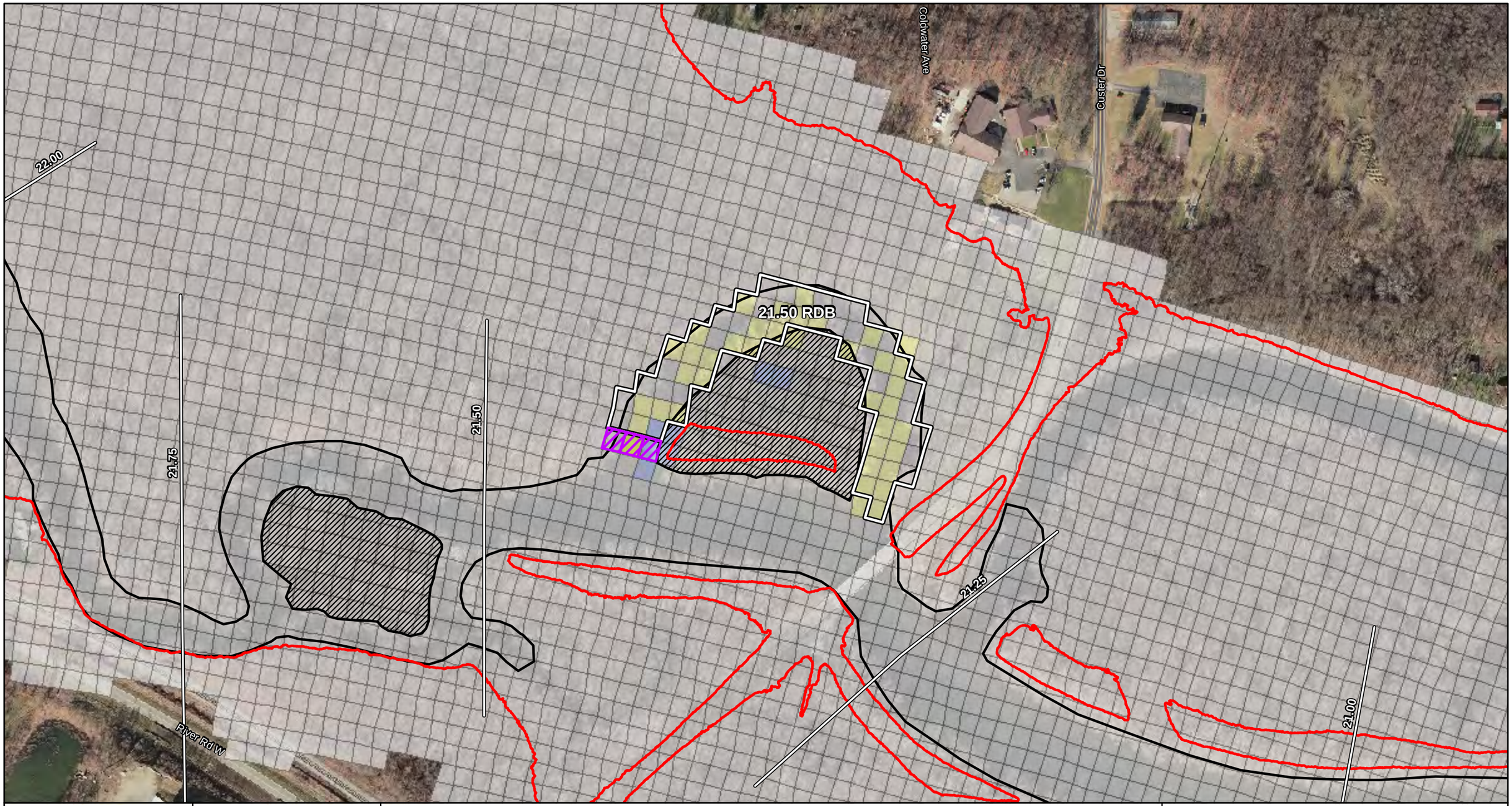
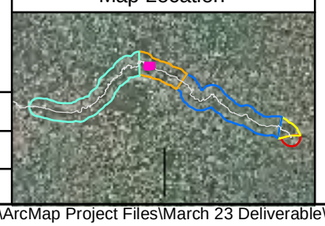
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
21.50 RDB

SHEET 9 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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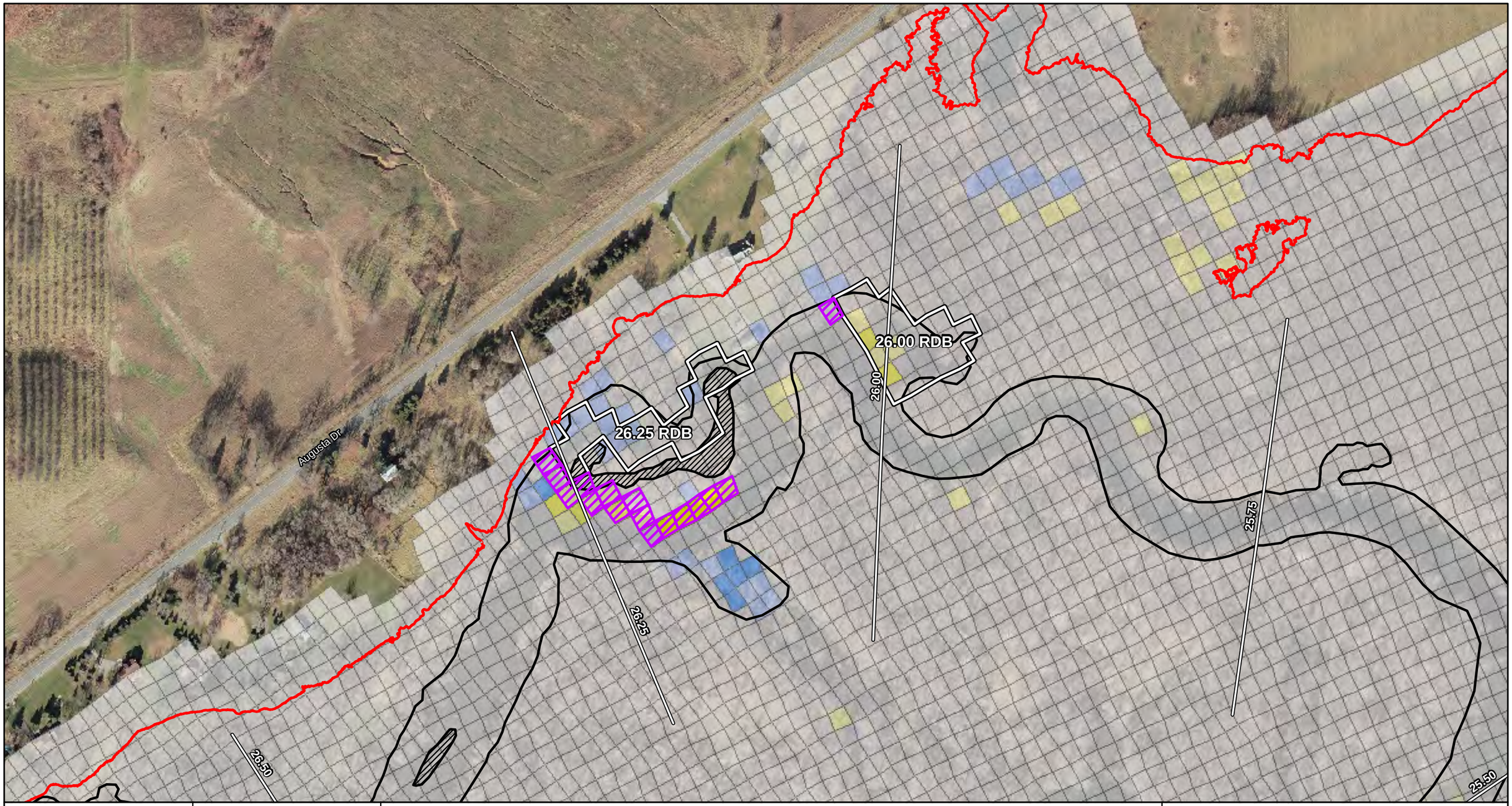
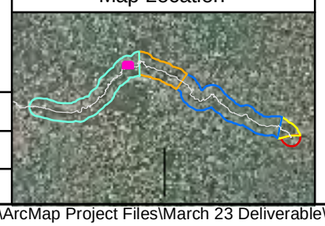
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
26.00 RDB & 26.25 RDB

SHEET 10 OF 15

ENBRIDGE LINE 6B MP 608
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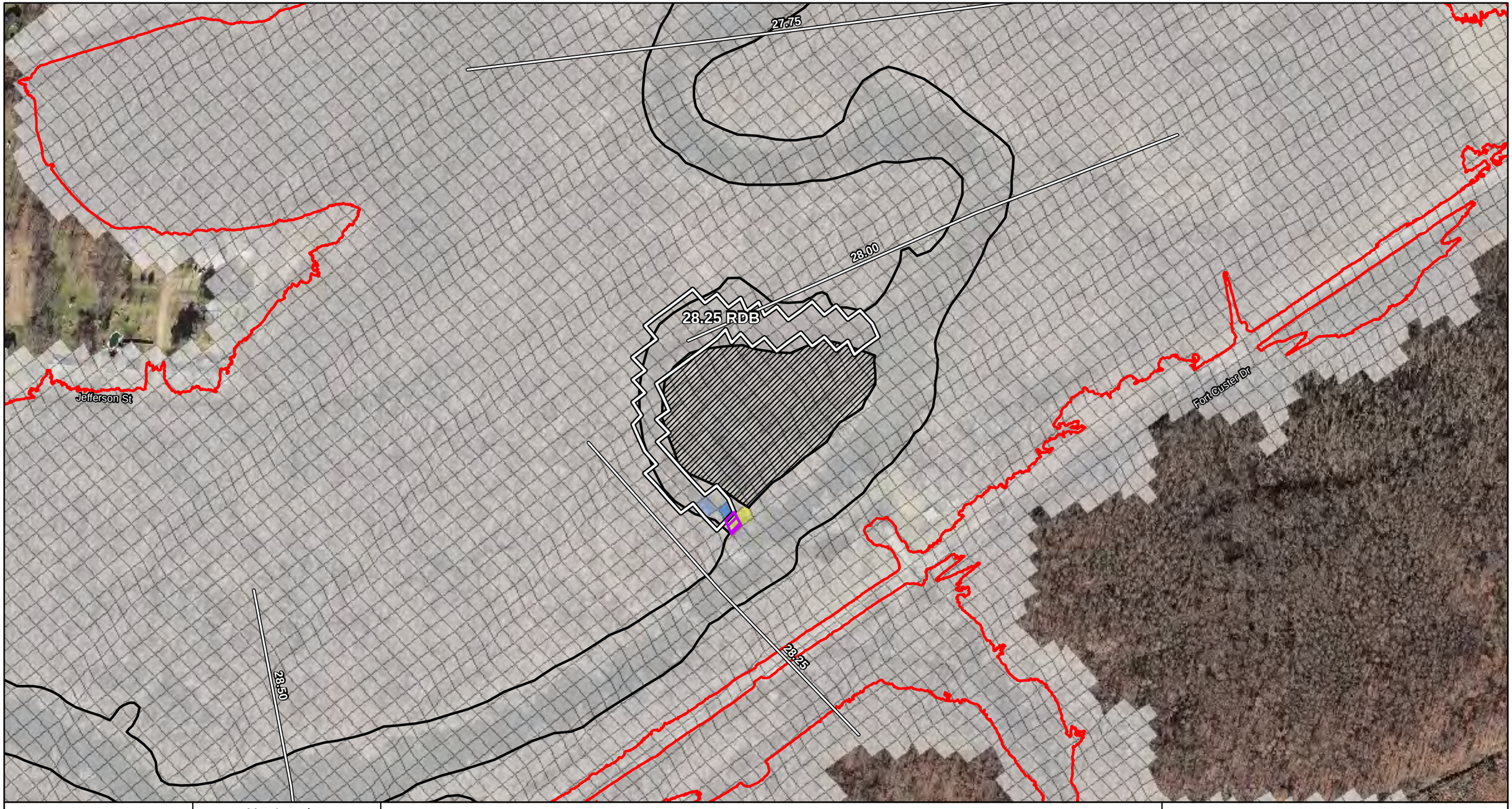
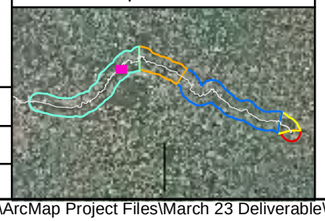
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
28.25 RDB

SHEET 11 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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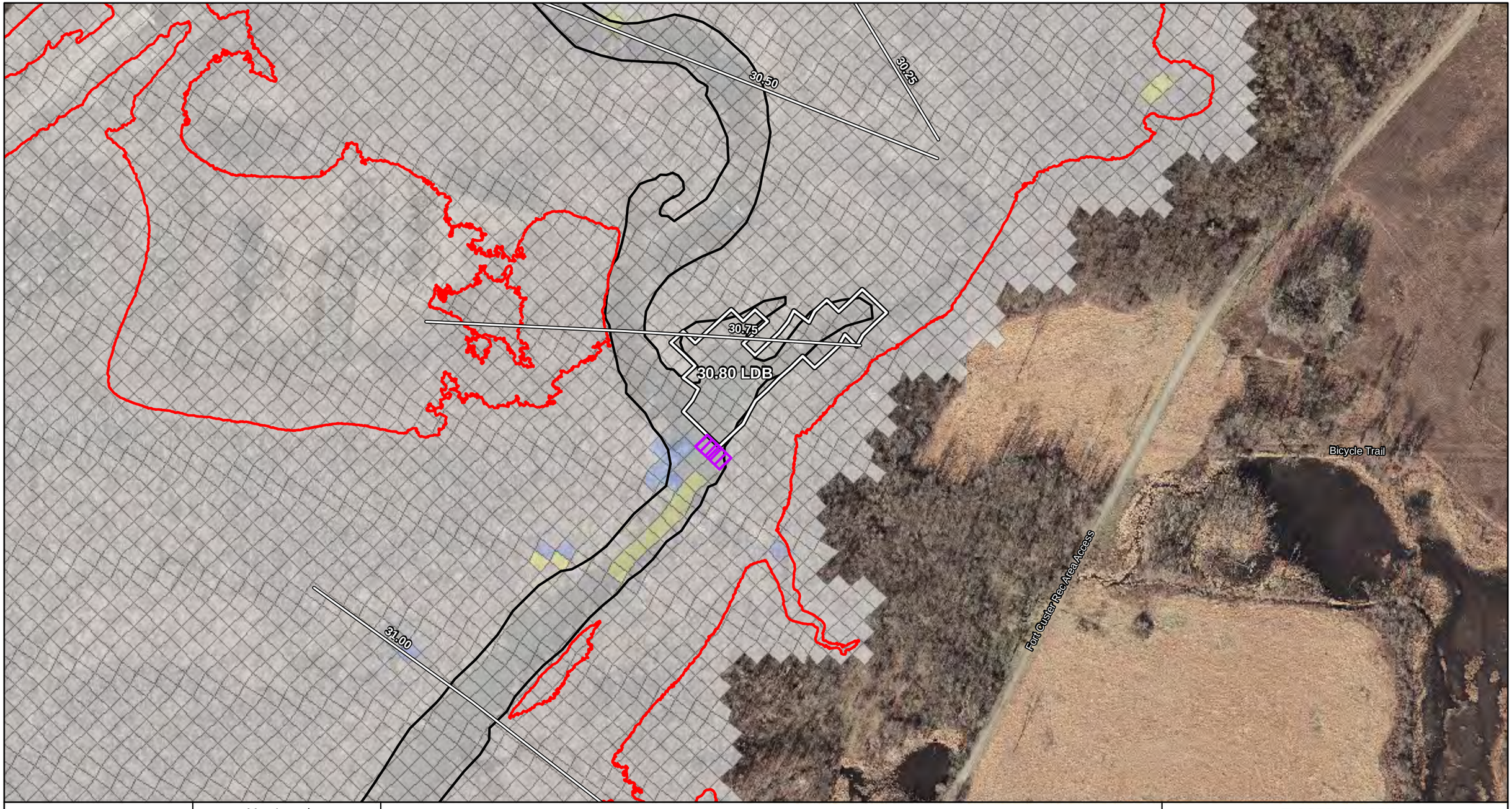
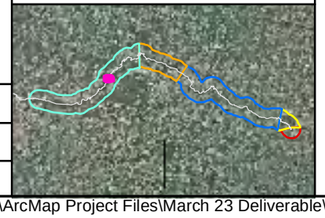
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures
- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
30.80 LDB

SHEET 12 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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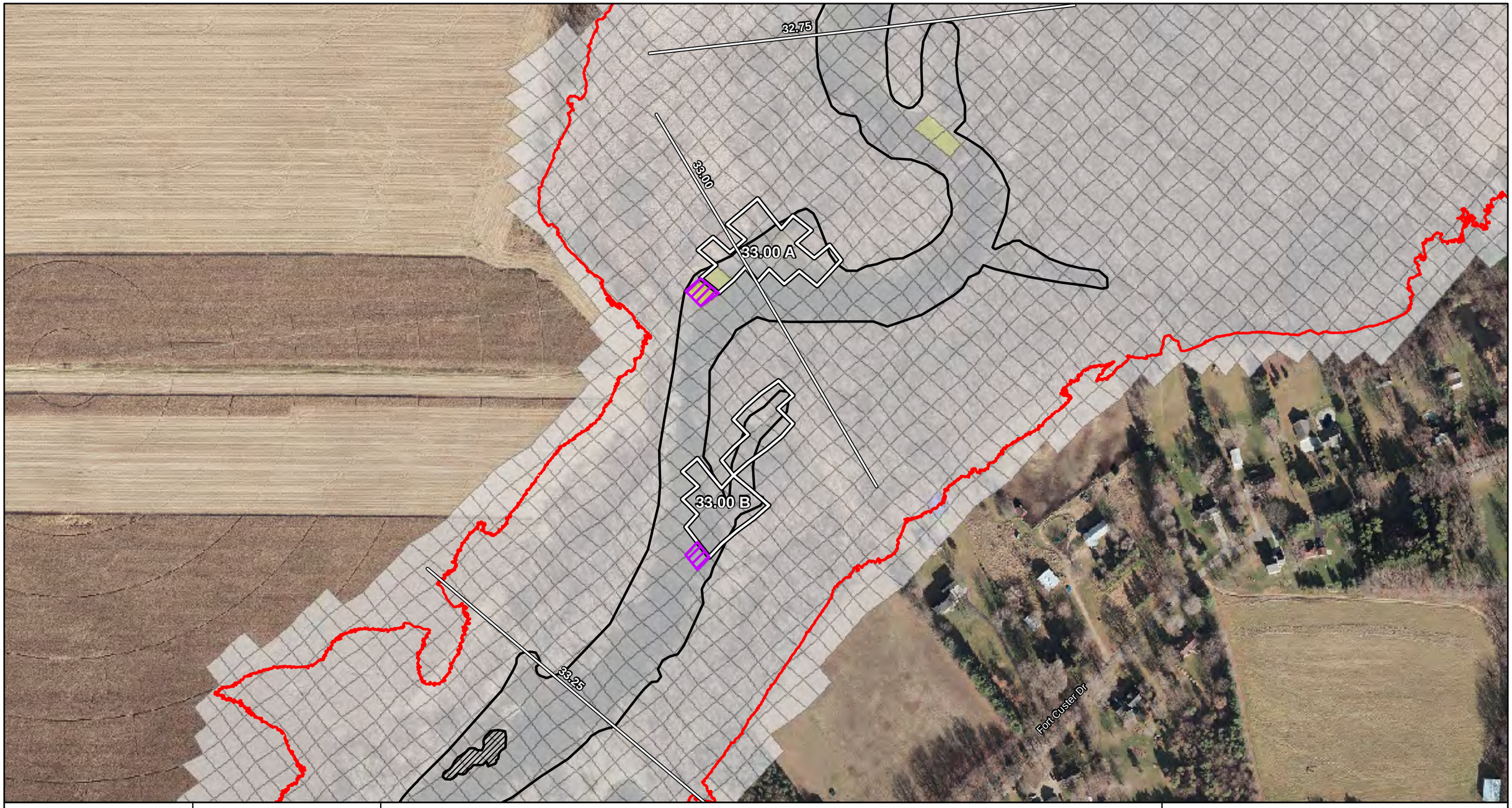
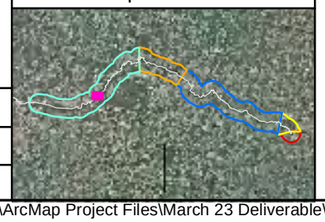
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell
- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
33.00 A & 33.00 B

SHEET 13 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
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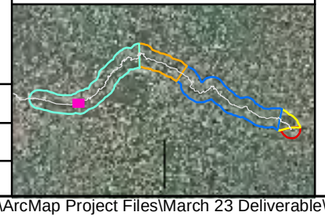
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location



Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
36.10 NW & DELTA A

SHEET 14 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/9/2012
Approved:	DBR 4/9/2012
Project #:	106-4186

Map Location

Difference in Net Change in Silt Mass (g/m2)
75% Structures vs. No Structures

- 5,000 - 10,000 decrease in net change
- 1,000 - 5,000 decrease in net change
- 100 - 1,000 decrease in net change

g/m2 = Grams Per Square Meter

- No Change
- 100 - 1,000 increase in net change
- 1,000 - 5,000 increase in net change
- 5,000 - 10,000 increase in net change
- HEC-RAS 100-Year Floodplain
- Christmas Tree Structure Cell
- Coir Log Structure Cell

- Sediment Trap Area
- Channel Bankline
- Island Bankline
- Quarter Mile Grid Segment

N

0 125 250 500
Scale in Feet

FLOODPLAIN GRID
DIFFERENCE IN NET CHANGE IN SILT MASS
100-YEAR FLOOD --- 75% VS. NO STRUCTURES
37.75 ISLANDS

SHEET 15 OF 15

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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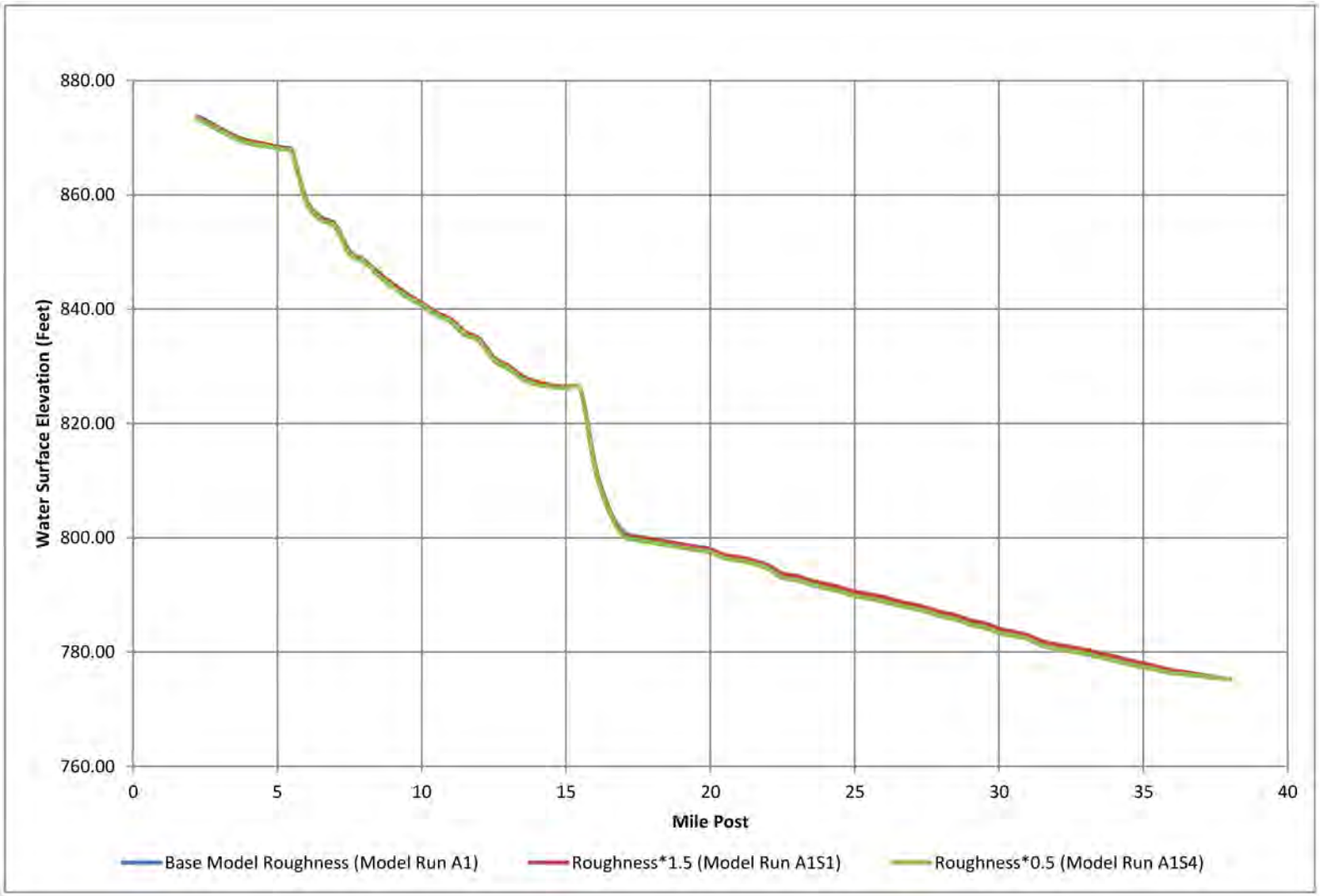
Aerial Photography Date: November 2011

Figure 8-1

Riverine: Effect of Roughness on Water Surface Elevation



ENBRIDGE

Drawn:	MB	4/18/2012
Approved:	CM	4/18/2012
Project #:	106-4186	

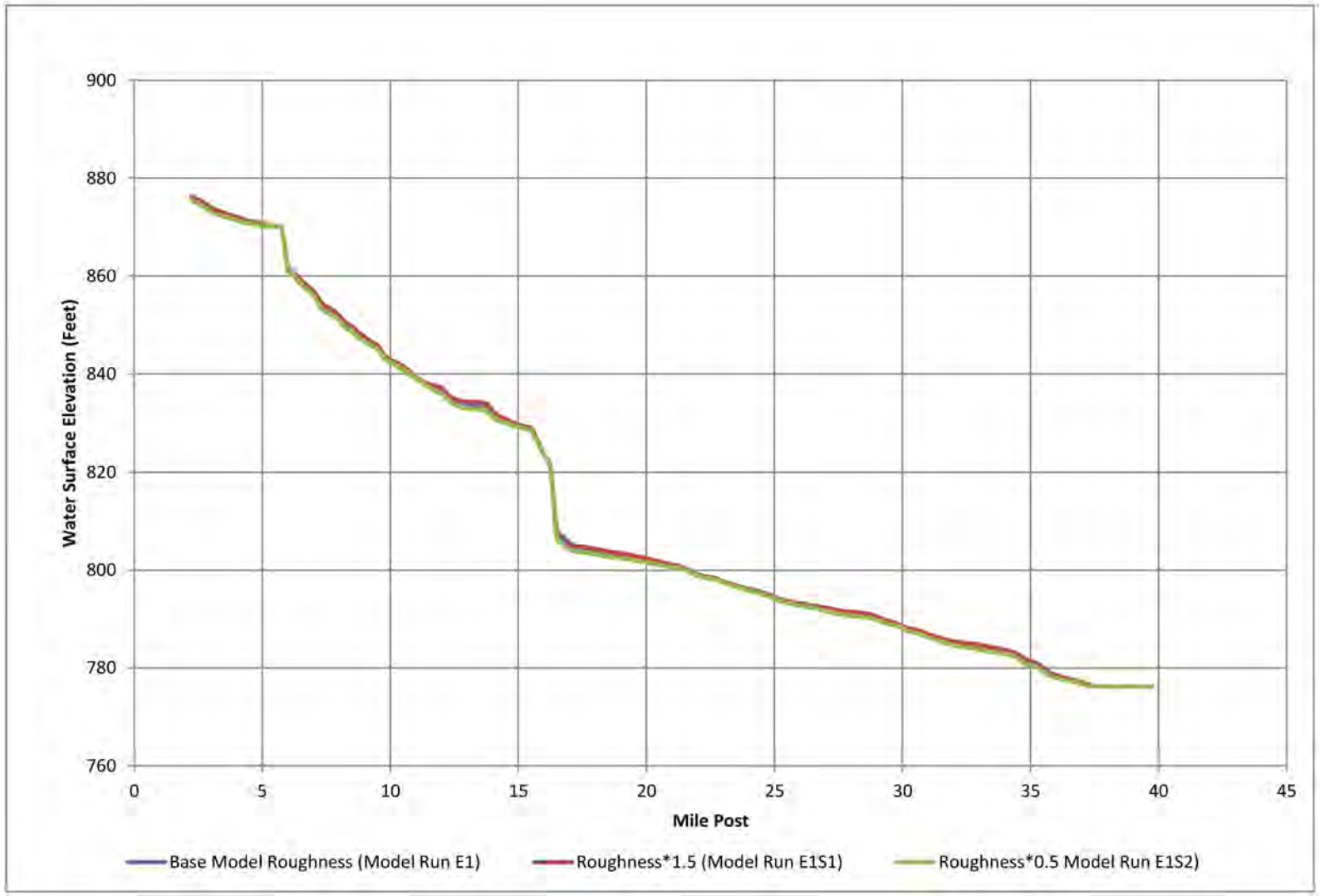
Footnotes:
Not all data is distinguishable due to scale and similarity of water surface elevation.

RIVERINE: EFFECT OF ROUGHNESS ON WATER SURFACE ELEVATION

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 8-2

Floodplain: Effect of Roughness on Water Surface Elevation



ENBRIDGE

Drawn:	MB	4/18/2012
Approved:	CM	4/18/2012
Project #:	106-4186	

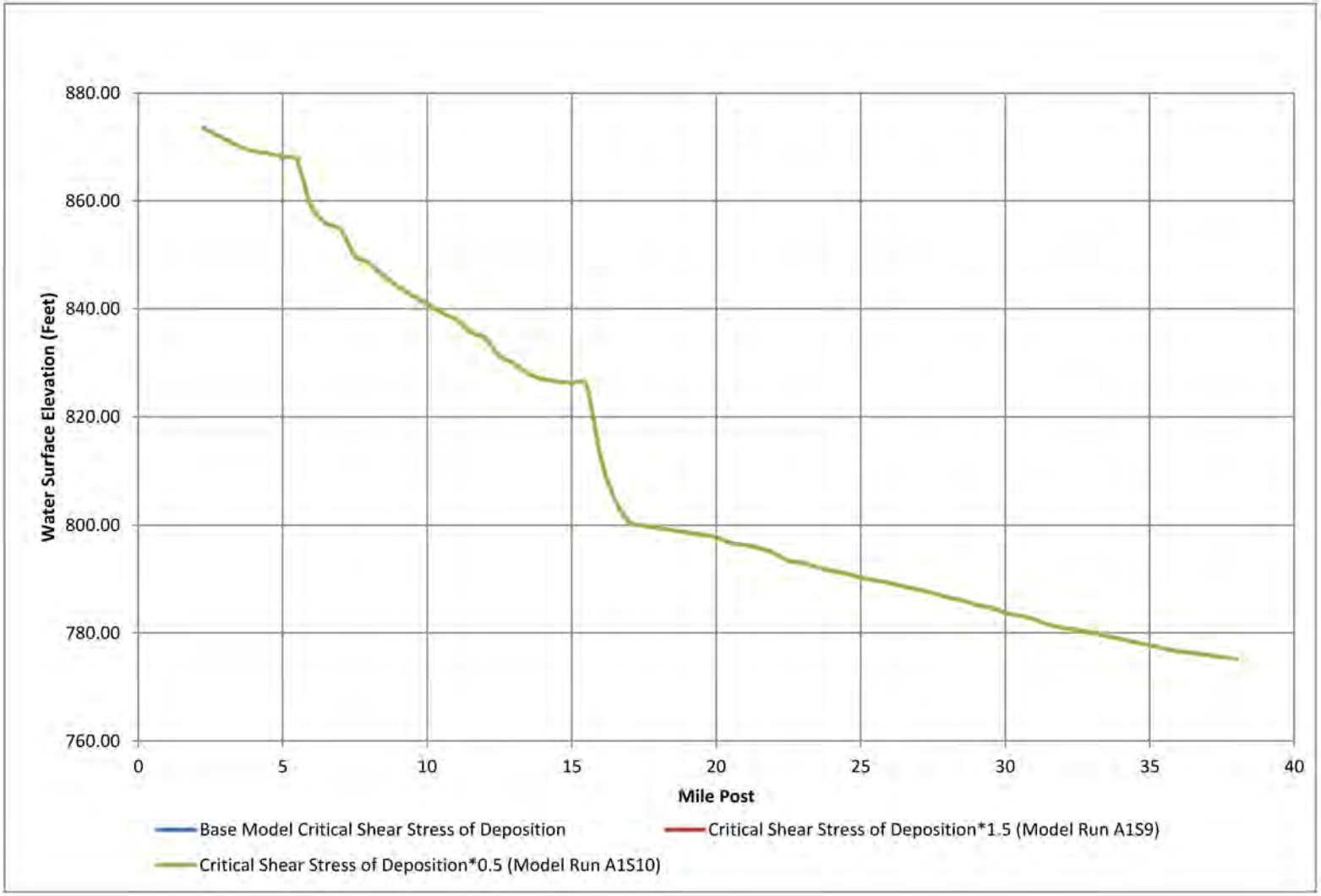
Footnotes:
Not all data is distinguishable due to scale and similarity of water surface elevation.

FLOODPLAIN: EFFECT OF ROUGHNESS ON WATER SURFACE ELEVATION

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 8-3

Riverine: Effect of Critical Shear Stress of Deposition on Water Surface Elevation



ENBRIDGE

Drawn:	JLH	04/17/2012
Approved:	DBR	04/17/2012
Project #:	106-4186	

Footnotes:

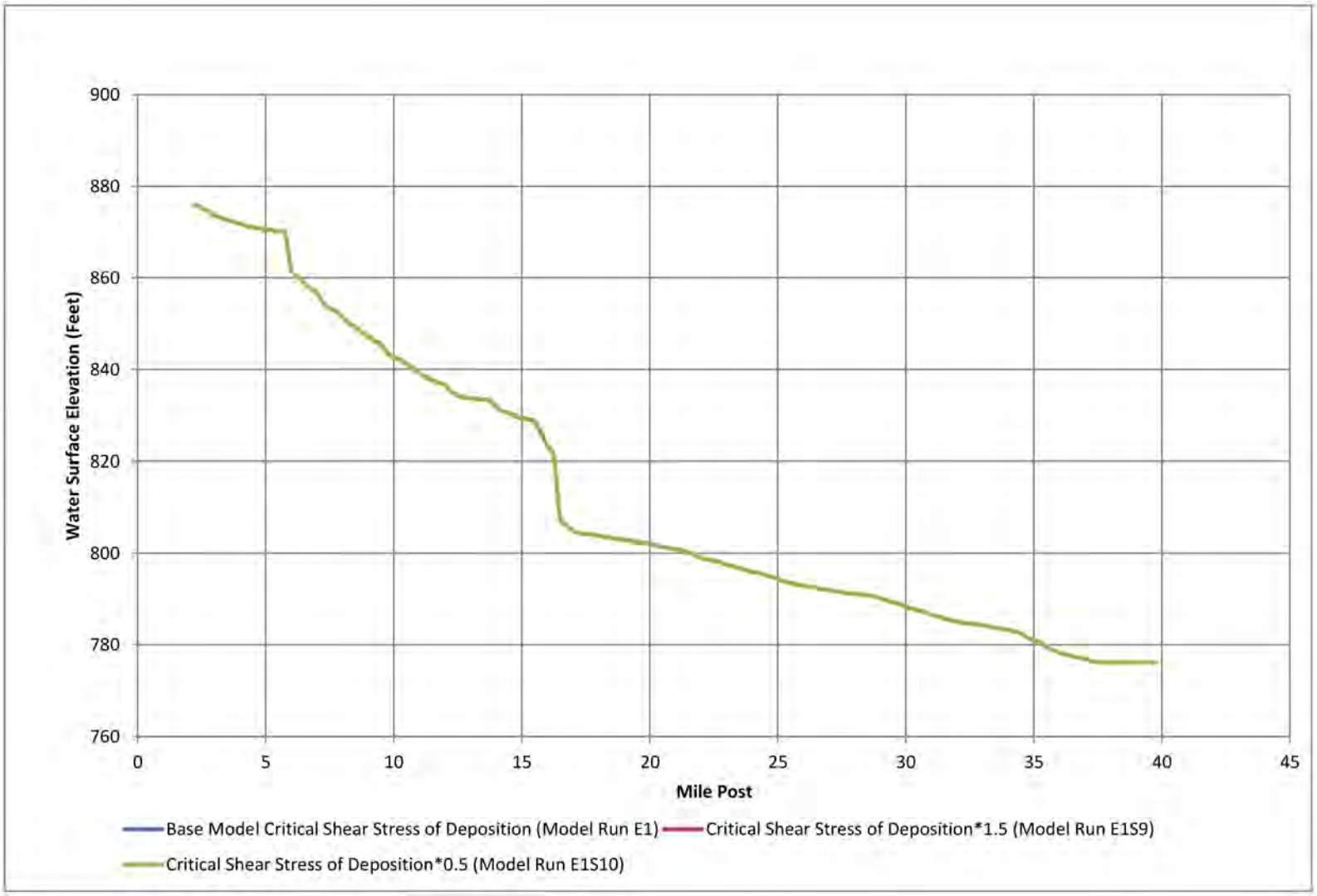
Not all data is distinguishable due to scale and similarity of water surface elevation.

RIVERINE: EFFECT OF CRITICIAL SHEAR STRESS OF DEPOSITION ON WATER SURFACE ELEVATION

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 8-4

Floodplain: Effect of Critical Shear Stress of Deposition on Water Surface Elevation



ENBRIDGE

Drawn:	MB	4/18/2012
Approved:	CM	4/18/2012
Project #:	106-4186	

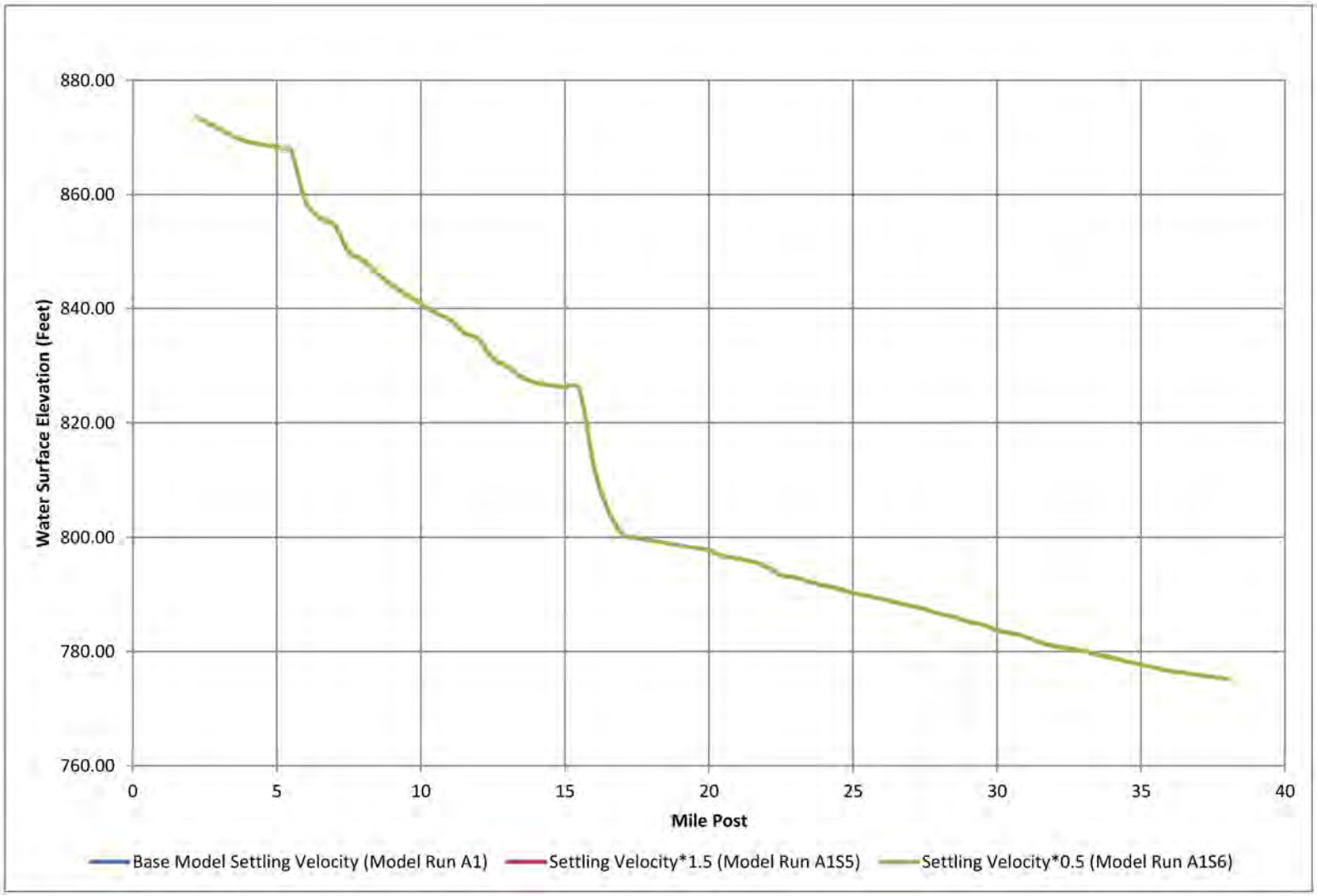
Footnotes:
Not all data is distinguishable due to scale and similarity of water surface elevation.

FLOODPLAIN: EFFECT OF CRITICAL SHEAR STRESS OF DEPOSITION ON WATER SURFACE ELEVATION

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 8-5

Riverine: Effect of Settling Velocity on Water Surface Elevation



ENBRIDGE

Drawn:	MB	4/18/2012
Approved:	CM	4/18/2012
Project #:	106-4186	

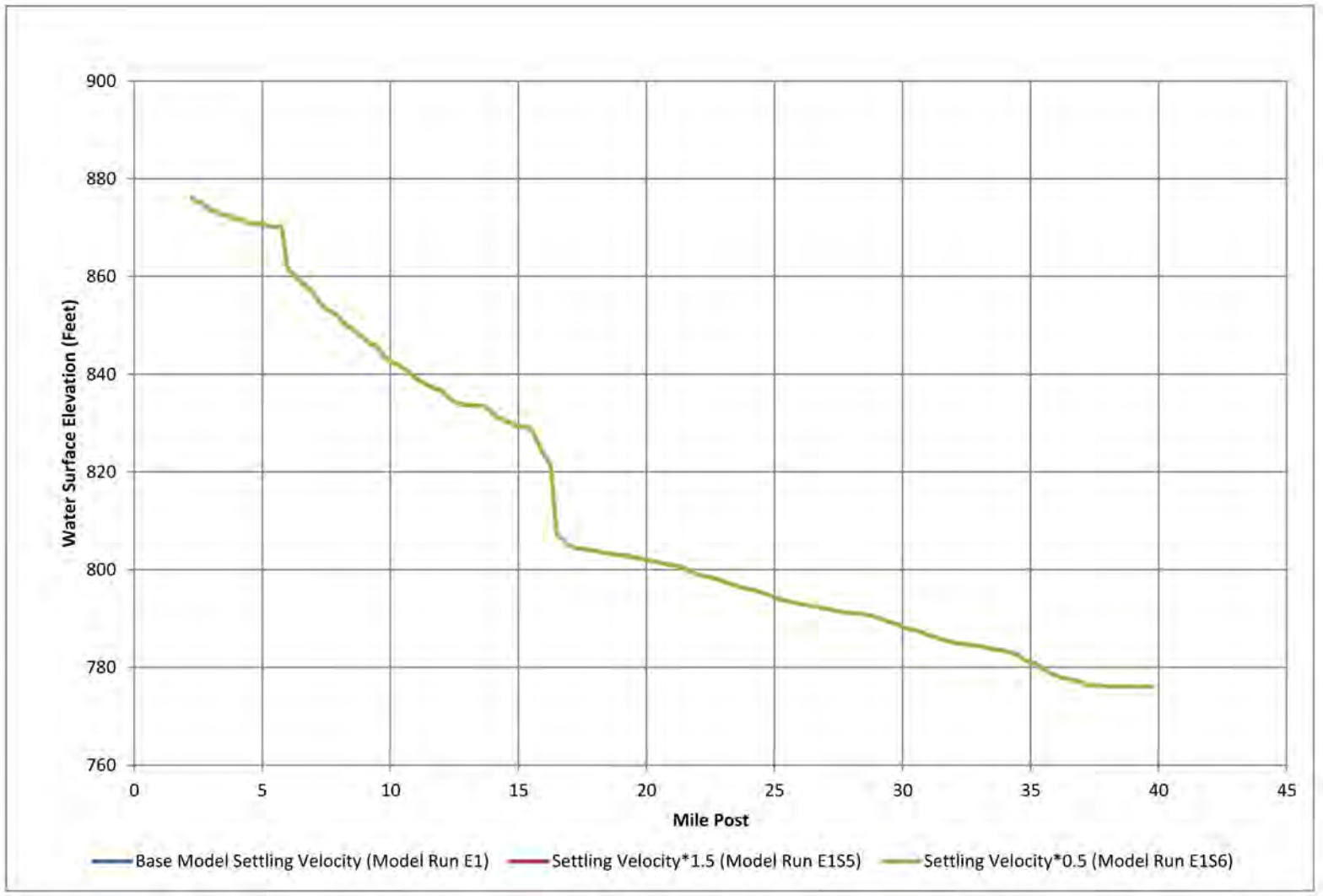
Footnotes:
Not all data is distinguishable due to scale and similarity of water surface elevation.

RIVERINE: EFFECT OF SETTLING VELOCITY ON WATER SURFACE ELEVATION

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 8-6

Floodplain: Effect of Settling Velocity on Water Surface Elevation



ENBRIDGE

Drawn:	JLH	04/17/2012
Approved:	DBR	04/17/2012
Project #:	106-4186	

Footnotes:

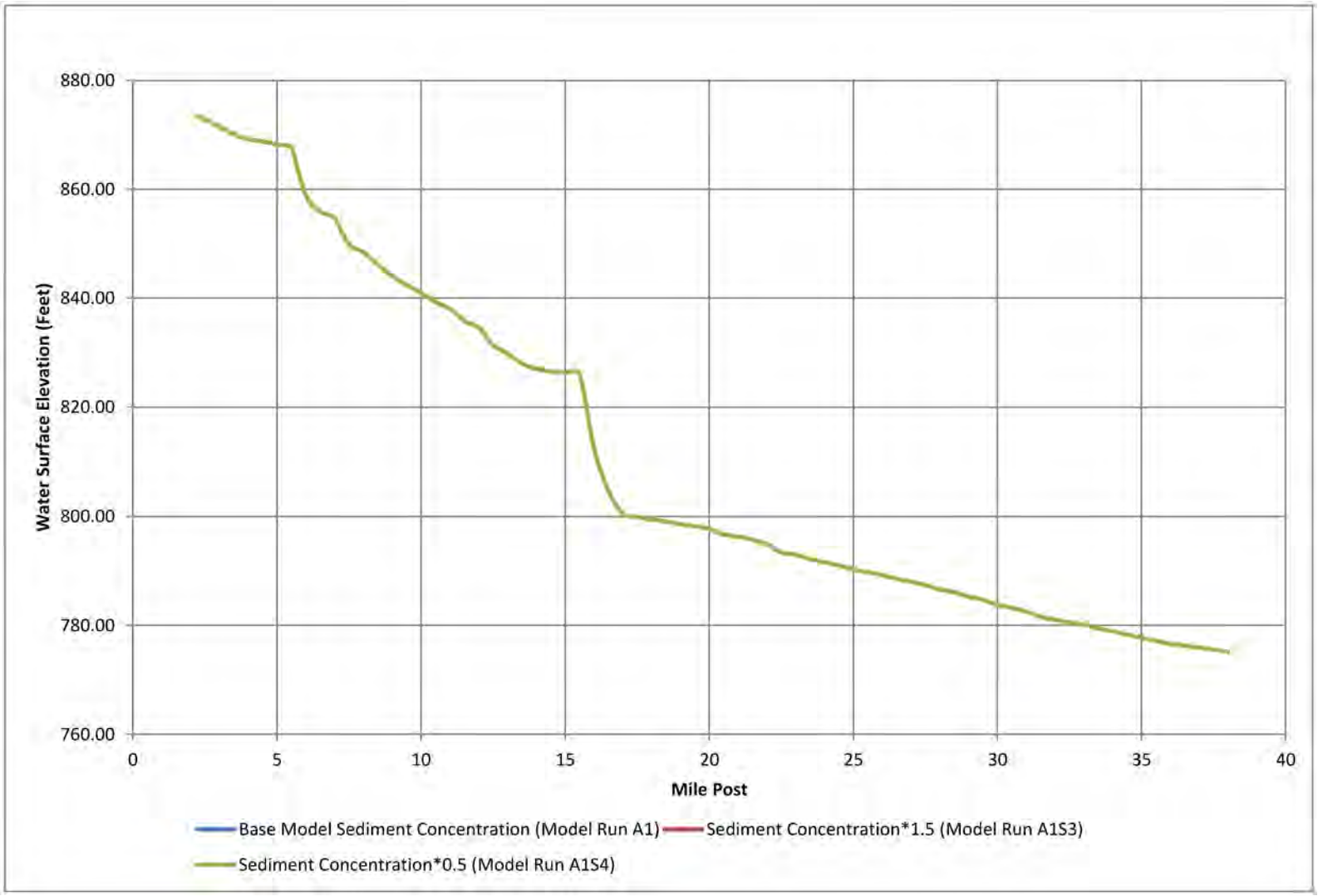
Not all data is distinguishable due to scale and similarity of water surface elevation.

FLOODPLAIN: EFFECT OF SETTLING VELOCITY ON WATER SURFACE ELEVATION

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 8-7

Riverine: Effect of Sediment Concentration on Water Surface Elevation



ENBRIDGE

Drawn:	MB	4/18/2012
Approved:	CM	4/18/2012
Project #:	106-4186	

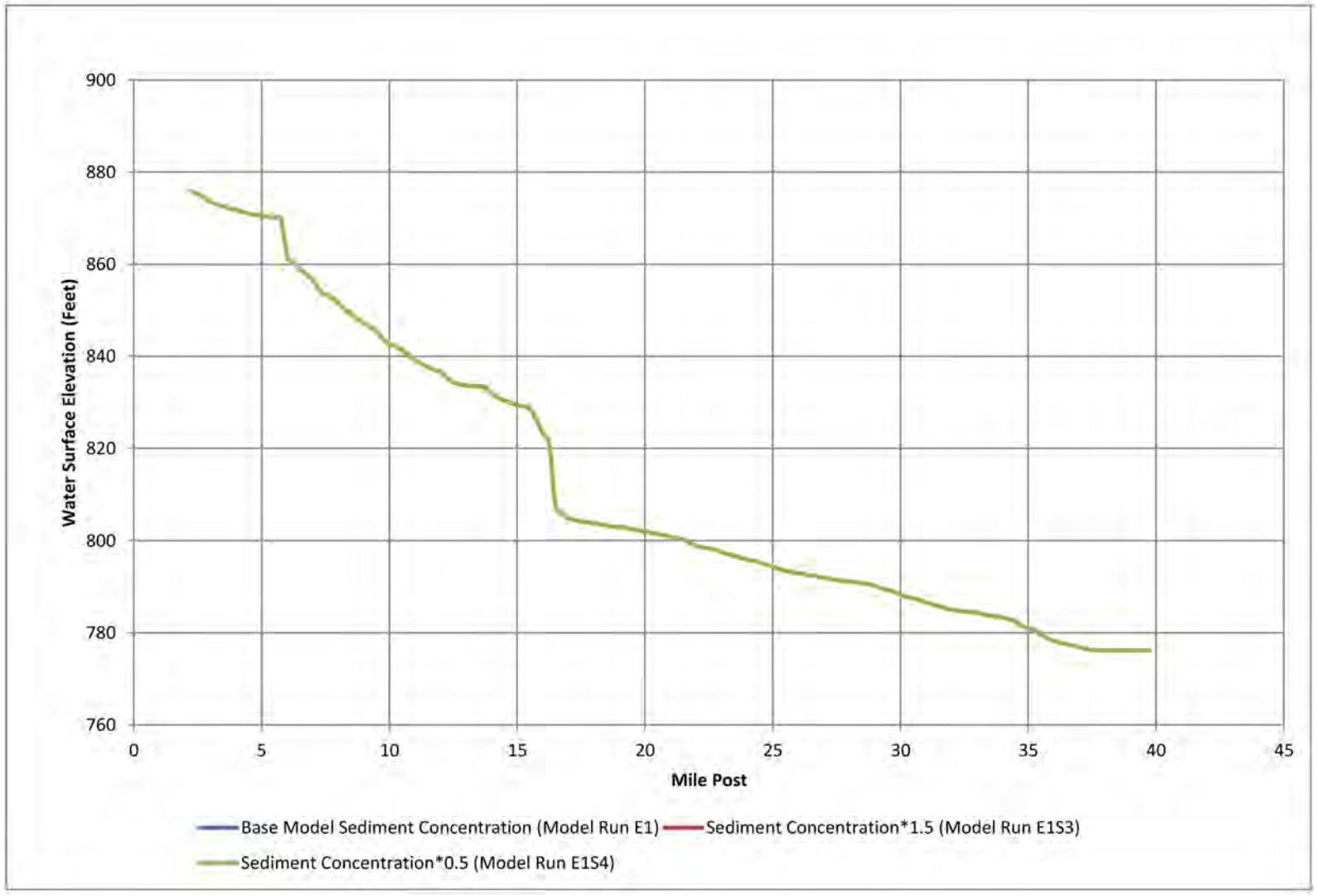
Footnotes:
Not all data is distinguishable due to scale and similarity of water surface elevation.

RIVERINE: EFFECT OF SEDIMENT CONCENTRATION ON WATER SURFACE ELEVATION

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 8-8

Floodplain: Effect of Sediment Concentration on Water Surface Elevation



ENBRIDGE

Drawn:	MB	4/18/2012
Approved:	CM	4/18/2012
Project #:	106-4186	

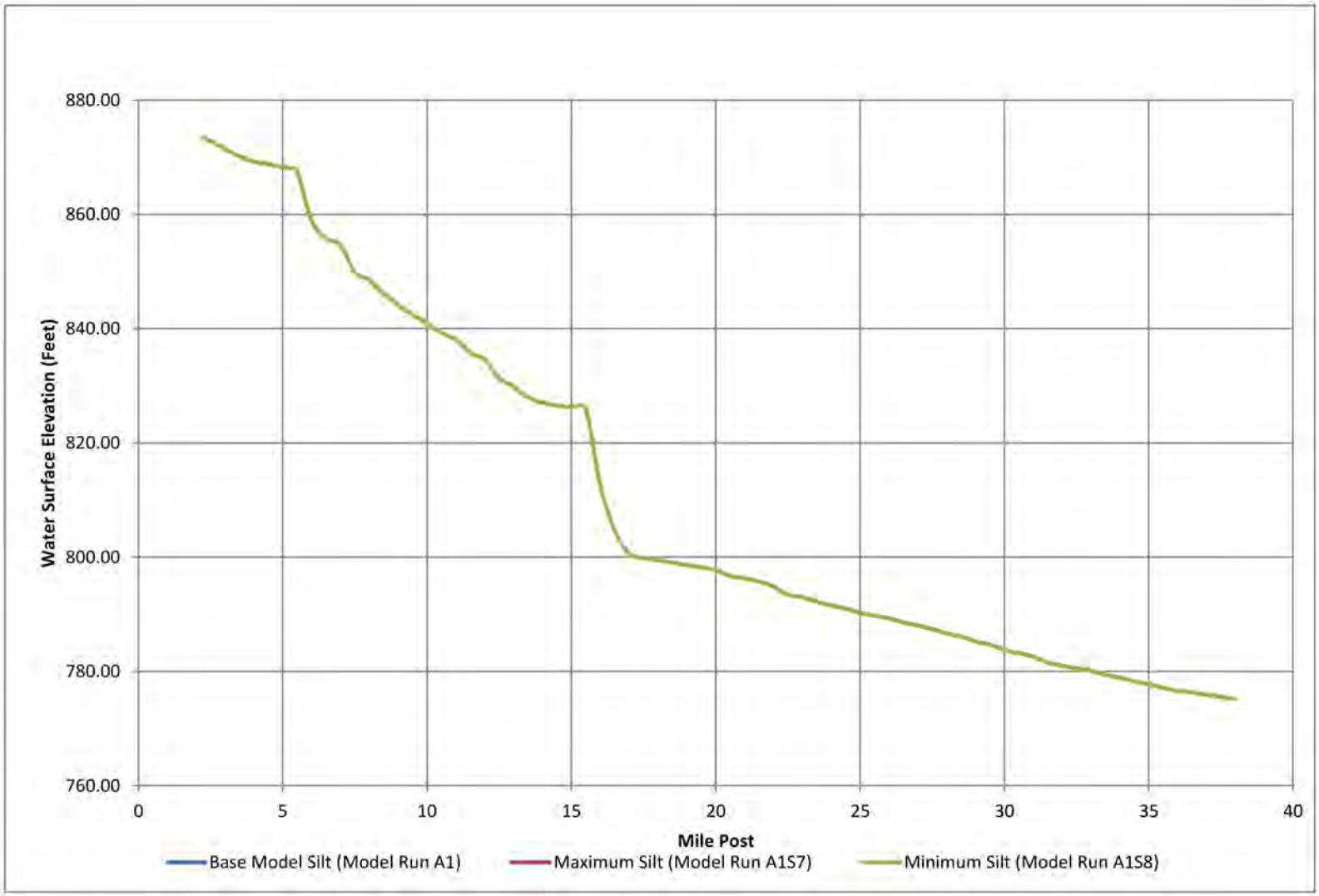
Footnotes:
Not all data is distinguishable due to scale and similarity of water surface elevation.

FLOODPLAIN: EFFECT OF SEDIMENT CONCENTRATION ON WATER SURFACE ELEVATION

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 8-9

Riverine: Effect of Silt Composition on Water Surface Elevation



ENBRIDGE

Drawn:	MB	4/18/2012
Approved:	CM	4/18/2012
Project #:	106-4186	

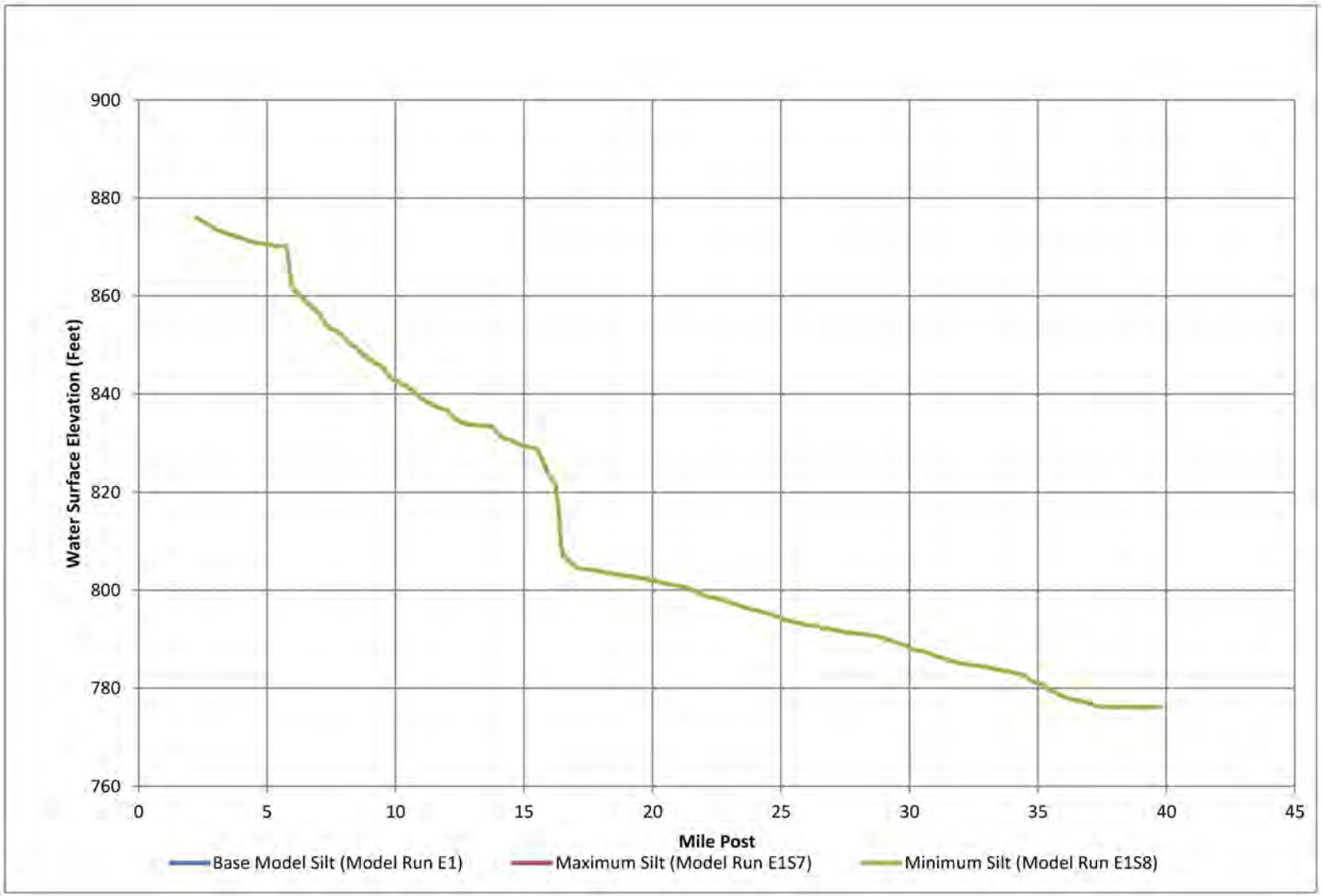
Footnotes:
Not all data is distinguishable due to scale and similarity of water surface elevation.

RIVERINE: EFFECT OF SILT COMPOSITION ON WATER SURFACE ELEVATION

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 8-10

Floodplain: Effect of Silt Composition on Water Surface Elevation



ENBRIDGE

Drawn:	MB	4/18/2012
Approved:	CM	4/18/2012
Project #:	106-4186	

Footnotes:
Not all data is distinguishable due to scale and similarity of water surface elevation.

