



Update on Lower Fox River Remediation Project, Green Bay, Wisconsin



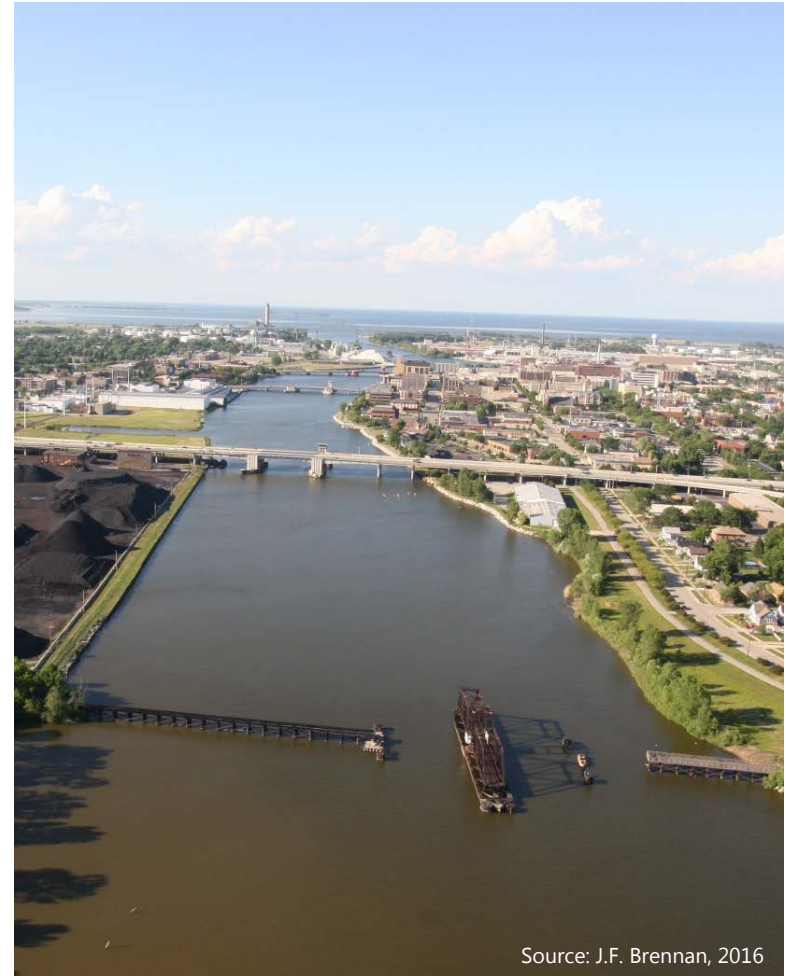
Presented by
P. LaRosa, PE, and D. Binkney, Anchor QEA, LLC
R. Feeney, PE, and T. Blackmar, PE, Tetra Tech, Inc.
G. Smith and D. Bauman, J.F. Brennan Company, Inc.



WEDA Dredging Summit | June 25–28, 2018

Overview

- History and Background
- Update on Remediation Progress
- Lessons Learned
 - Innovative techniques for dredging near upland structures
 - Field locating and remediation above submerged utilities
 - Disposal of Toxic Substances Control Act- (TSCA-) regulated sediment
 - Coordination with U.S. Army Corps of Engineers (USACE)

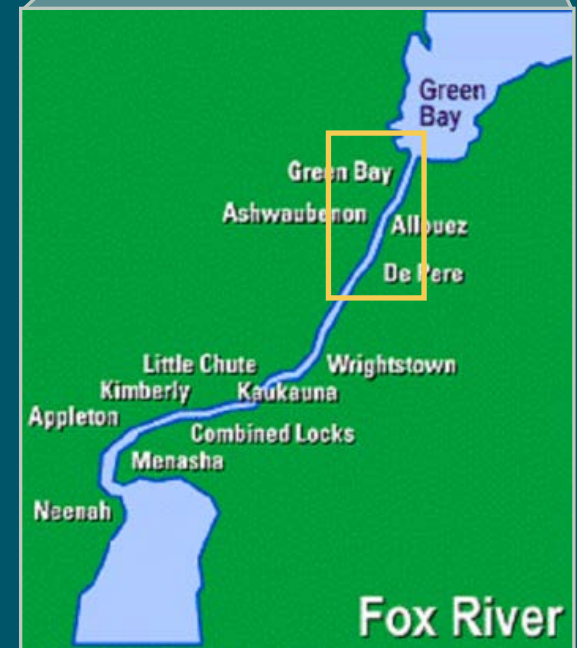
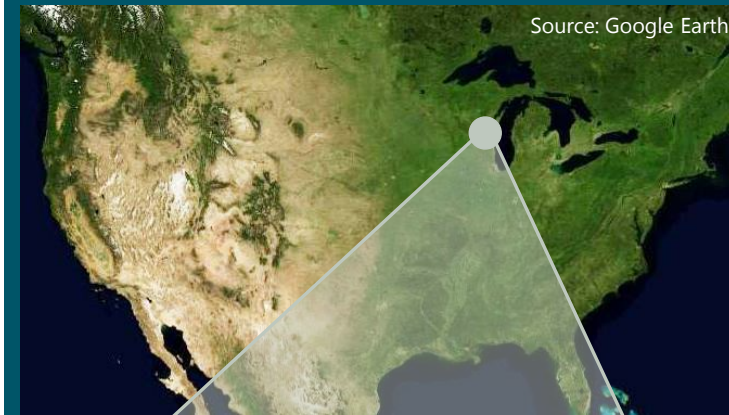


