Centredale Manor Superfund Site
11/28/07 MAC Meeting
Continuing Dam Removal Discussion
10 am
Council Chambers, North Providence Town Hall

Proposed Agenda

I. Introductions – 5 min.

II. Purpose of Meeting / Desired Outcomes - 5 min.

Purpose

a. Information exchange
b. Begin discussion of anticipated schedule & proposed next steps

Desired Outcomes

- Improved technical understanding of dam removal option
- Identification of any remaining technical concerns
- Input for anticipated schedule & proposed next steps

III. QEA Presentation – 30 min.

IV. Q&A Session – 60 min.

V. Schedule / Next Steps – 20 min.

Q&A Session

- Alternative #4 presented today is a version of a previous alternative presented
- Proposed Plan contains a range of potential options
- Alternatives will be folded into Feasibility Study
- Alternative 2 & 4 CDF acreage vs. pond acreage
- Artist rendition would be helpful
- Any fill of wetlands would require mitigation
- Need to investigate wetland requirements
- Effects on Manton Pond unclear
- Monton Pond info contained in referenced 800 figures
- FOLLOW-UP ITEM: share disk with Jenny
- Findings: minimum impact on Manton Pond. Forthcoming Eco Report will reference
- Sediment transport was not evaluated
- Sediment - up stream contribution - how impact river flow. Any analysis? -no.
- Rt. 44 sanding how impact river. Whole series of storm water management issues
- Spillway elevation of upriver. Concern of downstream velocity. High hazard dams risk upstream which can impact site area
- If option chosen, design analysis would need to take into account
- Inundation areas - what would they look like? Would significant armoring be needed to protect against erosion during flooding
- Flood plain areas tend not to get high velocity therefore would likely not see unsightly armoring
- Question if CDF is on erosional side would indeed need amore
- Metrics were spatially average speed → does that account for bend speed, hence is it adequate?
- Belief average was reasonable for immediate purpose. Do have specific data. Averages used for comparative purposes.
- Be careful about how value fish. Local fishery & value to children needs to be honored
- Have not discussed potential impact to surrounding population
- CDF characteristics? 2 ft cap on top of contaminated fill. Raising elevation out of floodplain

Centredale Manor Superfund Site
Anticipated Schedule / Proposed Next Steps

Winter/Spring 2008	Specific Topic MAC Meetings
Spring 2008	Remedial Investigation / Feasibility Newsletter
June 2008	Pre-Proposed Plan Dialogue Meeting
Aug/Sept. 2008	Proposed Plan Issued Public Meeting

11/28/07 MAC Meeting Attendees

1. Jane Sherman	WRWC
2. Russ Keenan	AMEC
3. Patrick Gwinn	AMEC
4. Jeff Loureiro	LEA
5. Beverly Lawrence	ACOE
6. Louis Maccarone	RIDEM
7. Ken Munney	US FWS
8. Eve Vaudo	EPA
9. Ken Finkelstein	NOAA
10. Dave Scotti	LEA
11. Crystal Adams	Brown SBRP
12. Frank Bursie	Town of North Providence
13. Kirk Ziegler	QEA
14. Brian Waz	ACOE
15. Scott Michalek	ACOE
16. Cornell Rosiu	EPA
17. Anna Krasko	EPA
18. Jenny Pereira	WRWC
19. Eugenia Marks	Audubon
20. Deirdre Dahlen	Battelle
21. Lorri Caruso	City of Johnston
22. Jerry Muys	Emhart
23. Johanna Hunter	EPA
24. Stacy Greendlinger	EPA

Centredale Manor Restoration Project Superfund Site

Hydrodynamic Analysis of Remedial Alternatives

C. Kirk Ziegler
Quantitative Environmental Analysis, LLC

QEA

November 28, 2007

Overview of Presentation

- Background
- Study objectives
- Hydrodynamic model description and development
- Remedial alternative design considerations
- Evaluation of remedial alternatives
- Comparison of remedial alternative designs and present conditions
- Summary and conclusions

QEA

Background

- Reasons for performing a hydrodynamic analysis of remedial alternatives
  - Consider all possible remedial alternatives, not only those alternatives with current configuration of river/ponds/dams
  - Removing Allendale and Lyman Mill Dams or capping material within the existing footprint of the ponds results in changes to river hydrodynamics
  - Identify the significance of hydrodynamic changes so that the alternatives may be fully evaluated during the FS

QEA

Study Objectives

- **Evaluate four channel designs in Allendale and Lyman Mill Ponds to determine:**
  - **Hydrodynamics and floodplain inundation in the areas of Allendale, Lyman Mill, and Manton Ponds**
  - **Stage height and floodplain during high-flow events in the region from Manton Dam to the confluence of the Woonasquatucket and Moshassuck Rivers**
  - **Impacts on the Oxbow area**

Hydrodynamic Modeling Framework

- Using EFDC, which is a well-tested model that is EPA approved
- Model is being applied in 2-D, vertically-averaged mode, which is a valid approach for shallow, non-stratified conditions
- EFDC has capability to simulate flooding and drying of floodplain areas
- Maximum extent of floodplain inundation estimated from aerial photographs of study area
- Numerical grid uses 2-meter, square grid cells
  - About 119,000 grid cells total

Hydrodynamic Modeling Framework

- **Model input includes:**
  - **Bathymetry and topography provided by LEA**
  - **River flow rates simulated:**
    - **7Q10 flow (seven day, consecutive low flow with a ten year return frequency) (8 cfs)**
    - **Average flow (73 cfs)**
    - **2-yr flood (570 cfs)**
    - **100-yr flood (2,300 cfs)**
  - **Lower- and upper-bound values of effective bed roughness height**

- **Model output includes:**
  - **Total water surface area**
  - **Extent of floodplain inundation**
  - **Water depth and surface elevation**
  - **Current velocity/speed**
  - **Bed shear stress**
  - **Stable grain size**