FLOODPLAIN: EFFECT OF SILT COMPOSITION ON WATER SURFACE ELEVATION

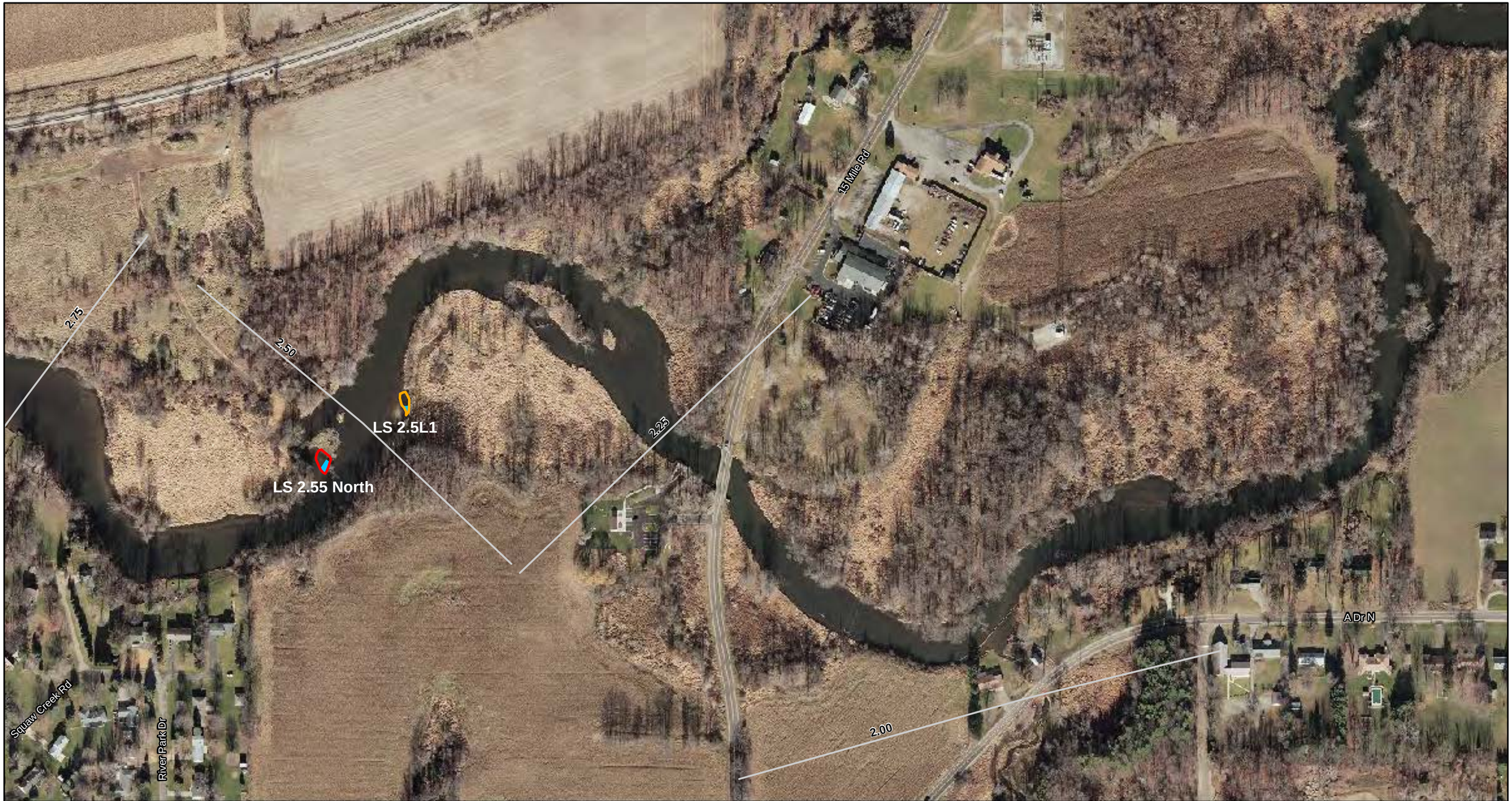
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY,
LIMITED PARTNERSHIP

Figure 10-1

2011 Year-End Submerged Oil

Areas with Highest Remobilization Potential

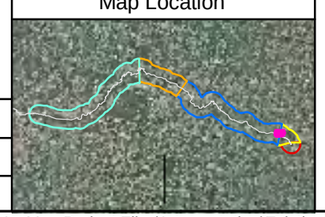
Sheets 1 through 56



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 01.95 - MP 02.75

SHEET 1 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

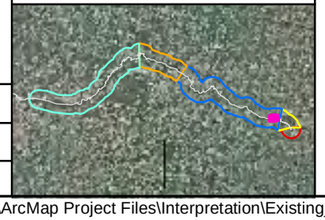
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 02.60 - MP 03.40

SHEET 2 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

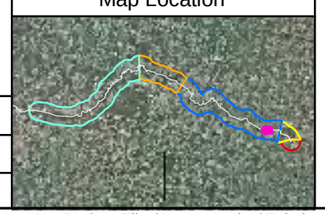
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

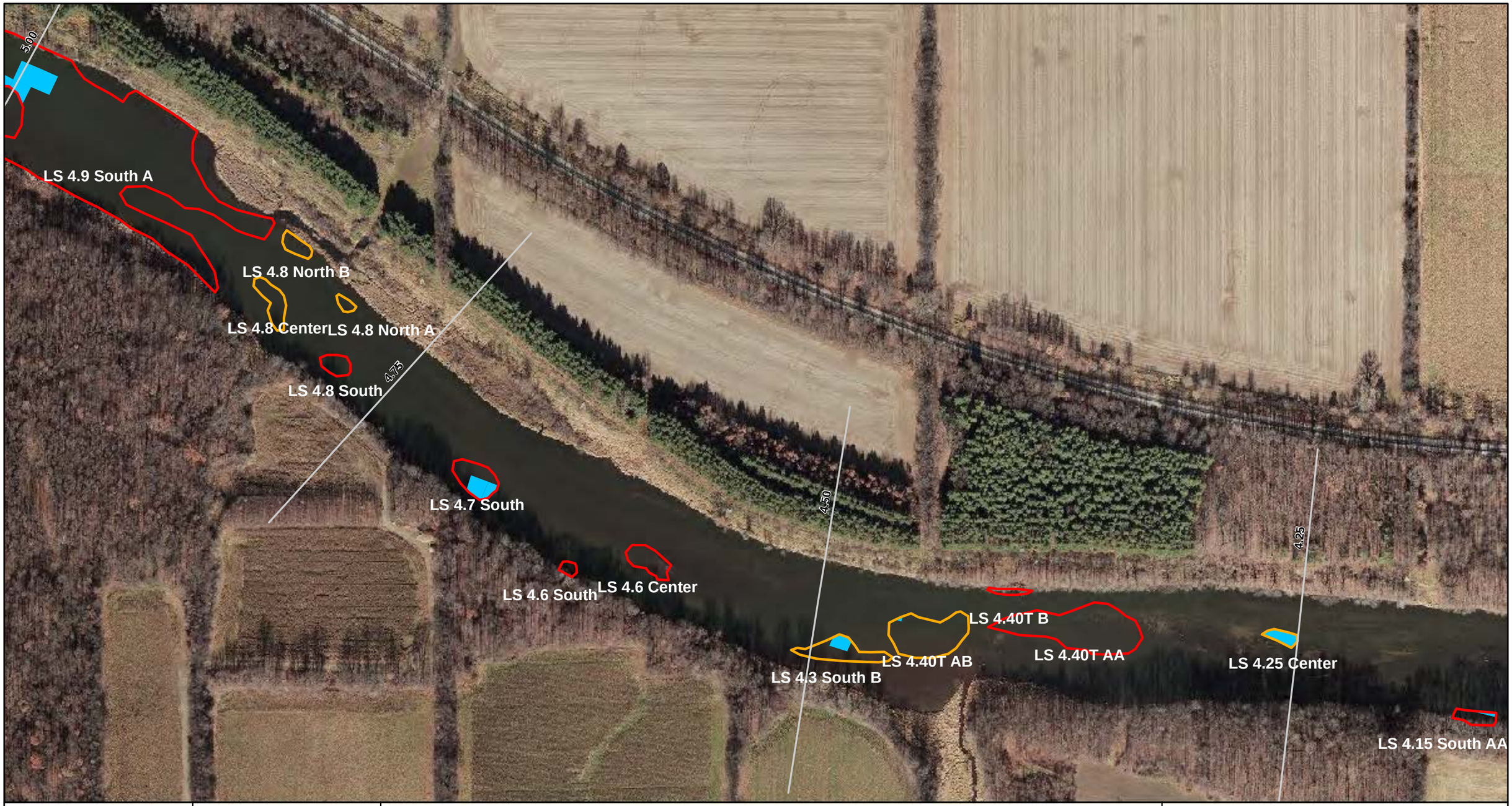
MP 03.40 - MP 04.20

SHEET 3 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

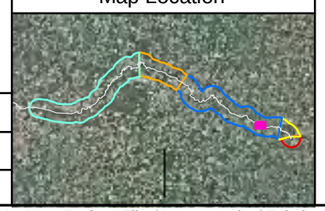
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

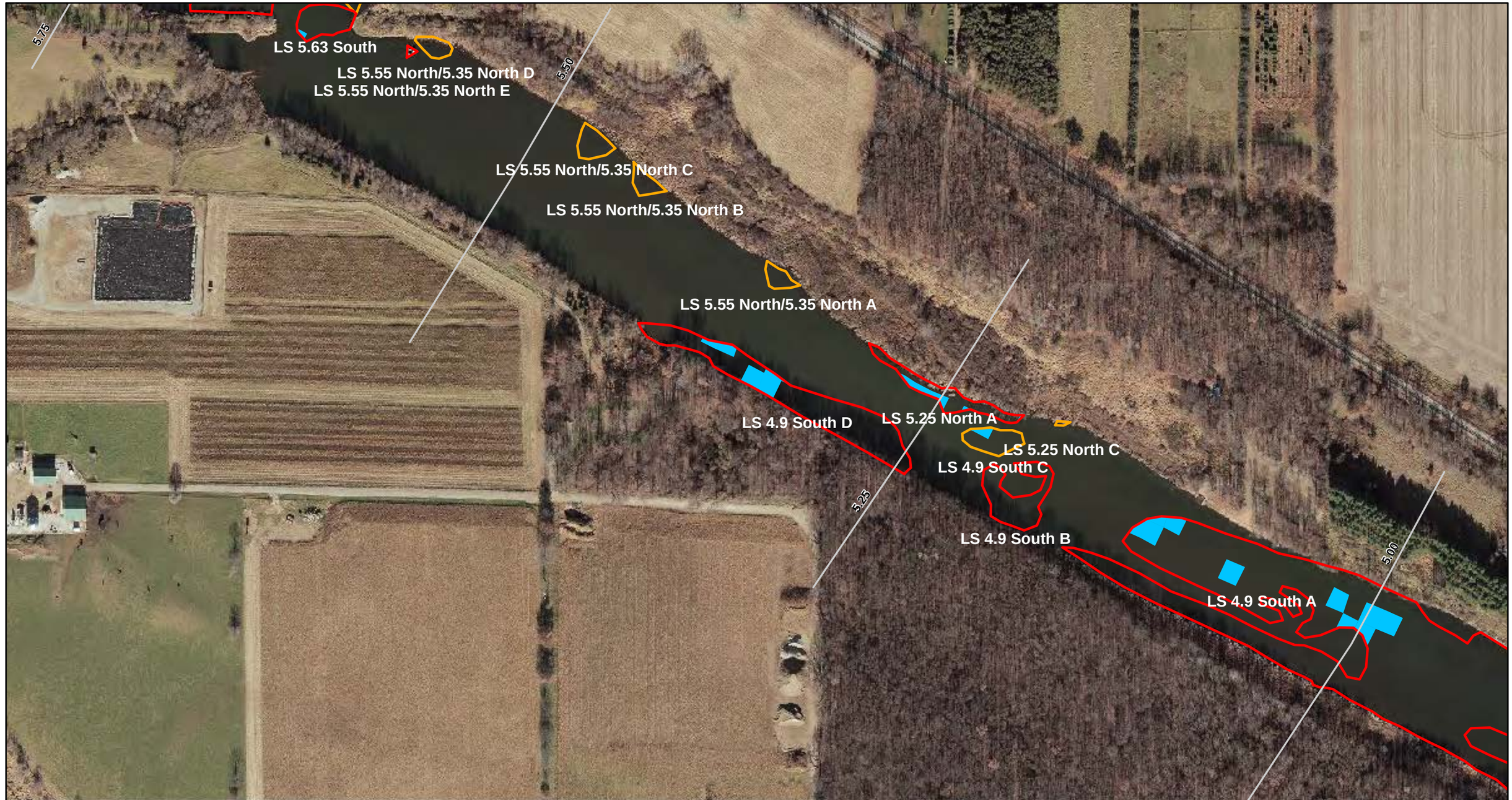
MP 04.15 - MP 05.00

SHEET 4 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

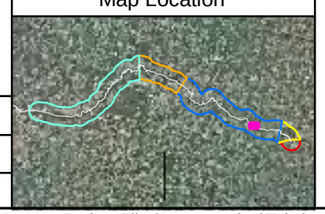
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

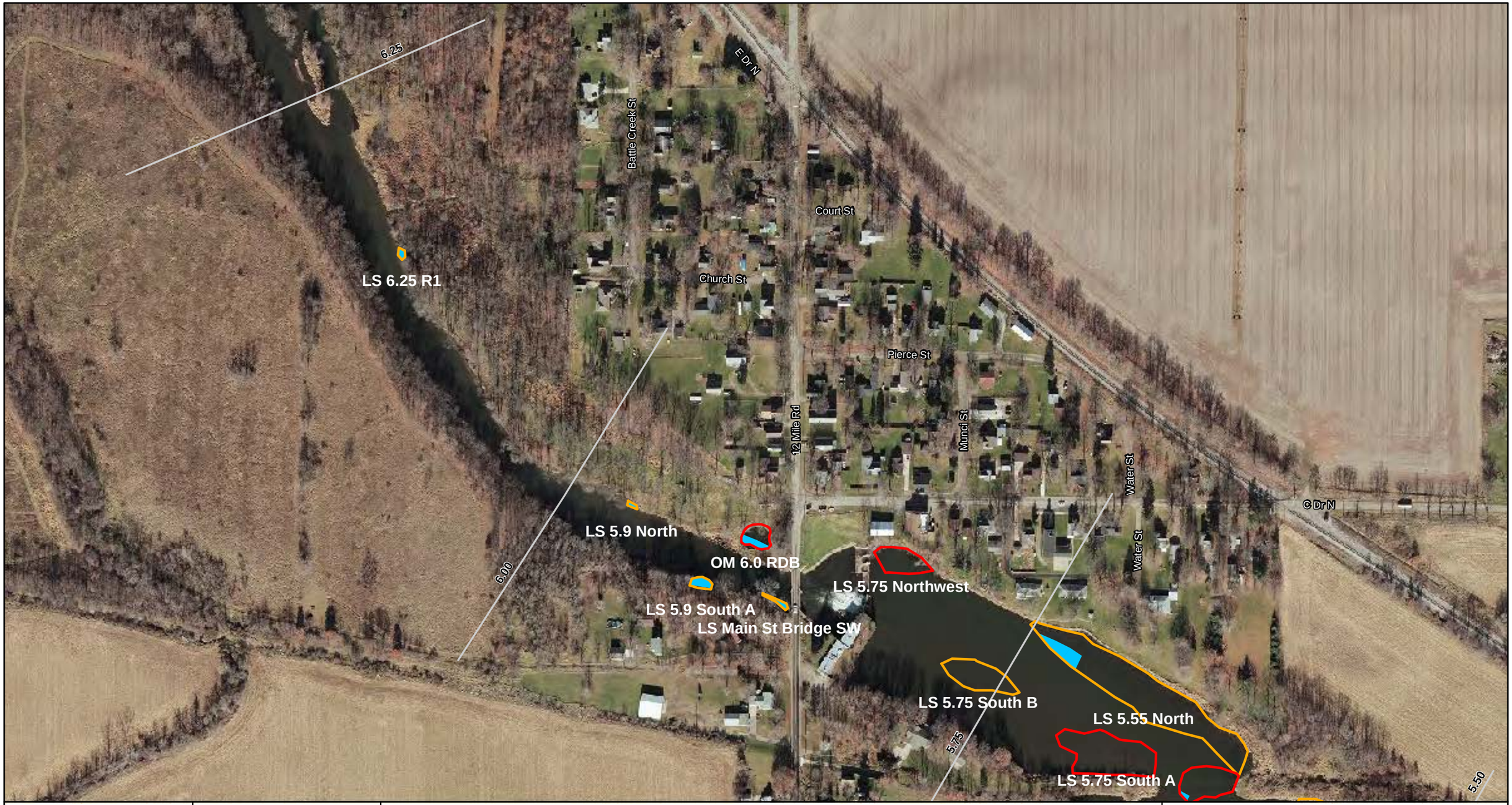
MP 04.90 - MP 05.65

SHEET 5 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

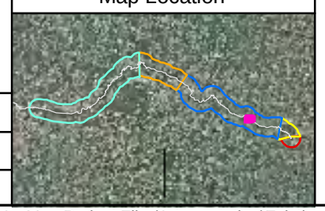
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 05.65 - MP 06.30

SHEET 6 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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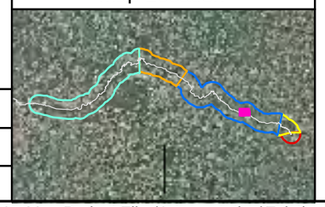
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 06.20 - MP 07.15

SHEET 7 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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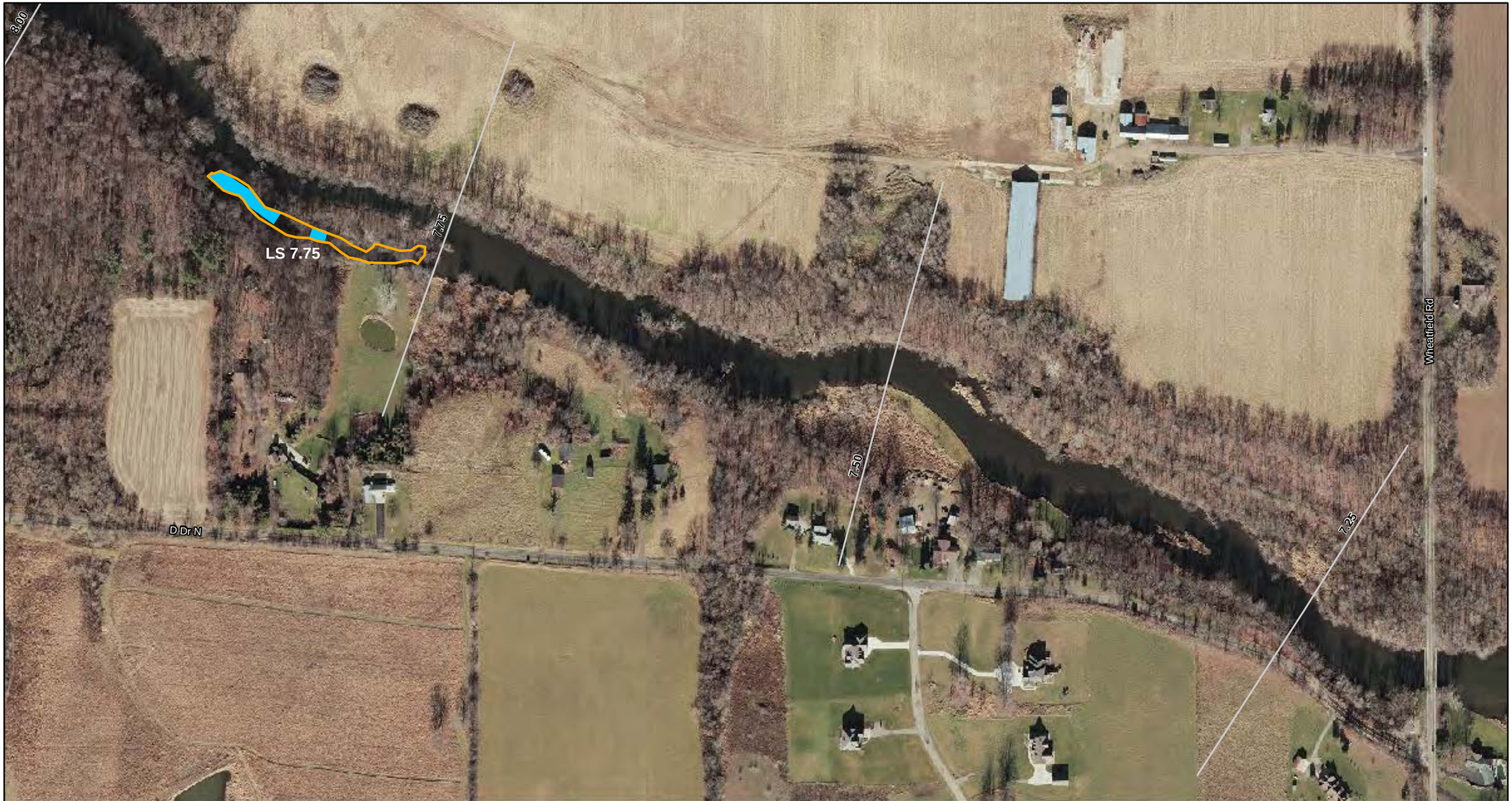
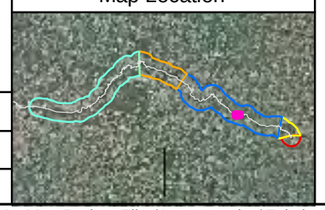
Aerial Photography Date: November 2011



ENBRIDGE	
Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 07.15 - MP 07.95

SHEET 8 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

8.75

LS 8.75 North B

8.50

LS 8.43TLS 8.5 L3

8.25

LS 8.5 L1

OM 8.5 R1

LS 8.25 I2 A

LS 8.25 I2 B

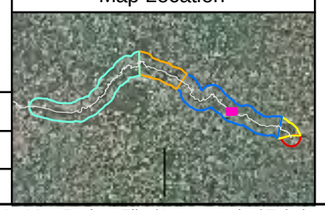
LS 8.25 I1 B

8.00

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

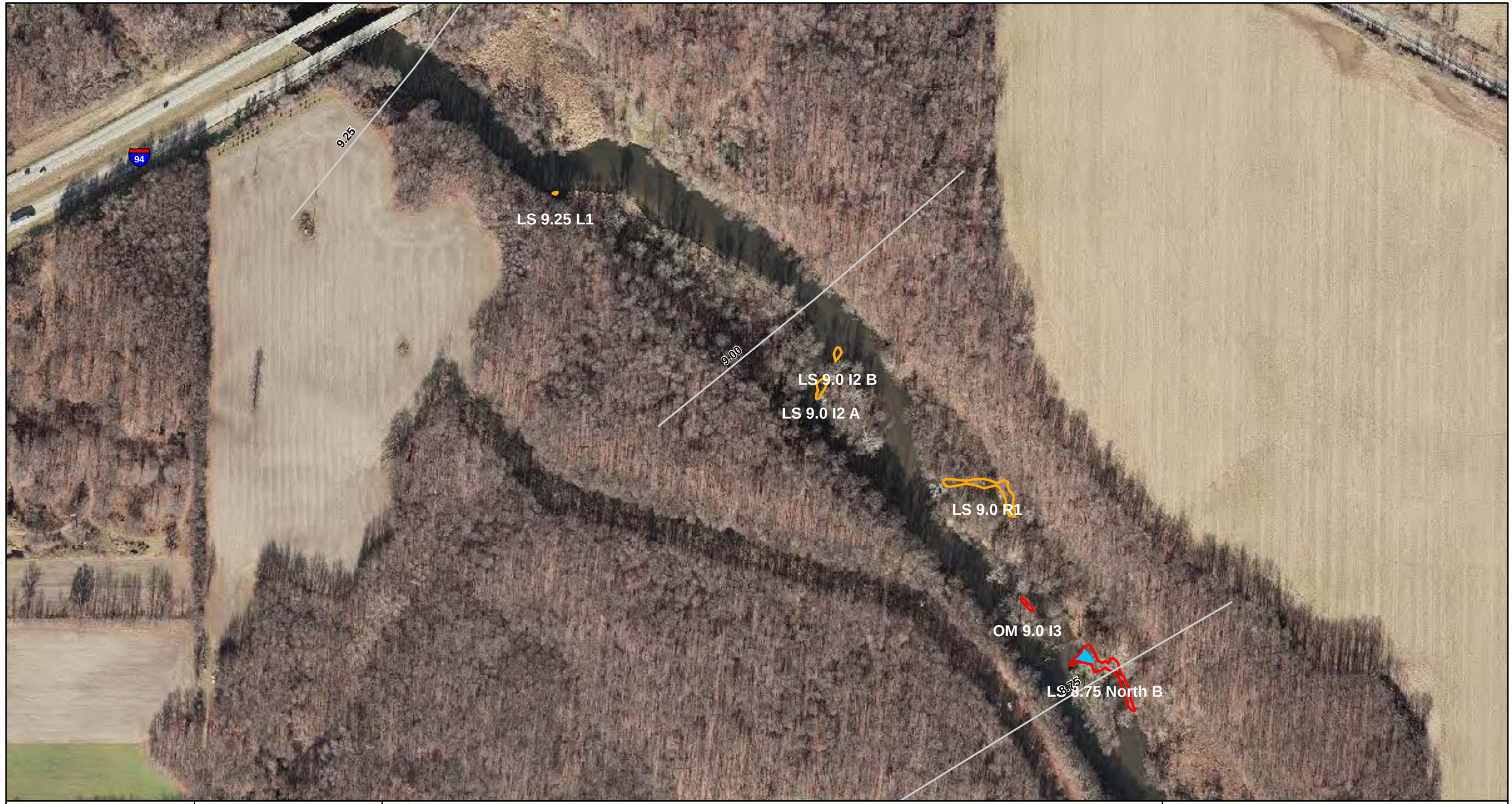
MP 07.90 - MP 08.75

SHEET 9 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

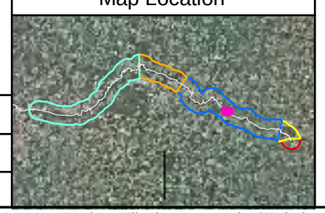
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 08.70 - MP 09.30

SHEET 10 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location

Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 09.25 - MP 10.05

SHEET 11 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

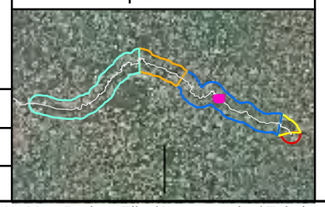
Aerial Photography Date: November 2011

LS 10.65T A
LS 10.65 North D
LS 10.65T B
LS 10.75L2
LS 10.5 North
10.50
10.25
LS 10.4 North
River Rd E
LS 10.17T
LS 10.21T
LS 10.25 North
LS 10.2 South
Golden Ave
10.00
LS 10.0 Center

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

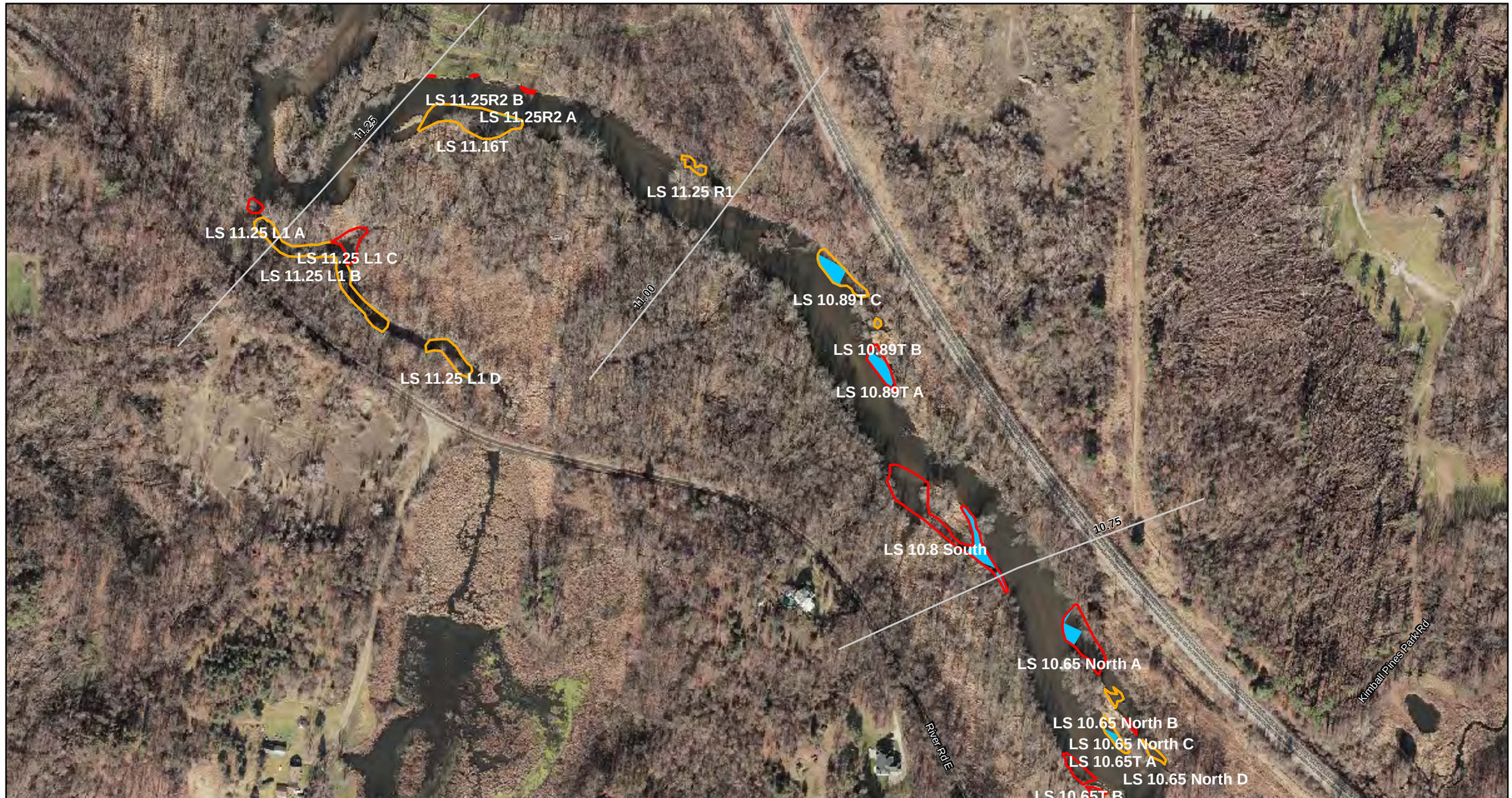
MP 10.00 - MP 10.65

SHEET 12 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

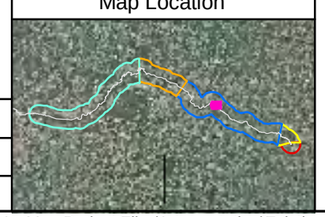
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 10.60 - MP 11.40

SHEET 13 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

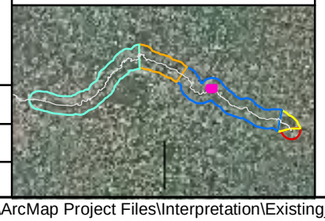
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

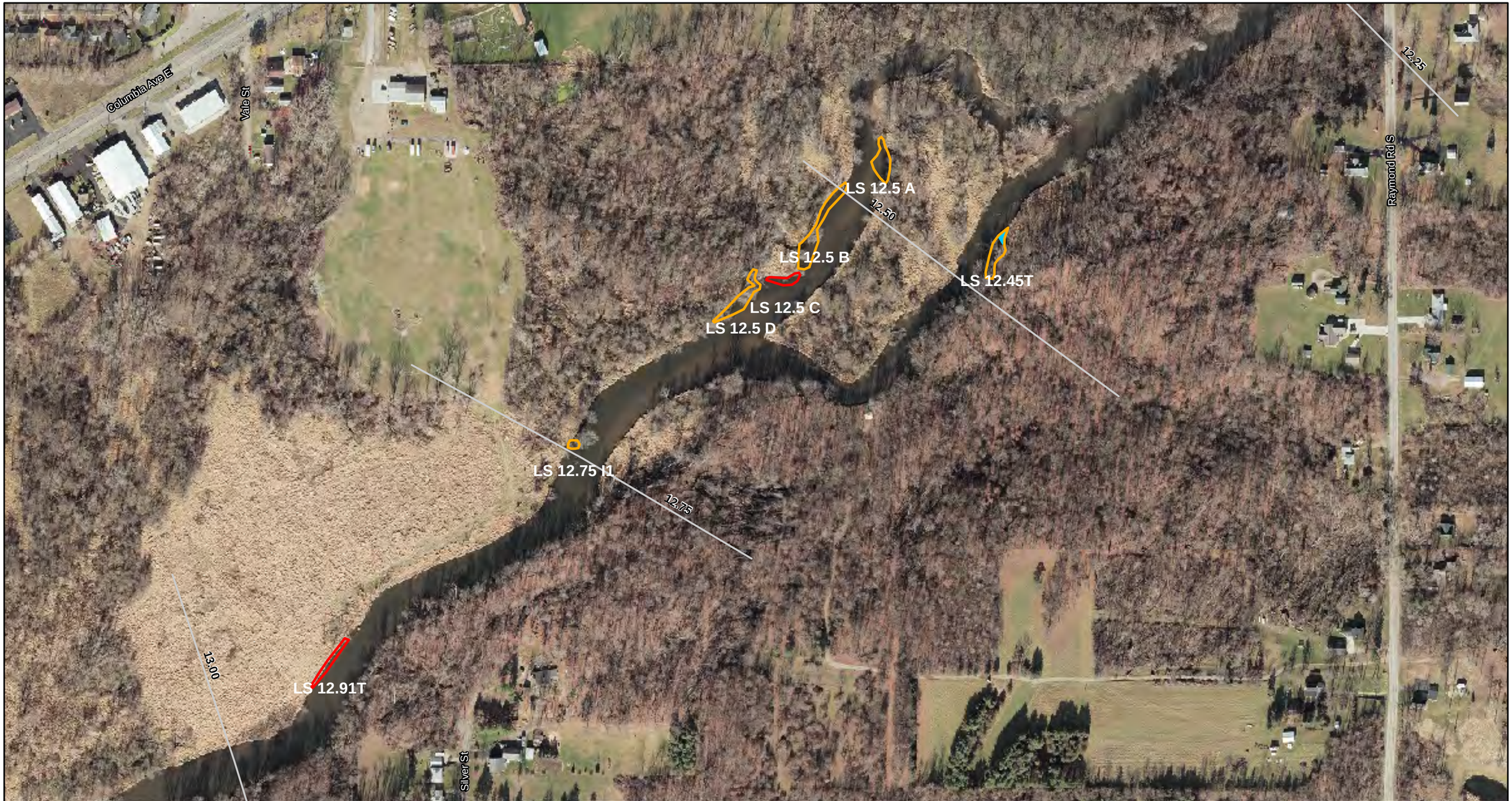
MP 11.10 - MP 12.45

SHEET 14 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

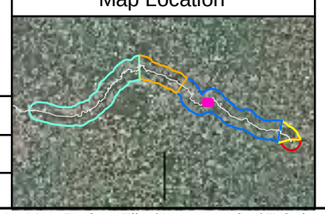
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 12.30 - MP 13.05

SHEET 15 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

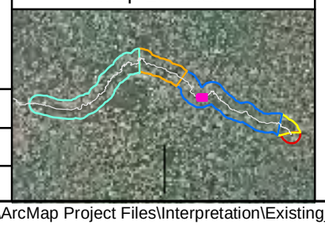
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

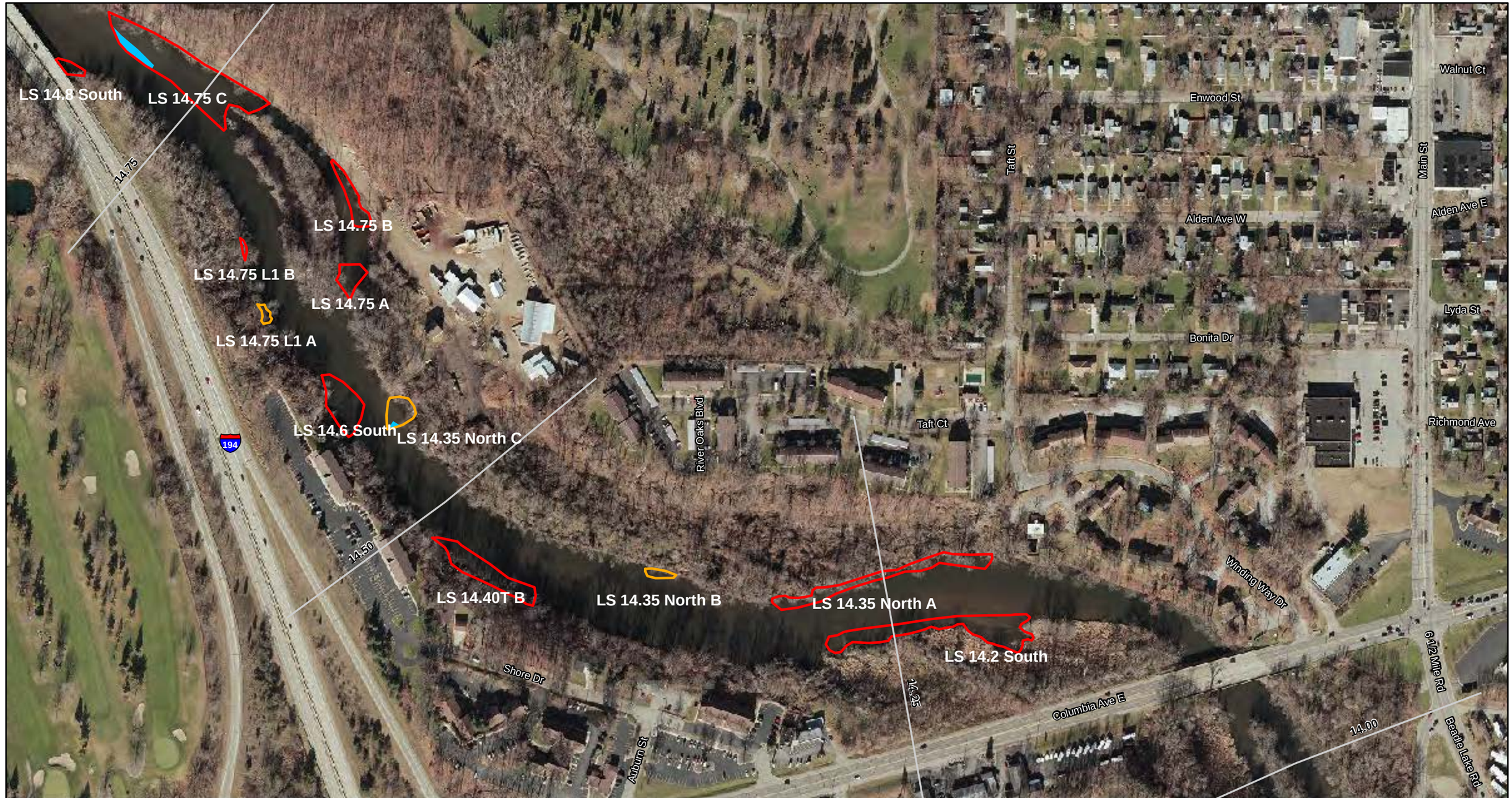
MP 13.00 - MP 14.10

SHEET 16 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location

Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

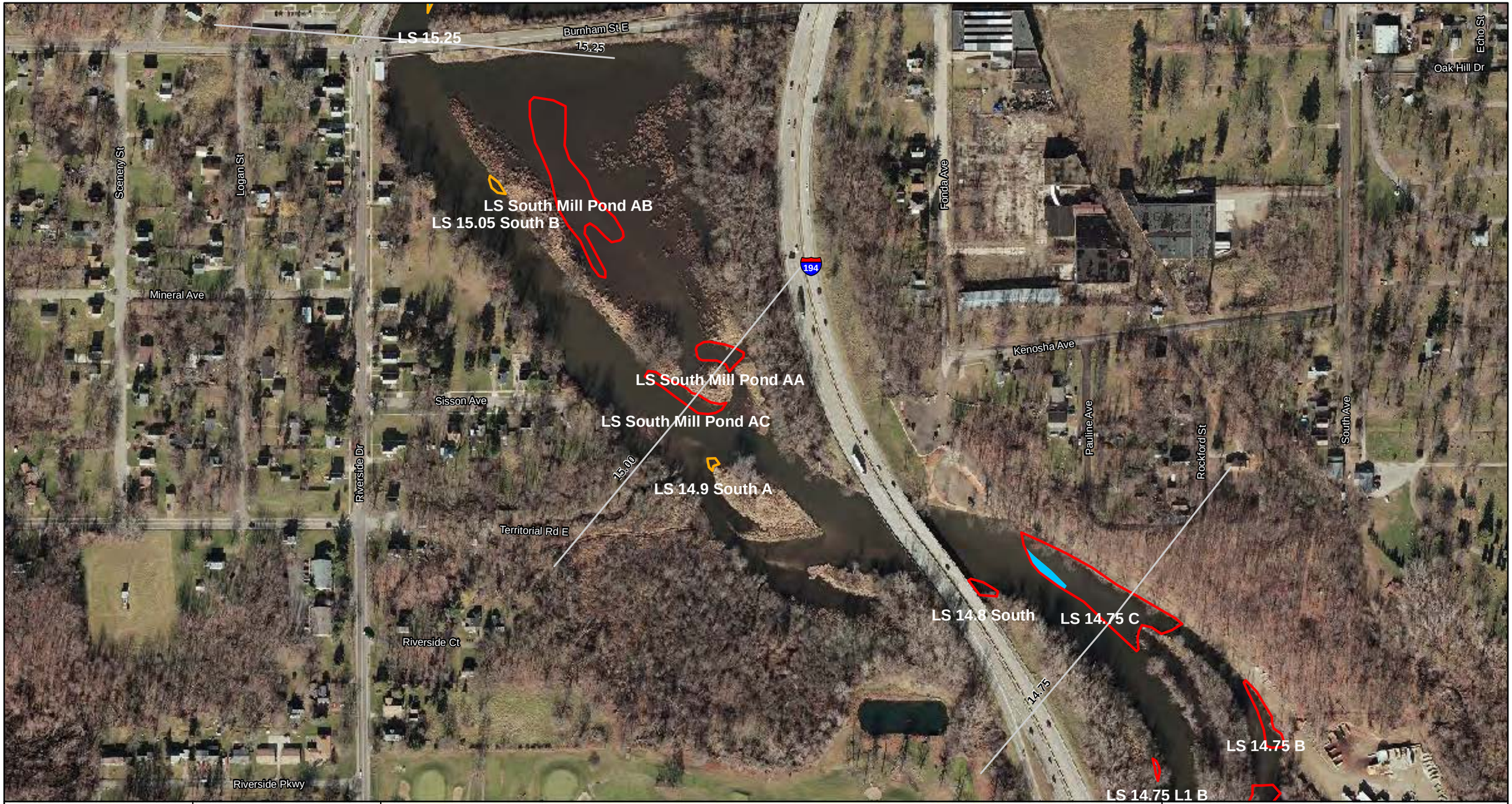
MP 14.00 - MP 14.85

SHEET 17 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

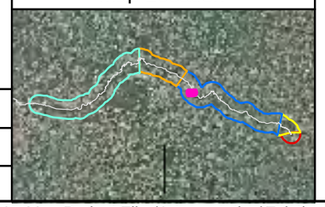
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

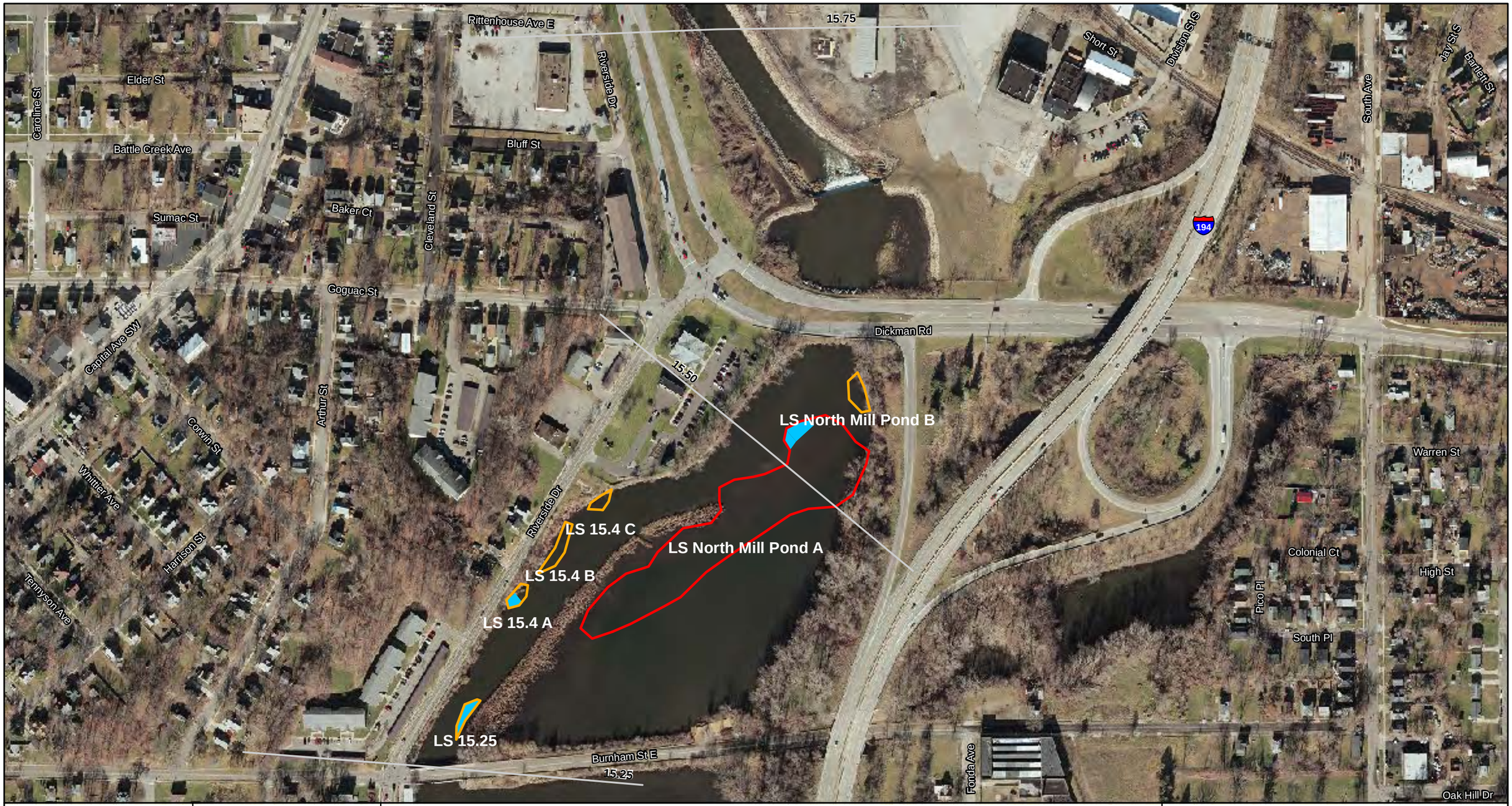
MP 14.65 - MP 15.25

SHEET 18 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

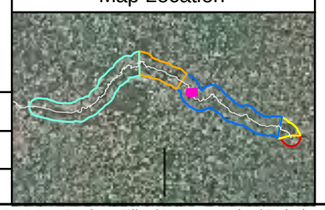
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 15.25 - MP 15.75

SHEET 19 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

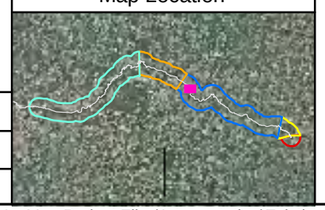
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 15.75 - MP 16.30

SHEET 20 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

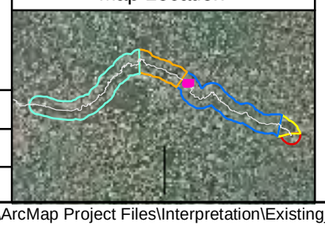
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

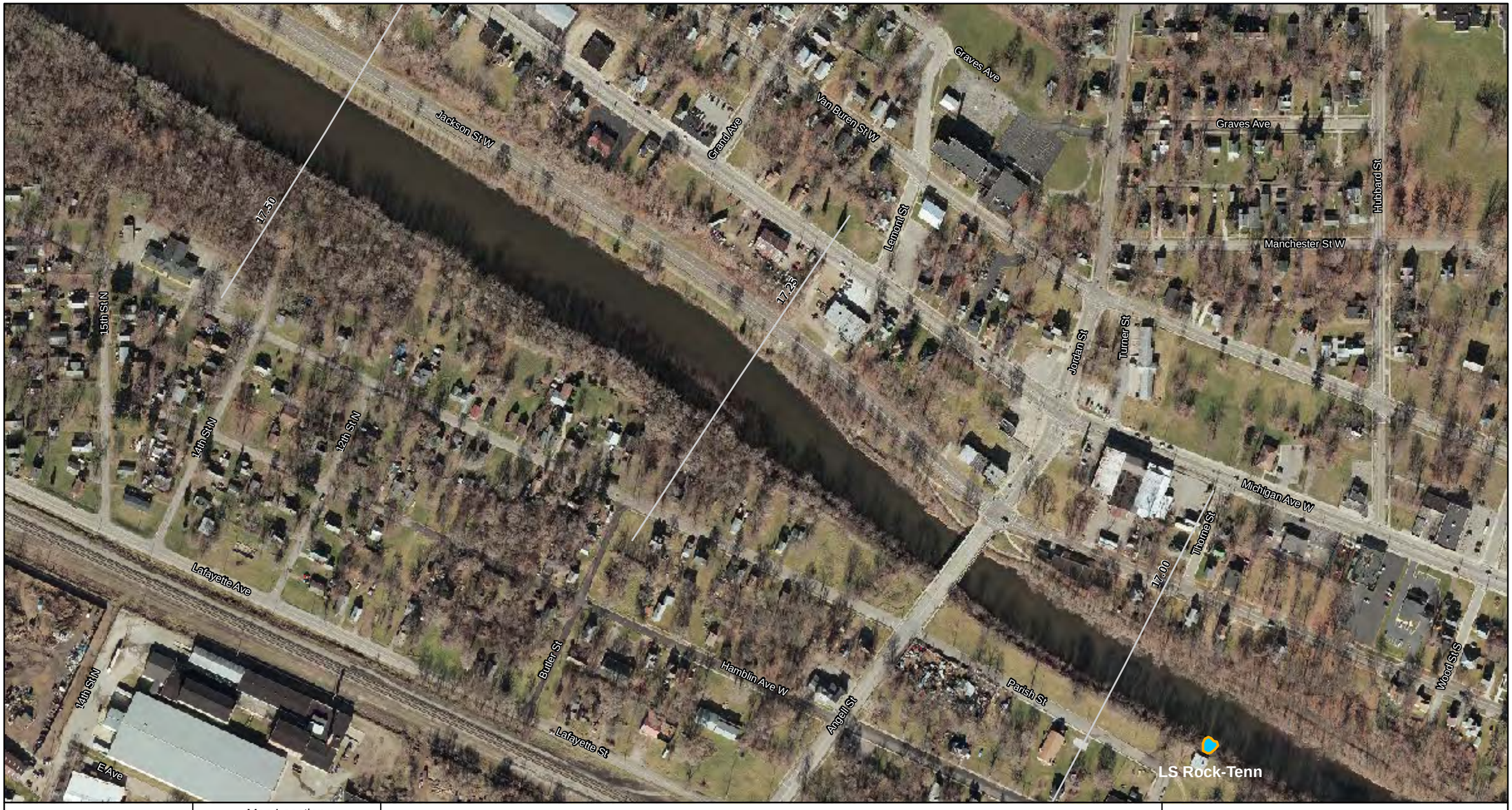
MP 16.30 - MP 16.95

SHEET 21 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

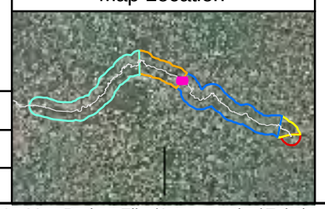
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 16.85 - MP 17.60

SHEET 22 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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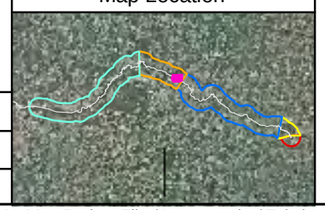
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 17.60 - MP 18.40

SHEET 23 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

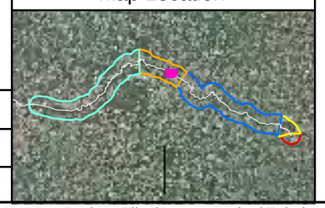
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 18.30 - MP 19.15

SHEET 24 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location

Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 19.10 - MP 19.95

SHEET 25 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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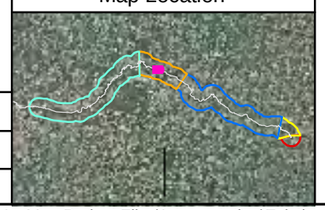
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 19.90 - MP 20.75

SHEET 26 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location

Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

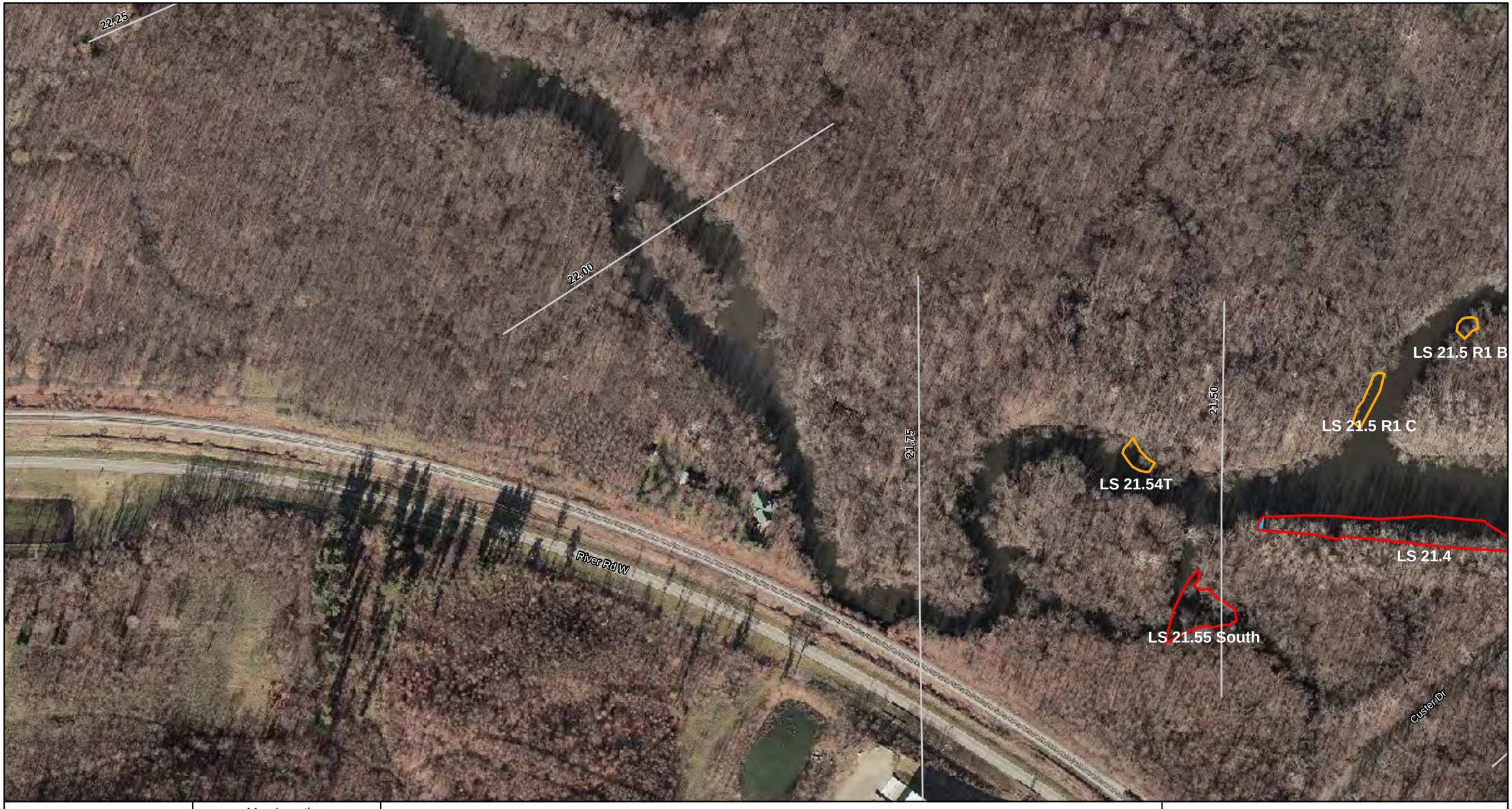
MP 20.70 - MP 21.50

SHEET 27 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

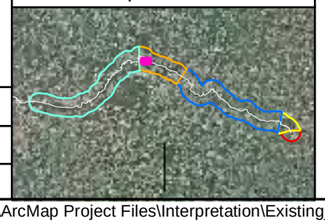
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 21.35 - MP 22.15

SHEET 28 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

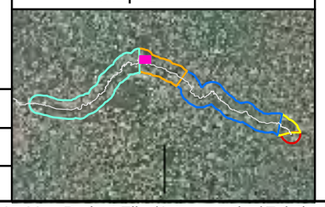
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 22.15 - MP 22.90

SHEET 29 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location

Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

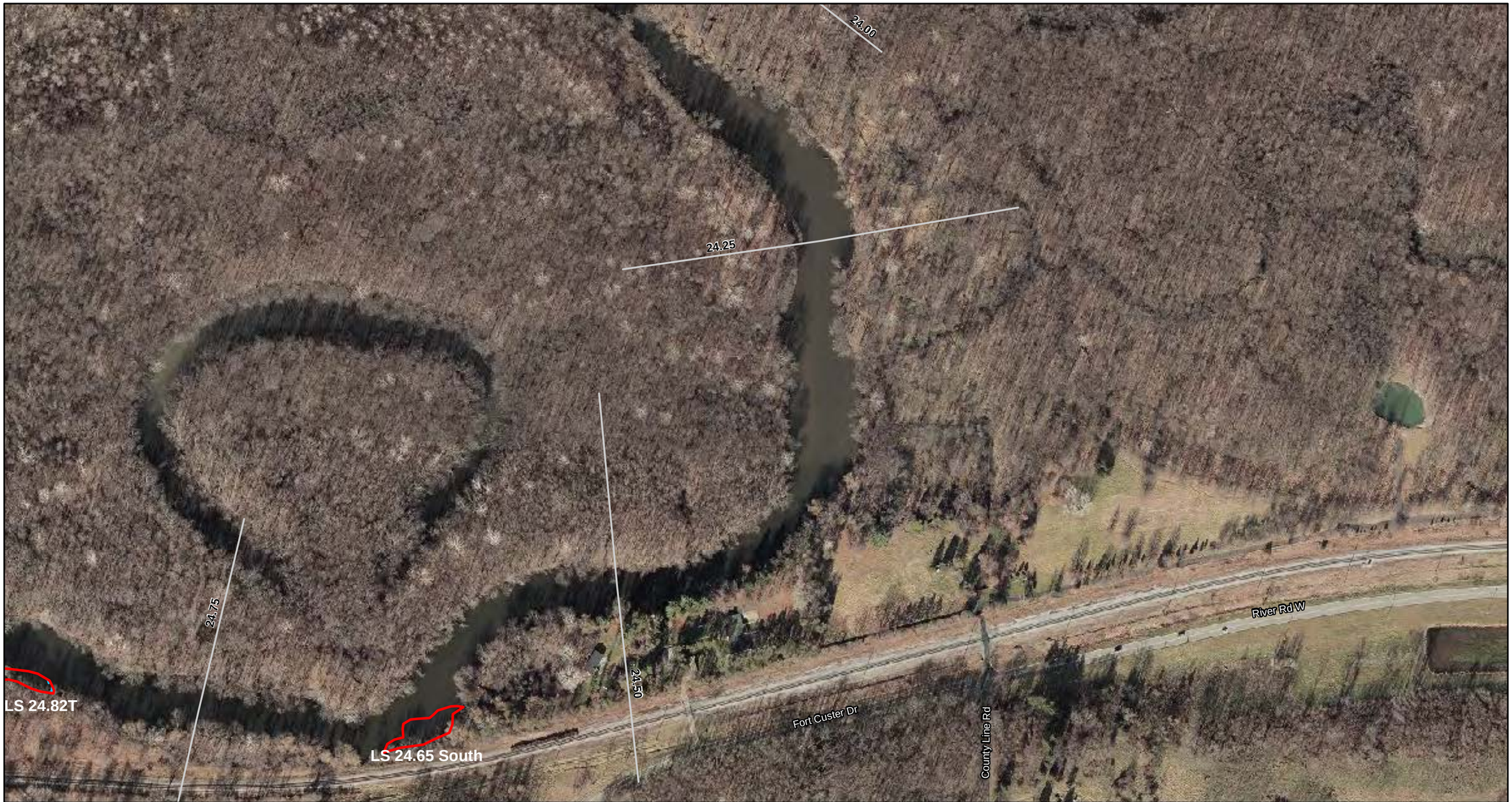
MP 22.80 - MP 24.10

SHEET 30 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

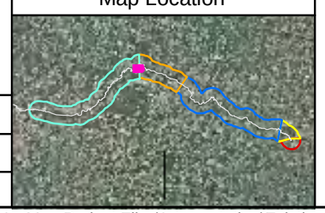
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 24.10 - MP 24.85

SHEET 31 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

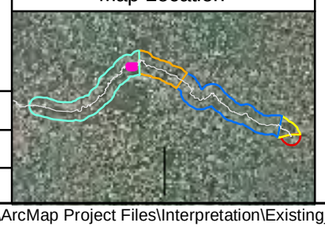
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 24.80 - MP 25.65

SHEET 32 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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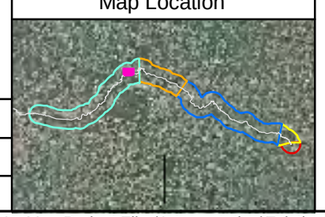
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 25.55 - MP 26.40

SHEET 33 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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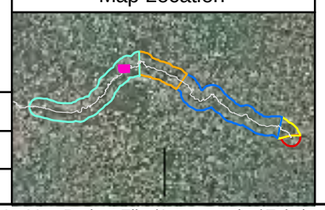
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 26.40 - MP 27.45

SHEET 34 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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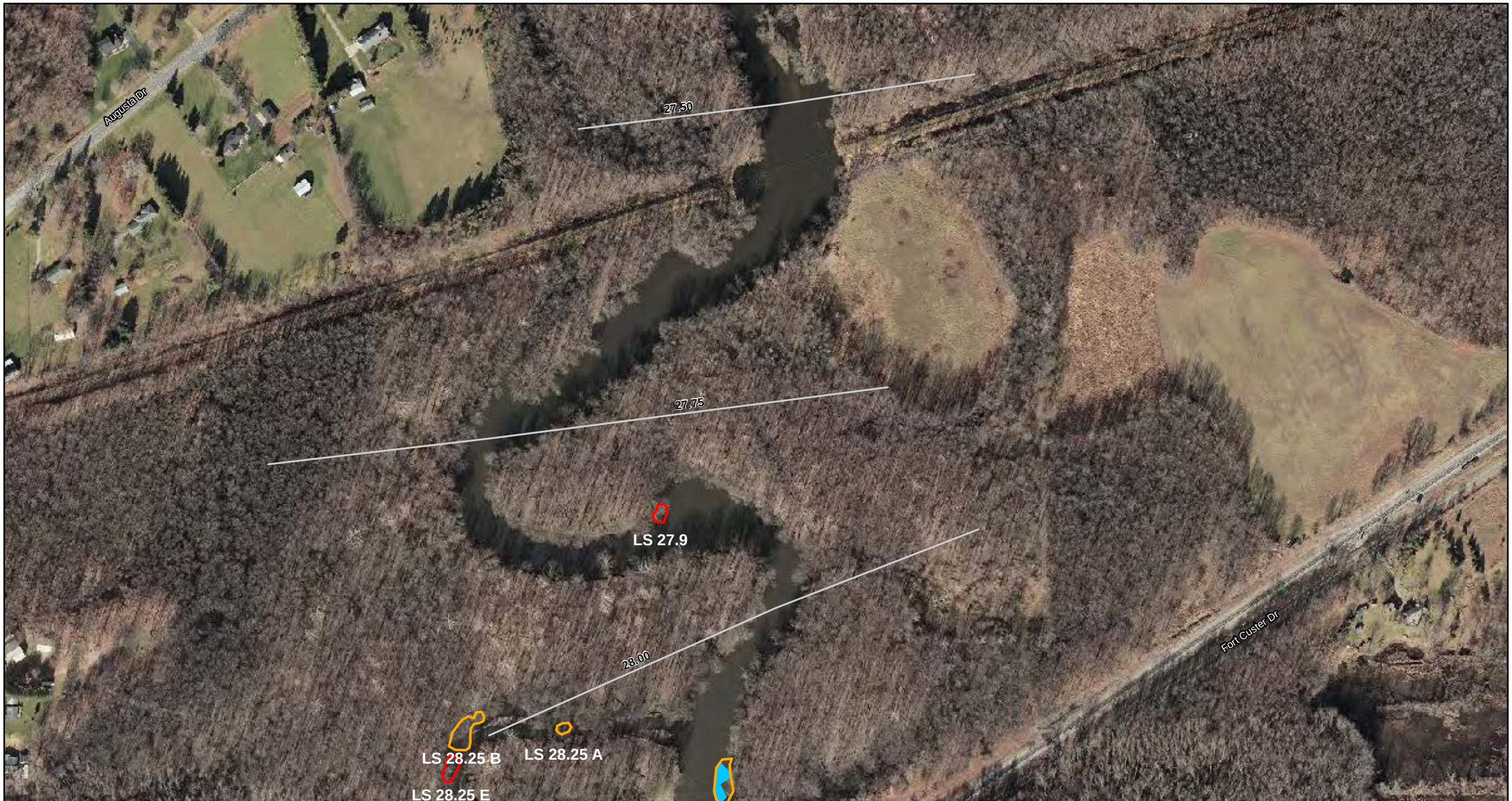
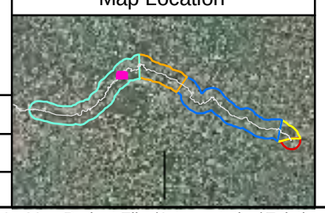
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

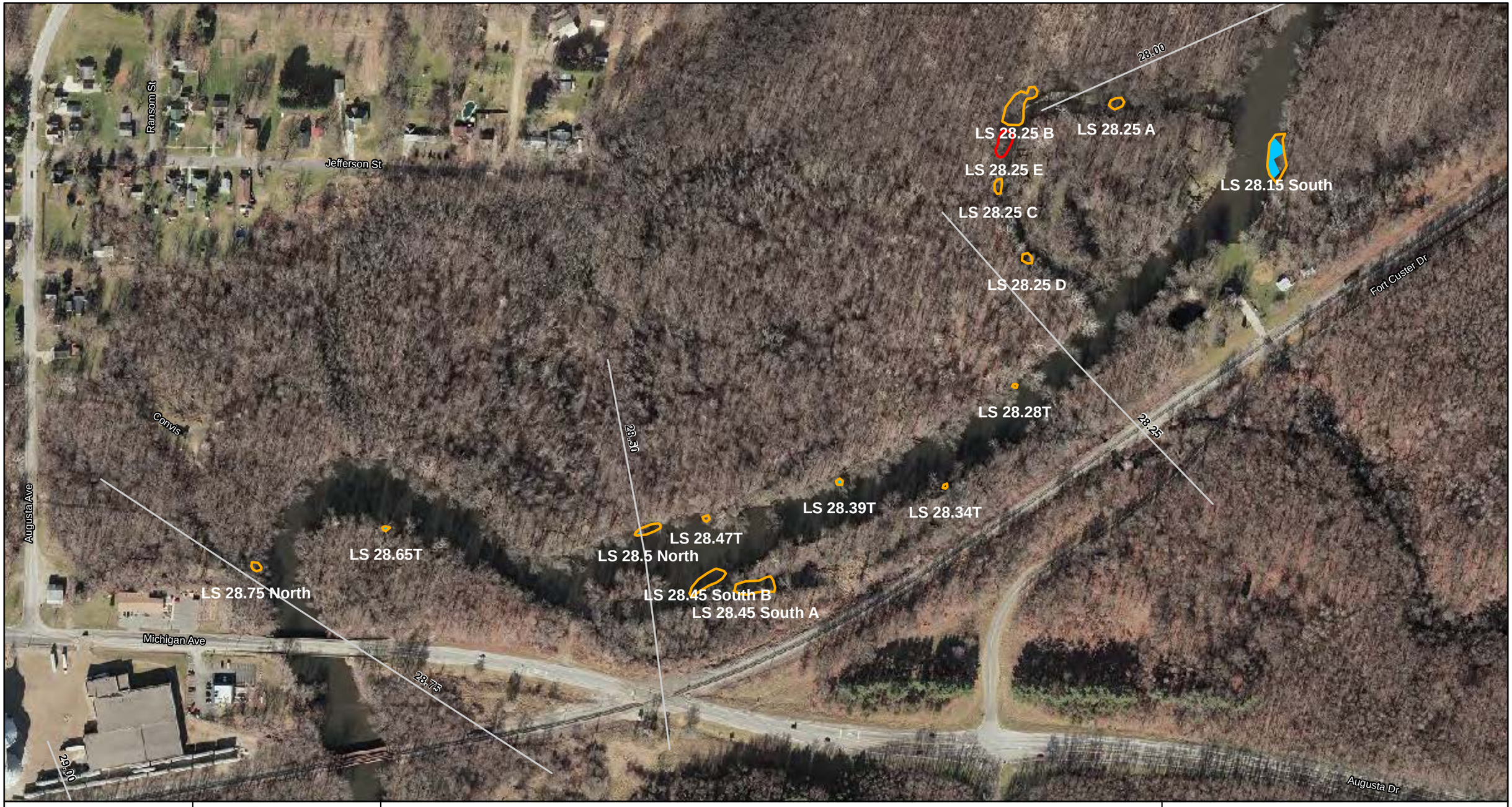
MP 27.45 - MP 28.10

SHEET 35 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

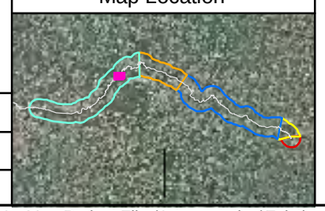
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 28.05 - MP 28.85

SHEET 36 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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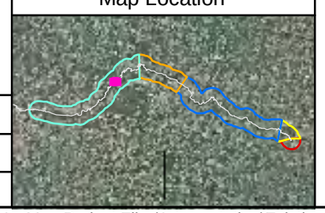
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 28.85 - MP29.55

SHEET 37 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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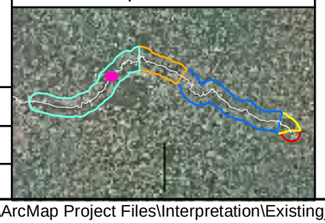
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 29.50 - MP29.95

SHEET 38 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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Aerial Photography Date: November 2011

30.00

30.25

30.50

30.75

Fort Custer Rec Area BAS

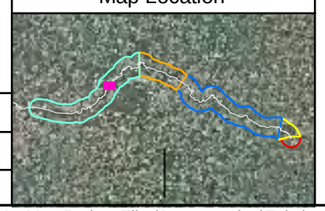
Fort Custer Rec Area Access

LS 30.7 North

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 29.95 - MP 30.80

SHEET 39 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

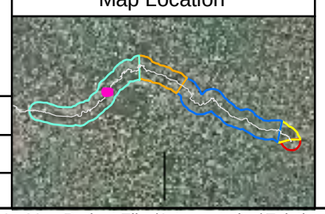
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 30.75 - MP 31.25

SHEET 40 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

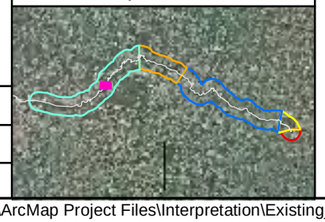
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 31.25 - MP 31.70

SHEET 41 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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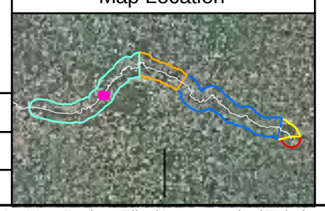
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

