Proposed Remedy

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Mark Rupnow, U. S. Steel

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Overview

- Welcome and Introductions
- Great Lakes Legacy Act
- Roles and Responsibilities
- Site History
- Extent of Impacts
- Proposed Cleanup Approach
- Benefits of the Project
- Potential Impacts
- Schedule
- Opportunities for Input
Implementation Approach

Great Lakes Legacy Act (Cooperative)

instead of

MERLA (Enforcement)
Great Lakes Legacy Act

Goal:

• *Faster:* Accelerate the pace of sediment remediation at Areas of Concern (AOCs)

• *Better:* Go above and beyond the minimum requirements

• *Restore:* Incorporate habitat restoration into remediation projects

Mechanism:

• Uses public-private *partnerships* to remove roadblocks to sediment remediation
Great Lakes Legacy Act Projects

Completed or ongoing projects

Legend
- U.S. AOCs
- Binational AOCs
- Areas in Recovery
- Delisted AOCs
GLLA Remediation to date:

- Sheboygan
- River Raisin
- Ottawa River
- Grand Calumet - Roxana
- Ashtabula North Slip
- DSO
- Lincoln Park - Phase 1
- Grand Calumet - Reach 3,4,5
- St. Marys MGP
- Kinnickinnic River
- Black Lagoon
- Hog Island
- Ruddiman Creek
- Tannery Bay

2,370,500 cubic yards remediated
Who are the GLLA Non-Federal Sponsors?

- States
- Industries
- Municipalities
- Combinations of the above
Industries (37) Involved in GLLA Projects

- DuPont Co.
- GenCorp Inc.
- Honeywell International Inc.
- Illinois Tool Works, Inc.
- United Technologies
- Allied Waste Industries, Inc.
- Phelps Dodge (Now Freeport-McMoRan)
- Cabot Corp
- Detrex Corp
- XIK Corp
- Consumers Energy
- Varta Microbattery, Inc.
- The Mosaic Co.
- BP-Husky Refining
- BASF Corp.
- Arkema Corp
- Wisconsin Public Service
- Pollution Risk Services
- Cleveland Illuminating Co.
- Mallinckrodt Inc
- Millennium Inorganic Chemicals
- Ohio Power
- Olin Corp
- Occidental Chemical
- RMI Titanium Co
- Sherwin Williams
- Union Carbide
- CBS Operations (Viacom Intl)
- Elkem Metals
- Perstorp Polyols, Inc.
- Chevron USA
- Sunoco, Inc
- Pilkington North America
- U. S. Steel
- Ford
- Tyco Fire Products
- Fraser Shipyards
Benefits of GLLA

• Cooperative, Collaborative Approach
• Faster Implementation
• Shared Goals
• Shared Costs
• More Comprehensive Approach
Roles and Responsibilities

• U.S. EPA
  – Project Management
  – Project Implementation
  – Funding

• U. S. Steel
  – Project Management
  – Project Implementation
  – Funding

• MPCA
  – Project Oversight/Permitting
  – Technical Coordination/Technical Expertise
Project Location
Former Duluth Works
History of Duluth Works

- Development of steel making facility beginning in 1907
- Operations commence in 1915
- Integrated steel manufacturing plant (Coke, Iron, Steel and Finishing facilities)
- Production peaks in World War I, II and 1950s
- Shutting down by 1979
- Most structures demolished by 1988
History of Duluth Works

- Environmental site listing 1983 (Federal and State SuperFund programs)
- Record of Decision 1989 - Prescribed upland remedies & “no action with periodic inspections/monitoring” for sediments units
- Upland remediation work completed in phases – additional work based on Agency 5 year reviews
- On-going monitoring activities
- Duluth Seaway Port Authority partnership
- U. S. Steel and EPA - partners on Spirit Lake sediment site planning since 2011
Project Area
Spirit Lake Sediment Studies
Area of Sediment Impacts
Milestones

• Remedial Investigations (RI) 2011-2013
  – Multiple sampling events – winter and summer
• Feasibility Study (FS) 2013-2015
  – Twelve Alternatives developed and evaluated
• Seven Resource Managers meetings held along the way to obtain feedback
• Final FS Addendum December 2015
  – Incorporated additional hybrid Alternative
Potential Remedial Alternatives

- No Action
- Monitored Natural Recovery
- Capping
- Dredging
- Enhanced Natural Recovery
- Combination Remedies
Remedy Evaluation Factors

- Protection of Human Health and the Environment
- Compliance with State and Federal Laws
- Long Term Effectiveness
- Short Term Effectiveness
- Reduction in Toxicity, Mobility, and/or Volume
- Implementability
- Cost
- State and Community Acceptance
## Screening Level Evaluation of Alternatives

