LOWER FOX RIVER REMEDIAL DESIGN

CAP OPERATIONS, MAINTENANCE AND MONITORING PLAN

Prepared for

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List of Acronyms and Abbreviations

AECOM	AECOM Technical Services, Inc.
AOC	Administrative Order on Consent
ADCI	Association of Diving Contractors International
ARAR	applicable or relevant and appropriate requirement
CCU	cap certification unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COMMP	Cap Operations, Maintenance, and Monitoring Plan
CQAPP	Construction Quality Assurance Project Plan
cy	cubic yard
EM	Engineer Manual
ER	Engineer Regulation
GAC	granular activated carbon
GEI	GEI Consultants
Glatfelter	P.H. Glatfelter and Company
GP	Georgia-Pacific Consumer Products LLC
IGLD85	International Great Lakes Datum of 1985
LLC	Lower Fox River Remediation LLC
LTMP	Long-Term Monitoring Plan
MGP	manufactured gas plant
NAVD88	North American Vertical Datum of 1988
NCR	NCR Corporation
NFA	North Focus Area
NOAA	National Oceanic and Atmospheric Administration
OU	Operable Unit
PCB	polychlorinated biphenyl
ppm	part per million
QAPP	Quality Assurance Project Plan
RA	remedial action
RAL	remedial action level
RAWP	Work Plan for Remedial Action
RD	remedial design
RP	Responsible Party
RI/FS	remedial investigation/feasibility study

List of Acronyms and Abbreviations

ROD	Record of Decision
Site	Operable Units 2 to 5 for the Lower Fox River and Green Bay Site
SFA	South Focus Area
SOP	Standard Operating Procedure
SRA	Special Remediation Area
SWAC	surface-weighted average concentration
USACE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WDNR	Wisconsin Department of Natural Resources
WPS	Wisconsin Public Service Corporation

1 INTRODUCTION

This document presents the Cap Operations, Maintenance, and Monitoring Plan (COMMP) for sediment remedial actions (RAs) involving capping in Operable Units (OUs) 2 to 5 for the Lower Fox River and Green Bay Site (Site; Figure 1-1). The OU 2 to 4 portion of the Site includes approximately 32 miles of the Lower Fox River downstream of the Appleton Locks to the mouth of the Fox River at the City of Green Bay. The bay portion (OU 5) of the Site extends from the mouth of the Fox River at the City of Green Bay into Green Bay.

The original COMMP was prepared pursuant to the remedial design (RD) Administrative Order on Consent (AOC) for OUs 2 to 5, originally executed in March 2004 by Fort James Operating Company, Inc., and NCR Corporation (NCR) and amended in October 2007. The U.S. Environmental Protection Agency (USEPA) and Wisconsin Department of Natural Resources (WDNR) (collectively the "Response Agencies") approved the COMMP on May 1, 2009. A revised COMMP was prepared in October 2012 and approved on October 26, 2012, as part of the Response Agencies' approval of the *Lower Fox River Remedial Design; 100 Percent Design Report Volume 1 for 2012 and Beyond Remedial Actions* (100 Percent Design Report Volume 2; Tetra Tech et al. 2012). A further revised COMMP was approved by the Response Agencies in March 2019.

The RA for OUs 2 to 5 is complete and has been performed pursuant to an Administrative Order for Remedial Action, USEPA Docket Number V-W-08-C-885 (the "Order"). During implementation of the RA, appropriate revisions to the COMMP were identified based on conditions encountered during construction. This revision to the COMMP was prepared as part of the RA work pursuant to the Order and reflects the completion of remedial construction and includes other developments since the previous version from March 2019, including responses to additional comments and requests provided by the Response Agencies during a series of work group meetings conducted in 2020 and early 2021. Implementation of this COMMP (Revision 3) is a requirement of the Order, which was issued in 2007 to eight companies, including NCR, Georgia-Pacific Consumer Products LLC (GP), and P.H. Glatfelter Company (Glatfelter). NCR has entered into a consent decree with the government to complete the RA. GP and Glatfelter have entered into a separate consent decree with the government to implement the COMMP.

The polychlorinated biphenyls (PCBs) cleanup remedy for the Lower Fox River was originally set forth in Records of Decision (RODs) for OUs 2 to 5 issued in December 2002 and June 2003 by the Response Agencies under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 United States Code (USC) §§ 9601-9675 (USEPA and WDNR 2003). In order to support detailed RD analyses consistent with the RODs, intensive data collection was performed between 2004 and 2007, resulting in collection and analysis of approximately 10,200 sediment samples from 1,900 locations at the Site. In June 2007, a ROD Amendment was issued by USEPA and WDNR that changed parts of the remedy described in the original RODs in response to new information collected since 2003 and from experience with prior remediation activities at the Site (USEPA and WDNR 2007).

The *Lower Fox River Remedial Design; 100 Percent Design Report Volume 1 for 2009 Remedial Actions* (100 Percent Design Report Volume 1; Tetra Tech et al. 2008) describes RA activities performed in 2009, and the 100 Percent Design Report Volume 2 (Tetra Tech et al. 2012) describes RA activities performed beginning in 2010. Between 2009 and the project completion in 2020, more than 6 million cubic yards (cy) of sediments exceeding the 1.0 part per million (ppm) PCB remedial action level (RAL) specified in the ROD (USEPA and WDNR, 2003) and ROD Amendment (USEPA and WDNR, 2007) will have been dredged from OUs 2 to 5, dewatered, and transported to permitted disposal facilities.

As part of the RA, between 2009 and 2020, engineered caps and bulkhead wall caps were installed over approximately 156 acres of the river and shoreline that exceed the 1.0 ppm RAL, and remedy sand covers were installed over an additional area of approximately 108 acres to address thin sediment deposits containing relatively low PCB concentrations. In addition, caps and sand covers for dredging residuals management were installed over an area of approximately 519 acres. The capping and covering operations generally proceeded in an upstream to downstream sequence following the completion of dredging in those areas. The cap areas in OUs 2 to 5 are shown in the OUs 2-5 Certification of Completion Report (Tetra Tech et al. 2021 DRAFT).

As described in the ROD Amendment, long-term monitoring of engineered caps constructed in OUs 2[1] to 5 will be performed to verify their long-term integrity and protectiveness. However, sand covers (placed as the primary remedy or as a post-dredge residuals management technique) will not require long-term monitoring or maintenance, consistent with the ROD Amendment. Baseline cap conditions will be established following cap placement (i.e., during

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[1] The caps in OU2 are exempt from the COMMP requirements of monitoring and maintenance.

the season in which they are installed and designated as Year 0[2]) using post-cap bathymetric surveys and physical cap material thickness measurements. As described in more detail in Section 3, long-term monitoring of typical engineered caps will include bathymetric surveys (primarily using hydrographic methods supplemented with manual surveying or poling, and sub-bottom profiling as necessary) of the cap surface to monitor their integrity and surface elevation, beginning in Year 2 following construction, continuing at Year 4, and then approximately every 5 years thereafter unless monitoring indicates a reduced frequency is appropriate. If an area appears to be disturbed, geophysical surveying and/or diver-assisted inspection may also be performed to better understand the mechanism(s) responsible for the disturbance and the extent of the disturbance. Given that cap construction occurred over an 11-year span (beginning in 2010 with completion in 2020), the initial (i.e., Year 2) monitoring has occurred independently within groups of cap certification units (CCUs) completed within the same year of construction. However, subject to the Response Agencies' approval, follow-on monitoring of CCUs completed in different years may be combined to more efficiently monitor the caps. If post-construction monitoring or other information indicates that the cap in an area no longer meets its original performance criteria and that degradation of the cap may result in an actual or threatened release of PCBs exceeding the 1.0 ppm RAL to the sediment surface, additional response activities will be undertaken in the affected area. These additional response actions will be subject to collaborative workgroup discussion and the Response Agencies' approval.

The attached Appendix A provides the long-term monitoring schedule for routine cap monitoring events. The following types of capped areas will be monitored:

- Aggregate caps (Section 3.1)
- Bulkhead wall caps at the RGL Slip and C. Reiss Terminal (Section 3.2)
- Special Remediation Area (SRA) caps (Section 3.3)
- The manufactured gas plant (MGP) North Focus Area (NFA) armored cap (Section 3.4)

The post-dredge North Focus Area (NFA) armored cap was designed as a potential final remedy for the MGP site, subject to further consideration as part of the USEPA MGP CERCLA RI/FS process for the Adams Street MGP site, which includes the NFA and adjacent South Focus

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[2] Reporting of Year 0 surveys may be delayed to a future year to correspond with the Long-Term Cap Monitoring Schedule provided in Appendix A (e.g., caps placed in OU 4 in 2013 and 2014 and 2015 through 2017)

Area (SFA). If the NFA armored cap is retained as a final remedy for the NFA, it is NCR's, GP's, GLT's and WPS' expectation that this cap will become part of the MGP site remedy, and the cap monitoring and maintenance will be included as part of WPS's implementation order with USEPA and WDNR. Until a final decision is made by the Agencies and a legally enforceable document under CERCLA authority transfers liability for the NFA armored cap to a different entity (e.g., WPS), the COMMP requirements of this cap are the responsibility of the PCB project's Responsible Parties (RPs) subject to their respective CDs, which identify GP as first in line for this responsibility.

1.1 Purpose and Scope

As discussed in the ROD Amendment and outlined in Section 1, certain elements of the OUs 2 to 5 RA will require long-term monitoring and/or maintenance. Long-term monitoring plans in engineered cap areas, along with cap maintenance and contingency measures, are presented in this COMMP.

This document describes post-RA environmental monitoring activities that will be performed in OUs 2 to 5, including post-construction monitoring and maintenance of capped areas (including SRA caps, the MGP NFA armored cap and bulkhead wall caps as appropriate) to verify that the constructed caps maintain long-term stability and will effectively contain PCB contamination to remain chemically protective over time. The overall objective of the COMMP is to confirm that the OUs 2 to 5 RA activities achieve the performance standards for verification of the effectiveness of engineered caps specified in the ROD Amendment. This COMMP also identifies points of compliance for the RA and outlines contingency response actions that will be implemented in the event that engineered caps do not meet performance standards.

There are three types of compliance monitoring: protection, performance, and confirmation monitoring. The objectives of each type of compliance monitoring and associated data evaluations are as follows:

1. **Protection monitoring.** Confirm that human health and the environment are adequately protected during the construction period of the RA
2. **Performance monitoring.** Confirm that the RA has attained the RAL and/or surface-weighted average concentration (SWAC), and demonstrate compliance with location--specific applicable or relevant and appropriate requirements (ARARs)
3. **Confirmation monitoring.** Confirm the long-term effectiveness of the RA once protection and performance monitoring is completed within a given OU

Protection and performance monitoring were performed during implementation of the OUs 2 to 5 RA and verified the performance of dredging, capping, and sand cover placement relative to RD and ROD Amendment requirements. Protection and performance monitoring programs were initially detailed in the 2009 Construction Quality Assurance Project Plan (CQAPP) included as Appendix D of the 100 Percent Design Report Volume 1 (Tetra Tech et al. 2008). The 2009 CQAPP was expanded to a Site-wide comprehensive CQAPP, which was presented in the 100 Percent Design Volume 2 (Tetra Tech et al. 2012), updated as needed, and submitted as Appendix A of each annual Phase 2B Work Plan for Remedial Action (RAWP). The CQAPP plans and performance criteria were developed consistent with the ROD Amendment and built on similar plans and criteria that were used for the Phase 1 and OU 1 projects. Detailed bathymetric surveying and sediment-sampling and -analysis procedures described in the CQAPP (see the October 2012 version included as Appendix F of the 100 Percent Design Report Volume 2; Tetra Tech et al. 2012) are incorporated by reference into this COMMP.

This COMMP addresses confirmation monitoring elements as follows:

- Data quality objectives for post-construction monitoring of caps, including rationale for the type, location, and frequency of monitoring
- Monitoring techniques/methods to be used
- Response actions
- Reporting requirements

1.2 COMMP Organization

Section 2 presents a design and construction summary of the aggregate caps, and bulkhead wall caps, SRA caps, and the MGP NFA armored cap. Section 3 presents the long-term monitoring and contingency response program to verify the continued protectiveness of the completed RA. Long-term monitoring of sediment, surface water, and biota, as well as monitoring of the chemical isolation layer of certain caps, are being performed as a separate, coordinated Site-wide activity as described in the Long-Term Monitoring Plan (LTMP) (Anchor QEA et al. 2009) and the *OU2-3 Long-Term Monitoring Sampling and Analysis Plan* (Foth 2012a).

1.3 COMMP Methods of Revision

This COMMP has been updated to reflect final engineered and constructed caps, SRA caps, and bulkhead wall caps completed in OUs 2 to 5 through the end of 2020. As part of implementation of the COMMP, the parties responsible for implementing the COMMP may propose to the Response Agencies revisions to the COMMP. If approved by the Response Agencies, any revisions to the COMMP will become enforceable requirements. Upon approval by the Response Agencies, the COMMP may also be revised on an as-needed basis, based on experience and field conditions.

2 CAP DESIGN AND CONSTRUCTION SUMMARY

As discussed in detail in the 100 Percent Design Report Volume 2 (Tetra Tech et al. 2012) for OUs 2 to 5 and summarized in Section 2.1, four different standard cap designs were developed and constructed to address different capping requirements within the Lower Fox River, consistent with the ROD Amendment. In addition to these four cap designs, bulkhead wall caps, SRA caps, and the MGP NFA armored cap were constructed to address location-specific conditions.

Section 2.2 summarizes RA bulkhead wall caps at both the RGL Slip and C. Reiss Terminal in OU 4 to provide structural integrity of the shoreline to facilitate dredging of contaminated sediments to the maximum extent practicable.[3] Section 2.3 summarizes SRA caps designed and constructed in areas requiring site-specific designs, including modified caps and cap transition areas (e.g., CB60-SRA and SRA-04), and caps over relatively small utility corridors (e.g., SRAs -03, -05/07, -06, and -08) installed after dredging as close as practicable to these structures, where further dredging would be unsafe. Section 2.4 describes the armored cap installed at the NFA. The SRA caps are categorized as "exceptional areas" as identified in the ROD and ROD Amendment because they cannot practicably achieve cap performance criteria due to location-specific constraints.

Long-term monitoring programs for caps, bulkheads wall caps, SRA caps, and the NFA armored cap are detailed in Section 3.

2.1 Aggregate Caps

The four standard cap type designs described in the 100 Percent Design Report Volume 2 (Tetra Tech et al. 2012) for OUs 2 to 5 have specified target and minimum thickness criteria for the types of aggregates of which these caps are constructed, summarized as follows:

- **Cap A: sand and gravel cap for PCBs ≤ 10 ppm in the underlying 6-inch sediment interval and ≤ 50 ppm in all underlying sediment intervals.** Cap A consists of a targeted average thickness of 6 inches of clean sand overlain with a targeted average thickness of 7 or 9 inches of placed gravel, taking into consideration operational constraints and overplacement allowances. The placed thickness was verified as

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[3] The 2003 ROD noted that dredging would be unable to "remove contaminated sediment in some areas near shoreline facilities and in-water structures because removal of the sediment could undermine and destabilize those facilities and structures"; the Agencies "may approve use of modified remedial approaches or other remedial approaches in exceptional areas at the Site" (USEPA and WDNR 2003).

described in the latest version of the Standard Operating Procedure (SOP) for Engineered Cap Verification Sampling and consistent with ROD Amendment requirements.

- **Cap B: sand and gravel cap for PCBs > 10 ppm in the underlying 6-inch sediment interval and ≤ 50 ppm in all underlying sediment intervals.** Cap B consists of a targeted average thickness of 9 inches of clean sand overlain with a targeted average thickness of 7 or 9 inches of placed gravel, verified as described in the latest version of the SOP for Engineered Cap Verification Sampling and consistent with ROD Amendment requirements.
- **Cap C: sand and quarry spall cap for PCBs > 50 ppm in any underlying sediment interval and for any caps placed in OU 4 federal navigation channels.** Cap C consists of a targeted average thickness of 9 inches of clean sand, overlain by a 6-inch filter layer of placed gravel (or an alternate filter layer design approved by the Response Agencies [e.g., geotextile]), and finally overlain by a targeted average thickness of 18 inches of suitably sized armor stone. Within the OU 4 navigation channel, 4- to 9-inch quarry spall was used for the armor layer. Placed thickness was verified as described in the latest version of the SOP for Engineering Cap Verification Sampling and consistent with ROD Amendment requirements.
- **Shoreline Caps.** A range of shoreline cap designs were developed during RD. These shoreline caps are appropriately categorized as exceptional areas as identified in the ROD Amendment. The RD established appropriate transitions from offshore remedies into adjacent shoreline areas (as documented in annual Phase 2B RAWPs) and factored in riparian landowner considerations. Shoreline caps used Cap A, B, or C designs, depending on the PCB concentrations and erosional conditions, as well as alternate designs approved by the Response Agencies (e.g., geotextile).

Further details of the designs for the four types of aggregate-constructed caps are provided in Table 6-6 of the 100 Percent Design Report Volume 2 (Tetra Tech et al. 2012). As described in the CQAPP, CCUs were defined as part of construction for the purpose of verifying that cap aggregate placement performance standards were achieved. Post-aggregate-cap placement bathymetric surveys, conducted during the year of cap completion (Year 0), were used to establish the baseline condition for the subsequent (Year 2 and beyond) COMMP assessment of long-term changes in the aggregate cap surface elevations and thickness. This baseline condition was developed on a CCU basis. Location-specific CCUs were documented in the annual Phase 2B RAWPs.

2.2 Bulkhead Wall Caps

At two OU 4 locations, bulkhead wall improvements were constructed during the RA to provide structural integrity of the shoreline to facilitate dredging of sediments adjacent to the bulkheads to the maximum extent practicable. These two bulkheads are designated as caps designed to prevent the release of contaminated sediment[4][5] remaining between the new and pre-existing bulkhead that could not be practicably removed. The bulkhead wall caps are categorized as caps in accordance with provisions in the ROD Amendment for modified remedial approaches or other remedial approaches in exceptional areas and documented by the USEPA email dated October 5, 2018. See also related GP comment emails dated February 22, 2017, and February 16, 2018 (emails are included in Appendix H). However, the bulkhead wall caps are not considered "exceptional caps" (as are SRA caps) because they are designed and constructed to fully achieve ROD cap performance criteria. Therefore, performance monitoring of these new bulkhead wall caps is included in this COMMP. Summaries of the RD and RA at the RGL Slip and C. Reiss Terminal bulkheads are provided in the following sub-sections.

2.2.1 RGL Slip Remediation Summary

The RA implemented at the RGL Slip included debris removal, multiple phases of dredging adjacent to the existing bulkhead wall, installation of a new structural support wall approximately 2 to 4 feet in front of the existing steel and wooden wall, removal as practicable of material between the walls (interstitial sediment), and placement of a stabilization buttress in the western end of the slip. The chronology of RA in this area is summarized as follows:

- Installation of the new structural steel bulkhead, approximately 540 feet in length, occurred in 2015 (Tetra Tech et al. 2016).
- Dredging within the slip adjacent to the new bulkhead wall occurred in May and June 2015 (Tetra Tech et al. 2016).

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[4] The C. Reiss bulkhead wall cap contains ~110 cy of >= 1.0 ppm RAL sediment. Average PCB concentration of 2.2 ppm (8.2 ppm maximum concentration).

[5] The RGL bulkhead wall cap contains ~220 cy of >= 1.0 ppm RAL sediment. Average PCB concentration of 28.4 ppm (99.9 ppm maximum concentration) including ~56 cy of TSCA sediment.

- Removal of interstitial sediment between the walls occurred in August 2015 using the dredge slurry pipeline with no cutterhead attached to a booster pump (Tetra Tech et al. 2016). However, removal of all interstitial RAL sediment was not achieved.
- Additional dredging in the slip occurred in August, September, and November 2016 (Tetra Tech et al. 2017).
- The western end of the RGL Slip was dredged in 2017, followed by placement of a stabilization buttress (Tetra Tech et al. 2018).
- In 2018, J.F. Brennan constructed 5 cluster piles (dolphins) in the RGL slip (note: this work was completed for the owner and was not associated with the Lower Fox River PCB Project) (GEI 2018)
- The Agencies, NCR, and RGL agreed to leave PCB-contaminated sediment between the old and new bulkhead walls on the condition that the bulkhead wall would be designated as a cap and the bulkhead wall cap would be subject to long-term monitoring and maintenance (see Appendix E for details).

The design of the new bulkhead wall was based on the following:

- Subsurface investigation and dock stability study by Soil Testing Services of Wisconsin, Inc. (STS 1976)
- Geotechnical and Structural Evaluation Report (AECOM 2014)
- A structural analysis for the existing wall (Westbrook 2015)

In 2016, the newly installed steel bulkhead wall required repair due to a deflection in the wall southwards into the slip. The failure was caused by overstressing of the upland soils behind the wall. The repair was designed by GEI Consultants (GEI; GEI 2016) and implemented in July 2016.

Subsequent to the repair and separate from the RA for OUs 2 to 5, modifications were made to the Site to facilitate improved use of the slip on the RGL Slip property. These modifications were designed by AECOM Technical Services, Inc. (AECOM), in 2017 and constructed in 2018 and 2019. The as-built configuration of the Site based on the AECOM drawings serves as the basis of monitoring for the COMMP.

Initial monitoring of the RGL bulkhead walls was performed following construction, which is documented in Appendix B. Approximately 220 cy of sediment with PCB concentration exceeding the 1.0 ppm RAL remain behind the improved RGL Slip bulkhead wall cap (including intervals greater than 50 ppm).

2.2.2 C. Reiss Terminal Remediation Summary

The RA implemented adjacent to the C. Reiss Terminal included debris removal, multiple phases of dredging, installation of a new structural support wall in front of the existing timber wall, and placement of a buttress. The chronology of RA in this area is summarized as follows:

- Dredging adjacent to the terminal occurred in September 2016 (Tetra Tech et al. 2017).
- Installation of approximately 250 feet of new bulkhead wall occurred in September and October 2016 at the southern end of the property (Tetra Tech et al. 2017).
- Installation of a buttress adjacent to the new bulkhead wall occurred in October and November 2016 (Tetra Tech et al. 2017).
- Additional dredging was performed adjacent to the C. Reiss property in 2017 (Tetra Tech et al. 2018).

The design of the new bulkhead wall was based on the following:

- Technical memorandum regarding: Structural Condition Assessment of Bulkhead at the C. Reiss Coal Company (AECOM 2011)
- *Additional Investigation of Dockwall and Recommended Repair Program* (AECOM 2013)
- Technical memorandum regarding: New Bulkhead at the South End of the C. Reiss Coal Company Site, Green Bay, Wisconsin – Summary of Technical Aspects (AECOM 2016)
- Technical memorandum regarding: Geotechnical Evaluation for C. Reiss Steel Bulkhead (Tetra Tech 2016)

Approximately 110 cy of sediment with PCB concentrations exceeding the 1.0 ppm RAL remain (average concentration of remaining sediment is 2.2 ppm, with a maximum concentration of 8.2 ppm) behind the improved C. Reiss Terminal bulkhead wall cap.

2.3 SRA Caps

In localized areas of OU 4, SRA caps were constructed in areas requiring site-specific designs, including modified caps and transition areas (e.g., CB60-SRA and SRA-04) and caps over utility crossings (e.g., SRA-03, SRA-05, SRA-06, SRA-07 and SRA-08) intended to provide chemical isolation and armoring where it would be unsafe to dredge closer to the utility. Due to location-specific constraints, SRA caps cannot achieve all standard aggregate cap design or performance criteria and are appropriately categorized as exceptional caps as identified in the ROD and ROD Amendment.

SRA caps were designed to prevent, to the extent practicable, the release of contaminated sediment in these unique areas, including those above utilities where federal navigation depths restrict the cap thicknesses. Long-term monitoring and maintenance of SRA caps is described in Section 3.3. Table 2-1 summarizes the seven SRA caps that have been constructed as part of the RA.

Table 2-1
Summary of SRA Caps

SRA Cap	Comment
SRA-03	Constructed; Utility 023 (6 inches of GAC amended sand overlain with aggregate in most areas)
SRA-04	Constructed; D74 DMU-3 (GP Day Street Mill Water Intake Utility; 6 inches of sand with aggregate with a portion overlain by sand buttress)
SRA-05	Constructed; Utility 030 (6 inches of GAC amended sand overlain with aggregate in most areas)
SRA-06	Constructed; Utility 020 (Average 12 inches of sand with aggregate in most areas)
SRA-07	Constructed; Utility 029 (6 inches of GAC amended sand overlain with aggregate in most areas)
SRA-08	Constructed; Utility 049 (6 inches of sand overlain with aggregate in most areas)
CB60-SRA	Constructed; near the WPS Pulliam Plant abandoned north intake channel (6 inches of sand with aggregate, associated with propeller wash evaluations and armoring requirements, includes sand buttress)

Seven SRA caps were designed and constructed between 2014 and 2020: SRA-03, SRA-04, SRA-05, SRA-06, SRA -07 and CB60-SRA. Five of the SRA caps (SRA-03, SRA-05, SRA-06, SRA-07 and SRA-08) were constructed immediately above and adjacent to utilities where further dredging of sediment above the 1.0 ppm PCB RAL could not be performed safely. The caps were also constructed to minimize encroachment on navigation depths.

The design of the SRA caps associated with the utility crossings was developed such that even if SRA cap material mixed into the 1 foot of underlying sediment, the 1.0 ppm PCB RAL would still be achieved. To provide additional protectiveness, select SRA caps were amended with granular activated carbon (GAC) to reduce potential bioavailability, as summarized in the technical memorandum regarding: Cap Modeling Results for SRA Caps (Anchor QEA 2018). Varying thicknesses (up to approximately 5 feet) of aggregate (median armor stone size of 0.75 inches) were placed above the sand and/or mixed sand/GAC caps in areas where the aggregate would not encroach on navigation depths.

Cap SRA-04 was constructed adjacent to the GP Day Street Mill water intake to cap the contaminated sediment, that could not be removed, due to structural wall integrity and also to provide post-dredge structural support to the bulkhead wall associated with the intake. SRA-04 is comprised of a 6-inch thick sand layer overlain by a 6-inch thick filter layer and armored with quarry spall (median stone size of 13 inches) (Tetra Tech and Anchor QEA, 2019d).

Cap CB60-SRA, covers the Wisconsin Public Service (WPS) abandoned north intake channel, includes an SRA component that has additional armoring (quarry spall with a median stone size of 14 inches) compared to a typical Cap type B, associated with the vessel propeller wash evaluation and the potential for vessel straying beyond the navigation channel. The SRA component of CB60 is located along the slope leading up to the abandoned channel and a small transition area at the top of the slope. This SRA has low potential for PCB release due to the depositional nature of the area.

Additional details of SRA cap designs are provided in technical memoranda presented in Appendix F, and developed for each of the seven constructed SRA caps:

- Remedy Design for SRA-03 in Utility Corridor 023 (Tetra Tech and Anchor QEA 2019a)
- Remedy Design for SRA-04 Cap for GP Day St. Mill Intake (Tetra Tech and Anchor QEA 2019e)
- Remedy Design for SRA-05 in Utility Corridor 030 (Tetra Tech and Anchor QEA 2019b)
- Remedy Design for SRA-06 in Utility Corridor 020 (Tetra Tech and Anchor QEA 2018)
- Remedy Design for SRA-07 in Utility Corridor 029 (Tetra Tech and Anchor QEA 2019c)
- Remedy Design for SRA-08 in Utility Corridor 049 (Tetra Tech and Anchor QEA 2020)
- Remedy Design for SRA-CB60 and CB60 Cap (Tetra Tech and Anchor QEA, 2019f)

2.4 North Focus Area Armored Cap

A post-dredge cap has been designed and constructed in the NFA adjacent to the Georgia-Pacific Day Street Mill, downstream of a former MGP owned by Wisconsin Public Service Corporation (WPS). WPS, who is responsible for the MGP waste, reached agreement with the Lower Fox River Remediation LLC (LLC) to conduct a joint RA within the NFA to remove the majority of the PCB-impacted sediment that is co-mingled with the MGP waste and to cap the remaining impacted materials where dredging is not feasible due to bulkhead wall stability limitations, which is primarily MGP waste including dense nonaqueous phase liquid (DNAPL). This agreement allows the PCB remediation project being performed by the LLC to move forward while also providing an early action remedy for the MGP-related impacts ahead of a remedial investigation/feasibility study (RI/FS) to be performed by WPS.

The post-dredge NFA armored cap was designed to be protective of human health and the environment; it includes a chemical isolation layer amended with organoclay and GAC overlain by a geotextile filter layer and a grouted mattress armor layer for stability and erosion protection. The cap design was accepted by WDNR and USEPA (USEPA and WDNR 2019) to potentially ensure that it meets performance standards for both the Lower Fox River and MGP sites. The post-dredge North Focus Area (NFA) armored cap was designed as a potential final remedy for the MGP site, subject to further consideration as part of the USEPA MGP CERCLA RI/FS process for the Adams Street MGP site, which includes the NFA and adjacent South Focus Area (SFA).[6] If the NFA armored cap is retained as a final remedy for the NFA, it is NCR's, GP's, GLT's and WPS' expectation that this cap will become part of the MGP site remedy, and the cap monitoring and maintenance will be included as part of WPS's implementation order with USEPA and WDNR. Until a final decision is made by the Agencies and a legally enforceable document under CERCLA authority transfers liability for the NFA armored cap to a different entity (e.g., WPS), the COMMP requirements of this cap are the responsibility of the PCB project's RPs subject to their respective CDs, which identify GP as first in line for this responsibility.

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[6] Upland shoreline excavation and backfill of the upland soils in the south bank of the East River, soft sediment dredging within the East River, mechanical dredging of clay below the sediment, and sand covering were conducted in the SFA in 2018. However, long-term monitoring of the sand cover in the SFA is not a component of the COMMP.

3 MONITORING AND MAINTENANCE OF CAPPING AREAS

The ROD Amendment requires long-term monitoring and maintenance of engineered caps constructed in OUs 2 to 5 to ensure their long-term integrity and protectiveness. Long-term monitoring and maintenance will include the following:

- Routine monitoring in all capped areas using bathymetric surveys and other techniques (e.g., geophysical surveys, poling, probing, inspections and sub-bottom profiling), as appropriate
- Event-based monitoring in "sentinel" cap and bulkhead wall caps using bathymetric surveys, instrumentation, and other techniques, as appropriate
- Additional cap monitoring and/or sampling based on the routine and event-based monitoring, as appropriate and determined through collaborative workgroup discussions
- Cap maintenance, enhancement, or other contingency actions as necessary

The physical integrity of constructed aggregate caps will be monitored under this COMMP to verify that they continue to remain protective, consistent with ROD Amendment performance standards. The physical integrity of bulkhead wall caps and SRA caps will be monitored per the procedures in Sections 3.2 and 3.3, respectively.

Bathymetric surveys conducted as part of the COMMP will utilize existing survey monuments and benchmarks certified and registered with the Wisconsin State Cartographer's Office that were used for RA. The state maintains the survey monuments and benchmarks and would make any required repairs to a damaged or disturbed monument or benchmark. If any maintenance needs are observed during project use, they will be reported using the online survey station condition reporting form on the Survey Control Finder website[7].

The CQAPP and SOP for Engineered Cap Thickness Verification describe the use of sediment cores, "catch pans," or other techniques for measuring the thickness of placed aggregates during construction with consideration of armor stone size. Cap thickness was initially measured by collecting samples and measuring the thickness of the chemical isolation layer, geotechnical filter layer (if present), and armor layer of the cap immediately following construction. These thickness measurements were used to correlate the cap thickness with aggregate placement records and pre- and post-placement bathymetric surveys and to confirm

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[7] Survey Control Finder (Wisc.edu)

construction in accordance with the design. Measurements of the amount of aggregate placed, verified with post-construction surveys and core and catch-pan thickness measurements, were performed as necessary to verify that aggregate placement specifications (e.g., thickness and extent) were met.

Given that cap construction will have spanned 12 years (beginning in 2009 and completed in 2020), monitoring has been initiated independently within groupings of CCUs. COMMP monitoring has been or will be performed as specified in the timeline shown on Figure 3-1 and the schedule, approved on April 13, 2020 by the Response Agencies, presented in Appendix A. A Year 0 bathymetric survey will be used to establish the baseline cap condition for the subsequent assessment of long-term changes in cap thickness. Subject to the Response Agencies' approval, follow-on post-construction physical monitoring of CCUs completed in different years will be combined to monitor more efficiently. For example, the survey schedule for the group of caps placed in OU 4 between 2018 and 2020 (see Figure 3-1), would be modified so that monitoring would occur during Year 0 (2018, 2019, 2020 respectively), Year 2 (2022) and then Year 7 (2027) to align with the 5-year schedule for the other groups of caps placed between 2009 and 2017. Furthermore, the frequency of monitoring outlined previously, which is consistent with the ROD, may be reduced, subject to Response Agencies' approval if multiple events show cap areas to be stable.

As discussed in more detail in this section, if bathymetric surveys show evidence of armor layer erosion or disruption of aggregate or SRA caps, GP or Glatfelter, as appropriate, in consultation with the Response Agencies will evaluate the need for additional assessment of affected cap areas, potentially including sampling, poling, and/or sub-bottom profiling. If cap erosion or disruption is confirmed by these additional assessments such that the minimum cap isolation or armor/bioturbation layer thicknesses are no longer present in more than a minor area of the cap (defined in Section 3.8), then possible response actions can include the following:

- Armor or otherwise repair the identified area of erosion (e.g., reestablish cap thickness) if the RD performance standards (e.g., minimum design thickness criteria provided by the 100 Percent Design Report Volume 2; Tetra Tech et al. 2012, or Section 3.3 for SRA caps) are no longer being met
- Removal of the cap and underlying contaminated sediment if monitoring or other information shows a pattern of cap degradation in multiple areas, and pending the results of engineering evaluations

- No further action will be required for any SRA cap erosion or disruption within the 2-foot navigational channel buffer zone (i.e., above elevation 551.6 ft. (NAVD88) within the authorized navigation channel

In addition, as discussed in Section 3.2 and in Appendix B, if topographic or visual surveys of bulkhead walls caps at the RGL Slip and C. Reiss Terminal identify significant movement, additional evaluations may be initiated in collaboration with the Response Agencies. These evaluations include use of existing inclinometers at the RGL Slip to compare existing conditions to the baseline bulkhead conditions established in 2020 to determine if any deflection greater than the threshold of movement defined by the design engineer has occurred. New inclinometers may also be installed, if necessary, to monitor future deflections. Additionally, ground surveys may be completed to evaluate the alignment and elevation of the concrete cap of the walls relative to the as-built condition. This may include topographic surveys adjacent to the walls to evaluate if settlement or depressions of the ground surface are observed in the zone of influence of the wall that may indicate releases of contaminated sediment into the river.

The results of all cap monitoring will be summarized and submitted to the Response Agencies. These submittals will be used as input to the cap monitoring decision framework discussed in Section 3.8. Consistent with CERCLA requirements, the Response Agencies and GP or Glatfelter, as appropriate, will evaluate cap performance and the need for and scope of continued cap monitoring and contingency response actions as part of the 5-year review process.

The following sections present the cap monitoring plan and contingency response decision framework.

3.1 Routine Monitoring of Aggregate Caps

Following the initial post-construction bathymetric surveying of the capped areas as described in the CQAPP, long-term COMMP monitoring of aggregate cap areas will be performed, including bathymetric surveying in all cap areas (SRA caps will be monitored as described in Section 3.3). A list of the caps placed in the Lower Fox River, Operable Units 2-5 are included in Appendix C and Figure 3-1 provides a timeline of the years when caps were placed in OUs 1 through 4 and a schedule of the routine monitoring events described in this COMMP.

Post-construction bathymetric surveys of the CCUs within all capped areas have been or will be completed as specified in the timeline shown on Figure 3-1. To more efficiently align the routine monitoring events, USEPA and WDNR prepared a Long-Term Cap Monitoring Schedule, approved on April 13, 2020 (provided as Appendix A), which identifies the specific years that routine monitoring is expected to be performed for each OU over the next 30 years.

For example, capping in OU 2 and OU 3 was completed in 2011 (with the exception of CA3, which was completed in 2009). The OU 3 Year 0 post-construction bathymetric survey was completed in November 2011, as shown on Figure 3-1, and an assessment of baseline cap conditions in OU 3 was completed in 2012 (Foth 2012b). By agreement with the Response Agencies, the OU 3 Year 2 cap monitoring event was performed in 2014 (Foth 2015), with follow-on monitoring in 2018 (OU 3 Year 7). Also, by agreement with Response Agencies, the small area of caps placed in OU 2 were categorized as exceptional areas, given their location in slack water and habitat improvements and are therefore not subject to COMMP requirements.

Similarly for OU4, in accordance with the COMMP Long-Term Cap Monitoring Schedule (Appendix A), the Year 0 post-construction survey for caps constructed in 2013 and 2014 was conducted in 2013 and 2014 (Foth 2015b), with follow-on monitoring in 2016 (Year 2; Foth 2016) and 2018 (Year 4; Foth, 2019), as shown on Figure 3-1. The Year 0 and Year 2 evaluations have been approved by the Response Agencies.

Additionally, in accordance with the COMMP monitoring schedule, the Year 0 post-construction survey for caps completed between 2015 and 2017 in OU4 was conducted in 2015, 2016, and 2017, with follow-on monitoring in 2018 (Year 1) (Foth, 2019 DRAFT). Furthermore, the Year 0 post-construction survey for caps completed 2018-2020 were completed in their respective construction year. Cap monitoring conducted between project completion in 2020 and submittal of this Revision 3 COMMP in March 2021 has been coordinated to combine monitoring events as practicable to take place during the same year to improve monitoring efficiencies, with Response Agency approval.

The long-term monitoring hydrographic surveys will be performed using multi-beam acoustical systems that conform to guidelines set forth by Engineer Manual (EM) 1110-2-1003 (*Engineering and Design – Hydrographic Surveying*; USACE 2013). Details of the survey position and control equipment are presented in the CQAPP and in Section 4 of the 100 Percent Design Report Volume 1 (Tetra Tech et al. 2008). Details of the field instrument calibration and preventative maintenance techniques are presented in the most recent version of the Fox River Quality Assurance Project Plan (QAPP). To the extent possible, survey data will be collected along the same transects in each CCU from year to year (including pre- and post-cap surveys) to provide comparable data.

3.2 Routine Monitoring of Bulkhead Wall Caps

Routine monitoring of the RGL Slip and C. Reiss Terminal bulkhead wall caps will include topographic surveying of monitoring points on the walls to measure deflection, topographic surveying of select upland areas to identify potential subsidence behind the walls and visual monitoring for significant deflection, damage and/or movement as detailed in Appendix B.

The routine monitoring program of the bulkhead walls was developed based on input from the engineers of record for the design of the bulkhead wall improvements (AECOM and GEI for RGL Slip and AECOM for C. Reiss Terminal) as well as the guidelines set forth in EM 1110-2-6054 (*Inspection, Evaluation and Repair of Hydraulic Steel Structures*; USACE 2001) and Engineer Regulation (ER) 1110-2-100 (*Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures*; USACE 1995).

Topographic surveying will be based on survey monitoring points installed in December 2020 by AECOM. The monitoring points are stainless steel washers screwed into the concrete cap along the top of the walls, approximately 50-feet on center, as depicted in drawings included in Appendix B. The washers are stamped with unique identifiers for tracking and reporting of results. Routine monitoring of the walls will include topographic surveying of the monitoring points, with a cumulative threshold of greater than 1.0-inch when compared to the baseline (condition and location at time of washer installation in 2020) at any single point. Exceedances of the 1.0-inch threshold will trigger additional evaluations, to be collaboratively determined between GP and the Response Agencies, which may include the following:

- Geotechnical instrumentation monitoring (e.g., inclinometer readings at RGL)
- Bathymetric surveying
- Steel sheet member thickness monitoring
- Increased or decreased frequency of monitoring
- Diver inspection
- No action

The enhanced visual monitoring component of the routine monitoring will be based on land-side observations and photographs collected at select locations (depicted on drawings included in Appendix B) for:

The visual monitoring will include the following observations and elements:

- Horizontal and vertical alignment
- Cracks in the top of the concrete wall cap
- Subsidence behind the wall

The visual inspections will be performed in general accordance with EM 1110-2-6054 (USACE 2001) and will follow an established checklist prepared in advance (included in Appendix B). The inspector should be familiar with the general features and design of the bulkhead walls prior to inspection. Following additional monitoring of the inclinometers at RGL scheduled for 2021, subject to Response Agencies' approval, beginning in 2022 (to align with the monitoring schedule for aggregate caps) and going forward, bulkhead wall cap monitoring will be performed every 5 years.

Following routine monitoring events, GP or Glatfelter, as appropriate, will prepare an inspection summary report, consistent with EM 1110-2-100 (USACE 1995) after each visual inspection event to document the surveying and visual inspection and to provide a basis for increased or decreased observation frequency and to provide a basis for any repair work, should it be required.

3.3 Routine Monitoring of SRA Caps

Following the initial post-construction bathymetric surveying of the SRAs as described in the CQAPP, long-term COMMP monitoring of the SRA caps will be performed, including bathymetric surveying in all SRA cap areas.

Similar to the group of aggregate caps placed between 2018-2020 (see Section 3.1), and subject to the Response Agencies' approval, the post-construction bathymetric surveys of the SRAs will be modified so that they are performed during Years 0 (year of placement), 2 (2022), 7 (2027) and every 5 years thereafter for each SRA to align with the 2022 monitoring event for all caps to increase the efficiency of the monitoring program. The long-term monitoring bathymetric surveys will be performed using multi-beam acoustical systems that conform to guidelines set forth by EM 1110-2-1003 (USACE 2013).

Routine monitoring will be based on bathymetric surveying, compared to the initial post-construction surveys. If bathymetric surveys show evidence of erosion of the top of the cap in excess of the amounts listed below for specific SRA caps for a contiguous area greater than 5% of the individual SRA CCU footprint, GP and Glatfelter, as appropriate will evaluate the need for additional assessment in collaboration with the Response Agencies.

The trigger for discussions on addition evaluations of SRA caps will be based on the following thresholds:

- In excess of 6-inches – SRA-03, -05, -06 and -07
- In excess of 1-times the median armor stone of 13 inches – SRA-04 (portion of SRA not overlain by the stabilization buttress)
- In excess of 1-times the median armor stone of 14 inches – CB60-SRA (portion of SRA not overlain by the stabilization buttress)

The COMMP will include monitoring of sand buttresses installed for shoreline stability even though the buttresses have no impact on cap performance. Therefore, COMMP surveys will be compared to the as-built cap surface prior to installation of stabilization buttresses for SRA-04 and CB60-SRA. The surveys of the buttresses will not include metrics for additional evaluation, but if significant changes in elevation are noted, the RPs will discuss the results with the Response Agencies to determine whether additional evaluations are warranted.

If bathymetric surveys show evidence of erosion or disruption of the surface of the SRA in excess of the thresholds defined above, GP and Glatfelter, as appropriate will evaluate the need for additional assessment of the SRA in collaboration with the Response Agencies, which may include the following:

- Increased/decreased frequency of monitoring
- Poling
- Sub-bottom profiling
- Surface sediment sampling
- No action

If significant erosion or disruption that is potentially impacting the performance of the SRA cap is confirmed by these additional assessments, then possible response actions, in collaborative discussion with and approved by the Response Agencies, can may include the following:

- Armor, or otherwise repair, the identified area of erosion to meet the SRA Site-specific design
- No further action will be required for any cap erosion or disruption within the 2-foot navigational channel buffer zone[8] (i.e., above elevation 551.6 feet (NAVD88) within the authorized navigational channel)
- No further action (for further discussion, see the following paragraph)

It is recognized that the caps were not designed to withstand full large vessel propeller wash assumptions. It is therefore not expected that SRA cap repairs will be required given these design limitations except under extreme or unusual damage events. The decision on the need for a repair will be assessed collaboratively with the Response Agencies.

3.4 Routine Monitoring of North Focus Area Armored Cap

The initial installation of the NFA armored cap was verified through surveys (Year 0 survey) and the design bathymetry was confirmed by the LLC. The next scheduled survey of the NFA armored cap will occur in 2022, as the Year 2 survey for caps completed in OU 4 between 2018 and 2020 as shown on Figure 3-1. This survey will be performed over the entire cap footprint including the buttress and sand portions of the cap. The survey will include a follow-up investigation of anomalies that are encountered and warrant further review; the scope of these investigations will be developed in consultation with WDNR and USEPA.

If the final remedy for the MGP site has not been determined prior to 2022, the NFA armored cap will be included with the monitoring of all other caps addressed in this COMMP beyond the Year 2 survey planned for 2022 and reported in the USEPA 5-year review, until such time as a final remedy for the MGP site is determined and the cap monitoring and maintenance responsibility has been legally transferred to WPS by the Responsible Agencies, through the formal CERCLA RI/FS, ROD process/mechanism.

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[8] Note, an agreement (attached) was reached between the USEPA, State of Wisconsin, and USACE to not require the repair or replacement of any part of an SRA cap that is removed by USACE activities above elevation 551.6 feet (NAVD88) within the authorized navigational channel.

3.5 Event-Based Monitoring of Aggregate Caps

In addition to the routine monitoring of all capped areas in OUs 3 to 5 (discussed in Section 3.1), supplemental bathymetric surveys will be performed only in sentinel capping areas following major river-flow events, periods of extended low water, or construction activities that may have a significant impact on river hydrodynamics. Sentinel capping areas are defined herein as those areas most likely to exhibit erosion under extreme flow events or areas with the greatest risk of contaminant exposure located in areas with relatively high peak bottom shear stresses from river flows, seiches, wakes, and/or propeller wash, and also in areas with relatively high near-surface PCB concentrations. Selection of sentinel cap areas for each cap type included the following considerations:

- Peak shear stress resulting from river flows and seiches
- Near-surface PCB concentration
    - Cap (especially Cap B) areas with relatively high PCB concentrations in the 6 inches of sediment immediately below the cap
- Transition areas (i.e., the northern end of the unmaintained recreational navigation channel, where it transitions to the maintained navigation channel for commercial and industrial use that may be subject to elevated erosional forces from propeller wash or anchor drag)

Tables 3-1 and 3-2 include a list of the cap areas identified for sentinel cap monitoring in OU 3 and OU 4, respectively. The OU 3 sentinel caps were originally identified in 2019 in the technical memorandum “Lower Fox River OU3 – Sentinel Cap Selection” (Foth, 2019b). The sentinel caps are depicted on Figures D-1 and D-2 in Appendix D. Specific sentinel monitoring locations may be refined to correspond with final cap management units, which will be documented as appropriate.

Table 3-1
Summary of OU 3 Sentinel Cap Areas

Cap ID	Cap Management Unit	Cap Type	Area of Footprint (Acres)
CA3	CA3	Cap A	0.31
CA9A	CA9A	Cap A	1.44
CA69	CA69	Cap A	0.66
CB3A	CB3A	Cap B	0.58
CA15	CA15	Cap A	2.45
CB31	CB31	Cap B	1.74

Note: Table 3-1 is based on the following documents: Technical Memorandum "Hydrodynamic Modeling of Post-Remedy Conditions in OU 3 to Evaluate Cap Stability" dated April 17, 2018 and Memorandum "Lower Fox River OU3 – Sentinel Cap Areas Selection" dated October 15, 2019.

Table 3-2
Preliminary Summary of OU 4 Sentinel Cap Areas

Cap ID	Cap Management Unit	Cap Type	Area of Footprint (Acres)
CB39	CB39	Cap B	5.65
CC14	OU4-CC14-1	Cap C	0.62
CB11A	OU4-CB11A-1	Cap B	0.76
CC17	CC17	Cap C	0.75
CC22	CC22	Cap C	0.23

Note: Before Table 3-2 can be finalized, the following documents must be submitted to and accepted by the Agencies: Technical Memorandum "Hydrodynamic Modeling of Post-Remedy Conditions in OU4/5 to Evaluate Cap Stability" and Memorandum "Lower Fox River OU4/5 – Sentinel Cap Areas Selection".

Sentinel cap area monitoring will be performed within 1 year following a river flow (combined flood and seiche discharge) event with a recurrence interval of 20 years or more. Table 3--3 presents the flow rates in the Lower Fox River for various return-interval flow events.

Table 3-3
Summary of Lower Fox River Flow Rates[1]

Recurrence Interval	Flows at Rapide Croche, Appleton, Wisconsin USGS station 040084500[2]040084500[2] (cfs)	Flows at Oil Tank Depot at Green Bay, Wisconsin USGS station 040851385 (cfs)
2	12,800	14,300
5	16,600	18,800
10	18,500	21,900
20	19,800	23,700
25	20,500	25,900
50	21,700	29,000
100	22,800	32,100

Notes:
[1] The computed recurrence interval flows for the Lower Fox River at USGS station Nos. 04084445 and 040851385 are from *Flood-Frequency Characteristics of Wisconsin Streams* (Walker et al, 2017). The 20-year recurrence interval was interpolated from the computed recurrence intervals.
[2] USGS Station No. 04084500 is no longer operational; therefore, actual flows for OU 3 are back-calculated from USGS Station No. 04084445 (Fox River at Appleton) flows (using a ratio of OU 3/OU 1 as documented in the July 23, 2019 memorandum *OU 3 River Flow Determination and Revised Recurrence Intervals for OU 1, OU 3, and OU 4* [Foth, 2019]) in order to evaluate.
cfs = cubic feet per second

Flows in OU 2 and OU 3 are no longer measured using the gaging station at the Rapide Croche Dam in Wrightstown (Station No. 04084500 http://waterdata.usgs.gov/wi/nwis/rt). This station (Station No. 04084500 http://waterdata.usgs.gov/wi/nwis/rt) is no longer operational; therefore, actual flows, as presented in Appendix G, for OU 3 are back-calculated from USGS Station No. 04084445 (Fox River at Appleton) flows (using a ratio of OU 3/OU 1 as documented in the July 23, 2019 memorandum OU 3 River Flow Determination and Revised Recurrence Intervals for OU 1, OU 3, and OU 4 [Foth, 2019]) in order to evaluate. If a new gaging station is reestablished in OU 2 or OU 3, then this data will be used instead of back calculating from the Appleton gage location. Flow rates during a typical year range between 1,060 and 9,900 cubic feet per second (cfs), with the highest discharge occurring in the spring (March through June). Hourly average flows exceeding the 20-year return-interval flow rate listed in Table 3-3 (i.e., 19,800 cfs) will be used to trigger the supplemental bathymetric surveys. If cap integrity and performance are verified under a 20-year flow event, follow-on event-based cap monitoring will occur following a 100-year flow event (e.g., 22,800 cfs; see Table 3-3; subject to future updates). Once the 100-year storm is exceeded and event monitoring occurs, and if sentinel caps are found to be performing as designed, the high-flow monitoring requirement for OUs 2 and 3 shall be considered complete.

Flows near the mouth of the Lower Fox River in OU 4 (including the combined effects of upstream floods and seiches) are measured approximately every 15 minutes at the Oil Tank Depot gaging station (Station No. 040851385 http://waterdata.usgs.gov/nwis/). The Oil Tank Depot gage is currently operated by USGS and supported by the Green Bay Metropolitan Sewerage District, which plan to continue operation of the gage into the future. Hourly average flows exceeding the 20-year return-interval flow rate listed in Table 3-3 (i.e., 23,700 cfs) will be used to trigger the supplemental bathymetric surveys. Updated return-interval flow rates developed by USGS and/GP or Glatfelter's LTM team, as appropriate, will also be monitored to refine the appropriate triggers for event-based cap monitoring activities. If cap integrity and performance are verified under a 20-year flow event, follow-on event-based cap monitoring will occur following a 100-year flow event (e.g., 32,100 cfs; see Table 3-3; subject to future updates). Once the 100-year storm is exceeded and event monitoring occurs, and if sentinel caps are found to be performing as designed, the high flow monitoring requirement for OU 4 shall be considered complete.

At the time of this COMMP, several years of cap monitoring in OU 3 and OU 4 have already been performed, as documented in the Draft 2018 Cap Integrity Assessment (Foth 2019). Flow records indicate that both the updated 20-year and updated 100-year recurrence-interval flow values were exceeded in OU 4 several times since 2015 and the updated 20-year recurrence-interval flow value was exceeded in OU 3 in 2018. Monitoring of caps installed following these events confirms that caps have remained intact and are functioning as designed. Because cap integrity and performance have been verified under the 20-year flow event in OU 3, the next flow triggered event-based cap monitoring in OU 3 will occur for selected sentinel caps following a 100-year flow event. Because cap integrity and performance have been verified under the 100-year flow event in OU 4, no additional flow event-based cap monitoring will be performed in OU 4 for the caps that were installed prior to 2018. However, for caps installed in OU4 in 2018 through 2020, the next flow event-based cap monitoring will occur in 2021 for selected sentinel caps following the 20-year flow event that occurred in 2020.

Supplemental bathymetric surveys will also be performed in sentinel cap areas within 1 year following major river construction events (e.g., new bridge construction) in or nearby caps or if monthly average water levels drop more than 1 foot below the low-water elevations used to develop the cap designs, as summarized in Table 3-4, to confirm the caps have remained intact and are functioning as designed. If cap integrity and performance are verified following a low-water event, follow-on event-based cap monitoring would be triggered by a subsequent water level drop of 1 foot below the previous low-water elevation. If that subsequent 1 foot of water elevation drop occurs prior to the survey triggered by the initial low-water elevation, both events would be monitored during the same survey. If a planned 5-year monitoring survey is scheduled for the year following a low-water elevation trigger, monitoring surveys may be combined for efficiency. Long-term monitoring modifications will be documented in a revision to this COMMP.

Table 3-4
Summary of Baseline and Design Low-Water Elevations

	Water Elevation Dynamic Height (NAVD88)*			
Operable Unit	**Design (feet)**	**1 Foot Below Design (feet)**	**2 Feet Below Design (feet)**	**Basis for Selection**
OU 2	593.6	592.6	591.6	NOAA Low Water Datum above Little Kaukauna Dam
OU 3	587.5	586.5	585.5	Crest of De Pere Dam (and NOAA Low Water Datum)
OU 4 within Navigation Channel	577.6	576.6	575.6	Lower 1% occurrence frequency of hourly summer data from NOAA gage at Green Bay (adjusted for long-term data record through 1953)
OU 4 outside Navigation Channel	576.6	575.6	574.6	

Note:
*For IGLD85 elevation, subtract 0.1 foot from NAVD88 elevation.

Lake Michigan water levels, which correspond to water levels in OU 4, are currently measured at the National Oceanic and Atmospheric Administration (NOAA) gaging station near the mouth of Green Bay (Station No. 9087079). Water levels in OU 3 are currently measured at the NOAA gage station located at the Rapide Croche Dam (Station No. 040084500). Annual low-water elevations (defined as the lowest monthly average within a given water year) from the NOAA gaging stations will be assessed each April after typical annual low water periods between November and March. If the gage records indicate that the monthly average for any month during the previous water year (April to March) was more than 1 foot below the RD baseline water elevation (576.6 feet North American Vertical Datum of 1988 [NAVD88] in OU 4, or 586.5 feet NAVD88 in OU 3), supplemental bathymetric surveying will be triggered for the following fall after the spring flood season and summer recreational boating season. Follow- on maintenance activities will be scheduled and documented as appropriate.

In addition to bathymetric surveys for caps, bank surveys will be performed during low--water conditions to monitor caps placed on river banks and side-slope areas. The bank surveys will include the following:

- Field reconnaissance for evidence of erosional features (e.g., presence of gullies, escarpments, slumps)
- Monitoring elevation changes using stakes embedded in the cap
- Follow- on land surveying as necessary to verify elevation changes

If the low-water field surveys document erosion along the banks, follow -on bathymetric or other geophysical surveys will be conducted in the adjacent areas of the river to determine whether the erosion extends into deeper water.

No low-elevation events have occurred in either OU 3 or OU 4 to date.

3.6 Event-Based Monitoring of Bulkhead Wall Caps

The low water conditions described in the previous sections will also trigger monitoring of the bulkhead wall caps at the RGL slip and C. Reiss terminal. In addition to low water elevations, bulkheads experience a unique set of potential events that may require action, including, but not limited to:

- Vessel impacts
- Low water conditions (refer to Section 3.5)
- Ice impacts or damage
- New construction
- Upland surcharge greater than the design specifications

Should one of the events occur at the RGL Slip or C. Reiss Terminal bulkheads, GP will be notified by the owners as requested in the letter that will be provided to RGL and C. Reiss on an annual basis to inform them of the need for evaluation in the event of these potential events. GP will then notify the Response Agencies within 48-hours. Event-based bulkhead wall cap monitoring will be conducted as deemed appropriate through collaborative discussions between GP and the Response Agencies and may include topographic surveying of the bulkhead wall tops as described in Section 3.2 and Appendix B. A visual inspection of the bulkhead wall cap, per the requirements of Appendix B, from above the water surface will be performed to determine if significant movement or damage occurred due to the event. If the topographic survey identifies movement beyond the 1.0-inch cumulative threshold at any single point or if the visual inspection survey identifies significant movement, then additional evaluations will be initiated, and GP will engage the Response Agencies for further consultation. These evaluations may include the use of existing inclinometers at the RGL Slip to compare existing conditions to the 2020 bulkhead wall cap baseline conditions to determine if any deflection greater than the threshold of movement defined by the design engineer has occurred, as described in Appendix B. New inclinometers may also be installed, if necessary, to monitor future deflections. Additionally, ground surveys may be completed to evaluate the alignment and elevation of the concrete cap relative to the as-built condition and to evaluate if settlement or depressions are observed in the zone of influence of the wall.

If warranted, following the upland topographic and visual observation surveys, GP will discuss with the Response Agencies the need for a dive team certified by the Association of Diving Contractors International (ADCI) standard to be hired to perform an inspection of the bulkhead wall cap for structural integrity and breaches in the bulkhead seal (e.g., puncture, seam separation. The dive team will report its findings to GP and to the engineer of record or to a Wisconsin licensed Professional Engineer. GP will provide the dive team report and associated recommendations from the engineer to the Agencies upon receipt.

Refer to Section 3.2 and Appendix B for details on the topographic surveying and visual observations to be performed during a monitoring event. It is GP's current intent to contract with AECOM to conduct the inspections of the RGL and C. Reiss bulkhead wall caps as part of the COMMP because they were designers of the walls and have an ongoing relationship with the site owners.

In the event of a low water elevation that is more than 1-foot below the annual low water datum elevation in OU 4 (see Table 3-4), additional inspections of bulkhead wall caps may be conducted while there is a greater amount of exposed surface to visually assess the condition of the bulkhead. Follow-on event-based monitoring may be triggered by a subsequent water level drop of 1 foot below the previous low-water elevation if time permits an evaluation prior to water levels rising back up to typical elevations. If a planned 5-year monitoring survey is scheduled for the year following a low-water elevation trigger, monitoring surveys may be combined for efficiency.

An annual letter[9] (attached to Appendix B) will be sent to riparian property owners reminding them to notify the responsible parties if an event occurs. Appendix H includes agreements signed between GP, RGL, and C. Reiss that establishes a system of communication between the owners of the bulkheads and GP.

A communication process flow chart for riparian property owners and the responsible parties is also included as an attachment to Appendix B.

3.7 Event-Based Monitoring of North Focus Area Armored Cap

As noted in Section 3.4, if the final remedy for the MGP site has not been determined before 2022 (Year 3), the NFA armored cap will be monitored along with all the other caps addressed in this COMMP and reported in the USEPA 5-year review until a final remedy for the MGP site is determined and the cap monitoring and maintenance responsibility has been legally transferred to WPS by the Response Agencies. The monitoring of the NFA cap under the COMMP requirements will include event-based monitoring.

Similar to event-based monitoring for aggregate caps and bulkhead caps discussed in previous sections, low water conditions will trigger monitoring of the NFA armored cap (see Section 3.5). In addition to low water, the monitoring of the NFA armored cap may be triggered by other events including, but not limited to, the following:

- Vessel impacts
- Ice impacts or damage
- New construction

If one of the events occurs at the NFA armored cap, GP will notify the Response Agencies within 48-hours of learning of the event. Event-based monitoring will be conducted as deemed appropriate through collaborative discussions between GP and the Response Agencies and will likely include a bathymetric survey of the armored cap and the structural buttress.

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[9] Attached to Appendix B is a draft annual letter.

As noted in Section 3.3, the COMMP includes monitoring of sand buttresses installed for shoreline stability even though the buttresses have no impact on cap performance. The survey of the NFA buttress does not include metrics for additional evaluation because the buttress has no impact on cap performance; however, if significant changes in elevation are noted, GP will discuss the results with the Response Agencies to determine whether additional evaluations are warranted.

3.8 Cap Monitoring Decision Framework Summary

As discussed in Sections 3.1 through 3.7, monitoring of OU 2 to 5 caps will primarily involve routine evaluation of the cap's physical integrity as well as periodic monitoring in sentinel cap areas triggered by high flows, periods of low water, or major in-river construction projects. The cap monitoring decision trees to be used in OUs 2 to 5 are summarized on Figures 3-2 (aggregate caps), 3-3 (bulkhead wall caps), and 3-4 (SRA caps). The bathymetric survey results and bulkhead wall cap monitoring results will be summarized in technical memoranda to be submitted to the Response Agencies. Potential erosion within aggregate cap areas (including SRA caps) will be identified based on comparison of the most recent bathymetric surveys with the Year 0 bathymetric surveys as the baseline, also taking into consideration the prior surveys. Potential deterioration of bulkhead wall caps will be identified based on comparison of the as-built drawings[10]established as the baseline measurement and to the 2020 baseline conditions for topographic surveying or inclinometer readings at RGL Slip.

3.9 Aggregate and SRA Cap Monitoring Responses

If bathymetric surveying indicates that a typical aggregate cap armor layer remains intact over 95% or more of a CCU area based on a comparison to the baseline survey, no maintenance will be required at that location (see Figure 3-2). For SRA caps, bathymetric survey data comparisons will be used to determine excessive erosion, if so, the RPs will evaluate the need for additional assessment of the SRA has occurred as described in Section 3.3 in collaboration with the Response Agencies (see Figure 3-4).

Given natural hydrodynamic fluctuations, small regions of the cap would be expected to self-level over time, such that the cap armor stone will continue to be maintained. If long-term bathymetric surveying indicates a decrease in the top of cap elevation, but sub-bottom profiling or physical poling confirms the armor stone remains intact, it will be determined that

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[10] As-built drawings are included as attachments in Appendix B.

consolidation of the underlying sediment has occurred rather than erosion of cap thickness. In this event, there will be no need for further cap maintenance.

In the event that the bathymetric surveys, physical poling, and/or geophysical surveys (e.g., sub-bottom profiling) identify a contiguous area totaling more than 5% of a CCU with insufficient armor layer for typical caps or excessive erosion averaged over the SRA cap footprint as described in Section 3.3, GP or Glatfelter, as appropriate, in consultation with the Response Agencies will evaluate the need for additional assessment based on the cap type, potentially including the following:

- **Typical Aggregate Caps**
  - Poling of the area(s) preliminarily determined to have undergone erosion to delineate the extent of the area(s); a visual characterization of the cap thickness and physical composition of the cap layer(s) in the suspect area as determined by divers
  - Diver inspection to evaluate the need for follow-on cap monitoring/assessment, subject to technical workgroup discussions and Response Agencies' approval
    - If an intact armor layer is encountered during the visual characterization, the diver will document the thickness of recently deposited sediment that may have accumulated above the armor layer. No additional sampling will be performed (e.g., coring).
    - If the diver determines that the armor layer has been eroded and is or damaged at the location, the diver will collect a manual measurement and/or push core of the remaining cap layer(s). Collaboratively with the Agencies, GP or Glatfelter, as appropriate, will recommend an appropriate analysis technique for the recovered measurement data based on the Site-specific conditions and results of the physical monitoring.
- **SRA Caps**
  - Diver inspections
  - Increased/decreased frequency of monitoring
  - Poling to confirm erosion has occurred as described in Section 3.3 for a contiguous area greater than 5% of the SRA CCU footprint, not including portions overlain by buttresses, as applicable
  - Sub-bottom profiling

  - Surface sediment sampling
  - No action
  - In collaboration with the Agencies, GP or Glatfelter, as appropriate, will evaluate whether the identified erosion has impacted the overall performance of the cap

In the event that core sampling and chemical analyses are recommended by GP or Glatfelter, as appropriate, in consultation with the Response Agencies, such activities will be performed in accordance with the QAPP. As part of the adaptive management process, alternative methods to monitor the physical and/or chemical integrity of the caps may be identified.

The sampling and analysis techniques discussed previously may be revised as necessary as part of the Adaptive Management Plan (see Appendix E of the 100 Percent Design Report, Volume 2; Tetra Tech et al. 2012). They can be viewed as individual tools that are part of a larger toolbox of potential responses and strategies following initial indications from geophysical surveying of cap erosion.

If cap erosion, to the point that the cap thickness no longer meets ROD or remedial design specifications, is confirmed by bathymetric surveys and verified by follow-on monitoring and sampling, possible response actions for each cap type can include the following:

- **Typical Aggregate Caps**
  - Repairing or augmentation of the thickness of the cap to ensure cap integrity
  - Increasing the frequency and intensity of cap monitoring
  - Armoring the area of erosion with larger stone
  - Removing the cap and underlying contaminated sediment if monitoring or other information shows a pattern of cap degradation in multiple areas, and pending the results of engineering evaluations
- **SRA Caps**
  - Repairing or augmentation of the thickness of the cap in the identified area of erosion to meet the SRA site-specific design
  - Increasing the frequency and intensity of cap monitoring
  - No further action will be required for any cap erosion or disruption within the 2-foot navigational channel buffer zone (i.e., above elevation 551.6 feet (NAVD88) within the authorized navigational channel)

  - No further action (It is recognized that the caps were not designed to withstand full large vessel propeller wash assumptions. It is therefore not expected that SRA cap repairs will be required given these design limitations except under extreme or unusual damage events. The decision on the need for a repair will be assessed collaboratively)

If monitoring data indicate that a cap placed in an area no longer meets its original design criteria and that degradation of significant areas of the cap may result in an actual or threatened release of PCBs at or from the area, additional supplemental evaluations will be performed to identify response activities that may be appropriate for consideration in the area. If monitoring or other information shows a pattern of cap degradation in multiple areas, then additional response activities may be considered, including cap and underlying contaminated sediment removal for non-SRA caps. Consistent with CERCLA requirements, the Response Agencies, GP or Glatfelter, as appropriate, will evaluate cap performance and the need for and scope of continued cap monitoring, and modifications or revisions to the COMMP as part of the 5-year review process.

Alternatively, if cap monitoring results, after event-based monitoring and/or scheduled monitoring or inspection, indicate that a typical, non-SRA cap has consistently maintained integrity over at least 95% of the area (by CCU), GP or Glatfelter, as appropriate, may request those CCUs be removed from the requirements of the COMMP following the 5-year reviews, prior to the end of the expected 30-year monitoring period, through collaborative discussions with the Response Agencies.

If repairs to the SRA are made, then the initial bathymetric monitoring frequency would be reinstated because the repair would be considered as occurring in Year 0 of the program.

3.10 Bulkhead Wall Cap Monitoring Responses

The decision framework for bulkhead monitoring is shown on Figure 3-5. To determine when event-based monitoring of the bulkhead wall caps is required, GP will monitor river conditions for event-based triggers including river-flow events (e.g., flooding or ice). Although no obligations or requirements have been assigned to the bulkhead wall owners (RGL Holdings and the C. Reiss Coal Company), they have agreed to notify GP via email within 48 hours of any wall impacts, new construction, or upland surcharges greater than the design specifications that would trigger event-based monitoring. The signed agreements between the bulkhead wall owners and GP are provided in Appendix H.

The Response Agencies will be notified within 48 hours of GP's learning of a qualified event that may have caused damage to the bulkhead wall. A survey and dive team inspection (if appropriate) will be conducted within 30 days of the event (as weather and river conditions allow) and response actions will be considered as shown on Figure 3-3.

GP will provide RGL and C. Reiss with an annual letter reminding them of the agreement to notify GP of any circumstances that could trigger event-based monitoring. Sample letters for RGL and C. Reiss are provided as Attachment 5 to Appendix B.

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FIGURES

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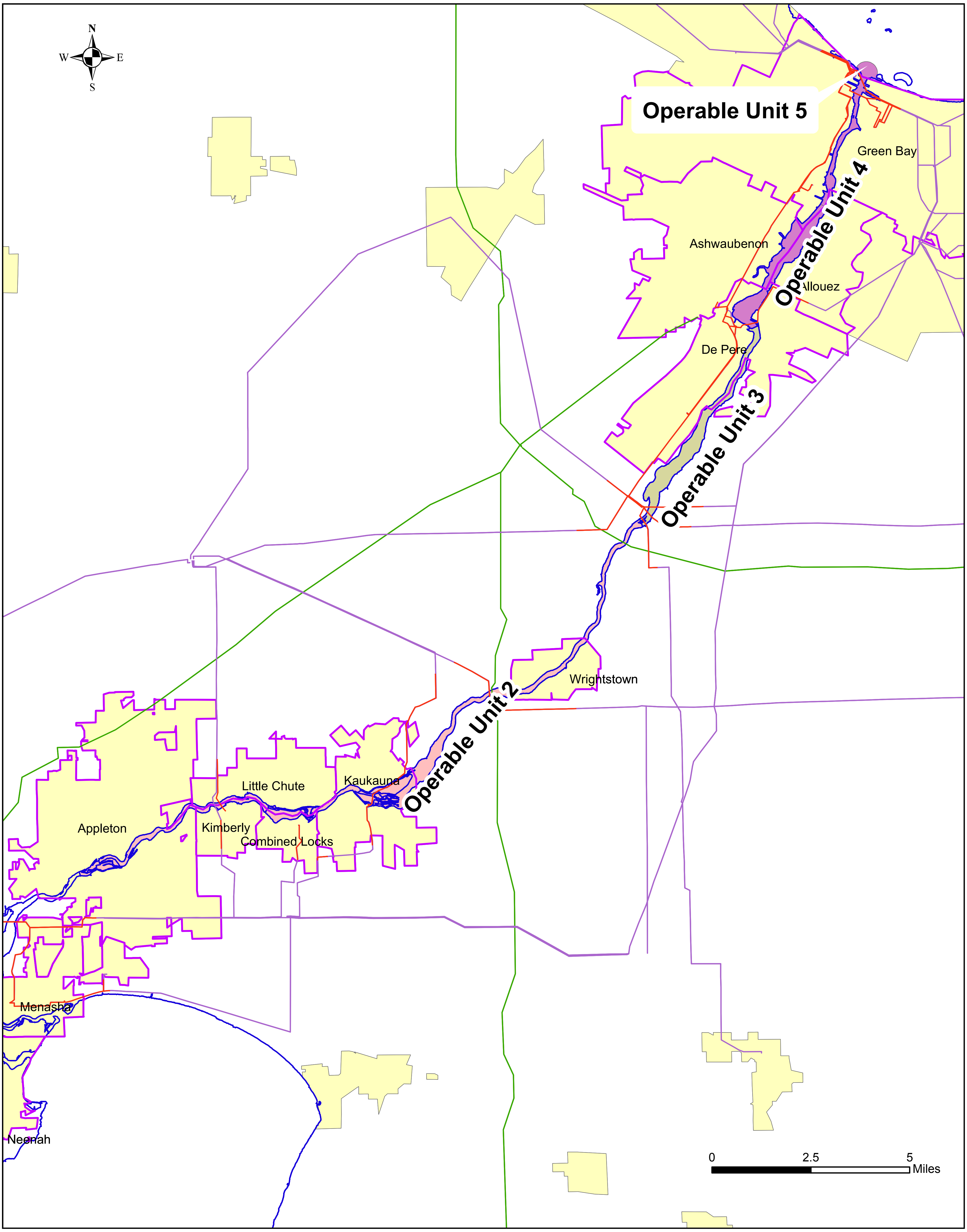


Legend

╱╲	USACE Channel Definition
╱╲	American Transmission Company Line
╱╲	Transmission System
╱╲	Natural Gas Pipeline
☐	Fox River Boundary
▭	Municipal Boundary

Operable Unit Number

🟥	2
🟩	3
🟪	4

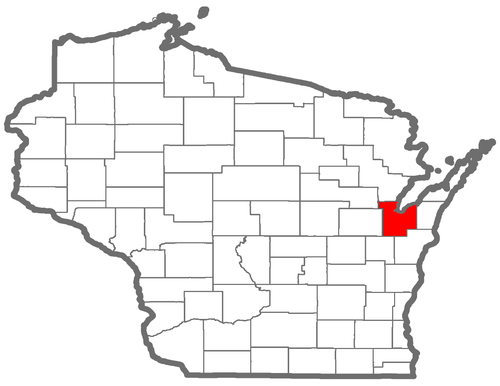
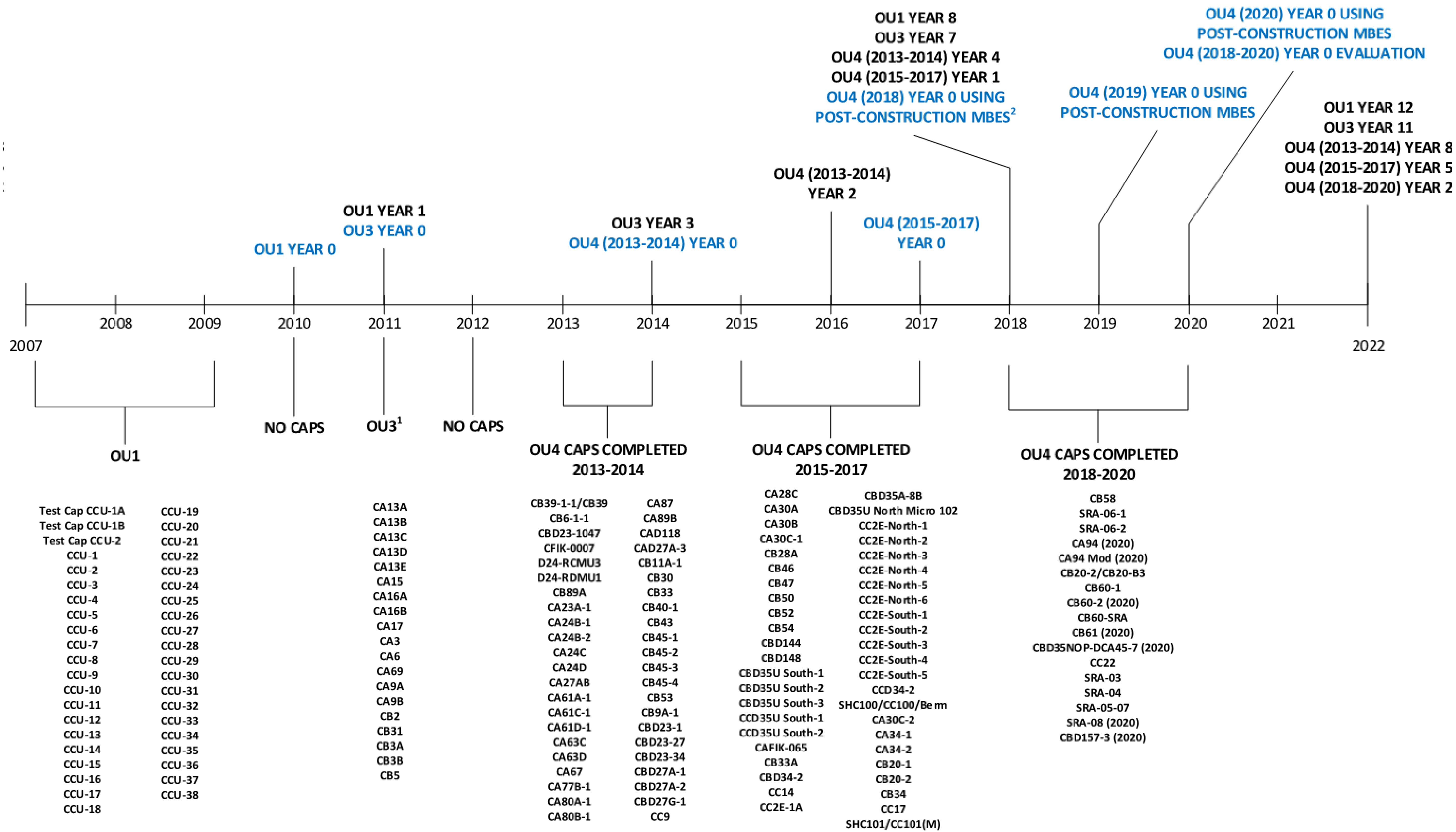


Figure 1-1
Lower Fox River Area Location Map

Lower Fox River OU 2-OU 5

TETRA TECH

ANCHOR QEA



NOTES:
1. Caps in OU3 Completed in 2011 except CA3 which was completed in 2009.
2. MBES = Multi Beam Echosounder Survey

FIGURE 3-1

COMMP Routine Monitoring Timeline Through 2022

Foth

Date: NOVEMBER 2019	Revision Date:

Drawn By: DAT	Checked By: TMK1	Project: 18G036.19

Path: Q:\Georgia-Pacific Corporation\18G036\GIS\mxd\COMMP Routine Monitoring Timeline.mxd Date: 11/13/2019

Apr 01, 2021 12:57pm dbinkney A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2019\DESIGN\Sentinel Caps\0295-RP-001_Revised 2021_04_01 (COMMP Figs).dwg Figure 3-2

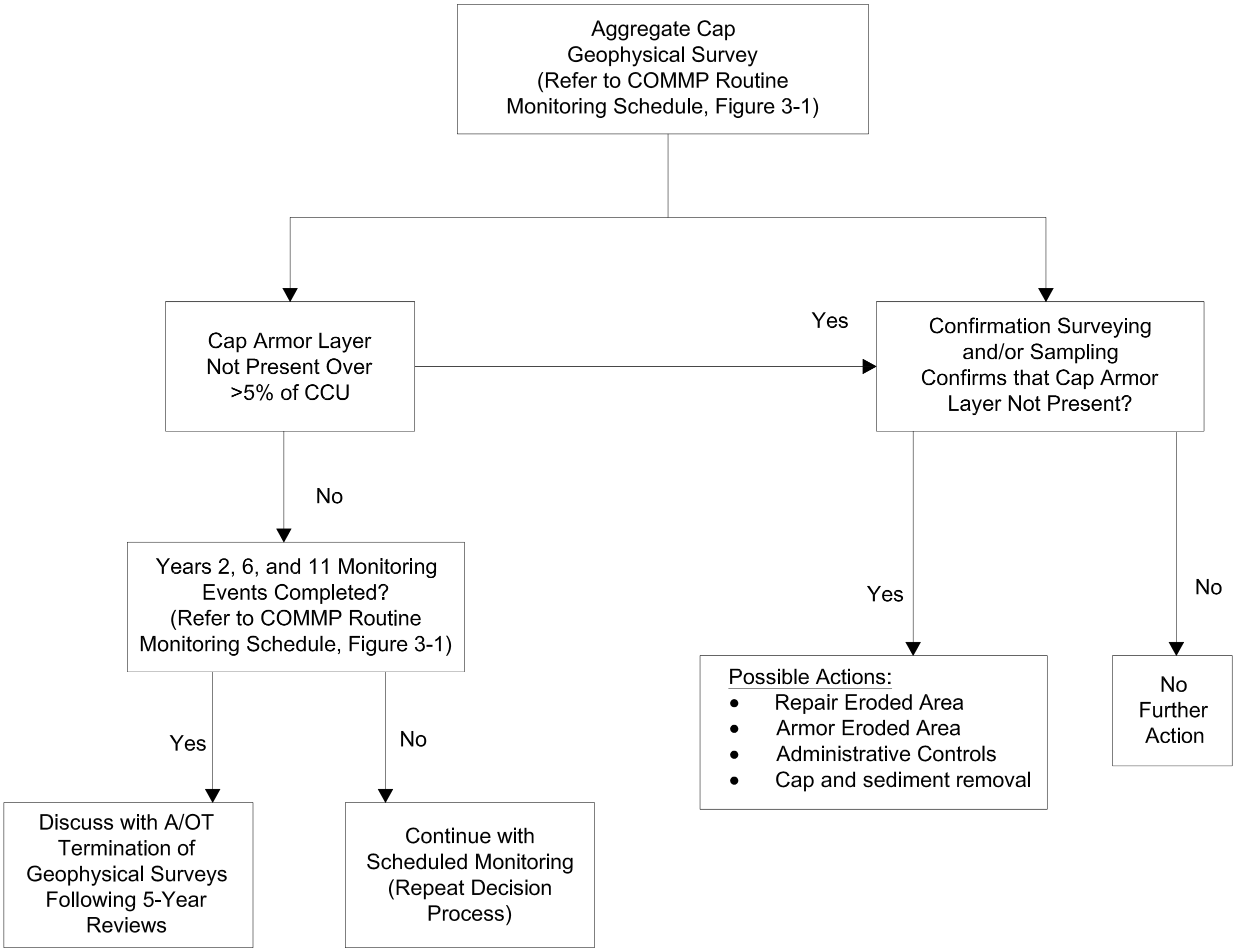


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Figure 3-2
Decision Framework for Aggregate Cap Monitoring
Lower Fox River OUs 2 to 5

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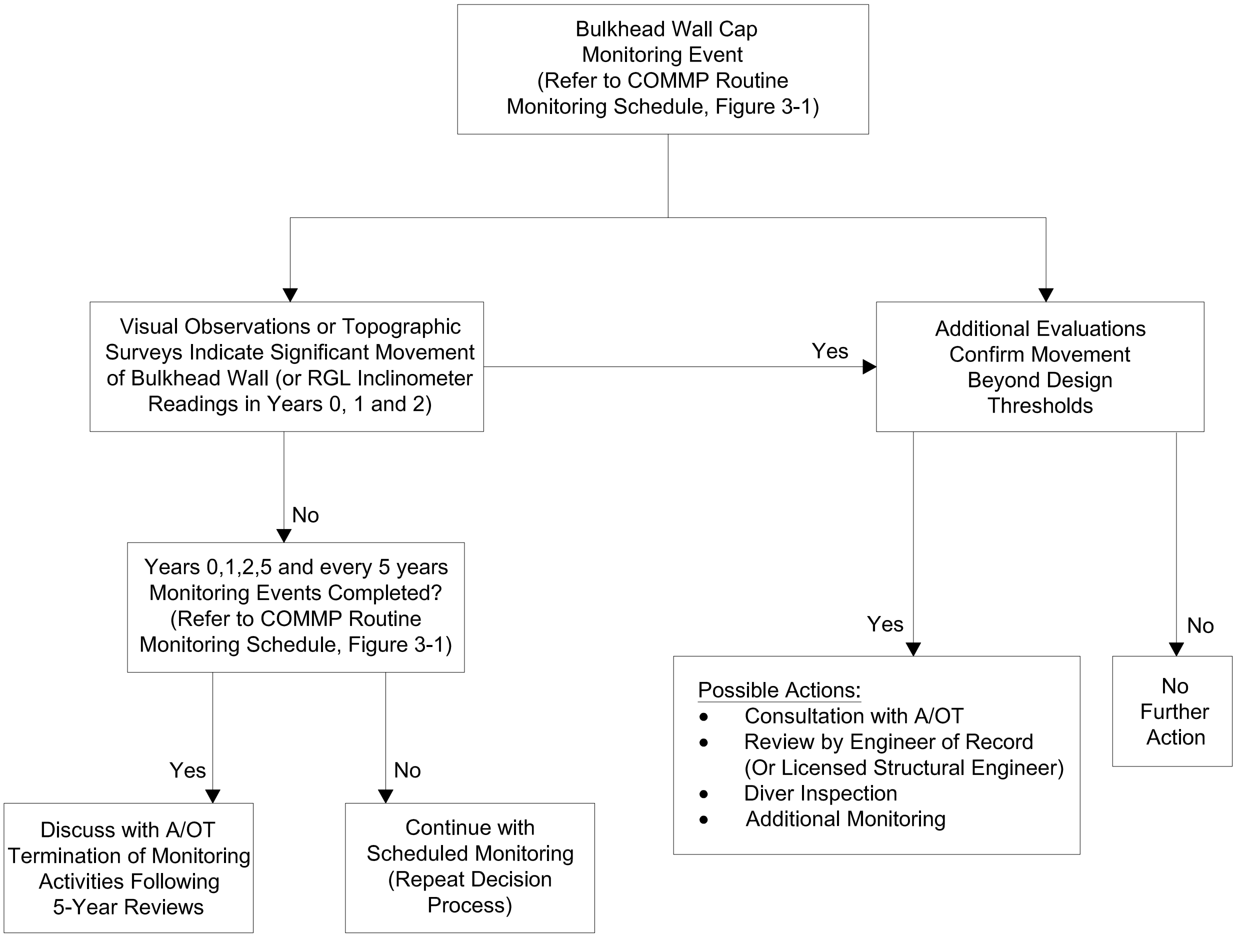

Figure 3-3
Decision Framework for Bulkhead Wall Monitoring
Lower Fox River OUs 2 to 5

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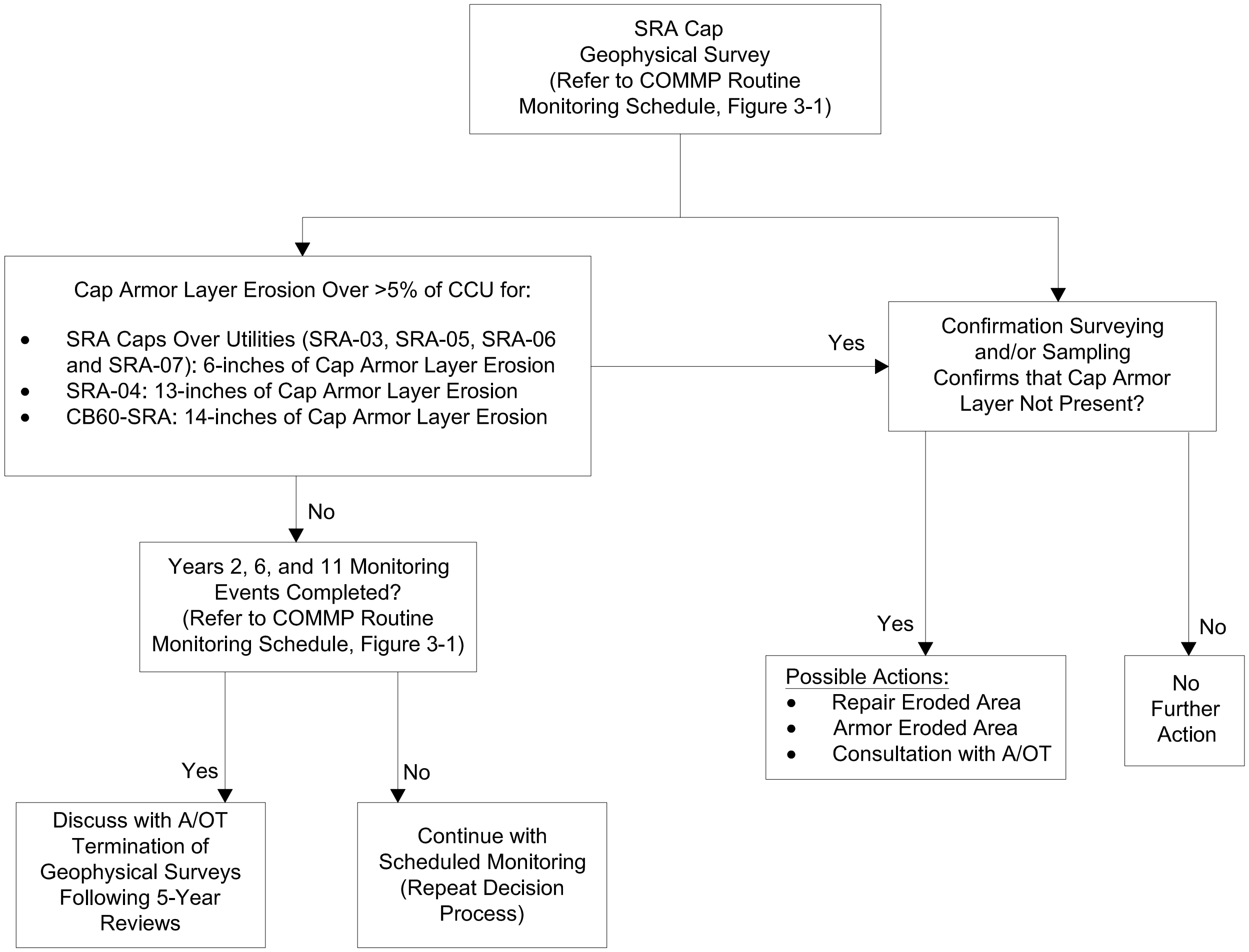

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Figure 3-4
Decision Framework for
SRA Cap Monitoring
Lower Fox River OUs 2 to 5

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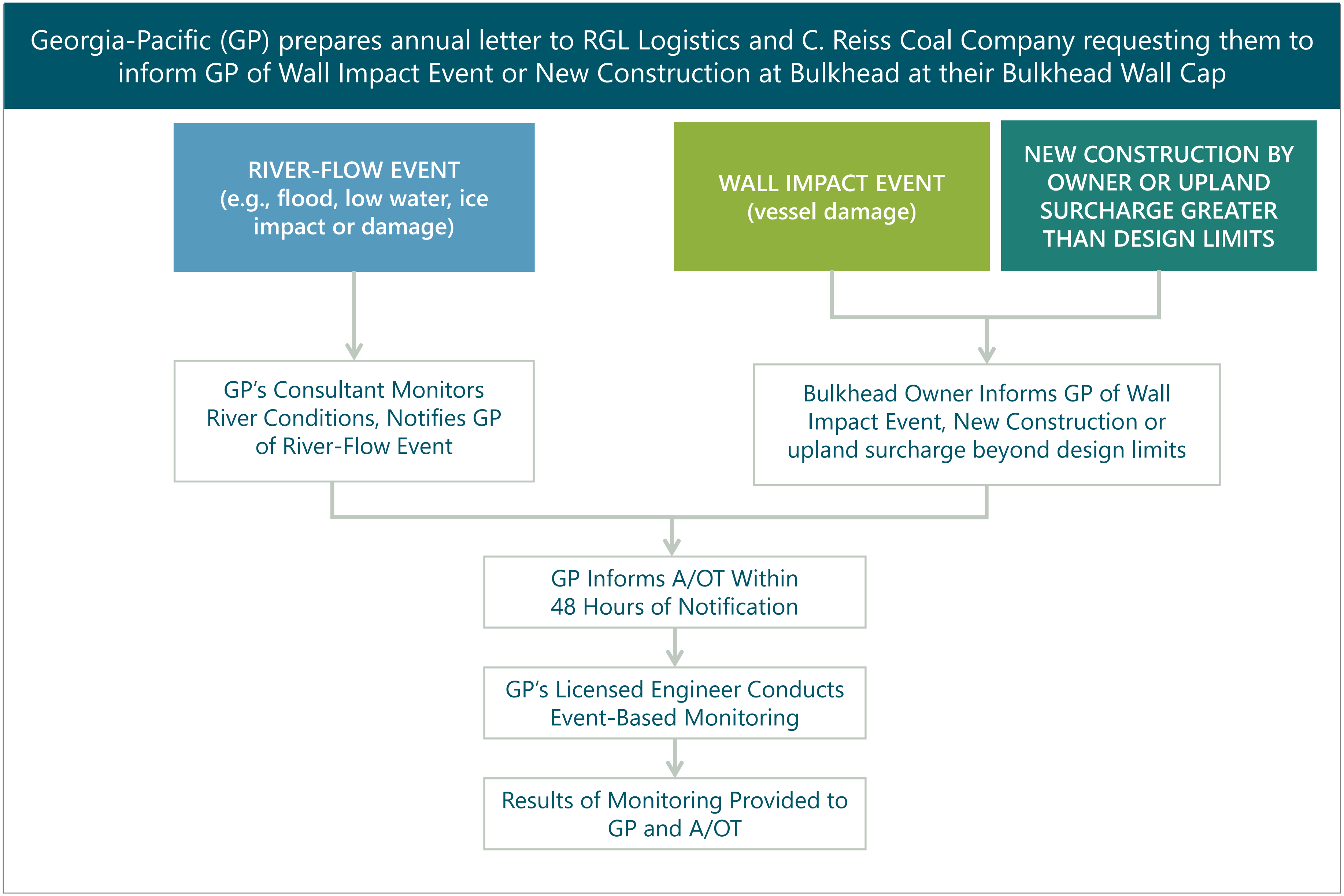

Georgia-Pacific (GP) prepares annual letter to RGL Logistics and C. Reiss Coal Company requesting them to inform GP of Wall Impact Event or New Construction at Bulkhead at their Bulkhead Wall Cap

RIVER-FLOW EVENT (e.g., flood, low water, ice impact or damage)

WALL IMPACT EVENT (vessel damage)

NEW CONSTRUCTION BY OWNER OR UPLAND SURCHARGE GREATER THAN DESIGN LIMITS

GP's Consultant Monitors River Conditions, Notifies GP of River-Flow Event

Bulkhead Owner Informs GP of Wall Impact Event, New Construction or upland surcharge beyond design limits

GP Informs A/OT Within 48 Hours of Notification

GP's Licensed Engineer Conducts Event-Based Monitoring

Results of Monitoring Provided to GP and A/OT

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Figure 3-5
Bulkhead Wall Cap Event-Based Monitoring Communication Flow Chart

APPENDIX A
LOWER FOX RIVER EPA GUIDELINES
LONG TERM MONITORING SCHEDULES
APPROVED ON APRIL 13, 2020

USEPA/WDNR Lower Fox River PCB Project
Long Term Chemical Monitoring Schedule
April 13, 2020

This table identifies the USEPA/WDNR requirements regarding when monitoring functions are to be completed e.g., caps, fish tissue, etc.
If an Operable Unit is completed earlier or later than expected then the USEPA/WDNR will revise this monitoring schedule.

Calendar Year	EPA 5 Year Report	OU1 Fish, and Water (Construction Completed 2009)	OU2 Fish, Water, and MNR Sediment (Construction Completed 2009)	OU3 Fish, Water, and Isolation-Layer (Construction Completed 2011)	OU4 Fish, Water, and Isolation-Layer (Construction Completed 2020)	OU5 Fish, Water, and MNR Sediment (Construction Completed Upstream 2020)	Calendar Year
2009	Yes						2009
2010		Fish Tissue-OU1-Year 0 Water-OU1-Year 0					2010
2012		Fish Tissue-OU1-Year 2 Water-OU1-Year 2	Fish Tissue-OU2-Year 0 Water-OU2-Year 0 MNR Sediment-OU2-Year 0	Fish Tissue-OU3-Year 0 Water-OU3-Year 0 Isolation-Layer-OU3-Year 0			2012
2014	Yes		Fish Tissue-OU2-Year 2 Water-OU2-Year 2 MNR Sediment-OU2-Year 2	Fish Tissue-OU3-Year 2 Water-OU3-Year 2 Isolation-Layer-OU3-Year 2			2014
2018		Fish Tissue-OU1-Year 8 Water-OU1-Year 8	Fish Tissue-OU2-Year 6 Water-OU2-Year 6 MNR Sediment-OU2-Year 6	Fish Tissue-OU3-Year 6 Water-OU3-Year 6 Isolation-Layer-OU3-Year 6			2018
2019	Yes						2019
2021					Fish Tissue-OU4-Year 0 Water-OU4-Year 0 Isolation-Layer-OU4-Year 0	Fish Tissue-OU5-Year 0 Water-OU5-Year 0 MNR Sediment-OU5-Year 0	2021
2022		Fish Tissue-OU1-Year 12 Water-OU1-Year 12	Fish Tissue-OU2-Year 10 Water-OU2-Year 10 MNR Sediment-OU2-Year 10	Fish Tissue-OU3-Year 10 Water-OU3-Year 10 Isolation-Layer-OU3-Year 10	Fish Tissue-OU4-Year 1 Water-OU4-Year 1 Isolation-Layer-OU4-Year 1	Fish Tissue-OU5-Year 1 Water-OU5-Year 1 MNR Sediment-OU5-Year 1	2022
2024	Yes						2024
2027		Fish Tissue-OU1-Year 17 Water-OU1-Year 17	Fish Tissue-OU2-Year 15 Water-OU2-Year 15 MNR Sediment-OU2-Year 15	Fish Tissue-OU3-Year 15 Water-OU3-Year 15 Isolation-Layer-OU3-Year 15	Fish Tissue-OU4-Year 6 Water-OU4-Year 6 Isolation-Layer-OU4-Year 6	Fish Tissue-OU5-Year 6 Water-OU5-Year 6 MNR Sediment-OU5-Year 6	2027
2029	Yes						2029
2032		Fish Tissue-OU1-Year 22 Water-OU1-Year 22	Fish Tissue-OU2-Year 20 Water-OU2-Year 20 MNR Sediment-OU2-Year 20	Fish Tissue-OU3-Year 20 Water-OU3-Year 20 Isolation-Layer-OU3-Year 20	3Fish Tissue-OU4-Year 11 Water-OU4-Year 11 Isolation-Layer-OU4-Year 11	Fish Tissue-OU5-Year 11 Water-OU5-Year 11 MNR Sediment-OU5-Year 11	2032
2034	Yes						2034
2037		Fish Tissue-OU1-Year 27 Water-OU1-Year 27	Fish Tissue-OU2-Year 25 Water-OU2-Year 25 MNR Sediment-OU2-Year 25	Fish Tissue-OU3-Year 25 Water-OU3-Year 25 Isolation-Layer-OU3-Year 25	Fish Tissue-OU4-Year 16 Water-OU4-Year 16 Isolation-Layer-OU4-Year 16	Fish Tissue-OU5-Year 16 Water-OU5-Year 16 MNR Sediment-OU5-Year 16	2037
2039	Yes						2039
2042		Fish Tissue-OU1-Year 32 Water-OU1-Year 32	Fish Tissue-OU2-Year 30 Water-OU2-Year 30 MNR Sediment-OU2-Year 30	Fish Tissue-OU3-Year 30 Water-OU3-Year 30 Isolation-Layer-OU3-Year 30	Fish Tissue-OU4-Year 21 Water-OU4-Year 21 Isolation-Layer-OU4-Year 21	Fish Tissue-OU5-Year 21 Water-OU5-Year 21 MNR Sediment-OU5-Year 21	2042
2044	Yes						2044
2047		**Repeat year 2042 monitoring for fish tissue, water, chemical isolation-layer, and monitored natural recovery sediment every five (5) years in perpetuity.**					2047
2049	Yes						2049

USEPA/WDNR Lower Fox River PCB Project
Long Term Cap Monitoring Schedule
April 13, 2020

This table identifies the USEPA/WDNR requirements regarding when monitoring functions are to be completed e.g., caps, fish tissue, etc.
If an Operable Unit is completed earlier or later than expected then the USEPA/WDNR will revise this monitoring schedule. Note: Cap Monitoring in OU2 is not required.

Calendar Year	EPA 5 Year Report	OU1 Caps (Construction Completed 2009)	OU3 Caps (Construction Completed 2011)	OU4 Caps 2013 - 2014 (Construction Completed 2014)	OU4 Caps 2015 - 2017 (Construction Completd 2017)	OU4/OU5 Caps 2018 - 2020 (Construction Completed 2020)	Calendar Year
2009	Yes						2009
2010		Caps-OU1-Year 0 Note: Year zero for OU1 was the year after construction was completed.					2010
2011		Caps-OU1-Year 1 Note: Bathymetric Survey Triggered in 2011 by a 5 year recurrence flow rate.	Caps-OU3-Year 0				2011
2012		Caps-OU1-Year 2 Note: Bathymetric Survey of cap waived because of the 2011 Bathymetric Survey results for 5 year recurrence flow rate.					2012
2014	Yes		Caps-OU3-Year 3	Caps-OU4-Year 0 (2013-2014)			2014
2016				Caps-OU4-Year 2 (2013-2014)			2016
2017					Caps-OU4-Year 0 (2015-2017)		2017
2018		Caps-OU1-Year 8	Caps-OU3-Year 7	Caps-OU4-Year 4 (2013-2014)	Caps-OU4-Year 1 (2015-2017)		2018
2019	Yes						2019
2020						Caps-OU4/OU5-Year 0 (2018-2020)	2020
2022		Caps-OU1-Year 12	Caps-OU3-Year 11	Caps-OU4-Year 8 (2013-2014)	Caps-OU4-Year 5 (2015-2017)	Caps-OU4/OU5-Year 2 (2018-2020)	2022
2024	Yes						2024
2027		Caps-OU1-Year 17	Caps-OU3-Year 16	Caps-OU4-Year 13 (2013-2014)	Caps-OU4-Year 10 (2015-2017)	Caps-OU4/OU5-Year 7 (2018-2020)	2027
2029	Yes						2029
2032		Caps-OU1-Year 22	Caps-OU3-Year 21	Caps-OU4-Year 18 (2013-2014)	Caps-OU4-Year 15 (2015-2017)	Caps-OU4/OU5-Year 12 (2018-2020)	2032
2034	Yes						2034
2037		Caps-OU1-Year 27	Caps-OU3-Year 26	Caps-OU4-Year 23 (2013-2014)	Caps-OU4-Year 20 (2015-2017)	Caps-OU4/OU5-Year 17 (2018-2020)	2037
2039	Yes						2039
2042		Caps-OU1-Year 32	Caps-OU3-Year 31	Caps-OU4-Year 28 (2013-2014)	Caps-OU4-Year 25 (2015-2017)	Caps-OU4/OU5-Year 22 (2018-2020)	2042
2044	Yes						2044
2047		**Repeat year 2042 monitoring for Caps every five (5) years in perpetuity.**					2047
2049	Yes						2049

APPENDIX B

BULKHEAD WALL CAP MONITORING PROGRAM OUTLINE

1 INTRODUCTION

As discussed in Section 2.2 of the Cap Operations, Maintenance, and Monitoring Plan, and as part of remedial actions (RAs) in the Lower Fox River, two bulkhead walls have been newly installed, repaired, or replaced to act as caps, and to provide structural integrity of the shoreline to facilitate dredging of contaminated sediments to the maximum extent practicable. Brief summaries of RAs at the two bulkhead construction sites (RGL Slip and C. Reiss Terminal) are provided in this appendix.

A stand-alone technical memorandum (AECOM 2021) that describes bulkhead monitoring completed at the time of this COMMP submittal and the structural engineer's recommendations for future monitoring, has been submitted under separate cover. Drawings that depict the existing conditions and proposed monitoring points and locations at the RGL Slip and C. Reiss Terminal are included as Attachments 1 and 2 to this Appendix, respectively. The drawings include as-built locations for installed inclinometers at RGL Slip, monitoring points along the tops of the bulkhead walls installed in 2020 to be used as topographic survey reference points at both sites, and the locations for planned visual monitoring and photographs.

1.1 Construction and Remediation Summary

The RA implemented in 2015 at the RGL Slip included installation of a new structural support wall approximately 2 to 4 feet in front of the existing steel and wooden wall, removal of contaminated sediment as practicable between the walls, and placement of a stabilization buttress on the western end of the slip. The wall was installed for the sole purpose of allowing the removal of the contaminated sediment. In 2016, the newly installed steel bulkhead wall required repair due to a deflection in the wall southward into the slip caused by overstressing of the upland soils behind the wall. The repair was designed by GEI Consultants (GEI; GEI 2016) and implemented in summer 2016. Subsequent to the repair installation and separate from the RA for OUs 2 to 5, modifications were made to the site to facilitate improved use of the slip on the RGL property. The site improvements were designed by AECOM Technical Services, Inc (AECOM) in 2017 and constructed in 2018 and 2019. The as-built configuration of the site based on the AECOM drawings serves as the basis of monitoring for the Cap Operations, Maintenance and Monitoring Plan.

The RA implemented in 2016 at the C. Reiss Terminal included installation of a new fully functional wall in front of the existing timber wall and placement of a buttress outboard of the wall for structural support. Unlike the bulkhead wall installed and repaired in the RGL Slip, the C. Reiss bulkhead wall was designed and installed to allow enhanced use of the shoreline for docking ships and not just to facilitate remedial dredging. C. Reiss was in the process of planning the wall improvements and entered into a cost sharing agreement with the LLC to expedite the schedule for these improvements to facilitate the dredging.

Even though contaminated sediments were removed to the maximum extent practicable, approximately 220[1] and 110[2] cubic yards of sediment with polychlorinated biphenyl (PCB) concentrations above the 1.0 part per million Lower Fox River remedial action level remain behind both the RGL Slip and C. Reiss Terminal walls, respectively. While these new bulkheads were designed to prevent the release of contaminated sediment contained between the walls, focused future monitoring is necessary to confirm continued protection of human health and the environment.

Initial monitoring of the RGL bulkhead wall was performed for several months following repair construction. This monitoring data has been evaluated and compared with monitoring results from 2020 and is documented in the Technical Memorandum on Bulkhead Monitoring (AECOM 2021), which is included as Attachment 3.

2 MONITORING PROGRAM

This monitoring program outlines the procedures for long-term monitoring of the RGL Slip and the C. Reiss Terminal bulkhead wall caps. This monitoring program is based on input from the engineers of record for the design of the bulkhead improvements (AECOM and GEI for the RGL Slip bulkhead and AECOM for the C. Reiss Terminal bulkhead) as well as the guidelines set forth in the Engineer Manual (EM) 1110-2-6054 (*Inspection, Evaluation and Repair of Hydraulic Steel Structures*; USACE 2001) and Engineer Regulation (ER) 1110-2-100 (*Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures*; USACE 1995).

---

[1] The RGL bulkhead wall cap contains ~220 cy of >= 1.0 ppm RAL sediment. Average PCB concentration of 28.4 ppm (99.9 ppm maximum concentration) including ~56 cy of TSCA sediment.

[2] The C. Reiss bulkhead wall cap contains ~110 cy of >= 1.0 ppm RAL sediment. Average PCB concentration of 2.2 ppm (8.2 ppm maximum concentration).

The bulkhead monitoring program will consist of three main components: inclinometer readings (at the RGL Slip only), topographic surveying and enhanced visual monitoring, which are discussed below.

2.1 Inclinometer Readings (RGL Slip)

At the RGL Slip, three inclinometers exist in working order, identified as I-101, I-102 and I-103 and are depicted on Attachment 1, the RGL Monitoring Plan. These inclinometers were installed shortly after construction and were initially monitored in 2016 and 2017. GEI collected an additional round of inclinometer readings at the RGL Slip on November 13, 2020. The results of these readings are discussed and evaluated in the Technical Memorandum on Bulkhead Monitoring (AECOM 2021), which is included as Attachment 3.

Additional inclinometer readings will occur in 2021 and 2022. Readings will be targeted in March, June, September, and December 2021 and once in the fourth quarter of 2022. These readings will be compared to November 2020 baseline data set as well as the initial baseline measurements from 2016. Following these four readings (which will act as "Year 1" and "Year 2" surveys), routine inclinometer readings will be performed every 5 years during the long-term cap monitoring.

Plots of the inclinometer readings will be developed that will show movement for each axis (A and B) of the inclinometers across the entire depth range of the inclinometer. The A-axis of the inclinometers is perpendicular to the slip with positive values indicating movement towards the river. The B-axis is parallel to the slip with positive values indicating movement towards the east (towards the Lower Fox River). Inclinometer readings will also be presented in a table that will identify the direction and amount of movement at the top of each of the three inclinometers. In addition, a second table will be developed to present the maximum reading of movement and direction at depth for each inclinometer. Readings will be compared to 2020 results and to 2016 results for reference. Movements in excess of +/- 1.0-inch in any direction will trigger an evaluation, with consideration of additional monitoring, in collaboration with the Response Agencies.

2.2 Topographic Surveying

Topographic surveying will be performed at the monitoring points installed by AECOM in December 2020. The monitoring points are non-corroding stainless-steel washers screwed into the top of the walls, 50-feet on center, and are depicted on the monitoring plan drawings included as Attachment 1 (RGL Slip) and Attachment 2 (C. Reiss Terminal). The washers were stamped with unique identifiers for tracking and reporting of results. Routine monitoring will include topographic surveying of the monitoring points, with a threshold of greater than 1.0-inch in any direction at any single survey point when compared to the baseline (condition and location at time of washer installation in 2020).

The topographic surveys shall tie into the Fox River Control Network and coordinates will be recorded in the following datums, consistent with the remediation project:

- Horizontal: Wisconsin State Plane, Central Zone, North American Datum of 1983 (US survey feet)
- Vertical: North American Vertical Datum of 1988 (feet)

2.2.1 Subsidence Surveying

In addition to topographic surveying of the monitoring points, at each monitoring point, a measurement of the vertical elevation difference between the concrete wall cap and the adjacent ground surface will be collected to provide quantitative evidence of any ground subsidence behind the walls. The subsidence will be measured using an approximate area of 50 square feet defined by 6-point rectangle adjacent to each wall monitoring point as shown schematically on Figure 1. Measurements at the six points will be averaged for a 50 square-foot area that will be compared to the elevation of the monitoring point on top of the wall and to previous subsidence monitoring results. To account for the difference in substrate comprising upland surface at the sites, two thresholds for monitoring subsidence will be used:

- RGL Slip (paved upland surface)
  - +/- 1-inch of elevation difference compared to the 2020 baseline, using a standard survey rod and prism
- C. Reiss Terminal (gravel surface)
  - +/- 6-inches of elevation difference compared to the 2020 baseline (and to the 2016 Brennan coordinates for reference)

  - To account for inaccuracies with gravel, at C. Reiss, the gravel surface elevations will be collected with a rod that has a 6-inch diameter circular plate attached to the base (consistent with manual bathymetric sounding poles [USACE 2013])

The results of the topographic surveys of the monitoring points and the subsidence measurements will be compared to the 2020 baselines at each site.

2.3 Enhanced Visual Monitoring

The enhanced visual monitoring will include observations and date-stamped photographs of the following elements:

- Horizontal and vertical alignment
- Cracks in the top of the concrete wall cap
- Subsidence behind the wall

Future wall inspections as part of the COMMP will be performed in general accordance with EM 1110-2-6054 (USACE 2001) and will follow an established checklist prepared in advance and included as Attachment 4. In addition, the inspector will be familiar with the general features and design of the bulkheads prior to inspection.

Subject to Response Agencies' approval, beginning in 2022 (to align with the monitoring schedule for aggregate caps) and going forward, bulkhead wall cap monitoring will be performed every 5 years. The schedule may be adjusted to coincide with the USEPA 5-year review.

2.4 Additional Evaluations

If the inclinometer readings at the RGL Slip or topographic surveys at either site observe an exceedance of the applicable threshold for movements or the visual survey notes apparent significant movement, cracking of the concrete wall cap, or subsidence behind the wall not identified by the topographic surveying, additional evaluations will be initiated. The scope of the evaluations will be collaboratively determined between Georgia-Pacific Consumer Products LLC (GP) and the Response Agencies, and may include the following:

- Geotechnical instrumentation monitoring (e.g., inclinometer readings)
- Bathymetric surveying
- Steel sheet member thickness monitoring
- Increased or decreased frequency of monitoring

- Diver inspection
- No action

As noted, additional surveys may include use of existing inclinometers to compare existing conditions to the 2020 baseline bulkhead conditions to determine if any deflection greater than the threshold of +/- 1.0-inch in any direction (for inclinometer readings), or movement in excess of 1.0-inch of the wall monitoring points, has occurred or subsidence was measured in excess of 1-inch at RGL or 6-inches at C. Reiss. New inclinometers may also be installed, if necessary, to monitor future deflections. Additionally, detailed ground surveys of the upland portions of the sites may be completed to evaluate if settlement or depressions are observed in the zone of influence of the wall. This will be determined by the engineer of record or a Wisconsin licensed Professional Engineer experienced in the design and analysis of bulkhead systems. It is GP's current intent to contract with AECOM to conduct the inspections of the RGL and C. Reiss bulkhead walls as part of the COMMP because they were designers of the walls and have an ongoing relationship with the site owners. AECOM was consulted in the preparation of this monitoring plan and developed the Bulkhead Monitoring technical memorandum that is included as Attachment 3.

2.4.1 Bathymetric Scour Monitoring

If bathymetric monitoring for scour at the base of the walls is collaboratively determined as a required additional evaluation, hydrographic survey would be performed to evaluate the sediment bed at the toe of the wall and determine if scour has occurred below the level assumed for the basis of design.

2.5 Event Based Monitoring

Additional observations may be necessary due to flood, ice, vessel impacts, new construction, or other potential causes of damage or change to the wall system. An annual letter will be sent to riparian property owners by the RPs reminding them to notify the responsible parties if an event occurs (included as Attachments 5a and 5b for RGL and C. Reiss, respectively). Attachments 6a and 6b are signed agreements between GP, RGL and C. Reiss, respectively, that establishes the system of communication via the annual letters and notifications from the bulkhead owners if an event requiring monitoring occurs. Figure 2 depicts a communication a flow chart describing the chain of communications for event-based monitoring.

3 PERIODIC INSPECTION REPORTING

GP will prepare a summary report consistent with ER 1110-2-100 (USACE 1995) after each visual inspection to become part of the permanent record and to provide a basis for increased observation or repair work should any be indicated. Periodic Inspection Reports will be completed within 30 days of the observations.

4 REFERENCES

AECOM Technical Services Inc, (AECOM), 2017. *RGL Logistics Fox River Dock Improvements 2018, City of Green Bay, Brown County, Wisconsin. December 7, 2017.*

AECOM, 2021. *Technical Memorandum on Bulkhead Monitoring*. Lower Fox River Remediation Cap Operations, Maintenance and Monitoring Plan Revisions. Dated March 6, 2021

GEI (GEI Consultants), 2016. *Final Report for RGL Holdings Bulkhead Wall Investigation and Rehabilitation, Subsurface Exploration and Geotechnical Engineering Evaluation*. Prepared for J.F. Brennan Company, Inc. August 10, 2016.

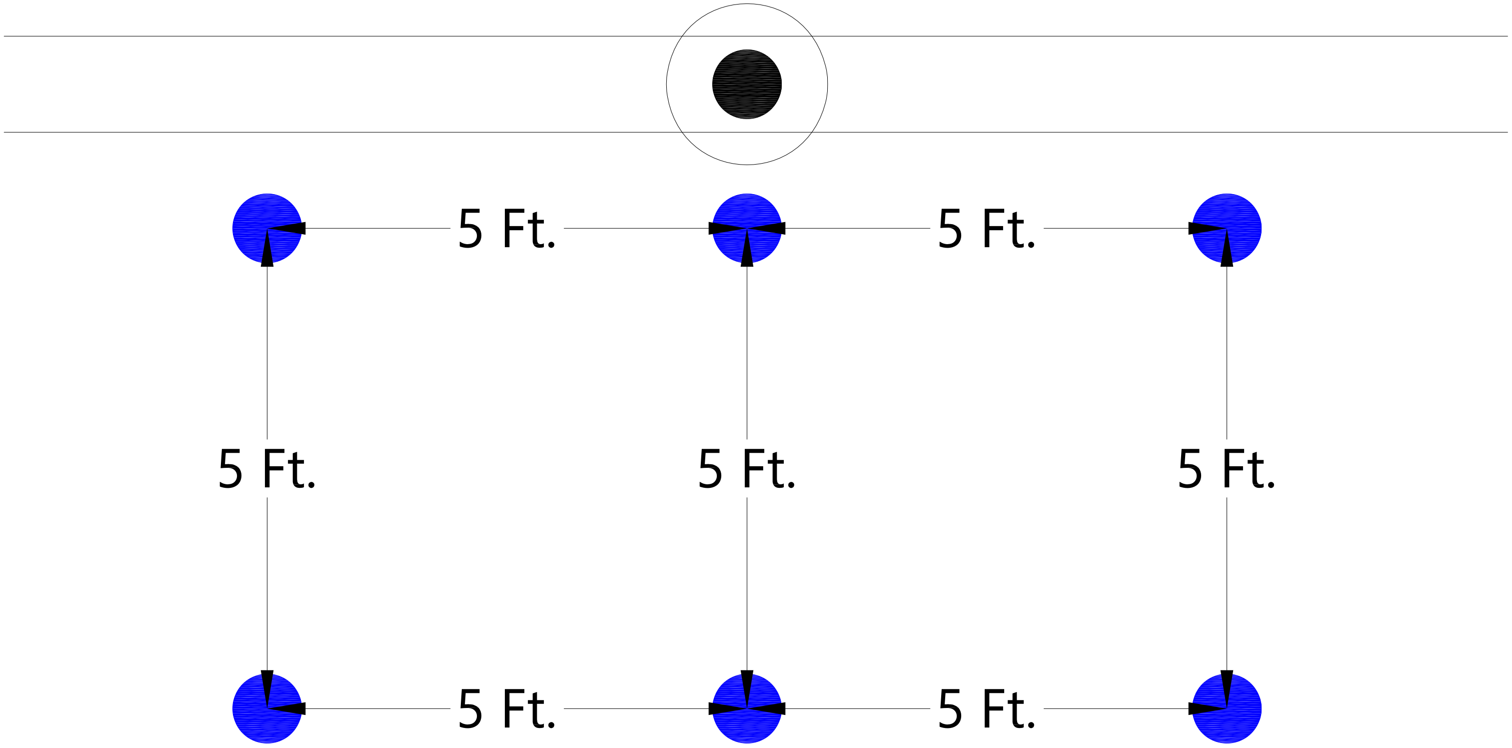
GEI, 2017. Letter sent via email to: Mike Binsfield (J.F. Brennan Company, Inc.). Regarding: Completion of Repair and Monitoring of the RGL Holdings Bulkhead Wall on the Lower Fox River in Green Bay, Wisconsin. March 14, 2017.

USACE (U.S. Army Corps of Engineers), 1995. *Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures*. Engineer Regulation 1110-2-100. February 15, 1995.

USACE, 2001. *Inspection and, Evaluation, and Repair of Hydraulic Steel Structures*. Engineer Manual 1110-2-6054. December 1, 2001.

USACE, 2013. *Engineering and Design – Hydrographic Surveying*. Engineer Manual 1110-2-1003. November 20, 2013.

FIGURES



NOTES:

1. This Figure is a schematic only, and representative of typical conditions. Actual conditions and alignments may vary.
2. Subsidence Monitoring Point adjacent to Bulkhead Wall Monitoring Point shall be as close as feasible to the wall edge to allow for surveying.

LEGEND:

═ Bulkhead Wall Cap

◉ Bulkhead Wall Monitoring Point

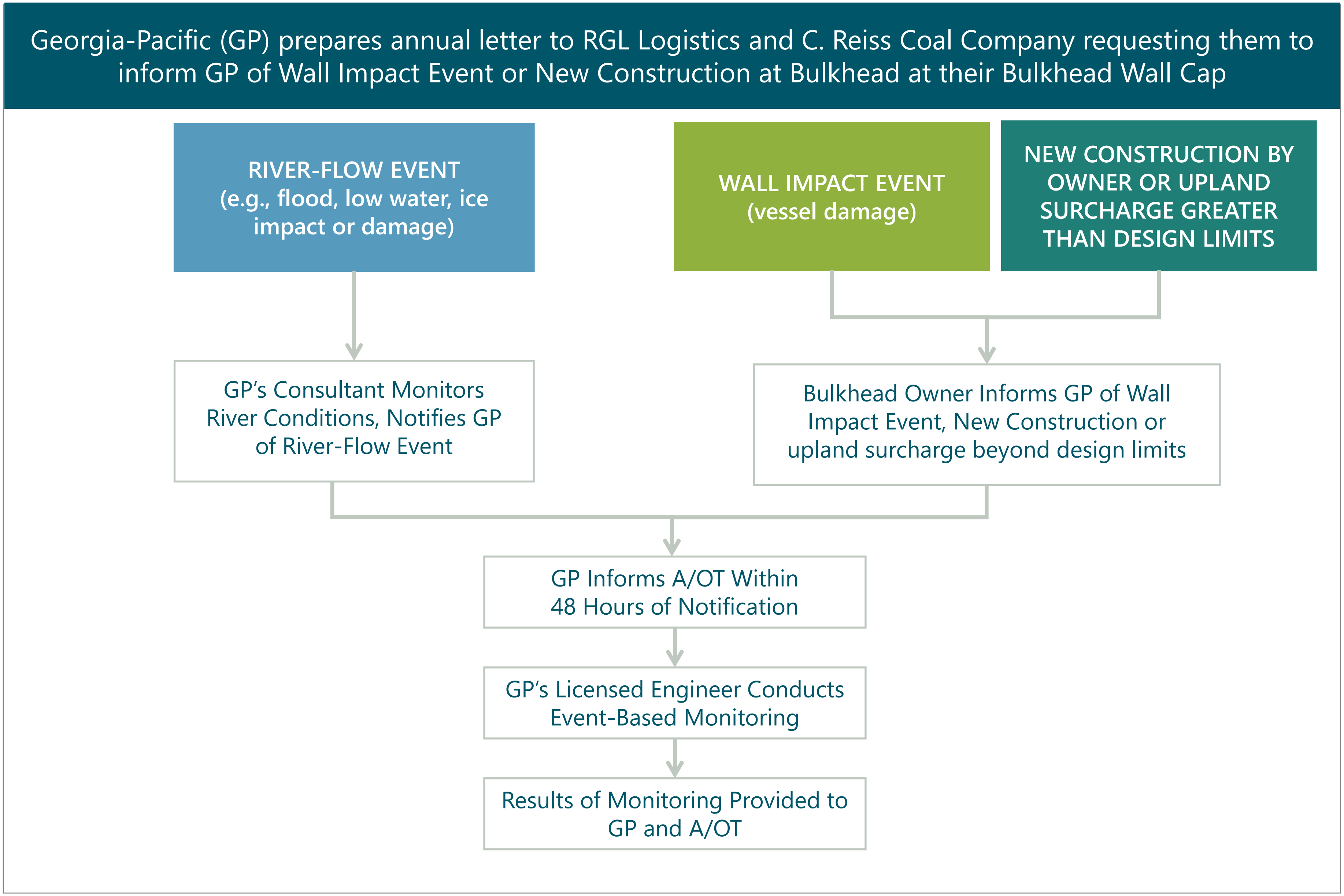
● Subsidence Monitoring Point

Publish Date: 2021/07/02 11:12 AM | User: dbinkney
Filepath: A:\Projects\Fox_River\Fox River\Georgia-Pacific Work\COMMP Review\COMMP\REV3 Updates (Fall-Winter 2020-2021)\archive\CAD\COMMP Figures Isopach and Subsidence Schematic.dwg Figure 1 - Subsidence Schematic

ANCHOR QEA

Figure 1
Subsidence Monitoring Schematic

Appendix B - RGL Slip and C. Reiss Terminal Bulkhead Monitoring Program Outline
Lower Fox River Cap, Operations, Maintenance and Monitoring Plan



Georgia-Pacific (GP) prepares annual letter to RGL Logistics and C. Reiss Coal Company requesting them to inform GP of Wall Impact Event or New Construction at Bulkhead at their Bulkhead Wall Cap

RIVER-FLOW EVENT
(e.g., flood, low water, ice impact or damage)

WALL IMPACT EVENT
(vessel damage)

NEW CONSTRUCTION BY OWNER OR UPLAND SURCHARGE GREATER THAN DESIGN LIMITS

GP's Consultant Monitors River Conditions, Notifies GP of River-Flow Event

Bulkhead Owner Informs GP of Wall Impact Event, New Construction or upland surcharge beyond design limits

GP Informs A/OT Within 48 Hours of Notification

GP's Licensed Engineer Conducts Event-Based Monitoring

Results of Monitoring Provided to GP and A/OT

Filepath: \\athena\Amesbury\Projects\Fox_River\Fox River\Georgia-Pacific Work\COMMP Review\COMMP\REV3 Updates (Fall-Winter 2020-2021)\COMMP Figs - Appendices\Figures

Figure 2

Event-Based Monitoring Communication Flow Chart

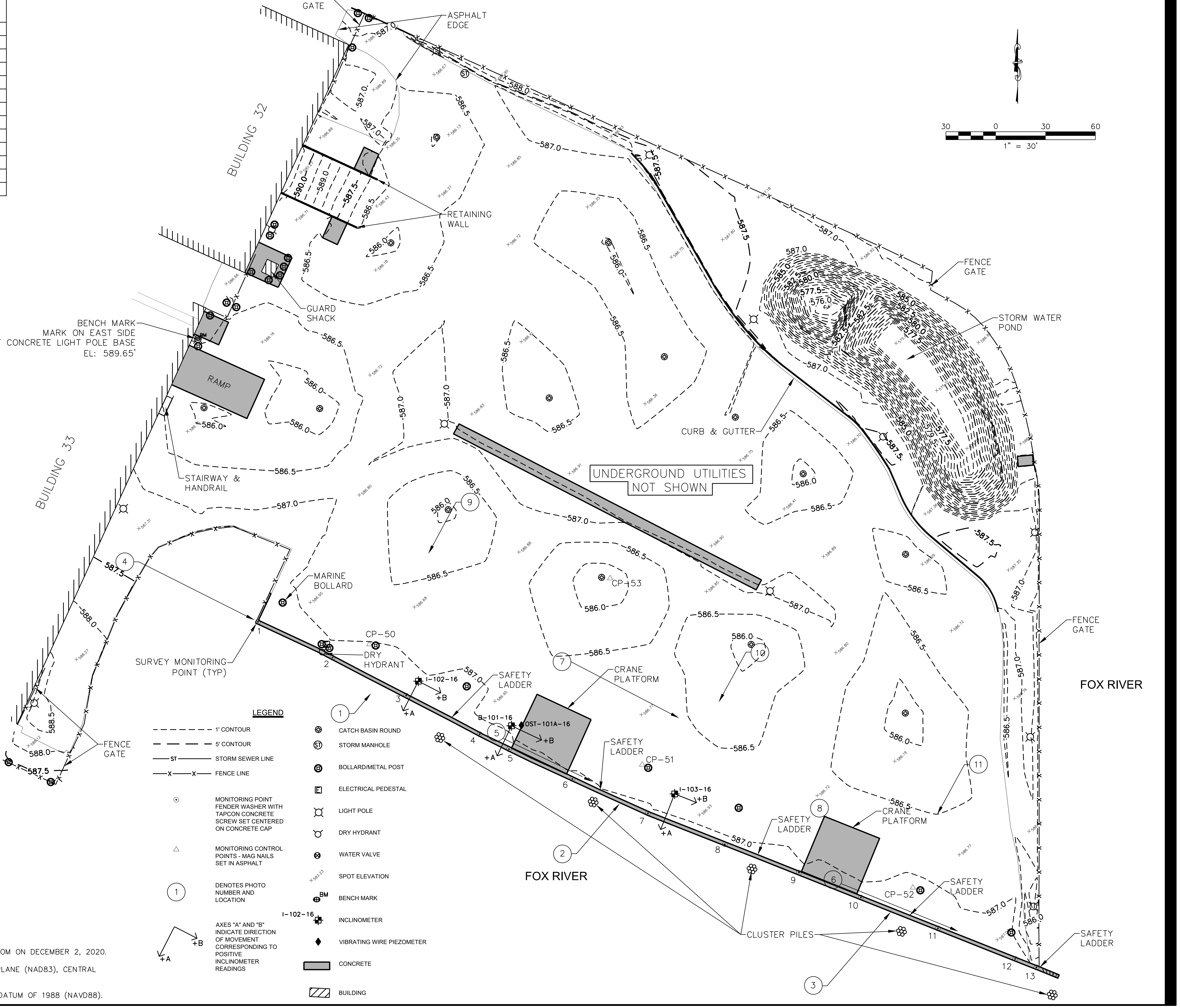
Cap Operations, Maintenance and Monitoring Plan - Appendix B – RGL and C. Reiss Terminal Bulkhead Monitoring Program Outline

Lower Fox River Remediation

ATTACHMENT 1

RGL SLIP MONITORING DRAWING

Baseline Monuments - December 2, 2020			
	Northing	Easting	NAVD88 Elevation
MON 1	248497.014	2483273.349	587.066
MON 2	248475.469	2483318.3	587.065
MON 3	248452.667	2483362.59	587.081
MON 4	248429.395	2483406.831	587.075
MON 5	248420.384	2483424.505	587.042
MON 6	248402.426	2483462.665	587.034
MON 7	248381.758	2483508.164	587.04
MON 8	248363.119	2483554.437	587.048
MON 9	248346.096	2483599.087	587.075
MON 10	248331.014	2483636.353	587.074
MON 11	248312.469	2483682.765	587.077
MON 12	248294.052	2483729.271	587.099
MON 13	248288.991	2483742.035	587.084



LEGEND

- - - - - 1' CONTOUR

— — — 5' CONTOUR

——ST—— STORM SEWER LINE

——X——X—— FENCE LINE

⊙ MONITORING POINT FENDER WASHER WITH TAPCON CONCRETE SCREW SET CENTERED ON CONCRETE CAP

△ MONITORING CONTROL POINTS - MAG NAILS SET IN ASPHALT

① DENOTES PHOTO NUMBER AND LOCATION

+A +B AXES "A" AND "B" INDICATE DIRECTION OF MOVEMENT CORRESPONDING TO POSITIVE INCLINOMETER READINGS

⊕ CATCH BASIN ROUND

Ⓢ STORM MANHOLE

⊚ BOLLARD/METAL POST

E ELECTRICAL PEDESTAL

¤ LIGHT POLE

Ծ DRY HYDRANT

⊗ WATER VALVE

×583.23 SPOT ELEVATION

⊕BM BENCH MARK

I-102-16 ✚ INCLINOMETER

◆ VIBRATING WIRE PIEZOMETER

▭ CONCRETE

▨ BUILDING

TO OBTAIN LOCATIONS OF PARTICIPANTS UNDERGROUND FACILITIES BEFORE YOU DIG IN WISCONSIN

CALL DIGGERS HOTLINE
1-800-242-8511
TOLL FREE

WIS STATUTE 182.0175(1974)

"THE INFORMATION SHOWN ON THIS DRAWING CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO."

NOTES:

1. MONITORING POINT BASELINE SURVEY PERFORMED BY AECOM ON DECEMBER 2, 2020.
2. HORIZONTAL COORDINATES BASED ON WISCONSIN STATE PLANE (NAD83), CENTRAL ZONE.
3. VERTICAL DATUM BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

Last saved by: DESROCHERSR(2021-02-09) Last Plotted: 2021-02-09
Filename: K:\PROJECTS\60607084_RGL AND REISS COMMP\900_CAD_GIS\RGL\MONITORING POINTS_12-2-2020.DWG

Project Management Initials: Designer: ____ Checked: ____ Approved: ____

ANSI D 22" x 34"

AECOM

PROJECT

CONCRETE CAP
MONITORING

CLIENT

RGL LOGISTICS
1401 State Street
Green Bay, Wisconsin 54304
920.432.8632 tel
www.rgllogistics.com

CONSULTANT

AECOM Green Bay
2985 South Ridge Road
Suite B
Green Bay, Wisconsin 54304
920.468.1978 tel 920.468.3212 fax
www.aecom.com

REGISTRATION

ISSUE/REVISION

A	12/02/2020	BASELINE SURVEY
I/R	DATE	DESCRIPTION

KEY PLAN

SHEET TITLE

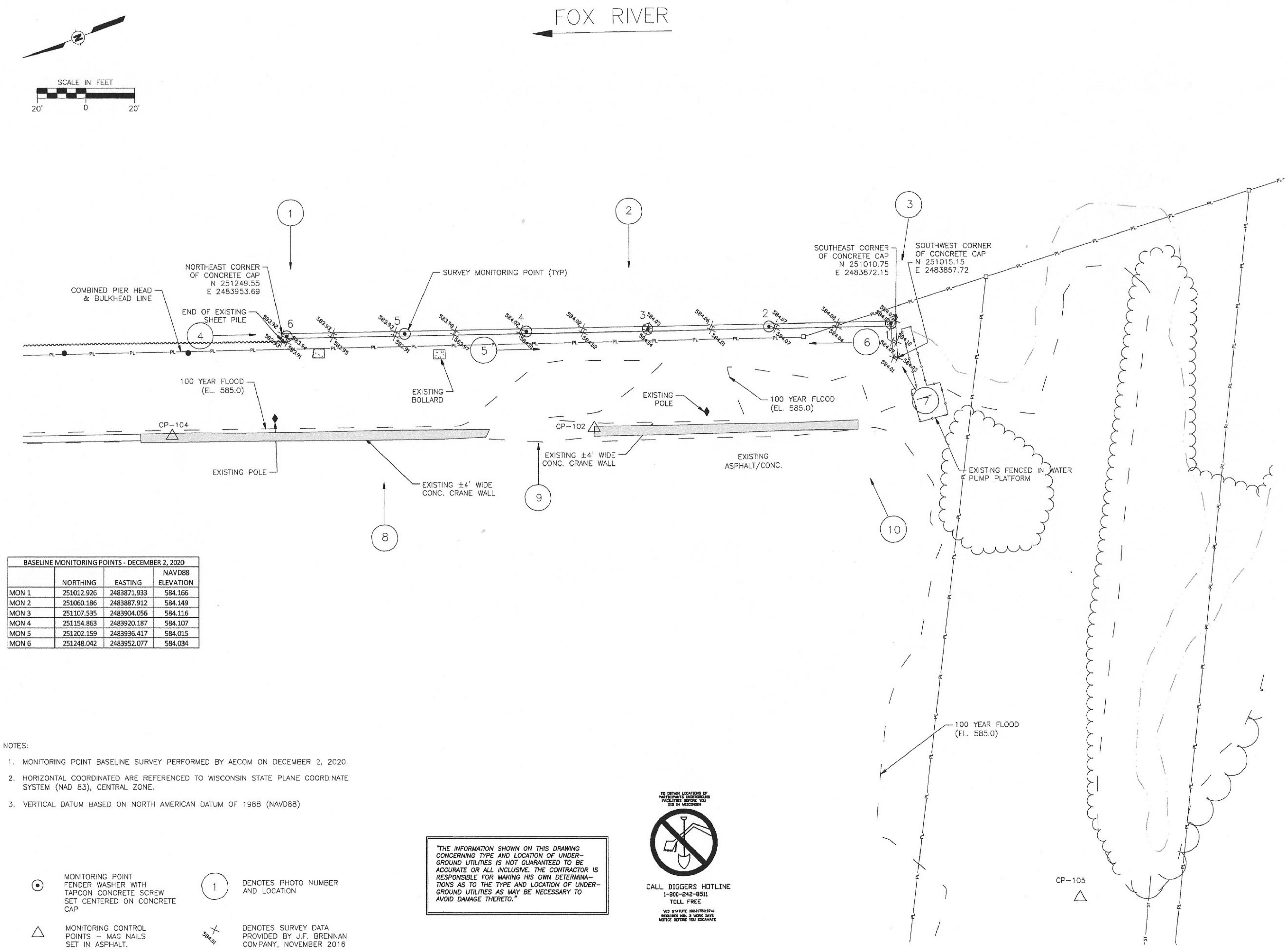
EXISTING CONDITIONS

SHEET NUMBER

RC-1

ATTACHMENT 2
C. REISS TERMINAL MONITORING DRAWING

Filename: K:\PROJECTS\60607084_RGL AND REISS COMMP\900_CAD_GIS\C. REISS\C. REISS_MONITORING POINTS_12-2-2020.DWG Last saved by: DESROCHERSR Last Plotted: 2020-12-10 Project Management Initials: Designer: ____ Checked: ____ Approved: ____ ANSI D 22" x 34"



BASELINE MONITORING POINTS - DECEMBER 2, 2020			
	NORTHING	EASTING	NAVD88 ELEVATION
MON 1	251012.926	2483871.933	584.166
MON 2	251060.186	2483887.912	584.149
MON 3	251107.535	2483904.056	584.116
MON 4	251154.863	2483920.187	584.107
MON 5	251202.159	2483936.417	584.015
MON 6	251248.042	2483952.077	584.034

NOTES:

1. MONITORING POINT BASELINE SURVEY PERFORMED BY AECOM ON DECEMBER 2, 2020.
2. HORIZONTAL COORDINATED ARE REFERENCED TO WISCONSIN STATE PLANE COORDINATE SYSTEM (NAD 83), CENTRAL ZONE.
3. VERTICAL DATUM BASED ON NORTH AMERICAN DATUM OF 1988 (NAVD88)

⊙	MONITORING POINT FENDER WASHER WITH TAPCON CONCRETE SCREW SET CENTERED ON CONCRETE CAP
△	MONITORING CONTROL POINTS - MAG NAILS SET IN ASPHALT.
①	DENOTES PHOTO NUMBER AND LOCATION
× 584.01	DENOTES SURVEY DATA PROVIDED BY J.F. BRENNAN COMPANY, NOVEMBER 2016

"THE INFORMATION SHOWN ON THIS DRAWING CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO."

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TOLL FREE

WIS STATUTE 182.0175(1974)
REQUIRES MIN. 3 WORK DAYS
NOTICE BEFORE YOU EXCAVATE

AECOM

PROJECT
South Concrete Cap Monitoring

CLIENT
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Green Bay, WI 54303

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AECOM
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Suite B
Green Bay, WI 54304
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(920) 468-3312 fax
www.aecom.com

DAVID A. ATKINS
E-30459
GREEN BAY, WI

David A. Atkins

REGISTRATION 12-10-2020

ISSUE/REVISION

1	12/10/2020	BASELINE SURVEY
I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER
60607084

SHEET TITLE
EXISTING SITE PLAN

SHEET NUMBER
FIG-1

ATTACHMENT 3

BULKHEAD MONITORING TECHNICAL MEMORANDUM

AECOM
2985 South Ridge Road, Suite B
Green Bay, WI 54304
aecom.com

Project name: Lower Fox River Remediation Cap Operations, Maintenance and Monitoring Plan Revisions

To: George Berken (Boldt), Gary Kincaid (Wisconsin Department of Natural Resources)

AECOM Project No.: 60607084

From: Jeremy Thomas and David Atkins (AECOM)

CC: Paul Montney (Georgia-Pacific), Paul LaRosa and Dan Binkney (Anchor QEA, LLC)

Date:
May 7, 2021

Technical Memorandum

Executive Summary

As part of the Fox River remediation project, bulkhead walls were installed at two locations (RGL Logistics Slip [RGL] and C. Reiss Terminal [C. Reiss]) in order to provide structural support for dredging operations within the Fox River adjacent to the walls. The bulkhead walls should also prevent the release of polychlorinated biphenyl (PCB)-contaminated sediment remaining in place behind the walls.

Following construction, the RGL bulkhead wall was monitored using slope inclinometers in 2016 and 2017; the results of that monitoring were within the +/- 0.5-inch performance expectations. Measured movement of the RGL bulkhead wall has consistently been away from the slip (i.e., towards the upland) at all three inclinometers, and with the exception of a reading on April 7, 2017, that was collected following removal of a large upland stockpile from the site between September and December 2016 (GEI 2017b), all recorded readings are less than the anticipated seasonal and annual movement threshold of +/- 0.5 inch for typical riverside bulkhead walls that experience fluctuating water levels. Based on these results, inclinometer monitoring was suspended in 2017 at the recommendation of the design engineer (GEI 2017a, 2017b).[1]

Extensive site improvements were completed at RGL in 2019. These improvements included raising site grades, driving H-piles, constructing reinforced concrete crane support platforms, and paving. The inclinometers and piezometers were preserved as part of the site improvements; however, as noted below, we believe the inclinometers were disturbed during construction.

---

[1] Note: The A/OT were not notified when this required monitoring was suspended by the responsible parties (RPs) and did not approve any changes to the Cap Operations, Maintenance and Monitoring Plan (COMMP).

