

US EPA ARCHIVE DOCUMENT

March 1, 2013

Mr. Ralph Dollhopf  
Federal OSC and Incident Commander  
U.S. EPA, Region 5  
Emergency Response Branch  
801 Garfield Avenue, #229  
Traverse City, MI 49686

**Re: Net Environmental Benefit Analysis December 2012 Update  
Enbridge Line 6B MP 608, Marshall, MI Pipeline Release**

Dear Mr. Dollhopf,

Attached are our recommendations resulting from a December 2012 application of the Net Environmental Benefit Analysis (NEBA) to submerged oil tactical areas in the Kalamazoo River related to the Enbridge Line 6B Oil Spill. The attached document also includes a description of the methodologies and data used to perform the application of the NEBA. The evaluation is based on opinions that we have received from individuals involved in the Scientific Support Coordination Group (SSCG).

The purpose of the attached work was to update the May and June 2012 application and integration of the NEBA to tactical areas known to contain Line 6B submerged oil, specifically the three impoundments along the affected portion of the Kalamazoo River – Ceresco, Mill Ponds, and Morrow Lake/Delta. The December 2012 update is based on monitoring (poling) data collected during the 2012 Late Summer Reassessment (LSR) and other monitoring activities, and observations of sheen management required during the Summer and Fall of 2012.

A summary of the NEBA conceptual design and a history of previous application and integration of the NEBA relative risk matrices with tactical areas are also included. As part of the December 2012 update, the additional information needs identified in the NEBA conceptual design document were revisited, and it was confirmed by individuals of the SSCG that, while the additional information could be beneficial, it is not required for implementing the NEBA tactical area recommendations.

The attached document represents our synthesis (as Scientific Support Coordinators and Operations Section Chief) of the applicable opinions and recommendations received from individuals involved with the SSCG. The individual scientific opinions provided to us are based on each scientist's prior experiences in addressing issues related to oil spill recovery and potential effects of recovery. Opinions expressed by individuals from the SSCG are included in the attached document, or are otherwise documented in supporting documents maintained in the response files. This documentation does not necessarily represent consensus among the

individuals of the group. We were all present for the discussions, or included in written correspondence, regarding the referenced subject matter.

We recommend continued adoption of the application of the NEBA process to tactical areas to evaluate the potential effects of further oil recovery operations from the Kalamazoo River.

Sincerely,

/s/

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**Application and Integration of Net Environmental Benefit Analysis (NEBA)  
With Tactical Areas:  
Ceresco Impoundment, Mill Ponds, and Morrow Lake Delta  
December 2012 Update  
In Support of the Kalamazoo River NEBA  
Kalamazoo River System  
Enbridge Line 6B MP 608 Marshall, MI Pipeline Release**

**Scientific Support Coordinators (SSC's):** Dr. Faith Fitzpatrick (USGS), Dr. Tom Graan (Weston Solutions, Inc.), Isaac Aboulafia, P.E (MEC<sup>X</sup>, LP).

**U.S. EPA Operations Section Chief:** Dan Capone (Weston Solutions, Inc.)

**Scientific Support Coordination Group (SSCG) Contributors (alphabetical):** Dr. Adriana Bejarano (Research Planning, Inc.), Michelle DeLong (Michigan Dept. of Environmental Quality), Dr. Stephen Hamilton (Michigan State University), Dr. Jacqui Michel (Research Planning, Inc.), and Dr. Lisa Williams (U.S. Fish and Wildlife Service)

### **Background**

This document is the December 2012 update of the Net Environmental Benefit Analysis (NEBA) tactical area application and integration for remaining areas of submerged oil in the impounded sections of the Kalamazoo River (Ceresco Impoundment, Mill Ponds, and Morrow Lake Delta). The December 2012 update originates from a series of opinions received during conference calls in November and December 2012 from the Scientific Support Coordinators (SSCs), U.S. EPA Operations Section Chief, and individuals from the Scientific Support Coordination Group (SSCG). The update was based on monitoring (poling) data collected during the 2012 Late Summer Reassessment (LSR) and observations of sheen management required during the Summer and Fall of 2012. A summary of the NEBA conceptual design and a history of previous application and integration of the NEBA relative risk matrices with tactical areas are included. As part of the December 2012 update, the additional information needs identified in the NEBA conceptual design document were revisited, and it was confirmed by individuals of the SSCG that the additional information is beneficial but not required for implementing the NEBA tactical area recommendations.

The development of the NEBA for residual submerged oil conditions in the Kalamazoo River consisted of two components. The first component was the NEBA conceptual design and development of relative risk rankings for eight distinct habitat types and eight submerged oil recovery actions. The rankings were developed by weighing the potential environmental risks associated with leaving residual submerged oil in place as opposed to habitat disturbance associated with active recovery actions for Line 6B oil. The second component was a detailed application and integration of the NEBA relative risk rankings with specific submerged oil tactical areas identified by operations staff as part of the Unified Command. In general, the

tactical areas are areas of the Kalamazoo River containing Line 6B moderate or heavy submerged oil poling results. The shape, size, and number of tactical areas might be updated by operations staff (Unified Command) after each poling reassessment to reflect changes in the areal extent of moderate and heavy poling results. The NEBA application was first done with May 2012 tactical areas (143 areas) based on Fall 2011 poling reassessment and Winter 2011-12 observations and assessments. The NEBA tactical area application was revisited in June 2012 after the tactical areas were expanded from 143 areas to approximately 240 areas after incorporation of the Spring 2012 poling reassessment results.

The purpose of the previous applications and integrations of the NEBA relative risk matrices with tactical areas was to consider, for each individual tactical area and based on available information, the relative potential ecological benefit or harm associated with actively recovering the submerged oil or leaving it in place. In the absence of conclusive acute toxicity results for submerged oil, recommendations to the Federal On-Scene Coordinator (FOSC) to evaluate active recovery for some tactical areas were made because of additional ongoing manifestation of sheening, oil globs and oiled sludge related to the Enbridge Line 6B spill. In tactical areas with NEBA recommendations of “evaluate for possible future recovery”, there is expected to be no net ecological harm from active recovery and likely some ecological benefit. The NEBA tactical area recommendations are provided as one line of evidence for the FOSC, Michigan Department of Environmental Quality (MDEQ), and onsite operations to consider when determining future response actions.