### Table 2.2

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Description</th>
<th>Screening Level Evaluation</th>
<th>Relative Rankings</th>
<th>Additional Factors for Consideration</th>
<th>Balance for Detailed Evaluation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1</td>
<td>Lagoon</td>
<td>Lagoon</td>
<td>Low</td>
<td>Low</td>
<td>No, consider HUEP in lieu of option B.</td>
</tr>
<tr>
<td>Alternative 2</td>
<td>Expanded Corp.</td>
<td>Expanded Corp.</td>
<td>Medium</td>
<td>Medium</td>
<td>No, because it may result in regrading of existing habitat and water quality issues</td>
</tr>
<tr>
<td>Alternative 3</td>
<td>Full Removal</td>
<td>Full Removal</td>
<td>High</td>
<td>High</td>
<td>No, because it may result in regrading of existing habitat and water quality issues</td>
</tr>
<tr>
<td>Alternative 4</td>
<td>On-Site Biofilter</td>
<td>On-Site Biofilter</td>
<td>High</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td>Alternative 5</td>
<td>Off-Site Biofilter</td>
<td>Off-Site Biofilter</td>
<td>Low</td>
<td>Low</td>
<td>No, because although feasible, it is alternative that has not undergone further analysis or field testing.</td>
</tr>
<tr>
<td>Alternative 6</td>
<td>On-Site Sediment Barriers</td>
<td>On-Site Sediment Barriers</td>
<td>Medium</td>
<td>Medium</td>
<td>Yes, because this alternative has the lowest risk than Alternative K.</td>
</tr>
<tr>
<td>Alternative 7</td>
<td>Off-Site Sediment Barriers</td>
<td>Off-Site Sediment Barriers</td>
<td>High</td>
<td>High</td>
<td>No, because it may result in regrading of existing habitat and water quality issues</td>
</tr>
</tbody>
</table>

**Notes:**
- Lagoon: High risk of damage to existing habitat and water quality issues.
- Expanded Corp.: Medium risk of damage to existing habitat and water quality issues.
- Full Removal: High risk of damage to existing habitat and water quality issues.
- On-Site Biofilter: High risk of damage to existing habitat and water quality issues.
- Off-Site Biofilter: Low risk of damage to existing habitat and water quality issues.
- On-Site Sediment Barriers: Medium risk of damage to existing habitat and water quality issues.
- Off-Site Sediment Barriers: High risk of damage to existing habitat and water quality issues.

**Additional Information:**
- The alternatives were evaluated based on their potential impact on the environment, feasibility, and cost-effectiveness.
- The evaluation was conducted by the Great Lakes National Program Office, U.S. Environmental Protection Agency.
Screening Alternatives - continued

### Table 3-2

**Screening Level Evaluation of Alternatives**
Former U.S. Steel/JSW Site - Saint Louis River
Duluth, Minnesota

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Description</th>
<th>Potential Alternatives for Screening Considerations</th>
<th>Implementability</th>
<th>Relative Rankings</th>
<th>Screening Level</th>
<th>Additional Consideration</th>
<th>Referenced for Further Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative A</td>
<td>By closing the dam and installing a new dam on the Duluth Canal</td>
<td>Reduce sediment and improve water quality in the Duluth Canal.</td>
<td>Yes</td>
<td>High</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Alternative B</td>
<td>By closing the dam and installing a new dam on the Duluth Canal</td>
<td>Reduce sediment and improve water quality in the Duluth Canal.</td>
<td>Yes</td>
<td>High</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Alternative C</td>
<td>By closing the dam and installing a new dam on the Duluth Canal</td>
<td>Reduce sediment and improve water quality in the Duluth Canal.</td>
<td>Yes</td>
<td>High</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Alternative D</td>
<td>By closing the dam and installing a new dam on the Duluth Canal</td>
<td>Reduce sediment and improve water quality in the Duluth Canal.</td>
<td>Yes</td>
<td>High</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Alternative E</td>
<td>By closing the dam and installing a new dam on the Duluth Canal</td>
<td>Reduce sediment and improve water quality in the Duluth Canal.</td>
<td>Yes</td>
<td>High</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Alternative F</td>
<td>By closing the dam and installing a new dam on the Duluth Canal</td>
<td>Reduce sediment and improve water quality in the Duluth Canal.</td>
<td>Yes</td>
<td>High</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Screening Key**
- High Importance/Priority
- Medium Importance/Priority
- Low Importance/Priority

**Notes:**
- The table above includes a summary of the screening evaluation for the alternatives presented.
- Each alternative is evaluated based on criteria such as potential benefits, costs, and overall feasibility.
- The screening level evaluation helps in identifying the most promising alternatives for further detailed evaluation.