Following discussions with the Agencies/Oversight Team (A/OT), additional inclinometer readings were collected from RGL on November 13, 2020 and compared to the baseline results collected following construction of the bulkhead wall on August 2, 2016. We believe the November 2020 readings indicate that the inclinometers were disturbed by the 2019 improvement activities at the site and that the 2016 baseline readings for the inclinometers are no longer valid. The disturbance of the inclinometers is evidenced by large magnitudes of movement perpendicular to the slip and large movements measured parallel to the slip which were not previously observed. We believe some movement of the wall perpendicular to the slip may have occurred during construction due to the change in loading conditions during construction. However, the magnitude of movement, especially in the direction parallel to the slip, do not make sense when considering the physical impact construction activities would have on the overall structure. The large movement parallel to the slip is an indication that the instruments themselves were disturbed during construction. Therefore, it is the opinion of AECOM that the 2020 measurements in the parallel and perpendicular directions are unreliable.

In response to the unexpected inclinometer readings from November 2020, the following readings will be collected moving forward: four additional sets of readings will be collected from the three inclinometers in 2021 (targeted for March, June, September, and December); one reading will be collected from the three inclinometers in the fourth quarter of 2022; and one reading will be collected from the three inclinometers every 5 years thereafter. These reading will use the November 2020 data set as the new baseline for future inclinometer monitoring as proposed in the forthcoming Lower Fox River Cap Operations, Maintenance and Monitoring Plan (COMMP) Revision 3. The frequency of collecting readings will be evaluated in collaboration with the A/OT based on the results obtained and may be decreased after the initial five readings are completed, however, a minimum of one five-year event (2027) would be required prior to considering a decreased frequency request.

Inclinometers were not installed at C. Reiss following construction of the bulkhead wall. However, the contractor responsible for constructing the bulkhead, J.F. Brennan Company (Brennan), performed a survey of the bulkhead cap immediately after the completion of the project, in 2016. The A/OT requested that comparisons be made between future topographic survey readings of the C. Reiss bulkhead wall monitoring points that were installed in 2020 and the Brennan 2016 post-construction data set to see if any conclusions can be made. AECOM has reviewed the 2016 Brennan data set versus the 2020 monitoring locations, and although a good faith attempt was made to align the 2020 monitoring points with the 2016 Brennan coordinates, they do not match up perfectly. The AECOM Survey Chief has concluded that because those points do not align perfectly, making comparisons between future readings versus the 2016 coordinates is not viable or useful to the monitoring program.

Introduction

This document has been prepared by AECOM to document the rationale and justification for proposed monitoring of bulkhead walls at two sites: RGL and C. Reiss. In addition, this memorandum includes proposed measurable metrics for routine monitoring of movement of the walls that would trigger additional response actions and proposes what those additional monitoring or response actions should be, if required.

This document is intended to supersede recommendations from AECOM regarding the bulkhead wall monitoring as documented in the AECOM memorandum titled “Proposed C. Reiss Bulkhead Wall Monitoring Program Outline” and dated March 17, 2017. The recommendations from 2017 were incorporated in the Lower Fox River Cap Operations, Maintenance and Monitoring Plan (COMMP) Revision 2. Pending approval from the Agencies/Oversight Team (A/OT), the content of this document will be incorporated into the forthcoming Revision 3 of the COMMP.

Bulkhead Monitoring Completed to Date

RGL Logistics

An improved RGL bulkhead wall was initially installed in 2015 by J.F. Brennan (Brennan), the remedial construction contractor, in order to provide structural support for dredging operation within the Fox River adjacent to the wall. The design for the bulkhead wall at RGL involved installation of a new wall approximately 2 feet in front of the existing bulkhead wall, which left approximately 220 cubic yards of polychlorinated biphenyl (PCB)-contaminated sediment, including some sediment greater than 50 parts per million (ppm) remaining between the new and old bulkhead walls that could not be removed. Because of the remaining PCB contamination between the two walls, the new bulkhead wall was categorized as a "cap" and therefore are subject to long-term cap monitoring. The bulkhead wall should prevent the potential release of Toxic Substances Control Act (TSCA) and non-TSCA PCB-contaminated sediment, which was not fully removed during the remedial construction phase.

In 2016, the newly installed bulkhead wall at RGL experienced excessive deflection of the wall towards the slip as a result of surcharge loading behind the wall that exceeded the design allowance. GEI Consultants (GEI) was hired by Brennan to design a repair for the wall, which was implemented in 2016. Following these repairs, a period of intensive monitoring of the wall was performed by GEI using geotechnical instrumentation, including three inclinometers (depicted on Figure 1) and four piezometers along the wall during and after dredging in the adjacent slip (between August and mid-December 2016, or for 3 months following completion of dredging). Five rounds of inclinometer readings between August and April 2017 were compared to a baseline reading taken on August 2, 2016.

The results of the initial period of monitoring are described in a March 14, 2017, letter from GEI to Brennan, which is included as Attachment 1 to this memorandum. The March letter was followed by a second letter from GEI to Brennan, dated June 30, 2017 (included as Attachment 2). Both letters included the following statement "*The measured movements through April 7, 2017 did not indicate or suggest any unexpected trends for wall performance, and in our opinion the wall system is performing in accordance with the design intent.*" (GEI 2017a, 2017b). In addition, both letters indicate that "*inclinometer and piezometer monitoring can be stopped*" (GEI 2017a, 2017b). These letters were not shared with the A/OT prior to discontinuing the monitoring specified in the COMMP Revision 2.

Plots of the inclinometer readings are attached to the March 14, 2017, letter and are referenced in the June 30, 2017, letter. The three inclinometers are identified as I-101, I-102, and I-103. Baseline inclinometer readings were collected on August 2, 2016. Subsequent readings were collected on August 31, 2016; September 7, 2016; September 19, 2016; December 12, 2016; and April 7, 2017. Movement was measured along two axes perpendicular to and parallel to the bulkhead wall, identified as A and B, respectively. Movement has consistently been away from the slip (i.e., toward the upland) at all three inclinometers.

The recorded approximate measurements, relative to the baseline are included in Tables 1a and 1b. Table 1a shows the deflection at grade, while Table 1b shows the maximum deflection and the depth below grade at which that deflection was measured. A negative value at Measurement Axis A indicates movement away from the slip (toward the upland), whereas a positive value indicates movement toward the slip. A positive value at Measurement Axis B indicates movement away from the river (toward the west), whereas a positive value indicates movement toward the river (toward the east). The positive direction of Axis A and Axis B is shown at each inclinometer on the site plan attached to this Technical Memorandum.

Table 1a—Deflection at Grade Relative to 8/2/2016 Baseline

Inclinometer ID	Measurement Axis	Inclinometer Deflection [inches] [a]				
		Date of Inclinometer Reading				
		8/31/2016	9/7/2016	9/19/2016	12/12/2016	4/7/2017
I-101	A	0	0	0	-0.2	-0.25
	B	0	0	0	-0.2	-0.375
I-102	A	0	0	0	-0.25	-0.25
	B	0	0	0	-0.125	-0.25
I-103	A	0	0	0	-0.5	-0.75
	B	0	0	0	0	0

a. Deflection is reported relative to the baseline reading on August 2, 2016

Table 1b—Maximum Deflection Relative to 8/2/2016 Baseline

Inclinometer ID	Measurement Axis	Inclinometer Deflection [inches] and Depth Below Grade Where Measured [feet] [a]				
		Date of Inclinometer Reading				
		8/31/2016	9/7/2016	9/19/2016	12/12/2016	4/7/2017
I-101	A	0	0	0	-0.2, 0	-0.25, 0
	B	0	0	0	-0.2, 0	-0.375, 0
I-102	A	0	0	0	-0.25, 0	-0.25, 0
	B	0	0	0	-0.125, 0	-0.25, 0
I-103	A	0	0	0.125, 36	-0.5, 0	-0.75, 0
	B	0	0	0	+0.125, 42	+0.125, 42

a. Deflection is reported relative to the baseline reading on August 2, 2016

Small (+/-0.5 inch) seasonal and annual movements of riverside bulkhead walls are to be expected due to fluctuations in the water table on the land side of the bulkhead and variation in the river level on the water side. Except for the April 7, 2017 reading at I-103, all recorded readings show less than this anticipated amount of movement. According to GEI, the larger movements at I-103 shown in the April 7, 2017, reading resulted from an upland large stockpile being removed from the site between September and December 2016 (GEI 2017b). AECOM agrees that these inclinometer readings indicate no unexpected trends in wall movement and that the wall is performing as expected.

Extensive site improvements completed at RGL in 2019 included raising site grades, driving H-piles, constructing reinforced concrete crane support platforms, and paving. Although the inclinometers and piezometers were preserved as part of the site improvements project, we believe the inclinometers were disturbed during construction. GEI collected an additional round of inclinometer readings at RGL on November 13, 2020. A letter provided to AECOM from GEI, dated November 25, 2020, including plots of the inclinometer readings is included with this memorandum as Attachment 3. Figure 1 extracted from the letter depicts the as-built locations of the inclinometers and piezometer located at the RGL site. Figures 2 through 4, also extracted from the November 25, 2020 letter depict the 2020 readings compared to 2016 results at each of the three inclinometers and axes of measurement.

A summary of recorded approximate measurements of the deflection of the inclinometers, relative to the August 2, 2016 baseline, are included in Tables 2a and 2b. Table 2a shows the deflection at grade, while Table 2b shows the maximum deflection and the depth below grade at which that deflection was measured.

Table 2a—Deflection at Grade Relative to 8/2/2016 Baseline

Inclinometer ID	Measurement Axis	Inclinometer Deflection [inches] [a]
		Date of Inclinometer Reading
		11/13/2020
I-101	A	+0.25
	B	-1.25
I-102	A	-2.0
	B	+1.25
I-103	A	0
	B	+1.5

a. Deflection is reported relative to the baseline readings of August 2, 2016; positive values for Measurement Axis A indicate movement toward the slip, and negative indicates movement away from the slip (toward the upland); positive values for Measurement Axis B indicate movement toward the river (toward the east), and negative indicates movement away from the river (toward the west)

b. Table 2b—Maximum Deflection Relative to 8/2/2016 Baseline

Inclinometer ID	Measurement Axis	Inclinometer Deflection [inches] and Depth Below Grade Where Measured [feet] [a]
		Date of Inclinometer Reading
		11/13/2020
I-101	A	-0.5, 18
	B	-1.25, 0
I-102	A	-2.0, 0
	B	+1.25, 50
I-103	A	+0.625, 36
	B	+1.5, 0

a. Deflection is reported relative to the baseline readings of August 2, 2016; positive values for Measurement Axis A indicate movement toward the slip, and negative indicates movement away from the slip (toward the upland); positive values for Measurement Axis B indicate movement toward the river (toward the east), and negative indicates movement away from the river (toward the west)

The 2020 inclinometer readings show deviations from the pre-2017 data. Based on the direction and magnitude of movements, it is our opinion that the inclinometers have been disturbed by the 2019 construction activities at the site and are not currently representative of the movement that has occurred in the bulkhead. Full depth readings of the inclinometers were possible; however, it does appear that significant disturbance has occurred, and the original baseline readings are no longer representative of the conditions at the site. Therefore, as described in the Proposed Bulkhead Monitoring Plan in the following section below, four additional readings will be completed at the three inclinometers in 2021 (targeted for March, June, September, and December) and one additional reading in the fourth quarter of 2022 using the November 2020 data set as the new baseline.

C. Reiss Terminal

An improved C. Reiss bulkhead wall was installed in 2016 by Brennan, the remedial construction contractor, in order to provide structural support for dredging operation within the Fox River adjacent to the wall. The design for the bulkhead wall at C. Reiss involved installation of a new wall in front of the existing, heavily deteriorated, timber bulkhead wall, which left approximately 110 cubic yards of PCB-contaminated sediment (all less than 50 ppm) remaining between the new and old bulkhead walls that could not be fully removed. Because of the remaining PCB contamination between the two walls, the new bulkhead wall was categorized as a “cap”.

Post-construction survey data points on the top of this new wall were established by Brennan on November 17, 2016. These points are at approximately 25 feet on center. The location of each point, in both the horizontal and the vertical planes, was surveyed by Brennan. The data set was sent to AECOM. Another set of data points was collected in 2020, as described in the Proposed Bulkhead Monitoring Plan in the following section. The points are depicted on Attachment 5, a drawing which includes the survey points and monitoring locations for C. Reiss. AECOM reviewed the 2016 Brennan data set versus the 2020 data set, and although a good faith attempt was made to align the 2020 monitoring points with the 2016 Brennan coordinates, they do not match up perfectly. The AECOM Survey Chief has concluded that because those points do not align perfectly, making comparisons between future readings versus the 2016 coordinates is not viable or useful to the monitoring program. In the future, the new 2020 data set will be used as the baseline. The 2020 data set will provide the most repeatability for readings because they are installed permanently and are clearly marked on the top of the wall.

Ongoing monitoring of the C. Reiss bulkhead wall was proposed by AECOM in a memorandum dated March 14, 2017 (included as Attachment 1). This monitoring plan proposed for the C. Reiss wall was adopted as the basis of the COMMP Revision 2 Appendix B, which was applicable to both the C. Reiss and RGL bulkheads. However, monitoring following construction was not completed at C. Reiss.

Proposed Bulkhead Monitoring Plan

The bulkhead walls at RGL and C. Reiss, which are the subject of this memorandum are expected to prevent the potential release of PCB-contaminated sediment, which is encapsulated by the bulkhead walls, into the river. A bulkhead monitoring plan cannot consist simply of standard bulkhead wall monitoring but must provide a reasonable degree of confidence that contaminated sediment is not being released through the wall.

AECOM developed this recommended bulkhead monitoring program for both the RGL and C. Reiss bulkhead walls based on the results of monitoring completed at RGL to date, the guidelines set forth in Engineer Manual (EM) 1110-2-6054 (*Inspection, Evaluation and Repair of Hydraulic Steel Structures*; USACE 2001) and Engineer Regulation (ER) 1110-2-100 (*Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures*; USACE 1995), and our professional experience with similar bulkhead wall installations. As mentioned in the previous section, small (+/-0.5 inch) seasonal and annual movements of riverside bulkhead walls are to be expected due to fluctuations in the water table on the land side of the bulkhead and variation in the river level on the water side. Sophisticated geotechnical instrumentation (such as inclinometers) can be used to capture these movements. When monitoring a bulkhead in the long-term, attention should be placed instead on large movements (i.e., more than 1-inch) and unexpected physical changes (i.e., concrete cracking and ground settlement) because these are indications of potential wall failure. Geotechnical instrumentation is not normally required to detect large movements and changes; they can be detected through regular visual observation and a program of surveying points along the bulkhead.

AECOM therefore has installed stamped, non-corroding washers to the top of each of the two bulkhead walls with stainless-steel screws. Each washer was stamped with a unique identification number for recording and tracking results over time. The washers were installed approximately 50 feet on center along the top of the RGL and C. Reiss walls. The washers at the C. Reiss wall were located as close as possible to the survey locations established by Brennan in 2016. Routine and event-based monitoring will use the washers as survey monitoring points to monitor movement of the walls over time and will reference a threshold of 1.0-inch in either direction (towards the land or river) when compared to the 2020 baseline.

Periodic readings of the inclinometers at RGL will be completed in 2021. Four readings in 2021 (targeted for March, June, September, and December) and one additional reading in the fourth quarter of 2022 will be completed, and the data will be compared to a new baseline of the November 2020 data. Movement along the length of the inclinometer will be evaluated to confirm that the wall remains within the tolerable threshold value (see Section titled “Wall Movement Thresholds”). Routine inclinometer readings will continue every 5 years after 2022 during routine long term cap monitoring events.

Routine Monitoring of Bulkhead Walls

The routine monitoring of the RGL and C. Reiss bulkhead walls will consist of three primary components:

- Visual monitoring with date-stamped photographs, with special attention paid to unanticipated changes such as concrete cracking and ground settlement
- Topographic surveying to measure deflection of walls over time, using the installed washers as reference points and measurements of wall elevations versus the adjacent upland elevation
- The RGL bulkhead wall will include routine inclinometer readings.

Visual Monitoring

Visual monitoring will include land-side observations and photographs at select locations of the bulkheads for the following:

- Horizontal and vertical alignment—new bulging of the wall toward the river would indicate potentially undesirable movement
- Cracks in the concrete wall cap—although hairline cracks are to be expected as the result of concrete shrinkage, cracks larger than approximately 0.125 inch in width would indicate potentially undesirable movement
- Subsidence behind the wall—observations of settlement combined with topographic surveying proposed in the following section would indicate potentially undesirable movement

Drawings that depict proposed locations for visual monitoring and photographs and the proposed locations for installation of permanent survey points (non-corroding washers) are included as Attachment 4 (RGL Monitoring locations) and Attachment 5 (C. Reiss Monitoring locations). A checklist will be referenced that is also included as Attachment 6.

Topographic Surveying

Topographic surveying of the bulkhead walls and uplands will include the following:

- Topographic surveying of monitoring points (i.e., installed washers)
- Measurements of the elevation difference between the concrete wall cap and the adjacent pavement or gravel upland surface at the installed washer monitoring point locations
- Subsidence behind the wall:
    - One-inch settlement of asphalt adjacent to the concrete cap at RGL would indicate potentially undesirable movement
    - Six-inch settlement of gravel backfill adjacent to the concrete cap at C. Reiss would indicate potentially undesirable movement or migration of backfill through the bulkhead.
    - Adjacent to each washer location on the cap, six data points, in a 5-foot by 5-foot grid, will be surveyed. The settlement at each data point, as well as the average of the six points, will be

presented in the memorandum or report to the A/OT. The 6-inch threshold is recommended based on site use at the C. Reiss property. Stormwater and traffic adjacent to the bulkhead could cause movement of the gravel surface but are not indicative of wall movements. The subsidence of the upland surface behind the wall will be analyzed in tandem with the horizontal movement of the survey points to evaluate the overall condition of the bulkhead structure. A schematic of the proposed grid of points is included as Figure 5.

Wall Movement Thresholds

As mentioned previously, seasonal and annual movements in the bulkhead of approximately +/- 1/2 inch are to be expected and are not typically a concern. Therefore, AECOM proposes that the threshold for additional monitoring (as described in the following section) should be when the cumulative bulkhead movement in either direction (toward the land side or toward the river) is greater than 1 inch when compared to the baseline set of readings collected in 2020. Each future monitoring summary report will document the results of the inclinometer readings at RGL.

Measurements of the elevation difference between the wall and the adjacent upland surface will be used to supplement the topographic surveying and visual observations. Differences in elevation on the order of 1-inch at RGL or 6-inches at C. Reiss would indicate potentially undesirable movement and could trigger additional monitoring based on collaborative discussions with the A/OT.

Additional Monitoring

If visual observations from the land side of the wall indicate movement may be occurring (e.g., depressions, tension cracks in the soil, or concrete cracking) or if movement of the bulkhead walls has been measured in excess of the previously described cumulative 1-inch threshold, Georgia-Pacific will evaluate the need for additional monitoring in collaboration with the A/OT. Additional monitoring or assessments may include the following:

- Geotechnical instrumentation monitoring
- Bathymetric surveying to identify scour of sediment below the level shown on the design drawings
- Steel sheet member thickness monitoring
- Increased/decreased frequency of monitoring
- Diver inspection
- No action

Frequency of Routine Bulkhead Wall Monitoring

The frequency of the bulkhead monitoring events will be aligned with the typical cap monitoring schedule; therefore, the first monitoring event will take place in 2020 and be considered the “Year 0” survey. The results of the Year 0 survey will be used as a baseline for comparison of future results. The next four monitoring events would occur in 2021 as the “Year 1” survey and then one additional survey in the fourth quarter of 2022 as the “Year 2” survey. Following the Year 2 survey in 2022, monitoring would occur every 5 years for the balance of the program (e.g., 2027, 2032).

Each future monitoring summary report will document and evaluate the results of the inclinometer readings (at RGL) and the visual monitoring and topographic surveying at each site.

References

GEI (GEI Consultants), 2017a. Letter to: Mike Binsfeld (J.F. Brennan Company, Inc.). Regarding: Completion of Repair and Monitoring of the RGL Holdings Bulkhead Wall on the Lower Fox River in Green Bay, Wisconsin. March 14, 2017.

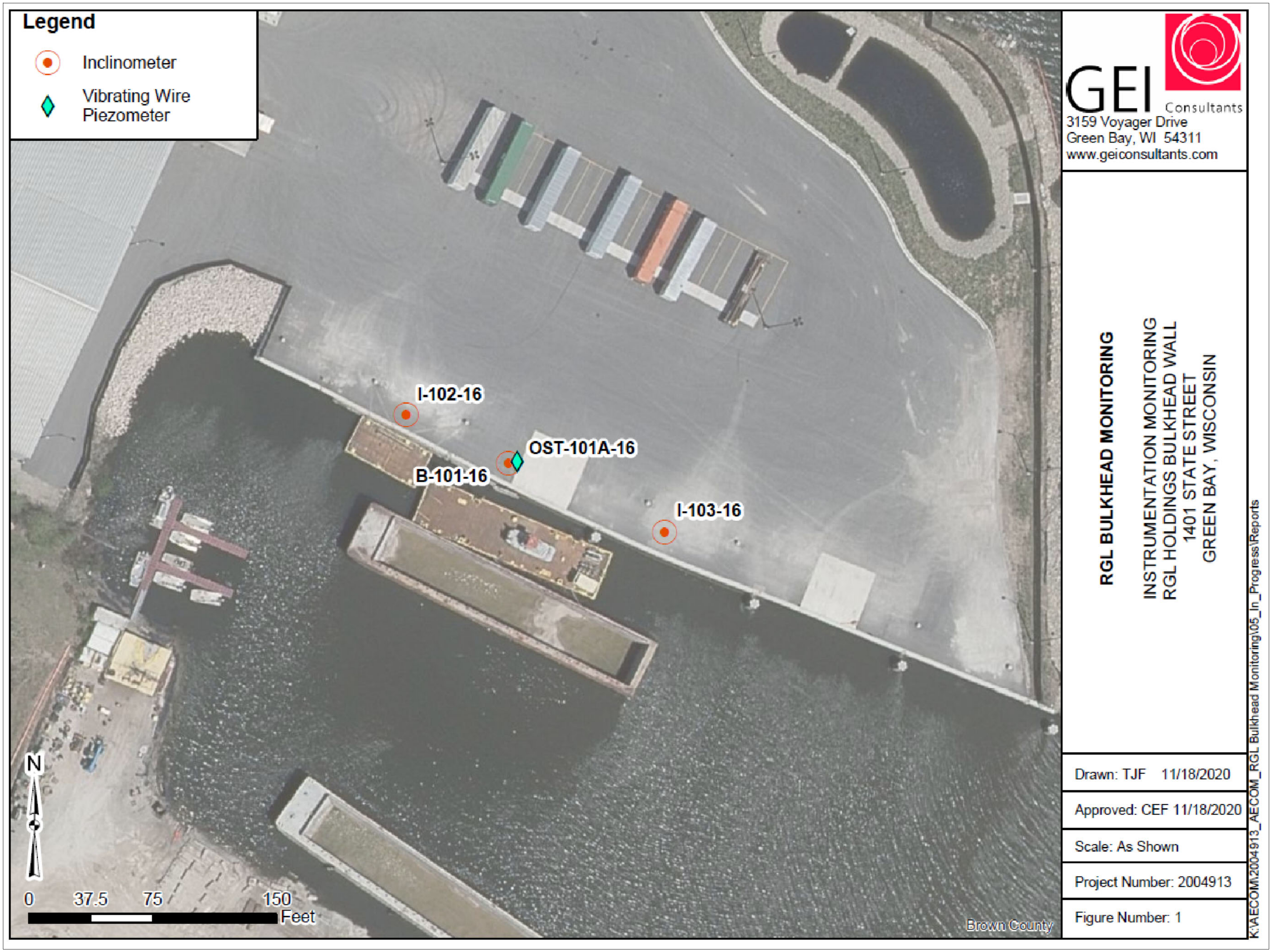
GEI, 2017b. Letter to: Mike Binsfeld (J.F. Brennan Company, Inc.). Regarding: Monitoring of the RGL Holdings Bulkhead Wall on the Lower Fox River in Green Bay, Wisconsin. June 30, 2017.

GEI, 2020. Letter to: Jeremy Thomas (AECOM). Regarding: Instrumentation Monitoring at RGL Holdings, Inc. Bulkhead Wall, RGL Holdings, Inc. 1401 State Street, Green Bay, Wisconsin. November 25, 2020.

USACE (U.S. Army Corps of Engineers), 1995. *Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures*. ER 1110-2-100. February 15, 1995.

USACE, 2001. *Inspection, Evaluation and Repair of Hydraulic Steel Structures*. EM 1110-2-6054. December 1, 2001.

Figures



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Filepath: A:\Projects\Fox_River\Fox River\Georgia-Pacific Work\COMMP Review\COMMP\Tech Memo for Bulkhead Monitoring\Revised (November 2020)\To GP (12-8-2020)\Figures\Figures.dwg Figure 1

Figure 1
RGL Holdings Slip - As-Built Locations of Monitoring Instruments

Bulkhead Monitoring Technical Memorandum
Lower Fox River Cap, Operations, Maintenance and Monitoring Plan

SOURCE: Figures extracted from GEI Letter to AECOM, dated November 25, 2020 Re: Instrumentation Monitoring at RGL Holdings, Inc. Bulkhead Wall.

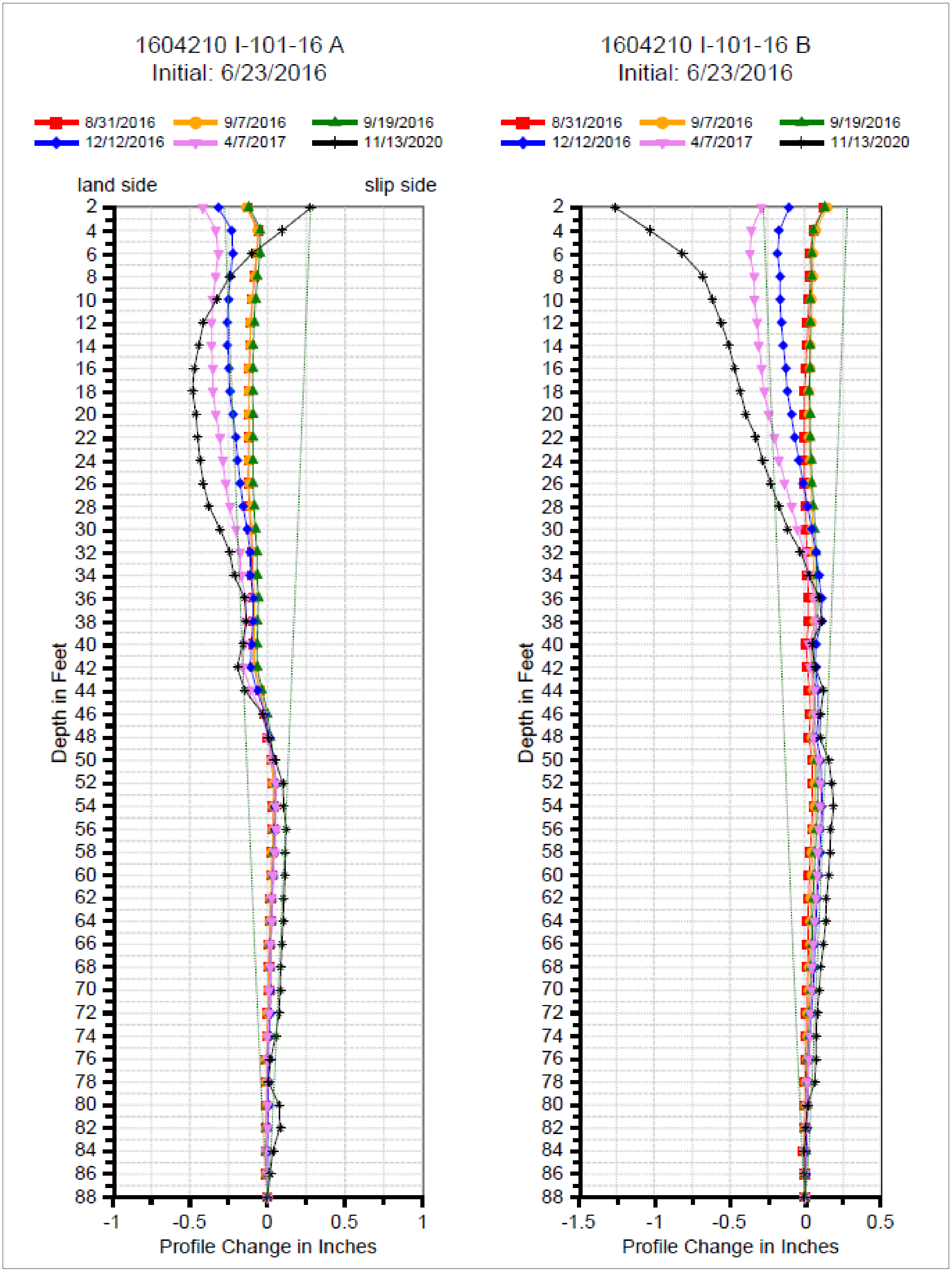

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Figure 2
RGL Holdings Slip - Inclinometer I-101 Results

Bulkhead Monitoring Technical Memorandum
Lower Fox River Cap, Operations, Maintenance and Monitoring Plan

SOURCE: Figures extracted from GEI Letter to AECOM, dated November 25, 2020 Re: Instrumentation Monitoring at RGL Holdings, Inc. Bulkhead Wall.

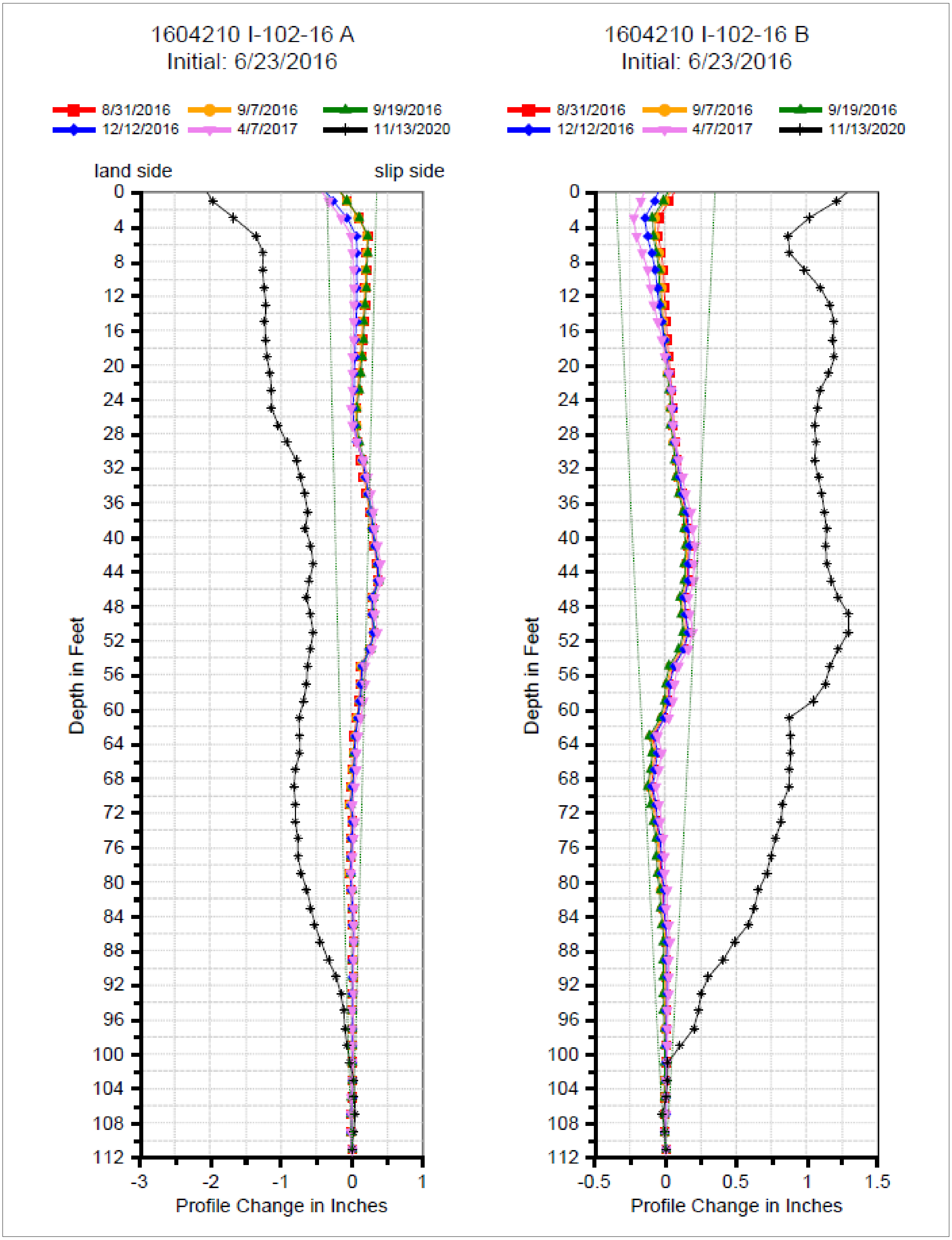

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Figure 3
RGL Holdings Slip - Inclinometer I-102 Results

Bulkhead Monitoring Technical Memorandum
Lower Fox River Cap, Operations, Maintenance and Monitoring Plan

SOURCE: Figures extracted from GEI Letter to AECOM, dated November 25, 2020 Re: Instrumentation Monitoring at RGL Holdings, Inc. Bulkhead Wall.

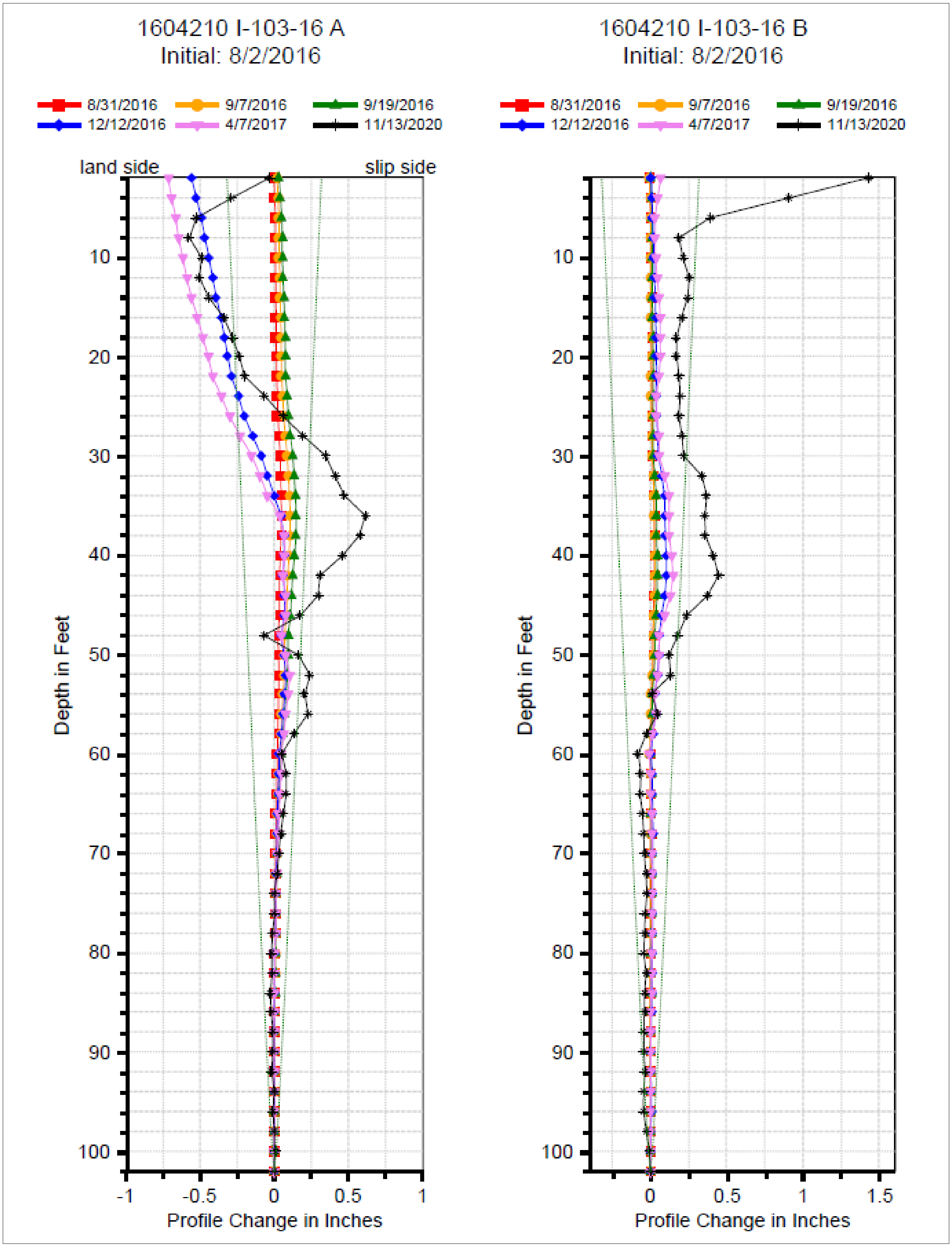

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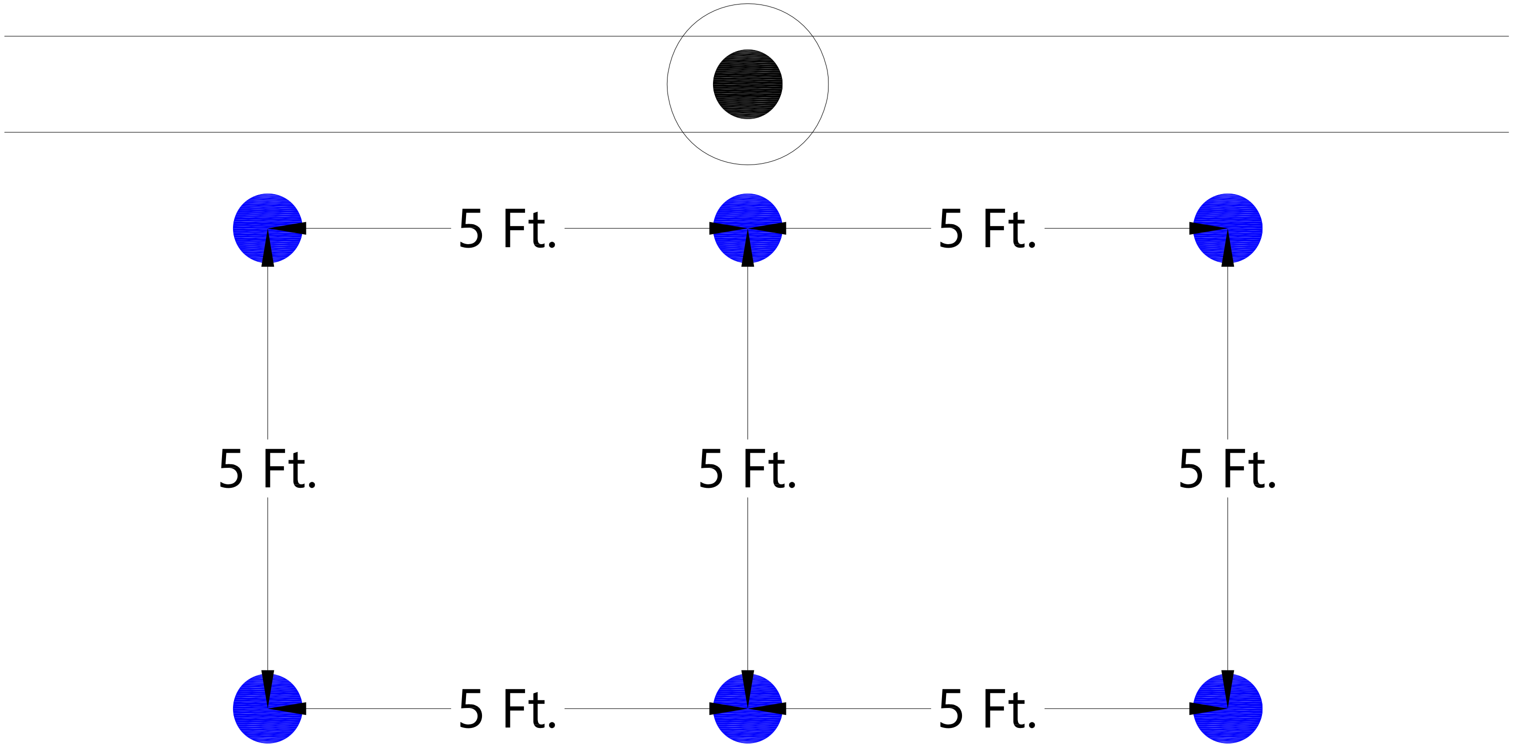
Figure 4
RGL Holdings Slip - Inclinometer I-103 Results

Bulkhead Monitoring Technical Memorandum
Lower Fox River Cap, Operations, Maintenance and Monitoring Plan

SOURCE: Figures extracted from GEI Letter to AECOM, dated November 25, 2020 Re: Instrumentation Monitoring at RGL Holdings, Inc. Bulkhead Wall.



NOTES:

1. This Figure is a schematic only, and representative of typical conditions. Actual conditions and alignments may vary.
2. Subsidence Monitoring Point adjacent to Bulkhead Wall Monitoring Point shall be as close as feasible to the wall edge to allow for surveying.

LEGEND:

═	Bulkhead Wall Cap
◉	Bulkhead Wall Monitoring Point
●	Subsidence Monitoring Point

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ANCHOR QEA

Figure 5
Subsidence Monitoring Schematic
Bulkhead Monitoring Technical Memorandum
Lower Fox River Cap, Operations, Maintenance and Monitoring Plan

Attachments

Attachment 1 – March 14, 2017 Letter

GEI Consultants

Consulting
Engineers and
Scientists

March 14, 2017
Project No. 1604210

VIA EMAIL: *mikebinsfeld@jfbrennan.com*

Mr. Mike Binsfeld
J.F. Brennan Company, Inc.
818 Bainbridge Street
La Crosse, Wisconsin 54603

Re: Completion of Repair and Monitoring of the RGL Holdings Bulkhead Wall on the Lower Fox River in Green Bay, Wisconsin

Dear Mr. Binsfeld,

The repairs to the damaged dock wall were completed in late July 2016 in accordance with our construction drawings, titled RGL Holdings Bulkhead Wall Rehabilitation, Revision 1, dated June 21, 2016, and subsequent design changes issued on sketches SK-1 through SK-5, with one exception. Sketch SK-5, Rev.1, issued on July 26, 2016, required locknuts to be installed on the tie rod ends along the front riverside dock wall. As we indicated when that sketch was issued, the locknuts are not required prior to dredging, but should be installed soon afterwards as the overall dock wall repairs are nearing completion. We understand that the locknuts will be installed when the wall fender system is installed later this year. Final as-built conditions were documented on our as-built drawings, dated March 8, 2017.

The following provides relevant design information for future reference during operations around the wall:

- The maximum uniform surface surcharge within 120 feet of the repaired wall is limited to 500 pounds per square foot (psf) (e.g., maximum of 4 feet of soil behind the wall).

- Refer to the Westbrook design drawings for the maximum surcharge behind the portion of the original wall that did not require 2016 repairs.

- The toe of any material stockpile with a contact pressure greater than 500 psf should be located at least 120 feet behind the wall. The height of the stockpile should be limited to a maximum of 30 feet, and the base width of the stockpile should not exceed 150 feet in the north-south direction. The cross section of the stockpile was assumed to be trapezoidal, and the material unit weight not to exceed 125 pounds per cubic foot.

- We recommend careful trafficking with heavy equipment (e.g., less than HS20-40 truck and heavier) in approximately the eastern half of the repaired area where the final grades are lower. Truck loading and equipment operation (e.g., excavations) should be done with caution to avoid potential damage to the tie rods. The soil cover over the tie rods in this area is approximately 18 inches. We suggest any cranes be placed on timber mats and the pressure under the mats should be no higher than 500 psf. The risk for damage under repetitive heavy traffic loads is higher particularly if the soil becomes wet, as the soil has an increased amount of fines, and is more susceptible to disturbance under traffic when wet.

Following completion of the wall in late July 2016, we continued to monitor the three inclinometers and four piezometers along the wall during and after dredging. Dredging was completed in mid-September. Our monitoring continued to mid-December, or three months after dredging. Plots of the inclinometer and piezometer readings are attached. The inclinometer readings are relative to a baseline on August 2, 2016, which is after the completion of the wall and prior to the start of dredging. With the exception of inclinometer I-103, the inclinometer readings indicate that the movement during and after dredging was within the tolerance envelope of the instrument. Note that the tolerance is shown as the two solid lines that start at the same point at the base of the plots, and diverge upward. The tolerance is a maximum at the ground surface of approximately ¼ inch, and decreases with increasing depth. The magnitude of movements within this envelope is considered negligible. The December reading at I-103 shows small wall movement toward land of approximately ½ inch at the top, and decreasing with depth. This movement is not unexpected and is reasonable because a large stockpile was at this location at the time of the prior reading on September 19, 2016, and had been removed prior to the December reading. In our opinion, the wall system is performing in accordance with the design intent.

On our design drawings, we specified that relatively frequent (monthly) instrumentation readings be done for three to four months after the dredging. This monitoring was intended to evaluate the performance of the wall relative to the dredging. This monitoring was completed showing the dredging did not cause problems with wall stability, based on our last readings in December 2016. Based on the negligible movements measured in the inclinometers through December 2016 and the performance of the wall at I-103 in response to the removal of the stockpile, it is our opinion that the monitoring can be stopped. If future visual observations behind the wall suggest movement may be occurring (e.g., depressions, tension cracks in the soil, etc.), additional readings should be made. If observations suggest additional readings may be appropriate, we can assist in establishing a monitoring frequency, action plan and provide interpretation of the results. All instruments should be protected from damage so they can be monitored in the future, if necessary.

Proposed vessel sizes and loads will be considered for the future design of a system to accommodate vessels docking at the wall. For large vessels, a system of pile clusters can be used to protect the wale and tie rods on the river side of the wall. To address smaller vessels, a lightweight fender system could be installed on the wall to protect the wale and tie rods.

If you have any questions, please feel free to contact us at 847-984-3401.

Sincerely,

GEI CONSULTANTS, INC.

William H. Walton

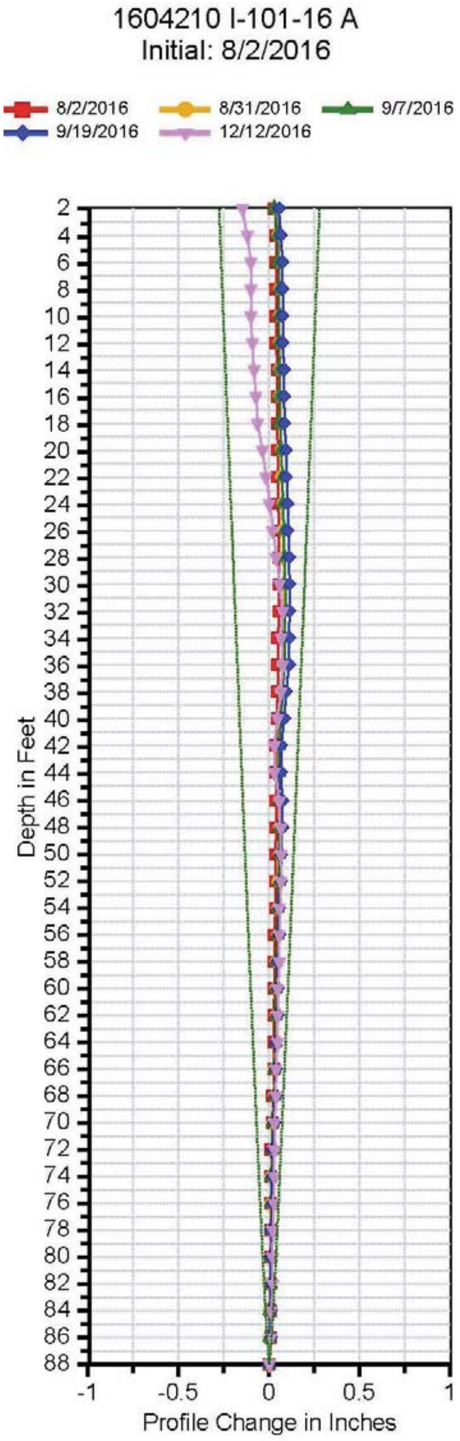
William H. Walton, P.E. (WI), S.E., F.ASCE
Senior Vice President

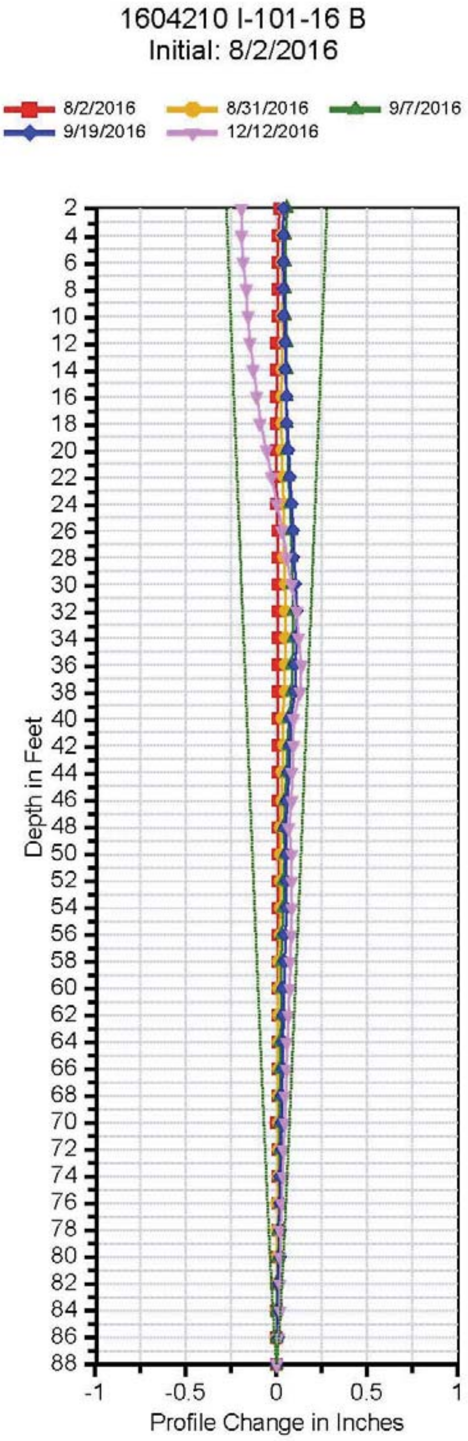
WILLIAM WALTON
30270
BARRINGTON, ILLINOIS
Exp. 7/31/18

Attachments: Inclinometer and Piezometer Results

GEI Consultants	**Client**	JF Brennan			**Page**	1 of 3
	Project	RGL Holdings Bulkhead Wall Rehabilitation			**Pg. Rev.**	
	By	C. Fritsch	**Chk.**	SWN	**App.**	
	Date	12/12/2016	**Date**	3/10/17	**Date**	

GEI Project No.	1604210	**Document No.**	N/A
Subject	Inclinometer Plots – 12/12/2016		

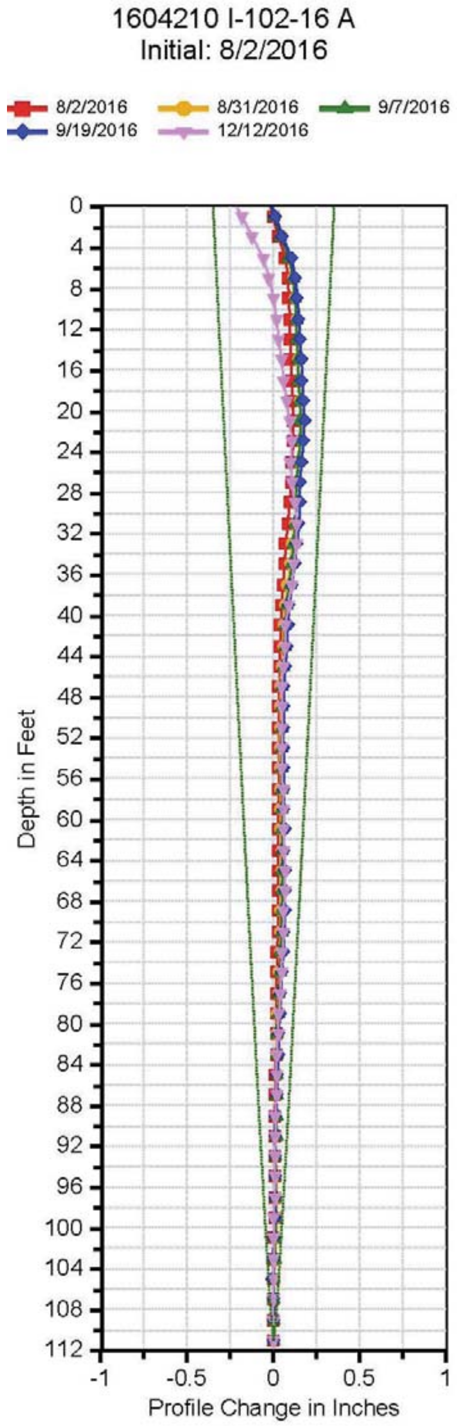


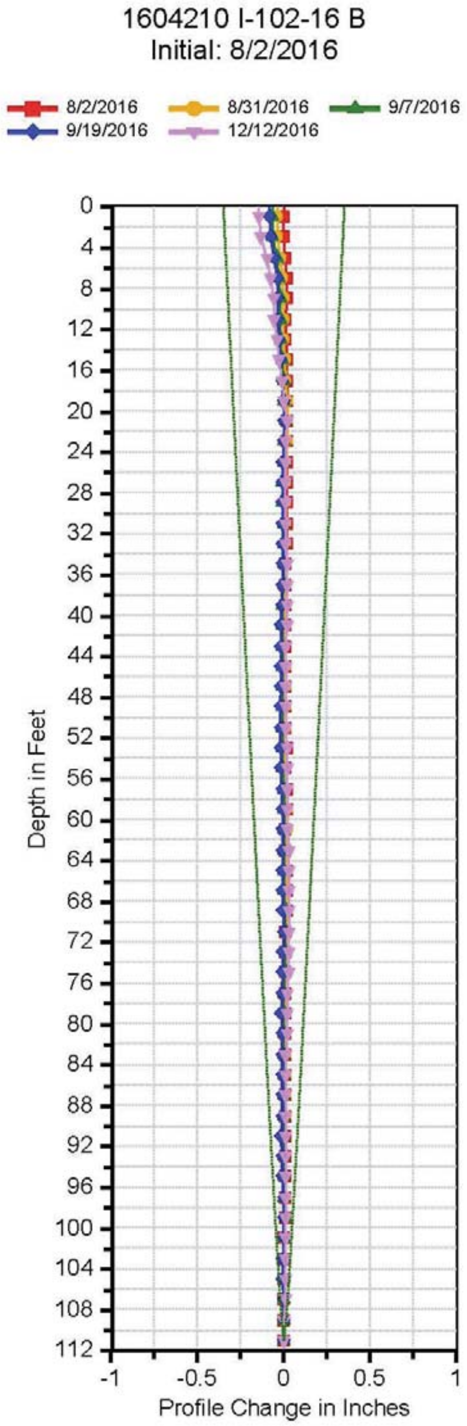


GEI Consultants

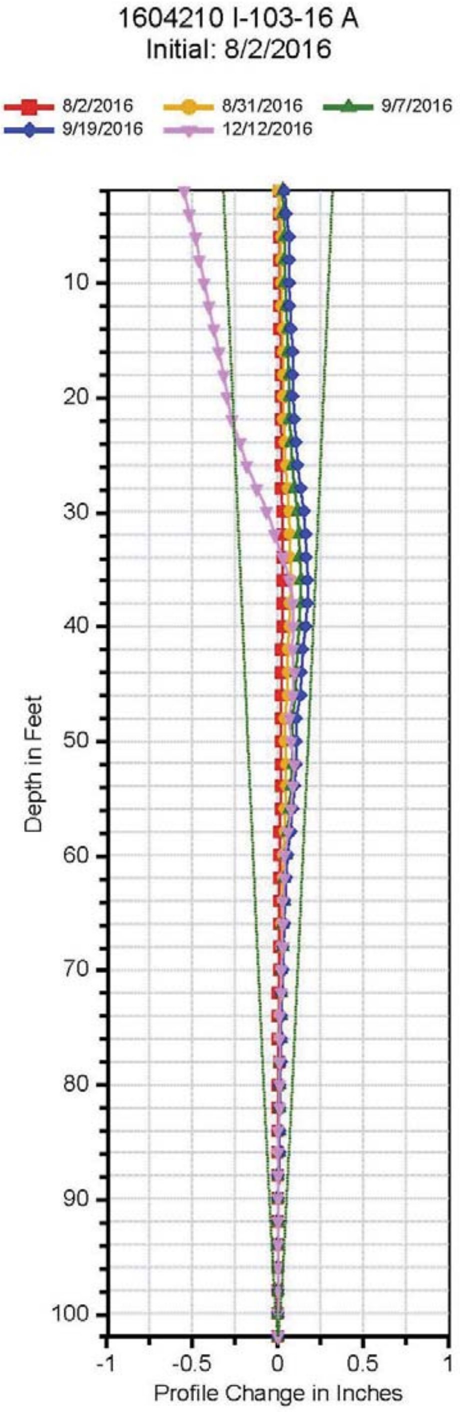
Client	JF Brennan			**Page**	2 of 3
Project	RGL Holdings Bulkhead Wall Rehabilitation			**Pg. Rev.**	
By	C. Fritsch	**Chk.**	SWN	**App.**	
Date	12/12/2016	**Date**	3/10/17	**Date**	

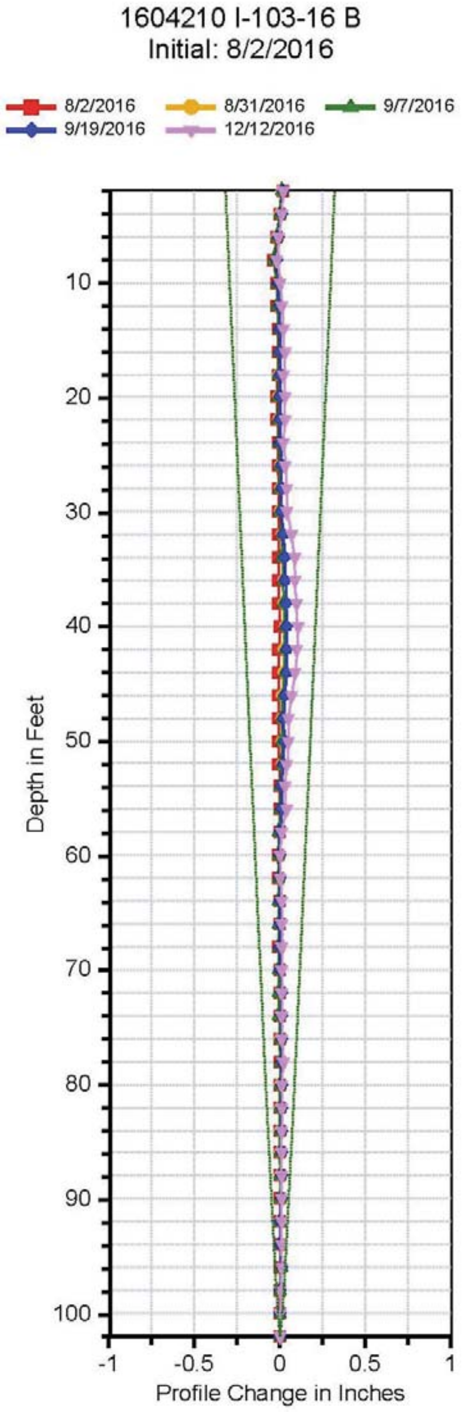
GEI Project No.	1604210	**Document No.**	N/A
Subject	Inclinometer Plots – 12/12/2016		





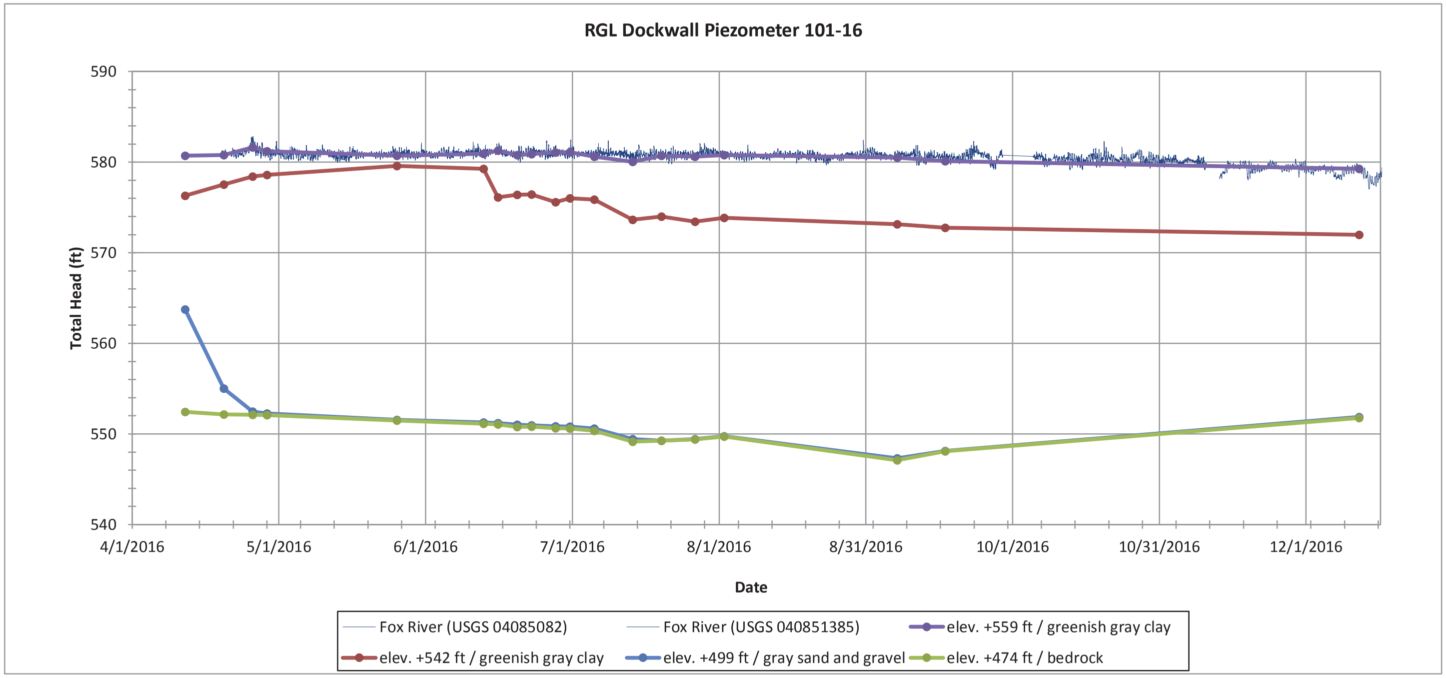
GEI Consultants	**Client**	JF Brennan			**Page**	3 of 3
	Project	RGL Holdings Bulkhead Wall Rehabilitation			**Pg. Rev.**	
	By	C. Fritsch	**Chk.**	SWN	**App.**	
	Date	12/12/2016	**Date**	3/10/17	**Date**	
GEI Project No.	1604210	**Document No.**	N/A			
Subject	Inclinometer Plots – 12/12/2016					





Piezometer Data Plot

	Piezometer Depth - 25 ft				Piezometer Depth - 42 ft				Piezometer Depth - 85 ft				Piezometer Depth - 110 ft			
	SN	1501268	Elevation	559.1	SN	1501107	Elevation	542.1	SN	1500977	Elevation	499.1	SN	1504686	Elevation	474.1
			Pressure	Total Head				Total Head			Pressure	Total Head			Pressure	Total Head
Date	Hz	Temp C	(psi)	(ft)	Hz	Temp C	Pressure (psi)	(ft)	Hz	Temp C	(psi)	(ft)	Hz	Temp C	(psi)	(ft)
4/12/2016	2,754.6	10.7	9.4	580.7	2,669.6	12.5	14.8	576.3	2,573.7	11.3	28.0	563.8	2,685.2	11.0	34.0	552.4
4/20/2016	2,754.3	10.6	9.4	580.8	2,664.0	12.6	15.4	577.5	2,619.4	11.1	24.2	555.0	2,686.4	11.0	33.8	552.2
4/26/2016	2,750.5	10.5	9.8	581.6	2,660.4	13.3	15.7	578.4	2,632.5	11.1	23.1	552.5	2,686.6	11.0	33.8	552.1
4/29/2016	2,752.4	10.4	9.6	581.2	2,658.8	11.3	15.8	578.6	2,633.7	11.1	23.0	552.2	2,686.8	11.0	33.8	552.1
5/26/2016	2,754.5	10.1	9.4	580.7	2,654.4	11.2	16.2	579.6	2,637.3	10.9	22.7	551.5	2,689.5	11.0	33.5	551.5
6/13/2016	2,753.6	10.0	9.5	580.9	2,655.8	11.4	16.1	579.3	2,638.7	11.3	22.6	551.3	2,691.2	11.2	33.4	551.1
6/16/2016	2,752.0	10.2	9.6	581.3	2,669.9	11.3	14.7	576.1	2,639.2	11.3	22.6	551.2	2,691.4	11.2	33.4	551.1
6/20/2016	2,754.2	10.1	9.4	580.8	2,668.6	11.3	14.9	576.4	2,640.1	11.3	22.5	551.0	2,692.7	11.2	33.2	550.8
6/23/2016	2,753.7	10.1	9.4	580.9	2,668.5	11.3	14.9	576.4	2,640.5	11.3	22.5	550.9	2,692.6	11.2	33.2	550.8
6/28/2016	2,752.9	10.1	9.53	581.08	2,672.3	11.3	14.5	575.6	2,641.0	11.3	22.4	550.84	2,693.3	11.2	33.18	550.64
7/1/2016	2,752.9	10.2	9.53	581.09	2,670.4	11.3	14.7	576.0	2,641.2	11.3	22.4	550.81	2,693.5	11.2	33.16	550.60
7/6/2016	2,755.0	10.2	9.32	580.61	2,671.0	11.3	14.6	575.9	2,642.3	11.3	22.3	550.58	2,694.7	11.2	33.05	550.34
7/14/2016	2,757.5	10.2	9.08	580.04	2,680.9	11.3	13.7	573.7	2,648.2	11.3	21.8	549.45	2,700.0	11.2	32.54	549.16
7/20/2016	2,754.6	10.2	9.36	580.70	2,679.2	11.2	13.8	574.0	2,649.1	11.3	21.7	549.27	2,699.5	11.2	32.58	549.27
7/27/2016	2,755.1	10.4	9.32	580.60	2,681.8	11.2	13.6	573.4	2,648.3	11.3	21.8	549.43	2,699.0	11.2	32.63	549.38
8/2/2016	2,754.3	10.5	9.40	580.78	2,680.0	11.2	13.8	573.8	2,646.6	11.3	22.0	549.75	2,697.5	11.2	32.78	549.73
9/7/2016	2,755.8	11.3	9.27	580.49	2,683.0	11.2	13.5	573.2	2,659.0	11.3	20.9	547.32	2,709.3	11.2	31.65	547.11
9/17/2016	2,757.5	11.6	9.11	580.12	2,684.9	11.2	13.3	572.7	2,655.0	11.3	21.2	548.11	2,704.8	11.2	32.08	548.10
12/12/2016	2,761.6	13.3	8.75	579.28	2,688.3	11.5	13.0	572.0	2,635.7	11.3	22.9	551.88	2,688.2	11.3	33.67	551.77



Attachment 2 – June 30, 2017 Letter

GEI Consultants

Consulting
Engineers and
Scientists

June 30, 2017
Project No. 1604210

VIA EMAIL: *mikebinsfeld@jfbrennan.com*

Mr. Mike Binsfeld
J.F. Brennan Company, Inc.
818 Bainbridge Street
La Crosse, Wisconsin 54603

Re: Monitoring of the RGL Holdings Bulkhead Wall on the Lower Fox River in Green Bay, Wisconsin

Dear Mr. Binsfeld,

This letter is intended to provide a compilation of our previous recommendations for future monitoring of the referenced dock wall, and a brief description of earlier wall monitoring results that formed the basis for our recommendations.

Following completion of the wall in late July 2016, we continued to monitor the three inclinometers and four piezometers along the wall during and after dredging. Dredging was completed in mid-September 2016. Our monitoring continued to mid-December 2016, or three months after dredging. The inclinometer readings were relative to a baseline on August 2, 2016, which was after the completion of the wall and prior to the start of dredging. With the exception of inclinometer I-103, the inclinometer readings indicated that the movement during and after dredging was within the tolerance reading envelope of the instrument. Readings within the tolerance envelope are viewed with less confidence that they are representative. That is, the recorded movement readings may not be actual ground movement, but a result of the tolerance of the instrument, or within the measurement errors of the instrument.

The December reading at I-103 showed small wall movement toward land of approximately 1/2 inch at the top, and decreasing with depth. This movement was not unexpected and was reasonable because a large stockpile was at this location at the time of the prior reading on September 19, 2016, and had been removed prior to the December reading. Therefore, the wall was rebounding after removal of the load.

As requested, one subsequent round of readings was taken on April 7, 2017. Inclinometer I-101 suggested very slight movement (1/8 inch) toward land (north) since the last reading in December 2016. Inclinometer I-102 was essentially unchanged from the December 2016 reading. It should be noted again that the readings of both of these instruments remained within the tolerance envelope of the instrument. Inclinometer I-103 indicated an additional maximum movement at the top of approximately 1/4 inch toward land. This movement is beyond the tolerance of the instrument, and therefore is likely representative of the actual wall movement. Movement decreases to zero at a depth of approximately 35 feet.

The measured movements through April 7, 2017 did not indicate or suggest any unexpected trends for wall performance, and in our opinion the wall system is performing in accordance with the design intent. Therefore, it is our opinion that inclinometer and piezometer monitoring can be stopped. This recommendation is based on the factors below:

- Conventional dock walls of this type are typically not monitored with specialized geotechnical instrumentation unless special circumstances warrant it; for example, as described below.

- Due to the 2016 failure, the repaired wall system has atypical conditions, and monitoring through the completion of dredging was considered prudent. The purpose of our monitoring was to evaluate the geotechnical and structural performance of the wall. The wall has seen maximum dredging and surcharge loadings anticipated in the design, and the geotechnical and structural performance of the wall has been satisfactory with negligible wall movement toward the slip.

- The inclinometers and piezometers installed for the repair project are highly accurate instruments. It is uncommon to use instruments with such accuracy to monitor a conventional dock wall. Inclinometer I-101 and the piezometers were installed at the beginning of our design phase of services to provide the needed accuracy, timeliness, and comprehensive data (full wall profile available from the inclinometer) to assist in understanding the failure mechanism of the original wall. The two supplemental inclinometers I-102 and I-103 were installed to complement I-101. The instrumentation has served the design and construction purpose for monitoring the repaired wall, and continued monitoring with such accurate instrumentation is not considered necessary since the repaired wall has shown negligible movements during maximum dredging and when subjected to the maximum surcharge loading condition.

Periodic visual observations should continue to be made. At a minimum, observations should be made annually. However, if there is considerable activity of heavy equipment and stockpiling behind the wall, semi-annual observations should be made. This monitoring can also be done for the western-most section of the original wall (approximately 50 feet) that was not repaired by J.F. Brennan and GEI.

If visual observations behind the wall suggest movement may be occurring (e.g., depressions, tension cracks in the soil, etc.), additional instrumentation readings should be made. If observations suggest additional readings may be appropriate, we can assist in establishing a monitoring frequency, action plan and provide interpretation of the results. All instruments should be protected from damage so they can be monitored in the future, if necessary.

Future monitoring using these instruments or other methods, for reasons other than discussed above, could be done by the Owner at the Owner's discretion.

If you have any questions, please feel free to contact us at 847-984-3401.

Sincerely,

GEI CONSULTANTS, INC.

William H. Walton

William H. Walton, P.E. (WI), S.E., F.ASCE
Senior Vice President

WILLIAM
WALTON
30270
BARRINGTON,
ILLINOIS

Exp. 7/31/18

Attachment 3 – November 25, 2020 Letter

GEI Consultants

Consulting
Engineers and
Scientists

November 25, 2020
Project 2004913

Mr. Jeremy Thomas, P.E.
Associate Geotechnical Engineer
AECOM
558 N. Main Street
Oshkosh, Wisconsin 54901

Re: Instrumentation Monitoring at RGL Holdings, Inc. Bulkhead Wall
RGL Holdings, Inc.
1401 State Street
Green Bay, Wisconsin

Dear Mr. Thomas:

GEI Consultants, Inc. (GEI) is pleased to provide the geotechnical instrumentation monitoring results associated with the inclinometers and piezometers at the RGL Holdings, Inc. (RGL) bulkhead wall located along the west bank of the Fox River at 1401 State Street in Green Bay, Wisconsin. This letter summarizes the most recent instrumentation monitoring results and compares the information to previous readings.

Background

Geotechnical instrumentation was installed at the RGL bulkhead wall in 2016 by GEI as part of the rehabilitation of a portion of failed dock wall. It is our understanding that the Agency Oversight Team has requested that AECOM obtain an additional round of monitoring on the instrumentation installed at the site.

In 2016, geotechnical instrumentation was installed by the drill crew in borings B-101-16, OST-101A-16, I-102-16, and I-103-16 upon completion of drilling. Locations of the borings and instrumentation are shown on **Figure 1**. Inclinometer casing was installed within B-101-16, I-102-16, and I-103-16 so that horizontal movements with depth can be measured during the 2016 study and for future monitoring, if desired. The inclinometer casing installed was a Slope Indicator 70 mm QC Casing. The casings were installed in general accordance with Slope Indicator installation recommendations. GEI obtained baseline readings in June 2016. At B-101-16 the inclinometer casing was completed at the ground surface with a flush mount cap and at I-102-16 and I-103-16 the casing was left approximately 3 feet above the ground surface at that time and protected with a 4-inch diameter steel protector pipe. Boring logs for the inclinometers are included in **Attachment A.**

Four nested vibrating wire piezometers (VWPs) were installed at various depths in a cement grouted test boring OST-101A-16. Slope Indicator VW standard piezometer pressure transducers were used. The installation of the VWPs is in general accordance with Slope Indicator’s recommendations. The VWPs monitors the pore water pressures within the upper two clay layers at elevation (El.) +559.1 feet and El. +542.1 feet, in the underlying sand and gravel layer at

El. +499.1 feet, and in the dolomite bedrock at El. +474.1 feet. The locations and depths that the VWPs are included on the construction diagram in **Attachment A.**

Monitoring Trip Summary

On Thursday, November 12, 2020, Mr. Casey Fritsch from GEI visited the site to assess the condition of the instruments due anticipated changes in site conditions from 2017 when the instruments were last monitored by GEI. At the time of the site visit it was noted that I-102-16 was inaccessible because a new water valve box cover was installed over the previous 4-inch diameter protector pipe and cap with a lock on it. It was determined that a grinder or a torch would be necessary to remove the cap to access the inclinometer casing. B-101-16 was accessible; however, the casing cap was on the pipe approximately 3-feet below ground surface. The inclinometer installed in I-103-16 had the previous 4-diameter protector pipe cutoff and a new water valve box cover placed around it. The vibrating wire piezometers were not accessed on the November 12, 2020 site visit; however, they were suspected to be next to a depression in the pavement next to one of the crane pads where a water valve box cover was partially paved over.

On Friday, November 13, 2020, Mr. Fritsch met Mr. Philip R Brochocki, PG from Ramboll at the site to perform the instrumentation monitoring. The metal cap on I-102-16 was cutoff with a grinder to access the inclinometer casing to take readings. Asphalt that was placed over the water valve cover box installed to protect the VWPs installed in OST-101A-16 was removed to allow access to the VWPs. Readings were obtained on the three (3) inclinometers and four (4) VWPs.

Instrumentation Monitoring Results

Inclinometer results are presented as cumulative displacement plots against depths and are shown in **Attachment B**. The field accuracy envelope of the profile changes due to system errors per the equipment manufacturer is also indicated on the cumulative displacement plot. The recorded measurements with the field accuracy envelope may be due the instrumentation system errors and should be treated with cautions. Any movements in the upper 10 feet should be reviewed with caution due to site restoration activities since the installation of the inclinometers.

Manual readings were obtained on the four VWPs installed in OST-101A-16 and are summarized in **Attachment C**. In general, VWPs are consistent with observations obtained in 2016 and 2017.

Closing

We appreciate the opportunity to work with you on this project. If another round of instrumentation monitoring is required, we would be pleased to assist you at your request.

If you have any questions, please contact us at 920.455.8200.

Sincerely,

GEI CONSULTANTS, INC.

Casey E Fritsch John M Trast

Casey E. Fritsch, P.E.
Project Manager

John M. Trast, P.E., D.GE
Vice President

Attachments:
- Figure 1 – Instrumentation Location Diagram
- Attachment A – Boring Logs, Installation Diagrams, and Calibration Certificates
- Attachment B – Inclinometer Results
- Attachment C – Piezometer Results

CEF:cah
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GEI Consultants
3159 Voyager Drive
Green Bay, WI 54311
www.geiconsultants.com

RGL BULKHEAD MONITORING

INSTRUMENTATION MONITORING
RGL HOLDINGS BULKHEAD WALL
1401 STATE STREET
GREEN BAY, WISCONSIN

Drawn: TJF 11/18/2020

Approved: CEF 11/18/2020

Scale: As Shown

Project Number: 2004913

Figure Number: 1

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Attachment A

Boring Logs, Installation Diagrams, and Calibration Certificates

GEI Consultants

CLIENT:
J. F. Brennan Company, Inc.

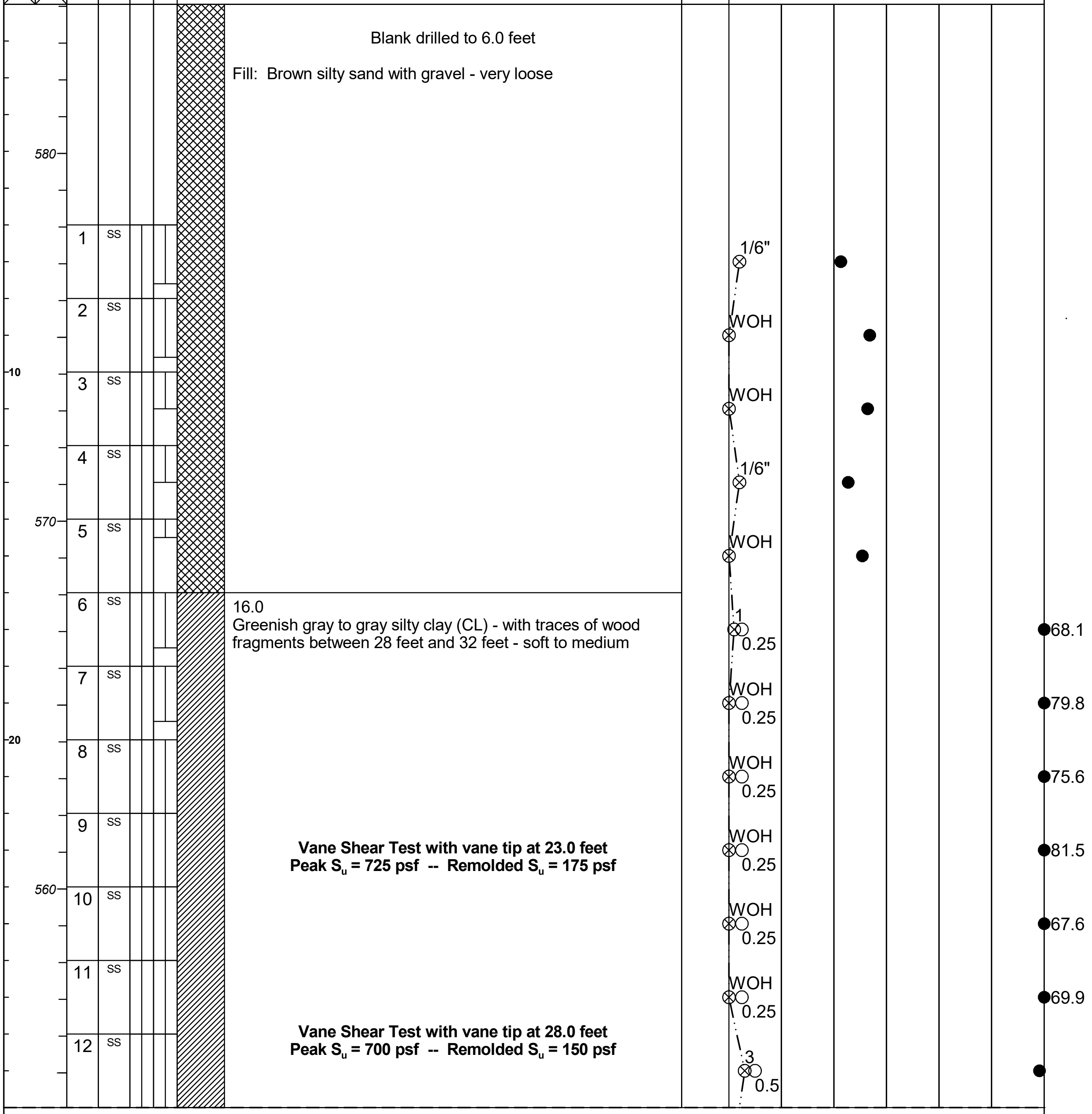
PROJECT NAME:
RGL Holdings Bulkhead Wall Rehabilitation

LOG OF BORING NUMBER **B-101-16**

ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL SURFACE ELEVATION (ft.) 584.1	UNIT DRY WT. LBS/FT³	○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT² 1 2 3 4 5 PLASTIC LIMIT (%) ✕ WATER CONTENT (%) ● LIQUID LIMIT (%) △ 10 20 30 40 50 ⊗ STANDARD PENETRATION BLOWS/FT 10 20 30 40 50 60



Blank drilled to 6.0 feet

Fill: Brown silty sand with gravel - very loose

16.0
Greenish gray to gray silty clay (CL) - with traces of wood fragments between 28 feet and 32 feet - soft to medium

Vane Shear Test with vane tip at 23.0 feet
Peak S_u = 725 psf -- Remolded S_u = 175 psf

Vane Shear Test with vane tip at 28.0 feet
Peak S_u = 700 psf -- Remolded S_u = 150 psf

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL:

BORING STARTED **3/28/2016**

BORING COMPLETED **2/28/2016**

GEI OFFICE **Green Bay, WI**

ENTERED BY **BJV**

APPROVED BY **CKT**

NORTHING **248,434.6**

EASTING **2,483,426.2**

RIG/FOREMAN **B-61 / JW**

GEI PROJECT NO. **1604210**

GEI Consultants

CLIENT:
J. F. Brennan Company, Inc.

PROJECT NAME:
RGL Holdings Bulkhead Wall Rehabilitation

LOG OF BORING NUMBER **B-101-16**

ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

DESCRIPTION OF MATERIAL

SURFACE ELEVATION (ft.) 584.1

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE
		13	SS
		14	SS
	550	15	SS
		16	SS
		17	SS
40		18	SS
		19	SS
	540	20	SS
		21	SS
		22	SS
50		23	SS
		24	SS
	530	25	SS
		26	SS
		27	SS

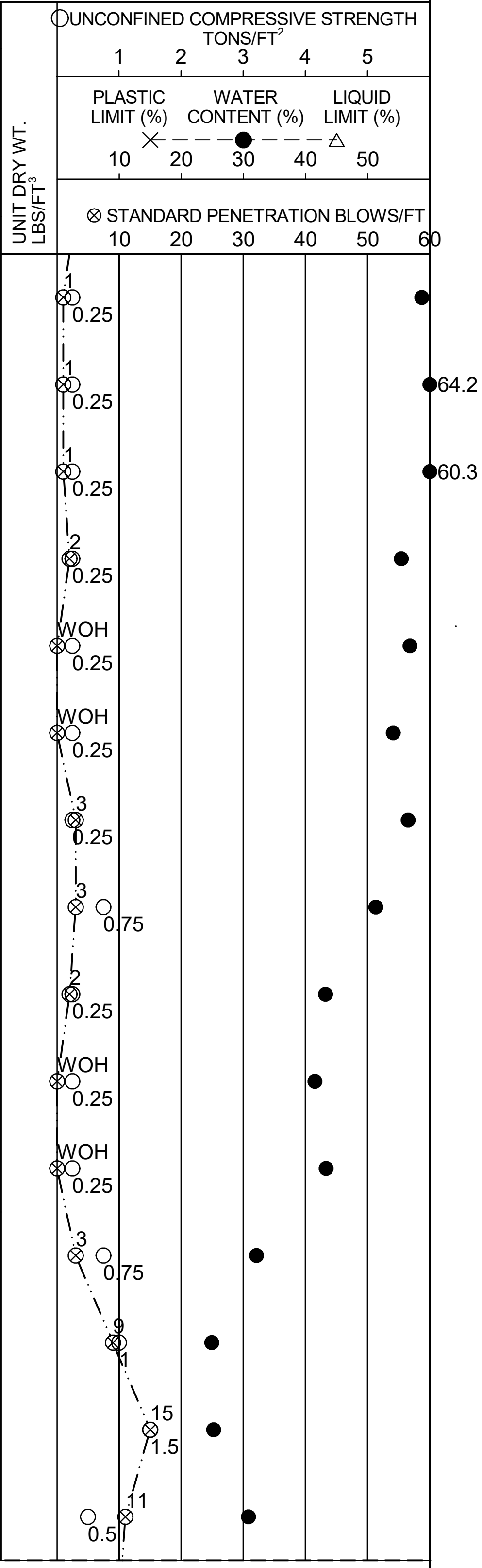
30.0
Greenish gray to gray silty clay (CL) - with traces of sea shells between 46 feet and 48 feet - soft to medium

Vane Shear Test with vane tip at 36.0 feet
Peak S_u = 875 psf -- Remolded S_u = 175 psf

Vane Shear Test with vane tip at 43.5 feet
Peak S_u = 1,100 psf -- Remolded S_u = 400 psf

* Loss of drilling mud at approximately 46 feet

52.0
Brown to reddish brown silty clay (CH) - with traces of sand and fine gravel - medium to stiff
Vane Shear Test with vane tip at 53.5 feet
Peak S_u = 1,675 psf -- Remolded S_u = 200 psf



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL:

BORING STARTED
3/28/2016

BORING COMPLETED
2/28/2016

GEI OFFICE
Green Bay, WI

ENTERED BY
BJV

APPROVED BY
CKT

NORTHING
248,434.6

EASTING
2,483,426.2

RIG/FOREMAN
B-61 / JW

GEI PROJECT NO.
1604210

GEI Consultants

CLIENT:
J. F. Brennan Company, Inc.

PROJECT NAME:
RGL Holdings Bulkhead Wall Rehabilitation

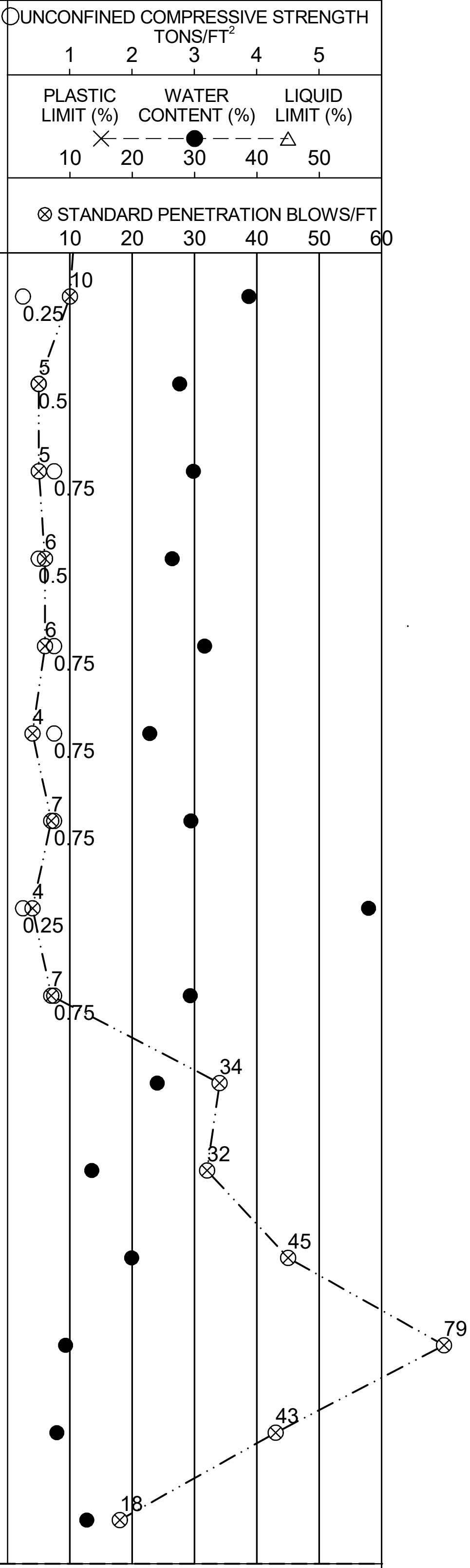
LOG OF BORING NUMBER **B-101-16**

ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

SURFACE ELEVATION (ft.) 584.1

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS/FT³
		28	SS			60.0 Brown to reddish brown silty clay (CH) - with traces of sand and fine gravel - medium to stiff	
		29	SS				
	520	30	SS			**Vane Shear Test with vane tip at 65.5 feet** **Peak S_u = 1,575 psf -- Remolded S_u = 550 psf**	
		31	SS				
		32	SS				
70		33	SS				
		34	SS			**Vane Shear Test with vane tip at 72.5 feet** **Peak S_u = 1,850 psf -- Remolded S_u = 700 psf**	
	510	35	SS				
		36	SS			76.0 Reddish brown silty clay (CH) - with silty gravel - stiff	
		37	SS				
80		38	SS			80.0 Light brown fine to medium silty sand (SM) - medium dense	
		39	SS			83.0 Gray sandy gravel (GP) - moist - very dense	
	500	40	SS				
		41	SS				
		42	SS				



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL:	BORING STARTED **3/28/2016**	GEI OFFICE **Green Bay, WI**	
	BORING COMPLETED **2/28/2016**	ENTERED BY **BJV**	APPROVED BY **CKT**
NORTHING **248,434.6** EASTING **2,483,426.2**	RIG/FOREMAN **B-61 / JW**	GEI PROJECT NO. **1604210**	PAGE NO. **3** OF **4**

GEI Consultants	CLIENT: **J. F. Brennan Company, Inc.**	LOG OF BORING NUMBER **B-101-16**
	PROJECT NAME: **RGL Holdings Bulkhead Wall Rehabilitation**	ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

SURFACE ELEVATION (ft.) 584.1

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS/FT³	○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT² 1 2 3 4 5 / PLASTIC LIMIT (%) × WATER CONTENT (%) ● LIQUID LIMIT (%) △ 10 20 30 40 50 / ⊗ STANDARD PENETRATION BLOWS/FT 10 20 30 40 50 60
	490					90.0 Gray sandy gravel (GP) - moist - very dense		
100	480					97.0 End of Boring Boring advanced from 0 to 8.0 feet with solid stem auger Boring advanced from 8.0 to 97.0 feet with rock bit and drilling fluid HW casing driven to 8.0 feet Installed inclinometer to 89.5 feet below ground; backfilled annular space between borehole and inclinometer casing pipe with cementitious grout		
110	470							

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL:	BORING STARTED **3/28/2016**	GEI OFFICE **Green Bay, WI**	
	BORING COMPLETED **2/28/2016**	ENTERED BY **BJV**	APPROVED BY **CKT**
NORTHING **248,434.6** EASTING **2,483,426.2**	RIG/FOREMAN **B-61 / JW**	GEI PROJECT NO. **1604210**	PAGE NO. **4** OF **4**

GEI Consultants

CLIENT:
J. F. Brennan Company, Inc.

PROJECT NAME:
RGL Holdings Bulkhead Wall Rehabilitation

LOG OF BORING NUMBER **I-102-16**

ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

DEPTH (FT) | ELEVATION (FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY

DESCRIPTION OF MATERIAL

SURFACE ELEVATION (ft.) 584.0

UNIT DRY WT. LBS/FT^3

○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT^2
1 2 3 4 5

PLASTIC LIMIT (%) × — — WATER CONTENT (%) ● — — LIQUID LIMIT (%) △
10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/FT
10 20 30 40 50 60

Depth (ft)	Elevation (ft)
	580
10	
	570
20	
	560
30	
	550
40	
	540
50	
	530
60	

Blind drilled to 80.0 feet

Driller Note:
Hole collapsed at 32 feet while sampling prior to HW casing install

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL: Not Observed

BORING STARTED **6/13/2016**

BORING COMPLETED **6/15/2016**

GEI OFFICE **Green Bay, WI**

ENTERED BY **BJV**

APPROVED BY **CEF**

NORTHING

EASTING

RIG/FOREMAN **B-61 / JD**

GEI PROJECT NO. **1604210**

PAGE NO. **1** OF **2**

GEI Consultants

CLIENT:
J. F. Brennan Company, Inc.

PROJECT NAME:
RGL Holdings Bulkhead Wall Rehabilitation

LOG OF BORING NUMBER **I-102-16**

ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

SURFACE ELEVATION (ft.) 584.0

DEPTH (FT): 70, 80, 90, 100, 110, 120
ELEVATION (FT): 520, 510, 500, 490, 480, 470

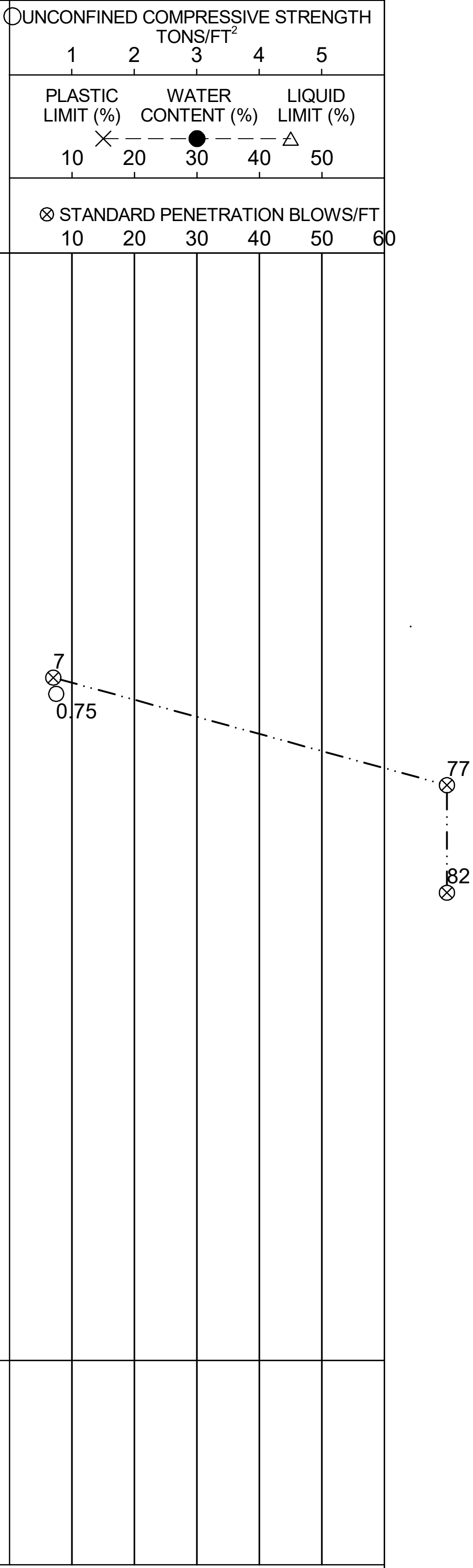
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL
			Blind drilled to 80.0 feet
80	1	SS	80.0 Brown silty clay (CL) - trace sand and fine gravel - moist to wet - medium dense
	2	SS	82.0 Brownish gray silty medium to coarse sand and gravel (GP) - moist to wet - very dense Driller's Note: Trace gravel while drilling at 82.0 feet
90	3	SS	
	R #4	DB	107.5 Limestone (dolomite) bedrock

Run #	Depth ft.	Recovery %	RQD %	Fracture Frequency
1	107.5-112.5	96	63	------

Installed Inclinometer to 111.6 feet

112.5
End of Boring
Boring advanced with hollow stem auger from 0 to 10.0 ft; with rock bit and drilling fluid from 10.0 to 107.5 ft.; and with NX rock core from 107.5 to 112.5 ft.
HW casing driven to 107.0 feet
Installed Inclinometer to 111.6 feet

UNIT DRY WT. LBS/FT³



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL: Not Observed	BORING STARTED **6/13/2016**	GEI OFFICE **Green Bay, WI**
	BORING COMPLETED **6/15/2016**	ENTERED BY **BJV** APPROVED BY **CEF**
NORTHING EASTING	RIG/FOREMAN **B-61 / JD**	GEI PROJECT NO. **1604210**

GEI Consultants

CLIENT:
J. F. Brennan Company, Inc.

PROJECT NAME:
RGL Holdings Bulkhead Wall Rehabilitation

LOG OF BORING NUMBER **I-103-16**

ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

SURFACE ELEVATION (ft.) 584.0

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS/FT³	○ UNCONFINED COMPRESSIVE STRENGTH TONS/FT² 1 2 3 4 5 PLASTIC LIMIT (%) ✕ — WATER CONTENT (%) ● — LIQUID LIMIT (%) △ 10 20 30 40 50 ⊗ STANDARD PENETRATION BLOWS/FT 10 20 30 40 50 60
						Blind drilled to 90.0 feet		
	580							
10								
	570							
20								
	560							
30								
	550							
40								
	540							
50								
	530							
60								

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL: Not Observed

BORING STARTED **6/15/2016**

BORING COMPLETED **6/17/2016**

GEI OFFICE **Green Bay, WI**

ENTERED BY **CAH**

APPROVED BY **CEF**

NORTHING

EASTING

RIG/FOREMAN **B-61 / JC**

GEI PROJECT NO. **1604210**

PAGE NO. **1** OF **2**

GEI Consultants	CLIENT: **J. F. Brennan Company, Inc.**	LOG OF BORING NUMBER **I-103-16**
	PROJECT NAME: **RGL Holdings Bulkhead Wall Rehabilitation**	ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

SURFACE ELEVATION (ft.) 584.0

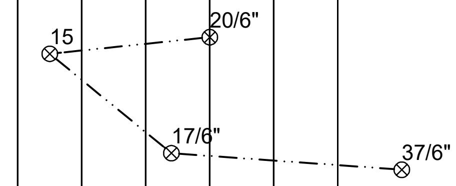
DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS/FT^3
				Blind drilled to 90.0 feet	
86.9				86.9 Gray silty gravel (GP) - moist to wet - dense Driller Note: Gravel while drilling from 86.9 to 90.0 ft	
90.5		1 1A	SS SS	90.5 Reddish brown silty clay (CL) - moist to wet - medium to stiff	
96.0		2 2A	SS SS	96.0 Gray silty gravel (GP) - moist to wet - dense Apparent Bedrock - Refusal at 100.2 to 100.7 feet	
100.7				100.7 End of Boring Boring advanced with hollow-stem auger from 0 to 10.0 feet Boring advanced with rock bit and drilling fluid from 0 to 100.7 feet HW casing driven to 100.7 feet Installed inclinometer to 100.7 feet	

Depth scale: 70, 80, 90, 100, 110, 120
Elevation scale: 520, 510, 500, 490, 480, 470

○UNCONFINED COMPRESSIVE STRENGTH TONS/FT^2: 1 2 3 4 5

PLASTIC LIMIT (%) × — — ● — — △ WATER CONTENT (%) LIQUID LIMIT (%): 10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 60



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL: Not Observed	BORING STARTED **6/15/2016**	GEI OFFICE **Green Bay, WI**	
	BORING COMPLETED **6/17/2016**	ENTERED BY **CAH**	APPROVED BY **CEF**
NORTHING / EASTING	RIG/FOREMAN **B-61 / JC**	GEI PROJECT NO. **1604210**	PAGE NO. **2** OF **2**

GEI Consultants

CLIENT:
J. F. Brennan Company, Inc.

PROJECT NAME:
RGL Holdings Bulkhead Wall Rehabilitation

LOG OF BORING NUMBER **OST-101A-16**

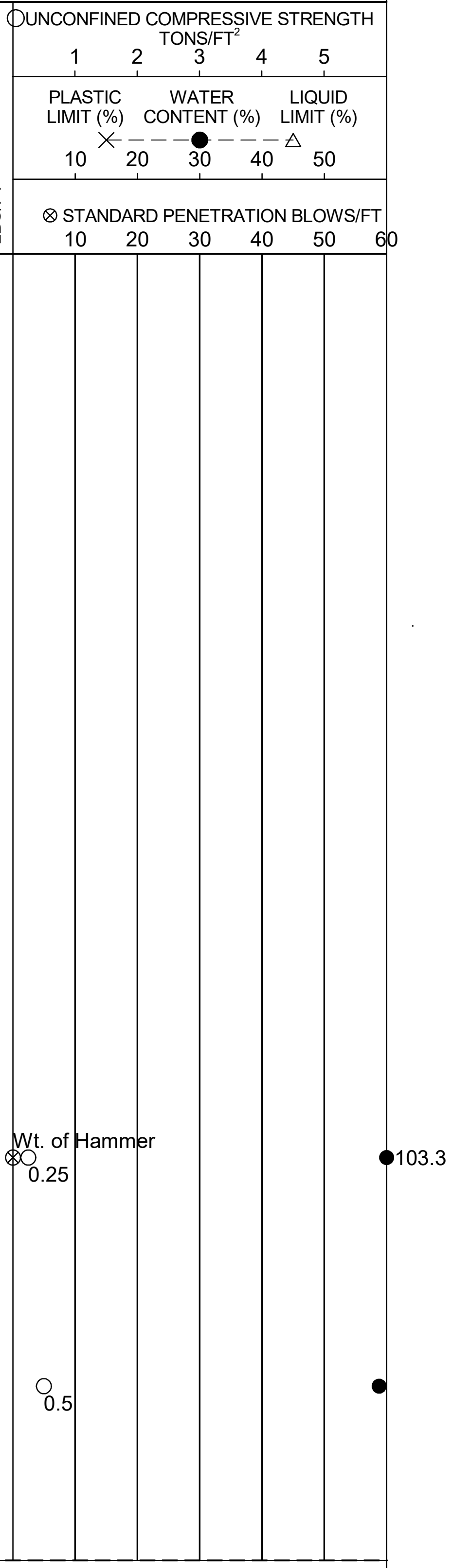
ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

DESCRIPTION OF MATERIAL

SURFACE ELEVATION (ft.) 584.0

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS/FT³
				Blank Drilled to 18.5 feet	
	580				
10					
	570				
18.5				Greenish gray to gray silty clay (CL) - soft to medium	
20		1	SS		
				Vane Shear Test with vane tip at 23.0 feet **Peak S_u = 725 psf -- Remolded S_u = 175 psf**	
	560				
		OST-1	OST	**Vibrating Wire Piezometer S/N 1501268 installed at 25 feet**	64
				Vane Shear Test with vane tip at 28.0 feet **Peak S_u = 700 psf -- Remolded S_u = 150 psf**	



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL:	BORING STARTED 4/1/2016	GEI OFFICE Green Bay, WI	
	BORING COMPLETED 4/6/2016	ENTERED BY BJV	APPROVED BY CKT
NORTHING 248,435.1 EASTING 2,483,431.6	RIG/FOREMAN B-61 / JPW	GEI PROJECT NO. 1604210	PAGE NO. 1 OF 4

GEI Consultants

CLIENT:
J. F. Brennan Company, Inc.

PROJECT NAME:
RGL Holdings Bulkhead Wall Rehabilitation

LOG OF BORING NUMBER **OST-101A-16**

ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

DESCRIPTION OF MATERIAL

SURFACE ELEVATION (ft.) 584.0

SAMPLE NO.	SAMPLE TYPE	UNIT DRY WT. LBS/FT³
OST -2	OST	59.9
OST -3	OST	
OST -4	ST	72.1
2	ST	100.2

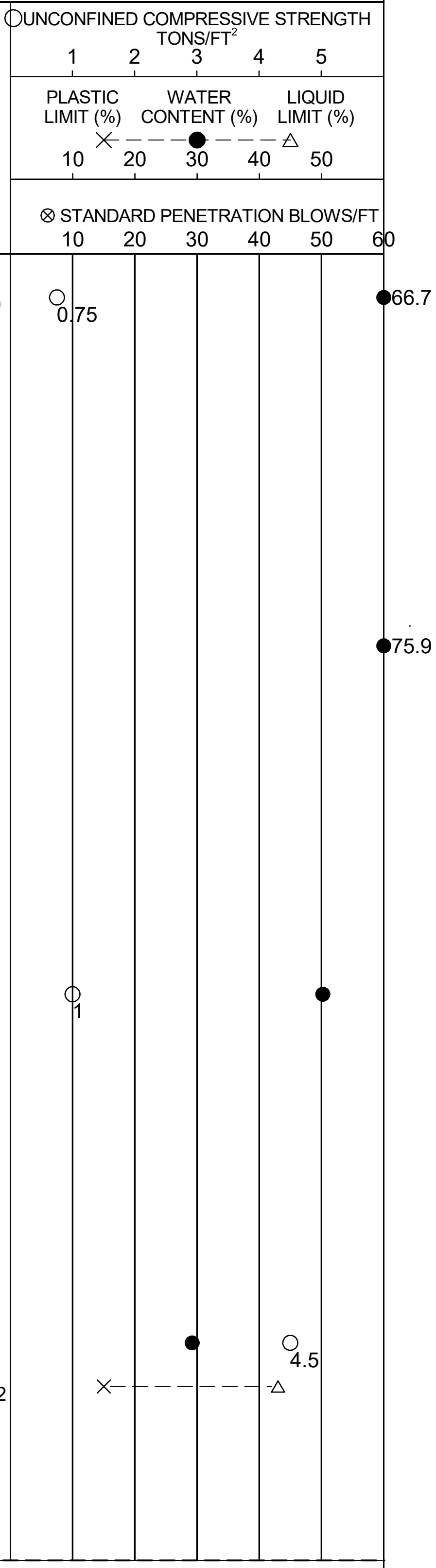
Vane Shear Test with vane tip at 36.0 feet
Peak S_u = 875 psf -- Remolded S_u = 175 psf

Vibrating Wire Piezometer S/N 1501107 installed at 42 feet
Vane Shear Test with vane tip at 43.5 feet
Peak S_u = 1,100 psf -- Remolded S_u = 400 psf

52.0

Vane Shear Test with vane tip at 53.5 feet
Peak S_u = 1,675 psf -- Remolded S_u = 200 psf

Brown to reddish brown silty clay (CH) - with traces of sand and fine gravel - medium to stiff



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL:

BORING STARTED **4/1/2016**

BORING COMPLETED **4/6/2016**

GEI OFFICE **Green Bay, WI**

ENTERED BY **BJV**

APPROVED BY **CKT**

NORTHING **248,435.1**

EASTING **2,483,431.6**

RIG/FOREMAN **B-61 / JPW**

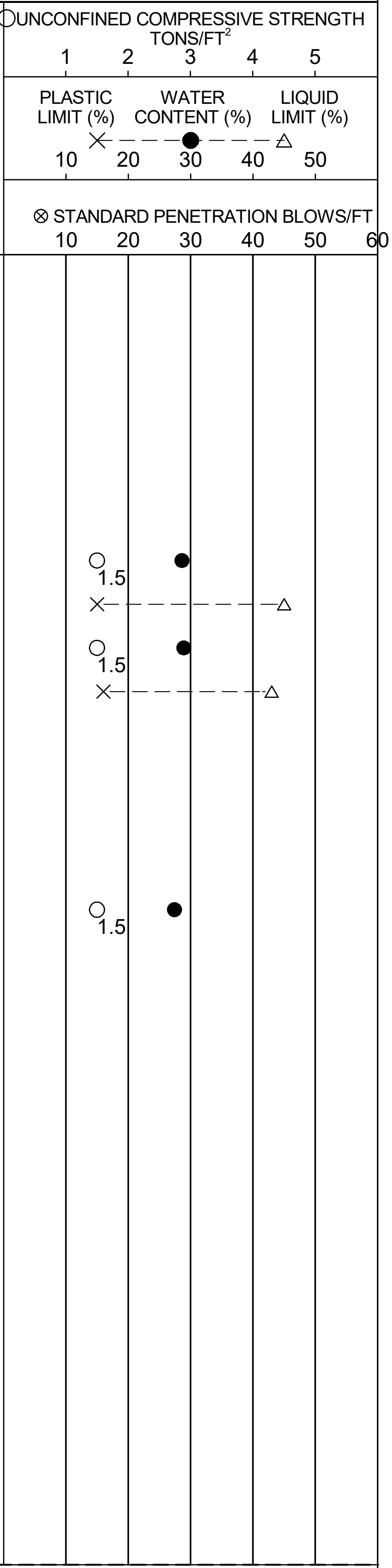
GEI PROJECT NO. **1604210**

GEI Consultants	CLIENT: **J. F. Brennan Company, Inc.**	LOG OF BORING NUMBER **OST-101A-16**
	PROJECT NAME: **RGL Holdings Bulkhead Wall Rehabilitation**	ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

SURFACE ELEVATION (ft.) 584.0

DEPTH (FT)	ELEVATION (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS/FT³
	520						
						Vane Shear Test with vane tip at 65.5 feet **Peak S_u = 1,575 psf -- Remolded S_u = 550 psf**	
		3	ST				95.4
		4	ST				
70							
						Vane Shear Test with vane tip at 72.5 feet **Peak S_u = 1,850 psf -- Remolded S_u = 700 psf**	
	510	5	ST				98.2
						76.0 No soil samples collected below this depth	
80							
	500						
						Vibrating Wire Piezometer S/N 1500977 installed at 85 feet	



The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL:	BORING STARTED **4/1/2016**	GEI OFFICE **Green Bay, WI**
	BORING COMPLETED **4/6/2016**	ENTERED BY **BJV** / APPROVED BY **CKT**
NORTHING **248,435.1** EASTING **2,483,431.6**	RIG/FOREMAN **B-61 / JPW**	GEI PROJECT NO. **1604210** / PAGE NO. **3** OF **4**

GEI Consultants

CLIENT:
J. F. Brennan Company, Inc.

LOG OF BORING NUMBER **OST-101A-16**

PROJECT NAME:
RGL Holdings Bulkhead Wall Rehabilitation

ARCHITECT-ENGINEER

LOCATION: Green Bay, Wisconsin

DEPTH (FT) | ELEVATION (FT) | SAMPLE NO. | SAMPLE TYPE | SAMPLE DISTANCE | RECOVERY | DESCRIPTION OF MATERIAL | UNIT DRY WT. LBS/FT^3

SURFACE ELEVATION (ft.) 584.0

○UNCONFINED COMPRESSIVE STRENGTH TONS/FT^2
1 2 3 4 5

PLASTIC LIMIT (%) ✕ WATER CONTENT (%) ● LIQUID LIMIT (%) △
10 20 30 40 50

⊗ STANDARD PENETRATION BLOWS/FT
10 20 30 40 50 60

490

100

Encountered boulder from 100.5 to 102.0 feet

480

105.0
Encountered bedrock at 105.0 feet

110

Vibrating Wire Piezometer S/N 1504686 installed at 110 ft

112.0
End of Boring
Boring advanced to 112.0 feet with rock bit and drilling fluid
Vibrating Wire Piezometers installed at:
- 25.0 feet - S/N 1501268
- 42.0 feet - S/N 1501107
- 85.0 feet - S/N 1500977
- 110.0 feet - S/N 1504686

470

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WATER LEVEL:

BORING STARTED **4/1/2016**

BORING COMPLETED **4/6/2016**

GEI OFFICE **Green Bay, WI**

ENTERED BY **BJV**

APPROVED BY **CKT**

NORTHING **248,435.1**

EASTING **2,483,431.6**

RIG/FOREMAN **B-61 / JPW**

GEI PROJECT NO. **1604210**

MULTI-LEVEL PIEZOMETER INSTALLATION DIAGRAM

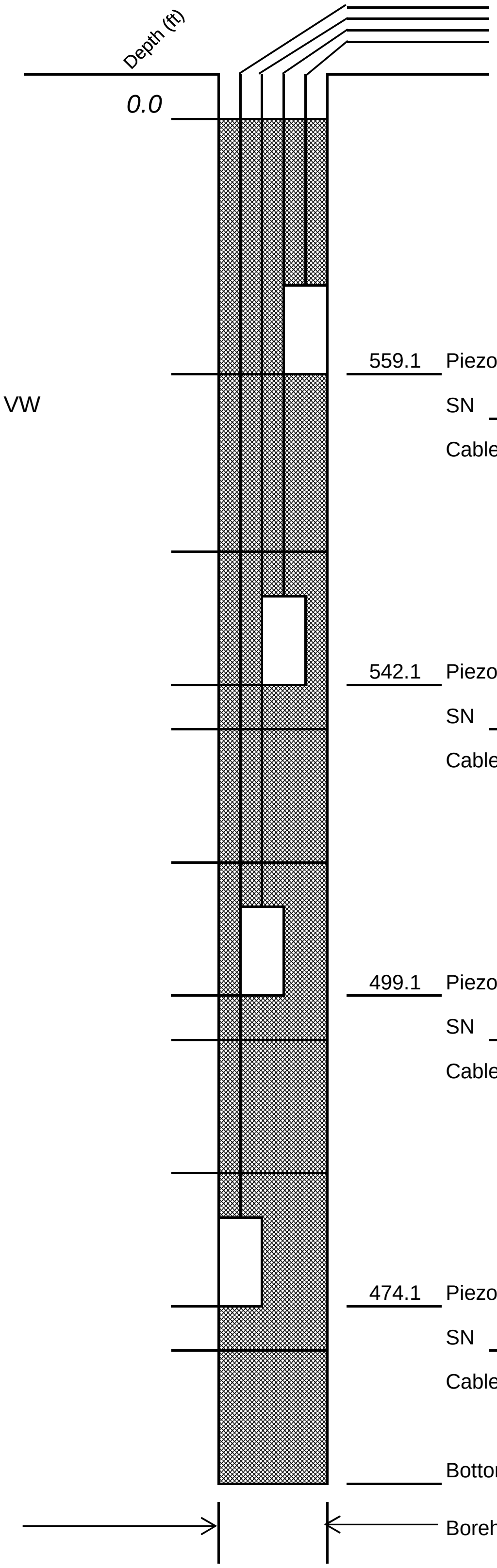
OST-101A-16

Project RGL Dockwall Evaluation
City / Town Green Bay, WI
Client JF Brennan Company, Inc
Contractor
Driller Subsurface Exploration Services **Rig** CME 850

GEI Proj. No. 1604210
Location
Northing: 248441.15
Easting: 2483429.20
Date 4/7/16

Installed in:
Protector pipe / box Box

Ground Surface Elevation 584.04



Sand:
None

Piezometer Model:
Slope Indicator - Standard VW

Type:
☐ Pneumatic
☒ Vibrating Wire

░ Filter Pack Type:
None

▨ Seal Type:
Bentonite Cement Grout

559.1 Piezometer Depth 25.0
SN 1501268
Cable I.D.

542.1 Piezometer Depth 42.0
SN 1501107
Cable I.D.

499.1 Piezometer Depth 85.0
SN 1500977
Cable I.D.

474.1 Piezometer Depth 110.0
SN 1504686
Cable I.D.

Bottom of Borehole 112.0

Borehole Diameter (inches) 4.0

SLOPE INDICATOR

VW Piezometer Calibration Certificate

Serial #: 1500977
Range : 350 kPa
Cable Length: 30 m
Date of Calibration: 3/26/2015

Part #: 52611024
Cable Part # : 50613524
Calibrated by: AM
Note:

ABC Calibration Factors

	A	B	C
kPa	-1.149803E-4	2.628356E-2	8.877675E+2
psi	-1.667648E-5	3.812108E-3	1.287598E+2

Pressure in kPa/psi = (A x Hz^2) + (B x Hz) + C, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	8.863804E+2	2.544650E-2	1.799769E-1	-1.148377E-4	5.996201E-6	-1.348407E-3
psi	1.285541E+2	3.690573E-3	2.610252E-2	-1.665521E-5	8.696448E-7	-1.955630E-4

Pressure in kPa/psi = C0 + (C1 x Hz) + (C2 x T) + (C3 x Hz^2) + (C4 x Hz x T) + (C5 x T^2)

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.

TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.

Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

Thermistor reading is 14.8 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

Applied	Equivalent	Frequency	Calculated		Error
(kPa)	(psi)	(Hz)	(kPa)	(psi)	(%FS)
0.0	0.00	2895.2	0.1	0.01	-0.02
35.0	5.08	2840.1	35.0	5.07	0.01
70.0	10.15	2783.8	69.9	10.14	0.03
105.0	15.23	2726.1	104.9	15.22	0.02
140.0	20.31	2667.0	140.0	20.31	-0.01
175.0	25.38	2606.6	175.1	25.39	-0.02
210.0	30.46	2544.9	210.0	30.46	0.00
245.0	35.53	2481.4	245.0	35.54	0.00
280.0	40.61	2416.3	280.0	40.60	0.01
315.0	45.69	2349.2	315.0	45.68	0.01
350.0	50.76	2280.0	350.0	50.76	0.01

VW Piezometer Calibration Certificate

Serial #: 1501107
Range : 350 kPa
Cable Length: 15 m
Date of Calibration: 4/9/2015

Part #: 52611028
Cable Part # : 50613524
Calibrated by: AM
Note:

ABC Calibration Factors

	A	B	C
kPa	-1.233112E-4	-1.117352E-2	1.011483E+3
psi	-1.788478E-5	-1.620582E-3	1.467032E+2

Pressure in kPa/psi = (A x Hz^2) + (B x Hz) + C, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	1.010032E+3	-1.182186E-2	9.598006E-2	-1.234307E-4	7.304231E-5	-1.749780E-3
psi	1.464876E+2	-1.714555E-3	1.392024E-2	-1.790148E-5	1.059352E-5	-2.537752E-4

Pressure in kPa/psi = C0 + (C1 x Hz) + (C2 x T) + (C3 x Hz^2) + (C4 x Hz x T) + (C5 x T^2)

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.
TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.
Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

Thermistor reading is 15.2 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

Applied (kPa)	Equivalent (psi)	Frequency (Hz)	Calculated (kPa)	Calculated (psi)	Error (%FS)
0.0	0.00	2819.0	0.1	0.01	-0.02
35.0	5.08	2769.1	35.0	5.08	0.00
70.0	10.15	2718.3	69.9	10.14	0.02
105.0	15.23	2666.4	105.0	15.23	0.00
140.0	20.31	2613.6	139.9	20.30	0.01
175.0	25.38	2559.6	175.0	25.38	0.00
210.0	30.46	2504.5	210.0	30.46	-0.01
245.0	35.53	2448.2	245.0	35.54	-0.01
280.0	40.61	2390.7	280.0	40.61	0.00
315.0	45.69	2331.7	315.0	45.69	0.00
350.0	50.76	2271.3	350.0	50.76	0.01

VW Piezometer Calibration Certificate

Serial #: 1501268	Part #: 52611028
Range : 350 kPa	Cable Part # : 50613524
Cable Length: 15 m	Calibrated by: AM
Date of Calibration: 4/29/2015	Note:

ABC Calibration Factors

	A	B	C
kPa	-1.167703E-4	-3.181358E-2	1.039071E+3
psi	-1.693610E-5	-4.614170E-3	1.507045E+2

Pressure in kPa/psi $= (A \times Hz^2) + (B \times Hz) + C$, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	1.034764E+3	-2.956537E-2	5.556825E-2	-1.173841E-4	5.260737E-5	-1.368908E-3
psi	1.500745E+2	-4.287943E-3	8.059210E-3	-1.702453E-5	7.629785E-6	-1.985363E-4

Pressure in kPa/psi $= C0 + (C1 \times Hz) + (C2 \times T) + (C3 \times Hz^2) + (C4 \times Hz \times T) + (C5 \times T^2)$

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.

TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.

Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

Thermistor reading is 15.3 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

Applied	Equivalent	Frequency	Calculated		Error
(kPa)	(psi)	(Hz)	(kPa)	(psi)	(%FS)
0.0	0.00	2849.5	0.3	0.04	-0.08
35.0	5.08	2799.3	35.0	5.07	0.00
70.0	10.15	2748.0	69.9	10.13	0.04
105.0	15.23	2695.6	104.8	15.20	0.05
140.0	20.31	2642.2	139.8	20.28	0.05
175.0	25.38	2587.5	175.0	25.38	0.01
210.0	30.46	2531.6	210.2	30.48	-0.04
245.0	35.53	2474.6	245.3	35.58	-0.08
280.0	40.61	2416.7	280.2	40.64	-0.06
315.0	45.69	2357.7	315.0	45.68	0.01
350.0	50.76	2297.2	349.8	50.73	0.06

VW Piezometer Calibration Certificate

Serial #: 1504686
Range : 350 kPa
Cable Length: 60 m
Date of Calibration: 12/8/2015

Part #: 52611026
Cable Part # : 50613524
Calibrated by: AM
Note:

ABC Calibration Factors

	A	B	C
kPa	-1.166943E-4	-3.064713E-2	1.158289E+3
psi	-1.692508E-5	-4.444991E-3	1.679956E+2

Pressure in kPa/psi $= (A \times Hz^2) + (B \times Hz) + C$, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	1.158113E+3	-3.145588E-2	4.002813E-2	-1.166868E-4	5.200750E-5	-1.558955E-3
psi	1.679642E+2	-4.562129E-3	5.805385E-3	-1.692339E-5	7.542785E-6	-2.260993E-4

Pressure in kPa/psi $= C0 + (C1 \times Hz) + (C2 \times T) + (C3 \times Hz^2) + (C4 \times Hz \times T) + (C5 \times T^2)$

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.
TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.
Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

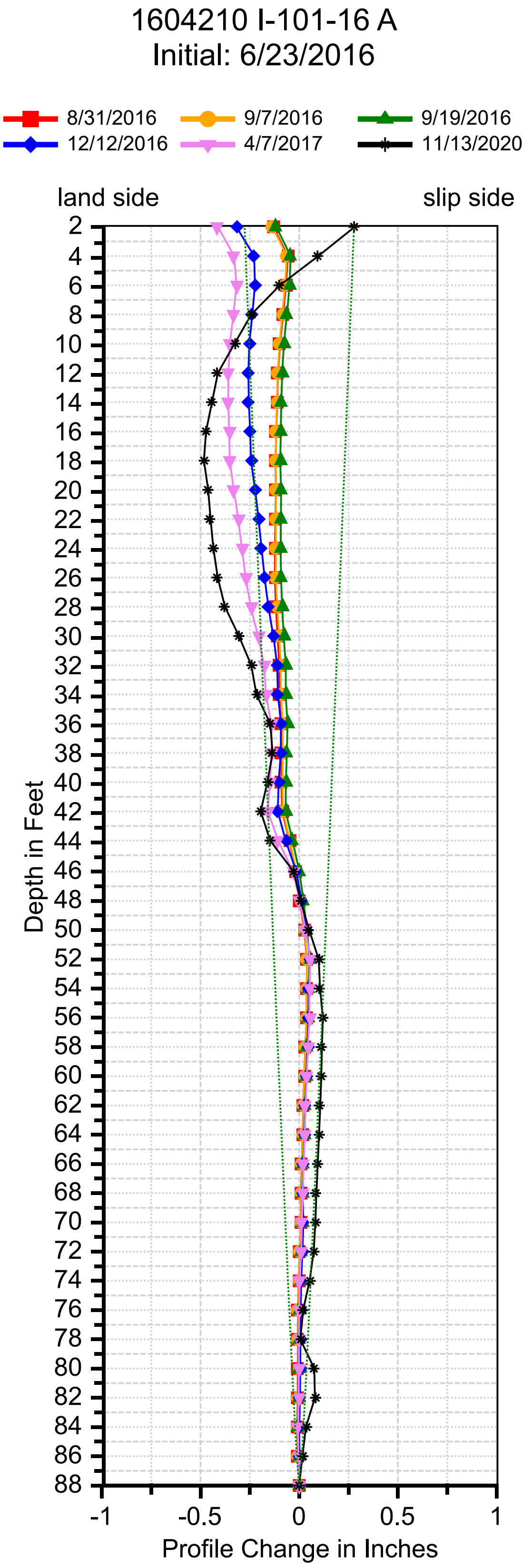
Thermistor reading is 14.6 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

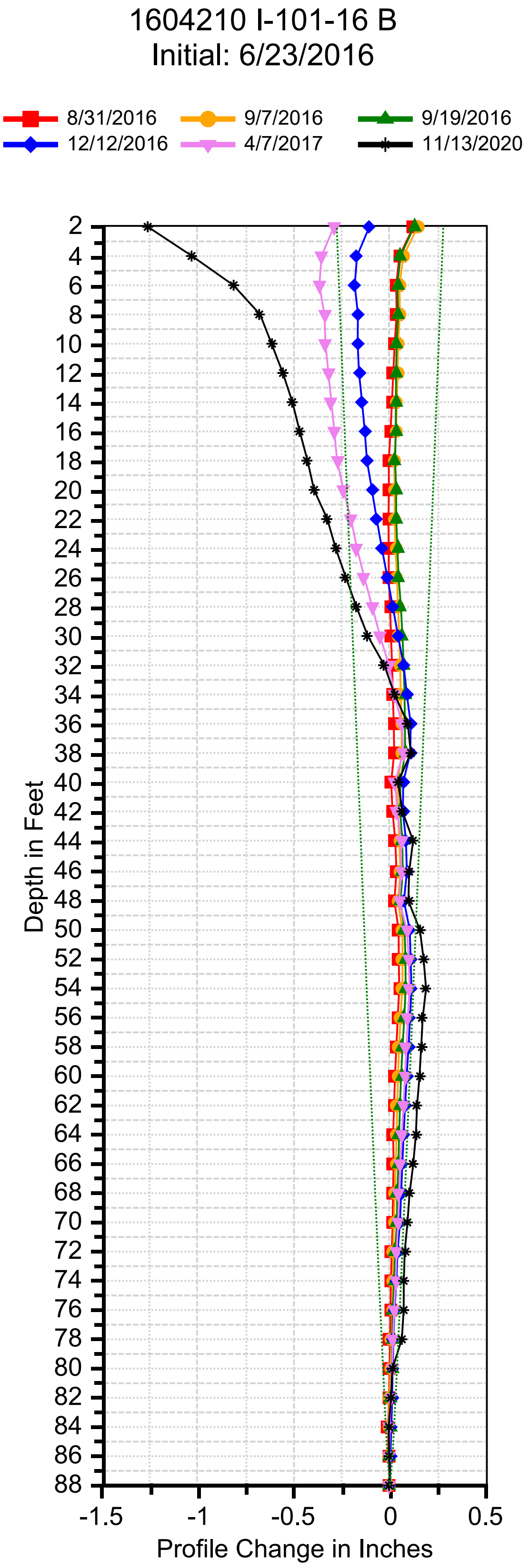
Applied (kPa)	Equivalent (psi)	Frequency (Hz)	Calculated (kPa)	(psi)	Error (%FS)
0.0	0.00	3021.7	0.2	0.03	-0.05
35.0	5.08	2974.0	35.0	5.08	-0.01
70.0	10.15	2925.5	69.9	10.14	0.03
105.0	15.23	2876.1	104.9	15.21	0.04
140.0	20.31	2825.8	139.9	20.29	0.04
175.0	25.38	2774.5	175.0	25.38	0.01
210.0	30.46	2722.2	210.1	30.47	-0.03
245.0	35.53	2669.0	245.2	35.56	-0.06
280.0	40.61	2615.1	280.1	40.63	-0.03
315.0	45.69	2560.1	315.0	45.69	0.00
350.0	50.76	2504.1	349.8	50.74	0.05

Attachment B

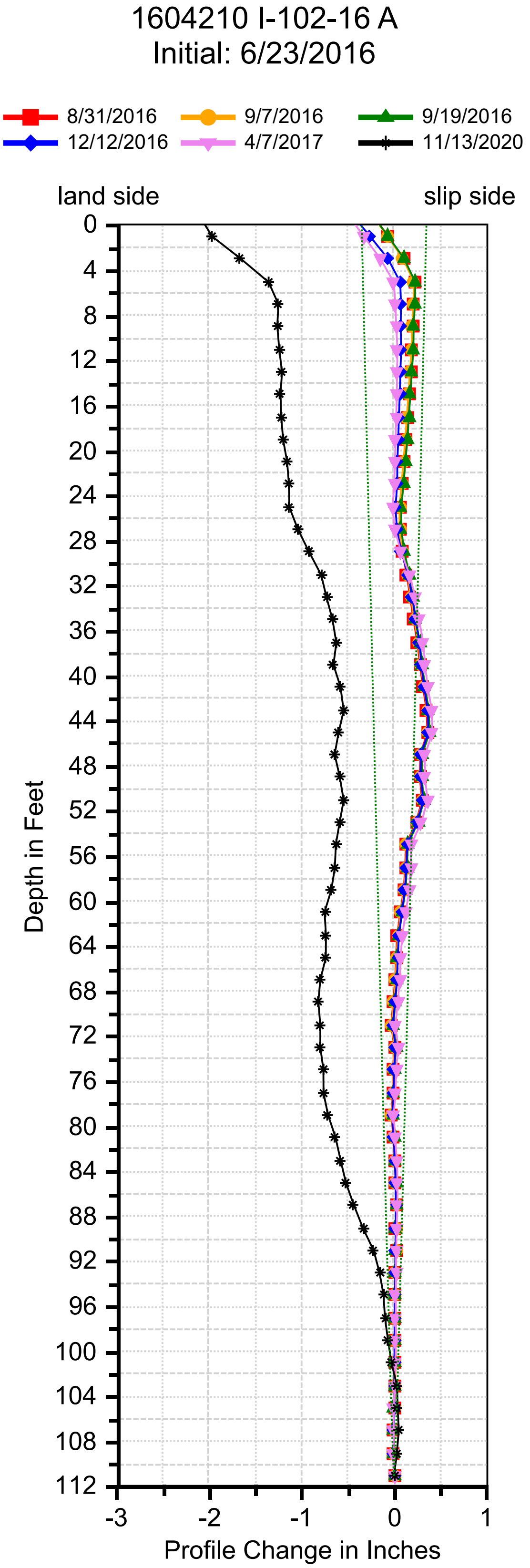
Inclinometer Results



1604210 I-101-16 A
Initial: 6/23/2016



1604210 I-101-16 B
Initial: 6/23/2016


1604210 I-102-16 A
Initial: 6/23/2016
8/31/2016
9/7/2016
9/19/2016
12/12/2016
4/7/2017
11/13/2020
land side
slip side
Depth in Feet
0
4
8
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108
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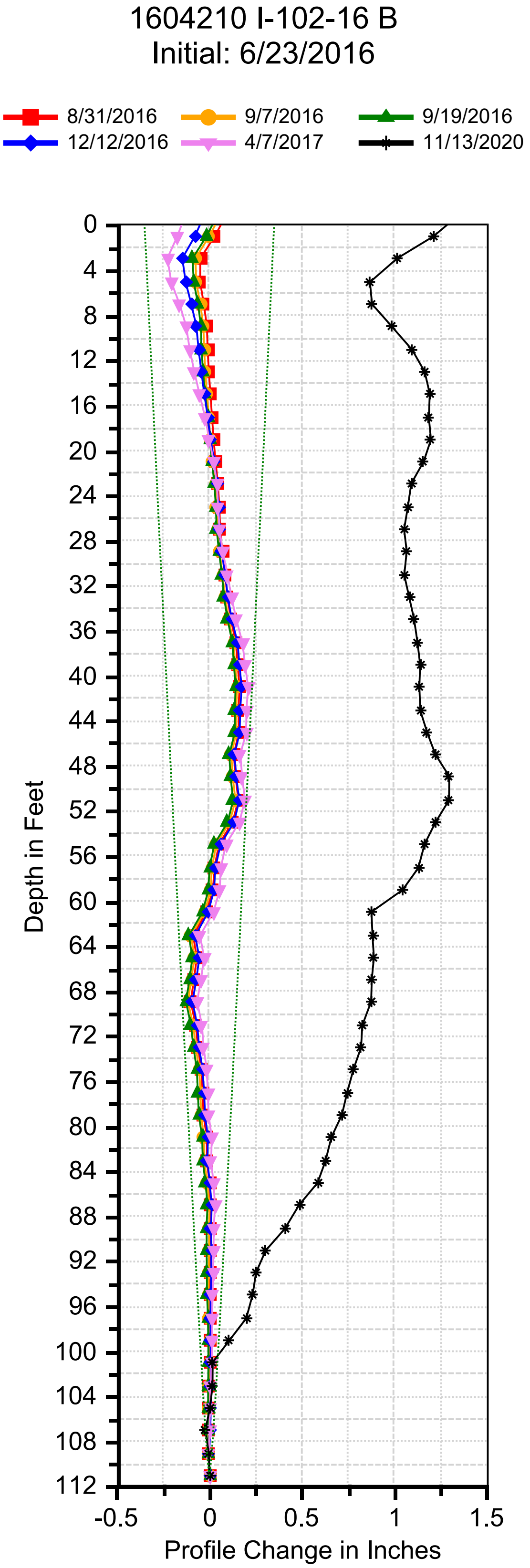
-3
-2
-1
0
1
Profile Change in Inches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Initial: 6/23/2016
8/31/2016
9/7/2016
9/19/2016
12/12/2016
4/7/2017
11/13/2020
Depth in Feet
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4
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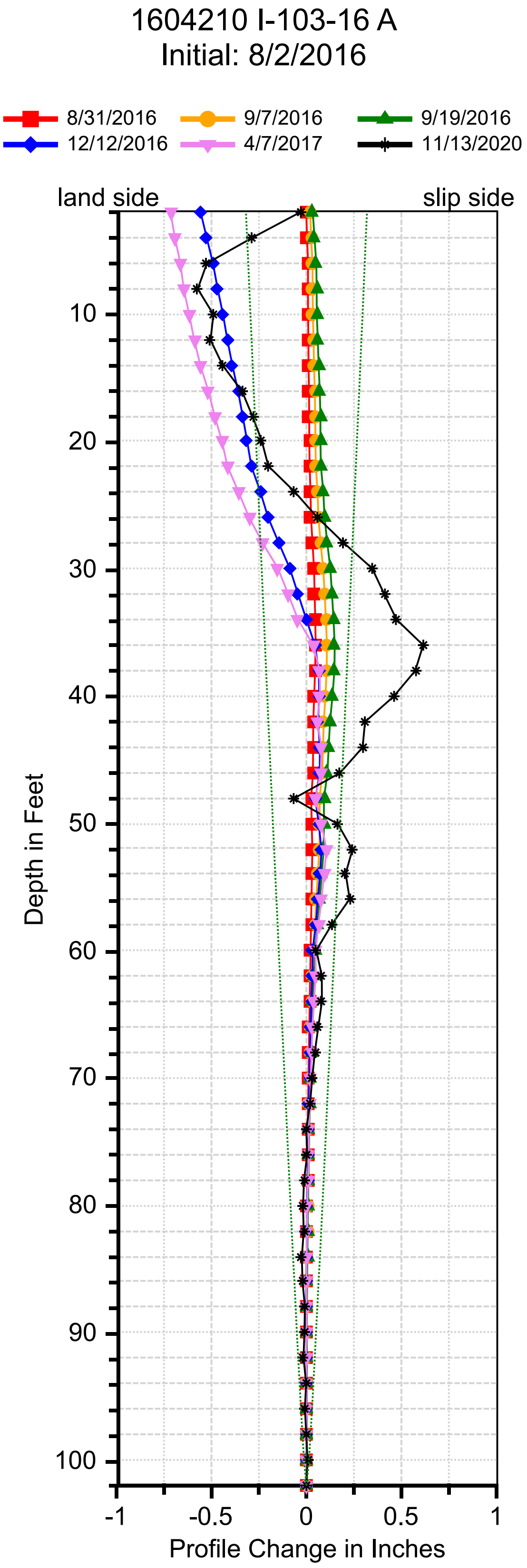
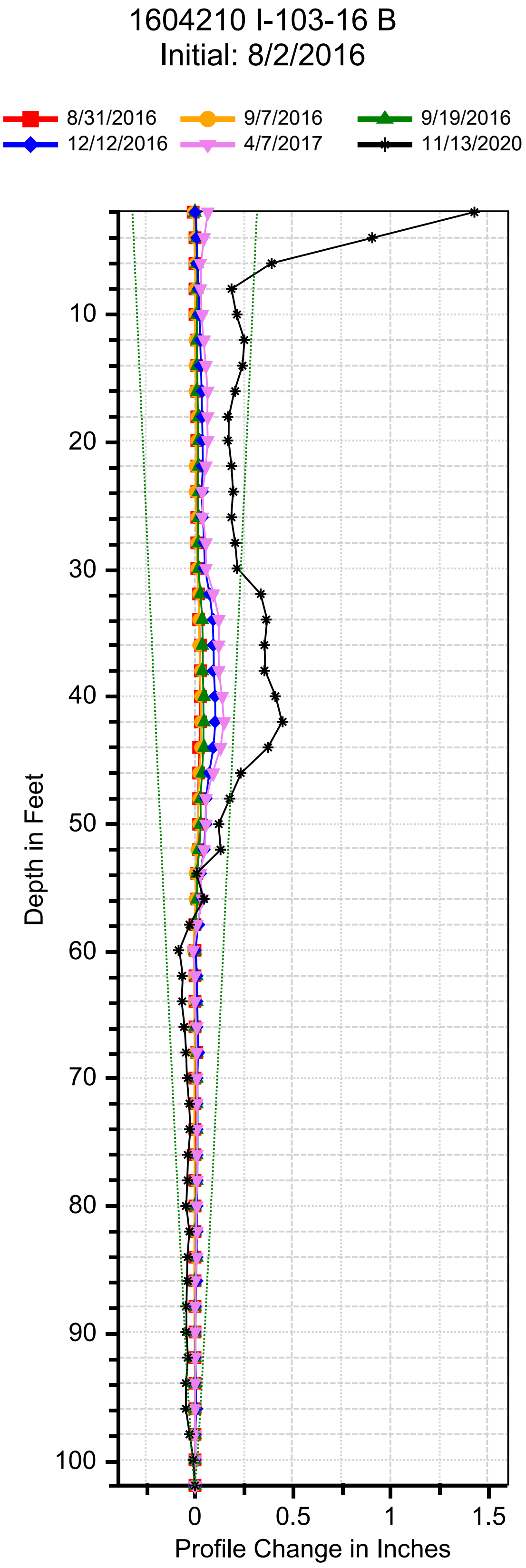
Profile Change in Inches


1604210 I-103-16 A
Initial: 8/2/2016

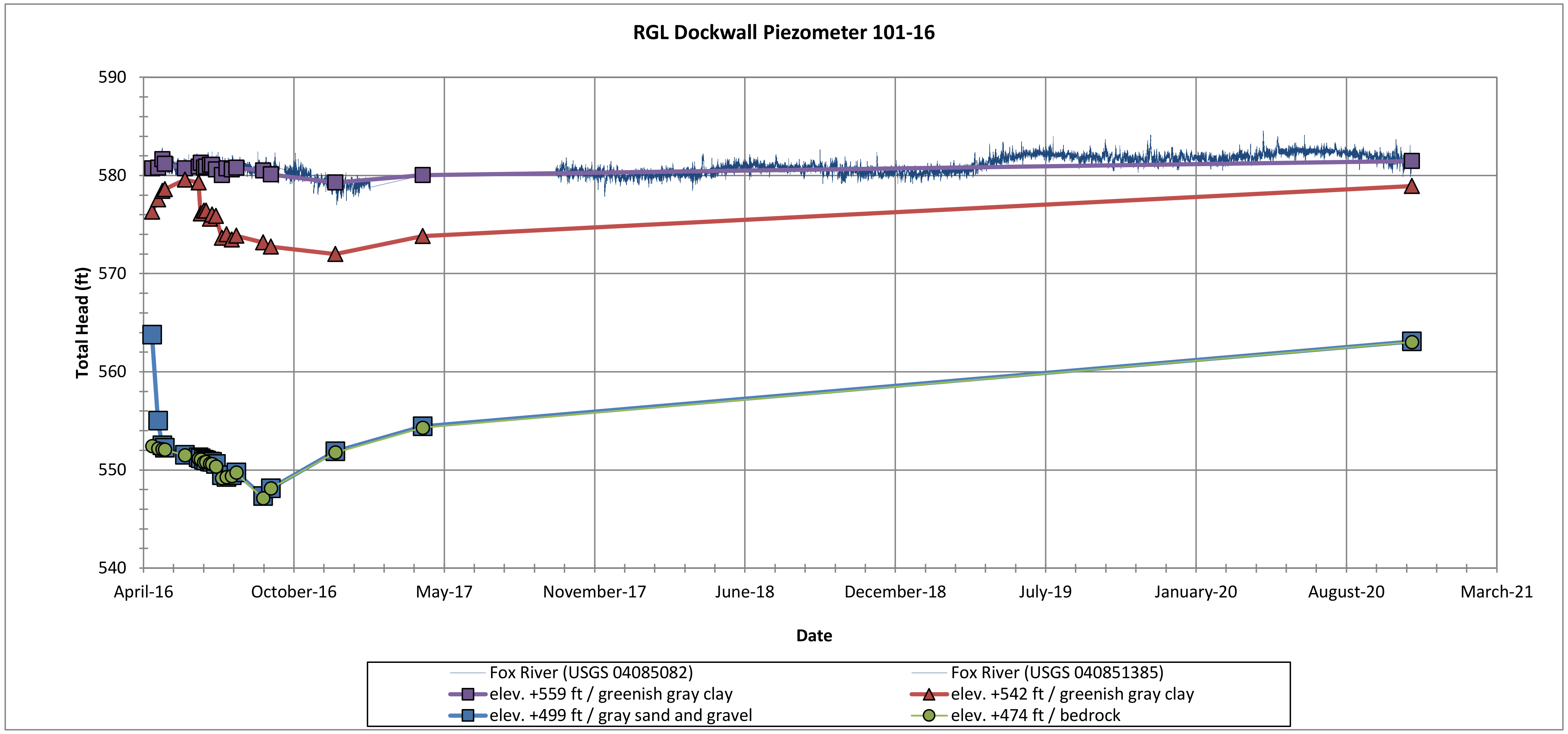

1604210 I-103-16 B
Initial: 8/2/2016

Attachment C

Piezometer Results

Piezometer Data Plot

	Piezometer Depth - 25 ft				Piezometer Depth - 42 ft				Piezometer Depth - 85 ft				Piezometer Depth - 110 ft			
	SN	1501268	Elevation	559.1	SN	1501107	Elevation	542.1	SN	1500977	Elevation	499.1	SN	1504686	Elevation	474.1
Date	Hz	Temp C	Pressure (psi)	Total Head (ft)	Hz	Temp C	Pressure (psi)	Total Head (ft)	Hz	Temp C	Pressure (psi)	Total Head (ft)	Hz	Temp C	Pressure (psi)	Total Head (ft)
4/12/2016	2,754.6	10.7	9.4	580.7	2,669.6	12.5	14.8	576.3	2,573.7	11.3	28.0	563.8	2,685.2	11.0	34.0	552.4
4/20/2016	2,754.3	10.6	9.4	580.8	2,664.0	12.6	15.4	577.5	2,619.4	11.1	24.2	555.0	2,686.4	11.0	33.8	552.2
4/26/2016	2,750.5	10.5	9.8	581.6	2,660.4	13.3	15.7	578.4	2,632.5	11.1	23.1	552.5	2,686.6	11.0	33.8	552.1
4/29/2016	2,752.4	10.4	9.6	581.2	2,658.8	11.3	15.8	578.6	2,633.7	11.1	23.0	552.2	2,686.8	11.0	33.8	552.1
5/26/2016	2,754.5	10.1	9.4	580.7	2,654.4	11.2	16.2	579.6	2,637.3	10.9	22.7	551.5	2,689.5	11.0	33.5	551.5
6/13/2016	2,753.6	10.0	9.5	580.9	2,655.8	11.4	16.1	579.3	2,638.7	11.3	22.6	551.3	2,691.2	11.2	33.4	551.1
6/16/2016	2,752.0	10.2	9.6	581.3	2,669.9	11.3	14.7	576.1	2,639.2	11.3	22.6	551.2	2,691.4	11.2	33.4	551.1
6/20/2016	2,754.2	10.1	9.4	580.8	2,668.6	11.3	14.9	576.4	2,640.1	11.3	22.5	551.0	2,692.7	11.2	33.2	550.8
6/23/2016	2,753.7	10.1	9.4	580.9	2,668.5	11.3	14.9	576.4	2,640.5	11.3	22.5	550.9	2,692.6	11.2	33.2	550.8
6/28/2016	2,752.9	10.1	9.53	581.1	2,672.3	11.3	14.5	575.6	2,641.0	11.3	22.4	550.8	2,693.3	11.2	33.18	550.6
7/1/2016	2,752.9	10.2	9.53	581.1	2,670.4	11.3	14.7	576.0	2,641.2	11.3	22.4	550.8	2,693.5	11.2	33.16	550.6
7/6/2016	2,755.0	10.2	9.32	580.6	2,671.0	11.3	14.6	575.9	2,642.3	11.3	22.3	550.6	2,694.7	11.2	33.05	550.3
7/14/2016	2,757.5	10.2	9.08	580.0	2,680.9	11.3	13.7	573.7	2,648.2	11.3	21.8	549.4	2,700.0	11.2	32.54	549.2
7/20/2016	2,754.6	10.2	9.36	580.7	2,679.2	11.2	13.8	574.0	2,649.1	11.3	21.7	549.3	2,699.5	11.2	32.58	549.3
7/27/2016	2,755.1	10.4	9.32	580.6	2,681.8	11.2	13.6	573.4	2,648.3	11.3	21.8	549.4	2,699.0	11.2	32.63	549.4
8/2/2016	2,754.3	10.5	9.40	580.8	2,680.0	11.2	13.8	573.8	2,646.6	11.3	22.0	549.7	2,697.5	11.2	32.78	549.7
9/7/2016	2,755.8	11.3	9.27	580.5	2,683.0	11.2	13.5	573.2	2,659.0	11.3	20.9	547.3	2,709.3	11.2	31.65	547.1
9/17/2016	2,757.5	11.6	9.11	580.1	2,684.9	11.2	13.3	572.7	2,655.0	11.3	21.2	548.1	2,704.8	11.2	32.08	548.1
12/12/2016	2,761.6	13.3	8.75	579.3	2,688.3	11.5	13.0	572.0	2,635.7	11.3	22.9	551.9	2,688.2	11.3	33.67	551.8
4/7/2017	2,757.8	11.1	9.07	580.0	2,680.2	11.4	13.7	573.8	2,622.3	11.0	24.0	554.4	2,676.6	10.9	34.77	554.3
11/13/2020	2,751.8	12.6	9.69	581.5	2,657.4	11.4	16.0	578.9	2,577.1	11.0	27.7	563.1	2,636.6	11.0	38.55	563.0

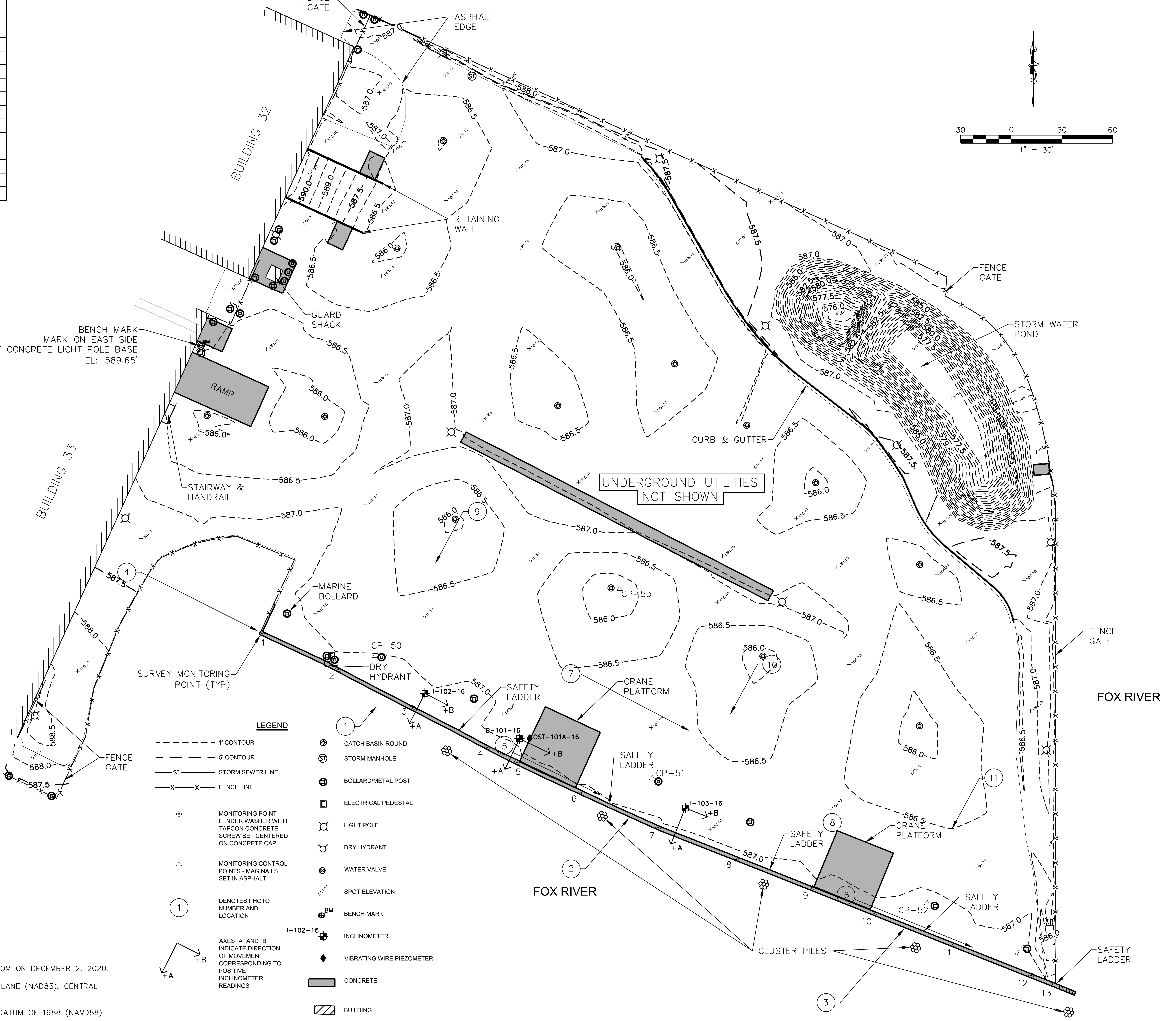


Attachment 4 – RGL Monitoring Drawing

ANSI D 22" x 34"

Project Management Initials: ____ Designer: ____ Checked: ____ Approved: ____

Baseline Monuments - December 2, 2020			
	Northing	Easting	NAVD88 Elevation
MON 1	248497.014	2483273.349	587.066
MON 2	248475.469	2483318.3	587.065
MON 3	248452.667	2483362.59	587.081
MON 4	248429.395	2483406.831	587.075
MON 5	248420.384	2483424.505	587.042
MON 6	248402.426	2483462.665	587.034
MON 7	248381.758	2483508.164	587.04
MON 8	248363.119	2483554.437	587.048
MON 9	248346.096	2483599.087	587.075
MON 10	248331.014	2483636.353	587.074
MON 11	248312.469	2483682.765	587.077
MON 12	248294.052	2483729.271	587.099
MON 13	248288.991	2483742.035	587.084



TO OBTAIN LOCATIONS OF PARTICIPANTS UNDERGROUND FACILITIES BEFORE YOU DIG IN WISCONSIN

CALL DIGGERS HOTLINE
1-800-242-8511
TOLL FREE
WIS STATUTE 182.0175(1974)

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LEGEND

- - - - - 1' CONTOUR
— — — 5' CONTOUR
——ST—— STORM SEWER LINE
—X——X— FENCE LINE
⊙ MONITORING POINT FENDER WASHER WITH TAPCON CONCRETE SCREW SET CENTERED ON CONCRETE CAP
△ MONITORING CONTROL POINTS - MAG NAILS SET IN ASPHALT
① DENOTES PHOTO NUMBER AND LOCATION
+A +B AXES "A" AND "B" INDICATE DIRECTION OF MOVEMENT CORRESPONDING TO POSITIVE INCLINOMETER READINGS
⊕ CATCH BASIN ROUND
ST STORM MANHOLE
⊚ BOLLARD/METAL POST
E ELECTRICAL PEDESTAL
LIGHT POLE
DRY HYDRANT
⊗ WATER VALVE
×583.23 SPOT ELEVATION
⊕BM BENCH MARK
I-102-16 INCLINOMETER
◆ VIBRATING WIRE PIEZOMETER
▬ CONCRETE
▨ BUILDING

NOTES:

1. MONITORING POINT BASELINE SURVEY PERFORMED BY AECOM ON DECEMBER 2, 2020.
2. HORIZONTAL COORDINATES BASED ON WISCONSIN STATE PLANE (NAD83), CENTRAL ZONE.
3. VERTICAL DATUM BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

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AECOM

PROJECT

CONCRETE CAP
MONITORING

CLIENT

RGL LOGISTICS
1401 State Street
Green Bay, Wisconsin 54304
920.432.8632 tel
www.rgllogistics.com

CONSULTANT

AECOM Green Bay
2985 South Ridge Road
Suite B
Green Bay, Wisconsin 54304
920.468.1978 tel 920.468.3212 fax
www.aecom.com

REGISTRATION

ISSUE/REVISION

A	12/02/2020	BASELINE SURVEY
I/R	DATE	DESCRIPTION

KEY PLAN

SHEET TITLE

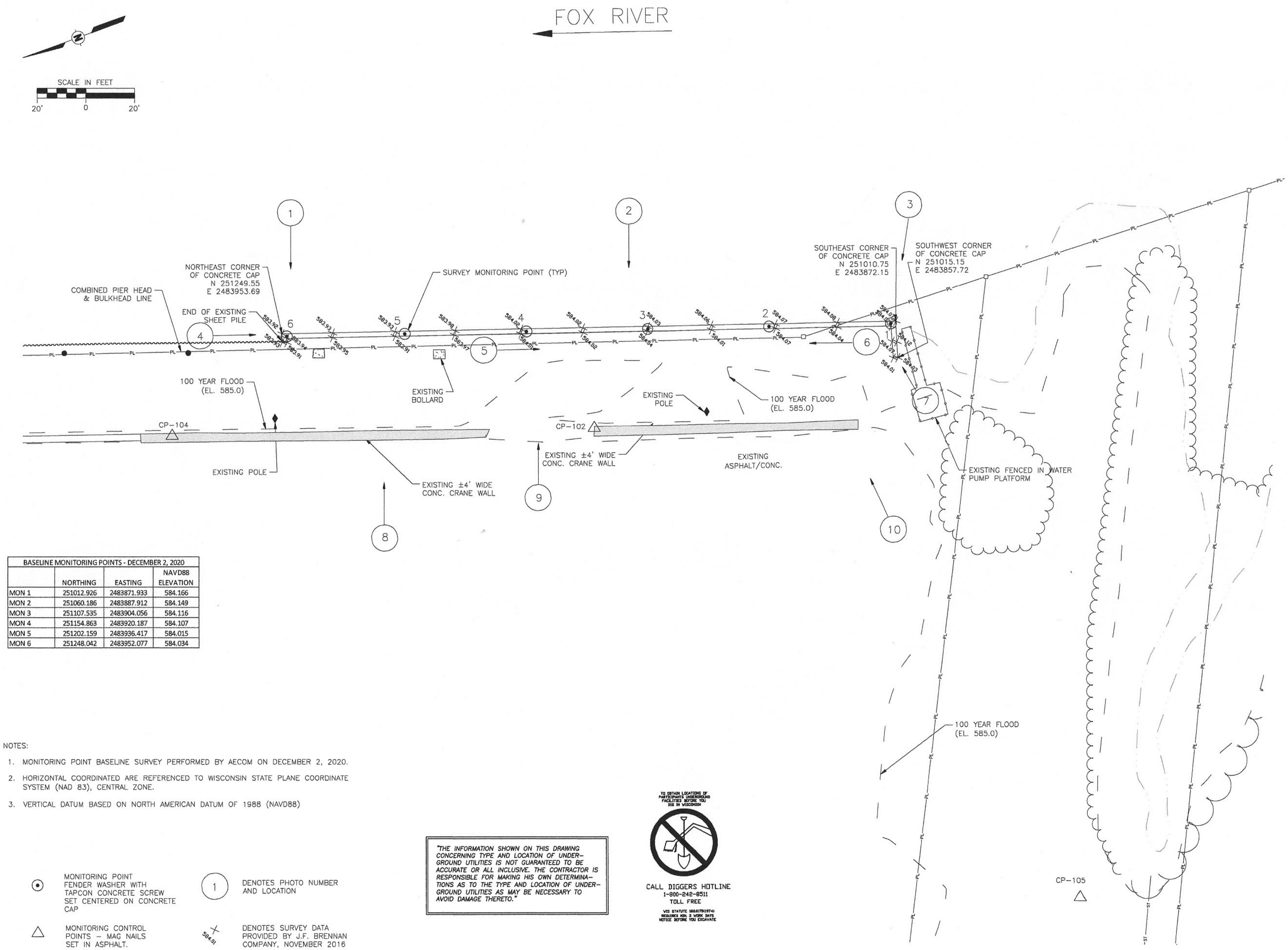
EXISTING CONDITIONS

SHEET NUMBER

RC-1

Attachment 5 – C. Reiss Monitoring Drawing

Filename: K:\PROJECTS\60607084_RGL AND REISS COMMP\900_CAD_GIS\C. REISS\C. REISS_MONITORING POINTS_12-2-2020.DWG Last saved by: DESROCHERSR Last Plotted: 2020-12-10 Project Management Initials: Designer: ____ Checked: ____ Approved: ____ ANSI D 22" x 34"



BASELINE MONITORING POINTS - DECEMBER 2, 2020			
	NORTHING	EASTING	NAVD88 ELEVATION
MON 1	251012.926	2483871.933	584.166
MON 2	251060.186	2483887.912	584.149
MON 3	251107.535	2483904.056	584.116
MON 4	251154.863	2483920.187	584.107
MON 5	251202.159	2483936.417	584.015
MON 6	251248.042	2483952.077	584.034

NOTES:

1. MONITORING POINT BASELINE SURVEY PERFORMED BY AECOM ON DECEMBER 2, 2020.
2. HORIZONTAL COORDINATED ARE REFERENCED TO WISCONSIN STATE PLANE COORDINATE SYSTEM (NAD 83), CENTRAL ZONE.
3. VERTICAL DATUM BASED ON NORTH AMERICAN DATUM OF 1988 (NAVD88)

⊙ MONITORING POINT FENDER WASHER WITH TAPCON CONCRETE SCREW SET CENTERED ON CONCRETE CAP

△ MONITORING CONTROL POINTS - MAG NAILS SET IN ASPHALT.

① DENOTES PHOTO NUMBER AND LOCATION

✕ 584.01 DENOTES SURVEY DATA PROVIDED BY J.F. BRENNAN COMPANY, NOVEMBER 2016

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TO OBTAIN LOCATIONS OF PARTICIPANTS UNDERGROUND FACILITIES BEFORE YOU DIG IN WISCONSIN

CALL DIGGERS HOTLINE
1-800-242-8511
TOLL FREE

WIS STATUTE 182.0175(1974)
REQUIRES MIN. 3 WORK DAYS
NOTICE BEFORE YOU EXCAVATE

AECOM

PROJECT

South Concrete Cap
Monitoring

CLIENT

C. Reiss Coal Company
111 W. Mason Street
Green Bay, WI 54303

CONSULTANT

AECOM
2985 South Ridge Road
Suite B
Green Bay, WI 54304
(920) 468-1978 tel
(920) 468-3312 fax
www.aecom.com

DAVID A.
ATKINS
E-30459
GREEN BAY,
WI

David A. Atkins

REGISTRATION 12-10-2020

ISSUE/REVISION

I/R	DATE	DESCRIPTION
1	12/10/2020	BASELINE SURVEY

KEY PLAN

PROJECT NUMBER

60607084

SHEET TITLE

EXISTING SITE PLAN

SHEET NUMBER

FIG-1

Attachment 6 – Visual Monitoring Checklist

AECOM

Inspection Checklist

Date / Time
Inspectors
Site

Concrete Cap

Movement/Rotation	
Control Joints and Expansion Joints	
Cracks	

Ground Surface

Sinkholes	
Cracks	

Steel Sheet Piles

Corrosion	
Waler	
Bolts/Anchor Rods	
Fender	

ATTACHMENT 4

VISUAL MONITORING CHECKLIST

AECOM Imagine it. Delivered.

Inspection Checklist

Date / Time
Inspectors
Site

Concrete Cap

Movement/Rotation	
Control Joints and Expansion Joints	
Cracks	

Ground Surface

Sinkholes	
Cracks	

Steel Sheet Piles

Corrosion	
Waler	
Bolts/Anchor Rods	
Fender	

ATTACHMENT 5

ANNUAL NOTIFICATION LETTERS

Georgia-Pacific Consumer Products LLC
133 Peachtree Street
Atlanta, Georgia 30303

March 12, 2021

Al Leisgang
Vice President / Chief Financial Officer
RGL Logistics
1401 State Street
Green Bay, Wisconsin 54304

Re: Bulkhead Wall Monitoring

Dear Mr. Leisgang,

As you are aware, Georgia-Pacific LLC (GP) is conducting monitoring of engineered caps as part of the Lower Fox Remediation project in accordance with the Cap Operations, Monitoring and Maintenance Plan (COMMP) for caps placed in the Lower Fox River as part of the remediation of polychlorinated biphenyls (PCBs) in Operable Units (OUs) 2 to 5 of the Lower Fox River and Green Bay Site. We appreciate the cooperation that you have afforded us to date to implement this program. This work is being performed under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §§ 9601-9675 and an Administrative Order on Consent, EPA Docket # V-W-04-781 (AOC) with the United States Environmental Protection Agency (EPA).

A portion of the bulkhead wall on RGL's property, as depicted on Attachment 1 (RGL Monitoring Plan Drawing), has been designated as a "cap" due to the presence of PCB containing sediment behind the wall and requires long-term monitoring as set forth in the COMMP, Revision 3, Dated March 12, 2021. We can provide you with a copy of COMMP on request. Therefore, GP is informing RGL of the need to notify GP if any of the following events occurs which may trigger immediate monitoring of the bulkhead wall cap:

- Vessel impact
- New construction
- Upland surcharge greater than design specifications

If warranted, event-based monitoring may include the following techniques and methods:

- Use of existing inclinometers
- Installation of new inclinometers

- Topographic surveying of monitoring points established on the bulkhead wall caps in 2020 (locations depicted on attached Monitoring Plan)
- Topographic surveying of select areas of the upland behind the bulkhead wall adjacent to the monitoring points
- Visual observations and photography
- Diver inspection of the bulkhead wall cap

Following notification of an event-based monitoring trigger, GP or one of its consultants will contact RGL to arrange for access to perform the monitoring within 14 calendar days of notice. RGL will be provided with a copy of any monitoring records or reports developed based on event-based monitoring for your records. Please note that this letter does not represent an agreement nor should it be construed as an admission of liability.

Thank you in advance for your cooperation.

Sincerely,

Dave Massengill
Georgia-Pacific, LLC

133 Peachtree Street

Atlanta, GA 30303
cc:

Attachments

Attachment 1 RGL Slip/C. Reiss Terminal Monitoring Plan Drawing

ANSI D 22" x 34"

Approved: ____ Checked: ____ Designer: ____ Project Management Initials: ____

Last saved by: DESROCHERSR(2021-02-09) Last Plotted: 2021-02-09
Filename: K:\PROJECTS\60607084_RGL AND REISS COMMP\900_CAD_GIS\RGL\MONITORING POINTS_12-2-2020.DWG

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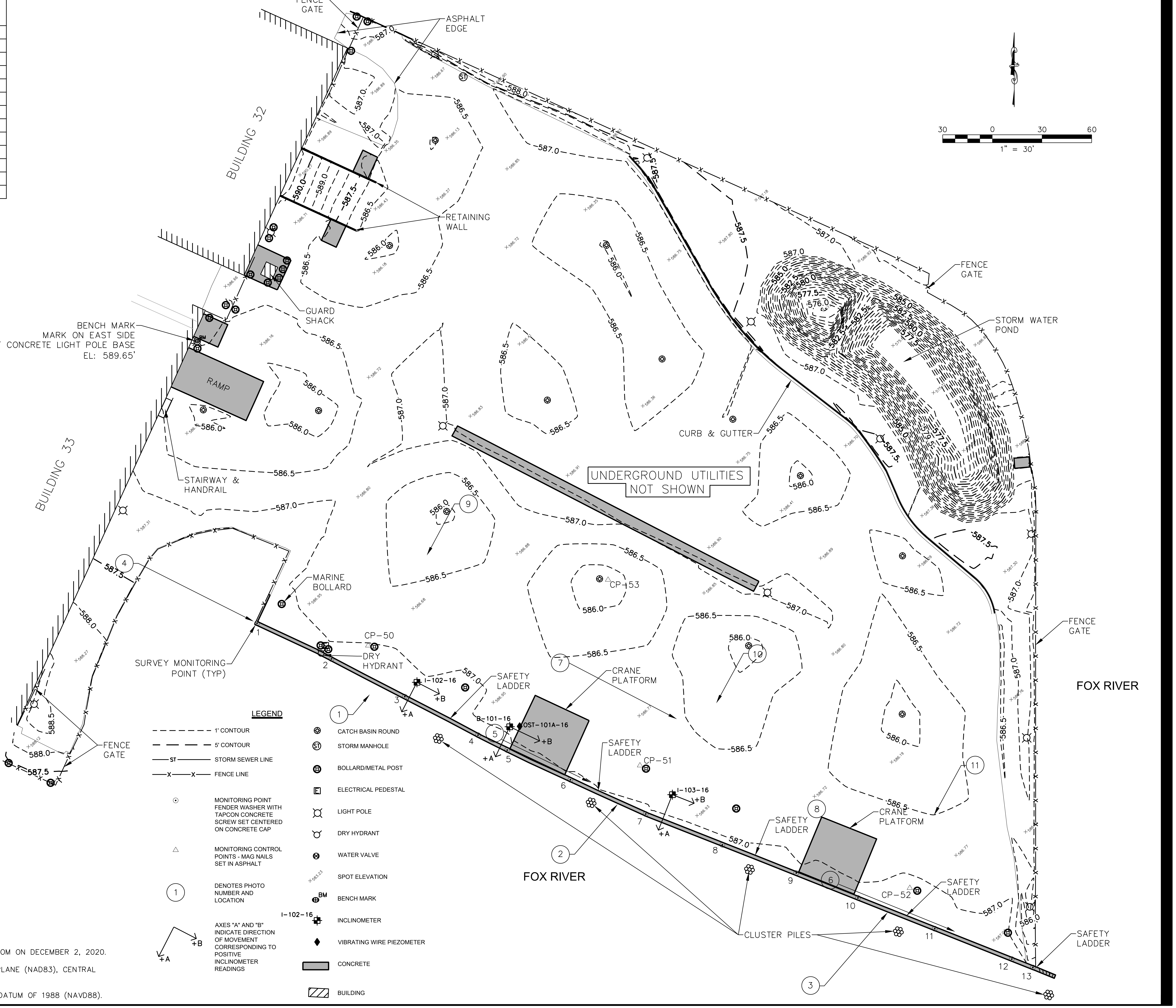

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3. VERTICAL DATUM BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

AECOM

PROJECT

CONCRETE CAP
MONITORING

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REGISTRATION

ISSUE/REVISION

A	12/02/2020	BASELINE SURVEY
I/R	DATE	DESCRIPTION

KEY PLAN

SHEET TITLE

EXISTING CONDITIONS

SHEET NUMBER

RC-1

DRAFT

Georgia-Pacific Consumer Products LLC
133 Peachtree Street
Atlanta, Georgia 30303

March 12, 2021

Christian Zuidmiller
Vice President
C. Reiss Coal Company, LLC
111 West Mason Street
Green Bay, Wisconsin 54304

Re: Bulkhead Wall Monitoring

Dear Mr. Zuidmiller,

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Sincerely,

Dave Massengill
Georgia-Pacific, LLC

133 Peachtree Street

Atlanta, GA 30303

cc:

Attachments

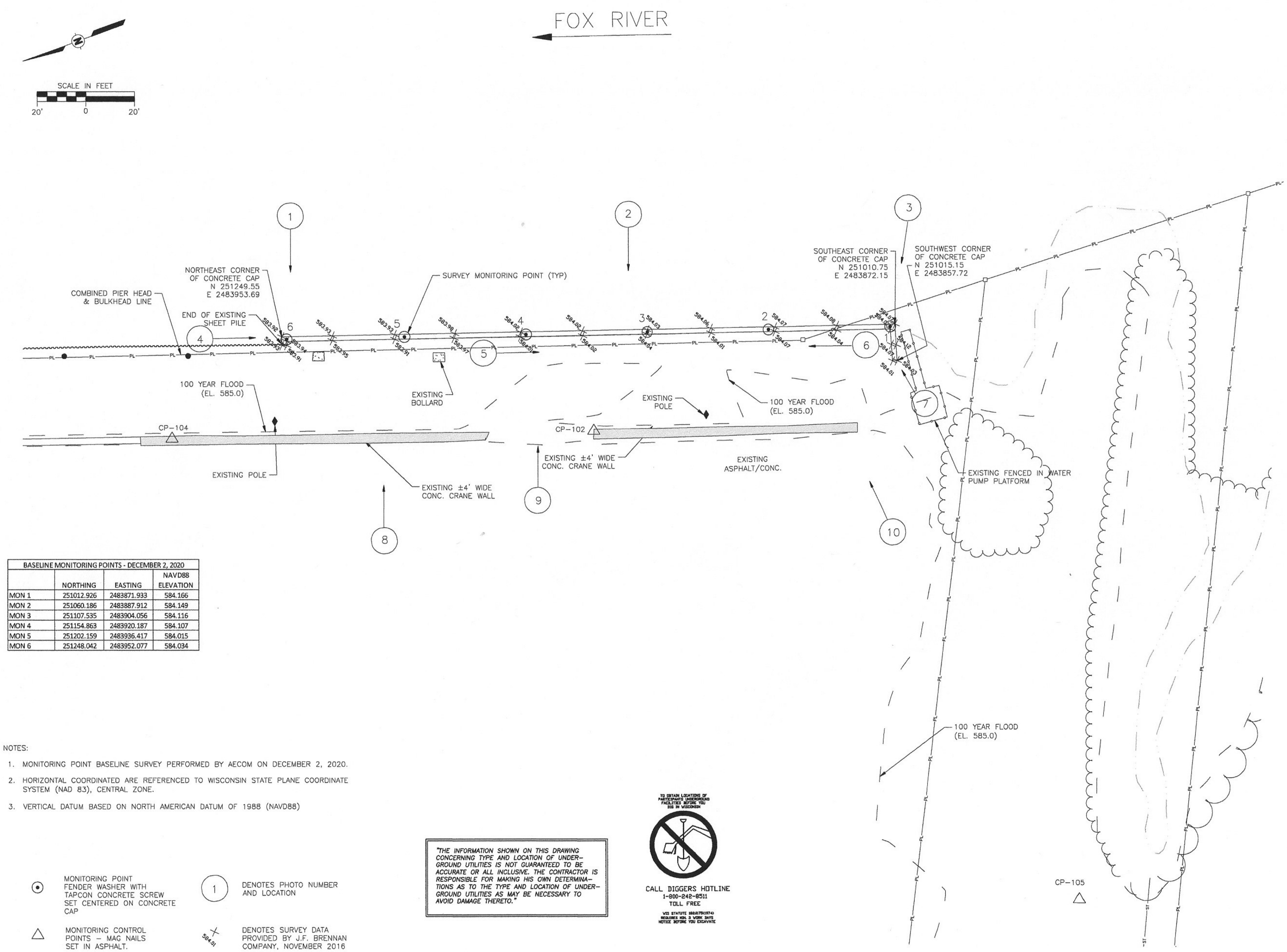
Attachment 1 C. Reiss Terminal Monitoring Plan Drawing

ANSI D 22" x 34"

Project Management Initials: ____ Designer: ____ Checked: ____ Approved: ____

Last Plotted: 2020-12-10 Last saved by: DESROCHERSR

Filename: K:\PROJECTS\60607084_RGL AND REISS COMM\900_CAD_GIS\C. REISS\C. REISS_MONITORING POINTS_12-2-2020.DWG



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△ MONITORING CONTROL POINTS - MAG NAILS SET IN ASPHALT.

① DENOTES PHOTO NUMBER AND LOCATION

× 584.01 DENOTES SURVEY DATA PROVIDED BY J.F. BRENNAN COMPANY, NOVEMBER 2016

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TOLL FREE

WIS STATUTE 182.0175(1974)
REQUIRES MIN. 3 WORK DAYS
NOTICE BEFORE YOU EXCAVATE

AECOM

PROJECT

South Concrete Cap Monitoring

CLIENT

C. Reiss Coal Company
111 W. Mason Street
Green Bay, WI 54303

CONSULTANT

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REGISTRATION 12-10-2020

ISSUE/REVISION

I/R	DATE	DESCRIPTION
1	12/10/2020	BASELINE SURVEY

KEY PLAN

PROJECT NUMBER

60607084

SHEET TITLE

EXISTING SITE PLAN

SHEET NUMBER

FIG-1

APPENDIX C

LIST OF LOWER FOX RIVER OPERABLE UNITS 2-5 CAPS

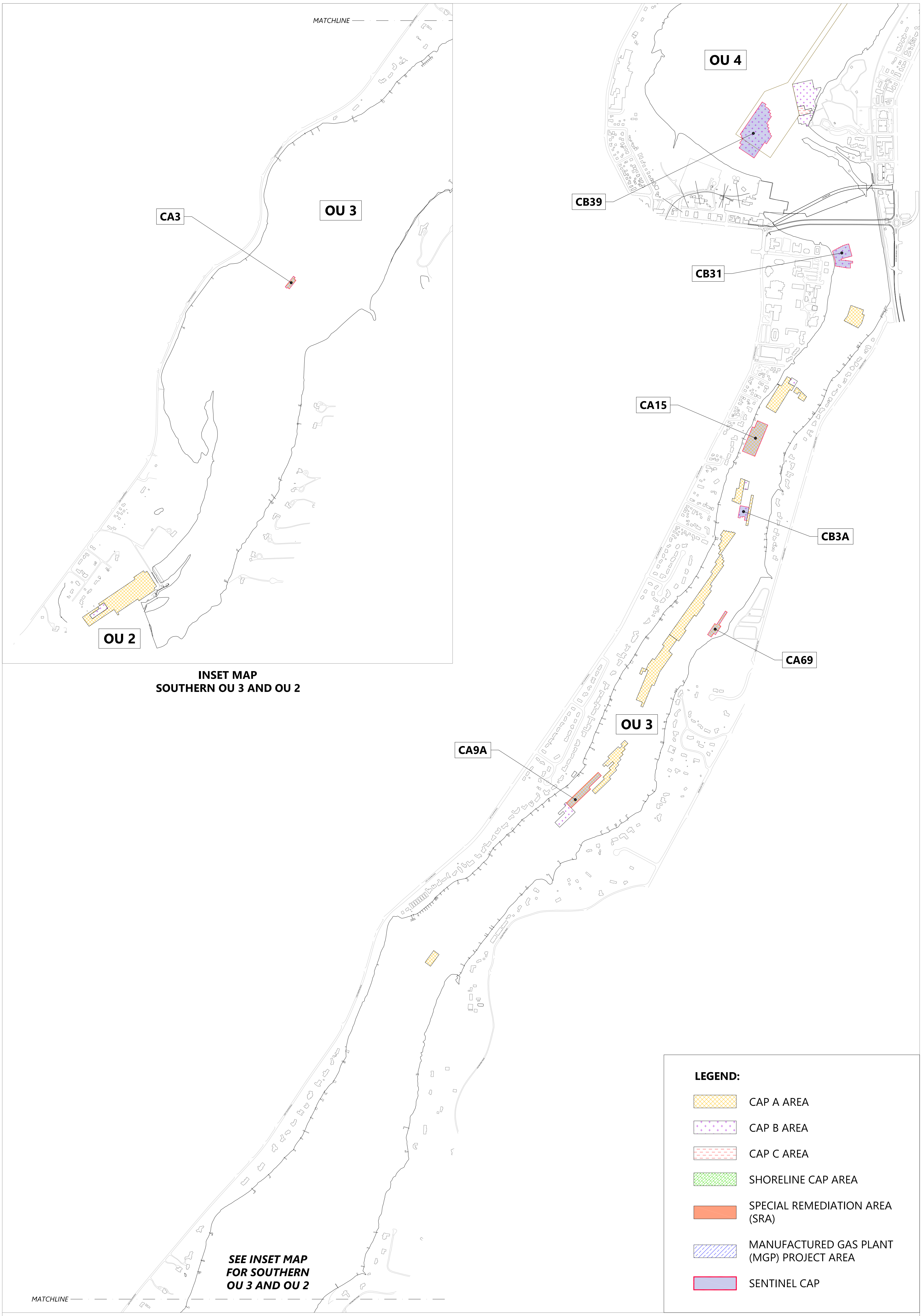
Appendix C

Operable Unit	Cap ID	Area (Acres)	Year of Cap Completion	Routine Monitoring Events																
				Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
OU 3	CA3	0.31	2009	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA6	0.55	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CB2	1.11	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA9A	1.44	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA9B	22.4	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA13A	4.27	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA13C	0.12	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA69	0.66	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA13B	5.53	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CB3A	0.58	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA13D	0.39	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA13E	0.83	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CB3B	0.21	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA15	2.45	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA16A	2.11	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA16B	0.39	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CB5	0.23	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CA17	1.52	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 3	CB31	1.79	2011	2011	--	--	2014	--	--	--	2018	--	--	--	2022	--	--	--	--	2027
OU 4	CBD23-1047	0.47	2013	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB39,CB39-1-1	5.65	2013	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	D24 RDMU1	2.06	2013	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	D24-RCMU3	0.39	2013	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CFIK-007	0.08	2013	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB6-1-1	4.28	2013	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CC9	0.48	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CBD23-1	0.49	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CBD23-27	0.46	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CBD23-34	0.71	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB 40 -1	0.14	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA61A-1	0.33	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA61C-1	0.12	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA61D-1	0.08	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB30	5.88	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA87	0.23	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CAD118	0.41	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA80A-1	0.15	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA80B-1	0.3	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA77B-1	0.14	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB9A-1	0.15	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB43	4.54	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CBD27A-1	0.63	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CBD27A-2	0.13	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA63-D	0.16	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CAD27A-3	0.09	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA63C	0.43	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA67	0.6	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB33	2.72	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB11A-1	0.76	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB45-1	3.47	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA23A-1	0.3	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA24B-1	1.37	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA24B-2	1.59	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB45-2	2.39	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB45-3	3.23	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB45-4	2.7	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CBD27G-1	0.27	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA24C	0.74	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA24D	0.56	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA27AB	1.11	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB53	0.09	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CB89A	0.26	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CA89B	0.33	2014	2014	--	2016	--	2018	--	--	--	2022	--	--	--	--	2027	--	--	--
OU 4	CC2E South-1	2.96	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC14	0.62	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB28A	0.99	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB46	0.37	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E South-2	3.23	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CA28C	2.08	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB47	0.41	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB54	0.15	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CBD148	0.63	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CA30A	1.61	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CA30B	0.18	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB52	0.53	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CBD144	0.25	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB50	3.5	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CA30C-1	2.28	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CBD35U South-1	0.34	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CCD35U South-1	0.1	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CBD35U South-2	0.08	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CCD35U South-2	0.09	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CBD35U South-3	0.5	2015	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E-South-3	1.95	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E-1A	0.39	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E-South-4	3.56	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E-South-5	3.39	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E-North-1	2.33	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--

Appendix C

Operable Unit	Cap ID	Area (Acres)	Year of Cap Completion	Routine Monitoring Events																
				Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
OU 4	CC2E-North-2	2.45	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E-North-3	3	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E-North-4	3	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E-North-5	3	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC2E-North-6	2.99	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CAFIK-065	0.23	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CBD34-2	0.23	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CCD34-2	0.04	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CBD35A-8B	0.34	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CBD35U North Micro 102	0.05	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	SHC100/CC100/Berm	0.3	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB33A	0.77	2016	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CA30C-2	1.05	2017	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB20-1	1.73	2017	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB20-2	1.77	2017	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CA34-1	1.17	2017	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CA34-2	1.29	2017	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB34	0.12	2017	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CC17	0.75	2017	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	SHC101/CC101(M)	0.53	2017	2017	2018	--	--	--	2022	--	--	--	--	2027	--	--	--	--	2032	--
OU 4	CB58	0.08	2018	2018	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CB20-2	1.77	2018	2018	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CB20-B3	1.73	2018	2018	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	SRA-06-1,2	2.87	2018	2018	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CB60-1	3.01	2019	2019	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CB60-SRA	0.92	2019	2019	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CC22	0.19	2019	2019	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	SRA-03	1.24	2019	2019	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	SRA-04	0.16	2019	2019	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	SRA-05/07	1.56	2019	2019	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CA94	2.83	2020	2020	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CA94-MOD	0.22	2020	2020	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CB60-2	0.38	2020	2020	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CB61	0.12	2020	2020	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CB35NOP-DCA45-7	0.15	2020	2020	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	CBD157-3	0.19	2020	2020	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--
OU 4	SRA-08	1.27	2020	2020	--	2022	--	--	--	--	2027	--	--	--	--	2032	--	--	--	--

APPENDIX D
SENTINEL CAP FIGURES



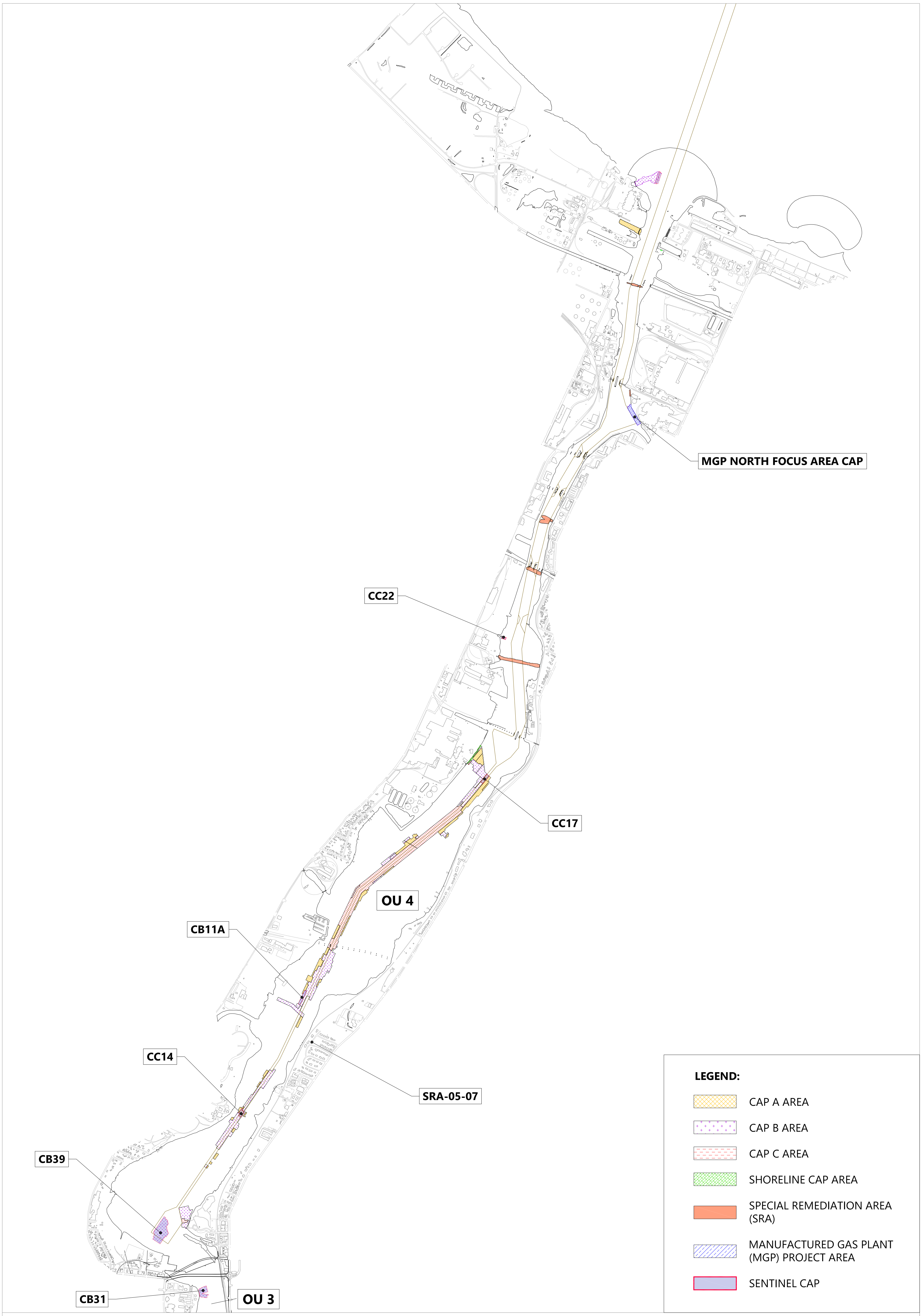
HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NORTH AMERICAN DATUM (NAD83), U.S. SURVEY FEET
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), FEET
NOTES:
1. DRAFT, SUBJECT TO CHANGE BASED ON FURTHER EVALUATIONS.

Publish Date: 2019/11/15 9:40 AM | User: dbinkney
Filepath: \\amesbury1\Greenleaf\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2019\DESIGN\Sentinel Caps\Fox River COMMP - Sentinel Caps - 10212019.dwg FIG_1_OU3-FULL

ANCHOR QEA

FIGURE D-1
SENTINEL CAP AREAS - OU 3

CAP OPERATIONS, MONITORING AND MAINTENANCE PLAN
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NORTH AMERICAN DATUM (NAD83), U.S. SURVEY FEET

VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), FEET

NOTES:

1. DRAFT, SUBJECT TO CHANGE BASED ON FURTHER EVALUATIONS.

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ANCHOR QEA

FIGURE D-2
SENTINEL CAP AREAS - OU 4

CAP OPERATIONS, MONITORING AND MAINTENANCE PLAN
LOWER FOX RIVER REMEDIATION

APPENDIX E
HISTORY OF BULKHEAD WALL CAPS

George Berken

From: George Berken
Sent: Tuesday, August 30, 2016 2:12 PM
To: Bill Hartman; 'bryan.heath@ncr.com'; David Massengill (DGMassen@gapac.com); 'jheyde@Sidley.com'; 'JLawson@project-control.com'; Mrotek, Melissa (GBY); 'PAMontne@GaPac.Com'; 'Roger.Kaminski@GaPac.com'; 'soconnell@project-control.com'; Ben Hendron (Ben.Hendron@tetratech.com); Bill Coleman - Tetra Tech ECI (bill.coleman@tetratech.com); Bjorn Lysne (Bjorn.Lysne@tetratech.com); Brandon Weston (Brandon.Weston@tetratech.com); Cynthia Jones (Cynthia.Jones@tetratech.com); Dan Binkney (dbinkney@anchorqea.com); Denis Roznowski (Denis.Roznowski@Foth.com); ECI.LFRRPC@tetratech.com; Fred Swed (Frederick.Swed@TetraTech.Com); George Willant (George.Willant@tetratech.com); Hugh Kinnard (Hugh.Kinnard@tetratech.com); Jimmy Jenkins (Jimmy.Jenkins@tetratech.com); Joe Francis (Joe.Francis@tetratech.com); Julie VanDeuren (Julie.VanDeuren@tetratech.com); MIchelle Miller; Morey Tabatabai (Morey.Tabatabai@tetratech.com); Paul LaRosa (plarosa@anchorqea.com); Richard Feeney (richard.feeney@tetratech.com); Ricky Gifford (ricky.gifford@tetratech.com); Tara Van Hoof (Tara.VanHoof@Foth.com); Terri Blackmar (Terri.Blackmar@tteci.com); Troy Gawronski (TGawronski@foth.com); 'dbauman@JFBRENNAN.COM'; 'gsmith@jfbrennan.com'; 'm.j.Luth@Boskalis.nl'; 'r.driessen@Boskalis.nl'; 'vbuhr@jfbrennan.com'
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: 87500 OU2-5 - FW: LFRR-16-0167 - Sample Results next to the C. Reiss Timber Bulkhead where the new Steel Wall will be installed
Attachments: DOC000.pdf

Richard, on behalf of the Agencies, on August 25, 2016 you emailed the A/OT with the following request:

==

Hi George,

Below is a reply you have seen that we received from Koch Minerals, on behalf of C. Reiss. In it they inform us that leaving interstitial sediment between the new wall and the deteriorated timber wall is acceptable.

Can you please let us know if this documentation of acceptance by the riparian property owner, for the interstitial sediment to remain in place, is sufficient?

Thanks

Richard J. Feeney, P.E. | **Vice President, Project Engineering**
National Environmental Engineering Discipline Lead
Direct: 973.630.8092 | Fax: 973.630.8025 | Cell: 201.650.1006
Fox River Green Bay, WI Project Office | Direct: 920.445.0732 | Fax: 920.445.0719
Richard.Feeney@tetratech.com

==

After receiving Craig Maetzold's (Koch Industries) email below, with the referenced page attached, the Agencies have determined that Koch Industries' acceptance of interstitial sediment, which exceeds the remedial action level (PCB Concentration greater than 1.0 ppm), has been sufficiently documented. This documentation is also consistent with Gary Kincaid's telephone discussions with Craig Maetzold.

Thanks,
George…

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

boldt.com

SafeThinking: Our Crusade to Eliminate Accidents

From: Kincaid, Gary W - DNR [mailto:Gary.Kincaid@wisconsin.gov]
Sent: Tuesday, August 30, 2016 12:02 PM
To: Jay Grosskopf <Jay.Grosskopf@Boldt.com>; George Berken <George.Berken@boldt.com>; Larry DeBruin <Larry.Debruin@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: Kincaid, Gary W - DNR <Gary.Kincaid@wisconsin.gov>
Subject: FW: LFRR-16-0167 - Sample Results next to the C. Reiss Timber Bulkhead where the new Steel Wall will be installed

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Gary W. Kincaid
Office Phone: [920-662-5136]
Cell Phone: [920-360-4513]
Gary.Kincaid@wi.gov

From: Maetzold, Craig [mailto:Craig.Maetzold@kochind.com]
Sent: Tuesday, August 30, 2016 11:57 AM
To: Kincaid, Gary W - DNR
Subject: FW: LFRR-16-0167 - Sample Results next to the C. Reiss Timber Bulkhead where the new Steel Wall will be installed

Gary: reference page from the agreement is attached.

Craig

From: Donelson, Leslie
Sent: Wednesday, August 24, 2016 3:58 PM
To: Feeney, Richard <Richard.Feeney@tetratech.com>; Zuidmulder, Christian <Christian.Zuidmulder@fracchem.com>; Brand, Austin <Austin.Brand@kochind.com>; Maetzold, Craig <Craig.Maetzold@kochind.com>
Cc: 'Kincaid, Gary W - DNR' <Gary.Kincaid@Wisconsin.gov>; George Berken <George.Berken@boldt.com>; 'Jay.Grosskopf@Boldt.com' <Jay.Grosskopf@Boldt.com>; 'Larry.Debruin@Boldt.com' <Larry.Debruin@Boldt.com>; Ava.Grosskopf@Boldt.com; Jeffrey Lawson <JLawson@project-control.com>; Bryan Heath (Bryan.Heath@ncr.com)

<Bryan.Heath@ncr.com>; Susan O'Connell <SOConnell@project-control.com>; Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com) <Troy.Gawronski@Foth.com>; Montney, Paul A. <PAMONTNE@GAPAC.com>; Kaminski, Roger (GBY) <ROGER.KAMINSKI@GAPAC.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Willant, George <George.Willant@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; Dustin Bauman (dbauman@JFBRENNAN.COM) <dbauman@JFBRENNAN.COM>
Subject: RE: LFRR-16-0167 - Sample Results next to the C. Reiss Timber Bulkhead where the new Steel Wall will be installed

Richard,

C. Reiss has reviewed the language of the cost sharing agreement between C. Reiss Coal Company and Lower Fox River Remediation LLC, dated August 19, 2016 para. 5d. part (i) and maintain the position of no objection as signed by both parties.

Les Donelson
Koch Minerals, LLC | Project Manager | 316.828.4832 p | 316.204.2647 c

---

From: Feeney, Richard [mailto:Richard.Feeney@tetratech.com]
Sent: Wednesday, August 24, 2016 3:13 PM
To: Donelson, Leslie <Leslie.Donelson@kochind.com>; Zuidmulder, Christian <Christian.Zuidmulder@fracchem.com>; Brand, Austin <Austin.Brand@kochind.com>; Maetzold, Craig <Craig.Maetzold@kochind.com>
Cc: 'Kincaid, Gary W - DNR' <Gary.Kincaid@Wisconsin.gov>; George Berken <George.Berken@boldt.com>; 'Jay.Grosskopf@Boldt.com' <Jay.Grosskopf@Boldt.com>; 'Larry.Debruin@Boldt.com' <Larry.Debruin@Boldt.com>; Ava.Grosskopf@Boldt.com; Jeffrey Lawson <JLawson@project-control.com>; Bryan Heath (Bryan.Heath@ncr.com) <Bryan.Heath@ncr.com>; Susan O'Connell <SOConnell@project-control.com>; Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com) <Troy.Gawronski@Foth.com>; Montney, Paul A. <PAMONTNE@GAPAC.com>; Kaminski, Roger (GBY) <ROGER.KAMINSKI@GAPAC.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Willant, George <George.Willant@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; Dustin Bauman (dbauman@JFBRENNAN.COM) <dbauman@JFBRENNAN.COM>
Subject: RE: LFRR-16-0167 - Sample Results next to the C. Reiss Timber Bulkhead where the new Steel Wall will be installed

Sent by an external sender

Hi Les,

As per the cost sharing agreement for the new wall, please send us an email acknowledging that leaving PCB contaminated sediment between the new steel wall and the existing timber wall is acceptable to C. Reiss.

Please let me know if you have any questions.

Thank you,

Richard J. Feeney, P.E. | Vice President, Project Engineering
National Environmental Engineering Discipline Lead
Direct: 973.630.8092 | Fax: 973.630.8025 | Cell: 201.650.1006
Fox River Green Bay, WI Project Office | Direct: 920.445.0732 | Fax: 920.445.0719
Richard.Feeney@tetratech.com

Tetra Tech, Inc. | Engineering
1000 The American Rd | Morris Plains, NJ 07950 | www.tteci.com | www.tetratech.com
1611 State Street | Green Bay, WI 54304

Think Green - Not every email needs to be printed.

From: Donelson, Leslie [mailto:Leslie.Donelson@kochind.com]
Sent: Thursday, August 18, 2016 1:17 PM
To: Feeney, Richard <Richard.Feeney@tetratech.com>; Zuidmulder, Christian <Christian.Zuidmulder@fracchem.com>; Brand, Austin <Austin.Brand@kochind.com>; Maetzold, Craig <Craig.Maetzold@kochind.com>
Cc: 'Kincaid, Gary W - DNR' <Gary.Kincaid@Wisconsin.gov>; George Berken <George.Berken@boldt.com>; 'Jay.Grosskopf@Boldt.com' <Jay.Grosskopf@Boldt.com>; 'Larry.Debruin@Boldt.com' <Larry.Debruin@Boldt.com>; Ava.Grosskopf@Boldt.com; Jeffrey Lawson <JLawson@project-control.com>; Bryan Heath (Bryan.Heath@ncr.com) <Bryan.Heath@ncr.com>; Susan O'Connell <SOConnell@project-control.com>; Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com) <Troy.Gawronski@Foth.com>; Montney, Paul A. <PAMONTNE@GAPAC.com>; Kaminski, Roger (GBY) <ROGER.KAMINSKI@GAPAC.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Willant, George <George.Willant@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; Dustin Bauman (dbauman@JFBRENNAN.COM) <dbauman@JFBRENNAN.COM>
Subject: RE: LFRR-16-0167 - Sample Results next to the C. Reiss Timber Bulkhead where the new Steel Wall will be installed

Richard,

On the previous drawing the volume of sediment was calculated at 110 cubic yards.

Can you verify what the volume of sediment will be on the latest drawing?

Thanks

Les Donelson
Koch Minerals, LLC | Project Manager | 316.828.4832 p | 316.204.2647 c

---

From: Feeney, Richard [mailto:Richard.Feeney@tetratech.com]
Sent: Thursday, August 18, 2016 11:46 AM
To: Donelson, Leslie <Leslie.Donelson@kochind.com>; Zuidmulder, Christian <Christian.Zuidmulder@fracchem.com>; Brand, Austin <Austin.Brand@kochind.com>; Maetzold, Craig <Craig.Maetzold@kochind.com>
Cc: 'Kincaid, Gary W - DNR' <Gary.Kincaid@Wisconsin.gov>; George Berken <George.Berken@boldt.com>; 'Jay.Grosskopf@Boldt.com' <Jay.Grosskopf@Boldt.com>; 'Larry.Debruin@Boldt.com' <Larry.Debruin@Boldt.com>; Ava.Grosskopf@Boldt.com; Jeffrey Lawson <JLawson@project-control.com>; Bryan Heath (Bryan.Heath@ncr.com) <Bryan.Heath@ncr.com>; Susan O'Connell <SOConnell@project-control.com>; Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com) <Troy.Gawronski@Foth.com>; Montney, Paul A. <PAMONTNE@GAPAC.com>; Kaminski, Roger (GBY) <ROGER.KAMINSKI@GAPAC.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Willant, George <George.Willant@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; Dustin Bauman (dbauman@JFBRENNAN.COM) <dbauman@JFBRENNAN.COM>
Subject: LFRR-16-0167 - Sample Results next to the C. Reiss Timber Bulkhead where the new Steel Wall will be installed

Sent by an external sender

Hi Les, et al,

A few weeks ago we went over lab results for samples obtained in the river near where the new bulkhead will be installed. Following that you asked Tetra Tech to collect additional samples from cores positioned closer to the timber wall. The idea was that these new locations would be more representative of interstitial sediment that will remain between the deteriorated timber wall and the new steel wall.

Attached for your information are a location figure and lab results for samples from five new core locations. As you will note these PCB levels are lower than those further out in the river that we reviewed previously. These new samples were positioned as close to the shoreline as close as we were able to collect sediment samples from, at locations suggested by the A/OT.

Please let us know if you have any comments or questions about this information.

Thanks

Richard J. Feeney, P.E. | **Vice President, Project Engineering**
National Environmental Engineering Discipline Lead
Direct: 973.630.8092 | Fax: 973.630.8025 | Cell: 201.650.1006
Fox River Green Bay, WI Project Office | Direct: 920.445.0732 | Fax: 920.445.0719
Richard.Feeney@tetratech.com

Tetra Tech, Inc. | **Engineering**
1000 The American Rd | Morris Plains, NJ 07950 | www.tteci.com | www.tetratech.com
1611 State Street | Green Bay, WI 54304

George Berken

From: Kincaid, Gary W - DNR <gary.kincaid@wisconsin.gov>
Sent: Monday, November 10, 2014 5:04 PM
To: Jay Grosskopf; Sharon Dunham; George Berken; Larry DeBruin; beth.olson@wisconsin.gov
Cc: Kincaid, Gary W - DNR
Subject: FW: Letter from RGL to the AOT indicating opposition to any capping in the RGL slip
Attachments: letter on behalf of RGL Real Estate, Inc. to G. Berken - Boldt (W0951337xA1F97).doc

FYI

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Gary W. Kincaid
Office Phone: [920-662-5136]
Cell Phone: [920-360-4513]
Gary.Kincaid@wi.gov

From: Al Leisgang [mailto:aleisgang@rgllogistics.com]
Sent: Monday, November 10, 2014 2:11 PM
To: Kincaid, Gary W - DNR
Subject: Letter

Gary, sending you a heads up, the attached letter went out today.

Thanks

al leisgang
VP/CFO
direct. 920.884.1388

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November 10, 2014

Mr. George Berken
Boldt Technical Services
2525 N. Roemer Road
Appleton, WI 54912-0419

Re: Lower Fox River Remedial Design
RGL Boat Slip

Dear Mr. Berken:

We write this letter in follow up to the meeting held at our office on October 30, 2014, among representatives of the Fox River Cleanup Group, NCR, TetraTech, Project Control Companies, Georgia-Pacific, the Wisconsin Department of Natural Resources, Boldt Technical Services, and the RGL entities (collectively, "RGL"). The Fox River Cleanup Group and its associated representatives gave a general conceptual overview of the range of potential remedial design options for the boat slip jointly owned by Georgia-Pacific and one of our entities, RGL Real Estate, Inc. The gist was that several remedial options are being considered for design. One "bookend" was said to be the "dredge only" design, which by definition would exclude capping. The opposite "bookend", described as a "placeholder", was said to involve capping at the base of RGL's dockwall with dredging to be performed away from the wall. Additional designs with varying combinations of dredging and capping would complete the set of remedial options. One design is to be proposed for selection as the final remedy.

The October 30, 2014, meeting was preliminary in nature. The Fox River Cleanup Group asked what use RGL might make of the boat slip in the future and what issues and concerns RGL has. RGL indicated that it contemplates the potential for using the boat slip for navigational purposes within five years. The attendees plan to reconvene for further discussion around mid-November. An additional topic was that an access agreement will become necessary to implement the remedial design that will ultimately be approved.

RGL opposes capping in the boat slip. RGL believes that any capping in the boat slip could become disrupted through natural and/or man-made causes so as to release PCBs from containment. As a member of the *de minimis group*, RGL has fully satisfied its share of liability for the Fox River cleanup. RGL opposes any remedial design that could subject RGL to any new liability. Moreover, RGL is interested in a cleanup that would restore the boat slip to navigational use. For these reasons, RGL asserts its firm endorsement of the "dredge only" remedy *to the exclusion* of any option that includes any capping in the boat slip. Our concern is paramount. Any complication posed by RGL's dockwall can be feasibly and reasonably addressed. We hope that by formally stating our concern at this time the remedial design process might be streamlined. We welcome continuing discussions.

We understand that the Wisconsin Department of Natural Resources must take many factors into account. We appreciate the agency's thorough consideration of our position.

Very truly yours,

Alan Leisgang, VP/CFO
RGL Real Estate, Inc.

cc: Richard J. Feeney, P.E. / TetraTech
Jay Grosskopf / Boldt
Brian Heath / NCR
John Heyde / Sidley & Austin
Roger Kaminski / Georgia Pacific
Gary Kincaid / WDNR
Jeffrey J. Lawson / Project Control Companies
George M. Willant / TetraTech
Russell W. Wilson / Ruder Ware

George Berken

From: george.berken@boldt.com
Sent: Monday, January 5, 2015 7:54 AM
To: terri.blackmar@tteci.com; bill.coleman@tetratech.com; richard.feeney@tetratech.com; tgawronski@foth.com; bryan.heath@ncr.com; jheyde@Sidley.com; roger.kaminski@gapac.com; Fred Swed; george.willant@tetratech.com; jlawson@project-control.com
Cc: AgenciesLFRTeam; LFR.OverSightTeam; beth.olson@wisconsin.gov; Rich Murawski; aleisgang@rgllogistics.com
Subject: 87500 OU2-5 - RGL Letter December 23, 2014: LFR RD "Alternatives Analysis for RGL Slip"
Attachments: RGL Letter 2014-12-23.PDF

Please find attached a scanned version of a letter I received from Alan Leisgang (VP/CFO - RGL Real Estate, Inc.) regarding the "Lower Fox River Remedial Design - Alternatives Analysis for RGL Slip".

Alan requested I forward this letter to the folks copied in the letter.

Thanks,
George...

(See attached file: RGL Letter 2014-12-23.PDF)

George A. Berken, PE
Engineering Project Manager
Technical Services

The Boldt Company
2525 N. Roemer Road
P.O. Box 419
Appleton, WI 54912-0419
920-225-6141 Phone
920-858-5449 Cell
920-225-6307 Fax
george.berken@boldt.com
www.boldt.com

George,

If it's possible could you forward to the people listed on the letter, since I don't have all the contact information.

Thanks

Alan

RGL
1401 State Street
Green Bay, WI 54304
920.432.8632
RGLlogistics.com

December 23, 2014

Mr. George Berken
Boldt Technical Services
2525 N. Roemer Road
Appleton, WI 54912-0419

Re: Lower Fox River Remedial Design
Alternatives Analysis for RGL Slip

Dear Mr. Berken:

We write this letter in follow up to the meeting held at TetraTech's processing facility on December 17, 2014, at which time TetraTech's Technical Memorandum *Alternative Analysis for RGL Slip* (December 2, 2014) ("Memo") was reviewed and discussed. The information contained in this letter is meant to supplement RGL's position set forth in my letter to you dated November 10, 2014. To confirm RGL's position stated at the December 17 meeting, RGL supports and endorses Remedial Scenario #2 as described in the Memo. We are opposed to Remedial Scenarios 1, 3, 4, and 5. RGL's position is based on two separate, independent bases: (1) our interest in full potential development and use of our boat slip for the long term, and (2) our interest in avoiding any potential liability in connection with PCB-contaminated sediment.

Full Potential Development and Use of the Boat Slip

To expand upon the December 17 discussion, RGL (under its former name, Leicht Transportation and Storage Co. or Leicht Industries, Inc., which was merged into Leicht Transportation and Storage Co. in 1994) was founded 1903. Since its inception, RGL has been located in the Fort Howard Neighborhood, which borders the west bank of the Fox River. RGL's business is to provide integrated logistical services to help its customers optimize the distribution of their goods (paper, packaging, food, bulk commodities, heavy machinery, plastics, chemicals) to their customers. Warehousing and transportation by various means are vital services that RGL has provided for one hundred and eleven years. RGL has probably employed people numbering in the thousands over its history. More information on RGL can be found in Green Bay's West Side: The Fort Howard Neighborhood by Gail Ives in association with On Broadway, Inc. (Arcadia Publishing, 2003).

RGL's facilities are located near the Brown County Airport and major highways. It has rail access and is a riparian owner. While the present condition of the boat slip is deteriorated and underutilized, that was not always the case. In the first half of the Twentieth Century when shipping through the Port of Green Bay was heavier, RGL operated a ship and boat handling division. With the advent of the interstate highway system, trucking became the primary means of hauling freight. Commercial traffic on the Fox River, however, has the potential to become revitalized. There are a limited quantity of boat slips on the Fox River. We understand through recent communications with the Port of Green Bay that the use of boat slips will come into increasing demand. RGL wants the opportunity to restore its boat slip to its highest and best commercial use in furtherance of its business interests. In addition, the public has an interest under the Wisconsin Constitution in the reasonable use of the waters of the state, including privately owned boat slips, which RGL freely acknowledges.

Looking back on RGL's long history, we can predict with confidence that the company will continue to be a major business and employer in the Green Bay area for many years to come. Infrastructure, buildings, and fixtures go through cycles of construction, deterioration, renovation, and revitalization. The boat slip is no exception. RGL definitely intends to upgrade and optimize the utility of the boat slip at some time in the future. Only remedial scenario #2 would provide enough draft for RGL to accomplish that purpose. Alternatives 1, 3, 4, and 5 would not provide sufficient draft for commercial use.

During the meeting, Mr. Kincaid asked whether there might be cost efficiencies to be had if RGL were to have the dock wall extended to the waterline in the wood wall area in conjunction with implementing remedial scenario #2. RGL is interested in exploring that question. **By copy of this letter to the FRG, we ask whether AECOM would provide an estimate for the incremental cost for RGL to extend the stability wall to the waterline.**

Avoiding Potential Liability in Connection with the PCB-contaminated Sediment

RGL is not persuaded with the argument that the "dredge and cap" scenarios (#s 1, 3, 4, and 5 are as protective as the "dredge only" scenario (#2). However robust the cap design might be, there is a risk that something could happen to damage the cap(s), whether that be from a continuous erosional force, some type of sudden accident, or a combination of the two. The *Titanic* was designed and built by the best engineers and ship builders in the world at the time. Even as the ship was sinking, many passengers and crew vowed that it could not sink.

The analogy to the *Titanic* is not overblown when consideration is given to the volume of TSCA-sediment that would be capped under remedial scenario #5 that is recommended by the FRG: 2,900 cubic yards, as revealed in Table 2 on page 6 of the Memo. A large dump truck typically holds about 10 cubic yards. In other words, the equivalent of about 290 large dump truck loads of TSCA sediment would remain in the boat slip.

The unstated premise of the Memo is that the C-cap in remedial scenario will never lose its integrity. What the Memo omits to ask are the questions: What if the cap should fail, and how would timely detection, containment, and remediation be effectively performed? RGL understands that the FRG sediment processing facility is to be demolished at the completion of the project. Suppose that one or both of the C-caps were to suddenly be ruptured after the processing facility will have been torn down. How would the TSCA sediment be treated under that circumstance? The Memo simply does not provide a risk assessment to address the possible failure of one or both of the caps. Moreover, the Memo takes cost into account only in the short term. While the cost of implementing remedial scenario #5 is less than that of #2, the Memo fails to account for risk of failure of the cap and the cost of addressing cap failure, should it occur. When the long term risk is taken into account, it is not at all clear that remedial scenario #5 is less costly than remedial scenario #2.

During the December 17 meeting, there was discussion about possible methods to shield RGL from potential future liability that might be imposed by government agencies and private parties in the event of cap failure. The potential for cap failure presents, in our view, an unacceptable risk to our company. We think that the focus should be on <u>eliminating</u> future risk now when the opportunity to do so exists. If the problem is fixed completely, then the risk goes away.

We very much appreciate the agency's thorough consideration of our position.

Very truly yours,

Alan Leisgang, VP/CFO
RGL Real Estate, Inc.

cc: Terri Blockincer (**unsure of spelling**) / TetraTech
Bill Coleman / TetraTech
Larry DeBruin / Boldt
Richard J. Feeney, P.E. / TetraTech
Troy Gawronski / Foth
Jay Grosskopf / Boldt
Brian Heath / NCR
John Heyde / Sidley & Austin
Roger Kaminski / Georgia Pacific
Gary Kincaid / WDNR
Jeffrey J. Lawson / Project Control Companies
Frederick Swed / TetraTech
George M. Willant / TetraTech
Russell W. Wilson / Ruder Ware

George Berken

From: Al Leisgang <aleisgang@rgllogistics.com>
Sent: Wednesday, February 22, 2017 2:50 PM
To: richard.feeney@tetratech.com
Cc: Gary Kincaid; George Berken; Jay Grosskopf; jlawson@project-control.com; bryan.heath@ncr.com; soconnell@project-control.com; Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com); bill.coleman@tetratech.com; george.willant@tetratech.com; Blackmar, Terri; plarosa@anchorqea.com; dbinkney@anchorqea.com; eci.lfrrpc@tetratech.com; pamontne@gapac.com; morey.tabatabai@tetratech.com
Subject: Re: Checklist of Information Needed to Design an Engineered Cap in the RGL/GP Slip
Attachments: February 22, 2017 Letter Regarding Boat Slip - Dock Modernization.pdf

Richard,

Attached is our response to the questions below.

Al

From: "Richard Feeney" <Richard.Feeney@tetratech.com>
To: "Al Leisgang" <aleisgang@rgllogistics.com>
Cc: "Gary Kincaid" <Gary.Kincaid@wisconsin.gov>, "George Berken" <George.Berken@boldt.com>, "Jay Grosskopf" <Jay.Grosskopf@Boldt.com>, "Jeffrey Lawson" <JLawson@project-control.com>, "Bryan Heath (Bryan.Heath@ncr.com)" <Bryan.Heath@ncr.com>, "Susan O'Connell" <SOConnell@project-control.com>, "Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com)" <Troy.Gawronski@Foth.com>, "Coleman, Bill" <Bill.Coleman@tetratech.com>, "Willant, George" <George.Willant@tetratech.com>, "Blackmar, Terri" <Terri.Blackmar@tetratech.com>, "Paul LaRosa (plarosa@anchorqea.com)" <plarosa@anchorqea.com>, "Dan Binkney" <dbinkney@anchorqea.com>, "ECI.LFRR Project Correspondence" <ECI.LFRRPC@tetratech.com>, PAMONTNE@GAPAC.com, "Tabatabai, Morey" <Morey.Tabatabai@tetratech.com>
Sent: Wednesday, February 15, 2017 4:39:03 PM
Subject: RE: Checklist of Information Needed to Design an Engineered Cap in the RGL/GP Slip

Hi Al,

I wanted to check in with you on some of the important issues we discussed during our meeting the week before last.

1. Concerning restoration of the RGL uplands property you were going to try to obtain historic photos from Scott Selby. Have you been able to and, if so, can you share them with Tetra Tech and the LLC?
2. Have you had a chance to try to obtain any of the information on the checklist below? I believe you were going to ask Dean Haen if he could help.
3. I recall you were planning to ask Russ Wilson to provide a letter indicating that leaving contaminated sediment between the older and newer walls is acceptable to RGL. Please recall we provided an email from the A/OT in which they stated that leaving this sediment in place was OK to them. Do you anticipate being able to provide that letter soon?

I realize you are probably busy with your normal work but it is important that the remediation project remains on schedule to keep making progress as the A/OT expects us to. Please let me know if you can provide updates on these issues or if perhaps a couple of us can stop over to talk, if that is easier.

Thanks again for your help and cooperation.

Richard J. Feeney, P.E. | **Vice President, Project Engineering**
National Environmental Engineering Discipline Lead
Direct: 973.630.8092 | Fax: 973.630.8025 | Cell: 201.650.1006
Fox River Green Bay, WI Project Office | Direct: 920.445.0732 | Fax: 920.445.0719
Richard.Feeney@tetratech.com

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6 Century Road, 3rd floor | **Parsippany**, NJ 07054 | www.tteci.com[tteci.com] | www.tetratech.com[tetratech.com]
1611 State Street | Green Bay, WI 54304

From: Feeney, Richard
Sent: Tuesday, February 07, 2017 5:02 PM
To: 'Al Leisgang' <aleisgang@rgllogistics.com>
Cc: 'Gary Kincaid' <Gary.Kincaid@wisconsin.gov>; George Berken <George.Berken@boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Jeffrey Lawson <JLawson@project-control.com>; Bryan Heath (Bryan.Heath@ncr.com) <Bryan.Heath@ncr.com>; Susan O'Connell <SOConnell@project-control.com>; Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com) <Troy.Gawronski@Foth.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Willant, George <George.Willant@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; Paul LaRosa (plarosa@anchorqea.com) <plarosa@anchorqea.com>; 'Dan Binkney' <dbinkney@anchorqea.com>; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Paul LaRosa (plarosa@anchorqea.com) <plarosa@anchorqea.com>; Kaminski, Roger (GBY) (ROGER.KAMINSKI@GAPAC.com) <ROGER.KAMINSKI@GAPAC.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Subject: Checklist of Information Needed to Design an Engineered Cap in the RGL/GP Slip

Hi Al,

Thanks again for meeting with several of us from the remediation project last week.

One of the action items for Tetra Tech was to compile a checklist of the information needed for us to be able to design the engineered cap for the northwest corner of the slip. This cap would enable us to complete remedial action there. Following is the checklist:

1. Name and data sheet (if available) of large vessels expected to bring cargo to RGL; of particular interest are the largest, most powerful vessels
2. Which companies are expected to operate these vessels?
3. What maximum draft will be required?
4. How will *any vessels* enter the slip, for example, will they always enter bow first or will they sometimes back in or be pushed in, stern first?
5. Is there a possibility that any (smaller) vessels might turn around in the slip such that the stern will face the west end?
6. How close to the west end of the slip will the vessels be positioned?
7. Will tug boats ever be used in the slip?

Please let me know if you have any questions about the items on the list. Thanks in advance for trying to obtain this information.

Regards,

Richard J. Feeney, P.E. | **Vice President, Project Engineering**
National Environmental Engineering Discipline Lead
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February 22, 2017

Richard J. Feeney, P.E.
Tetra Tech, Inc.
1611 State Street
Green Bay, WI 54304

Re: Leicht Transfer & Storage Co. Boat Slip and Dock Modernization

Dear Mr. Feeney:

This letter discusses and memorializes Leicht Transfer & Storage Co.'s ("Leicht") (formerly known as RGL Real Estate, Inc.) position regarding several items that concern our boat slip, western shoreline, and dock facility. Those issues are: residual liability for interstitial dockwall sediments; remediation of the western shoreline in the slip; characteristics of cargo vessels that will be using the slip; and the dock area restoration plan.

(1) Residual liability for interstitial sediments in the dockwall

We understand that during the construction of the new dockwall, efforts were made to dredge the PCB-contaminated sediments from in-between the old sheet pile wall and the new wall that was installed in 2015. We understand that sediments became compacted and trapped such that the dredging did not successfully remove all of the contamination. The question has been raised as to which party will hold residual liability for these interstitial dockwall sediments. Leicht unequivocally asserts that any and all such liability remains that of the Fox River Cleanup Group.

(2) Remediation of the western shoreline in the boat slip

Tetra Tech's proposed remedial strategy is described in its Technical Memorandum titled "Dredge-and-Buttress Plan for Western Shoreline Slope in the RGL Slip" dated October 20, 2016. Because that plan calls for excavation at a steep slope with a low safety factor, Tetra Tech proposes to install a sand buttress. Leicht understands that the WDNR's Administrative Oversight Team ("A/OT") would require that any such buttress be capped.

Capping is not acceptable to Leicht because it would impair the functionality of the slip. Leicht has firm plans to modernize its dock to a state-of-the-art facility. In order to achieve complete utility the slip and dock facility must be fully functional. A capped sand buttress extending from the western shoreline would impair the ability of cargo ships to dock, load, and unload. In addition, capping would create a residual liability concern that is also unacceptable to Leicht. We have expressed this concern previously in our letters to George Berken of the A/OT dated November 2014, (*RGL Boat Slip*) and December 23, 2014 (*Alternative Analysis for RGL*

Slip). I have included copies of those letter for your convenience, and we incorporate their content by reference in this letter.

Our plan to modernize the dock facility involves capital investment and design work that takes into account Department of Homeland Security measures. The remedial strategy for the western shoreline must (1) eliminate the possibility of a release of PCB-contaminated sediments, (2) not create any residual liability to Leicht, (3) allow for the full use and utility of the slip, dock, equipment, grounds, and warehouse; and, (4) allow for full compliance with Department of Homeland Security measures.

We cannot overstate the importance of these considerations. We understand and appreciate that the FRCG would like to start remedial work in the boat slip in June. Leicht and its consultant, AECOM, will gladly work with Tetra Tech and the A/OT expeditiously so as to identify an acceptable remedial strategy that fully protects our plan to modernize the dock facility. Capping, however, is not acceptable.

(3) Characteristics of cargo vessels

You have recently requested information in the form of a checklist for use in the remedial strategy design. I have reviewed your questions with Dean Haen of the Green Bay Port & Resource Recovery Department, and I am informed that the only guidance that can be given is that the boat slip must be fully accessible so as to accommodate any type of ship, boat, or barge. It is our hope and expectation that all manner of vessels large and small will bring cargo to be unloaded and then take on a load of different material from our warehouse before departing. We anticipate that all manner of maneuvering and (un)loading will take place, i.e. stern or bow entry, use of tugs, self-(un)loading, (un)loading via our mobile cranes, and the use of all available draft. We do not know who the operators will turn out to be. The one thing we do know is that a cap would impair the utility and functionality of the boat slip.

(4) Restoration plan for the dock area

Tetra Tech has proposed a grading plan that is shown in its "RGL Proposed Restoration Plan" drawing December 16, 2016. As you may recall we have had discussions with you over the extent to which concrete and asphalt paved areas existed prior to the rehabilitation of the dockwall. We have a practical counter-proposal to make in light of our dock facility modernization plan. We know that Leicht will be required to meet FEMA standards in implementing its plan, which means that the dock area will need to be elevated by about four feet. Rather than installing concrete and asphalt to its previous extent (or paying for the cost of such installation), Leicht proposes that the Fox River Group implement its proposed grading plan at the elevation necessary to meet FEMA development requirements.

We look forward to your response and to working with you.

1401 State Street
Green Bay, WI 53404

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Very truly yours,

Alan Leisgang, VP/CFO
Leicht Transfer & Storage Co.

Enclosures

cc w/encl:
Mr. Dean Haen (Haen_DR@co.brown.wi.us
Mr. Gary Kincaid (Gary.Kincaid@wisconsin.gov)
Mr. George Berken (George.Berken@boldt.com)
Mr. Jay Grosskopf (Jay.Grosskopf@boldt.com)
Mr. Jeffrey Lawson (JLawson@project-control.com)
Mr. Bryan Heath (Bryan.Heath@ncr.com)
Ms. Susan O'Connell (SOConnell@project-control.com)
Mr. Troy Gawronski (Troy.Gawronski@foth.com)
Mr. Bill Coleman (Bill.Coleman@tetratech.com)
Mr. George Willant (George.Willant@tetratech.com)
Mr. Terri Blackmar (Terri.Blackmar@tetratech.com)
Mr. Paul LaRosa (plarosa@anchorqea.com)
Mr. Dan Binkney (dbinkney@anchorqea.com)
Mr. Roger Kaminski (Roger.Kaminski@gapac.com)
Mr. Morey Tabatabai (Morey.Tabatabai@tetratech.com)
Mr. Russell W. Wilson (rwilson@ruderware.com)

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November 10, 2014

Mr. George Berken
Boldt Technical Services
2525 N. Roemer Road
Appleton, WI 54912-0419

Re: Lower Fox River Remedial Design
RGL Boat Slip

Dear Mr. Berken:

We write this letter in follow up to the meeting held at our office on October 30, 2014, among representatives of the Fox River Cleanup Group, NCR, TetraTech, Project Control Companies, Georgia-Pacific, the Wisconsin Department of Natural Resources, Boldt Technical Services, and the RGL entities (collectively, "RGL"). The Fox River Cleanup Group and its associated representatives gave a general conceptual overview of the range of potential remedial design options for the boat slip jointly owned by Georgia-Pacific and one of our entities, RGL Real Estate, Inc. The gist was that several remedial options are being considered for design. One "bookend" was said to be the "dredge only" design, which by definition would exclude capping. The opposite "bookend", described as a "placeholder", was said to involve capping at the base of RGL's dockwall with dredging to be performed away from the wall. Additional designs with varying combinations of dredging and capping would complete the set of remedial options. One design is to be proposed for selection as the final remedy.

The October 30, 2014, meeting was preliminary in nature. The Fox River Cleanup Group asked what use RGL might make of the boat slip in the future and what issues and concerns RGL has. RGL indicated that it contemplates the potential for using the boat slip for navigational purposes within five years. The attendees plan to reconvene for further discussion around mid-November. An additional topic was that an access agreement will become necessary to implement the remedial design that will ultimately be approved.

RGL opposes capping in the boat slip. RGL believes that any capping in the boat slip could become disrupted through natural and/or man-made causes so as to release PCBs from containment. As a member of the *de minimis group*, RGL has fully satisfied its share of liability for the Fox River cleanup. RGL opposes any remedial design that could subject RGL to any new liability. Moreover, RGL is interested in a cleanup that would restore the boat slip to navigational use. For these reasons, RGL asserts its firm endorsement of the "dredge only" remedy *to the exclusion* of any option that includes any capping in the boat slip. Our concern is paramount. Any complication posed by RGL's dockwall can be feasibly and reasonably addressed. We hope that by formally stating our concern at this time the remedial design process might be streamlined. We welcome continuing discussions.

We understand that the Wisconsin Department of Natural Resources must take many factors into account. We appreciate the agency's thorough consideration of our position.

Very truly yours,

Alan Leisgang, VP/CFO
RGL Real Estate, Inc.

cc:
Richard J. Feeney, P.E. / TetraTech
Jay Grosskopf / Boldt
Brian Heath / NCR
John Heyde / Sidley & Austin
Roger Kaminski / Georgia Pacific
Gary Kincaid / WDNR
Jeffrey J. Lawson / Project Control Companies
George M. Willant / TetraTech
Russell W. Wilson / Ruder Ware

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December 23, 2014

Mr. George Berken
Boldt Technical Services
2525 N. Roemer Road
Appleton, WI 54912-0419

Re: Lower Fox River Remedial Design
Alternatives Analysis for RGL Slip

Dear Mr. Berken:

We write this letter in follow up to the meeting held at TetraTech's processing facility on December 17, 2014, at which time TetraTech's Technical Memorandum *Alternative Analysis for RGL Slip* (December 2, 2014) ("Memo") was reviewed and discussed. The information contained in this letter is meant to supplement RGL's position set forth in my letter to you dated November 10, 2014. To confirm RGL's position stated at the December 17 meeting, RGL supports and endorses Remedial Scenario #2 as described in the Memo. We are opposed to Remedial Scenarios 1, 3, 4, and 5. RGL's position is based on two separate, independent bases: (1) our interest in full potential development and use of our boat slip for the long term, and (2) our interest in avoiding any potential liability in connection with PCB-contaminated sediment.

Full Potential Development and Use of the Boat Slip

To expand upon the December 17 discussion, RGL (under its former name, Leicht Transportation and Storage Co. or Leicht Industries, Inc., which was merged into Leicht Transportation and Storage Co. in 1994) was founded 1903. Since its inception, RGL has been located in the Fort Howard Neighborhood, which borders the west bank of the Fox River. RGL's business is to provide integrated logistical services to help its customers optimize the distribution of their goods (paper, packaging, food, bulk commodities, heavy machinery, plastics, chemicals) to their customers. Warehousing and transportation by various means are vital services that RGL has provided for one hundred and eleven years. RGL has probably employed people numbering in the thousands over its history. More information on RGL can be found in Green Bay's West Side: The Fort Howard Neighborhood by Gail Ives in association with On Broadway, Inc. (Arcadia Publishing, 2003).

RGL's facilities are located near the Brown County Airport and major highways. It has rail access and is a riparian owner. While the present condition of the boat slip is deteriorated and underutilized, that was not always the case. In the first half of the Twentieth Century when shipping through the Port of Green Bay was heavier, RGL operated a ship and boat handling division. With the advent of the interstate highway system, trucking became the primary means of hauling freight. Commercial traffic on the Fox River, however, has the potential to become revitalized. There are a limited quantity of boat slips on the Fox River. We understand through recent communications with the Port of Green Bay that the use of boat slips will come into increasing demand. RGL wants the opportunity to restore its boat slip to its highest and best commercial use in furtherance of its business interests. In addition, the public has an interest under the Wisconsin Constitution in the reasonable use of the waters of the state, including privately owned boat slips, which RGL freely acknowledges.

Looking back on RGL's long history, we can predict with confidence that the company will continue to be a major business and employer in the Green Bay area for many years to come. Infrastructure, buildings, and fixtures go through cycles of construction, deterioration, renovation, and revitalization. The boat slip is no exception. RGL definitely intends to upgrade and optimize the utility of the boat slip at some time in the future. Only remedial scenario #2 would provide enough draft for RGL to accomplish that purpose. Alternatives 1, 3, 4, and 5 would not provide sufficient draft for commercial use.

During the meeting, Mr. Kincaid asked whether there might be cost efficiencies to be had if RGL were to have the dock wall extended to the waterline in the wood wall area in conjunction with implementing remedial scenario #2. RGL is interested in exploring that question. **By copy of this letter to the FRG, we ask whether AECOM would provide an estimate for the incremental cost for RGL to extend the stability wall to the waterline.**

Avoiding Potential Liability in Connection with the PCB-contaminated Sediment

RGL is not persuaded with the argument that the "dredge and cap" scenarios (#s 1, 3, 4, and 5 are as protective as the "dredge only" scenario (#2). However robust the cap design might be, there is a risk that something could happen to damage the cap(s), whether that be from a continuous erosional force, some type of sudden accident, or a combination of the two. The *Titanic* was designed and built by the best engineers and ship builders in the world at the time. Even as the ship was sinking, many passengers and crew vowed that it could not sink.

The analogy to the *Titanic* is not overblown when consideration is given to the volume of TSCA-sediment that would be capped under remedial scenario #5 that is recommended by the FRG: 2,900 cubic yards, as revealed in Table 2 on page 6 of the Memo. A large dump truck typically holds about 10 cubic yards. In other words, the equivalent of about <u>290</u> large dump truck loads of TSCA sediment would remain in the boat slip.

The unstated premise of the Memo is that the C-cap in remedial scenario will never lose its integrity. What the Memo omits to ask are the questions: What if the cap should fail, and how would timely detection, containment, and remediation be effectively performed? RGL understands that the FRG sediment processing facility is to be demolished at the completion of the project. Suppose that one or both of the C-caps were to suddenly be ruptured after the processing facility will have been torn down. How would the TSCA sediment be treated under that circumstance? The Memo simply does not provide a risk assessment to address the possible failure of one or both of the caps. Moreover, the Memo takes cost into account only in the short term. While the cost of implementing remedial scenario #5 is less than that of #2, the Memo fails to account for risk of failure of the cap and the cost of addressing cap failure, should it occur. When the long term risk is taken into account, it is not at all clear that remedial scenario #5 is less costly than remedial scenario #2.

During the December 17 meeting, there was discussion about possible methods to shield RGL from potential future liability that might be imposed by government agencies and private parties in the event of cap failure. The potential for cap failure presents, in our view, an unacceptable risk to our company. We think that the focus should be on eliminating future risk now when the opportunity to do so exists. If the problem is fixed completely, then the risk goes away.

We very much appreciate the agency's thorough consideration of our position.

Very truly yours,

Alan Leisgang, VP/CFO
RGL Real Estate, Inc.

cc: Terri Blockincer **(unsure of spelling)** / TetraTech
Bill Coleman / TetraTech
Larry DeBruin / Boldt
Richard J. Feeney, P.E. / TetraTech
Troy Gawronski / Foth
Jay Grosskopf / Boldt
Brian Heath / NCR
John Heyde / Sidley & Austin
Roger Kaminski / Georgia Pacific
Gary Kincaid / WDNR
Jeffrey J. Lawson / Project Control Companies
Frederick Swed / TetraTech
George M. Willant / TetraTech
Russell W. Wilson / Ruder Ware

APPENDIX F

SRA CAPS - TECHNICAL MEMORANDA

APPENDIX F
SRA CAP – TECHNICAL MEMORANDA

- **Remedy Design for SRA-03 in Utility Corridor 023**
  (Tetra Tech and Anchor QEA 2019a)
- **Remedy Design for SRA-04 Cap for GP Day St. Mill Intake**
  (Tetra Tech and Anchor QEA 2019e)
- **Remedy Design for SRA-05 in Utility Corridor 030**
  (Tetra Tech and Anchor QEA 2019b)
- **Remedy Design for SRA-06 in Utility Corridor 020**
  (Tetra Tech and Anchor QEA 2018)
- **Remedy Design for SRA-07 in Utility Corridor 029**
  (Tetra Tech and Anchor QEA 2019c)
- **Remedy Design for SRA-08 in Utility Corridor 049**
  (Tetra Tech and Anchor QEA 2020)
- **Proposed Design for SRA-CB60 and CB60 Cap**
  (Tetra Tech and Anchor QEA, 2019f)

George Berken

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Thursday, March 7, 2019 4:53 PM
To: George Berken; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law); pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee; Vandenberg, Luke; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: RE: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023
Attachments: LFRR-17-0191A_Final Tech Memo_DUTIL-023_SRA-03_AOT_030719.pdf

Thanks, George. The final tech memo for SRA-03 is attached.

Terri

Terri Blackmar, PE | Vice President, Great Lakes Operations
Direct: 630.470.4217 / Home Office: 630-922-8772
Terri.Blackmar@tetratech.com

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From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, March 6, 2019 3:13 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com;

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Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

Terri, on behalf of the Agencies, the revised TM, submitted in your email below for SRA-03, is acceptable. Please distribute this technical memorandum in final form.

Thanks,
George…

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Wednesday, March 6, 2019 8:26 AM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

Thanks, George. Attached is the revised tech memo, with previous revisions accepted and responses to comments added.

Please review these revisions and let me know if this can be distributed in final form.

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
Direct: 630.470.4217 / Home Office: 630-922-8772
Terri.Blackmar@tetratech.com

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From: George Berken <George.Berken@boldt.com>
Sent: Monday, February 18, 2019 1:28 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

Terri, on behalf of the Agencies, the revised technical memorandum, submitted in your email below for SRA-03 cap in utility corridor 023, is acceptable subject to the attached comments being adequately addressed. Address these comments and distribute this technical memorandum in final form.

Please note, this cap is subject to the COMMP monitoring and maintenance requirements until such time the COMMP is modified otherwise.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
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From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Friday, February 15, 2019 8:15 AM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>; Davis, Michael (GP Law) <jmdavis@gapac.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

George,

Attached is the revised tech memo for the design of SRA-03 in utility 023. Per the notes for the meeting on submittal of the SRA cap tech memos and the COMMP, mentioned in your email below, any revisions pertaining to monitoring and maintenance will be made at a later date.

No revisions have been made to the tech memo attachments. A comment has been added regarding the assumed factor of safety for calculating the percent carbon to be added to the sand.

Please review these revisions and let me know if you have any questions or comments.

Thanks,

Terri

Terri Blackmar, PE | Vice President, Great Lakes Operations
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Terri.Blackmar@tetratech.com

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From: George Berken <George.Berken@boldt.com>
Sent: Thursday, January 31, 2019 3:40 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project

Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

Terri, on behalf of the Agencies, the revised technical memorandum, submitted in your email below for SRA-03 (Utility Corridor 023), was reviewed. Please address the attached comments and submit in final form.

Note, the COMMP requirements for this SRA Cap still needs to be added to this technical memorandum. An A/OT comment, released on January 28, 2019 for the "*Revision 2 COMMP*", requests a collaborative work group to review all SRA Cap monitoring and maintenance requirements.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Wednesday, January 16, 2019 8:53 AM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>; Jay Grosskopf

<Jay.Grosskopf@Boldt.com>; jennifer.hagen@obg.com; Larry DeBruin <Larry.Debruin@Boldt.com>; rich.weber@obg.com; rick.fox@obg.com; t.harrington@harrington-engineering.com
Subject: RE: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

George,

Attached is the Tech Memo for Cap SRA-03 over utility 023, which has been revised to include carbon amendment in the lower 6 inches of sand placed for the SRA cap, per A/OT comments at meetings on this subject.

Please review this memo and let me know if you have any questions or comments.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
Direct: 630.470.4217 / Home Office: 630-922-8772
Terri.Blackmar@tetratech.com

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From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, January 9, 2019 2:47 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>; George Berken <George.Berken@boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; jennifer.hagen@obg.com; Larry DeBruin <Larry.Debruin@Boldt.com>; rich.weber@obg.com; rick.fox@obg.com; t.harrington@harrington-engineering.com
Subject: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo in Utility Corridor 023

Paul, on behalf of the Agencies, it is the A/OT's understanding the revised technical memorandum, submitted in your email below for utility corridor DUTIL-023 SRA-03, is being revised and will be resubmitted to the Agencies. We will therefore not be releasing any comments on this submittal. Our understanding is based on a conversation we had this afternoon with Terri Blackmar.

Thanks,
George…

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Spillers, Paul <Paul.Spillers@tetratech.com>
Sent: Thursday, September 27, 2018 10:12 AM
To: gary.kincaid@wi.gov; George Berken <George.Berken@boldt.com>; Larry DeBruin <Larry.Debruin@Boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: jlawson@project-control.com; bryan.heath@ncr.com; soconnell@project-control.com; Gawronski, Troy A <Troy.Gawronski@Foth.com>; Database User <database@project-control.com>; bill.coleman@tetratech.com; george.willant@tetratech.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; morey.tabatabai@tetratech.com; eci.lfrrpc@tetratech.com
Subject: LFRR-17-0191A SRA-03 Tech Memo in Utility Corridor 023

Hello George,

Attached are the text and attachments for the SRA-03 Tech Memo in Utility 023. This TM was originally submitted in 2017. Changes appear in redline/strikeout. Please let me know if you have questions or comments.

Thank you, Paul

Paul Spillers, P.G. | **Special Projects Coordinator**
Fox River Project
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George Berken

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Thursday, March 7, 2019 4:53 PM
To: George Berken; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law); pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee; Vandenberg, Luke; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: RE: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023
Attachments: LFRR-17-0191A_Final Tech Memo_DUTIL-023_SRA-03_AOT_030719.pdf

Thanks, George. The final tech memo for SRA-03 is attached.

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
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From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, March 6, 2019 3:13 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com;

gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
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Subject: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

Terri, on behalf of the Agencies, the revised TM, submitted in your email below for SRA-03, is acceptable. Please distribute this technical memorandum in final form.

Thanks,
George…

BOLDT

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From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Wednesday, March 6, 2019 8:26 AM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

Thanks, George. Attached is the revised tech memo, with previous revisions accepted and responses to comments added.

Please review these revisions and let me know if this can be distributed in final form.

Terri

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To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

Terri, on behalf of the Agencies, the revised technical memorandum, submitted in your email below for SRA-03 cap in utility corridor 023, is acceptable subject to the attached comments being adequately addressed. Address these comments and distribute this technical memorandum in final form.

Please note, this cap is subject to the COMMP monitoring and maintenance requirements until such time the COMMP is modified otherwise.

Thanks,
George…

BOLDT.

George A. Berken | Engineering Project Manager
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From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Friday, February 15, 2019 8:15 AM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>; Davis, Michael (GP Law) <jmdavis@gapac.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

George,

Attached is the revised tech memo for the design of SRA-03 in utility 023. Per the notes for the meeting on submittal of the SRA cap tech memos and the COMMP, mentioned in your email below, any revisions pertaining to monitoring and maintenance will be made at a later date.

No revisions have been made to the tech memo attachments. A comment has been added regarding the assumed factor of safety for calculating the percent carbon to be added to the sand.

Please review these revisions and let me know if you have any questions or comments.

Thanks,

Terri

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From: George Berken <George.Berken@boldt.com>
Sent: Thursday, January 31, 2019 3:40 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project

Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
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Subject: 785. FW: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

Terri, on behalf of the Agencies, the revised technical memorandum, submitted in your email below for SRA-03 (Utility Corridor 023), was reviewed. Please address the attached comments and submit in final form.

Note, the COMMP requirements for this SRA Cap still needs to be added to this technical memorandum. An A/OT comment, released on January 28, 2019 for the "*Revision 2 COMMP*", requests a collaborative work group to review all SRA Cap monitoring and maintenance requirements.

Thanks,
George…

BOLDT

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SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Wednesday, January 16, 2019 8:53 AM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>; Jay Grosskopf

<Jay.Grosskopf@Boldt.com>; jennifer.hagen@obg.com; Larry DeBruin <Larry.Debruin@Boldt.com>; rich.weber@obg.com; rick.fox@obg.com; t.harrington@harrington-engineering.com
Subject: RE: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo for SRA-03 Cap in Utility Corridor 023

George,

Attached is the Tech Memo for Cap SRA-03 over utility 023, which has been revised to include carbon amendment in the lower 6 inches of sand placed for the SRA cap, per A/OT comments at meetings on this subject.

Please review this memo and let me know if you have any questions or comments.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
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From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, January 9, 2019 2:47 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
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Subject: 440. 87500 OU2-5 - FW: LFRR-17-0191A SRA-03 Tech Memo in Utility Corridor 023

Paul, on behalf of the Agencies, it is the A/OT's understanding the revised technical memorandum, submitted in your email below for utility corridor DUTIL-023 SRA-03, is being revised and will be resubmitted to the Agencies. We will therefore not be releasing any comments on this submittal. Our understanding is based on a conversation we had this afternoon with Terri Blackmar.

Thanks,
George…

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SafeThinking: Our Crusade to Eliminate Accidents

From: Spillers, Paul <Paul.Spillers@tetratech.com>
Sent: Thursday, September 27, 2018 10:12 AM
To: gary.kincaid@wi.gov; George Berken <George.Berken@boldt.com>; Larry DeBruin <Larry.Debruin@Boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: jlawson@project-control.com; bryan.heath@ncr.com; soconnell@project-control.com; Gawronski, Troy A <Troy.Gawronski@Foth.com>; Database User <database@project-control.com>; bill.coleman@tetratech.com; george.willant@tetratech.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; morey.tabatabai@tetratech.com; eci.lfrrpc@tetratech.com
Subject: LFRR-17-0191A SRA-03 Tech Memo in Utility Corridor 023

Hello George,

Attached are the text and attachments for the SRA-03 Tech Memo in Utility 023. This TM was originally submitted in 2017. Changes appear in redline/strikeout. Please let me know if you have questions or comments.

Thank you, Paul

Paul Spillers, P.G. | **Special Projects Coordinator**
Fox River Project
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Tetra Tech | Complex World, CLEAR SOLUTIONS™
Green Bay, Wisconsin | www.tetratech.com

TETRA TECH EC, INC

Technical Memorandum

To: Gary Kincaid, George Berken, Jay Grosskopf and Larry DeBruin (A/OT)

From: Richard Feeney, Terri Blackmar and Morey Tabatabai (Tetra Tech), Paul LaRosa (Anchor QEA)

CC: Jeff Lawson and Sue O'Connell (PCC, for the LLC), Bryan Heath (LLC), Troy Gawronski (Foth), Paul Montney and Roger Kaminski (GP), Bill Hartman (P.H. Glatfelter), Bill Coleman, George Willant, Ben Hendron and Ricky Gifford (Tetra Tech), Dustin Bauman (JF Brennan), Dan Binkney (Anchor QEA)

Date: March 6, 2019

Re: Remedy Design for SRA-03 in Utility Corridor 023

Document Control Number: LFRR-17-0191A

This revised technical memorandum (tech memo) provides the basis for the proposed remedial design in utility area number 23 (utility 023), which is referred to on the *Draft 2019 Update to the Phase 2B Remedial Action Work Plan* (2019 RAWP) drawings as dredge areas DUTIL-023 and DCA40. This tech memo was initially submitted on July 19, 2017 and was subsequently revised to address comments received from the Agencies/Oversight Team (A/OT) on October 17, 2017. The tech memo has also been revised to incorporate additional changes to the top of cap elevation buffer below the navigation channel and SRA cap design changes developed as the result of numerous meetings and communications with the A/OT, Green Bay Water Utility (GBWU), and the U.S. Army Corps of Engineers (USACE) that have occurred since that time. The revised tech memo was resubmitted to the Agencies on September 27, 2018, after which additional meetings were held with the A/OT. During these meetings, the A/OT requested that the Design Team evaluate the use of carbon-amended sand for the remaining SRA caps over utility areas. On November 6, 2018, the LLC presented the proposed cap modeling approach to the A/OT, and on November 8, 2018, slides from the meeting were submitted to the Agencies. On December 5, 2018, the LLC received the Agencies' acceptance for the cap modeling approach, which is described in this tech memo.

Utility 023 is an active 24-inch ductile iron water line, believed to have been installed using an open trench and placement method in 1971. This utility is owned by the City of Green Bay through GBWU.

As explained below, it was not feasible to consider installation of an engineered cap as a remedy where utility 023 crosses the navigation channel, with resultant prop wash impacts and likely noncompliance with the post-cap water depth requirement. A utility buffer was established 25 feet upstream and downstream of the pipeline for dredging with hydraulic dredges. Within this zone, dredging can only be performed with a specialized utility dredge, which can dredge to a maximum depth of 30 feet. Assuming the water is at elevation 580 feet North American Vertical Datum of 1988 (NAVD88), the dredge elevation corresponding to this depth is approximately 550 feet NAVD88. This allows dredging in closer proximity to the utility but will still leave some sediment exceeding the 1 part per million (ppm) polychlorinated biphenyl (PCB) remedial action level (RAL) un-dredged near the utility. In this area, the horizontal no-dredge buffer ranges from 21 feet to 23 feet wide. This range is based on the variation in pipe locations from different utility locate surveys, with a horizontal buffer of 5 feet outside of the pipe locations plus a horizontal deviation determined by the utility locate subcontractor, plus the radius of the pipe (1 foot). A five-foot vertical buffer is also shown above the pipeline to minimize the potential for damaging the pipeline during dredging. The remedial design for this utility corridor is therefore dredging up to the limits defined by the buffer zones. In areas beyond the larger 25-foot buffer zones, sediment that exceeds the 1 ppm PCB RAL was dredged to the neat line. Where sediment that exceeds the 1 ppm PCB RAL remains in the utility corridor following dredging, the area is identified as "special remediation area-03" (SRA-03) and a cap will be prepared specifically for this area. This SRA extends over most of the utility corridor alignment and may extend up to 25 feet upstream and downstream from the utility, before sloping at a 5:1 slope to the final dredge elevation just outside the area. This utility corridor will be remediated on an exception basis, subject to approval by the Agencies. The remedy for SRAs is not defined in the 2003 Record of Decision (ROD) or in the 2007 ROD Amendment, but these RODs do allow for "exceptional areas" such as this to be treated as a special case. Where the pipeline trench alignment is far enough from the navigation channel to allow a standard cap, with utility owner acceptance, a standard cap will be designed.

Background

During the 60 Percent Design phase for the OUs 2-5 project, no-action setbacks were established around utilities to avoid risk of damage and/or safety concerns during remediation in these areas. Concerns were based on potential risks associated with the dredge cutterhead or marine equipment spuds impacting the utilities, as well as potential injury to personnel. At that time, the utility locations were approximate based on desk-top searches for as-built drawings and had not been field located. Specific ground rules for design were established during the 60 Percent Design with placeholder offsets ranging from 25 to 50 feet based on the accuracy of the utility location information and the risk posed by the sediment contamination.

Following additional sampling that provided information regarding PCB concentrations in sediment near many of the utility crossings, the A/OT requested that utility locations be determined with greater confidence so that remediation could be performed as close to the utility as possible. Tetra Tech had many meetings with utility owners and requested as-built drawings from these owners as the initial step in this process.

In 2012, and again in early 2015, Tetra Tech retained the Marine Engineering Systems Company (MESCO) to field locate several of the utilities. Following that effort, later in 2015, Tetra Tech retained Depth of Cover (DoC) Mapping to locate more accurately most of the utilities as part of further planning for remedial action in these areas. In 2017, J. F. Brennan (Brennan) elected to perform yet additional field location efforts involving the use of its divers. As a result of these additional location efforts, the utility locations in OU4 have been located with greater confidence, including the location of utility 023. A 50-foot buffer zone remained in place following this mapping, although the Agencies required remediation within this zone that could be performed safely to the extent practicable. Brennan subsequently determined that dredging could be performed to the previously-described horizontal and vertical offsets from the pipeline, using the special equipment described below.

On February 28, 2018, a work group meeting was held with Mr. Jonathon Imbrunone of the U.S. Army Corps of Engineers (USACE), and Mr. Brian Powell, GBWU. The primary focus of the meeting was to discuss dredging and capping in utility 020. However, the meeting attendees recognized that decisions on dredging depths, dredging setbacks from utilities, and cap construction would likely be applicable to other SRA caps. Conditions for utility 020 and utility 023 are very similar, both are 24-inch water lines owned by GBWU. During the meeting, Mr. Imbrunone was asked to provide information regarding the USACE's preferences for the following: 1) the buffer zone depth to be added below the authorized navigation channel depth, to the top of the cap surface; and 2) the stone size to be used for cap armoring. On March 14, 2018, Mr. Imbrunone emailed the requested information to Mr. Paul Spillers (Tetra Tech). According to Mr. Imbrunone, the USACE's preferences are for a minimum 2-foot buffer below the authorized navigation channel depth, and for a smaller stone size.

As a follow-up to the February 28 meeting, an over-the-shoulder meeting was held with the A/OT on March 15, 2018 to discuss the information provided by Mr. Imbrunone. During that meeting, the A/OT stated that the use of small stone, with a D_{50} of 1.5 to 3 inches, would be acceptable for the SRA caps, and the top of cap should be designed to be no higher than elevation 551.6 feet NAVD88, to incorporate the USACE's request for a 2-foot buffer below the authorized navigation channel depth. In addition, the A/OT requested the following information to be provided regarding the proposed SRA caps:

- Additional information from Brennan, in writing, describing the efforts taken to dredge the 25-foot buffer zone located south and north of the utility, and the rationale for the inability to dredge below elevation 550 feet NAVD88 in this zone.
- The estimated volume of sediment remaining below elevation 550 feet NAVD88 in the navigation channel, that would be capped with the SRA cap, and is outside the assumed pipe trench area.

This information is provided below.

Equipment Capabilities and Risk Factors Assumed by Brennan for Dredging

Brennan initially began dredging close to utilities using diver-assisted dredging, with a shroud connected to a dredge via hydraulic suction hose. This arrangement proved to be less efficient than anticipated, so in 2017 Brennan elected to use divers to perform the field location work mentioned above, followed by dredging with the Vic Vac and an excavator mounted dredge, the *Midland*, located on a barge, to remove RAL sediment to within approximately five feet of the location of a utility. Brennan determined this to be the closest distance that could be dredged safely, to which the A/OT concurred. However, this dredge can only reach as low as approximately elevation 550 feet NAVD88, so where sediment exceeding the RAL extends below this elevation outside of the 5-foot buffer zone, the SRA cap will be extended to cover this sediment, as shown on the design.

During the 2017 season, while utilizing the *Midland,* Brennan attempted to modify the dredge apparatus to reach below elevation 550 feet NAVD88. This attempt was unsuccessful and led to damaging the equipment. Brennan then investigated two reasonable options that could have allowed safely dredging below elevation 550 feet NAVD88, as described below.

- Option 1 included adding the Vic Vac attachment onto a standard swinging ladder dredge attached to the guide barge. These dredges have a dredging depth of approximately 35 feet in the standard cutterhead configuration (dredge elevation 545 feet NAVD88 with water elevation of 580 feet NAVD88), but can only reach just under 28 feet (dredge elevation 552 feet NAVD88 with water elevation of 580 feet NAVD88) using the Vic Vac. The loss in dredging depth is due to the need for the dredge ladder to be articulated to operate the Vic Vac.

- Option 2 included using an excavator with longer reach capabilities. There are several issues associated with this option. First, the excavator on the *Midland* is a company-owned machine that has several post-market additions to enhance its ability to work in this capacity. Brennan modified the counterweight to allow the hydraulic power pack to be attached to the back of the excavator. In addition, the power pack is currently manufactured to attach to that specific excavator. These modifications cannot be made to rental excavators because doing so would void the warranty of the machine. Another problem is that the attachment's weight would still limit the reach of a standard class machine, and it would still not be able to reach the depths achievable by the Midland's excavator.

In addition to this information, Brennan supplied documentation attesting to the risks associated with dredging near the uncertain locations of utilities. Brennan also demonstrated the inability to dredge deeper than 30 feet, or lower than elevation 550 feet NAVD88 given the current water level of 580 feet NAVD88, given available equipment and industry standards. This documentation is presented in Attachment A.

Existing Conditions in the Utility 023 Corridor

A plan and profile drawing of the City-owned water line located in the utility 023 corridor is presented in Attachment B. The figure shows the approximate plan and profile for the utility and the location of cores obtained in the area used to define the depth of contamination (DOC). The DOC is the depth to which sediment exceeding the 1 ppm PCB RAL must be remediated, to the extent practicable given safety and other concerns such as potential for damage to property. Areas defined for additional dredging are outlined in red on the plan view map (top panel of the drawing) and labeled as dredge areas DUTIL-023 and DCA40 within the utility corridor. The cross-section profile (bottom panel on the drawing) shows the 2015 pre-season bathymetry and the modeled dredging design surface. The sediment between these surfaces will be dredged, including sediment within the SRA-03 area that is five feet or more above the pipeline. Sediment that exceeds the 1 ppm PCB RAL will remain in an area believed to be the pipeline trench, and in adjacent areas that are within a 25-foot buffer zone and below 550 feet NAVD88, which will require capping, as described herein. As is evident from the profile, some sediment below this elevation was removed, either through dredging with the utility dredge, through scour, or both. The SRA limits are shown in pink, green and orange in Attachment C.

The remedy for SRA-03 must consider the PCB concentrations likely to remain in the sediment after dredging. A core summary table (Table D-1) is presented in Attachment D, which includes cores obtained upstream, downstream, and within the 100-foot wide utility 023 corridor. As is evident from this table, cores in this area contain sediment with predominantly low PCB concentrations, typically less than 15 ppm. An assessment of these cores follows:

- Cores 4061-59, 4061-231, and 4061.5-227 contain sediment with maximum PCB concentrations of 3.54 ppm, 14.9 ppm, and 15 ppm, respectively. These intervals will not be dredged because the elevations where these concentrations were encountered are lower than the planned dredge depth. PCB concentrations directly below the cap will be 3.26 ppm, 8.73 ppm, and 2.84 ppm, respectively. Over the pipeline, there will be no intervals remaining that exceed 1 ppm PCB, based on current mudline and estimated dredge elevations.
- Core 4061-233 contains sediment with a maximum PCB concentration of 13.6 ppm. Approximately 2.5 feet of sediment will be dredged in this area, leaving a concentration of 13.6 ppm beneath the cap.

Based on the profile drawing of this area, the thickness of RAL sediment remaining around utility 023 in the SRA-03 area is expected to range from 0 to at least 3 feet after dredging, with PCB concentrations that are likely less than 15 ppm. The estimated volume of RAL sediment remaining in the navigation channel, below elevation 550.0 feet NAVD88 is 1,200 cubic yards.

Propeller Wash Zones

Propwash zones were determined assuming 100 percent bow thruster power level from a large straying and non-straying vessel traveling in the navigation channel. Maps showing these propwash zones are presented in Attachment E. The zones show the correlation between propwash impact and the stone size needed to resist this impact. Where these zones indicate that a standard A or B cap could be installed, or where propwash zones indicate that armor stone with a D_{50} of 6 inches or more would be required, the cap will be designed as an SRA cap as described below.

In the areas that a standard cap is identified by the prop wash analysis, because of wave action requirements, lack of post-cap water depth, and possibility of RAL sediment remaining within the pipeline trench, these caps were converted to SRA caps. There are two cap types proposed, as described in the Proposed Remedy section below. Armor stone for both cap types will have a D_{50} of ¾ inch.

Proposed Remedy for SRA-03 in the Utility 23 Corridor

Capping with a standard cap was considered as a potential remedy for SRA-03, but was not selected for the following reasons:

- The cap would be designed to withstand propeller wash from large vessels, which would require placement of very large stone or a concrete mat over the utility. This would result in a large hump that would not meet the 26-foot water depth required over the width of the navigation channel (see drawing in Attachment B).
- If a concrete mat was used for the cap, the hump would be smaller but it would make the water line very difficult to access if a repair was needed. The riparian owner, GBWU, previously requested that stone no larger than gravel be used for any part of the cap.
- The overburden pressure of the cap was not originally factored into the design of the utility, so this added pressure could create settlement or other problems with the pipeline, if installed.

Sand mixing calculations were performed for a range of initial PCB concentrations (up to 50 ppm PCB) and sand thicknesses of 6 inches and 9 inches. These calculations assume full mixing of the first 3 to 6 inches of sand with underlying undisturbed residual or generated residuals produced by the dredging process. The results for these calculations are presented graphically in Attachment F and indicate that a 6-inch thick sand cover mixing with the upper 3 to 6 inches of sediment containing PCB concentrations of 15 ppm or less would result in PCB concentrations at the surface of approximately 1.4 to 2.0 ppm. Likewise, a 9-inch thick sand cover with the lower 6-inch layer mixed with the underlying sediment would have an estimated PCB concentration in the range of 0.6 to 0.9 ppm at the mixed sand/sediment surface. However, to maintain a minimum 26-foot water depth in the navigation channel, SRA-03 would receive less than 9 inches of sand isolation layer.

Sand/GAC Ratio

A work group meeting was held on August 30, 2018 to discuss cap designs with minimal thickness due to navigation channel constraints. Based on the meeting discussion, it was determined that at least six inches of sand would be placed with an amendment of granular activated carbon (GAC) containing up to approximately 5% GAC by dry weight of sand. A minimum thickness of 3 inches of stone with D_{50} of ¾ inch will overlie the amended sand. The stone thickness interval will increase to achieve a top of cap elevation of 551.6 feet NAVD88.

Following the August 30, 2018 meeting, the modeling approach was developed by the Design Team and presented to the A/OT on November 6, 2018. The Agencies approved the proposed approach on December 5, 2018, with the contingency that a factor of safety be applied to the results. The approach included evaluating the sand/GAC ratio using Dr. Danny Reible's (Texas Tech University) latest cap model. The model would be run iteratively using site-specific parameters and PCB concentrations remaining below the cap, until the results showed the remedial action level would be met at the cap's surface for at least a 100-year period.

The modeling approach and results for SRA-03, SRA-05, and SRA-07 are presented in a memo in Attachment F. Because of the limited number of samples collected in each SRA and as indicated in the memo, a conservative approach was used that includes modeling with the maximum concentration that will remain under the planned SRA caps. This maximum concentration was observed in sediment remaining below cap SRA-07 (i.e., 41.9 ppm PCB). This concentration was converted to an equivalent range of porewater concentration in the sand for a range of the sand's total organic content of 0.10% to 0.67%. The modeled resulting GAC amendment needed to maintain a concentration of 1.0 ppm PCB for 100 years ranged from 0.0% to 1.4%. In consideration of the reasons this cap is being designated an SRA cap, additional conservatism, as described above, is being applied to the design (1.4% GAC was selected from this model range and multiplied by a factor of safety of 3), as directed by and identified throughout the design process by the A/OT. This results in the GAC added to the sand of 4.2% by dry weight of a sand (minimum 6-inches of sand).

Description of SRA Caps

The proposed remedies for SRA-03 are two types of SRA caps, as shown on Figure 1 in Attachment C. The SRA cap shown on the east side of the SRA-03 cap (in green) will be constructed with a minimum 6-inch CIL, plus a 3-inch thick over-placement allowance, with armor stone placed over the CIL. The armor stone used for this portion of the cap will have a D_{50} of ¾ inch, and the thickness of the cap has been increased to 5 feet as requested by the A/OT. Where propwash zones indicate that armor stone with a D_{50} of 6 inches or more would be required, the cap will be designated as an SRA cap.

In areas of the navigation channel, there is insufficient thickness between the bottom of the navigation channel and the top of the utility buffer to allow for the SRA cap described in the previous paragraph. In those areas, a thinner SRA cap will be placed, as shown in orange on Figure 1 in Attachment B. Amendment with GAC at a proportion of 4.2% GAC by dry weight of sand, will be used to complete the cap. In these areas, a minimum of six inches of GAC-amended sand will be placed, followed by a layer of aggregate with a D_{50} of ¾ inch placed to an elevation not exceeding 551.6 feet NAVD88.

On the east and west ends of SRA-03, the pipeline is at elevations greater than 551.6 feet NAVD88. In those areas, a six-inch sand layer will be placed over the utility, extending to the limits shown on Figure 1.

The SRA cap remedies provide the following advantages for this area:

- In the navigation channel, the carbon amendment will assist in attenuation of PCBs, when compared to a sand-only cap. This will allow for a thinner cap that will not interfere with the navigation channel.
- The spreader would be used in conjunction with an extended barge that could safely span the utility corridor such that impacts to utility 023 with spuds are not a concern. This could allow for installation of the SRA cap during the 2019 season.
- The SRA cap remedy would be effective based on the calculations previously discussed.
- The SRA caps should be acceptable to the City of Green Bay, owner of the pipeline.

The proposed SRA caps are not standard cap designs but will still provide some isolation and/or potential mixing of underlying PCB contamination that will help to reduce the impact of leaving these PCB concentrations in place. In summary, the advantages and disadvantages of the SRA cap design for utility 023 corridor are shown on Table 1.

Table 1. Advantages and Disadvantages of the SRA-03 Cap Design

Cap Design Criteria	Advantages of SRA-03 Cap Design	Disadvantages of SRA-03 Cap Design
Stone size – D_{50} of ¾ inch.	Provides some protection against erosive forces. Stone size is small enough to allow riparian owner reasonable access to the buried utility if needed.	Not large enough to protect against scour from propwash from large vessels throughout much of the area.
Activated carbon amendment	Increased attenuation of PCB compared to sand alone.	Requires mixing and measuring to achieve the amendment ratio of 4.2% by dry weight of carbon into the sand
Top of cap elevation in the navigation channel	Will meet design requirements in the navigation channel and allow a 2-foot buffer zone for channel dredging.	The stone size will not be large enough to function as a marker layer for dredging, so the armor layer could be disturbed by over-dredging.
Top of cap elevation outside the navigation channel	Acceptable for side slopes of the channel and in some areas near the shoreline.	As the cap approaches the shoreline on each side of the river, the top of cap elevation provides less than 6 feet of post-cap water depth. The proposed cap does not extend to the shoreline, therefore there will be at least 3 feet of draft above the SRA-03 cap, as required by the ROD.

Sand/GAC Placement Method

The sand and GAC mixture will be placed using J.F. Brennan's patented Broadcast Capping System (BCS™), which has three main systems/components that include the land plant, transportation, and the broadcast spreader. The land plant will be located onshore at the Lower Fox River processing facility, where cover sand and GAC will be stored and mixed before being hydraulically or mechanically transported to the spreader plant.

The land plant will be equipped with an integrated measuring system that includes a scale and hopper system that weighs and meters the amendment precisely. Two conveyors, one for sand and one for GAC will be used to supply the mixture. The conveyors will be set up in a leader-follower configuration. This enables precise mixing, because the leader is equipped with a scale controlled by a programmable logic controller (PLC), which will be set to accept a specific volume of material. The scale controller will provide electric pulses for every 0.01 tons that pass over the scale and transmits the information to the PLC. The PLC takes the pulse inputs from the sand conveyor and adjusts the GAC metering hopper to deliver the specified proportion of GAC to the sand.

The follower conveyor will automatically adjust the amount of GAC based on the amount of sand on the leader conveyor. The two metering conveyors will discharge onto the long conveyor that will either discharge into a slurry container or material barge.

Broadcast Capping System™

The GAC will be hydrated in large soaking tubs for at least 24 hours prior to mixing with the sand. This will increase the weight of the GAC to as much as double the dry weight, which will result in GAC that is similar in weight to the weight of the sand. The GAC weight change will be accounted for in the metering process to ensure an adequate mixing rate based on a percent of dry weight.

When the sand and GAC have been properly mixed at the land plant, the mixture will be hydraulically transported through pipelines to the broadcast spreader or mechanically transported via barge.

The broadcast spreader will be set up on a 40-foot (ft) by 80-ft distribution barge equipped with winches, spuds, and hydraulic power pack. The distribution barge will work in tandem with the same equipment, plus a rubber tracked excavator. Two cables will be connected between the excavator and cleats on the distribution barge to join the barges.

Once the sand / GAC mixture reaches the broadcast spreader it will be processed in a manner that depends on whether the delivery was via hydraulic or mechancal means. If hydraulically transported, the mixture will be dewatered through a set of hydrocyclones and a high-frequency shaker system. The slurry from the pipeline will be discharged into two 30-inch cyclones on the spreader barge located above the dewatering screen. The cyclones will remove the majority of the water from the slurry and then deposit the capping mixture onto the shaker bed. The discharged carriage water will be transported to a tank where a quiescent zone is created that will allow the remaining fines to drop out before the carriage water is discharged, via overflow weirs, into the river at the bow of the barge near the sand placement moon pool.

As fines settle out in the holding tank, a 4 inch pump will recycle the sand along with some carriage water through an 18-inch cyclone. This “recovery” cyclone will place the fines from the holding tank back onto the shaker screens to be dewatered again, thereby reducing the amount of lost fine material.

If the mixture is delivered by barge, a large material handler will be placed on the stern of the placement barge. The material handler will offload the transport barge and place the sand/GAC mixture into a small metering hopper similar to the one below the shaker deck.

BCS™ system Spreader Action

From the small metering hopper which feeds a belt conveyor, the sand/GAC mixture will be removed from the hopper via a 24-inch conveyor. The sand/GAC mixture will be deposited onto the dual spinners of the BCS™ system and spread in an overlapping manner. The spinners will then broadcast the cap mixture over an approximately 30-feet by 35-feet area. The spinners can be adjusted to develop an accurate pattern regardless of the sand size or amendment percentage. By broadcasting the mixture at a high delivery rate over a large footprint and using the water column to reduce the mixture's velocity, there is little mixing of the capping mixture and in-situ sediment, and a uniform sand/ GAC mixture is placed. The BCS™ system used for the sand/GAC mixing uses the same spreader as that currently used on the project for sand only covers and caps. This system minimizes the mixing at the sediment and sand interface as well as slope failures and "mud wave" effects. The BCS™ process is shown on the following flow diagram (**Exhibit 1**).

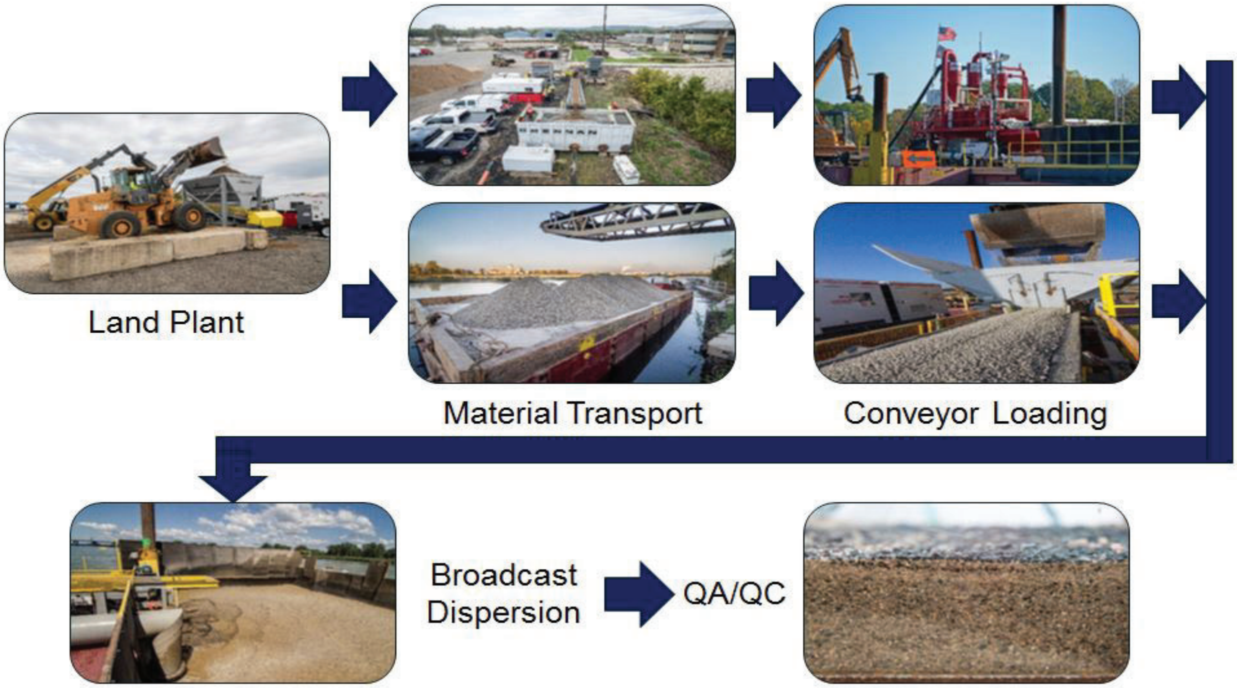


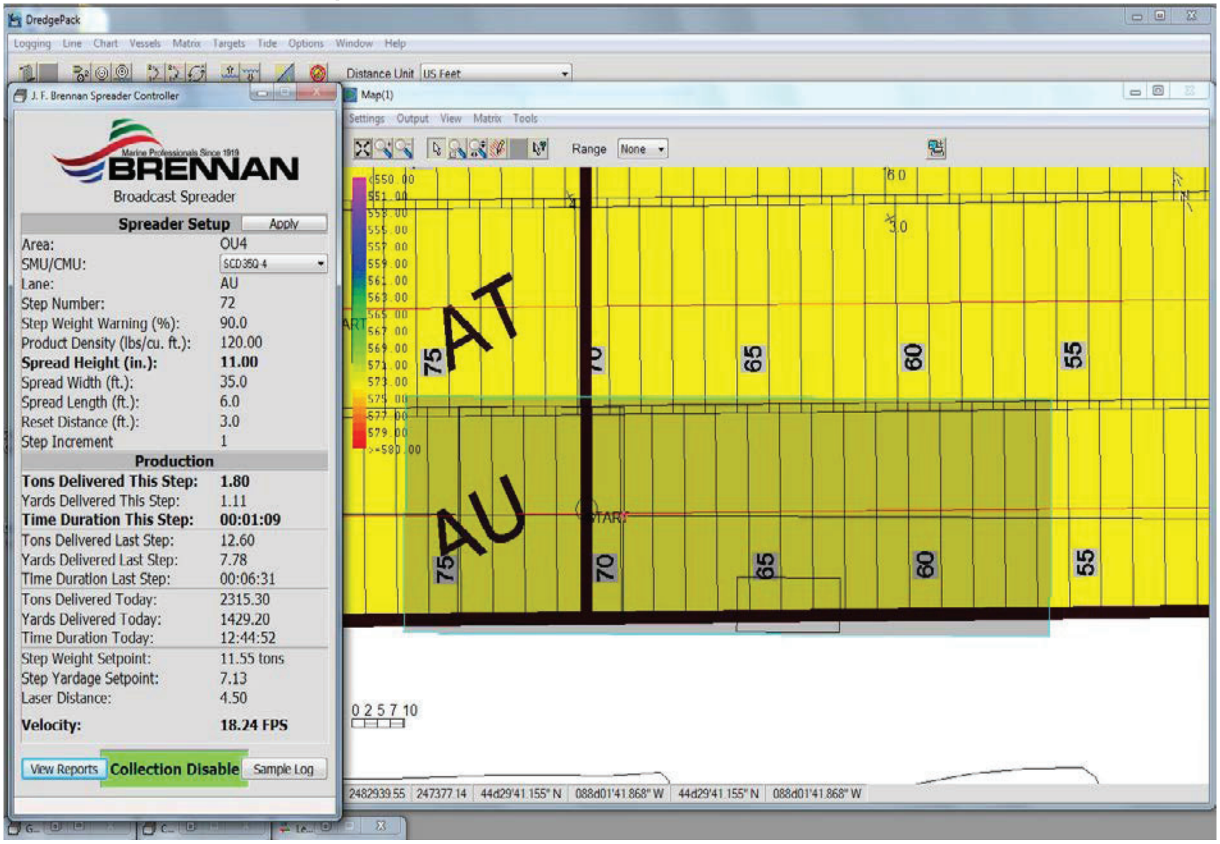
Exhibit 1: BCS™ Flow Diagram

Brennan Internal Process Quality Control

Brennan has developed customized software to aid in the quality control management. This software provides several measures to ensure the accurate placement of cap mixtures. Hypack software receives the information from the spreader's GPS sensors and downloads the data into the DREDGEPACK® module to provide real-time location of the spreader. As part of DREDGEPACK®, a Brennan Spreader Controller has been developed as shown in **Exhibit 2**. This controller has several input sections (Spreader Setup) that are easily modified to determine the amount of sand placement in each step. These inputs allow the spreader to be accurately adjusted for lane width, length, and height. Below the Spreader Setup section, the Spreader Controller tracks the production at each location, by including the belt scale data collected just before the dual spinner setup. These weights are tracked in real-time to measure precisely the amount of capping material placed in each step. This screen is also displayed in the excavator to alert the excavator operator when to step.

The Spreader Controller can also be used for quality control by recording a large database of information collected from each step. Once the spreader takes a step, the controller resets, the Spreader Controller records the data from the previous step and downloads it into the database. Brennan quality controll staff collect this information daily to anallyze for any discrepancies and use this information in the daily reporting process. The Spreader Controller system also provides a method for recording the location and results of quality control samples. The operators can enter the quality control sample result which is then logged in a database and also displayed on the DREDGEPACK® screen. Brennan quality control information is tracked by Brennan's quality control staff and compared to quality assurance results.

Exhibit 2: Screenshot of Spreader Control on BCS™ Plant



Spreader Setup

Area: OU4
SMU/CMU: SCD350 4
Lane: AU
Step Number: 72
Step Weight Warning (%): 90.0
Product Density (lbs/cu. ft.): 120.00
Spread Height (in.): 11.00
Spread Width (ft.): 35.0
Spread Length (ft.): 6.0
Reset Distance (ft.): 3.0
Step Increment 1

Production

Tons Delivered This Step: 1.80
Yards Delivered This Step: 1.11
Time Duration This Step: 00:01:09
Tons Delivered Last Step: 12.60
Yards Delivered Last Step: 7.78
Time Duration Last Step: 00:06:31
Tons Delivered Today: 2315.30
Yards Delivered Today: 1429.20
Time Duration Today: 12:44:52
Step Weight Setpoint: 11.55 tons
Step Yardage Setpoint: 7.13
Laser Distance: 4.50
Velocity: 18.24 FPS

2482939.55 247377.14 44d29'41.155" N 088d01'41.868" W 44d29'41.155" N 088d01'41.868" W

Additional Quality Assurance/Quality Control Procedures

In-situ and ex-situ samples of the CIL will be tested to verify the proper sand/GAC ratio. The testing will be conducted by AET laboratory and will utilize a thermal drying method to evaluate the GAC concentration in the sample. A description of the thermal drying method is presented in the Standard Operating Procedure, Appendix G.

Utility Owner and USACE Acceptance

On December 16, 2015, the Design Team met with representatives of the GBWU to discuss available means of remediation over its utilities, including the water line in utility corridor 023. Notes from this meeting are presented in Attachment H. During the meeting, representatives from GBWU stated that the code requires the pipeline to have at least two feet of cover following remediation. This was later confirmed to be in NR 811.76 (2)(a), which is the code requirement for water main design for underwater crossings. However, they also indicated that they would prefer more than two feet of cover, even restoration of the existing cover, where it is greater than 2 feet. As shown on the drawing in Attachment B, elevations following capping will be generally higher than pre-dredge elevations. Although the GBWU representatives stated that they preferred gravel to sand, the sand cover is needed for mixing and remediation purposes. The layer of larger stone used for armoring the cap will be only 6 inches thick, so should be acceptable to GBWU.

During the February 28, 2018 meeting, Mr. Brian Powell (GBWU) stated that the GBWU preference would be for small stone size that could be readily moved in the event of a repair. Mr. Jonathon Imbrunone (USACE) stated that USACE would prefer the stone size to be no larger than 6 inches in diameter. Notes for this meeting are presented in Attachment H. Given this feedback, the design has been revised to show the SRA cap with armor stone having a D_{50} of ¾ inch.

On June 18, 2018 Brian Powell was contacted regarding the SRA cap thicknesses of 5 feet, as required by the A/OT. Mr. Powell was receptive and agreeable to the proposed stone size and cap thickness. He agreed that the thickness will provide added protection to the pipeline and stated he would discuss this information with his supervisor. Mr. Powell was contacted again on September 24 and stated that an average stone size of ¾ inch would be acceptable to the City of Green Bay.

ATTACHMENT A

LETTERS FROM J.F. BRENNAN REGARDING DREDGING NEAR UTILITIES AND AGENCIES' COMMENTS ON THE INITIAL LETTER

Marine Professionals Since 1919
BRENNAN

J.F. Brennan Company, Inc.
818 Bainbridge Street
La Crosse, WI 54603
608.784.7173

May 1, 2018

Mr. Bill Coleman,
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54304

Re: Dredging Near Utilities

Dear Mr. Coleman

We are writing to address questions recently raised by the Agencies Oversight Team (A/OT) regarding the strategies and methods J. F. Brennan Company, Inc. ("Brennan") is using for remedial dredging in the vicinity of utilities that cross the river bottom. The A/OT has requested additional explanation from the project team for why the standard dredge cutterhead cannot be operated within the 25-foot setback. Brennan has attached its insurance letter stating a 50 foot offset should be used. Due to the extensive locates that have been done on this project during the design phase Brennan has reduced this requirement to the 25-foot offset.

Over the past several seasons, Brennan has worked closely with the project design team to develop strategies for dredging over utility lines to maximize sediment removal in the vicinity of those utilities in a safe manner. We developed methods utilizing the dredge Block Island with an open suction guided by divers, and we have utilized the utility dredge with a Vic Vac attachment. Using these methods, we have been able to dredge safely to within approximately 5 feet of utility lines 20, 23 and 26-30.

While it is true that the Vic Vac and the standard cutterhead attachment both rely upon GPS placement, the cutterhead does not operate in the same manner as the Vic Vac. A cutterhead attachment dredges more aggressively than the Vic Vac, which creates both more sediment disturbance and, significantly, more disruption of areas in the river bed near the area of dredge operations. Operation of the cutterhead necessarily increases the risk of damage to nearby utility lines. This is especially true If Brennan operates the cutterhead within the 25 foot utility offset.

The 25 foot utility offset is the operational standard used throughout the country. Recent projects completed by Brennan with similar offsets include Fox River OU1, East Branch Grand Calumet River – Reaches 4A and 4B, West Branch Grand Calumet River – Roxanna Marsh Reaches 1 and 2 and Connecticut River. Additionally, we have and are currently bidding several other projects nationwide with a similar offset. In fact, most projects increase offsets around high risk utilities, such as fiber optic lines.

Several attempts have been made to locate the utility lines in the river bottom. While these attempts have refined the information available to the project team, the resulting data has not provided the team with a sufficiently high level of certainty as to the actual location of those lines. The location data thus far received by the team has varied by more than 24 feet in regards to Utility 20 and by up to 33 feet for

Utility 21. Further dimensions of utility locate differences can be provided upon request. These differences show the level of complexity in accurately locating pipelines under the river bottom.

Operation of the standard cutterhead attachment inside a 25-foot setback is not a risk we can accept, nor is it a risk the project team should accept. That conclusion is more than evident when we have methods available that have produced a performance track record of safe dredge operation near utility lines. It is a method we have used on many other projects and it has produced a performance track record of safe dredge operations near utilities.

If you have any questions, please do not hesitate to contact us. Thank you.

Sincerely,

Dustin Bauman

Dustin Bauman
J. F. Brennan Company, Inc.

J.F. BRENNAN CO., INC.