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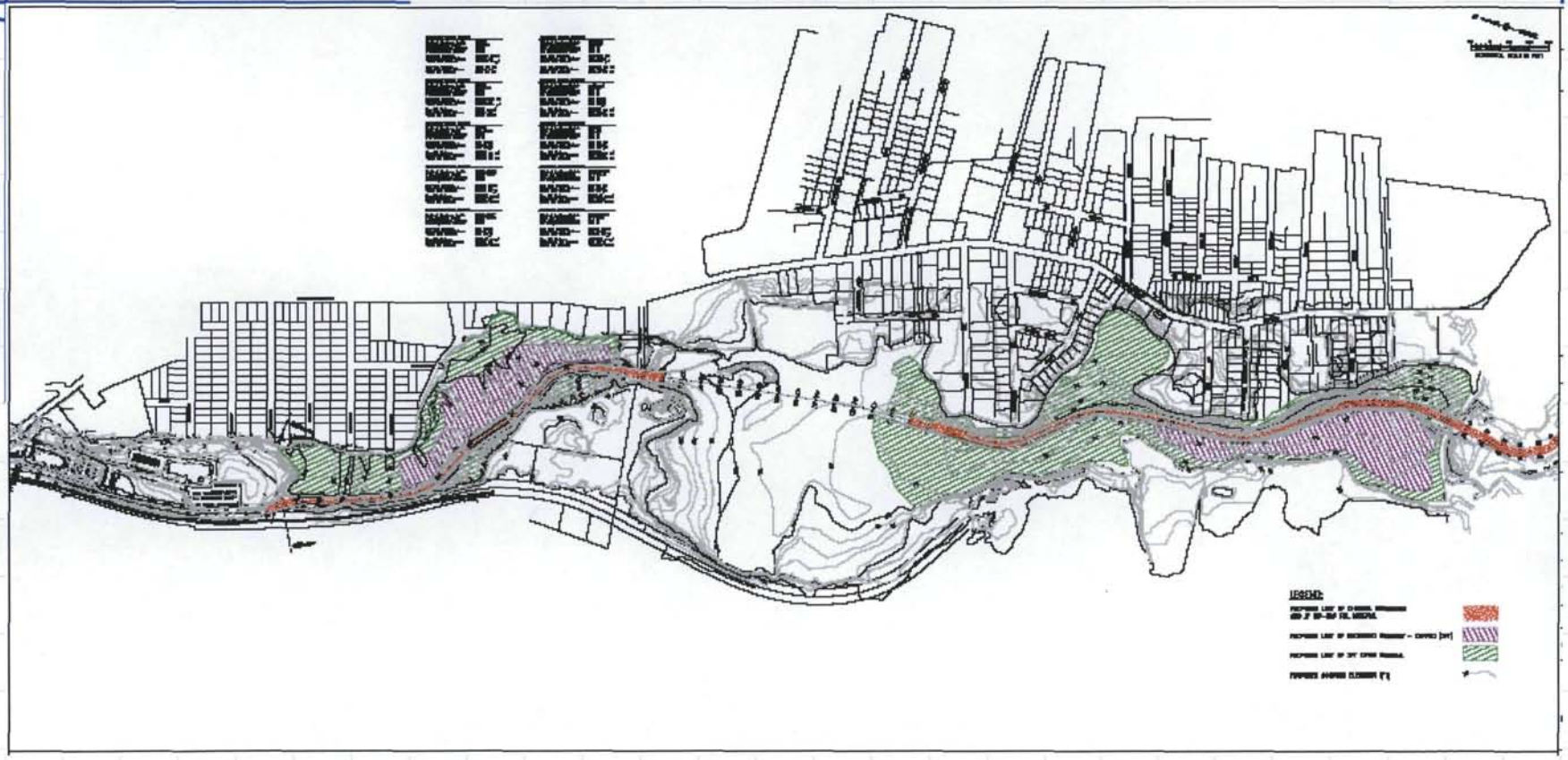
Alternative 1: River Channel

- **Goal: Return sections of river to pre-impoundment conditions**
  - **This scenario eliminates all ponds in the study area**
  - **Complete removal of Allendale and Lyman Mill Dams**
  - **Excavate impacted sediment from the proposed footprint of the river channel**
    - **~31,225 CY of sediment to create channel**
  - **Place excavated sediment next to channel and grade appropriately**
  - **Cap all impacted floodplain with 2-ft cap**

QEA

Alternative 1: River Channel



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Alternative 2: Channel & Pond Configuration

- **Goal: Return sections of river to free-flowing waters, but maintain some ponds within the study area**
  - **Replacement of dams with weir**
    - **Provides a restricted but continuous flowing river**
  - **Excavate impacted sediment within existing footprint of ponds**
    - **~116,600 CY of impacted sediment**
  - **Construct a pond/channel configuration**
  - **Place excavated sediment in near-shore confined disposal facilities (CDFs)**
  - **Grade floodplain appropriately**

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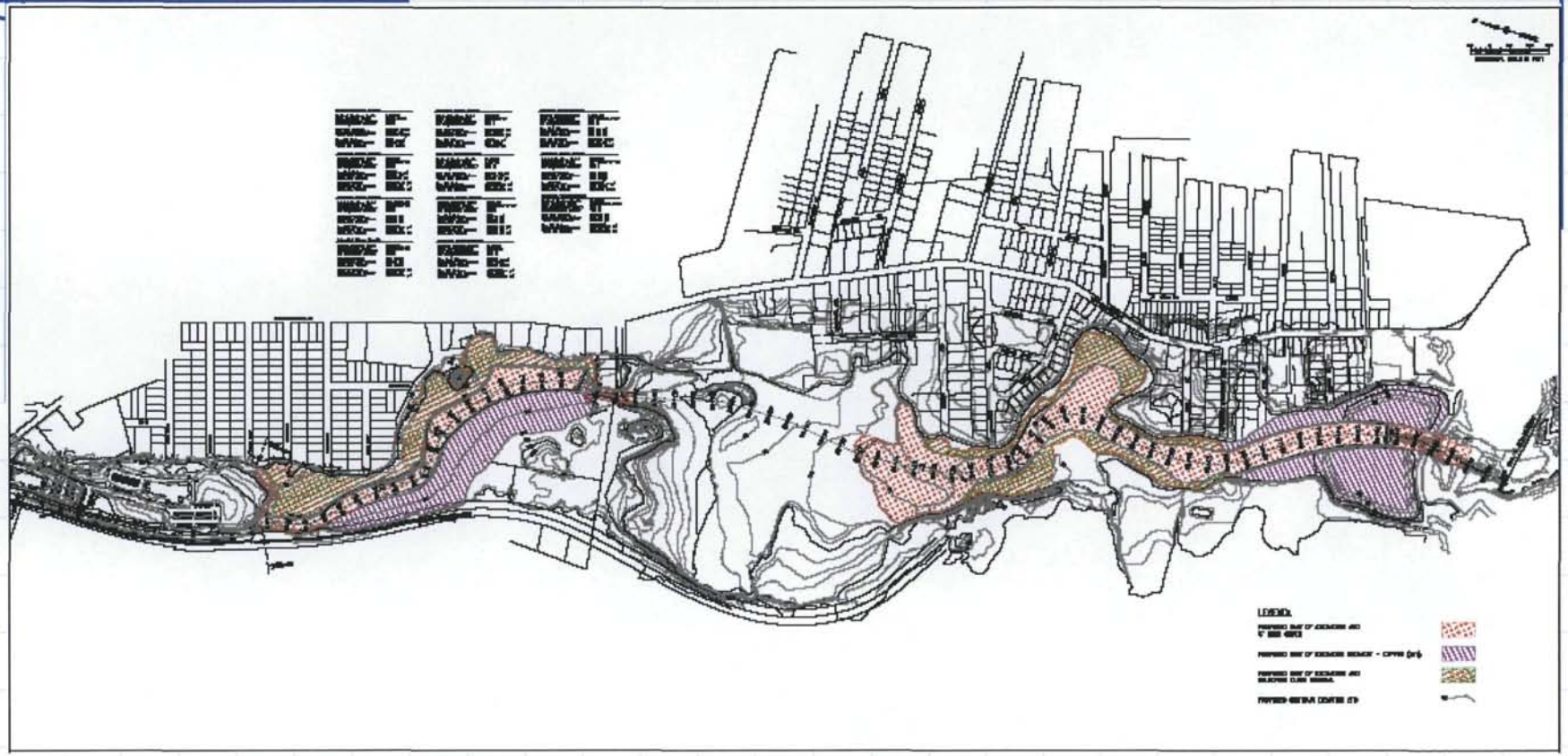
Remedial Alternative Design Considerations:

Alternative 2



QEA

Alternative 3: Channel & Pond Configuration

- **Goal: Return sections of river to free-flowing waters, but maintain some ponds within the study area**
  - **Replacement of dams with weir**
    - **Provides a restricted but continuous flowing river**
  - **Excavate impacted sediment within ~~existing~~ proposed footprint of ponds**
    - **~57,450 CY of impacted sediment**
  - **Construct a pond/channel configuration**
  - **Place excavated sediment adjacent to river and ponds**

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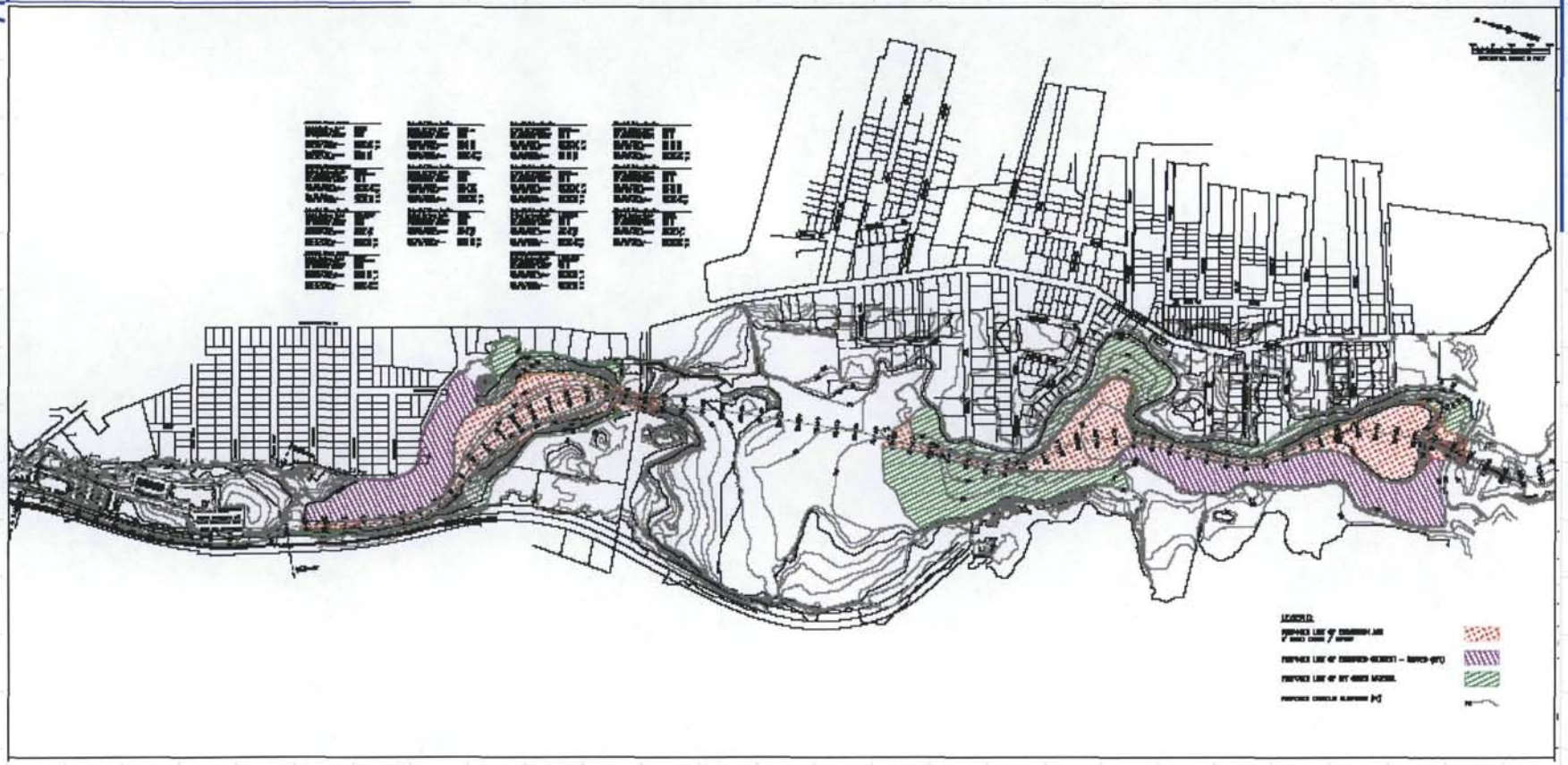
Remedial Alternative Design Considerations:

Alternative 3



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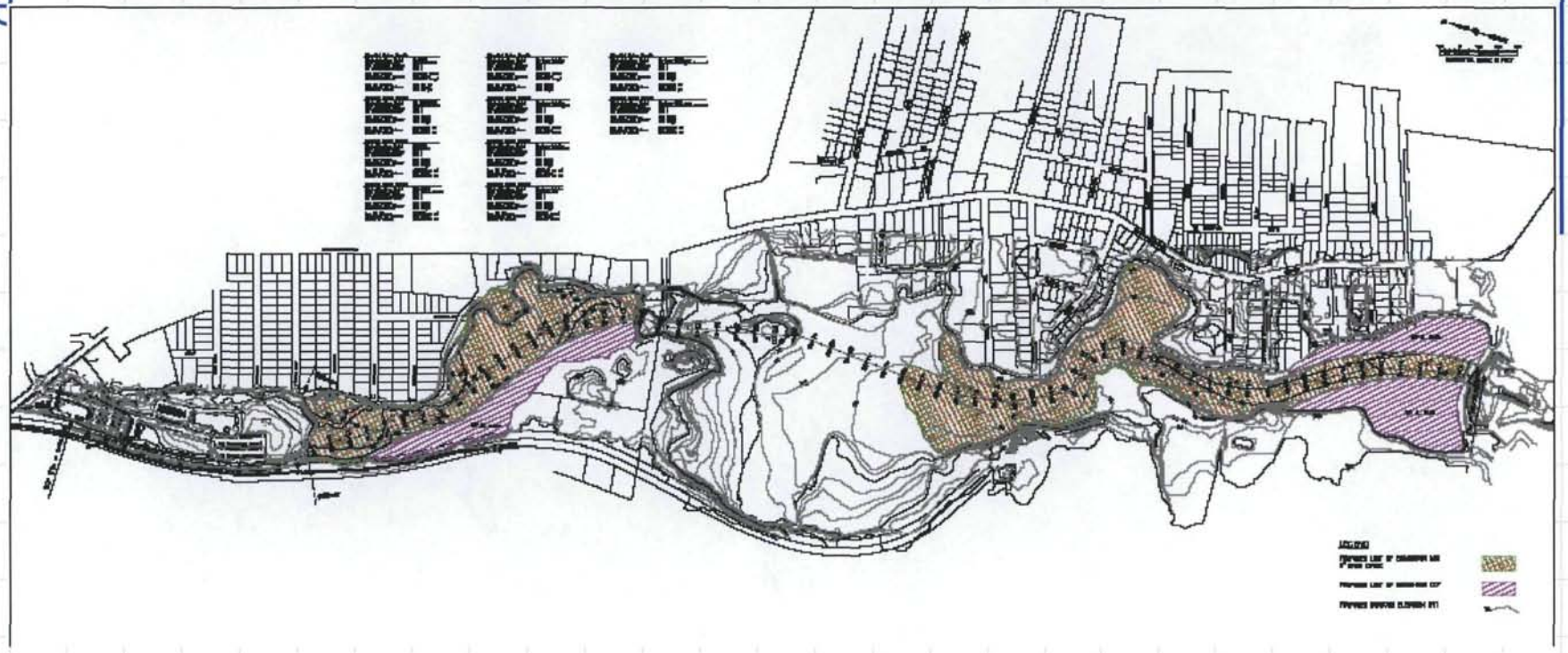
Alternative 4: Near-Shore CDF with Dams in Place

- **Goal: Keep existing dams and place contaminated sediment in near-shore CDFs**
  - **Existing dam structures remain**
  - **Allendale and Lyman Mill Ponds remain, but they are smaller in size**
  - **Excavate ~122,825 CY of impacted sediment**
  - **Place excavated sediment in near-shore CDFs**

Remedial Alternative Design Considerations:

Alternative 4



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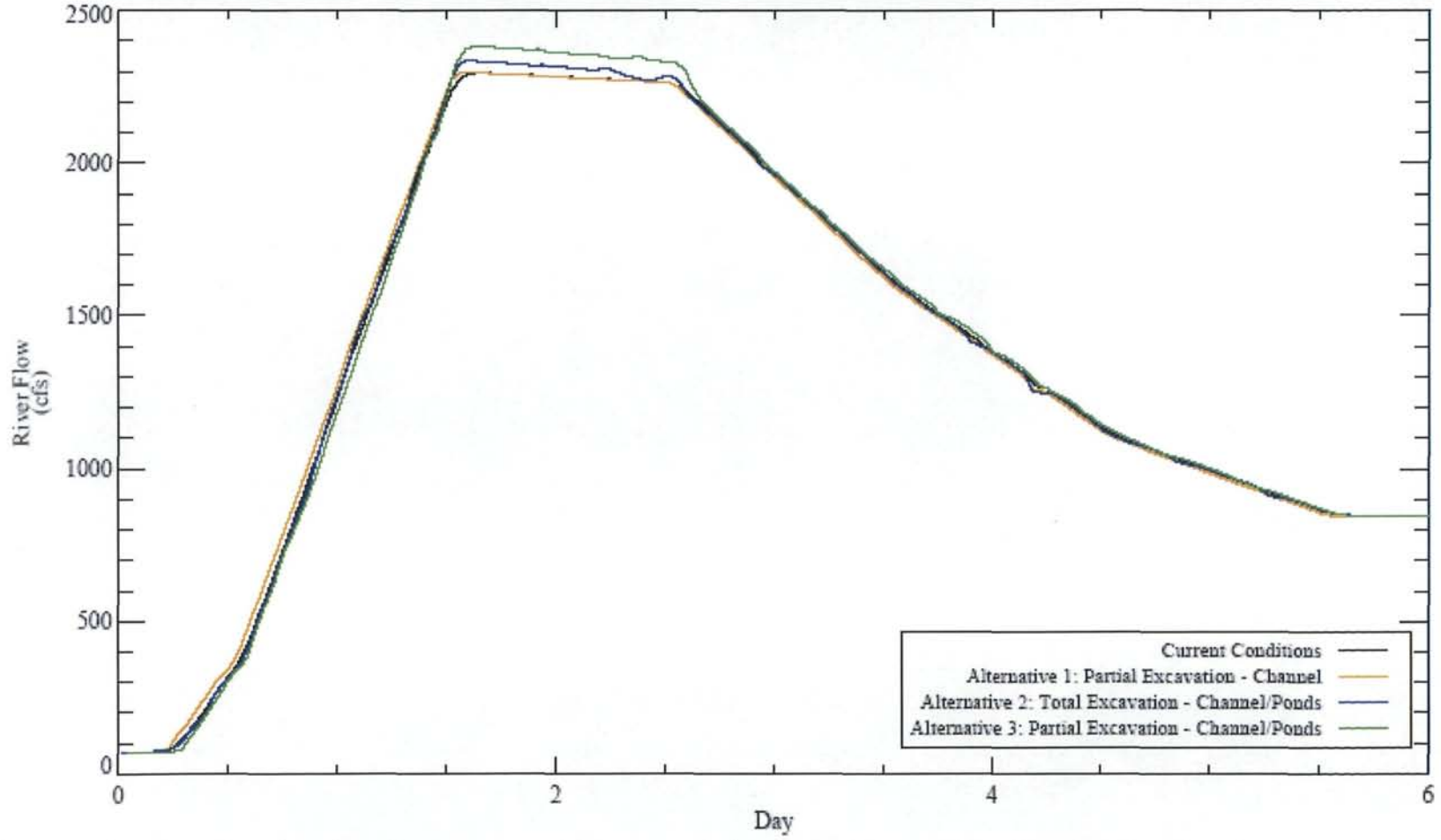
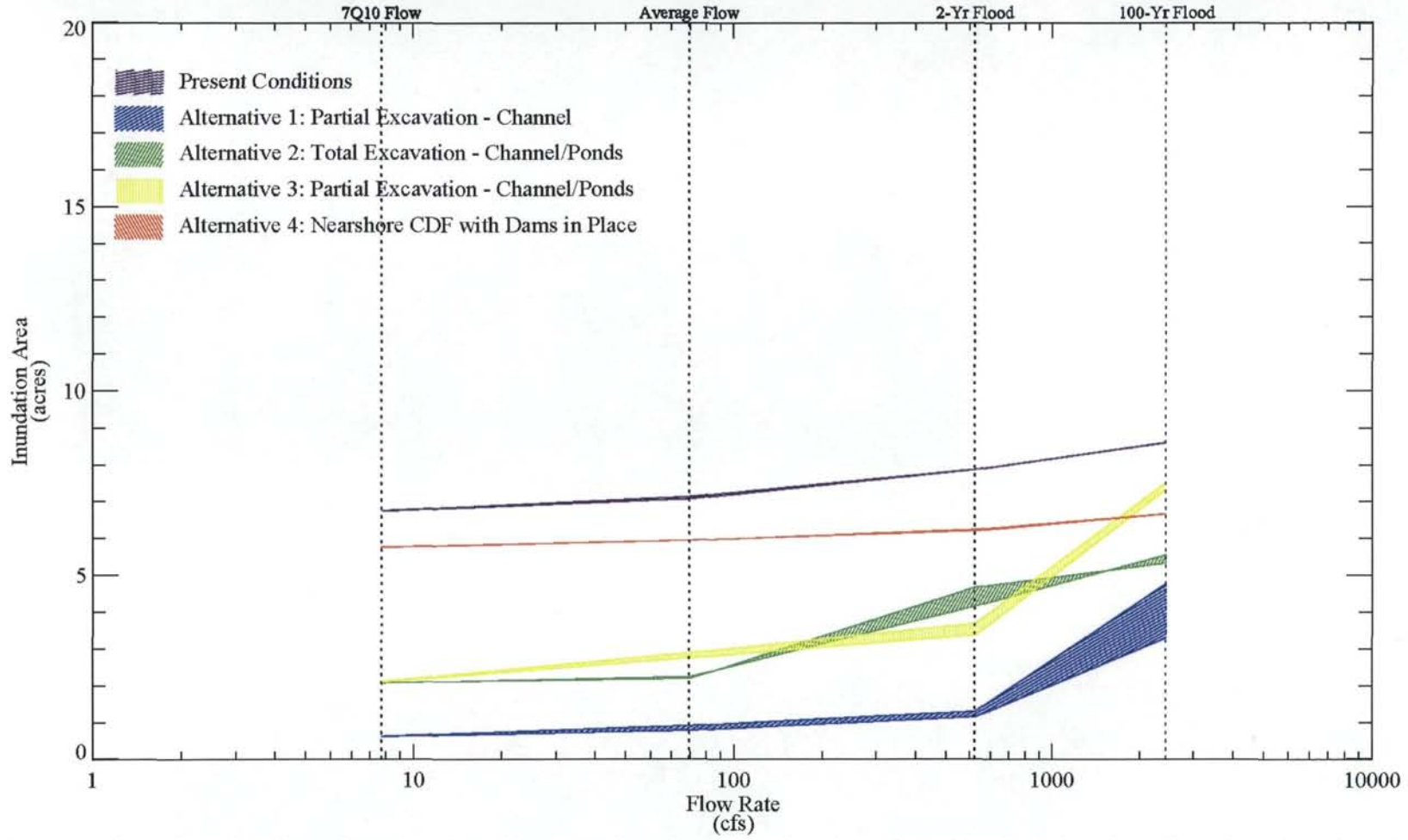
100-yr Flood Hydrograph at Manton Dam



QEA

Total Water Surface Area: Allendale Pond



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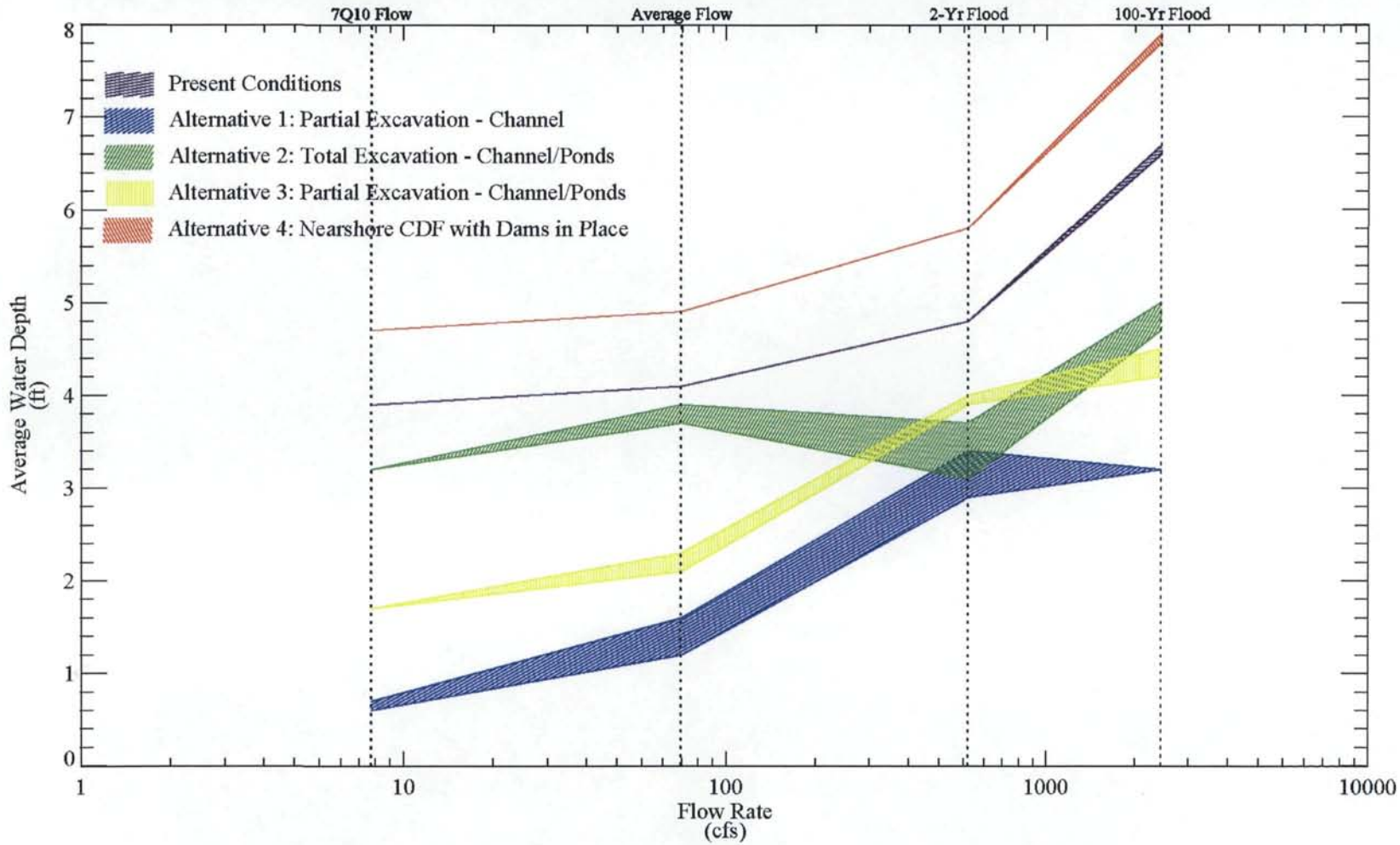
Average Water Depth: Allendale Pond