Source: J.F. Brennan, 2016

History and Background

History and Background

- Lower Fox River
 - Located between Appleton and Green Bay, Wisconsin
 - Project site: Operable Units 2 – 5
 - Client
 - Lower Fox River Remediation LLC
 - Agencies/Oversight Team
 - USEPA, WDNR, Industry firms
- History
 - Home to 24 historical and active paper and pulp mills
 - PCBs released into river between 1950s and 1970s
- Full scale remediation commenced in 2009



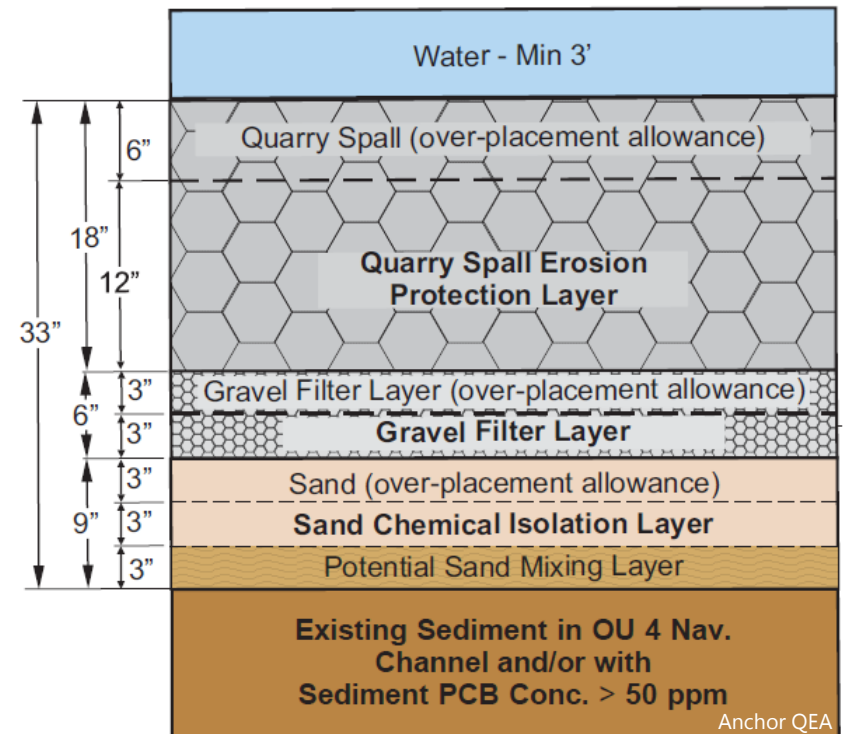
Source: Wisconsin Department of Natural Resources

History and Background

Components of the Remedy

- Dredging
 - Geostatistical model (Neatline) with variable cut thickness
 - Targeted elevation prisms (e.g., TSCA dredging)
 - Dredging to accommodate caps per post-cap water depth criteria
- Engineered Capping
 - 13- to 33-inch thick
 - Site-specific shoreline caps 43 inches thick or more
- Sand Covering