820 BAINBRIDGE · BOX 2557 · LA CROSSE, WI 54602-2557 PHONE: 608 / 784-7173 · FAX: 608 / 785-2090

August 22, 2011

Mr. Bill Coleman
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54303

Re: Dredging Near Utilities

Dear Bill:

As you are aware, there have been numerous meetings with utility owners recently, as well as subsequent discussions with the A/OT related to the remedial actions that will be performed in the vicinity of utilities that cross the river. While we applaud the effort to identify the location of the utilities as accurately as possible I understand that JF Brennan site personnel have expressed concerns with regard to the lack of detailed information on the exact location of these utilities. Pursuant to this, we need to make very clear that we, as a company, have a significant concern for the safety of our personnel, as well as our equipment and reputation, and cannot take unnecessary risks when working in the area of active utilities whose locations have not been accurately identified.

Due to our concerns, we spoke to our insurance carrier regarding this topic to see if they could provide any insight. Attached you will find a letter we recently received from them. In this letter you will note that there is mention of a 50 foot offset when working in the area of an active utility where the exact location is unknown. To this point, we understand that WPS has required this amount of setback when working near its active natural gas pipeline that crosses the river in the general vicinity of the highway 172 bridge. We agree with this approach and are willing to proceed in this direction when work in this area is undertaken. In fact, we would recommend this approach be used when completing remedial activities in other areas where the exact location of utilities in unknown. Perhaps it will be possible to reduce the amount of offset, depending upon the amount of information for the specific utility. However, this will need to be done on a case by case basis. As an example, if the location of the utility can be guaranteed within 5' in all directions we would be able to reduce the offset to 25'. In addition, if the location of the utility is ***accurately determined to be at least 20' below the sediment surface*** we would perform dredging over this utility, if the design identifies this as the selected remedy.

As you are aware, JF Brennan has modified our material spreading equipment such that we can cantilever over a utility, providing complete remediation via the placement of sand cover or an engineered cap, while maintaining the safety setback of 50'. Thus, we

would encourage this approach near utilities where the information regarding locations is questionable.

If you should have any questions once you have had a chance to review this information please feel free to contact me at your earliest convenience. We look forward to a safe and successful project.

Sincerely,

Tom Kennedy

Tom Kennedy
Vice President CFO

McGRIFF, SEIBELS & WILLIAMS OF MISSOURI, INC.

7711 Bonhomme Ave., Suite 900 • St. Louis, MO 63105 • TEL – (314) 854-5200 • FAX – (314) 854-5201

August 19, 2011

Mr. Tom Kennedy
Chief Financial Officer
J. F. Brennan Company, Inc.
PO Box 2557
LaCrosse, WI 54602-2557

RE: Fox River Project
Underwater Utilities

Dear Tom:

We wanted to follow up with you on our recent conversation regarding the Fox River project and issues related to dredging near and/or over utility lines, oil pipelines, gas pipelines and similar items (hereafter underwater utilities). It is our understanding that a significant complicating factor in the situation is that data does not exist to precisely locate these underwater utilities, either vertically or horizontally, at certain locations. Despite the unavailability of such data at several locations, regulatory authorities are not presently agreeing to an offset with a capping alternative that has been proposed by J. F. Brennan and the project's prime contractor. At the same time, J. F. Brennan is contractually obligated to take all necessary precautions for the safety of, and must provide the necessary protection to prevent damage, injury or loss to, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of performing dredging operations on the Fox River.

In our capacity as J.F. Brennan's insurance broker, we are compelled to advise you of the significantly higher risk associated with dredging an area where the precise location of underwater utilities is unknown. There are certain representations made to the various companies that underwrite your insurance program regarding policies and procedures as it relates to dredging river beds with known underwater utilities. At a minimum, there is an expectation on behalf of your insurers that J. F. Brennan is able to identify the location of such utilities prior to commencing dredge operations. They have been advised that in situations where the exact location of underwater utilities are unknown, J. F. Brennan's preferred protocols dictate a fifty (50) foot offset with capping performed as an alternative to dredging within that offset. We are concerned that a perceived lack of due diligence by J. F. Brennan in its approach to dredging operations, or in meeting its contractual obligations for the project, could significantly complicate any potential claim scenarios. Based on the variety of underwater utilities throughout the site, a loss or losses from an underwater utility strike could involve significant monetary damages and other claims. Caution is therefore certainly urged. The potential exists for claims from the project owner, prime contractor, underwater utility owners and other third-parties affected.

Although not ideal, J. F. Brennan could look to contractual protection for the risk associated with dredging an area with unknown underwater utilities in the form of an indemnification agreement. However, in order for such an agreement to provide any degree of protection, it would need to encompass all bodily injury, property damage, environmental damage, loss of use and other direct or indirect consequences from a strike as it relates to any and all potential claimants. This indemnification would have to include as signatories the project owner, prime contractor and all applicable underwater utility owners. Although impossible to secure indemnification from unknown third-parties potentially impacted by a claim situation, the project owner, prime contractor and/or the underwater utility owners would have to indemnify J. F. Brennan for any claim brought by a third-party related to an underwater utility strike.

In addition to the contractual protection, we strongly urge J. F. Brennan to require from the project owner or prime contractor improved information regarding the river bottom location of all underwater utilities on both a vertical and horizontal basis. If necessary, J. F. Brennan should seek relief under its contractual provisions with the prime contractor to assure that sufficient data is available to identify precisely the location of underwater utilities. It is our experience that underwater utilities have a tendency to shift positions over time, therefore, recent data is imperative to minimize the potential for losses as a result of your dredging operations.

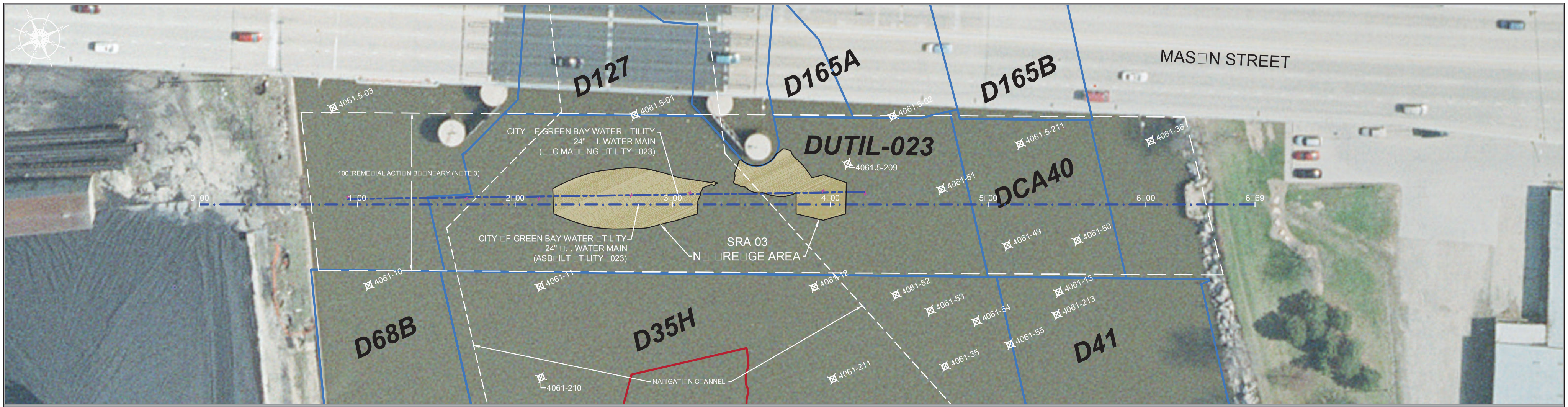
We appreciate J. F. Brennan including us in this process. We are available to assist your attorney in drafting appropriate indemnification language in an attempt to minimize potential claims occasioned by incomplete data.

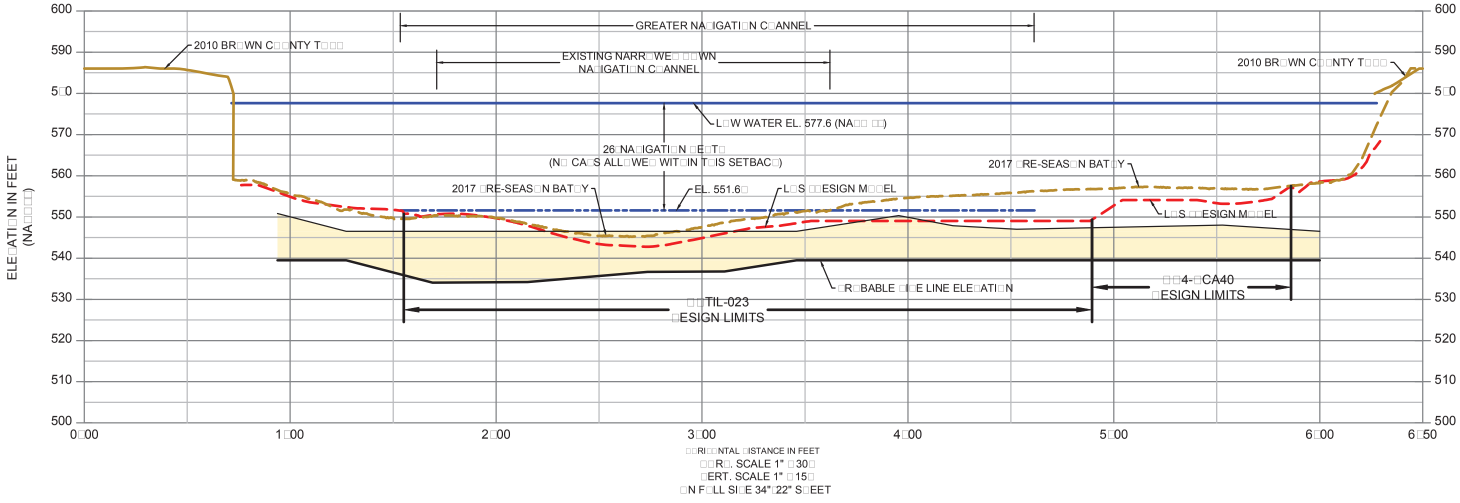
Sincerely,
McGRIFF, SEIBELS & WILLIAMS of MO, Inc.
C Baxter Southern III

C. Baxter Southern III
Executive Vice President

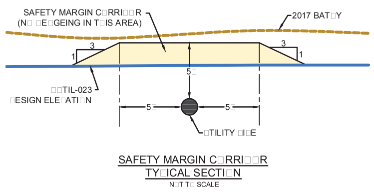
ATTACHMENT B

PLAN AND PROFILE FIGURES OF UTILITY 023 CORRIDOR SHOWING 25-FOOT BUFFER ZONE AROUND THE WATER LINE





HORIZONTAL DISTANCE IN FEET
HOR. SCALE 1" = 30'
VERT. SCALE 1" = 15'
ON FULL SIZE 34"x22" SHEET



SAFETY MARGIN CORRIDOR
TYPICAL SECTION
NOT TO SCALE

SOURCE INFORMATION

DoC MAPPING UTILITY #023

1. SOURCE DRAWING WAS PROVIDED BY:
DOC MAPPING LLC
3518 OCTAVIA STREET
NEW ORLEANS, LA 70125
(619) 566-6783

2. FILE NAME: "[illegible]023[illegible]"

3. DOC DRAWING IS BASED ON FIELD SURVEY OF MAY 2015, REFERENCED TO THE U.S. STATE PLANE - WISCONSIN CENTRAL ZONE COORDINATE SYSTEM, NAD83 AND NAVD88 VERTICAL DATUM.

ASBUILT RECORDS UTILITY #023

AB-1. SOURCE PLAN SET PREPARED BY:
DONOHUE & ASSOCIATES INC.
3311 WEEDEN CREEK ROAD
SHEBOYGAN, WI 53081
(904) 208-0296

AB-2. PLAN SET NAME: "MASON STREET WATER MAIN RIVER CROSSING", PROJECT NO. 1164

AB-3. A COPY OF THE ORIGINAL CONSTRUCTION DOCUMENT, DATED MAY 14, 1971 WAS OBTAINED FROM THE CITY OF GREEN BAY WATER UTILITIES DEPARTMENT.

AB-4. HORIZONTAL LOCATION OF PIPE SHOWN IS APPROXIMATE. IT WAS ESTIMATED BY ASSUMING A TIE IN TO MONUMENTS IDENTIFIED AS MS-25, MS-28, MS-29 AS SHOWN ON DONOHUE & ASSOCIATES PROJECT NO. 1164 AND AS SHOWN ON WISDOT STRUCTURE ALIGNMENT PLAN B-5-134, PROJECT I.D. 4171-1-72. IT WAS BELIEVED THAT THE ORIGINAL COORDINATE SYSTEM FOR THE SOURCE MONUMENTS WAS NAD1927 AND TETRA TECH CONVERTED TO NAD83 (WIS CENTRAL ZONE).

AB-5. VERTICLE DATUM IS BASED ON LOW WATER ELEVATION OF 576.75 (IGLD 55) AS SHOWN ON SOURCE PLANS.

AB-6. SPOT ELEVATIONS IN PROFILE VIEW SHOWN ON ASBUILT PIPE ARE BASED ON 1973 SOUNDINGS SHOWN ON DRAWING 5A OF SOURCE PLANS.

PLAN NOTES

1. **MSDoC ELEVATION**: MINIMUM STATISTICAL DEPTH OF COVER. REPRESENTS A 95% PROBABILITY THAT THE TRUE POSITION OF THE LINE LIES DEEPER THAN THIS POINT.
2. ALIGNMENT OF DOC MAPPING PIPE WAS ESTABLISHED USING "BEST FIT" LINE BASED ON DOC POINT DATA WITHIN THE RIVER.
3. 100' WIDE REMEDIAL ACTION BOUNDARY IS FROM 100% DESIGN DRAWINGS (2012). THE REMEDY INSIDE THIS BOUNDARY MAY CHANGE.

UTILITY NOTES

UTILITY TYPE: WATER MAIN

OWNER: CITY OF GREEN BAY WATER UTILITY

SIZE: 24"

MATERIAL: DUCTILE IRON

DATE INSTALLED: 1971

INSTALLATION METHOD: OPEN CUT AND PLACEMENT

UTILITY NAME: MASON STREET WATER MAIN RIVER CROSSING

LEGEND

━━	WATER LINE (ELEV: 577.6)
━ · ━	MAXIMUM ELEVATION FOR TOP OF CAP WITHIN NAVIGATION CHANNEL
– –	[illegible]F.B. 2017 PRE-SEASON BATHY
– –	LOS DESIGN MODEL
━━	2010 BROWN COUNTY TOPO
– – –	NAVIGATION CHANNEL
— —	UTILITY EXCLUSION ZONE (NOTE 3)
▨	SAFETY MARGIN CORRIDOR (NO DREDGING IN THIS AREA)
(540)	SPOT ELEVATION (SOURCE NOTE AB-6)
☒ 4061.5-01	DESIGN CORE

SCALE (1" = 30')

30 15 0 30 60

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: Utilities P&P #023 - 5-FT OFFSET DESIGN (S
DRAWN BY: SHANE.NELSON
DATE: July 6, 2017
LAST REVISED: July 6, 2017
CHECKED BY: M.T.
REVIEWED & APPROVED BY J.F. BRENNAN: D.B.

Fox River
LOWER FOX RIVER REMEDIATION LLC

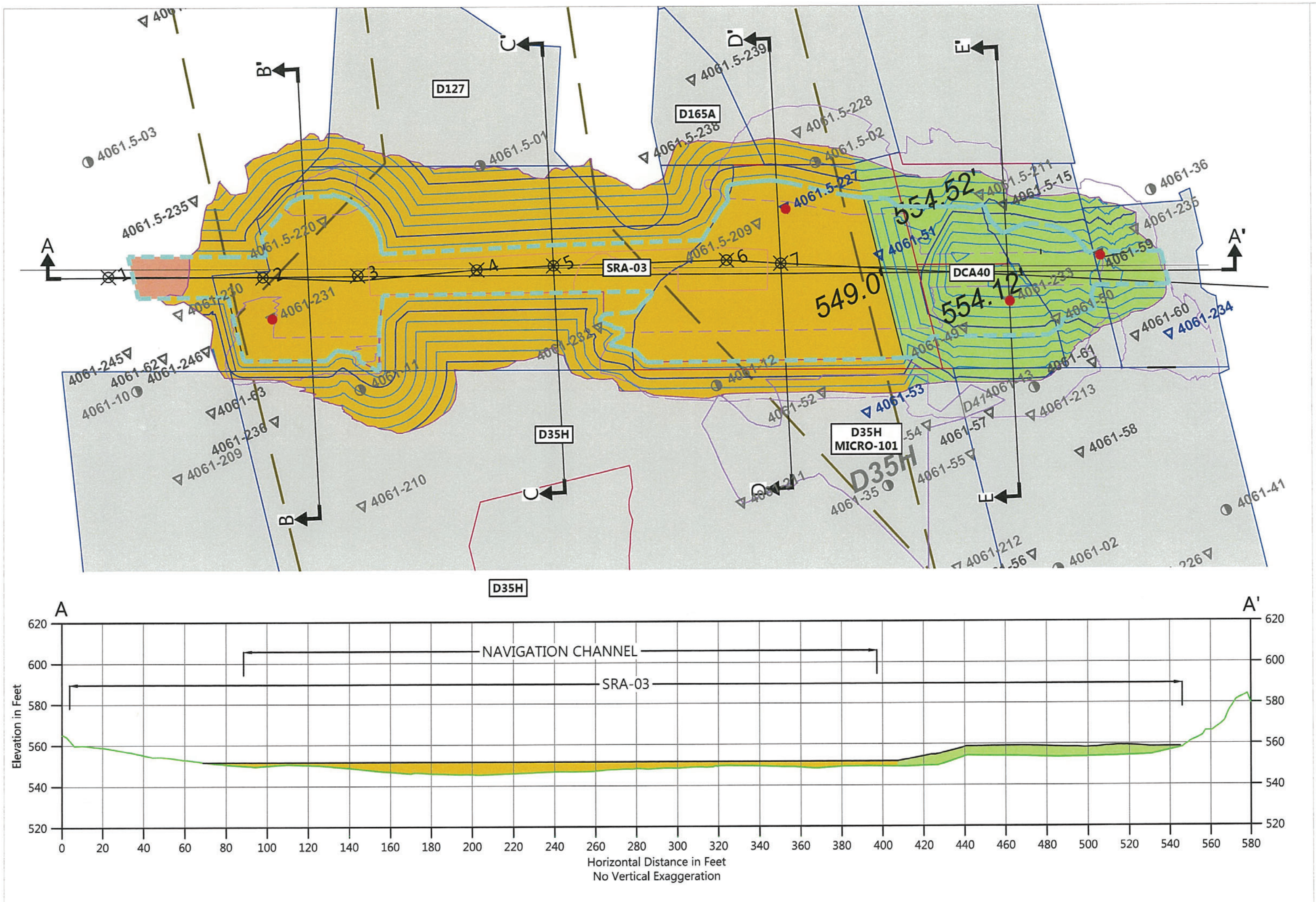
FIGURE E

PLAN & PROFILE DRAWING

CITY OF GREEN BAY WATER UTILITY - WATER MAIN
UTILITY [illegible]023

ATTACHMENT C

DESIGN PLANS AND SECTIONS



LEGEND:

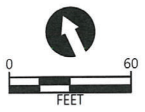
- ═ EXISTING ELEVATION CONTOURS (1 AND 5 FT. INTERVALS)
- ═ PROPOSED CAPPING DESIGN CONTOURS (1 AND 5 FT. INTERVALS)
- — SHORELINE
- ▨ DREDGE / EXCAVATION AREA
- ▨ SRA AREA
- 🟧 SPECIAL REMEDIATION CAP TYPE 1 (TOP OF CAP AT ELEVATION 551.6 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL)
- 🟩 SPECIAL REMEDIATION CAP TYPE 2 (5FT. THICK AS REQUESTED BY AOT)
- ● CORE WITH REMAINING CONTAMINATION

CAP VOLUME AND AREAS

FOOTPRINT (CAP TYPE 1): 37,697 SF
FOOTPRINT (CAP TYPE 2): 11,374 sf
CAP THICKNESS LESS THAN 0.5 FT: 0 SF
CAP THICKNESS 0.5 FT TO 1.0 FT: 0 SF
AREA WITHOUT CAP PLACEMENT: 1,848 SF

TOTAL CAP VOLUME: TOTAL 6,864 CY

HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.



Publish Date: 2019/01/09 2:24 PM | User: mcarlino
Filepath: C:\Users\mcarlino\Documents\CAD C-DRIVE\Fox River\2018 Grading\DUTIL023\ANC-2018-DUTIL-023-DCA40-CAP.dwg F1-Plan

ANCHOR QEA

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1611 STATE STREET
GREEN BAY, WI 54304
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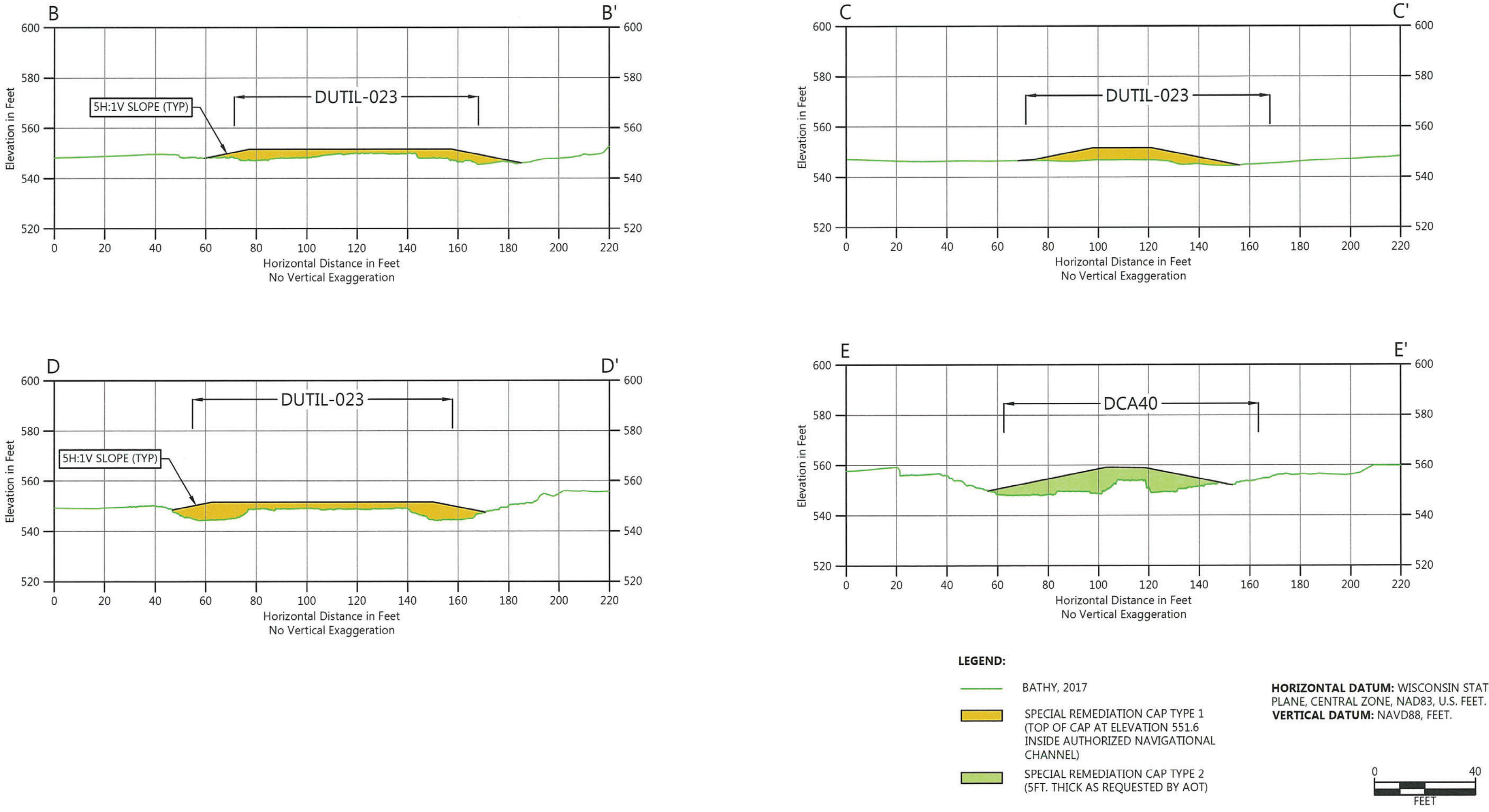
FIGURE 1
SRA-03 CAP PLAN

DESIGN REVIEW DOCUMENT SRA-03 CAP
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

Publish Date: 2019/01/09 2:24 PM | User: mcarlino
Filepath: C:\Users\mcarlino\Documents\CAD C-DRIVE\Fox River\2018 Grading\DUTIL023\ANC 2018 DUTIL 023 DCA40-CAP.dwg F2 XS-B-E

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FIGURE 2
SECTIONS B-E
DESIGN REVIEW DOCUMENT SRA-03 CAP
LOWER FOX RIVER REMEDIATION

ATTACHMENT D

CORE SUMMARY TABLE FOR AREA AROUND SRA-03
(TABLE D-1)

Table D-1

Management Area	DNA-057-1	DNA-057-1	DNA-057-1	DNA-057-1	DUTIL-023-DCA40-1	DUTIL-023-DCA40-1	DUTIL-023-DCA40-1	DUTIL-023-DCA40-1	DUTIL-023-DCA40-1	DUTIL-023-DCA40-1	DUTIL-023-DCA40-1	DUTIL-023-DCA40-1
Core ID	4061-234	4061-235	4061-59	4061-60	4061-61	4061-231	4061-232	4061-233	4061.5-220	4061.5-227	4061.5-228	4061.5-15
Post-Dredge Bathymetry	561.27	557.75	554.19	559.05	556.19	550.12	547.48	553.13	548.92	548.60	556.81	553.94
DOC	2.00	2.00	2.50	1.00	0.00	2.50	0.00	4.50	0.50	3.50	2.50	0.00
EOC	559.27	555.75	551.69	558.05	556.19	547.62	547.48	548.63	548.42	545.10	554.31	553.94
Residual Design	559.31	554.76	554.19	558.01	555.93	550.00	547.48	550.00	548.92	548.60	549.60	553.35
Residual Design OD	558.81	554.26	553.69	557.51	555.43	549.50	546.98	549.50	548.42	548.10	549.10	552.85
Post-Dredge Mudline	561.21	557.63	554.04	558.51	556.19	549.31	547.65	553.13	549.54	549.10	557.34	554.13
Depth Below Post Dredge Mudline	2.46	3.49	0.50	1.54	0.76	0.62	0.50	3.63	0.50	0.50	7.72	1.09
Discretes												
A	0	0	3.26	0.983	0.896	8.73	0.35	2.84	8.3	2.84	0.572	0.692
B	0	0	1.21	4.31	0.721	11.5	0.3	6.93	0.952	4.03	0.574	0.0643
C	3.32	1.12	3.54	0.156	0.472	14.9	0.0252	6.96	0.15	15	0.302	0.985
D	2.72	1.9	1.29	0.025	0.0251	3.85		12.1	0.302	7.9	4.41	0.444
E	0.792	0.665	1.11	0.0251	0.167	8.04		13	0.0518	6.35	21.5	0.224
F			0.47			0		13.6		2.75	0.025	0.116
G						0.0252		4.65		4.38	0.0252	
H						0.0252		4.03			0.0251	
J								1.53			0.0252	
K								0.559			0.0252	
L											0.0252	
Notes											Core with DMC1-1 Design	

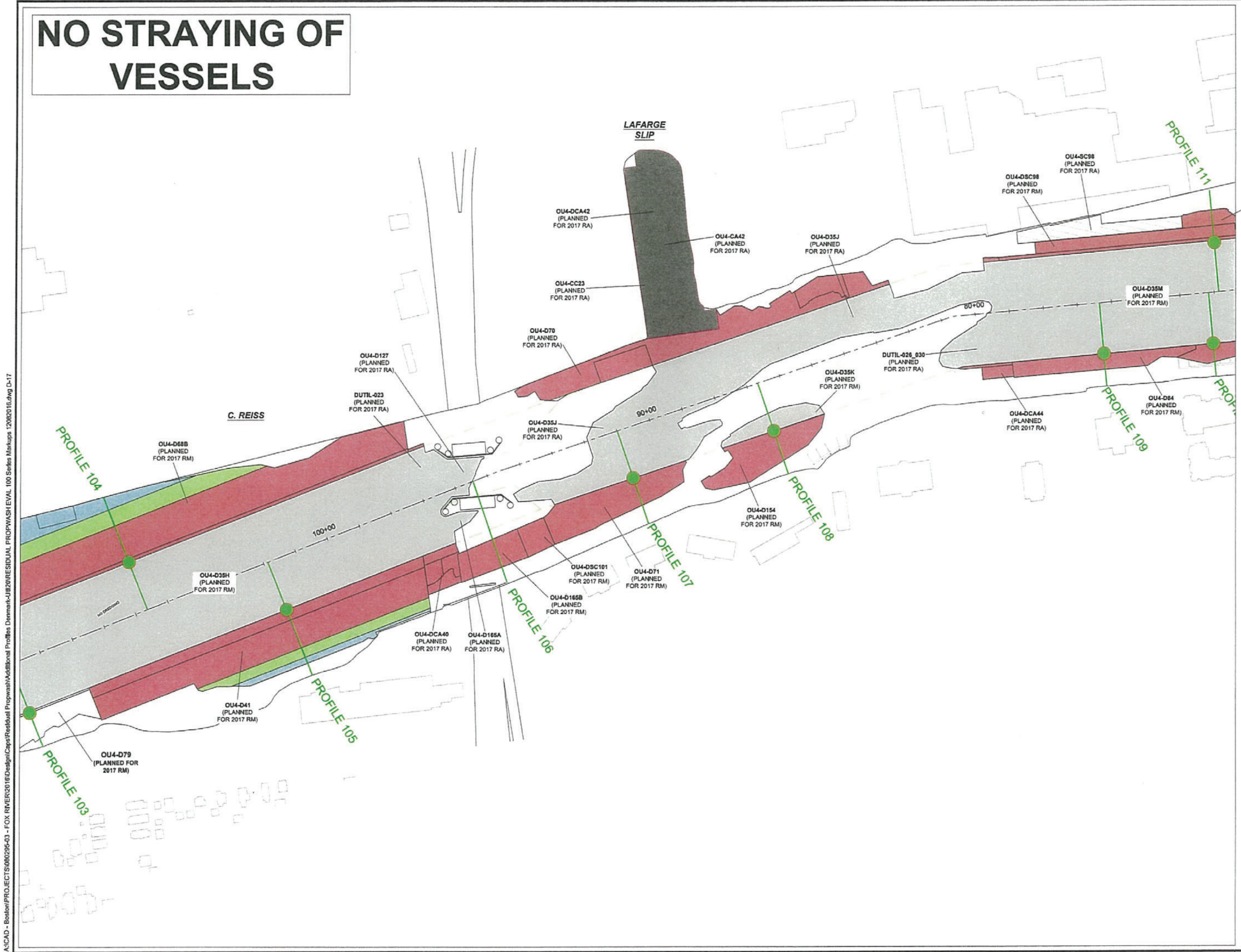
Management Area												
Core ID												
Post-Dredge Bathymetry												
DOC												
EOC												
Residual Design												
Residual Design OD												
Post-Dredge Mudline												
Depth Below Post Dredge Mudline												
Discretes												
A												
B												
C												
D												
E												
F												
G												
H												
J												
K												
L												
Notes												

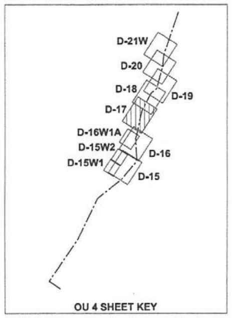
Prepared By: David Frisque
Reviewed By: Ricky E. Gifford
Last Modified: 7/19/2018

APPENDIX E

PROPWASH ZONE MAPS

NO STRAYING OF VESSELS





OU 4 SHEET KEY

LEGEND:

- 4019-24 CORE LOCATION (TYPICAL)
- 4002.5-98 CORE LOCATION (UNDEFINED DOC)
- 4012-111 CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM
- 4009-06 CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)
- 4002-93 CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)
- 4202-06 CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)
- 4006.5-118 CORE LOCATION TAKEN POST-PRODUCTION DREDGING
- 4048.5-139 CORE LOCATION TAKEN POST-PRODUCTION DREDGING (UNDEFINED DOC)
- 4006.5-118 CORE LOCATION TAKE POST-PRODUCTION DREDGING W/ ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM
- ▽4002.5-95 CORE LOCATION NOT INCLUDED IN FIK MODEL
- POLING LOCATION
- LOS 0.5 FOOTPRINT > 0.01 FT. DOC (2011, 2012, 2013, 2015, & 2016 UNCORRECTED)
- CROSS SECTION LOCATION
- ▽4036-402 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM
- ▽4036.5-402 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)
- ▽4034-400 CORE LOCATION NOT INCLUDED IN FIK MODEL (UNDEFINED DOC)
- ▽4034-401 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)
- ▽4048-127 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)

- 569.5' TARGET ENGINEERED DREDGE PRISM ELEVATION
- ▨ TARGET FINAL DESIGN DREDGE SURFACE CONTOUR (1 AND 5 FT. INTERVALS)
- OU4-CA23A **CAP A AREA** (7"-9" MIN. THICKNESS SAND AND GRAVEL CAP)
- OU4-CB11B **CAP B AREA** (10"-12" MIN. THICKNESS SAND AND GRAVEL CAP)
- OU4-CC2D **CAP C AREA** (21" MIN. THICKNESS SAND AND GRAVEL CAP WITH ARMOR LAYER)
- OU4-SC84 **SAND COVER AREA** (6" MIN. THICKNESS SAND COVER)
- **NAVIGATION CHANNEL LIMITS** (OU 4A - 75 FT. WIDE AND OU 4B [AUTHORIZED])
- **NAVIGATION CHANNEL LIMITS** (OU 4A - 150 FT. WIDE [HISTORIC])

RESIDUAL CAP PROPWASH EVALUATION ARMOR STONE SIZE ZONES

- 🟥 ARMOR STONE D_{50} > 6 IN.
- 🟩 ARMOR STONE D_{50} = 6 IN.
- 🟦 ARMOR STONE D_{50} = 3 IN.
- 🟪 ARMOR STONE D_{50} = 1.5 IN
- ⬜ DREDGING WITHIN NAVIGATION CHANNEL
- ● APPROXIMATE VESSEL POSITION (WORST CASE CONDITION, KEEL AT 562.5 FT)

NOTES:

1. ARMOR STONE SIZE ZONES BASED ON A VESSEL WITH 100 PERCENT POWER APPLIED TO BOW THRUSTER AT THE NOTED LOCATION

POOL	OPERABLE UNIT	RIVER MILE	NOAA LOW WATER ELEVATION (FEET NAVD88)
GREEN BAY	OU 4/5	0.0	577.6
DE PERE DAM	OU 3	7.1	587.5
LITTLE RAPIDS DAM	OU 2	13.1	593.6

NOAA LOW WATER CHART FROM NOAA CHART #14916 (2004)

0 150' 300'
HORIZONTAL SCALE

ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445-0720 FAX: (920) 445-0719

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: P. LAROSA / D.BINKNEY
DRAWN BY: D.BINKNEY / M.CARLINO
CHECKED BY: P. LAROSA / T. BLACKMAR
APPROVED BY: T. BLACKMAR
SCALE: AS SHOWN
DATE: MARCH 24, 2016

LOWER FOX RIVER REMEDIAL DESIGN
PHASE 2B WORK PLAN
FOR 2016 REMEDIAL ACTION

RESIDUAL CAPPING PROPWASH EVALUATION

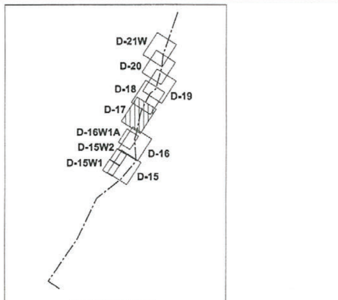
D-17

SHEET NO. 2 OF 5

A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2016\Design\Caps\Residual Propwash\Additional Profiles Denmark-UB20\RESIDUAL PROPWASH EVAL 100 Series Markups 12082016.dwg D-17

Dec 08, 2016 1:30pm dbinkney

VESSELS STRAYING



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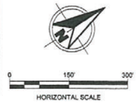

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REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: P. LAROSA / D.BINKNEY
DRAWN BY: D.BINKNEY / M.CARLINO
CHECKED BY: P. LAROSA / T. BLACKMAR
APPROVED BY: T. BLACKMAR
SCALE: AS SHOWN
DATE: MARCH 24, 2016

LOWER FOX RIVER REMEDIAL DESIGN
PHASE 2B WORK PLAN
FOR 2016 REMEDIAL ACTION

RESIDUAL CAPPING PROPWASH EVALUATION

D-17

SHEET NO. 2 OF 5

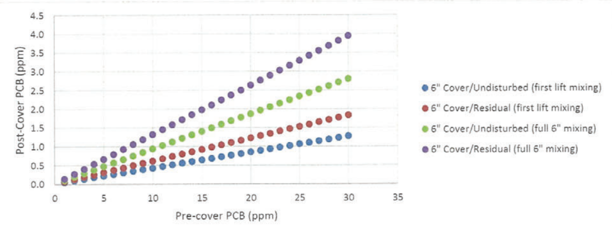
Dec 08, 2016 1:17pm dbinkney A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2016\Design\Caps\Residual Propwash\Additional Profiles Denmark-Util%20\RESIDUAL PROPWASH EVAL 100 Series Markups STRAYING 12082016.dwg D-17

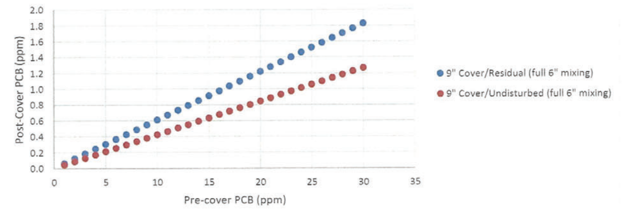
ATTACHMENT F

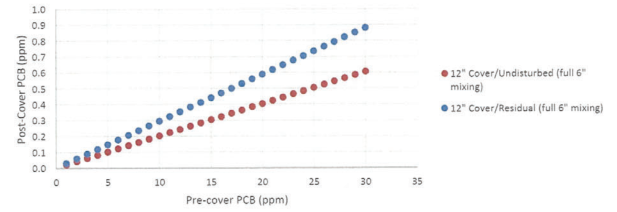
SAND MIXING LAYER CALCULATIONS AND CAP MODELING RESULTS FOR SAND WITH GAC

Sand Dry Den (kg/m^3)	Undisturbed Dry Den (kg/m^3)	Residual Dry Den (measured; kg/m^3)	Lift Thickness	Sand PCB conc	Compliance Depth (inches)
1500	462	680	3	0	4

	First Lift Mixing Only		Full 6" mixing		Full 6" mixing		Full 6" mixing	
PCB Conc	6" Cover/Undisturbed (first lift mixing) Post-cover PCB (mg/kg)	6" Cover/Residual (first lift mixing) Post-cover PCB (mg/kg)	6" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	6" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)	9" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	9" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)	12" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	12" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)
1	0.042	0.061	0.093	0.131	0.042	0.061	0.020	0.029
2	0.084	0.122	0.186	0.263	0.084	0.122	0.040	0.059
3	0.126	0.182	0.279	0.394	0.126	0.182	0.060	0.088
4	0.169	0.243	0.372	0.525	0.169	0.243	0.080	0.117
5	0.211	0.304	0.466	0.656	0.211	0.304	0.101	0.147
6	0.253	0.365	0.559	0.788	0.253	0.365	0.121	0.176
7	0.295	0.426	0.652	0.919	0.295	0.426	0.141	0.205
8	0.337	0.487	0.745	1.050	0.337	0.487	0.161	0.235
9	0.379	0.547	0.838	1.181	0.379	0.547	0.181	0.264
10	0.421	0.608	**0.931**	1.313	0.421	0.608	0.201	0.293
11	0.464	0.669	**1.024**	1.444	0.464	0.669	0.221	0.323
12	0.506	0.730	1.117	1.575	0.506	0.730	0.241	0.352
13	0.548	0.791	1.210	1.707	0.548	0.791	0.262	0.381
14	0.590	0.852	1.304	1.838	0.590	0.852	0.282	0.411
15	0.632	0.912	1.397	1.969	0.632	0.912	0.302	0.440
16	0.674	0.973	1.490	2.100	0.674	0.973	0.322	0.469
17	0.716	1.034	1.583	2.232	0.716	1.034	0.342	0.499
18	0.759	1.095	1.676	2.363	0.759	1.095	0.362	0.528
19	0.801	1.156	1.769	2.494	0.801	1.156	0.382	0.557
20	0.843	1.216	1.862	2.625	0.843	1.216	0.402	0.587
21	0.885	1.277	1.955	2.757	0.885	1.277	0.423	0.616
22	0.927	1.338	2.048	2.888	0.927	1.338	0.443	0.645
23	0.969	1.399	2.141	3.019	**0.969**	1.399	0.463	0.675
24	1.011	1.460	2.235	3.151	**1.011**	1.460	0.483	0.704
25	1.054	1.521	2.328	3.282	1.054	1.521	0.503	0.733
26	1.096	1.581	2.421	3.413	1.096	1.581	0.523	0.763
27	1.138	1.642	2.514	3.544	1.138	1.642	0.543	0.792
28	1.180	1.703	2.607	3.676	1.180	1.703	0.563	0.821
29	1.222	1.764	2.700	3.807	1.222	1.764	0.583	0.851
30	1.264	1.825	2.793	3.938	1.264	1.825	0.604	0.880
31	1.307	1.886	2.886	4.069	1.307	1.886	0.624	0.909
32	1.349	1.946	2.979	4.201	1.349	1.946	0.644	0.939
33	1.391	2.007	3.073	4.332	1.391	2.007	0.664	0.968
34	1.433	2.068	3.166	4.463	1.433	2.068	0.684	0.997
35	1.475	2.129	3.259	4.595	1.475	2.129	0.704	1.027
36	1.517	2.190	3.352	4.726	1.517	2.190	0.724	1.056
37	1.559	2.250	3.445	4.857	1.559	2.250	0.744	1.085
38	1.602	2.311	3.538	4.988	1.602	2.311	0.765	1.115
39	1.644	2.372	3.631	5.120	1.644	2.372	0.785	1.144
40	1.686	2.433	3.724	5.251	1.686	2.433	0.805	1.173
41	1.728	2.494	3.817	5.382	1.728	2.494	0.825	1.203
42	1.770	2.555	3.911	5.514	1.770	2.555	0.845	1.232
43	1.812	2.615	4.004	5.645	1.812	2.615	0.865	1.261
44	1.854	2.676	4.097	5.776	1.854	2.676	0.885	1.291
45	1.897	2.737	4.190	5.907	1.897	2.737	0.905	1.320
46	1.939	2.798	4.283	6.039	1.939	2.798	0.926	1.349
47	1.981	2.859	4.376	6.170	1.981	2.859	0.946	1.379
48	2.023	2.919	4.469	6.301	2.023	2.919	0.966	1.408
49	2.065	2.980	4.562	6.432	2.065	2.980	**0.986**	1.437
50	2.107	3.041	4.655	6.564	2.107	3.041	**1.006**	1.467







290 Elwood Davis Road, Suite 340
Liverpool, New York 13088
315.453.9009
ANCHOR QEA

Memorandum

December 21, 2018

To: Paul Spillers and Terri Blackmar, Tetra Tech

From: Deirdre Reidy and Paul LaRosa, Anchor QEA, LLC

Re: Cap Modeling Results for SRA Caps

In the SRA Cap areas, it is understood that the cap material may mix with the underlying PCB-impacted sediments, which may necessitate amendment of the sand, as opposed to the use of sand without amendment for the caps originally designed for the site (with full armor layer). For the purposes of this evaluation, it was assumed that 1 foot of cap material (sand and gravel) mixes with 1 foot of underlying sediment. Mixing and partitioning analyses were conducted to identify the granular activated carbon (GAC) dose required to maintain concentrations below target levels within these areas (e.g., less than 1 parts per million [mg/kg or ppm] PCB in the top 6 inches of the mixed layer. Because activated carbon sorbs PCBs (the job of GAC is to adsorb PCBs, so by default, the bulk PCB concentrations in a layer containing GAC will be greater than 1 ppm, but not bioavailable or mobile), compliance cannot be assessed on the solid phase. Therefore, the target concentration of 1 ppm PCB was converted to an equivalent porewater concentration using equilibrium partitioning theory with a log KOC of 5.7 liters per kilogram (L/kg) and total organic carbon (TOC) of the cap material (basis for compliance of site caps). TOC values of 0.1%, 0.3%, 0.5% and 0.67% were evaluated for sand material, consistent with non-SRA caps previously modeled at the site. The resulting range of target porewater concentrations are presented in the following table.

Table 1
Target Porewater Concentrations Equivalent to 1 ppm Solid Phase PCB for Range of TOC in Cap Material

TOC (%)	Target PCB Porewater Concentration (µg/L)[1]
0.1	2.00
0.3	0.667
0.5	0.400
0.67	0.298

Notes:
% - Percent
µg/L – micrograms per liter
1. Porewater concentration equivalent to 1 ppm PCBs varies based on TOC present in the cap material according to equilibrium partitioning theory.

A mixing calculation was performed to calculate the PCB concentration within the mixed sediments and cap material using the TOC of sediments, TOC of sand/gravel, PCB concentration in top foot of sediments (for the depth of mixing), and an assumed concentration of 0 ppm PCB in the sand material. The calculation accounted for the thickness of sediment and cap layers and the bulk density of these materials. PCB concentrations in sediment were based on the average bulk PCB concentrations in the top foot of sediment. These concentrations are listed in Table 2. As a conservative upper-bound, the maximum PCB concentration within the sediment (all cores) collected from the SRA Cap areas (41.9 mg/kg PCB) was also evaluated.

Using partitioning theory, the GAC dose needed to reduce the PCB concentrations in the mixed layer to the target porewater concentrations (shown in Table 1) was quantified. Based on literature, GAC has been shown to be 10 to 100 times more sorptive than TOC; therefore, a conservative partition coefficient of 6.7 L/kg (using the factor of 10x, which is lower-end of the range) was used to represent partitioning of PCBs onto GAC. The results of this evaluation indicated that the mixing of sand and sediment is enough to reduce concentrations below target porewater concentrations for most cases simulated. For the worst-case scenario (assuming the maximum concentration measured in the core would mix with the sand/gravel cap material, regardless of the depth at which that concentration was measured), the GAC dose within the mixed layer ranged from 0 to 0.5% (by weight), specified to the nearest tenth of a percentage. To get that percentage in the mixed sand/gravel and sediment layer, 0 to 1.4% by weight GAC needs to be placed in the 6-inch sand layer, depending on the assumed TOC. This scenario is conservative in that it assumes the maximum concentration, which was measured below 1 foot) is present immediately beneath the cap prior to mixing.

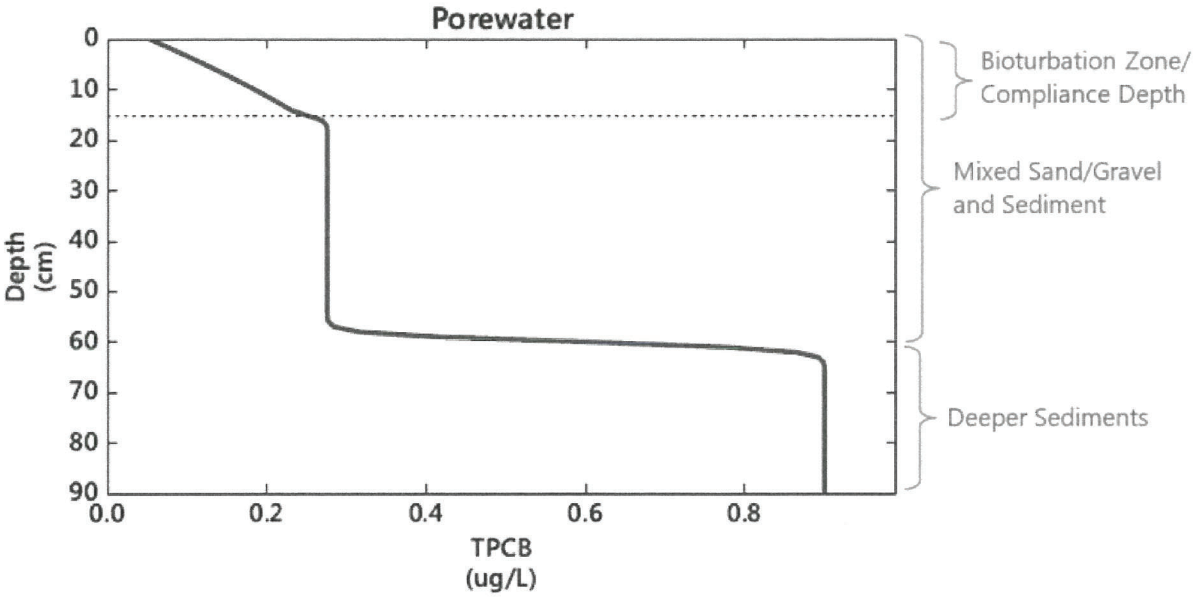
Table 2
Model Results for Caps in SRA-03, SRA-05, and SRA-07

SRA	Core	PCB Concentrations (mg/kg)		PCB Concentrations (µg/L)		GAC Required in 6-inch Sand Layer (% by weight)			
		Top Foot of Sediments	Max. below Top foot of Sediment	Mixed Layer	Max in Deeper Sediment	1.99 µg/L (0.1% TOC)	0.67 µg/L (0.3% TOC)	0.40 µg/L (0.5% TOC)	0.298 µg/L (0.67% TOC)
SRA-03	4061-231	10.1	14.9	0.211	0.320	0%	0%	0%	0%
SRA-03	4061.5-227	3.4	15.0	0.071	0.323	0%	0%	0%	0%
SRA-03	4061-233	2.8	0.56	0.058	0.012	0%	0%	0%	0%
SRA-03	4061-59	2.4	1.1	0.050	0.024	0%	0%	0%	0%
SRA-05	4065.5-17	3.4	1.9	0.071	0.041	0%	0%	0%	0%
SRA-05	4065.5-18	3.3	20.0	0.069	0.430	0%	0%	0%	0%
SRA-07	4065-15	3.5	41.9	0.073	0.901	0%	0%	0%	0%
All	Worst Case Scenario	41.9	41.9	0.87	0.901	0%	0.3%	0.8%	1.4%

Notes:
% – percent
mg/kg – milligrams per kilogram
µg/L – micrograms per liter

Although PCBs are not very mobile, transport processes that were considered when the PCB caps were first designed using the steady-state cap model were incorporated into this analysis. GAC doses quantified using the mixing calculation were then verified using Capsim, the cap model developed by Dr. Danny Reible (Texas Tech University), which is widely used across the United States. These model simulations account for additional PCB mass from underlying sediments that may be transported into the mixed sand/gravel and sediment layer over time (from advection/diffusion). Transport was simulated for 100 years, a typical cap design time frame. Modeling indicated that the GAC doses identified in the mixing/partitioning calculation were more than enough to meet the target porewater criteria for more than 100 years. The rate at which PCBs from deeper sediments transport into the mixed layers is slower than the rate of mixing (e.g., bioturbation) and advective flux out of the mixed layer into the water column; thus, over time, the modeling indicated the concentrations in the top 6 inches of the mixed sand/gravel and sediment mixed layer decreased. The figure below shows the concentration within the mixed sand/gravel and sediment and deeper sediments at the end of the 100-year simulation.

Figure 1
Depth profile of PCB concentrations after a 100-year simulation for Worst Case Scenario simulation, assuming 0.67% TOC in cap material.



In each scenario, GAC is not necessary; however, based on the sensitivity analysis, using worst case criteria, it is recommended that 1.4% by weight GAC be placed. Sufficient conservatism has been accounted for in the analysis.

ATTACHMENT G

STANDARD OPERATING PROCEDURE FOR GRANULAR ACTIVATED CARBON SAMPLE COLLECTION AND TESTING

STANDARD OPERATING PROCEDURE GRANULAR ACTIVATED CARBON (GAC) SAMPLE COLLECTION AND TESTING

LOWER FOX RIVER

GREEN BAY, WI

Prepared by:
Tetra Tech EC, Inc.

Prepared for:
Tetra Tech EC, Inc.
Lower Fox River Remediation Project

Document Control Number: LFRR-18-0298

December 31, 2018

Prepared/Revised By	Reviewed By	Date
Paul Spillers	Bjorn Lysne	
	Brandon Weston	

ACRONYM LIST

AET	American Engineering Testing, Inc.
ASTM	ASTM International
C	Celsius
GAC	Granular Activated Carbon
GPS	Global Positioning System
PPE	Personal Protective Equipment
RTK	Real Time Kinematic
SHSP	Site Health and Safety Plan
SOP	Standard Operating Procedure
SRA	Special Remediation Area

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the collection of samples of the granular activated carbon (GAC)-amended sand layer from special remediation area (SRA) caps and the testing of these samples for percent GAC by dry weight. The purpose of this SOP is to describe the sampling and testing methods to be used to determine the amount of GAC within the carbon-amended sand layer. Measurement of the sand layer thickness is not a part of this SOP. Layer thickness evaluations will be conducted by bathymetric survey, using evaluation methods employed for sand cover or cap layers without GAC.

This SOP is applicable for SRA caps over utilities or in other caps or covers on the Lower Fox River project requiring GAC amendments. Pre-placement (ex-situ) and post-placement (in-situ) amended sand in the SRA caps will be tested for GAC content. Pre-placement samples will be collected in substantial conformance with ASTM International (ASTM) Standard Method D75-14: Standard Practice for Sampling Aggregates. Post-placement samples will be collected from catch pans as described herein. GAC content measured as a percent of dry weight of sample will be determined using a thermal drying method.

2.0 EQUIPMENT AND SUPPLIES

This section contains a list of equipment that may be used to complete the procedures in this SOP, including the following:

- Vessel (sampling platform) that complies with State of Wisconsin and U.S. Coast Guard regulations with a minimum of 3 anchors or two anchoring spuds
- Real Time Kinematic (RTK) Global Positioning System (GPS) with horizontal accuracy of ± 1 meter
- Catch pans for sample collection (including retrieval system and buoys)
- 5-gallon buckets with lids
- Permanent marker
- Steel ruler to record or other measurement device to determine the sand thickness in catch pans
- Oven with capability to reach a temperature of 620º Celsius (C)
- No. 10 sieve (Actual size of sieves will depend on the gradation of the GAC)
- No. 50 sieve
- Duct tape
- Chain-of-custody forms
- Field notebook
- Appropriate personal protective equipment (PPE) in accordance with the site health and safety plan (SHSP)

3.0 PRE-PLACEMENT SAMPLE COLLECTION PROCEDURES

Samples of the sand only and sand/GAC mixture will be collected from the J.F. Brennan land plant using a modified version of ASTM Standard Method D75-14: Standard Practice for Sampling Aggregates as described below:

1) Sand only and GAC-amended sand samples will be collected in clean 5-gallon buckets using procedures described in ASTM D75-14-Standard Practice for Sampling Aggregates. At least 20 pounds of sand and GAC amended sand will be collected for each sample tested. The GAC amended sand sample will be collected from the conveyor. Sand-only samples will be collected from the active face of the loadout stockpile and tested to determine the quantity of naturally occurring organics (carbon) in the sand. The following procedure will be used to collect the conveyor belt sample:
    a. Obtain at least three approximately equal sample aliquots, selected at random, from the conveyor belt using an appropriately sized container, per ASTM D75-14. Samples can also be collected from the production stream, if accessible.
2) Label the buckets with a unique sample identification. Record the date and time of sample. Record the sample collection in a field notebook or similar. Document the sample on a chain-of-custody

form. The sample bucket and accompanying chain-of-custody form will be delivered to American Engineering Testing, Inc. (AET) in Green Bay, Wisconsin.

4.0 POST-PLACEMENT SAMPLE COLLECTION PROCEDURES

Post-placement samples will be collected in catch pans. A total of four catch pans will be placed to evaluate the variability of GAC content across each SRA cap. The samples will be collected in catch pans, using the following procedures:

1) Catch pans shall be constructed of 0.5-inch thick transparent acrylic plastic with the following internal dimensions: 24 inches square by 18 inches high.
2) Catch pans will be placed in the river at A/OT-approved sample locations prior to placement of GAC-amended sand. The coordinates for each pan location will be recorded when placed. If the catch pans are placed on a slope, the appropriate stabilizing subframe shall be used.
3) Following placement of the GAC-amended sand layer, the vessel will retrieve each pan from the bottom of the river using the cable float and hook method (similar to armor stone bucket retrieval).
4) Sand thickness will be measured in each catch pan by taking an average thickness to the nearest 0.1 foot from two measurements from each side of the pan (i.e. an average of 8 individual measurements per pan).
5) Photographs will be taken from the top and 4 sides of the catch pan. Each photograph will be labeled appropriately in the field.
6) Transport the catch pans to the processing area.
7) Place each sample in a clean 5-gallon bucket. Provide a unique sample ID for each sample.
8) Record sample collection notes in field log book and record laboratory samples on a chain-of-custody form.

Field notes will be stored in a log book or worksheet. The documentation will include the following:

- Sample identification
- Sample location GPS coordinates
- Date of sample collection
- Names of field personnel collecting and handling the samples
- Names of oversight personnel
- Observations to include, but not be limited to, weather conditions, unusual circumstances, or deviations to sampling method
- Thickness measurements of sample in catch pan
- Note whether GAC was observed in the sample
- Date sample shipped to laboratory

5.0 TESTING FOR GAC CONTENT BY PERCENT DRY WEIGHT

Thermal testing will be conducted using criteria specified in ASTM D2974: Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils by Method A for moisture content (or ASTM D2166 Standard Test Methods for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass. The sample procedure is described below:

1) Use a riffle splitter to reduce the sample size to approximately 5 pounds. Weigh the sample.
2) Dry the sample in an oven heated to 110º C.
3) Record the weight of the dried sample.
4) Process the oven-dry sample through a U.S. Standard No. 10 sieve and a U.S. Standard No. 50 sieve. Sieve sizes may be adjusted, depending on the grain size of sand and GAC used.
5) Weigh the portion of the sample passing the No. 10 sieve and retained on the No. 50 sieve. Place this portion in an oven heated to 440º C (ASTM D2974 Method C) to burn off naturally occurring organics typically found in the sand aggregate. The sample shall remain in the oven for a minimum of

three hours. NOTE: If the sample is a sand only sample, the test will be complete, and the percent of natural organics can be determined for the sand source.

6) Weigh the sample again. The difference in mass between the pre-oven (step 5) and post-oven sample (step 6) will be reported as the dry weight of naturally occurring organics. The weight from this step will include a correction factor for natural organics that will remain after this step, based on the testing of control (i.e., sand only) samples.
7) Place the sample in an oven at 620º C to burn off GAC. The sample should remain heated for a minimum of three hours or until GAC is no longer visible in the sample.
8) Weigh the sample again. The difference in mass between the mass in step 6 and this step (step 8) will be the mass of GAC. Determine the GAC content on a percent by weight basis, based on the mass relationships using dry weight results of the total sample (measured in step 3) from the sample masses prior to and after heating to each temperature, while factoring in inherent background organics and ash correlation, to be developed during ongoing control sample testing.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Entries in the field forms will be double-checked by the field team staff to verify that the information is correct. It is the responsibility of the Field Lead to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

The thickness of the sand in the catch pans will be monitored to verify the thickness is within 10% of the planned sand layer thickness.

Four discrete samples will be collected from each SRA cap. When the GAC proportions have been determined from the four samples, the average GAC percentage in the SRA cap will be determined using a mathematical average of the GAC content from the individual samples. The GAC percentage based on the mathematical average of the individual samples will be used to report a single GAC content for each SRA cap.

7.0 REFERENCES

ASTM International (ASTM). 2014. *ASTM D75-14-Standard Practice for Sampling Aggregates.*

ASTM. 2014. *ASTM D2974-14-Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils by Method A for moisture content (or ASTM D2166 Standard Test Methods for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass)*

ATTACHMENT H

NOTES FROM MEETING WITH THE USACE AND GREEN BAY WATER UTILITY

Lower Fox River Remedial Action OUs 2-5
Notes from Work Group Meeting – Utility #020 SRA Cap
Document Control Number: LFRR-18-0062
March 12, 2018
Page 1 of 4

Attendees

Tetra Tech	**Foth**
Terri Blackmar	Troy Gawronski
Paul Spillers	
George Willant	**Green Bay Water Utility**
Ben Hendron	Brian Powell
Rich Feeney (by phone)	
	U.S. Army Core of Engineers
Agencies/Oversight Team	Jonathon Imbrunone
Gary Kincaid	
George Berken	**J.F. Brennan**
Larry DeBruin	Dustin Bauman
Anchor QEA	**Lower Fox River Remediation LLC**
Dan Binkney	Jeff Lawson
Matt Carlino	

Prepared by: Ben Hendron

Reviewed by: Terri Blackmar

A meeting was held on February 28, 2018 to discuss the special remediation area (SRA) caps proposed for utility #020. The meeting was attended by the individuals listed above, which included representatives of Green Bay Water Utility (GBWU) and the U.S. Army Corps of Engineers (USACE). GBWU is the owner of the pipeline referred to as utility #020.

Terri Blackmar (Tetra Tech) started the meeting by describing the constraints that exist around developing a remedial dredge design for utility #020. This is a 2-foot diameter steel pipeline that was installed in 1961 and trenched into the sediment. This was during the period when polychlorinated biphenyls (PCBs) were being discharged into the river. Tetra Tech subcontracted two utility location service companies, Marine Engineering Services Company (MESCO) and Depth of Cover (DoC) Mapping, to perform utility location services for this pipeline. DoC Mapping and MESCO located the line and established 95 percent probability limits around the line, which provide confidence as to the utility location. To allow dredging around the pipeline, a 5-foot buffer was established upstream and downstream of utility #020, as well as above the utility. Within the 5-foot buffer, sediment is assumed to be contaminated with PCBs that exceed the 1 ppm PCB remedial action level (RAL). In addition, the utility dredge used for dredging close to utilities can only dredge 30 feet below the water line. This means that, based on recent water elevations of approximately 580 feet North American Vertical Datum of 1988 (NAVD88), the dredge can only reach roughly elevation 550 feet NAVD88. There are other dredges that can reach

lower than the utility dredge, but they will not work within 25 feet of the utility due to the risk of damaging the pipeline. With these factors in mind, a cap has been proposed after the utility dredge has removed as much sediment exceeding the 1 ppm PCB RAL as possible. However, there are constraints on installing a cap over the utility as well. The navigation channel is authorized down to an elevation of 553.6 feet NAVD88 (e.g. a 24-foot depth below the low water elevation of 577.6 feet NAVD88), with a 2-foot additional buffer for cap placement. Propeller wash (propwash) from commercial shipping vessels would cause the required stone size to be very large, which would likely infringe on the 2-foot buffer.

Drawings that included cross sections were presented to show the no-dredge buffer zone around the pipeline and the area proposed for capping. Photographs of the equipment used to dredge around the pipeline were also presented and discussed. Terri also mentioned that a meeting was held with the GBWU in 2015 to discuss the utility, and at that time GBWU indicated that two feet of cover was required over the pipeline after dredging, with stone no larger than gravel. She also stated that the Design Team hoped to get concurrence from the USACE and GBWU regarding the design for the SRA caps over this utility, since capping is planned for utility #020 early in the season.

The Agencies/Oversight Team (A/OT) inquired about the pipeline's longevity and if GBWU had any plans for replacing the line. Brian Powell (GBWU) replied that they fully expect the utility to be in service for the foreseeable future, and have no plans of replacing it any time soon. They are not comfortable with large stone being placed on top of their pipeline, which was clarified to be rip rap size stone. Brian provided the following explanation for this request. When holes are found in their pipelines, the first option for repair is sending a diver down to install a steel sleeve on the outside of the pipe to stop the leak. Any stones larger than a diver could move with their hands would cause a problem for the diver trying to access the pipeline. This type of repair was used in the mid-90s to repair a leak in the pipeline. If necessary, the next option for repair of this pipeline would be to install a liner inside the pipeline. Only after these two options are explored, would GBWU explore directionally digging a new pipeline.

The group's attention was then directed to the cap exhibits in the conference room, which show the sand and stone layer thicknesses and stone size used for A, B and C caps. Gary Kincaid (A/OT) inquired as to the USACE's opinion on the depth to the top of cap in the navigation channel, which is proposed to be 25 feet below the low water datum of 577.6 feet NAVD88. This is no higher than elevation 552.6 feet NAVD88. Jon Imbrunone (USACE) replied that he would need to confer with the Director of the Port of Green Bay, Dean Haen, and vessel operators before any decisions can be made. Gary remarked that Dean Haen has already made it known that he does not want any caps in the navigation channel. Jon stated that generally the elevation of the top of a cap should be 2 feet below the authorized navigational depth, but 3 feet is preferred. Sand is the most preferable cap material, but stone as large as 6 inches in diameter may also be acceptable. Larger stone has the potential to damage vessels. A 9-inch stone can cause just as much damage as a 12-inch stone, so avoiding the use of larger stones is generally preferable. Jon agreed that larger stone

could be used if placed more than 2 feet below the authorized navigation channel depth, although this was not ideal. He will discuss this with Dean Haen and the vessel fleet operators, and let us know their position. Jon also mentioned that dredging is performed at a 2:1 slope out from the navigation channel limits, and placing large stone on these slopes is also a concern unless the stone is at least 2 feet below the slope, to provide a buffer. These slopes should also be shown on drawing where future USACE dredging would occur. In most situations where a remedial cap is suggested in a navigation channel, Section 408 paperwork is submitted. Gary Kincaid replied that the LFRR project is a Superfund site and, therefore, is exempt from that permitting process. However, the substantive requirements of Section 408 still need to be met. This meeting serves as one means of communication to meet the requirements for the Section 408. A technical memorandum (tech memo) and design has been developed and will be distributed to stakeholders to gain acceptance or “no objection” from all involved parties.

Gary Kincaid explained that the Agencies would prefer to place a cap that is more robust than the minimum 1.5- to 2-foot thick SRA cap. He also mentioned that the Agencies were informed that Dean Haen (Port of Green Bay) does not want caps in the navigation channel in OU 4. Gary requested that the USACE provide a map showing the 2:1 slope areas where future USACE dredging would occur. Gary suggested that the proposed designs be sent to GBWU and the USACE for final review and commenting. The objective is to receive acceptance from the USACE and GBWU for the caps proposed over utility 20, or at least a notice of no objection to these caps.

George Willant (Tetra Tech) mentioned that Paul Spillers (Tetra Tech) received an email from Jon Imbrunone regarding a possible increase in the authorized depth of the navigation channel to 27 feet. Jon mentioned that, during the 1980s, Congress authorized a 27-foot navigation channel depth; however, funding was never appropriated. This authorization still exists and is valid to study deepening the channel to 27 feet. The inquiry originated from the office of Senator Tammy Baldwin, and included an inquiry about the presence of caps in the navigation channel. It’s likely that a stakeholder has been requesting that Senator Baldwin’s office support this proposal. The Senator’s office asked if there have been any caps installed north of the Canadian National Railroad (CNRR) bridge. No caps have been installed in that stretch of river to date, but, under the proposed design, SRA caps will be installed over some utilities in 2018.

George Willant stated that, as Tetra Tech moves down river with the remedial action, tech memos and designs are being developed for each cap including those over utilities in the navigation channel. All interested parties will have a chance to comment and sign off on these caps. George Berken (A/OT) noted that it’s possible that the USACE could dredge out the caps later, if necessary.

Jon Imbrunone stated that utilities and bridges typically present challenges for changing the navigation channel depth, so he’s not overly concerned about the Baldwin inquiry. George Berken (A/OT) noted that this could now become a political issue, so would need to be discussed with WDNR management. Jon offered to send the request to the WDNR and do some investigating

into the inquiry. He has sufficient information now to address the inquiry from Baldwin's office. He will also get input from Dean Haen and vessel fleet operators.

Brian Powell (GBWU) stated that sand and stone, up to 6-inch diameter, would be acceptable to GBWU, if needed. In a post-meeting side bar conversation with Tetra Tech personnel, Brian emphasized, however, that the stone cannot be in contact with the pipe. He also stated that a leak detection survey was performed recently, which did not identify any leaks in the pipeline.

Action items from the meeting include the following:

- Jon Imbrunone will get feedback from the Port Authority and vessel operators regarding acceptable stone size for caps in the navigation channel, and get back to Tammy Baldwin's office regarding the caps.
- Tetra Tech will finalize the dredge design (including LLC and A/OT reviews) by 3/26/18.
- A tech memo will be submitted that includes the dredge design surface, proposed cap footprints, and cross sections. This memo will be provided to the USACE and GBWU for review.
- Tetra Tech will provide all remaining SRA cap locations to the USACE.

Blackmar, Terri

From: Feeney, Richard
Sent: Thursday, December 17, 2015 9:43 AM
To: Brian Powell (BrianPo@greenbaywi.gov); 'PaulPa@ci.green-bay.wi.us'; 'NancyQu@greenbaywi.gov'
Cc: 'Kincaid, Gary W - DNR'; 'Jay.Grosskopf@Boldt.com'; 'George.Berken@boldt.com'; 'Ava.Grosskopf@Boldt.com'; 'Larry.Debruin@Boldt.com'; 'Jeffrey Lawson'; 'Susan O'Connell'; Bryan Heath (Bryan.Heath@ncr.com); Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com); Dustin Bauman (dbauman@JFBRENNAN.COM); Coleman, Bill; Willant, George; Blackmar, Terri; Tabatabai, Morey; Gifford, Ricky; 'dbinkney@anchorqea.com'; Paul LaRosa (plarosa@anchorqea.com); ECI.LFRR Project Correspondence; Nelson, Shane
Subject: Notes from Yesterday's Meeting with the Green Bay Water Utility (GBWU)

Hi Brian, Paul and Nancy. Thanks again for meeting with a few of us from the remediation project yesterday. Following are some brief notes from that meeting. Please let us know if anything is incorrect, requires clarification or if anything of importance is omitted.

On December 16, 2015 Troy, Dustin, Gary and I met with Brian Powell, Paul Pavlik and Nancy Quirk of the GBWU. Nancy is the General Manager who we had not met with previously but we have done so with Brian and Paul several times.

The primary purpose of the meeting was to obtain utility owner feedback on minimum post dredge cover required for water supply lines after remediation. This primarily concerns places where we may use the diver assisted dredging concept being developed by Brennan.

Brian said that, based on the installed depth of utility #045, which is the northern most water line and was installed via directionally drilling, GBWU has no concerns about us dredging as required across it. Based on the LOS neat line surface, the required dredge cuts over this utility are not deep. So there should be no concerns about working over utility #045 provided Brennan can safely spud around it.

Nancy said she had been in contact with a WDNR person in Madison about utility regulations (I missed her name but Gary knew of her). Nancy was told that there is a code requirement to have at least two feet of cover over GBWU's water lines.

So the GBWU's position is that, in any locations where our dredging would result in less than two feet of post dredge cover, the project should restore the required minimum cover depth. If we were to do so, Rich suggested using sand but the GBWU said they prefer for us to use gravel. Initially Gary said that the sand might not remain stable but Troy pointed out that it should be more stable than the sediment that was dredged and it would replace. So there was no firm decision on whether we would actually backfill over any water lines that get dredged over and, if so, what would be used for this purpose.

In any cases where there is presently more than two feet of cover over a water line, the GBWU stated their preference for having the project restore the existing cover depth after dredging. For example, if there is 5 feet of cover and we dredged two feet, leaving three feet of cover, the GBWU would want us to restore the cover to five feet after remediation. Gary said the A/OT would likely not require the project to do this but it is possible the GBWU may want to pay for this work to be performed, or this could be an opportunity for cost sharing between the project and the GBWU.

Richard J. Feeney, P.E. | Vice President, Project Engineering
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George Berken

From: George Berken
Sent: Wednesday, June 26, 2019 7:56 AM
To: Bill Hartman; Bryan Heath; Jeff Lawson; John Heyde; Michael Davis; Paul Montney; Roger Kaminski; Susan OConnell; Ben Hendron; Bill Coleman; Bjorn Lysne; Brandon Weston; Cynthia Jones; Dan Binkney; Denis Roznowski; ECI; Eric Bauer; Gary Phelps; Hugh Kinnard; Joe Francis; Lee Boreen; Luke Vandenberg; MIchelle Miller; Morey Tabatabai; Paul LaRosa; Paul Spillers; Rhonda ChierVerhagen; Richard Feeney; Ricky Gifford; Sarah Martin; Sharon Kozicki; Tara Van Hoof; Terri Blackmar; Troy Gawronski; Dustin Bauman; Greg Smith; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: 625. 87500 OU2-5 - FW: LFFRR-18-0044A-R2: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill
Attachments: GP Day Street Mill Intake Area Tech Memo 190624.pdf

Morey, on behalf of the Agencies, the technical memorandum, submitted in your email below, is acceptable.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Tuesday, June 25, 2019 3:37 PM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; Feeney, Richard <Richard.Feeney@tetratech.com>; ricky.gifford@tetratech.com; Martin, Sarah <Sarah.Martin@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen

<rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 625. 87500 OU2-5 - FW: LFFRR-18-0044A-R2: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

My apologies to all,
Revised Tech memo for the existing north bulkhead intake area at Georgia-Pacific Day Street Mill was sent with the wrong chain of emails, yesterday.
Please discard my yesterday's email time stamped 4:12PM Pacific time. I will separately send an email retracting that email.

George,
Attached is the revised TM for the intake area based on the below comments received from the A/OT yesterday, 6-24.

Respectfully

Morey Tabatabai, Design/Field Engineer
morey.tabatabai@tetratech.com
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www.tetratech.com

Think Green - Not every email needs printed

From: George Berken <George.Berken@boldt.com>
Sent: Monday, June 24, 2019 9:58 AM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Martin, Sarah <Sarah.Martin@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: FW: 625. 87500 OU2-5 - FW: LFFRR-18-0044A-R2: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

Morey, on behalf of the Agencies, the technical memorandum, submitted in your email below, is acceptable with the attached comment being adequately addressed. Address this comment and resubmit only the revised ATTACHMENT 1A DESIGN PLANS FOR D74-3 SRA CAP AND BUTTRESS.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Friday, June 21, 2019 12:34 PM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; Feeney, Richard <Richard.Feeney@tetratech.com>; ricky.gifford@tetratech.com; Martin, Sarah <Sarah.Martin@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 625. 87500 OU2-5 - FW: LFFRR-18-0044A-R2: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

George,
As requested by the A/OT, following final submittal of this Technical Memorandum by Paul spillers, a short meeting was held Wednesday 6-17 to clarify related submittals.
This TM was approved by the A/OT on June 6. Approved TM included the SRA cap as attachment 1 (replacing dredge and cap plan previously approved in 2018 for dredging).
Previous versions of the TM included the dredge and cap as attachment 1,
Revised final TM attached includes the August 21, 2018 approved dredge plan as attachment 1 and the SRA cap as attachment 1A.

The following have been added to the SRA cap drawings (Att 1A):

1. Reference to the approved dredge design in the legend area,
2. Approved cap limits before sloping to zero (daylight to dredged surface),

Also please note the termination of cap on the north end is based on data related to core 4077-30. This core was collected in 2016 and included in the primary design. Core mudline at time of collection (2016) was at 575.2 feet elevation with EOC at 573.2. Post primary dredge elevation at this core was at 572.98 feet elevation. This confirms core contamination addressed , therefore as the A/OT agreed excluded form capping.
Core 4077-30 data is provided below:

Sample Interval ID	Date of Collection	Logged Interval Bottom (ft)	Total PCB (mg/kg)	Refusal Encountered (Y/N)	Interval Top Elevation Uncorrected (ft)
4077-30-A	9/14/2016	0.5	14.5	N	575.20
4077-30-B	9/14/2016	1	9.14	N	574.70
4077-30-C	9/14/2016	1.5	3.35	N	574.20
4077-30-D	9/14/2016	2	1.28	N	573.70
4077-30-E	9/14/2016	2.5	0.0401	N	573.20
4077-30-F	9/14/2016	3	0.0261	N	572.70
4077-30-G	9/14/2016	3.5	0.0258	N	572.20
4077-30-H	9/14/2016	4	0.0409	N	571.70
4077-30-J	9/14/2016	4.5	0.03	N	571.20
4077-30-K	9/14/2016	5	0.0276	N	570.70
4077-30-L	9/14/2016	5.5	0.0253	N	570.20
4077-30-M	9/14/2016	6	0.0261	N	569.70

Respectfully

Morey Tabatabai, Design/Field Engineer
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From: George Berken <George.Berken@boldt.com>
Sent: Monday, June 10, 2019 10:49 AM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Martin, Sarah <Sarah.Martin@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen

<rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 625. 87500 OU2-5 - FW: LFFRR-18-0044A-R2: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

⚠ **CAUTION:** This email originated from an external sender. Verify the source before opening links or attachments. ⚠

Terri, on behalf of the Agencies, the Revision 2 Technical Memorandum, submitted in your email below for the Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill, is acceptable.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Monday, June 10, 2019 9:14 AM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
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Subject: RE: 625. 87500 OU2-5 - FW: LFFRR-18-0044A-R2: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

Hi George,

Attached is a slightly revised tech memo for the SRA caps proposed at the GP Day Street Mill. A paragraph was added to document GP's acceptance of the remedy in this area.

Please review these revisions and let me know if you have any questions. If the A/OT accepts these revisions, we will accept the revisions and issue the document as final.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
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From: George Berken <George.Berken@boldt.com>
Sent: Thursday, May 2, 2019 2:59 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 625. 87500 OU2-5 - FW: LFFRR-18-0044A: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

Morey, on behalf of the Agencies, the technical memorandum regarding the special remediation area (SRA) cap, submitted in your email below for the existing north shoreline and intake area at the GP Day Street Mill (D47-3), is acceptable with the attached comments being adequately addressed. Address these comments and resubmit.

Thanks,
George…

BOLDT.

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Monday, January 28, 2019 11:58 AM
To: George Berken <George.Berken@boldt.com>; Kincaid, Gary W - DNR (Gary.Kincaid@wisconsin.gov) <Gary.Kincaid@wisconsin.gov>; Larry DeBruin <Larry.Debruin@Boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: bryan.heath@ncr.com; jlawson@project-control.com; soconnell@project-control.com; 'Troy.Gawronski@Foth.com' <Troy.Gawronski@Foth.com>; bill.coleman@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; bjorn.lysne@tetratech.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; brandon.weston@tetratech.com; eci.lfrrpc@tetratech.com; database@project-control.com; Spillers, Paul <Paul.Spillers@tetratech.com>
Subject: RE: 625. 87500 OU2-5 - FW: LFFRR-18-0044A: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

George,
On January 15 the A/OT requested revisions to the residual design for the subject TM. The revisions request was to better describe the outline of the SRA cap before the TM can be approved, or conditionally approved with Riparian owner's consent.

Attached is the related revised attachment 1 to the TM.

Respectfully

Morey Tabatabai, Design/Field Engineer
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From: Tabatabai, Morey
Sent: Monday, December 10, 2018 1:14 PM
To: 'George Berken' <George.Berken@boldt.com>; Kincaid, Gary W - DNR (Gary.Kincaid@wisconsin.gov) <Gary.Kincaid@wisconsin.gov>; Larry.Debruin@Boldt.com; Jay Grosskopf (Jay.Grosskopf@Boldt.Com) (Jay.Grosskopf@Boldt.Com) <Jay.Grosskopf@Boldt.Com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: Bryan Heath (Bryan.Heath@ncr.com) <Bryan.Heath@ncr.com>; 'Jeffrey Lawson' (JLawson@project-control.com) (JLawson@project-control.com) <JLawson@project-control.com>; 'Susan O'Connell' (SOConnell@project-control.com) (SOConnell@project-control.com) <SOConnell@project-control.com>; 'Troy.Gawronski@Foth.com' <Troy.Gawronski@Foth.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Willant, George <George.Willant@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Blackmar, Terri (Terri.Blackmar@tetratech.com) <Terri.Blackmar@tetratech.com>;

Weston, Brandon <Brandon.Weston@tetratech.com>; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; 'database@project-control.com' <database@project-control.com>; Spillers, Paul <Paul.Spillers@tetratech.com>
Subject: RE: 625. 87500 OU2-5 - FW: LFFRR-18-0044A: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

George,

Attached is the revised TM for the dredging and SRA Cap/ Buttress at Day Street Intake area.
Please note revisions are based on below comments and comment resolution, also attached.
The GP acceptance letter as requested is in the process and will be forwarded to the A/OT as soon as available. The design team with the LLC had a meeting with GP Day Street folks at Broadway facilities in April 6 this year. During the meeting there was no major concerns brought up by GP except to see the possibility to leave the king piles in, instead of removing. Later, Mr. Paul Montney requested that the cap be reduced to the extent possible to keep from encroaching in front of the 2015 bulkhead built in front of the Day Street clarifier.
As agreed with the A/OT the final configuration and thickness of the SRA Cap in this area is subject to final grades achieved by dredging. The dredging will be based on the approved Residual Dredge Plan attachment to the TM and A/OT comments to the TM.

Respectfully

Morey Tabatabai, Design/Field Engineer
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From: George Berken <George.Berken@boldt.com>
Sent: Tuesday, May 8, 2018 6:41 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Willant, George <George.Willant@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <AgenciesLFRTeam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 625. 87500 OU2-5 - FW: LFFRR-18-0044A: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

Terri, on behalf of the Agencies, the A/OT has questions regarding the conceptual technical memorandum with supporting documents, submitted in your email below for the D74-3 residual remedial action area. Please arrange a work group meeting to discuss:

- Is the methodology of attachment 3 consistent with the methodology previously applied in the FHTB? If not, explain the differences and the reason(s) why. If it is not consistent with the previously approved propwash technical memorandum, the Agencies will need to review it in greater detail. Has attachment 3 been accepted by Tt/Anchor.
- The possible cap configuration(s) (chemical isolation layer, filter layer, and armor stone sizes and gradations).
- Why a grouted mat is being considered in attachment 3.
- Update this conceptual design with the latest design refinement core results.

Thanks,
George…

BOLDT.

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
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boldt.com BLOG

SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Tuesday, March 27, 2018 11:47 AM
To: Ava Grosskopf <Ava.Grosskopf@boldt.com>; George Berken <George.Berken@boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Kincaid, Gary W - DNR <Gary.Kincaid@wisconsin.gov>; Larry DeBruin <Larry.Debruin@Boldt.com>
Cc: bjorn.lysne@tetratech.com; Spillers, Paul <Paul.Spillers@tetratech.com>; dbauman@jfbrennan.com; eci.lfrrpc@tetratech.com; bryan.heath@ncr.com; jlawson@project-control.com; 'soconnell@project-control.com'; Troy Gawronski <Troy.Gawronski@Foth.com>; bill.coleman@tetratech.com; george.willant@tetratech.com; ben.hendron@tetratech.com; dbinkney@anchorqea.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; Matt Carlino <mcarlino@anchorqea.com>; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; michelle.miller@tetratech.com
Subject: LFFRR-18-0044A: Technical Memorandum - Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

George,

Attached is the tech memo on the proposed SRA caps for D74, next to the GP Day Street Mill. Please review this information and let me know if you have any questions or comments.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
Direct: 630.470.4217 / Home Office: 630-922-8772
Terri.Blackmar@tetratech.com

Tetra Tech | **Fox River Site**
1611 State Street | Green Bay, WI 54304 | www.tetratech.com

TETRA TECH EC, INC.

Technical Memorandum

To: George Berken, Jay Grosskopf, and Larry DeBruin (Boldt Oversight Team); Gary Kincaid and Beth Olson (WDNR); and Pablo Valentin (USEPA)

From: Terri Blackmar and Morey Tabatabai (Tetra Tech), and Dan Binkney (Anchor QEA)

cc: Jeff Lawson, Sue O'Connell (Project Control Companies for the LLC); Bryan Heath (NCR); Paul Montney and Roger Kaminski (Georgia-Pacific); Bill Hartman (P.H. Glatfelter); Bill Coleman, Bjorn Lysne, Lee Boreen, Rich Feeney, and Paul Spillers (Tetra Tech)

Date: June 10, 2019

Re: Special Remediation Area (SRA) Caps Proposed for the Existing North Bulkhead and Intake Area at the Georgia-Pacific Day Street Mill

Document Control Number: LFRR-18-0044A-R2

1. INTRODUCTION

This technical memorandum (tech memo) describes the final remedy proposed for the area in the Lower Fox River adjacent to the existing steel bulkhead at the northwest corner of the Georgia-Pacific (GP) Day Street Mill. A dredge-and-buttress design was approved for this area, designated as D74-3, that included the installation of temporary and permanent support to allow dredging to the required depths along the bulkhead. The bulkhead improvements were installed in this area and it was dredged in 2017 as part of the Lower Fox River Remediation project. The location of the bulkhead and its surrounding area are shown on Figure 1.

2. BACKGROUND

Structural analysis of the existing bulkhead and design of the structural support required to allow dredging next to the GP Day Street Mill bulkhead are described in the *Technical Memorandum - Structural Improvements to Allow Remedial Action near the Existing North Bulkhead*, dated May 23, 2017. This tech memo was acknowledged by the Agencies on June 19, 2017.

As described in this memo, there are two types of sheet pile that form the existing bulkhead in the area of the intake structure at the Mill. These two types of sheet pile near the intake are identified on Attachment 1. The northernmost section of the exiting bulkhead in this area consists of MP115/PMA22 anchored steel sheet pile that extends approximately 50 linear feet along the bulkhead. Based on information provided by GP, this bulkhead consists of sheet piles that are approximately 40 feet long, with an anchoring system that includes anchor rods connected to anchor piles located behind the bulkhead. The approved remediation design for the area next to this section of the bulkhead included installing temporary support piles and then dredging, followed by placement of sand buttress in front of the bulkhead to elevation 571.6 feet NAVD88, where required, with the buttress sloping down away from the bulkhead at a 4H:1V slope. This approach allows removal of the temporary support upon completion of buttress placement.

The section of existing bulkhead located between the MP115/PMA22 steel sheet pile and the intake structure is a PZ27 cantilevered sheet pile bulkhead that extends approximately 48 linear feet along the shoreline to the intake structure, and then continues to the east of the intake structure for approximately 12 additional linear feet. The location and extent of the cantilevered sheet pile is also shown on Attachment 1. Preliminary geotechnical analyses performed in 2016 for the two types of sheet pile that exist along this bulkhead indicated that little or no dredging could be performed safely adjacent to the bulkhead without additional measures being taken to improve its stability. Therefore, additional analyses were performed that indicated a dredge-and-buttress design could be implemented if structural improvements were made to the bulkhead and intake structure. Those improvements included the installation of king piles to provide temporary support to the cantilevered sheet piling and intake structure, which was also braced. After dredging, buttress sand placement was planned for the area, which would be in place before removing the temporary support piles. The sand buttress was designed to start at elevation 571.6 feet NAVD88 next to the bulkhead, and slope down at a 4H:1V slope. At the intake, buttress sand will be placed to elevation 570.0 feet, which is the invert elevation of the intake.

The previously-designed dredge-and-buttress design had acceptable factors of safety (FS) for dredging to the allowable dredge elevations after the structural improvements were completed. As described in Foundation Analysis and Design (Bowles 1988), an acceptable FS for a short-term stability of a retaining structure is 1.2 to 1.5, and an acceptable FS for long-term conditions is 1.5 to 2.0. Where conditions occur that are very infrequent, such as rapid drawdown, a FS in the range of 1.1 to 1.3 is acceptable. A FS less than 1.0 is indicative of potential failure.

In 2017, after the temporary support described above was installed, D74-3 was dredged to the design surface and post-dredge sampling was performed. The locations of the post-dredge cores, and additional design refinement cores obtained to determine the depth of contamination that exceeds the 1 ppm PCB RAL in this area, are shown on the Core Location Map in Attachment 1. A core summary table indicating the results obtained from these cores is also presented in Attachment 1. The elevation to which contamination extends is identified on this table in the row labeled “EOC”, which is the “elevation of contamination,” and the approximate depth to which dredging would typically be performed as part of the remedial action. The post-dredge surface bathymetry and elevations of contamination at core locations 4076.5-208 and 4077-214 are summarized on Table 1 below, along with the allowable dredge elevation for each section of wall.

Table 1. Core Locations Not Dredged to the 1 PPM PCB RAL

Core Location	Top of Core Elevation (ft. NAVD88)	Core EOC (ft NAVD88)	Adjacent Bulkhead	Allowable Dredge Elevation, with Overdredge (ft NAVD88)[1]
4076.5-208	561.53	553.0 or lower	Cantilevered wall	558.0
4077-214	571.22	Between 568.7 and 566.2, but hit refusal at 1.6 feet	Anchored wall	564.1[2]

[1] Allowable dredge elevation based on short-term FS of 1.2, with river elevation at 580 feet NAVD88.

[2] Includes up to 3.25 feet of excavation behind the wall. The allowable dredge elevation is 567.0 feet with 1.5 feet of excavation behind the wall, and 570.1 feet NAVD88 with no excavation behind the wall. If dredging is required below elevation 570.1 feet within 30 feet of the wall, excavation behind the wall will be required. Refusal was encountered in the initial core at a depth of 1.6 feet, so high subgrade may preclude dredging below elevation 569.2 feet, and dredging to the EOC.

These results indicated that very low-level contamination, likely less than 2 ppm PCB, would remain after dredging to elevation 558.0 feet NAVD88 at core 4076.5-208; and higher contamination, likely up to 19 ppm PCB, would remain after dredging to elevation 568.7 feet NAVD88 at core 4077-214. Additional dredging can be performed at each of these locations, based on the allowable dredge elevation, but not to the depth needed to remove all contamination exceeding the 1 ppm PCB RAL. Dredging all sediment exceeding the 1 ppm PCB RAL will not be possible at these locations without significant additional support.

3. RESIDUALS MANAGEMENT/SRA CAP DESIGN

A residuals management concept design has been developed for D74-3, which is presented in Attachment 1. This design is based on dredging to the allowable short-term dredge elevations near the bulkheads, as shown in Table 1, and assumes that the water level in the river is at elevation 580 feet NAVD88 at the time of dredging. Because contamination exceeding the 1 ppm PCB RAL will remain at the core locations mentioned above, caps will be installed at these locations in place of buttress after dredging to the allowable dredge elevations. These caps have been designed to provide similar protection and isolation of PCBs as the Type A and B caps designed for the project, but may be subjected to propeller wash forces that would require an even larger stone size to resist movement.

Evaluations were previously performed in this area for propeller wash under "worst case" vessel assumptions (e.g., the Great Republic) and vessel straying assumptions for both bow thruster and main propeller propwash. The results of these analyses are summarized below.

Bow Thruster Propwash: This propwash was analyzed for straying and non-straying scenarios assuming 100 percent power is applied to the bow thruster of a vessel turning in the East River Turning Basin. The results obtained from these analyses are shown on the figures in Attachment 2, and indicate that a D_{50} of 13 inches would be sufficient to resist this propwash at the proposed cap locations.

Main Propeller Propwash: This propwash was analyzed for a potential scenario that involved capping the sediment in this same area. The results of this analysis are also presented in Attachment 2. This scenario assumed 100 percent power was applied to the main propeller from the same large vessel, the Great Republic, located close to the area proposed for capping. Under this scenario, an 18-inch thick concrete mat cap was recommended to withstand the propwash at the proposed location.

Based on these evaluations, SRA caps are proposed for the areas around cores 4076.5-208 and 4077-214. These caps will be constructed with a minimum 6-inch thick sand layer, overlain by a minimum 6-inch thick filter stone with a D_{50} of 1.5 to 3 inches. Quarry spall with a minimum D50 of 13 inches will be installed over the filter stone layer. These caps will also provide buttress in these areas. These caps will not be able to withstand propwash from vessels applying maximum prop and bow thruster power turning and or maneuvering in the basin. Although these caps cannot withstand direct 100% propwash, the probability of this occurring is low.

The SRA caps must also meet the requirements for buttressing. If the temporary support of the bulkhead is removed, the cap will be constructed to extend to a minimum elevation of 571.6 feet NAVD88 at the wall, and slope down at a slope no steeper than 4:1, while maintaining the required SRA cap sand thickness. The only exception will be the buttress elevation at the intake, where buttress will be placed to elevation 570.0 feet (invert elevation of the intake), as shown on the drawings in Attachment 1. In the event the temporary support (king piles) is left in place, the top of the buttress elevation can be lowered to elevation 565.0 feet NAVD88.

4. SUMMARY AND RECOMMENDATIONS

Dredging will be attempted along the MP115 anchored bulkhead area, with 3.2 feet of excavation behind the bulkhead, to elevation 568.7 feet NAVD88 within 30 feet of the bulkhead. If high subgrade does not limit dredging to this depth, additional dredging will be performed to elevation 567.5 feet NAD88 . SRA cap/sand buttress will be placed to meet the SRA cap sand thickness requirements.

Additional dredging will be performed along the PZ27 cantilever bulkhead, where temporary structural support has been installed. Dredging can then be performed to an elevation as low as the allowable dredge elevation of 558.0 feet along this bulkhead. The proposed SRA cap will be placed to elevation 571.6 feet NAVD88 after dredging to restore the FS to a minimum of 1.5 for long-term stability and to allow removal of the temporary support. However, if the temporary support is left in place permanently, the top of SRA cap/buttress can be installed to a lower elevation of 565.0 feet NAVD88. The cap will be sloped at a slope no steeper than 4H:1V, to maintain the required SRA cap sand thickness, from the bulkhead to the post-dredge surface.

Structural improvements were also installed at the water intake area, and additional dredging will be performed up to 30 feet from the intake to the allowable dredge elevation of 558 feet NAVD88. After dredging, sand buttress will be placed in front of the intake to an elevation of 570.0 feet NAVD88 (565.0

feet NAVD88 if the king piles are not removed). The bracing will be removed after dredging and buttress placement, but the structural support will remain below the intake.

Analyses performed for the structures described herein were based on current conditions and existing building loads near the anchored bulkhead, cantilevered bulkhead, and intake structure. Following remediation, the long-term FS for stability of the bulkheads and intake will be a minimum of 1.5. This FS is greater than the FS that existed prior to dredging for the cantilevered wall, for moment equilibrium and embedment (FS of 1.3 and 1.2, respectively). The riparian property owner is advised that if current loads from traffic or buildings increase in the future, or if new loads are introduced, bulkhead stability must be re-analyzed for the change in conditions.

5. RIPARIAN PROPERTY OWNER ACCEPTANCE

This tech memo and the design drawings were reviewed with GP, the riparian property owner, in an effort to gain its acceptance for the proposed dredge-and-SRA cap remedy near the north bulkhead and intake area. Revised design plans for residual dredging, buttressing, and capping were submitted to GP on Sept. 13, 2018, and a comment was received from GP regarding a revision to the cap configuration. GP stated that they prefer the cap not be extended into the newly installed bulkhead supporting the clarifier to the south of the PZ27 cantilever bulkhead. The cap configuration presented in this memo addresses that comment. Once reviewed and accepted by GP, its written acceptance will be included in Attachment 3 of this memo.

On September 27, 2018, Tetra Tech contacted the LLC with a recommendation to delay remedial action at the Day Street Mill until 2019. The LLC had previously discussed this possibility with GP, which had concurred, so on October 3, 2018 the LLC agreed to this proposed remediation schedule.

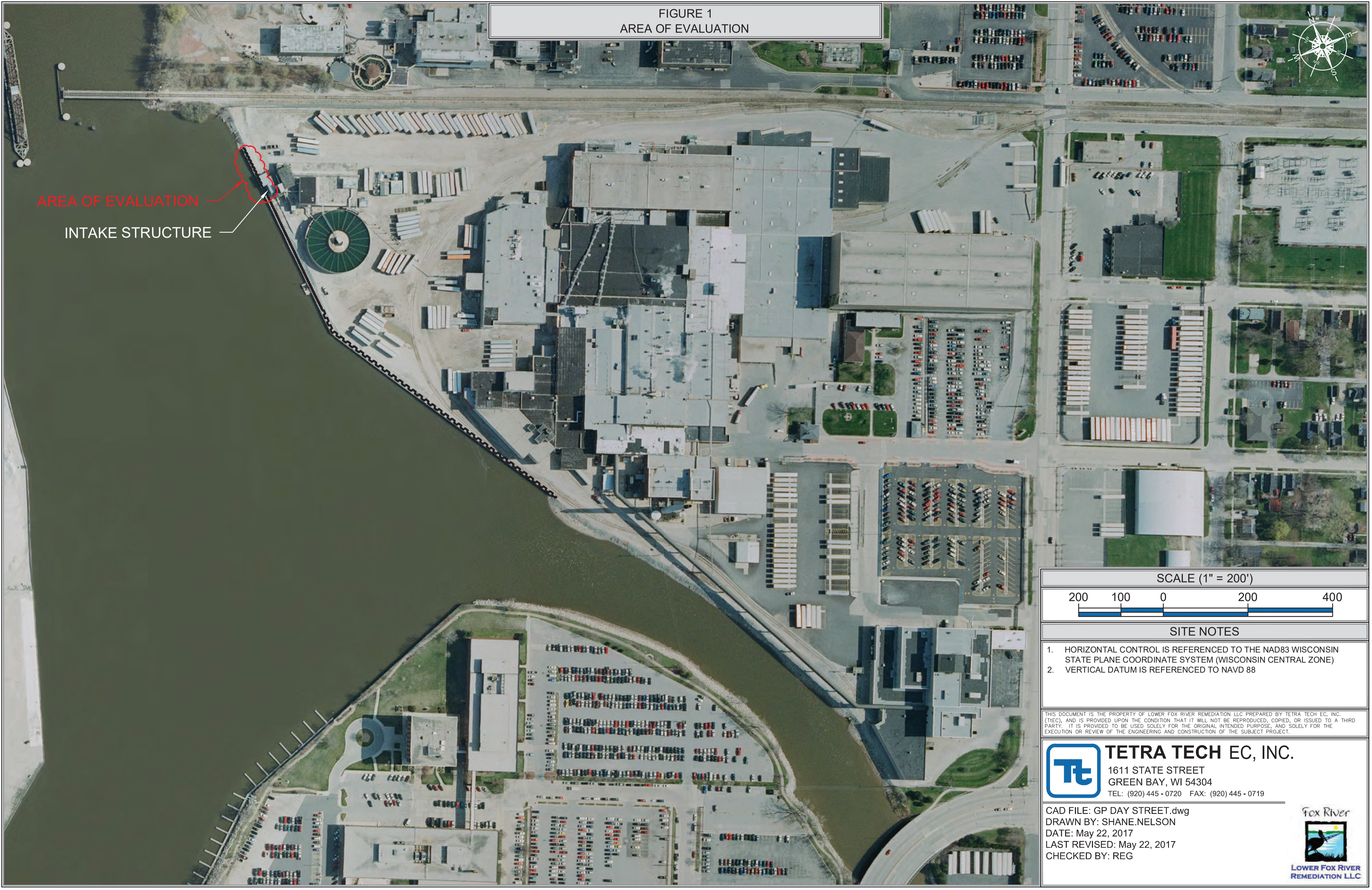
On May 2, 2019 the A/OT commented on the Tech Memo, requiring a larger cap, and armor stone with D_{50}=13-inches instead of the originally planned D_{50}=6-inch stone. Tetra Tech orally discussed this change with GP on May 3, 2019. On May 3, 2019, Tetra Tech emailed GP regarding these revisions and included a copy of the A/OT email describing the changes. On May 31, 2019, Tetra Tech submitted the revised remedial design to GP and requested that GP, as the riparian property owner, approve the remedial action, including the increased cap and armor stone size. On June 3, 2019, GP emailed Tetra Tech, accepting the revised design. A copy of the GP approval is included in Attachment 3.

6. REFERENCES

Bowles, J.E. 1988. Foundation Analysis and Design. Fourth Edition. McGraw Hill Book Company.

FIGURES

FIGURE 1
AREA OF EVALUATION



SCALE (1" = 200')

200 100 0 200 400

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: GP DAY STREET.dwg
DRAWN BY: SHANE.NELSON
DATE: May 22, 2017
LAST REVISED: May 22, 2017
CHECKED BY: REG

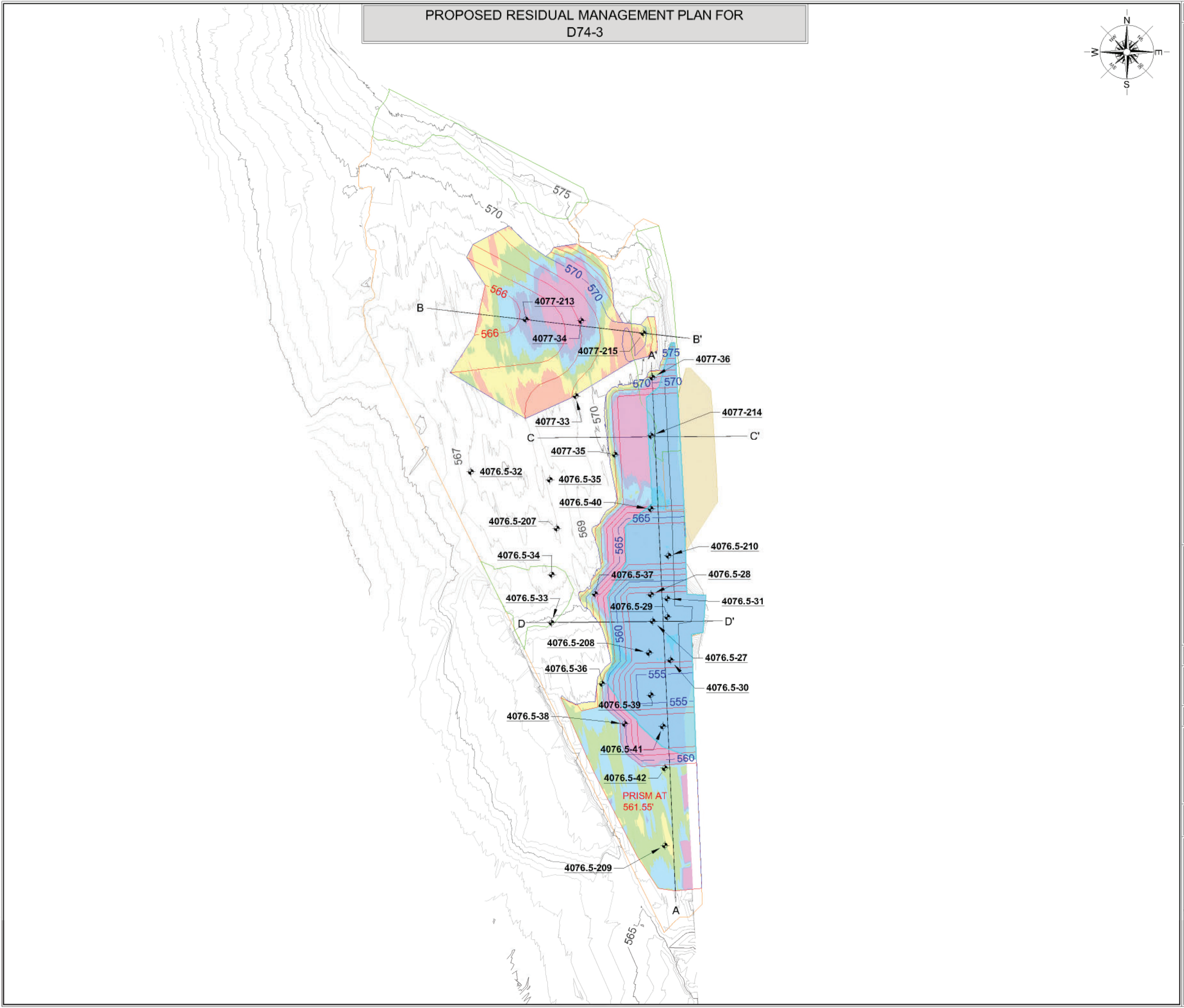
Fox River
LOWER FOX RIVER REMEDIATION LLC

P:\LLC\CAD\Field Engineering\Dredge Files\2017_2017 Misc\GP DAY STREET MILL\GP DAY STREET.dwg

ATTACHMENT 1

AUGUST 21, 2018 APPROVED DREDGE DESIGN PLANS FOR D74-3

PROPOSED RESIDUAL MANAGEMENT PLAN FOR D74-3



LEGEND

	MIN. EL.		MAX. EL.	
🟪	-14.91'	-	-2.00'	DOC DEPTHS
🟦	-2.00'	-	-1.50'	
🟦	-1.50'	-	-1.00'	
🟩	-1.00'	-	-0.50'	
🟨	-0.50'	-	0.00'	
🟧	0.00'	-	1.95'	

- DESIGN MINOR CONTOURS
- DESIGN MAJOR CONTOURS
- PRE-SEASON MINOR CONTOURS
- PRE-SEASON MAJOR CONTOURS
- DMU BOUNDARIES
- RDMU BOUNDARIES
- HIGH SUBGRADE LIMITS
- 🟦 SRA/BUTTRESS LIMITS
- 🟨 EXCAVATION LIMITS

SEE ATTACHED CORE SUMMARY TABLE FOR DETAIL INFORMATION FOR EACH CORE

OU# - D# - #

OPERABLE UNIT

DREDGE AREA

DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 50')

50 25 0 50 100

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
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CAD FILE: OU4-D74-3 RDMU Plan.dwg
DRAWN BY: DAVID.FRISQUE
DATE: August 15, 2018
LAST REVISED: August 15, 2018
CHECKED BY: REG

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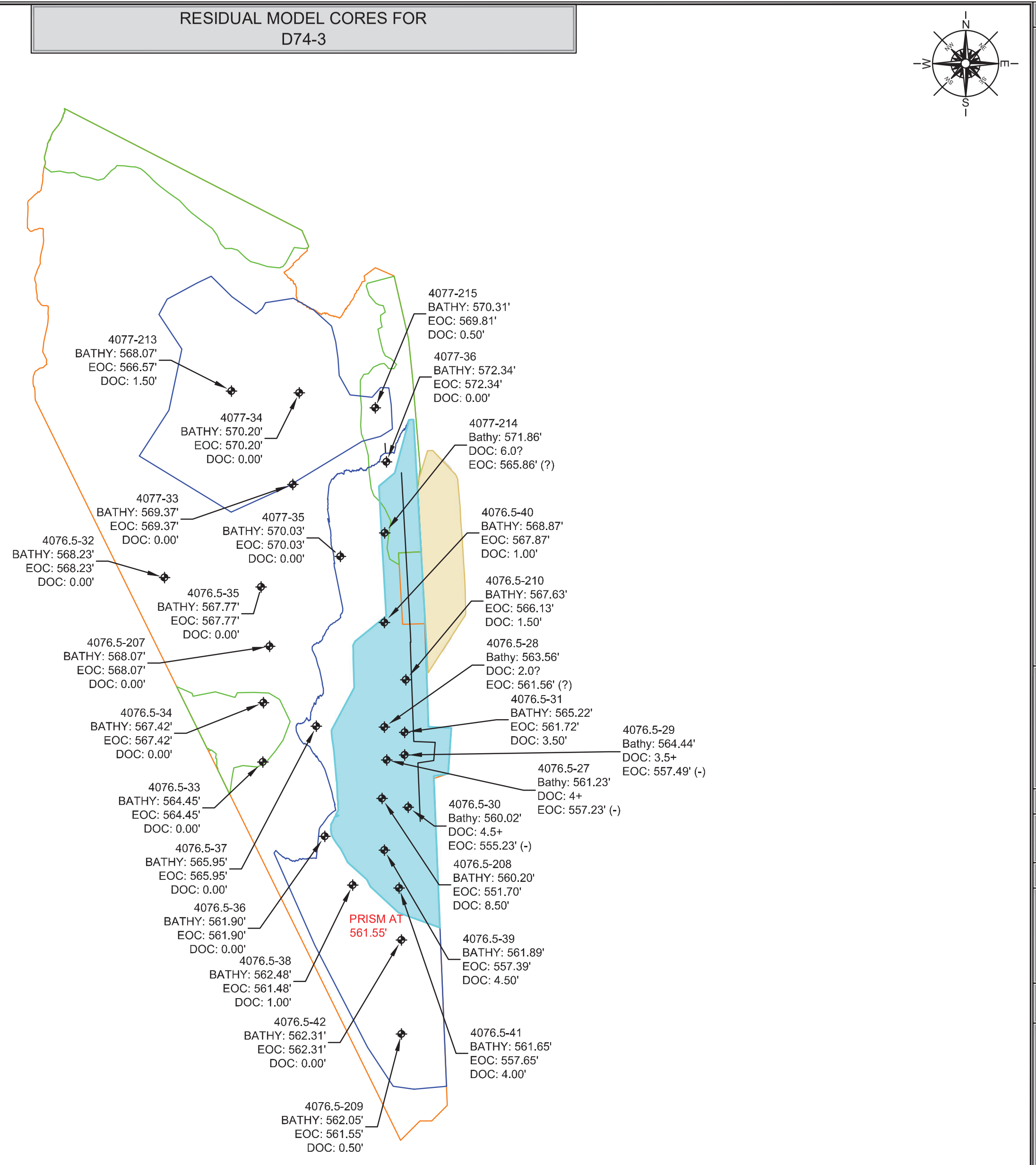
P:\LLC\CAD\Field Engineering\Dredge Files\2018_2018 Residual Management Plans\D74\DWG\OU4-D74-3 RDMU Plan.dwg

RESIDUAL MODEL CORES FOR D74-3



LEGEND

―	HIGH SUBGRADE LIMITS
🟦	SRA BUTTRESS LIMITS
🟨	EXCAVATION LIMITS
―	DMU BOUNDARIES
―	RDMU BOUNDARIES

OU# - D# - #

OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 50')

50 25 0 50 100

SITE NOTES

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CAD FILE: OU4-D74-3 RDMU Plan-Cores Map.dwg
DRAWN BY: DAVID.FRISQUE
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LAST REVISED: August 15, 2018
CHECKED BY: REG

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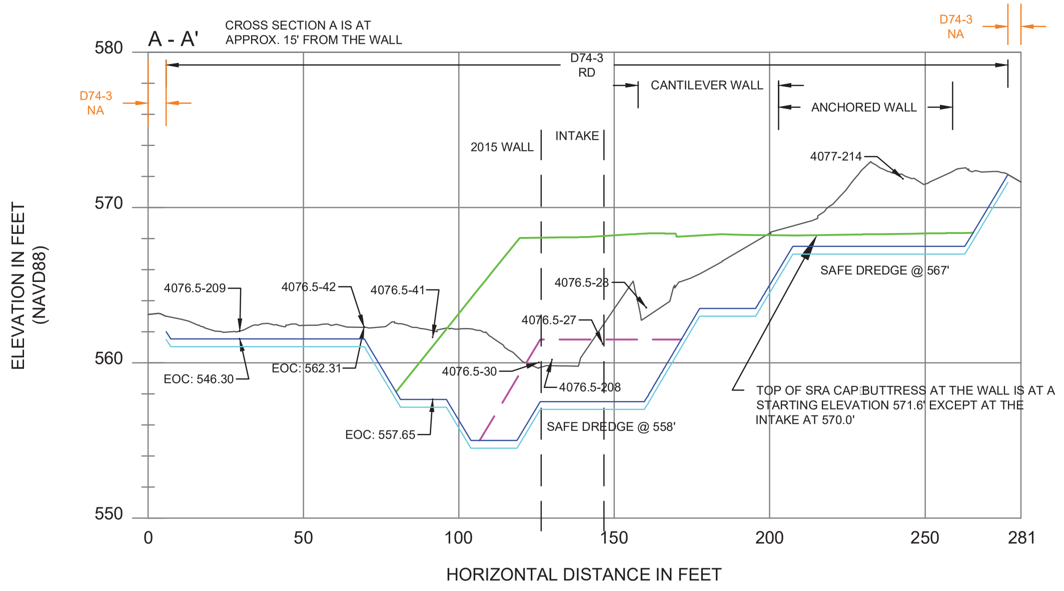
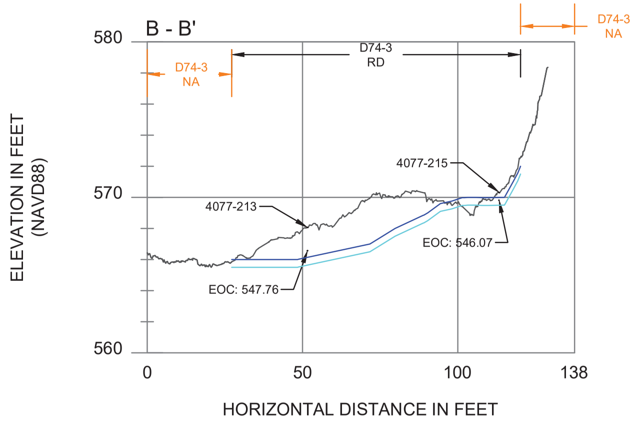
LOWER FOX RIVER REMEDIATION LLC

PROPOSED RESIDUAL MANAGEMENT PROFILES FOR D74-3





LEGEND

RD	RESIDUAL DREDGE
RM	RESIDUAL MANAGEMENT (NOT YET DETERMINED)
RSC	RESIDUAL SAND COVER
PD	PRIMARY DREDGE (NOT INCLUDED IN THIS DESIGN)
NA	NO ACTION

— DESIGN SURFACE
— DESIGN OD SURFACE
— EXISTING BATHYMETRY
— SRA CAP:BUTTRESS
— EXCAVATION SURFACE
— — PROPOSED CAP

OU# - D# - #
OPERABLE UNIT / DREDGE AREA / DREDGE MANAGEMENT UNIT
DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 40')

40 20 0 40 80

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
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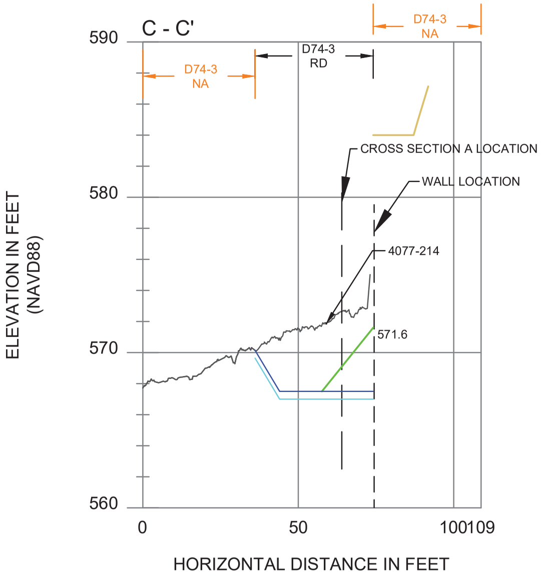
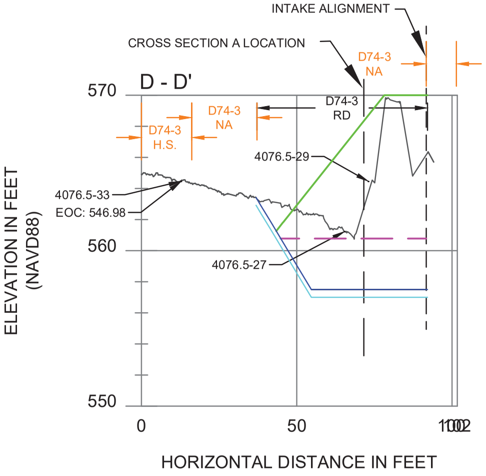
Fox River
LOWER FOX RIVER REMEDIATION LLC

P:\LLC\CAD\Field Engineering\Dredge Files\2018_2018 Resid...al Manage...en Plans\D74\DWG\OU4-D74-3 RDMU Plan.dwg

PROPOSED RESIDUAL MANAGEMENT PROFILES FOR D74-3





LEGEND

RD	RESIDUAL DREDGE
RM	RESIDUAL MANAGEMENT (NOT YET DETERMINED)
RSC	RESIDUAL SAND COVER
PD	PRIMARY DREDGE (NOT INCLUDED IN THIS DESIGN)
NA	NO ACTION
─	DESIGN SURFACE
─	DESIGN OD SURFACE
─	EXISTING BATHYMETRY
─	SRA CAP:BUTTRESS
─	EXCAVATION SURFACE
─ ─	PROPOSED CAP

OU# - D# - #

OPERABLE UNIT

DREDGE AREA

DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 40')

40 20 0 40 80

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Management Area	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3
Core ID	4076.5-209	4076.5-208	4076.5-207	4077-213	4076.5-210	4077-214	4077-215	4076.5-31	4076.5-28	4076.5-29	4076.5-27	4076.5-30
Post-Dredge Bathymetry	562.05	560.20	568.07	568.07	567.63	571.86	570.31	565.22	563.56	564.44	561.23	560.02
DOC	0.50	8.50	0.00	1.50	1.50	5.50	0.50	3.50	2.00	3.50	4.00	4.50
EOC	561.55	551.70	568.07	566.57	566.13	566.36	569.81	561.72	561.56	560.94	557.23	555.52
Residual Design	561.55	557.50	568.07	566.14	563.50	567.50	569.99	557.50	557.67	557.50	557.50	557.37
Residual Design OD	561.05	557.00	567.57	565.64	563.00	567.00	569.49	557.00	557.17	557.00	557.00	556.87
Post-Dredge Mudline	562.42	561.52	567.83	568.40	565.50	571.80	569.61	561.42	563.55	560.52	561.04	559.55
Depth Below Post Dredge Mudline	1.00	3.20	0.50	2.43	4.63	4.86	0.82	8.22	6.40	7.44	4.23	3.15
Discretes												
A	1.22	3.17	0.0251	1.6	3.3	22.5	2.23		2.7			
B	0.32	1.9		3.64	0.0359	18.1	0.0361		1.28			
C	0.337	1.86		4.34	1.28	5.05						
D	0.0257	2.66		0.169	0.0257	14.5						
E	0.0785	1.82		0.0262	0.027	18.9			0.926	8.09		
F		2.29						7.7	0.494	5.17	1.04	
G		1.71						3.96	0.708	10.5	1.14	0.863
H		0.99						0.491			1.01	0.66
J		1.39										1.29
K		0.725										
L		1.38										
Notes		Unkown DOC				Unkown DOC			Unkown DOC	Unkown DOC	Unkown DOC	Unkown DOC

Management Area	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	D74-3	
Core ID	4076.5-38	4076.5-39	4076.5-36	4076.5-33	4076.5-37	4076.5-34	4076.5-40	4077-35	4076.5-35	4076.5-32	4077-33	4077-36
Post-Dredge Bathymetry	562.48	561.89	561.90	564.45	565.95	567.42	568.87	570.03	567.77	568.23	569.37	572.34
DOC	1	4.5	0	0	0	0	1	0	0	0	0	0
EOC	561.48	557.39	561.90	564.45	565.95	567.42	567.87	570.03	567.77	568.23	569.37	572.34
Residual Design	560.1209	555	560.98	564.45	564.0069	567.42	566.5635	568.9706	567.77	568.23	569.37	570.8904
Residual Design OD	559.6209	554.5	560.48	563.95	563.5069	566.92	566.0635	568.4706	567.27	567.73	568.87	570.3904
Post-Dredge Mudline	562.57	562.68	561.78	564.21	565.67	567.15	569.02	570.52	568.15	568.11	569.61	#N/A
Depth Below Post Dredge Mudline	-560.1209	-555	-560.9816	-564.45	-564.0069	-567.42	-566.5635	-568.9706	-567.77	-568.23	-569.37	-570.8904
Discretes												
A	5.03	3.71	0.768	0.126	0.0588	0.0252	2.5	0.0842	0.0251	0.42	0.115	
B	1.78	2.07	0.0754	0.0449			3.75	0.0366		0.082	0.0253	
C	0.547	1.9	0.234	0.0343			0.313	0.0253		0.0251	0.0261	
D	0.377	3.36	0.14	0.124			0.0976	0.0252			0.0258	
E	0.308	2.76	0.126	0.0753			0.0287				0.0255	
F	0.114	1.65	0.0961	0.0251			0.043				0.0253	
G	0.152	1.04					0.047					
H	0.0255	2.33					0.0253					
J	0.0254	1.32					0.0253					
K												
L												
Notes		No DOC found...method refusal at 4.5'										No samples collected...refusal at surface due to rip rap

Prepared By: David Frisque
Reviewed By: Ricky E. Gifford
Last Modified: 8/7/2018

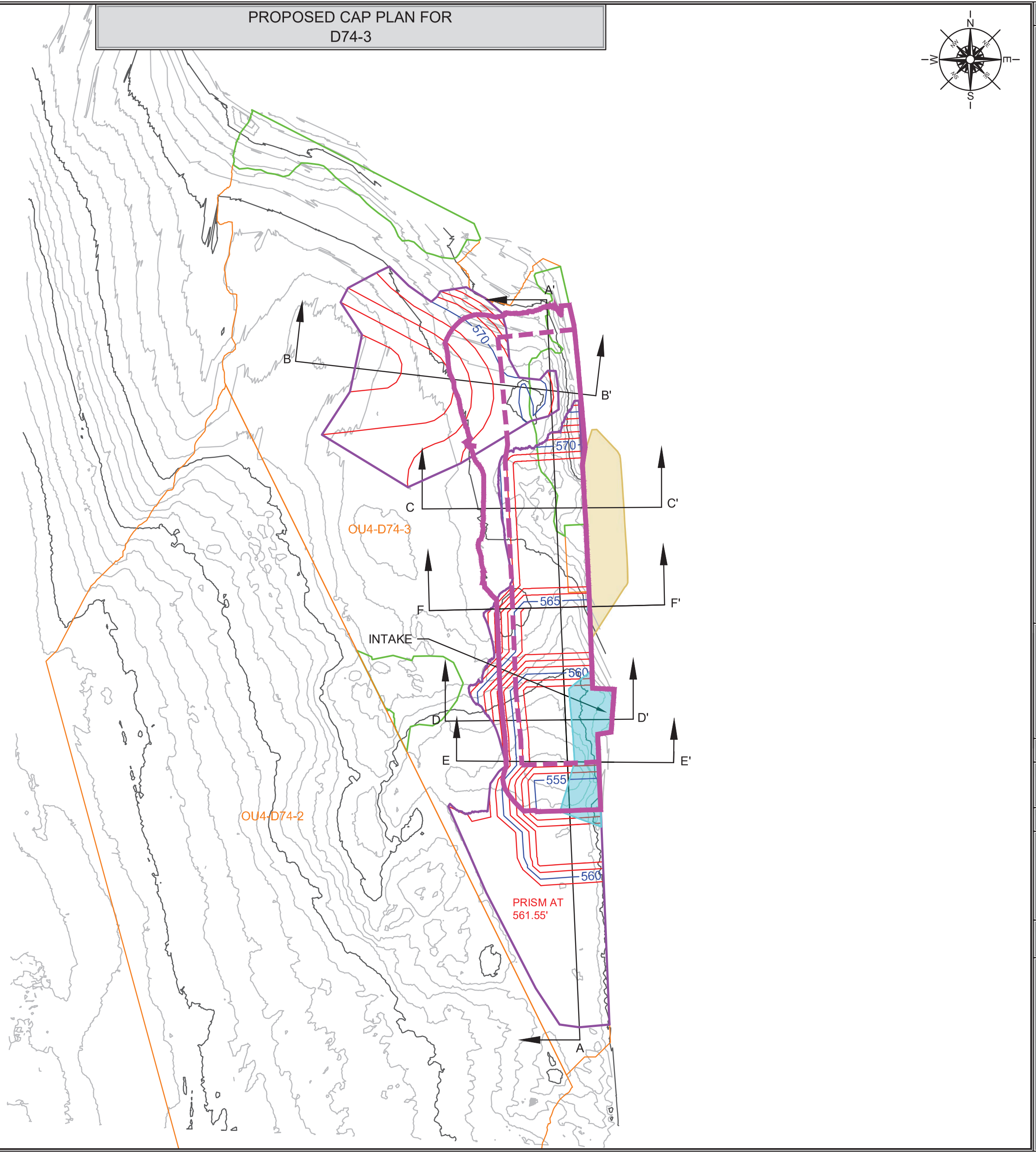
Management Area	D74-3	D74-3	D74-3
Core ID	4077-34	4076.5-41	4076.5-42
Post-Dredge Bathymetry	570.20	561.65	562.31
DOC	0.00	4.00	0.00
EOC	570.20	557.65	562.31
Residual Design	568.15	557.65	561.55
Residual Design OD	567.65	557.15	561.05
Post-Dredge Mudline	570.54	562.40	562.77
Depth Below Post Dredge Mudline	2.56	4.50	1.26
Discretes			
A	0.864	3	0.814
B	0.108	1.15	0.417
C	0.0255	2.12	0.162
D	0.0257	2.9	0.289
E	0.0254	3.51	0.112
F	0.0255	0.726	
G	0.0257	2.04	
H		1.11	
J		0.848	
K			
L			
Notes			

Management Area	
Core ID	
Post-Dredge Bathymetry	
DOC	
EOC	
Residual Design	
Residual Design OD	
Post-Dredge Mudline	
Depth Below Post Dredge Mudline	
Discretes	
A	
B	
C	
D	
E	
F	
G	
H	
J	
K	
L	
Notes	

Prepared By: David Frisque
Reviewed By: Ricky E. Gifford
Last Modified: 8/7/2018

ATTACHMENT 1A
DESIGN PLANS FOR D74-3
SRA CAP AND BUTTRESS

PROPOSED CAP PLAN FOR D74-3



LEGEND

— AUGUST 21, 2018 APPROVED DREDGE DESIGN MINOR CONTOURS
— AUGUST 21, 2018 APPROVED DREDGE DESIGN MAJOR CONTOURS
— PRE-SEASON MINOR CONTOURS
— PRE-SEASON MAJOR CONTOURS
— DMU BOUNDARIES
– – RDMU BOUNDARIES
— HIGH SUBGRADE LIMITS
▨ BUTTRESS LIMITS
▨ EXCAVATION LIMITS
– – SRA-04 CAP OUTLINE
— SRA-04 CAP TOE LIMITS

OU# - D# - #
OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT
DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 50')
50 25 0 50 100

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

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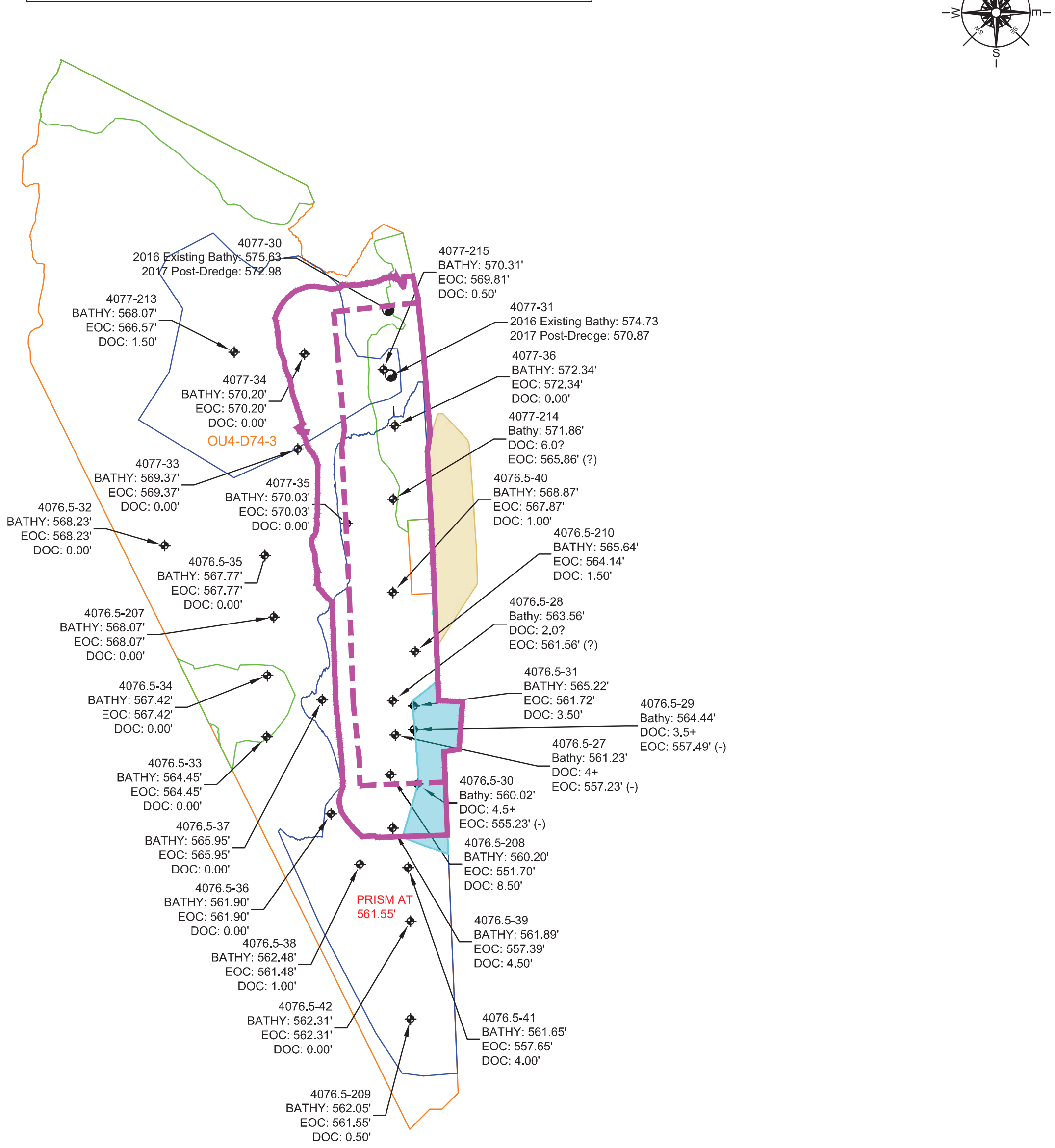
TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: OU4-D74-3 SRA-04.dwg
DRAWN BY: DOUG.FRISQUE
DATE: May 16, 2019
LAST REVISED: June 19, 2019
CHECKED BY: REG

Fox River
LOWER FOX RIVER REMEDIATION LLC

CAP MODEL CORES FOR D74-3



LEGEND

- HIGH SUBGRADE LIMITS
- 🟦 BUTTRESS LIMITS
- 🟨 EXCAVATION LIMITS
- DMU BOUNDARIES
- RDMU BOUNDARIES
- SRA-04 CAP OUTLINE
- SRA-04 CAP TOE LIMITS

SRA CAP	MIN	AVG.
SAND	6"	9"
1.5" ROCK	6"	9"
D50=13" RIP RAP	13"	39"

OU# - D# - #

OPERABLE UNIT

DREDGE AREA

DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 50')

50 25 0 50 100

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
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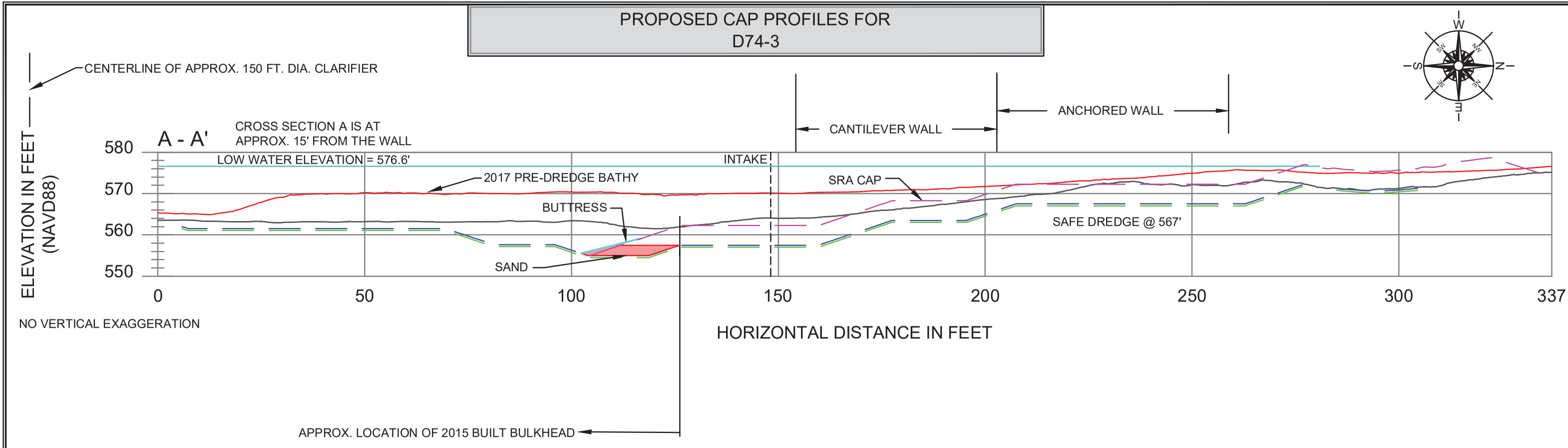
TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

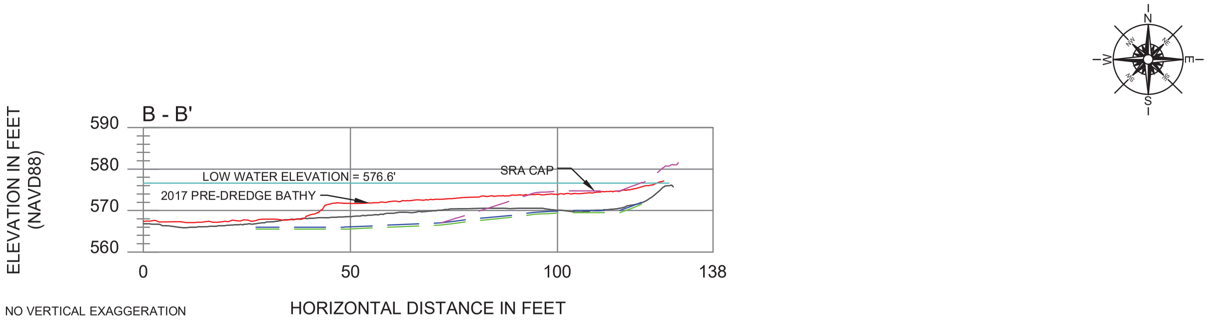
CAD FILE: OU4-D74-3 SRA-04-Cores Map.dwg
DRAWN BY: DOUG.FRISQUE
DATE: May 16, 2019
LAST REVISED: June 24, 2019
CHECKED BY: REG

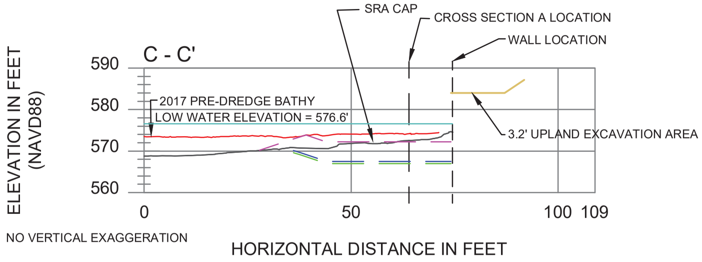
Fox River
LOWER FOX RIVER REMEDIATION LLC

\\tts276fs1\Projects\LLC\CAD\Field Engineering\Dredge Files\2019_2019 Misc\OU4-SRA-04\DWG\OU4-D74-3 SRA-04-Cores Map.dwg

PROPOSED CAP PROFILES FOR D74-3







LEGEND

- DREDGE DESIGN SURFACE
- DREDGE DESIGN OD SURFACE
- 2019 PRE-SEASON
- BUTTRESS
- 2017 PRE-DREDGE BATHYMETRY
- EXCAVATION SURFACE
- SRA CAP

OU# - D# - #

OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 30')

30 15 0 30 60

SITE NOTES

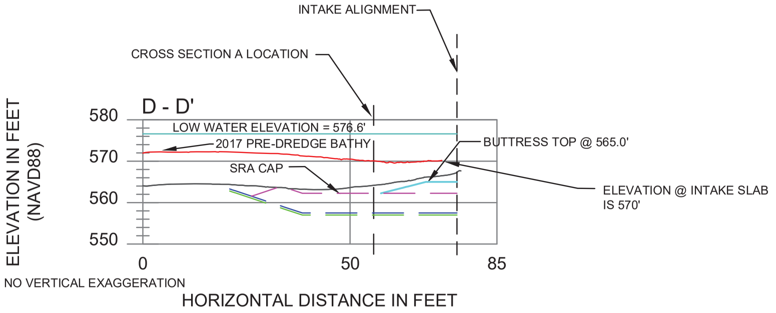
1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

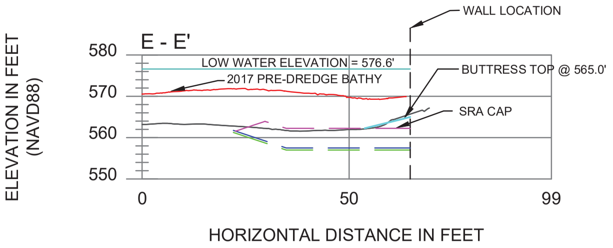
TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

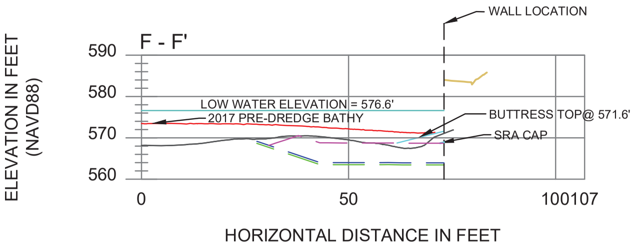
CAD FILE: OU4-D74-3 SRA-04.dwg
DRAWN BY: DOUG.FRISQUE
DATE: May 16, 2019
LAST REVISED: June 24, 2019
CHECKED BY: REG

Fox River
LOWER FOX RIVER REMEDIATION LLC

PROPOSED CAP PROFILES FOR D74-3







LEGEND

- — — DREDGE DESIGN SURFACE
- — — DREDGE DESIGN OD SURFACE
- —— 2019 PRE-SEASON
- —— BUTTRESS
- —— 2017 PRE-DREDGE BATHYMETRY
- —— EXCAVATION SURFACE
- — — SRA CAP

OU# - D# - #

OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 30')

30 15 0 30 60

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

TETRA TECH EC, INC.
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CAD FILE: OU4-D74-3 SRA-04.dwg
DRAWN BY: DOUG.FRISQUE
DATE: May 16, 2019
LAST REVISED: May 24, 2019
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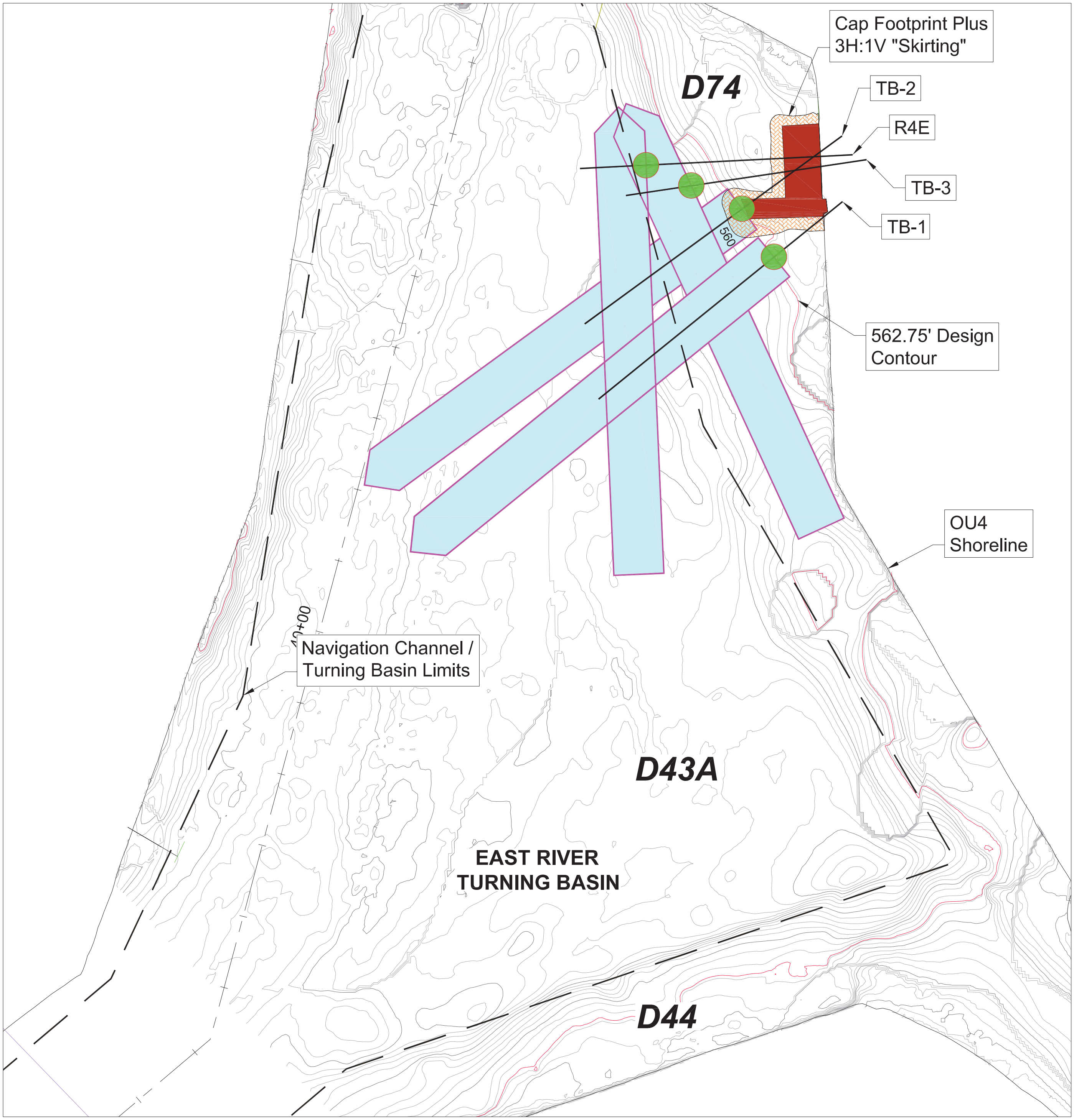
Fox River
LOWER FOX RIVER REMEDIATION LLC

P:\LLC\CAD\Field Engineering\Dredge Files\2019_2019 Misc\OU4-SRA-04\DWG\OU4-D74-3 SRA-04.dwg

ATTACHMENT 2

PROPWASH ANALYSES



A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2016\Design\D74 Cap\Fox-Day Street Cap Propwash-08252016.dwg Day St Cap

Sep 01, 2016 1:51pm dbinkney

HORIZONTAL DATUM: Wisconsin State Plane Central, NAD83, U.S. Feet.
VERTICAL DATUM: NAVD88, Feet.