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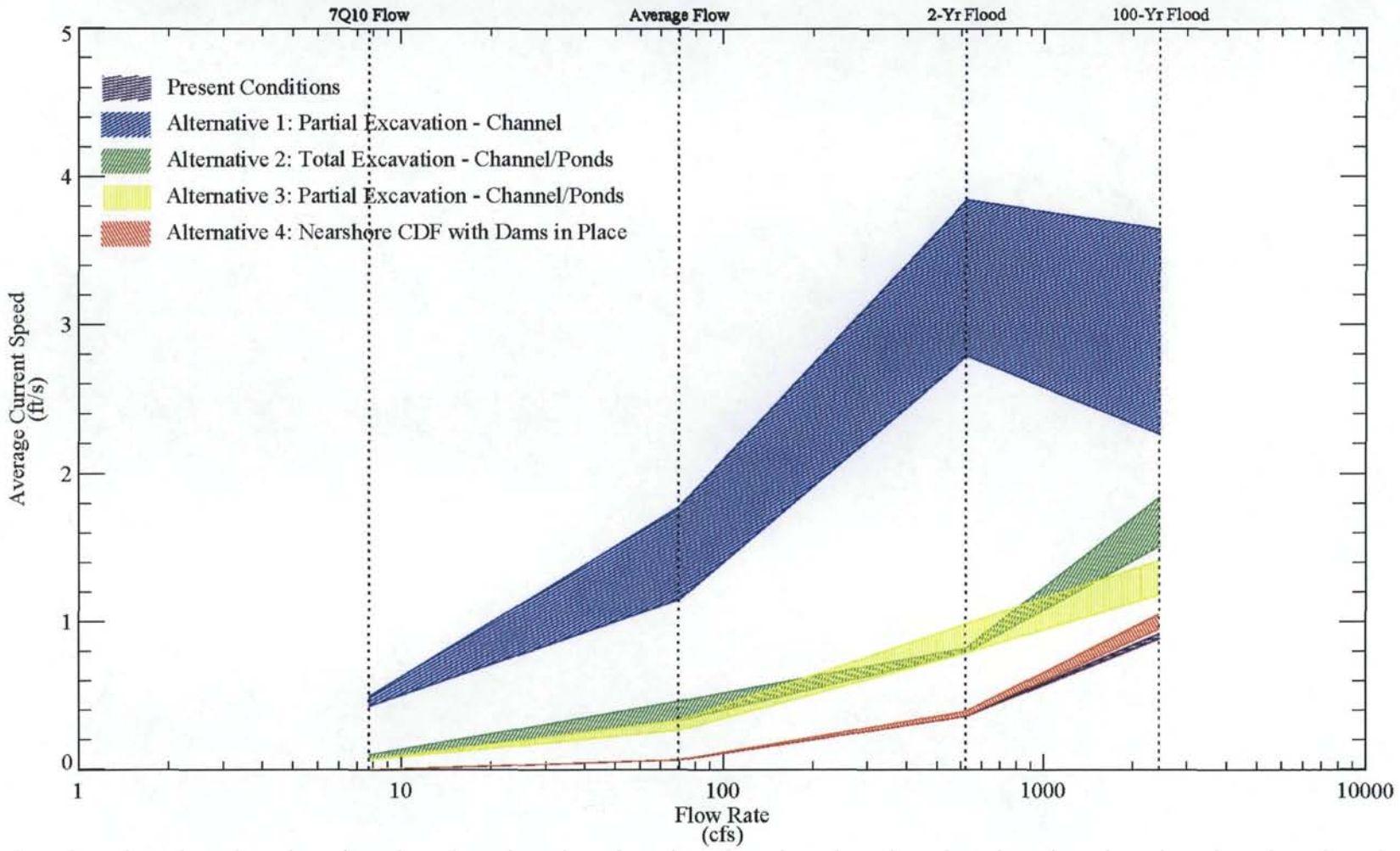
Average Current Speed: Allendale Pond