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**Great Lakes Restoration Initiative**
U.S. Environmental Protection Agency       Great Lakes National Program Office
# Detailed Alternatives Comparison

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</tr>
</thead>
<tbody>
<tr>
<td>Overall protection of human health and the environment</td>
<td>Score: 1 Protective</td>
<td>Score: 1 Protective</td>
<td>Score: 1 Protective</td>
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<td>Score: 1 Protective</td>
<td>Score: 1 Protective</td>
</tr>
<tr>
<td>Compliance with regulatory requirements (GPRPs)</td>
<td>Score: 3 Compliant</td>
<td>Score: 3 Compliant</td>
<td>Score: 3 Compliant</td>
<td>Score: 3 Compliant</td>
<td>Score: 3 Compliant</td>
<td>Score: 3 Compliant</td>
<td>Score: 3 Compliant</td>
<td>Score: 3 Compliant</td>
<td>Score: 3 Compliant</td>
</tr>
<tr>
<td>Long-term effectiveness and permanence</td>
<td>Score: 2 More stormwater structures to maintain</td>
<td>Score: 3 Effective</td>
<td>Score: 3 Stormwater management and three CDFs would require more O&amp;M than other alternatives and would be more likely to result in greater potential risk of short and long-term failure than the other alternatives.</td>
<td>Score: 3 Effective, Three CDFs would require more O&amp;M than other alternatives.</td>
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</tr>
<tr>
<td>Reduction of toxicity, mobility (overall risk)</td>
<td>Score: 2 Effective at reducing overall risk</td>
<td>Score: 1 Effective at reducing overall risk</td>
<td>Score: 1 Effective at reducing overall risk</td>
<td>Score: 1 Effective at reducing overall risk</td>
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<td>Score: 1 Effective at reducing overall risk</td>
</tr>
<tr>
<td>Short-term effectiveness</td>
<td>Score: 2 Effective, Stormwater diversion south of spit.</td>
<td>Score: 1 Effective.</td>
<td>Score: 1 Stormwater management presents risks during construction. Less effective than other alternatives because of longer construction duration.</td>
<td>Score: 1 Effective</td>
<td>Score: 1 Effective</td>
<td>Score: 1 Effective</td>
<td>Score: 1 Effective</td>
<td>Score: 1 Effective</td>
<td>Score: 1 Effective</td>
</tr>
<tr>
<td>Implementability</td>
<td>Score: 3 Implementable; however, Upland material must be moved longer distance to CDF.</td>
<td>Score: 3 Implementable; however, height of delta CDF creates potential slope-failure, impoundment, and geological loading concerns. In addition, elimination of the USBM railroad is required.</td>
<td>Score: 3 Implementable; however, the most uncertainty because of the complications of stormwater management in confined channel, and CDF construction, which includes steeper berms and requires soil stabilization, is more complicated than other alternatives. Height of OU-M Delta CDF has potential to create view-ship impacts. Longer construction schedule than other alternatives.</td>
<td>Score: 2 Implementable, Consolidation areas are proximal to source removal areas.</td>
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</tr>
<tr>
<td>Cost</td>
<td>Score: 2 Lowest cost of the alternatives retained for detailed analysis.</td>
<td>Score: 3 Moderate cost, more than Alternatives 4 and 8, but less than Alternatives 7 and 12.</td>
<td>Score: 3 Most expensive of the alternatives retained for detailed analysis.</td>
<td>Score: 3 Moderate cost</td>
<td>Score: 3 Moderate cost</td>
<td>Score: 3 Moderate cost</td>
<td>Score: 3 Moderate cost</td>
<td>Score: 3 Moderate cost</td>
<td>Score: 3 Moderate cost</td>
</tr>
<tr>
<td>Compliance with 11 Sediment Principles/Sediment Management Guidance</td>
<td>Score: 1 Compliant</td>
<td>Score: 1 Compliant</td>
<td>Score: 1 Compliant</td>
<td>Score: 1 Compliant</td>
<td>Score: 1 Compliant</td>
<td>Score: 1 Compliant</td>
<td>Score: 1 Compliant</td>
<td>Score: 1 Compliant</td>
<td>Score: 1 Compliant</td>
</tr>
<tr>
<td>Total Score</td>
<td>13</td>
<td>19</td>
<td>20</td>
<td>23</td>
<td>13</td>
<td>14</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
</tbody>
</table>

Scoring Key: 1 through 5, lowest score is the most desirable.
Alternative 8B Recommended
Components of the Proposed Remedy

- Dredging (697,000 cubic yards)
- Underwater Capping (109 acres in the estuary)
- Enhanced Monitored Natural Recovery (30 acres)
- Monitored Natural Recovery (59 acres)
- On Site Confined Disposal Facilities (CDFs)
- Long-Term Monitoring
- Habitat Restoration
- Estimated Cost is ~$70M
Proposed Remedy

Alternative 8B

Approximate U.S. Steel Operations Area

Spirit Island
(Elevation approx. 601.1 ft.)