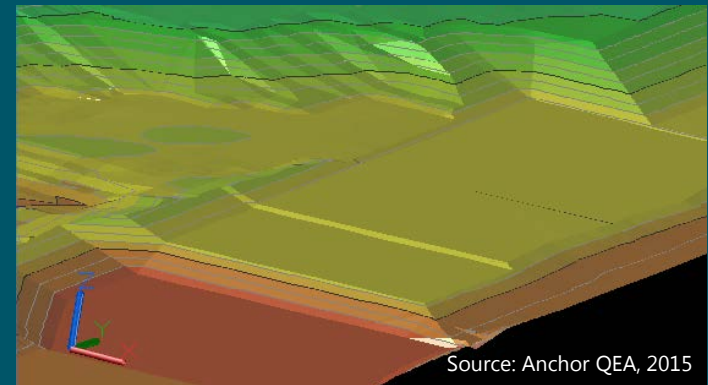
33-Inch Quarry Spall Armored Cap



History and Background

Contracting Method

- Design-Build
- Lead Contractor
 - Tetra Tech EC, Inc.
- Subcontractors
 - *Construction*: J.F. Brennan Marine
 - *Sediment Processing*: Stuyvesant Projects Realization, Inc. (SPRI)
 - *Engineering*: Anchor QEA, LLC, Tetra Tech CES
- Quality Assurance
 - Foth Infrastructure and Environment



Update on Remediation Progress

Update on Remediation Progress

	Approximate Project Quantity Totals To-Date (End of 2017)	Approximate Expected Totals at Project Conclusion (End of 2019)
In Situ Dredging (Primary and Residual)	>5 million cubic yards	>5.5 million cubic yards
Separated and Beneficially Reused Sand	>510,000 tons	>560,000 tons
Engineered Capping	110 acres	115 acres
Primary Sand Covering	90 acres	100 acres
Residual Sand Covering	400 acres	450 acres

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Note:

More than 2.4 million work hours without a lost time incident following ninth construction season at end of 2017

Innovative Techniques for Dredging Near Upland Structures

Lessons Learned

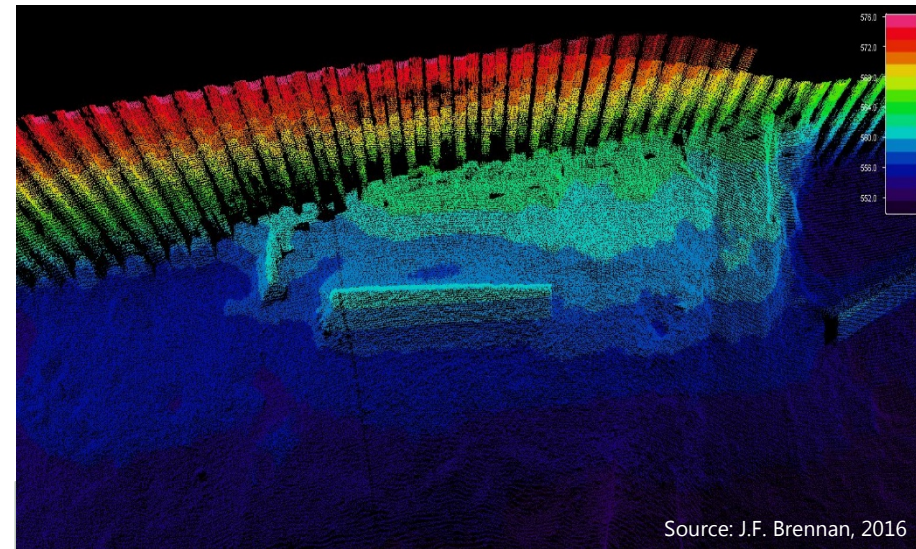
Innovative Techniques for Dredging Near Upland Structures

- Industrial and commercial sites adjacent to the river
- Bulkheads designed and constructed decades in the past have failed or have questionable integrity
- Improvements or replacements required to complete full remediation of contaminated sediments



Innovative Techniques for Dredging Near Upland Structures

- Temporary removal of surcharge loads on the adjacent uplands
- Installation of clean post-dredge buttress
- Installation of new structural members
- Temporary excavation behind sheet pile walls



Innovative Techniques for Dredging Near Upland Structures



Source: Tetra Tech, 2018

Temporary removal of surcharge loads on adjacent uplands

Innovative Techniques for Dredging Near Upland Structures



Installation of clean post-dredge buttress

Innovative Techniques for Dredging Near Upland Structures



Installation of structural members

Innovative Techniques for Dredging Near Upland Structures



Source: J.F. Brennan, 2018

Installation of structural members

Innovative Techniques for Dredging Near Upland Structures



Excavation behind sheetpile walls

Field Locating and Remediation Above Submerged Utilities

Lessons Learned

Field Locating and Remediation Above Submerged Utilities

- Submerged utilities present significant risks
- Research
- Dig-Safe
- Field Locating
- Remote Sensing