The purpose of this December 2012 update was to revisit the June 2012 NEBA tactical area recommendations at the three major impounded reaches of the Kalamazoo River affected by residual submerged oil in light of additional monitoring information or data collected during the intervening time period.

#### *Development of the NEBA Conceptual Design and Relative Risk Matrices*

A NEBA was developed in Spring 2012 for remaining submerged oil in the Kalamazoo River with opinions considered from individuals from the SSCG (NEBA Conceptual Design, August 8, 2012; document and appendixes; AR-0963). The purpose of the NEBA conceptual design was to help decision-makers weigh the ecological risks associated with leaving the residual submerged oil in place and allowing for natural attenuation (assuming that Line 6B oil would attenuate in the Kalamazoo River sediment/conditions), or removing the oil with selected recovery actions.

The NEBA is strictly applicable for determining ecological benefits for recovery actions and identifying cleanup endpoints, after the human health and safety factors are accounted for. The NEBA does not encompass other designated uses of a water body, such as recreational or water withdrawals. The relative risk rankings in the NEBA conceptual design are for the use of the FOSC and MDEQ when evaluating tactical approaches for residual submerged oil removal and for assisting the FOSC and MDEQ in determining cleanup endpoints. The NEBA is intended to evaluate ecological benefits or harm using existing monitoring and scientific data; its purpose is not to require additional collection of scientific data.

The NEBA conceptual design resulted in relative risk matrices for eight recovery actions (monitored natural attenuation, enhanced deposition, agitation toolbox, dredging/vacuum truck, dewater/excavate, sweep/push, scraping, and sheen collection), eight habitats (impoundments, flowing channels, depositional backwaters, bars, emergent wetlands, islands, oxbows, and wetlands), and six resource categories (plants, mammals, birds, amphibians/reptiles, fish, and invertebrates). Species of concern lists were generated for each habitat type and resource category. Risk of exposure via five pathways (aqueous exposure, sediment exposure, physical trauma, physical oiling/smothering, and indirect) was taken into account in terms of magnitude of impact and length of recovery. Supporting information used in the NEBA conceptual design included, but was not limited to: (1) acute aquatic toxicity results and sediment characteristics from stream bottom samples collected in Winter 2012 from Enbridge-oil affected reach of the Kalamazoo River, (2) a literature review of potential ecological effects resulting from sediment agitation, and (3) an analysis of turbidity data associated with sediment agitation in the Kalamazoo River during the Line 6B response.

The NEBA conceptual design of the relative risk rankings included several major assumptions, some of which are summarized below.

- The rankings were based on the current knowledge of the degree of oiling starting in the fall 2011, after two seasons of intensive recovery actions.
- Submerged oil recovery activities were expected to be more targeted to selected areas of the river with residual submerged oil going forward rather than covering the entire 40-miles of affected river in an upstream to downstream approach as was done in 2010-2011.
- The magnitude of the impacts of recovery actions is based on an anticipated footprint for a tactical area being about 0.1 to 5 acres.
- Rankings were conservative in that they are based on the aquatic organism most likely to be impacted by the greatest magnitude and length of recovery.
- Recovery times for aquatic organisms would start after the end of the 2012 submerged oil recovery season (assuming recovery would occur).
- Recovery times for aquatic organisms that depend on aquatic vegetation will be at least as long as the recovery time for the plant community.
- Toxicity effects from the oil on aquatic organisms were assumed to be less than or the same as physical effects from turbidity.
- The remaining Line 6B oil appears to be weathered and toxicity may decrease to some extent over time.

Habitat-specific assumptions were also incorporated.

Because of their depositional setting, it was assumed that impounded waters and delta habitats had significant amounts of residual submerged oil and would likely have the most intensive

future recovery actions for Line 6B oil. High rates of sedimentation, burial over time, and existing biological conditions may retard natural degradation. Residual submerged oil remobilized from upstream, either through resuspension during floods or incomplete recovery actions would likely accumulate in these depositional settings.

### *Previous Application and Integration of the NEBA with Tactical Areas*

The generic NEBA relative risk matrices in the conceptual design were applied and integrated with submerged oil tactical areas by individuals in the SSCG and on-site operations staff in an iterative process as new monitoring and assessment data were generated. Specific recommendations were made for each tactical area based on the NEBA risk rankings, site-specific oil recovery history, degree of remaining submerged oil, proximity to previously identified sensitive habitats, potential for oil remobilization, and distance to nearest designated oil/sediment trap. The NEBA tactical area application was first done for May 2012 tactical areas based on Fall 2011 poling reassessment results and Winter 2011-2012 observations and assessments. In June 2012, a second iteration of the application was done and the tactical area recommendations were re-examined and updated based on Spring 2012 poling reassessment results (See Application and Integration of NEBA with Spring 2012 Tactical Areas, July 8, 2012; document and spreadsheet). Similar to the general NEBA risk rankings, the specific NEBA recommendations for each tactical area were developed for the use of the FOSC and MDEQ for consideration in tactical approaches for residual submerged oil removal and for assisting the FOSC and MDEQ in determining cleanup endpoints.

The tactical areas had a range of NEBA recommendations in the original May 2012 and re-examined June 2012 applications:

- Sheen collection
- Monitored natural attenuation
- Increase monitoring frequency
- Evaluate for possible future recovery
- Follow sediment trap monitoring and maintenance plan
- Consider recovery (dredging/hydrovac/hand scraping)
- No action (no active recovery necessary)

Monitored natural attenuation (MNA) and sheen collection were recommended for most tactical areas, but there were some important exceptions:

- Tactical areas that had no heavy or moderate poling results - the NEBA recommendation was no action (no active recovery necessary).
- Tactical areas in designated sediment traps - the recommendation was to follow the sediment trap monitoring and maintenance plan, and consider dredging if oil accumulations exceeded the trigger for recovery action. The NEBA conceptual document

assumed that sediment traps would require repeated active submerged oil recovery, possibly every 6 months or after a major flood.