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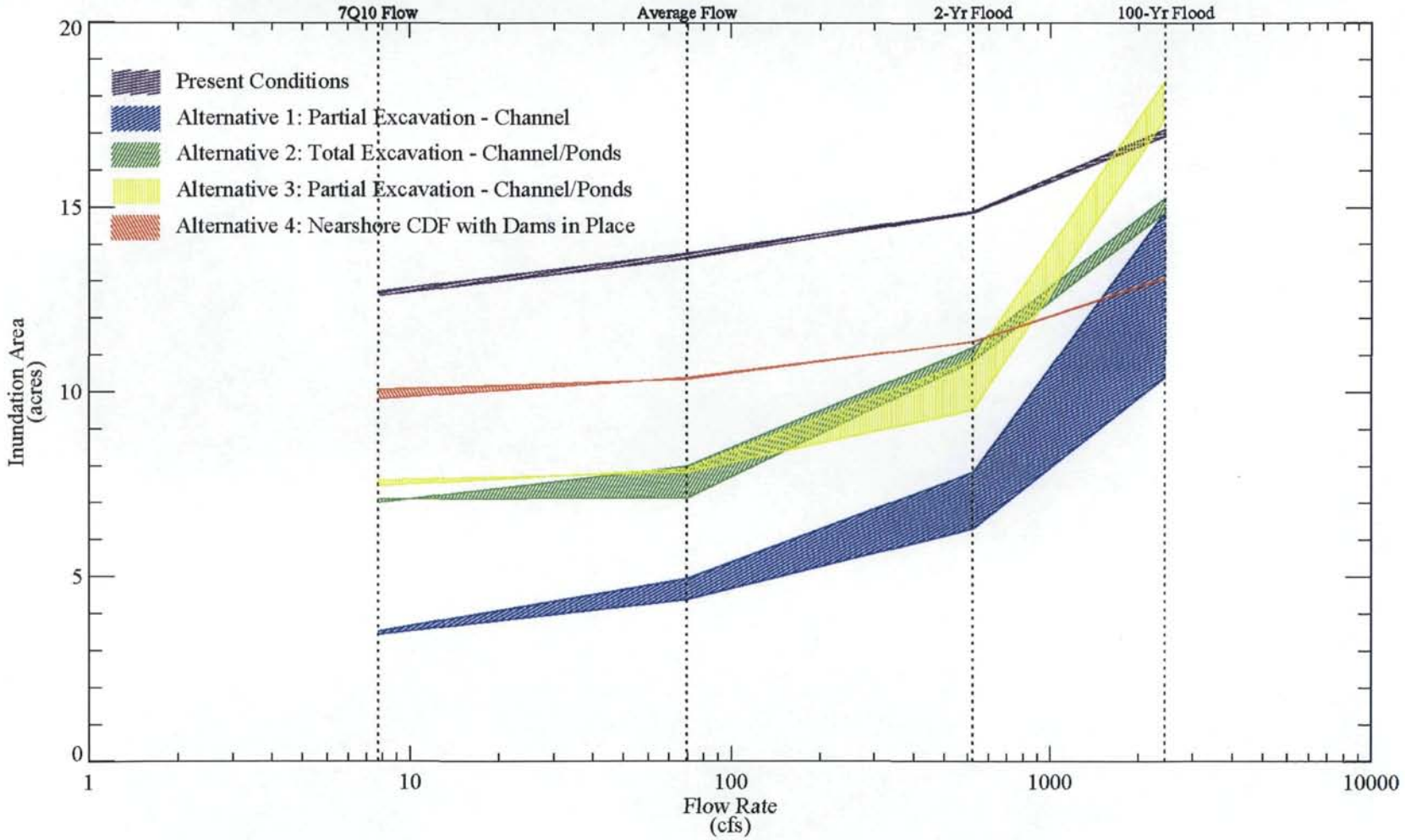
Total Water Surface Area:
Lyman Mill Pond



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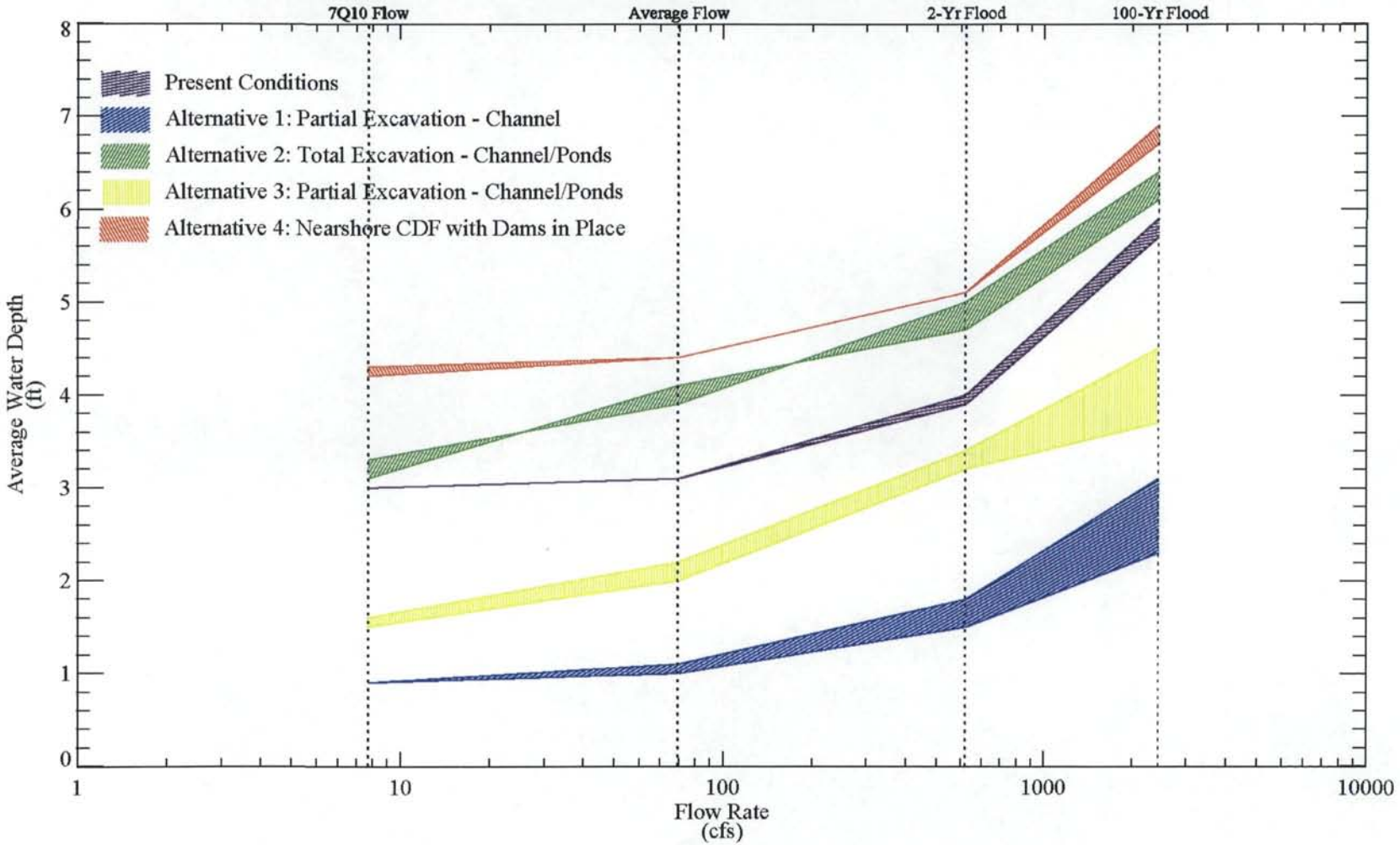
Average Water Depth: Lyman Mill Pond