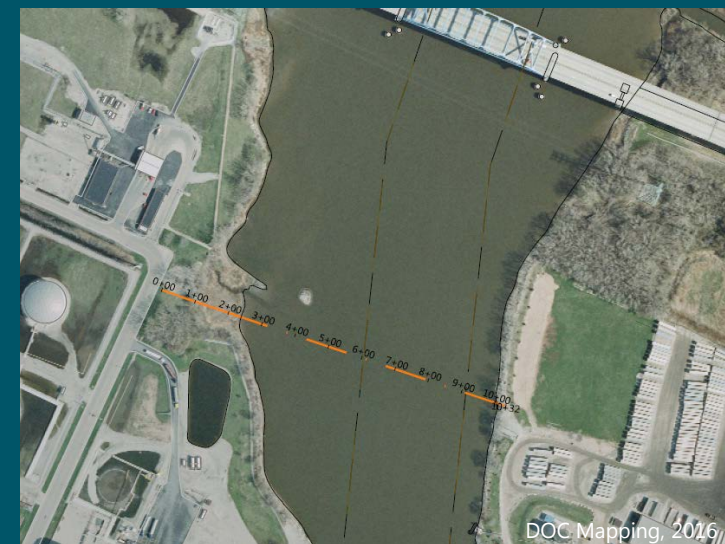
Photo by Central Brown County Water Authority, 2011

Field Locating and Remediation Above Submerged Utilities

- Remote Sensing
 - Performed by **DoC Mapping, LLC**
 - Electro-magnetic tracing conducted using submerged towfish
 - Provides 95% confidence level of utility elevation (MSDoc Elevation)