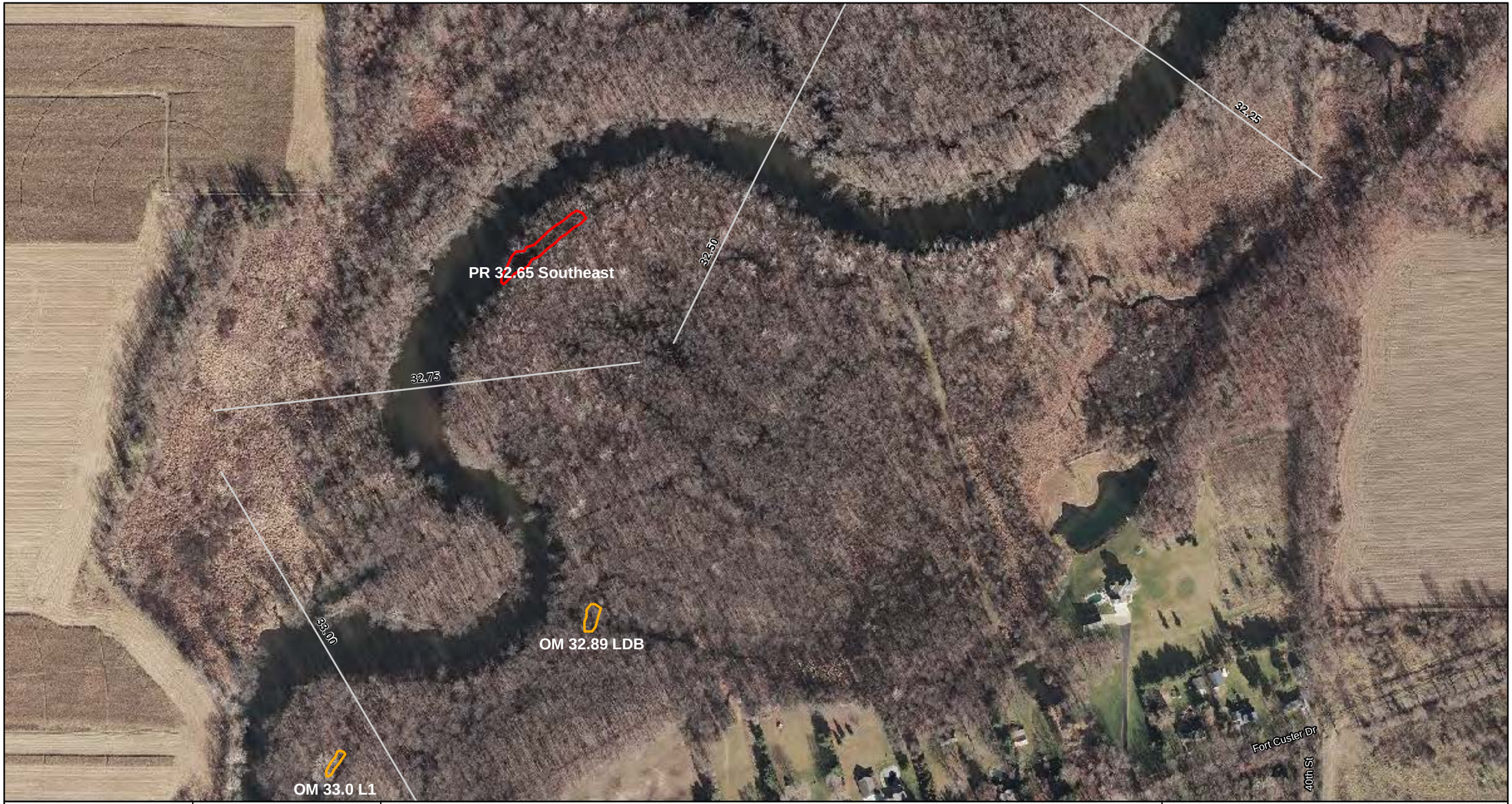
MP 31.65 - MP 32.25

SHEET 42 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

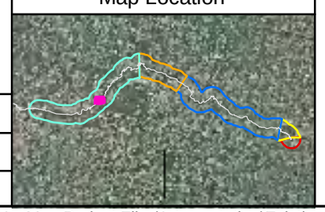
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 32.25 - MP 33.10

SHEET 43 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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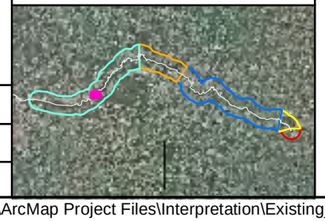
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 33.10 - MP 33.70

SHEET 44 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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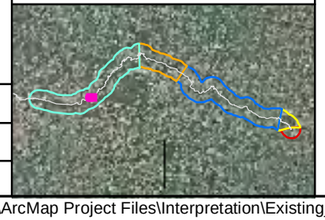
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 33.70 - MP 34.70

SHEET 45 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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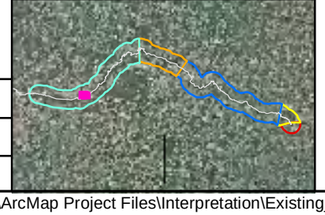
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 34.70 - MP 35.75

SHEET 46 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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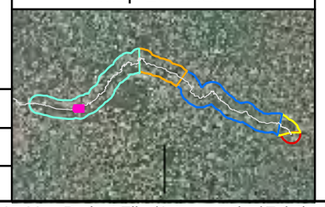
Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 35.75 - MP 36.80

SHEET 47 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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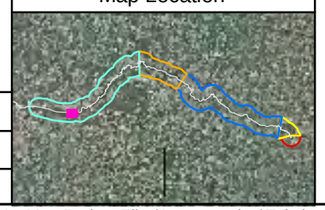
Aerial Photography Date: November 2011

PR 36.75 North
PR 37.1 North
PR Delta M
PR Delta G
PR Delta B A
PR Delta I
PR Delta B B
PR Delta N
PR Delta Q
PR Delta P
PR Delta FF
PR Delta HH
37.50
37.00
37.25
Miller Dr

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 36.80 - MP 37.55

SHEET 48 OF 56

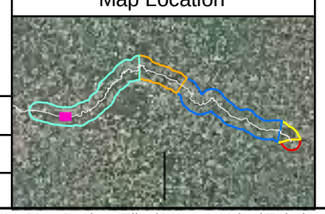
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE	
Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 37.55 - MP 38.30

SHEET 49 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

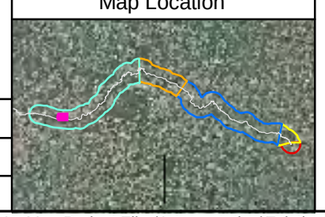
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 37.80 - MP 38.60N

SHEET 50 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

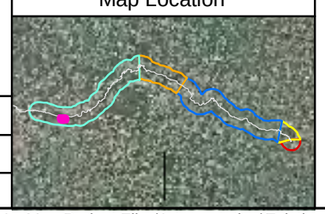
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 37.80 - MP 38.60S

SHEET 51 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

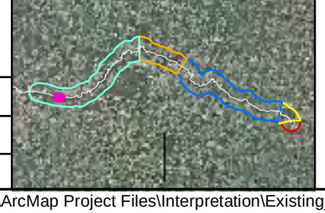
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 38.25 - MP 39.00C

SHEET 52 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

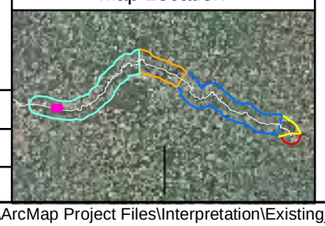
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)
- 2011 Year-end Submerged Oil
  - Heavy
  - Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 38.50 - MP 39.25N

SHEET 53 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

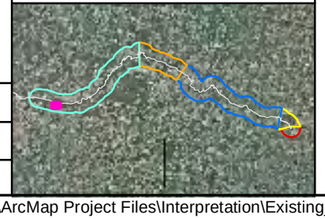
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

- Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

- Heavy
- Moderate
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

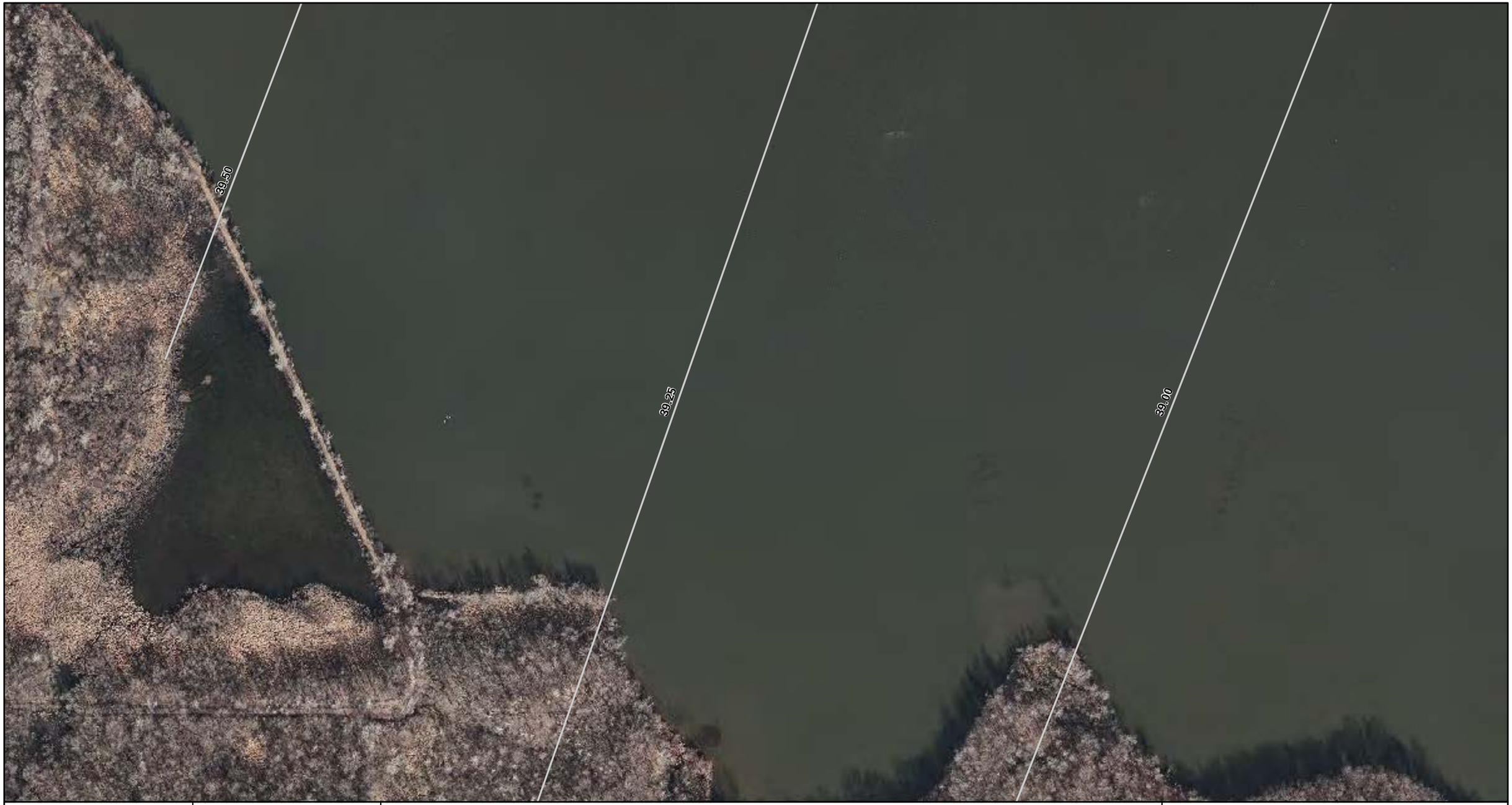
MP 38.50 - MP 39.25S

SHEET 54 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

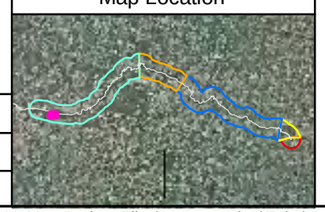
Aerial Photography Date: November 2011



ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 38.90 - MP 39.60S

SHEET 55 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

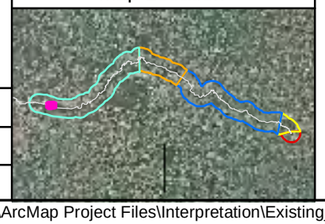
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

Aerial Photography Date: November 2011

ENBRIDGE

Drawn:	BRS	4/3/2012
Approved:	DBR	4/3/2012
Project #:	106-4186	

Map Location



Legend

Area of Highest Remobilization Potential (>0.1 mm/week erosion and net decrease in silt or clay mass)

2011 Year-end Submerged Oil

Heavy

Moderate

Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 125 250 500

Scale in Feet

2011 YEAR-END SUBMERGED OIL
AREAS WITH HIGHEST REMOBILIZATION POTENTIAL

MP 39.15 - MP 39.85

SHEET 56 OF 56

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Existing_Submerged_Oil_Highest_Remob_Potential.mxd

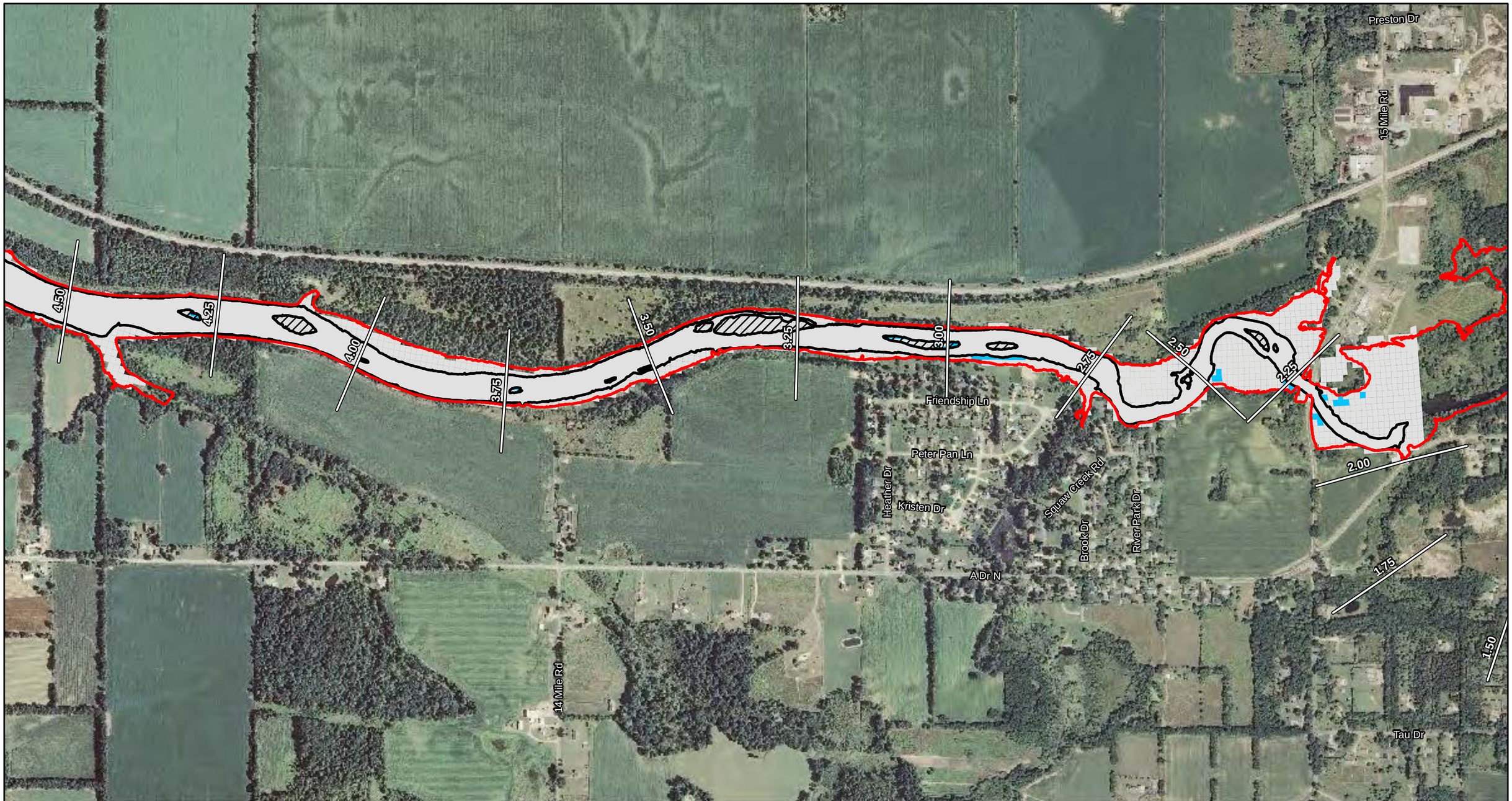
Aerial Photography Date: November 2011

Figure 10-2

Overbank Remobilization Potential

50-Year Flood

Sheets 1 through 16



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

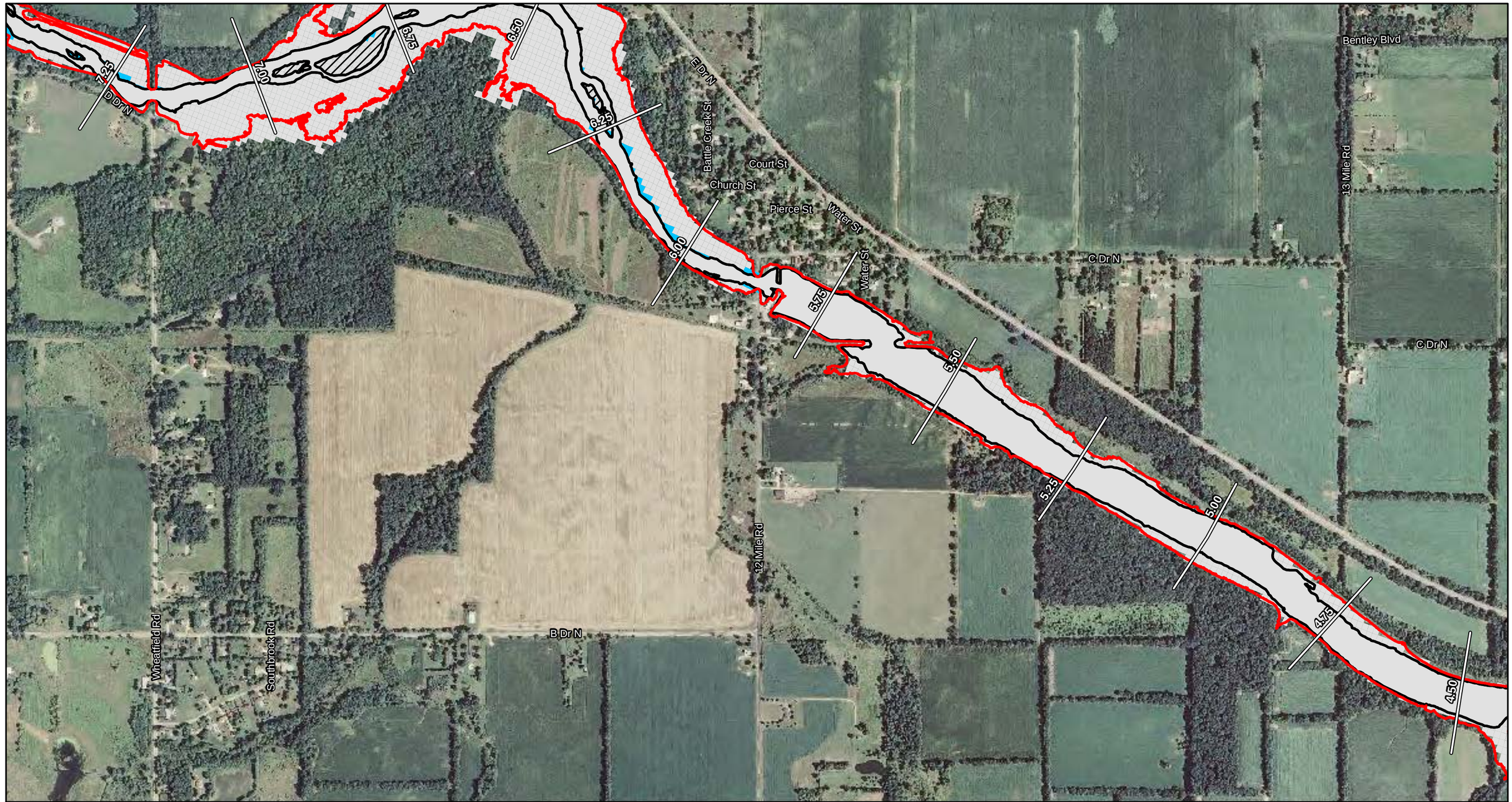
MP 1.50 - MP 4.50

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

Aerial Photography Date: July & August 2009



Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

MP 4.50 - MP 6.25

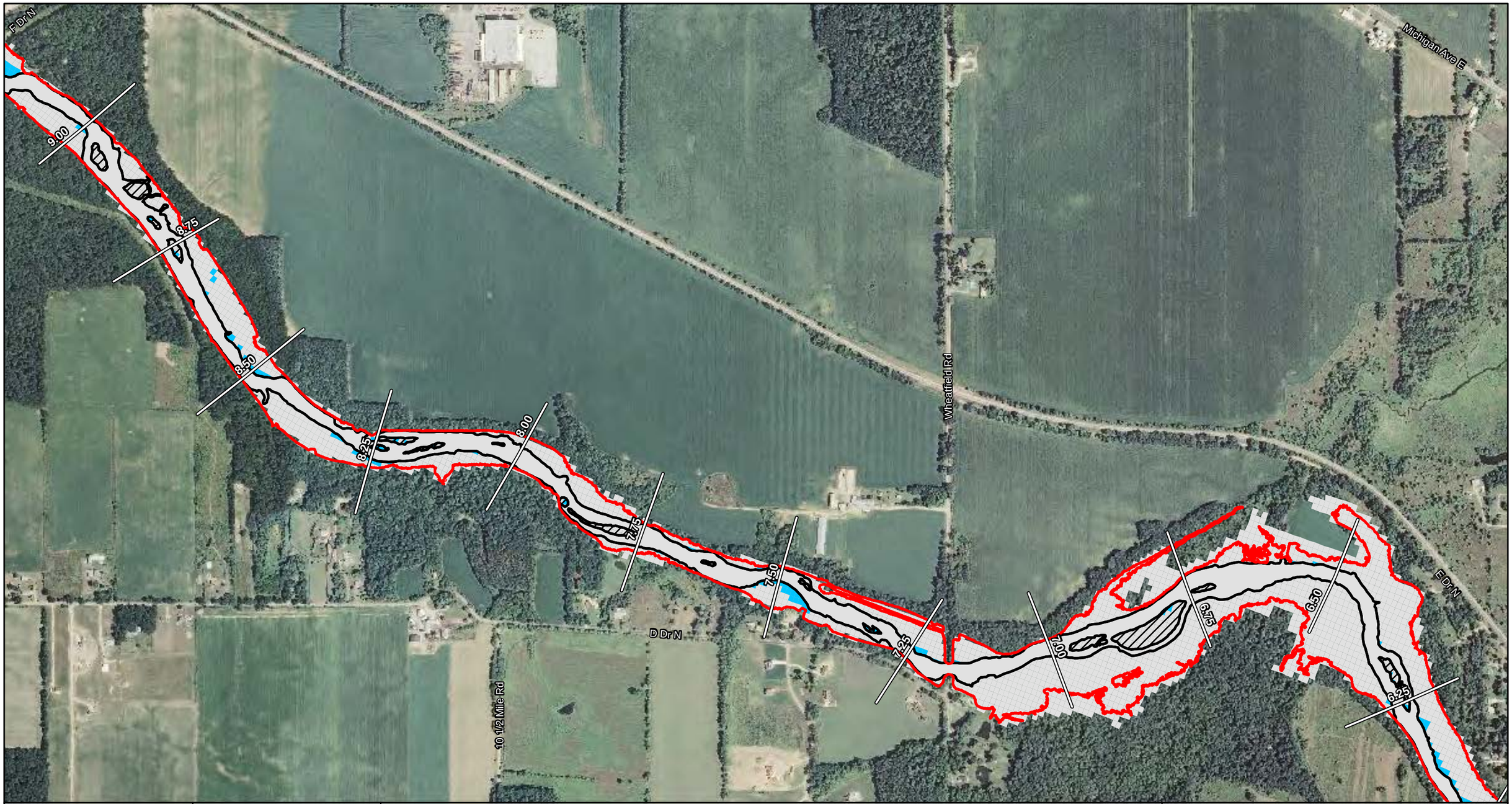
SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

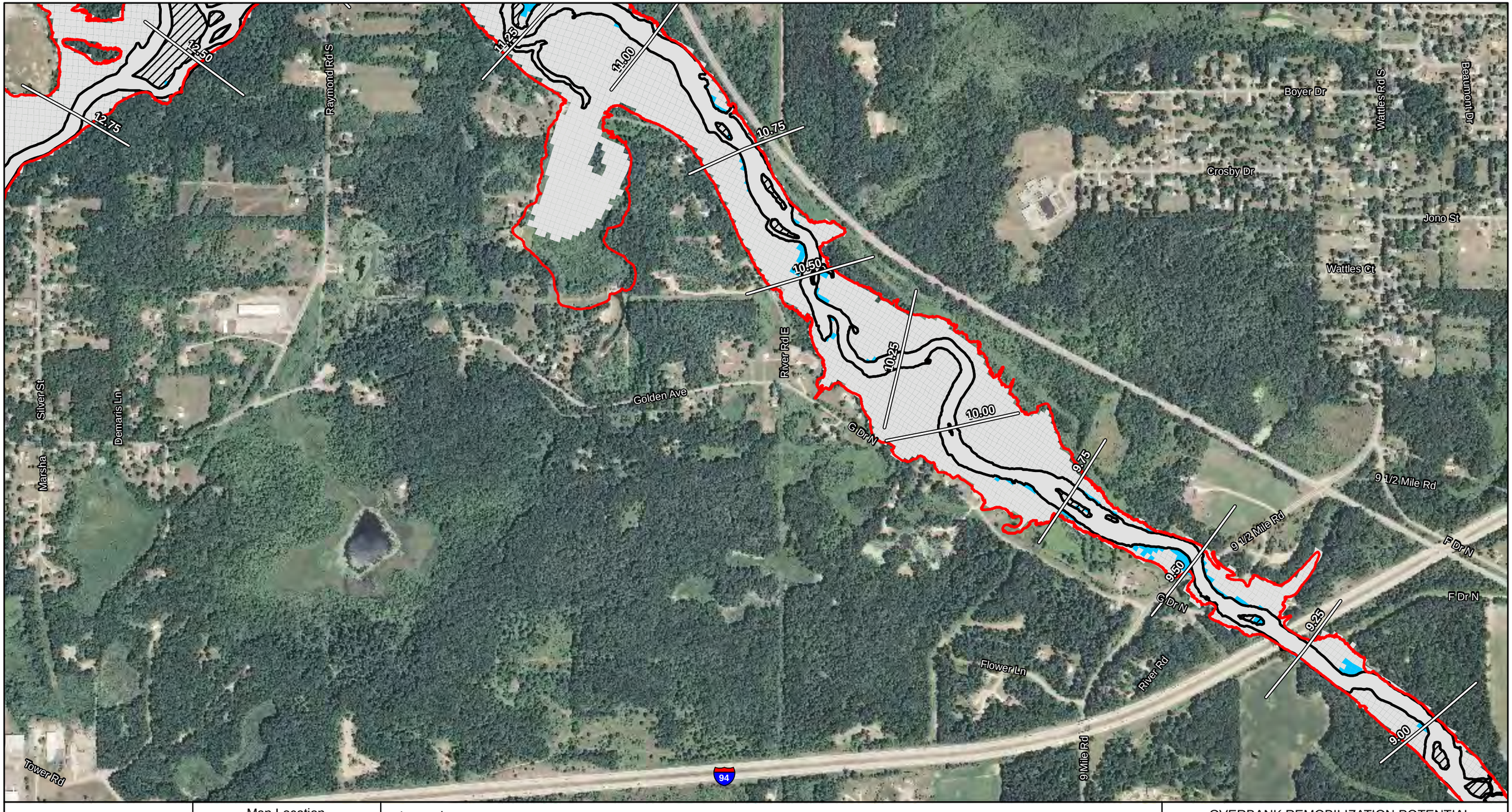
MP 6.25 - MP 9.00

SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

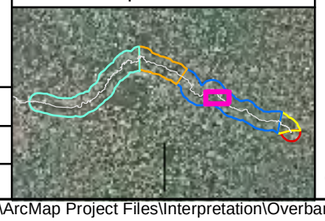
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

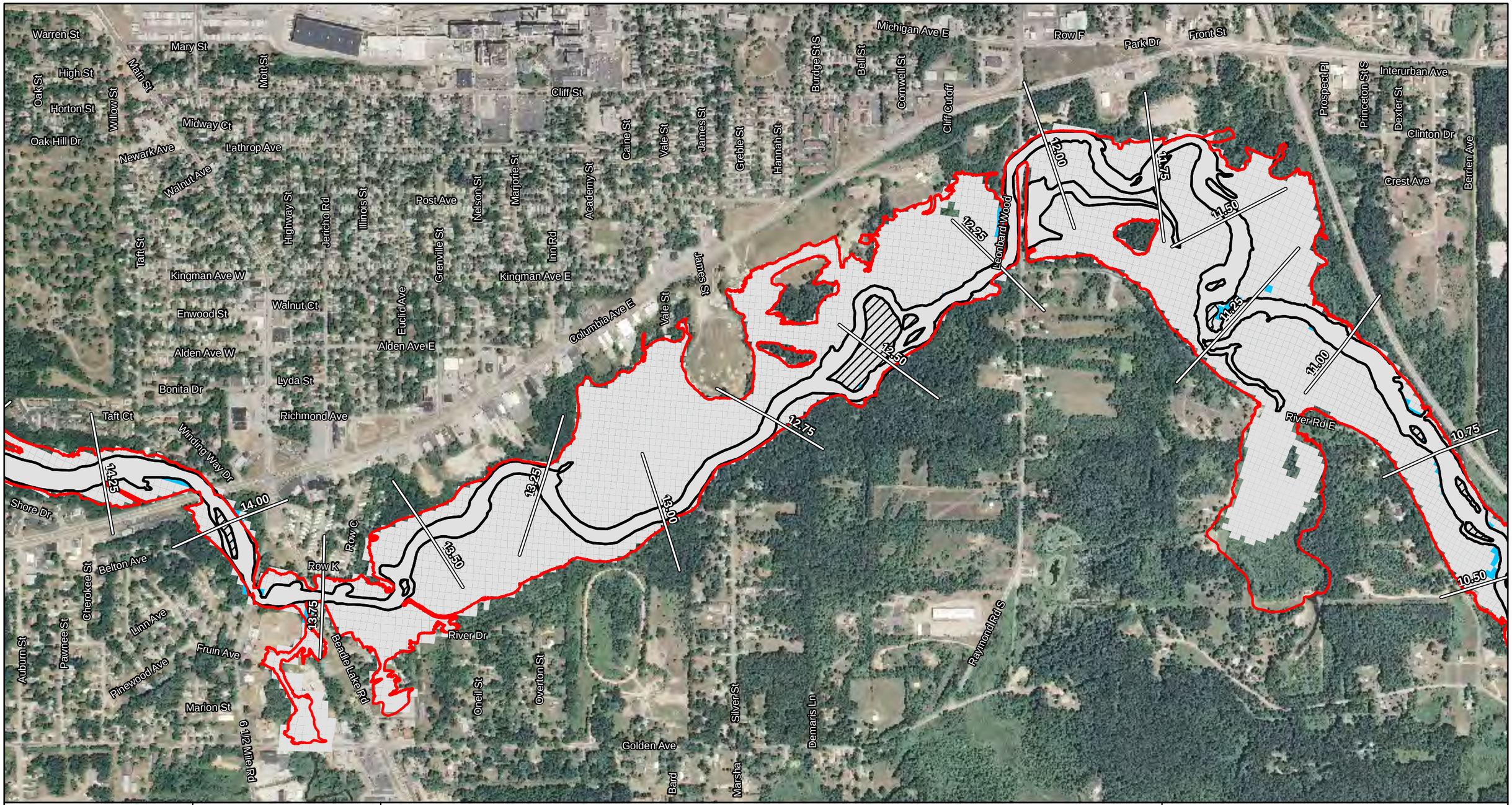
MP 9.00 - MP 10.50

SHEET 4 OF 16

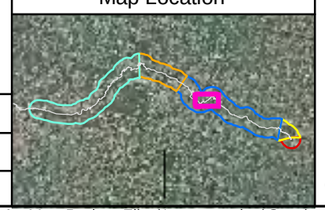
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

Aerial Photography Date: July & August 2009



Map Location



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

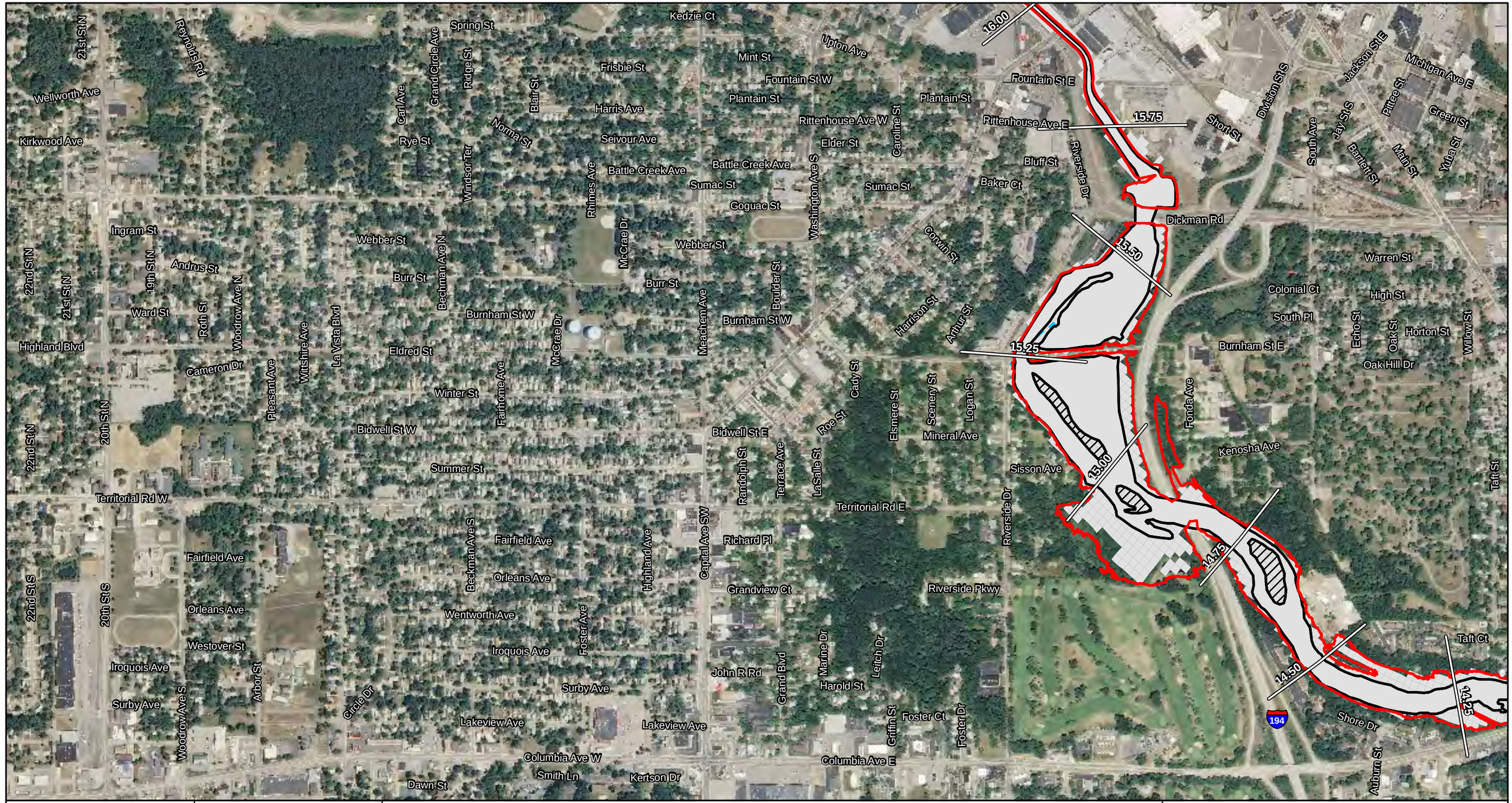
MP 10.50 - MP 14.25

SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

MP 14.25 - MP 16.00

SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

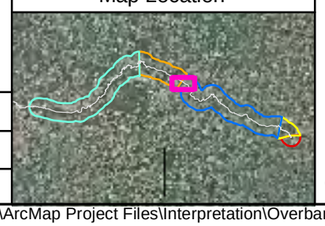
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

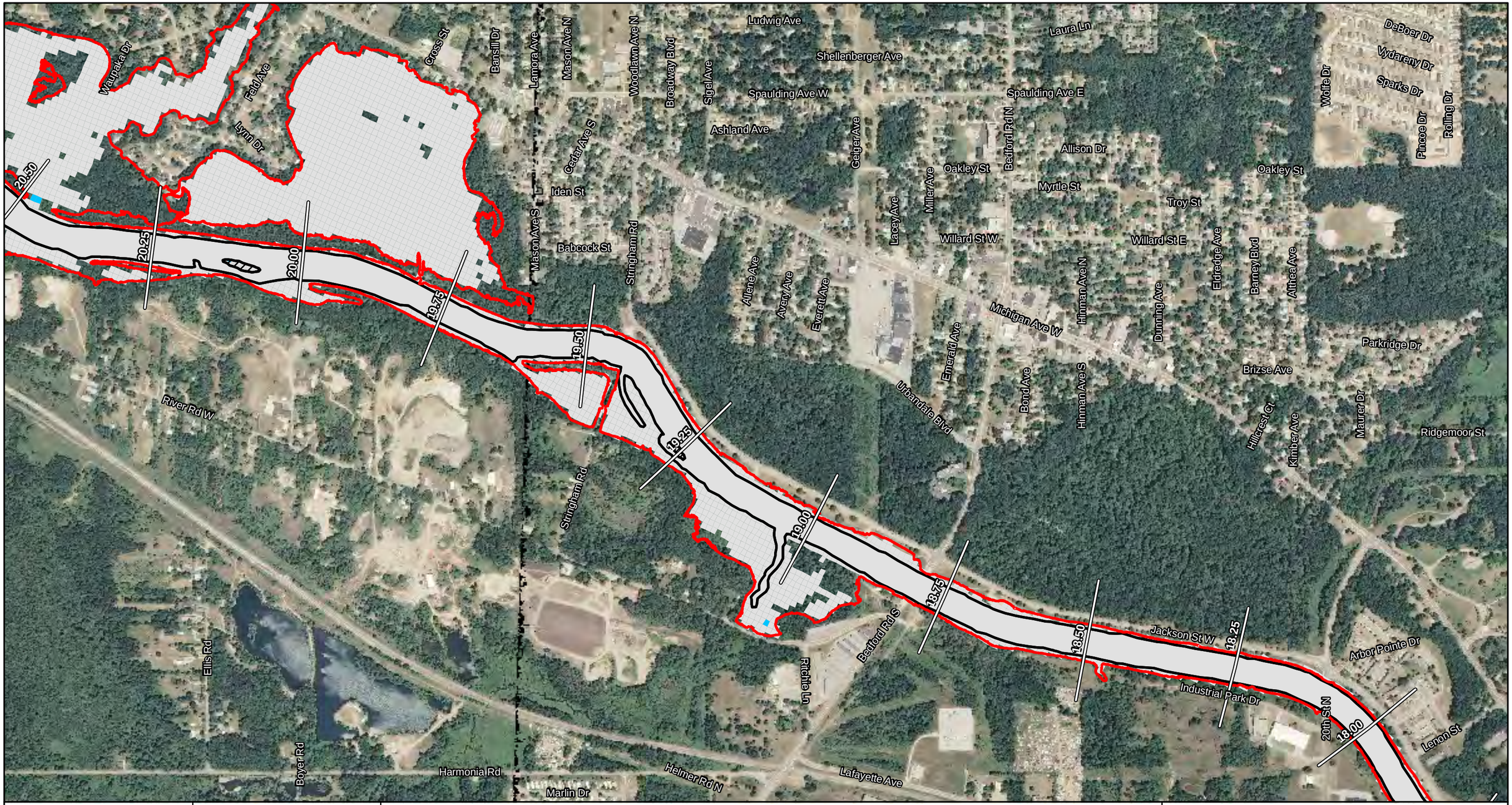
MP 16.00 - MP 18.00

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

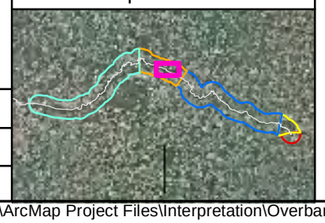
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

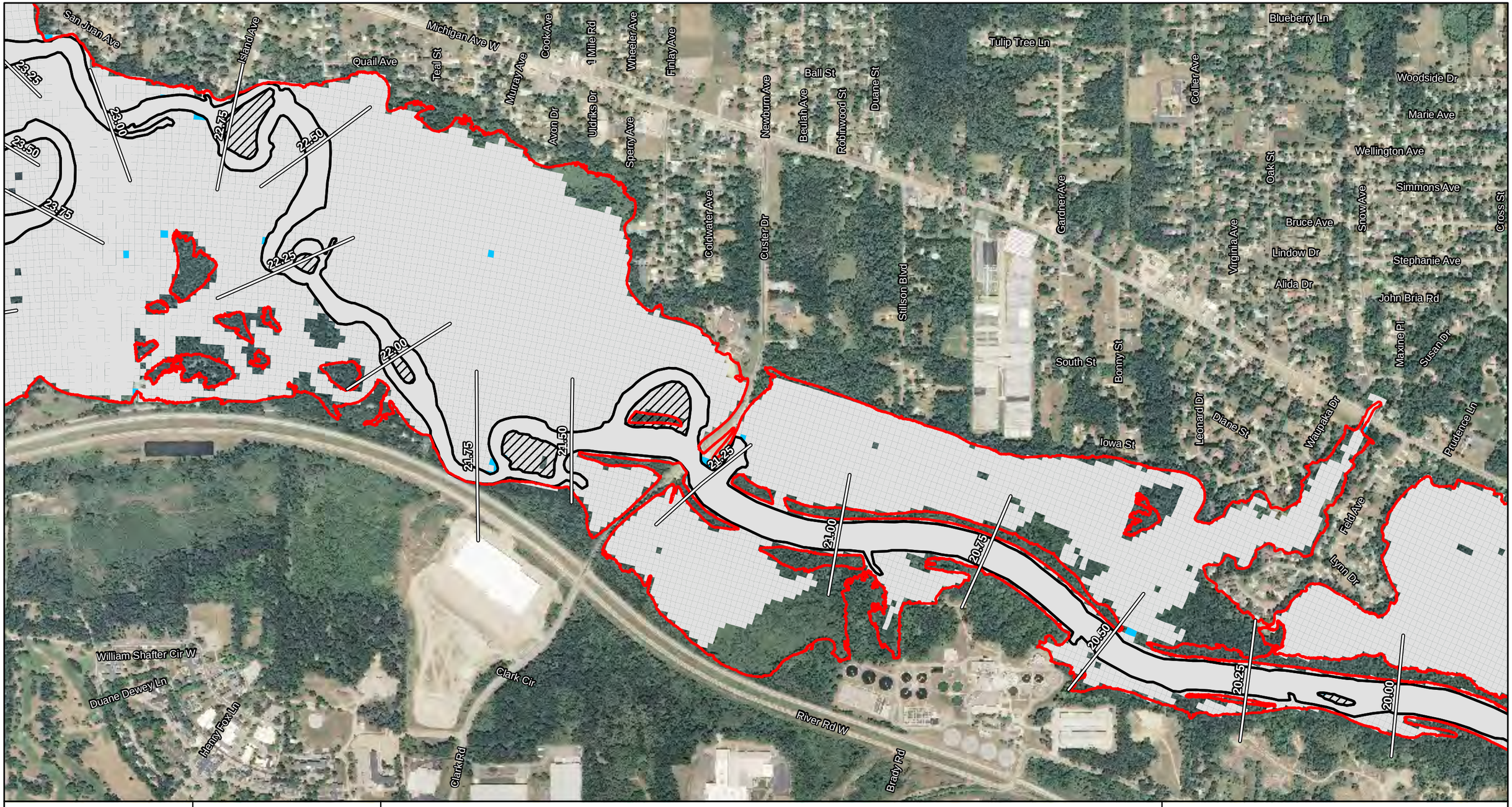
MP 18.00 - MP 20.00

SHEET 8 OF 16

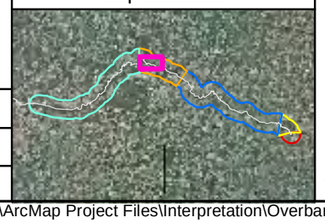
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

Aerial Photography Date: July & August 2009



Map Location



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

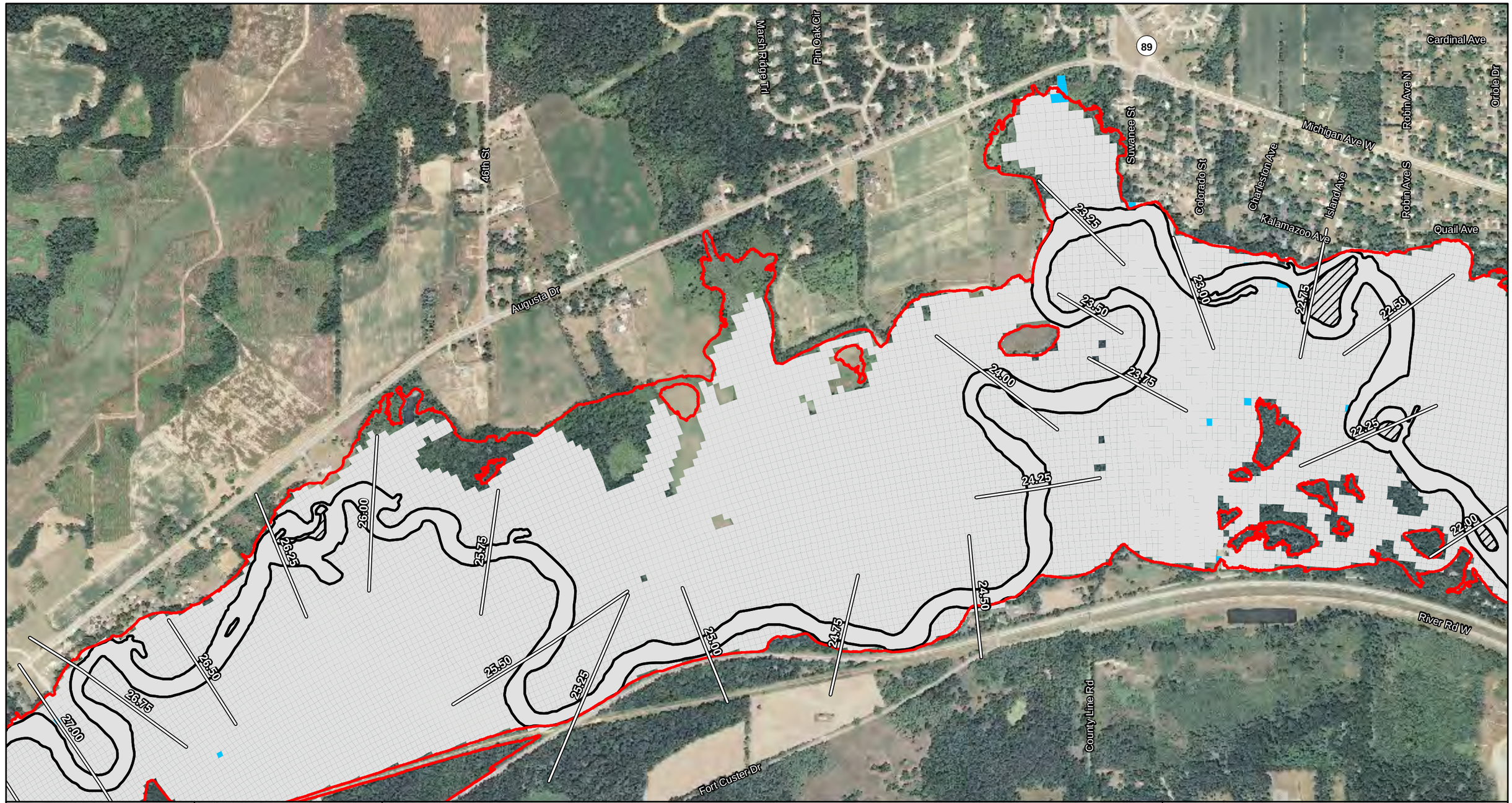
MP 20.00 - MP 22.50

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

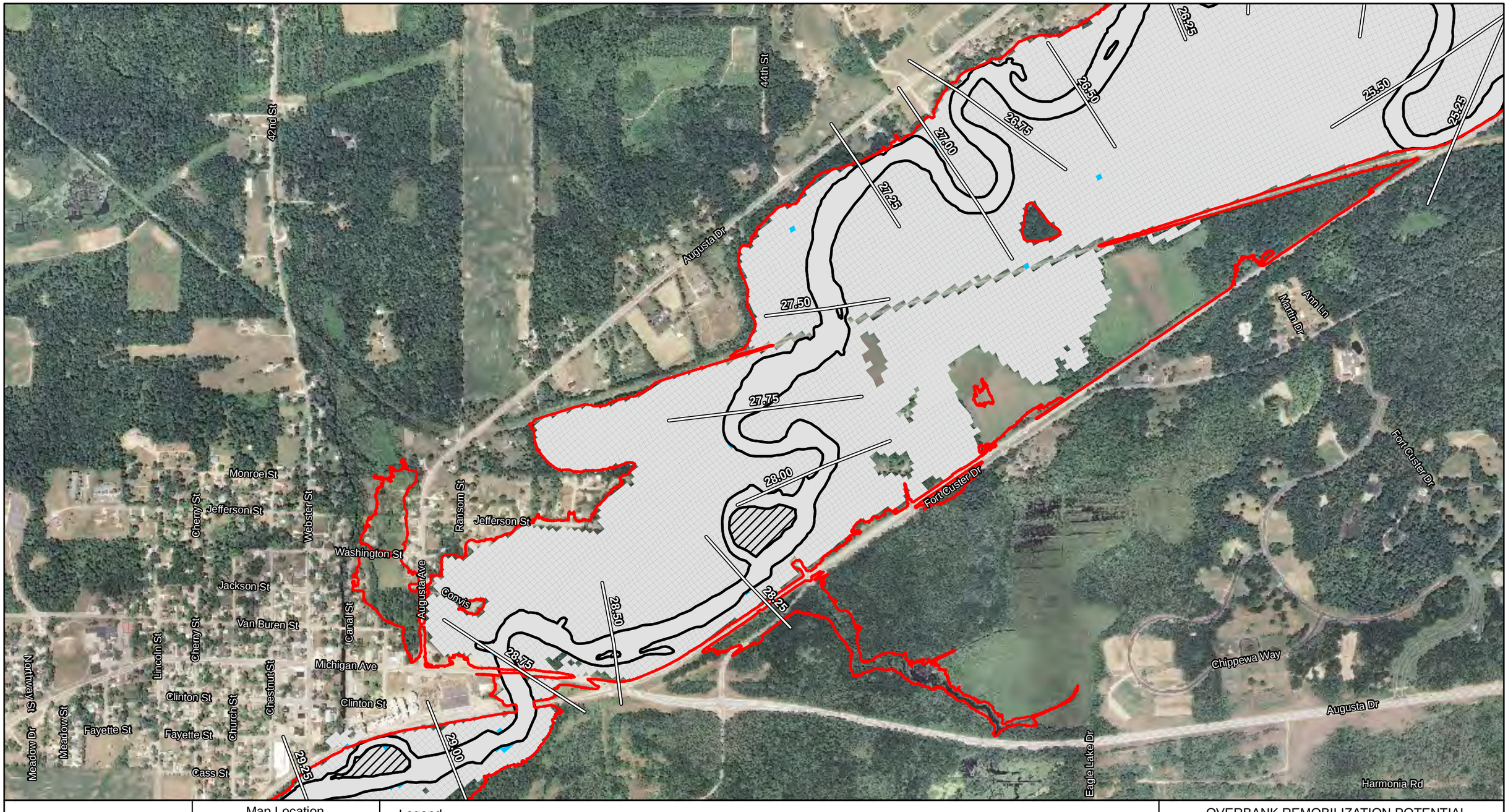
MP 22.50 - MP 27.00

SHEET 10 OF 16

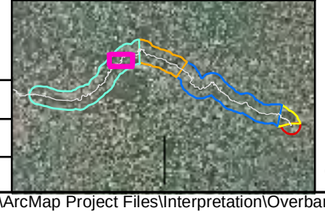
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

Aerial Photography Date: July & August 2009



Map Location



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

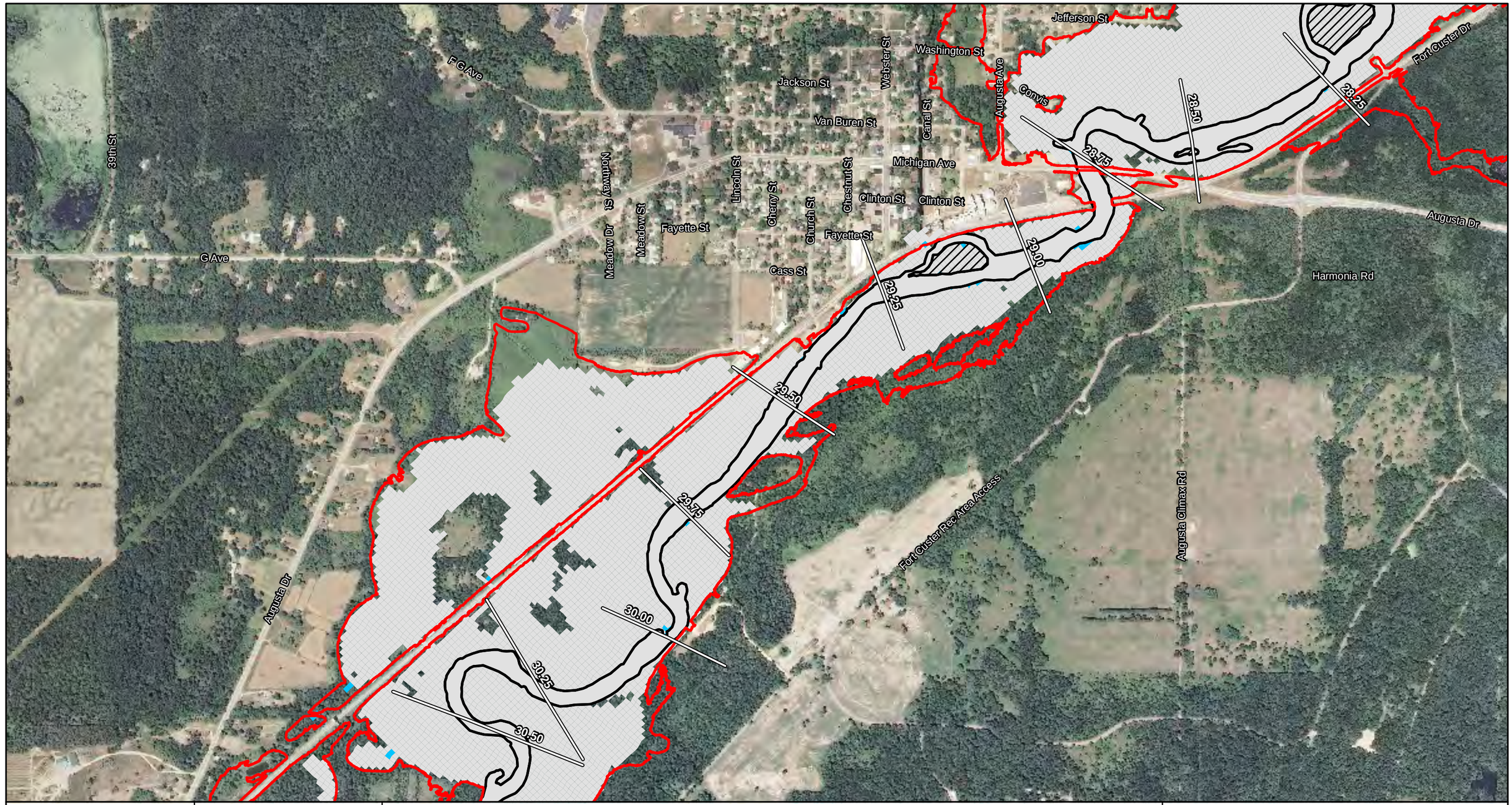
MP 27.00 - MP 28.75

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

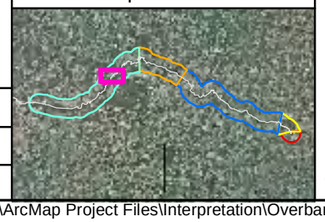
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

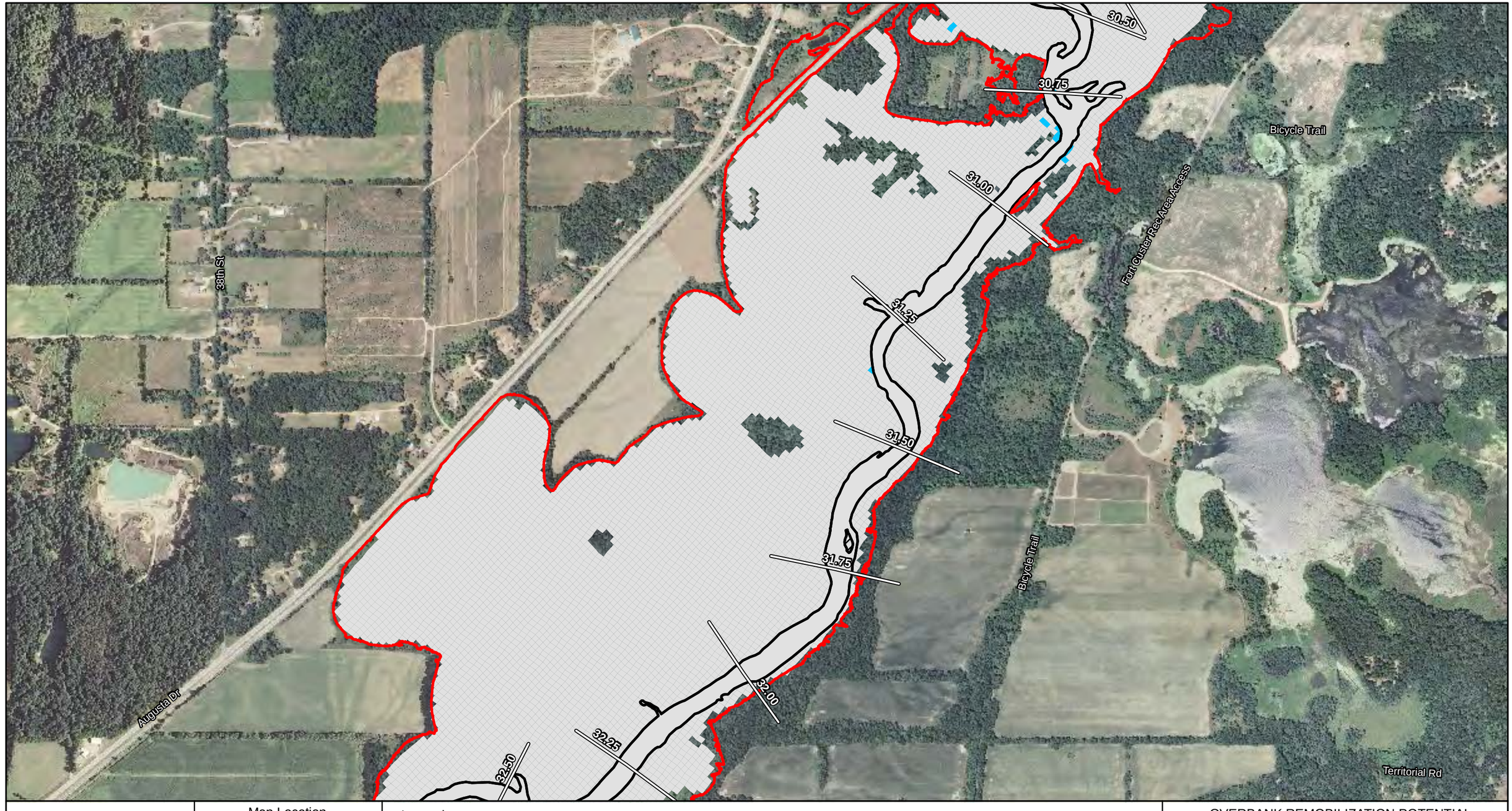
MP 28.75 - MP 30.50

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

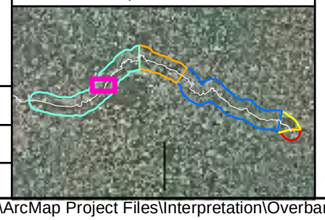
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

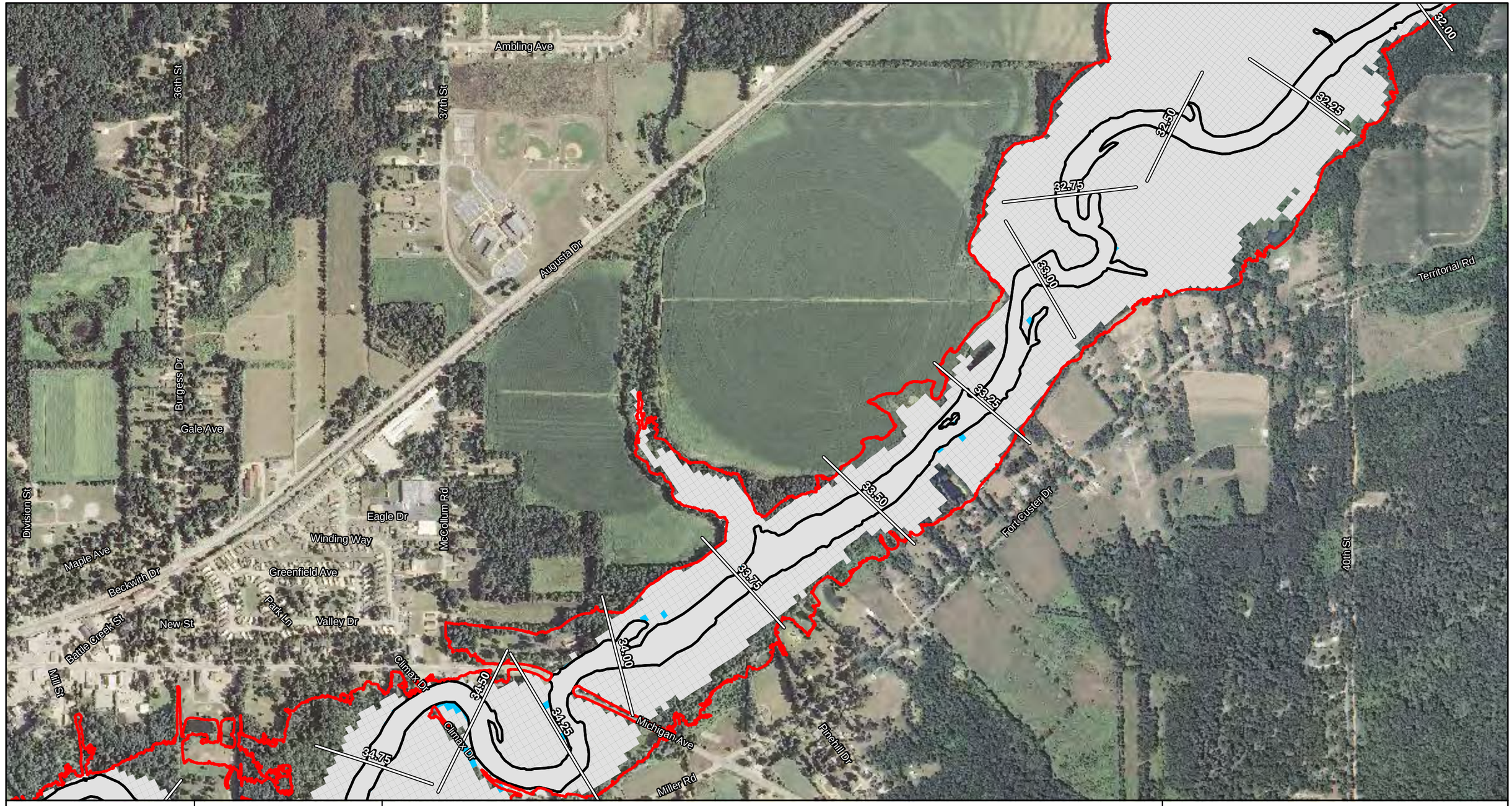
MP 30.50 - MP 32.25

SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

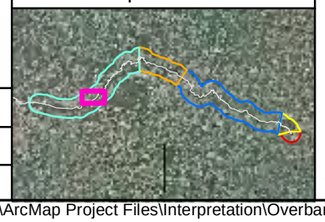
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

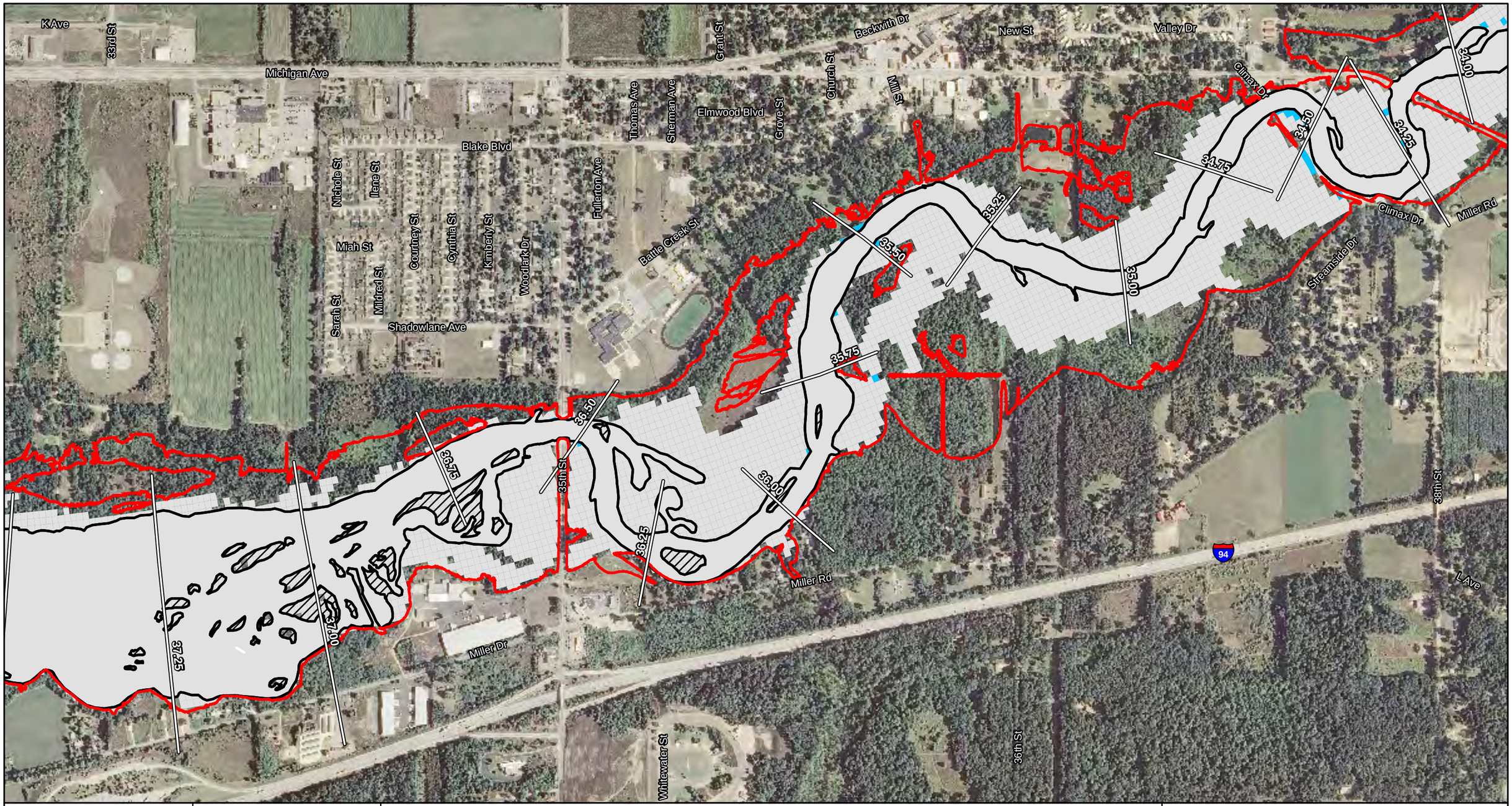
MP 32.25 - MP 34.75

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

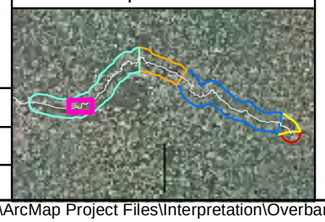
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