St. Louis River Channel

Great Lakes Restoration

U.S. Environmental Protection Agency  Great Lakes National Program Office
Dredging

- Dredging is the mechanical or hydraulic removal of sediments from the waterbody.
- Targeted for areas of higher contamination and where additional water depth is desired for ecological and human use.
- Most complicated remedial approach requiring multiple components
  - Dredging
  - Transport
  - Processing/Dewatering
  - Water Treatment
  - Disposal
  - Control of Residual Contamination
Confined Disposal Facilities

• Disposal cells specifically designed to manage and contain contaminated sediments.

• Targeted for impacted areas adjacent to Unnamed Creek and the Unnamed Creek Delta (total of 40 acres).

• Used successfully throughout the Great Lakes

• Require long-term maintenance and monitoring (U. S. Steel responsibility)
  – Overseen by EPA and MPCA

• Could include habitat/access enhancements
Confined Disposal Facilities
Confined Disposal Facilities
Capping

Remedial Capping to Permanently Contain Contaminated Sediments In Place

Bioactive Zone (BAZ)
- Provides new clean substrate for establishment of a healthy benthic community and rooted aquatic plants.
- May contain a reactive or adsorptive layer, or a root barrier.
- Edges of caps are sloped > 4 to 1.

Isolation Zone (IZ)
Engineered to prevent contamination from moving into the BAZ

<table>
<thead>
<tr>
<th>High Currents/Waves</th>
<th>Low Currents/Waves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armor Layers</td>
<td>Env. Media</td>
</tr>
<tr>
<td>Rip Rap/Cobble</td>
<td>Gravel/Sand</td>
</tr>
<tr>
<td>Silt/Mud</td>
<td></td>
</tr>
</tbody>
</table>
Capping
Capping

• Placement of clean material (cap) over contaminated sediments that will remain in place.
• Creates a physical and chemical barrier to prevent exposure to contaminants.
• Highly effective at immediately reducing exposures.
• Can be utilized to efficiently create targeted water depth for aquatic habitat restoration.
• Requires long-term monitoring and maintenance.
Monitored Natural Recovery

• Utilizes, on-going, naturally occurring processes to contain, destroy, or reduce the bioavailability or toxicity of contaminants.

• Targeted for areas where natural sedimentation has buried historical contamination.

• Primary MNR Mechanism: Sedimentation

• Secondary MNR Mechanism: Contaminant Breakdown (for PAHs)
Natural Cover Areas
Enhanced Monitored Natural Recovery

• Provides an additional thin layer cap to speed up the naturally occurring sedimentation processes taking place at the site.

• Targeted for areas where:
  – Surface contamination is low
  – Natural sedimentation has partially buried contamination
  – Models predict on-going sedimentation to occur
  – Areas of low energy
  – Areas of higher habitat quality
Enhanced Monitored Natural Recovery

- Amendment Mats
- Bulk Placement
- Amendment mixed with Sediments

U.S. Environmental Protection Agency  Great Lakes National Program Office
Restoration
Potential Restoration Opportunities

• Submerged Aquatic Plants
• Emergent Aquatic Plants
  – Wild Rice
• Fish Habitat
  – Shallow, Sheltered Bay
  – Structure
  – Spawning Habitat
• Public Access
  – Canoe/Kayak Launch
  – Hiking Trails
Summary of Project Benefits

- Protection of Human Health and the Environment
- Creation of Open Water (30 acres)
- Creation of Shallow, Sheltered Bay Habitat
- Shallow Water Vegetation
- Potential to Enhance Public Access to the River
Potential Short-term Impacts

- Noise During Construction
- Increased Truck Traffic
- Interruption of Railroad Operations
- Construction Lighting
Project Schedule

• Public Input/Finalize FS (November 2016)
• Design and Permitting (December 2017)
• Construction (January 2018 to December 2019)
• Long-Term Monitoring (Forever)
Opportunities for Input

- Q&A Session
- Poster Session
- Comment Forms
- Email
- Written Comments
- Additional Meetings During Design Phase
- EPA and U. S. Steel to Prepare a Response to Comments Document