LEGEND:

🟩 Propeller Position for Propeller Wash Evaluation

— Dredge Design Contours (1' & 5' Intervals)

0 200
Scale in Feet

Figure 1
OU4-D74 PROPOSED CAP AREA
PROPWASH EVALUATION
LOWER FOX RIVER REMEDIATION

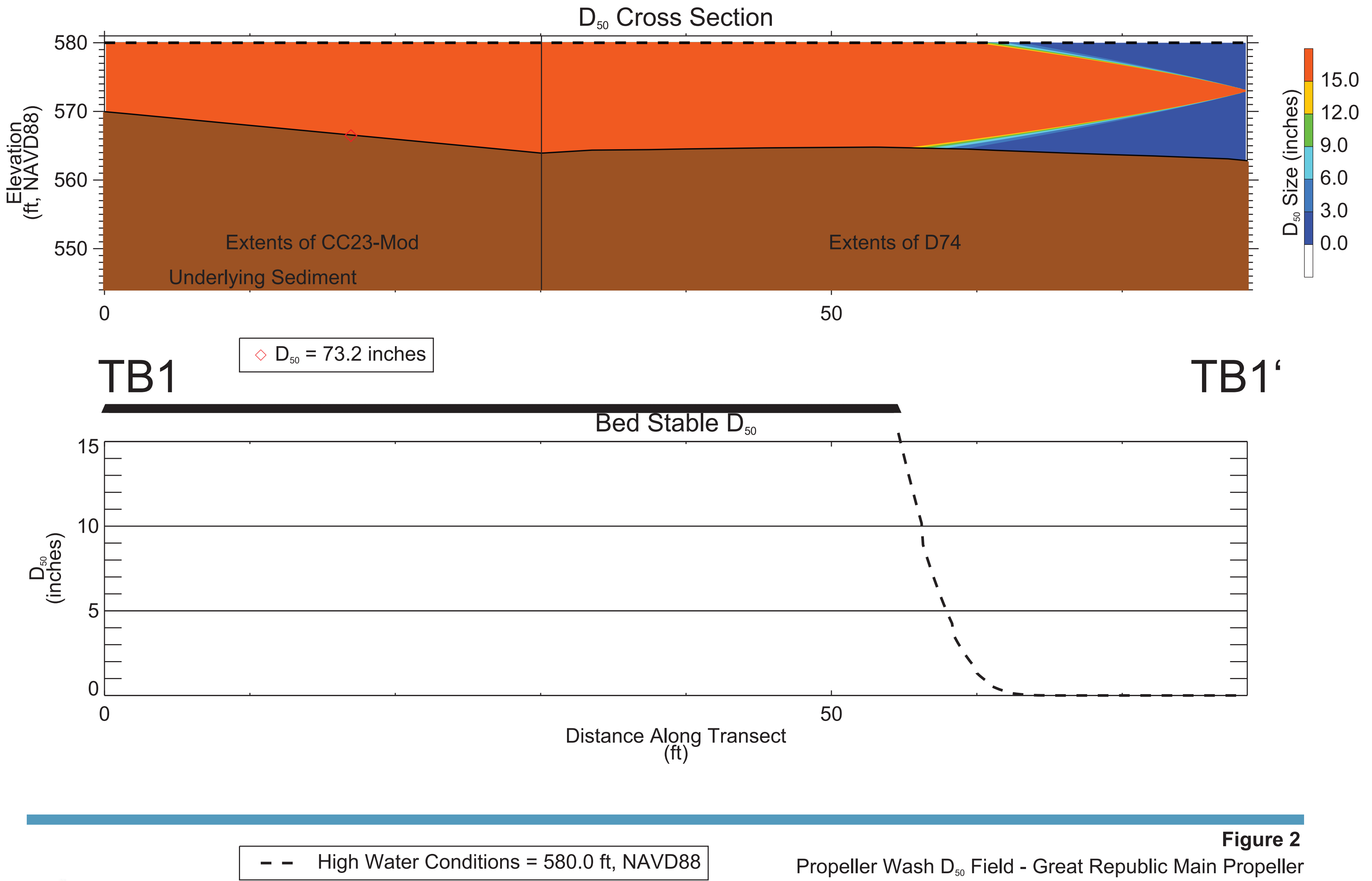


Figure 2

Propeller Wash D_{50} Field - Great Republic Main Propeller
Cap Armor Layer Propeller Wash Assessment
Lower Fox River Remediation

Notes: The applied horsepower is 100% at the location of where the bottom elevation is 562.75 feet NAVD88 with the keel of the vessel at elevation 562.75 feet NAVD88. Vessel propeller located 176 feet from navigation channel boundary. Sediment surface shown incorporates post-dredge and post-cap elevations where applicable.

BTR - \\amesbury1\greenleaf\Projects\Fox_River\Fox River\Capping\Propwash\blaaw_and_kaa_velocity_field_fox_river_3tide_150309.pro Tue Aug 30 15:07:58 2016

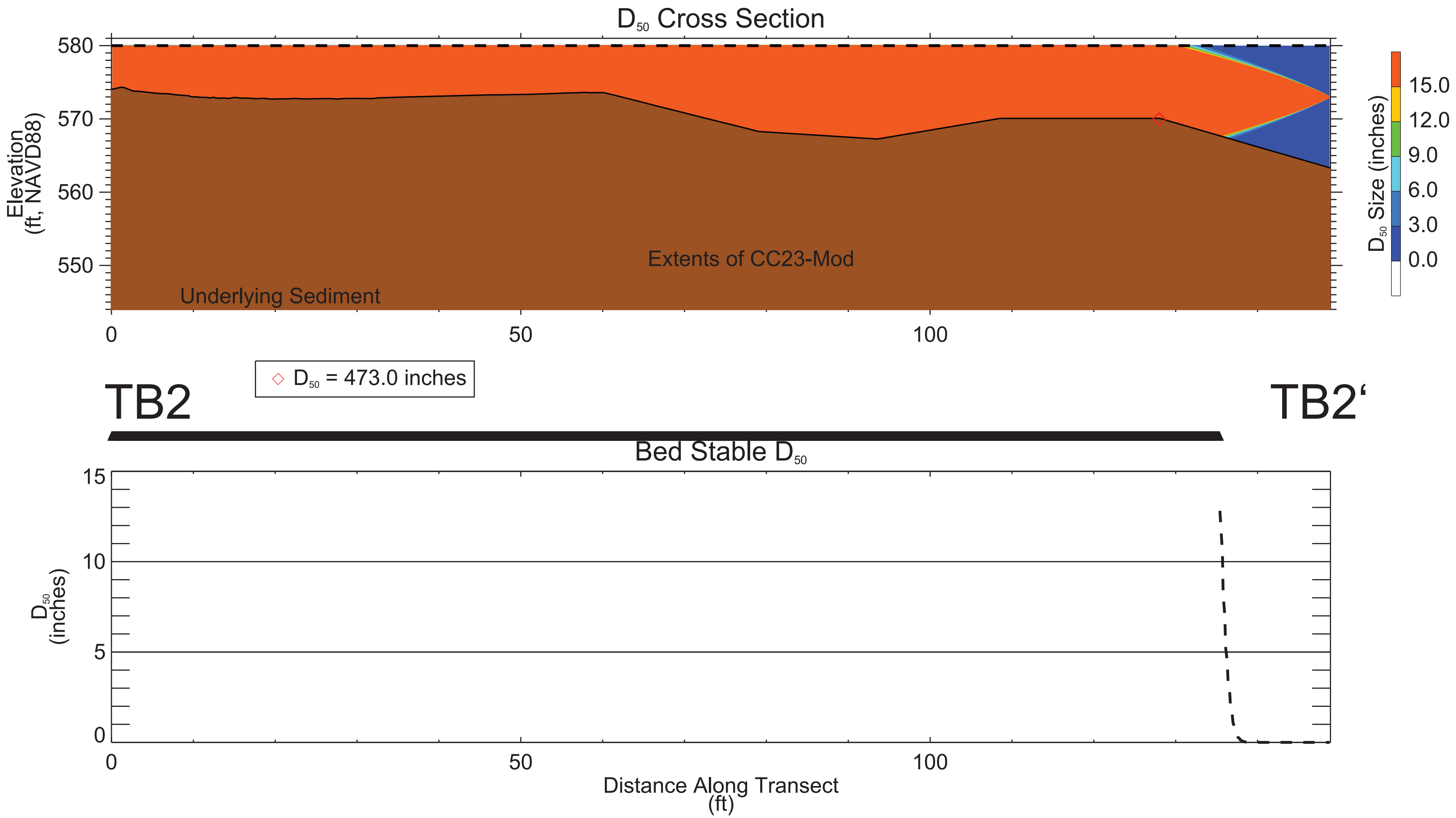
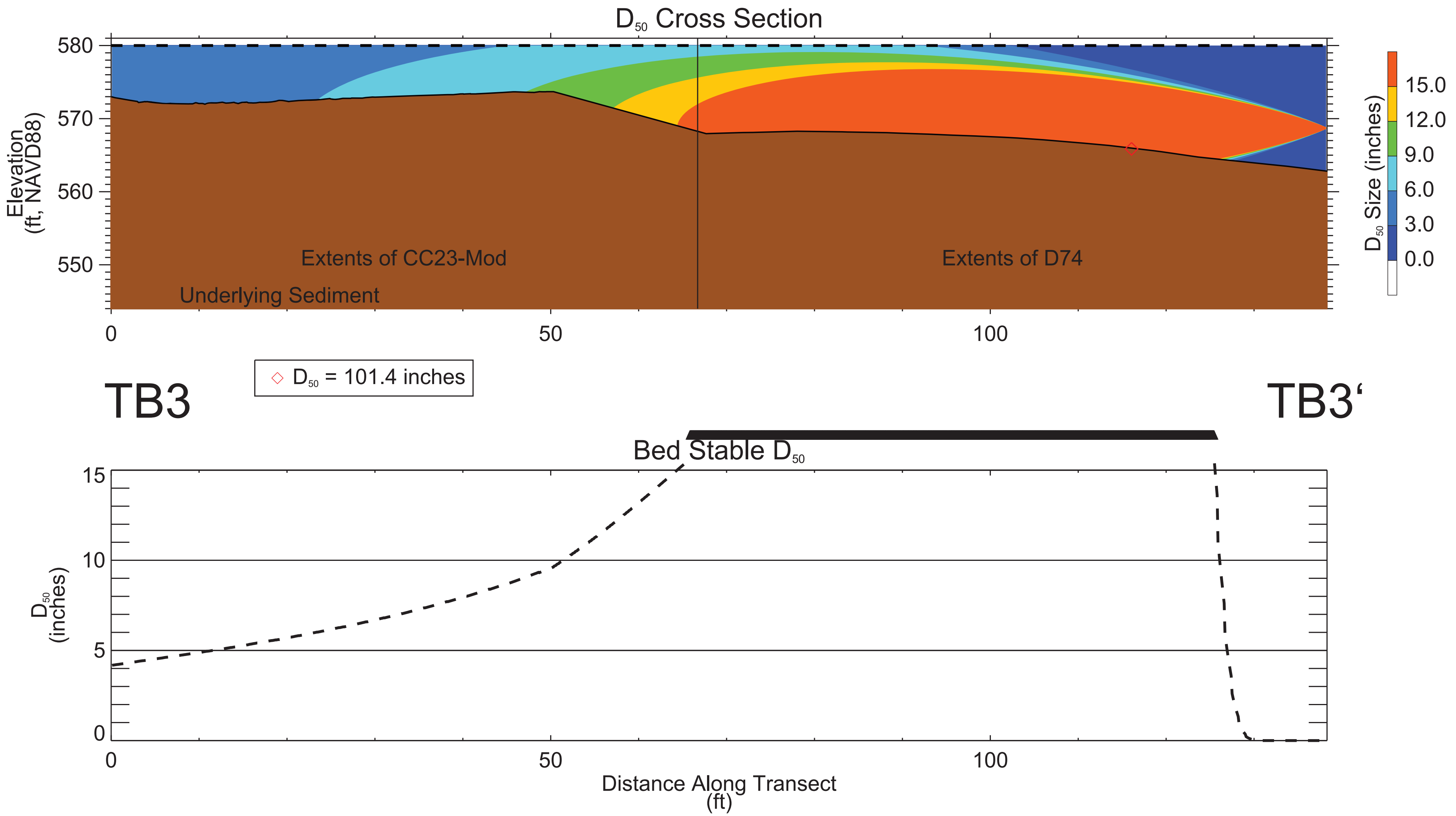


Figure 5

Propeller Wash D_{50} Field - Great Republic Main Propeller
Cap Armor Layer Propeller Wash Assessment
Lower Fox River Remediation

Notes: The applied horsepower is 100% at the location of where the bottom elevation is 562.75 feet NAVD88 with the keel of the vessel at elevation 562.75 feet NAVD88. Vessel propeller located 120 feet from navigation channel boundary. Sediment surface shown incorporates post-dredge and post-cap elevations where applicable.

BTR - \\amesbury1\greenleaf\Projects\Fox_River\Fox River\Capping\Propwash\blaaw_and_kaa_velocity_field_fox_river_3tide_150309.pro Tue Aug 30 15:03:00 2016



- - High Water Conditions = 580.0 ft, NAVD88

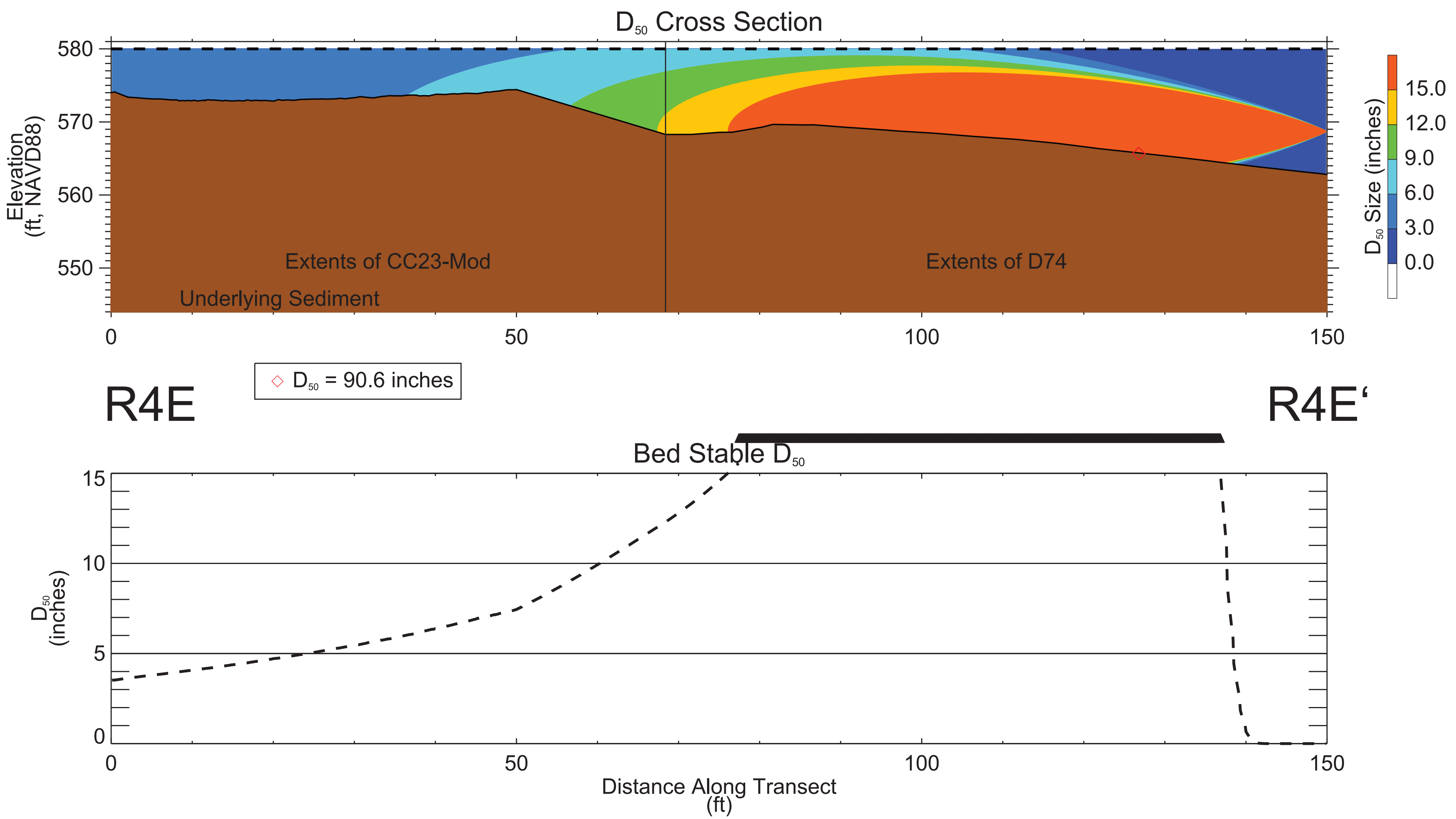
Figure 3

Propeller Wash D_{50} Field - Great Republic Bow Thruster
Cap Armor Layer Propeller Wash Assessment
Lower Fox River Remediation

ANCHOR QEA

Notes: The applied horsepower is 100% at the location of where the bottom elevation is 562.75 feet NAVD88 with the keel of the vessel at elevation 562.75 feet NAVD88. Vessel propeller located 109 feet from navigation channel boundary. Sediment surface shown incorporates post-dredge and post-cap elevations where applicable.

BTR - \\amesbury1\greenleaf\Projects\Fox_River\Fox River\Capping\Propwash\blaaw_and_kaa_velocity_field_fox_river_3tide_150309.pro Tue Aug 30 14:54:05 2016



- - High Water Conditions = 580.0 ft, NAVD88

Figure 4

Propeller Wash D_{50} Field - Great Republic Bow Thruster
Cap Armor Layer Propeller Wash Assessment
Lower Fox River Remediation

Notes: The applied horsepower is 100% at the location of where the bottom elevation is 562.75 feet NAVD88 with the keel of the vessel at elevation 562.75 feet NAVD88. Vessel propeller located 106 feet from navigation channel boundary. Sediment surface shown incorporates post-dredge and post-cap elevations where applicable.

BTR - \\amesbury1\greenleaf\Projects\Fox_River\Fox River\Capping\Propwash\blaaw_and_kaa_velocity_field_fox_river_3tide_150309.pro Tue Aug 30 15:11:17 2016

ATTACHMENT 3

RIPARIAN PROPERTY OWNER ACCEPTANCE

Spillers, Paul

From:	Kaminski, Roger (GBY) <ROGER.KAMINSKI@GAPAC.com>
Sent:	Monday, June 3, 2019 9:29 AM
To:	Spillers, Paul; Montney, Paul A.; Davis, Michael (GP Law); Kincaid, Gary; George.Berken@boldt.com; Ellsworth, Tim; Casper, Matthew (GBY); Czaja, William (GBD)
Cc:	Jeffrey Lawson; Heath, Bryan; Susan O'Connell (SOConnell@project-control.com); Gawronski, Troy A; Database User; Coleman, Bill; Lysne, Bjorn; Boreen, Lee; Tabatabai, Morey; Blackmar, Terri; ECI.LFRR Project Correspondence
Subject:	RE: LFRR-19-0108 Changes to Day Street Mill North Intake cap-UPDATE
Attachments:	Att 1-1 Revised Cap and buttress drawings.pdf; LFRR-19-0108 Changes to Day Street Mill North Intake cap

⚠ **CAUTION:** This email originated from an external sender. Verify the source before opening links or attachments. ⚠

Paul,

Georgia Pacific approves of the larger footprint of the D74-3 Cap, and the larger stone being used for the D74-3 Cap, North of the Day Street Mill's Intake.

Please feel free to contact me with any other questions?

Roger F. Kaminski
Senior Project Engineer Environmental
Georgia-Pacific
1919 South Broadway (54304)
P.O. Box 19130
Green Bay, WI 54307-9130
(920) 438-2198 Office
(920) 676-1770

From: Spillers, Paul <Paul.Spillers@tetratech.com>
Sent: Friday, May 31, 2019 8:21 AM
To: Kaminski, Roger (GBY) <ROGER.KAMINSKI@GAPAC.com>; Montney, Paul A. <PAMONTNE@GAPAC.com>; Davis, Michael (GP Law) <JMDAVIS@GAPAC.com>
Cc: Jeffrey Lawson <jlawson@project-control.com>; Heath, Bryan <bryan.heath@ncr.com>; Susan O'Connell (SOConnell@project-control.com) <SOConnell@project-control.com>; Gawronski, Troy A <Troy.Gawronski@foth.com>; Database User <database@project-control.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>
Subject: LFRR-19-0108 Changes to Day Street Mill North Intake cap-UPDATE

Sent by an external sender

Hello Roger,

This is a follow up to the telephone call you had with Bjorn Lysne and me on May 3, 2019 and the email Tetra Tech sent on May 3 stating the A/OT has directed the LLC to revise and extend the Day Street Mill North Intake cap further to the north and install D_{50} = 13-inch rip rap. The attached pdf file contains the revised drawings for the revised larger cap. The A/OT requires Georgia-Pacific's (GP's) approval before the remedial action is approved. As the riparian property owner, can GP provide a document stating it's approval of the revised cap? Please let us know if you have questions or comments.

Thank you, Paul

Paul Spillers, P.G. | **Special Projects Coordinator**
Fox River Project
Cell 208.871.2191, Phone 920.445.0709
paul.spillers@tetratech.com

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Green Bay, Wisconsin | www.tetratech.com

George Berken

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Thursday, March 7, 2019 4:54 PM
To: George Berken; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law); pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee; Vandenberg, Luke; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: RE: 765. 87500 OU2-5 - FW: LFRR-18-0218A SRA-07 &-05 Tech Memo for Utility Corridor 029 & 30/SRA-07 and LFRR-18-0219A Tech Memo for Utility Corridor 029 & 30/SRA-05
Attachments: LFRR-18-0219A_Final Tech Memo_DUTIL-030_SRA-05_AOT_030719.pdf

Thanks, George. The final tech memo for SRA-05 is attached. Due to file size, I will send the tech memo for SRA-07 separately.

Terri

Terri Blackmar, PE | Vice President, Great Lakes Operations
Direct: 630.470.4217 / Home Office: 630-922-8772
Terri.Blackmar@tetratech.com

Tetra Tech | Fox River Site
1611 State Street | Green Bay, WI 54304 | www.tetratech.com

From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, March 6, 2019 2:31 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri

<Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 765. 87500 OU2-5 - FW: LFRR-18-0218A SRA-07 &-05 Tech Memo for Utility Corridor 029 & 30/SRA-07 and LFRR-18-0219A Tech Memo for Utility Corridor 029 & 30/SRA-05

Terri, on behalf of the Agencies, the Technical Memorandums and Appendix 'C', submitted in your email below for SRA-05 and SRA-07, are acceptable. Please distribute these TMs in final form.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Wednesday, March 6, 2019 8:14 AM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 765. 87500 OU2-5 - FW: LFRR-18-0218A SRA-07 &-05 Tech Memo for Utility Corridor 029 & 30/SRA-07 and LFRR-18-0219A Tech Memo for Utility Corridor 029 & 30/SRA-05

George,

Attached are the Tech Memos and revised drawings for SRA-05 and SRA-07. The memos have not been revised since they were previously accepted, except to accept previous revisions and acknowledge the new revisions from the A/OT in a comment response. The drawings have been revised per the latest comments sent to Morey.

Please revise the revisions to the drawings and let me know if these memos can be distributed as final.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
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From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, February 27, 2019 2:30 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
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Subject: 765. 87500 OU2-5 - FW: LFRR-18-0218 SRA-07 &-05 Tech Memo in Utility Corridor 029 & 30

Morey, on behalf of the Agencies, address the attached comments and resubmit.

Thanks,
George…

BOLDT.

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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
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Subject: FW: LFRR-18-0218 SRA-07 &-05 Tech Memo in Utility Corridor 029 & 30

George,
This is in response to the A/OT comment number 116 dated 2019-2-07 on the RAWP and the follow up meetings.

Attached is the revised design review document for the SRA-05 (GB water line) and -07 (AT&T Fiber optic line) areas (attachment C to the Technical Memorandums SRA5 and SRA7 submitted on Jan 16). The revisions include extension of the cap over areas that cannot be residually dredged due to utilities, and expanded notes where caps cannot be placed.

Respectfully

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TETRA TECH EC, INC

TECHNICAL MEMORANDUM

To: Gary Kincaid, George Berken, Jay Grosskopf and Larry DeBruin (A/OT)

From: Terri Blackmar, Morey Tabatabai, Ricky Gifford, and Ben Hendron (Tetra Tech), Paul LaRosa (Anchor QEA)

CC: Jeff Lawson and Sue O'Connell (PCC, for the LLC), Bryan Heath (LLC), Troy Gawronski (Foth), Paul Montney and Roger Kaminski (GP), Bill Hartman (P.H. Glatfelter), Bill Coleman, George Willant, and Richard Feeney (Tetra Tech), Dustin Bauman (JF Brennan), Dan Binkney (Anchor QEA)

Date: March 6, 2019

Re: Remedy Design for Special Remediation Area (SRA)-05 in Utility 030 Corridor

Document Control Number: LFRR-18-0219A

This technical memorandum (tech memo) provides the basis for the proposed remedial design in utility area number 30 (utility 030), which is referred to on the *Draft 2019 Update to the Phase 2B Remedial Action Work Plan* (2019 RAWP) drawings as dredge areas DUTIL-026-030. Utility 030 is an active 16-inch diameter cast iron water line. This tech memo was previously submitted to the Agencies on August 4, 2017, and comments were received from the Agencies on October 18, 2017. The memo was resubmitted on September 27, 2018 but has been revised to include additional information discussed in meetings since that time.

This utility is owned by the City of Green Bay through the Green Bay Water Utility (GBWU). Based on GBWU information, the utility is believed to have been installed in 1906 using an open trench and placement method. Due to the date of installation, the trench area likely includes contaminated sediment, even if this has not been observed in cores nearby. Very few cores were installed within the narrow width of the trench, estimated to be approximately 12 feet, because of the desire to avoid damage to the pipeline.

As explained below, it was not feasible to consider installation of a standard engineered cap as a remedy where utility 030 crosses the navigation channel because of potential prop wash impacts and likely noncompliance with the post-cap water depth requirement. A utility buffer zone was established 25 feet upstream and downstream of the water line, which was established for dredging with hydraulic dredges. Within this zone, dredging can only be performed with a specialized utility dredge, and only to the maximum depth of 30 feet. Assuming the river water surface is at elevation 580 feet North American Vertical Datum of 1988 (NAVD88), the dredge elevation corresponding to this depth is approximately 550 feet NAVD88. This allows dredging in closer proximity to the utility but will still leave some sediment exceeding the 1 part per million (ppm) polychlorinated biphenyl (PCB) remedial action level (RAL) un-dredged near the utility. In this area, the dredge design is based on a secondary horizontal buffer that equals 5 feet plus a horizontal distance related to utility location uncertainty as determined by the utility locate subcontractor, plus the radius of the pipeline. The horizontal offset for Utility 030 is 7 feet on either side of the utility. This horizontal buffer is shown on the project drawings where applicable on the north and south sides of the utility alignment. A five-foot vertical buffer is also shown above the pipeline to minimize the potential for damaging the water line during dredging. The remedial design for this utility corridor area is therefore dredging up to the limits defined by the buffer zones. In any areas extending beyond the larger 25-foot buffer zones, sediment that exceeds the 1 ppm PCB RAL will be dredged to the neat line. Where sediment that exceeds the 1 ppm PCB RAL remains in the utility corridor following dredging, the area is identified as "special remediation area-5" (SRA-05) and the area will be capped using caps designed specifically for this area. This SRA extends over most of the utility corridor alignment and may extend up to 40 feet upstream and downstream from the utility, before sloping at a 5:1 slope to the final dredge elevation just outside the area. This utility corridor will be remediated on an exception basis, subject to approval by the Agencies/Oversight Team (A/OT). The remedy for an SRA is not defined in the 2003 Record of Decision (ROD) or in the 2007 ROD Amendment, but these RODs do allow for "exceptional areas" such as this to be treated as a special case. Where the pipeline trench is far enough from the navigation channel to allow a standard cap, with utility owner acceptance, a standard cap will be designed.

Background

During the 60 Percent Design phase for the OUs 2-5 project, no-action setbacks were established around utilities to avoid risk of damage and/or safety concerns during remediation in these areas. Concerns were based on potential risks associated with the dredge cutterhead or marine equipment spuds impacting the utilities, as well as potential injury to personnel. At that time, the utility locations were approximate based on desk-top searches for as-built drawings and had not been field located. Specific ground rules for design were established during the 60 Percent Design with placeholder offsets ranging from 25 to 50 feet based on the accuracy of the utility location information and the risk posed by the sediment contamination.

Following additional sampling that provided information regarding PCB concentrations in sediment near many of the utility crossings, the A/OT requested that utility locations be determined with greater confidence so that remediation could be performed as close to the utility as possible. Tetra Tech had many meetings with utility owners and requested as-built drawings from these owners as the initial step in this process.

In 2012, and again in early 2015, Tetra Tech retained the Marine Engineering Systems Company (MESCO) to field locate several of the utilities. Following that effort, later in 2015, Tetra Tech retained Depth of Cover (DoC) Mapping to locate more accurately most of the utilities as part of further planning for remedial action in these areas. In 2017, J. F. Brennan (Brennan) elected to perform yet additional field location efforts involving the use of its divers. Because of these additional location efforts, the utility locations in OU4 have been located with greater confidence, including the location of utility 030. A 50-foot buffer zone remained in place following this mapping, although the Agencies required remediation within this zone that could be performed safely to the extent practicable. Brennan subsequently determined that dredging could be performed to the previously-described horizontal and vertical offsets from the utility, using the special equipment described below.

On February 28, 2018, a work group meeting was held with representatives of the U.S. Army Corps of Engineers (USACE), Mr. John Imbrunone, and GBWU, Mr. Brian Powell. The primary focus of the meeting was to discuss dredging and capping in utility 020, a GBWU water line. However, the meeting attendees recognized that decisions on dredging depths, dredging setbacks from utilities, and cap construction would likely be applicable to other SRA caps including utility 030, another GBWU water line. During this meeting, Mr. Imbrunone was asked to provide information regarding the USACE's preferences for the following: 1) the buffer zone depth to be added below the authorized navigation channel depth, to the top of the cap surface; and 2) the stone size to be used for cap armoring. On March 14, 2018, Mr. Imbrunone emailed the requested information to Mr. Paul Spillers (Tetra Tech). According to Mr. Imbrunone, the USACE's preferences are for a minimum 2-foot buffer below the authorized navigation channel depth, and for a smaller stone size.

As a follow-up to the February 28th meeting, an over-the-shoulder meeting was held with the A/OT on March 15, 2018 to discuss the information provided by Mr. Imbrunone. During that meeting, the A/OT stated that the use of small stone, with a D_{50} of 1.5 to 3 inches, would be acceptable for the SRA caps, and the top of cap should be designed to be no higher than elevation 551.6 NAVD88, to incorporate the USACE's request for a 2-foot buffer below the authorized navigation channel depth. In addition, the A/OT requested the following information to be provided regarding the proposed SRA caps:

- Additional information from Brennan, in writing, describing the efforts taken to dredge the 25-foot buffer zone located south and north of the utility, and the rationale for the inability to dredge below elevation 550.0 feet NAVD88 in this zone.
- The estimated volume of sediment remaining below elevation 550 feet NAVD88 in the navigation channel, that would be capped with the SRA cap, and is outside the assumed pipe trench area.

This information is provided below.

Equipment Capabilities and Risk Factors Assumed by Brennan for Dredging

Brennan initially began dredging close to utility 030 using diver-assisted dredging, with a shroud connected to a dredge via hydraulic suction hose. This arrangement proved to be less efficient than anticipated, so in 2017 Brennan elected to use divers to perform the field work mentioned above. This was followed by dredging with the Vic Vac and an excavator mounted dredge, the *Midland*, located on a barge, to remove sediment exceeding the RAL to within approximately five feet of the location of a utility. Brennan determined this to be the closest distance that could be dredged safely, to which the A/OT concurred. However, this dredge can only reach as low as approximately elevation 550 feet

NAVD88, so where sediment exceeding the RAL extends below this elevation outside of the 5-foot buffer zone, the SRA cap will be extended to cover this sediment, as shown on the design.

During the 2017 season, while utilizing the *Midland,* Brennan attempted to modify the dredge apparatus to reach below elevation 550 feet NAVD88. This attempt was unsuccessful and led to damaging the equipment. Brennan then investigated two reasonable options that could have allowed safe dredging below elevation 550 feet NAVD88, as described below.

- Option 1 included adding the Vic Vac attachment onto a standard swinging ladder dredge attached to the guide barge. These dredges have a dredging depth of approximately 35 feet in the standard cutterhead configuration (dredge elevation 545 feet NAVD88 with water elevation of 580 feet NAVD88), but can only reach just under 28 feet (dredge elevation 552 feet NAVD88 with river water elevation of 580 feet NAVD88) using the Vic Vac. The loss in dredging depth is due to the need for the dredge ladder to be articulated to operate the Vic Vac.
- Option 2 included using an excavator with longer reach capabilities. There are several issues associated with this option. First, the *Midland* excavator is a company-owned machine that has several post-market additions to enhance its ability to work in this capacity. Brennan modified the counterweight to allow the hydraulic power pack to be attached to the back of the dredge. In addition, the power pack is currently manufactured to attach to that specific piece. These modifications cannot be made to rental equipment because doing so would void the warranty of the machine. Another problem is that the attachment's weight would still limit the reach of a standard class machine, and it still would not be able to reach the depths achievable by the Midland's excavator.

In addition to this information, on March 27, 2018, a letter was provided by J.F. Brennan and submitted to the Agencies that provided additional explanation related to the risks involved in dredging near utilities. On March 28, 2018, the LLC received comments from the Agencies on this letter, which included a request for more detailed information documenting the need for a 25-foot setback for dredging. On May 1, 2018, the LLC forwarded two letters from J.F Brennan containing the requested information. On May 2, 2018, the Agencies acknowledged receipt of the letters. The letters provided by J.F. Brennan and the Agencies' comments on the initial letter are presented in Attachment A.

In conclusion, Brennan has determined the maximum dredging depth of 30 feet (i.e., an elevation of 550 feet NAVD88 when the water level is at 580 feet NAVD88) to be the maximum reasonable depth based on available equipment and industry standards.

Existing Conditions in the Utility 030 Corridor

A plan and profile drawing of the GBWU-owned water line located in the utility 030 corridor is presented in Attachment B. The figure shows the approximate plan and profile for the utility and the location of cores obtained in the area used to define the depth of contamination (DOC). The DOC is the depth to which sediment exceeding the 1 ppm PCB RAL must be remediated, to the extent practicable given safety and other concerns such as damage to property. Areas defined for additional dredging are outlined in red on the plan view map (top panel of the drawing) and labeled as dredge areas DUTIL-030 and DCA44 within the utility corridor. The cross-section profile (bottom panel on the drawing) shows the 2015 pre-season bathymetry and the geostatistically modeled dredging design surface, which is based on a 0.5 level of significance (LOS). The sediment between these surfaces will be dredged, including sediment within the SRA-05 area that is five feet or more above the pipeline. Sediment that exceeds the 1 ppm PCB RAL will remain in the area believed to be the pipeline trench, and in adjacent areas that are within a 25-foot buffer zone and below elevation 550 feet NAVD88, which will require capping, as described herein. As is evident from the profile, some sediment below this elevation was removed, either through dredging with the shroud attachment, through scour, or both. The SRA-05 cap limits are shown on Figure 1 in Attachment C.

The remedy for SRA-05 and other cap areas must consider the PCB concentrations likely to remain in the sediment after dredging. A core summary table (CST) is presented in Attachment D, which includes cores obtained upstream, downstream, and within the 100-foot utility 030 corridor. As is evident from the core summary table D-1 in Attachment D, cores in this area contain sediment with PCB concentrations ranging from PCB less than 1 ppm to 41.9 ppm. An assessment of these cores follows:

- Cores 4065-15, 4065-211, and 4065-212 contain sediment with maximum PCB concentration of 41.9 ppm, 1.35 ppm, and 3.17 ppm, respectively. These intervals will not be dredged because the elevation of the maximum concentration is below 550 feet NAVD88 in core 4065-15, and the maximum PCB concentration is below the planned dredging depth in cores 4065-211 and 4065-211. These core locations are not further considered here because they are located adjacent to utility 029 and discussed in the utility 029 Tech Memo.
- Cores 4065.5-03, 4065.5-05, and 4065.5-06 are just north of, and outside of the footprint of the cap. Sediment within these cores contained maximum PCB concentrations ranging from <1 ppm to 9.34 ppm. PCB sediment containing greater than 1 ppm PCB will be dredged at these core locations, leaving sediment that will contain < 1ppm PCB.
- Cores 4065.5-17 and 4065.5-18 are located near the utility, and beneath the cap at elevations below 550.5 feet NAVD88. Therefore, PCB in sediment from these core locations will not be dredged. Sediment exposed at the depth of dredging of 550 feet NAVD88 ranges from 3.76 ppm in core 4065.5-17 to 20 ppm in core 4065.5-18.

The thickness of RAL sediment remaining around utility 030 is the SRA-05 cap area is expected to range from 0 to 3 feet after dredging, with PCB concentrations that are likely less than 20 ppm. The estimated volume of RAL sediment remaining in the navigation channel, below elevation 550.0 feet NAVD88 and outside the assumed 12-foot wide pipe trench area is 600 cubic yards.

Propeller Wash Zones

Propwash zones were determined assuming 100 percent bow thruster power level from a large straying vessel traveling in the navigation channel. Maps showing these propwash zones are presented in Attachment E. The zones show the correlation between propwash impact and the stone size needed to resist this impact. Where these zones indicate that a standard A or B cap could be installed, or where the propwash zones indicate that armor stone with a D_{50} of 6 inches or more would be required, the cap will be designed as an SRA cap as described below.

In the areas that a standard cap is identified by the propwash analysis, because of wave action requirements, lack of post-cap water depth, and possibility of contamination remaining with the pipeline trench, these caps were converted to SRA caps. There are two cap types proposed, as described in the Proposed Remedy section below. Armor stone for both cap types will have a D_{50} of ¾ inch.

Proposed Remedy for SRA-05 in the Utility 030 Corridor

Cap SRA-05 in utility 030 will not have a standard cap for the following reasons:

- The cap would be designed to withstand propeller wash from large vessels, which would require placement of very large stone or a concrete mat over the utility. This would result in a large hump that would not meet the 26-foot water depth required over the width of the navigation channel.
- If a concrete mat was used for the cap, the hump would be smaller, but it would make the water line very difficult to access if a repair was needed. The riparian owner, GBWU, requested that a concrete mat not be used and that stone no larger than gravel be used for any part of the cap.
- The overburden pressure of a cap was not originally factored into the design of the utility, so this added pressure could create settlement or other problems with the pipeline, if installed.

Sand mixing calculations were performed for a range of initial PCB concentrations (up to 50 ppm PCB) and sand thicknesses of 6 inches, 9 inches and 12 inches. These calculations assume full mixing of the first 3 to 6 inches of sand with underlying undisturbed residual or generated residuals produced by the dredging process. The results for these calculations are presented graphically in Attachment F and indicate that a 12-inch thick sand cover mixing with the upper 6 inches of sediment containing PCB concentrations of 20 ppm or less would result in PCB concentrations at the surface of approximately 0.40 to 0.59 ppm. However, to maintain a minimum 25-foot water depth in the navigation channel, some portions of SRA-05 cap would receive less than 12 inches of sand cover.

Sand/GAC Ratio

A work group meeting was held on August 21, 2018. It was agreed to increase the top of cap elevation from the USACE preferred elevation of 551.6 feet NAVD88 to 552.6 feet NAVD88 to provide one foot of cap clearance below the navigation channel authorized depth. Another work group meeting was held on August 30, 2018 to further discuss cap designs with minimal thickness due to navigation channel constraints. Based on the meeting discussion, it was determined that at least six inches of sand would be placed, with an amendment of granulated activated carbon (GAC) containing up to approximately 5% GAC by dry weight of aggregate. Although mixing of sand with underlying sediment has been rarely observed, and when it has been observed it is confined to the lower 3 inches of sand, this SRA cap design conservatively assumes that significant mixing would occur and that the PCB concentration at the surface may be greater than 1 ppm PCB after mixing with sand alone. In addition, there is a need to maintain 25-foot water depth in the navigation channel. Therefore, the SRA-07 cap will receive a 6-inch thickness of sand mixed with GAC. A minimum thickness of 3 inches of stone with D_{50} of ¾ inch will overlie the amended sand. The stone thickness interval will increase to achieve top of cap elevation of 552.6 feet NAVD88 where feasible.

Following the August 21, 2018 work group meeting, the modeling approach was developed by the Design Team and presented to the A/OT on November 6, 2018. The Agencies approved the proposed approach on December 5, 2018, with the contingency that a factor of safety be applied to the results. The approach included evaluating the sand/GAC ratio using Dr. Danny Reible's (Texas Tech University) latest cap model. The model would be run iteratively using site-specific parameters and PCB concentration remaining below the cap, until the results showed the project remedial action level of 1 ppm PCB would be met in pore water at the cap's surface for at least a 100-year period.

The modeling approach and results for SRA-03, SRA-05, and SRA-07 are presented in a memo in Attachment F. Because of the limited number of samples collected in each SRA and as indicated in the memo, a conservative approach was used that includes modeling with the maximum concentration that will remain under the planned SRA caps. This maximum concentration was observed in sediment remaining below cap SRA-07 (i.e., 41.9 ppm PCB). This concentration was converted to an equivalent range of porewater concentration in the sand for a range of the sand's total organic content of 0.10% to 0.67%. The modeled resulting GAC amendment needed to maintain a concentration of 1.0 ppm PCB for 100 years ranged from 0.0% to 1.4%. To be conservative, 1.4% GAC was selected from this model range which is multiplied by a required factor of safety of 3. This results in the GAC added to the sand of 4.2% by dry weight of a sand (minimum 6-inches of sand).

The proposed remedies for SRA-05 are two types of SRA caps as shown on Figure 1 in Attachment C. The SRA cap shown on the east side of the SRA-05 cap (in green) will be constructed with a minimum 9-inch sand layer, plus a 3-inch thick over-placement allowance, with armor stone placed over the sand. The armor stone used for this portion of the cap will have a D_{50} of ¾ inch, and the thickness of the cap has been increased to 5 feet as requested by the A/OT. Where the propwash zones indicate that armor stone with a D_{50} of 6 inches or more would be required, the cap will be designed as an SRA cap.

In areas of the navigation channel, there is insufficient thickness between the bottom of the navigation channel and the top of the utility buffer to allow for the SRA cap described in the previous paragraph. In those areas, a thinner SRA cap will be placed, as shown in orange on Figure 1 in Attachment B. Amendment with GAC, at a proportion of approximately 4.2% GAC by dry weight of aggregate, will be used to complete the cap. In these areas, a minimum of six inches of GAC-amended sand will be placed, with a cover of aggregate with a D_{50} of ¾ inch placed to an elevation not exceeding elevation 552.6 feet NAVD88.

On the east and west ends of SRA-05, the pipeline is at elevation greater than 552.6 feet NAVD88. In those areas, a six-inch sand layer will be placed over the utility, extending to the limits shown on Figure 1.

This cap remedies provide the following advantages for this area:

- In the navigation channel, the carbon amendment will assist in attenuation of PCBs, when compared to a sand-only cap. This will allow for a thinner cap that will not interfere with the navigation channel.
- The spreader would be used in conjunction with an extended barge that could safely span the utility corridor such that impacts to utility 030 with spuds are not a concern. This could allow for installation of the SRA cap during the 2019 season.
- The SRA caps remedy would be effective based on the calculations previously discussed.
- The SRA caps should be acceptable to GBWU, the utility owner.

Design plans and cross sections for the remaining dredging and capping over utility 030 are presented in Attachment C. Within the navigation channel limits, the SRA-05 cap is not expected to extend above elevation 552.6 feet NAVD88, because sediments in the navigation channel will be dredged to an elevation of elevation 550.0 feet.

The proposed SRA caps are not standard cap designs but will still provide some isolation and/or potential mixing of underlying PCB contamination that will help to reduce the impact of leaving these PCB concentrations in place. In summary, the advantages and disadvantages of the SRA cap design for Utility 030 corridor are shown on Table 1.

Table 1. Advantages and Disadvantages of the SRA-05 Cap Design

Cap Design Criteria	Advantages of SRA-05 Cap Design	Disadvantages of SRA-05 Cap Design
Stone size – D_{50} of ¾ inch.	Provides some protection against erosive forces. Stone size is small enough to allow utility owner reasonable access to the buried utility if needed.	Not large enough to protect against scour from propwash from large vessels throughout much of the area.
Armor stone thickness	Will be thicker than typically required over part of the SRA cap area.	The stone layer thickness will not be thick enough to protect against prop scour in the navigation channel and channel slope areas.
Sand isolation layer thickness	Will be thicker than typically required over part of the SRA cap area.	May be thinner than desired in the navigation channel due to limited depth of dredging and channel depth limitations.
Activated carbon amendment	Increased attenuation of PCB compared to sand alone.	Requires mixing and measuring to achieve the amendment ratio of 4.2% by dry weight of carbon into the sand
Top of cap elevation in the navigation channel	Will meet design requirements in the navigation channel and allow a 1-foot buffer zone for channel dredging.	The stone size will not be large enough to function as a marker layer for dredging, so the armor layer could be disturbed by over-dredging.
Top of cap elevation outside the navigation channel	Acceptable for side slopes of the channel and in some areas near the shoreline.	As the cap approaches the shoreline on each side of the river, the top of cap elevation provides less than 6 feet of post-cap water depth. However, the proposed cap does not extend to the shoreline, therefore there will be at least 3 feet of draft above the SRA-05 cap, as required in the ROD.

GAC Placement Method

The sand and GAC mixture will be placed using J.F. Brennan's patented Broadcast Capping System (BCS™), which has three main systems/components that include the land plant, transportation, and the broadcast spreader. The land plant will be located onshore at the Lower Fox River processing facility, where cover sand and GAC will be stored and mixed before being hydraulically or mechanically transported to the spreader plant.

Broadcast Capping System™

The land plant will be equipped with an integrated measuring system that includes a scale and hopper system that weighs and meters the amendment precisely. Two conveyors, one for sand and one for GAC will be used to supply the mixture. The conveyors will be set up in a leader-follower configuration. This enables precise mixing, because the leader is equipped with a scale controlled by a programmable logic controller (PLC), which will be set to accept a specific volume of material. The scale controller will provide electric pulses for every 0.01 tons that pass over the scale and transmits the information to the PLC. The PLC takes the pulse inputs from the sand conveyor and adjusts the GAC metering hopper to deliver the specified proportion of GAC to the sand.

The follower conveyor will automatically adjust the amount of GAC based on the amount of sand on the leader conveyor. The two metering conveyors will discharge onto the long conveyor that will either discharge into a slurry container or material barge.

The GAC will be hydrated in large soaking tubs for at least 24 hours prior to mixing with the sand. This will increase the weight of the GAC to as much as double the dry weight, which will result in GAC that is similar in weight to the weight of the sand. The GAC weight change will be accounted for in the metering process to ensure an adequate mixing rate based on a percent of dry weight.

When the sand and GAC have been properly mixed at the land plant, the mixture will be hydraulically transported through pipelines to the broadcast spreader or mechanically transported via barge.

The broadcast spreader will be set up on a 40-foot (ft) by 80-ft distribution barge equipped with winches, spuds, and hydraulic power pack. The distribution barge will work in tandem with the same equipment , plus a rubber tracked excavator. Two cables will be connected between the excavator and cleats on the distribution barge to join the barges.

Once the sand / GAC mixture reaches the broadcast spreader it will be processed in a manner that depends on whether the delivery was via hydraulic or mechancal means. If hydraulically transported, the mixture will be dewatered through a set of hydrocyclones and a high-frequency shaker system. The slurry from the pipeline will be discharged into two 30-inch cyclones on the spreader barge located above the dewatering screen. The cyclones will remove the majority of the water from the slurry and then deposit the capping mixture onto the shaker bed. The discharged carriage water will be transported to a tank where a quiescent zone is created that will allow the remaining fines to drop out before the carriage water is discharged, via overflow weirs, into the river at the bow of the barge near the sand placement moon pool. As fines settle out in the holding tank, a 4 inch pump will recycle the sand along with some carriage water through an 18-inch cyclone. This "recovery" cyclone will place the fines from the holding tank back onto the shaker screens to be dewatered again, thereby reducing the amount of lost fine material.

BCS™ system Spreader Action

If the mixture is delivered by barge, a large material handler will be placed on the stern of the placement barge. The material handler will offload the transport barge and place the sand/GAC mixture into a small metering hopper similar to the one below the shaker deck.

From the small metering hopper which feeds a belt conveyor, the sand/GAC mixture will be removed from the hopper via a 24-inch conveyor. The sand/GAC misture will be deposited onto the dual spinners of the BCS™ system and spread in an overlapping manner. The spinners will then broadcast the cap material over an approximately 30-feet by 35-feet area. The spinners can be adjusted to develop an accurate pattern regardless of the sand size or amendment percentage. By broadcasting the material at a high delivery rate over a large footprint and using the water column to reduce the mixture's velocity, there is little mixing of the capping material and in-situ material, and a uniform sand/ GAC mixture is placed. The BCS™ system used for the sand/GAC mixing uses the same spreader as that currently used on the project for sand covers and caps. This system minimizes mixing at the sediment and sand interface as well as slope failures and "mud wave" effects.

The BCS™ process is shown on the following flow diagram (**Exhibit 1**).

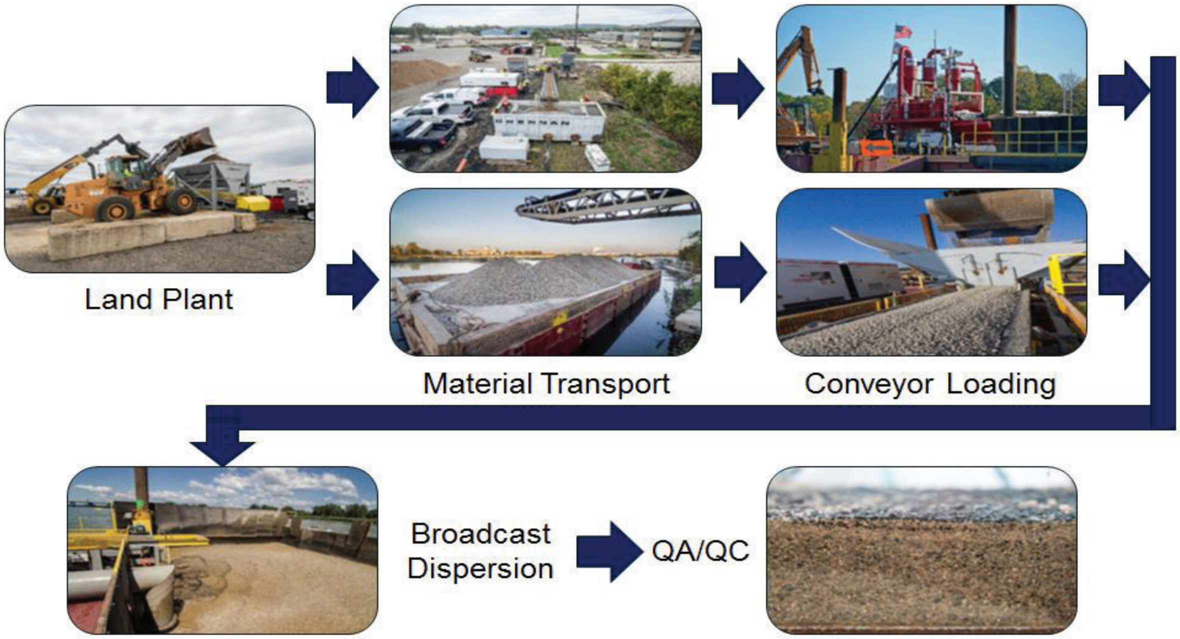


Exhibit 1: BCS™ Flow Diagram

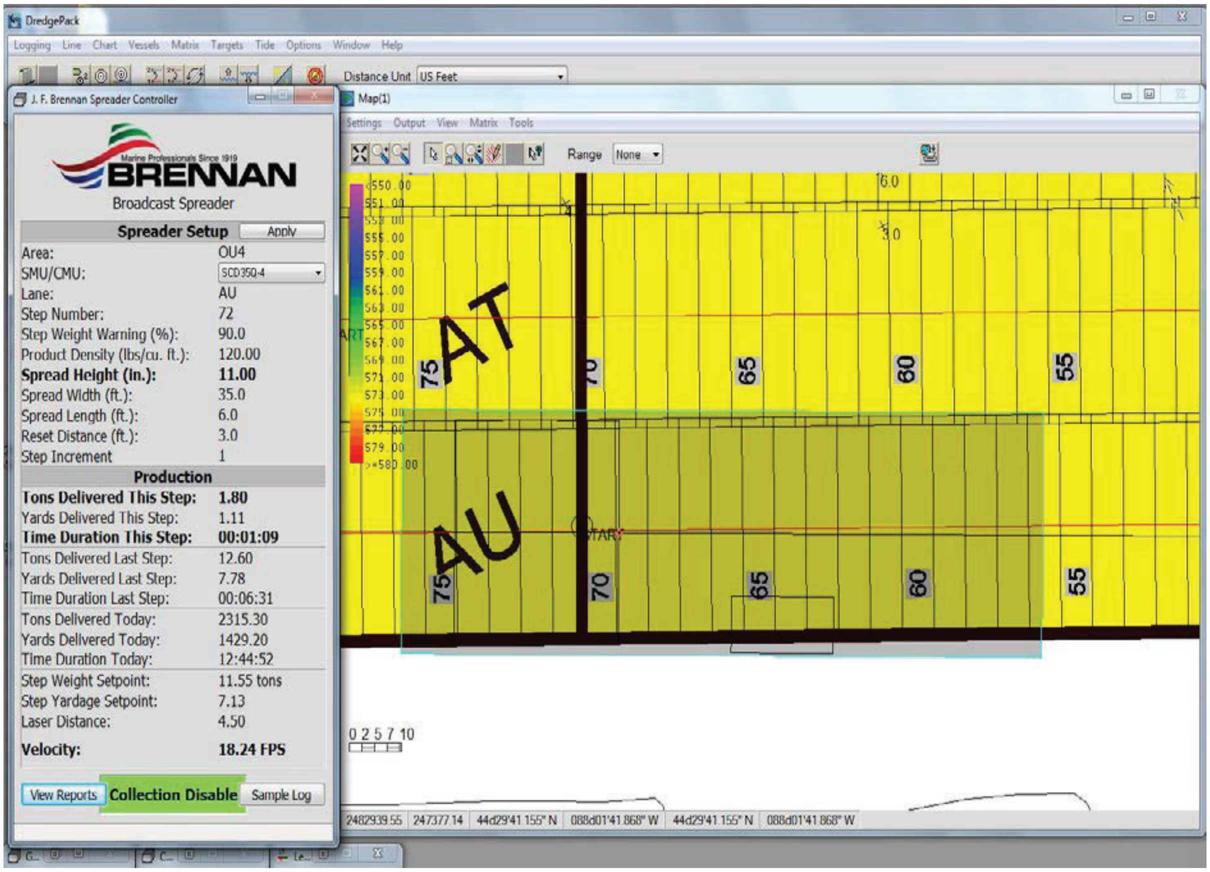
Brennan Internal Process Quality Control

Brennan has developed customized software to aid in the quality control management. This software provides several measures to ensure the accurate placement of cap mixtures. Hypack software receives the information from the spreader's GPS sensors and downloads the data into the DREDGEPACK® module to provide real-time location of the spreader. As part of DREDGEPACK®, a Brennan Spreader Controller has been developed as shown in **Exhibit 2**. This controller has several input sections (Spreader Setup) that are easily modified to determine the amount of sand placement in each step. These inputs allow the spreader to be accurately adjusted for lane width, length, and height. Below the Spreader Setup section, the Spreader Controller tracks the production at each location, by including the belt scale data collected just before the dual spinner setup. These weights are tracked in real-time to measure precisely the amount of material placed in each step. This screen is also displayed in the excavator to alert the excavator operator when to step.

The Spreader Controller can also be used for quality control by recording a large database of information collected from each step. Once the spreader takes a step, the controller resets, the Spreader Controller records the data from the previous step and downloads it into the database. Brennan quality controll staff collect this information daily to anallyze for any discrepancies and use this information in the daily reporting process. The Spreader Controller system also provides a method for recording the location and results of quality control samples. The operators can enter the quality control sample result which is then logged in a database and also displayed on the

DREDGEPACK® screen. Brennan quality control information is tracked by Brennan's quality control staff and compared to quality assurance results.

Exhibit 2: Screenshot of Spreader Control on BCS™ Plant



Spreader Setup

Area:	OU4
SMU/CMU:	SCD350-4
Lane:	AU
Step Number:	72
Step Weight Warning (%):	90.0
Product Density (lbs/cu. ft.):	120.00
Spread Height (in.):	**11.00**
Spread Width (ft.):	35.0
Spread Length (ft.):	6.0
Reset Distance (ft.):	3.0
Step Increment	1

Production

Tons Delivered This Step:	**1.80**
Yards Delivered This Step:	1.11
Time Duration This Step:	**00:01:09**
Tons Delivered Last Step:	12.60
Yards Delivered Last Step:	7.78
Time Duration Last Step:	00:06:31
Tons Delivered Today:	2315.30
Yards Delivered Today:	1429.20
Time Duration Today:	12:44:52
Step Weight Setpoint:	11.55 tons
Step Yardage Setpoint:	7.13
Laser Distance:	4.50
Velocity:	**18.24 FPS**

Additional Quality Assurance/Quality Control Procedures

In-situ and ex-situ samples of the CIL will be tested to verify the proper sand/GAC ratio. The testing will be conducted by AET Laboratory and will utilize a thermal drying method to evaluate the GAC concentration in the sample. A description of the thermal drying method is presented in the Standard Operating Procedure, Appendix G.

Utility Owner Acceptance

On December 16, 2015, the Design Team met with representatives of the GBWU to discuss available means of remediation over its utilities, including the water line in utility 30 corridor. Notes from this meeting are presented in Appendix G. During the meeting, representatives from GBWU stated that the code requires the pipeline to have at least two feet of cover following remediation. This was later confirmed to be in NR 811.76 (2)(a), which is the code requirement for water main design for underwater crossings. However, they also indicated that they would prefer more than two feet of cover, including restoration of the existing cover, where it is greater than 2 feet. As shown on the drawing in Attachment B, the revised design includes a 7-foot buffer zone on the north and south sides of the pipeline, as well as over the pipeline, where possible. The GBWU representatives stated that they preferred gravel to sand; the sand layer is need for mixing and remediation purposes. The layer of stone will be only ¾ inch diameter, so should be acceptable to GBWU.

During the February 28, 2018 meeting, Brian Powell (GBWU) stated that the GBWU preference would be for stone size that could be readily moved in the event of a repair. Mr. Jonathon Imbrunone (USACE) stated that the USACE would prefer stone size to be no larger than 6 inches in diameter. Notes from the meeting with the USACE and GBWU are presented in Attachment G. Given this feedback, the design contains an SRA cap with armor stone having a D_{50} of ¾ inch.

On June 18, 2018 Brian Powell was contacted regarding the SRA cap thicknesses of 5 feet, as required by the A/OT. Mr. Powell was receptive and agreeable to the proposed stone size and cap thickness. He agreed that the thickness will provide added protection to the pipeline and stated he would discuss this information with his supervisor. Mr. Powell was contacted again on September 24, 2018 and stated that an average stone size of ¾ inch would be acceptable to the City of Green Bay.

ATTACHMENT A

LETTERS FROM J.F. BRENNAN REGARDING DREDGING NEAR UTILITIES AND AGENCIES' COMMENTS ON THE INITIAL LETTER

Appendix F SRA-05

Marine Professionals Since 1919
BRENNAN

J.F. Brennan Company, Inc.
818 Bainbridge Street
La Crosse, WI 54603
608.784.7173

May 1, 2018

Mr. Bill Coleman,
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54304

Re: Dredging Near Utilities

Dear Mr. Coleman

We are writing to address questions recently raised by the Agencies Oversight Team (A/OT) regarding the strategies and methods J. F. Brennan Company, Inc. ("Brennan") is using for remedial dredging in the vicinity of utilities that cross the river bottom. The A/OT has requested additional explanation from the project team for why the standard dredge cutterhead cannot be operated within the 25-foot setback. Brennan has attached its insurance letter stating a 50 foot offset should be used. Due to the extensive locates that have been done on this project during the design phase Brennan has reduced this requirement to the 25-foot offset.

Over the past several seasons, Brennan has worked closely with the project design team to develop strategies for dredging over utility lines to maximize sediment removal in the vicinity of those utilities in a safe manner. We developed methods utilizing the dredge Block Island with an open suction guided by divers, and we have utilized the utility dredge with a Vic Vac attachment. Using these methods, we have been able to dredge safely to within approximately 5 feet of utility lines 20, 23 and 26-30.

While it is true that the Vic Vac and the standard cutterhead attachment both rely upon GPS placement, the cutterhead does not operate in the same manner as the Vic Vac. A cutterhead attachment dredges more aggressively than the Vic Vac, which creates both more sediment disturbance and, significantly, more disruption of areas in the river bed near the area of dredge operations. Operation of the cutterhead necessarily increases the risk of damage to nearby utility lines. This is especially true If Brennan operates the cutterhead within the 25 foot utility offset.

The 25 foot utility offset is the operational standard used throughout the country. Recent projects completed by Brennan with similar offsets include Fox River OU1, East Branch Grand Calumet River – Reaches 4A and 4B, West Branch Grand Calumet River – Roxanna Marsh Reaches 1 and 2 and Connecticut River. Additionally, we have and are currently bidding several other projects nationwide with a similar offset. In fact, most projects increase offsets around high risk utilities, such as fiber optic lines.

Several attempts have been made to locate the utility lines in the river bottom. While these attempts have refined the information available to the project team, the resulting data has not provided the team with a sufficiently high level of certainty as to the actual location of those lines. The location data thus far received by the team has varied by more than 24 feet in regards to Utility 20 and by up to 33 feet for

Utility 21. Further dimensions of utility locate differences can be provided upon request. These differences show the level of complexity in accurately locating pipelines under the river bottom.

Operation of the standard cutterhead attachment inside a 25-foot setback is not a risk we can accept, nor is it a risk the project team should accept. That conclusion is more than evident when we have methods available that have produced a performance track record of safe dredge operation near utility lines. It is a method we have used on many other projects and it has produced a performance track record of safe dredge operations near utilities.

If you have any questions, please do not hesitate to contact us. Thank you.

Sincerely,

Dustin Bauman
J. F. Brennan Company, Inc.

J.F. BRENNAN CO., INC.

820 BAINBRIDGE · BOX 2557 · LA CROSSE, WI 54602-2557 PHONE: 608 / 784-7173 · FAX: 608 / 785-2090

August 22, 2011

Mr. Bill Coleman
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54303

Re: Dredging Near Utilities

Dear Bill:

As you are aware, there have been numerous meetings with utility owners recently, as well as subsequent discussions with the A/OT related to the remedial actions that will be performed in the vicinity of utilities that cross the river. While we applaud the effort to identify the location of the utilities as accurately as possible I understand that JF Brennan site personnel have expressed concerns with regard to the lack of detailed information on the exact location of these utilities. Pursuant to this, we need to make very clear that we, as a company, have a significant concern for the safety of our personnel, as well as our equipment and reputation, and cannot take unnecessary risks when working in the area of active utilities whose locations have not been accurately identified.

Due to our concerns, we spoke to our insurance carrier regarding this topic to see if they could provide any insight. Attached you will find a letter we recently received from them. In this letter you will note that there is mention of a 50 foot offset when working in the area of an active utility where the exact location is unknown. To this point, we understand that WPS has required this amount of setback when working near its active natural gas pipeline that crosses the river in the general vicinity of the highway 172 bridge. We agree with this approach and are willing to proceed in this direction when work in this area is undertaken. In fact, we would recommend this approach be used when completing remedial activities in other areas where the exact location of utilities in unknown. Perhaps it will be possible to reduce the amount of offset, depending upon the amount of information for the specific utility. However, this will need to be done on a case by case basis. As an example, if the location of the utility can be guaranteed within 5' in all directions we would be able to reduce the offset to 25'. In addition, if the location of the utility is ***accurately determined to be at least 20' below the sediment surface*** we would perform dredging over this utility, if the design identifies this as the selected remedy.

As you are aware, JF Brennan has modified our material spreading equipment such that we can cantilever over a utility, providing complete remediation via the placement of sand cover or an engineered cap, while maintaining the safety setback of 50'. Thus, we

would encourage this approach near utilities where the information regarding locations is questionable.

If you should have any questions once you have had a chance to review this information please feel free to contact me at your earliest convenience. We look forward to a safe and successful project.

Sincerely,

Tom Kennedy

Tom Kennedy
Vice President CFO

McGRIFF, SEIBELS & WILLIAMS OF MISSOURI, INC.

7711 Bonhomme Ave., Suite 900 • St. Louis, MO 63105 • TEL – (314) 854-5200 • FAX – (314) 854-5201

August 19, 2011

Mr. Tom Kennedy
Chief Financial Officer
J. F. Brennan Company, Inc.
PO Box 2557
LaCrosse, WI 54602-2557

RE: Fox River Project
Underwater Utilities

Dear Tom:

We wanted to follow up with you on our recent conversation regarding the Fox River project and issues related to dredging near and/or over utility lines, oil pipelines, gas pipelines and similar items (hereafter underwater utilities). It is our understanding that a significant complicating factor in the situation is that data does not exist to precisely locate these underwater utilities, either vertically or horizontally, at certain locations. Despite the unavailability of such data at several locations, regulatory authorities are not presently agreeing to an offset with a capping alternative that has been proposed by J. F. Brennan and the project's prime contractor. At the same time, J. F. Brennan is contractually obligated to take all necessary precautions for the safety of, and must provide the necessary protection to prevent damage, injury or loss to, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of performing dredging operations on the Fox River.

In our capacity as J.F. Brennan's insurance broker, we are compelled to advise you of the significantly higher risk associated with dredging an area where the precise location of underwater utilities is unknown. There are certain representations made to the various companies that underwrite your insurance program regarding policies and procedures as it relates to dredging river beds with known underwater utilities. At a minimum, there is an expectation on behalf of your insurers that J. F. Brennan is able to identify the location of such utilities prior to commencing dredge operations. They have been advised that in situations where the exact location of underwater utilities are unknown, J. F. Brennan's preferred protocols dictate a fifty (50) foot offset with capping performed as an alternative to dredging within that offset. We are concerned that a perceived lack of due diligence by J. F. Brennan in its approach to dredging operations, or in meeting its contractual obligations for the project, could significantly complicate any potential claim scenarios. Based on the variety of underwater utilities throughout the site, a loss or losses from an underwater utility strike could involve significant monetary damages and other claims. Caution is therefore certainly urged. The potential exists for claims from the project owner, prime contractor, underwater utility owners and other third-parties affected.

Although not ideal, J. F. Brennan could look to contractual protection for the risk associated with dredging an area with unknown underwater utilities in the form of an indemnification agreement. However, in order for such an agreement to provide any degree of protection, it would need to encompass all bodily injury, property damage, environmental damage, loss of use and other direct or indirect consequences from a strike as it relates to any and all potential claimants. This indemnification would have to include as signatories the project owner, prime contractor and all applicable underwater utility owners. Although impossible to secure indemnification from unknown third-parties potentially impacted by a claim situation, the project owner, prime contractor and/or the underwater utility owners would have to indemnify J. F. Brennan for any claim brought by a third-party related to an underwater utility strike.

In addition to the contractual protection, we strongly urge J. F. Brennan to require from the project owner or prime contractor improved information regarding the river bottom location of all underwater utilities on both a vertical and horizontal basis. If necessary, J. F. Brennan should seek relief under its contractual provisions with the prime contractor to assure that sufficient data is available to identify precisely the location of underwater utilities. It is our experience that underwater utilities have a tendency to shift positions over time, therefore, recent data is imperative to minimize the potential for losses as a result of your dredging operations.

We appreciate J. F. Brennan including us in this process. We are available to assist your attorney in drafting appropriate indemnification language in an attempt to minimize potential claims occasioned by incomplete data.

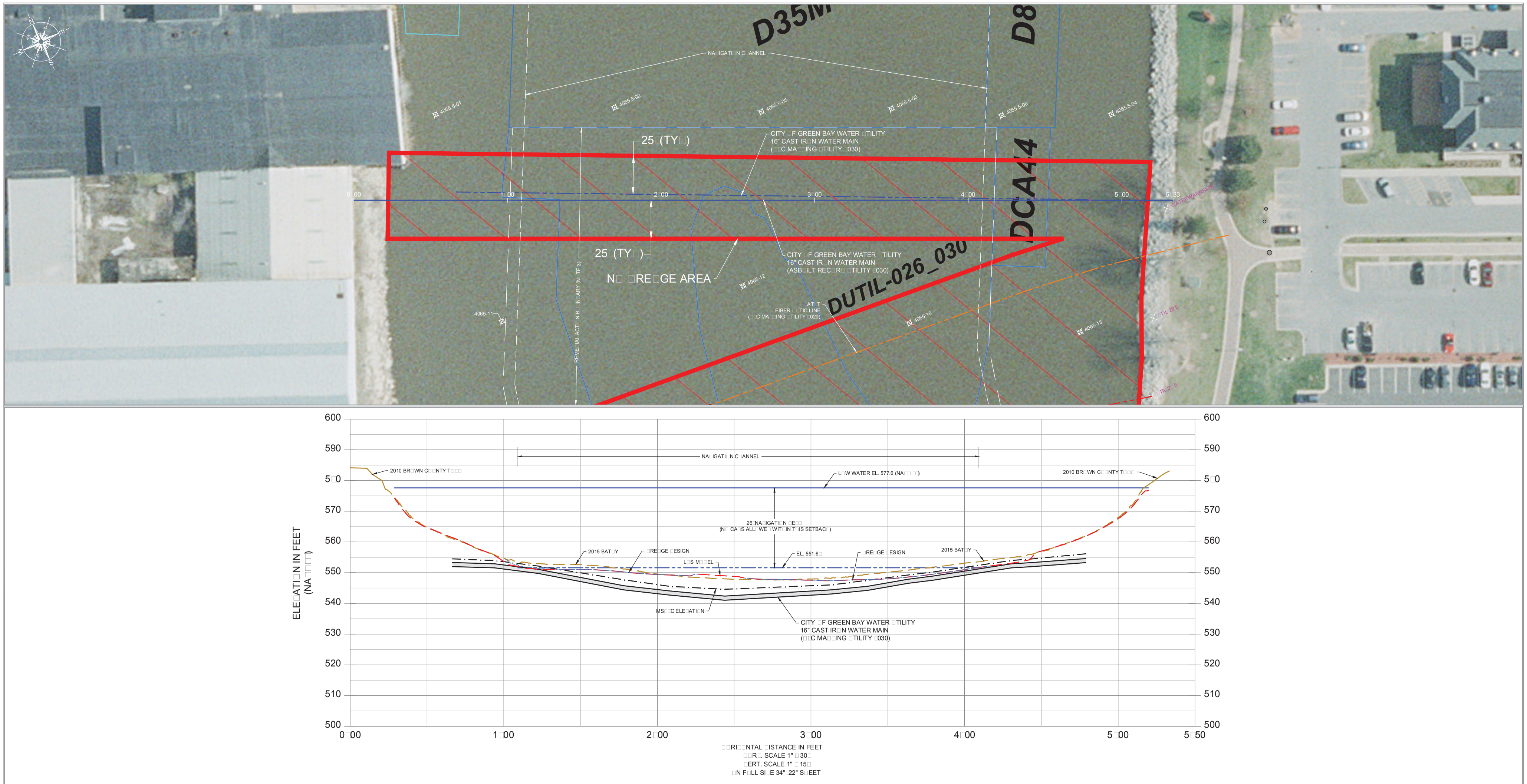
Sincerely,
McGRIFF, SEIBELS & WILLIAMS of MO, Inc.

C Baxter Southern III

C. Baxter Southern III
Executive Vice President

ATTACHMENT B

PLAN AND PROFILE FIGURES OF UTILITY 030 CORRIDOR SHOWING 25-FOOT BUFFER ZONE AROUND THE WATER PIPELINE



HORIZONTAL DISTANCE IN FEET
HOR. SCALE 1" = 30'
VERT. SCALE 1" = 15'
ON FULL SIZE 34"x22" SHEET

SOURCE INFORMATION

DoC MAPPING UTILITY #030

1. SOURCE DRAWING WAS PROVIDED BY:
   DOC MAPPING LLC
   3510 OCTAVIA STREET
   NEW ORLEANS, LA 70125
   (619) 566-6783
2. FILE NAME: "DOCM[illegible]030[illegible]"
3. DOC DRAWING IS BASED ON FIELD SURVEY OF MAY 2015, REFERENCED TO THE U.S. STATE PLANE - WISCONSIN CENTRAL ZONE COORDINATE SYSTEM, NAD83 AND NAVD88 VERTICAL DATUM.

ASBUILT RECORDS UTILITY #030

AB-1. CITY OF GREEN BAY WATER UTILITY "GENERAL PLAN A-1230" DATED SEPTEMBER 1905.

UTILITY #030 HORIZONTAL ALIGNMENT

TETRA TECH ESTIMATED THE POSITION OF THE HORIZONTAL ALIGNMENT FOR UTILITY 030 AS FOLLOWS:

1. A PDF IMAGE OF THE RECORD PLAN (DRAWING A-1230, DATED SEPT. 1905) WAS INSERTED ELECTRONICALLY INTO CIVIL 3D SOFTWARE.
2. BROWN COUNTY PARCEL DATA (OBTAINED FROM THE BROWN COUNTY WEBSITE) WAS USED AS A REFERENCE POINT TO ROTATE AND SCALE THE PDF IMAGE BASED ON THE RIGHT-OF-WAYS SHOWN ON THE RECORD DRAWING.
3. THE PARCELS AND RIGHT-OF-WAYS FROM THE RECORD DRAWING LINED UP FAIRLY WELL WITH THE CURRENT BROWN COUNTY DATA, AND THE WATER LINE WAS TRACED FROM THE PDF IMAGE INTO CIVIL 3D.
4. THE LINE WAS THEN SHIFTED APPROXIMATELY 2.8' NORTH SO THAT IT TIED INTO A WATER VALVE LOCATED ON SOUTH WASHINGTON STREET THAT WAS SURVEYED BY TETRA TECH IN JUNE 2015. (THIS WAS THE SAME WATER VALVE USED BY DOC DURING THEIR LOCATE WORK.)

PLAN NOTES

1. **MSDoC ELEVATION**: MINIMUM STATISTICAL DEPTH OF COVER. REPRESENTS A 95% PROBABILITY THAT THE TRUE POSITION OF THE LINE LIES DEEPER THAN THIS POINT.
2. HORIZONTAL ALIGNMENT OF PIPE WAS ESTABLISHED USING "BEST FIT" LINE BASED ON DOC POINT DATA WITHIN THE RIVER (SEE INDIVIDUAL "X" MARKS IN PLAN VIEW).
3. REMEDIAL ACTION BOUNDARY IS FROM THE LATEST RA WORK PLAN DRAWINGS. THE REMEDY INSIDE THIS BOUNDARY MAY CHANGE.

UTILITY NOTES

UTILITY TYPE: WATER MAIN

OWNER: CITY OF GREEN BAY WATER UTILITY

SIZE: 16"

MATERIAL: CAST IRON

DATE INSTALLED: 1906

INSTALLATION METHOD: SHALLOW - NO COVER

UTILITY NAME: NA

LEGEND

WATER LINE (ELEV: 577.6)
MAXIMUM ELEVATION FOR TOP OF CAP WITHIN NAVIGATION CHANNEL
U.F.B. 2015 PRE-SEASON BATHY
LOS MODEL
2010 BROWN COUNTY TOPO
NAVIGATION CHANNEL
ANCHOR UTILITY EXCLUSION ZONE
DREDGE DESIGN SURFACE
SAND COVER
CAP A
CAP B
CAP C
☒ 4061.5-01 DESIGN CORE

SCALE (1" = 30')

30 15 0 30 60

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD88

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: Utilities P&P #030.dwg
DRAWN BY: SHANE.NELSON
DATE: May 20, 2015
LAST REVISED: January 19, 2017
CHECKED BY: M.T.
REVIEWED & APPROVED BY J.F. BRENNAN:

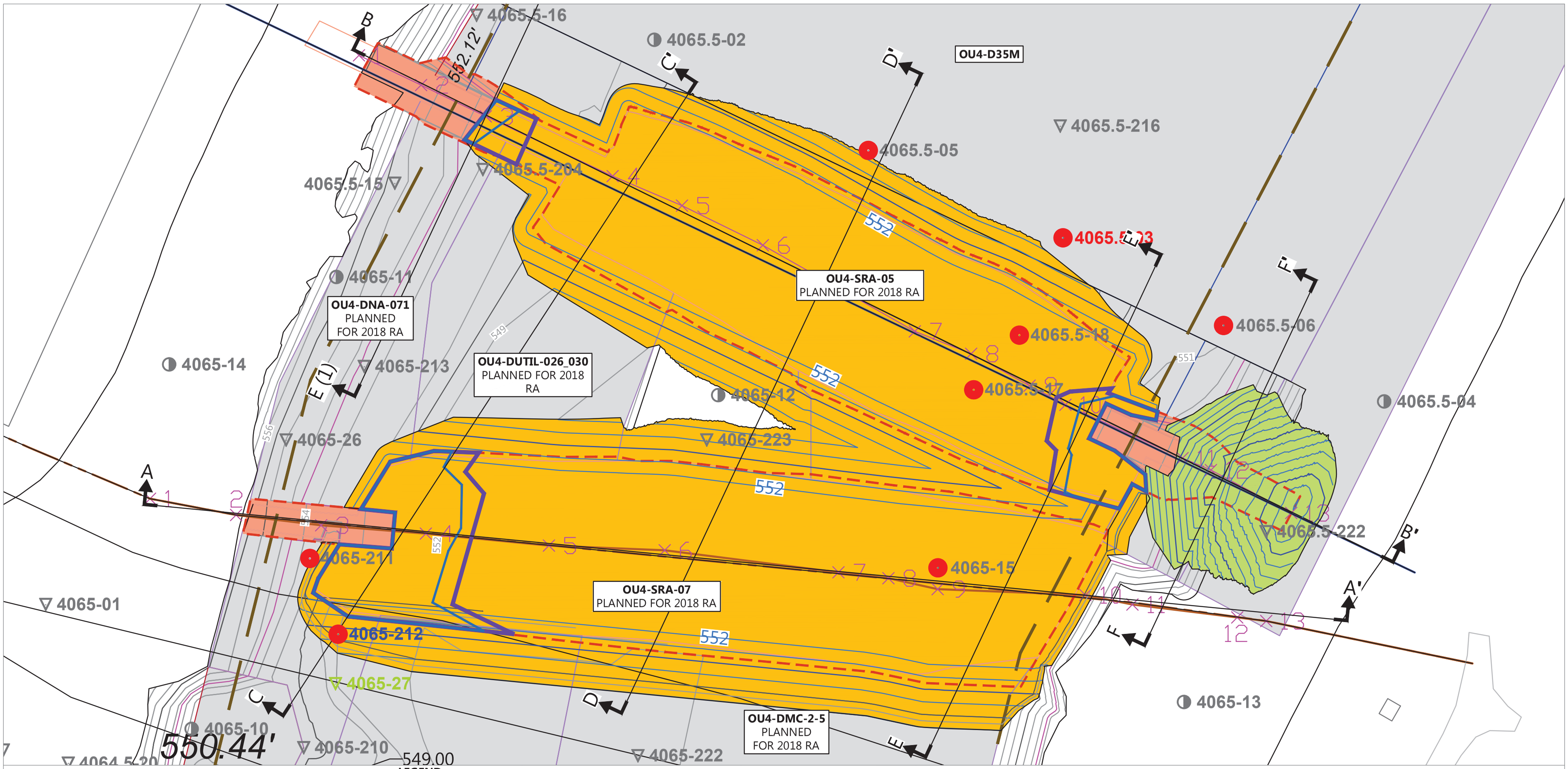
Fox River
LOWER FOX RIVER REMEDIATION LLC

FIGURE [illegible]
PLAN & PROFILE DRAWING

CITY OF GREEN BAY WATER UTILITY - WATER MAIN
UTILITY #030

ATTACHMENT C

DESIGN PLANS AND SECTIONS



LEGEND:

HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

═	APPROVED DREDGE ELEVATIONS (1 AND 5 FT. INTERVALS)
═	PROPOSED CAP DESIGN CONTOURS (1 AND 5 FT. INTERVALS)
—	SHORELINE
▭	DREDGE / EXCAVATION AREA
🟥	SRA AREA
🟧	SPECIAL REMEDIATION CAP TYPE 1 (TOP OF CAP AT ELEVATION 552.6 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL)
🟩	SPECIAL REMEDIATION CAP TYPE 2 (5FT. THICK AS REQUESTED BY AOT)
—	0.5 FT OR LESS OF CAP MATERIAL
—	1.0FT OR LESS OF CAP MATERIAL
●	CORE WITH REMAINING CONTAMINATION

0 40
FEET

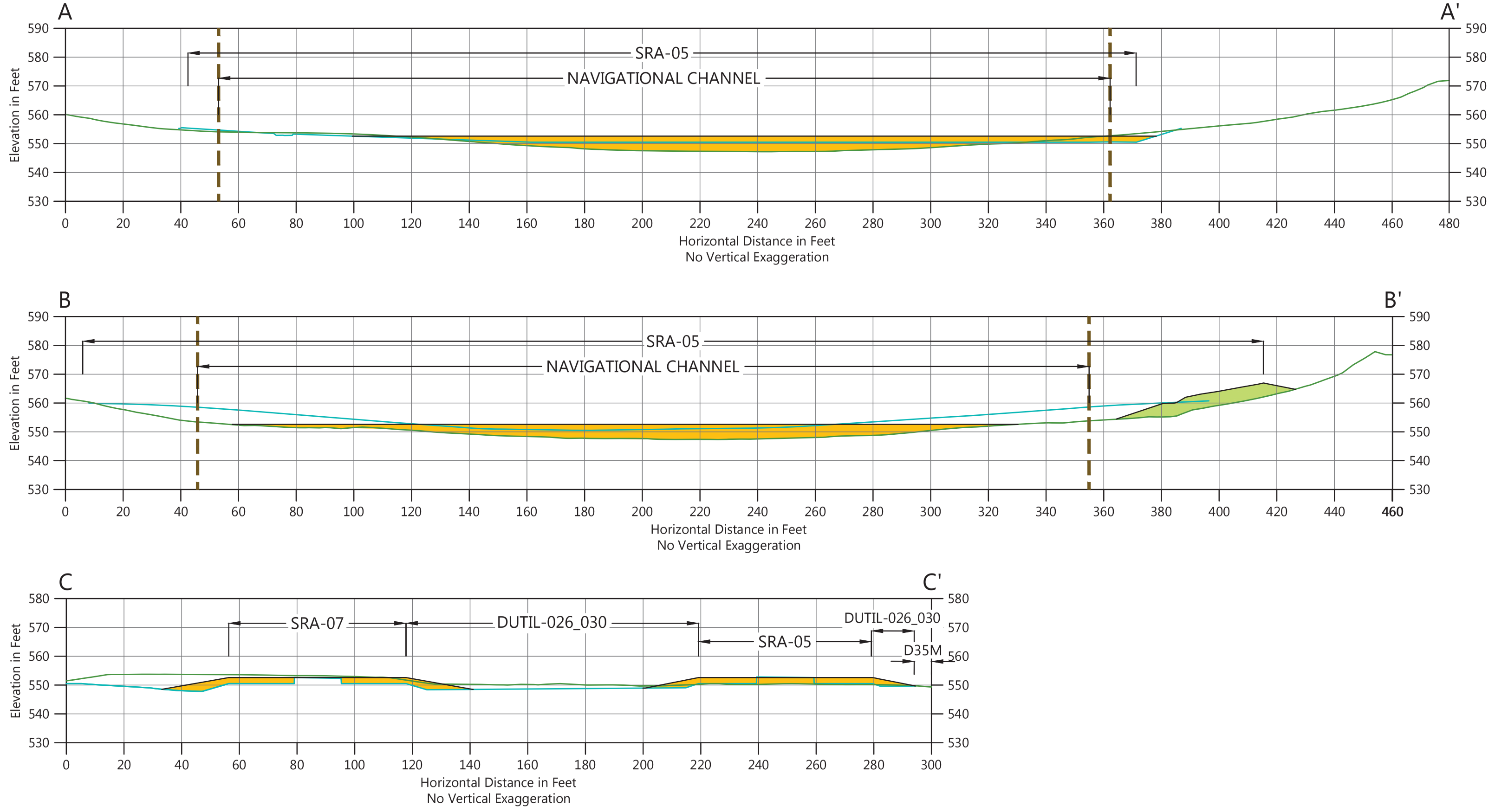
Publish Date: 2018/09/07 12:48 PM | User: mcarlino
Filepath: C:\Users\mcarlino\Documents\CAD C-DRIVE\Fox River\2018 Grading\DUTIL026-030\ANC-2018-DUTIL026030-Cap Design.dwg F2 XS-PLAN

ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445-0720 FAX: (920) 445-0719

FIGURE 1
PLAN

DESIGN REVIEW DOCUMENT SRA-05 & SRA-07
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

PROFILE LEGEND:

- 2018 POST DREDGE BATHY
- DESIGN DREDGE ELEVATION

🟧 SPECIAL REMEDIATION CAP TYPE 1 (TOP OF CAP AT ELEVATION 552.6 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL & 10-FT BUFFER)

🟩 SPECIAL REMEDIATION CAP TYPE 2 (5FT. THICK AS REQUESTED BY AOT)

0 40
FEET

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ANCHOR QEA

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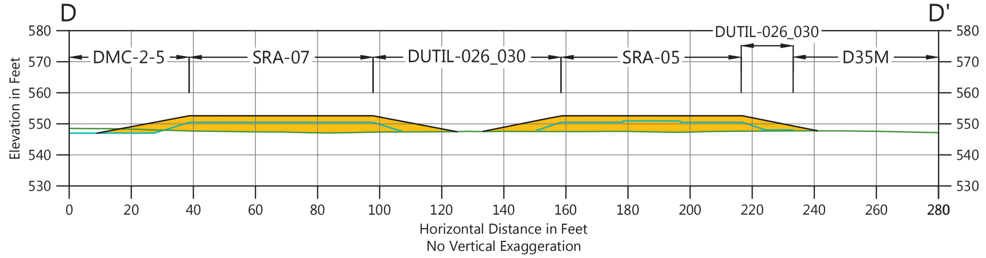
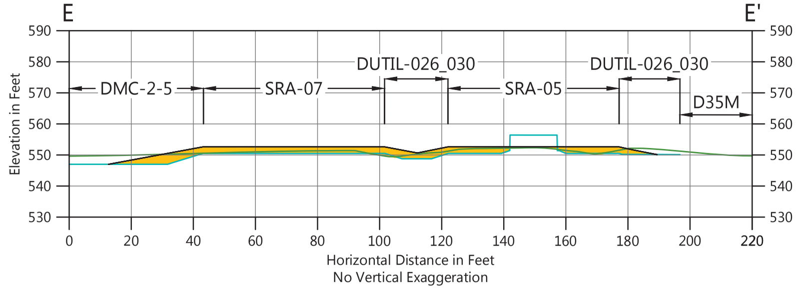
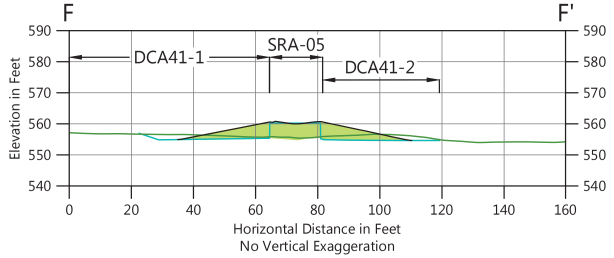
FIGURE 2
SECTIONS A-C
DESIGN REVIEW DOCUMENT SRA-05 & SRA-07
LOWER FOX RIVER REMEDIATION







HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

PROFILE LEGEND:

—	2018 POST DREDGE BATHY
—	DESIGN DREDGE ELEVATION
🟧	SPECIAL REMEDIATION CAP TYPE 1 (TOP OF CAP AT ELEVATION 552.6 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL & 10-FT BUFFER)
🟩	SPECIAL REMEDIATION CAP TYPE 2 (5FT. THICK AS REQUESTED BY AOT)

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ANCHOR QEA

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FIGURE 3
SECTIONS D-F
DESIGN REVIEW DOCUMENT SRA-05 & SRA-07
LOWER FOX RIVER REMEDIATION

ATTACHMENT D

CORE SUMMARY TABLE FOR VICINITY OF SRA-05
(TABLE D-1)

Table D-1

Dutil26-30, DNA-071, DCA44, DMC2-5; 180613

Core ID	4065.5-03	4065.5-05	4065.5-06	4065.5-16	4065.5-17	4065.5-18	4065-15	4065-211	4065-212
DE				552.12	550.50	550.50	550.5	551.5552	547.7
LOS	548.07	548.13	550.70	554.36	547.82	548.05	547.20	551.94	551.92
Bathy	547.94	547.70	550.44	554.22	549.45	549.04	549.64	554.05	553.92
EOC	548.10	548.15	550.70	552.12	547.45	548.08	547.16	551.51	
Refusal			547.80					550.71	
Elevation									
570.0									
569.5									
569.0									
568.5									
568.0									
567.5									
567.0									
566.5									
566.0									
565.5									
565.0									
564.5									
564.0									
563.5									
563.0									
562.5									
562.0									
561.5									
561.0									
560.5									
560.0									
559.5	This core is outside this Remedial Action area and is included to show influence to the SRA cap.								
559.0									
558.5									
558.0									
557.5									
557.0									
556.5									
556.0									
555.5									
555.0									
554.5									
554.0			**TOC**	**TOC**				**TOC**	
553.5			0.49	0.527				1.39	**TOC**
553.0			3.31	0.409				1.82	1.64
552.5			11.4	0.473				1.49	2.02
552.0			2.22	1.32				1.78	2.29
551.5				0.34				1.35	2.65
551.0			20					0.0252	2.69
550.5	**TOC**		9.34						3.43
550.0	6.66		0.03			**TOC**			0.649
549.5	56.9					1.92	**TOC**		
549.0	39.8	**TOC**			**TOC**	4.6	0.776		2.06
548.5	34.3	6.49	0.02		3.76	20	6.27		3.17
548.0	7.88	3.38			3.13	4.56	41.9		1.64
547.5	0.02	0.44			1.86	0.0254	32.7		
547.0		0.22			0.029	0.0251	22.4		
546.5					0.0251	0.0252	0.1		
546.0					0.0252	0.0253	0.03		
545.5					0.0254				
545.0					0.0253				
544.5									
544.0									

Created By: B. J. Hendron
Reviewed By: M. Tabatabai,
Date: 13-Jun
Update: 11-Sep SRA-07 cores

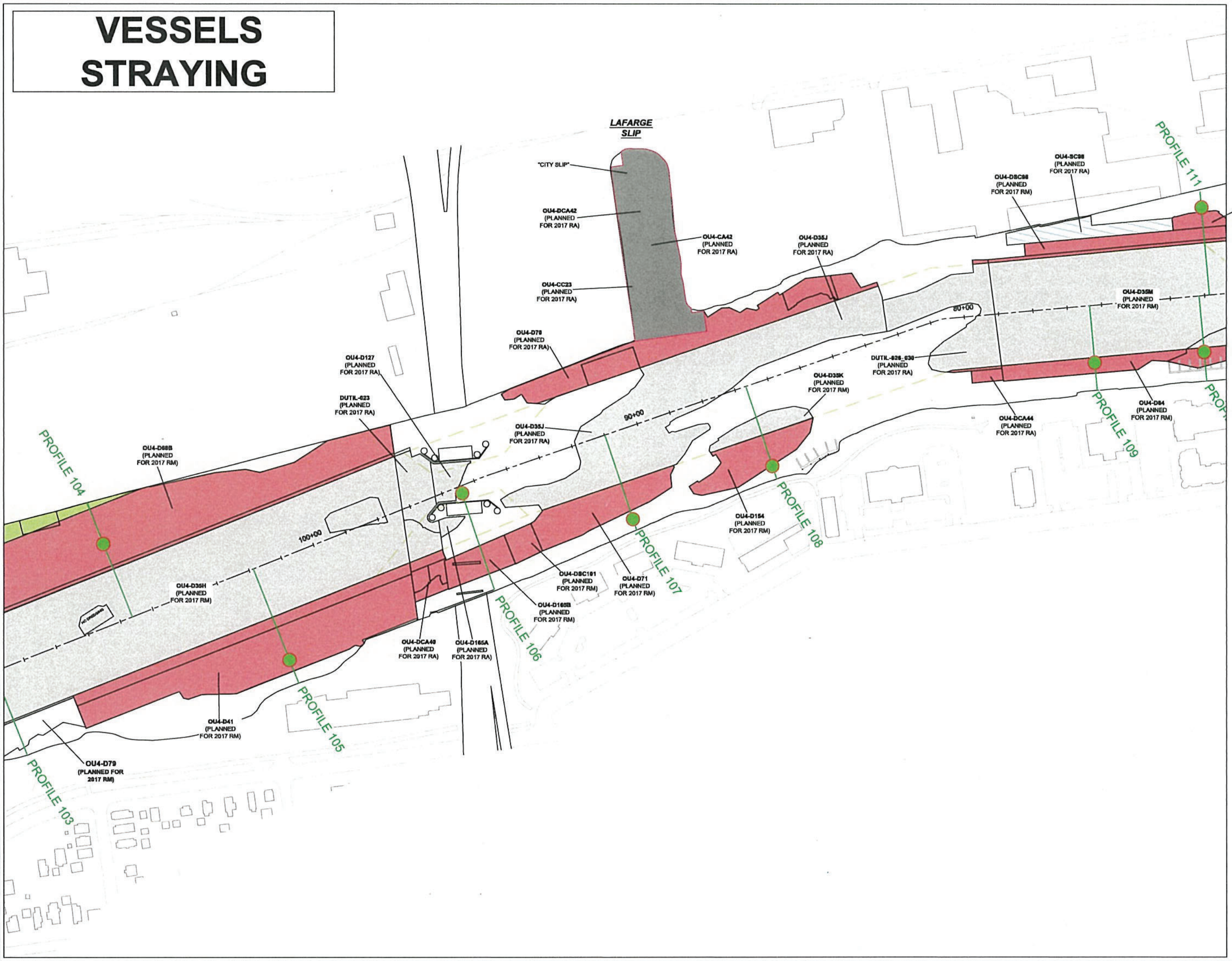
Legend

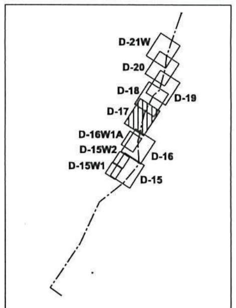
TOC	Top of Core
🟩	Approximate elevation of bathymetry prior to dredging. (Either 2017 pre-season or post dredge)
—	Approximate elevation of neat line. (0.5 LOS Model Surface)
▨	Approximate Dredge Design Elevation. (LOS surface unless otherwise noted)
▨	Approximate elevation of contamination.
▨	Approximate cap/cover elevation.
57	≥ 50 ppm PCB
NA	Not available.
🟨	Known contamination below or influencing the SRA Cap

ATTACHMENT E

PROPWASH ZONE MAPS

VESSELS STRAYING





OU 4 SHEET KEY

LEGEND:

4019-24	CORE LOCATION (TYPICAL)
4002.5-98	CORE LOCATION (UNDEFINED DOC)
4012-111	CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM
4009-06	CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)
4002-03	CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)
4202-06	CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)
4006.5-118	CORE LOCATION TAKEN POST-PRODUCTION DREDGING
4048.5-139	CORE LOCATION TAKEN POST-PRODUCTION DREDGING (UNDEFINED DOC)
4006.5-118	CORE LOCATION TAKE POST-PRODUCTION DREDGING W/ ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM
▼4002.5-85	CORE LOCATION NOT INCLUDED IN FIK MODEL
	POLING LOCATION
	LOS 0.5 FOOTPRINT > 0.01 FT. DOC (2011, 2012, 2013, 2015, & 2016 UNCORRECTED)
A DC-1	CROSS SECTION LOCATION
▼4036-402	CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM
▼4036.5-402	CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)
▼4034-400	CORE LOCATION NOT INCLUDED IN FIK MODEL (UNDEFINED DOC)
▼4034-401	CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)
▼4048-127	CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)
569.5'	TARGET ENGINEERED DREDGE PRISM ELEVATION
▨	TARGET FINAL DESIGN DREDGE SURFACE CONTOUR (1 AND 5 FT. INTERVALS)
OU4-CA23A	**CAP A AREA** (7"-9" MIN. THICKNESS SAND AND GRAVEL CAP)
OU4-CB11B	**CAP B AREA** (10"-12" MIN. THICKNESS SAND AND GRAVEL CAP)
OU4-CC2D	**CAP C AREA** (21" MIN. THICKNESS SAND AND GRAVEL CAP WITH ARMOR LAYER)
OU4-SC84	**SAND COVER AREA** (6" MIN. THICKNESS SAND COVER)
- - - -	**NAVIGATION CHANNEL LIMITS** (OU 4A - 75 FT. WIDE AND OU 4B [AUTHORIZED])
———	**NAVIGATION CHANNEL LIMITS** (OU 4A - 150 FT. WIDE [HISTORIC])

RESIDUAL CAP PROPWASH EVALUATION ARMOR STONE SIZE ZONES

🟥	ARMOR STONE D_{50} > 6 IN.
🟩	ARMOR STONE D_{50} = 6 IN.
🟦	ARMOR STONE D_{50} = 3 IN.
🟪	ARMOR STONE D_{50} = 1.5 IN
⬜	DREDGING WITHIN NAVIGATION CHANNEL
●	APPROXIMATE VESSEL POSITION (WORST CASE CONDITION, KEEL AT 562.5 FT. OUTSIDE THE CHANNEL)

NOTES:

1. ARMOR STONE SIZE ZONES BASED ON A VESSEL WITH 100 PERCENT POWER APPLIED TO BOW THRUSTER AT THE NOTED LOCATION

POOL	OPERABLE UNIT	RIVER MILE	NOAA LOW WATER ELEVATION (FEET NAVD88)
GREEN BAY	OU 4/5	0.0	577.6
DE PERE DAM	OU 3	7.1	587.5
LITTLE RAPIDS DAM	OU 2	13.1	593.6

NOAA LOW WATER CHART FROM NOAA CHART #14916 (2004)

0 150' 300'
HORIZONTAL SCALE

ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445-0720 FAX: (920) 445-0719

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: P. LAROSA / D.BINKNEY
DRAWN BY: D.BINKNEY / M.CARLINO
CHECKED BY: P. LAROSA / T. BLACKMAR
APPROVED BY: T. BLACKMAR
SCALE: AS SHOWN
DATE: MARCH 24, 2016

LOWER FOX RIVER REMEDIAL DESIGN
PHASE 2B WORK PLAN
FOR 2016 REMEDIAL ACTION

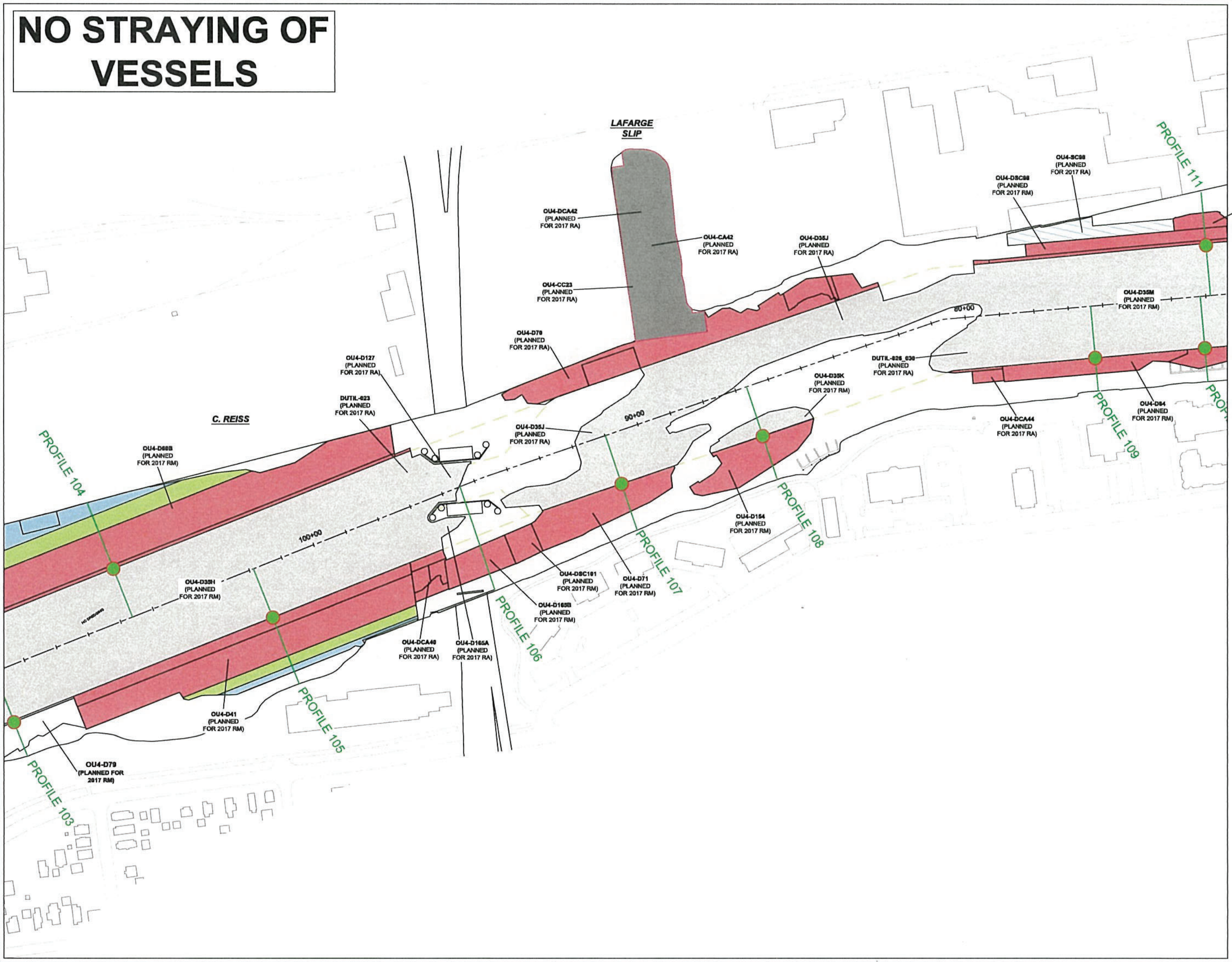
RESIDUAL CAPPING PROPWASH EVALUATION

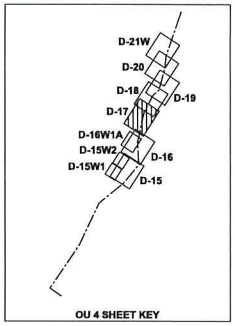
D-17

SHEET NO. 2 OF 5

Dec 08, 2016 1:17pm dbinkney A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2016\Design\Caps\Residual Propwash\Additional Profiles Denmark-Util20\RESIDUAL PROPWASH EVAL 100 Series Markups STRAYING 12082016.dwg D-17

NO STRAYING OF VESSELS





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▼4002.5-95	CORE LOCATION NOT INCLUDED IN FIK MODEL
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REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: P. LAROSA / D.BINKNEY
DRAWN BY: D.BINKNEY / M CARLINO
CHECKED BY: P. LAROSA / T. BLACKMAR
APPROVED BY: T. BLACKMAR
SCALE: AS SHOWN
DATE: MARCH 24, 2016

LOWER FOX RIVER REMEDIAL DESIGN
PHASE 2B WORK PLAN
FOR 2016 REMEDIAL ACTION

RESIDUAL CAPPING PROPWASH EVALUATION

D-17

SHEET NO. 2 OF 5

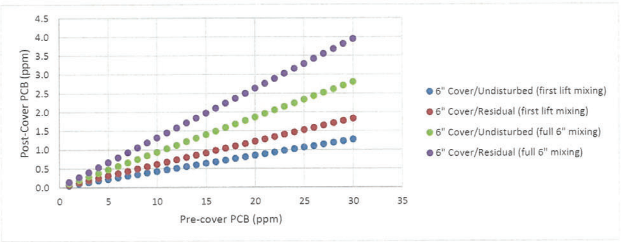
Dec 08, 2016 1:30pm dbinkney A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2016\Design\Caps\Residual Propwash\Additional Profiles Denmark-Util20\RESIDUAL PROPWASH EVAL 100 Series Markups 12082016.dwg D-17

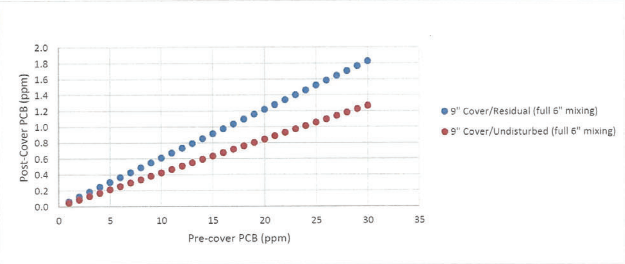
ATTACHMENT F

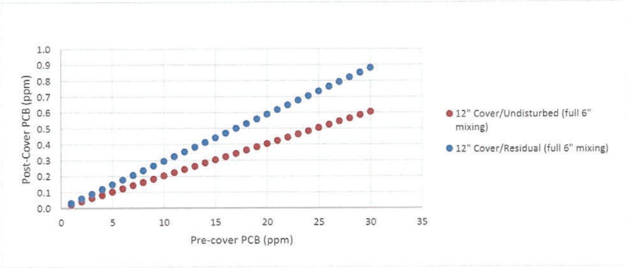
SAND MIXING LAYER CALCULATIONS AND CAP MODELING RESULTS FOR SAND WITH GAC

Sand Dry Den (kg/m³)	Undisturbed Dry Den (kg/m³)	Residual Dry Den (measured; kg/m³)	Lift Thickness	Sand PCB conc	Compliance Depth (inches)
1500	462	680	3	0	4

	First Lift Mixing Only		Full 6" mixing		Full 6" mixing		Full 6" mixing	
PCB Conc	6" Cover/Undisturbed (first lift mixing) Post-cover PCB (mg/kg)	6" Cover/Residual (first lift mixing) Post-cover PCB (mg/kg)	6" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	6" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)	9" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	9" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)	12" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	12" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)
1	0.042	0.061	0.093	0.131	0.042	0.061	0.020	0.029
2	0.084	0.122	0.186	0.263	0.084	0.122	0.040	0.059
3	0.126	0.182	0.279	0.394	0.126	0.182	0.060	0.088
4	0.169	0.243	0.372	0.525	0.169	0.243	0.080	0.117
5	0.211	0.304	0.466	0.656	0.211	0.304	0.101	0.147
6	0.253	0.365	0.559	0.788	0.253	0.365	0.121	0.176
7	0.295	0.426	0.652	0.919	0.295	0.426	0.141	0.205
8	0.337	0.487	0.745	1.050	0.337	0.487	0.161	0.235
9	0.379	0.547	0.838	1.181	0.379	0.547	0.181	0.264
10	0.421	0.608	**0.931**	1.313	0.421	0.608	0.201	0.293
11	0.464	0.669	**1.024**	1.444	0.464	0.669	0.221	0.323
12	0.506	0.730	1.117	1.575	0.506	0.730	0.241	0.352
13	0.548	0.791	1.210	1.707	0.548	0.791	0.262	0.381
14	0.590	0.852	1.304	1.838	0.590	0.852	0.282	0.411
15	0.632	0.912	1.397	1.969	0.632	0.912	0.302	0.440
16	0.674	0.973	1.490	2.100	0.674	0.973	0.322	0.469
17	0.716	1.034	1.583	2.232	0.716	1.034	0.342	0.499
18	0.759	1.095	1.676	2.363	0.759	1.095	0.362	0.528
19	0.801	1.156	1.769	2.494	0.801	1.156	0.382	0.557
20	0.843	1.216	1.862	2.625	0.843	1.216	0.402	0.587
21	0.885	1.277	1.955	2.757	0.885	1.277	0.423	0.616
22	0.927	1.338	2.048	2.888	0.927	1.338	0.443	0.645
23	0.969	1.399	2.141	3.019	**0.969**	1.399	0.463	0.675
24	1.011	1.460	2.235	3.151	**1.011**	1.460	0.483	0.704
25	1.054	1.521	2.328	3.282	1.054	1.521	0.503	0.733
26	1.096	1.581	2.421	3.413	1.096	1.581	0.523	0.763
27	1.138	1.642	2.514	3.544	1.138	1.642	0.543	0.792
28	1.180	1.703	2.607	3.676	1.180	1.703	0.563	0.821
29	1.222	1.764	2.700	3.807	1.222	1.764	0.583	0.851
30	1.264	1.825	2.793	3.938	1.264	1.825	0.604	0.880
31	1.307	1.886	2.886	4.069	1.307	1.886	0.624	0.909
32	1.349	1.946	2.979	4.201	1.349	1.946	0.644	0.939
33	1.391	2.007	3.073	4.332	1.391	2.007	0.664	0.968
34	1.433	2.068	3.166	4.463	1.433	2.068	0.684	0.997
35	1.475	2.129	3.259	4.595	1.475	2.129	0.704	1.027
36	1.517	2.190	3.352	4.726	1.517	2.190	0.724	1.056
37	1.559	2.250	3.445	4.857	1.559	2.250	0.744	1.085
38	1.602	2.311	3.538	4.988	1.602	2.311	0.765	1.115
39	1.644	2.372	3.631	5.120	1.644	2.372	0.785	1.144
40	1.686	2.433	3.724	5.251	1.686	2.433	0.805	1.173
41	1.728	2.494	3.817	5.382	1.728	2.494	0.825	1.203
42	1.770	2.555	3.911	5.514	1.770	2.555	0.845	1.232
43	1.812	2.615	4.004	5.645	1.812	2.615	0.865	1.261
44	1.854	2.676	4.097	5.776	1.854	2.676	0.885	1.291
45	1.897	2.737	4.190	5.907	1.897	2.737	0.905	1.320
46	1.939	2.798	4.283	6.039	1.939	2.798	0.926	1.349
47	1.981	2.859	4.376	6.170	1.981	2.859	0.946	1.379
48	2.023	2.919	4.469	6.301	2.023	2.919	0.966	1.408
49	2.065	2.980	4.562	6.432	2.065	2.980	**0.986**	1.437
50	2.107	3.041	4.655	6.564	2.107	3.041	**1.006**	1.467







290 Elwood Davis Road, Suite 340
Liverpool, New York 13088
315.453.9009

ANCHOR QEA

Memorandum

December 21, 2018

To: Paul Spillers and Terri Blackmar, Tetra Tech

From: Deirdre Reidy and Paul LaRosa, Anchor QEA, LLC

Re: Cap Modeling Results for SRA Caps

In the SRA Cap areas, it is understood that the cap material may mix with the underlying PCB-impacted sediments, which may necessitate amendment of the sand, as opposed to the use of sand without amendment for the caps originally designed for the site (with full armor layer). For the purposes of this evaluation, it was assumed that 1 foot of cap material (sand and gravel) mixes with 1 foot of underlying sediment. Mixing and partitioning analyses were conducted to identify the granular activated carbon (GAC) dose required to maintain concentrations below target levels within these areas (e.g., less than 1 parts per million [mg/kg or ppm] PCB in the top 6 inches of the mixed layer. Because activated carbon sorbs PCBs (the job of GAC is to adsorb PCBs, so by default, the bulk PCB concentrations in a layer containing GAC will be greater than 1 ppm, but not bioavailable or mobile), compliance cannot be assessed on the solid phase. Therefore, the target concentration of 1 ppm PCB was converted to an equivalent porewater concentration using equilibrium partitioning theory with a log KOC of 5.7 liters per kilogram (L/kg) and total organic carbon (TOC) of the cap material (basis for compliance of site caps). TOC values of 0.1%, 0.3%, 0.5% and 0.67% were evaluated for sand material, consistent with non-SRA caps previously modeled at the site. The resulting range of target porewater concentrations are presented in the following table.

Table 1
Target Porewater Concentrations Equivalent to 1 ppm Solid Phase PCB for Range of TOC in Cap Material

TOC (%)	Target PCB Porewater Concentration (µg/L)[1]
0.1	2.00
0.3	0.667
0.5	0.400
0.67	0.298

Notes:
% - Percent
µg/L – micrograms per liter
1. Porewater concentration equivalent to 1 ppm PCBs varies based on TOC present in the cap material according to equilibrium partitioning theory.

A mixing calculation was performed to calculate the PCB concentration within the mixed sediments and cap material using the TOC of sediments, TOC of sand/gravel, PCB concentration in top foot of sediments (for the depth of mixing), and an assumed concentration of 0 ppm PCB in the sand material. The calculation accounted for the thickness of sediment and cap layers and the bulk density of these materials. PCB concentrations in sediment were based on the average bulk PCB concentrations in the top foot of sediment. These concentrations are listed in Table 2. As a conservative upper-bound, the maximum PCB concentration within the sediment (all cores) collected from the SRA Cap areas (41.9 mg/kg PCB) was also evaluated.

Using partitioning theory, the GAC dose needed to reduce the PCB concentrations in the mixed layer to the target porewater concentrations (shown in Table 1) was quantified. Based on literature, GAC has been shown to be 10 to 100 times more sorptive than TOC; therefore, a conservative partition coefficient of 6.7 L/kg (using the factor of 10x, which is lower-end of the range) was used to represent partitioning of PCBs onto GAC. The results of this evaluation indicated that the mixing of sand and sediment is enough to reduce concentrations below target porewater concentrations for most cases simulated. For the worst-case scenario (assuming the maximum concentration measured in the core would mix with the sand/gravel cap material, regardless of the depth at which that concentration was measured), the GAC dose within the mixed layer ranged from 0 to 0.5% (by weight), specified to the nearest tenth of a percentage. To get that percentage in the mixed sand/gravel and sediment layer, 0 to 1.4% by weight GAC needs to be placed in the 6-inch sand layer, depending on the assumed TOC. This scenario is conservative in that it assumes the maximum concentration, which was measured below 1 foot) is present immediately beneath the cap prior to mixing.

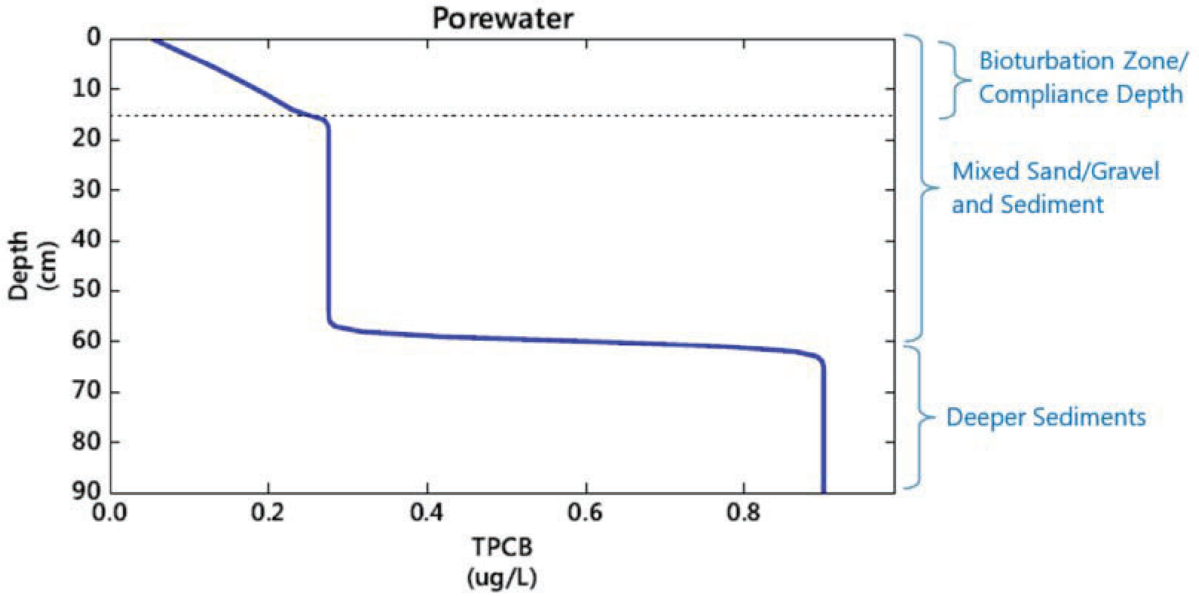
Table 2
Model Results for Caps in SRA-03, SRA-05, and SRA-07

SRA	Core	PCB Concentrations (mg/kg)		PCB Concentrations (µg/L)		GAC Required in 6-inch Sand Layer (% by weight)			
		Top Foot of Sediments	Max. below Top foot of Sediment	Mixed Layer	Max in Deeper Sediment	1.99 µg/L (0.1% TOC)	0.67 µg/L (0.3% TOC)	0.40 µg/L (0.5% TOC)	0.298 µg/L (0.67% TOC)
SRA-03	4061-231	10.1	14.9	0.211	0.320	0%	0%	0%	0%
SRA-03	4061.5-227	3.4	15.0	0.071	0.323	0%	0%	0%	0%
SRA-03	4061-233	2.8	0.56	0.058	0.012	0%	0%	0%	0%
SRA-03	4061-59	2.4	1.1	0.050	0.024	0%	0%	0%	0%
SRA-05	4065.5-17	3.4	1.9	0.071	0.041	0%	0%	0%	0%
SRA-05	4065.5-18	3.3	20.0	0.069	0.430	0%	0%	0%	0%
SRA-07	4065-15	3.5	41.9	0.073	0.901	0%	0%	0%	0%
All	Worst Case Scenario	41.9	41.9	0.87	0.901	0%	0.3%	0.8%	1.4%

Notes:
% – percent
mg/kg – milligrams per kilogram
µg/L – micrograms per liter

Although PCBs are not very mobile, transport processes that were considered when the PCB caps were first designed using the steady-state cap model were incorporated into this analysis. GAC doses quantified using the mixing calculation were then verified using Capsim, the cap model developed by Dr. Danny Reible (Texas Tech University), which is widely used across the United States. These model simulations account for additional PCB mass from underlying sediments that may be transported into the mixed sand/gravel and sediment layer over time (from advection/diffusion). Transport was simulated for 100 years, a typical cap design time frame. Modeling indicated that the GAC doses identified in the mixing/partitioning calculation were more than enough to meet the target porewater criteria for more than 100 years. The rate at which PCBs from deeper sediments transport into the mixed layers is slower than the rate of mixing (e.g., bioturbation) and advective flux out of the mixed layer into the water column; thus, over time, the modeling indicated the concentrations in the top 6 inches of the mixed sand/gravel and sediment mixed layer decreased. The figure below shows the concentration within the mixed sand/gravel and sediment and deeper sediments at the end of the 100-year simulation.

Figure 1
Depth profile of PCB concentrations after a 100-year simulation for Worst Case Scenario simulation, assuming 0.67% TOC in cap material.



In each scenario, GAC is not necessary; however, based on the sensitivity analysis, using worst case criteria, it is recommended that 1.4% by weight GAC be placed. Sufficient conservatism has been accounted for in the analysis.

ATTACHMENT G

STANDARD OPERATING PROCEDURE FOR GRANULAR ACTIVATED CARBON SAMPLE COLLECTION AND TESTING

STANDARD OPERATING PROCEDURE
GRANULAR ACTIVATED CARBON (GAC)
SAMPLE COLLECTION AND TESTING

LOWER FOX RIVER
GREEN BAY, WI

Prepared by:
Tetra Tech EC, Inc.

Prepared for:
Tetra Tech EC, Inc.
Lower Fox River Remediation Project

Document Control Number: LFRR-18-0298

December 31, 2018

Prepared/Revised By	Reviewed By	Date
Paul Spillers	Bjorn Lysne	
	Brandon Weston	

ACRONYM LIST

AET	American Engineering Testing, Inc.
ASTM	ASTM International
C	Celsius
GAC	Granular Activated Carbon
GPS	Global Positioning System
PPE	Personal Protective Equipment
RTK	Real Time Kinematic
SHSP	Site Health and Safety Plan
SOP	Standard Operating Procedure
SRA	Special Remediation Area

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the collection of samples of the granular activated carbon (GAC)-amended sand layer from special remediation area (SRA) caps and the testing of these samples for percent GAC by dry weight. The purpose of this SOP is to describe the sampling and testing methods to be used to determine the amount of GAC within the carbon-amended sand layer. Measurement of the sand layer thickness is not a part of this SOP. Layer thickness evaluations will be conducted by bathymetric survey, using evaluation methods employed for sand cover or cap layers without GAC.

This SOP is applicable for SRA caps over utilities or in other caps or covers on the Lower Fox River project requiring GAC amendments. Pre-placement (ex-situ) and post-placement (in-situ) amended sand in the SRA caps will be tested for GAC content. Pre-placement samples will be collected in substantial conformance with ASTM International (ASTM) Standard Method D75-14: Standard Practice for Sampling Aggregates. Post-placement samples will be collected from catch pans as described herein. GAC content measured as a percent of dry weight of sample will be determined using a thermal drying method.

2.0 EQUIPMENT AND SUPPLIES

This section contains a list of equipment that may be used to complete the procedures in this SOP, including the following:

- Vessel (sampling platform) that complies with State of Wisconsin and U.S. Coast Guard regulations with a minimum of 3 anchors or two anchoring spuds
- Real Time Kinematic (RTK) Global Positioning System (GPS) with horizontal accuracy of ± 1 meter
- Catch pans for sample collection (including retrieval system and buoys)
- 5-gallon buckets with lids
- Permanent marker
- Steel ruler to record or other measurement device to determine the sand thickness in catch pans
- Oven with capability to reach a temperature of 620º Celsius (C)
- No. 10 sieve (Actual size of sieves will depend on the gradation of the GAC)
- No. 50 sieve
- Duct tape
- Chain-of-custody forms
- Field notebook
- Appropriate personal protective equipment (PPE) in accordance with the site health and safety plan (SHSP)

3.0 PRE-PLACEMENT SAMPLE COLLECTION PROCEDURES

Samples of the sand only and sand/GAC mixture will be collected from the J.F. Brennan land plant using a modified version of ASTM Standard Method D75-14: Standard Practice for Sampling Aggregates as described below:

1) Sand only and GAC-amended sand samples will be collected in clean 5-gallon buckets using procedures described in ASTM D75-14-Standard Practice for Sampling Aggregates. At least 20 pounds of sand and GAC amended sand will be collected for each sample tested. The GAC amended sand sample will be collected from the conveyor. Sand-only samples will be collected from the active face of the loadout stockpile and tested to determine the quantity of naturally occurring organics (carbon) in the sand. The following procedure will be used to collect the conveyor belt sample:
    a. Obtain at least three approximately equal sample aliquots, selected at random, from the conveyor belt using an appropriately sized container, per ASTM D75-14. Samples can also be collected from the production stream, if accessible.
2) Label the buckets with a unique sample identification. Record the date and time of sample. Record the sample collection in a field notebook or similar. Document the sample on a chain-of-custody

form. The sample bucket and accompanying chain-of-custody form will be delivered to American Engineering Testing, Inc. (AET) in Green Bay, Wisconsin.

4.0 POST-PLACEMENT SAMPLE COLLECTION PROCEDURES

Post-placement samples will be collected in catch pans. A total of four catch pans will be placed to evaluate the variability of GAC content across each SRA cap. The samples will be collected in catch pans, using the following procedures:

1) Catch pans shall be constructed of 0.5-inch thick transparent acrylic plastic with the following internal dimensions: 24 inches square by 18 inches high.
2) Catch pans will be placed in the river at A/OT-approved sample locations prior to placement of GAC-amended sand. The coordinates for each pan location will be recorded when placed. If the catch pans are placed on a slope, the appropriate stabilizing subframe shall be used.
3) Following placement of the GAC-amended sand layer, the vessel will retrieve each pan from the bottom of the river using the cable float and hook method (similar to armor stone bucket retrieval).
4) Sand thickness will be measured in each catch pan by taking an average thickness to the nearest 0.1 foot from two measurements from each side of the pan (i.e. an average of 8 individual measurements per pan).
5) Photographs will be taken from the top and 4 sides of the catch pan. Each photograph will be labeled appropriately in the field.
6) Transport the catch pans to the processing area.
7) Place each sample in a clean 5-gallon bucket. Provide a unique sample ID for each sample.
8) Record sample collection notes in field log book and record laboratory samples on a chain-of-custody form.

Field notes will be stored in a log book or worksheet. The documentation will include the following:

- Sample identification
- Sample location GPS coordinates
- Date of sample collection
- Names of field personnel collecting and handling the samples
- Names of oversight personnel
- Observations to include, but not be limited to, weather conditions, unusual circumstances, or deviations to sampling method
- Thickness measurements of sample in catch pan
- Note whether GAC was observed in the sample
- Date sample shipped to laboratory

5.0 TESTING FOR GAC CONTENT BY PERCENT DRY WEIGHT

Thermal testing will be conducted using criteria specified in ASTM D2974: Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils by Method A for moisture content (or ASTM D2166 Standard Test Methods for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass. The sample procedure is described below:

1) Use a riffle splitter to reduce the sample size to approximately 5 pounds. Weigh the sample.
2) Dry the sample in an oven heated to 110º C.
3) Record the weight of the dried sample.
4) Process the oven-dry sample through a U.S. Standard No. 10 sieve and a U.S. Standard No. 50 sieve. Sieve sizes may be adjusted, depending on the grain size of sand and GAC used.
5) Weigh the portion of the sample passing the No. 10 sieve and retained on the No. 50 sieve. Place this portion in an oven heated to 440º C (ASTM D2974 Method C) to burn off naturally occurring organics typically found in the sand aggregate. The sample shall remain in the oven for a minimum of

three hours. NOTE: If the sample is a sand only sample, the test will be complete, and the percent of natural organics can be determined for the sand source.

6) Weigh the sample again. The difference in mass between the pre-oven (step 5) and post-oven sample (step 6) will be reported as the dry weight of naturally occurring organics. The weight from this step will include a correction factor for natural organics that will remain after this step, based on the testing of control (i.e., sand only) samples.
7) Place the sample in an oven at 620º C to burn off GAC. The sample should remain heated for a minimum of three hours or until GAC is no longer visible in the sample.
8) Weigh the sample again. The difference in mass between the mass in step 6 and this step (step 8) will be the mass of GAC. Determine the GAC content on a percent by weight basis, based on the mass relationships using dry weight results of the total sample (measured in step 3) from the sample masses prior to and after heating to each temperature, while factoring in inherent background organics and ash correlation, to be developed during ongoing control sample testing.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Entries in the field forms will be double-checked by the field team staff to verify that the information is correct. It is the responsibility of the Field Lead to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

The thickness of the sand in the catch pans will be monitored to verify the thickness is within 10% of the planned sand layer thickness.

Four discrete samples will be collected from each SRA cap. When the GAC proportions have been determined from the four samples, the average GAC percentage in the SRA cap will be determined using a mathematical average of the GAC content from the individual samples. The GAC percentage based on the mathematical average of the individual samples will be used to report a single GAC content for each SRA cap.

7.0 REFERENCES

ASTM International (ASTM). 2014. *ASTM D75-14-Standard Practice for Sampling Aggregates.*

ASTM. 2014. *ASTM D2974-14-Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils by Method A for moisture content (or ASTM D2166 Standard Test Methods for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass)*

ATTACHMENT H

NOTES FROM MEETINGS WITH THE GREEN BAY WATER UTILITY AND THE USACE

Lower Fox River Remedial Action OUs 2-5
Notes from Work Group Meeting – Utility #020 SRA Cap
Document Control Number: LFRR-18-0062
March 12, 2018
Page 1 of 4

Attendees

Tetra Tech	**Foth**
Terri Blackmar	Troy Gawronski
Paul Spillers	
George Willant	**Green Bay Water Utility**
Ben Hendron	Brian Powell
Rich Feeney (by phone)	
	U.S. Army Core of Engineers
Agencies/Oversight Team	Jonathon Imbrunone
Gary Kincaid	
George Berken	**J.F. Brennan**
Larry DeBruin	Dustin Bauman
Anchor QEA	**Lower Fox River Remediation LLC**
Dan Binkney	Jeff Lawson
Matt Carlino	

Prepared by: Ben Hendron

Reviewed by: Terri Blackmar

A meeting was held on February 28, 2018 to discuss the special remediation area (SRA) caps proposed for utility #020. The meeting was attended by the individuals listed above, which included representatives of Green Bay Water Utility (GBWU) and the U.S. Army Corps of Engineers (USACE). GBWU is the owner of the pipeline referred to as utility #020.

Terri Blackmar (Tetra Tech) started the meeting by describing the constraints that exist around developing a remedial dredge design for utility #020. This is a 2-foot diameter steel pipeline that was installed in 1961 and trenched into the sediment. This was during the period when polychlorinated biphenyls (PCBs) were being discharged into the river. Tetra Tech subcontracted two utility location service companies, Marine Engineering Services Company (MESCO) and Depth of Cover (DoC) Mapping, to perform utility location services for this pipeline. DoC Mapping and MESCO located the line and established 95 percent probability limits around the line, which provide confidence as to the utility location. To allow dredging around the pipeline, a 5-foot buffer was established upstream and downstream of utility #020, as well as above the utility. Within the 5-foot buffer, sediment is assumed to be contaminated with PCBs that exceed the 1 ppm PCB remedial action level (RAL). In addition, the utility dredge used for dredging close to utilities can only dredge 30 feet below the water line. This means that, based on recent water elevations of approximately 580 feet North American Vertical Datum of 1988 (NAVD88), the dredge can only reach roughly elevation 550 feet NAVD88. There are other dredges that can reach

lower than the utility dredge, but they will not work within 25 feet of the utility due to the risk of damaging the pipeline. With these factors in mind, a cap has been proposed after the utility dredge has removed as much sediment exceeding the 1 ppm PCB RAL as possible. However, there are constraints on installing a cap over the utility as well. The navigation channel is authorized down to an elevation of 553.6 feet NAVD88 (e.g. a 24-foot depth below the low water elevation of 577.6 feet NAVD88), with a 2-foot additional buffer for cap placement. Propeller wash (propwash) from commercial shipping vessels would cause the required stone size to be very large, which would likely infringe on the 2-foot buffer.

Drawings that included cross sections were presented to show the no-dredge buffer zone around the pipeline and the area proposed for capping. Photographs of the equipment used to dredge around the pipeline were also presented and discussed. Terri also mentioned that a meeting was held with the GBWU in 2015 to discuss the utility, and at that time GBWU indicated that two feet of cover was required over the pipeline after dredging, with stone no larger than gravel. She also stated that the Design Team hoped to get concurrence from the USACE and GBWU regarding the design for the SRA caps over this utility, since capping is planned for utility #020 early in the season.

The Agencies/Oversight Team (A/OT) inquired about the pipeline's longevity and if GBWU had any plans for replacing the line. Brian Powell (GBWU) replied that they fully expect the utility to be in service for the foreseeable future, and have no plans of replacing it any time soon. They are not comfortable with large stone being placed on top of their pipeline, which was clarified to be rip rap size stone. Brian provided the following explanation for this request. When holes are found in their pipelines, the first option for repair is sending a diver down to install a steel sleeve on the outside of the pipe to stop the leak. Any stones larger than a diver could move with their hands would cause a problem for the diver trying to access the pipeline. This type of repair was used in the mid-90s to repair a leak in the pipeline. If necessary, the next option for repair of this pipeline would be to install a liner inside the pipeline. Only after these two options are explored, would GBWU explore directionally digging a new pipeline.

The group's attention was then directed to the cap exhibits in the conference room, which show the sand and stone layer thicknesses and stone size used for A, B and C caps. Gary Kincaid (A/OT) inquired as to the USACE's opinion on the depth to the top of cap in the navigation channel, which is proposed to be 25 feet below the low water datum of 577.6 feet NAVD88. This is no higher than elevation 552.6 feet NAVD88. Jon Imbrunone (USACE) replied that he would need to confer with the Director of the Port of Green Bay, Dean Haen, and vessel operators before any decisions can be made. Gary remarked that Dean Haen has already made it known that he does not want any caps in the navigation channel. Jon stated that generally the elevation of the top of a cap should be 2 feet below the authorized navigational depth, but 3 feet is preferred. Sand is the most preferable cap material, but stone as large as 6 inches in diameter may also be acceptable. Larger stone has the potential to damage vessels. A 9-inch stone can cause just as much damage as a 12-inch stone, so avoiding the use of larger stones is generally preferable. Jon agreed that larger stone

could be used if placed more than 2 feet below the authorized navigation channel depth, although this was not ideal. He will discuss this with Dean Haen and the vessel fleet operators, and let us know their position. Jon also mentioned that dredging is performed at a 2:1 slope out from the navigation channel limits, and placing large stone on these slopes is also a concern unless the stone is at least 2 feet below the slope, to provide a buffer. These slopes should also be shown on drawing where future USACE dredging would occur. In most situations where a remedial cap is suggested in a navigation channel, Section 408 paperwork is submitted. Gary Kincaid replied that the LFRR project is a Superfund site and, therefore, is exempt from that permitting process. However, the substantive requirements of Section 408 still need to be met. This meeting serves as one means of communication to meet the requirements for the Section 408. A technical memorandum (tech memo) and design has been developed and will be distributed to stakeholders to gain acceptance or "no objection" from all involved parties.

Gary Kincaid explained that the Agencies would prefer to place a cap that is more robust than the minimum 1.5- to 2-foot thick SRA cap. He also mentioned that the Agencies were informed that Dean Haen (Port of Green Bay) does not want caps in the navigation channel in OU 4. Gary requested that the USACE provide a map showing the 2:1 slope areas where future USACE dredging would occur. Gary suggested that the proposed designs be sent to GBWU and the USACE for final review and commenting. The objective is to receive acceptance from the USACE and GBWU for the caps proposed over utility 20, or at least a notice of no objection to these caps.

George Willant (Tetra Tech) mentioned that Paul Spillers (Tetra Tech) received an email from Jon Imbrunone regarding a possible increase in the authorized depth of the navigation channel to 27 feet. Jon mentioned that, during the 1980s, Congress authorized a 27-foot navigation channel depth; however, funding was never appropriated. This authorization still exists and is valid to study deepening the channel to 27 feet. The inquiry originated from the office of Senator Tammy Baldwin, and included an inquiry about the presence of caps in the navigation channel. It's likely that a stakeholder has been requesting that Senator Baldwin's office support this proposal. The Senator's office asked if there have been any caps installed north of the Canadian National Railroad (CNRR) bridge. No caps have been installed in that stretch of river to date, but, under the proposed design, SRA caps will be installed over some utilities in 2018.

George Willant stated that, as Tetra Tech moves down river with the remedial action, tech memos and designs are being developed for each cap including those over utilities in the navigation channel. All interested parties will have a chance to comment and sign off on these caps. George Berken (A/OT) noted that it's possible that the USACE could dredge out the caps later, if necessary.

Jon Imbrunone stated that utilities and bridges typically present challenges for changing the navigation channel depth, so he's not overly concerned about the Baldwin inquiry. George Berken (A/OT) noted that this could now become a political issue, so would need to be discussed with WDNR management. Jon offered to send the request to the WDNR and do some investigating

into the inquiry. He has sufficient information now to address the inquiry from Baldwin's office. He will also get input from Dean Haen and vessel fleet operators.

Brian Powell (GBWU) stated that sand and stone, up to 6-inch diameter, would be acceptable to GBWU, if needed. In a post-meeting side bar conversation with Tetra Tech personnel, Brian emphasized, however, that the stone cannot be in contact with the pipe. He also stated that a leak detection survey was performed recently, which did not identify any leaks in the pipeline.