- In general, agitation toolbox techniques were not recommended for recovery given the uncertainty associated with potential physical and chemical effects.
- Tactical areas where moderate and heavy poling results stayed the same or increased - the recommendations were to increase monitoring frequency and continue to evaluate for possible future recovery. A number of tactical areas in or near flowing channel habitats had noticeably more moderate and heavy poling results in Spring 2012, as compared to Fall 2011.
- Because of the high likelihood that the submerged oil in flowing channel habitats could migrate during high-flow events, recommendations for tactical areas in or near these habitats were to consider dredging, hydrovac, or hand scraping while water levels were low.
- For the large tactical area that encompassed Morrow Lake delta and fan, a recommendation was to subdivide the area in to smaller tactical areas for further evaluation and application of the NEBA.

### **December 2012 Update for NEBA Application with Impoundment Tactical Areas**

The SSCs (Dr. Faith Fitzpatrick, Dr. Tom Graan, and Isaac Aboulafia, P.E.) and the U.S. EPA Operations Section Chief (Dan Capone) had a series of conference calls in November and December 2012 with individuals of the SSCG (Dr. Adriana Bejarano, Michelle DeLong, Dr. Steve Hamilton, Dr. Jacqui Michel, and Dr. Lisa Williams) to solicit their opinions related to updated monitoring (poling) results and additional observations (sheen observances) from the tactical areas in the Ceresco Impoundment, Mill Ponds, and Morrow Lake Delta. These three areas were given special attention in this update because they are the major depositional areas located upstream of the three dams within the reach of the Kalamazoo River affected by residual submerged oil. The following topics were discussed during the calls:

- Geographical Information System (GIS) maps showing 2012 LSR poling results; monitoring results of periodic monitoring for the Morrow Lake delta, fan, and sediment traps within the impoundment areas; and sheen tracking and management.
- Simulated velocity spatial distributions from the April 2012 hydrodynamic model for the May 2011 flood and 100-yr flood events.
- Individual opinions on whether changes were needed to the June 2012 NEBA tactical area recommendations.

- Additional information gaps identified in the NEBA conceptual design document to clarify whether the additional information is required before the NEBA tactical area recommendations can be implemented.

Tables 1 through 3 contain NEBA recommendations for the tactical areas in the Ceresco Impoundment, Mill Ponds, and Morrow Lake delta (respectively) for all three iterations of the application of the NEBA relative risk matrices with tactical areas (May 2012, June 2012 and December 2012). Recommendations in almost all tactical areas stayed the same, with only slight adjustments. Figures 1 through 3 show the tactical areas with color coded integrated NEBA recommendations, and overlays of the latest poling results. The specific NEBA recommendations for each tactical area in these tables are for the use of the FOSC and MDEQ for consideration in tactical approaches for residual submerged oil removal and for assisting the FOSC and MDEQ in determining cleanup endpoints.

### *Ceresco Impoundment*

For the nine tactical areas in the Ceresco impoundment, the only changes in NEBA recommendations from June 2012 to December 2012 were replacement of the recommendations of “follow sediment trap monitoring and maintenance plan and evaluate for possible future recovery” with “sheen collection, increase monitoring frequency, and evaluate for possible recovery” for tactical areas SO 5.84 A and SO 5.84 B (Table 1, Figure 1). During the June 2012 discussions, it was inadvertently assumed that these tactical areas were part of a designated Ceresco sediment trap. Designated sediment traps were assumed to have periodic recovery actions according to the 2012 Sediment Trap Monitoring and Maintenance Plan (July 10, 2012). The designated Ceresco sediment trap that spans tactical areas SO 5.84 C and SO 5.84 D has exceeded the trigger for recovery action identified in the Sediment Trap Monitoring and Maintenance Plan based on 2012 LSR poling results (Figure 1). For tactical area SO 5.15, the recommendation to “evaluate for possible future recovery” remained unchanged, along with sheen collection and increase monitoring frequency.

For all the tactical areas with “evaluate for possible future recovery”, targeted dredging is a practical recovery action from the NEBA perspective and was preferred over agitation toolbox techniques because of concerns regarding unknowns about the efficacy and ecological effects of agitation toolbox techniques. The lengthy, continuous need for long-term management of sheen and globules derived from spontaneous eruption and stirring of the sediment from boat activity in these areas, as was demonstrated over most of 2012, was not anticipated during previous NEBA iterations and was also taken into consideration. Removal of the bulk of the remaining oiled sediment from all the tactical areas at one time was preferred to avoid the need for repeated disturbance, multiple restarts of ecological recovery time, and the risk of submerged oil from the upstream tactical areas bypassing the sediment trap and migrating over the dam into downstream areas during floods. The physical habitat in these tactical areas was heavily disturbed by agitation toolbox techniques in 2011. Aquatic vegetation was removed and the streambed agitated and churned to a depth of about 1 foot several times, loosening the sediment and

eliminating structure. In consideration of ecological recovery time, targeted dredging is preferred because smaller areas have a better chance to be recolonized faster by aquatic vegetation than larger areas. Lastly, dredging was a successful recovery action in the Ceresco impoundment in 2010 for reducing the extent of moderate and heavy poling results.