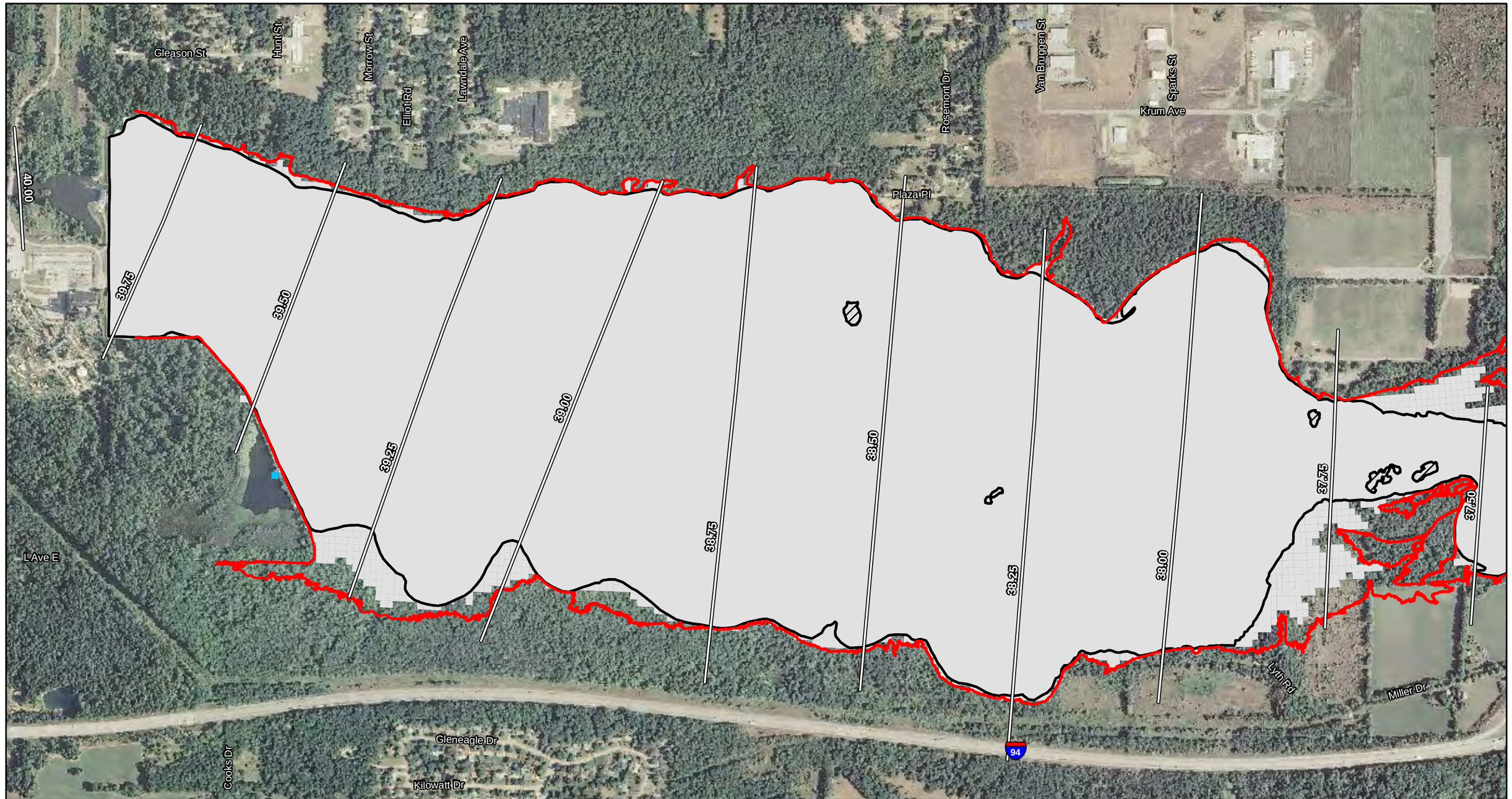
MP 34.25 - MP 37.50

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_50yr.mxd

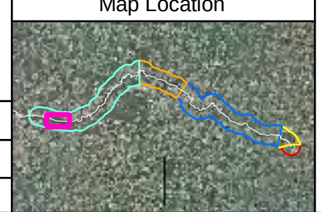
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 50-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
50-YEAR FLOOD

MP 37.50 - MP 40.00

SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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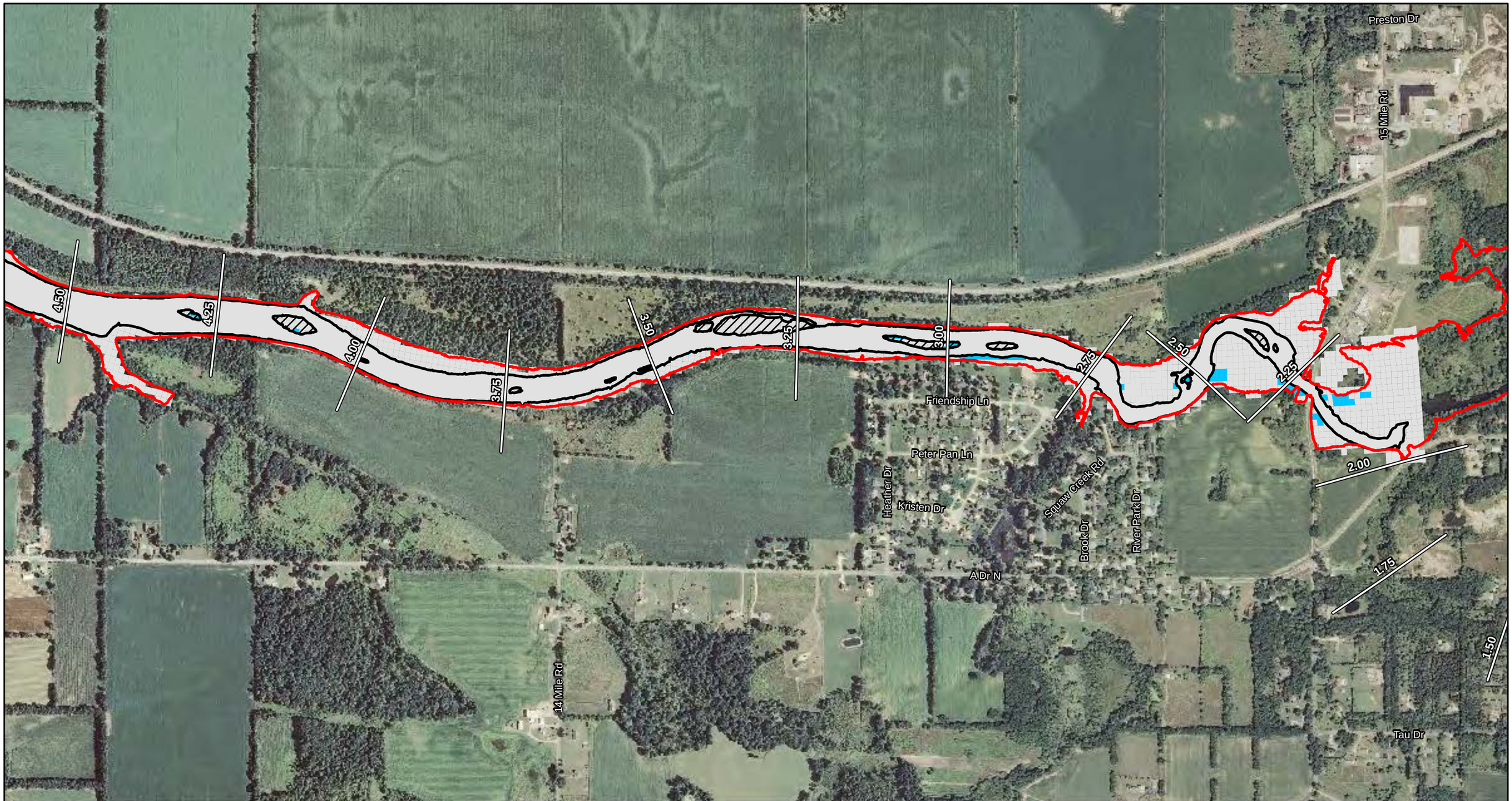
Aerial Photography Date: July & August 2009

Figure 10-3

Overbank Remobilization Potential

100-Year Flood

Sheets 1 through 16



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

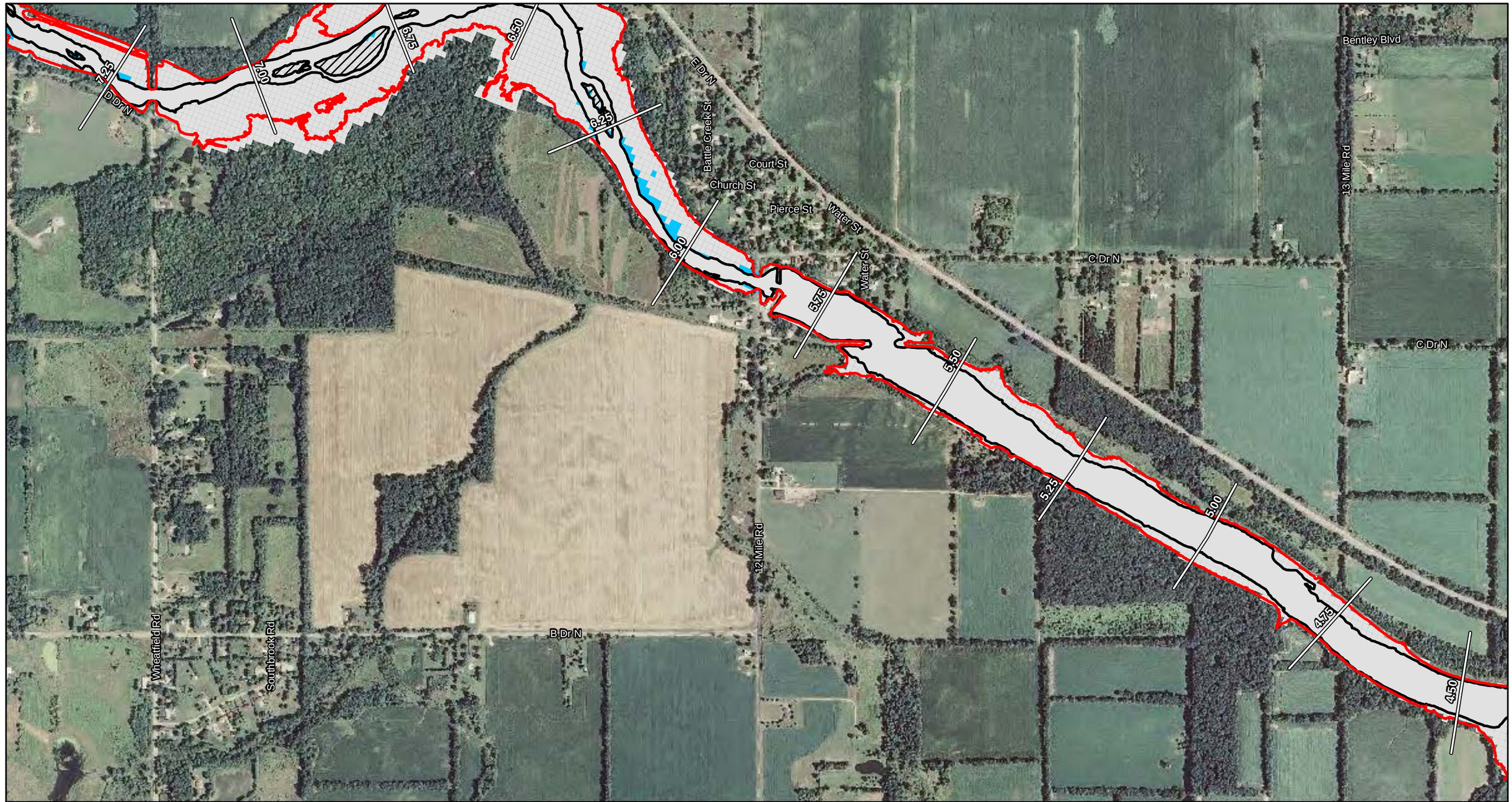
MP 1.50 - MP 4.50

SHEET 1 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

Aerial Photography Date: July & August 2009



Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

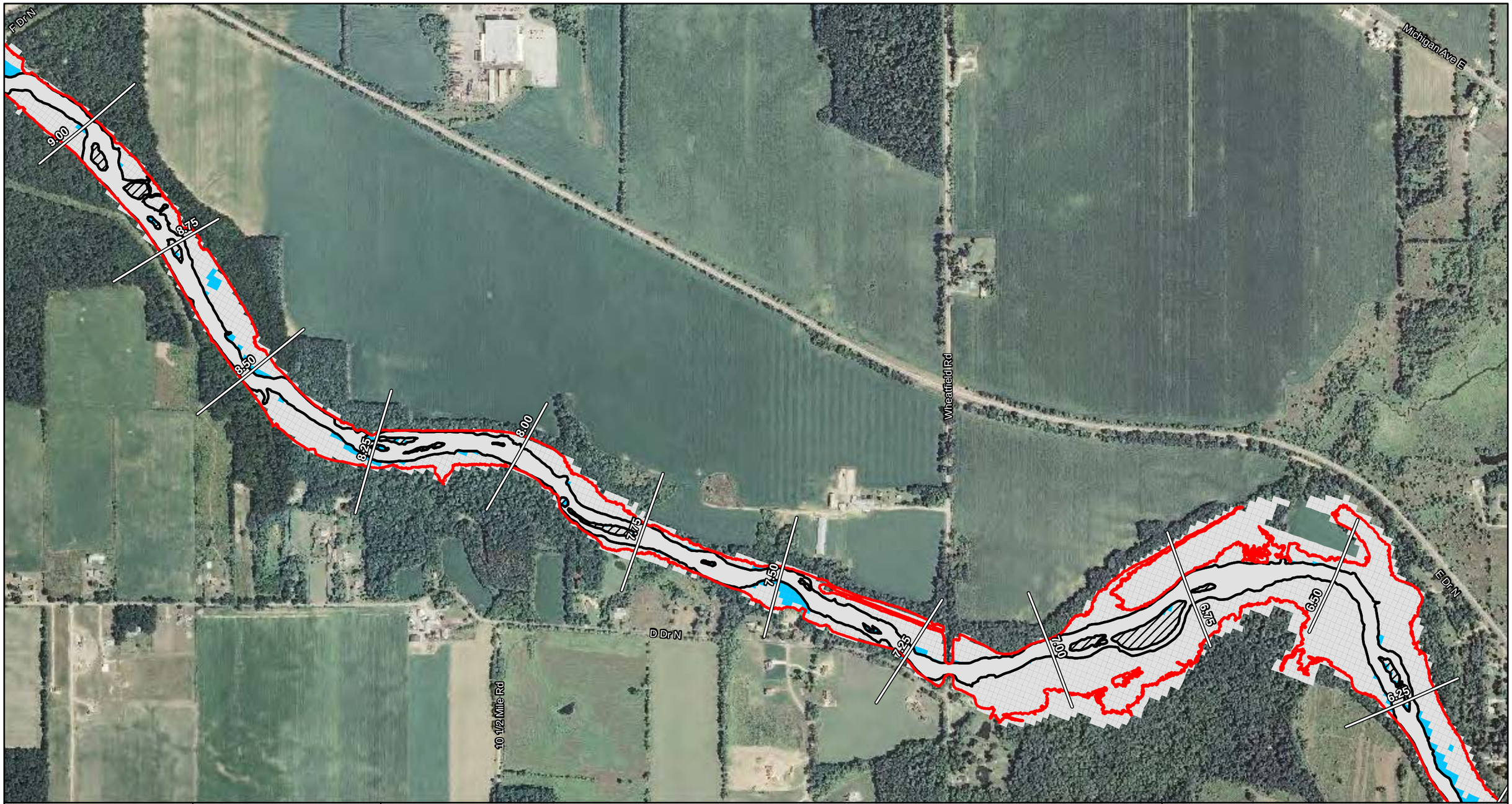
MP 4.50 - MP 6.25

SHEET 2 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

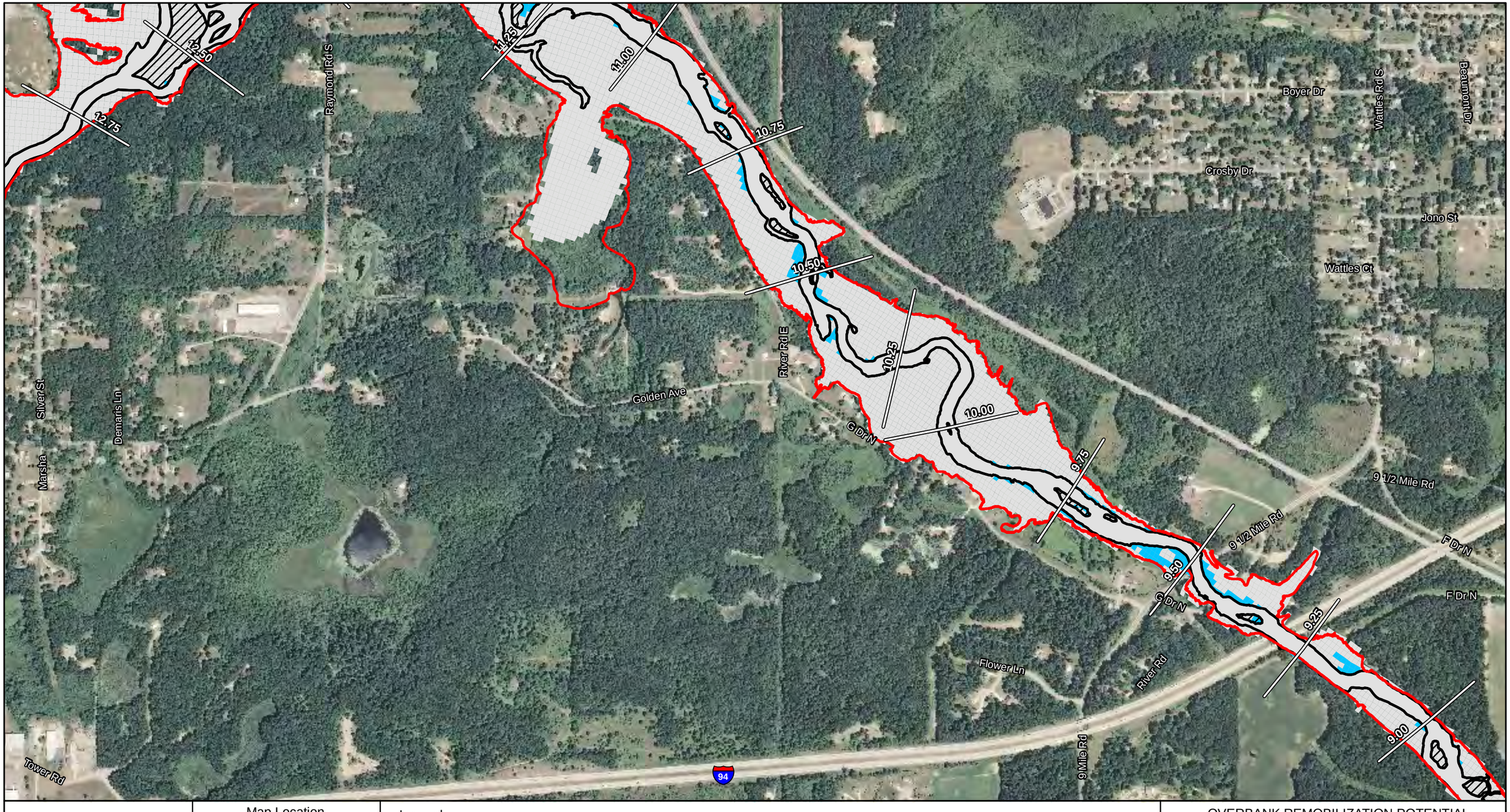
MP 6.25 - MP 9.00

SHEET 3 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

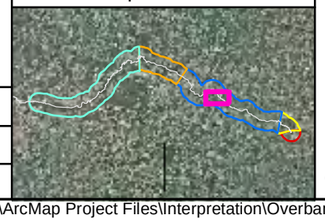
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

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- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

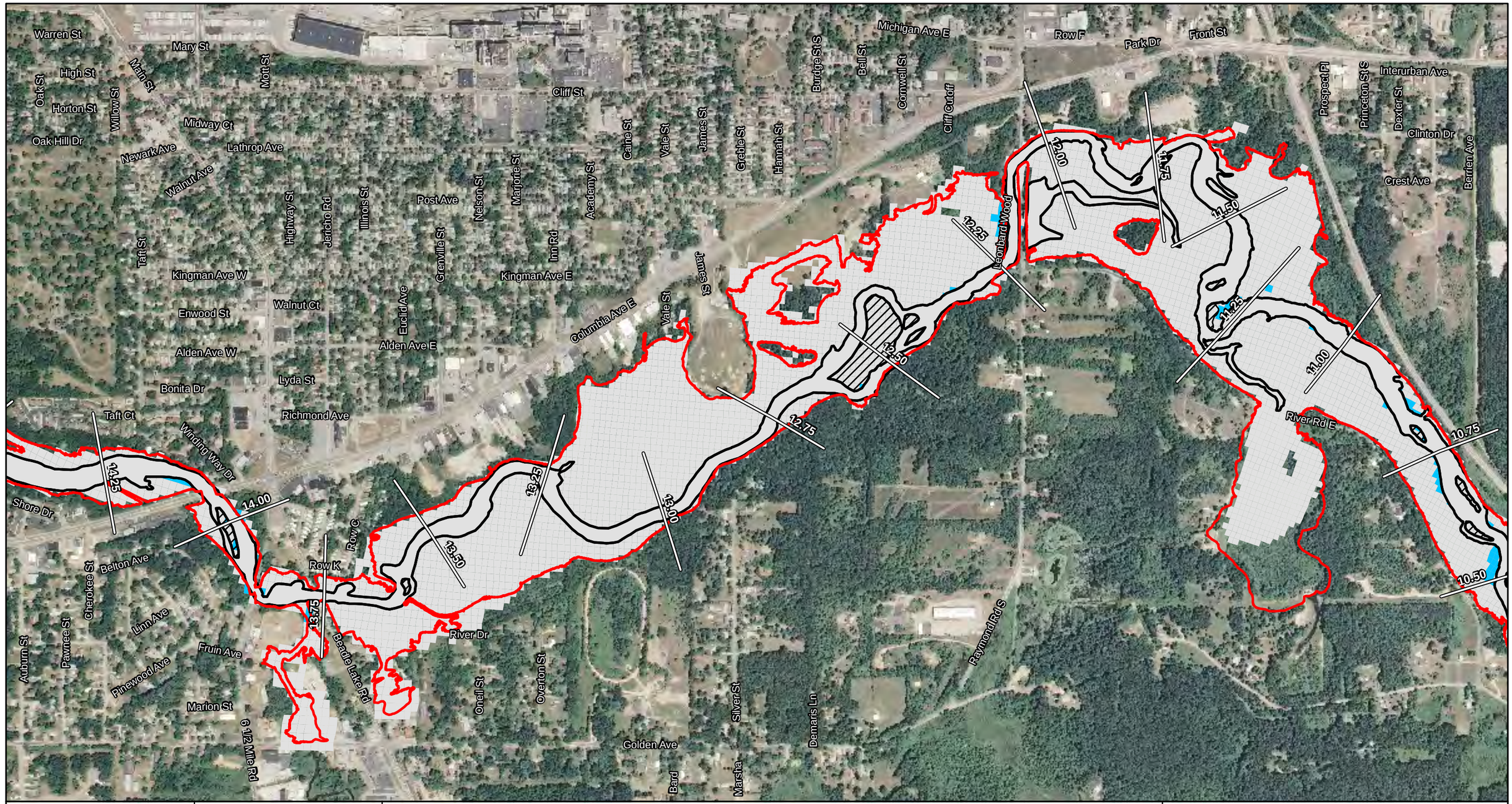
MP 9.00 - MP 10.50

SHEET 4 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

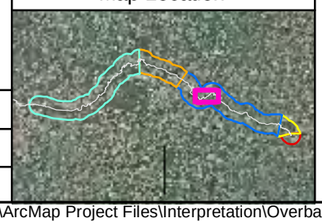
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

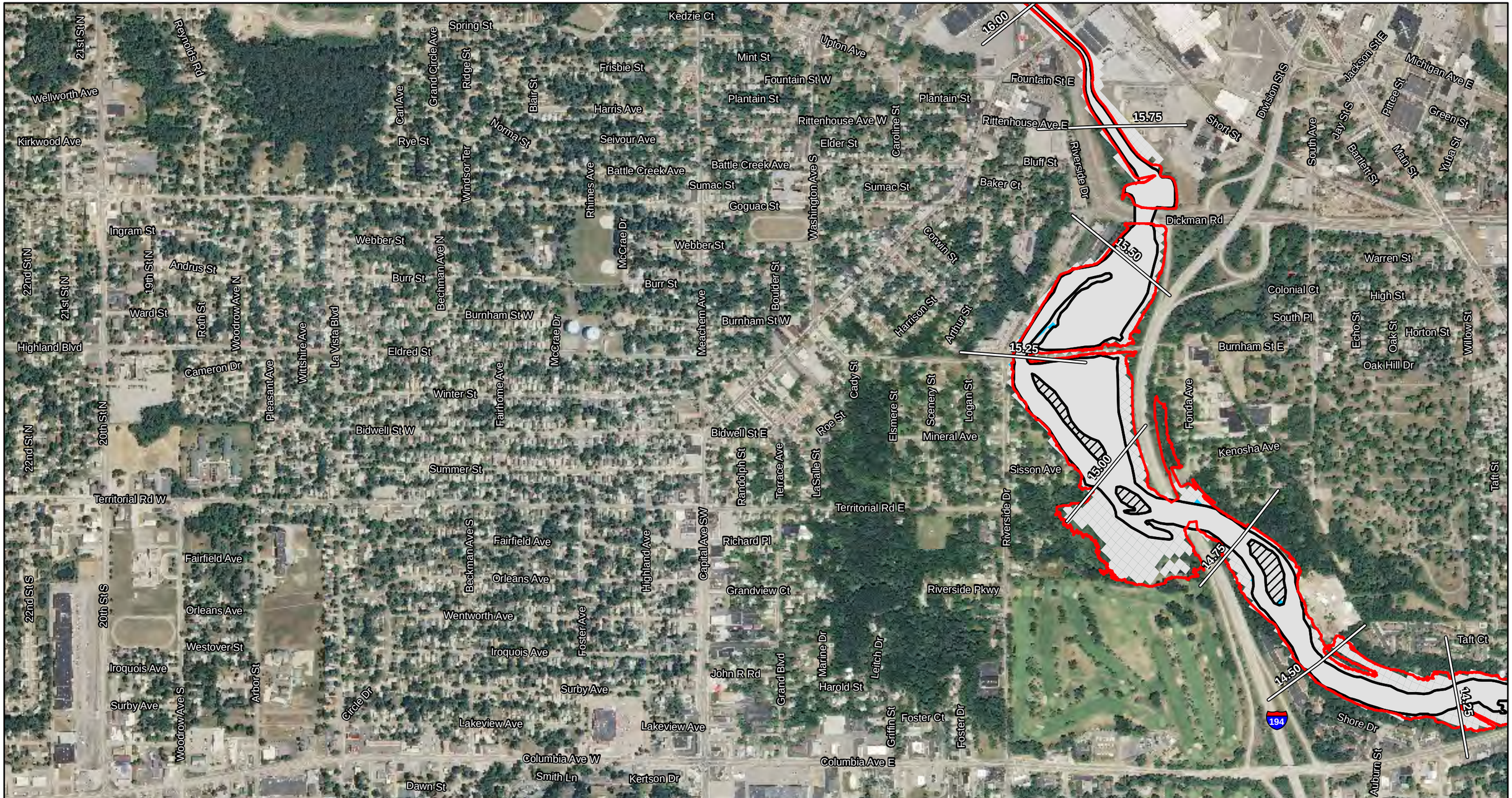
MP 10.50 - MP 14.25

SHEET 5 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

MP 14.25 - MP 16.00

SHEET 6 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

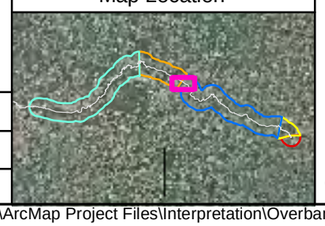
X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

Aerial Photography Date: July & August 2009

ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

MP 16.00 - MP 18.00

SHEET 7 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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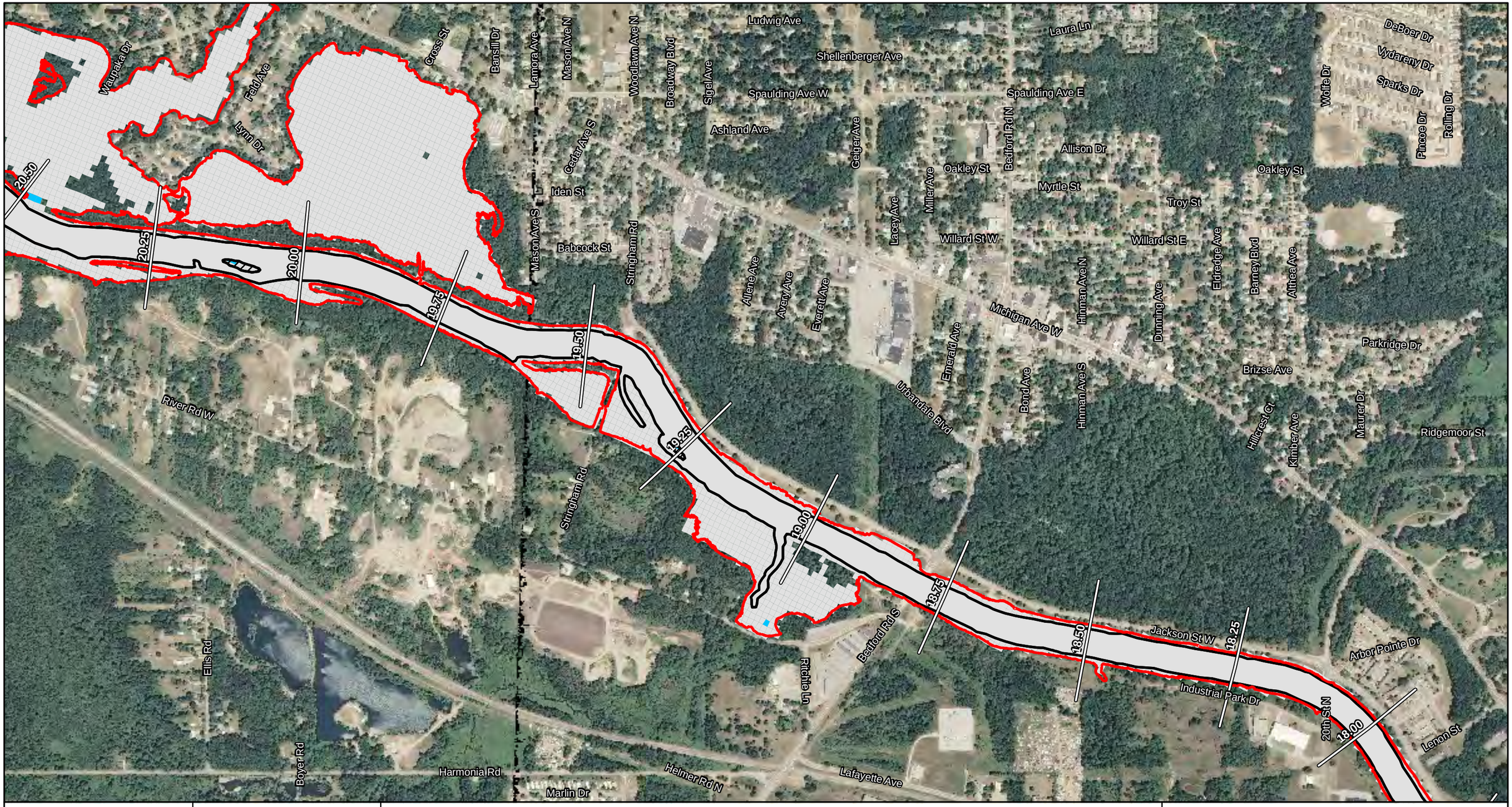
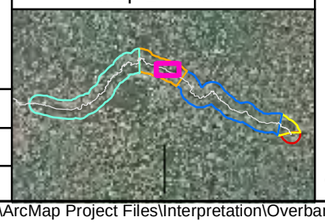
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

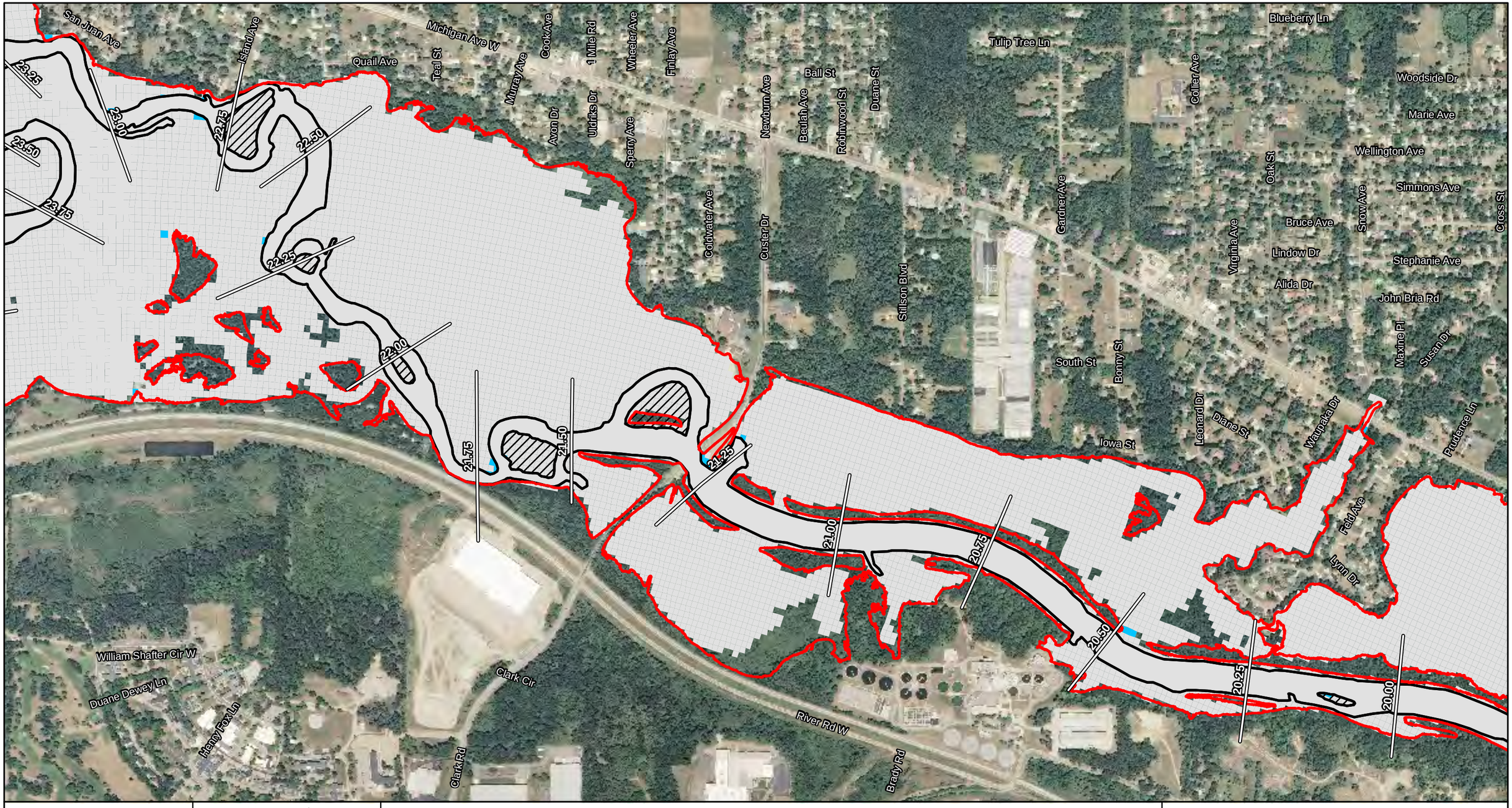
MP 18.00 - MP 20.00

SHEET 8 OF 16

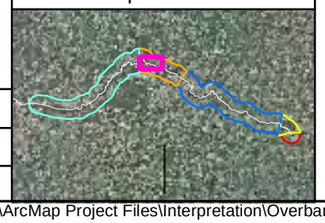
ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

Aerial Photography Date: July & August 2009



Map Location



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

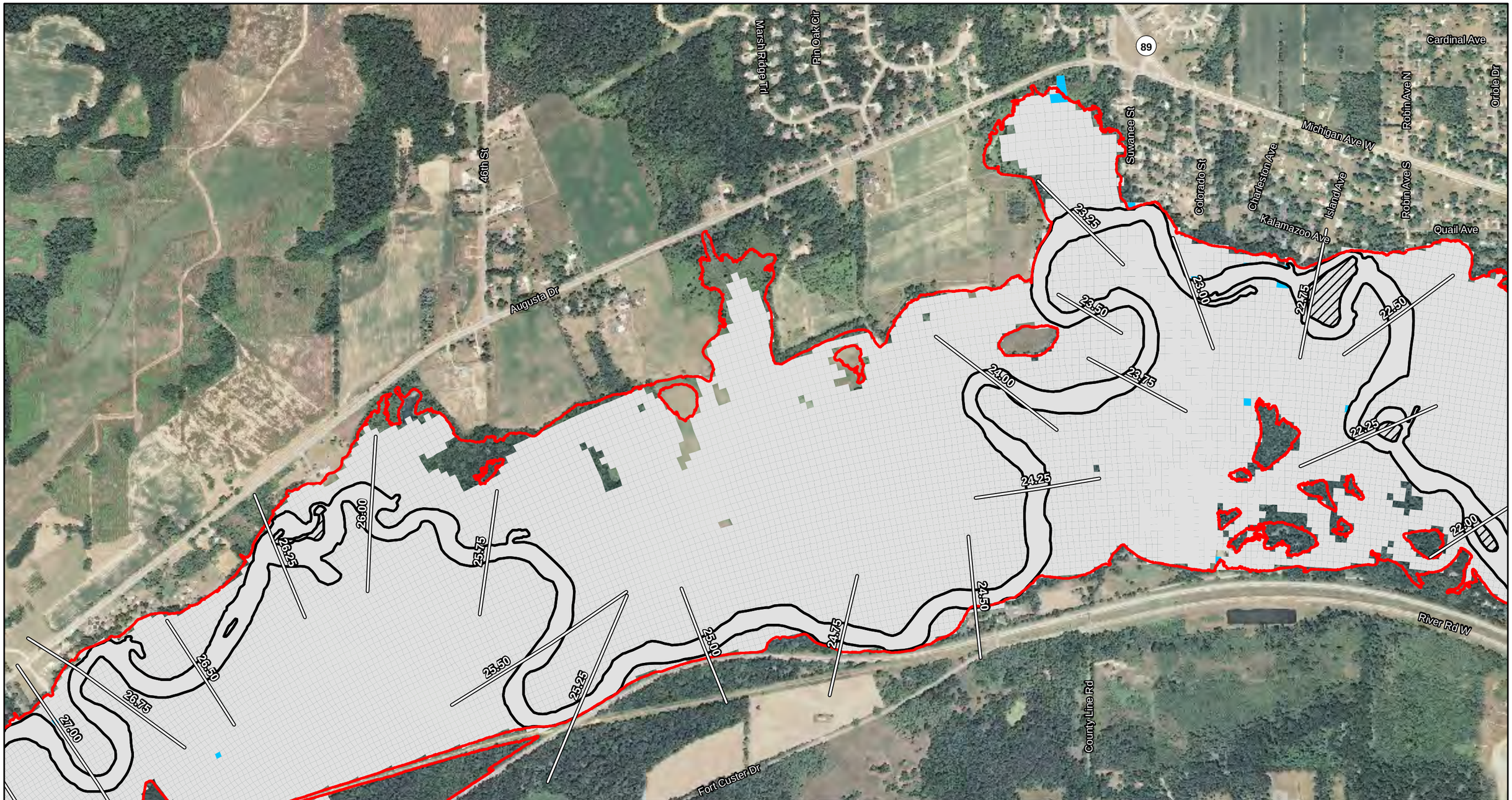
MP 20.00 - MP 22.50

SHEET 9 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

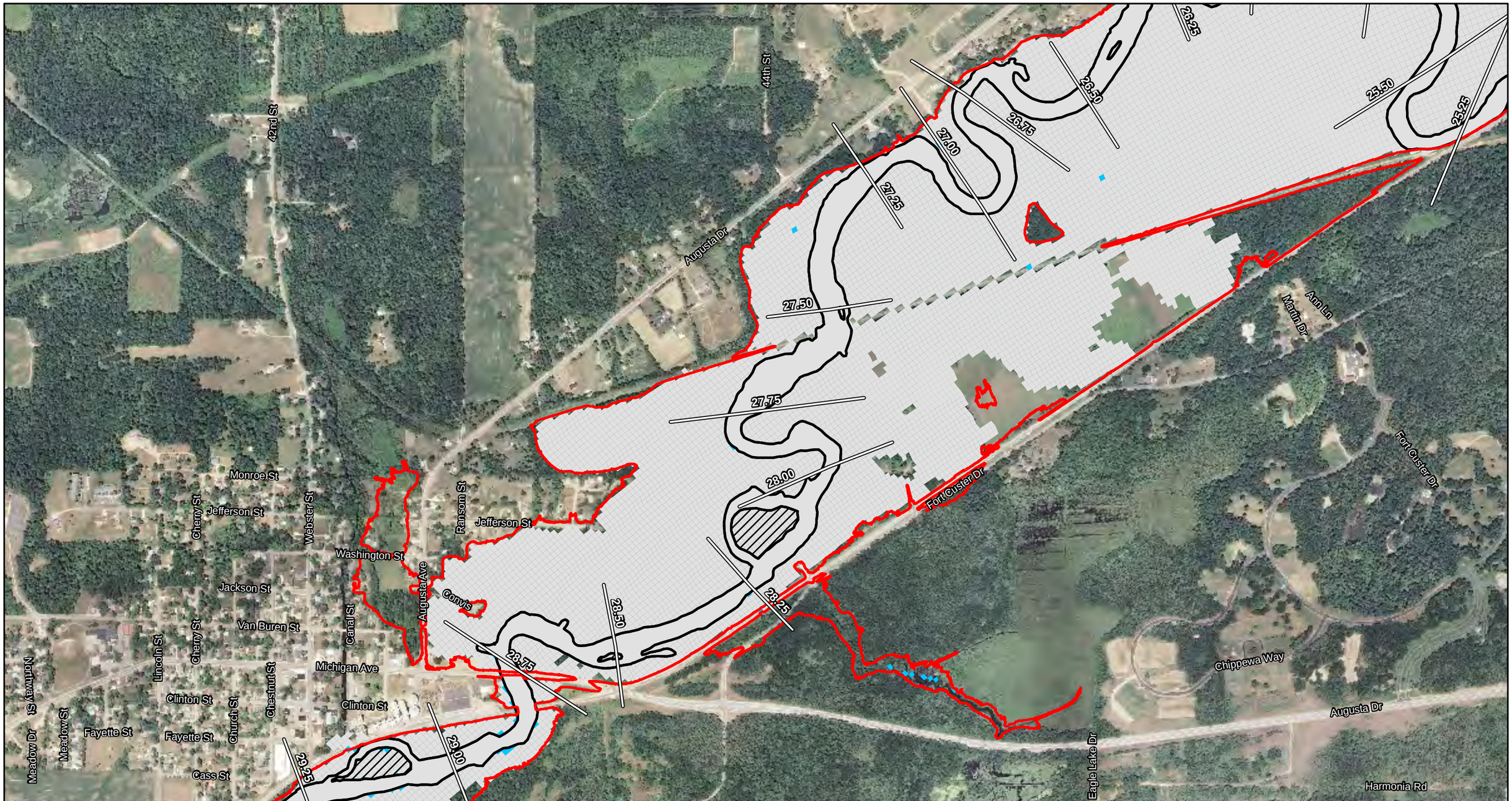
MP 22.50 - MP 27.00

SHEET 10 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location

Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
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- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

MP 27.00 - MP 28.75

SHEET 11 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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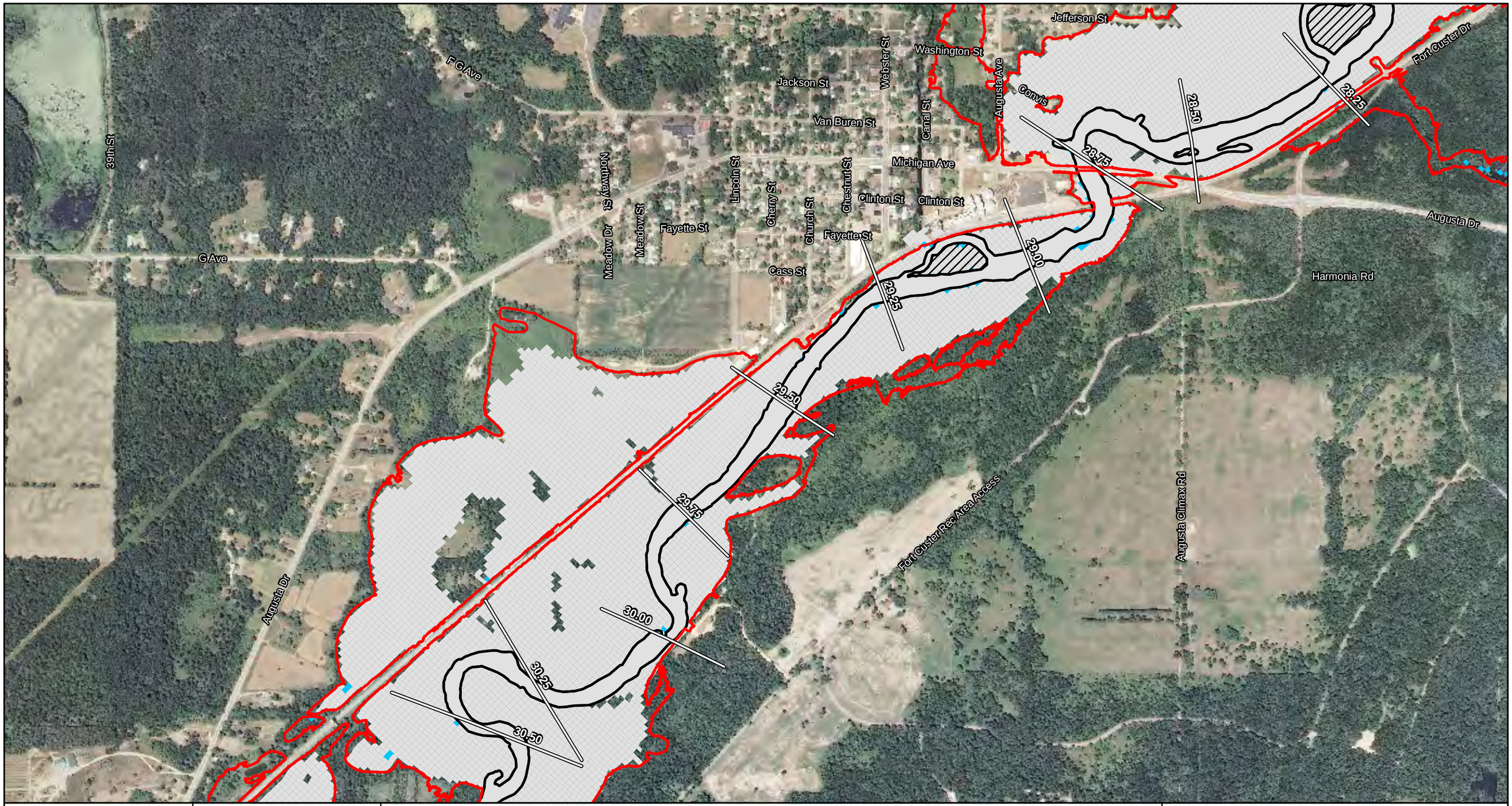
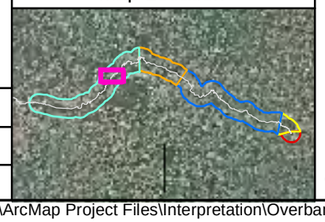
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

MP 28.75 - MP 30.50

SHEET 12 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

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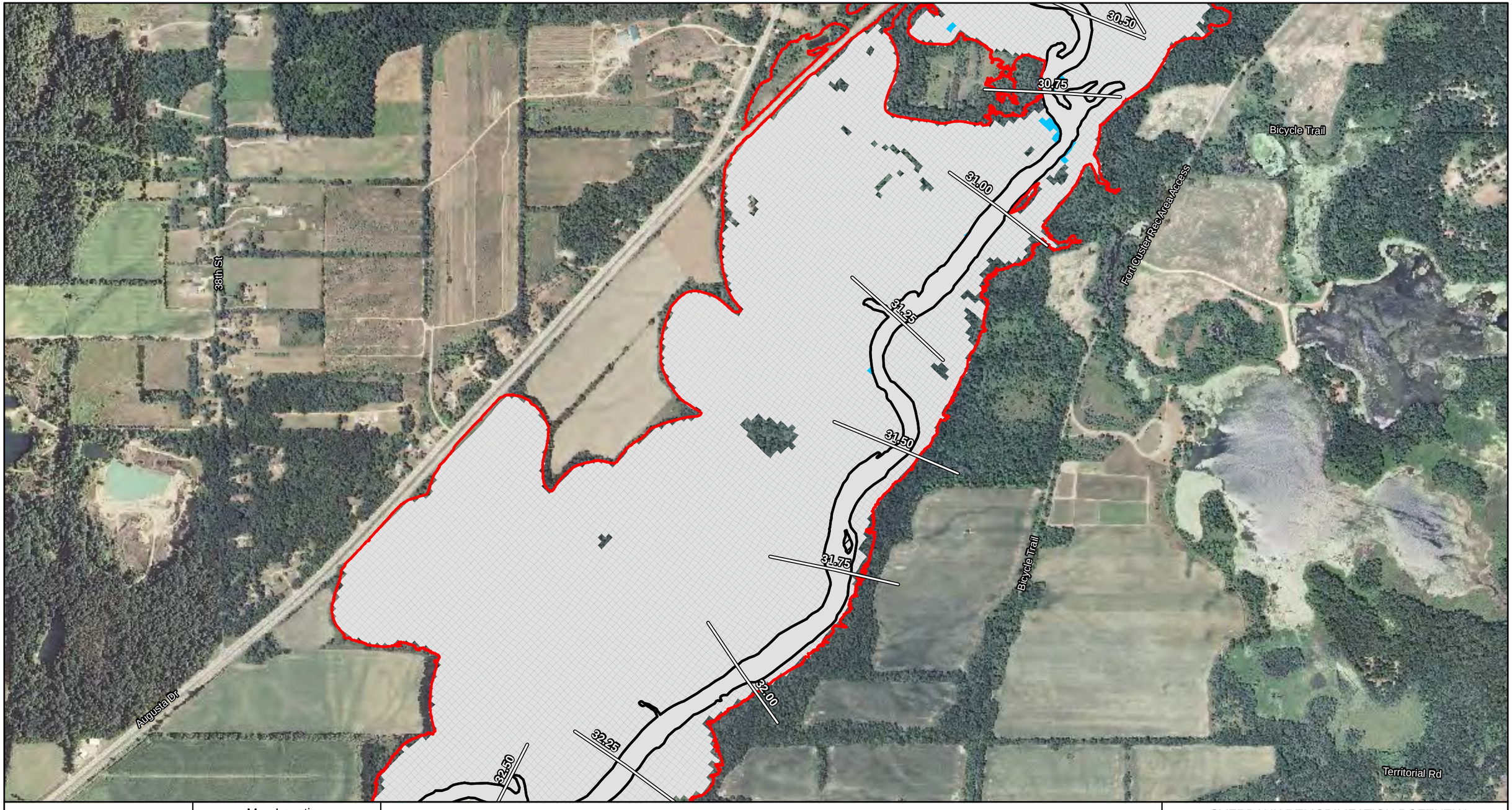
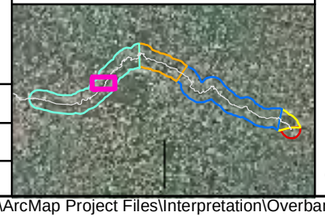
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

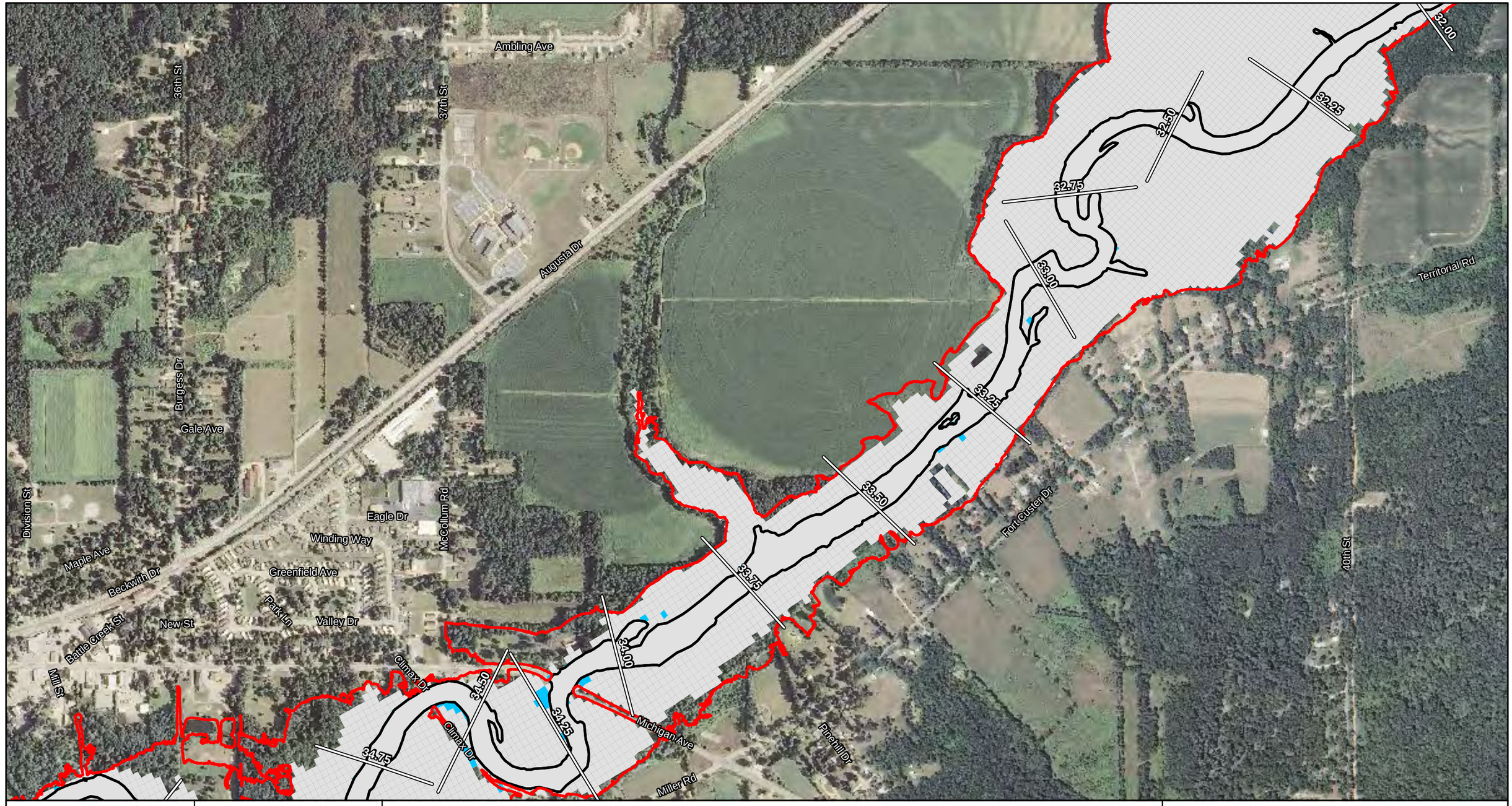
MP 30.50 - MP 32.25

SHEET 13 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

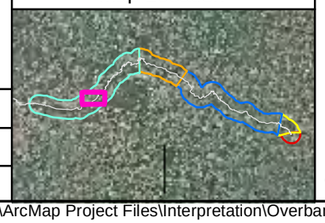
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

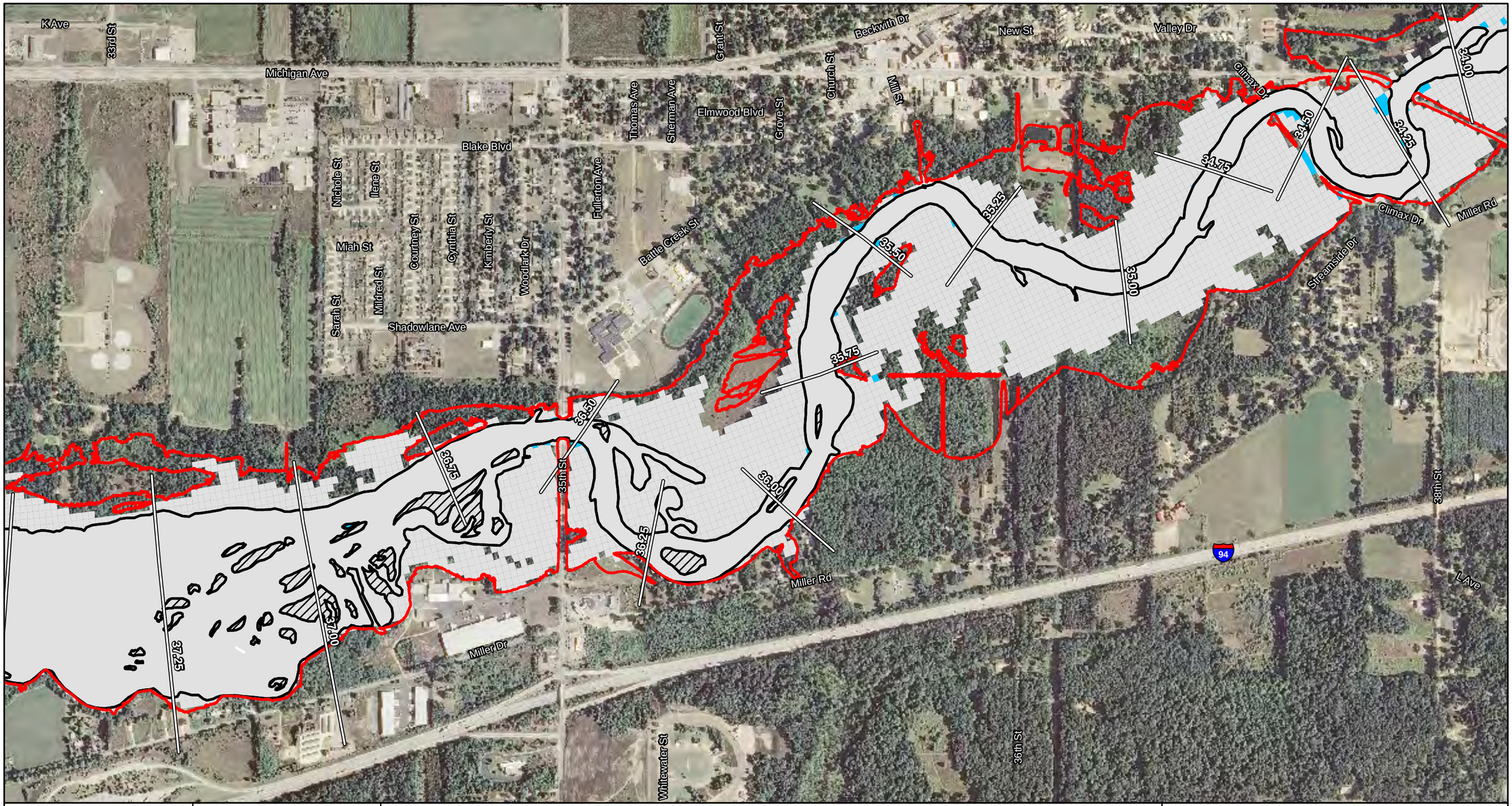
MP 32.25 - MP 34.75

SHEET 14 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

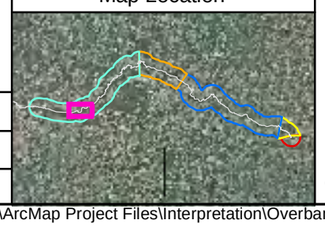
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

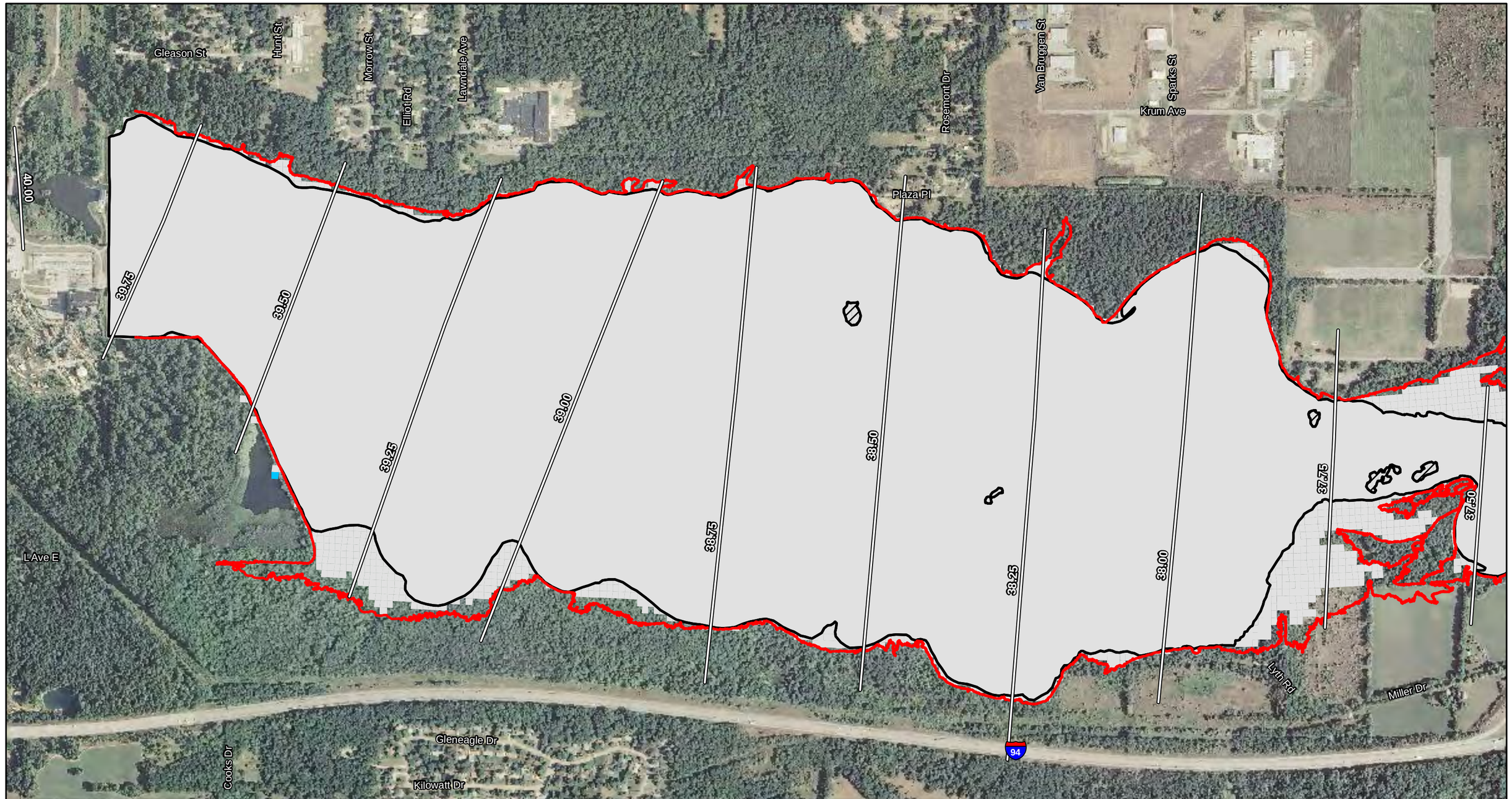
MP 34.25 - MP 37.50

SHEET 15 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

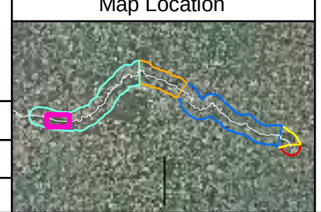
Aerial Photography Date: July & August 2009



ENBRIDGE

Drawn:	BRS 4/3/2012
Approved:	DBR 4/3/2012
Project #:	106-4186

Map Location



Legend

- Area of Highest Likelihood for Overbank Remobilization (>0.1 mm/week erosion and net decrease in silt or clay mass)
- EFDC 100-Year Floodplain
- Channel Bankline
- Island Bankline
- HEC-RAS 100-Year Floodplain
- Quarter Mile Grid Segment

mm/week = Millimeters Per Week

N

0 400 800 1,600

Scale in Feet

OVERBANK REMOBILIZATION POTENTIAL
100-YEAR FLOOD

MP 37.50 - MP 40.00

SHEET 16 OF 16

ENBRIDGE LINE 6B MP 608
MARSHALL, MI PIPELINE RELEASE
ENBRIDGE ENERGY, LIMITED PARTNERSHIP

X:\Hydrodynamic Model Data Transfer\ArcMap Project Files\Interpretation\Overbank_Remob_100yr.mxd