Action items from the meeting include the following:

- Jon Imbrunone will get feedback from the Port Authority and vessel operators regarding acceptable stone size for caps in the navigation channel, and get back to Tammy Baldwin's office regarding the caps.
- Tetra Tech will finalize the dredge design (including LLC and A/OT reviews) by 3/26/18.
- A tech memo will be submitted that includes the dredge design surface, proposed cap footprints, and cross sections. This memo will be provided to the USACE and GBWU for review.
- Tetra Tech will provide all remaining SRA cap locations to the USACE.

Blackmar, Terri

From:	Feeney, Richard
Sent:	Thursday, December 17, 2015 9:43 AM
To:	Brian Powell (BrianPo@greenbaywi.gov); 'PaulPa@ci.green-bay.wi.us'; 'NancyQu@greenbaywi.gov'
Cc:	'Kincaid, Gary W - DNR'; 'Jay.Grosskopf@Boldt.com'; 'George.Berken@boldt.com'; 'Ava.Grosskopf@Boldt.com'; 'Larry.Debruin@Boldt.com'; 'Jeffrey Lawson'; 'Susan O'Connell'; Bryan Heath (Bryan.Heath@ncr.com); Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com); Dustin Bauman (dbauman@JFBRENNAN.COM); Coleman, Bill; Willant, George; Blackmar, Terri; Tabatabai, Morey; Gifford, Ricky; 'dbinkney@anchorqea.com'; Paul LaRosa (plarosa@anchorqea.com); ECI.LFRR Project Correspondence; Nelson, Shane
Subject:	Notes from Yesterday's Meeting with the Green Bay Water Utility (GBWU)

Hi Brian, Paul and Nancy. Thanks again for meeting with a few of us from the remediation project yesterday. Following are some brief notes from that meeting. Please let us know if anything is incorrect, requires clarification or if anything of importance is omitted.

On December 16, 2015 Troy, Dustin, Gary and I met with Brian Powell, Paul Pavlik and Nancy Quirk of the GBWU. Nancy is the General Manager who we had not met with previously but we have done so with Brian and Paul several times.

The primary purpose of the meeting was to obtain utility owner feedback on minimum post dredge cover required for water supply lines after remediation. This primarily concerns places where we may use the diver assisted dredging concept being developed by Brennan.

Brian said that, based on the installed depth of utility #045, which is the northern most water line and was installed via directionally drilling, GBWU has no concerns about us dredging as required across it. Based on the LOS neat line surface, the required dredge cuts over this utility are not deep. So there should be no concerns about working over utility #045 provided Brennan can safely spud around it.

Nancy said she had been in contact with a WDNR person in Madison about utility regulations (I missed her name but Gary knew of her). Nancy was told that there is a code requirement to have at least two feet of cover over GBWU's water lines.

So the GBWU's position is that, in any locations where our dredging would result in less than two feet of post dredge cover, the project should restore the required minimum cover depth. If we were to do so, Rich suggested using sand but the GBWU said they prefer for us to use gravel. Initially Gary said that the sand might not remain stable but Troy pointed out that it should be more stable than the sediment that was dredged and it would replace. So there was no firm decision on whether we would actually backfill over any water lines that get dredged over and, if so, what would be used for this purpose.

In any cases where there is presently more than two feet of cover over a water line, the GBWU stated their preference for having the project restore the existing cover depth after dredging. For example, if there is 5 feet of cover and we dredged two feet, leaving three feet of cover, the GBWU would want us to restore the cover to five feet after remediation. Gary said the A/OT would likely not require the project to do this but it is possible the GBWU may want to pay for this work to be performed, or this could be an opportunity for cost sharing between the project and the GBWU.

Richard J. Feeney, P.E. | **Vice President, Project Engineering**
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George Berken

From: George Berken
Sent: Monday, October 29, 2018 4:23 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Gary Phelps; george.willant@tetratech.com; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Luke Vandenberg; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Paul Spillers; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; terri.blackmar@tteci.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: 764. 87500 OU2-5 - FW: LFRR-18-0094 Design Review Document, SRA 06 Cap, additional work/Revisions to approved plan
Attachments: ANC-2018-DUTIL020 Cap-010262018-No-Vert-Sectionsr9.pdf

Morey, on behalf of the Agencies, the SRA-06 cap revisions, submitted in your email below, are acceptable.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Monday, October 29, 2018 1:59 PM
To: George Berken <George.Berken@boldt.com>; Kincaid, Gary W - DNR (Gary.Kincaid@wisconsin.gov) <Gary.Kincaid@wisconsin.gov>; Larry DeBruin <Larry.Debruin@Boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: bryan.heath@ncr.com; jlawson@project-control.com; soconnell@project-control.com; 'Troy.Gawronski@Foth.com' <Troy.Gawronski@Foth.com>; bill.coleman@tetratech.com; george.willant@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; bjorn.lysne@tetratech.com; ricky.gifford@tetratech.com; brandon.weston@tetratech.com; ben.hendron@tetratech.com; Spillers, Paul <Paul.Spillers@tetratech.com>; eci.lfrrpc@tetratech.com
Subject: LFRR-18-0094 Design Review Document, SRA 06 Cap, additional work/Revisions to approved plan

George,

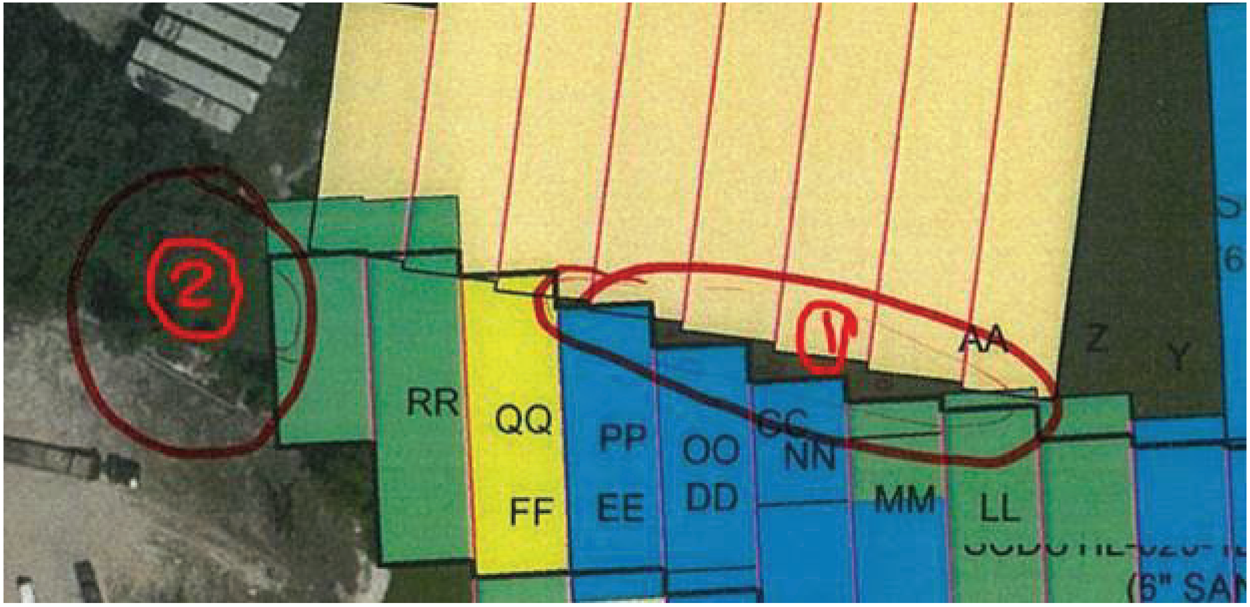
As you recall, early last week, we met regarding Utility 20 area, lane layouts and A/OT 10-25 email decision related to post dredge at Dutil20-1AR2. Items 1 and 2 have been addressed (your email of 10/29 to Ricky).
Item 3 was also addressed last week with Dustin and JFB to continue placing the 1.5" rock.
What remains is item 4 below and attached design revision is intended to capture the last of A/OT concerns on Dutil 20 area. Design revisions are at:

? Northwest corner of SRA-06 cap is extended north to include area of Dutil-20-1AR2 that did not pass high subgrade (no caption is shown below).

? At the east end, design is extended easterly to shoreline.

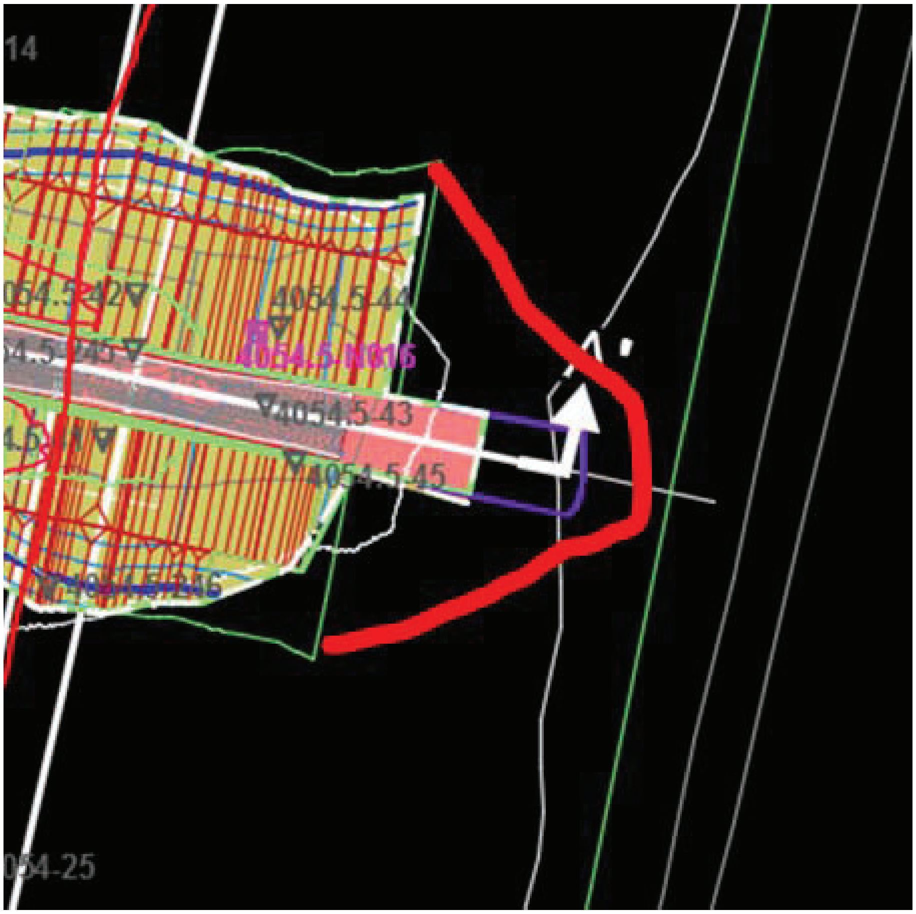
Both extension areas are transitioned from 5 feet down to 2 feet minimum of SRA cap.
With your agreement we will forward the changes to the field for implementation.

1. There is a need to complete the Dutil-20-1AR2 with 9 inches of sand on the north to join the existing 6 inch lanes in D39-3
2. Same 9 inch thickness applies to the west of the lanes already placed (to the RA boundary). This area may be difficult to place sand by spreader and Larry agreed with attempting to spray 9 inches.



3. JFB can continue placing 1.5 inch rock from east to west but complete 9 inch sand item 1 above before moving into DMU-1A with rock.

4. Tetra Tech to revise SRA06 cap and extend design to east shoreline, to the east of already placed cap. An extension/revision to the approved design because shoreline is further east and existing design did not extend all the way to the shoreline.



Thank you

Morey Tabatabai, Design/Field Engineer
morey.tabatabai@tetratech.com
Fox River Green Bay, WI Project Office | Direct: **920.455.1077**| Cell: 720-394-3473 | Fax: 920.445.0719
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Think Green - Not every email needs printed

George Berken

From: George Berken
Sent: Tuesday, December 18, 2018 2:30 PM
To: Bill Hartman; Bryan Heath; Jeff Lawson; John Heyde; Paul Montney; Roger Kaminski; Susan OConnell; Ben Hendron; Bill Coleman; Bjorn Lysne; Brandon Weston; Cynthia Jones; Dan Binkney; Denis Roznowski; ECI; Eric Bauer; Gary Phelps; George Willant; Hugh Kinnard; Joe Francis; Luke Vandenberg; MIchelle Miller; Morey Tabatabai; Paul LaRosa; Paul Spillers; Rhonda ChierVerhagen; Richard Feeney; Ricky Gifford; Tara Van Hoof; Terri Blackmar; Troy Gawronski; Dan Huycke; Dustin Bauman; Greg Smith; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: 713. 87500 U2-5 - FW: LFRR-18-0045A-R1: Tech Memo on Design of SRA-6 in Utility 020
Attachments: Attachments

Terri, on behalf of the Agencies, the technical memorandum, submitted in your email below for SRA-06 in DUTIL-020, is acceptable.

Thanks<
George...

Citrix Attachments Expires June 16, 2019

FINAL Tech Memo_Proposed Remedy at D...418.pdf 5.2 MB

Download Attachments

George Berken uses Citrix Files to share documents securely.

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SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Friday, August 24, 2018 1:12 PM
To: George Berken <George.Berken@boldt.com>; bryan.heath@ncr.com; jheyde@Sidley.com; jlawson@project-control.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; william.hartman@glatfelter.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com;

eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; george.willant@tetratech.com; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>; Spillers, Paul <Paul.Spillers@tetratech.com>
Cc: AgenciesLFRTeam <AgenciesLFRTeam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 713. 87500 U2-5 - FW: LFRR-18-0045A-R1: Tech Memo on Design of SRA-6 in Utility 020

George,

The draft final Tech Memo describing the SRA-6 cap design for DUTIL-020 has been uploaded to the FTP Site for A/OT review, and a final pdf version is also attached. The files can be accessed as follows:

Folder: /Tech Memo – Design of SRA-6 Cap in DUTIL-020/

A/OT review .ftp Site Access Instructions:
Please utilize the following link (From the Windows START MENU: Select **Start then Run** and **Cut/Paste** the following line in the "*Open*" field and select "*OK*"):
%systemroot%/explorer ftp://040179-aot%40040179-aot:foxtail07@ftp.anchorqea.com/

For manual login from a browser:
ftp://ftp.anchorqea.com
This will launch a “Log on As” window. (Right-click on the window, and enter the following info in the username and password fields)
Username: **040179-aot@040179-aot** (this refers to the particular FTP user account @ the FTP project name)
Password: **foxtail07**

This is the final distribution of this memo, unless there are any further questions or comments.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
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Terri.Blackmar@tetratech.com

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From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, August 15, 2018 1:26 PM
To: bryan.heath@ncr.com; jheyde@Sidley.com; jlawson@project-control.com; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; william.hartman@glatfelter.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn

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Cc: AgenciesLFRTeam <AgenciesLFRTeam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 713. 87500 U2-5 - FW: LFRR-18-0045A: Tech Memo for SRA-6 in Utility 020

Terri, on behalf of the Agencies, the technical memorandum (TM), submitted in your email below for SRA-6 Capping DUTIL-020, is acceptable with the comments shown below being adequately addressed. Note, the RLSO of these comments are also attached. Modify the TM per the comments and submit in draft final form.

Comments:

1. A/OT Comment 2018-08-15: Opening section, second paragraph; Change “3:1 slope” to “5:1 slope”.
2. A/OT Comment 2018-08-15: Section - Proposed Remedy for the Utility 020 Corridor in a High Propwash Impact Area, second paragraph; Change the second use of “a *minimum*” to “*an average*”.
3. A/OT Comment 2018-08-15: Attachment E; Update drawings to reflect the most recent design(s).

Thanks,
George…

BOLDT

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SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Friday, August 10, 2018 10:28 AM
To: Ava Grosskopf <Ava.Grosskopf@boldt.com>; George Berken <George.Berken@boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Kincaid, Gary W - DNR <Gary.Kincaid@wisconsin.gov>; Larry DeBruin <Larry.Debruin@Boldt.com>
Cc: bjorn.lysne@tetratech.com; Spillers, Paul <Paul.Spillers@tetratech.com>; bryan.heath@ncr.com; jlawson@project-control.com; 'soconnell@project-control.com'; Troy Gawronski <Troy.Gawronski@Foth.com>; bill.coleman@tetratech.com; george.willant@tetratech.com; ben.hendron@tetratech.com; dbinkney@anchorqea.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; Matt Carlino <mcarlino@anchorqea.com>;

morey.tabatabai@tetratech.com; plarosa@anchorqea.com; eci.lfrrpc@tetratech.com; michelle.miller@tetratech.com
Subject: LFRR-18-0045A: Tech Memo for SRA-6 in Utility 020

Hi George,

Attached is the Technical Memorandum - Remedy Design for the Special Remediation Area (SRA)-6 Cap in Utility 20 Corridor for the SRA, which includes the design for the proposed SRA cap over utility 20. We have also included information from the OTS meetings held recently to discuss this cap.

Please review this tech memo and let me know if you have any questions or comments.

Thanks,

Terri

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TETRA TECH EC, INC

Technical Memorandum

To: Gary Kincaid, George Berken, Jay Grosskopf and Larry DeBruin (A/OT)

From: Terri Blackmar, Morey Tabatabai, Ricky Gifford, and Ben Hendron (Tetra Tech), Paul LaRosa (Anchor QEA)

CC: Jeff Lawson and Sue O'Connell (PCC, for the LLC), Bryan Heath (LLC), Troy Gawronski (Foth), Paul Montney and Roger Kaminski (GP), Bill Hartman (P.H. Glatfelter), Bill Coleman, George Willant, and Richard Feeney (Tetra Tech), Dustin Bauman (JF Brennan), Dan Binkney (Anchor QEA)

Date: August 15, 2018

Re: Remedy Design for Special Remediation Area (SRA)-6 Cap in Utility 020 Corridor

Document Control Number: LFRR-18-0045A-R1

This technical memorandum provides the basis for the proposed remedial design in utility area number 20 (utility 020), which is referred to on the 2018 Remedial Action Work Plan (RAWP) drawings as dredge area DUTIL-020. Utility 020 is an active 24-inch steel water line, believed to have been installed using an open trench and placement method based on information obtained from Green Bay Water Utility (GBWU). This utility is owned by the City of Green Bay through the GBWU. This utility was installed in 1961, so the trench area likely includes contaminated sediment, even if this has not been observed in cores nearby. Very few cores were installed within the narrow width of the trench, estimated to be approximately 12 feet, because of the desire to avoid damage to the pipeline.

As explained below, it was not feasible to consider installation of a standard engineered cap as a remedy where utility 020 crosses the navigation channel, with resultant prop wash impacts and likely noncompliance with the post-cap water depth requirement. A utility buffer zone was established 25 feet upstream and downstream of the utility line that pertains to dredging with hydraulic dredges. Within this zone, dredging can only be performed with a specialized utility dredge, and only to maximum depth of 30 feet. Assuming the water is at elevation 580 feet North American Vertical Datum of 1988 (NAVD88), the dredge elevation corresponding to this depth is approximately 550 feet NAVD88. This allows dredging in closer proximity to the utility but will still leave some sediment exceeding the 1 ppm PCB RAL un-dredged in close proximity to the utility. In this area, the dredge design is based on a secondary horizontal buffer that equals 5 feet plus a horizontal deviation of 3.42 feet determined by the utility locate subcontractor, plus the radius of the pipe. This horizontal buffer is shown on the project drawings where applicable on the north and south sides of the pipeline alignment. A five-foot vertical buffer is also shown above the pipeline to minimize the potential for damaging the pipeline during dredging. The remedy for this utility corridor area is therefore dredging up to the limits defined by the buffer zones. In any areas extending beyond the larger 25-foot buffer zones, sediment that exceed the 1 ppm polychlorinated biphenyl (PCB) remedial action level (RAL) will be dredged to the neat line. Where sediment that exceeds the 1 ppm PCB RAL remains in the utility corridor following dredging the area is identified as "special remediation area-6" (SRA-6) and the area will be capped using a cap designed specifically for this area. This SRA extends over most of the utility corridor alignment and may extend up to 25 feet upstream and downstream from the utility, before sloping at a 5:1 slope to the final dredge elevation just outside the area. This utility corridor will be remediated on an exception basis, subject to approval by the Agencies/Oversight Team (A/OT). The remedy for an SRA is not defined in the 2003 Record of Decision (ROD) or in the 2007 ROD Amendment, but these RODs do allow for "exceptional areas" such as this to be treated as a special case. Where the pipeline trench alignment is far enough from the navigation channel to allow a standard cap, with utility owner acceptance, a standard cap will be designed.

Background

During the 60 Percent Design phase for the OUs 2-5 project, no-action setbacks were established around utilities to avoid risk of damage and/or safety concerns during remediation in these areas. Concerns were based on potential risks associated with the dredge cutterhead or marine equipment spuds impacting the utilities, as well as potential injury to personnel. At that time, the utility locations were approximate based on desk-top searches for as-built drawings and had not been field located. Specific ground rules for design were established during the 60 Percent Design with placeholder offsets ranging from 25 to 50 feet based on the accuracy of the utility location information and the risk posed by the sediment contamination.

Following additional sampling that provided information regarding PCB concentrations in sediment near many of the utility crossings, the A/OT requested that utility locations be determined with greater confidence so that remediation could be performed as close to the utility as possible. Tetra Tech had many meetings with utility owners and requested as-built drawings from these owners as the initial step in this process.

In 2012, and again in early 2015, Tetra Tech retained the Marine Engineering Systems Company (MESCO) to field locate several of the utilities. Following that effort, later in 2015, Tetra Tech retained Depth of Cover (DoC) Mapping to locate more accurately most of the utilities as part of further planning for remedial action in these areas. In 2017, J. F. Brennan (Brennan) elected to perform yet additional field location efforts involving the use of its divers. As a result of these additional location efforts, the utility locations in OU4 have been located with greater confidence, including the location of utility 020. A 50-foot buffer zone remained in place following this mapping, although the Agencies required remediation within this zone that could be performed safely to the extent practicable. Brennan subsequently determined that dredging could be performed to the previously-described horizontal and vertical offsets from the pipeline, using the special equipment described below.

On February 28, 2018, a work group meeting was held with representatives of the U.S. Army Corps of Engineers (USACE), Mr. Jonathon Imbrunone, and GBWU, Mr. Brian Powell. During this meeting, Mr. Imbrunone was asked to provide information regarding the USACE's preferences for the following: 1) the buffer zone depth to be added below the authorized navigation channel depth, to the top of cap surface; and 2) the stone size to be used for cap armoring. On March 14, 2018, Mr. Imbrunone emailed the requested information to Mr. Paul Spillers (Tetra Tech). According to Mr. Imbrunone, the USACE's preferences are for a minimum 2-foot buffer below the authorized channel depth, and for a smaller stone size.

As a follow-up to the February 28th meeting, an over-the-shoulder meeting was held with the A/OT on March 15, 2018 to discuss the information provided by Mr. Imbrunone. During that meeting, the A/OT stated that the use of small stone, with a D_{50} of 1.5 to 3 inches, would be acceptable for the SRA caps, and the top of cap should be designed to be no higher than elevation 551.6 feet NAVD88, to incorporate the USACE's request for a 2-foot buffer below the authorized navigation channel depth. In addition, the A/OT requested the following information be provided regarding the proposed utility 020 SRA cap:

- Additional information from J.F. Brennan, in writing, describing the efforts taken to dredge the 25-foot buffer zone located south and north of the utility, and the rationale for the inability to dredge below elevation 550.0 feet NAVD88 in this zone.
- The estimated volume of sediment remaining below elevation 550 feet NAVD88 in the navigation channel, that would be capped with the SRA cap, and is outside the assumed pipe trench area.

This information is provided below.

Equipment Capabilities and Risk Factors Assumed by J.F. Brennan for Dredging

Brennan initially began dredging close to utility 020 using diver-assisted dredging, with a shroud connected to a dredge via hydraulic suction hose. This arrangement proved to be less efficient than anticipated, so in 2017 Brennan elected to use divers to perform the field work mentioned above. This was followed by dredging with the Vic Vac and an excavator-mounted dredge, the *Midland*, located on a barge, to remove sediment exceeding the RAL to within approximately five feet of the location of a utility. Brennan determined this to be the closest distance that could be dredged safely, to which the A/OT concurred. However, this dredge can only reach as low as approximately elevation 550 feet NAVD88, so where sediment exceeding the RAL extends below this elevation outside of the 5-foot buffer zone, the SRA cap will be extended to cover this sediment, as shown on the design.

During the 2017 season, while utilizing the *Midland*, Brennan attempted to modify the dredge apparatus to reach below elevation 550 feet NAVD88. This attempt was unsuccessful and led to damaging the equipment. Brennan then investigated two reasonable options that could have allowed safe dredging below elevation 550 feet NAVD88, as described below.

- Option 1 included adding the Vic Vac attachment onto a standard swinging ladder dredge attached to the guide barge. These dredges have a dredging depth of approximately 35 feet in the standard cutterhead configuration (dredge elevation 545 feet NAVD88 with water elevation of 580 feet NAVD88), but can only reach just under 28 feet (dredge elevation 552 feet NAVD88 with water elevation of 580 feet NAVD88) using the Vic Vac. The loss in dredging depth is due to the need for the dredge ladder to be articulated to operate the Vic Vac.

- Option 2 included using an excavator with longer reach capabilities. There are several issues associated with this option. First, the *Midland* excavator is a company-owned machine that has several post-market additions to enhance its ability to work in this capacity. Brennan modified the counterweight to allow the hydraulic power pack to be attached to the back of the dredge. In addition, the power pack is currently manufactured to attach to that specific piece. These modifications cannot be made to rental pieces of equipment because doing so would void the warranty of the machine. Another problem is that the attachment's weight prevents a standard class machine from reaching the depths required while handling the weight. These machines are also not readily available on the rental market.

In addition to this information, on March 27, 2018, a letter was provided by J.F. Brennan and submitted to the Agencies, that provided additional explanation related to the risks involved in dredging near utilities. On March 28, 2017, the LLC received comments from the Agencies on the letter, which included a request for more detailed information documenting the need for a 25-foot setback for dredging. On May 1, 2018, the LLC forwarded two letters from J.F. Brennan containing the requested information. On May 2, 2018, the Agencies acknowledged receipt of the letters. The letters provided by J.F. Brennan and the Agencies' comments on the initial letter are presented in Attachment A.

In conclusion, Brennan has determined the maximum dredging depth of 30 feet (i.e., an elevation of 550 feet NAVD88 when the water level is at 580 feet NAVD88) to be the maximum reasonable depth based on available equipment and industry standards.

Existing Conditions in the Utility 020 Corridor

A plan and profile figure of the City-owned water line located in the utility 020 corridor is presented in Attachment B. The figure shows the approximate plan and profile location for the utility and the location of cores obtained in the area used to define the depth of contamination (DOC). The DOC is the depth to which sediment exceeding the 1 ppm PCB RAL must be remediated, to the extent practicable given safety and other concerns such as damage to property. Areas defined for additional dredging are outlined by the "concept design border" on the plan view map (top panel of the drawing) within the utility corridor. The cross-section profile (bottom panel on the figure) shows the 2017 post-season bathymetry and the dredge design model surface representing the interpolated DOC. The sediment between these surfaces will be dredged, including sediment within the SRA-6 and other cap areas that is five feet or more above the pipeline. Sediment that exceeds the 1 ppm PCB RAL will remain in an area believed to be the pipeline trench, and in adjacent areas that are within a 25-foot buffer zone and below elevation 550 feet NAVD88, which will require capping, as described herein. As is evident from the profile, some sediment below this elevation was removed, either through dredging with the shroud attachment, through scour, or both. The SRA cap limits are shown as hatched in pink on the figure in Attachment B.

The remedy for SRA-6 and other cap areas must consider the PCB concentrations likely to remain in the sediment after dredging. A core summary table (CST) is presented in Attachment C, which includes cores obtained upstream, downstream, and within the 100-foot utility 020 corridor. As is evident from this table, cores in this area previously contained sediment with PCB concentrations of up to 62.8 ppm that were remaining, but some of these concentrations were removed during final dredging. An assessment of these cores is as follows:

- Cores 4054-274, 4054-275, 4054-61, and 4054-62 in SRA-6 will have from 1 to 3.5 feet of sediment remaining with concentrations that range from less than 10 ppm (core 4054-274) to 30.9 ppm (core 4054-62).
- Cores 4054.5-39, 4054.5-245, have from 3.5 to 7.5 feet of sediment remaining with concentrations that range from 2.5 ppm to 62.8 ppm PCB.

The thickness of RAL sediment remaining around utility 020 in the SRA-6 cap area is expected to range from 0 to 7 feet after dredging, with PCB concentrations that are likely less than 40 ppm. The estimated volume of RAL sediment remaining in the navigation channel, below elevation 550.0 feet NAVD88 and outside the assumed 12-foot wide pipe trench area, is 264 cy.

In addition to these areas, the pipeline trench is likely to contain contaminated sediment that was not sampled, due to its proximity to the pipeline. The SRA cap will therefore be installed throughout the likely trench area that runs along the pipeline alignment. Propwash impact and its effect on the design is described below.

Propeller Wash Zones

Propwash zones were determined assuming 100 percent bow thruster power level from a large straying vessel traveling in the navigation channel. Maps showing these propwash zones are presented in Attachment D. The zones show the correlation between propwash impact and the stone size needed to resist this impact. Where these zones indicate that a standard A or B cap could be installed, or where the propwash zones indicate that armor stone with a D_{50} of 6 inches or more would be required, the cap will be designed as an SRA cap as described below.

In the areas that a standard cap is identified by the prop wash analysis, because of wave action requirements, lack of post-cap water depth, and possibility of contamination remaining within the pipeline trench, these caps were converted to SRA caps. Armor stone used for these caps will have a D_{50} of 1.5 to 3 inches.

The SRA caps shown will be constructed with a minimum 9-inch sand layer, plus a 3-inch thick over-placement allowance, with armor stone placed over the sand. The armor stone used for these caps will have a D_{50} of 1.5 to 3 inches, and the thickness of the cap is increased to 5 feet as requested by the A/OT. Where the propwash zones indicate that armor stone with a D_{50} of 6 inches or more would be required, the cap will be designed as an SRA cap, as described below. The location of the SRA caps are shown on the drawings in Attachment E.

Proposed Remedy for the Utility 020 Corridor in a High Propwash Impact Area

Capping with a standard cap is a potential remedy for a portion of the utility corridor; however, the remaining portion designated as SRA-6 will not have a standard cap for the following reasons:

- The cap would be designed to withstand propeller wash from large vessels, which would require placement of very large stone or a concrete mat over the utility. This would result in a large hump that would not meet the 26-foot water depth required over the width of the navigation channel.
- If a concrete mat was used for the cap, the hump would be smaller but it would make the water line very difficult to access if a repair was needed. The riparian owner, GBWU, previously requested that stone no larger than gravel be used for any part of the cap.
- The overburden pressure of a thick cap was not originally factored into the design of the utility, so this added pressure could create settlement or other problems with the pipeline, if installed.

The proposed remedy for SRA-6 is therefore a special exception cap that may eventually mix with the underlying sediment to reduce PCB levels. This cap will be comprised of sand, installed at a thickness which will maintain a minimum 25-foot water depth in the navigation channel. This depth will be based on the low water elevation of 577.6 feet NAVD88, so the maximum top-of-cap elevation will be no higher than 551.6 feet NAVD88. Sand mixing calculations were performed for a range of initial PCB concentrations (up to 50 ppm PCB) and sand thicknesses of 6 inches, 9 inches and 12 inches. These calculations assume full mixing of the first 3 to 6 inches of sand with underlying undisturbed residual or generated residuals produced by the dredging process. The results for these calculations are presented graphically in Attachment F and indicate that a 12-inch thick sand cover mixing with the upper 6 inches of sediment containing PCB concentrations of 40 ppm or less would result in PCB concentrations at the surface of approximately 0.81 to 1.17 ppm. A variable thickness layer of 3-inch stone will be installed over the sand layer, which will further reduce PCB concentrations at the surface through diffusion. Therefore, an average 12-inch thick sand layer is recommended, with the lower 6-inch layer assumed to be a mixing layer, for the undisturbed and disturbed residual contamination that may remain after dredging. An armor layer will be installed over the sand layer, using stone with a D_{50} of 1.5 inches or 3-inches in the SRA area. This remedy would provide the following advantages for this area:

- No special equipment would be needed, J. F. Brennan's broadcast spreader would be used for placing sand over the pipeline. The spreader would be used in conjunction with an extended barge that could safely span the utility corridor such that impacts to utility 020 with spuds are not a concern. This could allow for installation of the SRA cap during the 2018 season.
- The SRA caps remedy would be effective based on the calculations previously discussed.
- The SRA caps should be acceptable to the City of Green Bay, owner of the pipeline.

Design plans and cross sections for the remaining dredging and capping over utility #020 are presented in Attachment E. Within the navigation channel limits, the SRA-6 cap is not expected to extend above elevation 551.6 feet NAVD88, since the current bathymetry in this area is just below elevation 550.0 feet. If armor stone with a D_{50} larger than 3-inch is placed in the navigation channel, the U.S. Army Corps of Engineers (USACE) may require that this stone be no higher in elevation than 551.6 feet NAVD88.

The proposed SRA cap is not a standard cap design but will still provide some isolation and/or potential mixing of underlying PCB contamination that will help to reduce the impact of leaving these PCB concentrations in place. In summary, the advantages and disadvantages of the SRA cap design for Utility 020 corridor are shown on Table 1.

Table 1. Advantages and Disadvantages of the SRA-6 Cap Design

Cap Design Criteria	Advantages of SRA-6 Cap Design	Disadvantages of SRA-6 Cap Design
Stone size – D_{50} of 1.5 to 3 inches	Provides some protection against erosive forces. Small enough to allow riparian owner easy access to the buried utility if needed.	Not large enough be protect against scour from propwash from large vessels throughout much of the area.
Armor stone thickness	Will be thicker than typically required over most of the SRA cap area.	The stone layer thickness will not be thick enough to protect against prop scour in the navigation channel and channel slope areas.
Sand isolation layer thickness	Will be thicker than typically required over most of the SRA cap area.	May be thinner than desired in the navigation channel due to limited depth of dredging and channel depth limitations.
Top of cap elevation in the navigation channel	Will meet design requirements in the navigation channel and allow a 2-foot buffer zone for channel dredging.	The stone size will not be large enough to function as a marker layer for dredging, so the armor layer could be disturbed by over-dredging.
Top of cap elevation outside the navigation channel	Acceptable for side slopes of the channel and in some areas near the shoreline.	As the cap approaches the shoreline on each side of the river, the top of cap elevation provides less than 6 feet of post-cap water depth.

Previous and recent input received from the GBWU, regarding the pipeline and potential remedies over the pipeline, is discussed in the following section. Input recently received from the USACE is also discussed.

Utility Owner and USACE Acceptance

On December 16, 2015, the Design Team met with representatives of the GBWU to discuss available means of remediation over its utilities, including the water line in utility corridor 20. Notes from this meeting are presented in Attachment G. During the meeting, representatives from GBWU stated that the code requires the pipeline to have at least two feet of cover following remediation. This was later confirmed to be in NR 811.76 (2)(a), which is the code requirement for water main design for underwater crossings. However, they also indicated that they would prefer more than two feet of cover, even restoration of the existing cover, where it is greater than 2 feet. As shown on the drawing in Attachment B, at least 5 feet of cover will remain after dredging, and the placement of SRA caps would increase that depth of cover to about 5.5 feet. The GBWU representatives stated that they preferred gravel to sand; the sand layer is needed for mixing and remediation purposes. The layer of larger stone used for armoring the cap will be only 6 inches thick, so should be acceptable to GBWU.

During the February 28, 2018 meeting, Brian Powell (GBWU) stated that GBWU would prefer the stone size to be no larger than 6 inches in diameter, so they can access the pipeline for repairs, if needed. Rip rap-sized stone could not be used, but stone with a D_{50} of up to 6 inches may be acceptable. Notes for this meeting are also presented in Attachment G. Given this feedback and that from the USACE, the design has been revised to show the SRA cap with armor stone having a D_{50} of 1.5 to 3 inches.

On June 18, 2018 Brian Powell was contacted regarding the SRA cap thicknesses of 5 feet, as required by the A/OT. Mr. Powell was receptive and agreeable to the proposed stone size and cap thickness, He agreed that the thickness will provide added protection to the pipeline and stated he would discuss this information with his supervisor.

ATTACHMENT A

LETTERS FROM J.F. BRENNAN REGARDING DREDGING NEAR UTILITIES AND AGENCIES' COMMENTS ON THE INITIAL LETTER

Marine Professionals Since 1919
BRENNAN

J.F. Brennan Company, Inc.
818 Bainbridge Street
La Crosse, WI 54603
608.784.7173

May 1, 2018

Mr. Bill Coleman,
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54304

Re: Dredging Near Utilities

Dear Mr. Coleman

We are writing to address questions recently raised by the Agencies Oversight Team (A/OT) regarding the strategies and methods J. F. Brennan Company, Inc. ("Brennan") is using for remedial dredging in the vicinity of utilities that cross the river bottom. The A/OT has requested additional explanation from the project team for why the standard dredge cutterhead cannot be operated within the 25-foot setback. Brennan has attached its insurance letter stating a 50 foot offset should be used. Due to the extensive locates that have been done on this project during the design phase Brennan has reduced this requirement to the 25-foot offset.

Over the past several seasons, Brennan has worked closely with the project design team to develop strategies for dredging over utility lines to maximize sediment removal in the vicinity of those utilities in a safe manner. We developed methods utilizing the dredge Block Island with an open suction guided by divers, and we have utilized the utility dredge with a Vic Vac attachment. Using these methods, we have been able to dredge safely to within approximately 5 feet of utility lines 20, 23 and 26-30.

While it is true that the Vic Vac and the standard cutterhead attachment both rely upon GPS placement, the cutterhead does not operate in the same manner as the Vic Vac. A cutterhead attachment dredges more aggressively than the Vic Vac, which creates both more sediment disturbance and, significantly, more disruption of areas in the river bed near the area of dredge operations. Operation of the cutterhead necessarily increases the risk of damage to nearby utility lines. This is especially true If Brennan operates the cutterhead within the 25 foot utility offset.

The 25 foot utility offset is the operational standard used throughout the country. Recent projects completed by Brennan with similar offsets include Fox River OU1, East Branch Grand Calumet River – Reaches 4A and 4B, West Branch Grand Calumet River – Roxanna Marsh Reaches 1 and 2 and Connecticut River. Additionally, we have and are currently bidding several other projects nationwide with a similar offset. In fact, most projects increase offsets around high risk utilities, such as fiber optic lines.

Several attempts have been made to locate the utility lines in the river bottom. While these attempts have refined the information available to the project team, the resulting data has not provided the team with a sufficiently high level of certainty as to the actual location of those lines. The location data thus far received by the team has varied by more than 24 feet in regards to Utility 20 and by up to 33 feet for

Utility 21. Further dimensions of utility locate differences can be provided upon request. These differences show the level of complexity in accurately locating pipelines under the river bottom.

Operation of the standard cutterhead attachment inside a 25-foot setback is not a risk we can accept, nor is it a risk the project team should accept. That conclusion is more than evident when we have methods available that have produced a performance track record of safe dredge operation near utility lines. It is a method we have used on many other projects and it has produced a performance track record of safe dredge operations near utilities.

If you have any questions, please do not hesitate to contact us. Thank you.

Sincerely,

Dustin Bauman
J. F. Brennan Company, Inc.

J.F. BRENNAN CO., INC.

820 BAINBRIDGE · BOX 2557 · LA CROSSE, WI 54602-2557 PHONE: 608 / 784-7173 · FAX: 608 / 785-2090

August 22, 2011

Mr. Bill Coleman
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54303

Re: Dredging Near Utilities

Dear Bill:

As you are aware, there have been numerous meetings with utility owners recently, as well as subsequent discussions with the A/OT related to the remedial actions that will be performed in the vicinity of utilities that cross the river. While we applaud the effort to identify the location of the utilities as accurately as possible I understand that JF Brennan site personnel have expressed concerns with regard to the lack of detailed information on the exact location of these utilities. Pursuant to this, we need to make very clear that we, as a company, have a significant concern for the safety of our personnel, as well as our equipment and reputation, and cannot take unnecessary risks when working in the area of active utilities whose locations have not been accurately identified.

Due to our concerns, we spoke to our insurance carrier regarding this topic to see if they could provide any insight. Attached you will find a letter we recently received from them. In this letter you will note that there is mention of a 50 foot offset when working in the area of an active utility where the exact location is unknown. To this point, we understand that WPS has required this amount of setback when working near its active natural gas pipeline that crosses the river in the general vicinity of the highway 172 bridge. We agree with this approach and are willing to proceed in this direction when work in this area is undertaken. In fact, we would recommend this approach be used when completing remedial activities in other areas where the exact location of utilities in unknown. Perhaps it will be possible to reduce the amount of offset, depending upon the amount of information for the specific utility. However, this will need to be done on a case by case basis. As an example, if the location of the utility can be guaranteed within 5' in all directions we would be able to reduce the offset to 25'. In addition, if the location of the utility is ***accurately determined to be at least 20' below the sediment surface*** we would perform dredging over this utility, if the design identifies this as the selected remedy.

As you are aware, JF Brennan has modified our material spreading equipment such that we can cantilever over a utility, providing complete remediation via the placement of sand cover or an engineered cap, while maintaining the safety setback of 50'. Thus, we

would encourage this approach near utilities where the information regarding locations is questionable.

If you should have any questions once you have had a chance to review this information please feel free to contact me at your earliest convenience. We look forward to a safe and successful project.

Sincerely,

Tom Kennedy

Tom Kennedy
Vice President CFO

McGRIFF, SEIBELS & WILLIAMS OF MISSOURI, INC.

7711 Bonhomme Ave., Suite 900 • St. Louis, MO 63105 • TEL – (314) 854-5200 • FAX – (314) 854-5201

August 19, 2011

Mr. Tom Kennedy
Chief Financial Officer
J. F. Brennan Company, Inc.
PO Box 2557
LaCrosse, WI 54602-2557

RE: Fox River Project
Underwater Utilities

Dear Tom:

We wanted to follow up with you on our recent conversation regarding the Fox River project and issues related to dredging near and/or over utility lines, oil pipelines, gas pipelines and similar items (hereafter underwater utilities). It is our understanding that a significant complicating factor in the situation is that data does not exist to precisely locate these underwater utilities, either vertically or horizontally, at certain locations. Despite the unavailability of such data at several locations, regulatory authorities are not presently agreeing to an offset with a capping alternative that has been proposed by J. F. Brennan and the project's prime contractor. At the same time, J. F. Brennan is contractually obligated to take all necessary precautions for the safety of, and must provide the necessary protection to prevent damage, injury or loss to, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of performing dredging operations on the Fox River.

In our capacity as J.F. Brennan's insurance broker, we are compelled to advise you of the significantly higher risk associated with dredging an area where the precise location of underwater utilities is unknown. There are certain representations made to the various companies that underwrite your insurance program regarding policies and procedures as it relates to dredging river beds with known underwater utilities. At a minimum, there is an expectation on behalf of your insurers that J. F. Brennan is able to identify the location of such utilities prior to commencing dredge operations. They have been advised that in situations where the exact location of underwater utilities are unknown, J. F. Brennan's preferred protocols dictate a fifty (50) foot offset with capping performed as an alternative to dredging within that offset. We are concerned that a perceived lack of due diligence by J. F. Brennan in its approach to dredging operations, or in meeting its contractual obligations for the project, could significantly complicate any potential claim scenarios. Based on the variety of underwater utilities throughout the site, a loss or losses from an underwater utility strike could involve significant monetary damages and other claims. Caution is therefore certainly urged. The potential exists for claims from the project owner, prime contractor, underwater utility owners and other third-parties affected.

Although not ideal, J. F. Brennan could look to contractual protection for the risk associated with dredging an area with unknown underwater utilities in the form of an indemnification agreement. However, in order for such an agreement to provide any degree of protection, it would need to encompass all bodily injury, property damage, environmental damage, loss of use and other direct or indirect consequences from a strike as it relates to any and all potential claimants. This indemnification would have to include as signatories the project owner, prime contractor and all applicable underwater utility owners. Although impossible to secure indemnification from unknown third-parties potentially impacted by a claim situation, the project owner, prime contractor and/or the underwater utility owners would have to indemnify J. F. Brennan for any claim brought by a third-party related to an underwater utility strike.

In addition to the contractual protection, we strongly urge J. F. Brennan to require from the project owner or prime contractor improved information regarding the river bottom location of all underwater utilities on both a vertical and horizontal basis. If necessary, J. F. Brennan should seek relief under its contractual provisions with the prime contractor to assure that sufficient data is available to identify precisely the location of underwater utilities. It is our experience that underwater utilities have a tendency to shift positions over time, therefore, recent data is imperative to minimize the potential for losses as a result of your dredging operations.

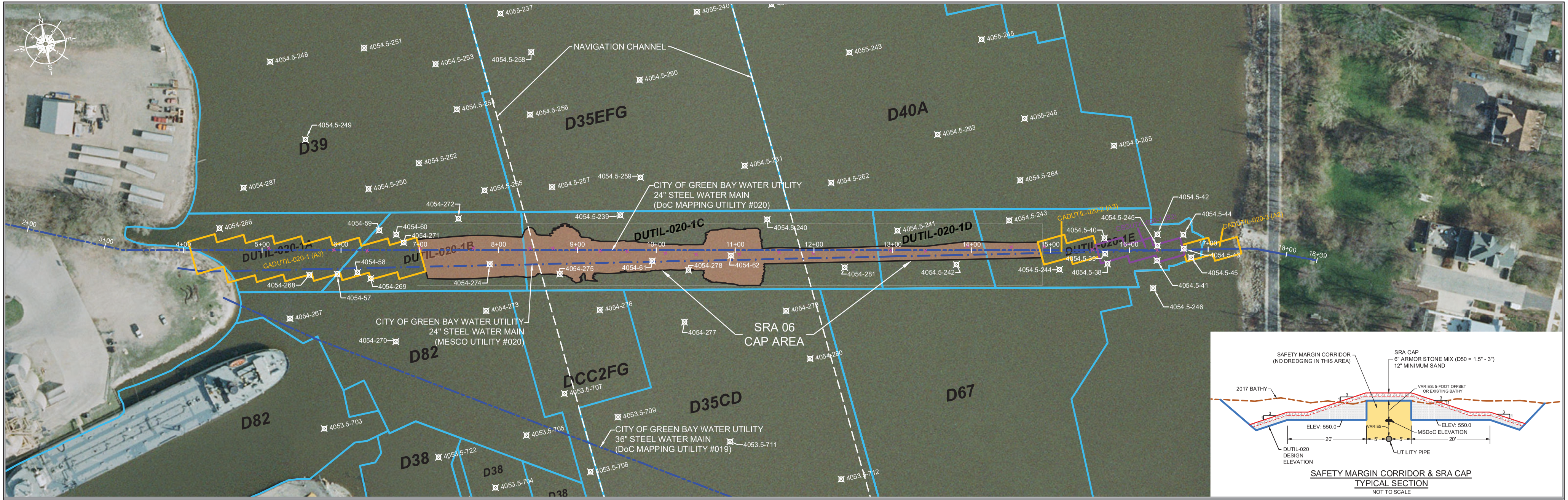
We appreciate J. F. Brennan including us in this process. We are available to assist your attorney in drafting appropriate indemnification language in an attempt to minimize potential claims occasioned by incomplete data.

Sincerely,
McGRIFF, SEIBELS & WILLIAMS of MO, Inc.
C Baxter Southern III

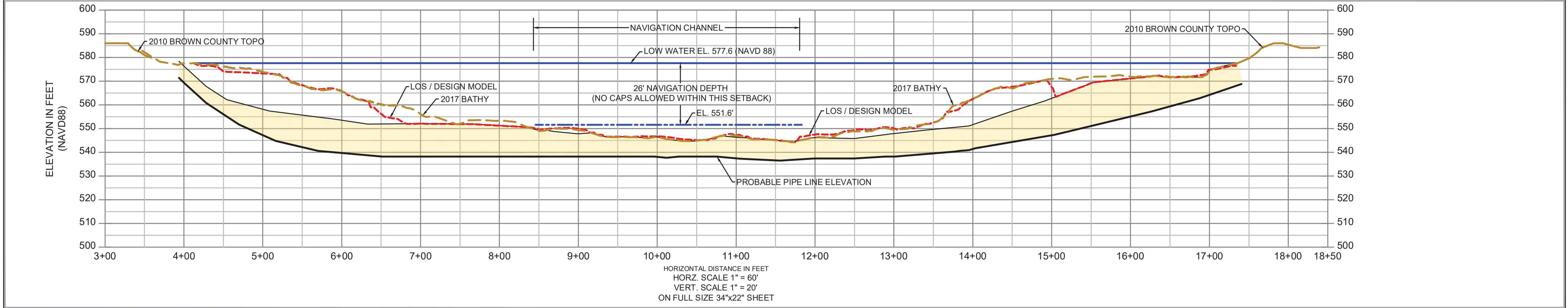
C. Baxter Southern III
Executive Vice President

ATTACHMENT B

PLAN AND PROFILE DRAWINGS OF UTILITY #020 CORRIDOR SHOWING 5-FOOT BUFFER ZONE AROUND THE WATER LINE



SAFETY MARGIN CORRIDOR & SRA CAP
TYPICAL SECTION
NOT TO SCALE



HORIZONTAL DISTANCE IN FEET
HORZ. SCALE 1" = 60'
VERT. SCALE 1" = 20'
ON FULL SIZE 34"x22" SHEET

SOURCE INFORMATION

DoC MAPPING UTILITY #020

1. SOURCE DRAWING WAS PROVIDED BY:

DoC MAPPING LLC
3518 OCTAVIA STREET
NEW ORLEANS, LA 70125
(619) 566-6783

2. FILE NAME: "DoCMapping_020_TOP"

3. DoC DRAWING IS BASED ON FIELD SURVEY OF MAY 2015, REFERENCED TO THE U.S. STATE PLANE - WISCONSIN CENTRAL ZONE COORDINATE SYSTEM, NAD83 AND NADV88 VERTICAL DATUM.

CITY OF GREEN BAY ASBUILT DRAWING

FILE NO. A-16171
5 SHEETS, DATED MARCH 4, 1964
JERRY DONOHOUE ENGINEERING CO.

MESCO UTILITY #020

1. SOURCE DRAWING WAS PROVIDED BY:

STROUD DIVING & HYDROGRAPHY
A DIVISION OF
MARINE ENGINEERING SYSTEMS COMPANY, INC.
5030 OLD KINGS ROAD
JACKSONVILLE, FLORIDA 32254
(904) 355-1777

2. DRAWING FILE NAME: "264-4 UTIL #20 24in GBWU WATER FOX RIVER WI REV APR2015"

3. MESCO DRAWING IS BASED ON FIELD SURVEY OF APRIL 2015, REFERENCED TO THE U.S. STATE PLANE - WISCONSIN CENTRAL ZONE COORDINATE SYSTEM, NAD83 AND NADV88 VERTICAL DATUM.

PLAN NOTES

1. **MSDoC ELEVATION**: MINIMUM STATISTICAL DEPTH OF COVER. REPRESENTS A 95% PROBABILITY THAT THE TRUE POSITION OF THE LINE LIES DEEPER THAN THIS POINT.

2. ALIGNMENT OF PIPE WAS ESTABLISHED USING "BEST FIT" LINE BASED ON DoC POINT DATA WITHIN THE RIVER.

3. DoC ALIGNMENT WEST OF STATION 5+00 IS INFERRED BASED ON CITY'S ASBUILT DRAWING. IT WAS CONFIRMED, IN GENERAL, BY DoC SHOTS AT STA: 0+00 & STA: 0+38 AT VAULT. INFLECTION POINT AT APPROXIMATE STA: 3+15 COULD NOT BE SURVEYED.

4. ALIGNMENT EAST OF STATION 16+35 IS BASED ON LAND SHOTS AT STA: 17+90 & STA: 18+37 AT VAULT.

UTILITY NOTES

UTILITY #020

UTILITY TYPE: WATER MAIN

OWNER: CITY OF GREEN BAY WATER UTILITY

SIZE: 24"

MATERIAL: STEEL

DATE INSTALLED: 1961

INSTALLATION METHOD: OPEN CUT AND PLACEMENT

LEGEND

━━━	WATER LINE (ELEV: 577.6)
━ · ━	MAXIMUM ELEVATION FOR TOP OF CAP WITHIN NAVIGATION CHANNEL
– – –	J.F.B. 2017 EXISTING BATHY
– – –	LOS / DESIGN MODEL
━━━	2010 BROWN COUNTY TOPO
– – –	NAVIGATION CHANNEL
☒ 4061.5-01	DESIGN CORE
▨	SAFETY MARGIN CORRIDOR (NO DREDGING IN THIS AREA)
▨	SRA CAP LIMITS
━━━	REMEDIAL ACTION FOOPRINT

SCALE (1" = 60')

60 30 0 60 120

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: UTIL-020 - SRA CAP (552.6).dwg
DRAWN BY: SHANE.NELSON
DATE: February 21, 2018
LAST REVISED: March 12, 2018
CHECKED BY: M.T.
REVIEWED & APPROVED BY J.F. BRENNAN: D.B.

Fox River
LOWER FOX RIVER REMEDIATION LLC

FIGURE C
PLAN & PROFILE DRAWING

CITY OF GREEN BAY WATER UTILITY - WATER MAIN
UTILITY #020

ATTACHMENT C

CORE SUMMARY TABLE FOR AREA AROUND SRA-6

DUTIL-020 Final Concept Plan Core Summary Table

Core ID	4054-266	4054-268	4054-57	4054-58	4054-269	4054-59	4054-60	4054-271	4054-272	4054-274	4054-275	4054.5-239	4054-61	4054-278	4054-62	4054.5-240	4054-281	4054.5-241	4054.5-242	4054.5-243	4054.5-244	4054.5-38	4054.5-39	4054.5-40	4054.5-246	4054.5-41	4054.5-245	4054.5-42	4054.5-45	4054.5-43	4054.5-44
DE	573.49	0.00	0.00	557.49	552.62	562.31	555.67	554.11	550.55	551.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	557.73	567.73	566.23	570.12	570.01	566.13	0.00	570.32	571.97	570.48	572.28	571.68	571.69
Bathy	575.80	565.21	562.67	558.50	556.18	562.81	560.69	559.43	551.63	553.55	548.24	544.95	546.26	545.78	547.37	545.41	547.45	552.42	559.94	568.24	570.02	572.09	571.75	572.09	574.36	572.48	572.12	571.89	572.14	571.94	572.19
EOC	573.80			558.00	552.18	562.31	555.69	554.43	551.13	550.05	547.24		543.26		545.87				557.94	567.74		571.59	562.75	566.09	573.86	570.48	568.62	570.89			571.69
Refusal			556.87	552.60	549.18	556.41	553.39	553.83	549.13	546.55	545.74	542.45	542.26	543.28	541.57	542.91	544.95			565.74		564.79	562.25	564.79		566.78	566.82	564.89		564.94	
Elevation																															
576.5																															
576.0	🟩																														
575.5	0.132																														
575.0	0.257																														
574.5	3.32																								🟩						
574.0	19.1																								1.33						
573.5	0.0685																								0.0253/0.026						
573.0																									0.0256						
572.5																										🟩			▨		
572.0																						🟩		🟩		19	▨	🟩	🟩	🟩	🟩
571.5																						46.8/25.7	🟩	2.82		12	11	13.4	0.155	0.413	4.11
571.0																						0.248/13.8	8.17	8.25		9.98	35.2	4.02	0.0795	0.161	0.186
570.5																						0.025/0.0251/1.71	10.8	30		14.3	29.4	0.0251	0.205	0.0335	0.0251
570.0																					🟩	0.025/0.0527	28.5	57.2		0.62	23.5	0.0251/0.0251	0.275	0.0451	0.0252
569.5																					0.5	0.0251/0.0251	62.8	37		0.025/0.0251	18.8		0.0251		0.0253
569.0																					0.0632	0.0253/0.0252	30	31.9/34.2		0.0251	15.6/16.6		0.0252		
568.5																					0.178	0.0252	32.5	27.1			7.27				
568.0																				🟩	0.0255		35.9	32.3			0.102				
567.5																				1.64	0.0255		30/30.9	26.3			0.139				
567.0																				0.0369			27.1	16.6/16.7							
566.5																				0.0441			29	13.5							
566.0																					▨		12.3	1.92							
565.5																							15.7/17.7	0.0254							
565.0		🟩																					22.2								
564.5		0.28																					3.62								
564.0		0.114																					19.6								
563.5		0.0253																					2.52								
563.0						🟩																	0.739								
562.5			🟩			1.16																	7.8								
562.0			0.0958			0.896																	0.063								
561.5			0.052			0.0377/0.0511																									
561.0			0.0255/0.0259			0.0254																									
560.5							🟩																								
560.0							1.25												🟩												
559.5							1.51	🟩											10.1												
559.0							4.24	1.35											15.2												
558.5				🟩			15.5	17											18												
558.0				1.84			7.71	20											12.8												
557.5				0.124			23.9	10.1											0.21												
557.0				0.126			16.8	15.3																							
556.5				0.0254			12.8	18.4																							
556.0				0.0254	🟩		4.17/4.26	15/15.3																							
555.5					1.17		2.44	21.3																							
555.0					2.3		0.65	14.6																							
554.5					6.16		0.188/0.211	8.09																							
554.0					6.98		0.0253	▨																							
553.5					7.35					🟩																					
553.0					3.61					0.573																					
552.5					2.57					3.08								🟩													
552.0					3.24					3.72								0.728													
551.5					0.221				🟩	1.67								0.445													
551.0					0.0254/0.0254				1.6	7.59								0.682													
550.5									0.0648	8.78								0.347													
550.0									0.0256	5.61																					
549.5										0.0266/0.0376																					
549.0																															
548.5																															
548.0											🟩																				
547.5											14				🟩		🟩														
547.0											6.55				30.9		0.0254														
546.5											0.193		🟩		26.2		0.0254														
546.0											0.0287		16.3	🟩	17.8		0.0254														
545.5													19.1	0.185	0.365/0.401	🟩															
545.0												🟩	25.1	0.123	0.0253	0.469															
544.5												0.158	12.9	0.0403		0.0256															
544.0												0.0628	10.5/11.3			0.0327															
543.5												0.0251	3.69			0.0254															
543.0																															
542.5																															
542.0																															
541.5																															
541.0																															

① a) No Cap thickness restriction based on navigation depth
b) No Contamination in outer 20' Zone

a) NAV Chan. affected
b) Contamination in outer 20' Zone only near the west side of Nav. chan.

Similar to ①

outside NAV. C.

outside NAV. C.

X Cores -61, -62, -39 & -245 Are assumed to be within the pipeline trench & their Contamination does not apply to the outer 20' Zone.

O Cores -274, & -275 are within the outer 20' Zone.

Legend

🟩 Approximate elevation of most recent bathymetry.
(Either 2017 pre-season or post dredge)

57 ≥ 50 ppm PCB

▨ Approximate Design Elevation.
(LOS surface unless otherwise noted)

░ Approximate elevation of contamination.

— Approximate elevation of refusal.

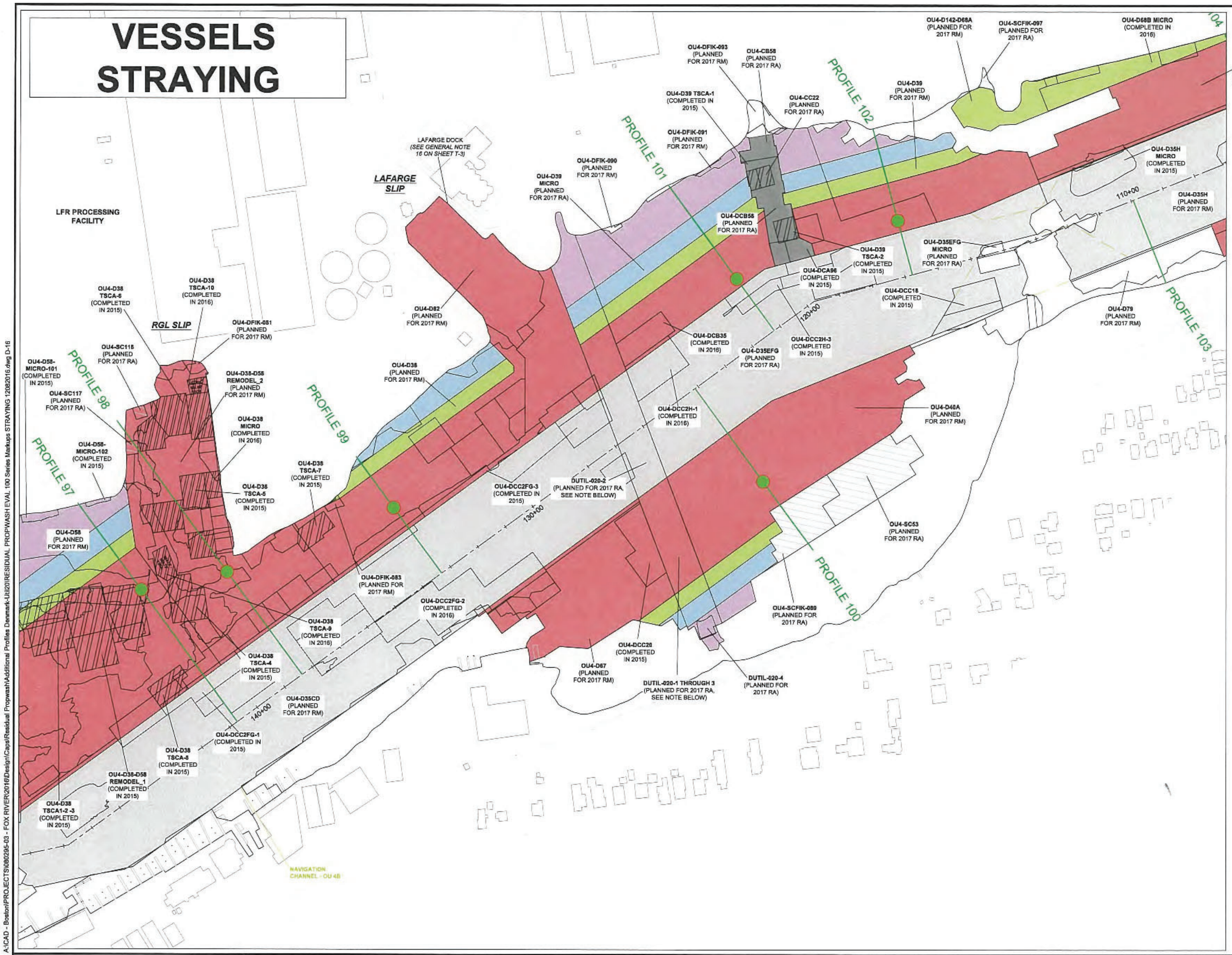
3-16

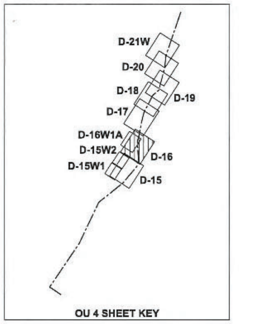
Created By: B. Hendron
Reviewed By: T. Blackmar
Date: 1/10/2018

ATTACHMENT D

PROPWASH ZONE MAPS

VESSELS STRAYING





OU 4 SHEET KEY

LEGEND:

4019-24 CORE LOCATION (TYPICAL)

4002.5-98 CORE LOCATION (UNDEFINED DOC)

4012-111 CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM

4009-06 CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)

4002-93 CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)

4202-06 CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)

4000.5-118 CORE LOCATION TAKEN POST-PRODUCTION DREDGING

4048.5-139 CORE LOCATION TAKEN POST-PRODUCTION DREDGING (UNDEFINED DOC)

4008.5-118 CORE LOCATION TAKE POST-PRODUCTION DREDGING W/ ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM

▽4002.5-95 CORE LOCATION NOT INCLUDED IN FIK MODEL

POLING LOCATION

LOS 0.5 FOOTPRINT > 0.01 FT. DOC (2011, 2012, 2013, 2015, & 2016 UNCORRECTED)

A / DC-1 CROSS SECTION LOCATION

▽4036-402 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM

▽4036.5-402 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)

▽4034-400 CORE LOCATION NOT INCLUDED IN FIK MODEL (UNDEFINED DOC)

▽4034-401 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)

▽4048-127 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)

569.5' TARGET ENGINEERED DREDGE PRISM ELEVATION

▨ TARGET FINAL DESIGN DREDGE SURFACE CONTOUR (1 AND 5 FT. INTERVALS)

OU4-CA23A **CAP A AREA** (7"-9" MIN. THICKNESS SAND AND GRAVEL CAP)

OU4-CB11B **CAP B AREA** (10"-12" MIN. THICKNESS SAND AND GRAVEL CAP)

OU4-CC2D **CAP C AREA** (21" MIN. THICKNESS SAND AND GRAVEL CAP WITH ARMOR LAYER)

OU4-SC84 **SAND COVER AREA** (6" MIN. THICKNESS SAND COVER)

NAVIGATION CHANNEL LIMITS (OU 4A - 75 FT. WIDE AND OU 4B [AUTHORIZED])

NAVIGATION CHANNEL LIMITS (OU 4A - 150 FT. WIDE [HISTORIC])

RESIDUAL CAP PROPWASH EVALUATION ARMOR STONE SIZE ZONES

🟥 ARMOR STONE D_{50} > 6 IN.

🟩 ARMOR STONE D_{50} = 6 IN.

🟦 ARMOR STONE D_{50} = 3 IN.

🟪 ARMOR STONE D_{50} = 1.5 IN

⬜ DREDGING WITHIN NAVIGATION CHANNEL

● APPROXIMATE VESSEL POSITION (WORST CASE CONDITION, KEEL AT 562.5 FT. OUTSIDE THE CHANNEL)

NOTES:

1. ARMOR STONE SIZE ZONES BASED ON A VESSEL WITH 100 PERCENT POWER APPLIED TO BOW THRUSTER AT THE NOTED LOCATION

POOL	OPERABLE UNIT	RIVER MILE	NOAA LOW WATER ELEVATION (FEET NAVD88)
GREEN BAY	OU 4/5	0.0	577.6
DE PERE DAM	OU 3	7.1	587.5
LITTLE RAPIDS DAM	OU 2	13.1	593.6

NOAA LOW WATER CHART FROM NOAA CHART #14916 (2004)

HORIZONTAL SCALE

ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445-0720 FAX: (920) 445-0719

REV	DATE	BY	APP'D	DESCRIPTION

REVISIONS

DESIGNED BY: P. LAROSA / D.BINKNEY
DRAWN BY: D.BINKNEY / M.CARLINO
CHECKED BY: P. LAROSA / T. BLACKMAR
APPROVED BY: T. BLACKMAR
SCALE: AS SHOWN
DATE: MARCH 24, 2016

LOWER FOX RIVER REMEDIAL DESIGN
PHASE 2B WORK PLAN
FOR 2016 REMEDIAL ACTION

RESIDUAL CAPPING PROPWASH EVALUATION

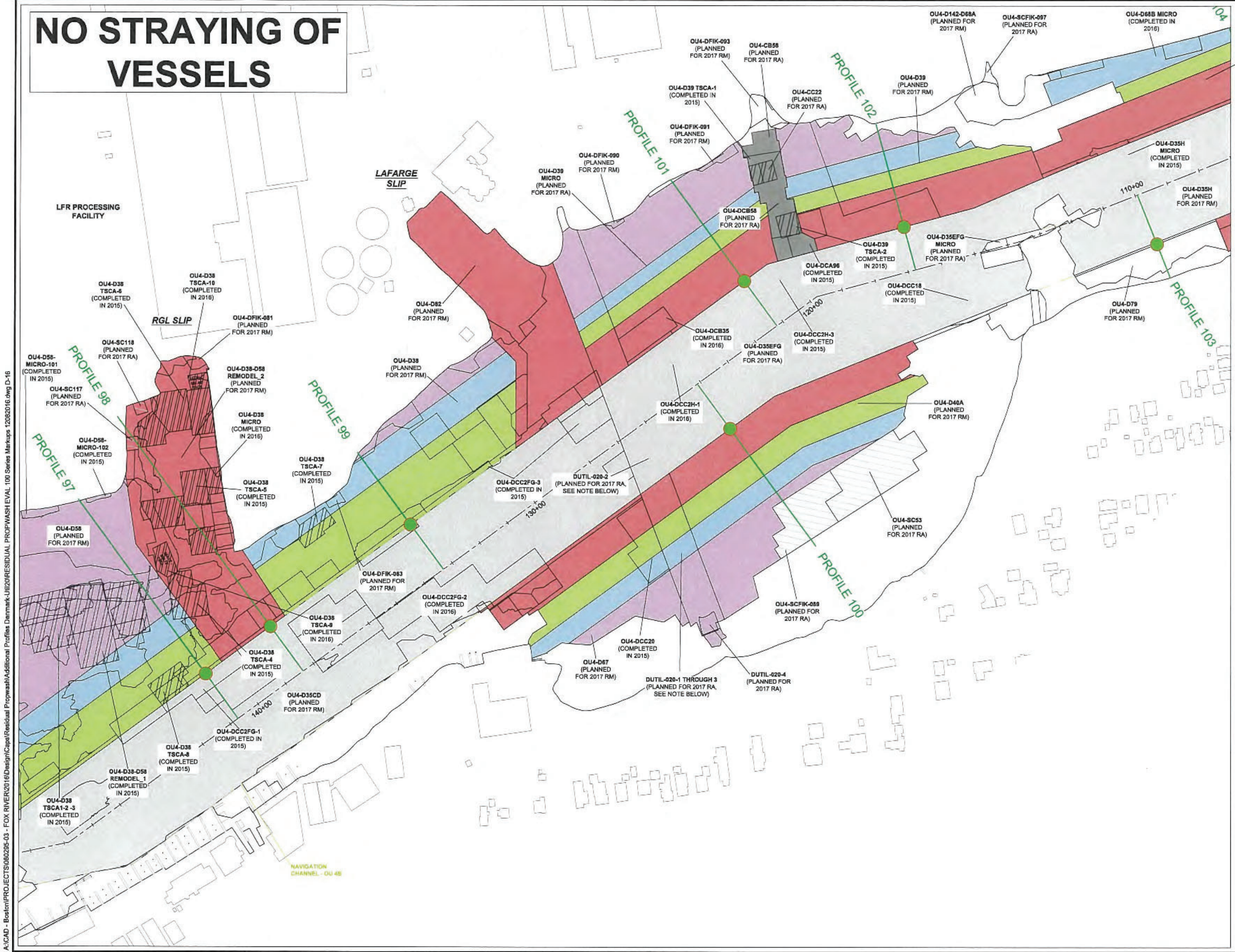
D-16

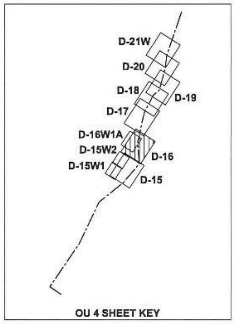
SHEET NO. 1 OF 5

A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2016\Design\Caps\Residual Propwash\Additional Profiles Denmark-Uil20\RESIDUAL PROPWASH EVAL 100 Series Markups STRAYING 12082016.dwg D-16

Dec 08, 2016 1:17pm dbinkney

NO STRAYING OF VESSELS





OU 4 SHEET KEY

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A DC-1	CROSS SECTION LOCATION
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⬜	DREDGING WITHIN NAVIGATION CHANNEL
●	APPROXIMATE VESSEL POSITION (WORST CASE CONDITION, KEEL AT 562.5 FT)

NOTES:

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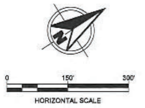
DE PERE DAM	OU 3	7.1	587.5
LITTLE RAPIDS DAM	OU 2	13.1	593.6

NOAA LOW WATER CHART FROM NOAA CHART #14916 (2004)



ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445-0720 FAX: (920) 445-0719

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: P. LAROSA / D.BINKNEY
DRAWN BY: D.BINKNEY / M.CARLINO
CHECKED BY: P. LAROSA / T. BLACKMAR
APPROVED BY: T. BLACKMAR
SCALE: AS SHOWN
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LOWER FOX RIVER REMEDIAL DESIGN
PHASE 2B WORK PLAN
FOR 2016 REMEDIAL ACTION

RESIDUAL CAPPING PROPWASH EVALUATION

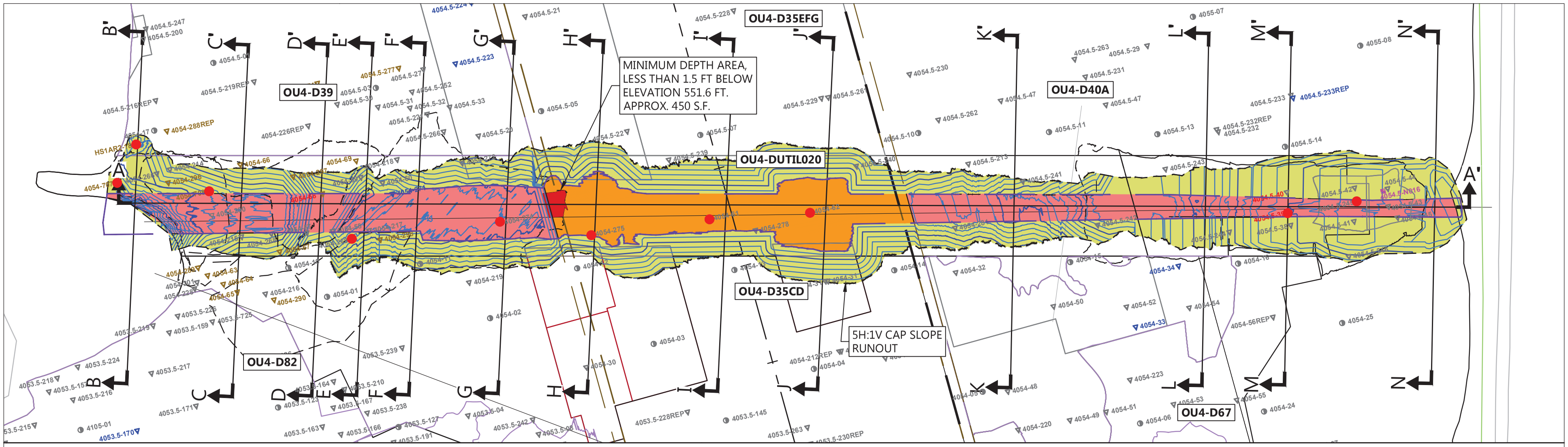
D-16

SHEET NO. 1 OF 5

Dec 08, 2016 1:30pm dbinkney A:\CAD - Boston\PROJECTS\0802095-03 - FOX RIVER\2016\Design\Caps\Residual Propwash\Additional Profiles Denmark-Util\20\RESIDUAL PROPWASH EVAL 100 Series Markups 12082016.dwg D-16

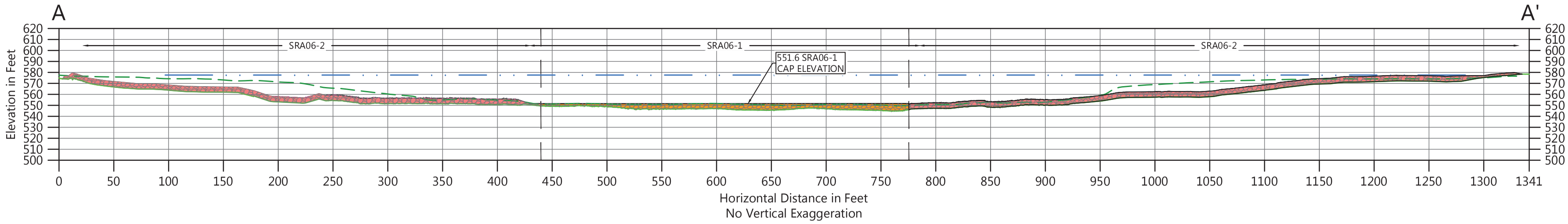
ATTACHMENT E

DESIGN PLANS AND SECTIONS



MINIMUM DEPTH AREA,
LESS THAN 1.5 FT BELOW
ELEVATION 551.6 FT.
APPROX. 450 S.F.

5H:1V CAP SLOPE
RUNOUT



551.6 SRA06-1
CAP ELEVATION

HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

NOTES:
1. NOT FOR CONSTRUCTION

LEGEND:

─	2018 POST DREDGE BATHY CONTOUR MAJR
─	2018 POST DREDGE BATHY CONTOUR MINR
━	PROPOSED SRA CAP
─ ─	SRA CAP 5H:1V RUNOUT (MINIMUM THICKNESS)
🟧	SPECIAL REMEDIATION CAP TYPE 1 (TOP OF CAP AT ELEVATION 551.6 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL)
🟥	SPECIAL REMEDIATION CAP TYPE 2 (5FT. THICK AS REQUESTED BY AOT)
●	CORE WITH REMAINING CONTAMINATION

PROFILE LEGEND:

─	2018 POST DREDGE BATHY
─ ─	2008 BATHY
▨	PROPOSED SRA CAP

0 100
FEET

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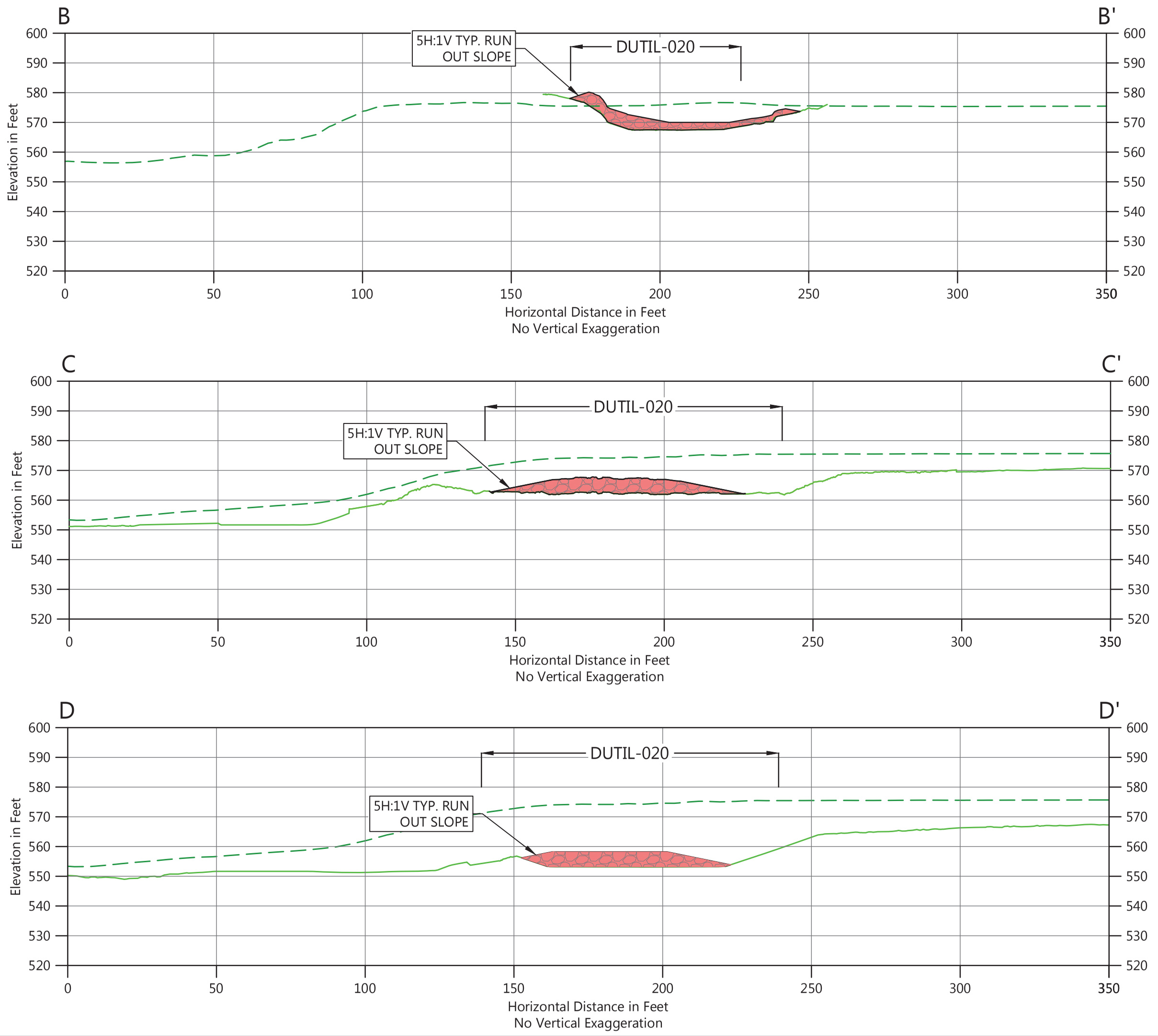
ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445-0720 FAX: (920) 445-0719

FIGURE 1
PLAN
DESIGN REVIEW DOCUMENT UTILITY 20 - SRA 06-2
LOWER FOX RIVER REMEDIATION



LEGEND:

- ─── 2018 POST DREDGE BATHY
- – – – 2008 BATHY
- ▨ PROPOSED SRA CAP

HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

NOTES:

1. CAP MATERIAL IS NOT UNIFORM AS SHOWN ON CROSS SECTIONS. MEMBER THICKNESS AND GRADATION TO BE DETERMINED.

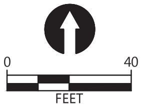


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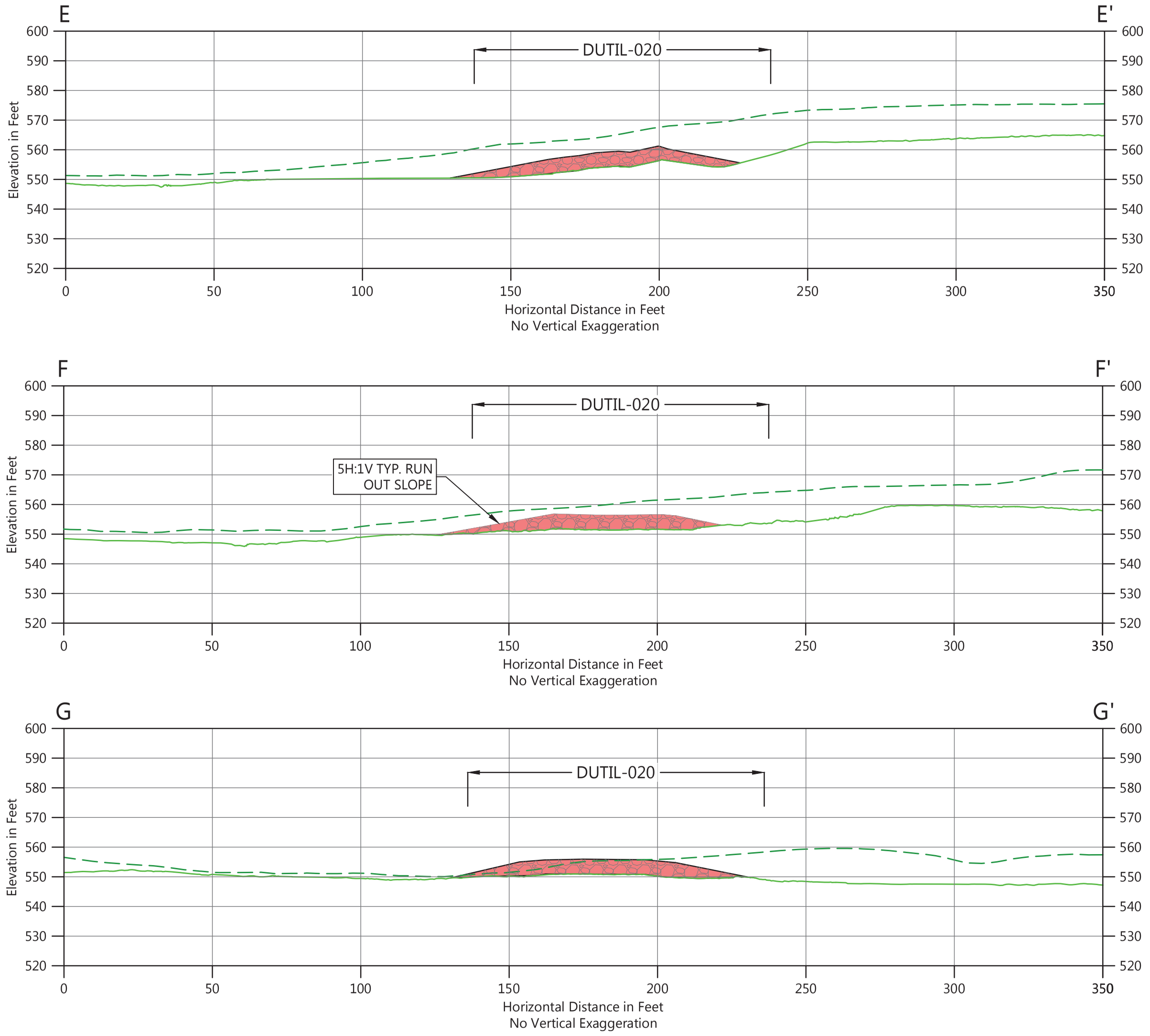
FIGURE 2
SECTIONS B - D
DESIGN REVIEW DOCUMENT UTILITY 20 - SRA 06-2
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

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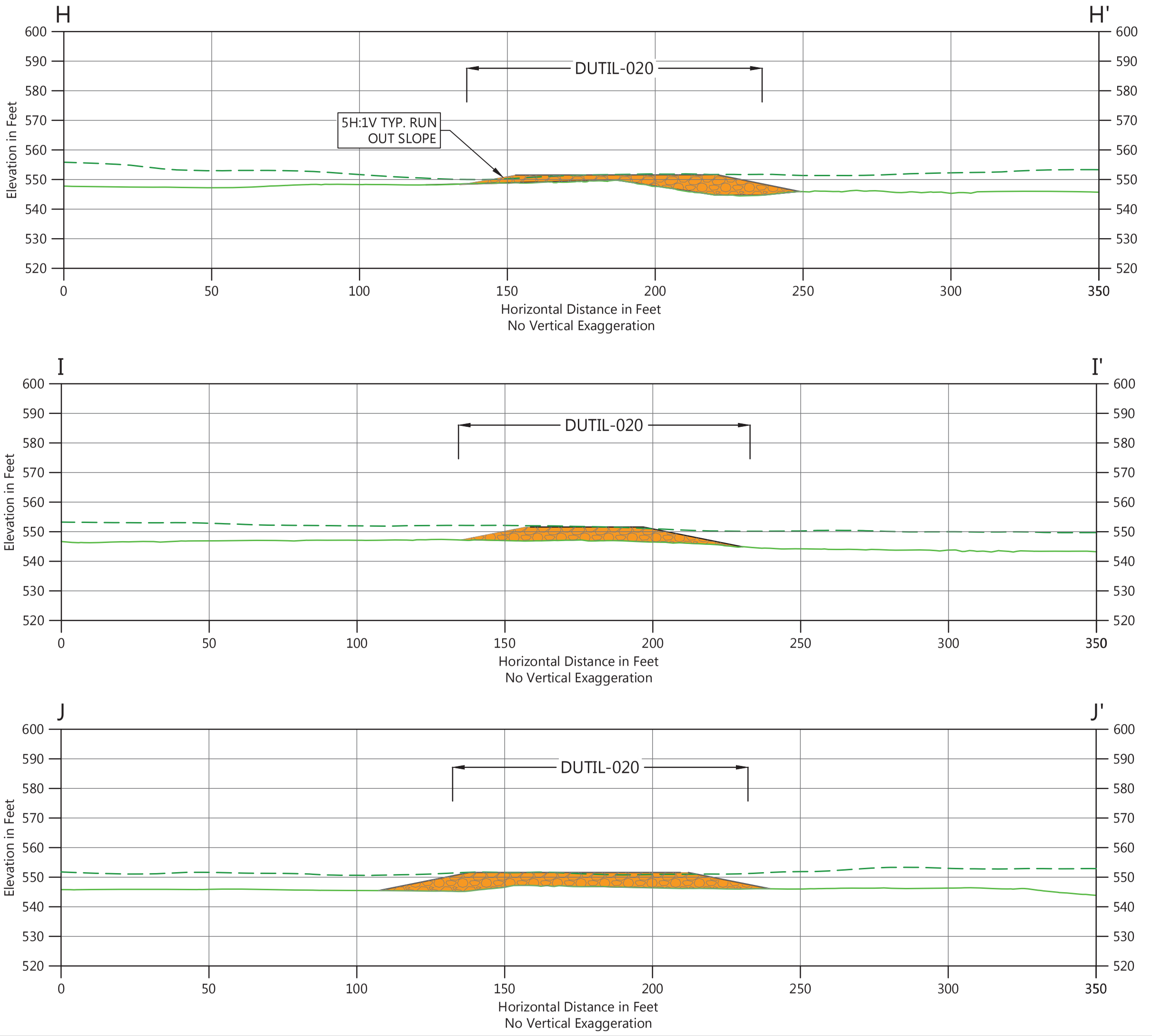
FIGURE 3
SECTIONS E - G
DESIGN REVIEW DOCUMENT UTILITY 20 - SRA 06-2
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

NOTES:
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ANCHOR QEA

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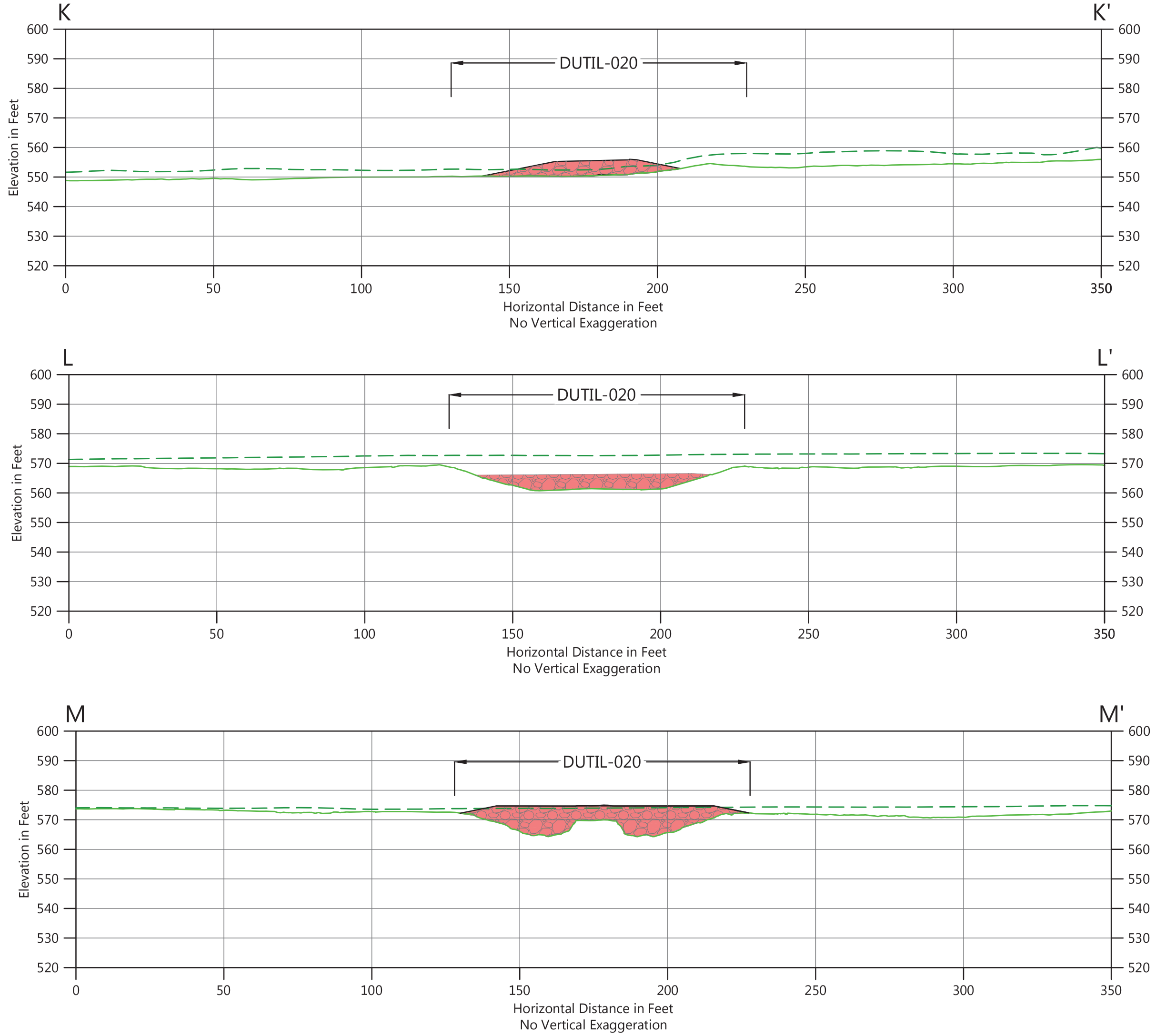
FIGURE 4
SECTIONS H - J

DESIGN REVIEW DOCUMENT UTILITY 20 - SRA 06-2
LOWER FOX RIVER REMEDIATION



LEGEND:

- ━ 2018 POST DREDGE BATHY
- ╌ 2008 BATHY
- ▨ PROPOSED SRA CAP

HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

NOTES:

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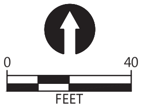

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ANCHOR QEA

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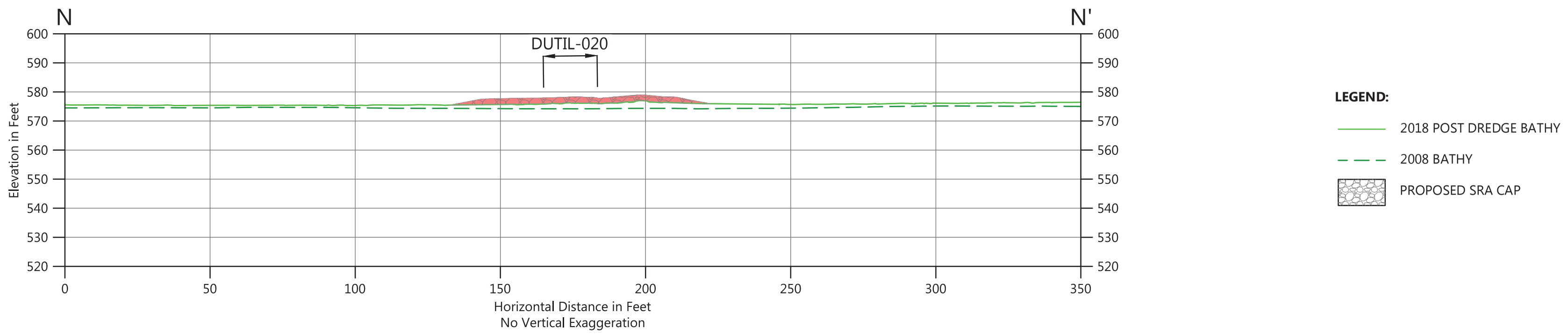
FIGURE 5
SECTIONS K - M

DESIGN REVIEW DOCUMENT UTILITY 20 - SRA 06-2
LOWER FOX RIVER REMEDIATION



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VERTICAL DATUM: NAVD88, FEET.

NOTES:
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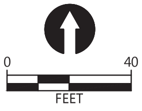

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FIGURE 6
SECTION N
DESIGN REVIEW DOCUMENT UTILITY 20 - SRA 06-2
LOWER FOX RIVER REMEDIATION

ATTACHMENT F

SAND MIXING LAYER CALCULATIONS

Prepared by: Matt Smith

Checked by: Paul LaRosa
Last Updated: 7-Mar-16

Sand Dry Den (kg/m^3)	Undistrubed Dry Den (kg/m^3)	Residual Dry Den (measured; kg/m^3)	CST Residual Dry Den (kg/m^3)	Lift Thickness	Compliance Depth (inches)
1500	462	680	300	3	4

PCB Criteria (ppm)
1

Assumes full 6" mixing each lift (conservative)

Undistrubed sediment

Cover Thick	# Lifts	Sed Comp	Cover Comp	**Initial PCB (mg/kg)**
6	2	0.25	0.75	10.74
9	3	0.125	0.875	23.73
12	4	0.0625	0.9375	49.70

(3" clean sand mix with 3" sediment 1st lift, 3" clean sand with 3" 50/50 sediment/sand 2nd lift, etc)

Dredge residuals (measured dry density)

Cover Thick	# Lifts	Sed Comp	Cover Comp	**Initial PCB (mg/kg)**
6	2	0.25	0.75	7.62
9	3	0.125	0.875	16.44
12	4	0.0625	0.9375	34.09

Dredge residuals (dry density from column settling tests)

Cover Thick	# Lifts	Sed Comp	Cover Comp	**Initial PCB (mg/kg)**
6	2	0.25	0.75	16.00
9	3	0.125	0.875	36.00
12	4	0.0625	0.9375	76.00

Notes:

Sed Comp = contributing proportion of initial underlying sediment properties to final top 6" of placed/mixed material properties

Cover Comp = contributing proportion of sand cap properties to final top 6" placed/mixed material properties

Assumes first 3" lift mixes completely, no mixing after

Native sediment

Cover Thick	# Lifts	Sed Thick	Cover Thick	Initial PCB
6	2	0.5	3.5	23.73
9	3			Top 4" is 100% clean sand
12	4			Top 4" is 100% clean sand

(3" clean sand mix with 3" sediment 1st lift, 3" clean sand 2nd lift does not mix; evaluate 4" = 3" clean sand+1" 50/50 sand/sed)

Dredge residuals (measured dry density)

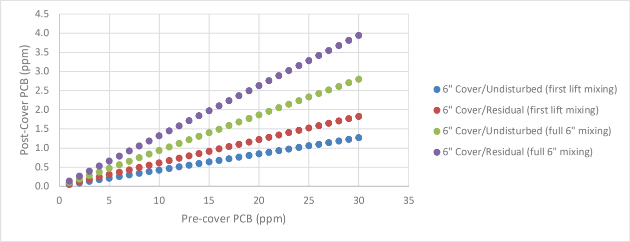
Cover Thick	# Lifts	Sed Thick	Cover Thick	Initial PCB
6	2	0.5	3.5	16.44
9	3			Top 4" is 100% clean sand
12	4			Top 4" is 100% clean sand

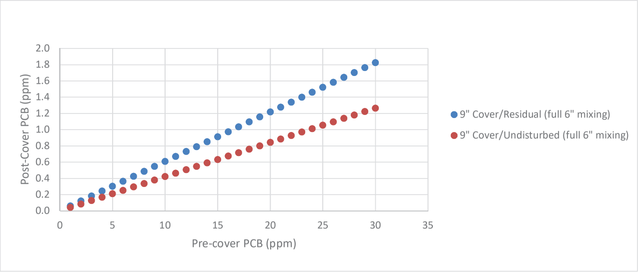
Dredge residuals (dry density from column settling tests)

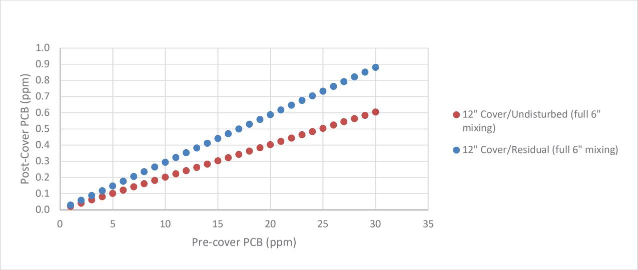
Cover Thick	# Lifts	Sed Thick	Cover Thick	Initial PCB
6	2	0.5	3.5	36.00
9	3			Top 4" is 100% clean sand
12	4			Top 4" is 100% clean sand

Sand Dry Den (kg/m^3)	Undisturbed Dry Den (kg/m^3)	Residual Dry Den (measured; kg/m^3)	Lift Thickness	Sand PCB conc	Compliance Depth (inches)
1500	462	680	3	0	4

	First Lift Mixing Only		Full 6" mixing		Full 6" mixing		Full 6" mixing	
PCB Conc	6" Cover/Undisturbed (first lift mixing)	6" Cover/Residual (first lift mixing)	6" Cover/Undisturbed (full 6" mixing)	6" Cover/Residual (full 6" mixing)	9" Cover/Undisturbed (full 6" mixing)	9" Cover/Residual (full 6" mixing)	12" Cover/Undisturbed (full 6" mixing)	12" Cover/Residual (full 6" mixing)
	Post-cover PCB (mg/kg)	Post-cover PCB (mg/kg)	Post-cover PCB (mg/kg)	Post-cover PCB (mg/kg)	Post-cover PCB (mg/kg)	Post-cover PCB (mg/kg)	Post-cover PCB (mg/kg)	Post-cover PCB (mg/kg)
1	0.042	0.061	0.093	0.131	0.042	0.061	0.020	0.029
2	0.084	0.122	0.186	0.263	0.084	0.122	0.040	0.059
3	0.126	0.182	0.279	0.394	0.126	0.182	0.060	0.088
4	0.169	0.243	0.372	0.525	0.169	0.243	0.080	0.117
5	0.211	0.304	0.466	0.656	0.211	0.304	0.101	0.147
6	0.253	0.365	0.559	0.788	0.253	0.365	0.121	0.176
7	0.295	0.426	0.652	0.919	0.295	0.426	0.141	0.205
8	0.337	0.487	0.745	1.050	0.337	0.487	0.161	0.235
9	0.379	0.547	0.838	1.181	0.379	0.547	0.181	0.264
10	0.421	0.608	**0.931**	1.313	0.421	0.608	0.201	0.293
11	0.464	0.669	**1.024**	1.444	0.464	0.669	0.221	0.323
12	0.506	0.730	1.117	1.575	0.506	0.730	0.241	0.352
13	0.548	0.791	1.210	1.707	0.548	0.791	0.262	0.381
14	0.590	0.852	1.304	1.838	0.590	0.852	0.282	0.411
15	0.632	0.912	1.397	1.969	0.632	0.912	0.302	0.440
16	0.674	0.973	1.490	2.100	0.674	0.973	0.322	0.469
17	0.716	1.034	1.583	2.232	0.716	1.034	0.342	0.499
18	0.759	1.095	1.676	2.363	0.759	1.095	0.362	0.528
19	0.801	1.156	1.769	2.494	0.801	1.156	0.382	0.557
20	0.843	1.216	1.862	2.625	0.843	1.216	0.402	0.587
21	0.885	1.277	1.955	2.757	0.885	1.277	0.423	0.616
22	0.927	1.338	2.048	2.888	0.927	1.338	0.443	0.645
23	0.969	1.399	2.141	3.019	**0.969**	1.399	0.463	0.675
24	1.011	1.460	2.235	3.151	**1.011**	1.460	0.483	0.704
25	1.054	1.521	2.328	3.282	1.054	1.521	0.503	0.733
26	1.096	1.581	2.421	3.413	1.096	1.581	0.523	0.763
27	1.138	1.642	2.514	3.544	1.138	1.642	0.543	0.792
28	1.180	1.703	2.607	3.676	1.180	1.703	0.563	0.821
29	1.222	1.764	2.700	3.807	1.222	1.764	0.583	0.851
30	1.264	1.825	2.793	3.938	1.264	1.825	0.604	0.880
31	1.307	1.886	2.886	4.069	1.307	1.886	0.624	0.909
32	1.349	1.946	2.979	4.201	1.349	1.946	0.644	0.939
33	1.391	2.007	3.073	4.332	1.391	2.007	0.664	0.968
34	1.433	2.068	3.166	4.463	1.433	2.068	0.684	0.997
35	1.475	2.129	3.259	4.595	1.475	2.129	0.704	1.027
36	1.517	2.190	3.352	4.726	1.517	2.190	0.724	1.056
37	1.559	2.250	3.445	4.857	1.559	2.250	0.744	1.085
38	1.602	2.311	3.538	4.988	1.602	2.311	0.765	1.115
39	1.644	2.372	3.631	5.120	1.644	2.372	0.785	1.144
40	1.686	2.433	3.724	5.251	1.686	2.433	0.805	1.173
41	1.728	2.494	3.817	5.382	1.728	2.494	0.825	1.203
42	1.770	2.555	3.911	5.514	1.770	2.555	0.845	1.232
43	1.812	2.615	4.004	5.645	1.812	2.615	0.865	1.261
44	1.854	2.676	4.097	5.776	1.854	2.676	0.885	1.291
45	1.897	2.737	4.190	5.907	1.897	2.737	0.905	1.320
46	1.939	2.798	4.283	6.039	1.939	2.798	0.926	1.349
47	1.981	2.859	4.376	6.170	1.981	2.859	0.946	1.379
48	2.023	2.919	4.469	6.301	2.023	2.919	0.966	1.408
49	2.065	2.980	4.562	6.432	2.065	2.980	**0.986**	1.437
50	2.107	3.041	4.655	6.564	2.107	3.041	**1.006**	1.467







ATTACHMENT G

NOTES FROM MEETINGS WITH THE GREEN BAY WATER UTILITY AND THE USACE

Appendix F SRA-06

Archived: Friday, August 24, 2018 12:56:55 PM
From: Feeney, Richard
Sent: boundary="_000_7465687266787466688079777672696775767469707677737465766_"MIME
To: Brian Powell (BrianPo@greenbaywi.gov); 'PaulPa@ci.green-bay.wi.us'; 'NancyQu@greenbaywi.gov'
Cc: 'Kincaid, Gary W - DNR'; 'Jay.Grosskopf@Boldt.com'; 'George.Berken@boldt.com'; 'Ava.Grosskopf@Boldt.com'; 'Larry.Debruin@Boldt.com'; 'Jeffrey Lawson'; 'Susan O'Connell'; Bryan Heath (Bryan.Heath@ncr.com); Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com); Dustin Bauman (dbauman@JFBRENNAN.COM); Coleman, Bill; Willant, George; Blackmar, Terri; Tabatabai, Morey; Gifford, Ricky; 'dbinkney@anchorqea.com'; Paul LaRosa (plarosa@anchorqea.com); ECI.LFRR Project Correspondence; Nelson, Shane
Subject: Notes from Yesterday's Meeting with the Green Bay Water Utility (GBWU)
Importance: Normal

Hi Brian, Paul and Nancy. Thanks again for meeting with a few of us from the remediation project yesterday. Following are some brief notes from that meeting. Please let us know if anything is incorrect, requires clarification or if anything of importance is omitted.

On December 16, 2015 Troy, Dustin, Gary and I met with Brian Powell, Paul Pavlik and Nancy Quirk of the GBWU. Nancy is the General Manager who we had not met with previously but we have done so with Brian and Paul several times.

The primary purpose of the meeting was to obtain utility owner feedback on minimum post dredge cover required for water supply lines after remediation. This primarily concerns places where we may use the diver assisted dredging concept being developed by Brennan.

Brian said that, based on the installed depth of utility #045, which is the northern most water line and was installed via directionally drilling, GBWU has no concerns about us dredging as required across it. Based on the LOS neat line surface, the required dredge cuts over this utility are not deep. So there should be no concerns about working over utility #045 provided Brennan can safely spud around it.

Nancy said she had been in contact with a WDNR person in Madison about utility regulations (I missed her name but Gary knew of her). Nancy was told that there is a code requirement to have at least two feet of cover over GBWU's water lines.

So the GBWU's position is that, in any locations where our dredging would result in less than two feet of post dredge cover, the project should restore the required minimum cover depth. If we were to do so, Rich suggested using sand but the GBWU said they prefer for us to use gravel. Initially Gary said that the sand might not remain stable but Troy pointed out that it should be more stable than the sediment that was dredged and it would replace. So there was no firm decision on whether we would actually backfill over any water lines that get dredged over and, if so, what would be used for this purpose.

In any cases where there is presently more than two feet of cover over a water line, the GBWU stated their preference for having the project restore the existing cover depth after dredging. For example, if there is 5 feet of cover and we dredged two feet, leaving three feet of cover, the GBWU would want us to restore the cover to five feet after remediation. Gary said the A/OT would likely not require the project to do this but it is possible the GBWU may want to pay for this work to be performed, or this could be an opportunity for cost sharing between the project and the GBWU.

Richard J. Feeney, P.E. | **Vice President, Project Engineering**
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1611 State Street | Green Bay, WI 54304

George Berken

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Thursday, March 7, 2019 4:55 PM
To: George Berken; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law); pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee; Vandenberg, Luke; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: RE: 765. 87500 OU2-5 - FW: LFRR-18-0218A SRA-07 &-05 Tech Memo for Utility Corridor 029 & 30/SRA-07 and LFRR-18-0219A Tech Memo for Utility Corridor 029 & 30/SRA-05
Attachments: LFRR-18-0218-R2_Final Tech Memo_DUTIL 029_SRA-07_AOT_030719pdf.pdf

Attached is the final tech memo for cap SRA-07.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
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From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, March 6, 2019 2:31 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>;

Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 765. 87500 OU2-5 - FW: LFRR-18-0218A SRA-07 &-05 Tech Memo for Utility Corridor 029 & 30/SRA-07 and LFRR-18-0219A Tech Memo for Utility Corridor 029 & 30/SRA-05

Terri, on behalf of the Agencies, the Technical Memorandums and Appendix 'C', submitted in your email below for SRA-05 and SRA-07, are acceptable. Please distribute these TMs in final form.

Thanks,
George…

BOLDT.

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Wednesday, March 6, 2019 8:14 AM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 765. 87500 OU2-5 - FW: LFRR-18-0218A SRA-07 &-05 Tech Memo for Utility Corridor 029 & 30/SRA-07 and LFRR-18-0219A Tech Memo for Utility Corridor 029 & 30/SRA-05

George,

Attached are the Tech Memos and revised drawings for SRA-05 and SRA-07. The memos have not been revised since they were previously accepted, except to accept previous revisions and acknowledge the new revisions from the A/OT in a comment response. The drawings have been revised per the latest comments sent to Morey.

Please revise the revisions to the drawings and let me know if these memos can be distributed as final.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
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From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, February 27, 2019 2:30 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 765. 87500 OU2-5 - FW: LFRR-18-0218 SRA-07 &-05 Tech Memo in Utility Corridor 029 & 30

Morey, on behalf of the Agencies, address the attached comments and resubmit.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
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E: George.Berken@Boldt.Com
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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Tuesday, February 19, 2019 11:37 AM
To: George Berken <George.Berken@boldt.com>; Kincaid, Gary W - DNR (Gary.Kincaid@wisconsin.gov) <Gary.Kincaid@wisconsin.gov>; Larry DeBruin <Larry.Debruin@Boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; ricky.gifford@tetratech.com; dbinkney@anchorqea.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; bryan.heath@ncr.com; jlawson@project-control.com; soconnell@project-control.com; database@project-control.com; brandon.weston@tetratech.com; eci.lfrrpc@tetratech.com; Spillers, Paul <Paul.Spillers@tetratech.com>; 'troy.gawronski@foth.com' <Troy.Gawronski@Foth.com>
Subject: FW: LFRR-18-0218 SRA-07 &-05 Tech Memo in Utility Corridor 029 & 30

George,
This is in response to the A/OT comment number 116 dated 2019-2-07 on the RAWP and the follow up meetings.

Attached is the revised design review document for the SRA-05 (GB water line) and -07 (AT&T Fiber optic line) areas (attachment C to the Technical Memorandums SRA5 and SRA7 submitted on Jan 16). The revisions include extension of the cap over areas that cannot be residually dredged due to utilities, and expanded notes where caps cannot be placed.

Respectfully

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Think Green - Not every email needs printed

TETRA TECH EC, INC

Technical Memorandum

To: Gary Kincaid, George Berken, Jay Grosskopf and Larry DeBruin (A/OT)

From: Terri Blackmar, Morey Tabatabai, Ricky Gifford, and Ben Hendron (Tetra Tech), Paul LaRosa (Anchor QEA)

CC: Jeff Lawson and Sue O'Connell (PCC, for the LLC), Bryan Heath (LLC), Troy Gawronski (Foth), Paul Montney and Roger Kaminski (GP), Bill Hartman (P.H. Glatfelter), Bill Coleman, George Willant, and Richard Feeney (Tetra Tech), Dustin Bauman (JF Brennan), Dan Binkney (Anchor QEA)

Date: March 8, 2019

Re: Remedy Design for SRA-07 in Utility Corridor 029

Document Control Number: LFRR-18-0218-R2

This technical memorandum (tech memo) provides the basis for the proposed remedial design in utility area number 29 (utility 029), which is referred to on the *Draft 2019 Update to the Phase 2B Remedial Action Work Plan* (2019 RAWP) drawings as within the dredge areas DUTIL-026-030. This tech memo was initially submitted on September 27, 2018 but is being revised to include information discussed in meetings on SRA cap design subsequent to this date.

Utility 029 consists of several active fiber optic lines bundled within multiple ducts. This utility is owned by AT&T, and the utility corridor has been present since the 1940s. In a telephone conversation on September 26, 2018, AT&T representative Mr. Eric Adair stated that the utility corridor was established in 1942 and cables have been placed from the 1940s up to 2014. The utility corridor currently contains steel conduit installed by horizontal boring, containing fiber optic lines.

As explained below, it was not feasible to consider installation of a standard engineered cap as a remedy where utility 029 crosses the navigation channel because of potential prop wash impacts and likely noncompliance with the post-cap water depth requirement. A utility buffer zone was established 25 feet upstream and downstream of the utility ducts, which was established for dredging with hydraulic dredges. Within this zone, dredging can only be performed with a specialized utility dredge, and only to the maximum depth of 30 feet. Assuming the river water surface is at elevation 580 feet North American Vertical Datum of 1988 (NAVD88), the dredge elevation corresponding to this depth is approximately 550 feet NAVD88. This allows dredging in closer proximity to the utility but will still leave some sediment exceeding the 1 part per million (ppm) polychlorinated biphenyl (PCB) remedial action level (RAL) un-dredged near the utility. In this area, the dredge design is based on a secondary horizontal buffer that equals 5 feet plus a horizontal distance related to utility location uncertainty as determined by the utility locate subcontractor, plus the radius of the fiber optic line ducts. The resulting horizontal offset for Utility 029 is 7 feet on either side of the utility. This horizontal buffer is shown on the project drawings where applicable on the north and south sides of the utility alignment. A five-foot vertical buffer is also shown above the ducts to minimize the potential for damaging the fiber optic lines during dredging. The remedial design for this utility corridor area is therefore dredging up to the limits defined by the buffer zones. In any areas extending beyond the larger 25-foot buffer zones, sediment that exceeds the 1 ppm PCB RAL was dredged to the modeled neat line. Where sediment that exceeds the 1 ppm PCB RAL remains in the utility corridor following dredging, the area is identified as "special remediation area-7" (SRA-07) and the area will be capped using a cap designed specifically for this area. This SRA extends over most of the utility corridor alignment and may extend up to 25 feet upstream and downstream from the utility, before sloping at a 5:1 slope to the final dredge elevation just outside the area. This utility corridor will be remediated on an exception basis, subject to approval by the Agencies. The remedy for an SRA is not defined in the 2003 Record of Decision (ROD) or in the 2007 ROD Amendment, but these RODs do allow for "exceptional areas" such as this to be treated as a special case. Where the fiber optic ducts are far enough from the navigation channel to allow a project standard cap, with the utility owner acceptance, a project standard cap will be designed.

Background

During the 60 Percent Design phase for the OUs 2-5 project, no-action setbacks were established around utilities to avoid risk of damage and/or safety concerns during remediation in these areas. Concerns were based on potential risks associated with the dredge cutterhead or marine equipment spuds impacting the utilities, as well as potential injury to personnel. At that time, the utility locations were approximate based on desk-top searches for as-built drawings and had not been field located. Specific ground rules for design were established during the 60 Percent Design with placeholder offsets ranging from 25 to 50 feet based on the accuracy of the utility location information and the risk posed by the sediment contamination.

Following additional sampling that provided information regarding PCB concentrations in sediment near many of the utility crossings, the A/OT requested that utility locations be determined with greater confidence so that remediation could be performed as close to the utility as possible. Tetra Tech had many meetings with utility owners and requested as-built drawings from these owners as the initial step in this process.

In 2012, and again in early 2015, Tetra Tech retained the Marine Engineering Systems Company (MESCO) to field locate several of the utilities. Following that effort, later in 2015, Tetra Tech retained Depth of Cover (DoC) Mapping to locate more accurately most of the utilities as part of further planning for remedial action in these areas. In 2017, J. F. Brennan (Brennan) elected to perform yet additional field location efforts involving the use of its divers. As a result of these additional location efforts, the utility locations in OU4 have been located with greater confidence, including the location of utility 029. A 50-foot buffer zone remained in place following this mapping, although the Agencies required remediation within this zone that could be performed safely to the extent practicable. Brennan subsequently determined that dredging could be performed to the previously-described horizontal and vertical offsets from the utility, using the special equipment described below.

On February 28, 2018, a work group meeting was held with representatives of the U.S. Army Corps of Engineers (USACE), Mr. John Imbrunone, and Mr. Brian Powell, Green Bay Water Utility (GBWU).

The primary focus of the meeting was to discuss dredging and capping in DUTIL-020, a GBWU water line. However, the meeting attendees recognized that decisions on dredging depths, dredging setbacks from utilities, and cap construction would likely be applicable to other SRA caps including utility 029. During this meeting, Mr. Imbrunone was asked to provide information regarding the USACE's preferences for the following: 1) the buffer zone depth to be added below the authorized navigation channel depth, to the top of the cap surface; and 2) the stone size to be used for cap armoring. On March 14, 2018, Mr. Imbrunone emailed the requested information to Mr. Paul Spillers (Tetra Tech). According to Mr. Imbrunone, the USACE's preferences are for a minimum 2-foot buffer below the authorized navigation channel depth, and for a smaller stone size.

As a follow-up to the February 28th meeting, an over-the-shoulder meeting was held with the A/OT on March 15, 2018 to discuss the information provided by Mr. Imbrunone. During that meeting, the A/OT stated that the use of small stone, with a D_{50} of 1.5 to 3 inches, would be acceptable for the SRA caps, and in general the top of cap should be designed to be no higher than elevation 551.6 NAVD88, to incorporate the USACE's request for a 2-foot buffer below the authorized navigation channel depth.

In addition, the A/OT requested the following information to be provided regarding the proposed SRA caps:

- Additional information from Brennan, in writing, describing the efforts taken to dredge the 25-foot buffer zone located south and north of the utility, and the rationale for the inability to dredge below elevation 550.0 feet NAVD88 in this zone.
- The estimated volume of sediment remaining below elevation 550 feet NAVD88 in the navigation channel, that would be capped with the SRA cap, and is outside the assumed utility area.

This information is provided below.

Equipment Capabilities and Risk Factors Assumed by Brennan for Dredging

Brennan initially began dredging close to utilities using diver-assisted dredging, with a shroud connected to a dredge via hydraulic suction hose. This arrangement proved to be less efficient than anticipated, so in 2017 Brennan elected to use divers to perform the field work mentioned above. This was followed by dredging with the Vic Vac and an excavator mounted dredge, the *Midland*, located on a barge, to remove sediment exceeding the RAL to within approximately five feet of the location of a utility. Brennan determined this to be the closest distance that could be dredged safely, to which the A/OT concurred. However, this dredge can only reach as low as approximately elevation 550 feet NAVD88, so where sediment exceeding the RAL extends below this elevation outside of the 5-foot buffer zone, the SRA cap will be extended to cover this sediment, as shown on the design.

During the 2017 season, while utilizing the *Midland,* Brennan attempted to modify the dredge apparatus to reach below elevation 550 feet NAVD88. This attempt was unsuccessful and led to damaging the equipment. Brennan then investigated two reasonable options that could have allowed safely dredging below elevation 550 feet NAVD88, as described below.

- Option 1 included adding the Vic Vac attachment onto a standard swinging ladder dredge attached to the guide barge. These dredges have a dredging depth of approximately 35 feet in the standard cutterhead configuration (dredge elevation 545 feet NAVD88 with water elevation of 580 feet NAVD88), but can only reach just under 28 feet (dredge elevation 552 feet NAVD88 with water elevation of 580 feet NAVD88) using the Vic Vac. The loss in dredging depth is due to the need for the dredge ladder to be articulated to operate the Vic Vac.
- Option 2 included using an excavator with longer reach capabilities. There are several issues associated with this option. First, the *Midland* excavator is a company-owned machine that has several post-market additions to enhance its ability to work in this capacity. Brennan modified the counterweight to allow the hydraulic power pack to be attached to the back of the dredge. In addition, the power pack is currently manufactured to attach to that specific piece. These modifications cannot be made to rental equipment because doing so would void the warranty of the machine. Another problem is that the attachment's weight would still limit the reach of a standard class machine, and it still would not be able to reach the depths achievable by the Midland's excavator.

In addition to this information, on March 27, 2018, a letter was provided by J.F. Brennan and submitted to the Agencies that provided additional explanation related to the risks involved in dredging near utilities. On March 28, 2018, the LLC received comments from the Agencies on the letter, which included a request for more detailed information documenting the need for a 25-foot setback for dredging. On May 1, 2018, the LLC forwarded two letters from J.F Brennan containing the requested information. On May 2, 2018 the Agencies acknowledged receipt of the letters. The letters provided by J.F. Brennan and the Agencies' comments on the initial letter are presented in Attachment A.

In conclusion, Brennan has determined the maximum dredging depth of 30 feet (i.e., an elevation of 550 feet NAVD88 when the water level is at 580 feet NAVD88) to be the maximum reasonable depth based on available equipment and industry standards.

Existing Conditions in the Utility 029 Corridor

A plan and profile drawing of the AT&T-owned fiber optic ducts located in the utility 029 corridor is presented on Figure 1 in Attachment B. The figure shows the approximate plan and profile for the utility and the location of cores obtained in the area used to define the depth of contamination (DOC). The DOC is the depth to which sediment exceeding the 1 ppm PCB RAL must be remediated, to the extent practicable given safety and other concerns such as damage to property. Areas defined for dredging are outlined in red on the plan view map (top panel of the drawing) and labeled as dredge areas DUTIL-026-030 and DCA44 within the utility corridor. The cross-section profile (bottom panel on the drawing) shows the 2015 pre-season bathymetry and the modeled dredging design surface. The sediment between these surfaces will be dredged, including sediment within the SRA-07 area that is five feet or more above the fiber optic lines. Sediment that exceeds the 1 ppm PCB RAL will remain in adjacent areas that are within a 25-foot buffer zone and below elevation 550 feet NAVD88. These areas will require capping, as described herein.

The SRA-07 cap limits are shown on Figure 1 in Attachment C. The west side of proposed SRA-07 cap connects with the SRA-05 cap over utility 030 located just to the north. Cap construction for the adjoining caps is similar.

The remedy for SRA-07 must consider the PCB concentrations likely to remain in the sediment after dredging. A core summary table (Table D-1) is presented in Attachment D, which only includes cores upstream, downstream, and within the 100-foot utility 029 corridor that still contain PCB contamination above 1 ppm. An assessment of these cores follows:

- Cores 4065-212 and 4065-15 contain intervals with PCB concentrations that will remain following dredging, with concentrations as high as 3.17 and 41.9 ppm, respectively.
- Cores 4065.5-17 and 4065.5-18 are also within the navigation channel and contain PCB concentrations up to 20 ppm at surface.

The thickness of RAL sediment remaining around utility 029 in the SRA-07 cap area is expected to range from 0 to 2 feet after dredging, with PCB concentrations that are likely less than 1 ppm and 3 ppm at the surface, just below the cap. The estimated volume of RAL sediment remaining in the navigation channel, below elevation 550.0 feet NAVD88 is approximately 450 cubic yards.

Propeller Wash Zones

Propwash zones were determined assuming 100 percent bow thruster power level from a large non-straying and straying vessel traveling in the navigation channel. Maps showing these propwash zones are presented in Attachment E. The zones show the correlation between propwash impact and the stone size needed to resist this impact. These zones indicate that an armor stone with a D_{50} of 6 inches or more would be required, which is larger than desired by the USACE. Therefore, the cap will be designed as an SRA cap with smaller stone used for armoring. Armor stone used for these caps will have a D_{50} of ¾ inch.

In some areas of the navigation channel, insufficient thickness is present between the bottom of the navigation channel and the top of the utility buffer to allow for the SRA cap described in the previous paragraph. In those areas, a thinner SRA cap will be placed. The top of the cap in the navigation zone will not exceed elevation 552.6 NAVD88.

Proposed Remedy for the Utility 029 Corridor in a High Propwash Impact Area

Capping with a standard cap is not feasible for the utility 029 corridor. A standard cap would require a surface armor layer with very large diameter stone or placement of a concrete mat to resist maximum theoretical propeller wash from large vessels. Either design would result in a large hump that would not meet the 25-foot (24-foot navigation channel plus 1-foot buffer) water depth required over the width of the navigation channel.

The proposed remedies for SRA-07 are special exception caps. Sand mixing calculations were performed for a range of initial PCB concentrations (up to 50 ppm PCB at the surface) and sand thicknesses of 6 inches, 9 inches and 12 inches. These calculations assume full mixing of the first 3 to 6 inches of sand with underlying undisturbed residual or generated residuals, which are assumed to be produced by the dredging process. The results for these calculations are presented graphically in Attachment F. These calculations indicate that a 12-inch thick sand cover mixing with the upper 6 inches of sediment containing PCB concentrations of 42 ppm or less would result in PCB concentrations at the surface of approximately 0.85 to 1.23 ppm. Although mixing of sand with underlying sediment has been rarely observed, and when it has been observed it is confined to the lower 3 inches of sand, this SRA cap design conservatively assumes that significant mixing would occur and that the PCB concentration at the surface may be greater than 1 ppm PCB after mixing with sand alone. In addition, there is a need to maintain 25-foot water depth in the navigation channel. Therefore, the SRA-07 cap will receive a 6-inch thickness of sand mixed with GAC. The addition of GAC to the sand layer will provide adsorption of PCBs in addition to dilution effected by mixing of the sand and GAC with the sediment. Both effects will reduce the concentration of PCBs.

Sand/GAC Ratio

A work group meeting was held on August 21, 2018, during which it was agreed to increase the top of cap elevation from USACE preferred elevation of 551.6 NAVD88 to 552.6 NAVD88 to provide one foot of cap clearance below the navigation channel authorized depth of 24 feet. Another work group meeting was held on August 30, 2018 to further discuss cap designs with minimal thickness due to navigation channel constraints. Based on the meeting discussion, it was determined that at least six inches of sand would be placed with an amendment of GAC containing up to approximately 5% GAC by dry weight of sand. A minimum thickness of 3 inches of stone with D_{50} of ¾ inch will overlie the amended sand. The stone thickness interval will increase to achieve top of cap elevation of 552.6 feet NAVD88 where feasible. On the west end of SRA-07, the fiber optic utility lines are at elevation greater than 552.6 feet NAVD88. In that area, a six-inch sand cover will be placed over the utility, extending at least seven feet north and south of the utility. Figure 1 in Attachment C presents the cap types proposed SRA-07 in utility 029.

Following the August 21, 2018, the modeling approach was developed by the Design Team and presented to the A/OT on November 6, 2018. The Agencies approved the proposed approach on December 5, 2018, with the contingency that a factor of safety be applied to the results. The approach included evaluating the sand/GAC ratio using Dr. Danny Reible's (Texas Tech University) latest cap model. The model would be run iteratively using site-specific parameters and PCB concentration remaining below the cap, until the results showed the project remedial action level of 1 ppm PCB would be met in pore water at the cap's surface for at least a 100-year period.

The modeling approach and results for SRA-03, SRA-05, and SRA-07 are presented in a memo in Attachment F. Because of the limited number of samples collected in each SRA and as indicated in the memo, a conservative approach was used that includes modeling with the maximum concentration that will remain under the planned SRA caps. This maximum concentration was observed in sediment remaining below cap SRA-07 (i.e., 41.9 ppm PCB). This concentration was converted to an equivalent range of porewater concentration in the sand for a range of the sand's total organic content of 0.10% to 0.67%. The modeled resulting GAC amendment needed to maintain a concentration of 1.0 ppm PCB for 100 years ranged from 0.0% to 1.4%. To be conservative, 1.4% GAC was selected from this model range which is multiplied by a required factor of safety of 3. This results in the GAC added to the sand of 4.2% by dry weight of a sand (minimum 6-inches of sand).

This remedy would provide the following advantages for this area:

- The carbon amendment will increase attenuation of PCBs, when compared to a sand-only cap. This will allow for a thinner cap that will not interfere with the navigation channel.
- The spreader would be used in conjunction with an extended barge that could safely span the utility corridor such that impacts to utility 029 with spuds are not a concern. This could allow for installation of the SRA cap during the 2019 season.
- The SRA caps remedy would be effective based on the calculations previously discussed.
- The SRA caps should be acceptable to AT&T, the utility owner, as the cap design will not interfere with future access to the utility, if needed.

Design plans and cross sections for the remaining dredging and capping over utility 029 are presented in Attachment C. Within the navigation channel limits, the SRA-07 cap is not expected to extend above elevation 552.6 feet NAVD88, because sediments in the navigation channel will be dredged to an elevation of 550.0 feet.

The proposed SRA cap is not a standard cap design but will still provide isolation and/or potential mixing of underlying PCB contamination that will help to reduce the potential impact of leaving these PCB concentrations in place. In summary, the advantages and disadvantages of the SRA cap design for Utility 029 corridor are shown on Table 1.

Table 1. Advantages and Disadvantages of the SRA-07 Cap Design

Cap Design Criteria	Advantages of SRA-07 Cap Design	Disadvantages of SRA-07 Cap Design
Stone size – D_{50} of ¾ inch	Provides more protection against erosive forces compared to sand. Stone size is small enough to allow the utility owner reasonable access to the buried utility, if needed.	Not large enough to protect against scour from theoretical full power bow thruster propwash from large vessels throughout much of the area.
Sand isolation layer thickness	Will be thicker than typically required over most of the SRA cap area.	May be thinner than desired in the navigation channel due to limited depth of dredging and channel depth limitations.
Activated Carbon Amendment	Increased attenuation of PCB compared to sand alone.	Requires mixing and measuring to achieve the amendment ratio of 4.2% by dry weight of the sand.
Top of cap elevation in the navigation channel	Will allow a 1-foot buffer zone for channel dredging.	The stone size will not be large enough to function as a marker layer for dredging, so the armor layer could be disturbed by over-dredging.
Top of cap elevation outside the navigation channel	Acceptable for side slopes of the channel and in some areas near the shoreline.	As the cap approaches the shoreline on each side of the river, the top of cap elevation provides less than 6 feet of post-cap water depth. The proposed cap does not extend to the shoreline, therefore there will be 3 feet of draft above the SRA-07 cap, as required by the ROD. The 6-foot post-cap water depth is preferred by the A/OT.

Previous and recent input received from AT&T, regarding cap placement above the fiber optic line, is discussed in the following section. Input received from the USACE is also discussed.

GAC Placement Method

The sand and GAC mixture will be placed using J.F. Brennan's patented Broadcast Capping System (BCS™), which has three main systems/components that include the land plant, transportation, and the broadcast spreader. The land plant will be located onshore at the Lower Fox River processing facility, where cover sand and GAC will be stored and mixed before being hydraulically or mechanically transported to the spreader plant.

The land plant will be equipped with an integrated measuring system that includes a scale and hopper system that weighs and meters the amendment precisely. Two conveyors, one for sand and one for GAC will be used to supply the mixture. The conveyors will be set up in a leader-follower configuration. This enables precise mixing, because the leader is equipped with a scale controlled by a programmable logic controller (PLC), which will be set to accept a specific volume of material. The scale controller will provide electric pulses for every 0.01 tons that pass over the scale and transmits the information to the PLC. The PLC takes the pulse inputs from the sand conveyor and adjusts the GAC metering hopper to deliver the specified proportion of GAC to the sand.

The scale controller will provide electric pulses for every 0.01 tons that pass over the scale and transmits the information to the PLC. The follower conveyor will automatically adjust the amount of GAC based on the amount of sand on the leader conveyor. The two metering conveyors will discharge onto the long conveyor that will either discharge into a slurry container or material barge.

The GAC will be hydrated in large soaking tubs for at least 24 hours prior to mixing with the sand. This will increase the weight of the GAC to as much as double the dry weight, which will result in GAC that is similar in weight to the weight of the sand. The GAC weight change will be accounted for in the metering process to ensure an adequate mixing rate based on a percent of dry weight.

When the sand and GAC have been properly mixed at the land plant, the mixture will be hydraulically transported through pipelines to the broadcast spreader or mechanically transported via barge.

Broadcast Capping System™

The broadcast spreader will be set up on a 40-feet by 80-feet distribution barge equipped with winches, spuds, and hydraulic power pack. The distribution barge will work in tandem with the same equipment , plus a rubber tracked excavator. Two cables will be connected between the excavator and cleats on the distribution barge to join the barges.

Once the sand / GAC mixture reaches the broadcast spreader it will be processed in a manner that depends on whether the delivery was via hydraulic or mechanical means. If hydraulically transported, the mixture will be dewatered through a set of hydrocyclones and a high-frequency shaker system. The slurry from the pipeline will be discharged into two 30-inch cyclones on the spreader barge located above the dewatering screen. The cyclones will remove the majority of the water from the slurry and then deposit the capping mixture onto the shaker bed. The discharged carriage water will be transported to a tank where a quiescent zone is created that will allow the remaining fines to drop out before the carriage water is discharged, via overflow weirs, into the river at the bow of the barge near the sand placement moon pool. As fines settle out in the holding tank, a 4 inch pump will recycle the sand along with some carriage water through an 18-inch cyclone. This "recovery" cyclone will place the fines from the holding tank back onto the shaker screens to be dewatered again, thereby reducing the amount of lost fine material.

If the mixture is delivered by barge, a large material handler will be placed on the stern of the placement barge. The material handler will offload the transport barge and place the sand/GAC mixture into a small metering hopper similar to the one below the shaker deck.

From the small metering hopper which feeds a belt conveyor, the sand/GAC mixture will be removed from the hopper via a 24-inch conveyor. The sand/GAC misture will be deposited onto the dual spinners of the BCS™ system and spread in an overlapping manner. The spinners will then broadcast the cap material over an approximately 30-feet by 35-feet area. The spinners can be adjusted to develop an accurate pattern regardless of the sand size or amendment percentage. By broadcasting the material at a high delivery rate over a large footprint and using the water column to reduce the mixture's velocity, there is little mixing of the capping material and in-situ material, and a uniform sand/ GAC mixture is placed. The BCS™ system used for the sand/GAC mixing uses the same spreader as that currently used on the project for sand only covers and caps. This system minimizes mixing at the sediment and sand interface as well as slope failures and "mud wave" effects. The BCS™ process is shown on the following flow diagram (**Exhibit 1**).

BCS™ Spreader Action

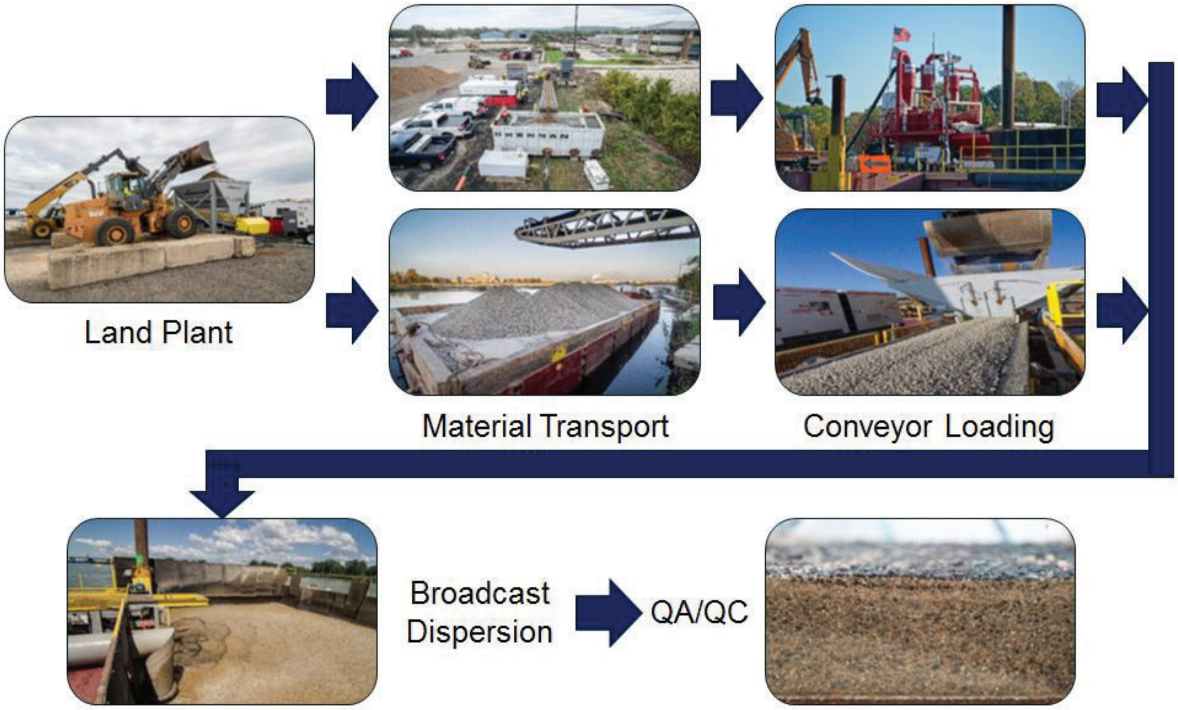


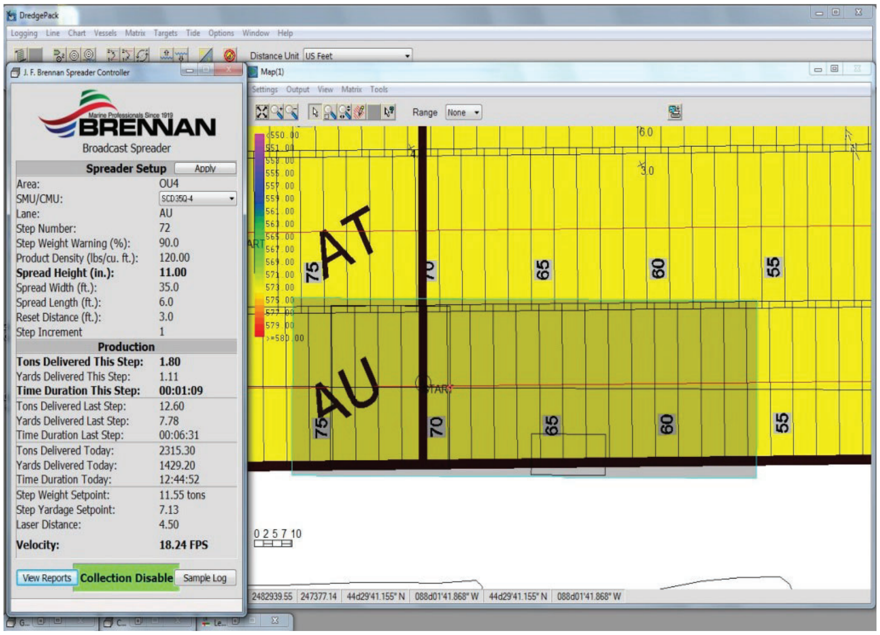
Exhibit 1: BCS™ Flow Diagram

Brennan Internal Process Quality Control

Brennan has developed customized software to aid in the quality control management. This software provides several measures to ensure the accurate placement of cap mixtures. Hypack software receives the information from the spreader's GPS sensors and downloads the data into the DREDGEPACK® module to provide real-time location of the spreader. As part of DREDGEPACK®, a Brennan Spreader Controller has been developed as shown in **Exhibit 2**. This controller has several input sections (Spreader Setup) that are easily modified to determine the amount of sand placement in each step. These inputs allow the spreader to be accurately adjusted for lane width, length, and height. Below the Spreader Setup section, the Spreader Controller tracks the production at each location, by including the belt scale data collected just before the dual spinner setup. These weights are tracked in real-time to measure precisely the amount of material placed in each step. This screen is also displayed in the excavator to alert the excavator operator when to step.