**Table 1. NEBA/tactical area recommendations for remaining submerged oil in the Ceresco Impoundment.**

<b>Tactical Area Name</b>	<b>Size (acres)</b>	<b>May 2012 recommendation</b>	<b>June 2012 recommendation</b>	<b>December 2012 recommendation</b>
SO 4.80	0.1	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation
SO 4.81	0.1	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation
SO 4.84 A	0.1	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation
SO 4.84 B	0.1	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation
SO 5.15	7.7	Sheen collection/monitored natural attenuation; evaluate removal after spring assessment	Sheen collection, increase monitoring frequency, continue to evaluate for possible recovery	Sheen collection, increase monitoring frequency, continue to evaluate for possible recovery
SO 5.84 A	12.3	Sheen collection/monitored natural attenuation; evaluate removal after spring assessment	Follow sediment trap monitoring/maintenance plan and evaluate for possible future recovery	Sheen collection, increase monitoring frequency, continue to evaluate for possible recovery
SO 5.84 B	3.4	Sheen collection/monitored natural attenuation; evaluate removal after spring assessment	Follow sediment trap monitoring/maintenance plan and evaluate for possible future recovery	Sheen collection, increase monitoring frequency, continue to evaluate for possible recovery
SO 5.84 C	2.3	Sheen collection/monitored natural attenuation; evaluate removal after spring assessment	Follow sediment trap monitoring/maintenance plan, consider recovery (dredging)	Follow sediment trap monitoring/maintenance plan, consider recovery (dredging)
SO 5.84 D	3.4	Sheen collection/monitored natural attenuation; evaluate removal after spring assessment	Follow sediment trap monitoring/maintenance plan, consider recovery (dredging)	Follow sediment trap monitoring/maintenance plan, consider recovery (dredging)

**Mill Ponds**

Out of the 10 tactical areas in the Mill Ponds, only one had a change in its NEBA recommendation from June 2012 to December 2012. The tactical area SO 15.56 LDB shifted from “sheen collection/monitored natural attenuation” to “sheen collection, increase monitoring frequency, and continue to evaluate for possible future recovery actions” (Table 2, Figure 2). This was a new tactical area in the Spring 2012 and moderate and heavy poling results were again observed in the 2012 LSR. Based on the comparison of the 2012 Spring Reassessment and 2012 LSR poling results, it appears that submerged oil is accumulating in the flowing channel habitat upstream of the culverts at SO 15.56 LDB and SO 15.56 RDB, and that additional poling should be conducted in the vicinity of SO 15.35 and SO 15.45 to delineate the extent of moderate and heavy poling results.

Additional notes were added to two tactical area recommendations regarding aquatic vegetation. For SO 15.10, it was recommended to look for possible regrowth of beneficial aquatic vegetation during future monitoring, and for SO 15.56 RDB (north mill pond) an additional recommendation was to protect any remaining beneficial aquatic vegetation, similar to SO 15.23 (south Mill Pond).

Tactical area SO 14.81 contains a designated sediment trap. The poling assessments conducted under the Sediment Trap Monitoring and Maintenance Plan indicate that the trigger for recovery action has been exceeded.

For all tactical areas with recommendations of “continue to evaluate for possible future recovery” targeted dredging was preferred over agitation toolbox techniques for the same reasons given for Ceresco Impoundment.

**Table 2. NEBA/tactical area recommendations for remaining submerged oil in the Mill Ponds [NA, tactical area not delineated]**

Tactical Area Name	Size (acres)	May 2012 recommendation	June 2012 recommendation	December 2012 recommendation
SO 14.81	2.28	Sheen collection/monitored natural attenuation; enhanced deposition	Follow sediment trap monitoring/maintenance plan and consider recovery using dredging/hydrovac (easy road access), especially in oiled area downstream of trap	Follow sediment trap monitoring/maintenance plan and consider recovery using dredging/hydrovac (easy road access), especially in oiled area downstream of trap
SO 14.83	0.06	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation

Tactical Area Name	Size (acres)	May 2012 recommendation	June 2012 recommendation	December 2012 recommendation
SO 15.10	2.92	Sheen collection/monitored natural attenuation	Sheen collection, increase monitoring frequency, continue to evaluate for possible future recovery actions	Sheen collection, increase monitoring frequency, continue to evaluate for possible future recovery actions; avoid areas with regrowth of beneficial aquatic vegetation
SO 15.23	10.28	Sheen collection/monitored natural attenuation	Sheen collection, increased monitoring frequency, natural attenuation, possibly no other recovery because of high quality vegetation	Sheen collection, increased monitoring frequency, natural attenuation, possibly no other recovery because of high quality vegetation
SO 15.25	0.04	NA	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation
SO 15.35	0.33	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation	Sheen collection/monitored natural attenuation
SO 15.45	0.52	Sheen collection/monitored natural attenuation	No active recovery necessary	No active recovery necessary
SO 15.56 LDB	0.36	NA	Sheen collection/monitored natural attenuation	Sheen collection, increased monitoring frequency, continue to evaluate for possible future recovery
SO 15.56 RDB	5.21	Sheen collection/monitored natural attenuation	Sheen collection, increased monitoring frequency, continue to evaluate for possible future recovery	Sheen collection, increased monitoring frequency, continue to evaluate for possible future recovery; protect remaining high quality vegetation
SO 15.65	2.04	NA	Sheen collection, increased monitoring frequency, continue to evaluate for possible future recovery (dredging/hydrovac)	Sheen collection, increased monitoring frequency, continue to evaluate for possible future recovery (dredging/hydrovac)

*Morrow Lake Delta*

The NEBA recommendations stayed the same for the large tactical area in Morrow Lake delta except that “increase monitoring frequency” was added to correct an oversight in the June 2012 recommendations (Table 3, Figure 3). There has been a continuing recommendation that this

area be subdivided into multiple tactical areas. The tactical areas should be expanded to include the moderate and heavy poling results that are present in the northeast and southeast coves of the Morrow Lake fan, and also westward on the fan (Figure 3). The designated sediment trap Delta Z should be expanded southward to include area of heavy poling results along the south shoreline. Out of the three designated sediment traps in the Morrow Lake Delta, Delta Z has exceeded the submerged oil trigger based on poling assessments conducted under the Sediment Trap Monitoring and Maintenance Plan. It was noted that there has not been much noticeable regrowth of aquatic plants over the Summer of 2012, but that an aquatic vegetation survey would be helpful to track recovery rates along the entire stretch of the river affected by the oil spill and cleanup techniques. Of the active recovery alternatives considered, targeted dredging was preferred over agitation because of the unknown factors associated with the efficacy and ecological effects of agitation toolbox techniques, similar to Ceresco and Mill Ponds impoundments.