Lower Fox River – Operable Unit 4B



Submerged Utility No. 043 Plan View

Field Locating and Remediation Above Submerged Utilities

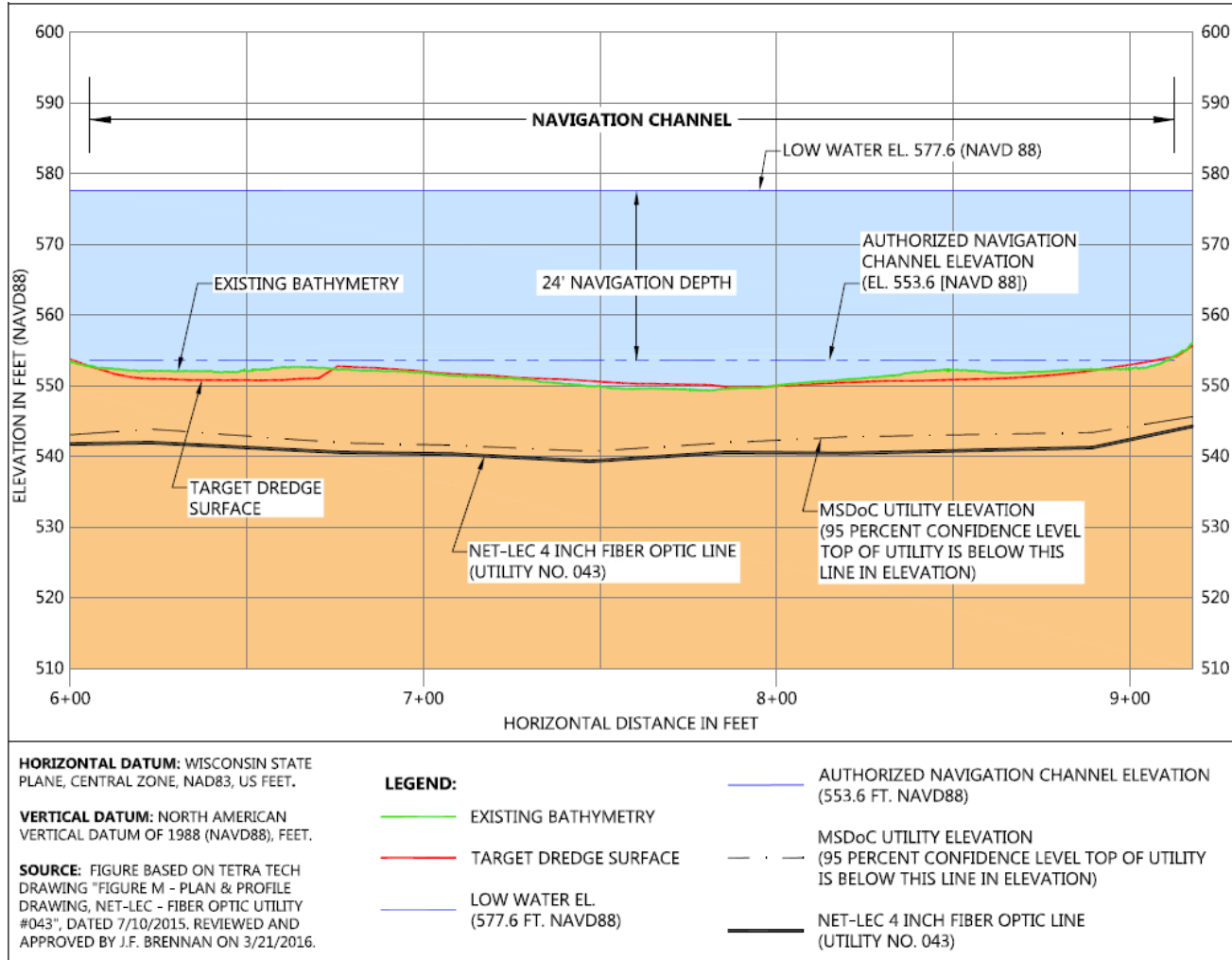


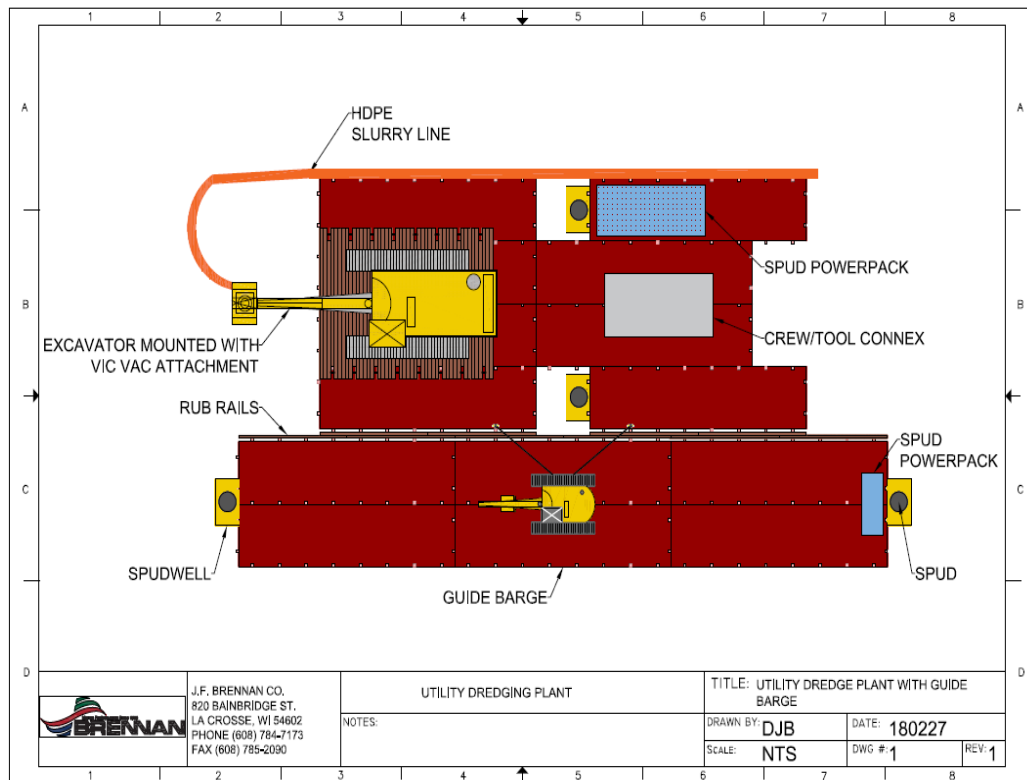
Figure By Anchor QEA, LLC (2018)
Data provided by DOC Mapping, LLC

Field Locating and Remediation Above Submerged Utilities

- Remedial Design
 - 5-foot vertical and horizontal offset zone around utility
 - Capping, sand cover, or no action within offset zone
 - Dredging outside of offset zone
- Modifications to Dredging
 - Use of spudded guide barge to safely straddle utility
 - Use of excavator with mounted dredge head
 - Open-suction dredging with diver assistance
 - VIC VAC TM

Field Locating and Remediation Above Submerged Utilities

Schematic view



Source: J.F. Brennan, 2017

J.F. Brennan's VIC VAC™ includes flexible agitating tines to allow for increased productivity in areas of dense sediment