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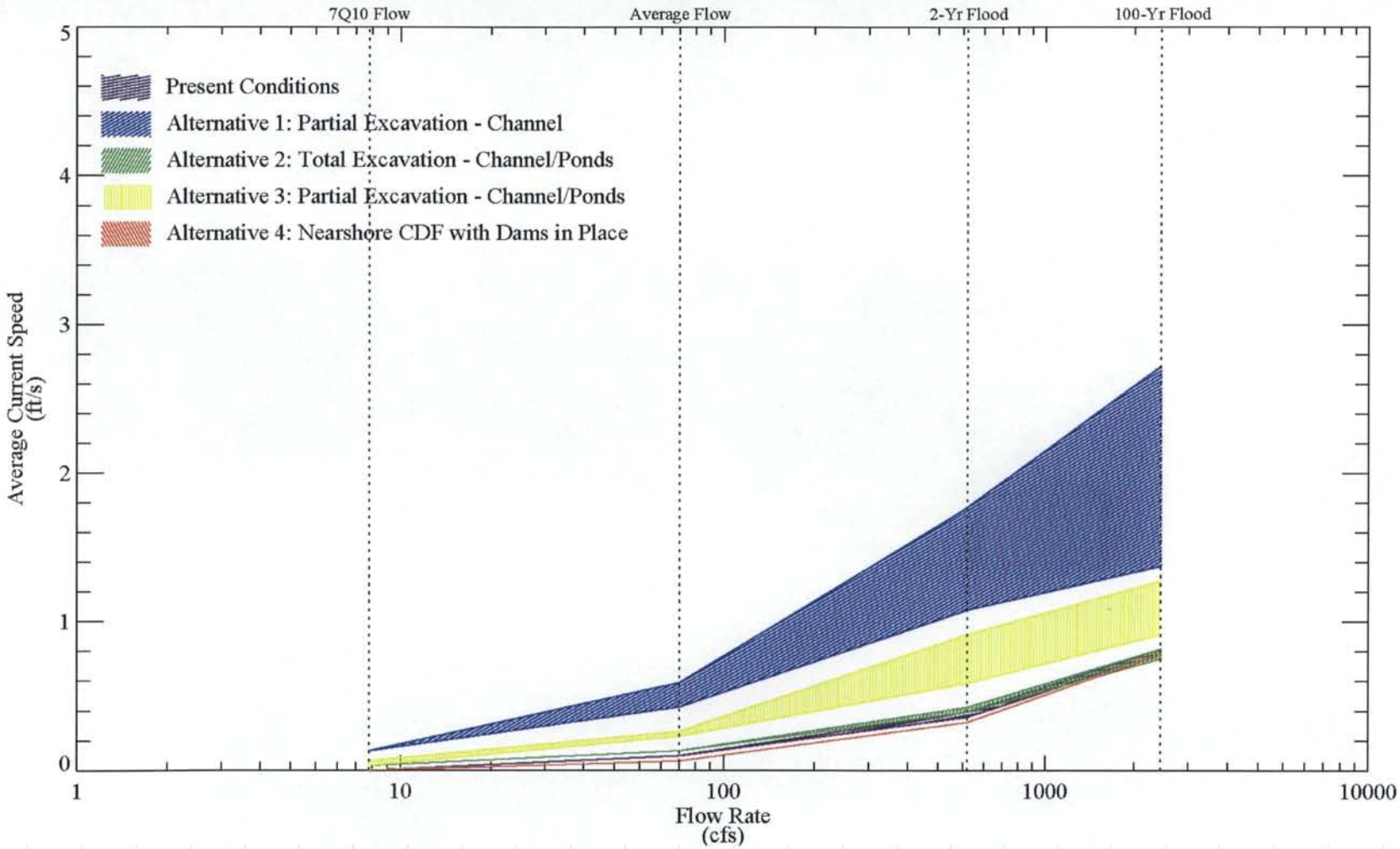
Average Current Speed: Lyman Mill Pond



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Ecological Summary

- **Alternative 1: River Channel**
  - **Free-flowing river**
    - **Anadromous fish access (e.g., alewife, shad, herring) and other species (American eel)**
    - **Could lose warm water species in this reach (e.g., sunfish, perch, shiner)**
  - **Increases upland areas**
    - **Improved habitat for small mammals, song birds and other terrestrial avian species**
    - **Potential decreases in semi-aquatic and insectivorous bird habitat in this reach**
  - **Oxbow area largely unaffected**

QEA

Ecological Summary

- **Alternatives 2 & 3: Channel & Pond Configuration**
  - **Restricted, but continuous flowing, river**
    - **Anadromous fish access (e.g., alewife, shad, herring) and other species (American eel)**
    - **No significant impact on warm water species in this reach (e.g., sunfish, perch, shiner)**
  - **Increase of emergent wetland areas**
    - **Improved habitat for fisheries, semi-aquatic birds, and insectivorous birds**
    - **Moderate improvement for small mammals and song birds and other terrestrial avian species**
  - **Oxbow area largely unaffected**

Ecological Summary

- **Alternative 4: Near-Shore CDF with Dams in Place**
  - **Restricted low-flow river**
    - **No significant impact on warm water species in this reach (e.g., sunfish, perch, shiner)**
    - **No change for anadromous species**
  - **Decrease in pond area**
  - **Decrease in emergent wetland areas**
    - **Moderate loss of habitat for fisheries, semi-aquatic birds, and insectivorous bird**
    - **Moderate improvement for small mammals and song birds and other terrestrial avian species**
  - **Oxbow area largely unaffected**

Summary

- Total of 40 hydrodynamic simulations were conducted
  - Model results are illustrated on nearly 800 figures
  - CD available upon request
- Bounding simulations were used to minimize uncertainty of model results
- Hydrodynamic model is an effective diagnostic tool for evaluating various remedial alternatives, including dam removal options
  - High-resolution numerical grid provides flexibility for evaluating different channel/pond geometries

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Conclusions

- Model predictions for all four alternatives result in:
  - Reasonable ranges of current speed
    - Any of the alternatives can be engineered to minimize erosion
  - Flood inundation has no appreciable effect beyond that for existing conditions for the areas adjacent to Allendale and Lyman Mill Ponds, even for 100-yr flood
  - Negligible effect on stage height and floodplain inundation during high-flow events in region downstream of Manton Dam
- Thus, any of the four alternatives are viable remedial options from a hydrodynamics standpoint

QEA