**Table 3. NEBA/tactical area recommendations for remaining submerged oil in Morrow Lake delta**

<b>Tactical Area Name</b>	<b>Size (acres)</b>	<b>May 2012 recommendation</b>	<b>June 2012 recommendation</b>	<b>December 2012 recommendation</b>
SO 38.40	316.3	Sheen collection/monitored natural attenuation; consider agitation after reassessment	Subdivide into subareas, evaluate recovery actions after subarea delineations, follow existing sediment trap monitoring and maintenance plan, for heavy oiled areas consider recovery (dredging)	Subdivide into subareas, evaluate recovery actions after subarea delineations, follow existing sediment trap monitoring and maintenance plan, for heavy oiled areas consider recovery (dredging)

**Potential Additional Beneficial Information for NEBA**

The NEBA relative risk matrices were completed in Spring 2012 to provide an immediate tool that could be used by on-site operations to help weigh the benefits and risks associated with further active recovery of submerged oil during the upcoming 2012 recovery season. The application and integration of the NEBA relative risk matrices with tactical areas was performed to further provide a NEBA perspective for individual tactical areas. The intent was to update both the relative risk matrices and NEBA recommendations, if needed, for individual tactical areas as new information became available over time.

New monitoring data collected during the Summer and Fall of 2012 included poling assessment results, sheen management, and the relative spatial distribution of simulated velocities from a partially calibrated hydrodynamic model. These data were examined and reviewed by individuals of the SSCG on the November and December 2012 conference calls with regard to existing and

new tactical areas identified by operations staff. During the development of the NEBA conceptual design in May 2012, individuals from the SSCG identified four other types of information that could be used to review and possibly update the relative risk matrices in the future, if the information became available. The additional data also would be useful for more long-term ecological risk assessments.

- Additional acute and chronic sediment toxicity data,
- Toxicity and physical smothering associated with agitation toolbox techniques,
- Line 6B oil biodegradation rates, and
- Quantification of volume of remaining Line 6B oil.

At the time of the November/December 2012 conference calls, there was no new sediment toxicity data. An agitation toolbox effects study had been done in July 2012 but the results from the study were not available. A biodegradation report was completed by an EPA Emergency Response Team. The quantification of volume of remaining Line 6B oil was in progress.

During the November/December 2012 conference calls with SSCG individuals, the importance of the additional information related to the application of the NEBA relative risk rankings was discussed. The individuals from the SSCG each stated that the NEBA relative risk matrices and recommendations from the integration of the NEBA with tactical areas were intended to be used by operations staff in the Summer of 2012, as recommendations based upon the best comprehensive evaluation of available information. The intent of identifying potentially beneficial additional information was not to halt ongoing recovery operations while the additional information is pursued; rather the intent was to identify the types of information that, if obtained in the future, may result in the need to update the iterative NEBA document.

Based on individuals' experience and professional judgment, significant changes associated with the NEBA relative risk rankings were not expected even if and when the information was obtained. As more data become available, the NEBA relative risk matrices should still be reviewed and updated, if needed, as already planned. The application and integration of the NEBA relative risk matrices with tactical areas and oil spill response should continue as additional monitoring and assessment data are gathered, even in the absence of additional information identified in the NEBA conceptual design document. Other types of information (i.e., updated aquatic community surveys) should also be considered in subsequent integration efforts when it is available.

#### *Acute and Chronic Sediment Toxicity*

Results for the acute sediment toxicity tests performed in the late Winter 2012 were inconclusive. There has been no additional acute toxicity data generated since Spring 2012.

A major assumption in the NEBA is that the oiled sediment has little toxicity. Toxicity in the oiled sediment would have the most effect on the "monitored natural attenuation" response action, especially in depositional habitats. Therefore, if significant additional toxicity effects were determined, "monitored natural attenuation" may no longer be a viable response action for Line 6B submerged oil and/or oil-containing sediments. The NEBA relative risk matrix and

tactical area recommendations should be revisited when and if more toxicity data become available.

### *Agitation Toolbox Techniques*

After completion of the agitation effects study, the NEBA risk-ranking matrix for agitation toolbox techniques will be re-examined. The purpose of the agitation study was to evaluate the efficiency of the agitation toolbox techniques that were used extensively throughout the affected river in 2011. Results from the study will be useful for determining the relative risk difference between the active recovery actions of dredging and agitation toolbox. Currently both recovery actions have the same ranking for each habitat type and resource category. The agitation effects study results also will be useful to understand the resuspension potential of submerged oil, physical properties of the oiled sediment, and the chemical characteristics (e.g., weathering) of the remaining Line 6B oil.

### *Biodegradation*

Similar to sediment toxicity, additional data on biodegradation rates would have the most effect on the response action of “monitored natural attenuation”, especially in depositional habitats.

The U.S. EPA performed a bench scale study of Line 6B oil to determine potential biodegradability under optimum (not actual) biological conditions. In an October 2012 U.S. EPA report documenting the bench scale study of Enbridge Line 6B oil biodegradation potential, U.S. EPA concluded that while the remaining Line 6B oil has the potential to further degrade under optimum conditions, the degradation would be limited to approximately 25% of the current residual mass. Therefore, under conditions optimum for biodegradation to occur, approximately 75% of the existing Line 6B residual oil mass would persist.

The U.S. EPA bench scale test was performed using induced conditions most favorable for the biodegradation of Line 6B oil. Therefore, biodegradation is expected to be slower, or less effective in anaerobic depositional settings, such as those found in the impounded sections of the Kalamazoo River.