Aerial Photography Date: July & August 2009

Table 3-1. Summary of In-Channel Sediment Bed Characteristics Grouped by Geomorphic Polygons
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Geomorphic Surfaces	Wet Bulk Density (Grams per Cubic Centimeter)			Dry Bulk Density (Grams per Cubic Centimeter)			Solid Density (Grams per Cubic Centimeter)			Porosity (Percent)			Sand (Percent)			Silt (Percent)			Clay (Percent)		
	Min	Average	Max	Min	Average	Max	Min	Average	Max	Min	Average	Max	Min	Average	Max	Min	Average	Max	Min	Average	Max
Anthropgenic Thalweg	1.93	1.93	1.93	1.69	1.69	1.69	2.22	2.22	2.22	24	24	24	43	43	43	40	40	40	17	17	17
Anthropogenic Deposit	1.10	1.36	1.93	0.37	0.79	1.69	1.34	1.68	2.22	20	57	75	16	34	59	24	47	68	16	18	22
Anthropogenic Thalweg	1.12	1.38	1.93	0.30	0.75	1.69	1.47	1.99	2.51	24	62	88	25	32	43	40	51	58	16	17	18
Backwater	1.03	1.26	1.68	0.24	0.64	1.32	1.16	1.64	2.19	36	62	79	16	38	60	24	45	68	10	17	18
Channel Deposit	1.05	1.42	1.92	0.31	0.90	1.58	1.19	1.82	2.39	20	52	78	23	37	59	24	46	60	13	16	19
Cut Bank	1.05	1.32	1.76	0.32	0.78	1.52	1.17	1.64	2.27	20	55	72	17	30	59	24	52	65	12	18	24
Cutoff Channel	1.09	1.33	1.71	0.37	0.80	1.31	1.21	1.68	2.20	40	53	78	24	42	78	5	42	60	12	16	19
Dam Deposit	1.04	1.06	1.09	0.29	0.34	0.40	1.16	1.23	1.32	70	73	75	24	31	38	48	54	60	14	15	16
Delta	1.18	1.31	1.39	0.61	0.82	0.93	1.41	1.59	1.71	44	49	57	24	24	24	62	62	62	14	14	14
Delta Bar	1.15	1.32	1.55	0.53	0.80	1.09	1.32	1.65	2.02	46	52	66	30	47	59	24	39	60	10	14	17
Delta Island Deposit	1.15	1.25	1.71	0.53	0.65	1.30	1.32	1.59	2.19	41	59	66	26	47	55	29	39	62	10	14	17
Distributary Channel	1.14	1.33	1.84	0.47	0.80	1.48	1.43	1.66	2.31	36	54	67	40	46	59	24	39	46	14	15	19
Distributary Fan	1.14	1.25	1.81	0.47	0.63	1.51	1.43	1.58	2.16	30	62	67	40	47	56	29	38	46	14	15	16
Former Channel	1.03	1.05	1.14	0.31	0.39	0.51	1.11	1.15	1.37	60	66	73	16	22	26	58	62	66	16	17	18
Former Floodplain	1.03	1.28	1.92	0.33	0.70	1.74	1.11	1.55	2.12	18	58	73	16	28	30	56	58	68	12	15	16
Former Oxbow	1.03	1.13	1.33	0.35	0.47	0.70	1.11	1.36	1.87	62	67	69	18	23	26	58	61	68	14	15	16
Island	1.19	1.19	1.19	0.53	0.53	0.53	1.56	1.56	1.56	66	66	66	30	30	30	60	60	60	10	10	10
Island Deposit	1.05	1.35	1.76	0.31	0.88	1.52	1.19	1.64	2.27	20	48	78	16	38	59	24	46	68	10	15	22
Low Energy Deposit	1.14	1.28	1.43	0.47	0.71	0.89	1.42	1.65	1.94	54	58	67	28	39	55	28	47	58	14	14	17
Mid-Channel Bar	1.09	1.82	1.95	0.52	1.50	1.66	1.21	2.18	2.34	20	32	57	40	52	59	24	32	46	14	16	19
Near Bank Dam Deposit	1.02	1.08	1.19	0.24	0.29	0.35	1.10	1.50	2.43	75	79	87	20	27	32	54	57	62	14	16	18
Near Bank High Energy	1.06	1.66	1.93	0.33	1.29	1.69	1.22	1.99	2.22	20	37	73	26	43	59	24	41	60	12	16	17
Near Bank Low Energy	1.14	1.18	1.24	0.37	0.50	0.79	1.42	1.58	1.70	45	67	78	28	34	40	46	52	58	14	14	16
Near Bank Moderate Energy	1.06	1.22	1.50	0.33	0.60	1.08	1.22	1.53	1.94	42	62	73	26	32	38	48	53	58	14	15	16
Oxbow	1.24	1.37	1.59	0.75	0.89	1.14	1.47	1.70	2.19	35	48	62	27	36	56	28	46	56	16	18	19
Point Bar	1.05	1.36	1.76	0.32	0.80	1.52	1.17	1.78	2.27	20	56	72	23	30	59	24	54	64	12	15	17
Remnant Terrace	1.15	1.25	1.49	0.55	0.64	1.01	1.32	1.70	2.01	48	61	73	16	23	34	54	63	68	10	14	16
Thalweg	1.09	1.56	1.71	0.32	1.15	1.52	1.21	1.96	2.43	20	42	87	24	41	59	24	44	60	12	15	18
Tributary	1.12	1.27	1.45	0.37	0.61	0.83	1.47	1.76	2.19	62	66	75	24	42	60	24	41	58	16	17	18

Table 3-2. Soil Survey Geographic Database (SSURGO) Map Unit Data
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Map Unit Symbol	Map Unit Name	Wet Bulk Density (Grams per Cubic Centimeter)	Dry Bulk Density (Grams per Cubic Centimeter)	Porosity (Percent)	Sand (Percent)	Silt (Percent)	Clay (Percent)
113B	Urban land-Coloma complex, 0 to 6 percent slopes	1.65	1.35	49	80	15	5
12B	Coloma loamy sand, 0 to 6 percent slopes	1.65	1.35	49	80	15	5
12C	Coloma loamy sand, 6 to 12 percent slopes	1.65	1.35	49	80	15	5
12E	Coloma loamy sand, 18 to 40 percent slopes	1.65	1.35	49	80	15	5
13B	Spinks loamy sand, 0 to 6 percent slopes	1.70	1.40	47	80	40	20
13C	Spinks loamy sand, 6 to 12 percent slopes	1.70	1.40	47	80	40	20
13D	Spinks loamy sand, 12 to 18 percent slopes	1.70	1.40	47	80	40	20
13E	Spinks loamy sand, 18 to 40 percent slopes	1.70	1.40	47	80	40	20
14B	Bronson sandy loam, 0 to 6 percent slopes	1.60	1.30	51	60	25	15
16B	Oshtemo sandy loam, 0 to 6 percent slopes	1.65	1.35	49	60	25	15
16C	Oshtemo sandy loam, 6 to 12 percent slopes	1.65	1.35	49	60	25	15
16D	Oshtemo sandy loam, 12 to 18 percent slopes	1.65	1.35	49	60	25	15
16E	Oshtemo sandy loam, 18 to 40 percent slopes	1.65	1.35	49	60	25	15
17B	Boyer sandy loam, 0 to 6 percent slopes	1.60	1.30	51	60	25	15
17C	Boyer sandy loam, 6 to 12 percent slopes	1.60	1.30	51	60	25	15
17D	Boyer sandy loam, 12 to 18 percent slopes	1.60	1.30	51	60	25	15
17E	Boyer sandy loam, 18 to 40 percent slopes	1.60	1.30	51	60	25	15
2	Houghton muck, undrained	0.35	0.20	92	--	--	--
23B	Hixton loam, 0 to 6 percent slopes	1.55	1.35	49	40	40	20
25A	Kalamazoo loam, 0 to 2 percent slopes	1.65	1.30	51	40	40	20
25B	Kalamazoo loam, 2 to 6 percent slopes	1.65	1.30	51	40	40	20
25C	Kalamazoo loam, 6 to 12 percent slopes	1.65	1.30	51	40	40	20
25D	Kalamazoo loam, 12 to 18 percent slopes	1.65	1.30	51	40	40	20
29B	Hillsdale sandy loam, 0 to 6 percent slopes	1.60	1.30	51	60	25	15
29C	Hillsdale sandy loam, 6 to 12 percent slopes	1.60	1.30	51	60	25	15
29D	Hillsdale sandy loam, 12 to 18 percent slopes	1.60	1.30	51	60	25	15
29E	Hillsdale sandy loam, 18 to 25 percent slopes	1.60	1.30	51	60	25	15
4	Adrian muck	0.55	0.03	99	--	--	--
43B	Brady sandy loam, 1 to 4 percent slopes	1.55	1.35	49	60	25	15
44A	Matherton loam, 0 to 3 percent slopes	1.65	1.30	51	40	40	20
61	Algansee fine sand, occasionally flooded	1.50	1.35	49	90	5	5
63	Gilford fine sandy loam, gravelly substratum	1.70	1.50	43	60	25	15
64	Cohoctah loam, gravelly substratum, frequently flooded	1.60	1.20	55	40	40	20
65	Sebewa loam	1.60	1.10	58	40	40	20
8	Edwards muck	0.55	0.30	89	--	--	--
82	Udipsamments and Udorthents, nearly level to steep	1.70	1.35	49	60	25	15
84	Histosols and Aquents, ponded	0.45	0.15	94	--	--	--
85	Histosols and Fluvaquents, frequently flooded	0.45	0.15	94	--	--	--
96B	Urban land-Oshtemo complex, 0 to 6 percent slopes	1.60	1.35	49	60	25	15
96C	Urban land-Oshtemo complex, 6 to 12 percent slopes	1.60	1.35	49	60	25	15

Table 3-2. Soil Survey Geographic Database (SSURGO) Map Unit Data
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Map Unit Symbol	Map Unit Name	Wet Bulk Density (Grams per Cubic Centimeter)	Dry Bulk Density (Grams per Cubic Centimeter)	Porosity (Percent)	Sand (Percent)	Silt (Percent)	Clay (Percent)
96D	Urban land-Oshtemo complex, 12 to 18 percent slopes	1.60	1.35	49	60	25	15
99	Urban land	--	--	--	--	--	--
Ad	Adrian muck	0.55	0.30	89	--	--	--
BdA	Brady sandy loam, 0 to 3 percent slopes	1.41	1.25	53	60	25	15
BrA	Bronson sandy loam, 0 to 3 percent slopes	1.60	1.14	57	60	25	15
CoB	Coloma loamy sand, 0 to 6 percent slopes	1.65	1.35	49	80	15	5
CoC	Coloma loamy sand, 6 to 12 percent slopes	1.65	1.35	49	80	15	5
Gd	Gilford sandy loam	1.70	1.50	43	60	25	15
Gn	Glendora sandy loam	1.50	1.35	49	60	25	15
Hn	Houghton muck	0.45	0.15	94	--	--	--
Hs	Houghton and Sebewa soils, ponded	0.30	0.08	97	40	40	20
KaB	Kalamazoo loam, 2 to 6 percent slopes	1.64	1.10	58	40	40	20
OsB	Oshtemo sandy loam, 1 to 6 percent slopes	1.60	1.14	57	60	25	15
OsC	Oshtemo sandy loam, 6 to 12 percent slopes	1.60	1.14	57	60	25	15
OsD	Oshtemo sandy loam, 12 to 18 percent slopes	1.60	1.14	57	60	25	15
OsE	Oshtemo sandy loam, 18 to 35 percent slopes	1.60	1.14	57	60	25	15
PfB	Plainfield loamy sand, 0 to 6 percent slopes	1.65	1.35	49	80	15	5
RdB	Riddles loam, 2 to 6 percent slopes	1.60	1.10	59	40	40	20
SeA	Sleeth loam, 0 to 3 percent slopes	1.60	1.10	59	40	40	20
StE	Spinks-Coloma loamy sands, 18 to 35 percent slopes	1.60	1.14	57	80	40	20
Ug	Urban land-Glendora complex	1.50	1.35	49	60	25	15
UkB	Urban land-Kalamazoo complex, 0 to 6 percent slopes	1.64	1.10	58	40	40	20

Table 4-1. Flow Exceedance Percentiles Calibration at Kalamazoo River Gage Near Battle Creek
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Riverine Calibration Time Series

Date	Flow (Cubic Feet per Second)	Flow Exceedance Percentile*
10/28/2011	849	24.9
10/29/2011	795	28.4
10/30/2011	755	31.3
10/31/2011	718	34.5
11/1/2011	686	37.3
11/2/2011	662	39.5
11/3/2011	642	41.5
11/4/2011	623	43.5
11/5/2011	610	44.8
11/6/2011	575	49.0
11/7/2011	560	50.8
11/8/2011	590	47.2
11/9/2011	609	45.1

Floodplain Calibration Time Series

Date	Flow (Cubic Feet per Second)	Flow Exceedance Percentile*
7/23/2010	1820	3.2
7/24/2010	2390	1.2
7/25/2010	2830	0.6
7/26/2010	2930	0.6
7/27/2010	2510	1.1
7/28/2010	2150	1.9
7/29/2010	1900	2.8
7/30/2010	1630	4.7
7/31/2010	1380	7.6

Footnotes:
* Flow exceedance percentile is based on length of flow record from July 27, 1937 to December 31, 2011

Table 5-1. Flow Exceedance Percentiles Validation at Kalamazoo River Gage Near Battle Creek
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Riverine Validation Time Series

Date	Flow (Cubic Feet per Second)	Flow Exceedance Percentile*
5/13/2011	876	23.2
5/14/2011	1060	15.1
5/15/2011	1120	13.1
5/16/2011	1200	11.0
5/17/2011	1220	10.6
5/18/2011	1200	11.0
5/19/2011	1210	10.8
5/20/2011	1340	8.2
5/21/2011	1550	5.4
5/22/2011	1560	5.3
5/23/2011	1430	6.9
5/24/2011	1260	9.8

Floodplain Validation Time Series

Date	Flow (Cubic Feet per Second)	Flow Exceedance Percentile*
5/25/2011	1440	6.7
5/26/2011	1900	2.8
5/27/2011	2720	0.8
5/28/2011	3390	0.2
5/29/2011	3350	0.3
5/30/2011	3230	0.3
5/31/2011	2970	0.5
6/1/2011	2660	0.9
6/2/2011	2260	1.6
6/3/2011	1850	3.0
6/4/2011	1520	5.7
6/5/2011	1290	9.1
6/6/2011	1150	12.3
6/7/2011	1030	16.0
6/8/2011	885	22.7

Footnotes:
* Flow exceedance percentile is based on length of flow record from July 27, 1937 to December 31, 2011

Table 7-1. October - November 2011 Zonal Summary
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Velocity

Sediment Trap Name	No Structures (Feet per Second)			99 Percent Porosity Structures (Feet per Second)			75 Percent Porosity Structures (Feet per Second)		
	10/31/2011	11/3/2011	11/7/2011	10/31/2011	11/3/2011	11/7/2011	10/31/2011	11/3/2011	11/7/2011
3.25 R1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Ceresco	0.4	0.4	0.3	0.4	0.4	0.3	0.4	0.3	0.3
10.40 N	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0
10.50 L2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
10.75 LDB	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
MP 11.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MP 11.78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14.75 RDB	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.3	0.3
19.25 LDB	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
21.50 RDB	0.3	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.2
26.00 RDB	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
26.25 RDB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28.25 RDB	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
30.80 LDB	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
33.00 A	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3
33.00 B	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.2	0.2
36.10 NW	0.5	0.4	0.4	0.5	0.4	0.4	0.4	0.3	0.3
Delta A	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2
37.75 Islands	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Table 7-1. October - November 2011 Zonal Summary
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Shear Stress

Sediment Trap Name	No Structures (Pascals)			99 Percent Porosity Structures (Pascals)			75 Percent Porosity Structures (Pascals)		
	10/31/2011	11/3/2011	11/7/2011	10/31/2011	11/3/2011	11/7/2011	10/31/2011	11/3/2011	11/7/2011
3.25 R1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Ceresco	0.5	0.4	0.4	0.5	0.4	0.4	0.5	0.4	0.4
10.40 N	4.6	4.4	4.4	4.5	4.3	4.3	4.2	4.1	4.0
10.50 L2	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3
10.75 LDB	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0
MP 11.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MP 11.78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14.75 RDB	0.6	0.5	0.5	0.6	0.5	0.5	0.3	0.3	0.3
19.25 LDB	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
21.50 RDB	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
26.00 RDB	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.4	0.4
26.25 RDB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28.25 RDB	0.3	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0
30.80 LDB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.00 A	0.6	0.6	0.5	0.6	0.6	0.5	0.6	0.5	0.5
33.00 B	0.4	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3
36.10 NW	0.4	0.4	0.3	0.4	0.4	0.3	0.3	0.3	0.2
Delta A	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2
37.75 Islands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 7-1. October - November 2011 Zonal Summary
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Simulated Sedimentation Rate

Sediment Trap Name	No Structures	99 Percent Porosity Structures		75 Percent Porosity Structures	
	Milimeters per Week	Milimeters per Week	Change in Deposition Rate (Percent)	Milimeters per Week	Change in Deposition Rate (Percent)
3.25 R1	0.00	0.00	N/A*	0.10	N/A*
Ceresco	0.39	0.39	-2	0.30	-24
10.40 N	-3.53	-3.60	N/A*	-2.00	N/A*
10.50 L2	1.18	1.22	3	1.17	0
10.75 LDB	0.00	0.00	N/A*	0.00	N/A*
MP 11.21	0.00	0.00	N/A*	0.00	N/A*
MP 11.78	0.00	0.00	N/A*	0.00	N/A*
14.75 RDB	0.17	0.17	2	0.38	121
19.25 LDB	0.26	0.29	10	0.49	84
21.50 RDB	0.77	0.76	-1	0.54	-30
26.00 RDB	0.73	0.74	2	0.80	10
26.25 RDB	0.00	0.00	N/A*	0.00	N/A*
28.25 RDB	0.07	0.06	N/A*	0.05	N/A*
30.80 LDB	0.29	0.32	11	0.44	50
33.00 A	0.36	0.34	-6	0.32	-12
33.00 B	0.84	0.84	-1	0.87	4
36.10 NW	0.52	0.55	6	1.12	118
Delta A	0.20	0.20	0	0.19	-7
37.75 Islands	0.00	0.00	N/A*	0.00	N/A*

Footnotes:
Positive values result in depostion and negative values result in erosion.
N/A*: The change in depositional rate was not calcualated for sediment traps with a depostion rate less than 0.1 mm.

Table 7-2. May 2011 Zonal Summary
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Velocity

Sediment Trap Name	No Structures (Feet per Second)			99 Percent Porosity Structures (Feet per Second)			75 Percent Porosity Structures (Feet per Second)		
	5/20/2011	5/21/2011	5/23/2011	5/20/2011	5/21/2011	5/23/2011	5/20/2011	5/21/2011	5/23/2011
3.25 R1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Ceresco	0.6	0.6	0.5	0.6	0.6	0.5	0.6	0.5	0.5
10.40 N	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2
10.50 L2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10.75 LDB	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.5
MP 11.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MP 11.78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14.75 RDB	0.8	0.7	0.7	0.7	0.7	0.7	0.5	0.5	0.5
19.25 LDB	0.7	0.7	0.6	0.7	0.7	0.6	0.5	0.5	0.5
21.50 RDB	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
26.00 RDB	0.4	0.4	0.5	0.4	0.5	0.5	0.4	0.4	0.4
26.25 RDB	0.5	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6
28.25 RDB	0.5	0.6	0.6	0.5	0.6	0.6	0.5	0.5	0.5
30.80 LDB	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
33.00 A	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7
33.00 B	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
36.10 NW	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5
Delta A	0.4	0.5	0.5	0.4	0.5	0.5	0.3	0.4	0.4
37.75 Islands	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2

Shear Stress

Sediment Trap Name	No Structures (Pascals)			99 Percent Porosity Structures (Pascals)			75 Percent Porosity Structures (Pascals)		
	5/20/2011	5/21/2011	5/23/2011	5/20/2011	5/21/2011	5/23/2011	5/20/2011	5/21/2011	5/23/2011
3.25 R1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Ceresco	1.0	0.9	0.8	1.0	0.9	0.8	1.0	0.9	0.8
10.40 N	5.6	5.6	5.3	5.4	5.4	5.2	4.9	4.9	4.7
10.50 L2	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.5
10.75 LDB	2.2	2.1	2.0	2.2	2.1	2.0	2.0	2.0	1.9
MP 11.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MP 11.78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14.75 RDB	1.2	1.2	1.1	1.1	1.1	1.0	0.6	0.6	0.5
19.25 LDB	1.0	1.0	0.9	1.0	1.0	0.8	0.6	0.6	0.5
21.50 RDB	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
26.00 RDB	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.7
26.25 RDB	1.2	1.4	1.3	1.4	1.5	1.5	1.4	1.4	1.4
28.25 RDB	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6
30.80 LDB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.00 A	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1
33.00 B	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4
36.10 NW	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.4	0.4
Delta A	0.5	0.6	0.6	0.5	0.6	0.6	0.3	0.3	0.4
37.75 Islands	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Simulated Sedimentation Rate

Sediment Trap Name	No Structures	99 Percent Porosity Structures		75 Percent Porosity Structures	
	Milimeters per Week	Milimeters per Week	Change in Deposition Rate (Percent)	Milimeters per Week	Change in Deposition Rate (Percent)
3.25 R1	0.3	0.3	-7	0.5	53
Ceresco	2.1	2.1	0	2.0	-7
10.40 N	-5.4	-5.5	N/A	-4.7	N/A
10.50 L2	3.6	3.8	4	3.3	-9
10.75 LDB	1.5	1.5	1	1.8	20
MP 11.21	0.0	0.0	N/A	0.0	N/A
MP 11.78	0.0	0.0	N/A	0.0	N/A
14.75 RDB	0.2	0.2	1	0.8	425
19.25 LDB	0.1	0.1	N/A	0.4	N/A
21.50 RDB	2.7	2.7	1	2.5	-5
26.00 RDB	1.5	1.7	15	1.8	20
26.25 RDB	0.5	0.3	-30	0.3	-37
28.25 RDB	1.7	1.7	2	2.0	21
30.80 LDB	2.1	2.0	-3	1.4	-32
33.00 A	1.5	1.6	4	1.8	20
33.00 B	4.8	4.8	0	4.8	-1
36.10 NW	1.8	1.8	1	2.1	18
Delta A	0.6	0.7	4	1.0	54
37.75 Islands	0.5	0.5	0	0.5	-2

Footnotes:
Positive values result in depostion and negative values result in erosion.
N/A*: The change in depositional rate was not calcualated for sediment traps with a depostion rate less than 0.1 mm.

Table 7-3. July 2010 Zonal Summary
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Velocity

Sediment Trap Name	No Structures (Feet per Second)			99 Percent Porosity Structures (Feet per Second)			75 Percent Porosity Structures (Feet per Second)		
	7/24/2010	7/26/2010	7/28/2010	7/24/2010	7/26/2010	7/28/2010	7/24/2010	7/26/2010	7/28/2010
3.25 R1	0.6	0.8	0.7	0.6	0.8	0.7	0.6	0.8	0.7
Ceresco	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.5	0.4
OB 8.48 LDB	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
10.40 N	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.7
10.50 L2	1.0	1.0	0.9	1.0	1.0	0.9	1.0	1.0	0.8
10.75 LDB	0.8	0.8	0.6	0.8	0.8	0.6	0.7	0.7	0.5
MP 11.21	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.5	0.4
MP 11.78	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5
14.75 RDB	0.4	0.4	0.3	0.4	0.4	0.3	0.4	0.4	0.3
19.25 LDB	0.4	0.4	0.3	0.4	0.4	0.3	0.4	0.4	0.3
21.50 RDB	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4
26.00 RDB	0.3	0.4	0.3	0.3	0.4	0.3	0.3	0.4	0.3
26.25 RDB	0.2	0.4	0.4	0.2	0.4	0.4	0.2	0.3	0.3
28.25 RDB	0.7	0.7	0.6	0.7	0.7	0.6	0.7	0.7	0.5
30.80 LDB	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
33.00 A	0.7	0.9	0.9	0.7	0.9	0.9	0.7	0.9	0.8
33.00 B	0.4	0.5	0.5	0.4	0.5	0.5	0.4	0.5	0.5
36.10 NW	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2
Delta A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37.75 Islands	0.8	0.8	0.6	0.8	0.8	0.6	0.8	0.8	0.6

Table 7-3. July 2010 Zonal Summary
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Shear Stress

Sediment Trap Name	No Structures (Pascals)			99 Percent Porosity Structures (Pascals)			75 Percent Porosity Structures (Pascals)		
	7/24/2010	7/26/2010	7/28/2010	7/24/2010	7/26/2010	7/28/2010	7/24/2010	7/26/2010	7/28/2010
3.25 R1	2.5	2.3	1.8	2.5	2.3	1.8	2.4	2.2	1.8
Ceresco	1.3	1.2	0.9	1.3	1.2	0.9	1.3	1.2	0.9
OB 8.48 LDB	4.4	4.1	3.0	4.3	4.0	2.9	4.3	4.0	2.9
10.40 N	6.7	6.6	5.8	6.7	6.6	5.8	6.1	6.0	5.4
10.50 L2	7.7	7.6	6.2	7.7	7.6	6.2	7.4	7.3	5.9
10.75 LDB	7.7	7.6	6.3	7.6	7.6	6.3	7.3	7.3	6.0
MP 11.21	3.9	3.8	2.9	3.7	3.6	2.7	3.7	3.6	2.7
MP 11.78	3.1	3.2	3.2	2.8	2.8	2.8	2.8	2.8	2.8
14.75 RDB	4.1	4.2	2.4	4.1	4.2	2.4	3.8	3.9	2.2
19.25 LDB	2.2	2.3	1.5	2.2	2.3	1.4	1.9	2.0	1.3
21.50 RDB	0.7	0.8	0.5	0.7	0.8	0.5	0.6	0.7	0.4
26.00 RDB	1.4	1.5	1.4	1.4	1.5	1.4	1.3	1.3	1.3
26.25 RDB	1.6	1.8	1.7	1.8	2.0	1.8	2.3	2.3	2.2
28.25 RDB	0.8	1.0	0.9	0.8	1.0	0.9	0.8	1.0	0.9
30.80 LDB	2.5	4.2	3.5	2.5	4.2	3.5	2.4	4.0	3.4
33.00 A	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2
33.00 B	2.9	3.6	3.4	2.9	3.6	3.4	2.8	3.5	3.3
36.10 NW	2.7	4.2	4.0	2.7	4.1	4.0	2.6	4.0	3.8
Delta A	0.4	0.8	0.8	0.4	0.8	0.8	0.4	0.7	0.7
37.75 Islands	0.1	0.3	0.3	0.1	0.3	0.3	0.1	0.3	0.3

Table 7-3. July 2010 Zonal Summary
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Simulated Sedimentation Rate

Sediment Trap Name	No Structures	99 Percent Porosity Structures		75 Percent Porosity Structures	
	Milimeters per Week	Milimeters per Week	Change in Deposition Rate	Milimeters per Week	Change in Deposition Rate
3.25 R1	0.3	0.3	0	0.3	-3
Ceresco	0.5	0.5	-3	0.5	-6
OB 8.48 LDB	-0.1	-0.1	N/A*	-0.1	N/A*
10.40 N	-2.3	-2.2	N/A*	-1.2	N/A*
10.50 L2	5.2	5.4	3	6.3	20
10.75 LDB	8.9	8.9	0	9.3	5
MP 11.21	-0.1	0.0	N/A*	0.0	N/A*
MP 11.78	0.2	0.4	65	0.4	65
14.75 RDB	1.1	1.1	1	1.3	16
19.25 LDB	0.3	0.3	-1	0.4	9
21.50 RDB	0.9	0.9	2	1.2	41
26.00 RDB	0.5	0.5	0	0.5	5
26.25 RDB	0.3	0.2	-29	0.1	-68
28.25 RDB	0.6	0.6	0	0.6	-1
30.80 LDB	1.2	1.2	0	1.1	-5
33.00 A	0.0	0.0	N/A*	0.0	N/A*
33.00 B	1.8	1.8	1	1.9	7
36.10 NW	6.5	6.5	0	6.4	-2
Delta A	0.4	0.4	1	0.5	10
37.75 Islands	0.4	0.4	0	0.4	2

Footnotes:
Positive values result in depostion and negative values result in erosion.
N/A*: The change in depositional rate was not calcualated for sediment traps with a depostion rate less than 0.1 mm.

Table 7-4. 100-Year Zonal Summary
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Velocity

Sediment Trap Name	No Structures (Feet per Second)			99 Percent Porosity Structures (Feet per Second)			75 Percent Porosity Structures (Feet per Second)		
	Day 4.5	Day 6.5	Day 8.5	Day 4.5	Day 6.5	Day 8.5	Day 4.5	Day 6.5	Day 8.5
3.25 R1	0.7	1.2	1.0	0.7	1.2	1.0	0.6	1.2	1.0
Ceresco	0.7	1.2	1.0	0.7	1.2	1.0	0.7	1.2	1.0
OB 8.48 LDB	0.5	0.8	0.7	0.4	0.8	0.7	0.4	0.8	0.7
10.40 N	0.8	1.1	1.0	0.8	1.1	1.0	0.7	1.0	1.0
10.50 L2	0.8	1.5	1.3	0.8	1.5	1.3	0.7	1.4	1.3
10.75 LDB	0.8	1.5	1.4	0.8	1.5	1.3	0.8	1.4	1.3
MP 11.21	0.4	0.7	0.6	0.4	0.6	0.6	0.4	0.6	0.6
MP 11.78	0.5	0.7	0.6	0.4	0.6	0.6	0.4	0.6	0.6
14.75 RDB	0.4	1.2	1.1	0.4	1.1	1.1	0.3	1.1	1.0
19.25 LDB	0.2	0.9	0.8	0.2	0.8	0.8	0.2	0.8	0.7
21.50 RDB	0.3	0.8	0.7	0.2	0.8	0.7	0.2	0.8	0.8
26.00 RDB	0.1	0.5	0.5	0.1	0.5	0.5	0.2	0.5	0.5
26.25 RDB	0.2	0.5	0.5	0.2	0.5	0.5	0.2	0.6	0.6
28.25 RDB	0.0	0.5	0.5	0.0	0.5	0.5	0.0	0.5	0.5
30.80 LDB	0.1	1.1	1.3	0.1	1.1	1.3	0.1	1.1	1.3
33.00 A	0.3	0.6	0.6	0.3	0.6	0.6	0.3	0.6	0.6
33.00 B	0.3	1.1	1.3	0.3	1.1	1.3	0.3	1.0	1.3
36.10 NW	0.0	0.8	1.0	0.0	0.8	1.0	0.0	0.7	1.0
Delta A	0.1	0.5	0.7	0.1	0.5	0.7	0.1	0.5	0.6
37.75 Islands	0.0	0.3	0.4	0.0	0.3	0.4	0.0	0.3	0.4

Table 7-4. 100-Year Zonal Summary
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Shear Stress

Sediment Trap Name	No Structures (Pascals)			99 Percent Porosity Structures (Pascals)			75 Percent Porosity Structures (Pascals)		
	Day 4.5	Day 6.5	Day 8.5	Day 4.5	Day 6.5	Day 8.5	Day 4.5	Day 6.5	Day 8.5
3.25 R1	2.2	4.5	3.4	2.2	4.5	3.4	2.2	4.2	3.2
Ceresco	1.0	2.5	2.0	1.0	2.5	2.0	1.1	2.6	2.1
OB 8.48 LDB	3.1	8.4	7.2	3.0	8.4	7.2	3.0	8.4	7.2
10.40 N	5.8	9.5	8.7	5.7	9.4	8.6	5.4	8.3	7.6
10.50 L2	6.0	13.4	11.8	6.0	13.3	11.7	5.7	13.1	11.5
10.75 LDB	6.1	10.8	9.9	6.1	10.7	9.9	5.9	10.4	9.6
MP 11.21	2.7	4.9	4.5	2.5	4.7	4.4	2.6	4.7	4.4
MP 11.78	3.1	4.1	3.7	2.8	3.7	3.4	2.8	3.7	3.4
14.75 RDB	1.0	7.1	6.7	1.0	7.0	6.6	0.9	6.5	6.2
19.25 LDB	1.1	5.4	4.7	1.1	5.4	4.6	0.9	4.6	3.9
21.50 RDB	0.3	2.2	2.1	0.3	2.2	2.1	0.2	2.2	2.1
26.00 RDB	0.3	1.5	1.3	0.3	1.5	1.3	0.4	1.3	1.2
26.25 RDB	0.5	2.1	2.0	0.6	2.2	2.0	1.0	2.3	2.1
28.25 RDB	0.0	1.3	1.2	0.0	1.3	1.2	0.0	1.3	1.2
30.80 LDB	0.1	6.4	7.3	0.1	6.4	7.2	0.1	6.1	6.9
33.00 A	0.7	1.3	1.5	0.7	1.3	1.5	0.6	1.3	1.4
33.00 B	0.6	4.5	5.8	0.6	4.5	5.8	0.5	4.3	5.5
36.10 NW	0.0	7.6	10.9	0.0	7.6	10.9	0.0	7.3	10.5
Delta A	0.1	1.4	2.2	0.1	1.3	2.1	0.1	1.1	1.7
37.75 Islands	0.0	0.6	1.1	0.0	0.6	1.1	0.0	0.5	1.0

Simulated Sedimentation Rate

Sediment Trap Name	No Structures	99 Percent Porosity Structures		75 Percent Porosity Structures	
	Milimeters per Week	Milimeters per Week	Change in Deposition Rate (Percent)	Milimeters per Week	Change in Deposition Rate (Percent)
3.25 R1	3.6	3.6	0	3.5	-2
Ceresco	-0.2	-0.2	N/A*	-0.5	N/A*
OB 8.48 LDB	2.0	2.3	14	2.3	14
10.40 N	-4.2	-3.9	N/A*	-2.1	N/A*
10.50 L2	-3.8	-3.5	N/A*	-1.7	N/A*
10.75 LDB	8.5	8.7	3	10.8	27
MP 11.21	0.0	0.0	N/A*	0.0	N/A*
MP 11.78	0.2	0.5	116	0.5	116
14.75 RDB	2.5	2.6	3	3.2	28
19.25 LDB	1.9	1.9	0	2.2	17
21.50 RDB	4.4	4.4	0	4.4	0
26.00 RDB	0.4	0.4	0	0.4	4
26.25 RDB	0.1	0.1	N/A*	0.0	N/A*
28.25 RDB	0.4	0.4	0	0.4	-5
30.80 LDB	1.1	1.1	1	1.2	6
33.00 A	0.1	0.1	N/A*	0.1	N/A*
33.00 B	3.8	3.8	2	4.5	19
36.10 NW	34.3	34.3	0	33.9	-1
Delta A	0.7	0.8	12	1.1	58
37.75 Islands	0.1	0.1	1	0.1	5

Footnotes:
Positive values result in depostion and negative values result in erosion.
N/A*: The change in depositional rate was not calcualated for sediment traps with a depostion rate less than 0.1 mm.

Table 8-1. Model Run Descriptions
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Run Name	Riverine Model	Floodplain Model	Sensitivity Parameter	Parameter Coefficient	Run Start Date	Run End Date	Shear Stress and Velocity Dates			Sediment Accumulation	
							Rising	Peak	Falling		
A1	x		Baseline Model Delivered on March 23, 2012	1.0	10/28/2011	11/9/2011	10/31/2012	11/3/2012	11/7/2012	10/31/2012	11/7/2012
A1S01	x		Roughness	1.5							
A1S02	x		Roughness	0.5							
A1S03	x		Sediment Concentration	1.5							
A1S04	x		Sediment Concentration	0.5							
A1S05	x		Settling Velocity	1.5							
A1S06	x		Settling Velocity	0.5							
A1S07	x		Silt Composition	Maximum Silt							
A1S08	x		Silt Composition	Minimum Silt							
A1S09	x		Critical Shear Stress of Deposition	1.5							
A1S10	x		Critical Shear Stress of Deposition	0.5							
E1		x	Baseline Model Delivered on March 23, 2012	1.0	7/23/2010	8/3/2010	7/24/2012	7/26/2012	7/28/2012	7/24/2012	7/31/2012
E1S01		x	Roughness	1.5							
E1S02		x	Roughness	0.5							
E1S03		x	Sediment Concentration	1.5							
E1S04		x	Sediment Concentration	0.5							
E1S05		x	Settling Velocity	1.5							
E1S06		x	Settling Velocity	0.5							
E1S07		x	Silt Composition	Maximum Silt							
E1S08		x	Silt Composition	Minimum Silt							
E1S09		x	Critical Shear Stress of Deposition	1.5							
E1S10		x	Critical Shear Stress of Deposition	0.5							

Footnotes:
Minimum Silt=5% Silt
Maximum Silt=68% Silt

Table 8-2. Riverine: Effect of Roughness Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.59	0.00	0.97	0.57	0.00	0.95	0.56	0.00	0.94
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.50	0.00	1.26	0.46	0.00	1.26	0.45	0.00	1.24
14.75 RDB Sediment Trap	0.49	0.27	0.70	0.46	0.26	0.66	0.45	0.25	0.64
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.58	0.00	1.50	0.55	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.28	0.12	0.52	0.26	0.11	0.49	0.24	0.10	0.47
26.00 RDB Sediment Trap	0.30	0.00	1.22	0.28	0.01	1.08	0.26	0.01	0.97
33.00 A Sediment Trap	0.36	0.00	1.25	0.33	0.00	1.13	0.31	0.00	1.04
Morrow Lake Delta	0.23	0.00	2.06	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.53	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Roughness * 1.5 (Model Run A1S1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.57	0.00	0.96	0.53	0.00	0.93	0.52	0.00	0.91
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.51	0.00	1.20	0.47	0.00	1.16	0.46	0.00	1.15
14.75 RDB Sediment Trap	0.58	0.27	1.18	0.54	0.25	1.11	0.52	0.25	1.08
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.58	0.00	1.41	0.54	0.00	1.36	0.52	0.00	1.34
21.50 RDB Sediment Trap	0.34	0.12	0.83	0.32	0.11	0.76	0.30	0.10	0.74
26.00 RDB Sediment Trap	0.59	0.00	1.48	0.54	0.01	1.38	0.51	0.02	1.30
33.00 A Sediment Trap	0.60	0.00	1.64	0.55	0.00	1.53	0.51	0.00	1.45
Morrow Lake Delta	0.22	0.00	1.91	0.20	0.00	1.82	0.18	0.00	1.76
Sediment Fan	0.09	0.00	0.54	0.08	0.00	0.49	0.07	0.00	0.45
West End of Morrow Lake	0.05	0.00	0.62	0.05	0.00	0.55	0.04	0.00	0.49

Roughness * 0.5 (Model Run A1S2)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.67	0.00	1.15	0.63	0.00	1.11	0.62	0.00	1.21
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.56	0.00	1.41	0.52	0.00	1.35	0.51	0.00	1.33
14.75 RDB Sediment Trap	0.63	0.28	1.30	0.58	0.26	1.21	0.57	0.25	1.19
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.62	0.00	1.67	0.58	0.00	1.60	0.56	0.00	1.58
21.50 RDB Sediment Trap	0.37	0.12	0.98	0.34	0.10	0.91	0.33	0.09	0.90
26.00 RDB Sediment Trap	0.64	0.00	1.75	0.58	0.00	1.62	0.54	0.01	1.54
33.00 A Sediment Trap	0.68	0.00	1.99	0.56	0.00	1.90	0.52	0.00	1.82
Morrow Lake Delta	0.24	0.00	2.33	0.22	0.00	2.20	0.20	0.00	2.12
Sediment Fan	0.09	0.00	0.53	0.08	0.00	0.47	0.07	0.00	0.43
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.48

Table 8-3. Riverine: Effect of Roughness Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	0.98	0.00	2.92	0.92	0.00	2.89	0.91	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.01	0.00	4.03	0.92	0.00	4.05	0.90	0.00	3.99
14.75 RDB Sediment Trap	0.61	0.21	1.13	0.56	0.20	1.02	0.53	0.19	0.97
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.85	0.00	4.55	0.77	0.00	4.38	0.74	0.00	4.30
21.50 RDB Sediment Trap	0.18	0.03	0.70	0.17	0.03	0.69	0.17	0.03	0.70
26.00 RDB Sediment Trap	0.42	0.00	3.25	0.37	0.00	2.80	0.34	0.00	2.48
33.00 A Sediment Trap	0.60	0.00	3.13	0.55	0.00	2.81	0.50	0.00	2.54
Morrow Lake Delta	0.39	0.00	8.18	0.34	0.00	7.68	0.31	0.00	7.38
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Roughness * 1.5 (Model Run A1S1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	1.15	0.00	3.24	1.09	0.00	3.16	1.07	0.00	3.16
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.37	0.00	4.96	1.29	0.00	4.81	1.25	0.00	4.75
14.75 RDB Sediment Trap	0.90	0.25	2.94	0.83	0.23	2.74	0.80	0.22	2.64
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	1.07	0.00	5.18	0.98	0.00	5.02	0.94	0.00	4.94
21.50 RDB Sediment Trap	0.35	0.04	1.49	0.33	0.04	1.36	0.32	0.03	1.26
26.00 RDB Sediment Trap	1.18	0.00	4.01	1.04	0.00	3.57	0.95	0.00	3.31
33.00 A Sediment Trap	1.38	0.00	5.07	1.25	0.00	4.68	1.15	0.00	4.39
Morrow Lake Delta	0.48	0.00	9.24	0.43	0.00	8.63	0.39	0.00	8.26
Sediment Fan	0.03	0.00	0.55	0.02	0.00	0.45	0.02	0.00	0.38
West End of Morrow Lake	0.01	0.00	0.40	0.00	0.00	0.32	0.00	0.00	0.26

Roughness * 0.5 (Model Run A1S2)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	0.80	0.00	2.55	0.76	0.00	2.54	0.75	0.00	3.02
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.77	0.00	3.05	0.71	0.00	2.91	0.70	0.00	2.86
14.75 RDB Sediment Trap	0.53	0.13	1.82	0.48	0.12	1.67	0.46	0.11	1.61
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.63	0.00	3.67	0.57	0.00	3.50	0.55	0.00	3.42
21.50 RDB Sediment Trap	0.24	0.02	1.13	0.23	0.02	1.04	0.22	0.02	1.01
26.00 RDB Sediment Trap	0.87	0.00	3.11	0.75	0.00	2.77	0.68	0.00	2.58
33.00 A Sediment Trap	1.06	0.00	4.20	0.79	0.00	4.02	0.70	0.00	3.79
Morrow Lake Delta	0.27	0.00	6.88	0.24	0.00	6.34	0.22	0.00	5.96
Sediment Fan	0.01	0.00	0.26	0.01	0.00	0.21	0.01	0.00	0.18
West End of Morrow Lake	0.00	0.00	0.23	0.00	0.00	0.19	0.00	0.00	0.15

Table 8-4. Riverine: Effect of Roughness Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	14.0	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.0	15.4	14.0	18.0	33.3	24.0	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	30.0	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.6	26.9	60.0	16.8	10.0	51.4	34.5	21.7	53.0
21.50 RDB Sediment Trap	44.0	44.0	44.0	19.0	19.0	19.0	37.0	37.0	37.0
26.00 RDB Sediment Trap	34.0	34.0	34.0	12.0	12.0	12.0	54.0	54.0	54.0
33.00 A Sediment Trap	47.4	24.0	58.0	18.0	18.0	18.0	34.6	24.0	58.0
Morrow Lake Delta	49.6	24.0	68.0	14.5	10.0	19.0	35.9	16.0	59.0
Sediment Fan	60.2	24.0	68.0	14.8	10.0	18.0	25.0	16.0	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.1	15.4	14.0	18.0	33.3	23.9	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	29.9	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.1	1.0	60.2	16.4	3.1	72.5	35.5	0.6	95.9
21.50 RDB Sediment Trap	44.1	44.0	44.3	19.0	18.9	19.0	36.9	36.8	37.0
26.00 RDB Sediment Trap	34.1	33.7	34.7	12.0	11.9	12.3	53.9	53.0	54.5
33.00 A Sediment Trap	47.3	23.8	58.1	18.0	17.9	18.0	34.7	23.9	58.3
Morrow Lake Delta	49.6	23.9	68.1	14.5	9.9	19.1	35.9	15.9	59.2
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Roughness * 1.5 (Model Run A1S1)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.3	24.0	62.0	15.3	14.0	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.0	62.0	15.5	13.9	18.0	33.6	20.0	59.0
14.75 RDB Sediment Trap	56.3	44.0	60.0	12.7	10.0	16.0	31.1	26.2	42.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.0	0.7	60.3	16.3	2.4	71.9	35.7	0.7	96.9
21.50 RDB Sediment Trap	45.3	44.0	57.0	18.4	14.0	19.0	36.3	25.0	42.0
26.00 RDB Sediment Trap	39.2	33.7	60.4	13.0	11.9	17.1	47.7	22.5	54.4
33.00 A Sediment Trap	49.3	23.9	58.7	17.6	14.1	18.2	33.0	23.1	58.2
Morrow Lake Delta	49.6	23.9	68.1	14.5	9.9	19.0	35.8	15.9	59.1
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Table 8-4. Riverine: Effect of Roughness Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Roughness * 0.5 (Model Run A1S2)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.3	62.0	15.5	14.0	18.0	33.5	20.0	58.5
14.75 RDB Sediment Trap	56.3	44.0	60.0	12.7	10.0	16.0	31.0	26.2	42.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.3	1.7	91.3	16.3	4.7	65.4	35.4	0.5	93.6
21.50 RDB Sediment Trap	45.3	44.0	57.0	18.4	14.0	19.0	36.3	25.0	42.0
26.00 RDB Sediment Trap	39.2	33.6	60.5	13.0	11.9	17.1	47.7	22.3	54.6
33.00 A Sediment Trap	49.4	23.8	58.9	17.6	14.1	18.3	33.0	22.8	58.4
Morrow Lake Delta	49.6	23.8	68.1	14.5	9.9	19.1	35.8	15.9	59.3
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Table 8-5. Riverine: Effect of Roughness Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.05	-3.12	2.02
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.30	-2.27	2.89
14.75 RDB Sediment Trap	0.16	0.00	1.19
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.10	-4.65	4.22
21.50 RDB Sediment Trap	0.75	0.00	1.76
26.00 RDB Sediment Trap	0.79	-3.04	2.66
33.00 A Sediment Trap	0.34	0.00	1.31
Morrow Lake Delta	0.08	-6.94	7.05
Sediment Fan	0.02	0.00	1.04
West End of Morrow Lake	0.00	0.00	0.00

Roughness * 1.5 (Model Run A1S1)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.01	-2.57	1.40
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.17	-6.24	3.56
14.75 RDB Sediment Trap	0.12	-0.80	1.08
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.07	-4.64	4.21
21.50 RDB Sediment Trap	0.62	0.00	1.71
26.00 RDB Sediment Trap	0.51	-2.93	2.94
33.00 A Sediment Trap	0.04	-2.27	2.71
Morrow Lake Delta	0.05	-6.44	7.12
Sediment Fan	0.04	0.00	1.01
West End of Morrow Lake	0.00	0.00	0.00

Table 8-5. Riverine: Effect of Roughness Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Roughness * 0.5 (Model Run A1S2)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.08	-5.58	2.01
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.04	-7.48	2.62
14.75 RDB Sediment Trap	0.32	-0.66	1.75
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.13	-4.47	4.53
21.50 RDB Sediment Trap	0.66	0.00	1.94
26.00 RDB Sediment Trap	0.35	-3.48	3.16
33.00 A Sediment Trap	0.23	-3.65	2.75
Morrow Lake Delta	0.11	-7.03	7.34
Sediment Fan	0.02	0.00	0.97
West End of Morrow Lake	0.00	0.00	0.00

Table 8-6. Riverine: Effect of Roughness Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	120.2	0.0	4186.0	3.2	0.0	107.0	12.4	-12693.0	7015.5
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	802.4	0.0	8991.4	30.1	0.0	183.0	137.0	-9680.1	9033.5
14.75 RDB Sediment Trap	531.7	0.0	4648.6	15.4	0.2	109.0	159.3	-73.3	2888.3
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	270.1	-1.3	8669.5	22.3	-0.2	204.0	190.5	-32352.0	25332.0
21.50 RDB Sediment Trap	3308.4	0.0	7100.8	141.4	0.0	224.0	39.6	0.0	498.8
26.00 RDB Sediment Trap	2740.3	0.0	8338.1	125.2	0.0	194.0	153.6	-27834.0	13962.0
33.00 A Sediment Trap	493.0	0.0	3616.5	15.0	0.0	108.0	1741.4	0.0	7492.5
Morrow Lake Delta	229.2	-526.7	6999.2	19.7	-164.0	216.0	15.6	-55991.0	45029.0
Sediment Fan	142.4	0.0	2978.9	95.9	0.0	197.0	0.1	-580.3	257.7
West End of Morrow Lake	9.1	-4.0	69.0	38.5	-0.8	116.0	0.1	-496.8	328.0

Roughness * 1.5 (Model Run A1S1)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	48.0	0.0	2052.2	1.2	0.0	53.3	-20.1	-10117.6	5173.3
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	724.5	0.0	10324.3	20.8	0.0	182.5	-550.0	-35266.3	8029.7
14.75 RDB Sediment Trap	396.7	0.0	3868.4	10.1	0.0	107.0	90.8	-4925.5	3076.3
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	216.0	-0.8	8743.6	19.2	0.0	189.1	74.9	-29145.5	23445.0
21.50 RDB Sediment Trap	2673.5	0.0	6979.0	87.8	0.0	193.8	69.1	-143.6	1018.9
26.00 RDB Sediment Trap	1879.7	0.0	8778.6	72.6	0.0	189.3	178.9	-25377.8	17860.4
33.00 A Sediment Trap	183.4	-3.2	2351.8	7.8	-1.1	97.4	671.9	-11034.8	14903.4
Morrow Lake Delta	164.8	-389.0	6346.6	12.7	-115.3	191.2	16.8	-53728.7	38252.9
Sediment Fan	170.9	0.0	2979.4	86.8	0.0	182.1	0.1	-315.2	172.0
West End of Morrow Lake	10.2	-3.0	66.8	36.6	0.0	107.5	0.0	-393.6	236.5

Roughness * 0.5 (Model Run A1S2)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	246.2	0.0	5715.3	6.6	0.0	123.3	-13.9	-19028.9	9528.5
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	645.9	0.0	6040.6	36.6	0.0	182.8	-986.9	-45896.8	9579.1
14.75 RDB Sediment Trap	1262.4	0.0	6668.4	41.0	0.1	217.1	64.9	-4704.6	2512.5
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	410.8	-1.3	7831.7	31.8	-0.4	268.7	67.0	-35682.1	29600.5
21.50 RDB Sediment Trap	2929.3	0.0	7961.8	156.8	0.0	250.9	114.4	-416.5	1734.1
26.00 RDB Sediment Trap	1522.0	0.0	8507.9	108.1	0.0	259.5	-338.6	-30819.1	21047.4
33.00 A Sediment Trap	887.3	-56.3	5104.5	28.7	-26.2	215.4	175.3	-19613.5	19754.2
Morrow Lake Delta	341.8	-963.4	7483.3	36.1	-294.3	277.4	12.6	-64501.7	57883.4
Sediment Fan	107.3	0.0	2878.8	116.6	0.0	253.1	0.0	-1137.4	493.5
West End of Morrow Lake	7.7	-6.0	68.8	45.1	-1.3	138.1	0.1	-814.3	495.8

Table 8-7. Effect of Input Parameter Change on Sediment Loading
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Ceresco

	Riverine					Floodplain				
	Base Model	Base Model * 1.5		Base Model * 0.5		Base Model	Base Model * 1.5		Base Model * 0.5	
Input Parameter	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change
Roughness	16.24	18.35	13	12.57	-23	218.26	169.81	-22	157.81	-28
Sediment Concentration	16.24	21.27	31	8.18	-50	218.26	242.36	11	93.96	-57
Settling Velocity	16.24	14.76	-9	18.68	15	218.26	210.39	-4	231.24	6
Silt Composition*	16.24	20.52	26	7.05	-57	218.26	279.84	28	80.88	-63
Critical Shear Stress of Deposition	16.24	11.38	-30	23.22	43	218.26	202.92	-7	241.96	11

Kalamazoo Dam

	Riverine					Floodplain				
	Base Model	Base Model * 1.5		Base Model * 0.5		Base Model	Base Model * 1.5		Base Model * 0.5	
Input Parameter	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change
Roughness	19.35	19.08	-1	20.61	7	251.79	202.19	945	187.68	870
Sediment Concentration	19.35	23.19	20	12.22	-37	251.79	279.77	1346	119.73	519
Settling Velocity	19.35	17.04	-12	23.18	20	251.79	232.52	1102	290.07	1399
Silt Composition*	19.35	22.77	18	12.54	-35	251.79	313.79	1522	118.20	511
Critical Shear Stress of Deposition	19.35	11.52	-40	65.04	236	251.79	207.66	973	365.49	1789

Kalamazoo Gage

	Riverine					Floodplain				
	Base Model	Base Model * 1.5		Base Model * 0.5		Base Model	Base Model * 1.5		Base Model * 0.5	
Input Parameter	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change
Roughness	61.02	61.21	0	62.49	2	365.62	371.07	508	350.18	474
Sediment Concentration	61.02	73.22	20	48.12	-21	365.62	521.66	755	228.18	274
Settling Velocity	61.02	47.77	-22	59.93	-2	365.62	314.25	415	401.91	559
Silt Composition*	61.02	66.85	10	48.88	-20	365.62	439.73	621	204.06	234
Critical Shear Stress of Deposition	61.02	48.60	-20	127.32	109	365.62	318.54	422	495.25	712

Table 8-7. Effect of Input Parameter Change on Sediment Loading
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

35th Street Bridge

	Riverine					Floodplain				
	Base Model	Base Model * 1.5		Base Model * 0.5		Base Model	Base Model * 1.5		Base Model * 0.5	
Input Parameter	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change
Roughness	55.13	51.86	-6	63.83	16	213.20	220.49	300	197.89	259
Sediment Concentration	55.13	74.42	35	36.01	-35	213.20	300.12	444	121.07	120
Settling Velocity	55.13	48.53	-12	68.22	24	213.20	175.99	219	282.49	412
Silt Composition*	55.13	64.78	17	35.27	-36	213.20	255.36	363	132.82	141
Critical Shear Stress of Deposition	55.13	38.15	-31	172.73	213	213.20	153.41	178	415.98	654

Neck of Delta

	Riverine					Floodplain				
	Base Model	Base Model * 1.5		Base Model * 0.5		Base Model	Base Model * 1.5		Base Model * 0.5	
Input Parameter	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change
Roughness	33.51	36.24	8	32.04	-4	179.00	189.42	465	157.61	370
Sediment Concentration	33.51	45.63	36	21.52	-36	179.00	256.26	665	97.19	190
Settling Velocity	33.51	28.13	-16	43.93	31	179.00	153.49	358	227.53	579
Silt Composition*	33.51	38.35	14	25.34	-24	179.00	214.78	541	113.83	240
Critical Shear Stress of Deposition	33.51	19.34	-42	141.76	323	179.00	121.22	262	382.00	1040

Morrow Lake Dam

	Riverine					Floodplain				
	Base Model	Base Model * 1.5		Base Model * 0.5		Base Model	Base Model * 1.5		Base Model * 0.5	
Input Parameter	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Average Load (Megagrams per Day)	Percent Change	Average Load (Megagrams per Day)	Percent Change
Roughness	3.18	3.03	-5	3.65	15	38.52	61.61	1838	62.38	1863
Sediment Concentration	3.18	18.51	482	2.01	-37	38.52	70.17	2108	50.07	1475
Settling Velocity	3.18	1.31	-59	8.07	154	38.52	25.44	700	60.74	1811
Silt Composition*	3.18	3.32	4	3.47	9	38.52	40.87	1186	43.21	1259
Critical Shear Stress of Deposition	3.18	2.35	-26	9.57	201	38.52	32.79	932	66.59	1995

Footnotes:
*Silt composition runs corresponded to maximum silt (68 percent) and minimum silt (5 percent)

Table 8-8. Floodplain: Effect of Roughness Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	1.22	0.00	2.66	1.16	0.00	2.58	1.02	0.00	2.46	0.19	0.00	2.32	0.17	0.00	2.20	0.13	0.00	1.98
Ceresco to Raymond Rd	1.46	0.00	4.06	1.43	0.00	4.00	1.28	0.00	3.69	0.26	0.00	2.52	0.26	0.00	2.39	0.20	0.00	2.01
Raymond Rd to Kalamazoo Dam	0.97	0.00	5.73	0.98	0.00	5.86	0.85	0.00	4.81	0.19	0.00	2.65	0.19	0.00	3.48	0.16	0.00	1.95
Kalamazoo Dam to Battle Creek River	2.98	0.00	9.77	3.05	0.00	9.99	2.57	0.00	8.52	1.02	0.00	11.13	1.04	0.00	11.49	0.82	0.00	9.98
Battle Creek River to Custer Dr	1.43	0.00	4.09	1.46	0.00	4.19	1.23	0.00	3.99	0.04	0.00	5.50	0.05	0.00	5.95	0.04	0.00	5.00
Custer Dr to M-96	1.03	0.00	3.07	1.04	0.00	3.02	1.00	0.00	3.02	0.16	0.00	2.62	0.21	0.00	3.48	0.16	0.00	3.52
M-96 to Michigan Ave	1.27	0.00	4.05	1.39	0.00	4.12	1.32	0.00	3.93	0.09	0.00	1.46	0.17	0.00	1.63	0.15	0.00	7.56
Michigan Ave to 35th Street	1.26	0.00	3.36	1.48	0.00	3.64	1.45	0.00	3.55	0.07	0.00	1.30	0.13	0.00	1.84	0.12	0.00	1.71
35th Street to MP 37.75	0.55	0.00	2.44	0.72	0.00	2.64	0.70	0.00	2.59	0.01	0.00	0.63	0.03	0.00	0.82	0.03	0.00	0.80
MP 37.75 to MP 38.75	0.16	0.00	0.75	0.20	0.00	0.95	0.20	0.00	0.93	0.00	0.00	0.06	0.01	0.00	0.17	0.01	0.00	0.16
MP 38.75 to Morrow Lake Dam	0.10	0.00	0.95	0.14	0.00	1.44	0.14	0.00	1.48	0.00	0.00	0.03	0.00	0.00	0.12	0.00	0.00	0.06

Roughness * 1.5 (Model Run E1S1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.86	0.00	2.51	0.81	0.00	2.43	0.70	0.00	2.28	0.41	0.00	2.24	0.39	0.00	2.17	0.33	0.00	2.23
Ceresco to Raymond Rd	0.96	0.00	3.71	0.94	0.00	3.67	0.84	0.00	3.38	0.45	0.00	3.55	0.44	0.00	3.47	0.38	0.00	3.18
Raymond Rd to Kalamazoo Dam	0.66	0.00	5.48	0.68	0.00	5.64	0.57	0.00	4.61	0.31	0.00	5.48	0.32	0.00	5.64	0.28	0.00	4.61
Kalamazoo Dam to Battle Creek River	1.77	0.00	10.07	1.84	0.00	10.27	1.48	0.00	8.91	1.33	0.00	10.07	1.38	0.00	10.27	1.13	0.00	8.91
Battle Creek River to Custer Dr	0.92	0.00	8.08	0.96	0.00	8.16	0.80	0.00	7.36	0.18	0.00	8.08	0.20	0.00	8.16	0.17	0.00	7.36
Custer Dr to M-96	0.70	0.00	2.97	0.72	0.00	3.30	0.68	0.00	2.88	0.23	0.00	2.93	0.28	0.00	3.40	0.24	0.00	3.44
M-96 to Michigan Ave	0.83	0.00	3.66	0.93	0.00	3.93	0.88	0.00	3.75	0.17	0.00	3.66	0.24	0.00	3.93	0.22	0.00	3.75
Michigan Ave to 35th Street	0.79	0.00	3.18	0.99	0.00	3.45	0.97	0.00	3.41	0.19	0.00	3.18	0.28	0.00	3.45	0.28	0.00	3.41
35th Street to MP 37.75	0.46	0.00	2.25	0.62	0.00	2.49	0.61	0.00	2.47	0.07	0.00	2.25	0.12	0.00	2.47	0.12	0.00	2.44
MP 37.75 to MP 38.75	0.14	0.00	0.72	0.19	0.00	0.95	0.19	0.00	0.94	0.02	0.00	0.43	0.03	0.00	0.54	0.03	0.00	0.54
MP 38.75 to Morrow Lake Dam	0.09	0.00	0.88	0.13	0.00	1.44	0.14	0.00	1.50	0.01	0.00	0.10	0.01	0.00	0.17	0.01	0.00	0.17

Roughness * 0.5 (Model Run E1S1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.98	0.00	2.86	0.92	0.00	2.79	0.80	0.00	2.75	0.48	0.00	2.86	0.45	0.00	2.74	0.37	0.00	2.75
Ceresco to Raymond Rd	1.17	0.00	4.28	1.14	0.00	4.27	0.99	0.00	3.99	0.51	0.00	4.24	0.49	0.00	4.11	0.41	0.00	3.61
Raymond Rd to Kalamazoo Dam	0.78	0.00	6.17	0.78	0.00	6.25	0.68	0.00	5.14	0.37	0.00	6.17	0.37	0.00	6.25	0.32	0.00	5.14
Kalamazoo Dam to Battle Creek River	1.99	0.00	12.97	1.99	0.00	12.56	1.63	0.00	11.19	1.51	0.00	12.97	1.51	0.00	12.56	1.26	0.00	11.19
Battle Creek River to Custer Dr	1.04	0.00	11.98	1.07	0.00	11.37	0.89	0.00	10.18	0.21	0.00	11.98	0.23	0.00	11.37	0.19	0.00	10.18
Custer Dr to M-96	0.86	0.00	3.52	0.90	0.00	3.43	0.83	0.00	3.46	0.23	0.00	3.52	0.27	0.00	4.02	0.22	0.00	4.05
M-96 to Michigan Ave	1.01	0.00	4.79	1.13	0.00	4.51	1.05	0.00	4.61	0.16	0.00	4.79	0.23	0.00	4.51	0.20	0.00	4.61
Michigan Ave to 35th Street	0.95	0.00	3.62	1.14	0.00	4.23	1.10	0.00	4.05	0.22	0.00	3.62	0.28	0.00	4.23	0.27	0.00	4.05
35th Street to MP 37.75	0.53	0.00	2.68	0.65	0.00	2.85	0.62	0.00	2.76	0.08	0.00	2.68	0.11	0.00	2.85	0.11	0.00	2.76
MP 37.75 to MP 38.75	0.16	0.00	0.78	0.20	0.00	0.94	0.19	0.00	0.90	0.02	0.00	0.51	0.03	0.00	0.65	0.03	0.00	0.62
MP 38.75 to Morrow Lake Dam	0.10	0.00	1.04	0.14	0.00	1.46	0.14	0.00	1.46	0.01	0.00	0.14	0.01	0.00	0.19	0.01	0.00	0.19

Table 8-9. Floodplain: Effect of Roughness Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.87	0.00	47.11	3.63	0.00	46.69	3.16	0.00	48.48	1.24	0.00	41.29	1.11	0.00	40.05	0.88	0.00	40.47
Ceresco to Raymond Rd	10.16	0.00	81.46	9.85	0.00	79.31	8.67	0.00	72.95	2.36	0.00	40.69	2.24	0.00	44.38	1.65	0.00	47.50
Raymond Rd to Kalamazoo Dam	5.09	0.00	66.30	5.13	0.00	65.33	4.39	0.00	52.60	1.00	0.00	100.80	1.07	0.00	170.10	0.83	0.00	32.79
Kalamazoo Dam to Battle Creek River	21.80	0.00	275.80	24.18	0.00	284.60	19.37	0.00	235.10	8.87	0.00	433.80	9.43	0.00	455.20	7.52	0.00	422.30
Battle Creek River to Custer Dr	4.31	0.00	135.40	4.43	0.00	146.30	3.43	0.00	118.40	0.23	0.00	226.80	0.30	0.00	257.80	0.25	0.00	230.10
Custer Dr to M-96	3.56	0.00	44.67	3.53	0.00	41.38	3.35	0.00	44.88	0.90	0.00	99.26	1.25	0.00	158.00	0.90	0.00	159.90
M-96 to Michigan Ave	4.49	0.00	87.13	5.05	0.00	67.45	4.66	0.00	70.10	0.48	0.00	23.10	0.91	0.00	31.77	0.82	0.00	594.10
Michigan Ave to 35th Street	5.17	0.00	29.71	6.58	0.00	36.18	6.36	0.00	34.87	0.46	0.00	13.84	0.96	0.00	23.22	0.91	0.00	21.52
35th Street to MP 37.75	1.10	0.00	10.13	1.52	0.00	13.96	1.44	0.00	13.36	0.02	0.00	6.43	0.09	0.00	7.95	0.09	0.00	7.57
MP 37.75 to MP 38.75	0.06	0.00	1.66	0.09	0.00	2.70	0.08	0.00	2.55	0.00	0.00	0.09	0.01	0.00	0.50	0.01	0.00	0.48
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.03	0.00	1.76	0.03	0.00	1.84	0.00	0.00	0.02	0.00	0.00	0.36	0.00	0.00	0.06

Roughness * 1.5 (Model Run E1S1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.65	0.00	51.60	3.39	0.00	49.90	2.87	0.00	47.43	2.37	0.00	51.60	2.18	0.00	49.90	1.81	0.00	47.43
Ceresco to Raymond Rd	8.53	0.00	93.10	8.26	0.00	90.08	7.02	0.00	77.57	4.09	0.00	93.10	3.94	0.00	90.08	3.22	0.00	77.57
Raymond Rd to Kalamazoo Dam	4.49	0.00	132.72	4.59	0.00	109.25	3.83	0.00	147.80	2.18	0.00	168.15	2.21	0.00	142.89	1.88	0.00	147.80
Kalamazoo Dam to Battle Creek River	19.88	0.00	501.24	20.75	0.00	507.35	17.00	0.00	452.70	14.33	0.00	501.24	14.89	0.00	507.35	12.48	0.00	452.70
Battle Creek River to Custer Dr	3.82	0.00	448.47	4.01	0.00	440.96	3.06	0.00	448.03	1.06	0.00	448.47	1.17	0.00	440.96	0.93	0.00	448.03
Custer Dr to M-96	3.34	0.00	42.14	3.49	0.00	40.42	3.17	0.00	43.93	1.28	0.00	99.24	1.62	0.00	166.43	1.28	0.00	169.49
M-96 to Michigan Ave	4.06	0.00	94.96	4.83	0.00	75.12	4.38	0.00	77.03	0.91	0.00	94.96	1.35	0.00	75.12	1.18	0.00	77.03
Michigan Ave to 35th Street	4.28	0.00	33.95	6.06	0.00	41.75	5.93	0.00	40.87	1.20	0.00	33.95	1.96	0.00	41.75	1.91	0.00	40.87
35th Street to MP 37.75	1.16	0.00	11.24	1.69	0.00	17.28	1.65	0.00	17.04	0.25	0.00	11.24	0.44	0.00	17.28	0.43	0.00	17.04
MP 37.75 to MP 38.75	0.07	0.00	1.77	0.11	0.00	3.14	0.10	0.00	3.09	0.02	0.00	1.77	0.04	0.00	2.95	0.04	0.00	2.90
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.82	0.03	0.00	2.14	0.03	0.00	2.33	0.00	0.00	0.03	0.00	0.00	0.08	0.00	0.00	0.09

Table 8-9. Floodplain: Effect of Roughness Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Roughness * 0.5 (Model Run E1S1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	2.47	0.00	34.44	2.28	0.00	33.42	1.92	0.00	32.30	1.65	0.00	36.80	1.52	0.00	36.45	1.20	0.00	32.30
Ceresco to Raymond Rd	6.47	0.00	68.52	6.21	0.00	69.05	5.26	0.00	71.18	3.06	0.00	68.52	2.92	0.00	69.05	2.31	0.00	71.18
Raymond Rd to Kalamazoo Dam	2.97	0.00	104.68	2.91	0.00	41.83	2.48	0.00	31.94	1.44	0.00	104.68	1.40	0.00	41.83	1.19	0.00	31.94
Kalamazoo Dam to Battle Creek River	13.18	0.00	419.93	12.33	0.00	394.55	10.74	0.00	362.76	9.64	0.00	419.93	9.05	0.00	394.55	8.07	0.00	362.76
Battle Creek River to Custer Dr	2.53	0.00	419.93	2.57	0.00	394.55	1.97	0.00	362.76	0.71	0.00	419.93	0.77	0.00	394.55	0.63	0.00	362.76
Custer Dr to M-96	2.62	0.00	42.28	2.82	0.00	41.16	2.45	0.00	42.85	0.92	0.00	89.49	1.19	0.00	126.71	0.87	0.00	128.21
M-96 to Michigan Ave	3.09	0.00	66.23	3.70	0.00	55.57	3.28	0.00	60.16	0.63	0.00	66.23	0.96	0.00	55.57	0.78	0.00	60.16
Michigan Ave to 35th Street	3.06	0.00	22.02	4.16	0.00	29.29	3.87	0.00	27.46	0.83	0.00	22.02	1.26	0.00	29.29	1.15	0.00	27.46
35th Street to MP 37.75	0.72	0.00	7.86	0.96	0.00	11.53	0.88	0.00	10.40	0.16	0.00	7.86	0.23	0.00	11.53	0.21	0.00	10.40
MP 37.75 to MP 38.75	0.04	0.00	1.25	0.06	0.00	2.00	0.05	0.00	1.83	0.01	0.00	1.13	0.02	0.00	1.51	0.02	0.00	1.38
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.69	0.02	0.00	1.32	0.02	0.00	1.32	0.00	0.00	0.03	0.00	0.00	0.05	0.00	0.00	0.05