Field Locating and Remediation Above Submerged Utilities

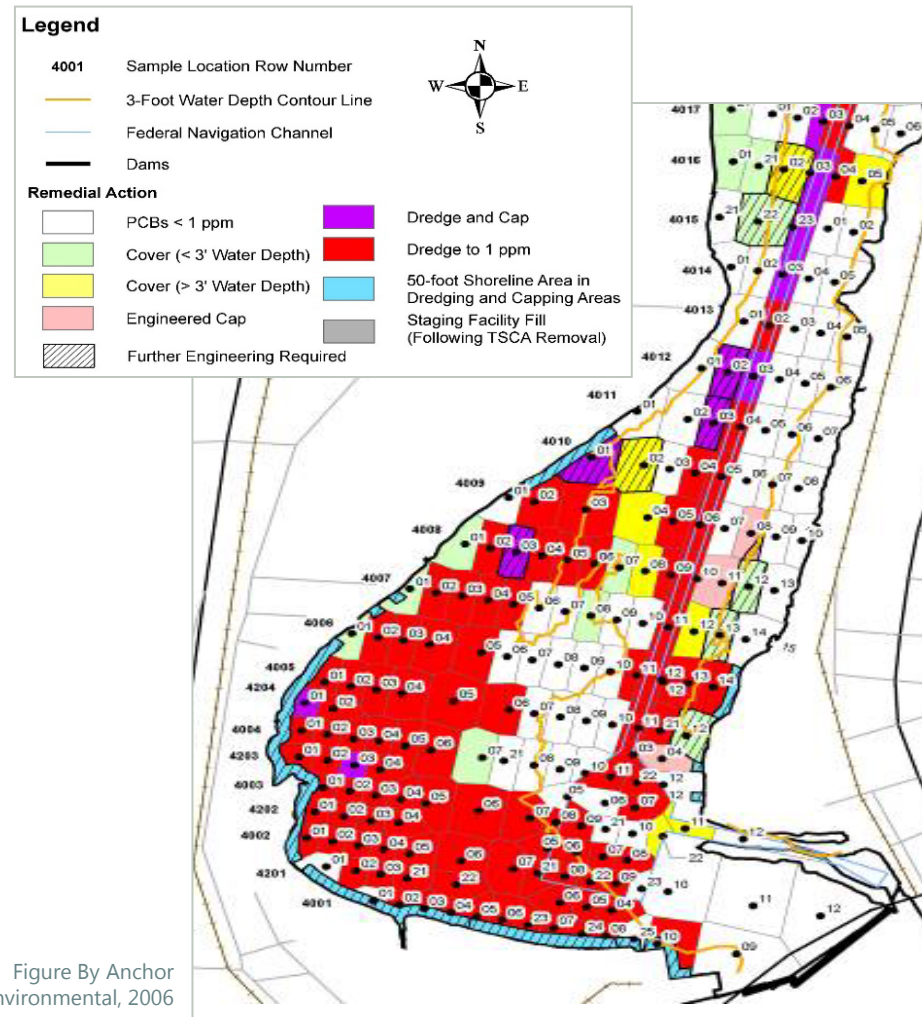
- Modifications to Capping
 - Within the 5-foot offset zone, Regulatory agencies required specially designed caps
 - Federal navigational channel depth and width restrictions and buffers
 - Vessel propeller wash considerations (bow-thrusters and main engine)
 - Variable thickness sand isolation caps with gravel armor
 - Coordination with USACE and utility owner required

Disposal of TSCA-Regulated Sediment in a Subtitle-D Landfill

Lessons Learned

Disposal of TSCA-Regulated Sediment in a Subtitle-D Landfill

- Lower Fox River TSCA delineation
 - Horizontal delineation using Thiessen polygons
 - Vertical delineation based on an average of 50 ppm over 2.5-foot intervals



Disposal of TSCA-Regulated Sediment in a Subtitle-D Landfill

- TSCA Dredging and Processing
 - Dredged in separate events from non-TSCA-regulated sediment
 - Undergoes typical scalping, de-sanding, and de-watering processing at on-site facility
 - PCB concentrations measured ex-situ in filter cake
 - Results have been significantly below 50 ppm