The U.S. EPA bench scale results do not change the NEBA relative risk matrices, and it is anticipated that any further biodegradation testing would not change the NEBA relative risk matrices.

### *Quantification of Remaining Line 6B Oil*

The amount of remaining submerged oil does not affect the NEBA relative risk matrices. However, data on polynuclear aromatic hydrocarbon (PAH) concentrations generated during the quantification process may provide further surrogate information on weathering, toxicity (especially alkylated PAHs), and biodegradation.

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## Summary

New data collected during the Summer and Fall of 2012, including poling assessment results, sheen management, and simulated velocities from a partially calibrated hydrodynamic modeling, were examined and reviewed by individuals of the SSCG with regard to existing and new tactical areas identified by operations staff.

The December 2012 update of the NEBA tactical area application and integration for Ceresco Impoundment, Mill Ponds, and Morrow Lake delta resulted in very few changes to NEBA tactical area recommendations from May and June 2012. For tactical areas with similar or increases in moderate and heavy poling results, recommendations were to “increase monitoring frequency and continue to evaluate for possible recovery”. Similar to the May and June 2012 recommendations, and in the absence of conclusive acute toxicity results for submerged oil, December 2012 recommendations for the FOSC to evaluate active recovery for some tactical areas in the impoundments were made because of persistent ongoing problems with sheening, oil globs, and oiled sludge related to the Enbridge Line 6B spill. There is expected to likely be some additional ecological benefit and no net ecological harm from active recovery in these areas because of the longevity of the sheening problem beyond what was originally expected and the ability to start the time of ecological recovery for these areas sooner than later.

It is the shared opinion of the SSCs and individuals from the SSCG questioned that the additional information that may be obtained in the future are not expected to substantially change the NEBA relative risk matrices or its integration with the tactical areas. However, additional information will be useful for ecological risk assessments conducted over longer time scales. The NEBA relative risk matrices and associated assumptions remained unchanged after these reviews and individuals remained confident in their application to tactical areas.

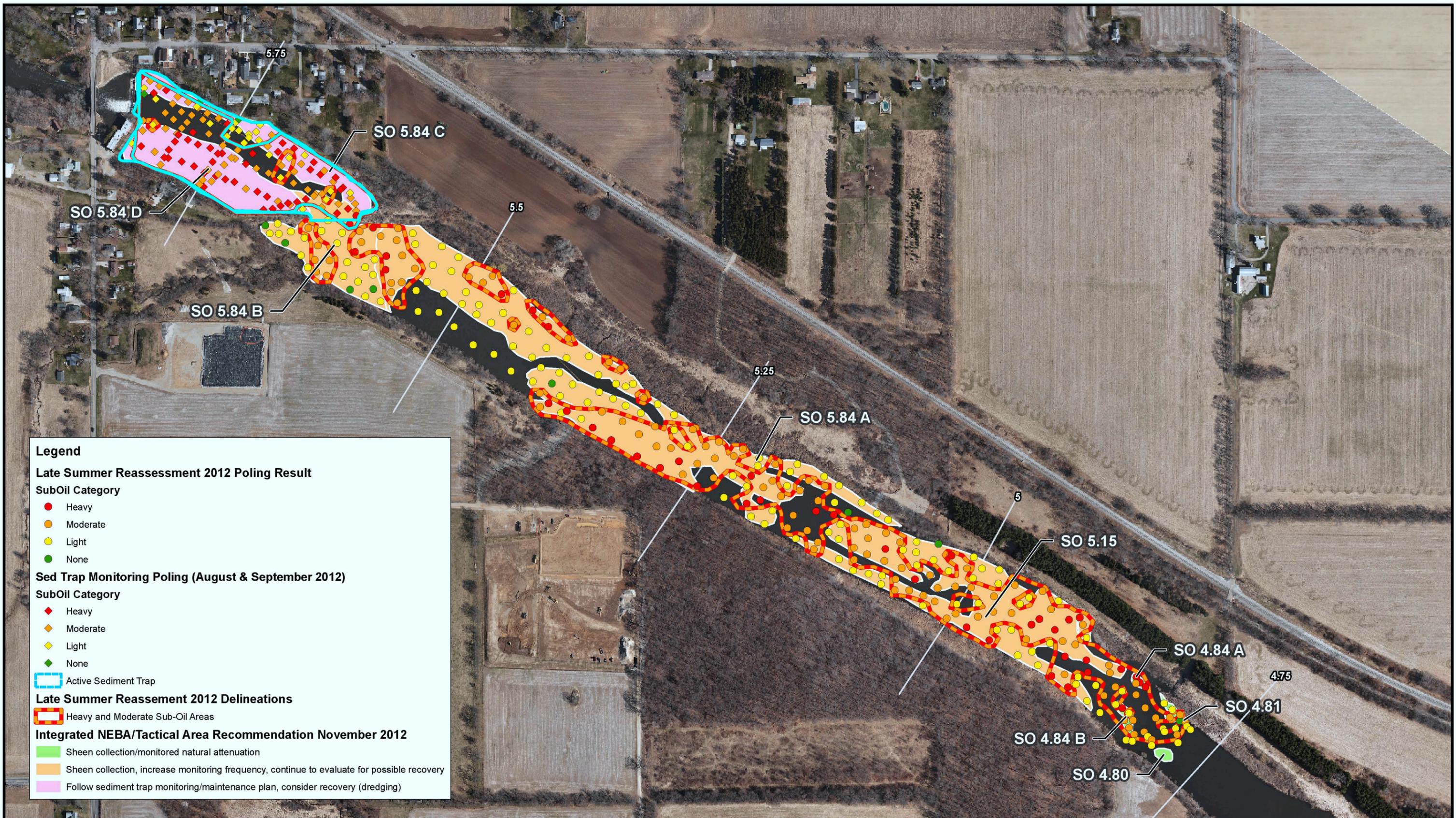
## Supporting Documents

Fitzpatrick, F., Bejarano, A., Michel, J., Williams, L., Capone, D., Hamilton, S., Chapman, J., DeGraeve, M., Alexander, M., DeLong, M., 2012 Net Environmental Benefit Analysis (NEBA) Relative Risk Ranking Conceptual Design, August 8, 2012 Letter, Document, and Attachments.