Table 8-10. Floodplain: Effect of Roughness Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.30	23.98	62.00	15.13	9.98	19.00	36.57	20.00	59.03	25.07	15.00	89.12	14.68	5.00	25.07	60.25	1.87	80.00
Ceresco to Raymond Rd	38.57	24.00	60.00	15.19	10.00	19.00	46.24	23.00	60.00	24.14	15.00	63.00	13.95	5.00	18.00	61.91	21.00	80.00
Raymond Rd to Kalamazoo Dam	47.63	0.00	60.00	15.81	0.00	22.00	36.48	0.00	78.00	24.20	15.00	58.00	13.99	5.00	18.00	61.81	24.00	80.00
Kalamazoo Dam to Battle Creek River	45.32	0.00	46.00	15.83	0.00	16.83	37.69	0.00	43.66	41.72	24.46	46.00	15.80	14.67	16.00	42.48	38.00	60.87
Battle Creek River to Custer Dr	45.56	0.00	60.00	17.71	0.00	22.00	36.73	24.00	100.00	23.52	14.86	58.00	11.30	4.95	18.00	65.17	24.00	80.18
Custer Dr to M-96	50.71	24.00	65.00	15.12	10.00	19.00	34.17	17.00	59.01	26.64	14.94	62.00	13.66	4.98	19.00	59.70	25.00	80.09
M-96 to Michigan Ave	47.99	24.00	60.06	15.81	9.99	24.00	36.19	22.93	60.00	24.85	15.00	50.15	13.80	5.00	18.00	61.35	34.80	80.00
Michigan Ave to 35th Street	44.79	24.00	60.00	16.18	10.00	24.00	39.03	23.00	60.00	22.61	15.00	50.00	12.02	5.00	18.00	65.37	35.00	80.00
35th Street to MP 37.75	47.67	24.00	68.00	14.38	10.00	19.00	37.94	16.00	59.00	21.97	15.00	46.00	11.80	5.00	22.00	66.23	40.00	80.00
MP 37.75 to MP 38.75	60.33	24.00	68.00	15.00	10.00	18.00	24.67	16.00	60.00	21.58	15.00	28.00	11.58	5.00	18.00	66.85	54.00	80.00
MP 38.75 to Morrow Lake Dam	58.64	56.00	68.00	15.07	10.00	16.00	26.29	16.00	30.00	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.26	23.06	62.67	15.12	9.40	18.96	36.62	19.14	60.61	25.47	14.81	97.55	14.60	2.39	28.21	59.93	0.03	80.26
Ceresco to Raymond Rd	38.40	0.00	60.99	15.20	0.00	19.41	46.40	22.15	100.00	24.07	14.08	63.13	13.90	4.69	18.11	62.03	20.88	81.23
Raymond Rd to Kalamazoo Dam	47.10	0.00	85.56	15.59	0.00	22.71	37.30	5.72	99.99	24.20	0.01	75.75	13.97	0.00	23.39	61.84	0.86	99.99
Kalamazoo Dam to Battle Creek River	4.95	0.00	97.21	1.12	0.00	16.00	93.93	0.11	100.00	29.35	0.01	97.03	9.06	0.00	33.67	61.58	0.20	99.99
Battle Creek River to Custer Dr	45.43	0.00	60.14	17.67	0.00	21.94	36.90	23.33	100.00	23.55	13.12	93.19	11.30	2.48	25.34	65.15	0.41	82.53
Custer Dr to M-96	50.66	23.71	65.90	15.10	9.82	19.57	34.24	15.85	59.50	26.64	14.43	62.13	13.66	4.81	19.16	59.70	24.87	80.77
M-96 to Michigan Ave	47.93	23.33	61.16	15.80	9.87	24.27	36.27	21.52	60.97	24.84	0.00	92.39	13.82	0.00	86.03	61.34	0.07	100.00
Michigan Ave to 35th Street	44.58	22.86	60.58	16.17	9.13	24.17	39.25	22.25	60.80	22.60	13.93	50.06	12.01	4.64	18.29	65.39	34.95	81.42
35th Street to MP 37.75	47.67	23.91	68.08	14.38	9.76	19.31	37.95	15.95	59.15	21.97	14.97	46.05	11.80	4.99	22.01	66.23	39.95	80.04
MP 37.75 to MP 38.75	60.34	24.00	68.09	15.01	10.00	18.03	24.64	15.90	60.00	21.58	15.00	28.01	11.58	5.00	18.01	66.85	53.98	80.00
MP 38.75 to Morrow Lake Dam	58.63	55.98	68.00	15.08	10.00	16.06	26.28	16.00	30.02	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Roughness * 1.5 (Model Run E1S1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.17	14.85	62.63	14.99	4.95	18.92	44.84	19.19	80.20	31.60	14.85	98.33	14.79	1.55	32.65	53.61	0.01	80.20
Ceresco to Raymond Rd	31.81	0.00	63.14	14.47	0.00	19.37	53.73	20.85	100.00	26.39	0.01	63.14	14.21	0.00	19.37	59.41	20.85	99.99
Raymond Rd to Kalamazoo Dam	38.08	0.00	86.24	15.26	0.00	22.74	46.65	0.54	99.99	28.18	0.00	86.24	14.21	0.00	22.74	57.61	0.54	99.99
Kalamazoo Dam to Battle Creek River	19.38	0.00	97.62	4.75	0.00	26.53	75.87	0.11	99.99	24.11	0.00	97.62	7.41	0.00	45.79	68.48	0.11	99.99
Battle Creek River to Custer Dr	35.12	0.00	79.20	13.67	0.00	21.97	51.21	18.68	99.99	26.47	0.01	94.65	12.12	0.00	21.97	61.41	0.09	99.99
Custer Dr to M-96	41.07	14.65	65.89	14.75	4.88	19.55	44.19	15.87	80.47	28.57	14.45	65.89	13.82	4.82	19.55	57.61	15.87	80.73
M-96 to Michigan Ave	38.85	14.60	61.17	15.05	4.86	24.20	46.09	21.49	80.54	26.42	0.00	91.85	13.98	0.00	84.84	59.60	0.10	100.00
Michigan Ave to 35th Street	35.62	14.10	60.47	14.48	4.70	24.20	49.90	22.39	81.19	25.45	14.10	60.47	12.52	4.70	24.00	62.03	22.39	81.19
35th Street to MP 37.75	44.13	14.97	68.09	13.98	4.99	19.27	41.89	15.94	80.04	26.58	14.97	68.08	12.17	4.99	22.01	61.25	15.95	80.04
MP 37.75 to MP 38.75	58.40	15.00	68.09	14.88	5.00	18.02	26.72	15.90	80.00	32.99	15.00	68.05	12.07	5.00	18.01	54.94	15.97	80.00
MP 38.75 to Morrow Lake Dam	56.94	25.00	68.00	15.09	10.00	18.00	27.97	16.00	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Roughness * 0.5 (Model Run E1S2)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.19	14.78	62.67	14.98	4.89	19.06	44.83	19.13	80.34	31.57	14.78	98.22	14.79	1.31	27.80	53.64	0.02	80.34
Ceresco to Raymond Rd	31.79	0.00	63.14	14.46	0.00	19.47	53.75	20.87	100.00	26.37	0.00	63.14	14.20	0.00	19.47	59.43	20.87	99.99
Raymond Rd to Kalamazoo Dam	38.08	0.00	87.69	15.26	0.00	26.93	46.66	0.88	100.00	28.18	0.00	87.69	14.21	0.00	26.93	57.60	0.88	100.00
Kalamazoo Dam to Battle Creek River	20.83	0.00	96.80	5.58	0.00	28.13	73.59	0.54	100.00	25.64	0.00	96.80	8.05	0.00	28.13	66.31	0.17	100.00
Battle Creek River to Custer Dr	35.13	0.00	91.01	13.67	0.00	21.85	51.20	0.54	100.00	26.47	0.00	95.45	12.12	0.00	21.85	61.41	0.20	100.00
Custer Dr to M-96	41.05	14.49	65.90	14.74	4.83	19.57	44.21	15.85	80.68	28.57	14.39	65.90	13.82	4.80	19.57	57.61	15.85	80.81
M-96 to Michigan Ave	38.83	14.44	61.13	15.05	4.80	24.25	46.12	21.63	80.75	26.41	0.00	86.17	13.98	0.00	90.25	59.61	0.04	100.00
Michigan Ave to 35th Street	35.60	14.03	60.71	14.47	4.68	24.12	49.93	22.09	81.30	25.44	14.03	60.71	12.52	4.68	24.05	62.04	22.09	81.30
35th Street to MP 37.75	44.14	14.98	68.08	13.98	4.99	19.42	41.88	15.93	80.03	26.57	14.98	68.08	12.17	4.99	22.00	61.26	15.94	80.03
MP 37.75 to MP 38.75	58.39	15.00	68.08	14.89	5.00	18.03	26.72	15.90	80.00	32.99	15.00	68.03	12.07	5.00	18.01	54.94	15.97	80.00
MP 38.75 to Morrow Lake Dam	56.94	25.00	68.00	15.09	10.00	18.00	27.97	16.00	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Table 8-11. Floodplain: Effect of Roughness Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.07	-16.87	27.24	0.33	-27.49	68.89
Ceresco to Raymond Rd	-1.37	-45.85	63.40	0.53	-43.65	52.15
Raymond Rd to Kalamazoo Dam	-0.05	-23.30	15.46	0.38	-27.12	119.33
Kalamazoo Dam to Battle Creek River	0.43	-0.15	8.81	1.23	-11.35	70.38
Battle Creek River to Custer Dr	-0.10	-31.58	44.48	0.16	-41.96	89.34
Custer Dr to M-96	0.15	-24.25	20.15	0.11	-57.36	78.82
M-96 to Michigan Ave	-0.23	-31.62	22.62	0.10	-53.82	80.49
Michigan Ave to 35th Street	-0.45	-36.79	69.67	0.25	-50.71	57.27
35th Street to MP 37.75	0.25	-27.23	20.19	0.05	-10.03	6.66
MP 37.75 to MP 38.75	0.47	0.00	3.36	0.01	-0.01	0.82
MP 38.75 to Morrow Lake Dam	0.02	-1.72	0.23	0.00	-0.01	0.01

Roughness * 1.5 (Model Run E1S1)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.17	-27.77	27.89	0.17	-27.77	32.84
Ceresco to Raymond Rd	-0.01	-46.26	66.72	0.16	-53.80	66.72
Raymond Rd to Kalamazoo Dam	0.10	-28.22	15.80	0.19	-28.22	50.37
Kalamazoo Dam to Battle Creek River	0.07	-24.71	11.44	0.44	-24.71	33.46
Battle Creek River to Custer Dr	0.16	-35.92	46.70	0.15	-43.59	51.28
Custer Dr to M-96	0.07	-32.31	24.18	0.11	-61.77	64.32
M-96 to Michigan Ave	-0.12	-49.02	27.42	0.13	-49.02	39.43
Michigan Ave to 35th Street	0.17	-51.34	69.04	0.31	-51.34	69.04
35th Street to MP 37.75	0.20	-27.14	19.56	0.07	-18.51	15.31
MP 37.75 to MP 38.75	0.49	0.00	3.46	0.02	-0.01	1.23
MP 38.75 to Morrow Lake Dam	0.03	-0.61	19.27	0.00	-0.01	0.01

Roughness * 0.5 (Model Run E1S2)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.31	-25.17	27.86	0.26	-25.17	27.43
Ceresco to Raymond Rd	-0.13	-42.51	77.34	0.23	-42.51	64.47
Raymond Rd to Kalamazoo Dam	0.18	-28.79	17.94	0.21	-26.12	56.33
Kalamazoo Dam to Battle Creek River	0.37	-28.79	62.42	0.24	-14.01	62.42
Battle Creek River to Custer Dr	0.21	-36.19	68.37	0.12	-44.41	68.37
Custer Dr to M-96	0.11	-37.81	27.66	0.13	-62.55	46.25
M-96 to Michigan Ave	-0.13	-46.82	43.91	0.11	-51.04	43.91
Michigan Ave to 35th Street	0.18	-52.50	64.73	0.22	-52.50	64.73
35th Street to MP 37.75	0.28	-28.90	24.27	0.06	-16.28	14.66
MP 37.75 to MP 38.75	0.34	-0.04	2.86	0.01	-0.04	1.28
MP 38.75 to Morrow Lake Dam	0.03	-0.25	19.99	0.00	-0.01	0.01

Table 8-12. Floodplain: Effect of Roughness Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	321	-1101	17074	7	-322	396	-502	-75396	81628	243	-656	21220	9	-393	334	619	-71100	193380
Ceresco to Raymond Rd	-76	-7342	9407	-49	-5199	224	-5517	-84718	144360	96	-892	15187	6	-535	319	1518	-95189	151320
Raymond Rd to Kalamazoo Dam	417	-24671	14280	-19	-7448	380	-1189	-70781	53918	326	-7176	25461	16	-4301	396	677	-70224	384150
Kalamazoo Dam to Battle Creek River	139	0	8950	3	0	128	5875	0	139390	57	-9672	8460	-29	-5804	228	2103	-58463	212170
Battle Creek River to Custer Dr	20	-16664	11903	-20	-7079	376	-815	-86462	196800	92	-30001	10488	8	-18000	288	303	-104790	195890
Custer Dr to M-96	203	-1808	10181	9	-573	325	-98	-81046	57478	155	-20982	14698	17	-12613	393	65	-88667	95864
M-96 to Michigan Ave	18	-19224	7555	-5	-5967	284	-1087	-88539	68446	99	-28214	20138	15	-16816	334	91	-85528	204640
Michigan Ave to 35th Street	-63	-2660	3600	-32	-1776	150	-2650	-83016	134720	43	-100	3060	6	-67	218	512	-80628	101000
35th Street to MP 37.75	258	-702	3975	32	-208	257	134	-82061	60917	58	0	4997	13	0	304	32	-15863	20591
MP 37.75 to MP 38.75	562	0	4475	194	0	285	0	-520	246	8	0	887	10	0	143	0	-67	41
MP 38.75 to Morrow Lake Dam	1	-4	23	134	0	226	-1	-2279	316	0	0	0	0	0	36	0	-13	11

Roughness * 1.5 (Model Run E1S1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	257	-538	17503	7	-324	327	-54	-84632	86049	251	-574	17503	9	-344	327	29	-71139	91168
Ceresco to Raymond Rd	12	-5823	12933	-17	-3791	289	-703	-94907	151118	72	-5823	14684	-1	-3578	316	131	-94907	151118
Raymond Rd to Kalamazoo Dam	275	-24112	11501	-10	-7279	341	-159	-70618	54962	295	-24112	23134	11	-7279	387	118	-70618	161811
Kalamazoo Dam to Battle Creek River	-90	-28919	7263	-87	-17351	268	1974	-86903	93996	-7	-28919	7263	-54	-17351	268	1386	-86903	122434
Battle Creek River to Custer Dr	57	-28919	11299	-11	-17351	366	88	-90349	190829	91	-28919	11299	6	-17351	366	274	-106003	190829
Custer Dr to M-96	166	-1506	11349	9	-475	381	-91	-84584	62577	153	-20677	12244	16	-12424	384	68	-84584	82527
M-96 to Michigan Ave	54	-11178	6953	3	-3470	312	-554	-89063	63579	100	-28104	19361	15	-16753	327	136	-89063	88035
Michigan Ave to 35th Street	-12	-2235	2812	-12	-1580	123	-450	-82925	132860	39	-2235	3993	4	-1580	226	593	-82925	125799
35th Street to MP 37.75	184	-548	5534	23	-162	285	130	-79593	58881	106	-548	5534	19	-162	285	-33	-56458	35700
MP 37.75 to MP 38.75	595	0	4437	176	0	263	0	-321	179	37	0	1712	33	0	236	0	-64	179
MP 38.75 to Morrow Lake Dam	1	-3	68	127	0	223	10	-826	40839	0	0	0	6	0	91	0	-10	9

Table 8-12. Floodplain: Effect of Roughness Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Roughness * 0.5 (Model Run E1S2)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	545	-2614	23471	12	-735	391	-39	-84715	75704	399	-2614	23471	11	-607	391	-60	-75843	75704
Ceresco to Raymond Rd	-28	-12339	13375	-49	-6766	359	-1042	-95585	188572	60	-12339	13375	-12	-6573	385	187	-95585	188572
Raymond Rd to Kalamazoo Dam	335	-28303	13427	-6	-8544	385	-101	-77312	65147	322	-24902	26308	12	-7517	412	107	-77312	170327
Kalamazoo Dam to Battle Creek River	-138	-30001	10284	-109	-18000	166	2504	-85064	315792	-37	-30001	10284	-86	-18000	166	831	-85064	315792
Battle Creek River to Custer Dr	68	-33933	12303	-24	-18000	394	279	-94674	315792	83	-33933	12303	-1	-18000	394	191	-106234	213147
Custer Dr to M-96	272	-4144	11078	14	-2530	358	-112	-92364	63657	165	-27733	18116	17	-16644	402	61	-92364	105862
M-96 to Michigan Ave	94	-33702	8135	-1	-10459	329	-621	-88933	123198	86	-33702	20456	12	-16697	337	95	-88933	123198
Michigan Ave to 35th Street	-23	-4472	4429	-25	-2266	209	-297	-91350	132330	22	-4472	4429	0	-2266	225	560	-91350	130062
35th Street to MP 37.75	369	-891	4909	53	-262	324	103	-86471	71935	88	-891	4909	21	-262	324	-46	-57953	39693
MP 37.75 to MP 38.75	392	0	3800	199	0	299	0	-1016	506	23	0	1705	32	0	250	0	-65	184
MP 38.75 to Morrow Lake Dam	1	-6	290	130	0	240	12	-861	43744	0	0	0	6	0	91	0	-11	10

Table 8-13. Riverine: Effect of Critical Shear Stress of Deposition Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.59	0.00	0.97	0.57	0.00	0.95	0.56	0.00	0.94
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.50	0.00	1.26	0.46	0.00	1.26	0.45	0.00	1.24
14.75 RDB Sediment Trap	0.49	0.27	0.70	0.46	0.26	0.66	0.45	0.25	0.64
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.58	0.00	1.50	0.55	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.28	0.12	0.52	0.26	0.11	0.49	0.24	0.10	0.47
26.00 RDB Sediment Trap	0.30	0.00	1.22	0.28	0.01	1.08	0.26	0.01	0.97
33.00 A Sediment Trap	0.36	0.00	1.25	0.33	0.00	1.13	0.31	0.00	1.04
Morrow Lake Delta	0.23	0.00	2.06	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.53	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Critical Shear Stress of Deposition * 1 .5 (Model Run A1S9)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.61	0.00	1.04	0.57	0.00	0.99	0.56	0.00	0.98
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.53	0.00	1.28	0.49	0.00	1.26	0.48	0.00	1.24
14.75 RDB Sediment Trap	0.60	0.27	1.23	0.56	0.26	1.15	0.54	0.25	1.13
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.60	0.00	1.52	0.56	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.36	0.12	0.89	0.33	0.11	0.82	0.31	0.10	0.80
26.00 RDB Sediment Trap	0.61	0.01	1.59	0.56	0.01	1.47	0.52	0.01	1.39
33.00 A Sediment Trap	0.63	0.00	1.77	0.58	0.00	1.65	0.54	0.00	1.57
Morrow Lake Delta	0.23	0.00	2.07	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.54	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Critical Shear Stress of Deposition * 0.5 (Model Run A1S10)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.61	0.00	1.04	0.57	0.00	0.99	0.56	0.00	0.98
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.53	0.00	1.28	0.49	0.00	1.26	0.48	0.00	1.24
14.75 RDB Sediment Trap	0.60	0.27	1.23	0.56	0.26	1.15	0.54	0.25	1.13
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.60	0.00	1.52	0.56	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.36	0.12	0.89	0.33	0.11	0.82	0.31	0.10	0.80
26.00 RDB Sediment Trap	0.61	0.01	1.59	0.56	0.01	1.47	0.52	0.01	1.39
33.00 A Sediment Trap	0.63	0.00	1.77	0.58	0.00	1.65	0.54	0.00	1.57
Morrow Lake Delta	0.23	0.00	2.06	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.54	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Table 8-14. Riverine: Effect of Critical Shear Stress of Deposition Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	0.98	0.00	2.92	0.92	0.00	2.89	0.91	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.01	0.00	4.03	0.92	0.00	4.05	0.90	0.00	3.99
14.75 RDB Sediment Trap	0.61	0.21	1.13	0.56	0.20	1.02	0.53	0.19	0.97
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.85	0.00	4.55	0.77	0.00	4.38	0.74	0.00	4.30
21.50 RDB Sediment Trap	0.18	0.03	0.70	0.17	0.03	0.69	0.17	0.03	0.70
26.00 RDB Sediment Trap	0.42	0.00	3.25	0.37	0.00	2.80	0.34	0.00	2.48
33.00 A Sediment Trap	0.60	0.00	3.13	0.55	0.00	2.81	0.50	0.00	2.54
Morrow Lake Delta	0.39	0.00	8.18	0.34	0.00	7.68	0.31	0.00	7.38
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Critical Shear Stress of Deposition * 1 .5 (Model Run A1S9)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	1.00	0.00	2.92	0.94	0.00	2.89	0.92	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.09	0.00	4.03	1.00	0.00	4.05	0.98	0.00	3.99
14.75 RDB Sediment Trap	0.74	0.20	2.44	0.67	0.18	2.26	0.64	0.17	2.18
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.87	0.00	4.55	0.79	0.00	4.38	0.76	0.00	4.30
21.50 RDB Sediment Trap	0.30	0.03	1.34	0.29	0.03	1.22	0.28	0.03	1.14
26.00 RDB Sediment Trap	1.05	0.00	3.60	0.92	0.00	3.24	0.83	0.00	3.01
33.00 A Sediment Trap	1.24	0.00	4.71	1.11	0.00	4.31	1.02	0.00	4.04
Morrow Lake Delta	0.38	0.00	8.19	0.34	0.00	7.69	0.31	0.00	7.38
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Critical Shear Stress of Deposition * 0.5 (Model Run A1S10)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	1.00	0.00	2.91	0.94	0.00	2.89	0.92	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.09	0.00	4.03	1.01	0.00	4.05	0.98	0.00	3.99
14.75 RDB Sediment Trap	0.74	0.20	2.45	0.67	0.18	2.26	0.64	0.17	2.18
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.87	0.00	4.55	0.79	0.00	4.38	0.76	0.00	4.29
21.50 RDB Sediment Trap	0.31	0.03	1.35	0.29	0.03	1.23	0.28	0.03	1.16
26.00 RDB Sediment Trap	1.05	0.00	3.61	0.92	0.00	3.24	0.83	0.00	3.02
33.00 A Sediment Trap	1.24	0.00	4.71	1.12	0.00	4.33	1.02	0.00	4.04
Morrow Lake Delta	0.38	0.00	8.16	0.34	0.00	7.65	0.31	0.00	7.33
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Table 8-15. Riverine: Effect of Critical Shear Stress of Deposition Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	14.0	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.0	15.4	14.0	18.0	33.3	24.0	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	30.0	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.6	26.9	60.0	16.8	10.0	51.4	34.5	21.7	53.0
21.50 RDB Sediment Trap	44.0	44.0	44.0	19.0	19.0	19.0	37.0	37.0	37.0
26.00 RDB Sediment Trap	34.0	34.0	34.0	12.0	12.0	12.0	54.0	54.0	54.0
33.00 A Sediment Trap	47.4	24.0	58.0	18.0	18.0	18.0	34.6	24.0	58.0
Morrow Lake Delta	49.6	24.0	68.0	14.5	10.0	19.0	35.9	16.0	59.0
Sediment Fan	60.2	24.0	68.0	14.8	10.0	18.0	25.0	16.0	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.1	15.4	14.0	18.0	33.3	23.9	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	29.9	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.1	1.0	60.2	16.4	3.1	72.5	35.5	0.6	95.9
21.50 RDB Sediment Trap	44.1	44.0	44.3	19.0	18.9	19.0	36.9	36.8	37.0
26.00 RDB Sediment Trap	34.1	33.7	34.7	12.0	11.9	12.3	53.9	53.0	54.5
33.00 A Sediment Trap	47.3	23.8	58.1	18.0	17.9	18.0	34.7	23.9	58.3
Morrow Lake Delta	49.6	23.9	68.1	14.5	9.9	19.1	35.9	15.9	59.2
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Critical Shear Stress of Deposition * 1 .5 (Model Run A1S9)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.1	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.1	62.0	15.5	14.0	18.0	33.6	20.0	58.8
14.75 RDB Sediment Trap	56.3	44.0	60.0	12.7	10.0	16.0	31.0	26.2	42.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.2	1.0	80.4	16.3	2.8	82.5	35.6	0.9	96.2
21.50 RDB Sediment Trap	45.3	44.0	57.0	18.4	14.0	19.0	36.3	25.0	42.0
26.00 RDB Sediment Trap	39.2	33.7	60.5	13.0	11.9	17.1	47.7	22.4	54.5
33.00 A Sediment Trap	49.4	23.8	58.8	17.6	14.1	18.2	33.0	23.0	58.3
Morrow Lake Delta	49.6	23.9	68.1	14.5	9.9	19.1	35.8	16.0	59.2
Sediment Fan	60.2	24.0	68.0	14.8	10.0	18.0	25.0	16.0	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Critical Shear Stress of Deposition * 0.5 (Model Run A1S10)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.3	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.2	62.0	15.5	13.9	18.0	33.5	20.0	58.6
14.75 RDB Sediment Trap	56.3	44.0	60.0	12.7	10.0	16.0	31.1	26.2	42.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.1	1.1	60.2	16.4	4.2	51.4	35.5	0.2	94.6
21.50 RDB Sediment Trap	45.4	44.0	57.0	18.4	14.0	19.0	36.2	25.0	42.1
26.00 RDB Sediment Trap	39.3	33.6	60.5	13.0	11.9	17.1	47.7	22.4	54.5
33.00 A Sediment Trap	49.3	23.8	58.7	17.6	14.1	18.2	33.0	23.0	58.3
Morrow Lake Delta	49.6	23.9	68.5	14.5	9.9	19.1	35.8	15.7	59.2
Sediment Fan	60.2	24.0	68.4	14.8	10.0	18.1	24.9	15.7	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.1	10.0	16.0	25.8	16.0	30.0

Table 8-16. Riverine: Effect of Critical Shear Stress of Deposition Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.05	-3.12	2.02
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.30	-2.27	2.89
14.75 RDB Sediment Trap	0.16	0.00	1.19
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.10	-4.65	4.22
21.50 RDB Sediment Trap	0.75	0.00	1.76
26.00 RDB Sediment Trap	0.79	-3.04	2.66
33.00 A Sediment Trap	0.34	0.00	1.31
Morrow Lake Delta	0.08	-6.94	7.05
Sediment Fan	0.02	0.00	1.04
West End of Morrow Lake	0.00	0.00	0.00

Critical Shear Stress of Deposition * 1.5 (Model Run A1S9)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.07	-3.12	1.64
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.07	-6.71	2.60
14.75 RDB Sediment Trap	0.11	-0.78	0.81
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.06	-4.65	4.22
21.50 RDB Sediment Trap	0.40	0.00	1.26
26.00 RDB Sediment Trap	0.39	-3.08	2.54
33.00 A Sediment Trap	0.12	-2.51	2.63
Morrow Lake Delta	0.05	-6.93	7.54
Sediment Fan	0.00	0.00	0.56
West End of Morrow Lake	0.00	0.00	0.00

Table 8-16. Riverine: Effect of Critical Shear Stress of Deposition Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Critical Shear Stress of Deposition * 0.5 (Model Run A1S10)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.00	-3.14	1.43
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.15	-6.75	4.53
14.75 RDB Sediment Trap	0.07	-0.79	1.39
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.19	-4.90	8.73
21.50 RDB Sediment Trap	1.40	0.00	4.45
26.00 RDB Sediment Trap	0.92	-3.14	5.91
33.00 A Sediment Trap	-0.09	-2.94	2.66
Morrow Lake Delta	0.14	-7.31	8.38
Sediment Fan	0.28	0.00	5.23
West End of Morrow Lake	0.01	0.00	0.19

Table 8-17. Riverine: Effect of Critical Shear Stress of Deposition Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	120.2	0.0	4186.0	3.2	0.0	107.0	12.4	-12693.0	7015.5
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	802.4	0.0	8991.4	30.1	0.0	183.0	137.0	-9680.1	9033.5
14.75 RDB Sediment Trap	531.7	0.0	4648.6	15.4	0.2	109.0	159.3	-73.3	2888.3
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	270.1	-1.3	8669.5	22.3	-0.2	204.0	190.5	-32352.0	25332.0
21.50 RDB Sediment Trap	3308.4	0.0	7100.8	141.4	0.0	224.0	39.6	0.0	498.8
26.00 RDB Sediment Trap	2740.3	0.0	8338.1	125.2	0.0	194.0	153.6	-27834.0	13962.0
33.00 A Sediment Trap	493.0	0.0	3616.5	15.0	0.0	108.0	1741.4	0.0	7492.5
Morrow Lake Delta	229.2	-526.7	6999.2	19.7	-164.0	216.0	15.6	-55991.0	45029.0
Sediment Fan	142.4	0.0	2978.9	95.9	0.0	197.0	0.1	-580.3	257.7
West End of Morrow Lake	9.1	-4.0	69.0	38.5	-0.8	116.0	0.1	-496.8	328.0

Critical Shear Stress of Deposition * 1 .5 (Model Run A1S9)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	232.6	0.0	3668.1	7.7	0.0	113.4	-19.4	-12690.9	7012.8
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	580.3	0.0	5682.2	34.1	0.0	180.9	-732.2	-39679.4	9030.6
14.75 RDB Sediment Trap	611.7	0.0	3011.0	26.8	0.0	109.4	87.4	-4982.6	2887.7
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	236.6	-0.3	5375.4	21.2	0.0	178.6	76.6	-32356.0	25332.7
21.50 RDB Sediment Trap	2081.4	0.0	5339.4	105.1	0.0	163.6	100.0	-262.4	1305.0
26.00 RDB Sediment Trap	1612.6	0.0	7210.0	79.6	0.0	168.3	-27.7	-27826.1	17597.1
33.00 A Sediment Trap	569.2	-1.4	3225.4	22.1	-0.5	113.3	485.5	-12335.6	16864.6
Morrow Lake Delta	197.4	-12.7	4670.1	22.6	-3.8	176.3	15.5	-55990.5	45026.4
Sediment Fan	62.5	0.0	1710.3	72.5	0.0	160.7	0.1	-580.4	257.7
West End of Morrow Lake	5.4	-2.0	46.4	29.1	-0.3	84.0	0.1	-473.0	328.2

Critical Shear Stress of Deposition * 0.5 (Model Run A1S10)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	20.7	-3.4	1709.1	0.8	-1.6	72.0	-19.4	-12696.9	7015.8
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	747.6	-251.5	12499.7	18.8	-95.6	203.2	-819.7	-40118.5	9061.3
14.75 RDB Sediment Trap	160.2	-17.7	2909.7	3.6	-1.2	51.5	87.4	-4985.7	2889.3
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	469.1	-696.3	21194.3	43.3	-221.9	588.5	76.8	-32500.2	25433.6
21.50 RDB Sediment Trap	5173.3	0.0	16730.7	150.4	0.0	406.5	102.7	-265.7	1352.6
26.00 RDB Sediment Trap	3208.0	-561.7	16282.1	141.2	-167.1	432.7	-27.4	-27884.0	17642.8
33.00 A Sediment Trap	-23.2	-1320.6	1842.6	-34.1	-406.2	124.2	493.6	-12450.0	16988.2
Morrow Lake Delta	345.6	-5788.3	20848.0	18.5	-1756.1	598.9	15.6	-56058.7	45132.4
Sediment Fan	743.9	-1.3	12960.7	264.3	0.0	542.4	0.1	-580.7	258.0
West End of Morrow Lake	25.3	-11.0	161.3	111.8	0.0	330.3	0.1	-420.4	332.4

Table 8-18. Floodplain: Effect of Critical Shear Stress of Deposition Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	1.22	0.00	2.66	1.16	0.00	2.58	1.02	0.00	2.46	0.19	0.00	2.32	0.17	0.00	2.20	0.13	0.00	1.98
Ceresco to Raymond Rd	1.46	0.00	4.06	1.43	0.00	4.00	1.28	0.00	3.69	0.26	0.00	2.52	0.26	0.00	2.39	0.20	0.00	2.01
Raymond Rd to Kalamazoo Dam	0.97	0.00	5.73	0.98	0.00	5.86	0.85	0.00	4.81	0.19	0.00	2.65	0.19	0.00	3.48	0.16	0.00	1.95
Kalamazoo Dam to Battle Creek River	2.98	0.00	9.77	3.05	0.00	9.99	2.57	0.00	8.52	1.02	0.00	11.13	1.04	0.00	11.49	0.82	0.00	9.98
Battle Creek River to Custer Dr	1.43	0.00	4.09	1.46	0.00	4.19	1.23	0.00	3.99	0.04	0.00	5.50	0.05	0.00	5.95	0.04	0.00	5.00
Custer Dr to M-96	1.03	0.00	3.07	1.04	0.00	3.02	1.00	0.00	3.02	0.16	0.00	2.62	0.21	0.00	3.48	0.16	0.00	3.52
M-96 to Michigan Ave	1.27	0.00	4.05	1.39	0.00	4.12	1.32	0.00	3.93	0.09	0.00	1.46	0.17	0.00	1.63	0.15	0.00	7.56
Michigan Ave to 35th Street	1.26	0.00	3.36	1.48	0.00	3.64	1.45	0.00	3.55	0.07	0.00	1.30	0.13	0.00	1.84	0.12	0.00	1.71
35th Street to MP 37.75	0.55	0.00	2.44	0.72	0.00	2.64	0.70	0.00	2.59	0.01	0.00	0.63	0.03	0.00	0.82	0.03	0.00	0.80
MP 37.75 to MP 38.75	0.16	0.00	0.75	0.20	0.00	0.95	0.20	0.00	0.93	0.00	0.00	0.06	0.01	0.00	0.17	0.01	0.00	0.16
MP 38.75 to Morrow Lake Dam	0.10	0.00	0.95	0.14	0.00	1.44	0.14	0.00	1.48	0.00	0.00	0.03	0.00	0.00	0.12	0.00	0.00	0.06

Critical Shear Stress of Deposition * 1.5 (Model Run E1S9)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.91	0.00	2.66	0.85	0.00	2.58	0.74	0.00	2.46	0.44	0.00	2.42	0.41	0.00	2.42	0.35	0.00	2.36
Ceresco to Raymond Rd	1.03	0.00	4.06	1.00	0.00	4.00	0.89	0.00	3.70	0.47	0.00	3.82	0.46	0.00	3.73	0.39	0.00	3.43
Raymond Rd to Kalamazoo Dam	0.70	0.00	5.73	0.71	0.00	5.84	0.61	0.00	4.81	0.34	0.00	5.73	0.34	0.00	5.84	0.29	0.00	4.81
Kalamazoo Dam to Battle Creek River	1.86	0.00	11.20	1.90	0.00	11.50	1.50	0.00	9.84	1.41	0.00	11.20	1.43	0.00	11.50	1.16	0.00	9.84
Battle Creek River to Custer Dr	0.97	0.00	9.50	1.00	0.00	9.84	0.83	0.00	8.70	0.20	0.00	9.50	0.21	0.00	9.84	0.17	0.00	8.70
Custer Dr to M-96	0.76	0.00	3.08	0.79	0.00	3.33	0.74	0.00	3.02	0.23	0.00	3.08	0.28	0.00	3.48	0.23	0.00	3.52
M-96 to Michigan Ave	0.89	0.00	4.07	1.00	0.00	4.12	0.95	0.00	3.93	0.16	0.00	4.07	0.24	0.00	4.12	0.22	0.00	3.93
Michigan Ave to 35th Street	0.85	0.00	3.36	1.05	0.00	3.64	1.02	0.00	3.55	0.20	0.00	3.36	0.28	0.00	3.64	0.27	0.00	3.55
35th Street to MP 37.75	0.48	0.00	2.44	0.63	0.00	2.64	0.61	0.00	2.58	0.08	0.00	2.44	0.11	0.00	2.64	0.11	0.00	2.58
MP 37.75 to MP 38.75	0.15	0.00	0.75	0.19	0.00	0.95	0.19	0.00	0.93	0.02	0.00	0.45	0.03	0.00	0.55	0.03	0.00	0.54
MP 38.75 to Morrow Lake Dam	0.09	0.00	0.96	0.14	0.00	1.44	0.14	0.00	1.48	0.01	0.00	0.12	0.01	0.00	0.18	0.01	0.00	0.18

Table 8-18. Floodplain: Effect of Critical Shear Stress of Deposition Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Critical Shear Stess of Deposition * 0.5 (Model Run E1S10)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.91	0.00	2.66	0.85	0.00	2.58	0.74	0.00	2.45	0.44	0.00	2.43	0.41	0.00	2.42	0.34	0.00	2.36
Ceresco to Raymond Rd	1.03	0.00	4.05	1.00	0.00	3.98	0.89	0.00	3.66	0.47	0.00	3.81	0.46	0.00	3.73	0.39	0.00	3.41
Raymond Rd to Kalamazoo Dam	0.70	0.00	5.75	0.71	0.00	5.88	0.61	0.00	4.83	0.34	0.00	5.75	0.34	0.00	5.88	0.29	0.00	4.83
Kalamazoo Dam to Battle Creek River	1.87	0.00	11.23	1.90	0.00	11.47	1.51	0.00	9.94	1.41	0.00	11.23	1.43	0.00	11.47	1.16	0.00	9.94
Battle Creek River to Custer Dr	0.97	0.00	9.58	1.00	0.00	9.70	0.83	0.00	8.64	0.20	0.00	9.58	0.21	0.00	9.70	0.17	0.00	8.64
Custer Dr to M-96	0.76	0.00	3.07	0.79	0.00	3.32	0.74	0.00	3.02	0.23	0.00	3.07	0.28	0.00	3.48	0.23	0.00	3.51
M-96 to Michigan Ave	0.89	0.00	4.06	1.00	0.00	4.12	0.95	0.00	3.92	0.17	0.00	4.06	0.24	0.00	4.12	0.22	0.00	3.92
Michigan Ave to 35th Street	0.85	0.00	3.36	1.05	0.00	3.65	1.02	0.00	3.55	0.20	0.00	3.36	0.28	0.00	3.65	0.27	0.00	3.55
35th Street to MP 37.75	0.48	0.00	2.44	0.63	0.00	2.64	0.61	0.00	2.58	0.08	0.00	2.44	0.11	0.00	2.64	0.11	0.00	2.58
MP 37.75 to MP 38.75	0.15	0.00	0.75	0.19	0.00	0.95	0.19	0.00	0.93	0.02	0.00	0.45	0.03	0.00	0.55	0.03	0.00	0.54
MP 38.75 to Morrow Lake Dam	0.09	0.00	0.96	0.14	0.00	1.44	0.14	0.00	1.48	0.01	0.00	0.12	0.02	0.00	0.25	0.01	0.00	0.18

Table 8-19. Floodplain: Effect of Critical Shear Stress of Deposition Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.87	0.00	47.11	3.63	0.00	46.69	3.16	0.00	48.48	1.24	0.00	41.29	1.11	0.00	40.05	0.88	0.00	40.47
Ceresco to Raymond Rd	10.16	0.00	81.46	9.85	0.00	79.31	8.67	0.00	72.95	2.36	0.00	40.69	2.24	0.00	44.38	1.65	0.00	47.50
Raymond Rd to Kalamazoo Dam	5.09	0.00	66.30	5.13	0.00	65.33	4.39	0.00	52.60	1.00	0.00	100.80	1.07	0.00	170.10	0.83	0.00	32.79
Kalamazoo Dam to Battle Creek River	21.80	0.00	275.80	24.18	0.00	284.60	19.37	0.00	235.10	8.87	0.00	433.80	9.43	0.00	455.20	7.52	0.00	422.30
Battle Creek River to Custer Dr	4.31	0.00	135.40	4.43	0.00	146.30	3.43	0.00	118.40	0.23	0.00	226.80	0.30	0.00	257.80	0.25	0.00	230.10
Custer Dr to M-96	3.56	0.00	44.67	3.53	0.00	41.38	3.35	0.00	44.88	0.90	0.00	99.26	1.25	0.00	158.00	0.90	0.00	159.90
M-96 to Michigan Ave	4.49	0.00	87.13	5.05	0.00	67.45	4.66	0.00	70.10	0.48	0.00	23.10	0.91	0.00	31.77	0.82	0.00	594.10
Michigan Ave to 35th Street	5.17	0.00	29.71	6.58	0.00	36.18	6.36	0.00	34.87	0.46	0.00	13.84	0.96	0.00	23.22	0.91	0.00	21.52
35th Street to MP 37.75	1.10	0.00	10.13	1.52	0.00	13.96	1.44	0.00	13.36	0.02	0.00	6.43	0.09	0.00	7.95	0.09	0.00	7.57
MP 37.75 to MP 38.75	0.06	0.00	1.66	0.09	0.00	2.70	0.08	0.00	2.55	0.00	0.00	0.09	0.01	0.00	0.50	0.01	0.00	0.48
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.03	0.00	1.76	0.03	0.00	1.84	0.00	0.00	0.02	0.00	0.00	0.36	0.00	0.00	0.06

Critical Shear Stress of Deposition * 1.5 (Model Run E1S9)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.16	0.00	47.13	2.93	0.00	46.71	2.51	0.00	48.49	2.070	0.000	47.127	1.913	0.000	46.709	1.615	0.000	48.494
Ceresco to Raymond Rd	7.87	0.00	81.48	7.59	0.00	79.35	6.46	0.00	73.01	3.756	0.000	81.483	3.611	0.000	79.353	2.922	0.000	73.012
Raymond Rd to Kalamazoo Dam	3.91	0.00	176.17	3.93	0.00	151.90	3.33	0.00	70.66	1.915	0.000	195.025	1.925	0.000	177.954	1.627	0.000	79.602
Kalamazoo Dam to Battle Creek River	17.03	0.00	452.74	17.18	0.00	452.97	13.26	0.00	423.82	12.328	0.000	452.740	12.400	0.000	452.973	9.895	0.000	423.825
Battle Creek River to Custer Dr	3.28	0.00	448.95	3.39	0.00	447.87	2.60	0.00	423.82	0.933	0.000	448.951	1.001	0.000	447.870	0.804	0.000	423.825
Custer Dr to M-96	3.10	0.00	51.44	3.27	0.00	48.33	2.95	0.00	49.55	1.159	0.000	99.265	1.477	0.000	158.001	1.136	0.000	160.015
M-96 to Michigan Ave	3.67	0.00	88.17	4.39	0.00	67.56	3.99	0.00	70.08	0.792	0.000	96.760	1.221	0.000	67.564	1.039	0.000	70.076
Michigan Ave to 35th Street	3.82	0.00	29.68	5.36	0.00	36.18	5.14	0.00	35.00	1.057	0.000	29.676	1.682	0.000	36.184	1.598	0.000	35.001
35th Street to MP 37.75	0.96	0.00	10.12	1.36	0.00	13.95	1.29	0.00	13.24	0.209	0.000	10.118	0.343	0.000	13.952	0.324	0.000	13.243
MP 37.75 to MP 38.75	0.05	0.00	1.66	0.08	0.00	2.69	0.08	0.00	2.54	0.015	0.000	1.659	0.031	0.000	2.484	0.030	0.000	2.338
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.02	0.00	1.76	0.03	0.00	1.84	0.001	0.000	0.030	0.004	0.000	0.065	0.004	0.000	0.068

Table 8-19. Floodplain: Effect of Critical Shear Stress of Deposition Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Critical Shear Stess of Deposition * 0.5 (Model Run E1S10)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.16	0.00	47.05	2.93	0.00	46.57	2.51	0.00	48.27	2.089	0.000	47.053	1.913	0.000	46.569	1.594	0.000	48.268
Ceresco to Raymond Rd	7.87	0.00	81.31	7.60	0.00	79.02	6.45	0.00	72.58	3.754	0.000	81.312	3.613	0.000	79.021	2.920	0.000	72.583
Raymond Rd to Kalamazoo Dam	3.91	0.00	172.56	3.94	0.00	151.65	3.33	0.00	78.33	1.916	0.000	193.294	1.932	0.000	177.654	1.626	0.000	79.140
Kalamazoo Dam to Battle Creek River	17.35	0.00	451.96	17.22	0.00	453.28	13.52	0.00	424.69	12.550	0.000	451.956	12.420	0.000	453.280	10.070	0.000	424.686
Battle Creek River to Custer Dr	3.29	0.00	447.16	3.37	0.00	440.32	2.59	0.00	424.69	0.929	0.000	447.156	0.996	0.000	440.322	0.802	0.000	424.686
Custer Dr to M-96	3.09	0.00	51.43	3.27	0.00	48.28	2.95	0.00	49.49	1.156	0.000	99.224	1.478	0.000	157.710	1.137	0.000	159.447
M-96 to Michigan Ave	3.67	0.00	86.86	4.40	0.00	66.99	3.99	0.00	69.38	0.785	0.000	86.861	1.219	0.000	66.990	1.036	0.000	69.377
Michigan Ave to 35th Street	3.83	0.00	29.59	5.36	0.00	36.11	5.14	0.00	34.86	1.058	0.000	29.593	1.683	0.000	36.107	1.598	0.000	34.857
35th Street to MP 37.75	0.96	0.00	10.11	1.37	0.00	13.97	1.29	0.00	13.25	0.209	0.000	10.114	0.344	0.000	13.972	0.325	0.000	13.247
MP 37.75 to MP 38.75	0.05	0.00	1.66	0.08	0.00	2.70	0.08	0.00	2.55	0.015	0.000	1.655	0.031	0.000	2.490	0.030	0.000	2.347
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.02	0.00	1.76	0.03	0.00	1.84	0.001	0.000	0.029	0.008	0.000	1.071	0.004	0.000	0.068

Table 8-20. Floodplain: Effect of Critical Shear Stress of Deposition Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.30	23.98	62.00	15.13	9.98	19.00	36.57	20.00	59.03	25.07	15.00	89.12	14.68	5.00	25.07	60.25	1.87	80.00
Ceresco to Raymond Rd	38.57	24.00	60.00	15.19	10.00	19.00	46.24	23.00	60.00	24.14	15.00	63.00	13.95	5.00	18.00	61.91	21.00	80.00
Raymond Rd to Kalamazoo Dam	47.63	0.00	60.00	15.81	0.00	22.00	36.48	0.00	78.00	24.20	15.00	58.00	13.99	5.00	18.00	61.81	24.00	80.00
Kalamazoo Dam to Battle Creek River	45.32	0.00	46.00	15.83	0.00	16.83	37.69	0.00	43.66	41.72	24.46	46.00	15.80	14.67	16.00	42.48	38.00	60.87
Battle Creek River to Custer Dr	45.56	0.00	60.00	17.71	0.00	22.00	36.73	24.00	100.00	23.52	14.86	58.00	11.30	4.95	18.00	65.17	24.00	80.18
Custer Dr to M-96	50.71	24.00	65.00	15.12	10.00	19.00	34.17	17.00	59.01	26.64	14.94	62.00	13.66	4.98	19.00	59.70	25.00	80.09
M-96 to Michigan Ave	47.99	24.00	60.06	15.81	9.99	24.00	36.19	22.93	60.00	24.85	15.00	50.15	13.80	5.00	18.00	61.35	34.80	80.00
Michigan Ave to 35th Street	44.79	24.00	60.00	16.18	10.00	24.00	39.03	23.00	60.00	22.61	15.00	50.00	12.02	5.00	18.00	65.37	35.00	80.00
35th Street to MP 37.75	47.67	24.00	68.00	14.38	10.00	19.00	37.94	16.00	59.00	21.97	15.00	46.00	11.80	5.00	22.00	66.23	40.00	80.00
MP 37.75 to MP 38.75	60.33	24.00	68.00	15.00	10.00	18.00	24.67	16.00	60.00	21.58	15.00	28.00	11.58	5.00	18.00	66.85	54.00	80.00
MP 38.75 to Morrow Lake Dam	58.64	56.00	68.00	15.07	10.00	16.00	26.29	16.00	30.00	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.26	23.06	62.67	15.12	9.40	18.96	36.62	19.14	60.61	25.47	14.81	97.55	14.60	2.39	28.21	59.93	0.03	80.26
Ceresco to Raymond Rd	38.40	0.00	60.99	15.20	0.00	19.41	46.40	22.15	100.00	24.07	14.08	63.13	13.90	4.69	18.11	62.03	20.88	81.23
Raymond Rd to Kalamazoo Dam	47.10	0.00	85.56	15.59	0.00	22.71	37.30	5.72	99.99	24.20	0.01	75.75	13.97	0.00	23.39	61.84	0.86	99.99
Kalamazoo Dam to Battle Creek River	4.95	0.00	97.21	1.12	0.00	16.00	93.93	0.11	100.00	29.35	0.01	97.03	9.06	0.00	33.67	61.58	0.20	99.99
Battle Creek River to Custer Dr	45.43	0.00	60.14	17.67	0.00	21.94	36.90	23.33	100.00	23.55	13.12	93.19	11.30	2.48	25.34	65.15	0.41	82.53
Custer Dr to M-96	50.66	23.71	65.90	15.10	9.82	19.57	34.24	15.85	59.50	26.64	14.43	62.13	13.66	4.81	19.16	59.70	24.87	80.77
M-96 to Michigan Ave	47.93	23.33	61.16	15.80	9.87	24.27	36.27	21.52	60.97	24.84	0.00	92.39	13.82	0.00	86.03	61.34	0.07	100.00
Michigan Ave to 35th Street	44.58	22.86	60.58	16.17	9.13	24.17	39.25	22.25	60.80	22.60	13.93	50.06	12.01	4.64	18.29	65.39	34.95	81.42
35th Street to MP 37.75	47.67	23.91	68.08	14.38	9.76	19.31	37.95	15.95	59.15	21.97	14.97	46.05	11.80	4.99	22.01	66.23	39.95	80.04
MP 37.75 to MP 38.75	60.34	24.00	68.09	15.01	10.00	18.03	24.64	15.90	60.00	21.58	15.00	28.01	11.58	5.00	18.01	66.85	53.98	80.00
MP 38.75 to Morrow Lake Dam	58.63	55.98	68.00	15.08	10.00	16.06	26.28	16.00	30.02	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Table 8-20. Floodplain: Effect of Critical Shear Stress of Deposition Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Critical Shear Stress * 1.5 (Model Run E1S9)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.19	14.89	62.67	14.98	4.93	18.96	44.83	19.14	80.18	31.59	14.89	98.55	14.77	1.30	27.94	53.64	0.01	80.18
Ceresco to Raymond Rd	31.80	0.00	63.10	14.46	0.00	19.41	53.74	20.89	100.00	26.38	0.01	63.10	14.20	0.00	19.41	59.41	20.89	99.99
Raymond Rd to Kalamazoo Dam	38.09	0.00	82.12	15.26	0.00	28.57	46.64	1.06	100.00	28.18	0.01	82.12	14.21	0.00	28.57	57.61	1.06	99.99
Kalamazoo Dam to Battle Creek River	20.52	0.00	96.51	5.50	0.00	29.81	73.98	0.12	100.00	24.83	0.00	96.51	7.93	0.00	33.35	67.24	0.12	100.00
Battle Creek River to Custer Dr	35.13	0.00	84.99	13.68	0.00	21.96	51.19	12.38	100.00	26.47	0.00	93.50	12.13	0.00	29.80	61.41	0.32	100.00
Custer Dr to M-96	41.07	14.59	65.90	14.74	4.86	19.57	44.19	15.85	80.54	28.57	14.43	65.90	13.82	4.81	19.57	57.61	15.85	80.77
M-96 to Michigan Ave	38.85	14.55	61.21	15.05	4.84	24.27	46.10	21.45	80.60	26.41	0.00	91.70	13.98	0.00	90.21	59.61	0.13	100.00
Michigan Ave to 35th Street	35.61	13.94	60.59	14.47	4.65	24.17	49.91	22.24	81.42	25.44	13.94	60.59	12.52	4.65	24.01	62.03	22.24	81.42
35th Street to MP 37.75	44.13	14.97	68.05	13.98	4.99	19.30	41.89	15.96	80.04	26.57	14.97	68.04	12.17	4.99	22.01	61.26	15.97	80.04
MP 37.75 to MP 38.75	58.38	15.00	68.05	14.89	5.00	18.03	26.73	15.94	80.00	32.99	15.00	68.01	12.07	5.00	18.01	54.94	15.98	80.00
MP 38.75 to Morrow Lake Dam	56.95	25.00	68.00	15.09	10.00	18.00	27.96	16.00	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Critical Shear Stess of Deposition * 0.5 (Model Run E1S10)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.15	14.79	62.65	14.99	4.93	18.96	44.86	19.16	80.28	31.51	14.79	97.36	14.80	2.60	45.81	53.68	0.04	80.28
Ceresco to Raymond Rd	31.78	0.00	63.12	14.45	0.00	19.38	53.77	20.88	100.00	26.37	0.01	63.12	14.20	0.00	19.38	59.43	20.88	99.99
Raymond Rd to Kalamazoo Dam	38.08	0.00	88.04	15.26	0.00	22.70	46.66	0.55	100.00	28.17	0.00	88.04	14.21	0.00	22.70	57.62	0.55	100.00
Kalamazoo Dam to Battle Creek River	20.85	0.00	97.61	5.03	0.00	26.03	74.12	0.15	100.00	25.01	0.00	97.61	7.57	0.00	35.83	67.42	0.15	100.00
Battle Creek River to Custer Dr	35.12	0.00	93.45	13.67	0.00	21.93	51.21	3.65	100.00	26.47	0.00	93.45	12.12	0.00	21.93	61.41	0.23	100.00
Custer Dr to M-96	41.06	14.59	65.82	14.74	4.86	19.51	44.20	15.95	80.55	28.57	14.42	65.82	13.82	4.81	19.51	57.61	15.95	80.77
M-96 to Michigan Ave	38.84	14.50	61.05	15.05	4.84	24.27	46.11	21.78	80.66	26.43	0.00	94.44	13.97	0.01	66.01	59.61	0.03	99.99
Michigan Ave to 35th Street	35.60	13.93	60.54	14.47	4.64	24.17	49.93	22.30	81.43	25.44	13.93	60.54	12.52	4.64	24.01	62.04	22.30	81.43
35th Street to MP 37.75	44.14	14.98	68.17	13.98	4.99	19.30	41.89	15.90	80.03	26.58	14.98	68.17	12.17	4.99	22.01	61.25	15.90	80.03
MP 37.75 to MP 38.75	58.43	15.00	68.18	14.88	5.00	18.03	26.69	15.79	80.00	32.99	15.00	68.14	12.07	5.00	18.02	54.94	15.92	80.00
MP 38.75 to Morrow Lake Dam	56.94	25.00	68.00	15.10	10.00	18.00	27.96	15.99	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Table 8-21. Floodplain: Effect of Critical Shear Stress of Deposition Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.07	-16.87	27.24	0.33	-27.49	68.89
Ceresco to Raymond Rd	-1.37	-45.85	63.40	0.53	-43.65	52.15
Raymond Rd to Kalamazoo Dam	-0.05	-23.30	15.46	0.38	-27.12	119.33
Kalamazoo Dam to Battle Creek River	0.43	-0.15	8.81	1.23	-11.35	70.38
Battle Creek River to Custer Dr	-0.10	-31.58	44.48	0.16	-41.96	89.34
Custer Dr to M-96	0.15	-24.25	20.15	0.11	-57.36	78.82
M-96 to Michigan Ave	-0.23	-31.62	22.62	0.10	-53.82	80.49
Michigan Ave to 35th Street	-0.45	-36.79	69.67	0.25	-50.71	57.27
35th Street to MP 37.75	0.25	-27.23	20.19	0.05	-10.03	6.66
MP 37.75 to MP 38.75	0.47	0.00	3.36	0.01	-0.01	0.82
MP 38.75 to Morrow Lake Dam	0.02	-1.72	0.23	0.00	-0.01	0.01

Critical Shear Stress of Deposition * 1.5 (Model Run E1S9)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.30	-27.49	27.23	0.31	-27.49	68.89
Ceresco to Raymond Rd	0.00	-45.85	63.36	0.21	-45.85	59.78
Raymond Rd to Kalamazoo Dam	0.24	-27.16	16.56	0.29	-27.16	120.47
Kalamazoo Dam to Battle Creek River	0.31	-18.69	28.69	0.95	-18.69	70.66
Battle Creek River to Custer Dr	0.20	-35.74	52.73	0.16	-41.70	89.48
Custer Dr to M-96	0.12	-36.42	26.09	0.14	-57.15	78.91
M-96 to Michigan Ave	-0.09	-47.13	27.87	0.12	-53.79	81.34
Michigan Ave to 35th Street	0.22	-50.74	69.63	0.28	-50.74	69.63
35th Street to MP 37.75	0.21	-27.11	20.11	0.04	-18.00	15.13
MP 37.75 to MP 38.75	0.23	-0.04	1.94	0.01	-0.04	0.68
MP 38.75 to Morrow Lake Dam	0.01	-1.72	0.19	0.00	-0.01	0.01

Critical Shear Stress of Deposition * 0.5 (Model Run E1S10)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.08	-27.51	27.48	0.15	-27.51	68.62
Ceresco to Raymond Rd	-0.37	-46.07	63.99	0.07	-46.07	59.87
Raymond Rd to Kalamazoo Dam	-0.02	-27.38	16.68	0.17	-26.92	118.37
Kalamazoo Dam to Battle Creek River	0.22	-24.70	28.23	0.90	-17.40	69.31
Battle Creek River to Custer Dr	0.04	-36.10	52.90	0.11	-44.00	89.12
Custer Dr to M-96	0.00	-37.03	26.23	0.11	-60.00	79.03
M-96 to Michigan Ave	-0.26	-47.04	27.98	0.12	-54.16	78.63
Michigan Ave to 35th Street	-0.10	-50.70	70.05	0.23	-50.70	70.05
35th Street to MP 37.75	0.21	-28.53	20.16	0.11	-19.65	15.21
MP 37.75 to MP 38.75	1.09	0.00	7.10	0.06	-0.01	3.33
MP 38.75 to Morrow Lake Dam	0.05	-1.73	0.36	0.00	-0.01	0.01

Table 8-22. Floodplain: Effect of Critical Shear Stress of Deposition Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	321	-1101	17074	7	-322	396	-502	-75396	81628	243	-656	21220	9	-393	334	619	-71100	193380
Ceresco to Raymond Rd	-76	-7342	9407	-49	-5199	224	-5517	-84718	144360	96	-892	15187	6	-535	319	1518	-95189	151320
Raymond Rd to Kalamazoo Dam	417	-24671	14280	-19	-7448	380	-1189	-70781	53918	326	-7176	25461	16	-4301	396	677	-70224	384150
Kalamazoo Dam to Battle Creek River	139	0	8950	3	0	128	5875	0	139390	57	-9672	8460	-29	-5804	228	2103	-58463	212170
Battle Creek River to Custer Dr	20	-16664	11903	-20	-7079	376	-815	-86462	196800	92	-30001	10488	8	-18000	288	303	-104790	195890
Custer Dr to M-96	203	-1808	10181	9	-573	325	-98	-81046	57478	155	-20982	14698	17	-12613	393	65	-88667	95864
M-96 to Michigan Ave	18	-19224	7555	-5	-5967	284	-1087	-88539	68446	99	-28214	20138	15	-16816	334	91	-85528	204640
Michigan Ave to 35th Street	-63	-2660	3600	-32	-1776	150	-2650	-83016	134720	43	-100	3060	6	-67	218	512	-80628	101000
35th Street to MP 37.75	258	-702	3975	32	-208	257	134	-82061	60917	58	0	4997	13	0	304	32	-15863	20591
MP 37.75 to MP 38.75	562	0	4475	194	0	285	0	-520	246	8	0	887	10	0	143	0	-67	41
MP 38.75 to Morrow Lake Dam	1	-4	23	134	0	226	-1	-2279	316	0	0	0	0	0	36	0	-13	11

Critical Shear Stress of Deposition * 1.5 (Model Run E1S9)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	546	-157	21935	17	-54	388	-43	-84600	81535	422	-157	21935	15	-83	388	126	-71095	193469
Ceresco to Raymond Rd	61	-2382	14790	-2	-1690	340	-817	-95179	151261	102	-2296	14790	5	-1625	344	172	-95179	151261
Raymond Rd to Kalamazoo Dam	428	-9252	12007	14	-4423	367	-176	-70762	55437	383	-9252	27270	19	-4423	411	243	-70762	384137
Kalamazoo Dam to Battle Creek River	49	-21292	11621	-52	-12775	251	2411	-87725	165785	75	-21292	11621	-32	-12775	251	2611	-87725	212749
Battle Creek River to Custer Dr	112	-21292	11621	1	-12775	351	180	-92229	196583	105	-21292	11164	9	-12775	351	260	-104659	196583
Custer Dr to M-96	248	-340	9122	16	-185	343	-108	-88668	62523	163	-7807	16553	20	-4747	378	85	-88668	96104
M-96 to Michigan Ave	89	-6914	5815	10	-2143	287	-565	-88484	68147	86	-29308	21562	17	-17485	353	133	-88484	204522
Michigan Ave to 35th Street	22	-661	2949	1	-475	178	-388	-82923	134648	31	-661	2949	6	-475	202	576	-82923	128641
35th Street to MP 37.75	221	-84	2957	44	-24	279	122	-82027	60993	65	-84	2957	21	-24	279	-39	-57348	37301
MP 37.75 to MP 38.75	257	0	2424	167	0	246	0	-519	246	14	0	969	28	0	204	0	-64	177
MP 38.75 to Morrow Lake Dam	0	-1	5	109	0	205	-1	-2279	319	0	0	0	5	0	72	0	-12	10

Table 8-22. Floodplain: Effect of Critical Shear Stress of Deposition Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Critical Shear Stess of Deposition * 0.5 (Model Run E1S10)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	48	-9013	16311	-39	-3569	391	-42	-84629	82732	117	-9013	16311	-15	-2876	391	126	-71346	192910
Ceresco to Raymond Rd	-522	-34489	14927	-262	-24429	282	-823	-95318	152580	-119	-34489	15910	-82	-24429	344	179	-95318	152580
Raymond Rd to Kalamazoo Dam	105	-28303	20820	-73	-8544	487	-176	-71032	55717	190	-28303	20820	-11	-8544	487	242	-71032	384132
Kalamazoo Dam to Battle Creek River	-321	-30001	7526	-183	-18000	171	2484	-87773	175833	-180	-30001	7526	-157	-18000	171	2604	-87773	209503
Battle Creek River to Custer Dr	-209	-73951	16169	-127	-31428	521	192	-92510	198000	10	-73951	16169	-26	-31428	521	262	-105157	198000
Custer Dr to M-96	87	-12809	17249	-19	-5408	491	-108	-88726	62822	142	-29636	17249	10	-17782	491	85	-88726	96134
M-96 to Michigan Ave	-145	-61029	10979	-68	-19418	386	-569	-88956	70124	85	-61029	17038	5	-19418	422	135	-88956	204692
Michigan Ave to 35th Street	-421	-16972	1711	-196	-10687	135	-391	-83659	135653	-33	-16972	6234	-28	-10687	287	580	-83659	129355
35th Street to MP 37.75	230	-6422	12879	1	-1903	440	122	-82366	61457	163	-6422	12879	16	-1903	440	-39	-57598	37480
MP 37.75 to MP 38.75	1428	0	9903	270	0	419	0	-520	246	84	0	5111	50	0	391	0	-65	124
MP 38.75 to Morrow Lake Dam	11	-16	200	212	0	369	-1	-2279	318	0	0	0	13	0	147	0	-12	10