Source: Tetra Tech, 2018



Photo by: R. Feeney

Disposal of TSCA-Regulated Sediment in a Subtitle-D Landfill

- TSCA Filter Cake Disposal
 - Local Subtitle-D landfill permitted to accept waste with up to 50 ppm PCB, regardless of characterization
 - Required permit modification
 - Dewatered filter cake from TSCA-delineated sediment has been carefully monitored, with no exceedances to date
- Resulted in significant cost savings

Coordination with U.S. Army Corps of Engineers Lessons Learned

Coordination with USACE

- Remediation of sediment above submerged utilities
- Placement of submerged berm to deter vessel movement into recreational channel
- Annual coordination of navigation channel maintenance and remedial dredging

Coordination with USACE

- Berm placed in recreational portion of navigation channel to prevent large vessels in active turning basin from damaging upstream engineered caps
- Simple sand, gravel, and boulder berm
- Potential fish habitat benefits

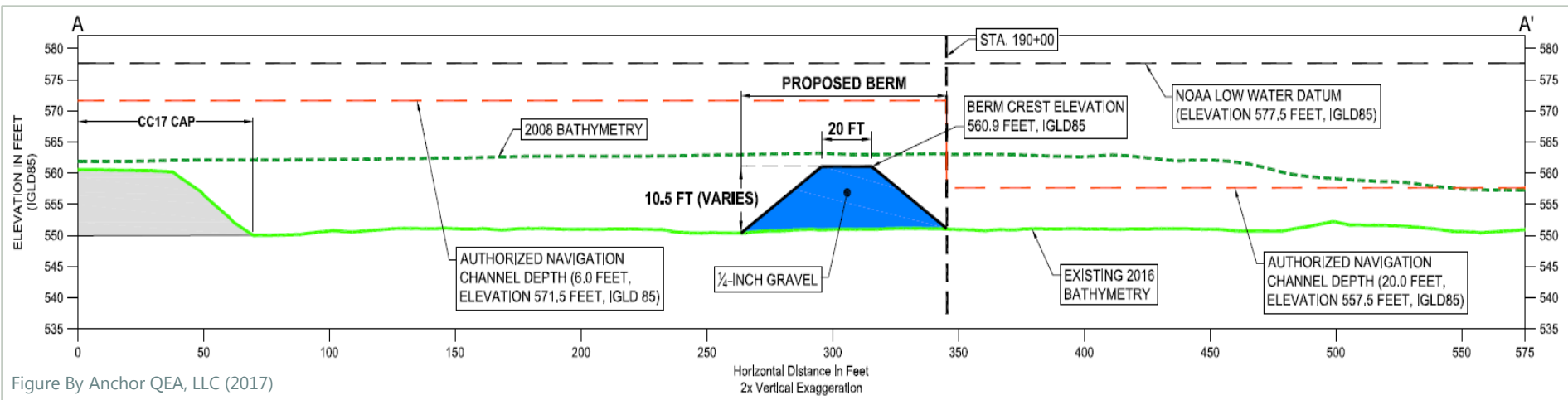
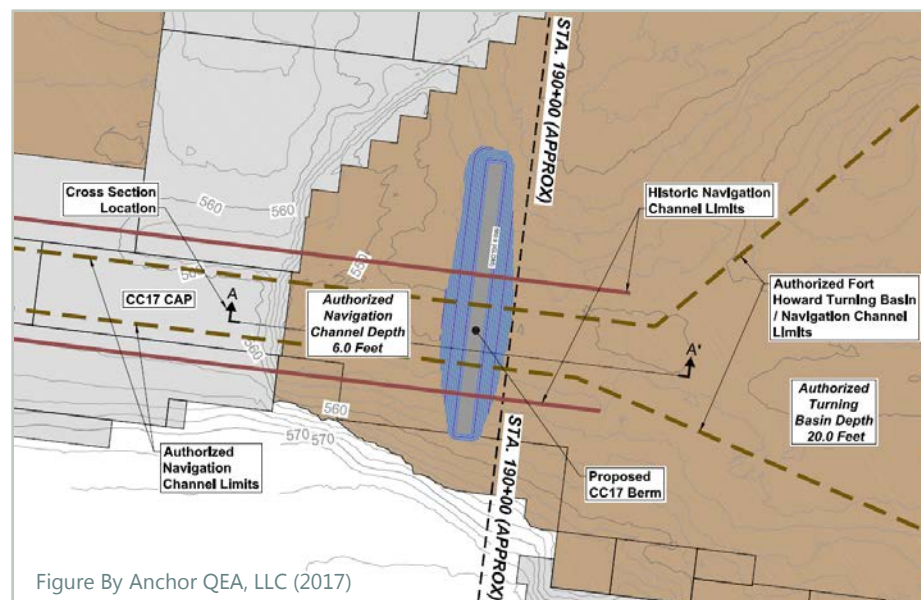