Fitzpatrick, F., Bejarano, A., Michel, J., Williams, L., Capone, D., Hamilton, S., Chapman, J., DeGraeve, M., Alexander, M., DeLong, M., 2012 Application and Integration of Net Environmental Benefit Analysis (NEBA) with Spring 2012 Tactical Areas”, August 8, 2012 Document.

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**Legend**

**Late Summer Reassessment 2012 Poling Result**

**SubOil Category**

- Heavy
- Moderate
- Light
- None

**Sed Trap Monitoring Poling (August & September 2012)**

**SubOil Category**

- ◆ Heavy
- ◆ Moderate
- ◆ Light
- ◆ None

▭ Active Sediment Trap

**Late Summer Reassessment 2012 Delineations**

▭ Heavy and Moderate Sub-Oil Areas

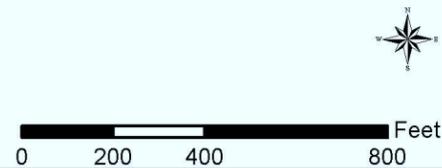
**Integrated NEBA/Tactical Area Recommendation November 2012**

- ▭ Sheen collection/monitored natural attenuation
- ▭ Sheen collection, increase monitoring frequency, continue to evaluate for possible recovery
- ▭ Follow sediment trap monitoring/maintenance plan, consider recovery (dredging)

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**DRAFT**

Note: The Data used to create Delineations was obtained from the 2012 LSR and Ceresco Sed-Trap poling results.

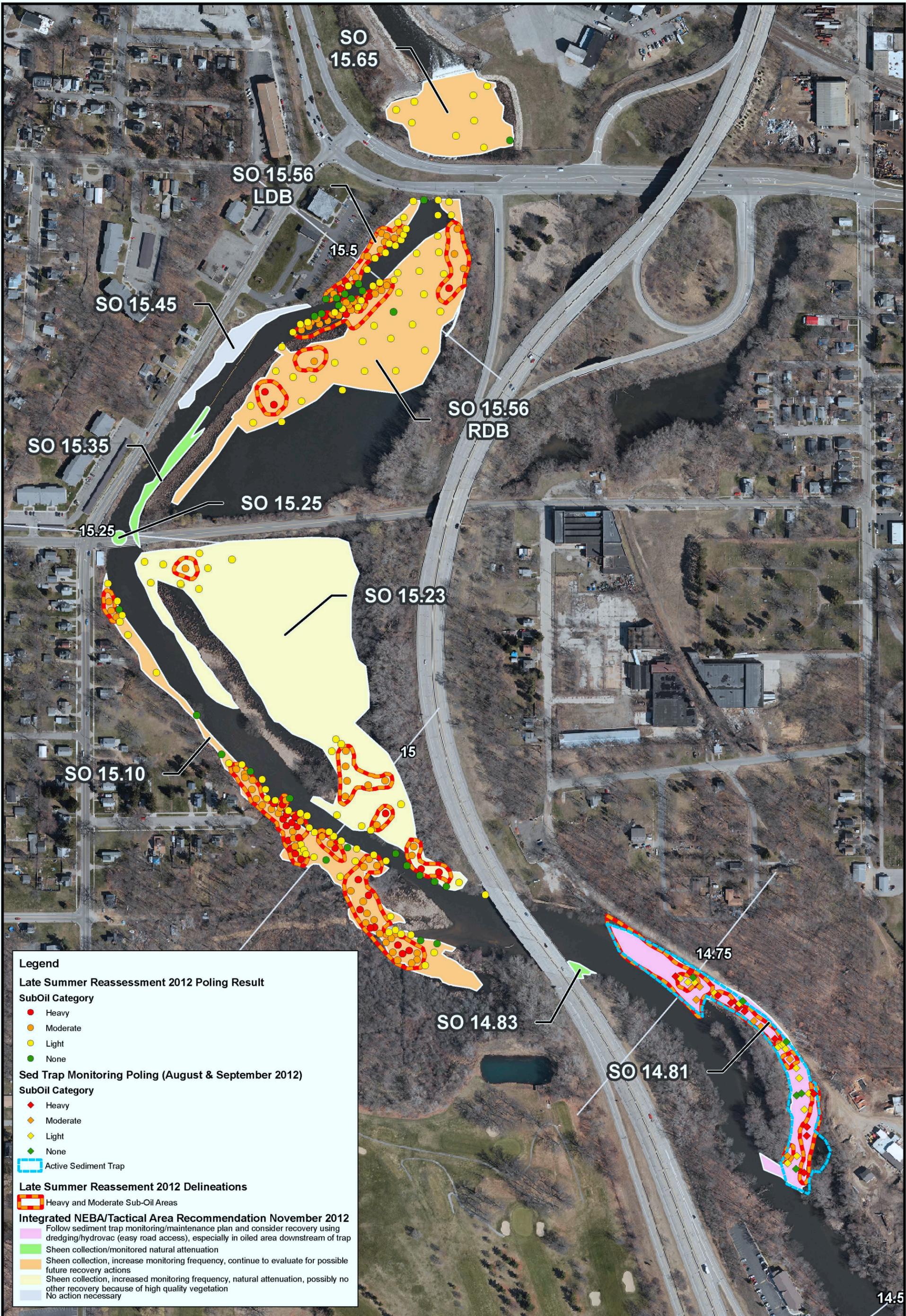


Prepared for:  
U.S. EPA REGION V  
Contract No.: EP-S5-06-04  
TDD: S05-0005-1007-030  
DCN: 1154-4D-AHMS