The Spreader Controller can also be used for quality control by recording a large database of information collected from each step. Once the spreader takes a step, the controller resets, the Spreader Controller records the data from the previous step and downloads it into the database. Brennan quality controll staff collect this information daily to anallyze for any discrepancies and use this information in the daily reporting process. The Spreader Controller system also provides a method for recording the location and results of quality control samples. The operators can enter the quality control sample result which is then logged in a database and also displayed on the DREDGEPACK® screen. Brennan quality control information is tracked by Brennan's quality control staff and compared to quality assurance results.

Exhibit 2: Screenshot of Spreader Control on BCS™ Plant



Spreader Setup	Apply
Area:	OU4
SMU/CMU:	SCD35Q-4
Lane:	AU
Step Number:	72
Step Weight Warning (%):	90.0
Product Density (lbs/cu. ft.):	120.00
Spread Height (in.):	**11.00**
Spread Width (ft.):	35.0
Spread Length (ft.):	6.0
Reset Distance (ft.):	3.0
Step Increment	1
Production	
Tons Delivered This Step:	**1.80**
Yards Delivered This Step:	1.11
Time Duration This Step:	**00:01:09**
Tons Delivered Last Step:	12.60
Yards Delivered Last Step:	7.78
Time Duration Last Step:	00:06:31
Tons Delivered Today:	2315.30
Yards Delivered Today:	1429.20
Time Duration Today:	12:44:52
Step Weight Setpoint:	11.55 tons
Step Yardage Setpoint:	7.13
Laser Distance:	4.50
Velocity:	**18.24 FPS**

2482939.55 | 247377.14 | 44d29'41.155" N | 088d01'41.868" W | 44d29'41.155" N | 088d01'41.868" W

Additional Quality Assurance/Quality Control Procedures

In-situ and ex-situ samples of the CIL will be tested to verify the proper sand/GAC ratio. The testing will be conducted by AET Laboratory and will utilize a thermal drying method to evaluate the GAC concentration in the sample. A description of the thermal drying method is presented in the Standard Operating Procedure, Attachment G.

Utility Owner Acceptance

The following information obtained from the USACE is also applicable to DUTIL-029, SRA-07. On February 28, 2018, a work group meeting was held for DUTIL-020 with representatives from USACE and Green Bay Water Utility. It was agreed that some of the discussions for DUTIL-020 would be equally applicable for other SRA utilities. Mr. Jon Imbrunone, USACE, was asked to provide information regarding the USACE's preferences for the buffer zone depth to be added below the navigation channel depth to the top of the cap surface, and the stone size preferred for cap armoring. On March 14, 2018, Mr. Imbrunone emailed Tetra Tech, stating the USACE's preferences are for a minimum 2-foot buffer below the authorized channel depth, and for small stone size.

On August 27, 2018, a representative of AT&T, Mr. Eric Adair, was contacted to discuss the proposed remediation near the fiber optic conduit identified as utility 029. Mr. Adair stated the fiber optic cable is in a steel conduit below the river bed. If future repairs are necessary, the fiber optic cable would be pulled from the conduit and replaced with a new one. Mr. Adair stated that dredging would not affect the fiber optic cable, and the presence of a sand and rock cap would not affect the AT&T fiber optic line. He stated that no additional notifications are necessary for AT&T.

The Design Team believes that AT&T has approved the remedy, and requests acceptance from the Agencies for this remedy in SRA-07.

ATTACHMENT A

LETTERS FROM J.F. BRENNAN REGARDING DREDGING NEAR UTILITIES AND AGENCIES' COMMENTS ON THE INITIAL LETTER

Marine Professionals Since 1919
BRENNAN

J.F. Brennan Company, Inc.
818 Bainbridge Street
La Crosse, WI 54603
608.784.7173

May 1, 2018

Mr. Bill Coleman,
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54304

Re: Dredging Near Utilities

Dear Mr. Coleman

We are writing to address questions recently raised by the Agencies Oversight Team (A/OT) regarding the strategies and methods J. F. Brennan Company, Inc. ("Brennan") is using for remedial dredging in the vicinity of utilities that cross the river bottom. The A/OT has requested additional explanation from the project team for why the standard dredge cutterhead cannot be operated within the 25-foot setback. Brennan has attached its insurance letter stating a 50 foot offset should be used. Due to the extensive locates that have been done on this project during the design phase Brennan has reduced this requirement to the 25-foot offset.

Over the past several seasons, Brennan has worked closely with the project design team to develop strategies for dredging over utility lines to maximize sediment removal in the vicinity of those utilities in a safe manner. We developed methods utilizing the dredge Block Island with an open suction guided by divers, and we have utilized the utility dredge with a Vic Vac attachment. Using these methods, we have been able to dredge safely to within approximately 5 feet of utility lines 20, 23 and 26-30.

While it is true that the Vic Vac and the standard cutterhead attachment both rely upon GPS placement, the cutterhead does not operate in the same manner as the Vic Vac. A cutterhead attachment dredges more aggressively than the Vic Vac, which creates both more sediment disturbance and, significantly, more disruption of areas in the river bed near the area of dredge operations. Operation of the cutterhead necessarily increases the risk of damage to nearby utility lines. This is especially true If Brennan operates the cutterhead within the 25 foot utility offset.

The 25 foot utility offset is the operational standard used throughout the country. Recent projects completed by Brennan with similar offsets include Fox River OU1, East Branch Grand Calumet River – Reaches 4A and 4B, West Branch Grand Calumet River – Roxanna Marsh Reaches 1 and 2 and Connecticut River. Additionally, we have and are currently bidding several other projects nationwide with a similar offset. In fact, most projects increase offsets around high risk utilities, such as fiber optic lines.

Several attempts have been made to locate the utility lines in the river bottom. While these attempts have refined the information available to the project team, the resulting data has not provided the team with a sufficiently high level of certainty as to the actual location of those lines. The location data thus far received by the team has varied by more than 24 feet in regards to Utility 20 and by up to 33 feet for

Utility 21. Further dimensions of utility locate differences can be provided upon request. These differences show the level of complexity in accurately locating pipelines under the river bottom.

Operation of the standard cutterhead attachment inside a 25-foot setback is not a risk we can accept, nor is it a risk the project team should accept. That conclusion is more than evident when we have methods available that have produced a performance track record of safe dredge operation near utility lines. It is a method we have used on many other projects and it has produced a performance track record of safe dredge operations near utilities.

If you have any questions, please do not hesitate to contact us. Thank you.

Sincerely,

Dustin Bauman
J. F. Brennan Company, Inc.

J.F. BRENNAN CO., INC.

820 BAINBRIDGE · BOX 2557 · LA CROSSE, WI 54602-2557 PHONE: 608 / 784-7173 · FAX: 608 / 785-2090

August 22, 2011

Mr. Bill Coleman
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54303

Re: Dredging Near Utilities

Dear Bill:

As you are aware, there have been numerous meetings with utility owners recently, as well as subsequent discussions with the A/OT related to the remedial actions that will be performed in the vicinity of utilities that cross the river. While we applaud the effort to identify the location of the utilities as accurately as possible I understand that JF Brennan site personnel have expressed concerns with regard to the lack of detailed information on the exact location of these utilities. Pursuant to this, we need to make very clear that we, as a company, have a significant concern for the safety of our personnel, as well as our equipment and reputation, and cannot take unnecessary risks when working in the area of active utilities whose locations have not been accurately identified.

Due to our concerns, we spoke to our insurance carrier regarding this topic to see if they could provide any insight. Attached you will find a letter we recently received from them. In this letter you will note that there is mention of a 50 foot offset when working in the area of an active utility where the exact location is unknown. To this point, we understand that WPS has required this amount of setback when working near its active natural gas pipeline that crosses the river in the general vicinity of the highway 172 bridge. We agree with this approach and are willing to proceed in this direction when work in this area is undertaken. In fact, we would recommend this approach be used when completing remedial activities in other areas where the exact location of utilities in unknown. Perhaps it will be possible to reduce the amount of offset, depending upon the amount of information for the specific utility. However, this will need to be done on a case by case basis. As an example, if the location of the utility can be guaranteed within 5' in all directions we would be able to reduce the offset to 25'. In addition, if the location of the utility is ***accurately determined to be at least 20' below the sediment surface*** we would perform dredging over this utility, if the design identifies this as the selected remedy.

As you are aware, JF Brennan has modified our material spreading equipment such that we can cantilever over a utility, providing complete remediation via the placement of sand cover or an engineered cap, while maintaining the safety setback of 50'. Thus, we

would encourage this approach near utilities where the information regarding locations is questionable.

If you should have any questions once you have had a chance to review this information please feel free to contact me at your earliest convenience. We look forward to a safe and successful project.

Sincerely,

Tom Kennedy

Tom Kennedy
Vice President CFO

McGRIFF, SEIBELS & WILLIAMS OF MISSOURI, INC.

7711 Bonhomme Ave., Suite 900 • St. Louis, MO 63105 • TEL – (314) 854-5200 • FAX – (314) 854-5201

August 19, 2011

Mr. Tom Kennedy
Chief Financial Officer
J. F. Brennan Company, Inc.
PO Box 2557
LaCrosse, WI 54602-2557

RE: Fox River Project
Underwater Utilities

Dear Tom:

We wanted to follow up with you on our recent conversation regarding the Fox River project and issues related to dredging near and/or over utility lines, oil pipelines, gas pipelines and similar items (hereafter underwater utilities). It is our understanding that a significant complicating factor in the situation is that data does not exist to precisely locate these underwater utilities, either vertically or horizontally, at certain locations. Despite the unavailability of such data at several locations, regulatory authorities are not presently agreeing to an offset with a capping alternative that has been proposed by J. F. Brennan and the project's prime contractor. At the same time, J. F. Brennan is contractually obligated to take all necessary precautions for the safety of, and must provide the necessary protection to prevent damage, injury or loss to, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of performing dredging operations on the Fox River.

In our capacity as J.F. Brennan's insurance broker, we are compelled to advise you of the significantly higher risk associated with dredging an area where the precise location of underwater utilities is unknown. There are certain representations made to the various companies that underwrite your insurance program regarding policies and procedures as it relates to dredging river beds with known underwater utilities. At a minimum, there is an expectation on behalf of your insurers that J. F. Brennan is able to identify the location of such utilities prior to commencing dredge operations. They have been advised that in situations where the exact location of underwater utilities are unknown, J. F. Brennan's preferred protocols dictate a fifty (50) foot offset with capping performed as an alternative to dredging within that offset. We are concerned that a perceived lack of due diligence by J. F. Brennan in its approach to dredging operations, or in meeting its contractual obligations for the project, could significantly complicate any potential claim scenarios. Based on the variety of underwater utilities throughout the site, a loss or losses from an underwater utility strike could involve significant monetary damages and other claims. Caution is therefore certainly urged. The potential exists for claims from the project owner, prime contractor, underwater utility owners and other third-parties affected.

Appendix F SRA-07

Although not ideal, J. F. Brennan could look to contractual protection for the risk associated with dredging an area with unknown underwater utilities in the form of an indemnification agreement. However, in order for such an agreement to provide any degree of protection, it would need to encompass all bodily injury, property damage, environmental damage, loss of use and other direct or indirect consequences from a strike as it relates to any and all potential claimants. This indemnification would have to include as signatories the project owner, prime contractor and all applicable underwater utility owners. Although impossible to secure indemnification from unknown third-parties potentially impacted by a claim situation, the project owner, prime contractor and/or the underwater utility owners would have to indemnify J. F. Brennan for any claim brought by a third-party related to an underwater utility strike.

In addition to the contractual protection, we strongly urge J. F. Brennan to require from the project owner or prime contractor improved information regarding the river bottom location of all underwater utilities on both a vertical and horizontal basis. If necessary, J. F. Brennan should seek relief under its contractual provisions with the prime contractor to assure that sufficient data is available to identify precisely the location of underwater utilities. It is our experience that underwater utilities have a tendency to shift positions over time, therefore, recent data is imperative to minimize the potential for losses as a result of your dredging operations.

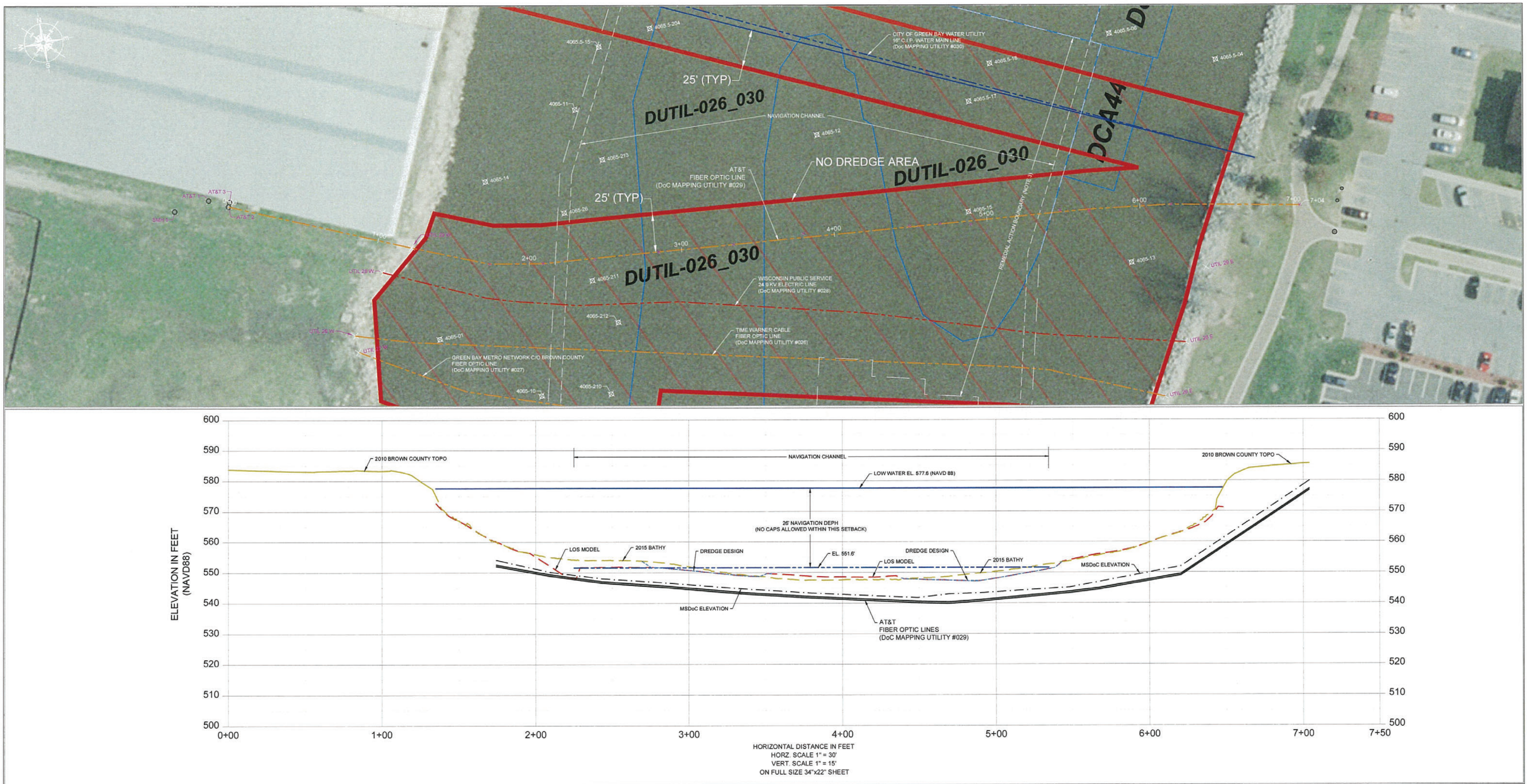
We appreciate J. F. Brennan including us in this process. We are available to assist your attorney in drafting appropriate indemnification language in an attempt to minimize potential claims occasioned by incomplete data.

Sincerely,
McGRIFF, SEIBELS & WILLIAMS of MO, Inc.
C Baxter Southern III

C. Baxter Southern III
Executive Vice President

ATTACHMENT B

PLAN AND PROFILE FIGURES OF UTILITY 029 CORRIDOR SHOWING 25-FOOT BUFFER ZONE AROUND THE FIBER OPTIC DUCTS



SOURCE INFORMATION

DoC MAPPING UTILITY #029

1. SOURCE DRAWING WAS PROVIDED BY:

DoC MAPPING LLC
3518 OCTAVIA STREET
NEW ORLEANS, LA 70125
(619) 566-6783

2. FILE NAME: "DoCMapping_029_COP"
3. DoC DRAWING IS BASED ON FIELD SURVEY OF MAY 2015, REFERENCED TO THE U.S. STATE PLANE - WISCONSIN CENTRAL ZONE COORDINATE SYSTEM, NAD83 AND NADV88 VERTICAL DATUM.
4. DATA POINTS REFERENCE ONE OF THE CABLES WITHIN THE CONDUITS. ORIENTATION OF THE CONDUIT BUNDLE AND LOCATION OF THE CABLE WITHIN THE CONDUIT IS UNKNOWN.

PLAN NOTES

1. **MSDoC ELEVATION**: MINIMUM STATISTICAL DEPTH OF COVER. REPRESENTS A 95% PROBABILITY THAT THE TRUE POSITION OF THE LINE LIES DEEPER THAN THIS POINT.
2. HORIZONTAL ALIGNMENT OF PIPE WAS ESTABLISHED USING "BEST FIT" LINE BASED ON DoC POINT DATA WITHIN THE RIVER (SEE INDIVIDUAL "X" MARKS IN PLAN VIEW).
3. REMEDIAL ACTION BOUNDARY IS FROM THE LATEST RA WORK PLAN DRAWINGS. THE REMEDY INSIDE THIS BOUNDARY MAY CHANGE.
4. EAST AND WEST BANK POINTS SHOWN WERE CONFIRMED BY J.F. BRENNAN SURVEY OF UTILITY LOCATE MARKERS.

UTILITY NOTES

UTILITY TYPE: FIBER OPTIC LINE

OWNER: AT&T

SIZE: UNKNOWN

MATERIAL: MULTIPLE PE DUCTS

DATE INSTALLED: 1940s

INSTALLATION METHOD: UNKNOWN

UTILITY NAME: NA

LEGEND

━━	WATER LINE (ELEV: 577.6)
━ · ━	MAXIMUM ELEVATION FOR TOP OF CAP WITHIN NAVIGATION CHANNEL
╌╌	J.F.B. 2015 PRE-SEASON BATHY
╌╌	LOS MODEL
━━	2010 BROWN COUNTY TOPO
─ ─	NAVIGATION CHANNEL
─ · ─	ANCHOR UTILITY EXCLUSION ZONE
╌╌	DREDGE DESIGN SURFACE
╌╌	SAND COVER
╌╌	CAP A
╌╌	CAP B
╌╌	CAP C
☒ 4061.5-01	DESIGN CORE

SCALE (1" = 30')

30 15 0 30 60

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

THIS DOCUMENT IS THE PROPERTY OF LOWER FOX RIVER REMEDIATION LLC PREPARED BY TETRA TECH EC, INC. (TtEC), AND IS PROVIDED UPON THE CONDITION THAT IT WILL NOT BE REPRODUCED, COPIED, OR ISSUED TO A THIRD PARTY. IT IS PROVIDED TO BE USED SOLELY FOR THE ORIGINAL INTENDED PURPOSE, AND SOLELY FOR THE EXECUTION OR REVIEW OF THE ENGINEERING AND CONSTRUCTION OF THE SUBJECT PROJECT.

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: Utilities P&P #029.dwg
DRAWN BY: SHANE.NELSON
DATE: June 11, 2015
LAST REVISED: June 26, 2017
CHECKED BY: M.T.
REVIEWED & APPROVED BY J.F. BRENNAN:

Fox River
LOWER FOX RIVER REMEDIATION LLC

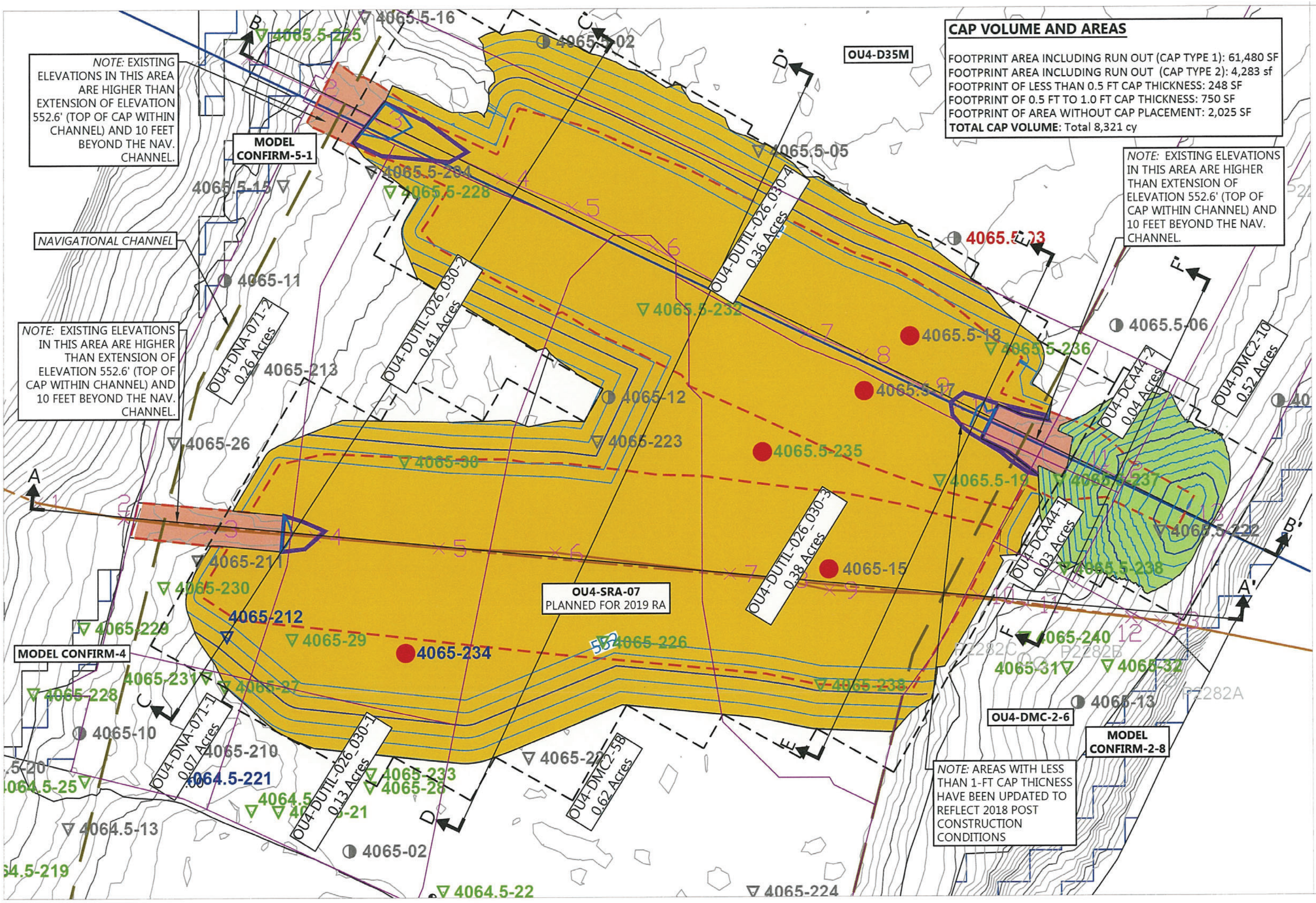
FIGURE I

PLAN & PROFILE DRAWING

AT&T - FIBER OPTIC LINE
UTILITY #029

ATTACHMENT C

DESIGN PLANS AND SECTIONS



CAP VOLUME AND AREAS

FOOTPRINT AREA INCLUDING RUN OUT (CAP TYPE 1): 61,480 SF
FOOTPRINT AREA INCLUDING RUN OUT (CAP TYPE 2): 4,283 sf
FOOTPRINT OF LESS THAN 0.5 FT CAP THICKNESS: 248 SF
FOOTPRINT OF 0.5 FT TO 1.0 FT CAP THICKNESS: 750 SF
FOOTPRINT OF AREA WITHOUT CAP PLACEMENT: 2,025 SF
TOTAL CAP VOLUME: Total 8,321 cy

NOTE: EXISTING ELEVATIONS IN THIS AREA ARE HIGHER THAN EXTENSION OF ELEVATION 552.6' (TOP OF CAP WITHIN CHANNEL) AND 10 FEET BEYOND THE NAV. CHANNEL.

NOTE: EXISTING ELEVATIONS IN THIS AREA ARE HIGHER THAN EXTENSION OF ELEVATION 552.6' (TOP OF CAP WITHIN CHANNEL) AND 10 FEET BEYOND THE NAV. CHANNEL.

NOTE: EXISTING ELEVATIONS IN THIS AREA ARE HIGHER THAN EXTENSION OF ELEVATION 552.6' (TOP OF CAP WITHIN CHANNEL) AND 10 FEET BEYOND THE NAV. CHANNEL.

NOTE: AREAS WITH LESS THAN 1-FT CAP THICNESS HAVE BEEN UPDATED TO REFLECT 2018 POST CONSTRUCTION CONDITIONS

LEGEND:

═	2018 POST CONSTRUCTION ELEVATIONS (1 AND 5 FT. INTERVALS)
═	PROPOSED CAP DESIGN CONTOURS (1 AND 5 FT. INTERVALS)
—	SHORELINE
▭	DREDGE / EXCAVATION AREA
🟥	RESTRICTED SRA AREA (6-INCH CARBON AMENDED SAND)
🟨	SPECIAL REMEDIATION CAP TYPE 1 (CONSISTS OF 6-INCH CARBON AMENDED SAND LAYER AND ¾-INCH ARMOR. TOP OF CAP AT ELEVATION 552.6 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL AND 10 FT. BUFFER)
🟩	SPECIAL REMEDIATION CAP TYPE 2 (CONSISTS OF 6-INCH SAND LAYER AND ¾-INCH ARMOR. 5 FT. THICK AS REQUESTED BY AOT)
—	0.5 FT OR LESS OF CAP MATERIAL
—	1.0 FT OR LESS OF CAP MATERIAL
●	CORE WITH REMAINING CONTAMINATION
⌐ ¬	SPREADER LANES
⌐ ¬	SRA DREDGE BOUNDARY
—	DMU BOUNDARIES

HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

NOTES:
1. BATHYMETRY BASED ON 2018 POST CONSTRUCTION SURVEY.

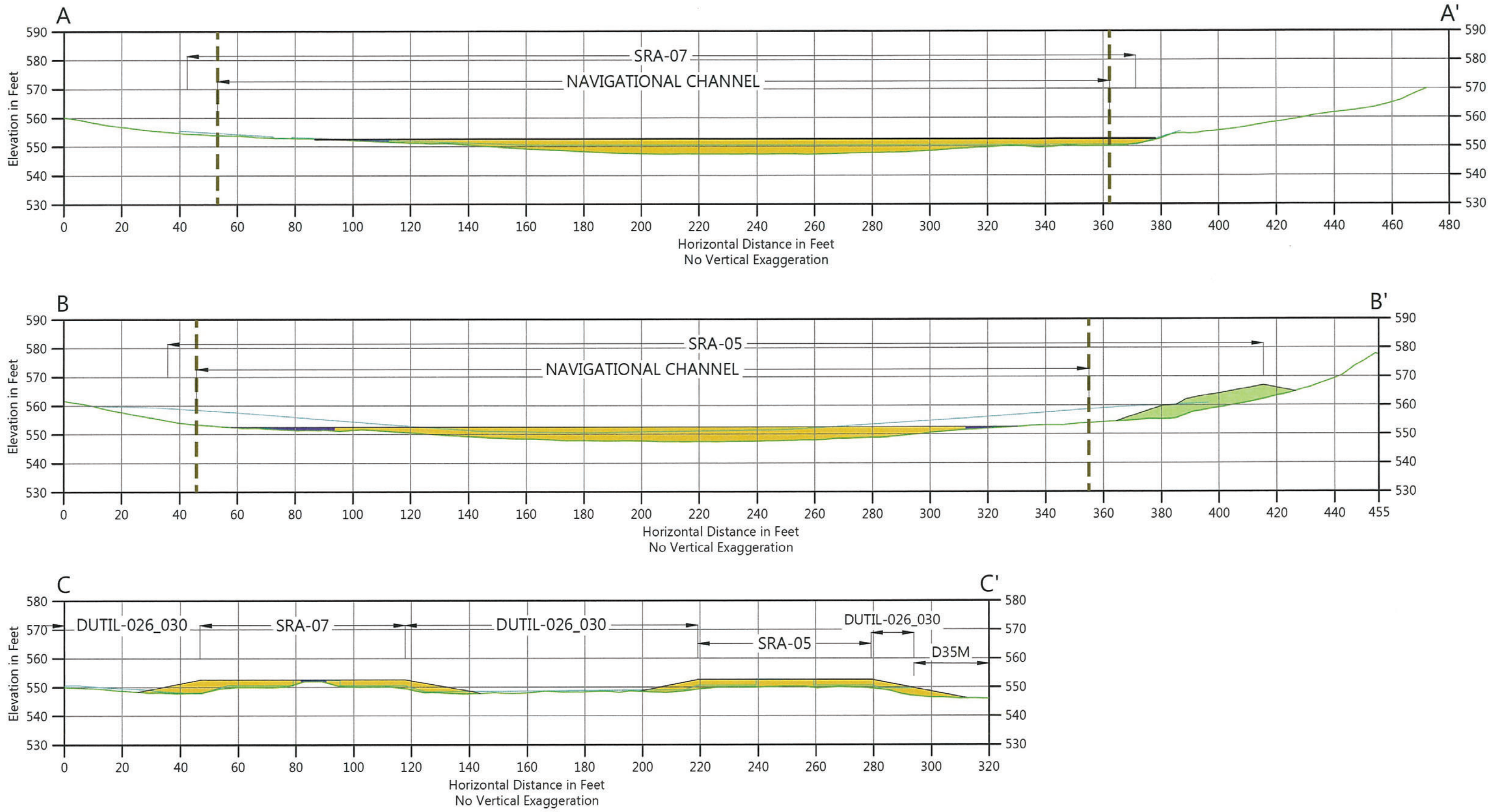
0 40
FEET

Publish Date: 2019/03/05 10:16 AM | User: mcarlino
Filepath: C:\Users\mcarlino\Documents\CAD C-DRIVE\Fox River\2019\Grading\SRA05-07\ANC 2019 DUTIL026030 SRA0506-Cap Design.dwg F2 XS-PLAN

ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL. (920) 445-0720 FAX (920) 445-0719

FIGURE 1
PLAN
DESIGN REVIEW DOCUMENT SRA-05 & SRA-07
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

PROFILE LEGEND:

🟩	2018 POST CONSTRUCTION BATHY
—	DESIGN DREDGE ELEVATION
🟧	SPECIAL REMEDIATION CAP TYPE 1 (CONSISTS OF 6-INCH CARBON AMENDED SAND LAYER AND ¾-INCH ARMOR. TOP OF CAP AT ELEVATION 552.6 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL & 10-FT BUFFER)
🟩	SPECIAL REMEDIATION CAP TYPE 2 (CONSISTS OF 6-INCH SAND LAYER AND ¾-INCH ARMOR. 5 FT. THICK AS REQUESTED BY AOT)
🟦	0.5 FT OR LESS OF CAP MATERIAL
🟪	1.0 FT OR LESS OF CAP MATERIAL

0 40
FEET

Publish Date: 2019/03/05 10:16 AM | User: mcarlino
Filepath: C:\Users\mcarlino\Documents\CAD C DRIVE\Fox River\2019\Grading\SRA05-07\ANC 2019 DUTIL026030 SRA0506 Cap Design.dwg F2 XS A

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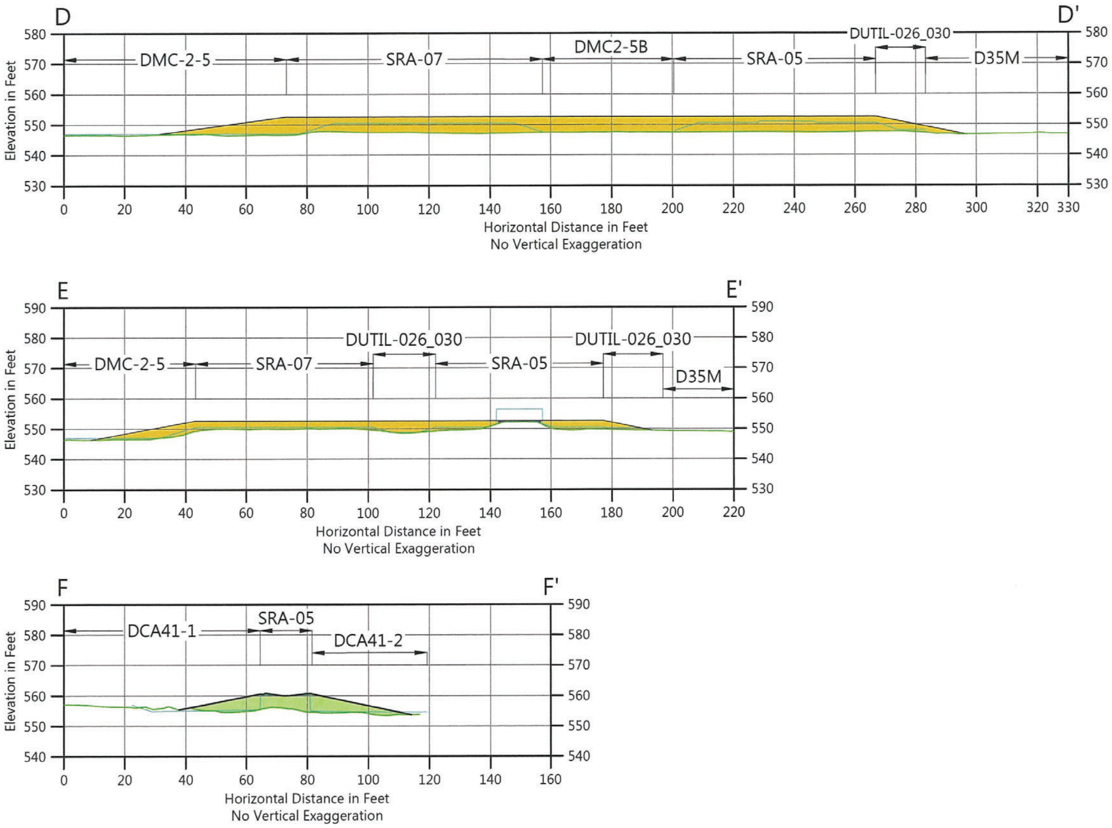
TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL (920) 445-0720 FAX (920) 445-0719

FIGURE 2
SECTIONS A-C
DESIGN REVIEW DOCUMENT SRA-05 & SRA-07
LOWER FOX RIVER REMEDIATION



PROFILE LEGEND:

- 2018 POST CONSTRUCTION BATHY
- DESIGN DREDGE ELEVATION

🟧 SPECIAL REMEDIATION CAP TYPE 1 (CONSISTS OF 6-INCH CARBON AMENDED SAND LAYER AND ¾-INCH ARMOR. TOP OF CAP AT ELEVATION 552.6 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL & 10-FT BUFFER)

🟩 SPECIAL REMEDIATION CAP TYPE 2 (CONSISTS OF 6-INCH SAND LAYER AND ¾-INCH ARMOR. 5 FT. THICK AS REQUESTED BY AOT)

- 0.5 FT OR LESS OF CAP MATERIAL
- 1.0 FT OR LESS OF CAP MATERIAL

HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

0 40
FEET

Publish Date: 2019/03/05 10:16 AM | User: mcarlino
Filepath: C:\Users\mcarlino\Documents\CAD C-DRIVE\Fox River\2019\Grading\SRA05-07\ANC 2019 DUTIL026030 SRA0506-Cap Design.dwg F2 XS-D-F

ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL (920) 445-0720 FAX (920) 445-0719

FIGURE 3
SECTIONS D-F
DESIGN REVIEW DOCUMENT SRA-05 & SRA-07
LOWER FOX RIVER REMEDIATION

ATTACHMENT D

CORE SUMMARY TABLE FOR VICINITY OF SRA-07

(TABLE D-1)

Dutil26-30, DNA-071, DCA44, DMC2-5; 180613

Core ID	4065.5-03	4065.5-05	4065.5-06	4065.5-16	4065.5-17	4065.5-18	4065-15	4065-211	4065-212
DE				552.12	550.50	550.50	550.5	551.5552	547.7
LOS	548.07	548.13	550.70	554.36	547.82	548.05	547.20	551.94	551.92
Bathy	547.94	547.70	550.44	554.22	549.45	549.04	549.64	554.05	553.92
EOC	548.10	548.15	550.70	552.12	547.45	548.08	547.16	551.51	
Refusal			547.80					550.71	
Elevation									
570.0									
569.5									
569.0									
568.5									
568.0									
567.5									
567.0									
566.5									
566.0									
565.5									
565.0									
564.5									
564.0									
563.5									
563.0									
562.5									
562.0									
561.5									
561.0									
560.5									
560.0									
559.5	This core is outside this Remedial Action area and is included to show influence to the SRA cap.								
559.0									
558.5									
558.0									
557.5									
557.0									
556.5									
556.0									
555.5									
555.0									
554.5									
554.0			TOC	TOC				TOC	
553.5			0.49	0.527				1.39	TOC
553.0			3.31	0.409				1.82	1.64
552.5			11.4	0.473				1.49	2.02
552.0			2.22	1.32				1.78	2.29
551.5				0.34				1.35	2.65
551.0			20					0.0252	2.69
550.5	TOC		9.34						3.43
550.0	6.66		0.03			TOC			0.649
549.5	56.9					1.92	TOC		
549.0	39.8	TOC			TOC	4.6	0.776		2.06
548.5	34.3	6.49	0.02		3.76	20	6.27		3.17
548.0	7.88	3.38			3.13	4.56	41.9		1.64
547.5	0.02	0.44			1.86	0.0254	32.7		
547.0		0.22			0.029	0.0251	22.4		
546.5					0.0251	0.0252	0.1		
546.0					0.0252	0.0253	0.03		
545.5					0.0254				
545.0					0.0253				
544.5									
544.0									

Created By: B. J. Hendron
Reviewed By: M. Tabatabai,
Date: 13-Jun
Update: 11-Sep SRA-07 cores

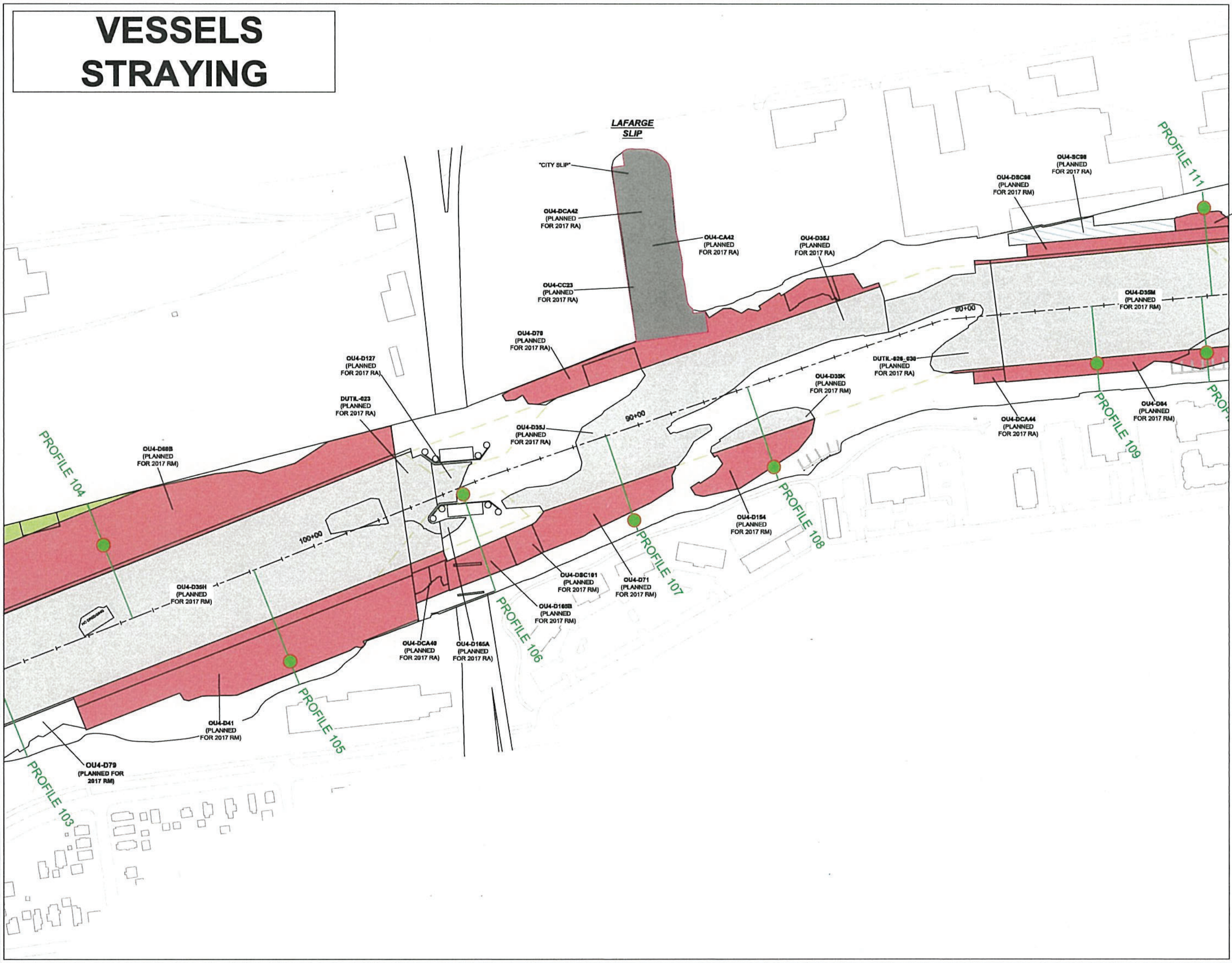
Legend

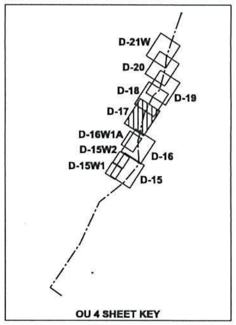
TOC	Top of Core
🟩	Approximate elevation of bathymetry prior to dredging. (Either 2017 pre-season or post dredge)
🟥	Approximate elevation of neat line. (0.5 LOS Model Surface)
▨	Approximate Dredge Design Elevation. (LOS surface unless otherwise noted)
	Approximate elevation of contamination.
▨	Approximate cap/cover elevation.
57	≥ 50 ppm PCB
NA	Not available.
🟨	Known contamination below or influencing the SRA Cap

ATTACHMENT E

PROPWASH ZONE MAPS

VESSELS STRAYING





OU 4 SHEET KEY

LEGEND:

4019-24	CORE LOCATION (TYPICAL)
4002.5-88	CORE LOCATION (UNDEFINED DOC)
4012-111	CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM
4009-06	CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)
4002-03	CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)
4202-06	CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)
4006.5-118	CORE LOCATION TAKEN POST-PRODUCTION DREDGING
4048.5-139	CORE LOCATION TAKEN POST-PRODUCTION DREDGING (UNDEFINED DOC)
4006.5-118	CORE LOCATION TAKE POST-PRODUCTION DREDGING W/ ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM
▼4002.5-95	CORE LOCATION NOT INCLUDED IN FIK MODEL
	POLING LOCATION
▼4036-402	CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM
▼4036.5-402	CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)
▼4034-400	CORE LOCATION NOT INCLUDED IN FIK MODEL (UNDEFINED DOC)
▼4034-401	CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)
▼4048-127	CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)
	LOS 0.5 FOOTPRINT > 0.01 FT. DOC (2011, 2012, 2013, 2015, & 2016 UNCORRECTED)
A / DC-1	CROSS SECTION LOCATION
569.5'	TARGET ENGINEERED DREDGE PRISM ELEVATION
▨	TARGET FINAL DESIGN DREDGE SURFACE CONTOUR (1 AND 5 FT. INTERVALS)
OU4-CA23A	**CAP A AREA** (7"-9" MIN. THICKNESS SAND AND GRAVEL CAP)
OU4-CB11B	**CAP B AREA** (10"-12" MIN. THICKNESS SAND AND GRAVEL CAP)
OU4-CC2D	**CAP C AREA** (21" MIN. THICKNESS SAND AND GRAVEL CAP WITH ARMOR LAYER)
OU4-SC84	**SAND COVER AREA** (6" MIN. THICKNESS SAND COVER)
– – –	**NAVIGATION CHANNEL LIMITS** (OU 4A - 75 FT. WIDE AND OU 4B [AUTHORIZED])
──	**NAVIGATION CHANNEL LIMITS** (OU 4A - 150 FT. WIDE [HISTORIC])

RESIDUAL CAP PROPWASH EVALUATION ARMOR STONE SIZE ZONES

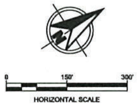
🟥	ARMOR STONE D_{50} > 6 IN.
🟩	ARMOR STONE D_{50} = 6 IN.
🟦	ARMOR STONE D_{50} = 3 IN.
🟪	ARMOR STONE D_{50} = 1.5 IN
⬜	DREDGING WITHIN NAVIGATION CHANNEL
●	APPROXIMATE VESSEL POSITION (WORST CASE CONDITION, KEEL AT 562.5 FT. OUTSIDE THE CHANNEL)

NOTES:

1. ARMOR STONE SIZE ZONES BASED ON A VESSEL WITH 100 PERCENT POWER APPLIED TO BOW THRUSTER AT THE NOTED LOCATION

POOL	OPERABLE UNIT	RIVER MILE	NOAA LOW WATER ELEVATION (FEET NAVD88)
GREEN BAY	OU 4/5	0.0	577.6
DE PERE DAM	OU 3	7.1	587.5
LITTLE RAPIDS DAM	OU 2	13.1	593.6

NOAA LOW WATER CHART FROM NOAA CHART #14916 (2004)



HORIZONTAL SCALE

ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445-0720 FAX: (920) 445-0719

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: P. LAROSA / D.BINKNEY
DRAWN BY: D.BINKNEY / M.CARLINO
CHECKED BY: P. LAROSA / T. BLACKMAR
APPROVED BY: T. BLACKMAR
SCALE: AS SHOWN
DATE: MARCH 24, 2016

LOWER FOX RIVER REMEDIAL DESIGN
PHASE 2B WORK PLAN
FOR 2016 REMEDIAL ACTION

RESIDUAL CAPPING PROPWASH EVALUATION

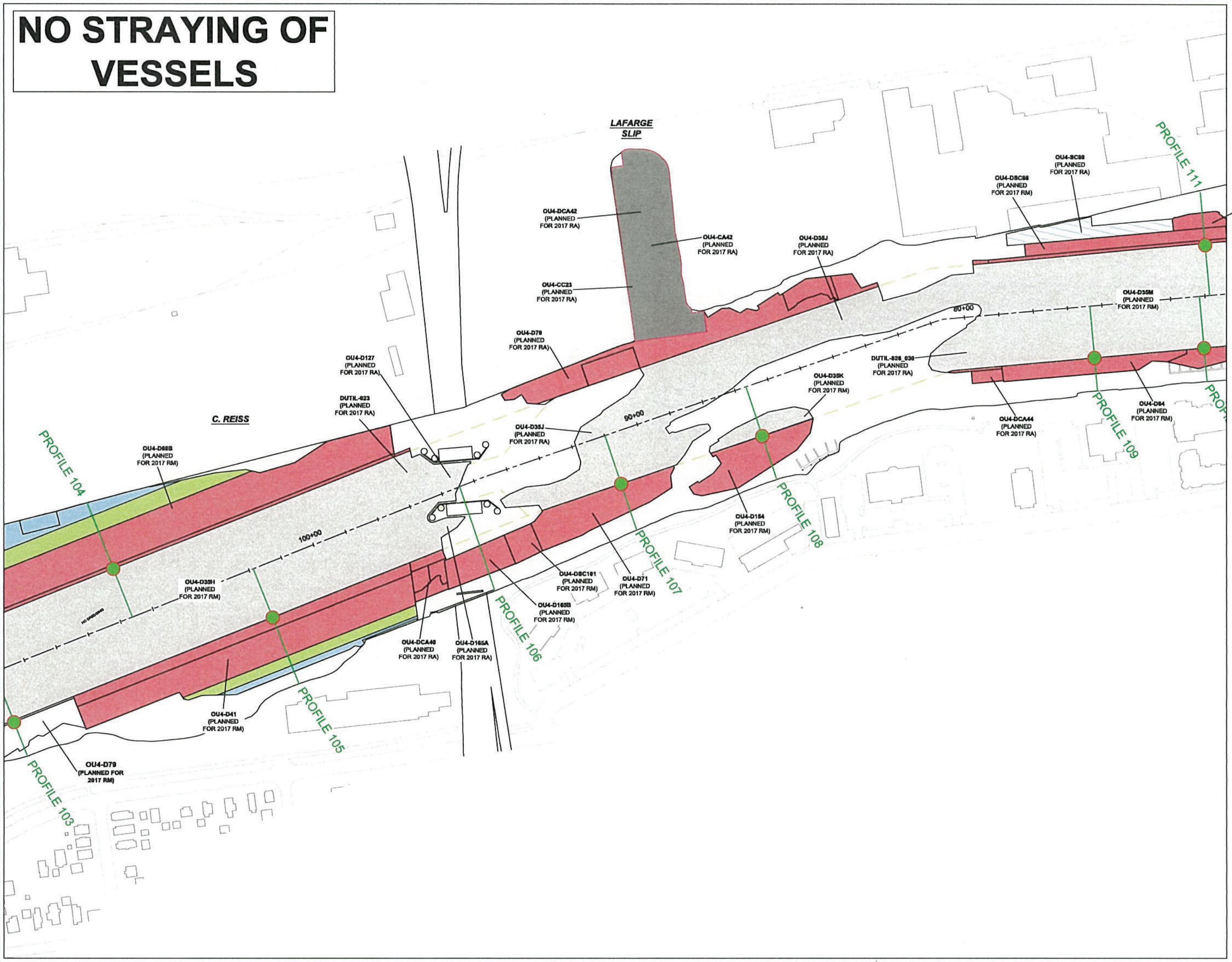
D-17

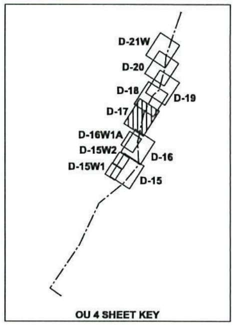
SHEET NO. 2 OF 5

A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2016\Design\Caps\Residual Propwash\Additional Profiles Denmark-U&I20\RESIDUAL PROPWASH EVAL 100 Series Markups STRAYING 12082016.dwg D-17

Dec 08, 2016 1:17pm dbinkney

NO STRAYING OF VESSELS





OU 4 SHEET KEY

LEGEND:

4019.24 CORE LOCATION (TYPICAL)

4002.5-98 CORE LOCATION (UNDEFINED DOC)

4012-111 CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM

4009-06 CORE LOCATION CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)

4002-03 CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)

4202-06 CORE LOCATION CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)

4008.5-118 CORE LOCATION TAKEN POST-PRODUCTION DREDGING

4048.5-139 CORE LOCATION TAKEN POST-PRODUCTION DREDGING (UNDEFINED DOC)

4006.5-118 CORE LOCATION TAKE POST-PRODUCTION DREDGING W/ ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM

▼4002.5-95 CORE LOCATION NOT INCLUDED IN FIK MODEL

POLING LOCATION

LOS 0.5 FOOTPRINT > 0.01 FT. DOC (2011, 2012, 2013, 2015, & 2016 UNCORRECTED)

A DC-1 CROSS SECTION LOCATION

▼4036-402 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM

▼4036.5-402 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA)

▼4034-400 CORE LOCATION NOT INCLUDED IN FIK MODEL (UNDEFINED DOC)

▼4034-401 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 6 IN. INTERVALS WITH PCB ≥ 50 PPM (UNDEFINED DOC)

▼4049-127 CORE LOCATION NOT INCLUDED IN FIK MODEL CONTAINING ONE OR MORE 2.5 FT. INTERVALS AVERAGING ≥ 50 PPM (TSCA & UNDEFINED DOC)

569.5' TARGET ENGINEERED DREDGE PRISM ELEVATION

▨ TARGET FINAL DESIGN DREDGE SURFACE CONTOUR (1 AND 5 FT. INTERVALS)

OU4-CA23A **CAP A AREA** (7"-9" MIN. THICKNESS SAND AND GRAVEL CAP)

OU4-CB11B **CAP B AREA** (10"-12" MIN. THICKNESS SAND AND GRAVEL CAP)

OU4-CC2D **CAP C AREA** (21" MIN. THICKNESS SAND AND GRAVEL CAP WITH ARMOR LAYER)

OU4-SC84 **SAND COVER AREA** (6" MIN. THICKNESS SAND COVER)

NAVIGATION CHANNEL LIMITS (OU 4A - 75 FT. WIDE AND OU 4B [AUTHORIZED])

NAVIGATION CHANNEL LIMITS (OU 4A - 150 FT. WIDE [HISTORIC])

RESIDUAL CAP PROPWASH EVALUATION ARMOR STONE SIZE ZONES

🟥 ARMOR STONE D_{50} > 6 IN.

🟩 ARMOR STONE D_{50} = 6 IN.

🟦 ARMOR STONE D_{50} = 3 IN.

🟪 ARMOR STONE D_{50} = 1.5 IN

☐ DREDGING WITHIN NAVIGATION CHANNEL

● APPROXIMATE VESSEL POSITION (WORST CASE CONDITION, KEEL AT 562.5 FT)

NOTES:

1. ARMOR STONE SIZE ZONES BASED ON A VESSEL WITH 100 PERCENT POWER APPLIED TO BOW THRUSTER AT THE NOTED LOCATION

POOL	OPERABLE UNIT	RIVER MILE	NOAA LOW WATER ELEVATION (FEET NAVD88)
GREEN BAY	OU 4/5	0.0	577.6
DE PERE DAM	OU 3	7.1	587.5
LITTLE RAPIDS DAM	OU 2	13.1	593.6

NOAA LOW WATER CHART FROM NOAA CHART #14916 (2004)

0 150' 300'
HORIZONTAL SCALE

ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 446-0720 FAX: (920) 446-0719

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: P. LAROSA / D.BINKNEY
DRAWN BY: D.BINKNEY / M CARLINO
CHECKED BY: P. LAROSA / T. BLACKMAR
APPROVED BY: T. BLACKMAR
SCALE: AS SHOWN
DATE: MARCH 24, 2016

LOWER FOX RIVER REMEDIAL DESIGN
PHASE 2B WORK PLAN
FOR 2016 REMEDIAL ACTION

RESIDUAL CAPPING PROPWASH EVALUATION

D-17

SHEET NO. 2 OF 5

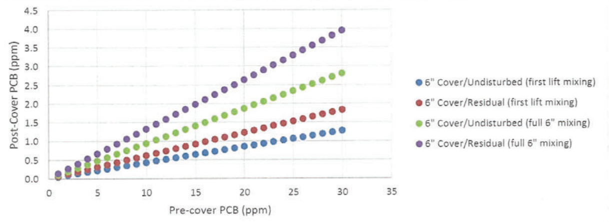
Dec 08, 2016 1:30pm dbinkney A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2016\Design\Caps\Residual Propwash\Additional Profiles Denmark-Util20\RESIDUAL PROPWASH EVAL 100 Series Markups 12082016.dwg D-17

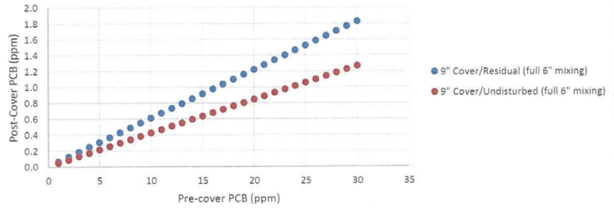
ATTACHMENT F

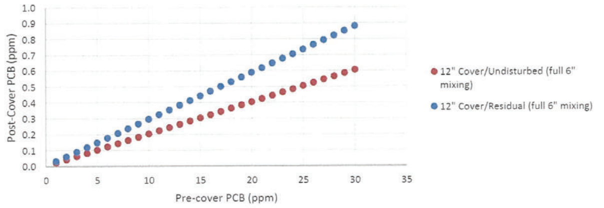
SAND MIXING LAYER CALCULATIONS
AND CAP MODELING RESULTS FOR SAND WITH GAC

Sand Dry Den (kg/m^3)	Undisturbed Dry Den (kg/m^3)	Residual Dry Den (measured; kg/m^3)	Lift Thickness	Sand PCB conc	Compliance Depth (inches)
1500	462	680	3	0	4

	First Lift Mixing Only		Full 6" mixing		Full 6" mixing		Full 6" mixing	
PCB Conc	6" Cover/Undisturbed (first lift mixing) Post-cover PCB (mg/kg)	6" Cover/Residual (first lift mixing) Post-cover PCB (mg/kg)	6" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	6" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)	9" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	9" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)	12" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	12" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)
1	0.042	0.061	0.093	0.131	0.042	0.061	0.020	0.029
2	0.084	0.122	0.186	0.263	0.084	0.122	0.040	0.059
3	0.126	0.182	0.279	0.394	0.126	0.182	0.060	0.088
4	0.169	0.243	0.372	0.525	0.169	0.243	0.080	0.117
5	0.211	0.304	0.466	0.656	0.211	0.304	0.101	0.147
6	0.253	0.365	0.559	0.788	0.253	0.365	0.121	0.176
7	0.295	0.426	0.652	0.919	0.295	0.426	0.141	0.205
8	0.337	0.487	0.745	1.050	0.337	0.487	0.161	0.235
9	0.379	0.547	0.838	1.181	0.379	0.547	0.181	0.264
10	0.421	0.608	**0.931**	1.313	0.421	0.608	0.201	0.293
11	0.464	0.669	**1.024**	1.444	0.464	0.669	0.221	0.323
12	0.506	0.730	1.117	1.575	0.506	0.730	0.241	0.352
13	0.548	0.791	1.210	1.707	0.548	0.791	0.262	0.381
14	0.590	0.852	1.304	1.838	0.590	0.852	0.282	0.411
15	0.632	0.912	1.397	1.969	0.632	0.912	0.302	0.440
16	0.674	0.973	1.490	2.100	0.674	0.973	0.322	0.469
17	0.716	1.034	1.583	2.232	0.716	1.034	0.342	0.499
18	0.759	1.095	1.676	2.363	0.759	1.095	0.362	0.528
19	0.801	1.156	1.769	2.494	0.801	1.156	0.382	0.557
20	0.843	1.216	1.862	2.625	0.843	1.216	0.402	0.587
21	0.885	1.277	1.955	2.757	0.885	1.277	0.423	0.616
22	0.927	1.338	2.048	2.888	0.927	1.338	0.443	0.645
23	0.969	1.399	2.141	3.019	**0.969**	1.399	0.463	0.675
24	1.011	1.460	2.235	3.151	**1.011**	1.460	0.483	0.704
25	1.054	1.521	2.328	3.282	1.054	1.521	0.503	0.733
26	1.096	1.581	2.421	3.413	1.096	1.581	0.523	0.763
27	1.138	1.642	2.514	3.544	1.138	1.642	0.543	0.792
28	1.180	1.703	2.607	3.676	1.180	1.703	0.563	0.821
29	1.222	1.764	2.700	3.807	1.222	1.764	0.583	0.851
30	1.264	1.825	2.793	3.938	1.264	1.825	0.604	0.880
31	1.307	1.886	2.886	4.069	1.307	1.886	0.624	0.909
32	1.349	1.946	2.979	4.201	1.349	1.946	0.644	0.939
33	1.391	2.007	3.073	4.332	1.391	2.007	0.664	0.968
34	1.433	2.068	3.166	4.463	1.433	2.068	0.684	0.997
35	1.475	2.129	3.259	4.595	1.475	2.129	0.704	1.027
36	1.517	2.190	3.352	4.726	1.517	2.190	0.724	1.056
37	1.559	2.250	3.445	4.857	1.559	2.250	0.744	1.085
38	1.602	2.311	3.538	4.988	1.602	2.311	0.765	1.115
39	1.644	2.372	3.631	5.120	1.644	2.372	0.785	1.144
40	1.686	2.433	3.724	5.251	1.686	2.433	0.805	1.173
41	1.728	2.494	3.817	5.382	1.728	2.494	0.825	1.203
42	1.770	2.555	3.911	5.514	1.770	2.555	0.845	1.232
43	1.812	2.615	4.004	5.645	1.812	2.615	0.865	1.261
44	1.854	2.676	4.097	5.776	1.854	2.676	0.885	1.291
45	1.897	2.737	4.190	5.907	1.897	2.737	0.905	1.320
46	1.939	2.798	4.283	6.039	1.939	2.798	0.926	1.349
47	1.981	2.859	4.376	6.170	1.981	2.859	0.946	1.379
48	2.023	2.919	4.469	6.301	2.023	2.919	0.966	1.408
49	2.065	2.980	4.562	6.432	2.065	2.980	**0.986**	1.437
50	2.107	3.041	4.655	6.564	2.107	3.041	**1.006**	1.467







290 Elwood Davis Road, Suite 340
Liverpool, New York 13088
315.453.9009

ANCHOR QEA

Memorandum

December 21, 2018

To: Paul Spillers and Terri Blackmar, Tetra Tech

From: Deirdre Reidy and Paul LaRosa, Anchor QEA, LLC

Re: Cap Modeling Results for SRA Caps

In the SRA Cap areas, it is understood that the cap material may mix with the underlying PCB-impacted sediments, which may necessitate amendment of the sand, as opposed to the use of sand without amendment for the caps originally designed for the site (with full armor layer). For the purposes of this evaluation, it was assumed that 1 foot of cap material (sand and gravel) mixes with 1 foot of underlying sediment. Mixing and partitioning analyses were conducted to identify the granular activated carbon (GAC) dose required to maintain concentrations below target levels within these areas (e.g., less than 1 parts per million [mg/kg or ppm] PCB in the top 6 inches of the mixed layer. Because activated carbon sorbs PCBs (the job of GAC is to adsorb PCBs, so by default, the bulk PCB concentrations in a layer containing GAC will be greater than 1 ppm, but not bioavailable or mobile), compliance cannot be assessed on the solid phase. Therefore, the target concentration of 1 ppm PCB was converted to an equivalent porewater concentration using equilibrium partitioning theory with a log KOC of 5.7 liters per kilogram (L/kg) and total organic carbon (TOC) of the cap material (basis for compliance of site caps). TOC values of 0.1%, 0.3%, 0.5% and 0.67% were evaluated for sand material, consistent with non-SRA caps previously modeled at the site. The resulting range of target porewater concentrations are presented in the following table.

Table 1
Target Porewater Concentrations Equivalent to 1 ppm Solid Phase PCB for Range of TOC in Cap Material

TOC (%)	Target PCB Porewater Concentration (µg/L)[1]
0.1	2.00
0.3	0.667
0.5	0.400
0.67	0.298

Notes:
% - Percent
µg/L – micrograms per liter
1. Porewater concentration equivalent to 1 ppm PCBs varies based on TOC present in the cap material according to equilibrium partitioning theory.

A mixing calculation was performed to calculate the PCB concentration within the mixed sediments and cap material using the TOC of sediments, TOC of sand/gravel, PCB concentration in top foot of sediments (for the depth of mixing), and an assumed concentration of 0 ppm PCB in the sand material. The calculation accounted for the thickness of sediment and cap layers and the bulk density of these materials. PCB concentrations in sediment were based on the average bulk PCB concentrations in the top foot of sediment. These concentrations are listed in Table 2. As a conservative upper-bound, the maximum PCB concentration within the sediment (all cores) collected from the SRA Cap areas (41.9 mg/kg PCB) was also evaluated.

Using partitioning theory, the GAC dose needed to reduce the PCB concentrations in the mixed layer to the target porewater concentrations (shown in Table 1) was quantified. Based on literature, GAC has been shown to be 10 to 100 times more sorptive than TOC; therefore, a conservative partition coefficient of 6.7 L/kg (using the factor of 10x, which is lower-end of the range) was used to represent partitioning of PCBs onto GAC. The results of this evaluation indicated that the mixing of sand and sediment is enough to reduce concentrations below target porewater concentrations for most cases simulated. For the worst-case scenario (assuming the maximum concentration measured in the core would mix with the sand/gravel cap material, regardless of the depth at which that concentration was measured), the GAC dose within the mixed layer ranged from 0 to 0.5% (by weight), specified to the nearest tenth of a percentage. To get that percentage in the mixed sand/gravel and sediment layer, 0 to 1.4% by weight GAC needs to be placed in the 6-inch sand layer, depending on the assumed TOC. This scenario is conservative in that it assumes the maximum concentration, which was measured below 1 foot) is present immediately beneath the cap prior to mixing.

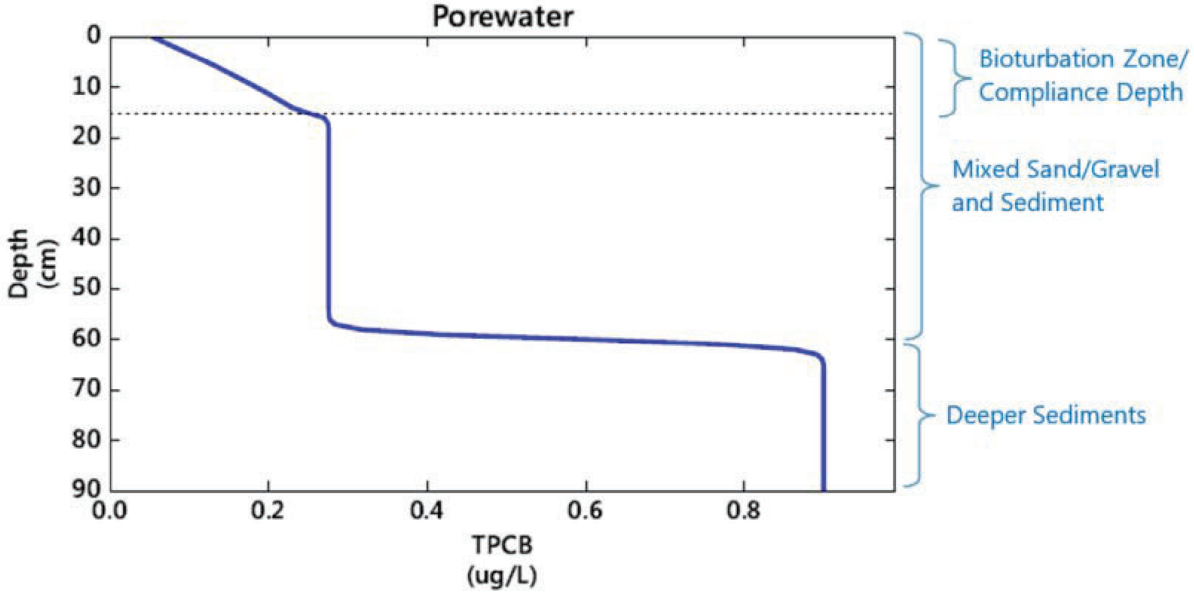
Table 2
Model Results for Caps in SRA-03, SRA-05, and SRA-07

		PCB Concentrations (mg/kg)		PCB Concentrations (µg/L)		GAC Required in 6-inch Sand Layer (% by weight)			
SRA	Core	Top Foot of Sediments	Max. below Top foot of Sediment	Mixed Layer	Max in Deeper Sediment	1.99 µg/L (0.1% TOC)	0.67 µg/L (0.3% TOC)	0.40 µg/L (0.5% TOC)	0.298 µg/L (0.67% TOC)
SRA-03	4061-231	10.1	14.9	0.211	0.320	0%	0%	0%	0%
SRA-03	4061.5-227	3.4	15.0	0.071	0.323	0%	0%	0%	0%
SRA-03	4061-233	2.8	0.56	0.058	0.012	0%	0%	0%	0%
SRA-03	4061-59	2.4	1.1	0.050	0.024	0%	0%	0%	0%
SRA-05	4065.5-17	3.4	1.9	0.071	0.041	0%	0%	0%	0%
SRA-05	4065.5-18	3.3	20.0	0.069	0.430	0%	0%	0%	0%
SRA-07	4065-15	3.5	41.9	0.073	0.901	0%	0%	0%	0%
All	Worst Case Scenario	41.9	41.9	0.87	0.901	0%	0.3%	0.8%	1.4%

Notes:
% – percent
mg/kg – milligrams per kilogram
µg/L – micrograms per liter

Although PCBs are not very mobile, transport processes that were considered when the PCB caps were first designed using the steady-state cap model were incorporated into this analysis. GAC doses quantified using the mixing calculation were then verified using Capsim, the cap model developed by Dr. Danny Reible (Texas Tech University), which is widely used across the United States. These model simulations account for additional PCB mass from underlying sediments that may be transported into the mixed sand/gravel and sediment layer over time (from advection/diffusion). Transport was simulated for 100 years, a typical cap design time frame. Modeling indicated that the GAC doses identified in the mixing/partitioning calculation were more than enough to meet the target porewater criteria for more than 100 years. The rate at which PCBs from deeper sediments transport into the mixed layers is slower than the rate of mixing (e.g., bioturbation) and advective flux out of the mixed layer into the water column; thus, over time, the modeling indicated the concentrations in the top 6 inches of the mixed sand/gravel and sediment mixed layer decreased. The figure below shows the concentration within the mixed sand/gravel and sediment and deeper sediments at the end of the 100-year simulation.

Figure 1
Depth profile of PCB concentrations after a 100-year simulation for Worst Case Scenario simulation, assuming 0.67% TOC in cap material.



In each scenario, GAC is not necessary; however, based on the sensitivity analysis, using worst case criteria, it is recommended that 1.4% by weight GAC be placed. Sufficient conservatism has been accounted for in the analysis.

ATTACHMENT G

STANDARD OPERATING PROCEDURE FOR GRANULAR ACTIVATED CARBON SAMPLE COLLECTION AND TESTING

STANDARD OPERATING PROCEDURE
GRANULAR ACTIVATED CARBON (GAC)
SAMPLE COLLECTION AND TESTING

LOWER FOX RIVER
GREEN BAY, WI

Prepared by:
Tetra Tech EC, Inc.

Prepared for:
Tetra Tech EC, Inc.
Lower Fox River Remediation Project

Document Control Number: LFRR-18-0298

December 31, 2018

Prepared/Revised By	Reviewed By	Date
Paul Spillers	Bjorn Lysne	
	Brandon Weston	

ACRONYM LIST

AET	American Engineering Testing, Inc.
ASTM	ASTM International
C	Celsius
GAC	Granular Activated Carbon
GPS	Global Positioning System
PPE	Personal Protective Equipment
RTK	Real Time Kinematic
SHSP	Site Health and Safety Plan
SOP	Standard Operating Procedure
SRA	Special Remediation Area

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the collection of samples of the granular activated carbon (GAC)-amended sand layer from special remediation area (SRA) caps and the testing of these samples for percent GAC by dry weight. The purpose of this SOP is to describe the sampling and testing methods to be used to determine the amount of GAC within the carbon-amended sand layer. Measurement of the sand layer thickness is not a part of this SOP. Layer thickness evaluations will be conducted by bathymetric survey, using evaluation methods employed for sand cover or cap layers without GAC.

This SOP is applicable for SRA caps over utilities or in other caps or covers on the Lower Fox River project requiring GAC amendments. Pre-placement (ex-situ) and post-placement (in-situ) amended sand in the SRA caps will be tested for GAC content. Pre-placement samples will be collected in substantial conformance with ASTM International (ASTM) Standard Method D75-14: Standard Practice for Sampling Aggregates. Post-placement samples will be collected from catch pans as described herein. GAC content measured as a percent of dry weight of sample will be determined using a thermal drying method.

2.0 EQUIPMENT AND SUPPLIES

This section contains a list of equipment that may be used to complete the procedures in this SOP, including the following:

- Vessel (sampling platform) that complies with State of Wisconsin and U.S. Coast Guard regulations with a minimum of 3 anchors or two anchoring spuds
- Real Time Kinematic (RTK) Global Positioning System (GPS) with horizontal accuracy of ± 1 meter
- Catch pans for sample collection (including retrieval system and buoys)
- 5-gallon buckets with lids
- Permanent marker
- Steel ruler to record or other measurement device to determine the sand thickness in catch pans
- Oven with capability to reach a temperature of 620º Celsius (C)
- No. 10 sieve (Actual size of sieves will depend on the gradation of the GAC)
- No. 50 sieve
- Duct tape
- Chain-of-custody forms
- Field notebook
- Appropriate personal protective equipment (PPE) in accordance with the site health and safety plan (SHSP)

3.0 PRE-PLACEMENT SAMPLE COLLECTION PROCEDURES

Samples of the sand only and sand/GAC mixture will be collected from the J.F. Brennan land plant using a modified version of ASTM Standard Method D75-14: Standard Practice for Sampling Aggregates as described below:

1) Sand only and GAC-amended sand samples will be collected in clean 5-gallon buckets using procedures described in ASTM D75-14-Standard Practice for Sampling Aggregates. At least 20 pounds of sand and GAC amended sand will be collected for each sample tested. The GAC amended sand sample will be collected from the conveyor. Sand-only samples will be collected from the active face of the loadout stockpile and tested to determine the quantity of naturally occurring organics (carbon) in the sand. The following procedure will be used to collect the conveyor belt sample:
    a. Obtain at least three approximately equal sample aliquots, selected at random, from the conveyor belt using an appropriately sized container, per ASTM D75-14. Samples can also be collected from the production stream, if accessible.
2) Label the buckets with a unique sample identification. Record the date and time of sample. Record the sample collection in a field notebook or similar. Document the sample on a chain-of-custody

form. The sample bucket and accompanying chain-of-custody form will be delivered to American Engineering Testing, Inc. (AET) in Green Bay, Wisconsin.

4.0 POST-PLACEMENT SAMPLE COLLECTION PROCEDURES

Post-placement samples will be collected in catch pans. A total of four catch pans will be placed to evaluate the variability of GAC content across each SRA cap. The samples will be collected in catch pans, using the following procedures:

1) Catch pans shall be constructed of 0.5-inch thick transparent acrylic plastic with the following internal dimensions: 24 inches square by 18 inches high.
2) Catch pans will be placed in the river at A/OT-approved sample locations prior to placement of GAC-amended sand. The coordinates for each pan location will be recorded when placed. If the catch pans are placed on a slope, the appropriate stabilizing subframe shall be used.
3) Following placement of the GAC-amended sand layer, the vessel will retrieve each pan from the bottom of the river using the cable float and hook method (similar to armor stone bucket retrieval).
4) Sand thickness will be measured in each catch pan by taking an average thickness to the nearest 0.1 foot from two measurements from each side of the pan (i.e. an average of 8 individual measurements per pan).
5) Photographs will be taken from the top and 4 sides of the catch pan. Each photograph will be labeled appropriately in the field.
6) Transport the catch pans to the processing area.
7) Place each sample in a clean 5-gallon bucket. Provide a unique sample ID for each sample.
8) Record sample collection notes in field log book and record laboratory samples on a chain-of-custody form.

Field notes will be stored in a log book or worksheet. The documentation will include the following:

- Sample identification
- Sample location GPS coordinates
- Date of sample collection
- Names of field personnel collecting and handling the samples
- Names of oversight personnel
- Observations to include, but not be limited to, weather conditions, unusual circumstances, or deviations to sampling method
- Thickness measurements of sample in catch pan
- Note whether GAC was observed in the sample
- Date sample shipped to laboratory

5.0 TESTING FOR GAC CONTENT BY PERCENT DRY WEIGHT

Thermal testing will be conducted using criteria specified in ASTM D2974: Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils by Method A for moisture content (or ASTM D2166 Standard Test Methods for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass. The sample procedure is described below:

1) Use a riffle splitter to reduce the sample size to approximately 5 pounds. Weigh the sample.
2) Dry the sample in an oven heated to 110º C.
3) Record the weight of the dried sample.
4) Process the oven-dry sample through a U.S. Standard No. 10 sieve and a U.S. Standard No. 50 sieve. Sieve sizes may be adjusted, depending on the grain size of sand and GAC used.
5) Weigh the portion of the sample passing the No. 10 sieve and retained on the No. 50 sieve. Place this portion in an oven heated to 440º C (ASTM D2974 Method C) to burn off naturally occurring organics typically found in the sand aggregate. The sample shall remain in the oven for a minimum of

three hours. NOTE: If the sample is a sand only sample, the test will be complete, and the percent of natural organics can be determined for the sand source.

6) Weigh the sample again. The difference in mass between the pre-oven (step 5) and post-oven sample (step 6) will be reported as the dry weight of naturally occurring organics. The weight from this step will include a correction factor for natural organics that will remain after this step, based on the testing of control (i.e., sand only) samples.
7) Place the sample in an oven at 620º C to burn off GAC. The sample should remain heated for a minimum of three hours or until GAC is no longer visible in the sample.
8) Weigh the sample again. The difference in mass between the mass in step 6 and this step (step 8) will be the mass of GAC. Determine the GAC content on a percent by weight basis, based on the mass relationships using dry weight results of the total sample (measured in step 3) from the sample masses prior to and after heating to each temperature, while factoring in inherent background organics and ash correlation, to be developed during ongoing control sample testing.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Entries in the field forms will be double-checked by the field team staff to verify that the information is correct. It is the responsibility of the Field Lead to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

The thickness of the sand in the catch pans will be monitored to verify the thickness is within 10% of the planned sand layer thickness.

Four discrete samples will be collected from each SRA cap. When the GAC proportions have been determined from the four samples, the average GAC percentage in the SRA cap will be determined using a mathematical average of the GAC content from the individual samples. The GAC percentage based on the mathematical average of the individual samples will be used to report a single GAC content for each SRA cap.

7.0 REFERENCES

ASTM International (ASTM). 2014. *ASTM D75-14-Standard Practice for Sampling Aggregates.*

ASTM. 2014. *ASTM D2974-14-Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils by Method A for moisture content (or ASTM D2166 Standard Test Methods for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass)*

ATTACHMENT H

NOTES FROM MEETING WITH THE USACE

Lower Fox River Remedial Action OUs 2-5
Notes from Work Group Meeting – Utility #020 SRA Cap
Document Control Number: LFRR-18-0062
March 12, 2018
Page 1 of 4

Attendees

Tetra Tech	**Foth**
Terri Blackmar	Troy Gawronski
Paul Spillers	
George Willant	**Green Bay Water Utility**
Ben Hendron	Brian Powell
Rich Feeney (by phone)	
	U.S. Army Core of Engineers
Agencies/Oversight Team	Jonathon Imbrunone
Gary Kincaid	
George Berken	**J.F. Brennan**
Larry DeBruin	Dustin Bauman
Anchor QEA	**Lower Fox River Remediation LLC**
Dan Binkney	Jeff Lawson
Matt Carlino	

Prepared by: Ben Hendron

Reviewed by: Terri Blackmar

A meeting was held on February 28, 2018 to discuss the special remediation area (SRA) caps proposed for utility #020. The meeting was attended by the individuals listed above, which included representatives of Green Bay Water Utility (GBWU) and the U.S. Army Corps of Engineers (USACE). GBWU is the owner of the pipeline referred to as utility #020.

Terri Blackmar (Tetra Tech) started the meeting by describing the constraints that exist around developing a remedial dredge design for utility #020. This is a 2-foot diameter steel pipeline that was installed in 1961 and trenched into the sediment. This was during the period when polychlorinated biphenyls (PCBs) were being discharged into the river. Tetra Tech subcontracted two utility location service companies, Marine Engineering Services Company (MESCO) and Depth of Cover (DoC) Mapping, to perform utility location services for this pipeline. DoC Mapping and MESCO located the line and established 95 percent probability limits around the line, which provide confidence as to the utility location. To allow dredging around the pipeline, a 5-foot buffer was established upstream and downstream of utility #020, as well as above the utility. Within the 5-foot buffer, sediment is assumed to be contaminated with PCBs that exceed the 1 ppm PCB remedial action level (RAL). In addition, the utility dredge used for dredging close to utilities can only dredge 30 feet below the water line. This means that, based on recent water elevations of approximately 580 feet North American Vertical Datum of 1988 (NAVD88), the dredge can only reach roughly elevation 550 feet NAVD88. There are other dredges that can reach

lower than the utility dredge, but they will not work within 25 feet of the utility due to the risk of damaging the pipeline. With these factors in mind, a cap has been proposed after the utility dredge has removed as much sediment exceeding the 1 ppm PCB RAL as possible. However, there are constraints on installing a cap over the utility as well. The navigation channel is authorized down to an elevation of 553.6 feet NAVD88 (e.g. a 24-foot depth below the low water elevation of 577.6 feet NAVD88), with a 2-foot additional buffer for cap placement. Propeller wash (propwash) from commercial shipping vessels would cause the required stone size to be very large, which would likely infringe on the 2-foot buffer.

Drawings that included cross sections were presented to show the no-dredge buffer zone around the pipeline and the area proposed for capping. Photographs of the equipment used to dredge around the pipeline were also presented and discussed. Terri also mentioned that a meeting was held with the GBWU in 2015 to discuss the utility, and at that time GBWU indicated that two feet of cover was required over the pipeline after dredging, with stone no larger than gravel. She also stated that the Design Team hoped to get concurrence from the USACE and GBWU regarding the design for the SRA caps over this utility, since capping is planned for utility #020 early in the season.

The Agencies/Oversight Team (A/OT) inquired about the pipeline's longevity and if GBWU had any plans for replacing the line. Brian Powell (GBWU) replied that they fully expect the utility to be in service for the foreseeable future, and have no plans of replacing it any time soon. They are not comfortable with large stone being placed on top of their pipeline, which was clarified to be rip rap size stone. Brian provided the following explanation for this request. When holes are found in their pipelines, the first option for repair is sending a diver down to install a steel sleeve on the outside of the pipe to stop the leak. Any stones larger than a diver could move with their hands would cause a problem for the diver trying to access the pipeline. This type of repair was used in the mid-90s to repair a leak in the pipeline. If necessary, the next option for repair of this pipeline would be to install a liner inside the pipeline. Only after these two options are explored, would GBWU explore directionally digging a new pipeline.

The group's attention was then directed to the cap exhibits in the conference room, which show the sand and stone layer thicknesses and stone size used for A, B and C caps. Gary Kincaid (A/OT) inquired as to the USACE's opinion on the depth to the top of cap in the navigation channel, which is proposed to be 25 feet below the low water datum of 577.6 feet NAVD88. This is no higher than elevation 552.6 feet NAVD88. Jon Imbrunone (USACE) replied that he would need to confer with the Director of the Port of Green Bay, Dean Haen, and vessel operators before any decisions can be made. Gary remarked that Dean Haen has already made it known that he does not want any caps in the navigation channel. Jon stated that generally the elevation of the top of a cap should be 2 feet below the authorized navigational depth, but 3 feet is preferred. Sand is the most preferable cap material, but stone as large as 6 inches in diameter may also be acceptable. Larger stone has the potential to damage vessels. A 9-inch stone can cause just as much damage as a 12-inch stone, so avoiding the use of larger stones is generally preferable. Jon agreed that larger stone

could be used if placed more than 2 feet below the authorized navigation channel depth, although this was not ideal. He will discuss this with Dean Haen and the vessel fleet operators, and let us know their position. Jon also mentioned that dredging is performed at a 2:1 slope out from the navigation channel limits, and placing large stone on these slopes is also a concern unless the stone is at least 2 feet below the slope, to provide a buffer. These slopes should also be shown on drawing where future USACE dredging would occur. In most situations where a remedial cap is suggested in a navigation channel, Section 408 paperwork is submitted. Gary Kincaid replied that the LFRR project is a Superfund site and, therefore, is exempt from that permitting process. However, the substantive requirements of Section 408 still need to be met. This meeting serves as one means of communication to meet the requirements for the Section 408. A technical memorandum (tech memo) and design has been developed and will be distributed to stakeholders to gain acceptance or "no objection" from all involved parties.

Gary Kincaid explained that the Agencies would prefer to place a cap that is more robust than the minimum 1.5- to 2-foot thick SRA cap. He also mentioned that the Agencies were informed that Dean Haen (Port of Green Bay) does not want caps in the navigation channel in OU 4. Gary requested that the USACE provide a map showing the 2:1 slope areas where future USACE dredging would occur. Gary suggested that the proposed designs be sent to GBWU and the USACE for final review and commenting. The objective is to receive acceptance from the USACE and GBWU for the caps proposed over utility 20, or at least a notice of no objection to these caps.

George Willant (Tetra Tech) mentioned that Paul Spillers (Tetra Tech) received an email from Jon Imbrunone regarding a possible increase in the authorized depth of the navigation channel to 27 feet. Jon mentioned that, during the 1980s, Congress authorized a 27-foot navigation channel depth; however, funding was never appropriated. This authorization still exists and is valid to study deepening the channel to 27 feet. The inquiry originated from the office of Senator Tammy Baldwin, and included an inquiry about the presence of caps in the navigation channel. It's likely that a stakeholder has been requesting that Senator Baldwin's office support this proposal. The Senator's office asked if there have been any caps installed north of the Canadian National Railroad (CNRR) bridge. No caps have been installed in that stretch of river to date, but, under the proposed design, SRA caps will be installed over some utilities in 2018.

George Willant stated that, as Tetra Tech moves down river with the remedial action, tech memos and designs are being developed for each cap including those over utilities in the navigation channel. All interested parties will have a chance to comment and sign off on these caps. George Berken (A/OT) noted that it's possible that the USACE could dredge out the caps later, if necessary.

Jon Imbrunone stated that utilities and bridges typically present challenges for changing the navigation channel depth, so he's not overly concerned about the Baldwin inquiry. George Berken (A/OT) noted that this could now become a political issue, so would need to be discussed with WDNR management. Jon offered to send the request to the WDNR and do some investigating

into the inquiry. He has sufficient information now to address the inquiry from Baldwin's office. He will also get input from Dean Haen and vessel fleet operators.
Brian Powell (GBWU) stated that sand and stone, up to 6-inch diameter, would be acceptable to GBWU, if needed. In a post-meeting side bar conversation with Tetra Tech personnel, Brian emphasized, however, that the stone cannot be in contact with the pipe. He also stated that a leak detection survey was performed recently, which did not identify any leaks in the pipeline.

Action items from the meeting include the following:

- Jon Imbrunone will get feedback from the Port Authority and vessel operators regarding acceptable stone size for caps in the navigation channel, and get back to Tammy Baldwin's office regarding the caps.
- Tetra Tech will finalize the dredge design (including LLC and A/OT reviews) by 3/26/18.
- A tech memo will be submitted that includes the dredge design surface, proposed cap footprints, and cross sections. This memo will be provided to the USACE and GBWU for review.
- Tetra Tech will provide all remaining SRA cap locations to the USACE.

Blackmar, Terri

From: Feeney, Richard
Sent: Thursday, December 17, 2015 9:43 AM
To: Brian Powell (BrianPo@greenbaywi.gov); 'PaulPa@ci.green-bay.wi.us'; 'NancyQu@greenbaywi.gov'
Cc: 'Kincaid, Gary W - DNR'; 'Jay.Grosskopf@Boldt.com'; 'George.Berken@boldt.com'; 'Ava.Grosskopf@Boldt.com'; 'Larry.Debruin@Boldt.com'; 'Jeffrey Lawson'; 'Susan O'Connell'; Bryan Heath (Bryan.Heath@ncr.com); Gawronski, Troy A (Troy.Gawronski@Foth.com) (Troy.Gawronski@Foth.com); Dustin Bauman (dbauman@JFBRENNAN.COM); Coleman, Bill; Willant, George; Blackmar, Terri; Tabatabai, Morey; Gifford, Ricky; 'dbinkney@anchorqea.com'; Paul LaRosa (plarosa@anchorqea.com); ECI.LFRR Project Correspondence; Nelson, Shane
Subject: Notes from Yesterday's Meeting with the Green Bay Water Utility (GBWU)

Hi Brian, Paul and Nancy. Thanks again for meeting with a few of us from the remediation project yesterday. Following are some brief notes from that meeting. Please let us know if anything is incorrect, requires clarification or if anything of importance is omitted.

On December 16, 2015 Troy, Dustin, Gary and I met with Brian Powell, Paul Pavlik and Nancy Quirk of the GBWU. Nancy is the General Manager who we had not met with previously but we have done so with Brian and Paul several times.

The primary purpose of the meeting was to obtain utility owner feedback on minimum post dredge cover required for water supply lines after remediation. This primarily concerns places where we may use the diver assisted dredging concept being developed by Brennan.

Brian said that, based on the installed depth of utility #045, which is the northern most water line and was installed via directionally drilling, GBWU has no concerns about us dredging as required across it. Based on the LOS neat line surface, the required dredge cuts over this utility are not deep. So there should be no concerns about working over utility #045 provided Brennan can safely spud around it.

Nancy said she had been in contact with a WDNR person in Madison about utility regulations (I missed her name but Gary knew of her). Nancy was told that there is a code requirement to have at least two feet of cover over GBWU's water lines.

So the GBWU's position is that, in any locations where our dredging would result in less than two feet of post dredge cover, the project should restore the required minimum cover depth. If we were to do so, Rich suggested using sand but the GBWU said they prefer for us to use gravel. Initially Gary said that the sand might not remain stable but Troy pointed out that it should be more stable than the sediment that was dredged and it would replace. So there was no firm decision on whether we would actually backfill over any water lines that get dredged over and, if so, what would be used for this purpose.

In any cases where there is presently more than two feet of cover over a water line, the GBWU stated their preference for having the project restore the existing cover depth after dredging. For example, if there is 5 feet of cover and we dredged two feet, leaving three feet of cover, the GBWU would want us to restore the cover to five feet after remediation. Gary said the A/OT would likely not require the project to do this but it is possible the GBWU may want to pay for this work to be performed, or this could be an opportunity for cost sharing between the project and the GBWU.

Richard J. Feeney, P.E. | **Vice President, Project Engineering**
Direct: 973.630.8092 | Fax: 973.630.8025 | Cell: 201.650.1006
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George Berken

From: George Berken
Sent: Tuesday, April 21, 2020 11:57 AM
To: RP Contact Group; Ben Hendron; Bill Coleman; Bjorn Lysne; Brandon Weston; Cynthia Jones; Dan Binkney; Denis Roznowski; ECI; Eric Bauer; Gary Phelps; Hugh Kinnard; MIchelle Miller; Morey Tabatabai; Nathan Anschutz; Paul LaRosa; Paul Spillers; Richard Feeney; Ricky Gifford; Sharon Kozicki; Tara Van Hoof; Terri Blackmar; Troy Gawronski; Dustin Bauman; Greg Smith; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: 1081. 87500 OU2-5 - FW: 1057. OU2-5 - FW: LFRR 19-0016 - Request for A/OT Acceptance of SRA-08 Top of Cap
Attachments: OU4-SRA-08 Variance Maps.pdf

Morey, on behalf of the Agencies, please proceed with redesigning the SRA-08 Cap in the navigational channel with the following design options:

Where elevation space is available, all options have;
Minimum 6-inches of GAC amended sand with 3-inches of overplacement averaging 9-inches. Sand is placed with the spreader or mechanically as needed.
Minimum of 4-inches of ¾-inch armor stone with 3-inches of overplacement averaging 7-inches. Stone is placed with the mechanical bucket.
Total sand plus stone averages 16-inches.

Option 1: This is the currently accepted design (which we have in hand already) with final top of cap elevation of no greater than 552.6'. This leaves approximately a 1-foot buffer below the authorized navigational channel but there will be some stone areas infringing into the 1-foot buffer space, due to overplacement.

Option 2: This is a redesign with final top of cap elevation of no greater than 551.3'. This leaves approximately a 2-foot buffer below the authorized navigational channel but there will be some stone areas infringing into the 2-foot buffer space, due to overplacement.

Option 3: This is a redesign with final top of cap elevation of no greater than 551.0'. This leaves a 2-foot buffer below the authorized navigational channel with no stone areas infringing into the 2-foot buffer.

Morey, options 2 and 3's designs are to be submitted to the A/OT by April 24, 2020 if possible. Please also provide the A/OT requested revisions to SRA-03, 05, and 07 along with the SRA-08 documents.

Once these three options along with SRA-03, 05 and 07 are reviewed internal to the Agencies and after reviewing them with the USACE a decision will be made on which option is to be implemented in the SRA-08 cap area. It is the A/OT's initial assumption that a minimum 2-foot buffer will be required by the USACE, however, we will need to confirm that assumption and specifically determine if the minimum 2-foot buffer applies to both sand and armor stone.

Thanks,
George…

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: George Berken
Sent: Monday, April 20, 2020 1:45 PM
To: RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; Ben Hendron <Ben.Hendron@tetratech.com>; Bill Coleman <bill.coleman@tetratech.com>; Bjorn Lysne <Bjorn.Lysne@tetratech.com>; Brandon Weston <Brandon.Weston@tetratech.com>; Cynthia Jones <Cynthia.Jones@tetratech.com>; Dan Binkney <dbinkney@anchorqea.com>; Denis Roznowski <Denis.Roznowski@Foth.com>; ECI <ECI.LFRRPC@TetraTech.com>; Eric Bauer <Eric.Bauer@tetratech.com>; Gary Phelps <Gary.Phelps@tetratech.com>; Hugh Kinnard <Hugh.Kinnard@tetratech.com>; MIchelle Miller <Michelle.Miller@TetraTech.Com>; Morey Tabatabai <Morey.Tabatabai@tetratech.com>; Nathan Anschutz <Nathan.Anschutz@tetratech.com>; Paul LaRosa <plarosa@anchorqea.com>; Paul Spillers <Paul.Spillers@TetraTech.com>; Richard Feeney <richard.feeney@tetratech.com>; Ricky Gifford <ricky.gifford@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; Tara Van Hoof <Tara.VanHoof@Foth.com>; Terri Blackmar <Terri.Blackmar@tteci.com>; Troy Gawronski <TGawronski@foth.com>; Dustin Bauman <dbauman@JFBRENNAN.COM>; Greg Smith <gsmith@jfbrennan.com>; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 1081. 87500 OU2-5 - FW: 1057. OU2-5 - FW: LFRR 19-0016 - Request for A/OT Acceptance of SRA-08 Top of Cap

Morey, on behalf of the Agencies, please set up a work group meeting to discuss the maps for SRA-08.

Thanks,
George…

BOLDT.

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Friday, April 17, 2020 2:22 PM
To: George Berken <George.Berken@boldt.com>; gary.kincaid@wisconsin.gov; Larry DeBruin <Larry.Debruin@Boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: jlawson@project-control.com; soconnell@project-control.com; bryan.heath@ncr.com; Gawronski, Troy A <Troy.Gawronski@Foth.com>; database@project-control.com; bill.coleman@tetratech.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; ricky.gifford@tetratech.com; brandon.weston@tetratech.com; eci.lfrrpc@tetratech.com; Spillers, Paul <Paul.Spillers@tetratech.com>
Subject: FW: 1057. OU2-5 - FW: LFRR 19-0016 - Request for A/OT Acceptance of SRA-08 Top of Cap

George,

Attached are two variance maps prepared for SRA8 cap within the Navigable Channel. As you may recall, during our meeting on Thursday 9 April, we were tasked to prepare variance maps of 3 inch vertical increments comparing elevation 551.6 feet with:

- design/existing bathy raised by 9 inches and
- another map raised by 16 inches.

This was to assist the AOT with a decision on honoring USACE request of 2 feet buffer in the navigable channel depth.

The variance map on sheet 1 shows that if a 6 inch sand layer (with 3 inches of overplacement tolerance) is placed across the Navigable Channel, an area of 31,175 sf will be lower than elevation 551.6 feet by 1,890 cy.
At the same time we will have 1,964 sf of sand cover that will be 3 inches less than 9 inches thick, 560 sf less by 6 inches, and 430 sf with near zero sand thickness.

The variance map on Sheet 2 shows that if we cap to a two ft buffer, we will have an area of 25,634 sf more than 16 inches thick by 1,280 cy (1.2 feet average thickness over the 1.6 feet).
At the same time we will have 2,695 sf that will be 3 inches less than 16 inches thick, 2,330 sf less by 6 inches, and on and on to near 400 sf of near zero cap thickness.

Respectfully

Morey Tabatabai, Design/Field Engineer
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From: George Berken <George.Berken@boldt.com>
Sent: Thursday, April 9, 2020 9:54 AM
To: RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; Tara Van Hoof <Tara.VanHoof@Foth.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>; Phil.Brochocki@ramboll.com
Subject: 1057. OU2-5 - FW: LFRR 19-0016 - Request for A/OT Acceptance of SRA-08 Top of Cap

Morey, on behalf of the Agencies, due to the recent USACE confirmation requiring a minimum of 2-foot overdredge buffer, the SRA-08 dredge and cap design needs to be evaluated. The current dredge and cap design for SRA-08 is no longer acceptable. Please arrange a work group meeting to collaborate on the path forward regarding a redesign and resubmittal.

Thanks,
George…

George A. Berken | Engineering Project Manager
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SafeThinking: Our Crusade to Eliminate Accidents

From: George Berken <George.Berken@boldt.com>
Sent: Friday, February 21, 2020 8:23 AM
To: RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; Eric Bauer <Eric.Bauer@tetratech.com>; Ben Hendron <Ben.Hendron@tetratech.com>; Bill Coleman <bill.coleman@tetratech.com>; Bjorn Lysne <Bjorn.Lysne@tetratech.com>; Brandon Weston <Brandon.Weston@tetratech.com>; Cynthia Jones <Cynthia.Jones@tetratech.com>; Dan Binkney <dbinkney@anchorqea.com>; Denis Roznowski <Denis.Roznowski@Foth.com>; ECI <ECI.LFRRPC@TetraTech.com>; Gary Phelps <Gary.Phelps@tetratech.com>; Hugh Kinnard <Hugh.Kinnard@tetratech.com>; Luke Vandenberg <Luke.Vandenberg@tetratech.com>; Michelle Miller <Michelle.Miller@TetraTech.Com>; Morey Tabatabai <Morey.Tabatabai@tetratech.com>; Nathan Anschutz <Nathan.Anschutz@tetratech.com>; Paul LaRosa <plarosa@anchorqea.com>; Paul Spillers <Paul.Spillers@TetraTech.com>; Rhonda ChierVerhagen <Rhonda.ChierVerhagen@tetratech.com>; Richard Feeney <richard.feeney@tetratech.com>; Ricky Gifford <ricky.gifford@tetratech.com>; Sarah Martin <Sarah.Martin@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; Tara Van Hoof <Tara.VanHoof@Foth.com>; Terri Blackmar <Terri.Blackmar@tteci.com>; Troy Gawronski <TGawronski@foth.com>; Dustin Bauman <dbauman@JFBRENNAN.COM>; Greg Smith <gsmith@jfbrennan.com>; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: Fw: 1057. OU2-5 - FW: LFRR 19-0016 - Request for A/OT Acceptance of SRA-08 Top of Cap

Morey, on behalf of the Agencies, the understanding by Tt's design team (submitted in your email narrative below) satisfies the A/OT's below email request as the final required documentation for SRA-08's Technical Memorandum (TM), and no further revisions are required to SRA-08's TM.

Thanks,

George…

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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Thursday, February 20, 2020 3:29 PM
To: George Berken <George.Berken@boldt.com>; RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; bjorn.lysne@tetratech.com <bjorn.lysne@tetratech.com>; brandon.weston@tetratech.com <brandon.weston@tetratech.com>; dbinkney@anchorqea.com <dbinkney@anchorqea.com>; eci.lfrrpc@tetratech.com <eci.lfrrpc@tetratech.com>; Spillers, Paul <Paul.Spillers@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; ricky.gifford@tetratech.com <ricky.gifford@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com <tgawronski@foth.com>; dbauman@jfbrennan.com <dbauman@jfbrennan.com>; gsmith@jfbrennan.com <gsmith@jfbrennan.com>; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>; database@project-control.com <database@project-control.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 1057. OU2-5 - FW: LFRR 19-0016 - Request for A/OT Acceptance of SRA-08 Top of Cap

George,

To follow up on our discussion of Monday 2-17 regarding the 8/9/2019 accepted tech memo for SRA-08 cap, the following summarizes the status of the memo:

The Technical Memorandum for SRA-08 cap in utility 49 area was accepted by the Agencies on 8/9/2019. In October, additional dredging was identified during post-dredge confirmation in DUTIL-49 and model-confirm sampling adjacent to the DUTIL-49.

A residual dredging plan was prepared for the newly-identified contamination and the A/OT accepted the plan on 11/5/2019. This added dredging caused expansion of the SRA-08 cap. This cap expansion was discussed with the A/OT during a meeting on 10/31/2019. The meeting discussion resulted in extension of the SRA-08 cap to the shorelines on the east and west sides of the river. The expansion of SRA-08 cap was approved by the A/OT on 2/4/2020.

Please confirm that this understanding by the design team and above narrative satisfies your request below as final documentation for the SRA-08 tech memo, and no further revisions are required.

Thank you

Respectfully

Morey Tabatabai, Design/Field Engineer
morey.tabatabai@tetratech.com
Direct: **920.455.1077**| Cell: 720-394-3473
2680 Vernon Drive | Green Bay, WI 54304
Tetra Tech, Inc. | **Engineering**
www.tetratech.com

Think Green - Not every email needs printed

From: George Berken <George.Berken@boldt.com>
Sent: Tuesday, December 10, 2019 10:37 AM
To: RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Martin, Sarah <Sarah.Martin@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 1057. OU2-5 - FW: LFRR 19-0016 - Request for A/OT Acceptance of SRA-08 Top of Cap

⚠ **CAUTION:** This email originated from an external sender. Verify the source before opening links or attachments. ⚠

Morey and Ricky, on behalf of the Agencies, this submittal will eventually be a revision to the Agencies' already accepted with comments SRA-08 technical memorandum (TM).

In your cover email for this resubmittal reference the email when this TM was accepted by the Agencies and a brief narrative of the discussion that was held in the SRA-08 work group that expanded this SRA-08 cap.

Also, in your resubmittal that expands the SRA-08 cap, use the same color coding and format that was used in the previously accepted TM drawings (reference the attached file (*Att C SRA08-DUTIL-049-CAP-190515.pdf*) for format and color coding).

Thanks,
George…

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

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SafeThinking: Our Crusade to Eliminate Accidents

From: Gifford, Ricky <ricky.gifford@tetratech.com>
Sent: Tuesday, December 10, 2019 8:27 AM
To: George Berken <George.Berken@boldt.com>; 'Kincaid, Gary W - DNR' <Gary.Kincaid@wisconsin.gov>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>; Larry DeBruin <Larry.Debruin@Boldt.com>
Cc: jlawson@project-control.com; soconnell@project-control.com; pamontne@gapac.com; bill.coleman@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; morey.tabatabai@tetratech.com; Gawronski, Troy A (Troy.Gawronski@Foth.com) <Troy.Gawronski@Foth.com>; eci.lfrrpc@tetratech.com; roger.kaminski@gapac.com; bryan.heath@ncr.com
Subject: LFRR 19-0016 - Request for A/OT Acceptance of SRA-08 Top of Cap

Mr. Berken,

The attached PDFs show the plan and profiles for the above mentioned area, for A/OT review and acceptance.

Thank you,

Ricky E. Gifford | **Field Engineering/CADD Manager**
Direct Dial: 920.445.0731
Mobile: 920.530.8604
Main: 920.445.0720 | Fax: 920.445.0719
Ricky.Gifford@tetratech.com

Tetra Tech EC | **Engineering**
1611 State Street | Green Bay, WI. 54304 | www.tetratech.com

George Berken

From: George Berken
Sent: Saturday, May 18, 2019 9:21 AM
To: Bill Hartman; Bryan Heath; Jeff Lawson; John Heyde; Michael Davis; Paul Montney; Roger Kaminski; Susan OConnell; Ben Hendron; Bill Coleman; Bjorn Lysne; Brandon Weston; Cynthia Jones; Dan Binkney; Denis Roznowski; ECI; Eric Bauer; Gary Phelps; Hugh Kinnard; Joe Francis; Lee Boreen; Luke Vandenberg; MIchelle Miller; Morey Tabatabai; Paul LaRosa; Paul Spillers; Rhonda ChierVerhagen; Richard Feeney; Ricky Gifford; Sarah Martin; Tara Van Hoof; Terri Blackmar; Troy Gawronski; Dan Huycke; Dustin Bauman; Greg Smith; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: 807. 87500 OU2-5 - FW: LFRR-19-036 SRA-08 Tech Memo in Utility Corridor 049
Attachments: Draft TM_DUTIL-049_SRA-08 19-36 BERKEN (002)_rev_051719.docx; Att A1 180501 Cutterhead Dredging Near Utilities Rev. 1_AOT_081018.pdf; Att A2 JFB Insurance Company letter re Dredging near Utilities (8-2011)_....pdf; Att B1 AOT approved dredge DRD-072518.pdf; Att B2 Utilities P&P-049.pdf; Att C SRA08-DUTIL-049-CAP-190515.pdf; Att D Core Summary Table Dutil 49 Group 180201 mt.pdf; Att E Fox-River_propwash-analysis-figures_General.pdf; Att F1 Fox_sand_cover_mixing_calc_rev 121318_AOT.PDF; Att F2 Fox_sand_cover_mixing_calc_rev 121318 _AOT.PDF; Att G GAC_Sand sampling SOP_123118_AOT.PDF; Att H1 2018-0905-Letter- West Shore Pipeline Study Results.pdf; Att H2 18-0267 US Venture pipeline ownership.pdf; Att H3 Telecom record w Hansel.pdf; Att H4 USACE-aggregate on utilities .pdf; Draft Final TM_DUTIL-049_SRA-08 19-36 BERKEN (002)_rev_051719_clean.docx

Morey, on behalf of the Agencies, the technical memorandum, submitted in your email below for SRA-08 Utility Corridor 049, is acceptable. Proceed with forwarding the clean version of the SRA-08 Technical Memorandum and attachments to the riparian owners ahead of our scheduled 11:00 AM Thursday (May 23rd) meeting with the riparians.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Friday, May 17, 2019 4:25 PM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com;

cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 807. 87500 OU2-5 - FW: LFRR-19-036 SRA-08 Tech Memo in Utility Corridor 049

George,
Attached is the revised Technical memorandum and attachments for the SRA-08 (US Venture pipeline) area. Revisions are based on the A/OT comments as indicated in your email below.
With your acceptance we will forward the clean version of the Tech memo and attachments to the riparian owners ahead of scheduled meeting of 5-23.

Respectfully

Morey Tabatabai, Design/Field Engineer
morey.tabatabai@tetratech.com
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2680 Vernon Drive | Green Bay, WI 54304
Tetra Tech, Inc. | **Engineering**
www.tetratech.com

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From: George Berken <George.Berken@boldt.com>
Sent: Thursday, April 18, 2019 2:16 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 807. 87500 OU2-5 - FW: LFRR-19-036 SRA-08 Tech Memo in Utility Corridor 049

Morey, on behalf of the Agencies, the technical memorandum, submitted in your email below for Utility Corridor 049, is acceptable when the attached comments are adequately addressed. Address these comments and resubmit in draft final form.

Thanks,
George…

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Monday, February 25, 2019 10:13 AM
To: George Berken <George.Berken@boldt.com>; Kincaid, Gary W - DNR (Gary.Kincaid@wisconsin.gov) <Gary.Kincaid@wisconsin.gov>; Larry DeBruin <Larry.Debruin@Boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; ricky.gifford@tetratech.com; dbinkney@anchorqea.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; bryan.heath@ncr.com; jlawson@project-control.com; soconnell@project-control.com; database@project-control.com; brandon.weston@tetratech.com; eci.lfrrpc@tetratech.com; Spillers, Paul <Paul.Spillers@tetratech.com>; 'troy.gawronski@foth.com' <Troy.Gawronski@Foth.com>
Subject: RE: LFRR-19-036 SRA-08 Tech Memo in Utility Corridor 049

George,
Please discard previous submittal, the document tracking number in the subject line is corrected and reference to revision removed from the document.
Attached is the ~~revised~~ Technical memorandum for the SRA-08 (US Venture pipeline) area.
~~Previous submittal has been updated to reflect sand amendments and follow up discussions with the A/OT.~~

Please call me with any questions

From: Tabatabai, Morey
Sent: Monday, February 25, 2019 8:40 AM
To: 'George.Berken@boldt.com' <George.Berken@boldt.com>; Kincaid, Gary W - DNR (Gary.Kincaid@wisconsin.gov) <Gary.Kincaid@wisconsin.gov>; 'Larry.Debruin@Boldt.com' <Larry.Debruin@Boldt.com>; Jay Grosskopf (Jay.Grosskopf@Boldt.Com) (Jay.Grosskopf@Boldt.Com) <Jay.Grosskopf@Boldt.Com>; 'Ava Grosskopf' <Ava.Grosskopf@boldt.com>
Cc: 'Coleman, Bill' <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Blackmar, Terri (Terri.Blackmar@tetratech.com) <Terri.Blackmar@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; 'dbinkney@anchorqea.com' <dbinkney@anchorqea.com>; Davis, Michael (GP Law) <jmdavis@gapac.com>; Paul Montney (PAMontne@GaPac.Com) <PAMontne@GaPac.Com>; Roger Kaminski (Roger.Kaminski@GaPac.com) <Roger.Kaminski@GaPac.com>; Bryan Heath (Bryan.Heath@ncr.com)

<Bryan.Heath@ncr.com>; ''Jeffrey Lawson' (JLawson@project-control.com)' <JLawson@project-control.com>; ''Susan O'Connell' (SOConnell@project-control.com)' <SOConnell@project-control.com>; 'database@project-control.com' <database@project-control.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Spillers, Paul <Paul.Spillers@tetratech.com>; 'troy.gawronski@foth.com' <Troy.Gawronski@Foth.com>
Subject: RE: LFRR-18-0218 SRA-08 Tech Memo in Utility Corridor 049

George,

Respectfully

Morey Tabatabai, Design/Field Engineer
morey.tabatabai@tetratech.com
Direct: **920.455.1077**| Cell: 720-394-3473
2680 Vernon Drive | Green Bay, WI 54304
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George Berken

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Sent: Friday, May 17, 2019 4:25 PM
To: George Berken; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law); pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee; Vandenberg, Luke; michelle.miller@tetratech.com; plarosa@anchorqea.com; Spillers, Paul; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; tara.vanhoof@foth.com; Blackmar, Terri; tgawronski@foth.com; dhuycke@jfbrennan.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: RE: 807. 87500 OU2-5 - FW: LFRR-19-036 SRA-08 Tech Memo in Utility Corridor 049
Attachments: Draft TM_DUTIL-049_SRA-08 19-36 BERKEN (002)_rev_051719.docx; Att A1 180501 Cutterhead Dredging Near Utilities Rev. 1_AOT_081018.pdf; Att A2 JFB Insurance Company letter re Dredging near Utilities (8-2011)_....pdf; Att B1 AOT approved dredge DRD-072518.pdf; Att B2 Utilities P&P-049.pdf; Att C SRA08-DUTIL-049-CAP-190515.pdf; Att D Core Summary Table Dutil 49 Group 180201 mt.pdf; Att E Fox-River_propwash-analysis-figures_General.pdf; Att F1 Fox_sand_cover_mixing_calc_rev 121318_AOT.PDF; Att F2 Fox_sand_cover_mixing_calc_rev 121318 _AOT.PDF; Att G GAC_Sand sampling SOP_123118_AOT.PDF; Att H1 2018-0905-Letter- West Shore Pipeline Study Results.pdf; Att H2 18-0267 US Venture pipeline ownership.pdf; Att H3 Telecom record w Hansel.pdf; Att H4 USACE-aggregate on utilities .pdf; Draft Final TM_DUTIL-049_SRA-08 19-36 BERKEN (002)_rev_051719_clean.docx

George,
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With your acceptance we will forward the clean version of the Tech memo and attachments to the riparian owners ahead of scheduled meeting of 5-23.

Respectfully

Morey Tabatabai, Design/Field Engineer
morey.tabatabai@tetratech.com
Direct: 920.455.1077| Cell: 720-394-3473
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To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-

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Subject: 807. 87500 OU2-5 - FW: LFRR-19-036 SRA-08 Tech Memo in Utility Corridor 049

Morey, on behalf of the Agencies, the technical memorandum, submitted in your email below for Utility Corridor 049, is acceptable when the attached comments are adequately addressed. Address these comments and resubmit in draft final form.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
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E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

boldt.com BLOG

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Sent: Monday, February 25, 2019 10:13 AM
To: George Berken <George.Berken@boldt.com>; Kincaid, Gary W - DNR (Gary.Kincaid@wisconsin.gov) <Gary.Kincaid@wisconsin.gov>; Larry DeBruin <Larry.Debruin@Boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; ricky.gifford@tetratech.com; dbinkney@anchorqea.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; bryan.heath@ncr.com; jlawson@project-control.com; soconnell@project-control.com; database@project-control.com; brandon.weston@tetratech.com; eci.lfrrpc@tetratech.com; Spillers, Paul <Paul.Spillers@tetratech.com>; 'troy.gawronski@foth.com' <Troy.Gawronski@Foth.com>
Subject: RE: LFRR-19-036 SRA-08 Tech Memo in Utility Corridor 049

George,

Please discard previous submittal, the document tracking number in the subject line is corrected and reference to revision removed from the document.
Attached is the ~~revised~~ Technical memorandum for the SRA-08 (US Venture pipeline) area.
~~Previous submittal has been updated to reflect sand amendments and follow up discussions with the A/OT.~~

Please call me with any questions

From: Tabatabai, Morey
Sent: Monday, February 25, 2019 8:40 AM
To: 'George.Berken@boldt.com' <George.Berken@boldt.com>; Kincaid, Gary W - DNR (Gary.Kincaid@wisconsin.gov) <Gary.Kincaid@wisconsin.gov>; 'Larry.Debruin@Boldt.com' <Larry.Debruin@Boldt.com>; Jay Grosskopf (Jay.Grosskopf@Boldt.Com) (Jay.Grosskopf@Boldt.Com) <Jay.Grosskopf@Boldt.Com>; 'Ava Grosskopf' <Ava.Grosskopf@boldt.com>
Cc: 'Coleman, Bill' <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Blackmar, Terri (Terri.Blackmar@tetratech.com) <Terri.Blackmar@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; 'dbinkney@anchorqea.com' <dbinkney@anchorqea.com>; Davis, Michael (GP Law) <jmdavis@gapac.com>; Paul Montney (PAMontne@GaPac.Com) <PAMontne@GaPac.Com>; Roger Kaminski (Roger.Kaminski@GaPac.com) <Roger.Kaminski@GaPac.com>; Bryan Heath (Bryan.Heath@ncr.com) <Bryan.Heath@ncr.com>; ''Jeffrey Lawson' (JLawson@project-control.com)' <JLawson@project-control.com>; ''Susan O'Connell' (SOConnell@project-control.com)' <SOConnell@project-control.com>; 'database@project-control.com' <database@project-control.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Spillers, Paul <Paul.Spillers@tetratech.com>; 'troy.gawronski@foth.com' <Troy.Gawronski@Foth.com>
Subject: RE: LFRR-18-0218 SRA-08 Tech Memo in Utility Corridor 049

George,

Respectfully

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TETRA TECH EC, INC.

Technical Memorandum

To: Gary Kincaid, George Berken, Jay Grosskopf and Larry DeBruin (A/OT)

From: Terri Blackmar, Morey Tabatabai, Paul Spillers (Tetra Tech), and Paul LaRosa (Anchor QEA)

CC: Jeff Lawson and Sue O'Connell (PCC, for the LLC), Bryan Heath (LLC), Troy Gawronski (Foth), Paul Montney and Roger Kaminski (GP), Bill Hartman (P.H. Glatfelter), Bill Coleman, and Ricky Gifford (Tetra Tech), Dustin Bauman (JF Brennan), Dan Binkney (Anchor QEA)

Date: June 12, 2020

Re: Remedy Design for SRA-08 in Utility Corridor 049

Document Control Number: LFRR-18-0298-R3

This technical memorandum (tech memo) provides the basis for the proposed remedial design in utility area number 49 (utility 049), which is referred to on the 2020 Addendum to 2019 Remedial Action Work Plan (RAWP) drawings as dredge area DUTIL-049, and cap SRA-08. Utility 049 is an active 10-inch steel petroleum pipeline, believed to have been installed using an open trench placement method. The pipeline installation date is unknown. This utility has recently changed ownership from West Shore Pipeline Company to US Venture, Inc. The agreement to cap the utility line is provided in attachment H.

As explained below, it was not feasible to consider installation of a standard engineered cap as a remedy where utility 049 crosses the navigation channel, with resultant prop wash impacts and likely noncompliance with the post-cap water depth requirement. A utility buffer was established 25 feet upstream and downstream of the pipeline for dredging with hydraulic dredges. Dredging in this buffer zone will be performed to maximum depth of 30 feet. Assuming the water is at elevation 580 feet North American Vertical Datum of 1988 (NAVD88), the dredge elevation corresponding to this depth is approximately 550 feet NAVD88. This allows dredging in close proximity to the utility but will still leave some sediment exceeding the 1 part per million (ppm) polychlorinated biphenyl (PCB) remedial action level (RAL) un-dredged near the utility.

A second (reduced) horizontal no-dredge buffer has been designed based on utility location information. The reduced buffer is based on the variation in pipe location from different utility locate surveys, an added horizontal buffer of 5 feet outside of the pipe location range, the horizontal deviation for the surveys determined by the utility locate subcontractor, and the radius of the pipe (1 foot). These factors were added together to obtain a total reduced horizontal buffer width of 21 to 26 feet across the utility (versus a total of 50 feet for the two 25-foot buffers), with the distance upstream and downstream of the utility varying with the standard deviation. A five-foot vertical buffer is also shown above the pipeline to minimize the potential for damaging the pipeline during dredging. The remedial design for this utility corridor is therefore dredging up to the limits defined by the reduced buffer zones.

In areas on either side of the original 25-foot buffer zones, sediment that exceeds the 1 ppm PCB RAL will be dredged to the neat line. Where sediment that exceeds the 1 ppm PCB RAL is expected to remain in the utility corridor following dredging, the area has been identified as "special remediation area-08" (SRA-08) and an SRA cap has been designed specifically for this area. This SRA extends over most of the utility corridor alignment and may extend up to 25 feet upstream and downstream of the utility, before sloping at a 5:1 slope to the final dredge elevation just outside the area. This utility corridor will be remediated on an exception basis, subject to approval by the Agencies. The remedy for SRAs is not defined in the 2003 Record of Decision (ROD) or in the 2007 ROD Amendment, but these RODs do allow for "exceptional areas" such as this to be treated as a special case. Where the pipeline trench alignment is far enough from the navigation channel to allow a standard cap, with utility owner acceptance, a standard cap will be designed.

Background

During the 60 Percent Design phase for the OUs 2-5 project, no-action setbacks were established around utilities to avoid risk of damage and/or safety concerns during remediation in these areas. Concerns were based on potential risks associated with the dredge cutterhead or marine equipment spuds impacting the utilities, as well as potential injury to personnel. At that time, the utility locations were approximate based on desk-top searches for as-built drawings and had not been field located. Specific ground rules for design were established during the 60 Percent Design with place holder offsets ranging from 25 to 50 feet based on the accuracy of the utility location information and the risk posed by the sediment contamination.

Following additional sampling that provided information regarding PCB concentrations in sediment near many of the utility crossings, the A/OT requested that utility locations be determined with greater confidence so that remediation could be performed as close to the utility as possible. Tetra Tech had many meetings with utility owners and requested as-built drawings from these owners as the initial step in this process.

In 2012, and again in early 2015, Tetra Tech retained the Marine Engineering Systems Company (MESCO) to field locate several of the utilities. Following that effort, later in 2015, Tetra Tech retained Depth of Cover (DoC) Mapping for additional utility location services as part of further planning for remedial action in these areas. In 2017, J. F. Brennan (Brennan) elected to perform yet additional field location efforts involving the use of its divers. As a result of these additional location efforts, the utility locations in OU4 have been located with greater confidence, including the location of utility 049. A buffer zone remained in place following this mapping, although the Agencies required remediation within this zone that could be performed safely to the extent practicable. Brennan subsequently determined that dredging could be performed to the previously-described horizontal and vertical offsets from the pipeline, using the special equipment described below.

On February 28, 2018, a work group meeting was held with Mr. Jonathon Imbrunone of the U.S. Army Corps of Engineers (USACE), and Mr. Brian Powell, GBWU. The primary focus of the meeting was to discuss dredging and capping in utility 020. However, the meeting attendees recognized that decisions on dredging depths, dredging setbacks from utilities, and cap construction would likely be applicable to other SRA caps. During the meeting, Mr. Imbrunone was asked to provide information regarding the USACE's preferences for the following: 1) the buffer zone depth to be added below the authorized navigation channel depth, to the top of the cap surface; and 2) the stone size to be used for cap armoring. On March 14, 2018, Mr. Imbrunone emailed the requested information to Mr. Paul Spillers (Tetra Tech). According to Mr. Imbrunone, the USACE's preferences are for a minimum 2-foot buffer below the authorized navigation channel depth, and for a smaller stone size.

As a follow-up to the February 28 meeting, an over-the-shoulder meeting was held with the A/OT on March 15, 2018 to discuss the information provided by Mr. Imbrunone. During that meeting, the A/OT stated that the use of small stone, with a D_{50} not exceeding 3 inches, would be acceptable for the SRA caps, and the top of cap should be designed to be no higher than elevation 551.6 NAVD88, to incorporate the USACE's request for a 2-foot buffer below the authorized navigation channel depth. In addition, the A/OT requested the following information to be provided regarding the proposed SRA caps:

- Additional information from Brennan, in writing, describing the efforts taken to dredge the 25-foot buffer zone located south and north of the utility, and the rationale for the inability to dredge below elevation 550 feet NAVD88 in this zone.
- The estimated volume of sediment remaining below elevation 550 feet NAVD88 in the navigation channel, that would be capped with the SRA cap, and is outside the assumed pipe trench area.

This information is provided below.

Equipment Capabilities and Risk Factors Assumed by Brennan for Dredging

Brennan initially began dredging close to utilities using diver-assisted dredging, with a shroud connected to a dredge via hydraulic suction hose. This arrangement proved to be less efficient than anticipated, so in 2017 Brennan elected to use divers to perform the field location work mentioned above, followed by dredging with the Vic Vac and an excavator mounted dredge, the *Midland*, located on a barge, to remove RAL sediment to within approximately five feet of the location of a utility. Brennan determined this to be the closest distance that could be dredged safely, to which the A/OT concurred. However, this dredge can only reach as low as approximately elevation 550 feet NAVD88, so where sediment exceeding the RAL extends below this elevation outside of the 5-foot buffer zone, the SRA cap will be extended to cover this sediment, as shown on the design.

During the 2017 season, while utilizing the *Midland,* Brennan attempted to modify the dredge apparatus to reach below elevation 550 feet NAVD88. This attempt was unsuccessful and led to damaging the equipment. Brennan then investigated two reasonable options that could have allowed safely dredging below elevation 550 feet NAVD88, as described below.

- Option 1 included adding the Vic Vac attachment onto a standard swinging ladder dredge attached to the guide barge. These dredges have a dredging depth of approximately 35 feet in the standard cutterhead configuration (dredge elevation 545 feet NAVD88 with water elevation of 580 feet NAVD88), but can only reach just under 28 feet (dredge elevation 552 feet NAVD88 with water elevation of 580 feet NAVD88) using the Vic Vac. The loss in dredging depth is due to the need for the dredge ladder to be articulated to operate the Vic Vac.
- Option 2 included using an excavator with longer reach capabilities. There are several issues associated with this option. First, the excavator on the *Midland* is a company-owned machine that has several post-market additions to enhance its ability to work in this capacity. Brennan modified the counterweight to allow the hydraulic power pack to be attached to the back of the dredge. In addition, the power pack is currently manufactured to attach to that specific piece. These modifications cannot be made to rental pieces because doing so would void the warranty of the machine. Another problem is that the attachment's weight prevents a standard class machine from reaching the depths while handling the weight.

In addition to this information, Brennan supplied documentation attesting to the risks associated with dredging near the uncertain locations of utilities. Brennan also demonstrated the inability to dredge deeper than 30 feet, or lower than elevation 550 feet NAVD88 given the current water level of 580 feet NAVD, given available equipment and industry standards. This documentation is presented in Attachment A.

Remedy Proposed for the Utility 049 Corridor

A dredge plan was submitted to the Agencies for dredging in DUTIL-049 to the buffer extents described above. This dredge plan was approved on July 25, 2018 and implemented during the 2019 season. Following confirmation sampling of the area dredged, a residual dredge plan was developed, which is presented in Attachment B. Implementation of this plan began in 2019, and residual dredging is scheduled to be completed in 2020. Upon completion of dredging, cap SRA-08 will be installed over the remaining sediment that exceeds the 1 ppm PCB RAL.

The design for SRA-08 considered the PCB concentrations likely to remain in the sediment after dredging. Two core summary tables are presented in Attachment D; Table D-1 includes cores obtained upstream, downstream, and within the utility 049 corridor for the primary dredging completed in 2019; and Table D-2 shows the cores related to the residual dredging in 2020. As is evident from the Table D-2, cores in this area contain sediment with predominantly low PCB concentrations just below the cap, typically less than 7 ppm. An assessment of these cores is as follows:

- Cores 4085-49, 4085-62, 4085-64, and 4085-218 had sediment with maximum PCB concentrations of 3.65 ppm, 19 ppm, 6.8 ppm, and 7.0 ppm respectively. These intervals will not be dredged because the elevations are lower than the dredge depth that was approved due to the equipment capabilities and risk factors indicated in the section above. Sediment just below the cap is expected to have PCB concentrations of 1.1 ppm, 3.8, and 6.8 ppm, respectively.

Based on the core data for this area after dredging, the thickness of RAL sediment remaining around utility 049 in the SRA-08 area is expected to range from 0 to 5.5 feet, with PCB concentrations that are likely less than 19 ppm. The estimated volume of RAL sediment remaining in the navigation channel, below elevation 550.0 feet NAVD88 is less than 800 cubic yards.

Propeller Wash Zones

Propwash zones were determined assuming 100 percent bow thruster power level from a large straying and non-straying vessel traveling in the navigation channel. Maps showing these propwash zones are presented in Attachment E. The zones show the correlation between propwash impact and the stone size needed to resist this impact. Where these zones indicate that a standard A or B cap could not be installed, or where propwash zones indicate that armor stone with a D_{50} of 6 inches or more would be required because authorized navigational depth will be compromised with such thick caps, the cap will be designed as an SRA cap as described below.

Proposed Remedy for SRA-08 in the Utility 49 Corridor

Capping with a standard cap was considered as a potential remedy for SRA-08, but was not selected for the following reasons:

- The cap would be designed to withstand propeller wash from large vessels, which would require placement of very large stone or a concrete mat over the utility. This would result in a large hump that would not meet the 26-foot water depth required over the width of the navigation channel.
- If a concrete mat was used for the cap, the hump would be smaller, but it would make this utility line very difficult to access if a repair was needed.
- The additional overburden pressure of a thick cap was not originally factored into the design of the utility, so this added pressure could create settlement or other problems with the pipeline, if installed.

Sand mixing calculations were performed for a range of initial PCB concentrations (up to 50 ppm PCB) and sand thicknesses of 6 inches and 9 inches. These calculations assume full mixing of the first 3 to 6 inches of sand with underlying undisturbed residual or generated residuals produced by the dredging process. The results for these calculations are presented graphically in Attachment F and indicate that a 6-inch thick sand cover mixing with the upper 3 to 6 inches of sediment containing PCB concentrations of 7 ppm or less would result in PCB concentrations at the surface of approximately 0.7 to 0.9 ppm. Likewise, a 9-inch thick sand cover with the lower 6-inch layer mixed with the underlying sediment would have an estimated PCB concentration of approximately 0.3 to 0.4 ppm at the mixed sand/sediment surface. To maintain a minimum 26-foot water depth in the navigation channel, SRA-08 would include an area of approximately 4,000 square feet that would receive only 6 inches of sand or less. However, the Agencies subsequently allowed the 26 feet to be reduced to 25 feet (one foot of buffer below authorized navigation depth). This reduces the area without SRA cap thickness to near 1,000 square feet, as shown on Attachment C.

The authorized depth for the navigational channel is 24 feet and the USACE normally requires a 2-foot buffer below the 24-feet. However, the USACE is allowing an exception and has accepted a 1-foot buffer. Reference Attachment H which contains the USACE's May 21, 2020 and June 1, 2020 emails, and the Agencies' June 16, 2020 email addressing the USACE's 1-foot exception.

Sand/GAC Ratio

A work group meeting was held on August 30, 2018 to discuss cap designs with minimal thickness due to navigation channel constraints. Based on the meeting discussion, it was determined that at least six inches of sand would be placed with an amendment of granular activated carbon (GAC) containing up to approximately 5% GAC by dry weight of aggregate. A minimum thickness of 3 inches of stone with D_{50} of ¾ inch will overlie the amended sand. The stone thickness interval will increase to achieve a top of cap elevation of 552.6 feet NAVD88.

Following the August 30, 2018 meeting, the modeling approach was developed by the Design Team and submitted to the A/OT on November 8, 2018. The Agencies approved the proposed approach on December 5, 2018, with the contingency that a factor of safety be applied to the results. The approach included evaluating the sand/GAC ratio using Dr. Danny Reible's (Texas Tech University) latest cap model. The model would be run iteratively using site-specific parameters and PCB concentration remaining below the cap, until the results showed the project remedial action level of 1 ppm PCB would be met in pore water at the cap's surface for at least a 100-year period.

The modeling approach and results for SRA-03, SRA-05, and SRA-07 are presented in a memo in Attachment F. Because of the limited number of samples collected in each SRA and as indicated in the memo, a conservative approach was used that includes modeling with the maximum concentration that will remain under the planned SRA caps. This maximum concentration was observed in sediment remaining below cap SRA-07 (i.e., 41.9 ppm PCB). This concentration was converted to an equivalent range of porewater concentration in the sand for a range of the sand's total organic content of 0.10% to 0.67%. The modeled resulting GAC amendment needed to maintain a concentration of 1.0 ppm PCB for 100 years ranged from 0.0% to 1.4%. To be conservative, 1.4% GAC was selected from this model range which is multiplied by a required factor of safety of 3. This results in the GAC added to the sand of 4.2% by dry weight of a sand (minimum 6-inches of sand). Therefore at least six inches of sand would be placed with an amendment of granular activated carbon (GAC) containing 4.2% GAC by dry weight of aggregate for SRA-08.

Description of SRA Caps

The proposed design for SRA-08 includes three types of SRA caps, as shown on Attachment C. The SRA caps shown in green and identified as SRA cap type 2 will be constructed with a minimum 6-inch sand layer, plus a 3-inch thick over-placement allowance, with armor stone placed over the amended sand. The armor stone used for this portion of the cap will have a D_{50} of ¾ inch, and the thickness of the cap has been increased to 5 feet as requested by the A/OT.

In areas of the navigation channel where there is insufficient thickness between the bottom of the navigation channel and the top of the utility buffer to allow for the SRA cap described in the previous paragraph, a thinner SRA cap will be placed, as shown in brown and identified as SRA cap type 1 on Attachment C. Amendment with GAC at a proportion of 4.2% GAC by dry weight of aggregate, will be used to complete the cap. In these areas, a minimum of six inches (with 3 inches of over-placement allowed) of GAC-amended sand will be placed, followed by a layer of aggregate with a D_{50} of ¾ inch placed to a design elevation of 552.0 with 6 inches of over-placement allowed not exceeding 552.5 feet NAVD88 (revised from 551.6 by the Agencies to allow for more cap material and still not compromise the authorized navigational depth.)

In three locations of SRA-08, with an approximate total area of 1,000 square feet within the authorized channel and 10 feet beyond, top of the pipeline is at elevations such that no cap can be placed there.

SRA cap type 3 completes the SRA 8 cap on the east and west extents of the type 2 cap areas to shoreline. This cap is a standard project cap identified as B2 and comprises 6 inches of sand with 3 inches of over-placement allowance plus 4 inches of $D_{50} = 1.5$" rock with 3 inches of over-placement allowance; its thickness varies where transitioning to type 2.

The SRA cap remedies provide the following advantages for this area:

- In the navigation channel, the carbon amendment will assist in attenuation of PCBs, when compared to a sand-only cap. This will allow for a thinner cap that will not interfere with the navigation channel.
- The spreader would be used in conjunction with an extended barge that could safely span the utility corridor such that impacts to utility 049 with spuds are not a concern. This could allow for installation of the SRA cap during the 2019 season.
- The SRA cap remedy would be effective based on the calculations previously discussed.
- The SRA caps should be acceptable to the utility owners of the pipeline.

The proposed SRA caps are not standard cap designs but will still provide some isolation and/or potential mixing of underlying PCB contamination that will help to reduce the impact of leaving these PCB concentrations in place. In summary, the advantages and disadvantages of the SRA cap design for utility 049 corridor are shown on Table 1.

Table 1. Advantages and Disadvantages of the SRA-08 Cap Design

Cap Design Criteria	Advantages of SRA-08 Cap Design	Disadvantages of SRA-08 Cap Design
Stone size – D_{50} of ¾ inch.	Provides some protection against erosive forces. Stone size is small enough to allow riparian owner easy access to the buried utility if needed.	Not large enough to protect against scour from propwash from large vessels throughout much of the area.
Activated carbon amendment	Increased attenuation of PCB compared to sand alone.	Requires mixing and measuring to achieve the amendment ratio of 5.0% by dry weight of carbon into the sand.
Top of cap elevation in the navigation channel	Will meet design requirements in the navigation channel and allow a 1-foot buffer zone for channel dredging.	The stone size will not be large enough to function as a marker layer for dredging, so the armor layer could be disturbed by over-dredging.
Top of cap elevation outside the navigation channel	Acceptable for side slopes of the channel and in some areas near the shoreline.	None.

Sand/GAC Placement Method

The sand and GAC mixture will be placed using J.F. Brennan's patented Broadcast Capping System (BCS™), which has three main systems/components that include the land plant, transportation, and the broadcast spreader. The land plant will be located onshore at the Lower Fox River processing facility, where cover sand and GAC will be stored and mixed before being hydraulically or mechanically transported to the spreader plant.

Broadcast Capping System™

The land plant will be equipped with an integrated measuring system that includes a scale and hopper system that weighs and meters the amendment precisely. Two conveyors, one for sand and one for GAC will be used to supply the mixture. The conveyors will be set up in a leader-follower configuration. This enables precise mixing, because the leader is equipped with a scale controlled by a programmable logic controller (PLC), which will be set to accept a specific volume of material. The scale controller will provide electric pulses for every 0.01 tons that pass over the scale and transmits the information to the PLC. The follower conveyor will automatically adjust the amount of GAC based on the amount of sand on the leader conveyor. The two metering conveyors will discharge onto the long conveyor that will either discharge into a slurry container or material barge.

The GAC will be hydrated in large soaking tubs for at least 24 hours prior to mixing with the sand. This will increase the weight of the GAC to as much as double the dry weight, which will result in GAC that is similar in weight to the weight of the sand. The GAC weight change will be accounted for in the metering process to ensure an adequate mixing rate based on a percent of dry weight.

When the sand and GAC have been properly mixed at the land plant, the mixture will be hydraulically transported through pipelines to the broadcast spreader or mechanically transported via barge.

The broadcast spreader will be set up on a 40-foot (ft) by 80-ft distribution barge equipped with winches, spuds, and hydraulic power pack. The distribution barge will work in tandem with the same equipment, plus a rubber tracked excavator. Two cables will be connected between the excavator and cleats on the distribution barge to join the barges.

Once the sand / GAC mixture reaches the broadcast spreader it will be processed in a manner that depends on whether the delivery was via hydraulic or mechancal means. If hydraulically transported, the mixture will be dewatered through a set of hydrocyclones and a high-frequency shaker system. The slurry from the pipeline will be discharged into two 30-inch cyclones on the spreader barge located above the dewatering screen. The cyclones will remove the majority of the water from the slurry and then deposit the capping material onto the shaker bed. The discharged carriage water will be transported to a tank where a quiescent zone is created that will allow the remaining fines to drop out before the carriage water is discharged, via overflow weirs, into the river at the bow of the barge near the sand placement moon pool. As fines settle out in the holding tank, a 4 inch pump will recycle the sand along with some carriage water through an 18-inch cyclone. This “recovery” cyclone will place the fines from the holding tank back onto the shaker screens to be dewatered again, thereby reducing the amount of lost fine material.

BCS™ system Spreader Action

If the mixture is delivered by barge, a large material handler will be placed on the stern of the placement barge. The material handler will offload the transport barge and place the sand/GAC mixture into a small metering hopper similar to the one below the shaker deck.

From the small metering hopper which feeds a belt conveyor, the sand/GAC mixture will be removed from the hopper via a 24-inch conveyor. The sand/GAC misture will be deposited onto the dual spinners of the BCS™ system and spread in an overlapping manner. The spinners will then broadcast the cap material over an approximately 30-feet by 35-feet area. The spinners can be adjusted to develop an accurate pattern regardless of the sand size or amendment percentage. By broadcasting the material at a high delivery rate over a large footprint and using the water column to reduce the mixture's velocity, there is little mixing of the capping material and in-situ material, and a uniform sand/ GAC mixture is placed. Other projects with similar sediment types have shown that utilizing this type of broadcast system reduces the mixing layer of the sediment and sand interface and eliminates slope failures and "mud wave" effects. The BCS™ process is shown on the following flow diagram (**Exhibit 1**).