J.F. Brennan, 2017

Submerged Berm Materials

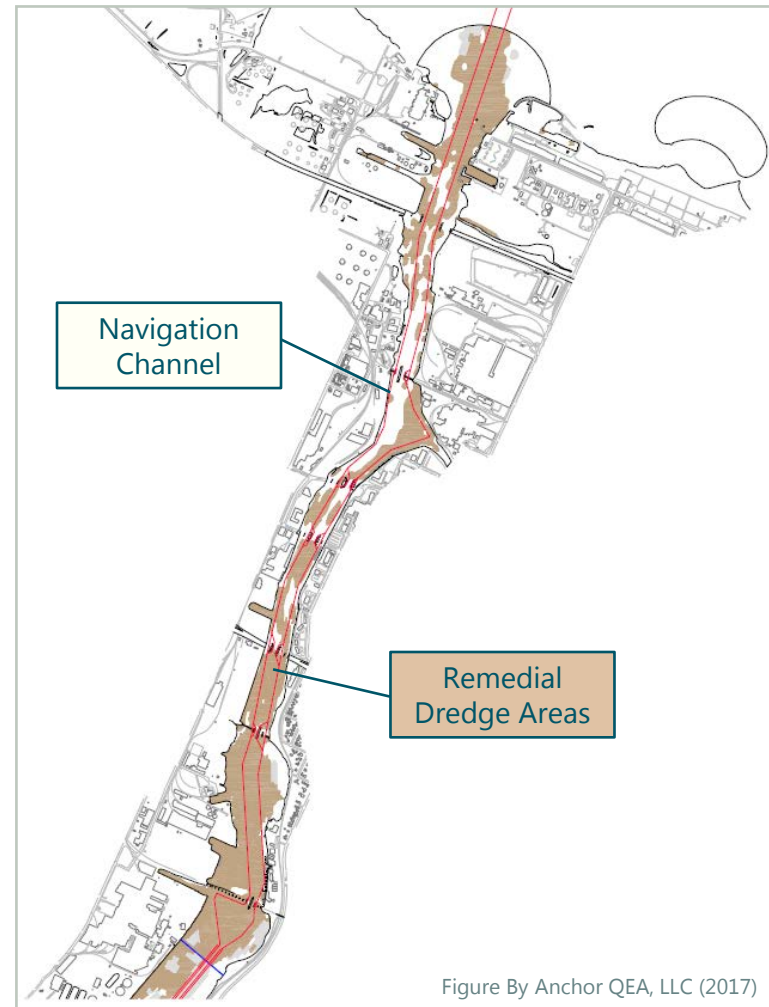
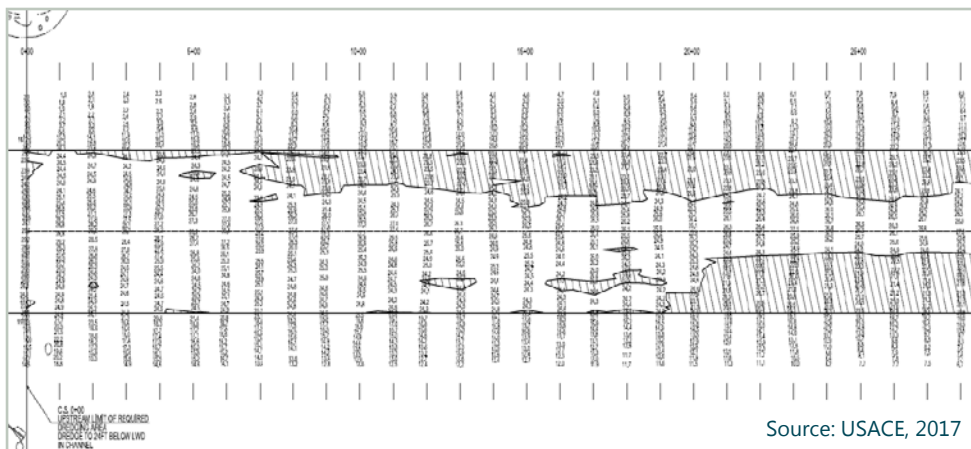
Coordination with USACE

- Placement of submerged berm to deter vessel movement



Coordination with USACE

- Maintenance dredging in the Federal Navigation Channel coordinated annually with remediation project





Questions

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