Prepared by:  
WESTON SOLUTIONS, INC.  
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NEBA/2012 TACTICAL AREAS AND LATE SUMMER REASSESSMENT  
2012 POLING RESULTS AND HEAVY/MODERATE DELINEATION AREAS  
CERESCO DAM AREA  
MARSHALL, MI PIPELINE RELEASE  
KALAMAZOO RIVER, MI  
CREATED: DECEMBER 11, 2012



**Legend**

**Late Summer Reassessment 2012 Poling Result**

**SubOil Category**

- Heavy
- Moderate
- Light
- None

**Sed Trap Monitoring Poling (August & September 2012)**

**SubOil Category**

- ◆ Heavy
- ◆ Moderate
- ◆ Light
- ◆ None

□ Active Sediment Trap

**Late Summer Reassessment 2012 Delineations**

- ▭ Heavy and Moderate Sub-Oil Areas

**Integrated NEBA/Tactical Area Recommendation November 2012**

- ▭ Follow sediment trap monitoring/maintenance plan and consider recovery using dredging/hydrovac (easy road access), especially in oiled area downstream of trap
- ▭ Sheen collection/monitored natural attenuation
- ▭ Sheen collection, increase monitoring frequency, continue to evaluate for possible future recovery actions
- ▭ Sheen collection, increased monitoring frequency, natural attenuation, possibly no other recovery because of high quality vegetation
- ▭ No action necessary

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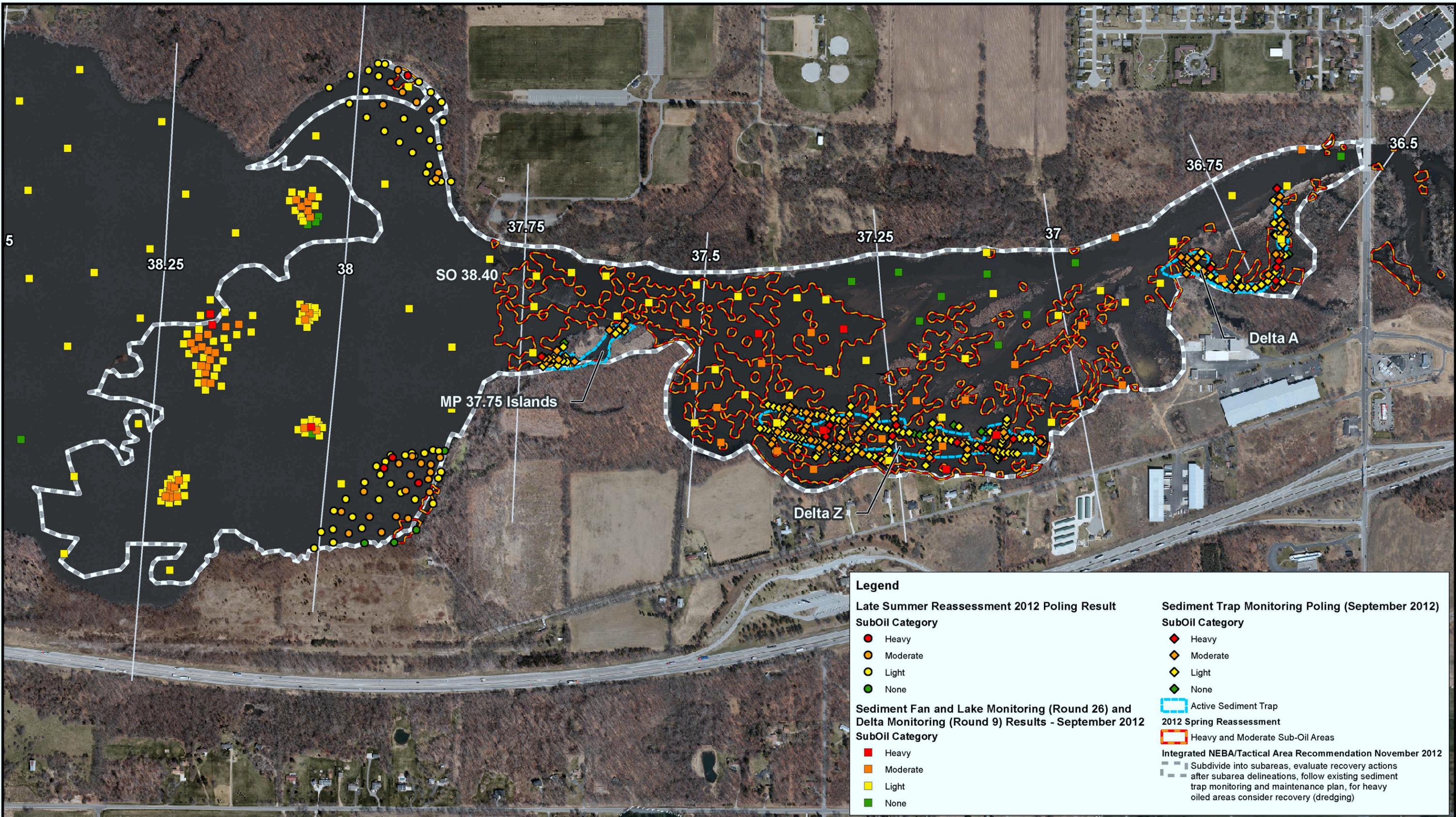
**DRAFT**

Note: The Data used to create Delineations was obtained from the 2012 LSR and Mill Pond Sed-Trap poling results.

Prepared for: U.S. EPA REGION V  
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**NEBA/2012 TACTICAL AREAS AND LATE SUMMER REASSESSMENT 2012 POLING RESULTS AND HEAVY/MODERATE DELINEATION AREAS**  
 MILL POND  
 MARSHALL, MI PIPELINE RELEASE  
 KALAMAZOO RIVER, MI  
 CREATED: DECEMBER 11, 2012



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NEBA/2012 TACTICAL AREA  
 MORROW LAKE DELTA  
 MARSHALL, MI PIPELINE RELEASE  
 KALAMAZOO RIVER, MI  
 CREATED: DECEMBER 17, 2012