Table 8-23. Riverine: Effect of Settling Velocity Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.59	0.00	0.97	0.57	0.00	0.95	0.56	0.00	0.94
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.50	0.00	1.26	0.46	0.00	1.26	0.45	0.00	1.24
14.75 RDB Sediment Trap	0.49	0.27	0.70	0.46	0.26	0.66	0.45	0.25	0.64
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.58	0.00	1.50	0.55	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.28	0.12	0.52	0.26	0.11	0.49	0.24	0.10	0.47
26.00 RDB Sediment Trap	0.30	0.00	1.22	0.28	0.01	1.08	0.26	0.01	0.97
33.00 A Sediment Trap	0.36	0.00	1.25	0.33	0.00	1.13	0.31	0.00	1.04
Morrow Lake Delta	0.23	0.00	2.06	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.53	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.61	0.00	1.04	0.57	0.00	0.99	0.56	0.00	0.97
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.53	0.00	1.27	0.49	0.00	1.26	0.48	0.00	1.24
14.75 RDB Sediment Trap	0.60	0.27	1.23	0.56	0.26	1.15	0.54	0.25	1.13
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.60	0.00	1.52	0.56	0.00	1.46	0.54	0.00	1.45
21.50 RDB Sediment Trap	0.36	0.12	0.89	0.33	0.11	0.82	0.31	0.10	0.80
26.00 RDB Sediment Trap	0.61	0.01	1.59	0.56	0.01	1.48	0.52	0.01	1.40
33.00 A Sediment Trap	0.64	0.00	1.78	0.58	0.00	1.66	0.54	0.00	1.57
Morrow Lake Delta	0.23	0.00	2.07	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.54	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.61	0.00	1.04	0.57	0.00	0.99	0.56	0.00	0.98
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.53	0.00	1.28	0.49	0.00	1.26	0.48	0.00	1.25
14.75 RDB Sediment Trap	0.60	0.27	1.23	0.56	0.26	1.15	0.54	0.25	1.13
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.60	0.00	1.51	0.56	0.00	1.45	0.54	0.00	1.43
21.50 RDB Sediment Trap	0.36	0.12	0.89	0.33	0.11	0.82	0.31	0.10	0.80
26.00 RDB Sediment Trap	0.61	0.01	1.58	0.56	0.01	1.47	0.52	0.01	1.39
33.00 A Sediment Trap	0.63	0.00	1.77	0.58	0.00	1.65	0.54	0.00	1.56
Morrow Lake Delta	0.23	0.00	2.07	0.21	0.00	1.98	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.54	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Table 8-24. Riverine: Effect of Settling Velocity Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	0.98	0.00	2.92	0.92	0.00	2.89	0.91	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.01	0.00	4.03	0.92	0.00	4.05	0.90	0.00	3.99
14.75 RDB Sediment Trap	0.61	0.21	1.13	0.56	0.20	1.02	0.53	0.19	0.97
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.85	0.00	4.55	0.77	0.00	4.38	0.74	0.00	4.30
21.50 RDB Sediment Trap	0.18	0.03	0.70	0.17	0.03	0.69	0.17	0.03	0.70
26.00 RDB Sediment Trap	0.42	0.00	3.25	0.37	0.00	2.80	0.34	0.00	2.48
33.00 A Sediment Trap	0.60	0.00	3.13	0.55	0.00	2.81	0.50	0.00	2.54
Morrow Lake Delta	0.39	0.00	8.18	0.34	0.00	7.68	0.31	0.00	7.38
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Settling Velocity * 1.5 (Model Run A1S5)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	1.00	0.00	2.94	0.94	0.00	2.92	0.92	0.00	2.93
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.09	0.00	4.03	1.00	0.00	4.06	0.98	0.00	4.00
14.75 RDB Sediment Trap	0.74	0.20	2.45	0.67	0.18	2.27	0.64	0.17	2.18
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.87	0.00	4.61	0.79	0.00	4.46	0.76	0.00	4.40
21.50 RDB Sediment Trap	0.30	0.03	1.34	0.28	0.03	1.22	0.27	0.03	1.14
26.00 RDB Sediment Trap	1.05	0.00	3.63	0.92	0.00	3.27	0.84	0.00	3.05
33.00 A Sediment Trap	1.25	0.00	4.76	1.13	0.00	4.39	1.04	0.00	4.10
Morrow Lake Delta	0.38	0.00	8.24	0.34	0.00	7.73	0.31	0.00	7.41
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Settling Velocity * 0.5 (Model Run A1S6)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	1.00	0.00	2.88	0.94	0.00	2.85	0.92	0.00	2.85
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.09	0.00	4.01	1.00	0.00	4.03	0.97	0.00	3.96
14.75 RDB Sediment Trap	0.74	0.20	2.44	0.67	0.18	2.26	0.65	0.17	2.17
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.87	0.00	4.48	0.79	0.00	4.31	0.76	0.00	4.23
21.50 RDB Sediment Trap	0.31	0.03	1.35	0.29	0.03	1.23	0.28	0.03	1.15
26.00 RDB Sediment Trap	1.04	0.00	3.58	0.91	0.00	3.22	0.83	0.00	2.99
33.00 A Sediment Trap	1.24	0.00	4.69	1.11	0.00	4.32	1.02	0.00	4.03
Morrow Lake Delta	0.38	0.00	8.17	0.34	0.00	7.68	0.30	0.00	7.38
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Table 8-25. Riverine: Effect of Settling Velocity Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	14.0	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.0	15.4	14.0	18.0	33.3	24.0	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	30.0	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.6	26.9	60.0	16.8	10.0	51.4	34.5	21.7	53.0
21.50 RDB Sediment Trap	44.0	44.0	44.0	19.0	19.0	19.0	37.0	37.0	37.0
26.00 RDB Sediment Trap	34.0	34.0	34.0	12.0	12.0	12.0	54.0	54.0	54.0
33.00 A Sediment Trap	47.4	24.0	58.0	18.0	18.0	18.0	34.6	24.0	58.0
Morrow Lake Delta	49.6	24.0	68.0	14.5	10.0	19.0	35.9	16.0	59.0
Sediment Fan	60.2	24.0	68.0	14.8	10.0	18.0	25.0	16.0	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.1	15.4	14.0	18.0	33.3	23.9	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	29.9	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.1	1.0	60.2	16.4	3.1	72.5	35.5	0.6	95.9
21.50 RDB Sediment Trap	44.1	44.0	44.3	19.0	18.9	19.0	36.9	36.8	37.0
26.00 RDB Sediment Trap	34.1	33.7	34.7	12.0	11.9	12.3	53.9	53.0	54.5
33.00 A Sediment Trap	47.3	23.8	58.1	18.0	17.9	18.0	34.7	23.9	58.3
Morrow Lake Delta	49.6	23.9	68.1	14.5	9.9	19.1	35.9	15.9	59.2
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Settling Velocity * 1.5 (Model Run A1S5)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.0	62.0	15.5	14.0	18.0	33.6	20.0	59.0
14.75 RDB Sediment Trap	56.3	44.0	60.0	12.7	10.0	16.0	31.0	26.0	42.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.4	17.7	60.1	17.3	10.0	81.6	34.4	0.7	53.0
21.50 RDB Sediment Trap	45.3	44.0	57.0	18.4	14.0	19.0	36.3	25.0	42.0
26.00 RDB Sediment Trap	39.2	34.0	60.0	13.0	11.9	17.0	47.7	23.0	54.0
33.00 A Sediment Trap	49.3	24.0	58.2	17.6	13.9	18.1	33.0	23.8	58.0
Morrow Lake Delta	49.6	24.0	68.1	14.5	10.0	19.0	35.8	15.9	59.0
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	16.0	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Table 8-25. Riverine: Effect of Settling Velocity Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Settling Velocity * 0.5 (Model Run A1S6)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.3	24.0	62.0	15.3	13.8	18.0	34.3	19.9	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.5	62.0	15.5	14.0	18.0	33.6	20.0	58.2
14.75 RDB Sediment Trap	56.3	43.9	60.0	12.7	10.0	16.0	31.1	26.3	42.2
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	47.9	0.1	60.6	15.9	0.1	46.7	36.2	0.5	99.8
21.50 RDB Sediment Trap	45.3	43.9	57.1	18.4	14.0	19.0	36.3	24.9	41.9
26.00 RDB Sediment Trap	39.3	33.4	60.8	13.0	11.8	17.2	47.7	22.0	54.8
33.00 A Sediment Trap	49.3	23.8	58.9	17.6	14.2	18.3	33.1	22.8	58.4
Morrow Lake Delta	49.6	23.9	68.1	14.5	9.8	19.2	35.9	15.9	59.2
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Table 8-26. Riverine: Effect of Settling Velocity Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.05	-3.12	2.02
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.30	-2.27	2.89
14.75 RDB Sediment Trap	0.16	0.00	1.19
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.10	-4.65	4.22
21.50 RDB Sediment Trap	0.75	0.00	1.76
26.00 RDB Sediment Trap	0.79	-3.04	2.66
33.00 A Sediment Trap	0.34	0.00	1.31
Morrow Lake Delta	0.08	-6.94	7.05
Sediment Fan	0.02	0.00	1.04
West End of Morrow Lake	0.00	0.00	0.00

Settling Velocity * 1.5 (Model Run A1S5)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.06	0.00	2.53
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.24	0.00	3.24
14.75 RDB Sediment Trap	0.22	0.00	1.55
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.10	0.00	3.53
21.50 RDB Sediment Trap	0.60	0.00	2.06
26.00 RDB Sediment Trap	0.57	0.00	3.06
33.00 A Sediment Trap	0.27	0.00	1.29
Morrow Lake Delta	0.07	-5.20	6.92
Sediment Fan	0.02	0.00	1.02
West End of Morrow Lake	0.00	0.00	0.00

Table 8-26. Riverine: Effect of Settling Velocity Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Settling Velocity * 0.5 (Model Run A1S6)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.02	-4.05	3.20
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.03	-7.34	7.35
14.75 RDB Sediment Trap	0.20	-1.70	1.13
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.16	-5.60	7.71
21.50 RDB Sediment Trap	0.60	-0.20	1.29
26.00 RDB Sediment Trap	0.15	-3.99	3.52
33.00 A Sediment Trap	0.28	-3.93	3.20
Morrow Lake Delta	0.08	-8.29	8.55
Sediment Fan	0.05	0.00	0.90
West End of Morrow Lake	0.00	0.00	0.00

Table 8-27. Riverine: Effect of Settling Velocity Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	120.2	0.0	4186.0	3.2	0.0	107.0	12.4	-12693.0	7015.5
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	802.4	0.0	8991.4	30.1	0.0	183.0	137.0	-9680.1	9033.5
14.75 RDB Sediment Trap	531.7	0.0	4648.6	15.4	0.2	109.0	159.3	-73.3	2888.3
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	270.1	-1.3	8669.5	22.3	-0.2	204.0	190.5	-32352.0	25332.0
21.50 RDB Sediment Trap	3308.4	0.0	7100.8	141.4	0.0	224.0	39.6	0.0	498.8
26.00 RDB Sediment Trap	2740.3	0.0	8338.1	125.2	0.0	194.0	153.6	-27834.0	13962.0
33.00 A Sediment Trap	493.0	0.0	3616.5	15.0	0.0	108.0	1741.4	0.0	7492.5
Morrow Lake Delta	229.2	-526.7	6999.2	19.7	-164.0	216.0	15.6	-55991.0	45029.0
Sediment Fan	142.4	0.0	2978.9	95.9	0.0	197.0	0.1	-580.3	257.7
West End of Morrow Lake	9.1	-4.0	69.0	38.5	-0.8	116.0	0.1	-496.8	328.0

Settling Velocity * 1.5 (Model Run A1S5)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	138.1	0.0	5476.1	4.6	0.0	148.8	0.0	0.0	0.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	769.5	0.0	10648.3	37.6	0.0	263.3	0.0	0.0	0.0
14.75 RDB Sediment Trap	797.5	0.0	6184.8	27.0	0.0	214.4	0.0	0.0	0.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	289.8	-1.3	9867.8	28.9	-0.2	299.0	-0.8	-880.2	213.2
21.50 RDB Sediment Trap	2791.1	0.0	8483.4	162.7	0.0	298.4	0.0	0.0	0.0
26.00 RDB Sediment Trap	2128.4	0.0	11046.3	119.1	0.0	271.1	117.8	0.0	1797.4
33.00 A Sediment Trap	428.2	-10.8	4211.0	15.4	-3.5	156.2	984.9	-3015.2	10081.0
Morrow Lake Delta	228.7	-518.8	8392.9	26.4	-140.7	301.7	-3.5	-37202.7	36282.1
Sediment Fan	109.1	0.0	3134.4	108.0	0.0	281.9	0.0	-9.6	17.2
West End of Morrow Lake	7.6	-4.0	65.5	30.3	-0.3	121.0	0.0	-135.6	89.8

Settling Velocity * 0.5 (Model Run A1S6)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	76.5	0.0	2456.1	1.6	0.0	54.5	-3.7	-21207.0	18793.4
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	544.1	0.0	5648.2	13.0	0.0	90.3	-1372.8	-60654.5	27329.0
14.75 RDB Sediment Trap	441.5	0.0	3380.2	8.9	0.0	107.7	632.0	-12385.9	7684.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	229.7	-0.4	6170.1	13.8	-0.1	114.3	602.8	-38238.2	50004.8
21.50 RDB Sediment Trap	2302.9	0.0	4980.6	67.5	0.0	109.0	285.3	-2017.6	3258.2
26.00 RDB Sediment Trap	1422.0	0.0	5253.5	48.1	0.0	109.9	-1597.6	-49513.8	26009.8
33.00 A Sediment Trap	241.5	-5.2	2507.3	4.3	-2.7	82.3	1374.5	-29749.9	21110.8
Morrow Lake Delta	215.5	-546.0	4784.6	11.4	-168.6	117.9	83.4	-80016.3	68215.4
Sediment Fan	214.6	0.0	2739.3	66.7	0.0	111.9	0.7	-1672.5	773.4
West End of Morrow Lake	12.5	-5.0	73.1	40.1	-0.9	79.1	0.4	-1258.1	633.0

Table 8-28. Floodplain: Effect of Settling Velocity Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	1.22	0.00	2.66	1.16	0.00	2.58	1.02	0.00	2.46	0.19	0.00	2.32	0.17	0.00	2.20	0.13	0.00	1.98
Ceresco to Raymond Rd	1.46	0.00	4.06	1.43	0.00	4.00	1.28	0.00	3.69	0.26	0.00	2.52	0.26	0.00	2.39	0.20	0.00	2.01
Raymond Rd to Kalamazoo Dam	0.97	0.00	5.73	0.98	0.00	5.86	0.85	0.00	4.81	0.19	0.00	2.65	0.19	0.00	3.48	0.16	0.00	1.95
Kalamazoo Dam to Battle Creek River	2.98	0.00	9.77	3.05	0.00	9.99	2.57	0.00	8.52	1.02	0.00	11.13	1.04	0.00	11.49	0.82	0.00	9.98
Battle Creek River to Custer Dr	1.43	0.00	4.09	1.46	0.00	4.19	1.23	0.00	3.99	0.04	0.00	5.50	0.05	0.00	5.95	0.04	0.00	5.00
Custer Dr to M-96	1.03	0.00	3.07	1.04	0.00	3.02	1.00	0.00	3.02	0.16	0.00	2.62	0.21	0.00	3.48	0.16	0.00	3.52
M-96 to Michigan Ave	1.27	0.00	4.05	1.39	0.00	4.12	1.32	0.00	3.93	0.09	0.00	1.46	0.17	0.00	1.63	0.15	0.00	7.56
Michigan Ave to 35th Street	1.26	0.00	3.36	1.48	0.00	3.64	1.45	0.00	3.55	0.07	0.00	1.30	0.13	0.00	1.84	0.12	0.00	1.71
35th Street to MP 37.75	0.55	0.00	2.44	0.72	0.00	2.64	0.70	0.00	2.59	0.01	0.00	0.63	0.03	0.00	0.82	0.03	0.00	0.80
MP 37.75 to MP 38.75	0.16	0.00	0.75	0.20	0.00	0.95	0.20	0.00	0.93	0.00	0.00	0.06	0.01	0.00	0.17	0.01	0.00	0.16
MP 38.75 to Morrow Lake Dam	0.10	0.00	0.95	0.14	0.00	1.44	0.14	0.00	1.48	0.00	0.00	0.03	0.00	0.00	0.12	0.00	0.00	0.06

Settling Velocity * 1.5 (Model Run E1S5)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.91	0.00	2.65	0.85	0.00	2.57	0.74	0.00	2.45	0.44	0.00	2.42	0.41	0.00	2.41	0.34	0.00	2.37
Ceresco to Raymond Rd	1.03	0.00	4.09	1.00	0.00	4.01	0.89	0.00	3.70	0.47	0.00	3.81	0.46	0.00	3.73	0.39	0.00	3.42
Raymond Rd to Kalamazoo Dam	0.70	0.00	5.73	0.71	0.00	5.85	0.61	0.00	4.81	0.34	0.00	5.73	0.34	0.00	5.85	0.29	0.00	4.81
Kalamazoo Dam to Battle Creek River	1.86	0.00	11.20	1.90	0.00	11.41	1.50	0.00	9.77	1.41	0.00	11.20	1.43	0.00	11.41	1.16	0.00	9.77
Battle Creek River to Custer Dr	0.97	0.00	9.48	1.00	0.00	9.55	0.83	0.00	8.48	0.20	0.00	9.48	0.21	0.00	9.55	0.17	0.00	8.48
Custer Dr to M-96	0.76	0.00	3.08	0.79	0.00	3.33	0.74	0.00	3.02	0.23	0.00	3.08	0.28	0.00	3.47	0.23	0.00	3.52
M-96 to Michigan Ave	0.89	0.00	4.06	1.00	0.00	4.14	0.95	0.00	3.95	0.17	0.00	4.06	0.24	0.00	4.14	0.22	0.00	3.95
Michigan Ave to 35th Street	0.85	0.00	3.37	1.05	0.00	3.64	1.02	0.00	3.56	0.20	0.00	3.37	0.28	0.00	3.64	0.27	0.00	3.56
35th Street to MP 37.75	0.48	0.00	2.44	0.63	0.00	2.65	0.62	0.00	2.60	0.08	0.00	2.44	0.11	0.00	2.65	0.11	0.00	2.60
MP 37.75 to MP 38.75	0.15	0.00	0.75	0.19	0.00	0.95	0.19	0.00	0.93	0.02	0.00	0.45	0.03	0.00	0.55	0.03	0.00	0.54
MP 38.75 to Morrow Lake Dam	0.09	0.00	0.95	0.14	0.00	1.44	0.14	0.00	1.48	0.01	0.00	0.12	0.01	0.00	0.18	0.01	0.00	0.18

Table 8-28. Floodplain: Effect of Settling Velocity Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Settling Velocity * 0.5 (Model Run E1S6)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.91	0.00	2.66	0.85	0.00	2.57	0.74	0.00	2.45	0.44	0.00	2.43	0.41	0.00	2.42	0.34	0.00	2.37
Ceresco to Raymond Rd	1.03	0.00	4.06	1.00	0.00	4.00	0.89	0.00	3.70	0.47	0.00	3.82	0.46	0.00	3.74	0.39	0.00	3.43
Raymond Rd to Kalamazoo Dam	0.70	0.00	5.73	0.71	0.00	5.86	0.61	0.00	4.81	0.34	0.00	5.73	0.34	0.00	5.86	0.29	0.00	4.81
Kalamazoo Dam to Battle Creek River	1.86	0.00	11.21	1.91	0.00	11.42	1.51	0.00	9.95	1.40	0.00	11.21	1.43	0.00	11.42	1.16	0.00	9.95
Battle Creek River to Custer Dr	0.97	0.00	9.42	1.00	0.00	9.73	0.83	0.00	8.64	0.20	0.00	9.42	0.21	0.00	9.73	0.17	0.00	8.64
Custer Dr to M-96	0.76	0.00	3.07	0.79	0.00	3.33	0.74	0.00	3.01	0.23	0.00	3.07	0.28	0.00	3.49	0.23	0.00	3.52
M-96 to Michigan Ave	0.89	0.00	4.07	1.00	0.00	4.12	0.95	0.00	3.92	0.16	0.00	4.07	0.24	0.00	4.12	0.22	0.00	3.92
Michigan Ave to 35th Street	0.85	0.00	3.36	1.05	0.00	3.65	1.02	0.00	3.55	0.20	0.00	3.36	0.28	0.00	3.65	0.27	0.00	3.55
35th Street to MP 37.75	0.48	0.00	2.43	0.63	0.00	2.64	0.62	0.00	2.58	0.08	0.00	2.43	0.11	0.00	2.64	0.11	0.00	2.58
MP 37.75 to MP 38.75	0.15	0.00	0.75	0.19	0.00	0.95	0.19	0.00	0.93	0.02	0.00	0.45	0.03	0.00	0.55	0.03	0.00	0.54
MP 38.75 to Morrow Lake Dam	0.09	0.00	0.96	0.14	0.00	1.44	0.14	0.00	1.48	0.01	0.00	0.12	0.01	0.00	0.18	0.01	0.00	0.18

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.87	0.00	47.11	3.63	0.00	46.69	3.16	0.00	48.48	1.24	0.00	41.29	1.11	0.00	40.05	0.88	0.00	40.47
Ceresco to Raymond Rd	10.16	0.00	81.46	9.85	0.00	79.31	8.67	0.00	72.95	2.36	0.00	40.69	2.24	0.00	44.38	1.65	0.00	47.50
Raymond Rd to Kalamazoo Dam	5.09	0.00	66.30	5.13	0.00	65.33	4.39	0.00	52.60	1.00	0.00	100.80	1.07	0.00	170.10	0.83	0.00	32.79
Kalamazoo Dam to Battle Creek River	21.80	0.00	275.80	24.18	0.00	284.60	19.37	0.00	235.10	8.87	0.00	433.80	9.43	0.00	455.20	7.52	0.00	422.30
Battle Creek River to Custer Dr	4.31	0.00	135.40	4.43	0.00	146.30	3.43	0.00	118.40	0.23	0.00	226.80	0.30	0.00	257.80	0.25	0.00	230.10
Custer Dr to M-96	3.56	0.00	44.67	3.53	0.00	41.38	3.35	0.00	44.88	0.90	0.00	99.26	1.25	0.00	158.00	0.90	0.00	159.90
M-96 to Michigan Ave	4.49	0.00	87.13	5.05	0.00	67.45	4.66	0.00	70.10	0.48	0.00	23.10	0.91	0.00	31.77	0.82	0.00	594.10
Michigan Ave to 35th Street	5.17	0.00	29.71	6.58	0.00	36.18	6.36	0.00	34.87	0.46	0.00	13.84	0.96	0.00	23.22	0.91	0.00	21.52
35th Street to MP 37.75	1.10	0.00	10.13	1.52	0.00	13.96	1.44	0.00	13.36	0.02	0.00	6.43	0.09	0.00	7.95	0.09	0.00	7.57
MP 37.75 to MP 38.75	0.06	0.00	1.66	0.09	0.00	2.70	0.08	0.00	2.55	0.00	0.00	0.09	0.01	0.00	0.50	0.01	0.00	0.48
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.03	0.00	1.76	0.03	0.00	1.84	0.00	0.00	0.02	0.00	0.00	0.36	0.00	0.00	0.06

Settling Velocity * 1.5 (Model Run E1S5)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.16	0.00	47.25	2.93	0.00	46.89	2.51	0.00	48.32	2.09	0.00	47.25	1.91	0.00	46.89	1.60	0.00	48.32
Ceresco to Raymond Rd	7.86	0.00	81.62	7.60	0.00	79.00	6.47	0.00	72.38	3.76	0.00	81.62	3.61	0.00	79.00	2.93	0.00	72.38
Raymond Rd to Kalamazoo Dam	3.90	0.00	170.41	3.94	0.00	151.14	3.28	0.00	53.04	1.91	0.00	190.04	1.92	0.00	171.08	1.58	0.00	53.04
Kalamazoo Dam to Battle Creek River	17.00	0.00	452.92	17.33	0.00	459.10	13.19	0.00	413.55	12.32	0.00	452.92	12.51	0.00	459.10	9.85	0.00	413.55
Battle Creek River to Custer Dr	3.28	0.00	446.75	3.38	0.00	438.36	2.60	0.00	413.55	0.94	0.00	446.75	1.00	0.00	438.36	0.81	0.00	413.55
Custer Dr to M-96	3.10	0.00	51.58	3.26	0.00	48.47	2.94	0.00	49.72	1.16	0.00	98.93	1.48	0.00	157.32	1.14	0.00	159.53
M-96 to Michigan Ave	3.66	0.00	87.26	4.40	0.00	67.57	3.97	0.00	70.15	0.78	0.00	87.26	1.22	0.00	67.57	1.04	0.00	70.15
Michigan Ave to 35th Street	3.82	0.00	29.86	5.36	0.00	36.54	5.16	0.00	35.28	1.06	0.00	29.86	1.68	0.00	36.54	1.61	0.00	35.28
35th Street to MP 37.75	0.96	0.00	10.15	1.37	0.00	13.97	1.30	0.00	13.39	0.21	0.00	10.15	0.34	0.00	13.97	0.33	0.00	13.39
MP 37.75 to MP 38.75	0.05	0.00	1.66	0.08	0.00	2.69	0.08	0.00	2.56	0.02	0.00	1.66	0.03	0.00	2.47	0.03	0.00	2.35
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.78	0.02	0.00	1.76	0.03	0.00	1.84	0.00	0.00	0.03	0.00	0.00	0.07	0.00	0.00	0.07

Table 8-29. Floodplain: Effect of Settling Velocity Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Settling Velocity * 0.5 (Model Run E1S6)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.16	0.00	47.02	2.93	0.00	46.48	2.51	0.00	48.50	2.08	0.00	47.02	1.91	0.00	46.48	1.59	0.00	48.50
Ceresco to Raymond Rd	7.86	0.00	81.73	7.59	0.00	79.74	6.45	0.00	73.44	3.75	0.00	81.73	3.61	0.00	79.74	2.91	0.00	73.44
Raymond Rd to Kalamazoo Dam	3.91	0.00	173.39	3.93	0.00	152.45	3.29	0.00	52.58	1.91	0.00	194.06	1.92	0.00	172.57	1.59	0.00	52.58
Kalamazoo Dam to Battle Creek River	17.02	0.00	454.25	17.55	0.00	459.49	13.53	0.00	423.74	12.32	0.00	454.25	12.65	0.00	459.49	10.07	0.00	423.74
Battle Creek River to Custer Dr	3.27	0.00	444.89	3.40	0.00	454.52	2.60	0.00	423.74	0.93	0.00	444.89	1.00	0.00	454.52	0.80	0.00	423.74
Custer Dr to M-96	3.10	0.00	51.48	3.27	0.00	48.15	2.95	0.00	49.26	1.16	0.00	99.68	1.48	0.00	158.35	1.14	0.00	160.03
M-96 to Michigan Ave	3.67	0.00	87.99	4.40	0.00	67.45	3.99	0.00	70.08	0.79	0.00	87.99	1.22	0.00	67.45	1.04	0.00	70.08
Michigan Ave to 35th Street	3.82	0.00	29.64	5.36	0.00	36.03	5.13	0.00	34.89	1.06	0.00	29.64	1.68	0.00	36.03	1.60	0.00	34.89
35th Street to MP 37.75	0.95	0.00	9.05	1.36	0.00	13.96	1.29	0.00	13.30	0.21	0.00	9.05	0.34	0.00	13.96	0.33	0.00	13.30
MP 37.75 to MP 38.75	0.05	0.00	1.66	0.08	0.00	2.70	0.08	0.00	2.57	0.02	0.00	1.66	0.03	0.00	2.49	0.03	0.00	2.37
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.02	0.00	1.76	0.03	0.00	1.84	0.00	0.00	0.03	0.00	0.00	0.24	0.00	0.00	0.07

Table 8-30. Floodplain: Effect of Settling Velocity Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.30	23.98	62.00	15.13	9.98	19.00	36.57	20.00	59.03	25.07	15.00	89.12	14.68	5.00	25.07	60.25	1.87	80.00
Ceresco to Raymond Rd	38.57	24.00	60.00	15.19	10.00	19.00	46.24	23.00	60.00	24.14	15.00	63.00	13.95	5.00	18.00	61.91	21.00	80.00
Raymond Rd to Kalamazoo Dam	47.63	0.00	60.00	15.81	0.00	22.00	36.48	0.00	78.00	24.20	15.00	58.00	13.99	5.00	18.00	61.81	24.00	80.00
Kalamazoo Dam to Battle Creek River	45.32	0.00	46.00	15.83	0.00	16.83	37.69	0.00	43.66	41.72	24.46	46.00	15.80	14.67	16.00	42.48	38.00	60.87
Battle Creek River to Custer Dr	45.56	0.00	60.00	17.71	0.00	22.00	36.73	24.00	100.00	23.52	14.86	58.00	11.30	4.95	18.00	65.17	24.00	80.18
Custer Dr to M-96	50.71	24.00	65.00	15.12	10.00	19.00	34.17	17.00	59.01	26.64	14.94	62.00	13.66	4.98	19.00	59.70	25.00	80.09
M-96 to Michigan Ave	47.99	24.00	60.06	15.81	9.99	24.00	36.19	22.93	60.00	24.85	15.00	50.15	13.80	5.00	18.00	61.35	34.80	80.00
Michigan Ave to 35th Street	44.79	24.00	60.00	16.18	10.00	24.00	39.03	23.00	60.00	22.61	15.00	50.00	12.02	5.00	18.00	65.37	35.00	80.00
35th Street to MP 37.75	47.67	24.00	68.00	14.38	10.00	19.00	37.94	16.00	59.00	21.97	15.00	46.00	11.80	5.00	22.00	66.23	40.00	80.00
MP 37.75 to MP 38.75	60.33	24.00	68.00	15.00	10.00	18.00	24.67	16.00	60.00	21.58	15.00	28.00	11.58	5.00	18.00	66.85	54.00	80.00
MP 38.75 to Morrow Lake Dam	58.64	56.00	68.00	15.07	10.00	16.00	26.29	16.00	30.00	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.26	23.06	62.67	15.12	9.40	18.96	36.62	19.14	60.61	25.47	14.81	97.55	14.60	2.39	28.21	59.93	0.03	80.26
Ceresco to Raymond Rd	38.40	0.00	60.99	15.20	0.00	19.41	46.40	22.15	100.00	24.07	14.08	63.13	13.90	4.69	18.11	62.03	20.88	81.23
Raymond Rd to Kalamazoo Dam	47.10	0.00	85.56	15.59	0.00	22.71	37.30	5.72	99.99	24.20	0.01	75.75	13.97	0.00	23.39	61.84	0.86	99.99
Kalamazoo Dam to Battle Creek River	4.95	0.00	97.21	1.12	0.00	16.00	93.93	0.11	100.00	29.35	0.01	97.03	9.06	0.00	33.67	61.58	0.20	99.99
Battle Creek River to Custer Dr	45.43	0.00	60.14	17.67	0.00	21.94	36.90	23.33	100.00	23.55	13.12	93.19	11.30	2.48	25.34	65.15	0.41	82.53
Custer Dr to M-96	50.66	23.71	65.90	15.10	9.82	19.57	34.24	15.85	59.50	26.64	14.43	62.13	13.66	4.81	19.16	59.70	24.87	80.77
M-96 to Michigan Ave	47.93	23.33	61.16	15.80	9.87	24.27	36.27	21.52	60.97	24.84	0.00	92.39	13.82	0.00	86.03	61.34	0.07	100.00
Michigan Ave to 35th Street	44.58	22.86	60.58	16.17	9.13	24.17	39.25	22.25	60.80	22.60	13.93	50.06	12.01	4.64	18.29	65.39	34.95	81.42
35th Street to MP 37.75	47.67	23.91	68.08	14.38	9.76	19.31	37.95	15.95	59.15	21.97	14.97	46.05	11.80	4.99	22.01	66.23	39.95	80.04
MP 37.75 to MP 38.75	60.34	24.00	68.09	15.01	10.00	18.03	24.64	15.90	60.00	21.58	15.00	28.01	11.58	5.00	18.01	66.85	53.98	80.00
MP 38.75 to Morrow Lake Dam	58.63	55.98	68.00	15.08	10.00	16.06	26.28	16.00	30.02	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Table 8-30. Floodplain: Effect of Settling Velocity Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Settling Velocity * 1.5 (Model Run E1S5)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.22	14.88	62.54	14.99	4.93	18.98	44.79	19.70	80.15	31.57	14.88	97.62	14.80	2.35	26.91	53.63	0.01	80.15
Ceresco to Raymond Rd	31.89	0.14	63.05	14.48	0.05	19.31	53.62	20.96	99.81	26.44	0.54	63.07	14.23	0.17	19.31	59.34	20.96	99.29
Raymond Rd to Kalamazoo Dam	38.21	0.00	85.45	15.37	0.00	45.42	46.42	0.23	100.00	28.24	0.02	85.45	14.26	0.01	45.42	57.50	0.23	99.98
Kalamazoo Dam to Battle Creek River	35.00	0.00	97.49	9.81	0.00	35.10	55.19	0.00	100.00	35.90	0.00	97.49	11.06	0.00	35.10	53.03	0.00	100.00
Battle Creek River to Custer Dr	35.21	0.00	96.89	13.77	0.00	63.79	51.02	0.01	100.00	26.48	0.00	96.89	12.15	0.00	63.79	61.37	0.01	100.00
Custer Dr to M-96	41.09	14.94	65.86	14.75	4.98	19.45	44.16	15.91	80.08	28.58	14.94	65.86	13.82	4.98	19.45	57.60	15.91	80.08
M-96 to Michigan Ave	38.88	14.83	61.18	15.06	4.93	24.01	46.06	21.48	80.23	26.42	0.00	91.78	13.99	0.00	92.25	59.59	0.03	99.99
Michigan Ave to 35th Street	35.70	14.83	60.72	14.49	4.94	24.00	49.81	22.81	80.23	25.47	14.83	60.72	12.53	4.94	24.00	62.00	22.81	80.23
35th Street to MP 37.75	44.14	15.00	68.08	13.98	5.00	19.32	41.87	15.94	80.00	26.58	15.00	68.08	12.17	5.00	22.01	61.25	15.94	80.00
MP 37.75 to MP 38.75	58.39	15.00	68.08	14.89	5.00	18.04	26.72	15.90	80.00	32.99	15.00	68.04	12.07	5.00	18.01	54.94	15.97	80.00
MP 38.75 to Morrow Lake Dam	56.94	25.00	68.00	15.09	10.00	18.00	27.96	16.00	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Settling Velocity * 0.5 (Model Run E1S6)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.13	14.57	62.85	14.99	4.85	19.00	44.88	18.91	80.58	31.40	1.43	97.93	14.73	0.18	21.07	53.87	0.01	98.39
Ceresco to Raymond Rd	31.79	0.00	63.05	14.46	0.00	19.50	53.75	20.97	100.00	26.33	0.00	63.05	14.18	0.00	19.50	59.49	20.97	100.00
Raymond Rd to Kalamazoo Dam	38.07	0.00	80.99	15.26	0.00	22.77	46.68	5.67	100.00	28.17	0.00	80.99	14.20	0.00	22.77	57.63	5.67	100.00
Kalamazoo Dam to Battle Creek River	15.82	0.00	94.69	4.45	0.00	25.04	79.73	2.51	100.00	20.92	0.00	94.69	7.08	0.00	32.73	72.00	2.06	100.00
Battle Creek River to Custer Dr	35.07	0.01	92.33	13.66	0.00	21.94	51.27	4.20	99.99	26.45	0.01	92.33	12.12	0.00	21.94	61.44	0.32	99.99
Custer Dr to M-96	41.05	14.24	65.93	14.74	4.74	19.58	44.21	15.81	81.01	28.56	14.09	65.93	13.82	4.70	19.58	57.62	15.81	81.22
M-96 to Michigan Ave	38.86	14.44	61.28	15.05	4.80	24.18	46.09	21.54	80.77	26.41	0.00	92.82	13.96	0.01	63.33	59.63	0.25	99.99
Michigan Ave to 35th Street	35.57	13.87	60.88	14.47	4.62	24.33	49.97	21.88	81.51	25.43	13.87	60.88	12.52	4.62	24.25	62.06	21.88	81.51
35th Street to MP 37.75	44.11	14.92	68.09	13.97	4.97	19.66	41.91	15.94	80.11	26.58	14.92	68.07	12.17	4.97	22.00	61.26	15.96	80.11
MP 37.75 to MP 38.75	58.41	15.00	68.09	14.87	5.00	18.01	26.71	15.91	80.00	32.99	15.00	68.05	12.07	5.00	18.01	54.94	15.97	80.00
MP 38.75 to Morrow Lake Dam	56.95	25.00	68.00	15.09	10.00	18.00	27.96	16.00	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Table 8-31. Effect of Settling Velocity Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.07	-16.87	27.24	0.33	-27.49	68.89
Ceresco to Raymond Rd	-1.37	-45.85	63.40	0.53	-43.65	52.15
Raymond Rd to Kalamazoo Dam	-0.05	-23.30	15.46	0.38	-27.12	119.33
Kalamazoo Dam to Battle Creek River	0.43	-0.15	8.81	1.23	-11.35	70.38
Battle Creek River to Custer Dr	-0.10	-31.58	44.48	0.16	-41.96	89.34
Custer Dr to M-96	0.15	-24.25	20.15	0.11	-57.36	78.82
M-96 to Michigan Ave	-0.23	-31.62	22.62	0.10	-53.82	80.49
Michigan Ave to 35th Street	-0.45	-36.79	69.67	0.25	-50.71	57.27
35th Street to MP 37.75	0.25	-27.23	20.19	0.05	-10.03	6.66
MP 37.75 to MP 38.75	0.47	0.00	3.36	0.01	-0.01	0.82
MP 38.75 to Morrow Lake Dam	0.02	-1.72	0.23	0.00	-0.01	0.01

Settling velocity * 1.5 (Model Run E1S5)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.17	-14.77	24.30	0.22	-14.77	124.16
Ceresco to Raymond Rd	0.06	-58.23	45.81	0.09	-58.23	45.81
Raymond Rd to Kalamazoo Dam	0.21	-23.94	18.96	0.26	-23.94	170.02
Kalamazoo Dam to Battle Creek River	-0.11	-23.98	6.20	0.98	-23.98	73.85
Battle Creek River to Custer Dr	0.06	-24.65	36.90	0.10	-66.58	113.99
Custer Dr to M-96	0.11	-20.72	15.15	0.11	-40.82	73.65
M-96 to Michigan Ave	0.03	-35.87	43.40	0.07	-40.62	96.32
Michigan Ave to 35th Street	0.18	-37.40	49.14	0.22	-37.40	49.14
35th Street to MP 37.75	0.15	-17.93	19.54	0.06	-13.85	9.35
MP 37.75 to MP 38.75	0.38	0.00	3.67	0.02	-0.01	1.44
MP 38.75 to Morrow Lake Dam	0.03	0.00	0.24	0.00	0.00	0.00

Settling Velocity * 0.5 (Model Run E1S6)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.23	-23.48	38.57	0.33	-23.48	34.21
Ceresco to Raymond Rd	-0.51	-52.27	70.97	0.30	-52.27	70.97
Raymond Rd to Kalamazoo Dam	0.05	-29.49	21.20	0.17	-29.49	80.00
Kalamazoo Dam to Battle Creek River	0.86	-23.78	43.83	0.93	-23.78	43.83
Battle Creek River to Custer Dr	0.32	-42.55	81.93	0.25	-44.63	81.93
Custer Dr to M-96	-0.08	-41.94	33.30	0.16	-55.26	57.91
M-96 to Michigan Ave	-0.53	-50.52	43.32	0.20	-58.12	62.04
Michigan Ave to 35th Street	0.12	-54.50	66.56	0.37	-54.50	66.56
35th Street to MP 37.75	0.37	-37.81	39.93	0.10	-29.69	17.10
MP 37.75 to MP 38.75	0.54	0.00	2.64	0.02	-0.03	1.32
MP 38.75 to Morrow Lake Dam	0.01	-3.98	0.33	0.00	-0.02	0.02

Table 8-32. Effect of Settling Velocity Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	321	-1101	17074	7	-322	396	-502	-75396	81628	243	-656	21220	9	-393	334	619	-71100	193380
Ceresco to Raymond Rd	-76	-7342	9407	-49	-5199	224	-5517	-84718	144360	96	-892	15187	6	-535	319	1518	-95189	151320
Raymond Rd to Kalamazoo Dam	417	-24671	14280	-19	-7448	380	-1189	-70781	53918	326	-7176	25461	16	-4301	396	677	-70224	384150
Kalamazoo Dam to Battle Creek River	139	0	8950	3	0	128	5875	0	139390	57	-9672	8460	-29	-5804	228	2103	-58463	212170
Battle Creek River to Custer Dr	20	-16664	11903	-20	-7079	376	-815	-86462	196800	92	-30001	10488	8	-18000	288	303	-104790	195890
Custer Dr to M-96	203	-1808	10181	9	-573	325	-98	-81046	57478	155	-20982	14698	17	-12613	393	65	-88667	95864
M-96 to Michigan Ave	18	-19224	7555	-5	-5967	284	-1087	-88539	68446	99	-28214	20138	15	-16816	334	91	-85528	204640
Michigan Ave to 35th Street	-63	-2660	3600	-32	-1776	150	-2650	-83016	134720	43	-100	3060	6	-67	218	512	-80628	101000
35th Street to MP 37.75	258	-702	3975	32	-208	257	134	-82061	60917	58	0	4997	13	0	304	32	-15863	20591
MP 37.75 to MP 38.75	562	0	4475	194	0	285	0	-520	246	8	0	887	10	0	143	0	-67	41
MP 38.75 to Morrow Lake Dam	1	-4	23	134	0	226	-1	-2279	316	0	0	0	0	0	36	0	-13	11

Settling Velocity * 1.5 (Model Run E1S5)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	434	-1091	28981	14	-366	561	-21	-83098	64824	367	-1091	28981	14	-405	561	159	-58435	314694
Ceresco to Raymond Rd	9	-7464	19851	-24	-5286	467	-112	-94384	144809	78	-6832	19851	-2	-4840	495	54	-94384	144809
Raymond Rd to Kalamazoo Dam	368	-24630	17243	-2	-7435	538	-15	-70275	51364	338	-24630	35241	17	-7435	598	267	-70275	538315
Kalamazoo Dam to Battle Creek River	-53	-30001	12785	-95	-18000	329	775	-77327	44194	35	-30001	12785	-60	-18000	329	2841	-74635	219247
Battle Creek River to Custer Dr	71	-30001	14471	-12	-18000	520	49	-85608	126464	92	-30001	14471	6	-18000	520	142	-96345	245565
Custer Dr to M-96	233	-1806	13577	15	-783	515	2	-72887	50731	160	-20219	20386	21	-12155	570	29	-72887	160101
M-96 to Michigan Ave	72	-19325	9228	6	-5997	388	-9	-78483	73900	90	-28340	27550	17	-16861	482	11	-78483	243841
Michigan Ave to 35th Street	-17	-2590	4266	-15	-1749	210	-47	-81373	116626	29	-2590	4266	4	-1749	294	359	-81373	116626
35th Street to MP 37.75	239	-698	5201	41	-204	409	5	-48008	58955	91	-698	5201	24	-204	409	-15	-40110	19619
MP 37.75 to MP 38.75	415	0	4794	226	0	378	0	-58	66	24	0	1825	32	0	278	0	-14	66
MP 38.75 to Morrow Lake Dam	0	-4	8	129	0	278	0	-143	86	0	0	0	4	0	72	0	-2	1

Table 8-32. Effect of Settling Velocity Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Settling Velocity * 0.5 (Model Run E1S6)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	236	-1104	11686	4	-409	204	-155	-84557	88707	211	-1104	11686	5	-405	204	290	-80252	91120
Ceresco to Raymond Rd	-13	-7371	9278	-27	-5220	167	-2143	-95368	179739	50	-6877	9332	-6	-4871	173	490	-95368	179739
Raymond Rd to Kalamazoo Dam	217	-24679	9374	-18	-7450	210	-339	-79085	76281	233	-24679	13958	4	-7450	225	143	-79085	263116
Kalamazoo Dam to Battle Creek River	-131	-30000	5690	-97	-18000	120	4212	-96882	225150	-36	-30000	5690	-65	-18000	120	2406	-96882	225150
Battle Creek River to Custer Dr	39	-30000	7969	-18	-18000	204	245	-96882	225150	74	-30000	7969	0	-18000	204	499	-101074	200449
Custer Dr to M-96	164	-1824	7942	6	-817	206	-427	-92623	71669	143	-21315	9520	10	-12800	219	181	-92623	124577
M-96 to Michigan Ave	60	-19180	5729	-2	-5952	176	-1647	-94538	94828	94	-28107	11317	8	-16796	202	293	-94538	159956
Michigan Ave to 35th Street	-21	-2710	2559	-18	-1803	102	-784	-87168	138629	32	-2710	2780	0	-1803	133	864	-87168	138629
35th Street to MP 37.75	256	-715	4242	19	-211	192	337	-93085	114203	111	-715	4242	13	-211	192	-32	-59553	41741
MP 37.75 to MP 38.75	749	0	3624	119	0	156	5	-1536	795	44	0	1983	28	0	144	0	-168	249
MP 38.75 to Morrow Lake Dam	17	-3	267	102	0	145	-2	-5432	619	0	0	0	9	0	87	0	-31	24

Table 8-33. Riverine: Effect of Sediment Concentration Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.59	0.00	0.97	0.57	0.00	0.95	0.56	0.00	0.94
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.50	0.00	1.26	0.46	0.00	1.26	0.45	0.00	1.24
14.75 RDB Sediment Trap	0.49	0.27	0.70	0.46	0.26	0.66	0.45	0.25	0.64
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.58	0.00	1.50	0.55	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.28	0.12	0.52	0.26	0.11	0.49	0.24	0.10	0.47
26.00 RDB Sediment Trap	0.30	0.00	1.22	0.28	0.01	1.08	0.26	0.01	0.97
33.00 A Sediment Trap	0.36	0.00	1.25	0.33	0.00	1.13	0.31	0.00	1.04
Morrow Lake Delta	0.23	0.00	2.06	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.53	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Sediment Concentration * 1.5 (Model Run A1S3)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.61	0.00	1.04	0.57	0.00	0.99	0.56	0.00	0.98
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.53	0.00	1.28	0.49	0.00	1.26	0.48	0.00	1.24
14.75 RDB Sediment Trap	0.60	0.27	1.23	0.56	0.26	1.15	0.54	0.25	1.13
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.60	0.00	1.52	0.56	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.36	0.12	0.89	0.33	0.11	0.82	0.31	0.10	0.80
26.00 RDB Sediment Trap	0.61	0.00	1.59	0.56	0.01	1.47	0.52	0.01	1.39
33.00 A Sediment Trap	0.63	0.00	1.77	0.58	0.00	1.65	0.54	0.00	1.57
Morrow Lake Delta	0.23	0.00	2.07	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.54	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.62	0.05	0.00	0.55	0.04	0.00	0.49

Sediment Concentration * 1.5 (Model Run A1S4)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.61	0.00	1.04	0.57	0.00	0.99	0.56	0.00	0.98
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.53	0.00	1.28	0.49	0.00	1.26	0.48	0.00	1.24
14.75 RDB Sediment Trap	0.60	0.27	1.23	0.56	0.26	1.15	0.54	0.25	1.13
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.60	0.00	1.52	0.56	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.36	0.12	0.89	0.33	0.11	0.82	0.31	0.10	0.80
26.00 RDB Sediment Trap	0.61	0.01	1.59	0.56	0.01	1.47	0.52	0.01	1.39
33.00 A Sediment Trap	0.63	0.00	1.77	0.58	0.00	1.65	0.54	0.00	1.57
Morrow Lake Delta	0.23	0.00	2.07	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.54	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Table 8-34. Riverine: Effect of Sediment Concentration Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	0.98	0.00	2.92	0.92	0.00	2.89	0.91	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.01	0.00	4.03	0.92	0.00	4.05	0.90	0.00	3.99
14.75 RDB Sediment Trap	0.61	0.21	1.13	0.56	0.20	1.02	0.53	0.19	0.97
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.85	0.00	4.55	0.77	0.00	4.38	0.74	0.00	4.30
21.50 RDB Sediment Trap	0.18	0.03	0.70	0.17	0.03	0.69	0.17	0.03	0.70
26.00 RDB Sediment Trap	0.42	0.00	3.25	0.37	0.00	2.80	0.34	0.00	2.48
33.00 A Sediment Trap	0.60	0.00	3.13	0.55	0.00	2.81	0.50	0.00	2.54
Morrow Lake Delta	0.39	0.00	8.18	0.34	0.00	7.68	0.31	0.00	7.38
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Sediment Concentration * 1.5 (Model Run A1S3)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	1.00	0.00	2.92	0.94	0.00	2.89	0.92	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.09	0.00	4.03	1.00	0.00	4.05	0.98	0.00	3.99
14.75 RDB Sediment Trap	0.74	0.20	2.45	0.67	0.18	2.26	0.65	0.17	2.18
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.87	0.00	4.55	0.79	0.00	4.38	0.76	0.00	4.30
21.50 RDB Sediment Trap	0.30	0.03	1.34	0.29	0.03	1.23	0.28	0.03	1.15
26.00 RDB Sediment Trap	1.05	0.00	3.60	0.92	0.00	3.24	0.83	0.00	3.01
33.00 A Sediment Trap	1.24	0.00	4.71	1.12	0.00	4.34	1.02	0.00	4.04
Morrow Lake Delta	0.38	0.00	8.17	0.34	0.00	7.68	0.31	0.00	7.39
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.33	0.00	0.00	0.26	0.00	0.00	0.21

Sediment Concentration * 0.5 (Model Run A1S4)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	1.00	0.00	2.92	0.94	0.00	2.89	0.92	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.09	0.00	4.03	1.00	0.00	4.05	0.98	0.00	3.99
14.75 RDB Sediment Trap	0.74	0.20	2.44	0.67	0.18	2.26	0.64	0.17	2.18
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.87	0.00	4.55	0.79	0.00	4.38	0.76	0.00	4.30
21.50 RDB Sediment Trap	0.30	0.03	1.34	0.29	0.03	1.22	0.28	0.03	1.14
26.00 RDB Sediment Trap	1.05	0.00	3.60	0.92	0.00	3.24	0.83	0.00	3.01
33.00 A Sediment Trap	1.24	0.00	4.71	1.12	0.00	4.34	1.02	0.00	4.04
Morrow Lake Delta	0.38	0.00	8.18	0.34	0.00	7.68	0.31	0.00	7.38
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Table 8-35. Riverine: Effect of Sediment Concentration Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	14.0	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.0	15.4	14.0	18.0	33.3	24.0	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	30.0	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.6	26.9	60.0	16.8	10.0	51.4	34.5	21.7	53.0
21.50 RDB Sediment Trap	44.0	44.0	44.0	19.0	19.0	19.0	37.0	37.0	37.0
26.00 RDB Sediment Trap	34.0	34.0	34.0	12.0	12.0	12.0	54.0	54.0	54.0
33.00 A Sediment Trap	47.4	24.0	58.0	18.0	18.0	18.0	34.6	24.0	58.0
Morrow Lake Delta	49.6	24.0	68.0	14.5	10.0	19.0	35.9	16.0	59.0
Sediment Fan	60.2	24.0	68.0	14.8	10.0	18.0	25.0	16.0	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.1	15.4	14.0	18.0	33.3	23.9	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	29.9	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.1	1.0	60.2	16.4	3.1	72.5	35.5	0.6	95.9
21.50 RDB Sediment Trap	44.1	44.0	44.3	19.0	18.9	19.0	36.9	36.8	37.0
26.00 RDB Sediment Trap	34.1	33.7	34.7	12.0	11.9	12.3	53.9	53.0	54.5
33.00 A Sediment Trap	47.3	23.8	58.1	18.0	17.9	18.0	34.7	23.9	58.3
Morrow Lake Delta	49.6	23.9	68.1	14.5	9.9	19.1	35.9	15.9	59.2
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Sediment Concentration * 1.5 (Model Run A1S3)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.1	62.0	15.5	13.9	18.0	33.6	20.0	58.8
14.75 RDB Sediment Trap	56.3	44.0	60.0	12.7	10.0	16.0	31.0	26.2	42.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.0	1.0	60.2	16.4	4.3	73.6	35.5	0.5	94.8
21.50 RDB Sediment Trap	45.3	44.0	57.0	18.4	14.0	19.0	36.3	25.0	42.0
26.00 RDB Sediment Trap	39.3	33.7	60.5	13.0	11.9	17.1	47.7	22.4	54.5
33.00 A Sediment Trap	49.4	23.8	58.8	17.6	14.1	18.2	33.0	23.0	58.3
Morrow Lake Delta	49.6	23.9	68.2	14.5	9.9	19.1	35.8	15.9	59.2
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	54.0	68.0	15.1	10.0	16.0	25.8	16.0	34.9

Table 8-35. Riverine: Effect of Sediment Concentration Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Sediment Concentration * 0.5 (Model Run A1S4)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.3	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.1	62.0	15.5	14.0	18.0	33.6	20.0	58.8
14.75 RDB Sediment Trap	56.3	44.0	60.0	12.7	10.0	16.0	31.0	26.2	42.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.1	1.0	60.2	16.2	1.9	71.9	35.7	1.0	97.2
21.50 RDB Sediment Trap	45.3	44.0	57.0	18.4	14.0	19.0	36.3	25.0	42.0
26.00 RDB Sediment Trap	39.2	33.6	60.5	13.0	11.9	17.1	47.8	22.4	54.5
33.00 A Sediment Trap	49.4	23.8	58.8	17.6	14.1	18.2	33.0	23.0	58.3
Morrow Lake Delta	49.6	23.9	68.1	14.5	9.9	19.1	35.8	16.0	59.2
Sediment Fan	60.2	24.0	68.0	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Table 8-36. Riverine: Effect of Sediment Concentration Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.05	-3.12	2.02
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.30	-2.27	2.89
14.75 RDB Sediment Trap	0.16	0.00	1.19
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.10	-4.65	4.22
21.50 RDB Sediment Trap	0.75	0.00	1.76
26.00 RDB Sediment Trap	0.79	-3.04	2.66
33.00 A Sediment Trap	0.34	0.00	1.31
Morrow Lake Delta	0.08	-6.94	7.05
Sediment Fan	0.02	0.00	1.04
West End of Morrow Lake	0.00	0.00	0.00

Sediment Concentration * 1.5 (Model Run A1S3)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.07	-3.12	2.99
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.64	-6.72	14.49
14.75 RDB Sediment Trap	0.23	-0.78	1.72
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.17	-4.65	10.48
21.50 RDB Sediment Trap	0.87	0.00	2.37
26.00 RDB Sediment Trap	0.71	-3.08	3.64
33.00 A Sediment Trap	0.09	-2.52	2.63
Morrow Lake Delta	0.11	-6.94	7.06
Sediment Fan	0.05	0.00	1.39
West End of Morrow Lake	0.00	0.00	18.66

Table 8-36. Riverine: Effect of Sediment Concentration Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Sediment Concentration * 0.5 (Model Run A1S4)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.01	-3.12	1.43
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.01	-6.73	2.60
14.75 RDB Sediment Trap	0.11	-0.78	0.96
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.05	-4.65	4.22
21.50 RDB Sediment Trap	0.38	0.00	1.16
26.00 RDB Sediment Trap	0.26	-3.08	2.54
33.00 A Sediment Trap	-0.01	-2.51	2.63
Morrow Lake Delta	0.04	-6.94	7.05
Sediment Fan	0.01	0.00	0.68
West End of Morrow Lake	0.00	0.00	0.00

Table 8-37. Riverine: Effect of Sediment Concentration Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	120.2	0.0	4186.0	3.2	0.0	107.0	12.4	-12693.0	7015.5
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	802.4	0.0	8991.4	30.1	0.0	183.0	137.0	-9680.1	9033.5
14.75 RDB Sediment Trap	531.7	0.0	4648.6	15.4	0.2	109.0	159.3	-73.3	2888.3
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	270.1	-1.3	8669.5	22.3	-0.2	204.0	190.5	-32352.0	25332.0
21.50 RDB Sediment Trap	3308.4	0.0	7100.8	141.4	0.0	224.0	39.6	0.0	498.8
26.00 RDB Sediment Trap	2740.3	0.0	8338.1	125.2	0.0	194.0	153.6	-27834.0	13962.0
33.00 A Sediment Trap	493.0	0.0	3616.5	15.0	0.0	108.0	1741.4	0.0	7492.5
Morrow Lake Delta	229.2	-526.7	6999.2	19.7	-164.0	216.0	15.6	-55991.0	45029.0
Sediment Fan	142.4	0.0	2978.9	95.9	0.0	197.0	0.1	-580.3	257.7
West End of Morrow Lake	9.1	-4.0	69.0	38.5	-0.8	116.0	0.1	-496.8	328.0

Sediment Concentration * 1.5 (Model Run A1S3)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	171.2	0.0	6246.9	4.9	0.0	157.2	-19.4	-12692.2	7014.6
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1063.2	0.0	14295.9	38.2	0.0	266.8	471.2	-40355.2	41066.9
14.75 RDB Sediment Trap	880.1	0.0	6827.3	23.2	0.6	193.5	88.0	-4992.3	2895.5
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	358.4	-1.0	12231.4	30.4	-0.2	283.0	243.2	-32367.6	25372.3
21.50 RDB Sediment Trap	3784.4	0.0	9720.6	157.5	0.0	277.1	100.8	-264.8	1321.5
26.00 RDB Sediment Trap	2654.1	0.0	11788.7	119.0	0.0	268.2	-30.4	-27881.0	17577.3
33.00 A Sediment Trap	490.4	-7.1	4995.6	16.2	-3.0	150.5	485.0	-12347.9	16877.7
Morrow Lake Delta	314.0	-527.3	9558.1	26.7	-163.8	294.1	15.6	-56108.3	45128.4
Sediment Fan	197.7	0.0	4072.4	129.8	0.0	269.8	0.1	-579.3	257.4
West End of Morrow Lake	13.6	-6.0	1469.6	53.5	0.0	152.5	12.8	-762.6	48080.0

Sediment Concentration * 0.5 (Model Run A1S4)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	57.5	0.0	2110.7	1.5	0.0	54.5	-19.4	-12693.6	7016.3
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	356.0	0.0	4527.4	12.4	0.0	87.4	-737.7	-39745.7	9035.3
14.75 RDB Sediment Trap	445.5	0.0	3419.5	11.7	0.0	108.3	87.5	-4981.6	2888.1
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	168.8	-1.6	5019.1	13.5	-0.2	126.2	76.8	-32348.8	25334.4
21.50 RDB Sediment Trap	1746.7	0.0	4494.8	73.3	0.0	114.5	100.5	-263.5	1316.4
26.00 RDB Sediment Trap	1090.6	0.0	4844.3	52.9	0.0	118.4	-27.5	-27840.0	17604.8
33.00 A Sediment Trap	225.3	-7.0	2273.0	4.9	-3.0	107.5	486.5	-12337.7	16870.9
Morrow Lake Delta	147.0	-526.7	4466.6	12.8	-163.7	132.5	15.5	-55990.0	45031.4
Sediment Fan	89.1	0.0	1904.6	61.0	0.0	123.3	0.1	-580.2	257.7
West End of Morrow Lake	5.1	-3.1	39.3	23.6	-0.6	70.7	0.1	-415.3	327.8

Table 8-38. Floodplain: Effect of Sediment Concentration Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	1.22	0.00	2.66	1.16	0.00	2.58	1.02	0.00	2.46	0.19	0.00	2.32	0.17	0.00	2.20	0.13	0.00	1.98
Ceresco to Raymond Rd	1.46	0.00	4.06	1.43	0.00	4.00	1.28	0.00	3.69	0.26	0.00	2.52	0.26	0.00	2.39	0.20	0.00	2.01
Raymond Rd to Kalamazoo Dam	0.97	0.00	5.73	0.98	0.00	5.86	0.85	0.00	4.81	0.19	0.00	2.65	0.19	0.00	3.48	0.16	0.00	1.95
Kalamazoo Dam to Battle Creek River	2.98	0.00	9.77	3.05	0.00	9.99	2.57	0.00	8.52	1.02	0.00	11.13	1.04	0.00	11.49	0.82	0.00	9.98
Battle Creek River to Custer Dr	1.43	0.00	4.09	1.46	0.00	4.19	1.23	0.00	3.99	0.04	0.00	5.50	0.05	0.00	5.95	0.04	0.00	5.00
Custer Dr to M-96	1.03	0.00	3.07	1.04	0.00	3.02	1.00	0.00	3.02	0.16	0.00	2.62	0.21	0.00	3.48	0.16	0.00	3.52
M-96 to Michigan Ave	1.27	0.00	4.05	1.39	0.00	4.12	1.32	0.00	3.93	0.09	0.00	1.46	0.17	0.00	1.63	0.15	0.00	7.56
Michigan Ave to 35th Street	1.26	0.00	3.36	1.48	0.00	3.64	1.45	0.00	3.55	0.07	0.00	1.30	0.13	0.00	1.84	0.12	0.00	1.71
35th Street to MP 37.75	0.55	0.00	2.44	0.72	0.00	2.64	0.70	0.00	2.59	0.01	0.00	0.63	0.03	0.00	0.82	0.03	0.00	0.80
MP 37.75 to MP 38.75	0.16	0.00	0.75	0.20	0.00	0.95	0.20	0.00	0.93	0.00	0.00	0.06	0.01	0.00	0.17	0.01	0.00	0.16
MP 38.75 to Morrow Lake Dam	0.10	0.00	0.95	0.14	0.00	1.44	0.14	0.00	1.48	0.00	0.00	0.03	0.00	0.00	0.12	0.00	0.00	0.06

Sediment Concentration * 1.5 (Model Run E1S3)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.91	0.00	2.66	0.85	0.00	2.58	0.74	0.00	2.45	0.44	0.00	2.42	0.41	0.00	2.42	0.35	0.00	2.36
Ceresco to Raymond Rd	1.03	0.00	4.06	1.00	0.00	4.00	0.89	0.00	3.70	0.47	0.00	3.82	0.46	0.00	3.73	0.39	0.00	3.43
Raymond Rd to Kalamazoo Dam	0.70	0.00	5.73	0.71	0.00	5.86	0.61	0.00	4.81	0.34	0.00	5.73	0.34	0.00	5.86	0.29	0.00	4.81
Kalamazoo Dam to Battle Creek River	1.84	0.00	11.05	1.90	0.00	11.51	1.51	0.00	9.97	1.39	0.00	11.05	1.43	0.00	11.51	1.16	0.00	9.97
Battle Creek River to Custer Dr	0.97	0.00	9.33	1.00	0.00	9.84	0.83	0.00	8.66	0.20	0.00	9.33	0.21	0.00	9.84	0.17	0.00	8.66
Custer Dr to M-96	0.76	0.00	3.07	0.79	0.00	3.33	0.74	0.00	3.02	0.23	0.00	3.07	0.28	0.00	3.48	0.23	0.00	3.52
M-96 to Michigan Ave	0.89	0.00	4.03	1.00	0.00	4.13	0.95	0.00	3.93	0.17	0.00	4.03	0.24	0.00	4.13	0.22	0.00	3.93
Michigan Ave to 35th Street	0.85	0.00	3.37	1.05	0.00	3.65	1.02	0.00	3.55	0.20	0.00	3.37	0.28	0.00	3.65	0.27	0.00	3.55
35th Street to MP 37.75	0.48	0.00	2.44	0.63	0.00	2.64	0.62	0.00	2.59	0.08	0.00	2.44	0.11	0.00	2.64	0.11	0.00	2.59
MP 37.75 to MP 38.75	0.15	0.00	0.75	0.19	0.00	0.95	0.19	0.00	0.93	0.02	0.00	0.46	0.03	0.00	0.55	0.03	0.00	0.54
MP 38.75 to Morrow Lake Dam	0.09	0.00	0.96	0.14	0.00	1.45	0.14	0.00	1.49	0.01	0.00	0.12	0.01	0.00	0.18	0.01	0.00	0.18

Sediment Concentration * 0.5 (Model Run E1S4)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.91	0.00	2.66	0.85	0.00	2.58	0.74	0.00	2.46	0.44	0.00	2.43	0.41	0.00	2.42	0.34	0.00	2.36
Ceresco to Raymond Rd	1.03	0.00	4.06	1.00	0.00	4.00	0.89	0.00	3.70	0.47	0.00	3.82	0.46	0.00	3.73	0.39	0.00	3.43
Raymond Rd to Kalamazoo Dam	0.70	0.00	5.73	0.71	0.00	5.87	0.61	0.00	4.81	0.34	0.00	5.73	0.34	0.00	5.87	0.30	0.00	4.81
Kalamazoo Dam to Battle Creek River	1.86	0.00	11.21	1.90	0.00	11.49	1.50	0.00	9.82	1.40	0.00	11.21	1.43	0.00	11.49	1.16	0.00	9.82
Battle Creek River to Custer Dr	0.97	0.00	9.49	1.00	0.00	9.88	0.83	0.00	8.66	0.20	0.00	9.49	0.21	0.00	9.88	0.17	0.00	8.66
Custer Dr to M-96	0.76	0.00	3.07	0.79	0.00	3.33	0.74	0.00	3.02	0.23	0.00	3.07	0.28	0.00	3.48	0.23	0.00	3.52
M-96 to Michigan Ave	0.89	0.00	4.03	1.00	0.00	4.13	0.95	0.00	3.93	0.17	0.00	4.03	0.24	0.00	4.13	0.22	0.00	3.93
Michigan Ave to 35th Street	0.85	0.00	3.37	1.05	0.00	3.64	1.02	0.00	3.56	0.20	0.00	3.37	0.28	0.00	3.64	0.27	0.00	3.56
35th Street to MP 37.75	0.48	0.00	2.44	0.63	0.00	2.64	0.62	0.00	2.58	0.08	0.00	2.44	0.11	0.00	2.64	0.11	0.00	2.58
MP 37.75 to MP 38.75	0.15	0.00	0.75	0.19	0.00	0.95	0.19	0.00	0.93	0.02	0.00	0.46	0.03	0.00	0.55	0.03	0.00	0.54
MP 38.75 to Morrow Lake Dam	0.09	0.00	0.96	0.14	0.00	1.45	0.14	0.00	1.49	0.01	0.00	0.12	0.01	0.00	0.18	0.01	0.00	0.18

Table 8-39. Floodplain: Effect of Sediment Concentration Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.87	0.00	47.11	3.63	0.00	46.69	3.16	0.00	48.48	1.24	0.00	41.29	1.11	0.00	40.05	0.88	0.00	40.47
Ceresco to Raymond Rd	10.16	0.00	81.46	9.85	0.00	79.31	8.67	0.00	72.95	2.36	0.00	40.69	2.24	0.00	44.38	1.65	0.00	47.50
Raymond Rd to Kalamazoo Dam	5.09	0.00	66.30	5.13	0.00	65.33	4.39	0.00	52.60	1.00	0.00	100.80	1.07	0.00	170.10	0.83	0.00	32.79
Kalamazoo Dam to Battle Creek River	21.80	0.00	275.80	24.18	0.00	284.60	19.37	0.00	235.10	8.87	0.00	433.80	9.43	0.00	455.20	7.52	0.00	422.30
Battle Creek River to Custer Dr	4.31	0.00	135.40	4.43	0.00	146.30	3.43	0.00	118.40	0.23	0.00	226.80	0.30	0.00	257.80	0.25	0.00	230.10
Custer Dr to M-96	3.56	0.00	44.67	3.53	0.00	41.38	3.35	0.00	44.88	0.90	0.00	99.26	1.25	0.00	158.00	0.90	0.00	159.90
M-96 to Michigan Ave	4.49	0.00	87.13	5.05	0.00	67.45	4.66	0.00	70.10	0.48	0.00	23.10	0.91	0.00	31.77	0.82	0.00	594.10
Michigan Ave to 35th Street	5.17	0.00	29.71	6.58	0.00	36.18	6.36	0.00	34.87	0.46	0.00	13.84	0.96	0.00	23.22	0.91	0.00	21.52
35th Street to MP 37.75	1.10	0.00	10.13	1.52	0.00	13.96	1.44	0.00	13.36	0.02	0.00	6.43	0.09	0.00	7.95	0.09	0.00	7.57
MP 37.75 to MP 38.75	0.06	0.00	1.66	0.09	0.00	2.70	0.08	0.00	2.55	0.00	0.00	0.09	0.01	0.00	0.50	0.01	0.00	0.48
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.03	0.00	1.76	0.03	0.00	1.84	0.00	0.00	0.02	0.00	0.00	0.36	0.00	0.00	0.06

Sediment Concentration * 1.5 (Model Run E1S3)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.16	0.00	47.11	2.93	0.00	46.70	2.51	0.00	48.46	2.07	0.00	47.11	1.91	0.00	46.70	1.60	0.00	48.46
Ceresco to Raymond Rd	7.87	0.00	81.47	7.60	0.00	79.31	6.45	0.00	72.97	3.76	0.00	81.47	3.61	0.00	79.31	2.92	0.00	72.97
Raymond Rd to Kalamazoo Dam	3.91	0.00	174.90	3.94	0.00	151.48	3.29	0.00	52.63	1.92	0.00	199.07	1.92	0.00	171.29	1.60	0.00	52.63
Kalamazoo Dam to Battle Creek River	15.89	0.00	431.69	17.18	0.00	454.63	13.71	0.00	424.48	11.55	0.00	431.69	12.39	0.00	454.63	10.20	0.00	424.48
Battle Creek River to Custer Dr	3.26	0.00	428.46	3.39	0.00	448.99	2.60	0.00	424.48	0.92	0.00	428.46	1.00	0.00	448.99	0.81	0.00	424.48
Custer Dr to M-96	3.10	0.00	51.50	3.27	0.00	48.33	2.95	0.00	49.55	1.16	0.00	99.26	1.48	0.00	158.00	1.14	0.00	159.95
M-96 to Michigan Ave	3.67	0.00	85.82	4.40	0.00	67.40	3.99	0.00	69.91	0.79	0.00	85.82	1.22	0.00	67.40	1.04	0.00	69.91
Michigan Ave to 35th Street	3.83	0.00	29.79	5.37	0.00	36.23	5.16	0.00	35.02	1.06	0.00	29.79	1.69	0.00	36.23	1.61	0.00	35.02
35th Street to MP 37.75	0.96	0.00	10.16	1.37	0.00	14.02	1.30	0.00	13.38	0.21	0.00	10.16	0.34	0.00	14.02	0.33	0.00	13.38
MP 37.75 to MP 38.75	0.05	0.00	1.67	0.08	0.00	2.70	0.08	0.00	2.57	0.02	0.00	1.67	0.03	0.00	2.49	0.03	0.00	2.36
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.80	0.02	0.00	1.78	0.03	0.00	1.86	0.00	0.00	0.03	0.00	0.00	0.07	0.00	0.00	0.07

Table 8-39. Floodplain: Effect of Sediment Concentration Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Sediment Concentration * 0.5 (Model Run E1S4)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.16	0.00	47.11	2.93	0.00	46.69	2.51	0.00	48.46	2.07	0.00	47.11	1.93	0.00	46.69	1.59	0.00	48.46
Ceresco to Raymond Rd	7.87	0.00	81.48	7.60	0.00	79.32	6.46	0.00	72.95	3.76	0.00	81.48	3.61	0.00	79.32	2.92	0.00	72.95
Raymond Rd to Kalamazoo Dam	3.91	0.00	169.08	3.88	0.00	65.36	3.37	0.00	140.19	1.92	0.00	190.84	1.88	0.00	89.90	1.66	0.00	140.19
Kalamazoo Dam to Battle Creek River	17.01	0.00	453.53	17.55	0.00	455.23	13.26	0.00	423.16	12.31	0.00	453.53	12.66	0.00	455.23	9.89	0.00	423.16
Battle Creek River to Custer Dr	3.28	0.00	448.09	3.40	0.00	454.78	2.60	0.00	423.16	0.94	0.00	448.09	1.00	0.00	454.78	0.80	0.00	423.16
Custer Dr to M-96	3.10	0.00	51.44	3.27	0.00	48.33	2.95	0.00	49.55	1.16	0.00	99.21	1.48	0.00	157.98	1.14	0.00	159.97
M-96 to Michigan Ave	3.67	0.00	86.15	4.40	0.00	67.40	3.99	0.00	69.91	0.79	0.00	86.15	1.22	0.00	67.40	1.04	0.00	69.91
Michigan Ave to 35th Street	3.84	0.00	29.80	5.37	0.00	36.23	5.16	0.00	35.09	1.06	0.00	29.80	1.69	0.00	36.23	1.61	0.00	35.09
35th Street to MP 37.75	0.96	0.00	10.16	1.37	0.00	14.02	1.29	0.00	13.29	0.21	0.00	10.16	0.34	0.00	14.02	0.33	0.00	13.29
MP 37.75 to MP 38.75	0.05	0.00	1.68	0.08	0.00	2.70	0.08	0.00	2.56	0.02	0.00	1.68	0.03	0.00	2.49	0.03	0.00	2.35
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.80	0.02	0.00	1.78	0.03	0.00	1.86	0.00	0.00	0.03	0.00	0.00	0.06	0.00	0.00	0.07

Table 8-40. Floodplain: Effect of Sediment Concentration on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.30	23.98	62.00	15.13	9.98	19.00	36.57	20.00	59.03	25.07	15.00	89.12	14.68	5.00	25.07	60.25	1.87	80.00
Ceresco to Raymond Rd	38.57	24.00	60.00	15.19	10.00	19.00	46.24	23.00	60.00	24.14	15.00	63.00	13.95	5.00	18.00	61.91	21.00	80.00
Raymond Rd to Kalamazoo Dam	47.63	0.00	60.00	15.81	0.00	22.00	36.48	0.00	78.00	24.20	15.00	58.00	13.99	5.00	18.00	61.81	24.00	80.00
Kalamazoo Dam to Battle Creek River	45.32	0.00	46.00	15.83	0.00	16.83	37.69	0.00	43.66	41.72	24.46	46.00	15.80	14.67	16.00	42.48	38.00	60.87
Battle Creek River to Custer Dr	45.56	0.00	60.00	17.71	0.00	22.00	36.73	24.00	100.00	23.52	14.86	58.00	11.30	4.95	18.00	65.17	24.00	80.18
Custer Dr to M-96	50.71	24.00	65.00	15.12	10.00	19.00	34.17	17.00	59.01	26.64	14.94	62.00	13.66	4.98	19.00	59.70	25.00	80.09
M-96 to Michigan Ave	47.99	24.00	60.06	15.81	9.99	24.00	36.19	22.93	60.00	24.85	15.00	50.15	13.80	5.00	18.00	61.35	34.80	80.00
Michigan Ave to 35th Street	44.79	24.00	60.00	16.18	10.00	24.00	39.03	23.00	60.00	22.61	15.00	50.00	12.02	5.00	18.00	65.37	35.00	80.00
35th Street to MP 37.75	47.67	24.00	68.00	14.38	10.00	19.00	37.94	16.00	59.00	21.97	15.00	46.00	11.80	5.00	22.00	66.23	40.00	80.00
MP 37.75 to MP 38.75	60.33	24.00	68.00	15.00	10.00	18.00	24.67	16.00	60.00	21.58	15.00	28.00	11.58	5.00	18.00	66.85	54.00	80.00
MP 38.75 to Morrow Lake Dam	58.64	56.00	68.00	15.07	10.00	16.00	26.29	16.00	30.00	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.26	23.06	62.67	15.12	9.40	18.96	36.62	19.14	60.61	25.47	14.81	97.55	14.60	2.39	28.21	59.93	0.03	80.26
Ceresco to Raymond Rd	38.40	0.00	60.99	15.20	0.00	19.41	46.40	22.15	100.00	24.07	14.08	63.13	13.90	4.69	18.11	62.03	20.88	81.23
Raymond Rd to Kalamazoo Dam	47.10	0.00	85.56	15.59	0.00	22.71	37.30	5.72	99.99	24.20	0.01	75.75	13.97	0.00	23.39	61.84	0.86	99.99
Kalamazoo Dam to Battle Creek River	4.95	0.00	97.21	1.12	0.00	16.00	93.93	0.11	100.00	29.35	0.01	97.03	9.06	0.00	33.67	61.58	0.20	99.99
Battle Creek River to Custer Dr	45.43	0.00	60.14	17.67	0.00	21.94	36.90	23.33	100.00	23.55	13.12	93.19	11.30	2.48	25.34	65.15	0.41	82.53
Custer Dr to M-96	50.66	23.71	65.90	15.10	9.82	19.57	34.24	15.85	59.50	26.64	14.43	62.13	13.66	4.81	19.16	59.70	24.87	80.77
M-96 to Michigan Ave	47.93	23.33	61.16	15.80	9.87	24.27	36.27	21.52	60.97	24.84	0.00	92.39	13.82	0.00	86.03	61.34	0.07	100.00
Michigan Ave to 35th Street	44.58	22.86	60.58	16.17	9.13	24.17	39.25	22.25	60.80	22.60	13.93	50.06	12.01	4.64	18.29	65.39	34.95	81.42
35th Street to MP 37.75	47.67	23.91	68.08	14.38	9.76	19.31	37.95	15.95	59.15	21.97	14.97	46.05	11.80	4.99	22.01	66.23	39.95	80.04
MP 37.75 to MP 38.75	60.34	24.00	68.09	15.01	10.00	18.03	24.64	15.90	60.00	21.58	15.00	28.01	11.58	5.00	18.01	66.85	53.98	80.00
MP 38.75 to Morrow Lake Dam	58.63	55.98	68.00	15.08	10.00	16.06	26.28	16.00	30.02	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Sediment Concentration * 1.5 (Model Run E1S3)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.19	14.81	62.67	14.98	4.91	18.96	44.83	19.14	80.26	31.59	14.81	97.57	14.78	2.40	31.97	53.63	0.01	80.26
Ceresco to Raymond Rd	31.80	0.00	63.15	14.46	0.00	19.41	53.74	20.86	100.00	26.39	0.01	63.15	14.20	0.00	19.41	59.41	20.86	99.99
Raymond Rd to Kalamazoo Dam	38.10	0.00	88.27	15.26	0.00	23.51	46.64	0.57	99.99	28.20	0.01	88.27	14.21	0.00	23.51	57.59	0.57	99.99
Kalamazoo Dam to Battle Creek River	21.52	0.00	97.44	5.29	0.00	27.42	73.19	0.07	100.00	25.68	0.00	97.44	7.77	0.00	33.59	66.55	0.07	100.00
Battle Creek River to Custer Dr	35.13	0.00	88.08	13.67	0.00	21.93	51.19	9.36	100.00	26.47	0.00	94.40	12.12	0.00	25.80	61.40	0.29	100.00
Custer Dr to M-96	41.07	14.59	65.90	14.74	4.86	19.57	44.19	15.85	80.54	28.57	14.42	65.90	13.82	4.81	19.57	57.61	15.85	80.77
M-96 to Michigan Ave	38.85	14.55	61.15	15.05	4.84	24.27	46.10	21.52	80.60	26.42	0.00	92.49	13.98	0.00	87.69	59.60	0.05	99.99
Michigan Ave to 35th Street	35.61	13.94	60.59	14.47	4.65	24.17	49.91	22.25	81.41	25.44	13.94	60.59	12.52	4.65	24.01	62.03	22.25	81.41
35th Street to MP 37.75	44.14	14.97	68.13	13.98	4.99	19.30	41.88	15.91	80.04	26.58	14.97	68.12	12.17	4.99	22.01	61.25	15.92	80.04
MP 37.75 to MP 38.75	58.40	15.00	68.13	14.89	5.00	18.04	26.71	15.86	80.00	32.99	15.00	68.06	12.07	5.00	18.02	54.94	15.96	80.00
MP 38.75 to Morrow Lake Dam	56.94	25.00	68.00	15.10	10.00	18.00	27.96	16.00	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Sediment Concentration * 0.5 (Model Run E1S4)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.15	14.80	62.67	14.99	4.93	18.96	44.85	19.14	80.27	31.55	14.80	97.47	14.79	2.43	22.84	53.66	0.02	80.27
Ceresco to Raymond Rd	31.79	0.00	63.10	14.46	0.00	19.41	53.75	20.89	100.00	26.37	0.01	63.10	14.20	0.00	19.41	59.42	20.89	99.99
Raymond Rd to Kalamazoo Dam	38.07	0.00	84.46	15.26	0.00	23.95	46.67	1.67	100.00	28.17	0.00	84.46	14.21	0.00	23.95	57.62	1.67	99.99
Kalamazoo Dam to Battle Creek River	19.21	0.00	97.08	4.99	0.00	26.02	75.80	0.21	100.00	23.75	0.00	97.08	7.52	0.00	26.02	68.73	0.21	100.00
Battle Creek River to Custer Dr	35.12	0.00	75.71	13.67	0.00	21.97	51.21	22.03	100.00	26.46	0.00	91.21	12.12	0.00	25.34	61.41	0.77	100.00
Custer Dr to M-96	41.06	14.59	65.90	14.75	4.86	19.57	44.20	15.85	80.54	28.56	14.42	65.90	13.82	4.81	19.57	57.62	15.85	80.77
M-96 to Michigan Ave	38.84	14.53	61.16	15.05	4.83	24.27	46.10	21.52	80.63	26.41	0.00	92.05	13.98	0.00	83.76	59.61	0.14	100.00
Michigan Ave to 35th Street	35.61	13.94	60.59	14.47	4.65	24.17	49.91	22.25	81.41	25.44	13.94	60.59	12.52	4.65	24.01	62.04	22.25	81.41
35th Street to MP 37.75	44.13	14.97	68.05	13.98	4.99	19.30	41.89	15.96	80.04	26.57	14.97	68.05	12.17	4.99	22.00	61.26	15.97	80.04
MP 37.75 to MP 38.75	58.39	15.00	68.05	14.88	5.00	18.02	26.73	15.94	80.00	32.99	15.00	68.02	12.07	5.00	18.01	54.94	15.98	80.00
MP 38.75 to Morrow Lake Dam	56.95	25.00	68.00	15.08	10.00	18.00	27.97	16.00	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Table 8-41. Floodplain: Effect of Sediment Concentration on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.07	-16.87	27.24	0.33	-27.49	68.89
Ceresco to Raymond Rd	-1.37	-45.85	63.40	0.53	-43.65	52.15
Raymond Rd to Kalamazoo Dam	-0.05	-23.30	15.46	0.38	-27.12	119.33
Kalamazoo Dam to Battle Creek River	0.43	-0.15	8.81	1.23	-11.35	70.38
Battle Creek River to Custer Dr	-0.10	-31.58	44.48	0.16	-41.96	89.34
Custer Dr to M-96	0.15	-24.25	20.15	0.11	-57.36	78.82
M-96 to Michigan Ave	-0.23	-31.62	22.62	0.10	-53.82	80.49
Michigan Ave to 35th Street	-0.45	-36.79	69.67	0.25	-50.71	57.27
35th Street to MP 37.75	0.25	-27.23	20.19	0.05	-10.03	6.66
MP 37.75 to MP 38.75	0.47	0.00	3.36	0.01	-0.01	0.82
MP 38.75 to Morrow Lake Dam	0.02	-1.72	0.23	0.00	-0.01	0.01

Sediment Concentration * 1.5 (Model Run E1S3)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.29	-27.49	27.23	0.28	-27.49	44.33
Ceresco to Raymond Rd	-0.04	-45.79	63.44	0.20	-45.79	59.72
Raymond Rd to Kalamazoo Dam	0.26	-27.15	16.57	0.29	-27.15	78.17
Kalamazoo Dam to Battle Creek River	0.20	-23.79	23.38	0.61	-23.79	48.72
Battle Creek River to Custer Dr	0.19	-35.77	52.54	0.17	-42.29	57.94
Custer Dr to M-96	0.13	-36.46	26.02	0.17	-60.21	66.39
M-96 to Michigan Ave	-0.10	-47.10	27.91	0.15	-53.80	60.16
Michigan Ave to 35th Street	0.19	-50.79	69.74	0.29	-50.79	69.74
35th Street to MP 37.75	0.31	-27.17	20.26	0.10	-18.08	15.09
MP 37.75 to MP 38.75	0.65	0.00	4.88	0.03	-0.01	2.13
MP 38.75 to Morrow Lake Dam	0.05	-0.45	19.50	0.00	-0.01	0.01

Sediment Concentration * 0.5 (Model Run E1S4)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.15	-27.49	27.23	0.12	-27.49	22.00
Ceresco to Raymond Rd	-0.06	-45.79	63.44	0.17	-45.79	59.74
Raymond Rd to Kalamazoo Dam	0.02	-27.16	16.57	0.09	-27.16	26.34
Kalamazoo Dam to Battle Creek River	0.09	-23.80	18.29	0.13	-23.80	18.45
Battle Creek River to Custer Dr	0.15	-35.79	52.58	0.10	-45.59	52.58
Custer Dr to M-96	0.04	-36.46	26.03	0.07	-63.98	51.72
M-96 to Michigan Ave	-0.13	-47.11	27.91	0.09	-53.81	31.02
Michigan Ave to 35th Street	0.18	-50.82	69.72	0.26	-50.82	69.72
35th Street to MP 37.75	0.16	-27.18	20.28	0.03	-18.07	15.09
MP 37.75 to MP 38.75	0.22	-0.04	1.82	0.01	-0.04	0.73
MP 38.75 to Morrow Lake Dam	0.00	-0.45	19.50	0.00	-0.01	0.01

Table 8-42. Floodplain: Effect of Boundary Sediment Concentration Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	321	-1101	17074	7	-322	396	-502	-75396	81628	243	-656	21220	9	-393	334	619	-71100	193380
Ceresco to Raymond Rd	-76	-7342	9407	-49	-5199	224	-5517	-84718	144360	96	-892	15187	6	-535	319	1518	-95189	151320
Raymond Rd to Kalamazoo Dam	417	-24671	14280	-19	-7448	380	-1189	-70781	53918	326	-7176	25461	16	-4301	396	677	-70224	384150
Kalamazoo Dam to Battle Creek River	139	0	8950	3	0	128	5875	0	139390	57	-9672	8460	-29	-5804	228	2103	-58463	212170
Battle Creek River to Custer Dr	20	-16664	11903	-20	-7079	376	-815	-86462	196800	92	-30001	10488	8	-18000	288	303	-104790	195890
Custer Dr to M-96	203	-1808	10181	9	-573	325	-98	-81046	57478	155	-20982	14698	17	-12613	393	65	-88667	95864
M-96 to Michigan Ave	18	-19224	7555	-5	-5967	284	-1087	-88539	68446	99	-28214	20138	15	-16816	334	91	-85528	204640
Michigan Ave to 35th Street	-63	-2660	3600	-32	-1776	150	-2650	-83016	134720	43	-100	3060	6	-67	218	512	-80628	101000
35th Street to MP 37.75	258	-702	3975	32	-208	257	134	-82061	60917	58	0	4997	13	0	304	32	-15863	20591
MP 37.75 to MP 38.75	562	0	4475	194	0	285	0	-520	246	8	0	887	10	0	143	0	-67	41
MP 38.75 to Morrow Lake Dam	1	-4	23	134	0	226	-1	-2279	316	0	0	0	0	0	36	0	-13	11

Sediment Concentration * 1.5 (Model Run E1S3)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	531	-1102	31779	15	-395	567	-44	-84670	81625	457	-1102	31779	16	-401	567	45	-71105	121353
Ceresco to Raymond Rd	29	-7345	22628	-24	-5201	472	-823	-95190	151355	110	-6877	22628	-1	-4871	510	174	-95190	151355
Raymond Rd to Kalamazoo Dam	503	-24723	20866	0	-7463	524	-156	-70775	55486	456	-24723	38167	20	-7463	601	157	-70775	247675
Kalamazoo Dam to Battle Creek River	-25	-30001	13197	-93	-18000	336	2319	-87908	155129	59	-30001	13197	-61	-18000	336	1733	-87908	159698
Battle Creek River to Custer Dr	109	-30001	17483	-12	-18000	549	166	-92255	196641	136	-30001	17483	8	-18000	549	244	-105383	196641
Custer Dr to M-96	307	-1810	15648	17	-813	527	-109	-88688	62568	231	-21095	21719	25	-12684	579	74	-88688	74209
M-96 to Michigan Ave	110	-19138	11084	6	-5940	407	-571	-88556	67855	139	-28318	30163	21	-16822	521	126	-88556	131896
Michigan Ave to 35th Street	-8	-2671	5218	-15	-1783	229	-393	-83021	134926	49	-2671	5218	5	-1783	318	577	-83021	129094
35th Street to MP 37.75	369	-705	7279	47	-209	427	123	-82159	61021	147	-705	7279	29	-209	427	-39	-57387	37320
MP 37.75 to MP 38.75	775	0	6520	271	0	405	0	-517	245	45	0	2884	47	0	335	0	-64	121
MP 38.75 to Morrow Lake Dam	1	-4	131	186	0	338	11	-611	42015	0	0	0	10	0	131	0	-12	10

Sediment Concentration * 0.5 (Model Run E1S4)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	174	-1102	10659	4	-395	183	-54	-84670	81624	151	-1102	10659	4	-413	183	-51	-71109	64183
Ceresco to Raymond Rd	-27	-7348	7731	-27	-5204	165	-823	-95190	151372	26	-6879	7731	-6	-4873	172	174	-95190	151372
Raymond Rd to Kalamazoo Dam	114	-24723	7228	-20	-7463	186	-156	-70801	55468	146	-24723	12766	3	-7463	225	51	-70801	82855
Kalamazoo Dam to Battle Creek River	-145	-30001	4500	-98	-18000	119	2125	-87622	134338	-53	-30001	4500	-66	-18000	119	621	-87622	134338
Battle Creek River to Custer Dr	10	-30001	6293	-18	-18000	196	153	-92265	196609	38	-30001	6293	-2	-18000	196	226	-106360	196609
Custer Dr to M-96	108	-1809	5627	5	-818	201	-109	-88685	62597	81	-21343	7672	8	-12818	213	62	-88685	62597
M-96 to Michigan Ave	28	-19149	3988	-2	-5944	156	-574	-88556	68035	47	-27893	10030	6	-16665	192	117	-88556	82172
Michigan Ave to 35th Street	-29	-2670	1933	-18	-1782	96	-393	-83021	134932	13	-2670	1933	0	-1782	114	577	-83021	129070
35th Street to MP 37.75	134	-705	2720	16	-209	177	123	-82165	61038	53	-705	2720	10	-209	177	-39	-57388	37325
MP 37.75 to MP 38.75	285	0	2429	100	0	150	0	-517	245	16	0	1082	17	0	122	0	-65	151
MP 38.75 to Morrow Lake Dam	0	-4	131	69	-1	125	11	-642	42015	0	0	0	3	0	40	0	-12	10

Table 8-43. Riverine: Effect of Silt Composition Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.59	0.00	0.97	0.57	0.00	0.95	0.56	0.00	0.94
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.50	0.00	1.26	0.46	0.00	1.26	0.45	0.00	1.24
14.75 RDB Sediment Trap	0.49	0.27	0.70	0.46	0.26	0.66	0.45	0.25	0.64
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.58	0.00	1.50	0.55	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.28	0.12	0.52	0.26	0.11	0.49	0.24	0.10	0.47
26.00 RDB Sediment Trap	0.30	0.00	1.22	0.28	0.01	1.08	0.26	0.01	0.97
33.00 A Sediment Trap	0.36	0.00	1.25	0.33	0.00	1.13	0.31	0.00	1.04
Morrow Lake Delta	0.23	0.00	2.06	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.53	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Maximum Silt (Model Run A1S7)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.61	0.00	1.04	0.57	0.00	0.99	0.56	0.00	0.98
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.53	0.00	1.27	0.49	0.00	1.26	0.48	0.00	1.24
14.75 RDB Sediment Trap	0.60	0.27	1.23	0.56	0.26	1.15	0.54	0.25	1.13
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.60	0.00	1.52	0.56	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.36	0.12	0.89	0.33	0.11	0.82	0.31	0.10	0.80
26.00 RDB Sediment Trap	0.61	0.01	1.59	0.56	0.01	1.47	0.52	0.01	1.39
33.00 A Sediment Trap	0.63	0.00	1.77	0.58	0.00	1.65	0.54	0.00	1.57
Morrow Lake Delta	0.23	0.00	2.07	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.54	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Minimum Silt (Model Run A1S8)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
MP 4.20 to MP 5.40	0.61	0.00	1.04	0.57	0.00	0.99	0.56	0.00	0.98
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.53	0.00	1.28	0.49	0.00	1.26	0.48	0.00	1.24
14.75 RDB Sediment Trap	0.60	0.27	1.23	0.56	0.26	1.15	0.54	0.25	1.13
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.60	0.00	1.52	0.56	0.00	1.46	0.54	0.00	1.44
21.50 RDB Sediment Trap	0.36	0.12	0.89	0.33	0.11	0.82	0.31	0.10	0.80
26.00 RDB Sediment Trap	0.61	0.01	1.59	0.56	0.01	1.47	0.52	0.02	1.39
33.00 A Sediment Trap	0.63	0.00	1.77	0.58	0.00	1.65	0.54	0.00	1.57
Morrow Lake Delta	0.23	0.00	2.07	0.21	0.00	1.97	0.19	0.00	1.91
Sediment Fan	0.09	0.00	0.54	0.08	0.00	0.48	0.07	0.00	0.44
West End of Morrow Lake	0.05	0.00	0.61	0.05	0.00	0.54	0.04	0.00	0.49

Table 8-44. Riverine: Effect of Silt Composition Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	0.98	0.00	2.92	0.92	0.00	2.89	0.91	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.01	0.00	4.03	0.92	0.00	4.05	0.90	0.00	3.99
14.75 RDB Sediment Trap	0.61	0.21	1.13	0.56	0.20	1.02	0.53	0.19	0.97
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.85	0.00	4.55	0.77	0.00	4.38	0.74	0.00	4.30
21.50 RDB Sediment Trap	0.18	0.03	0.70	0.17	0.03	0.69	0.17	0.03	0.70
26.00 RDB Sediment Trap	0.42	0.00	3.25	0.37	0.00	2.80	0.34	0.00	2.48
33.00 A Sediment Trap	0.60	0.00	3.13	0.55	0.00	2.81	0.50	0.00	2.54
Morrow Lake Delta	0.39	0.00	8.18	0.34	0.00	7.68	0.31	0.00	7.38
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Maximum Silt (Model Run A1S7)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	1.00	0.00	2.91	0.94	0.00	2.89	0.92	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.09	0.00	4.03	1.00	0.00	4.05	0.98	0.00	3.99
14.75 RDB Sediment Trap	0.74	0.20	2.44	0.67	0.18	2.26	0.64	0.17	2.18
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.87	0.00	4.55	0.79	0.00	4.38	0.76	0.00	4.30
21.50 RDB Sediment Trap	0.30	0.03	1.34	0.29	0.03	1.22	0.28	0.03	1.14
26.00 RDB Sediment Trap	1.05	0.00	3.60	0.92	0.00	3.24	0.83	0.00	3.01
33.00 A Sediment Trap	1.24	0.00	4.71	1.12	0.00	4.34	1.02	0.00	4.04
Morrow Lake Delta	0.38	0.00	8.18	0.34	0.00	7.68	0.31	0.00	7.38
Sediment Fan	0.02	0.00	0.41	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Minimum Silt (Model Run A1S8)

Zone	10/31/2011			11/3/2011			11/7/2011		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals)
MP 4.20 to MP 5.40	1.00	0.00	2.92	0.94	0.00	2.89	0.92	0.00	2.89
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	1.09	0.00	4.03	1.00	0.00	4.05	0.98	0.00	3.99
14.75 RDB Sediment Trap	0.74	0.19	2.44	0.67	0.18	2.26	0.64	0.17	2.18
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.87	0.00	4.55	0.79	0.00	4.38	0.76	0.00	4.30
21.50 RDB Sediment Trap	0.30	0.03	1.34	0.29	0.03	1.22	0.28	0.03	1.14
26.00 RDB Sediment Trap	1.05	0.00	3.60	0.92	0.00	3.24	0.83	0.00	3.01
33.00 A Sediment Trap	1.24	0.00	4.71	1.12	0.00	4.34	1.02	0.00	4.04
Morrow Lake Delta	0.38	0.00	8.18	0.34	0.00	7.68	0.31	0.00	7.38
Sediment Fan	0.02	0.00	0.40	0.02	0.00	0.33	0.02	0.00	0.28
West End of Morrow Lake	0.00	0.00	0.32	0.00	0.00	0.26	0.00	0.00	0.21

Table 8-45. Riverine: Effect of Silt Composition Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	14.0	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.0	15.4	14.0	18.0	33.3	24.0	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	30.0	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.6	26.9	60.0	16.8	10.0	51.4	34.5	21.7	53.0
21.50 RDB Sediment Trap	44.0	44.0	44.0	19.0	19.0	19.0	37.0	37.0	37.0
26.00 RDB Sediment Trap	34.0	34.0	34.0	12.0	12.0	12.0	54.0	54.0	54.0
33.00 A Sediment Trap	47.4	24.0	58.0	18.0	18.0	18.0	34.6	24.0	58.0
Morrow Lake Delta	49.6	24.0	68.0	14.5	10.0	19.0	35.9	16.0	59.0
Sediment Fan	60.2	24.0	68.0	14.8	10.0	18.0	25.0	16.0	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	51.3	42.0	60.1	15.4	14.0	18.0	33.3	23.9	42.0
14.75 RDB Sediment Trap	57.4	48.0	60.0	12.3	10.0	16.0	30.3	29.9	36.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.1	1.0	60.2	16.4	3.1	72.5	35.5	0.6	95.9
21.50 RDB Sediment Trap	44.1	44.0	44.3	19.0	18.9	19.0	36.9	36.8	37.0
26.00 RDB Sediment Trap	34.1	33.7	34.7	12.0	11.9	12.3	53.9	53.0	54.5
33.00 A Sediment Trap	47.3	23.8	58.1	18.0	17.9	18.0	34.7	23.9	58.3
Morrow Lake Delta	49.6	23.9	68.1	14.5	9.9	19.1	35.9	15.9	59.2
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Maximum Silt (Model Run A1S7)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.4	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.1	62.0	15.5	13.9	18.0	33.5	20.0	58.8
14.75 RDB Sediment Trap	56.3	44.0	60.0	12.7	10.0	16.0	31.0	26.2	42.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.1	1.0	60.2	16.4	3.3	68.8	35.6	0.6	95.8
21.50 RDB Sediment Trap	45.3	44.0	57.0	18.4	14.0	19.0	36.3	25.0	42.0
26.00 RDB Sediment Trap	39.3	33.7	60.5	13.0	11.9	17.1	47.7	22.4	54.5
33.00 A Sediment Trap	49.4	23.8	58.8	17.6	14.1	18.2	33.0	23.0	58.3
Morrow Lake Delta	49.6	23.9	68.2	14.5	9.9	19.1	35.8	15.9	59.2
Sediment Fan	60.2	24.0	68.1	14.8	10.0	18.0	25.0	15.9	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Table 8-45. Riverine: Effect of Silt Composition Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Minimum Silt (Model Run A1S8)

Zone	Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
MP 4.20 to MP 5.40	50.3	24.0	62.0	15.3	13.9	18.0	34.3	20.0	59.0
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	50.9	24.1	62.0	15.5	14.0	18.0	33.6	20.0	58.8
14.75 RDB Sediment Trap	56.3	44.0	60.0	12.7	10.0	16.0	31.1	26.2	42.0
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	48.0	1.0	60.2	16.4	3.4	88.9	35.6	0.7	95.6
21.50 RDB Sediment Trap	45.2	44.0	57.0	18.4	14.0	19.0	36.3	25.0	42.1
26.00 RDB Sediment Trap	39.2	33.6	60.5	13.0	11.9	17.1	47.8	22.4	54.5
33.00 A Sediment Trap	49.4	23.8	58.8	17.6	14.1	18.2	33.0	23.0	58.3
Morrow Lake Delta	49.6	23.9	68.0	14.5	9.9	19.1	35.8	16.0	59.2
Sediment Fan	60.2	24.0	68.0	14.8	10.0	18.0	25.0	16.0	60.0
West End of Morrow Lake	59.1	56.0	68.0	15.0	10.0	16.0	25.8	16.0	30.0

Table 8-46. Riverine: Effect of Silt Composition Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.05	-3.12	2.02
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.30	-2.27	2.89
14.75 RDB Sediment Trap	0.16	0.00	1.19
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.10	-4.65	4.22
21.50 RDB Sediment Trap	0.75	0.00	1.76
26.00 RDB Sediment Trap	0.79	-3.04	2.66
33.00 A Sediment Trap	0.34	0.00	1.31
Morrow Lake Delta	0.08	-6.94	7.05
Sediment Fan	0.02	0.00	1.04
West End of Morrow Lake	0.00	0.00	0.00

Maximum Silt (Model Run A1S7)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	0.06	-3.12	2.70
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	0.21	-6.73	3.89
14.75 RDB Sediment Trap	0.22	-0.78	1.62
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.11	-4.65	4.22
21.50 RDB Sediment Trap	0.79	0.00	2.21
26.00 RDB Sediment Trap	0.64	-3.08	3.31
33.00 A Sediment Trap	0.08	-2.51	2.63
Morrow Lake Delta	0.10	-6.94	7.05
Sediment Fan	0.04	0.00	1.31
West End of Morrow Lake	0.00	0.00	0.00

Table 8-46. Riverine: Effect of Silt Composition Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Minumum Silt (Model Run A1S8)

Zone	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
MP 4.20 to MP 5.40	-0.01	-3.12	1.43
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	-0.09	-6.73	2.60
14.75 RDB Sediment Trap	0.06	-0.78	0.66
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	0.02	-4.65	4.22
21.50 RDB Sediment Trap	0.16	0.00	0.70
26.00 RDB Sediment Trap	0.10	-3.08	2.54
33.00 A Sediment Trap	-0.03	-2.51	2.63
Morrow Lake Delta	0.02	-6.94	7.06
Sediment Fan	0.00	0.00	0.21
West End of Morrow Lake	0.00	0.00	0.00

Table 8-47. Riverine: Effect of Silt Composition Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	120.2	0.0	4186.0	3.2	0.0	107.0	12.4	-12693.0	7015.5
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	802.4	0.0	8991.4	30.1	0.0	183.0	137.0	-9680.1	9033.5
14.75 RDB Sediment Trap	531.7	0.0	4648.6	15.4	0.2	109.0	159.3	-73.3	2888.3
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	270.1	-1.3	8669.5	22.3	-0.2	204.0	190.5	-32352.0	25332.0
21.50 RDB Sediment Trap	3308.4	0.0	7100.8	141.4	0.0	224.0	39.6	0.0	498.8
26.00 RDB Sediment Trap	2740.3	0.0	8338.1	125.2	0.0	194.0	153.6	-27834.0	13962.0
33.00 A Sediment Trap	493.0	0.0	3616.5	15.0	0.0	108.0	1741.4	0.0	7492.5
Morrow Lake Delta	229.2	-526.7	6999.2	19.7	-164.0	216.0	15.6	-55991.0	45029.0
Sediment Fan	142.4	0.0	2978.9	95.9	0.0	197.0	0.1	-580.3	257.7
West End of Morrow Lake	9.1	-4.0	69.0	38.5	-0.8	116.0	0.1	-496.8	328.0

Maximum Silt (Model Run A1S7)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	155.1	0.0	5671.4	3.3	0.0	108.2	-19.4	-12692.2	7014.1
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	956.2	0.0	12194.2	27.6	0.0	189.5	-739.4	-39792.9	9032.4
14.75 RDB Sediment Trap	823.4	0.0	6381.4	17.6	0.2	109.3	87.4	-4981.3	2888.1
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	338.4	-1.3	11241.0	23.2	-0.2	218.1	76.6	-32353.6	25330.2
21.50 RDB Sediment Trap	3495.0	0.0	8980.9	126.7	0.0	227.2	100.5	-263.4	1318.0
26.00 RDB Sediment Trap	2436.6	0.0	10829.1	90.2	0.0	204.1	-27.9	-27830.0	17593.6
33.00 A Sediment Trap	455.2	-7.0	4618.0	11.0	-3.0	113.2	486.4	-12337.3	16870.3
Morrow Lake Delta	290.5	-526.7	8838.3	20.7	-163.7	230.4	15.5	-55989.7	45028.4
Sediment Fan	181.9	0.0	3744.6	100.1	0.0	207.6	0.1	-580.3	257.8
West End of Morrow Lake	12.2	-4.0	90.4	40.7	-0.5	124.1	0.1	-502.0	328.1

Minimum Silt (Model Run A1S8)

Zone	Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
MP 4.20 to MP 5.40	11.3	0.0	451.1	3.6	0.0	108.8	-19.4	-12694.3	7016.9
Ceresco Impoundment (MP 5.40 to Ceresco Dam)	74.7	0.0	964.9	28.7	0.0	199.6	-739.3	-39793.3	9036.6
14.75 RDB Sediment Trap	278.4	0.0	2126.6	17.8	0.3	109.4	87.4	-4981.3	2888.2
Mill Pond Area (MP 14.20 to Kalamazoo Dam)	91.8	-0.9	2325.7	24.4	-0.2	230.5	76.9	-32346.8	25335.6
21.50 RDB Sediment Trap	913.1	0.0	2360.4	133.1	0.0	231.5	100.6	-260.6	1316.1
26.00 RDB Sediment Trap	502.8	0.0	2243.2	93.7	0.0	215.9	-27.4	-27844.4	17609.0
33.00 A Sediment Trap	115.5	-7.0	1165.5	11.9	-3.0	118.4	486.3	-12337.8	16868.8
Morrow Lake Delta	79.2	-526.7	2406.9	21.7	-163.7	240.7	15.5	-55989.0	45032.4
Sediment Fan	45.5	0.0	1057.9	104.4	0.0	227.5	0.1	-580.4	257.7
West End of Morrow Lake	1.8	-4.0	15.3	42.6	0.0	129.7	0.1	-483.1	328.5

Table 8-48. Floodplain: Effect of Silt Composition Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	1.22	0.00	2.66	1.16	0.00	2.58	1.02	0.00	2.46	0.19	0.00	2.32	0.17	0.00	2.20	0.13	0.00	1.98
Ceresco to Raymond Rd	1.46	0.00	4.06	1.43	0.00	4.00	1.28	0.00	3.69	0.26	0.00	2.52	0.26	0.00	2.39	0.20	0.00	2.01
Raymond Rd to Kalamazoo Dam	0.97	0.00	5.73	0.98	0.00	5.86	0.85	0.00	4.81	0.19	0.00	2.65	0.19	0.00	3.48	0.16	0.00	1.95
Kalamazoo Dam to Battle Creek River	2.98	0.00	9.77	3.05	0.00	9.99	2.57	0.00	8.52	1.02	0.00	11.13	1.04	0.00	11.49	0.82	0.00	9.98
Battle Creek River to Custer Dr	1.43	0.00	4.09	1.46	0.00	4.19	1.23	0.00	3.99	0.04	0.00	5.50	0.05	0.00	5.95	0.04	0.00	5.00
Custer Dr to M-96	1.03	0.00	3.07	1.04	0.00	3.02	1.00	0.00	3.02	0.16	0.00	2.62	0.21	0.00	3.48	0.16	0.00	3.52
M-96 to Michigan Ave	1.27	0.00	4.05	1.39	0.00	4.12	1.32	0.00	3.93	0.09	0.00	1.46	0.17	0.00	1.63	0.15	0.00	7.56
Michigan Ave to 35th Street	1.26	0.00	3.36	1.48	0.00	3.64	1.45	0.00	3.55	0.07	0.00	1.30	0.13	0.00	1.84	0.12	0.00	1.71
35th Street to MP 37.75	0.55	0.00	2.44	0.72	0.00	2.64	0.70	0.00	2.59	0.01	0.00	0.63	0.03	0.00	0.82	0.03	0.00	0.80
MP 37.75 to MP 38.75	0.16	0.00	0.75	0.20	0.00	0.95	0.20	0.00	0.93	0.00	0.00	0.06	0.01	0.00	0.17	0.01	0.00	0.16
MP 38.75 to Morrow Lake Dam	0.10	0.00	0.95	0.14	0.00	1.44	0.14	0.00	1.48	0.00	0.00	0.03	0.00	0.00	0.12	0.00	0.00	0.06

Maximum Silt (Model Run E1S7)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.91	0.00	2.66	0.85	0.00	2.58	0.74	0.00	2.46	0.44	0.00	2.43	0.41	0.00	2.42	0.34	0.00	2.36
Ceresco to Raymond Rd	1.03	0.00	4.06	1.00	0.00	4.00	0.89	0.00	3.69	0.47	0.00	3.81	0.46	0.00	3.73	0.39	0.00	3.43
Raymond Rd to Kalamazoo Dam	0.70	0.00	5.73	0.71	0.00	5.85	0.61	0.00	4.81	0.34	0.00	5.73	0.34	0.00	5.85	0.29	0.00	4.81
Kalamazoo Dam to Battle Creek River	1.86	0.00	11.21	1.91	0.00	11.42	1.51	0.00	9.96	1.41	0.00	11.21	1.43	0.00	11.42	1.16	0.00	9.96
Battle Creek River to Custer Dr	0.97	0.00	9.42	1.00	0.00	9.72	0.83	0.00	8.59	0.20	0.00	9.42	0.21	0.00	9.72	0.17	0.00	8.59
Custer Dr to M-96	0.76	0.00	3.07	0.79	0.00	3.33	0.74	0.00	3.02	0.23	0.00	3.07	0.28	0.00	3.48	0.23	0.00	3.52
M-96 to Michigan Ave	0.89	0.00	4.06	1.00	0.00	4.12	0.95	0.00	3.93	0.17	0.00	4.06	0.24	0.00	4.12	0.22	0.00	3.93
Michigan Ave to 35th Street	0.85	0.00	3.36	1.05	0.00	3.64	1.02	0.00	3.55	0.20	0.00	3.36	0.28	0.00	3.64	0.27	0.00	3.55
35th Street to MP 37.75	0.48	0.00	2.44	0.63	0.00	2.64	0.61	0.00	2.58	0.08	0.00	2.44	0.11	0.00	2.64	0.11	0.00	2.58
MP 37.75 to MP 38.75	0.15	0.00	0.75	0.19	0.00	0.95	0.19	0.00	0.93	0.02	0.00	0.45	0.03	0.00	0.55	0.03	0.00	0.54
MP 38.75 to Morrow Lake Dam	0.09	0.00	0.95	0.14	0.00	1.44	0.14	0.00	1.48	0.01	0.00	0.12	0.02	0.00	0.18	0.01	0.00	0.18

Table 8-48. Floodplain: Effect of Silt Composition Change on Velocity (Feet per Second)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Minimum Silt (Model Run E1S8)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)	Average (Feet per Second)	Minimum (Feet per Second)	Maximum (Feet per Second)
Confluence to Ceresco	0.91	0.00	2.66	0.85	0.00	2.58	0.74	0.00	2.46	0.44	0.00	2.43	0.41	0.00	2.42	0.35	0.00	2.36
Ceresco to Raymond Rd	1.03	0.00	4.06	1.00	0.00	4.00	0.89	0.00	3.69	0.47	0.00	3.81	0.46	0.00	3.73	0.39	0.00	3.43
Raymond Rd to Kalamazoo Dam	0.70	0.00	5.73	0.71	0.00	5.85	0.61	0.00	4.81	0.34	0.00	5.73	0.34	0.00	5.85	0.29	0.00	4.81
Kalamazoo Dam to Battle Creek River	1.86	0.00	11.21	1.88	0.00	11.24	1.51	0.00	9.93	1.41	0.00	11.21	1.41	0.00	11.24	1.16	0.00	9.93
Battle Creek River to Custer Dr	0.97	0.00	9.42	1.00	0.00	9.51	0.83	0.00	8.52	0.20	0.00	9.42	0.21	0.00	9.51	0.17	0.00	8.52
Custer Dr to M-96	0.76	0.00	3.07	0.79	0.00	3.33	0.74	0.00	3.02	0.23	0.00	3.07	0.28	0.00	3.48	0.23	0.00	3.52
M-96 to Michigan Ave	0.89	0.00	4.06	1.00	0.00	4.12	0.95	0.00	3.93	0.17	0.00	4.06	0.24	0.00	4.12	0.22	0.00	3.93
Michigan Ave to 35th Street	0.85	0.00	3.36	1.05	0.00	3.64	1.02	0.00	3.55	0.20	0.00	3.36	0.28	0.00	3.64	0.27	0.00	3.55
35th Street to MP 37.75	0.48	0.00	2.44	0.63	0.00	2.64	0.62	0.00	2.59	0.08	0.00	2.44	0.11	0.00	2.64	0.11	0.00	2.59
MP 37.75 to MP 38.75	0.15	0.00	0.75	0.19	0.00	0.95	0.19	0.00	0.93	0.02	0.00	0.45	0.03	0.00	0.55	0.03	0.00	0.54
MP 38.75 to Morrow Lake Dam	0.09	0.00	0.95	0.14	0.00	1.44	0.14	0.00	1.48	0.01	0.00	0.12	0.01	0.00	0.18	0.01	0.00	0.18

Table 8-49. Floodplain: Effect of Silt Composition Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.87	0.00	47.11	3.63	0.00	46.69	3.16	0.00	48.48	1.24	0.00	41.29	1.11	0.00	40.05	0.88	0.00	40.47
Ceresco to Raymond Rd	10.16	0.00	81.46	9.85	0.00	79.31	8.67	0.00	72.95	2.36	0.00	40.69	2.24	0.00	44.38	1.65	0.00	47.50
Raymond Rd to Kalamazoo Dam	5.09	0.00	66.30	5.13	0.00	65.33	4.39	0.00	52.60	1.00	0.00	100.80	1.07	0.00	170.10	0.83	0.00	32.79
Kalamazoo Dam to Battle Creek River	21.80	0.00	275.80	24.18	0.00	284.60	19.37	0.00	235.10	8.87	0.00	433.80	9.43	0.00	455.20	7.52	0.00	422.30
Battle Creek River to Custer Dr	4.31	0.00	135.40	4.43	0.00	146.30	3.43	0.00	118.40	0.23	0.00	226.80	0.30	0.00	257.80	0.25	0.00	230.10
Custer Dr to M-96	3.56	0.00	44.67	3.53	0.00	41.38	3.35	0.00	44.88	0.90	0.00	99.26	1.25	0.00	158.00	0.90	0.00	159.90
M-96 to Michigan Ave	4.49	0.00	87.13	5.05	0.00	67.45	4.66	0.00	70.10	0.48	0.00	23.10	0.91	0.00	31.77	0.82	0.00	594.10
Michigan Ave to 35th Street	5.17	0.00	29.71	6.58	0.00	36.18	6.36	0.00	34.87	0.46	0.00	13.84	0.96	0.00	23.22	0.91	0.00	21.52
35th Street to MP 37.75	1.10	0.00	10.13	1.52	0.00	13.96	1.44	0.00	13.36	0.02	0.00	6.43	0.09	0.00	7.95	0.09	0.00	7.57
MP 37.75 to MP 38.75	0.06	0.00	1.66	0.09	0.00	2.70	0.08	0.00	2.55	0.00	0.00	0.09	0.01	0.00	0.50	0.01	0.00	0.48
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.03	0.00	1.76	0.03	0.00	1.84	0.00	0.00	0.02	0.00	0.00	0.36	0.00	0.00	0.06

Maximum Silt (Model Run E1S7)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.16	0.00	47.12	2.93	0.00	46.69	2.51	0.00	48.46	2.07	0.00	47.12	1.91	0.00	46.69	1.59	0.00	48.46
Ceresco to Raymond Rd	7.87	0.00	81.45	7.60	0.00	79.31	6.46	0.00	72.97	3.76	0.00	81.45	3.61	0.00	79.31	2.92	0.00	72.97
Raymond Rd to Kalamazoo Dam	3.90	0.00	176.13	3.93	0.00	149.79	3.38	0.00	151.35	1.91	0.00	194.98	1.93	0.00	174.82	1.66	0.00	151.35
Kalamazoo Dam to Battle Creek River	17.03	0.00	454.37	17.54	0.00	459.31	13.77	0.00	419.14	12.35	0.00	454.37	12.64	0.00	459.31	10.24	0.00	419.14
Battle Creek River to Custer Dr	3.28	0.00	445.40	3.40	0.00	453.78	2.60	0.00	419.14	0.93	0.00	445.40	1.01	0.00	453.78	0.81	0.00	419.14
Custer Dr to M-96	3.10	0.00	51.53	3.27	0.00	48.24	2.95	0.00	49.66	1.16	0.00	99.23	1.48	0.00	157.99	1.14	0.00	159.96
M-96 to Michigan Ave	3.68	0.00	87.22	4.41	0.00	67.46	3.98	0.00	70.01	0.79	0.00	87.22	1.23	0.00	67.46	1.04	0.00	70.01
Michigan Ave to 35th Street	3.83	0.00	29.69	5.37	0.00	36.19	5.14	0.00	34.96	1.06	0.00	29.69	1.68	0.00	36.19	1.60	0.00	34.96
35th Street to MP 37.75	0.96	0.00	10.12	1.37	0.00	13.97	1.29	0.00	13.26	0.21	0.00	10.12	0.34	0.00	13.97	0.32	0.00	13.26
MP 37.75 to MP 38.75	0.05	0.00	1.66	0.08	0.00	2.68	0.08	0.00	2.56	0.02	0.00	1.66	0.03	0.00	2.47	0.03	0.00	2.36
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.02	0.00	1.76	0.03	0.00	1.84	0.00	0.00	0.03	0.00	0.00	0.07	0.00	0.00	0.07

Table 8-49. Floodplain: Effect of Silt Composition Change on Shear Stress (Pascals)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Minimum Silt (Model Run E1S8)

Zone	Channel Cells									Floodplain Cells								
	7/24/2010			7/26/2010			7/28/2010			7/24/2010			7/26/2010			7/28/2010		
	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals	Average (Pascals)	Minimum (Pascals)	Maximum (Pascals
Confluence to Ceresco	3.16	0.00	47.12	2.93	0.00	46.70	2.51	0.00	48.49	2.09	0.00	47.12	1.91	0.00	46.70	1.62	0.00	48.49
Ceresco to Raymond Rd	7.87	0.00	81.46	7.59	0.00	79.30	6.46	0.00	72.95	3.76	0.00	81.46	3.61	0.00	79.30	2.92	0.00	72.95
Raymond Rd to Kalamazoo Dam	3.91	0.00	172.31	3.93	0.00	151.54	3.40	0.00	188.38	1.92	0.00	196.56	1.92	0.00	171.34	1.68	0.00	188.38
Kalamazoo Dam to Battle Creek River	17.04	0.00	454.40	16.24	0.00	437.18	13.58	0.00	416.32	12.34	0.00	454.40	11.76	0.00	437.18	10.12	0.00	416.32
Battle Creek River to Custer Dr	3.28	0.00	445.69	3.37	0.00	426.39	2.59	0.00	416.32	0.94	0.00	445.69	1.00	0.00	426.39	0.80	0.00	416.32
Custer Dr to M-96	3.10	0.00	51.47	3.27	0.00	48.33	2.95	0.00	49.63	1.16	0.00	99.28	1.48	0.00	157.85	1.14	0.00	159.74
M-96 to Michigan Ave	3.67	0.00	87.47	4.40	0.00	67.50	3.98	0.00	70.04	0.78	0.00	87.47	1.22	0.00	67.50	1.04	0.00	70.04
Michigan Ave to 35th Street	3.82	0.00	29.66	5.36	0.00	36.19	5.14	0.00	34.84	1.06	0.00	29.66	1.68	0.00	36.19	1.61	0.00	34.84
35th Street to MP 37.75	0.96	0.00	10.11	1.36	0.00	13.96	1.30	0.00	13.37	0.21	0.00	10.11	0.34	0.00	13.96	0.33	0.00	13.37
MP 37.75 to MP 38.75	0.05	0.00	1.65	0.08	0.00	2.70	0.08	0.00	2.56	0.02	0.00	1.65	0.03	0.00	2.49	0.03	0.00	2.36
MP 38.75 to Morrow Lake Dam	0.01	0.00	0.79	0.02	0.00	1.76	0.03	0.00	1.84	0.00	0.00	0.03	0.00	0.00	0.06	0.00	0.00	0.07

Table 8-50. Floodplain: Effect of Silt Composition Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Initial Conditions

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.30	23.98	62.00	15.13	9.98	19.00	36.57	20.00	59.03	25.07	15.00	89.12	14.68	5.00	25.07	60.25	1.87	80.00
Ceresco to Raymond Rd	38.57	24.00	60.00	15.19	10.00	19.00	46.24	23.00	60.00	24.14	15.00	63.00	13.95	5.00	18.00	61.91	21.00	80.00
Raymond Rd to Kalamazoo Dam	47.63	0.00	60.00	15.81	0.00	22.00	36.48	0.00	78.00	24.20	15.00	58.00	13.99	5.00	18.00	61.81	24.00	80.00
Kalamazoo Dam to Battle Creek River	45.32	0.00	46.00	15.83	0.00	16.83	37.69	0.00	43.66	41.72	24.46	46.00	15.80	14.67	16.00	42.48	38.00	60.87
Battle Creek River to Custer Dr	45.56	0.00	60.00	17.71	0.00	22.00	36.73	24.00	100.00	23.52	14.86	58.00	11.30	4.95	18.00	65.17	24.00	80.18
Custer Dr to M-96	50.71	24.00	65.00	15.12	10.00	19.00	34.17	17.00	59.01	26.64	14.94	62.00	13.66	4.98	19.00	59.70	25.00	80.09
M-96 to Michigan Ave	47.99	24.00	60.06	15.81	9.99	24.00	36.19	22.93	60.00	24.85	15.00	50.15	13.80	5.00	18.00	61.35	34.80	80.00
Michigan Ave to 35th Street	44.79	24.00	60.00	16.18	10.00	24.00	39.03	23.00	60.00	22.61	15.00	50.00	12.02	5.00	18.00	65.37	35.00	80.00
35th Street to MP 37.75	47.67	24.00	68.00	14.38	10.00	19.00	37.94	16.00	59.00	21.97	15.00	46.00	11.80	5.00	22.00	66.23	40.00	80.00
MP 37.75 to MP 38.75	60.33	24.00	68.00	15.00	10.00	18.00	24.67	16.00	60.00	21.58	15.00	28.00	11.58	5.00	18.00	66.85	54.00	80.00
MP 38.75 to Morrow Lake Dam	58.64	56.00	68.00	15.07	10.00	16.00	26.29	16.00	30.00	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	48.26	23.06	62.67	15.12	9.40	18.96	36.62	19.14	60.61	25.47	14.81	97.55	14.60	2.39	28.21	59.93	0.03	80.26
Ceresco to Raymond Rd	38.40	0.00	60.99	15.20	0.00	19.41	46.40	22.15	100.00	24.07	14.08	63.13	13.90	4.69	18.11	62.03	20.88	81.23
Raymond Rd to Kalamazoo Dam	47.10	0.00	85.56	15.59	0.00	22.71	37.30	5.72	99.99	24.20	0.01	75.75	13.97	0.00	23.39	61.84	0.86	99.99
Kalamazoo Dam to Battle Creek River	4.95	0.00	97.21	1.12	0.00	16.00	93.93	0.11	100.00	29.35	0.01	97.03	9.06	0.00	33.67	61.58	0.20	99.99
Battle Creek River to Custer Dr	45.43	0.00	60.14	17.67	0.00	21.94	36.90	23.33	100.00	23.55	13.12	93.19	11.30	2.48	25.34	65.15	0.41	82.53
Custer Dr to M-96	50.66	23.71	65.90	15.10	9.82	19.57	34.24	15.85	59.50	26.64	14.43	62.13	13.66	4.81	19.16	59.70	24.87	80.77
M-96 to Michigan Ave	47.93	23.33	61.16	15.80	9.87	24.27	36.27	21.52	60.97	24.84	0.00	92.39	13.82	0.00	86.03	61.34	0.07	100.00
Michigan Ave to 35th Street	44.58	22.86	60.58	16.17	9.13	24.17	39.25	22.25	60.80	22.60	13.93	50.06	12.01	4.64	18.29	65.39	34.95	81.42
35th Street to MP 37.75	47.67	23.91	68.08	14.38	9.76	19.31	37.95	15.95	59.15	21.97	14.97	46.05	11.80	4.99	22.01	66.23	39.95	80.04
MP 37.75 to MP 38.75	60.34	24.00	68.09	15.01	10.00	18.03	24.64	15.90	60.00	21.58	15.00	28.01	11.58	5.00	18.01	66.85	53.98	80.00
MP 38.75 to Morrow Lake Dam	58.63	55.98	68.00	15.08	10.00	16.06	26.28	16.00	30.02	25.05	25.00	28.00	15.05	15.00	18.00	59.90	54.00	60.00

Table 8-50. Floodplain: Effect of Silt Composition Change on Particle Size Distribution (Percent)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Maximum Silt (Model Run E1S7)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.19	14.81	62.67	14.99	4.91	18.96	44.83	19.14	80.26	31.60	14.81	98.07	14.76	1.89	28.27	53.64	0.01	80.26
Ceresco to Raymond Rd	31.80	0.00	63.14	14.46	0.00	19.41	53.74	20.87	100.00	26.38	0.01	63.14	14.20	0.00	19.41	59.41	20.87	99.99
Raymond Rd to Kalamazoo Dam	38.10	0.00	88.54	15.25	0.00	22.71	46.64	0.67	100.00	28.20	0.01	88.54	14.21	0.00	22.71	57.60	0.67	99.99
Kalamazoo Dam to Battle Creek River	21.44	0.00	97.79	5.06	0.00	23.49	73.50	0.08	100.00	25.64	0.00	97.79	7.58	0.00	32.76	66.79	0.08	100.00
Battle Creek River to Custer Dr	35.13	0.00	87.67	13.67	0.00	21.93	51.20	10.30	100.00	26.47	0.00	94.79	12.12	0.00	21.93	61.41	0.33	100.00
Custer Dr to M-96	41.07	14.59	65.90	14.74	4.86	19.57	44.19	15.85	80.54	28.57	14.43	65.90	13.82	4.81	19.57	57.61	15.85	80.77
M-96 to Michigan Ave	38.85	14.55	61.16	15.05	4.83	24.27	46.10	21.52	80.60	26.42	0.00	93.86	13.97	0.00	84.15	59.60	0.05	100.00
Michigan Ave to 35th Street	35.61	13.93	60.58	14.47	4.64	24.17	49.91	22.25	81.42	25.44	13.93	60.58	12.52	4.64	24.01	62.03	22.25	81.42
35th Street to MP 37.75	44.14	14.97	68.13	13.98	4.99	19.30	41.88	15.92	80.04	26.58	14.97	68.11	12.17	4.99	22.01	61.25	15.93	80.04
MP 37.75 to MP 38.75	58.40	15.00	68.13	14.88	5.00	18.03	26.71	15.87	80.00	32.99	15.00	68.06	12.07	5.00	18.01	54.94	15.96	80.00
MP 38.75 to Morrow Lake Dam	56.94	25.00	68.00	15.09	10.00	18.00	27.96	16.00	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Minimum Silt (Model Run E1S8)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)	Average (Percent)	Minimum (Percent)	Maximum (Percent)
Confluence to Ceresco	40.14	14.80	62.67	14.99	4.93	18.96	44.87	19.14	80.27	31.13	14.80	78.10	15.14	4.93	70.23	53.73	0.07	80.27
Ceresco to Raymond Rd	31.79	0.00	63.08	14.46	0.00	19.41	53.75	20.90	100.00	26.37	0.01	63.08	14.21	0.00	19.41	59.43	20.90	99.99
Raymond Rd to Kalamazoo Dam	38.01	0.00	61.05	15.31	0.00	71.81	46.68	2.27	100.00	28.11	0.00	61.05	14.23	0.00	71.81	57.66	2.27	99.99
Kalamazoo Dam to Battle Creek River	15.41	0.00	83.19	6.81	0.00	63.10	77.77	0.59	100.00	20.33	0.00	83.19	9.20	0.00	63.10	70.47	0.59	100.00
Battle Creek River to Custer Dr	35.10	0.00	60.14	13.68	0.00	22.02	51.23	23.33	100.00	26.44	0.00	68.40	12.14	0.00	68.63	61.42	0.99	100.00
Custer Dr to M-96	41.05	14.59	65.90	14.75	4.86	19.57	44.20	15.85	80.54	28.56	14.42	65.90	13.82	4.81	19.57	57.62	15.85	80.77
M-96 to Michigan Ave	38.84	14.51	61.16	15.05	4.84	24.27	46.11	21.52	80.65	26.39	0.00	61.16	14.00	0.00	95.41	59.61	0.22	100.00
Michigan Ave to 35th Street	35.61	13.93	60.58	14.47	4.64	24.17	49.91	22.25	81.42	25.44	13.93	60.58	12.52	4.64	24.01	62.04	22.25	81.42
35th Street to MP 37.75	44.12	14.97	68.01	13.98	4.99	19.30	41.90	15.97	80.04	26.57	14.97	68.00	12.17	4.99	22.01	61.26	15.99	80.04
MP 37.75 to MP 38.75	58.37	15.00	68.01	14.90	5.00	18.04	26.73	15.97	80.00	32.99	15.00	68.00	12.07	5.00	18.02	54.94	15.99	80.00
MP 38.75 to Morrow Lake Dam	56.94	25.00	68.00	15.09	10.00	18.00	27.96	16.00	60.00	34.04	25.00	68.00	14.88	10.00	18.00	51.08	16.00	60.00

Table 8-51. Floodplain: Effect of Silt Composition Change on Sedimentation Rate (Millimeters per Week)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run A1)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.07	-16.87	27.24	0.33	-27.49	68.89
Ceresco to Raymond Rd	-1.37	-45.85	63.40	0.53	-43.65	52.15
Raymond Rd to Kalamazoo Dam	-0.05	-23.30	15.46	0.38	-27.12	119.33
Kalamazoo Dam to Battle Creek River	0.43	-0.15	8.81	1.23	-11.35	70.38
Battle Creek River to Custer Dr	-0.10	-31.58	44.48	0.16	-41.96	89.34
Custer Dr to M-96	0.15	-24.25	20.15	0.11	-57.36	78.82
M-96 to Michigan Ave	-0.23	-31.62	22.62	0.10	-53.82	80.49
Michigan Ave to 35th Street	-0.45	-36.79	69.67	0.25	-50.71	57.27
35th Street to MP 37.75	0.25	-27.23	20.19	0.05	-10.03	6.66
MP 37.75 to MP 38.75	0.47	0.00	3.36	0.01	-0.01	0.82
MP 38.75 to Morrow Lake Dam	0.02	-1.72	0.23	0.00	-0.01	0.01

Maximum Silt (Model Run E1S7)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.26	-27.49	27.24	0.25	-27.49	30.23
Ceresco to Raymond Rd	-0.04	-45.85	63.40	0.20	-45.85	59.76
Raymond Rd to Kalamazoo Dam	0.21	-27.12	16.57	0.25	-27.12	56.12
Kalamazoo Dam to Battle Creek River	0.15	-23.84	21.12	0.40	-23.84	35.39
Battle Creek River to Custer Dr	0.19	-35.76	52.46	0.15	-43.13	52.46
Custer Dr to M-96	0.12	-36.43	26.08	0.15	-61.68	59.76
M-96 to Michigan Ave	-0.10	-47.09	27.88	0.14	-53.77	45.65
Michigan Ave to 35th Street	0.19	-50.70	69.66	0.29	-50.70	69.66
35th Street to MP 37.75	0.28	-27.23	20.17	0.09	-18.13	15.13
MP 37.75 to MP 38.75	0.58	0.00	4.43	0.03	-0.01	1.90
MP 38.75 to Morrow Lake Dam	0.03	-1.72	0.23	0.00	-0.01	0.01

Minimum Silt (Model Run E1S8)

Zone	Channel Cells			Floodplain Cells		
	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)	Average (Millimeters per Week)	Minimum (Millimeters per Week)	Maximum (Millimeters per Week)
Confluence to Ceresco	0.12	-27.49	56.10	0.22	-27.49	136.08
Ceresco to Raymond Rd	-0.06	-45.85	63.40	0.15	-45.85	59.78
Raymond Rd to Kalamazoo Dam	-0.08	-27.12	16.58	0.19	-27.12	260.55
Kalamazoo Dam to Battle Creek River	0.42	-23.84	47.68	2.08	-23.84	144.02
Battle Creek River to Custer Dr	0.15	-35.71	52.51	0.12	-40.05	195.61
Custer Dr to M-96	0.00	-36.43	26.07	0.07	-49.67	125.23
M-96 to Michigan Ave	-0.14	-47.10	27.87	0.08	-53.74	157.40
Michigan Ave to 35th Street	0.18	-50.73	69.69	0.26	-50.73	69.69
35th Street to MP 37.75	0.11	-27.24	20.19	0.01	-18.13	15.12
MP 37.75 to MP 38.75	0.11	-0.04	0.71	0.00	-0.04	0.03
MP 38.75 to Morrow Lake Dam	0.03	-1.72	0.24	0.00	-0.01	0.01

Table 8-52. Floodplain: Effect of Silt Composition Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Base Model (Model Run E1)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	321	-1101	17074	7	-322	396	-502	-75396	81628	243	-656	21220	9	-393	334	619	-71100	193380
Ceresco to Raymond Rd	-76	-7342	9407	-49	-5199	224	-5517	-84718	144360	96	-892	15187	6	-535	319	1518	-95189	151320
Raymond Rd to Kalamazoo Dam	417	-24671	14280	-19	-7448	380	-1189	-70781	53918	326	-7176	25461	16	-4301	396	677	-70224	384150
Kalamazoo Dam to Battle Creek River	139	0	8950	3	0	128	5875	0	139390	57	-9672	8460	-29	-5804	228	2103	-58463	212170
Battle Creek River to Custer Dr	20	-16664	11903	-20	-7079	376	-815	-86462	196800	92	-30001	10488	8	-18000	288	303	-104790	195890
Custer Dr to M-96	203	-1808	10181	9	-573	325	-98	-81046	57478	155	-20982	14698	17	-12613	393	65	-88667	95864
M-96 to Michigan Ave	18	-19224	7555	-5	-5967	284	-1087	-88539	68446	99	-28214	20138	15	-16816	334	91	-85528	204640
Michigan Ave to 35th Street	-63	-2660	3600	-32	-1776	150	-2650	-83016	134720	43	-100	3060	6	-67	218	512	-80628	101000
35th Street to MP 37.75	258	-702	3975	32	-208	257	134	-82061	60917	58	0	4997	13	0	304	32	-15863	20591
MP 37.75 to MP 38.75	562	0	4475	194	0	285	0	-520	246	8	0	887	10	0	143	0	-67	41
MP 38.75 to Morrow Lake Dam	1	-4	23	134	0	226	-1	-2279	316	0	0	0	0	0	36	0	-13	11

Maximum Silt (Model Run E1S7)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	482	-1102	28794	10	-394	403	-59	-84603	81628	414	-1102	28794	11	-406	403	3	-71101	84111
Ceresco to Raymond Rd	21	-7342	20554	-25	-5199	339	-817	-95189	151320	98	-6869	20554	-4	-4866	370	172	-95189	151320
Raymond Rd to Kalamazoo Dam	455	-24671	19206	-8	-7448	399	-176	-70776	55379	414	-24671	34629	12	-7448	433	108	-70776	176348
Kalamazoo Dam to Battle Creek River	-42	-30001	11946	-95	-18000	242	2160	-88273	150568	43	-30001	11946	-63	-18000	242	1223	-88273	150568
Battle Creek River to Custer Dr	95	-30001	15923	-14	-18000	401	160	-92251	196650	122	-30001	15923	4	-18000	401	236	-105936	196650
Custer Dr to M-96	280	-1807	14256	12	-817	383	-108	-88666	62527	211	-21166	19774	18	-12729	412	69	-88666	63315
M-96 to Michigan Ave	99	-19200	10120	3	-5959	302	-568	-88538	68365	127	-28366	27333	15	-16888	361	122	-88538	94070
Michigan Ave to 35th Street	-10	-2659	4787	-16	-1776	184	-389	-83016	134718	44	-2659	4787	3	-1776	233	576	-83016	128701
35th Street to MP 37.75	338	-702	6644	34	-208	316	122	-82060	60939	133	-702	6644	21	-208	316	-39	-57375	37316
MP 37.75 to MP 38.75	703	0	5941	197	0	296	0	-518	246	41	0	2622	34	0	245	0	-65	153
MP 38.75 to Morrow Lake Dam	1	-4	41	136	0	246	-1	-2279	317	0	0	0	7	0	99	0	-11	10

Table 8-52. Floodplain: Effect of Silt Composition Change on Net Change in Mass (Grams per Square Meter)
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Minimum Silt (Model Run E1S8)

Zone	Channel Cells									Floodplain Cells								
	Silt			Clay			Sand			Silt			Clay			Sand		
	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)	Average (Grams per Square Meter)	Minimum (Grams per Square Meter)	Maximum (Grams per Square Meter)
Confluence to Ceresco	32	-1102	2169	11	-394	448	-4	-84604	146864	29	-1102	2169	12	-370	448	402	-71096	381341
Ceresco to Raymond Rd	-50	-7342	1772	-25	-5199	363	-817	-95189	151333	-8	-6870	1772	-3	-4866	388	172	-95189	151333
Raymond Rd to Kalamazoo Dam	-43	-24671	1998	-7	-7448	427	-176	-70771	55448	21	-24671	2544	13	-7448	465	546	-70771	847585
Kalamazoo Dam to Battle Creek River	-196	-30001	1225	-96	-18000	258	3180	-85343	224090	-92	-30001	1225	-60	-18000	258	5735	-85343	296205
Battle Creek River to Custer Dr	-29	-30001	1810	-14	-18000	415	246	-92239	224090	-2	-30001	1810	5	-18000	415	316	-102039	427412
Custer Dr to M-96	28	-1806	1632	12	-815	406	-108	-88660	62524	21	-20651	1961	19	-12392	422	121	-88660	176465
M-96 to Michigan Ave	-5	-19159	1162	4	-5946	319	-557	-88537	68211	10	-28011	2014	16	-16775	395	158	-88537	452374
Michigan Ave to 35th Street	-38	-2660	640	-16	-1777	187	-389	-83016	134727	-2	-2660	640	3	-1777	244	576	-83016	128726
35th Street to MP 37.75	39	-702	901	36	-208	322	122	-82061	60932	16	-702	901	22	-208	322	-39	-57376	37308
MP 37.75 to MP 38.75	89	0	802	208	0	315	0	-519	246	4	0	346	36	0	257	0	-64	185
MP 38.75 to Morrow Lake Dam	0	-4	3	143	0	260	-1	-2279	330	0	0	0	7	0	103	0	-11	10

Table 10-1. Sediment Remobilization at Various Flow Events
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release
Enbridge Energy, Limited Partnership

Model Run	Approximate Flow (Cubic Feet per Second)	Submerged Oil Acreage with Highest Potential for Remobilization[1]	
		Acres	Percent[2]
September 2010	500	0.15	0.29
October - November 2011	700	0.32	0.62
April 2011	1300	0.70	1.36
May 2011	1500	0.79	1.53
July 2010	3000	1.04	2.01
May - June 2010	3500	0.70	1.36
50-Year	5500	0.95	1.84
100-Year	6500	1.99	3.85

Footnotes:

1=Summation of all grid cells in delineated areas that had a net decrease in mass of silt or clay and had a weekly erosion rate of greater than 0.1 mm.

2=Total 2011 year-end delineated acreage (moderate or heavy submerged oil, not including delta gap area) was 51.65 acres.