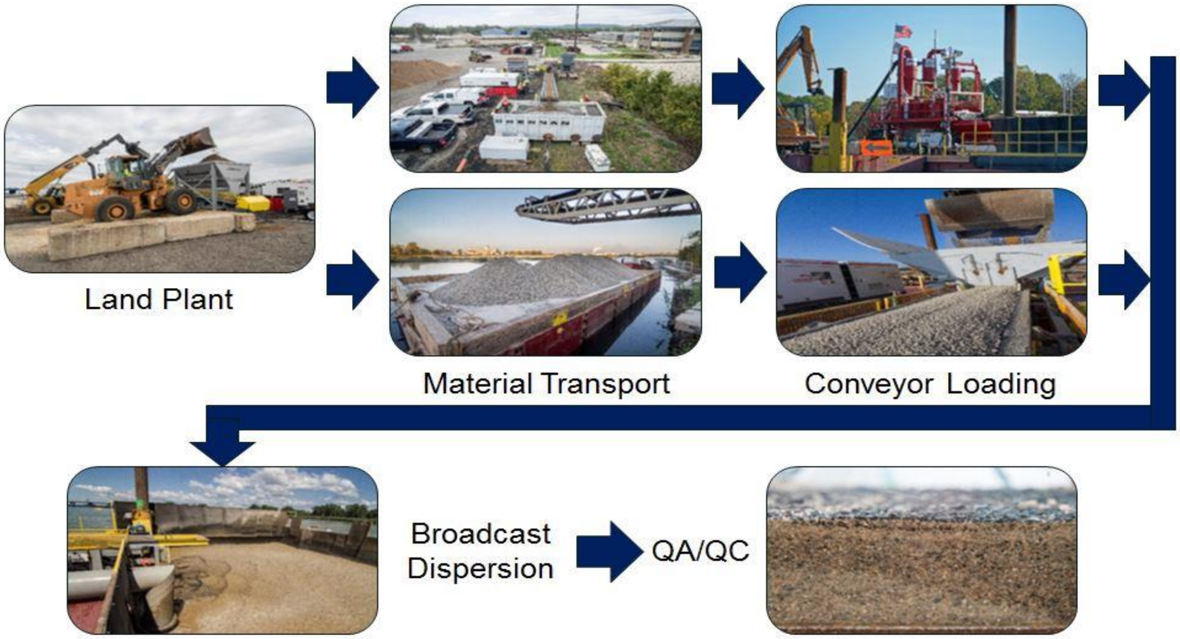


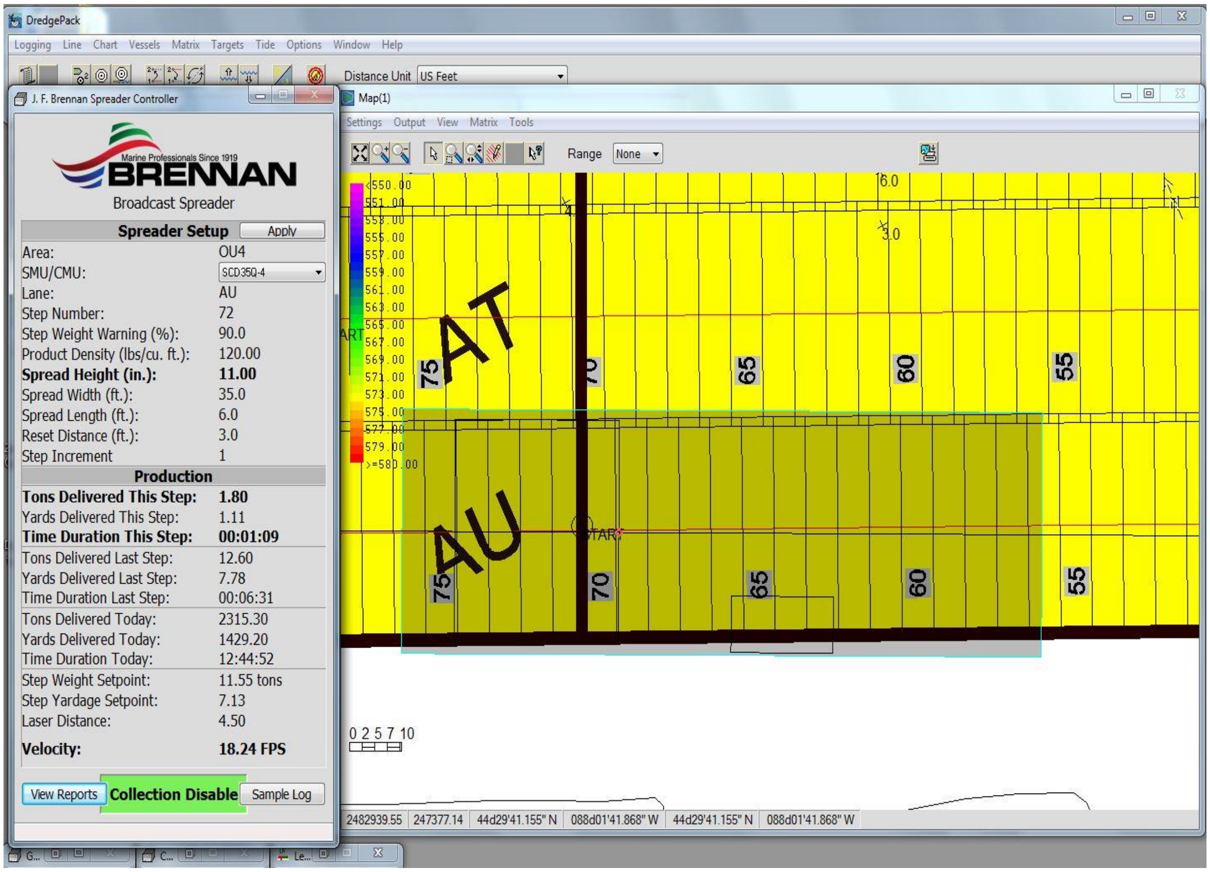
Exhibit 1: BCS™ Flow Diagram

Brennan Internal Process Quality Control

Brennan has developed customized software to aid in the quality control management. This software provides several measures to ensure the accurate placement of cap mixtures. Hypack software receives the information from the spreader's GPS sensors and downloads the data into the DREDGEPACK® module to provide real-time location of the spreader. As part of DREDGEPACK®, a Brennan Spreader Controller has been developed as shown in **Exhibit 2**. This controller has several input sections (Spreader Setup) that are easily modified to determine the amount of sand placement in each step. These inputs allow the spreader to be accurately adjusted for lane width, length, and height. Below the Spreader Setup section, the Spreader Controller tracks the production at each location, by including the belt scale data collected just before the dual spinner setup. These weights are tracked in real-time to measure precisely the amount of material placed in each step. This screen is also displayed in the excavator to alert the excavator operator when to step.

The Spreader Controller can also be used for quality control by recording a large database of information collected from each step. Once the spreader takes a step, the controller resets, the Spreader Controller records the data from the previous step and downloads it into the database. Brennan quality controll staff collect this information daily to anallyze for any discrepancies and use this information in the daily reporting process. The Spreader Controller system also provides a method for recording the location and results of quality control samples. The operators can enter the quality control sample result which is then logged in a database and also displayed on the DREDGEPACK® screen. Brennan quality control information is tracked by Brennan's quality control staff and compared to quality assurance results.

Exhibit 2: Screenshot of Spreader Control on BCS™ Plant



Spreader Setup	
Area:	OU4
SMU/CMU:	SCD35Q-4
Lane:	AU
Step Number:	72
Step Weight Warning (%):	90.0
Product Density (lbs/cu. ft.):	120.00
Spread Height (in.):	**11.00**
Spread Width (ft.):	35.0
Spread Length (ft.):	6.0
Reset Distance (ft.):	3.0
Step Increment	1
Production	
Tons Delivered This Step:	**1.80**
Yards Delivered This Step:	1.11
Time Duration This Step:	**00:01:09**
Tons Delivered Last Step:	12.60
Yards Delivered Last Step:	7.78
Time Duration Last Step:	00:06:31
Tons Delivered Today:	2315.30
Yards Delivered Today:	1429.20
Time Duration Today:	12:44:52
Step Weight Setpoint:	11.55 tons
Step Yardage Setpoint:	7.13
Laser Distance:	4.50
Velocity:	**18.24 FPS**

2482939.55 | 247377.14 | 44d29'41.155" N | 088d01'41.868" W | 44d29'41.155" N | 088d01'41.868" W

Additional Quality Assurance/Quality Control Procedures

In-situ and ex-situ samples of the CIL will be tested to verify the proper sand/GAC ratio. The testing will be conducted by AET laboratory and will utilize a thermal drying method to evaluate the GAC concentration in the sample. A description of the thermal drying method is presented in the Standard Operating Procedure, Appendix G.

Utility Owner and USACE Acceptance

The following information obtained from the USACE is also applicable to DUTIL-049, SRA-08. On February 28, 2018, a work group meeting was held for DUTIL-020 with representatives from USACE and Green Bay Water Utility. It was agreed that some of the discussions for DUTIL-020 would be equally applicable for other SRA utilities. Mr. Jon Imbrunone, USACE, was asked to provide information regarding the USACE's preferences for the buffer zone depth to be added below the navigation channel depth to the top of the cap surface, and the stone size preferred for cap armoring. On March 14, 2018, Mr. Imbrunone emailed Tetra Tech, stating the USACE's preferences are for a minimum 2-foot buffer below the authorized channel depth, and for small stone size. A copy of this email is included in Attachment H.

Tetra Tech met with the previous owners, Buckeye Pipeline Company (Buckeye-also known as West Shore Pipeline Company), the LLC, and the A/OT on July 30, 2018 to discuss the dredge and cap remedial design for DUTIL-049. The lateral and vertical no-dredge buffers were provided in the dredging design review document (DRD). Little or no dredging was proposed in some areas in the navigational channel because the pipeline is near the 2018 bathymetric surface. Mr. Casey Schwandt stated that Buckeye believes the pipeline may be exposed with no cover in portions of the navigational channel. When the pipeline was placed, it was coated with concrete to hold down the pipe. However, Buckeye does not know the current condition of the concrete coating. It is a concern to Buckeye that if too much of the pipe is exposed by dredging, the nitrogen-filled pipeline may float. Dredging of too much sediment may also cause additional pipeline exposure from future erosion or propwash-induced sediment disturbance.

Tetra Tech displayed the plan view and cross sections contained in the DRD. One of the dredge cuts on the east slope of the navigation channel would extend a few feet below the assumed depth of the pipeline. It was discussed that erosion or propwash forces in this location may expose additional pipeline. Tetra Tech proposed to design a cap to cover this portion of the pipeline to reduce the chance for pipeline exposure and stated that revised figures would be provided to Buckeye. Buckeye stated that the dredge plans in areas other than the area described above appeared to be acceptable. For capping, Buckeye provided no recommendation for aggregate size, but stated that maintaining an adequate amount of cover over the pipe was more important than the aggregate size of the cover. Buckeye indicated that when revised figures were received, they would be forwarded to Buckeye's engineering consultant for review of the remedial action's effect on pipeline stability.

On August 8, 2018, the revised DRD and July 30 meeting notes were presented to the meeting attendees. The revised DRD and meeting notes are included in Attachment H. Buckeye forwarded the notes and DRD to its engineering consultant, Farnsworth Group.

In 2018 the SRA cap design was evaluated for pipeline buoyancy, lateral movement, and riprap protection by the Farnworth Group. This evaluation is provided in Attachment H. On September 6, 2018 Buckeye emailed the Farnsworth Group report to Tetra Tech, and summarized the findings as follows:

- The pipeline should not be buoyant as a result of the dredging activities.
- No lateral movement is anticipated as a result of the dredging activities.

The Farnsworth Group report used a modeled aggregate size of D_{50} = 0.04 feet (about ½ inch diameter). However, the report recommended an aggregate size of Wisconsin Department of Transportation (WDOT) standard light rip rap as a suitable cap aggregate. WDOT light rip rap consists of aggregate up to 16 inches in diameter, much coarser than would be allowed in the navigation channel. For clarification, on September 25, 2018 Mr. Morey Tabatabai contacted Michelina Hansel of the Farnsworth Group to inquire about this recommendation. Ms. Hansel stated that light rip rap was specified because they assumed it would be a readily available aggregate product. However, they agreed that a smaller aggregate would be suitable, as indicated by their use of an aggregate size of D_{50} = 0.04 feet in the stability modeling. The Farnsworth Group stability report including the telecom with Ms. Hansel is included in Attachment H. Based on their finding, the required D_{50} can be achieved using rock sizes available to the LFRR project with a D_{50} of 0.06 feet (0.75 inches).

The conclusion that the pipeline will not be buoyant under 3 feet of cover will be true for most of the pipeline, but there is a small section in the authorized navigable channel that could be without cover. However, this section will still have a downward weight that is greater than the uplift force, 131 lb/ft against 74 lb/ft uplift, so uplift should not occur. The evaluation also indicated that there is no concern for lateral movement as long as the pipeline remains buried. The pipeline is and will continue to be buried over most of its extent, as shown on Attachment B.

Riprap protection was evaluated by the Farnworth Group and the D_{50} required rock size was reported to be 0.04 feet. The smallest standard WISDOT rock is identified as “light riprap” with D_{50} of about 0.5 feet.

On November 1, 2018 Tetra Tech was contacted by US Venture, who indicated interest in purchasing a portion of the Buckeye Pipeline, including the pipeline located under the Fox River. Buckeye Pipeline personnel confirmed that pipeline ownership may be transferred to US Venture. On December 14, 2018 Tetra Tech contacted Mr. Casey Schwandt, Buckeye Pipeline. Mr. Schwandt indicated that US Venture may still purchase the pipeline. On February 7, 2019, Tetra Tech was informed by Mark Reimer of US Venture, Inc. confirming the purchase of the facilities including the segment relative to Fox River. On

July 31, 2019 a letter of agreement to the capping of the pipeline was received from US Venture, Inc. as shown on Attachment H.

Construction Monitoring and Maintenance Plan (COMMP)

Requirements and plan for monitoring and/or maintenance of this SRA cap are included in the approved COMMP.

ATTACHMENT A1 AND A2

LETTERS FROM J.F. BRENNAN REGARDING DREDGING NEAR UTILITIES

ATTACHMENT B

APPROVED FINAL DREDGE DESIGN PLAN AND SECTIONS

ATTACHMENT C

REVISED SRA-08 CAP DESIGN PLANS AND SECTIONS

ATTACHMENT D

CORE SUMMARY TABLES FOR AREA AROUND SRA-08

D-1 PRIMARY DREDGE DESIGN TABLE

D-2 FINAL DREDGE DESIGN TABLE

APPENDIX E

PROPWASH ZONE MAPS

ATTACHMENT F

F1

SAND MIXING LAYER CALCULATIONS

F2

CAP MODELING RESULTS FOR SAND WITH GAC

ATTACHMENT G

STANDARD OPERATING PROCEDURE FOR GRANULAR ACTIVATED CARBON SAMPLE COLLECTION AND TESTING

ATTACHMENT H

Email Documentation from the USACE
West Shore Pipeline Study Results
US Venture Pipeline Ownership
Telecom record
&
US Venture Inc, Agreement Letter

ATTACHMENT A1 AND A2

LETTERS FROM J.F. BRENNAN REGARDING DREDGING NEAR UTILITIES

J.F. BRENNAN CO., INC.

820 BAINBRIDGE · BOX 2557 · LA CROSSE, WI 54602-2557 PHONE: 608 / 784-7173 · FAX: 608 / 785-2090

August 22, 2011

Mr. Bill Coleman
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54303

Re: Dredging Near Utilities

Dear Bill:

As you are aware, there have been numerous meetings with utility owners recently, as well as subsequent discussions with the A/OT related to the remedial actions that will be performed in the vicinity of utilities that cross the river. While we applaud the effort to identify the location of the utilities as accurately as possible I understand that JF Brennan site personnel have expressed concerns with regard to the lack of detailed information on the exact location of these utilities. Pursuant to this, we need to make very clear that we, as a company, have a significant concern for the safety of our personnel, as well as our equipment and reputation, and cannot take unnecessary risks when working in the area of active utilities whose locations have not been accurately identified.

Due to our concerns, we spoke to our insurance carrier regarding this topic to see if they could provide any insight. Attached you will find a letter we recently received from them. In this letter you will note that there is mention of a 50 foot offset when working in the area of an active utility where the exact location is unknown. To this point, we understand that WPS has required this amount of setback when working near its active natural gas pipeline that crosses the river in the general vicinity of the highway 172 bridge. We agree with this approach and are willing to proceed in this direction when work in this area is undertaken. In fact, we would recommend this approach be used when completing remedial activities in other areas where the exact location of utilities in unknown. Perhaps it will be possible to reduce the amount of offset, depending upon the amount of information for the specific utility. However, this will need to be done on a case by case basis. As an example, if the location of the utility can be guaranteed within 5’ in all directions we would be able to reduce the offset to 25’. In addition, if the location of the utility is ***accurately determined to be at least 20’ below the sediment surface*** we would perform dredging over this utility, if the design identifies this as the selected remedy.

As you are aware, JF Brennan has modified our material spreading equipment such that we can cantilever over a utility, providing complete remediation via the placement of sand cover or an engineered cap, while maintaining the safety setback of 50’. Thus, we

would encourage this approach near utilities where the information regarding locations is questionable.

If you should have any questions once you have had a chance to review this information please feel free to contact me at your earliest convenience. We look forward to a safe and successful project.

Sincerely,

Tom Kennedy

Tom Kennedy
Vice President CFO

McGRIFF, SEIBELS & WILLIAMS OF MISSOURI, INC.

7711 Bonhomme Ave., Suite 900 • St. Louis, MO 63105 • TEL – (314) 854-5200 • FAX – (314) 854-5201

August 19, 2011

Mr. Tom Kennedy
Chief Financial Officer
J. F. Brennan Company, Inc.
PO Box 2557
LaCrosse, WI 54602-2557

RE: Fox River Project
Underwater Utilities

Dear Tom:

We wanted to follow up with you on our recent conversation regarding the Fox River project and issues related to dredging near and/or over utility lines, oil pipelines, gas pipelines and similar items (hereafter underwater utilities). It is our understanding that a significant complicating factor in the situation is that data does not exist to precisely locate these underwater utilities, either vertically or horizontally, at certain locations. Despite the unavailability of such data at several locations, regulatory authorities are not presently agreeing to an offset with a capping alternative that has been proposed by J. F. Brennan and the project's prime contractor. At the same time, J. F. Brennan is contractually obligated to take all necessary precautions for the safety of, and must provide the necessary protection to prevent damage, injury or loss to, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of performing dredging operations on the Fox River.

In our capacity as J.F. Brennan's insurance broker, we are compelled to advise you of the significantly higher risk associated with dredging an area where the precise location of underwater utilities is unknown. There are certain representations made to the various companies that underwrite your insurance program regarding policies and procedures as it relates to dredging river beds with known underwater utilities. At a minimum, there is an expectation on behalf of your insurers that J. F. Brennan is able to identify the location of such utilities prior to commencing dredge operations. They have been advised that in situations where the exact location of underwater utilities are unknown, J. F. Brennan's preferred protocols dictate a fifty (50) foot offset with capping performed as an alternative to dredging within that offset. We are concerned that a perceived lack of due diligence by J. F. Brennan in its approach to dredging operations, or in meeting its contractual obligations for the project, could significantly complicate any potential claim scenarios. Based on the variety of underwater utilities throughout the site, a loss or losses from an underwater utility strike could involve significant monetary damages and other claims. Caution is therefore certainly urged. The potential exists for claims from the project owner, prime contractor, underwater utility owners and other third-parties affected.

Although not ideal, J. F. Brennan could look to contractual protection for the risk associated with dredging an area with unknown underwater utilities in the form of an indemnification agreement. However, in order for such an agreement to provide any degree of protection, it would need to encompass all bodily injury, property damage, environmental damage, loss of use and other direct or indirect consequences from a strike as it relates to any and all potential claimants. This indemnification would have to include as signatories the project owner, prime contractor and all applicable underwater utility owners. Although impossible to secure indemnification from unknown third-parties potentially impacted by a claim situation, the project owner, prime contractor and/or the underwater utility owners would have to indemnify J. F. Brennan for any claim brought by a third-party related to an underwater utility strike.

In addition to the contractual protection, we strongly urge J. F. Brennan to require from the project owner or prime contractor improved information regarding the river bottom location of all underwater utilities on both a vertical and horizontal basis. If necessary, J. F. Brennan should seek relief under its contractual provisions with the prime contractor to assure that sufficient data is available to identify precisely the location of underwater utilities. It is our experience that underwater utilities have a tendency to shift positions over time, therefore, recent data is imperative to minimize the potential for losses as a result of your dredging operations.

We appreciate J. F. Brennan including us in this process. We are available to assist your attorney in drafting appropriate indemnification language in an attempt to minimize potential claims occasioned by incomplete data.

Sincerely,
McGRIFF, SEIBELS & WILLIAMS of MO, Inc.
C Baxter Southern III

C. Baxter Southern III
Executive Vice President

Marine Professionals Since 1919
BRENNAN

J.F. Brennan Company, Inc.
818 Bainbridge Street
La Crosse, WI 54603
608.784.7173

May 1, 2018

Mr. Bill Coleman,
Project Manager
Tetra Tech EC, Inc.
1611 State Street
Green Bay, WI 54304

Re: Dredging Near Utilities

Dear Mr. Coleman

We are writing to address questions recently raised by the Agencies Oversight Team (A/OT) regarding the strategies and methods J. F. Brennan Company, Inc. ("Brennan") is using for remedial dredging in the vicinity of utilities that cross the river bottom. The A/OT has requested additional explanation from the project team for why the standard dredge cutterhead cannot be operated within the 25-foot setback. Brennan has attached its insurance letter stating a 50 foot offset should be used. Due to the extensive locates that have been done on this project during the design phase Brennan has reduced this requirement to the 25-foot offset.

Over the past several seasons, Brennan has worked closely with the project design team to develop strategies for dredging over utility lines to maximize sediment removal in the vicinity of those utilities in a safe manner. We developed methods utilizing the dredge Block Island with an open suction guided by divers, and we have utilized the utility dredge with a Vic Vac attachment. Using these methods, we have been able to dredge safely to within approximately 5 feet of utility lines 20, 23 and 26-30.

While it is true that the Vic Vac and the standard cutterhead attachment both rely upon GPS placement, the cutterhead does not operate in the same manner as the Vic Vac. A cutterhead attachment dredges more aggressively than the Vic Vac, which creates both more sediment disturbance and, significantly, more disruption of areas in the river bed near the area of dredge operations. Operation of the cutterhead necessarily increases the risk of damage to nearby utility lines. This is especially true If Brennan operates the cutterhead within the 25 foot utility offset.

The 25 foot utility offset is the operational standard used throughout the country. Recent projects completed by Brennan with similar offsets include Fox River OU1, East Branch Grand Calumet River – Reaches 4A and 4B, West Branch Grand Calumet River – Roxanna Marsh Reaches 1 and 2 and Connecticut River. Additionally, we have and are currently bidding several other projects nationwide with a similar offset. In fact, most projects increase offsets around high risk utilities, such as fiber optic lines.

Several attempts have been made to locate the utility lines in the river bottom. While these attempts have refined the information available to the project team, the resulting data has not provided the team with a sufficiently high level of certainty as to the actual location of those lines. The location data thus far received by the team has varied by more than 24 feet in regards to Utility 20 and by up to 33 feet for

Utility 21. Further dimensions of utility locate differences can be provided upon request. These differences show the level of complexity in accurately locating pipelines under the river bottom.

Operation of the standard cutterhead attachment inside a 25-foot setback is not a risk we can accept, nor is it a risk the project team should accept. That conclusion is more than evident when we have methods available that have produced a performance track record of safe dredge operation near utility lines. It is a method we have used on many other projects and it has produced a performance track record of safe dredge operations near utilities.

If you have any questions, please do not hesitate to contact us. Thank you.

Sincerely,

Dustin Bauman
J. F. Brennan Company, Inc.

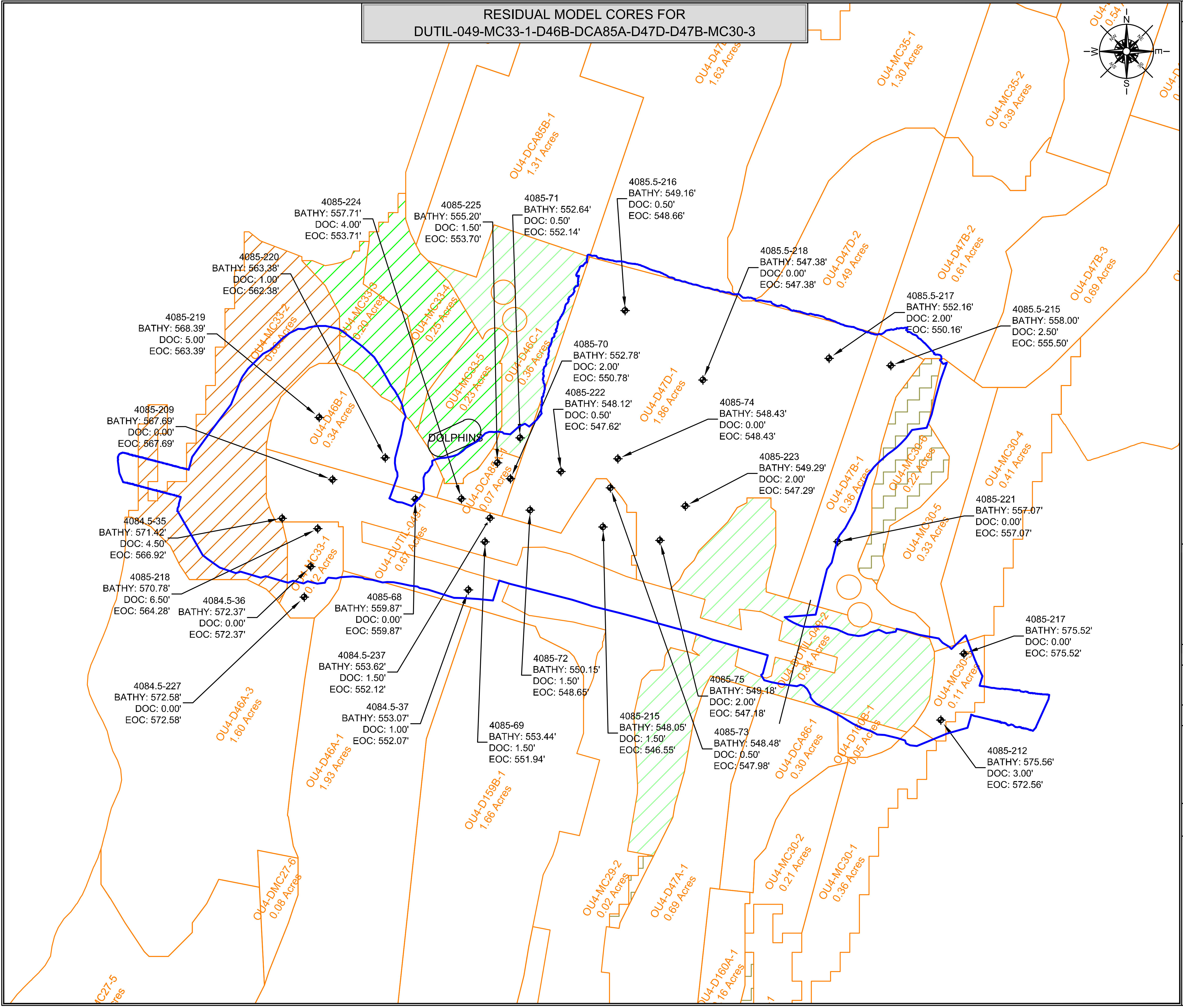
ATTACHMENT B

APPROVED

FINAL DREDGE DESIGN

PLAN AND SECTIONS

RESIDUAL MODEL CORES FOR DUTIL-049-MC33-1-D46B-DCA85A-D47D-D47B-MC30-3



LEGEND

RM	RESIDUALS MANAGEMENT HANDLED UNDER SEPARATE PLAN
RSC	RESIDUAL SAND COVER
NA or NFA	NO ACTION PLANNED OR NO FURTHER ACTION REQUIRED
PD	PRIMARY DREDGE REQUIRED
—	DMU BOUNDARIES
—	RDMU BOUNDARIES

OU# - D# - #

OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 100')

100 50 0 100 200

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: OU4-DUTIL-049 Area RM Plan.dwg
DRAWN BY: DAVID.FRISQUE
DATE: October 24, 2019
LAST REVISED: November 1, 2019
CHECKED BY: REG

Fox River
LOWER FOX RIVER REMEDIATION LLC

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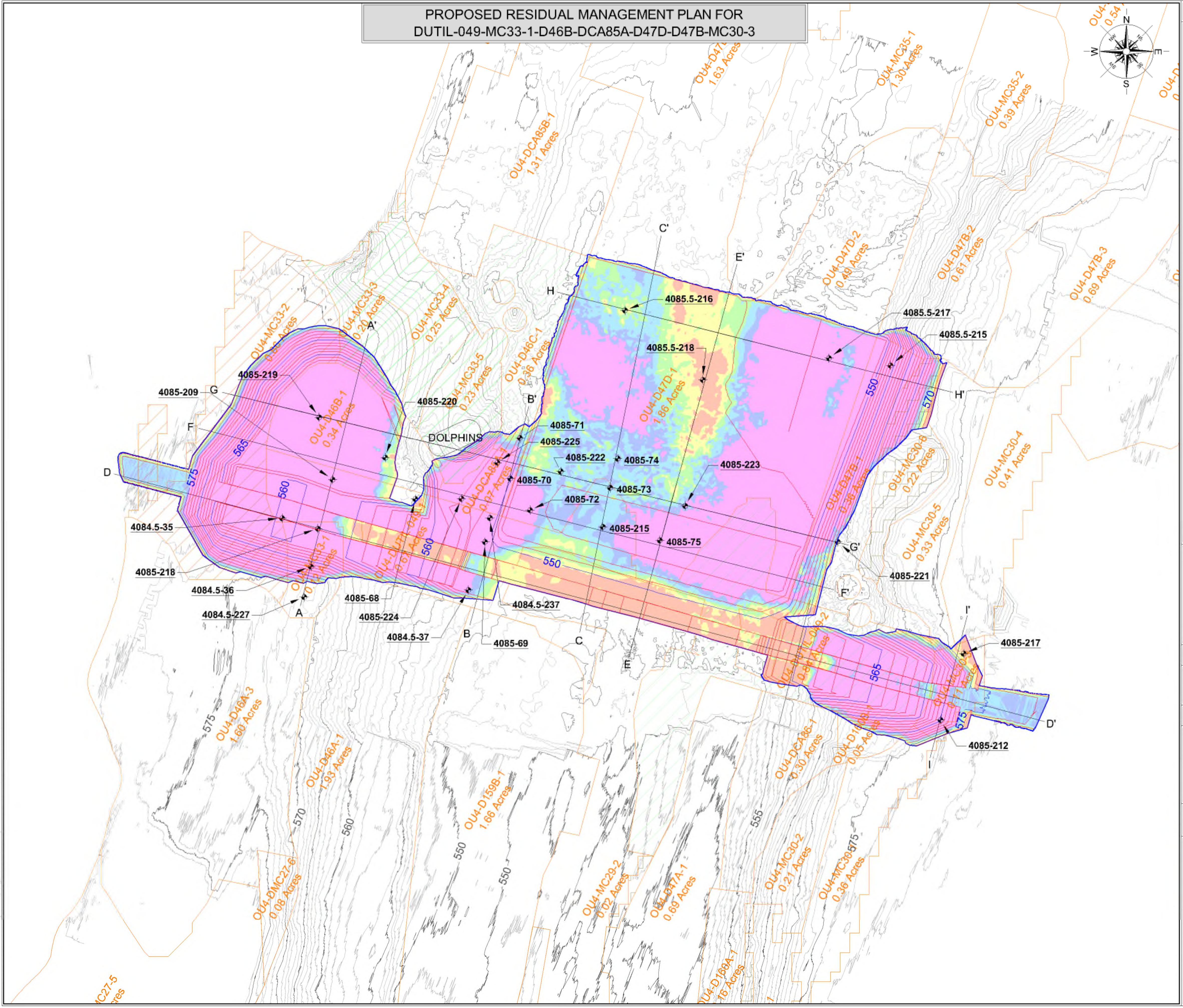
PROPOSED RESIDUAL MANAGEMENT PLAN FOR
DUTIL-049-MC33-1-D46B-DCA85A-D47D-D47B-MC30-3



LEGEND

MIN. EL.		MAX. EL.
🟪 -15.65'	-	-2.00'
🟦 -2.00'	-	-1.50'
🟦 -1.50'	-	-1.00'
🟩 -1.00'	-	-0.50'
🟨 -0.50'	-	0.00'
🟧 0.00'	-	5.20'

DOC DEPTHS

DESIGN MINOR CONTOURS
DESIGN MAJOR CONTOURS
EXISTING BATHY MINOR CONTOURS
EXISTING BATHY MAJOR CONTOURS
DMU BOUNDARIES
RDMU BOUNDARIES

SEE ATTACHED CORE SUMMARY TABLE FOR DETAIL INFORMATION FOR EACH CORE

OU# - D# - #

OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 100')

100 50 0 100 200

SITE NOTES

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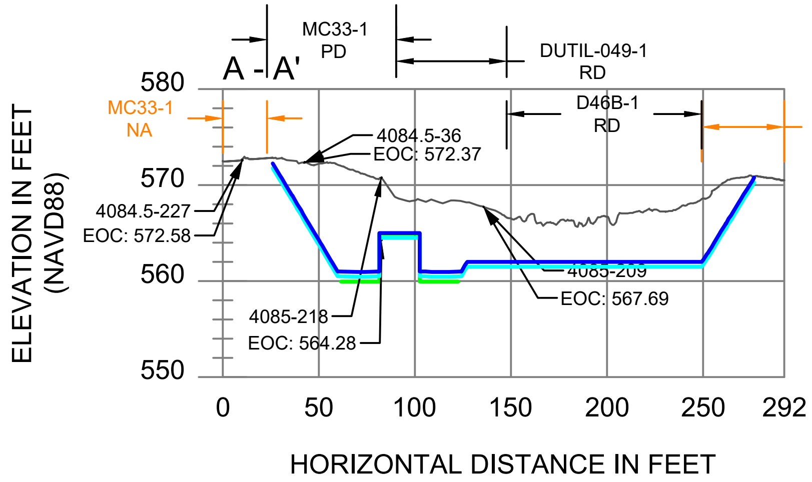
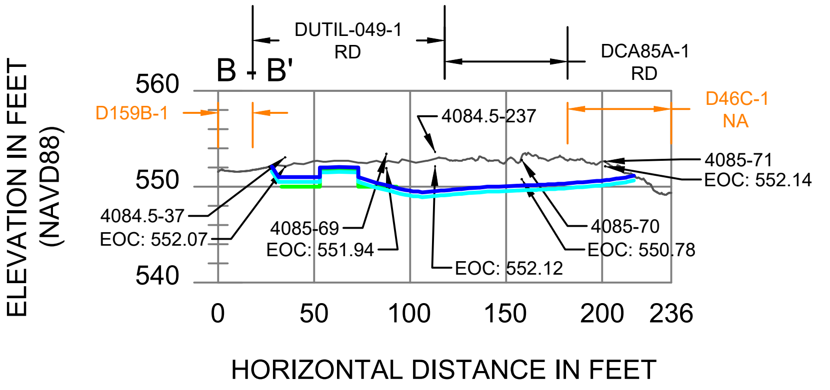
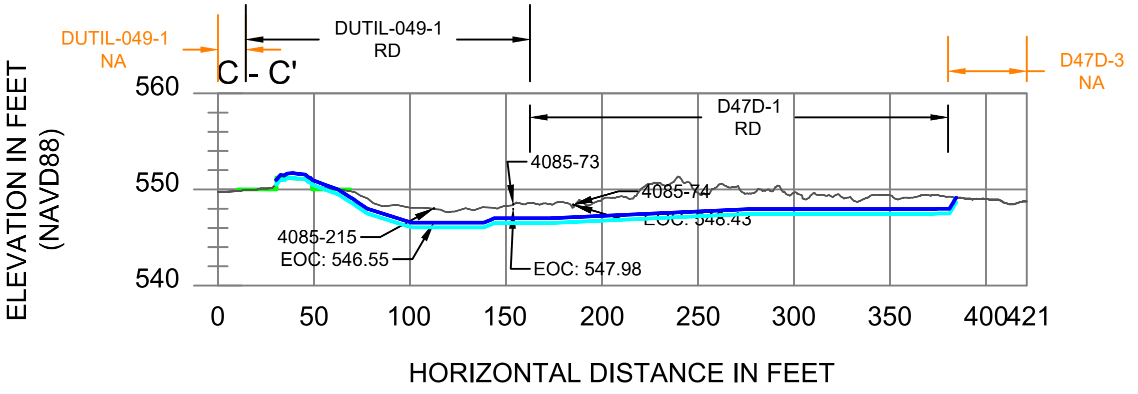
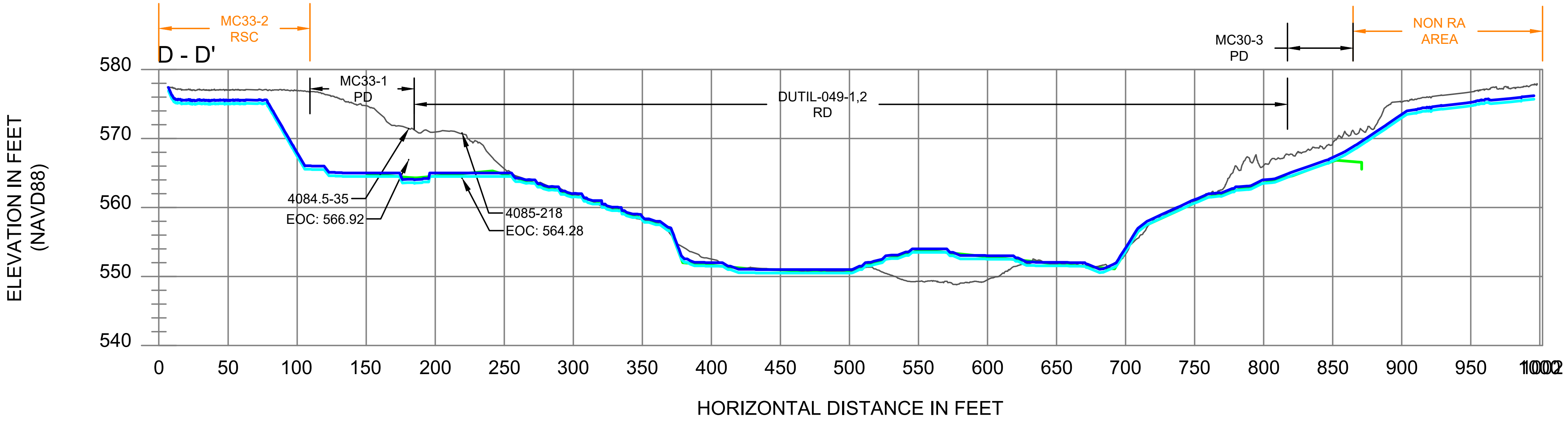
P:\LLC\CAD\Field Engineering\Dredge Files\2019_2019 Residual Management Plans\DUTIL-049-1-MC33-1\DWG\OU4-DUTIL-049 Area RM Plan.dwg

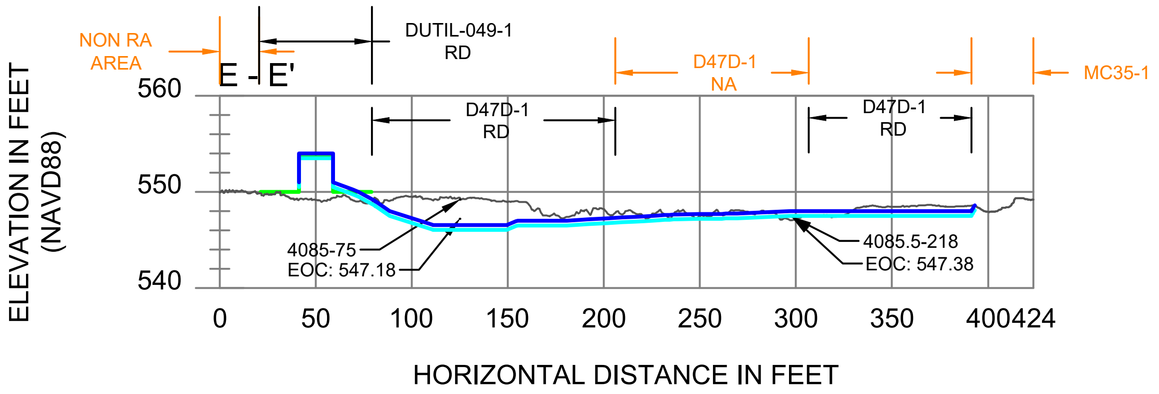
PROPOSED RESIDUAL MANAGEMENT PROFILES FOR DUTIL-049-MC33-1-D46B-DCA85A-D47D-D47B-MC30-3











LEGEND

RD	RESIDUAL DREDGE
RM	RESIDUAL MANAGEMENT (NOT YET DETERMINED)
RSC	RESIDUAL SAND COVER
PD	PRIMARY DREDGE (NOT INCLUDED IN THIS DESIGN)
NA	NO ACTION

—	DESIGN SURFACE
—	DESIGN OD SURFACE
—	EXISTING BATHYMETRY
—	BUFFER SURFACE

OU# - D# - #

OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 100')

100 50 0 100 200

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

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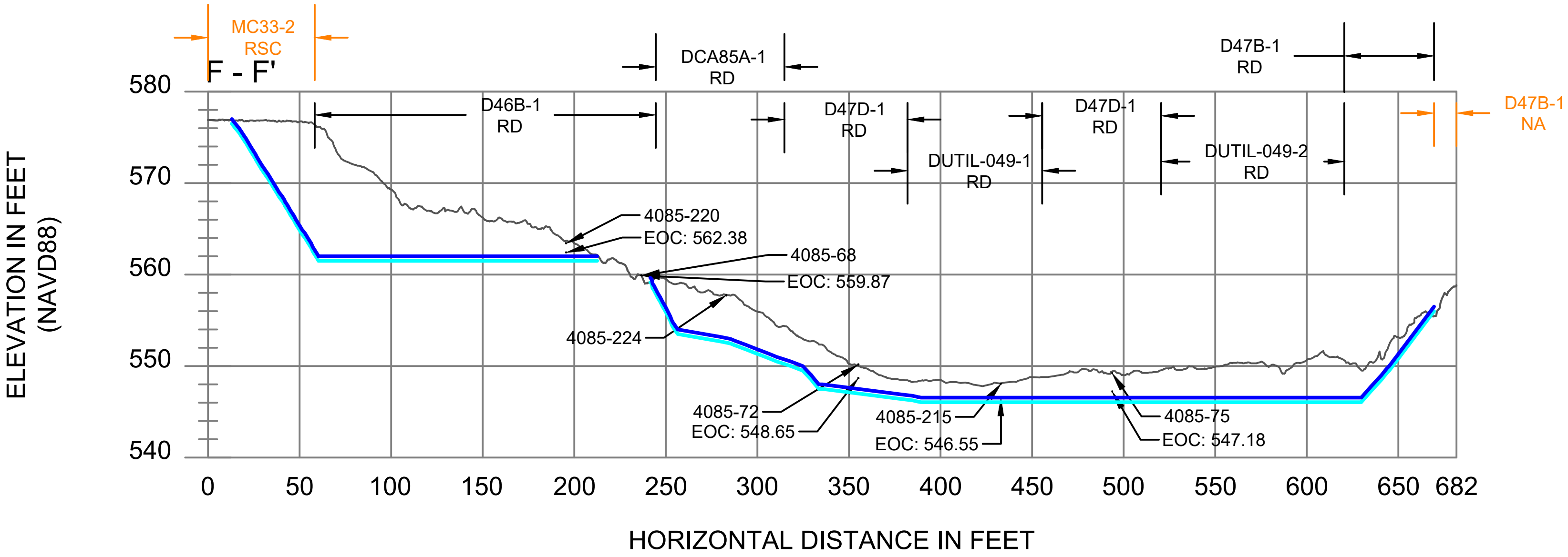
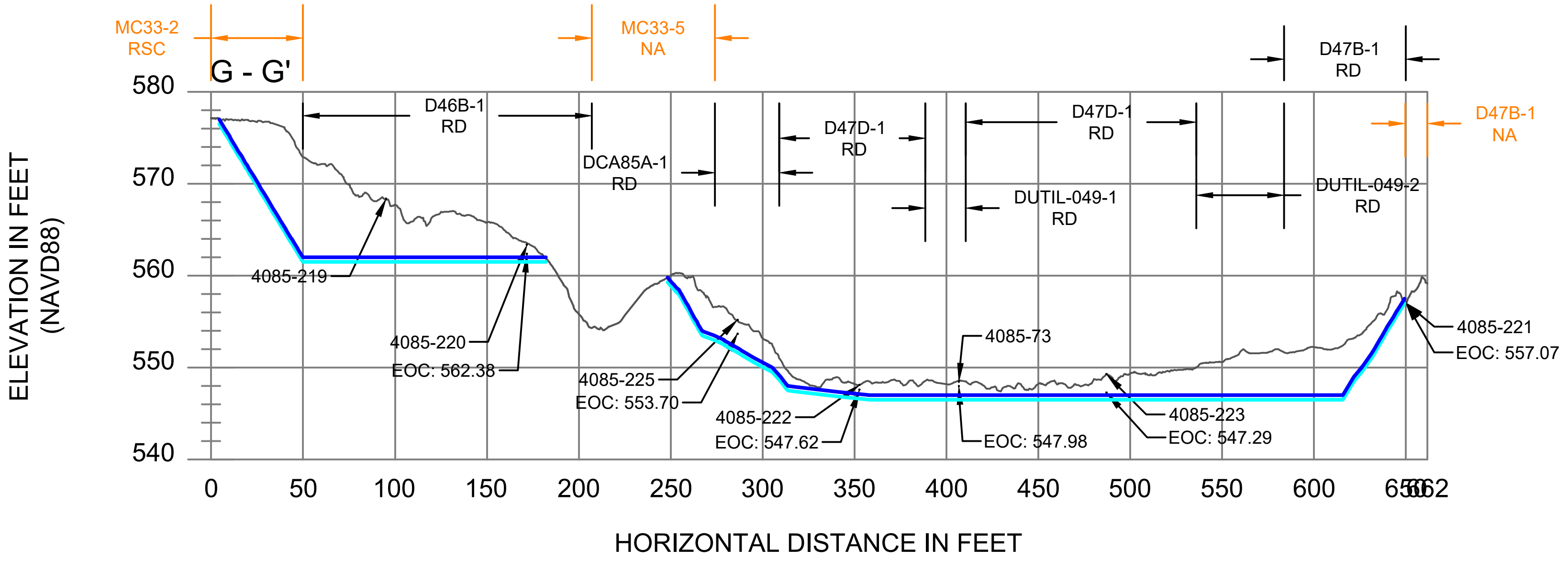
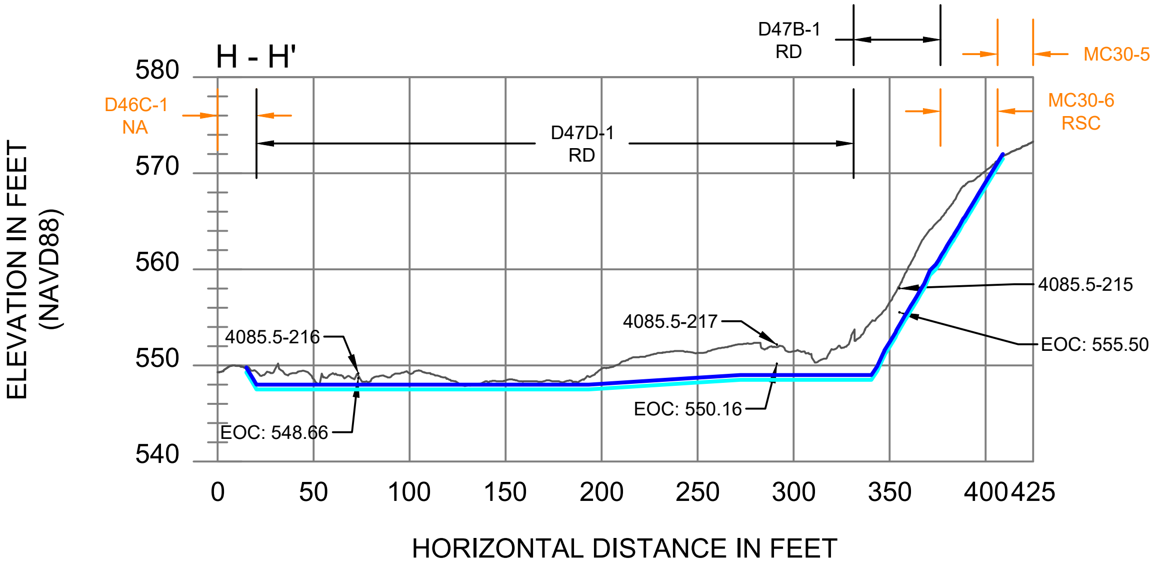
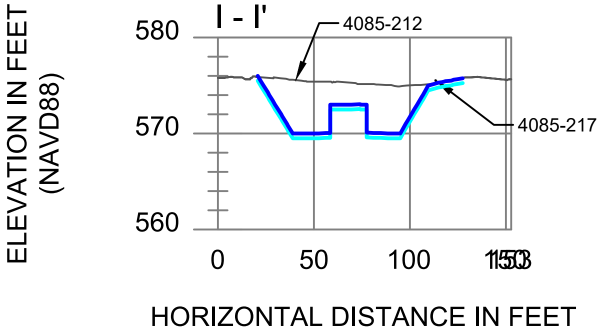
Fox River
LOWER FOX RIVER REMEDIATION LLC

PROPOSED RESIDUAL MANAGEMENT PROFILES FOR DUTIL-049-MC33-1-D46B-DCA85A-D47D-D47B-MC30-3









LEGEND

RD	RESIDUAL DREDGE
RM	RESIDUAL MANAGEMENT (NOT YET DETERMINED)
RSC	RESIDUAL SAND COVER
PD	PRIMARY DREDGE (NOT INCLUDED IN THIS DESIGN)
NA	NO ACTION

DESIGN SURFACE
DESIGN OD SURFACE
EXISTING BATHYMETRY
BUFFER SURFACE

OU# - D# - #
OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT
DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 100')
100 50 0 100 200

SITE NOTES

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DATE: October 24, 2019
LAST REVISED: November 1, 2019
CHECKED BY: REG

Fox River
LOWER FOX RIVER REMEDIATION LLC

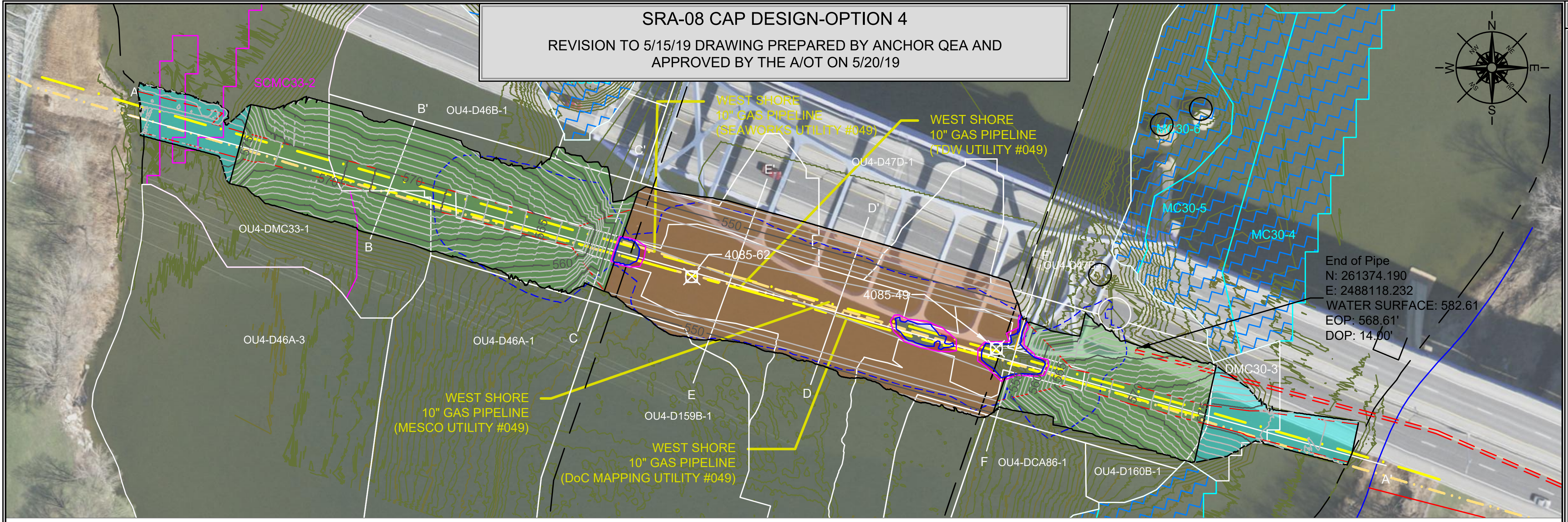
ATTACHMENT C

REVISED

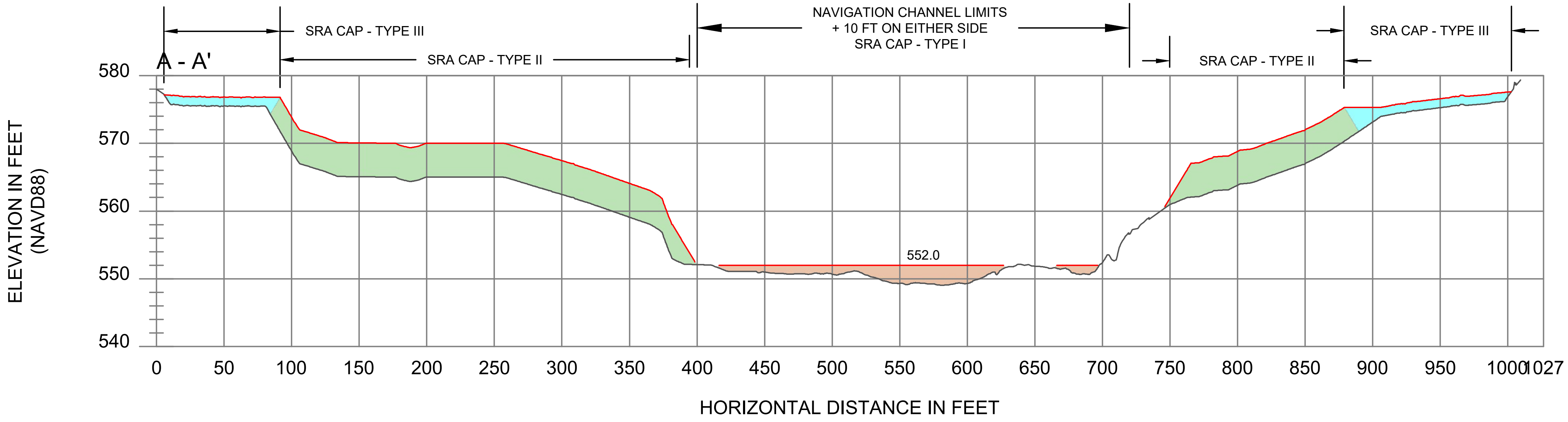
SRA-08 CAP DESIGN PLANS AND SECTIONS

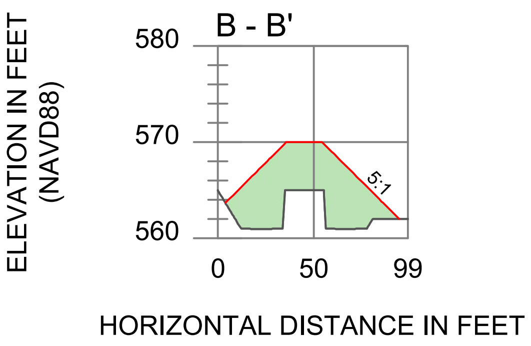
SRA-08 CAP DESIGN-OPTION 4

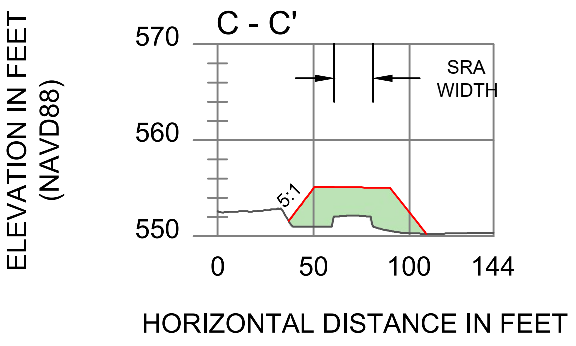
REVISION TO 5/15/19 DRAWING PREPARED BY ANCHOR QEA AND
APPROVED BY THE A/OT ON 5/20/19



End of Pipe
N: 261374.190
E: 2488118.232
WATER SURFACE: 582.61
EOP: 568.61'
DOP: 14.00'







—— 2020 PRE-SEASON COMBINED WITH DREDGE DESIGN
—— SRA-08 TOP OF CAP DESIGN

LEGEND

🟧 SRA CAP - TYPE I (top of cap design elevation at 552.0 with up to 6 inches of over placement allowed to 552.5)
TYPE 1: (CONSISTS OF 6-INCH CARBON AMENDED SAND LAYER THAT WILL BE PLACE BY JF BRENNAN SPREADER AND 3/4-INCH ARMOR THAT WILL BE PLACE MECHANICALLY; TOP OF CAP AT ELEVATION 552.0 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL AND 10 FT. BUFFER)

🟩 SRA CAP - TYPE 2 (5' THICK WITHIN THE SRA WIDTH)
TYPE 2: (CONSISTS OF 6-INCH SAND LAYER AND 3/4 INCH ARMOR THAT WILL BE PLACE MECHANICALLY; 5 FT. THICK AS REQUESTED BY A/OT)

🟦 SRA CAP - TYPE 3 (CAP B2)

🟥 SRA - GAC AMENDED SAND

— — — NAVIGATION CHANNEL LIMITS

—- - —- RETEC/JENKINS BOUNDARY

- - - - - OUTLINE OF OLD SRA CAP LIMITS

- - - - - RESTRICTED SRA AREA
(6" CARBON AMENDED SAND)

⊠ CORE WITH REMAINING CONTAMINATION

☐ 0.5' OR LESS OF CAP MATERIAL

☐ 0.5' to 0.75' OF CAP MATERIAL

OU# - D# - #

OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT

DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 100')

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

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TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: OU4-SRA-08 R11-Option 4-552.0.dwg
DRAWN BY: DAVID.FRISQUE
DATE: May 29, 2020
LAST REVISED: June 5, 2020
CHECKED BY: MT

Fox River
LOWER FOX RIVER
REMEDIATION LLC

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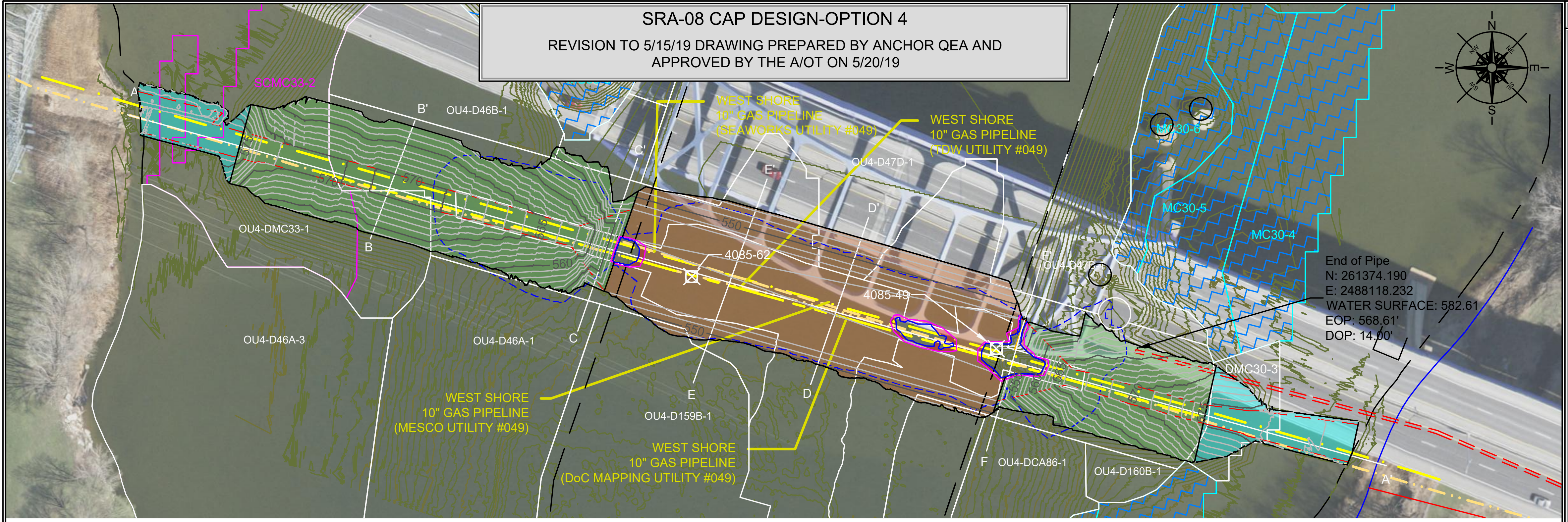
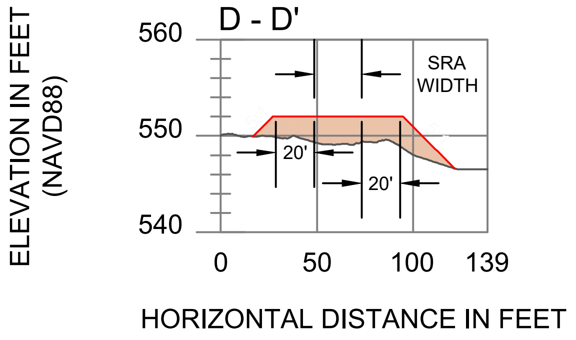
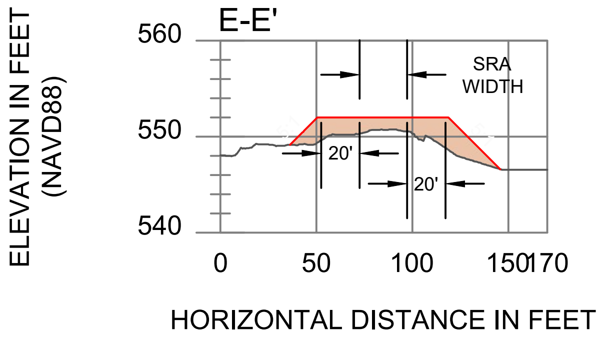
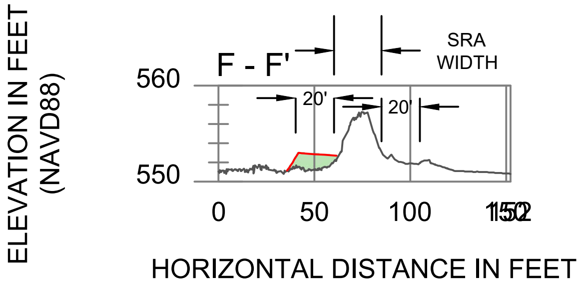
SRA-08 CAP DESIGN-OPTION 4

REVISION TO 5/15/19 DRAWING PREPARED BY ANCHOR QEA AND
APPROVED BY THE A/OT ON 5/20/19









——2020 PRE-SEASON COMBINED WITH DREDGE DESIGN
——SRA-08 TOP OF CAP DESIGN

LEGEND

🟧 SRA CAP - TYPE I (top of cap design elevation at 552.0 with up to 6 inches of over placement allowed to 552.5)
TYPE 1: (CONSISTS OF 6-INCH CARBON AMENDED SAND LAYER THAT WILL BE PLACE BY JF BRENNAN SPREADER AND 3/4-INCH ARMOR THAT WILL BE PLACE MECHANICALLY; TOP OF CAP AT ELEVATION 552.0 INSIDE AUTHORIZED NAVIGATIONAL CHANNEL AND 10 FT. BUFFER)

🟩 SRA CAP - TYPE 2 (5' THICK WITHIN THE SRA WIDTH)
TYPE 2: (CONSISTS OF 6-INCH SAND LAYER AND 3/4 INCH ARMOR THAT WILL BE PLACE MECHANICALLY; 5 FT. THICK AS REQUESTED BY A/OT)

🟦 SRA CAP - TYPE 3 (CAP B2)

🟥 SRA - GAC AMENDED SAND

— — — NAVIGATION CHANNEL LIMITS

—- - —RETEC/JENKINS BOUNDARY

- - - - - - OUTLINE OF OLD SRA CAP LIMITS

- - - - - - RESTRICTED SRA AREA (6" CARBON AMENDED SAND)

⊠ CORE WITH REMAINING CONTAMINATION

▭ 0.5' OR LESS OF CAP MATERIAL

▭ 0.5' to 0.75' OF CAP MATERIAL

OU# - D# - #

OPERABLE UNIT
DREDGE AREA
DREDGE MANAGEMENT UNIT

——— DREDGE MANAGEMENT UNIT (DMU)

SCALE (1" = 100')

100 50 0 100 200

SITE NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

TETRA TECH EC, INC.
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CAD FILE: OU4-SRA-08 R11-Option 4-552.0.dwg
DRAWN BY: DAVID.FRISQUE
DATE: May 29, 2020
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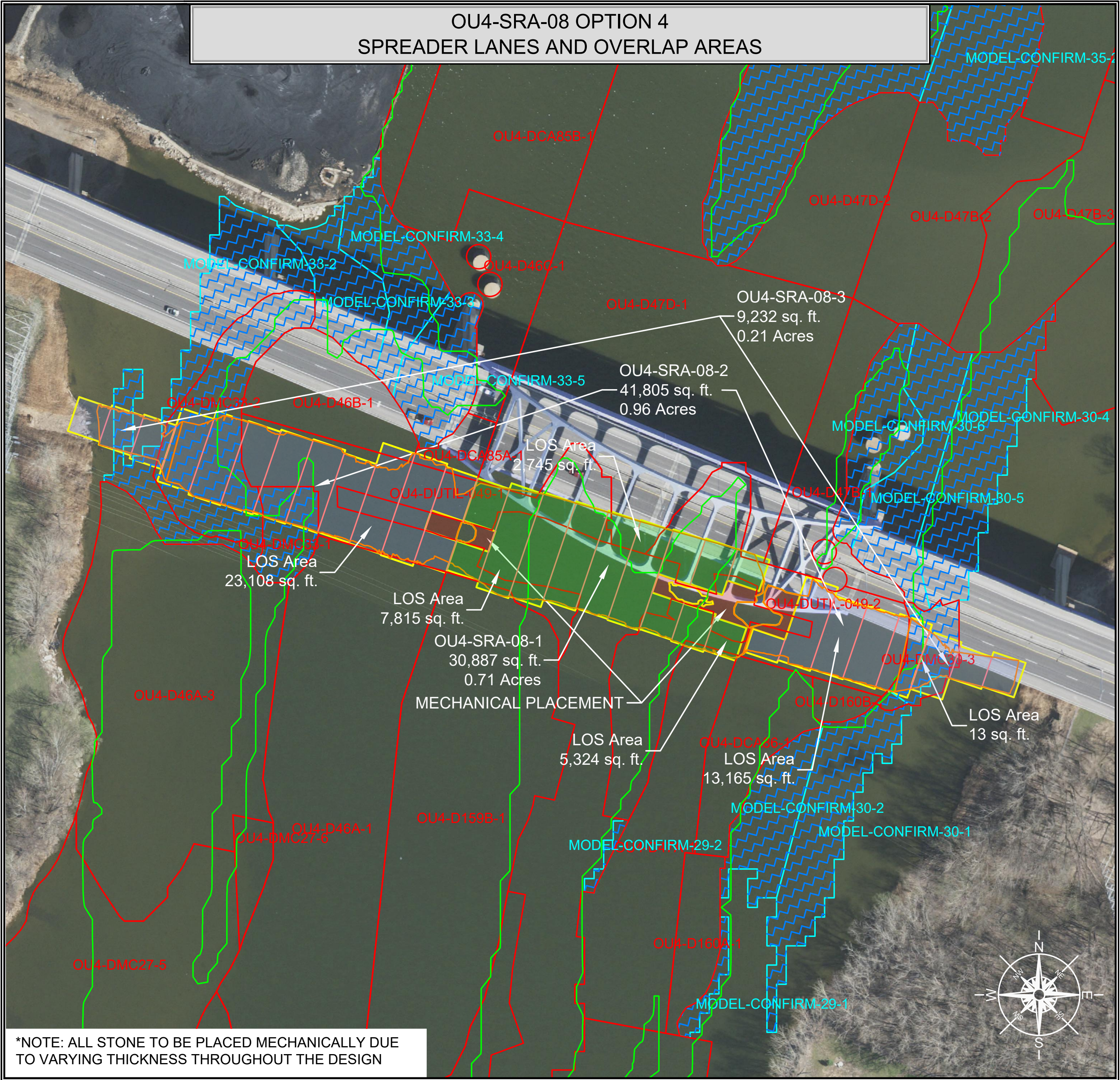
OU4-SRA-08 OPTION 4
SPREADER LANES AND OVERLAP AREAS



*NOTE: ALL STONE TO BE PLACED MECHANICALLY DUE TO VARYING THICKNESS THROUGHOUT THE DESIGN

NOTES

1. HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE)
2. VERTICAL DATUM IS REFERENCED TO NAVD 88

SCALE (1" = 150')

150 75 0 150 300

LEGEND

(YELLOW) 🟦 MANAGEMENT UNIT AND SPREADER AREA PLACED BY THE SPREADER - NO GAC AMENDED SAND

(YELLOW) 🟩 MANAGEMENT UNIT AND SPREADER AREA PLACED BY THE SPREADER - YES GAC AMENDED SAND

(YELLOW) 🟥 MANAGEMENT UNIT AND SPREADER AREA PLACED MECHANICALLY - YES GAC AMENDED SAND

DMU LIMITS

LOS LIMITS

INTERIOR SPREADER LANES

(WHITE) ADJACENT MANAGEMENT UNITS

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: OU4-SRA-08 Spreader Lane Overlaps-Opt 4.
DRAWN BY: RICKY.GIFFORD
DATE: May 28, 2020
LAST REVISED: June 2, 2020
CHECKED BY: MT

Fox River
LOWER FOX RIVER REMEDIATION LLC

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ATTACHMENT D

CORE SUMMARY TABLE FOR AREA AROUND SRA-08

Table D-1

Core ID	4084.5-01	4084.5-02	4084.5-03	4084.5-25	4084.5-11	4084.5-26	4084.5-13	4084.5-27	4084.5-05	4084.5-24	4085-03	4085-49	4085-64	4085-62	4085-01	4085-46	4085-10	4085-63	4085-47	4085-58	4085-48	4085-65	4085-66	4085-11	4085-61	4085-59	4085-60
DE	0.00	0.00	553.90	549.05	0.00	550.30	0.00	550.30	0.00	0.00	567.75	555.57	552.14	551.42	0.00	0.00	554.22	548.30	549.59	0	549.27	550.35	550.4	549.789	0	0	0
LOS	575.77	572.48	554.01	550.43	548.79	551.81	550.35	551.16	549.83	551.34	567.75	550.05	553.34	554.28	567.63	564.27	554.33	552.31	549.84	549.83	549.28	551.66	551.98	553.24	559.37	573.36	573.65
Bathy	575.91	572.44	553.71	550.11	548.44	552.10	549.84	550.77	549.88	551.81	572.51	554.55	553.80	553.61	573.90	566.50	558.38	552.12	553.53	557.41	549.77	552.71	551.97	554.50	559.86	573.66	574.06
EOC	#N/A	#N/A	553.90	549.04	548.64	550.30	#N/A	550.28			568.13	549.84	551.06		567.65	564.65	554.20	548.30	550.05	549.51	549.27	550.35	550.40		559.40		
Refusal	#N/A	#N/A		545.54	547.84		#N/A	546.88	549.00	551.15		548.24	548.26	548.09				546.60	547.05			548.05	547.70		555.40		
Elevation																											
576.5																											
576.0	▨																										
575.5																											
575.0																											
574.5																											**TOC**
574.0															**TOC**											**TOC**	0.187
573.5															0.7											0.083	0.158
573.0											**TOC**				0.51											0.226	0.22
572.5		▨									0.15				15.85											0.166	0.0251
572.0											1.8				16												
571.5											8.1				43												
571.0											30				34												
570.5											30				19												
570.0											13				12												
569.5																											
569.0											4.6																
568.5															2.07												
568.0											11				1.12												
567.5															3.35												
567.0											0.62				0.07												
566.5																**TOC**											
566.0											0.03					13.3											
565.5																											
565.0																20.1											
564.5																2.09											
564.0																0.05											
563.5																0.14											
563.0																0.11											
562.5																0.07											
562.0																0.02											
561.5																											
561.0																											
560.5																									**TOC**		
560.0																									0.19		
559.5																	**TOC**								1.79		
559.0																	0.941								0.698		
558.5			**TOC**							**TOC**							▨								0.791		
558.0			0.616														1.35								0.0252		
557.5																				▨							
557.0			1.18									**TOC**					2.82										
556.5																											
556.0			5.13														5.8										
555.5			8.94									0.66					5.33										
555.0			2.86							1.44		1.06					8.36							**TOC**			
554.5			1.42									1.86												0.73			
554.0			1.01		**TOC**					4.51		2.14	▨				5.47		**TOC**	**TOC**				0.44			
553.5			0.18		1.09							1.79	**TOC**	**TOC**			0.24		1.18								
553.0			0.04		1.26					3.91		1.93	0.787	1.27					1.23	0.573		**TOC**					
552.5					1.18				**TOC**				2.55	2.31				**TOC**	1.15		**TOC**	0.882	**TOC**				
552.0					1.16	▨				4.84			3.08	2.34				1.54	1.04		0.96	0.785	▨				
551.5					2.9	**TOC**				4.31			6.77	2.75				2.05	1.44		1.03	1.07					
551.0					3.1			**TOC**	2.17				5.1	3.8				1.91	1.14		1.28	2.62	2.81				
550.5						1.46		5.27	3.87			3.65	0.0253	6.39				2.46		3.42	1.11	2.6	4.17				
550.0				**TOC**		0.0253	▨	0.0253	2.49			1.73	0.0252	7.05				4.14	15	2.76	1.74	0.0253	0.0251	☰			
549.5						0.0252		0.0253/0.0267				0.02	0.0252	7.87				8.36	0.76	1.8	1.11	0.0255	0.0252/0.0252				
549.0				3.57	10.8	0.025						0.02	0.0253	12.1				9.93		0.503	0.02						
548.5				0.042	2.69	0.0251						0.02		12				7.74		0.762							
548.0				0.0251	0.02	0.025/0.0251								18.9				0.0549		0.868							
547.5				0.0252														0.0254		0.545							
547.0				0.0253																							
546.5																											
546.0																											
545.5																											

Legend

TOC	Top of Core
▨	Approximate elevation of most recent bathymetry. (Either 2017 pre-season or post dredge)
▁	Approximate elevation of neat line. (0.5 LOS Model Surface)
☰	Approximate Design Elevation. (LOS surface unless otherwise noted)
▭	Approximate elevation of contamination.
■	Approximate cap/cover elevation.
57	≥ 50 ppm PCB
NA	Not available.
▁	Approximate elevation of refusal.

Table D-2

Management Area	DUTIL-049-1	DUTIL-049-1	DUTIL-049-1	MC33-1	MC33-1	D46C-1	D47D-1	DUTIL-049-1	DUTIL-049-1	MC33-1	DUTIL-049-1	DUTIL-049-1
Core ID	4085-209	4084.5-237	4085-215	4084.5-227	4085-218	4085-71	4085-74	4084.5-37	4084.5-35	4084.5-36	4085-68	4085-69
Post-Dredge Bathymetry	567.69	553.62	548.05	572.58	570.78	552.64	548.43	553.07	571.42	572.37	559.87	553.44
DOC	0.00	1.50	1.50	0.00	6.50	0.50	0.00	1.00	4.50	0.00	0.00	1.50
EOC	NA	552.12	546.55	NA	564.28	552.14	NA	552.07	566.92	NA	NA	551.94
Residual Design	562.09	550.48	546.55	NA	565.00	550.77	547.45	551.00	564.15	566.75	NA	550.33
Residual Design OD	561.59	549.98	546.05	NA	564.50	550.27	546.95	550.50	563.65	566.25	NA	549.83
Post-Dredge Mudline	567.65	553.71	548.03	572.51	570.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depth Below Post Dredge Mudline	-6.06	-3.73	-1.98	NA	-5.71	550.27	546.95	550.50	563.65	566.25	NA	549.83
Discretes												
A	0.118	3.37	4.8	0.0304	1.39	4.56	0.025	3.5	11.3	0.025	0.498	2.94
B	0.0332	8.13	9.13	0.025	1.42	0.149	0.0251	5.48	32.7	0.0251	0.0679	5.39
C	0.0505	9.19	9.9	0.0251	3.79	0.0249			46	0.0251	0.0252	6.87
D	0.0807	0.0249	0.0407	0.0249	26.4	0.025			17	0.025	0.0252	0.186
E	0.0742	0.0249	0.0251	0.0326	23.5	0.025			30.7	0.0251	0.0251	
F					19.4	0.025			24.2	0.025		
G					10.2				19.6			
H					15.1				14.4			
J					25.6				11.6			
K					14.3							
L					5.38							
Notes					7.01, 2.23, method refusal Method Refusal			Method Refusal	Method Refusal			

Management Area	DCA85A-1	D47D-1	DUTIL-049-1	D47D-1	D46B-1	D46B-1	D47B-1	D47B-1	D47D-1	D47D-1	D47D-1	D47D-1
Core ID	4085-70	4085-72	4085-73	4085-75	4085-219	4085-220	4085-221	4085.5-215	4085-222	4085-223	4085.5-218	4085.5-216
Post-Dredge Bathymetry	552.78	550.15	548.48	549.18	568.39	563.38	557.07	558.00	548.12	549.29	547.38	549.16
DOC	2.00	1.50	0.50	2.00	5.00	1.00	0.00	2.50	0.50	2.00	0.00	0.50
EOC	550.78	548.65	547.98	547.18	563.39	562.38	NA	555.50	547.62	547.29	NA	548.66
Residual Design	550.10	547.47	547.05	546.68	562.82	562.04	NA	553.76	547.14	547.20	NA	547.99
Residual Design OD	549.60	546.97	546.55	546.18	562.32	561.54	NA	553.26	546.64	546.70	NA	547.49
Post-Dredge Mudline	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depth Below Post Dredge Mudline	549.60	546.97	546.55	546.18	562.32	561.54	NA	553.26	546.64	546.70	NA	547.49
Discretes												
A	5.81	6.86	1.23	17.8	8.5	2.26	0.151	2.58	3.55	16	0.0258	1.45
B	5.72	6.25	0.0251	20.4	6.07	2.06	0.0251	2.54	0.0898	23.4	0.0256	0.0251
C	4.53	5.51	0.0324	21.1	8.04	0.0299	0.0252	5.07	0.0251	17.1	0.0252	0.025
D	6.85	0.0251	0.0252	11.1	23.9	0.0251		5.94	0.0252	2.91		0.025
E		0.025	0.0251		18.4			2.48		0.0253		0.025
F					18.7					0.0253		
G					15.9					0.0252		
H					16.7							
J					8.57							
K					1.36							
L												
Notes	Method Refusal			Method Refusal	Method Refusal			Method Refusal				

Prepared By: David Frisque
Reviewed By: Ricky E. Gifford
Last Modified: 10/28/2019

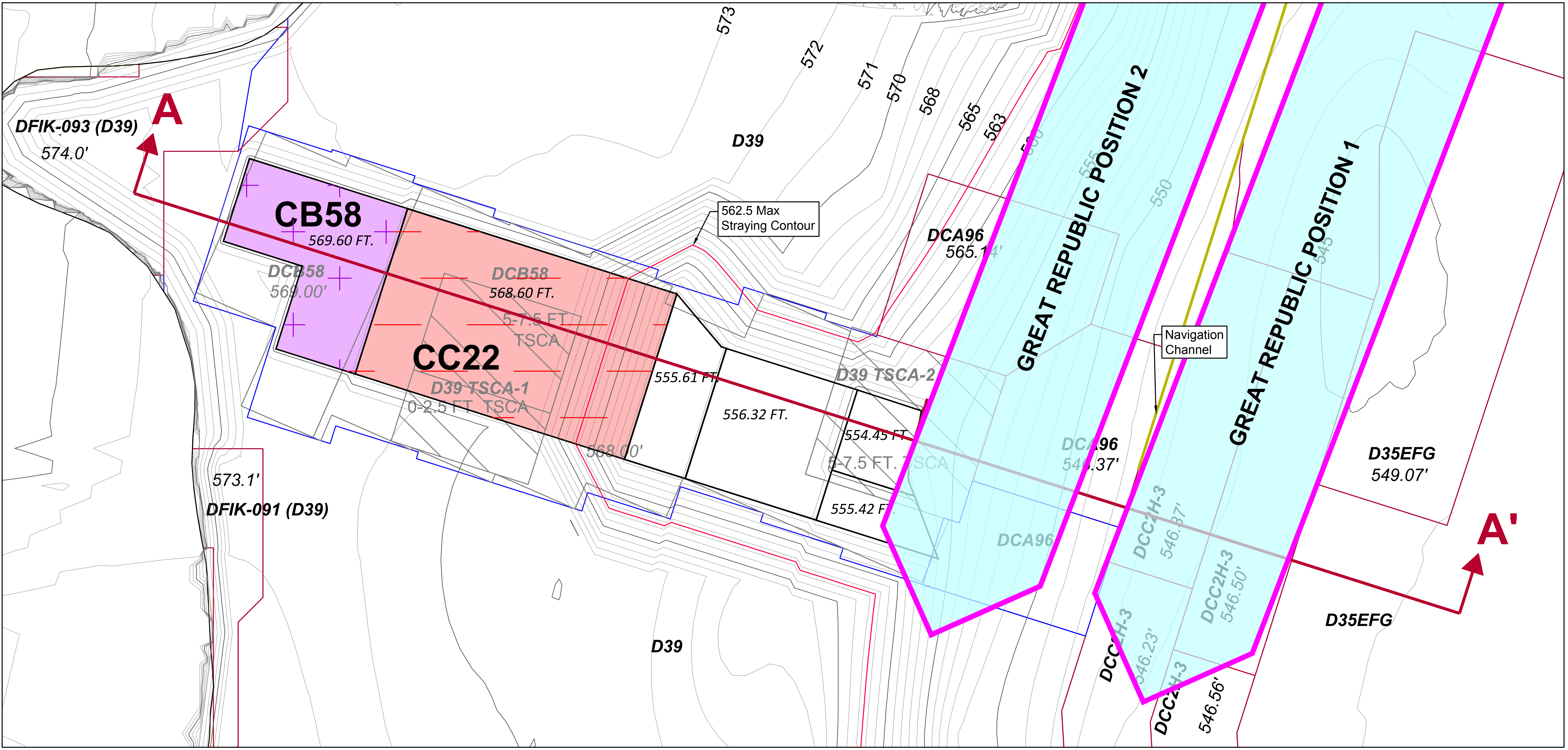
Management Area	D47D-1	DCA85A-1	DCA85A-1	MC30-3	MC30-3
Core ID	4085.5-217	4085-224	4085-225	4085-212	4085-217
Post-Dredge Bathymetry	552.16	557.71	555.20	575.56	575.52
DOC	2.00	4.00	1.50	3.00	0.00
EOC	550.16	553.71	553.70	572.56	NA
Residual Design	549.01	553.00	552.01	570.15	575.43
Residual Design OD	548.51	552.50	551.51	569.65	574.93
Post-Dredge Mudline	0.00	0.00	0.00	0.00	0.00
Depth Below Post Dredge Mudline	548.51	552.50	551.51	569.65	574.93
Discretes					
A	4.53	0.79	9.68	0.454	0.346
B	1.95	1.24	2.61	4.08	0.308
C	5.3	3.72	1.14	10.7	0.415
D	3.88	4.22	0.507	8.71	0.673
E	0.0253	2.2	0.0252	6.37	
F		5.38		2.64	
G		5.48			
H		6.72			
J		0.0588			
K					
L					
Notes					

Management Area	
Core ID	
Post-Dredge Bathymetry	
DOC	
EOC	
Residual Design	
Residual Design OD	
Post-Dredge Mudline	
Depth Below Post Dredge Mudline	
Discretes	
A	
B	
C	
D	
E	
F	
G	
H	
J	
K	
L	
Notes	

Prepared By: David Frisque
Reviewed By: Ricky E. Gifford
Last Modified: 10/28/2019

ATTACHMENT E
PROPWASH ZONE
MAPS

A:\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2016\Design\Caps\CB58\xANC-RAWP-RA-MASTER-03212016_CB58 Design_FIGURE_11292016.dwg Layout1



Nov 29, 2016 2:49pm mcarlino

SOURCE: Depicted bathymetry represents 2016 pre-season conditions. Survey data collected by J.F. Brennan.
HORIZONTAL DATUM: Wisconsin State Plane Central Zone, NAD83, US Feet.
VERTICAL DATUM: NAVD88, Feet.
NOTES:
This drawing is for information only, and should not be used for construction.

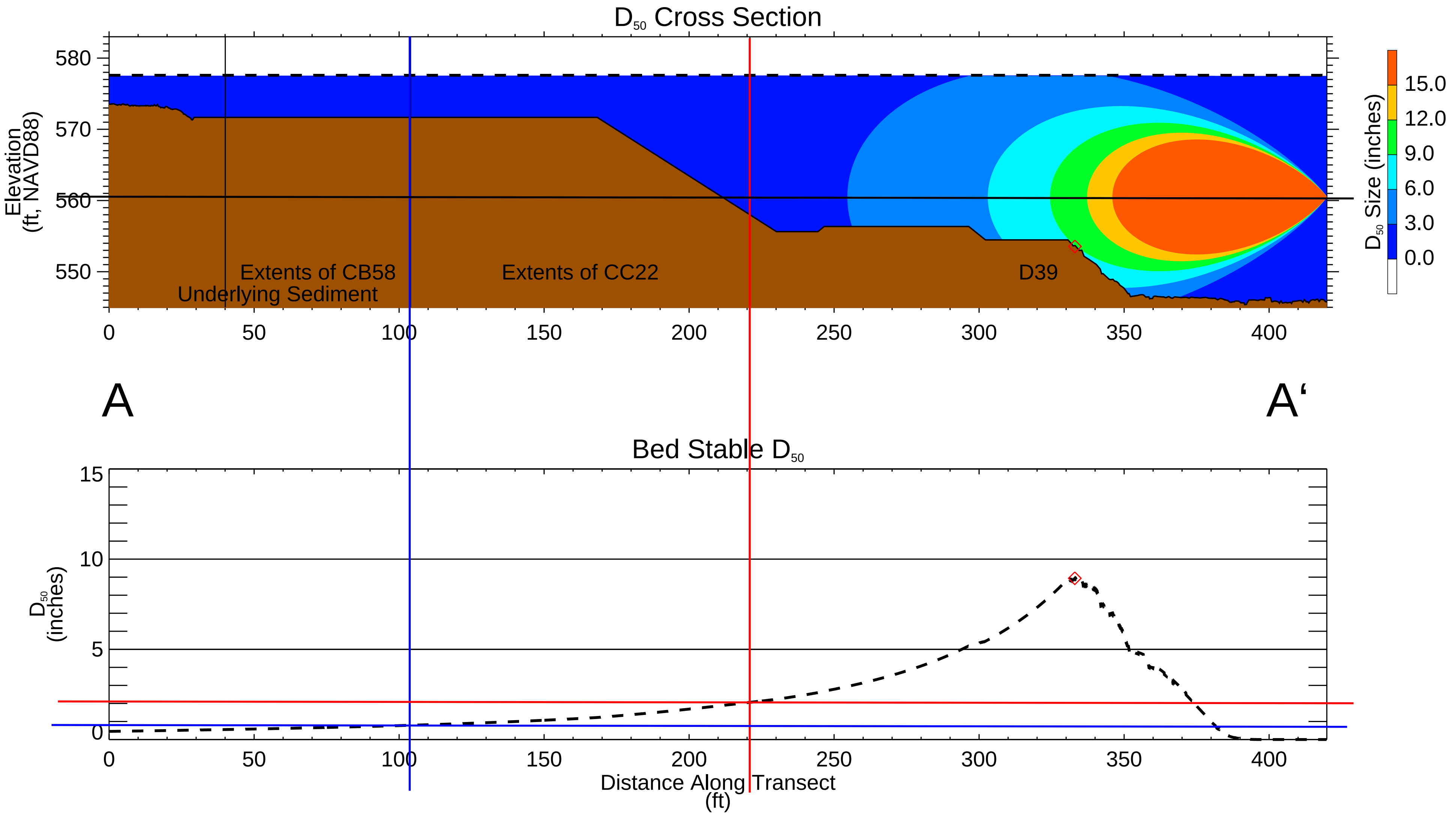
LEGEND:

▨	Proposed Cap B
▨	Proposed Cap C

0 40
Scale in Feet

DRAFT - NOT FOR CONSTRUCTION

Figure 2
Proposed Caps at CB58
Cap Armor Layer Propeller Wash Assessment
Fox River



- - High Water Conditions = 577.6 ft, NAVD88

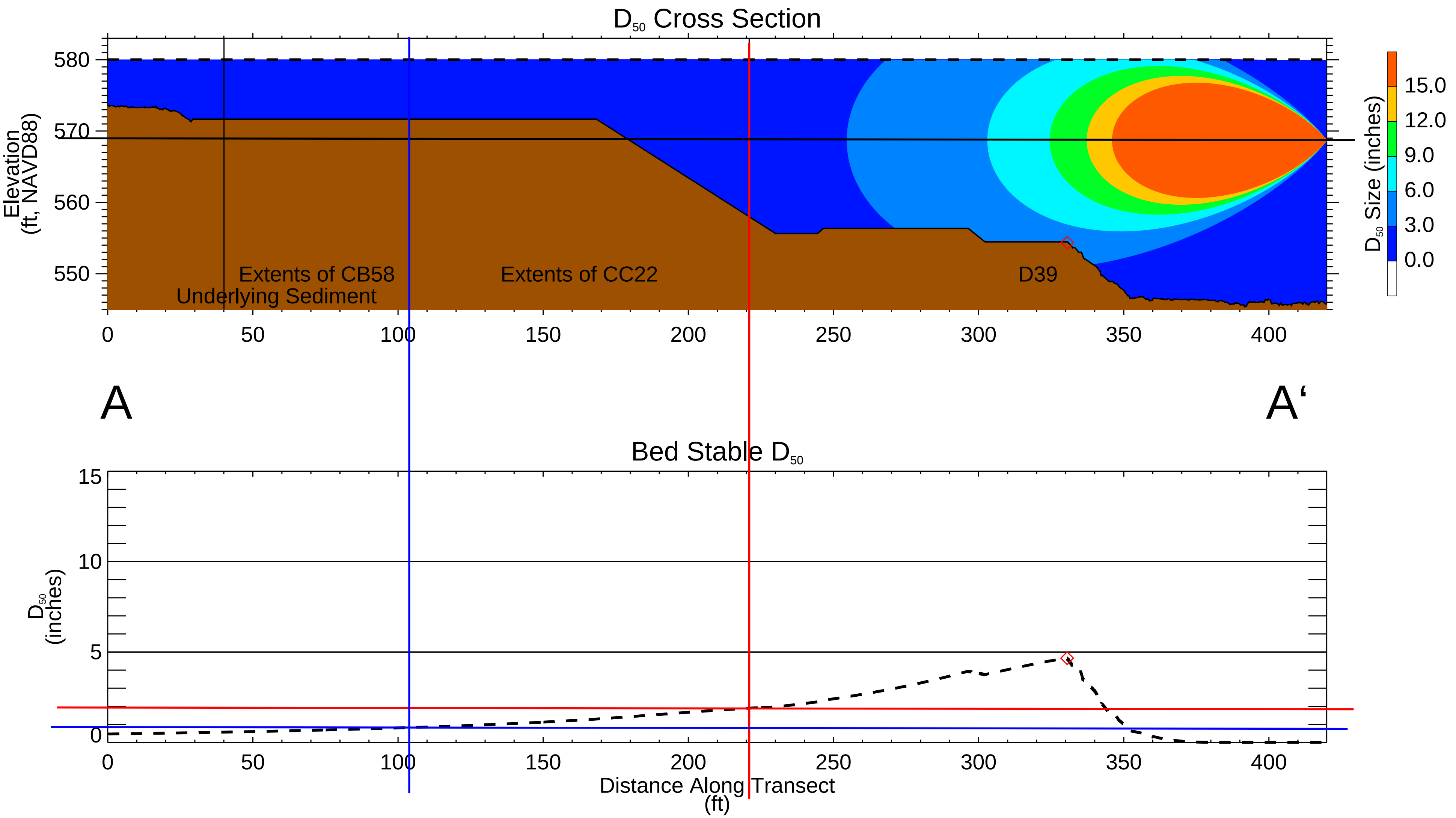
ANCHOR QEA

Figure 3

Propeller Wash D_{50} Field - Great Republic Bow Thruster
Cap Armor Layer Propeller Wash Assessment
Lower Fox River Remediation

Notes: The applied horsepower is 100% at a distance of 0 feet beyond the navigation channel boundary with the keel of the vessel at elevation 554.6 feet NAVD88. Sediment surface shown incorporates post-dredge and post-cap elevations where applicable.

BTR - \\amesbury1\Greenleaf\Projects\Fox_River\Fox River\Capping\Propwash\blaaw_and_kaa_velocity_field_fox_river_3tide_150309.pro Tue Nov 29 12:42:24 2016



– – High Water Conditions = 580.0 ft, NAVD88

ANCHOR QEA

Figure 4

Propeller Wash D_{50} Field - Great Republic Bow Thruster
Cap Armor Layer Propeller Wash Assessment
Lower Fox River Remediation

Notes: The applied horsepower is 100% at a distance of 0 feet beyond the navigation channel boundary with the keel of the vessel at elevation 562.75 feet NAVD88. Sediment surface shown incorporates post-dredge and post-cap elevations where applicable.

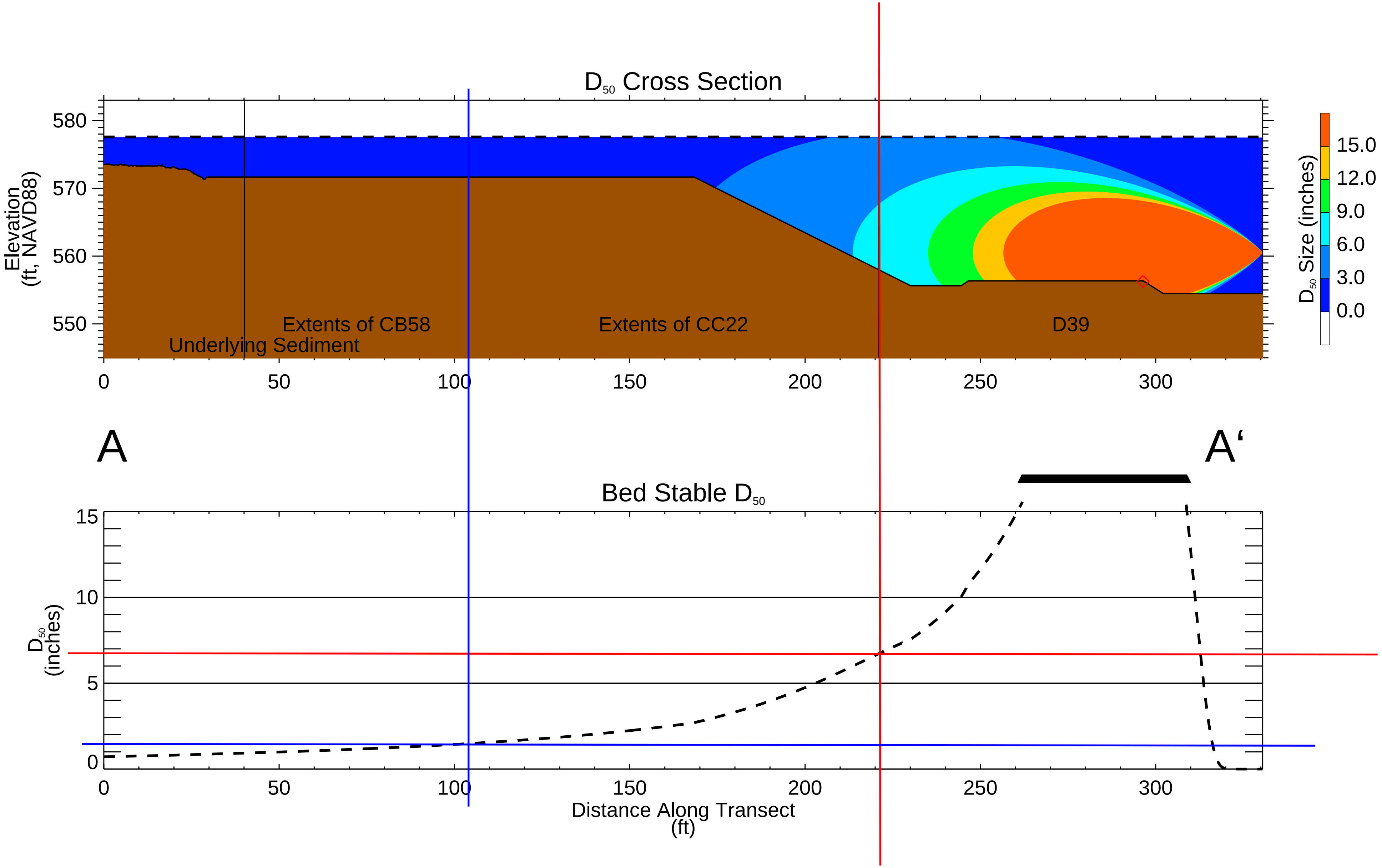


Figure 5

Propeller Wash D_{50} Field - Great Republic Bow Thruster
Cap Armor Layer Propeller Wash Assessment
Lower Fox River Remediation

– –	High Water Conditions = 577.6 ft, NAVD88

Notes: The applied horsepower is 100% at a distance of 89 feet beyond the navigation channel boundary with the keel of the vessel at elevation 554.6 feet NAVD88. Sediment surface shown incorporates post-dredge and post-cap elevations where applicable.

BTR - \\amesbury1\Greenleaf\Projects\Fox_River\Fox River\Capping\Propwash\blaaw_and_kaa_velocity_field_fox_river_3tide_150309.pro Tue Nov 29 12:47:26 2016

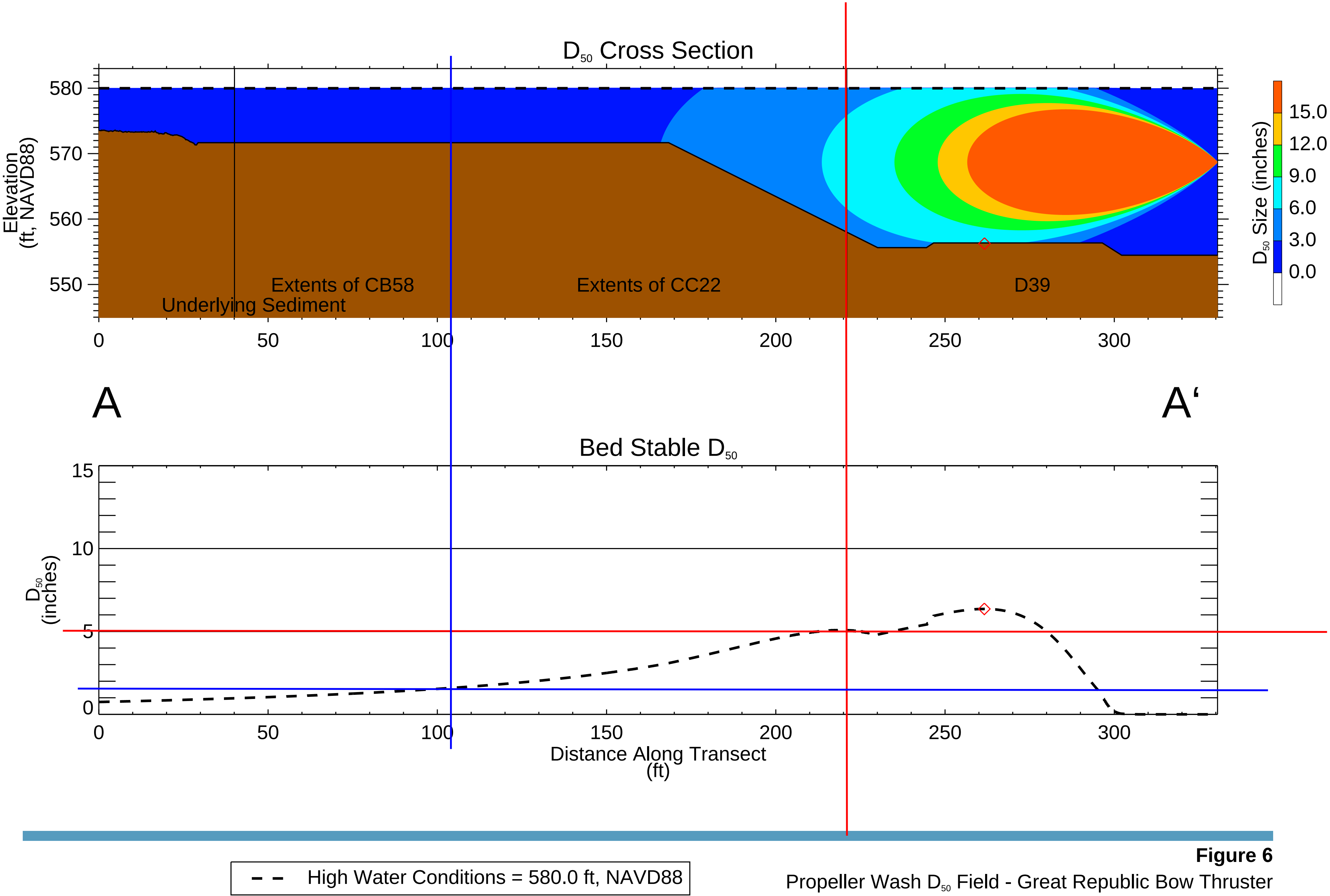


Figure 6

Propeller Wash D_{50} Field - Great Republic Bow Thruster
Cap Armor Layer Propeller Wash Assessment
Lower Fox River Remediation

Notes: The applied horsepower is 100% at a distance of 89 feet beyond the navigation channel boundary with the keel of the vessel at elevation 562.75 feet NAVD88.
Sediment surface shown incorporates post-dredge and post-cap elevations where applicable.

BTR - \\amesbury1\Greenleaf\Projects\Fox_River\Fox River\Capping\Propwash\blaaw_and_kaa_velocity_field_fox_river_3tide_150309.pro Tue Nov 29 12:46:04 2016

ATTACHMENT F

F1

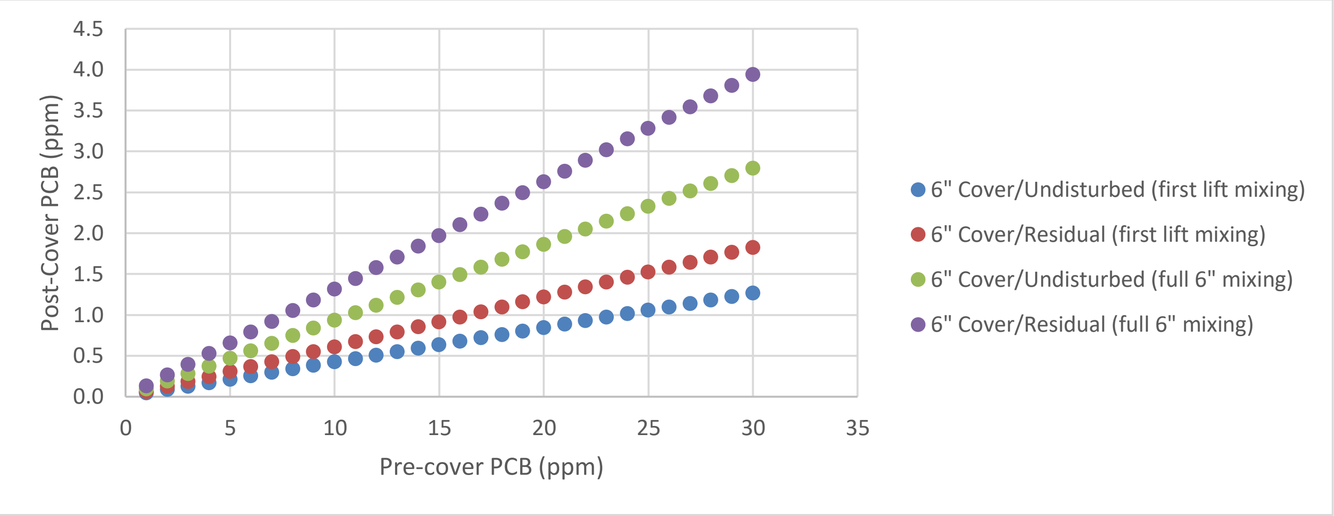
SAND MIXING LAYER CALCULATIONS

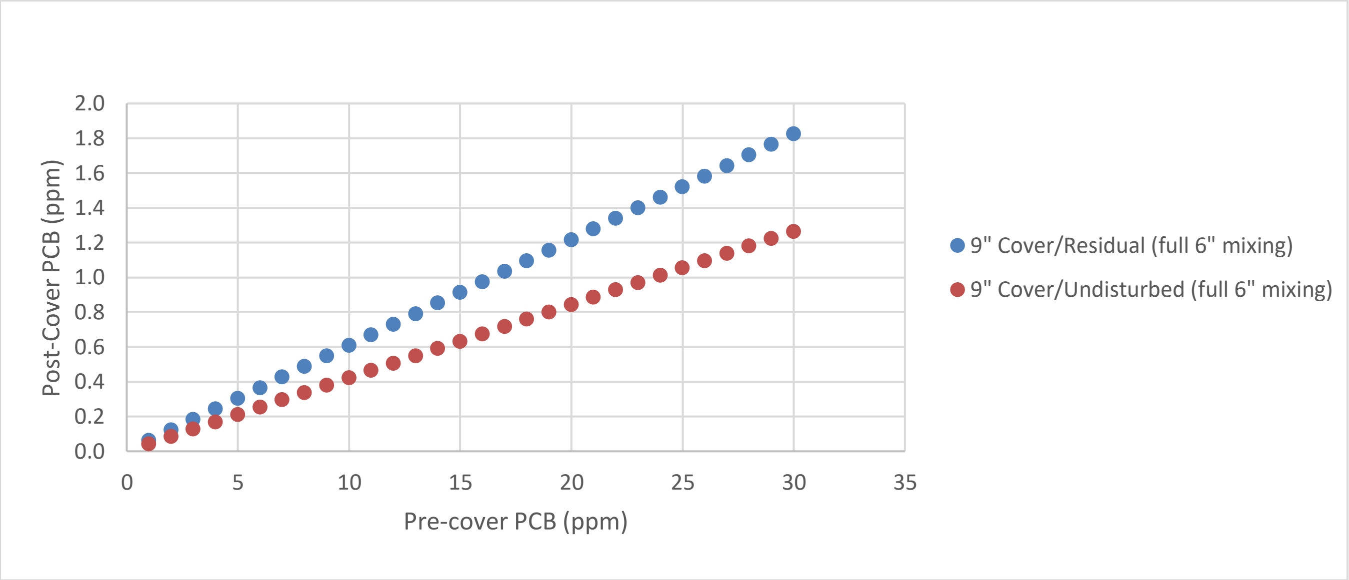
F2

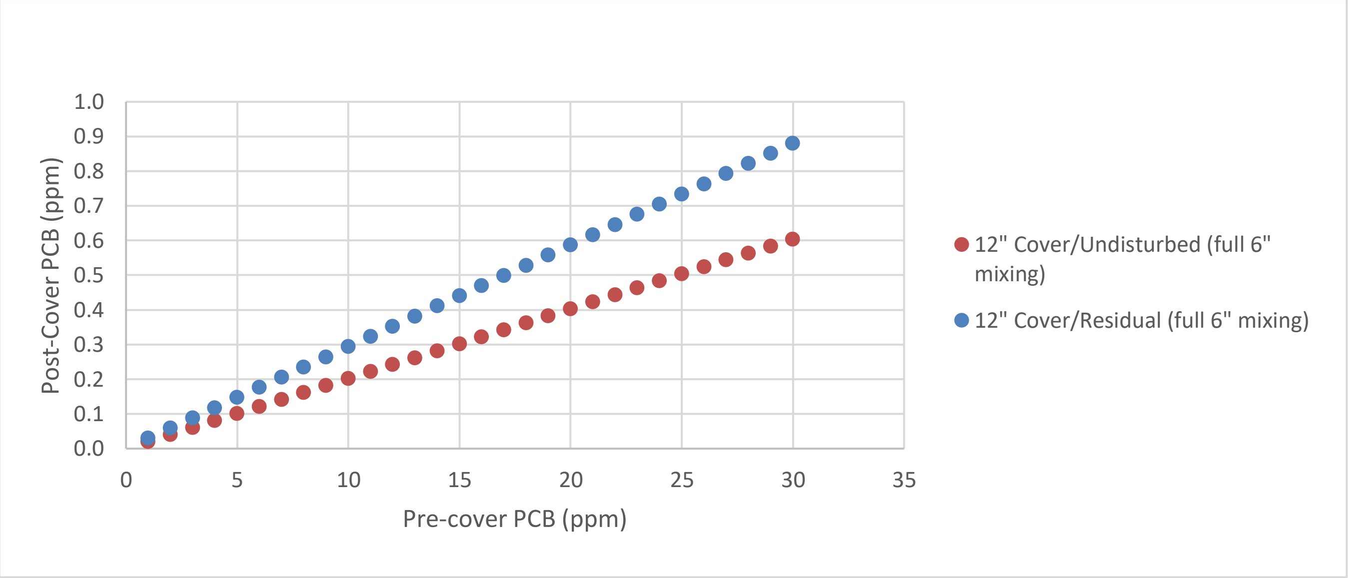
CAP MODELING RESULTS FOR SAND WITH GAC

Sand Dry Den (kg/m^3)	Undisturbed Dry Den (kg/m^3)	Residual Dry Den (measured; kg/m^3)	Lift Thickness	Sand PCB conc	Compliance Depth (inches)
1500	462	680	3	0	4

	First Lift Mixing Only		Full 6" mixing		Full 6" mixing		Full 6" mixing	
PCB Conc	6" Cover/Undisturbed (first lift mixing) Post-cover PCB (mg/kg)	6" Cover/Residual (first lift mixing) Post-cover PCB (mg/kg)	6" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	6" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)	9" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	9" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)	12" Cover/Undisturbed (full 6" mixing) Post-cover PCB (mg/kg)	12" Cover/Residual (full 6" mixing) Post-cover PCB (mg/kg)
1	0.042	0.061	0.093	0.131	0.042	0.061	0.020	0.029
2	0.084	0.122	0.186	0.263	0.084	0.122	0.040	0.059
3	0.126	0.182	0.279	0.394	0.126	0.182	0.060	0.088
4	0.169	0.243	0.372	0.525	0.169	0.243	0.080	0.117
5	0.211	0.304	0.466	0.656	0.211	0.304	0.101	0.147
6	0.253	0.365	0.559	0.788	0.253	0.365	0.121	0.176
7	0.295	0.426	0.652	0.919	0.295	0.426	0.141	0.205
8	0.337	0.487	0.745	1.050	0.337	0.487	0.161	0.235
9	0.379	0.547	0.838	1.181	0.379	0.547	0.181	0.264
10	0.421	0.608	**0.931**	1.313	0.421	0.608	0.201	0.293
11	0.464	0.669	**1.024**	1.444	0.464	0.669	0.221	0.323
12	0.506	0.730	1.117	1.575	0.506	0.730	0.241	0.352
13	0.548	0.791	1.210	1.707	0.548	0.791	0.262	0.381
14	0.590	0.852	1.304	1.838	0.590	0.852	0.282	0.411
15	0.632	0.912	1.397	1.969	0.632	0.912	0.302	0.440
16	0.674	0.973	1.490	2.100	0.674	0.973	0.322	0.469
17	0.716	1.034	1.583	2.232	0.716	1.034	0.342	0.499
18	0.759	1.095	1.676	2.363	0.759	1.095	0.362	0.528
19	0.801	1.156	1.769	2.494	0.801	1.156	0.382	0.557
20	0.843	1.216	1.862	2.625	0.843	1.216	0.402	0.587
21	0.885	1.277	1.955	2.757	0.885	1.277	0.423	0.616
22	0.927	1.338	2.048	2.888	0.927	1.338	0.443	0.645
23	0.969	1.399	2.141	3.019	**0.969**	1.399	0.463	0.675
24	1.011	1.460	2.235	3.151	**1.011**	1.460	0.483	0.704
25	1.054	1.521	2.328	3.282	1.054	1.521	0.503	0.733
26	1.096	1.581	2.421	3.413	1.096	1.581	0.523	0.763
27	1.138	1.642	2.514	3.544	1.138	1.642	0.543	0.792
28	1.180	1.703	2.607	3.676	1.180	1.703	0.563	0.821
29	1.222	1.764	2.700	3.807	1.222	1.764	0.583	0.851
30	1.264	1.825	2.793	3.938	1.264	1.825	0.604	0.880
31	1.307	1.886	2.886	4.069	1.307	1.886	0.624	0.909
32	1.349	1.946	2.979	4.201	1.349	1.946	0.644	0.939
33	1.391	2.007	3.073	4.332	1.391	2.007	0.664	0.968
34	1.433	2.068	3.166	4.463	1.433	2.068	0.684	0.997
35	1.475	2.129	3.259	4.595	1.475	2.129	0.704	1.027
36	1.517	2.190	3.352	4.726	1.517	2.190	0.724	1.056
37	1.559	2.250	3.445	4.857	1.559	2.250	0.744	1.085
38	1.602	2.311	3.538	4.988	1.602	2.311	0.765	1.115
39	1.644	2.372	3.631	5.120	1.644	2.372	0.785	1.144
40	1.686	2.433	3.724	5.251	1.686	2.433	0.805	1.173
41	1.728	2.494	3.817	5.382	1.728	2.494	0.825	1.203
42	1.770	2.555	3.911	5.514	1.770	2.555	0.845	1.232
43	1.812	2.615	4.004	5.645	1.812	2.615	0.865	1.261
44	1.854	2.676	4.097	5.776	1.854	2.676	0.885	1.291
45	1.897	2.737	4.190	5.907	1.897	2.737	0.905	1.320
46	1.939	2.798	4.283	6.039	1.939	2.798	0.926	1.349
47	1.981	2.859	4.376	6.170	1.981	2.859	0.946	1.379
48	2.023	2.919	4.469	6.301	2.023	2.919	0.966	1.408
49	2.065	2.980	4.562	6.432	2.065	2.980	**0.986**	1.437
50	2.107	3.041	4.655	6.564	2.107	3.041	**1.006**	1.467







Prepared by: Matt Smith

Checked by: Paul LaRosa
Last Updated: 7-Mar-16

Sand Dry Den (kg/m^3)	Undistrubed Dry Den (kg/m^3)	Residual Dry Den (measured; kg/m^3)	CST Residual Dry Den (kg/m^3)	Lift Thickness	Compliance Depth (inches)
1500	462	680	300	3	4

PCB Criteria (ppm)

1

Assumes full 6" mixing each lift (conservative)

Undistrubed sediment

Cover Thick	# Lifts	Sed Comp	Cover Comp	**Initial PCB (mg/kg)**
6	2	0.25	0.75	10.74
9	3	0.125	0.875	23.73
12	4	0.0625	0.9375	49.70

(3" clean sand mix with 3" sediment 1st lift, 3" clean sand with 3" 50/50 sediment/sand 2nd lift, etc)

Dredge residuals (measured dry density)

Cover Thick	# Lifts	Sed Comp	Cover Comp	**Initial PCB (mg/kg)**
6	2	0.25	0.75	7.62
9	3	0.125	0.875	16.44
12	4	0.0625	0.9375	34.09

Dredge residuals (dry density from column settling tests)

Cover Thick	# Lifts	Sed Comp	Cover Comp	**Initial PCB (mg/kg)**
6	2	0.25	0.75	16.00
9	3	0.125	0.875	36.00
12	4	0.0625	0.9375	76.00

Notes:

Sed Comp = contributing proportion of initial underlying sediment properties to final top 6" of placed/mixed material properties

Cover Comp = contributing proportion of sand cap properties to final top 6" placed/mixed material properties

Assumes first 3" lift mixes completely, no mixing after

Native sediment

Cover Thick	# Lifts	Sed Thick	Cover Thick	Initial PCB
6	2	0.5	3.5	23.73
9	3			Top 4" is 100% clean sand
12	4			Top 4" is 100% clean sand

(3" clean sand mix with 3" sediment 1st lift, 3" clean sand 2nd lift does not mix; evaluate 4" = 3" clean sand+1" 50/50 sand/sed

Dredge residuals (measured dry density)

Cover Thick	# Lifts	Sed Thick	Cover Thick	Initial PCB
6	2	0.5	3.5	16.44
9	3			Top 4" is 100% clean sand
12	4			Top 4" is 100% clean sand

Dredge residuals (dry density from column settling tests)

Cover Thick	# Lifts	Sed Thick	Cover Thick	Initial PCB
6	2	0.5	3.5	36.00
9	3			Top 4" is 100% clean sand
12	4			Top 4" is 100% clean sand

ATTACHMENT G

STANDARD OPERATING PROCEDURE FOR GRANULAR ACTIVATED CARBON SAMPLE COLLECTION AND TESTING

STANDARD OPERATING PROCEDURE
GRANULAR ACTIVATED CARBON (GAC)
SAMPLE COLLECTION AND TESTING

LOWER FOX RIVER
GREEN BAY, WI

Prepared by:
Tetra Tech EC, Inc.

Prepared for:
Tetra Tech EC, Inc.
Lower Fox River Remediation Project

Document Control Number: LFRR-18-0298

December 31, 2018

Prepared/Revised By	Reviewed By	Date
Paul Spillers	Bjorn Lysne	
	Brandon Weston	

ACRONYM LIST

AET	American Engineering Testing, Inc.
ASTM	ASTM International
C	Celsius
GAC	Granular Activated Carbon
GPS	Global Positioning System
PPE	Personal Protective Equipment
RTK	Real Time Kinematic
SHSP	Site Health and Safety Plan
SOP	Standard Operating Procedure
SRA	Special Remediation Area

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the collection of samples of the granular activated carbon (GAC)-amended sand layer from special remediation area (SRA) caps and the testing of these samples for percent GAC by dry weight. The purpose of this SOP is to describe the sampling and testing methods to be used to determine the amount of GAC within the carbon-amended sand layer. Measurement of the sand layer thickness is not a part of this SOP. Layer thickness evaluations will be conducted by bathymetric survey, using evaluation methods employed for sand cover or cap layers without GAC.

This SOP is applicable for SRA caps over utilities or in other caps or covers on the Lower Fox River project requiring GAC amendments. Pre-placement (ex-situ) and post-placement (in-situ) amended sand in the SRA caps will be tested for GAC content. Pre-placement samples will be collected in substantial conformance with ASTM International (ASTM) Standard Method D75-14: Standard Practice for Sampling Aggregates. Post-placement samples will be collected from catch pans as described herein. GAC content measured as a percent of dry weight of sample will be determined using a thermal drying method.

2.0 EQUIPMENT AND SUPPLIES

This section contains a list of equipment that may be used to complete the procedures in this SOP, including the following:

- Vessel (sampling platform) that complies with State of Wisconsin and U.S. Coast Guard regulations with a minimum of 3 anchors or two anchoring spuds
- Real Time Kinematic (RTK) Global Positioning System (GPS) with horizontal accuracy of ± 1 meter
- Catch pans for sample collection (including retrieval system and buoys)
- 5-gallon buckets with lids
- Permanent marker
- Steel ruler to record or other measurement device to determine the sand thickness in catch pans
- Oven with capability to reach a temperature of 620º Celsius (C)
- No. 10 sieve (Actual size of sieves will depend on the gradation of the GAC)
- No. 50 sieve
- Duct tape
- Chain-of-custody forms
- Field notebook
- Appropriate personal protective equipment (PPE) in accordance with the site health and safety plan (SHSP)

3.0 PRE-PLACEMENT SAMPLE COLLECTION PROCEDURES

Samples of the sand only and sand/GAC mixture will be collected from the J.F. Brennan land plant using a modified version of ASTM Standard Method D75-14: Standard Practice for Sampling Aggregates as described below:

1) Sand only and GAC-amended sand samples will be collected in clean 5-gallon buckets using procedures described in ASTM D75-14-Standard Practice for Sampling Aggregates. At least 20 pounds of sand and GAC amended sand will be collected for each sample tested. The GAC amended sand sample will be collected from the conveyor. Sand-only samples will be collected from the active face of the loadout stockpile and tested to determine the quantity of naturally occurring organics (carbon) in the sand. The following procedure will be used to collect the conveyor belt sample:
    a. Obtain at least three approximately equal sample aliquots, selected at random, from the conveyor belt using an appropriately sized container, per ASTM D75-14. Samples can also be collected from the production stream, if accessible.
2) Label the buckets with a unique sample identification. Record the date and time of sample. Record the sample collection in a field notebook or similar. Document the sample on a chain-of-custody

form. The sample bucket and accompanying chain-of-custody form will be delivered to American Engineering Testing, Inc. (AET) in Green Bay, Wisconsin.

4.0 POST-PLACEMENT SAMPLE COLLECTION PROCEDURES

Post-placement samples will be collected in catch pans. A total of four catch pans will be placed to evaluate the variability of GAC content across each SRA cap. The samples will be collected in catch pans, using the following procedures:

1) Catch pans shall be constructed of 0.5-inch thick transparent acrylic plastic with the following internal dimensions: 24 inches square by 18 inches high.
2) Catch pans will be placed in the river at A/OT-approved sample locations prior to placement of GAC-amended sand. The coordinates for each pan location will be recorded when placed. If the catch pans are placed on a slope, the appropriate stabilizing subframe shall be used.
3) Following placement of the GAC-amended sand layer, the vessel will retrieve each pan from the bottom of the river using the cable float and hook method (similar to armor stone bucket retrieval).
4) Sand thickness will be measured in each catch pan by taking an average thickness to the nearest 0.1 foot from two measurements from each side of the pan (i.e. an average of 8 individual measurements per pan).
5) Photographs will be taken from the top and 4 sides of the catch pan. Each photograph will be labeled appropriately in the field.
6) Transport the catch pans to the processing area.
7) Place each sample in a clean 5-gallon bucket. Provide a unique sample ID for each sample.
8) Record sample collection notes in field log book and record laboratory samples on a chain-of-custody form.

Field notes will be stored in a log book or worksheet. The documentation will include the following:

- Sample identification
- Sample location GPS coordinates
- Date of sample collection
- Names of field personnel collecting and handling the samples
- Names of oversight personnel
- Observations to include, but not be limited to, weather conditions, unusual circumstances, or deviations to sampling method
- Thickness measurements of sample in catch pan
- Note whether GAC was observed in the sample
- Date sample shipped to laboratory

5.0 TESTING FOR GAC CONTENT BY PERCENT DRY WEIGHT

Thermal testing will be conducted using criteria specified in ASTM D2974: Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils by Method A for moisture content (or ASTM D2166 Standard Test Methods for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass. The sample procedure is described below:

1) Use a riffle splitter to reduce the sample size to approximately 5 pounds. Weigh the sample.
2) Dry the sample in an oven heated to 110º C.
3) Record the weight of the dried sample.
4) Process the oven-dry sample through a U.S. Standard No. 10 sieve and a U.S. Standard No. 50 sieve. Sieve sizes may be adjusted, depending on the grain size of sand and GAC used.
5) Weigh the portion of the sample passing the No. 10 sieve and retained on the No. 50 sieve. Place this portion in an oven heated to 440º C (ASTM D2974 Method C) to burn off naturally occurring organics typically found in the sand aggregate. The sample shall remain in the oven for a minimum of

three hours. NOTE: If the sample is a sand only sample, the test will be complete, and the percent of natural organics can be determined for the sand source.

6) Weigh the sample again. The difference in mass between the pre-oven (step 5) and post-oven sample (step 6) will be reported as the dry weight of naturally occurring organics. The weight from this step will include a correction factor for natural organics that will remain after this step, based on the testing of control (i.e., sand only) samples.
7) Place the sample in an oven at 620º C to burn off GAC. The sample should remain heated for a minimum of three hours or until GAC is no longer visible in the sample.
8) Weigh the sample again. The difference in mass between the mass in step 6 and this step (step 8) will be the mass of GAC. Determine the GAC content on a percent by weight basis, based on the mass relationships using dry weight results of the total sample (measured in step 3) from the sample masses prior to and after heating to each temperature, while factoring in inherent background organics and ash correlation, to be developed during ongoing control sample testing.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Entries in the field forms will be double-checked by the field team staff to verify that the information is correct. It is the responsibility of the Field Lead to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

The thickness of the sand in the catch pans will be monitored to verify the thickness is within 10% of the planned sand layer thickness.

Four discrete samples will be collected from each SRA cap. When the GAC proportions have been determined from the four samples, the average GAC percentage in the SRA cap will be determined using a mathematical average of the GAC content from the individual samples. The GAC percentage based on the mathematical average of the individual samples will be used to report a single GAC content for each SRA cap.

7.0 REFERENCES

ASTM International (ASTM). 2014. *ASTM D75-14-Standard Practice for Sampling Aggregates.*

ASTM. 2014. *ASTM D2974-14-Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils by Method A for moisture content (or ASTM D2166 Standard Test Methods for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass)*

ATTACHMENT H

Email Documentation from the USACE
H1-H-3
West Shore Pipeline Study Results H-4
US Venture Pipeline Ownership Telecom record H-5
US Venture Inc, Agreement Letter H-6
A/OT Email 16 June 2020 H-7

Attachment H-1

Tabatabai, Morey

From: Imbrunone, Jonathon T CIV USARMY CELRE (US) <JONATHON.T.IMBRUNONE@usace.army.mil>
Sent: Wednesday, March 14, 2018 6:14 AM
To: Spillers, Paul
Cc: 'Bryan Heath'; Jeffrey Lawson; Susan O'Connell (SOConnell@project-control.com); Gawronski, Troy A; Coleman, Bill; Willant, George; Blackmar, Terri; Tabatabai, Morey; ECI.LFRR Project Correspondence; Boreen, Lee; Wright, David L CIV USARMY CELRE (US); Hachey, Joshua J CIV USARMY CELRE (US)
Subject: Re: [Non-DoD Source] LFRR-18-0067 Request for information for aggregate sizes on utility caps

Paul, sorry about the delay getting back to the group. I have had a chance to speak with USACE Operations and with the Port of Brown County. The response is virtually what was discussed in the teleconference from 28 Feb 2018.

For Depth of cap:
We ask that you stay at least 2 feet below the authorized depth of the Federal navigation channel and associated sideslopes assuming at least a 2 foot horizontal to 1 foot vertical slope from the bottom elevation of the navigation channel. Typically we currently ask for at least 3 feet of clearance, but the group has been coordinating these efforts prior to the current conceptualization of 3 feet of clearance. Though it is important to note, that it is likely that a cap in proximity to the Navigation channel will be disturbed in the future.

For stone sizing:
There is no clear definitive guidance. In a general sense, stone placed near the navigation channel has two primary possible effects that are concerning if displaced due to vessel prop effects, maintenance dredging activity or high flow events. Potential strikes (safety) and impacts on dredging activities if cap material ends up in our dredging prism. In terms of strikes, obviously the smaller the grain size of granular material the better. In terms of dredging impacts, sand and smaller stone is more easily disturbed by dredging activities. Hopefully you can design a size of granular material that offers scour protection from prop wash, minimizes safety concerns, and minimizes impacts to future dredging actions.

Port Opinion and Channel Users:
The opinion received is also generally what was discussed at the 28 Feb meeting. It is the preference of the Port and Users alike that caps be avoided where possible. The presence of caps complicates any consideration of deepening the channel, dredging deeper during extreme low water, vessel designs having deeper draft in the future, and probable disturbance of the cap by prop wash or dredging activities.

Thank You,

Jon Imbrunone
Operations Project Manager
US Army Corps of Engineers, Detroit District
477 Michigan Avenue, 7th Floor
Detroit, MI 48226
Office: 313-226-2156
Cell: 313-268-3269
email: jon.t.imbrunone@usace.army.mil

From: "Spillers, Paul" <Paul.Spillers@tetratech.com>
Sent: Tuesday, March 13, 2018 8:24 AM
To: "Imbrunone, Jonathon T CIV USARMY CELRE (US)" <JONATHON.T.IMBRUNONE@usace.army.mil>
CC: 'Bryan Heath' <bryan.heath@ncr.com>,Jeffrey Lawson <jlawson@project-control.com>,"Susan O'Connell

(SOConnell@project-control.com)" <SOConnell@project-control.com>,"Gawronski, Troy A" <Troy.Gawronski@Foth.com>,"Coleman, Bill" <Bill.Coleman@tetratech.com>,"Willant, George" <George.Willant@tetratech.com>,"Blackmar, Terri" <Terri.Blackmar@tetratech.com>,"Tabatabai, Morey" <Morey.Tabatabai@tetratech.com>,"ECI.LFRR Project Correspondence" <ECI.LFRRPC@tetratech.com>,"Boreen, Lee" <Lee.Boreen@tetratech.com>
Subject: [Non-DoD Source] LFRR-18-0067 Request for information for aggregate sizes on utility caps

Hello Jon,
Our dredge and cap designs are proceeding for utilities crossing the Fox River navigation channel, as discussed in the February 28 meeting. I was following up to see if you received any information from the Port or operators on preferences for stone sizes on utility caps?
Thank you, Paul

Paul Spillers, P.G. | **Special Projects Coordinator**
Fox River Project
Phone 920.445.0720, ext. 216 Cell 208.871.2191
paul.spillers@tetratech.com
Tetra Tech | Complex World, CLEAR SOLUTIONS™
Green Bay, Wisconsin | Blockedwww.tetratech.com

Attachment H-2

George Berken

From: Zuercher, Jeffrey K CIV USARMY CELRC (USA) <Jeffrey.K.Zuercher@usace.army.mil>
Sent: Thursday, May 21, 2020 6:20 PM
To: beth.olson@wisconsin.gov; George Berken; Gary Kincaid; Jim Killian; Jim Saric
Cc: Kroll, Timothy J CIV USARMY CELRC (USA); Fischer, Steven A CIV USARMY CELRC (USA); Kirksey-Harris, Felicia Y CIV USARMY CELRC (USA); Stanick, Robert L CIV USARMY CELRC (USA)
Subject: Fox River SRA-03, SRA-05, SRA-07 and SRA-08 (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

All,

USACE Chicago District would like to propose the following as a solution to the issue regarding space between the constructed/proposed caps over utility crossings within the Green Bay/Fox River authorized navigation project.

1. SRA-03 can remain as constructed.
2. SRA-05 and SRA-07 we would like to request that the 539 Cu. Yds. of material that currently reside in the 1' of overdepth (552.6' NAVD88 to 553.6' NAVD**) be removed to the extent possible.
3. Agree that the construction of a cap in SRA-08 to 552.6' NAVD88 should be allowed to provide the maximum amount of cover for contaminated material possible.

All of these options are contingent upon USEPA and WDNR providing necessary language that will allow USACE to have future dredge events that could utilize the allowable 2.0' of overdepth that is currently authorized and NOT have to repair or replace these caps. Should this language not be provided in satisfaction of USACE legal counsel we would reserve the right to require that the 2.0' of allowable depth below the maintained channel depth be cleared of all obstacles as requested in previous correspondence. All parties will ensure to negotiate in good faith towards a solution to this issue.

These suggestions are arrived at in light of operational conditions only and do not take into consideration any liability regarding the caps. USACE does not agree to these options to relieve anyone of liability or reduce liability in light of the actions that they are constructed for and only to the extent that information provided in documents and discussions today are true in terms of information provided regarding the clean-up requirements of the Fox River Project. Specifically, that the ROD allows the clean up to adjust to conditions in areas of utilities.

The above conditions are given at this time in consideration of the imminent end of dredging work at the site and the need to resolve the issue in a timely manner.

USACE Office of Counsel for legal coordination is Ms. Kim Sabo and can be reached at Kimberly.J.Sabo@usace.army.mil or (312) 846-5350.

Thanks for your consideration. We look forward to your response.

Sincerely,

Jeffrey K. Zuercher, PE, PMP
Project Manager, Chicago District
UNITED STATES ARMY CORPS OF ENGINEERS
231 S. LaSalle St, Suite 1500
Chicago, Illinois 60604

(312) 846-5558
(312) 860-0133 (Cell)
(312) 353-4256 (Fax)

CHICAGO USACE WEB SITE:
https://nam01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.lrc.usace.army.mil%2F&data=02%7C01%7CGeorge.Berken%40boldt.com%7C522606e586f14262123008d7fddd80f9%7C077203401c244a4d915a3cd0c8d7068f%7C0%7C0%7C637257000110911785&sdata=PV6GxTutJByjpsEss8ZOB%2BpQtUwaurQ5Ee0h7xwZKHw%3D&reserved=0
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CLASSIFICATION: UNCLASSIFIED

Attachment H-3

George Berken

From: Zuercher, Jeffrey K CIV USARMY CELRC (USA) <Jeffrey.K.Zuercher@usace.army.mil>
Sent: Monday, June 1, 2020 5:37 PM
To: Kincaid, Gary W - DNR
Cc: Kroll, Timothy J CIV USARMY CELRC (USA); Fischer, Steven A CIV USARMY CELRC (USA); Kirksey-Harris, Felicia Y CIV USARMY CELRC (USA); Stanick, Robert L CIV USARMY CELRC (USA); beth.olson@wisconsin.gov; Nelson, William J - DNR; Jim Saric; Murawski Rich; Stone Randall; Stoltzfus, Lorraine C - DOJ; George Berken; Killian, James - DNR; Jay Grosskopf; Ava Grosskopf; jordan.salley@wisconsin.gov
Subject: RE: Fox River SRA-03, SRA-05, SRA-07 and SRA-08 (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Gary,

Thanks for taking the time to coordinate our position with NCR. Given that leaving the 539 cu. yds. in the channel provides greater environmental protection USACE is willing to agree to leaving this material in place. Again, we re-iterate that all of this is contingent up on our respective legal groups coming up with acceptable language that will allow USACE to dredge this material in the future with no need to replace or incur liability.

Thanks for continuing to keep us up to date on this process and we look forward to continuing to work with you.

Sincerely,

Jeffrey K. Zuercher, PE, PMP
Project Manager, Chicago District
UNITED STATES ARMY CORPS OF ENGINEERS
231 S. LaSalle St, Suite 1500
Chicago, Illinois 60604
(312) 846-5558
(312) 860-0133 (Cell)
(312) 353-4256 (Fax)

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https://nam01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.lrc.usace.army.mil%2F&data=02%7C01%7CGeorge.Berken%40boldt.com%7Cecfa46c81da24975585308d8067c4db1%7C077203401c244a4d915a3cd0c8d7068f%7C0%7C0%7C637266478247912218&sdata=xFjDcgFe%2FNPJgeT1MJ0rFB5lDkF2VsxWjIGqj8RZ35s%3D&reserved=0
FACEBOOK:
https://nam01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.facebook.com%2Fusacechicago&data=02%7C01%7CGeorge.Berken%40boldt.com%7Cecfa46c81da24975585308d8067c4db1%7C077203401c244a4d915a3cd0c8d7068f%7C0%7C0%7C637266478247912218&sdata=QAwqciVC6fAUby9ERHRZUGcKiXyj0H3YtrLuNwSLxOo%3D&reserved=0

Attachment H-4

Farnsworth
GROUP

20 Allen Avenue, Suite 200
St. Louis, Missouri 63119
p 314.962.7900 f 314.962.1253

www.f-w.com

September 5, 2018

Buckeye Partners, L.P.
One Greenway Plaza, Suite 600
Houston, TX 77046

Attn: Alexander Oey

Re: West Shore Pipeline – Fox River Dredge (FGI# 0181302.00)

Dear Mr. Oey:

Buckeye Partners, L.P. contracted Farnsworth Group to evaluate the buoyancy, potential for lateral movement and recommended rock rip rap protection for an existing pipeline as a result of the proposed dredging operations of the Fox River in Green Bay, Wisconsin.

Buoyancy

The potential for buoyancy is checked by comparing the weight of the pipe and backfill to the weight of the water that is being displaced by the pipeline. The existing pipe is a 10" nominal pipe size (10.75" O.D.) steel pipeline with wall thickness of 0.43 (conservative thickness based on data provided by Buckeye). This pipe also has a 2" concrete coating. At minimum cover, the pipe is covered by approximately 3' of soil that is fully inundated by water.

The resulting weights of these components are:

• 10" Pipeline	48.28	lbs/ft	(down)
• 2" Concrete Coating	82.81	lbs/ft	(down)
• 3' of inundated soil (1.5 safety factor)	174.64	lbs/ft	(down)
• Water displaced by pipe (with coating)	74.14	lbs/ft	(up)
Net Result:	231.59	lbs/ft	(down)

There is significantly more downward force provided by the pipeline components than the water's upward force. Therefore, the pipeline should not be buoyant as a result of the dredging operations.

Lateral Movement

Assuming that the dredging operation will only remove materials on top of the pipe and the pipeline remains buried, the pipeline should not move laterally (horizontally).

Rip Rap Protection

The size of riprap needed for bank/bed stabilization on a channel is based on the velocity of the water and the channel geometry. The pipeline crosses near the mouth of the Fox River at Green Bay. The proximity of Green Bay means that the water levels and velocities in the Fox River are controlled by the water level in the bay.

The Floodway velocities from FEMA Flood Insurance Study (FIS) were used for this project. The velocity indicated in the FIS is 2.2 feet per second (fps), at section A, which is downstream of the project locations.

RIPRAP Design System Version 3.0 was used to determine the appropriate rock sizes using rock gradation approved by the US Army Corps of Engineers (COE) and the American Society of Civil Engineers (ASCE).

The calculated rock graduations were compared to Wisconsin Department of Transportation (WDOT) standard rip rap gradations (WDOT Specification Section 606). For the Fox River, at a velocity of 2.2 fps, the WDOT standard Light Riprap should be large enough to stabilize the soil over the existing pipeline.

Standard gradation from a local jurisdictional authority are recommended because local contractors are more familiar with the material, they are proven to be acceptable in the area, and should be readily available at the local quarries.

Summary

- The pipeline should not be buoyant as a result of the dredging activities.
- No lateral movement is anticipated as a result of the dredging activities.
- WDOT standard Light Riprap should have sufficient size to protect the soil above the pipe from erosion.

If you have any questions or comments about this information, feel free to reach out to myself or Charles Eickele.

Sincerely,

FARNSWORTH GROUP, INC.

Michelina (Micki) S Hansel, PE
Engineering Manager

CC: Charles E. Eickele, PE – Farnsworth Group, Inc.

Enclosure: Buoyancy Calculations
Riprap Calculations

Name: MSH / CEE
Date: 8/30/2018
Page: 1 of 2

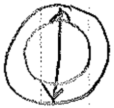
Project: West Shore Pipeline
Project No.: 0181302.00
Subject: Buoyancy Calculations

API Specification for Line Pipe

10"NPS, Wall Thickness = 0.438" = Weight = $\boxed{48.28 \text{ lb/ft} (\downarrow)}$
(Attached)

OD = 10.75" = 0.90 ft

2" Concrete Coating



dia = 10.75" + 2" + 2" = 14.75" => 1.23 ft

Unit Weight of Plain Concrete = 150 lb/ft

$W_p = (\pi \div 4)(1.23^2 - 0.90^2)150 = \boxed{82.81 \text{ lb/ft} (\downarrow)}$

Weight of Water Displaced (↑)

$W_W = (\pi \div 4)(1.23^2)(62.4) = \boxed{74.14 \text{ lb/ft}}$

$W_T = W_p + W_w$
$= (48.28 + 82.81) + (-74.14) = \boxed{56.95 \downarrow}$

Inundated Backfill

$W_I = w_I(0.1073 B_c^2 + H_I B_c)$

$W_I = 68$ (Average Soil Weight)
$B_c = 1.23$ ft (dia)
$H_I = 3'$ (assumed from email correspondence)

$W_I = (68)[(0.1073)(1.23)^2 + (3)(1.23)] = 261.96$ lbs/LF

Factor of Safety $= \frac{W_I}{1.5} = \frac{261.96}{1.5} = \boxed{174.64 \downarrow = W_p}$

Farnsworth GROUP

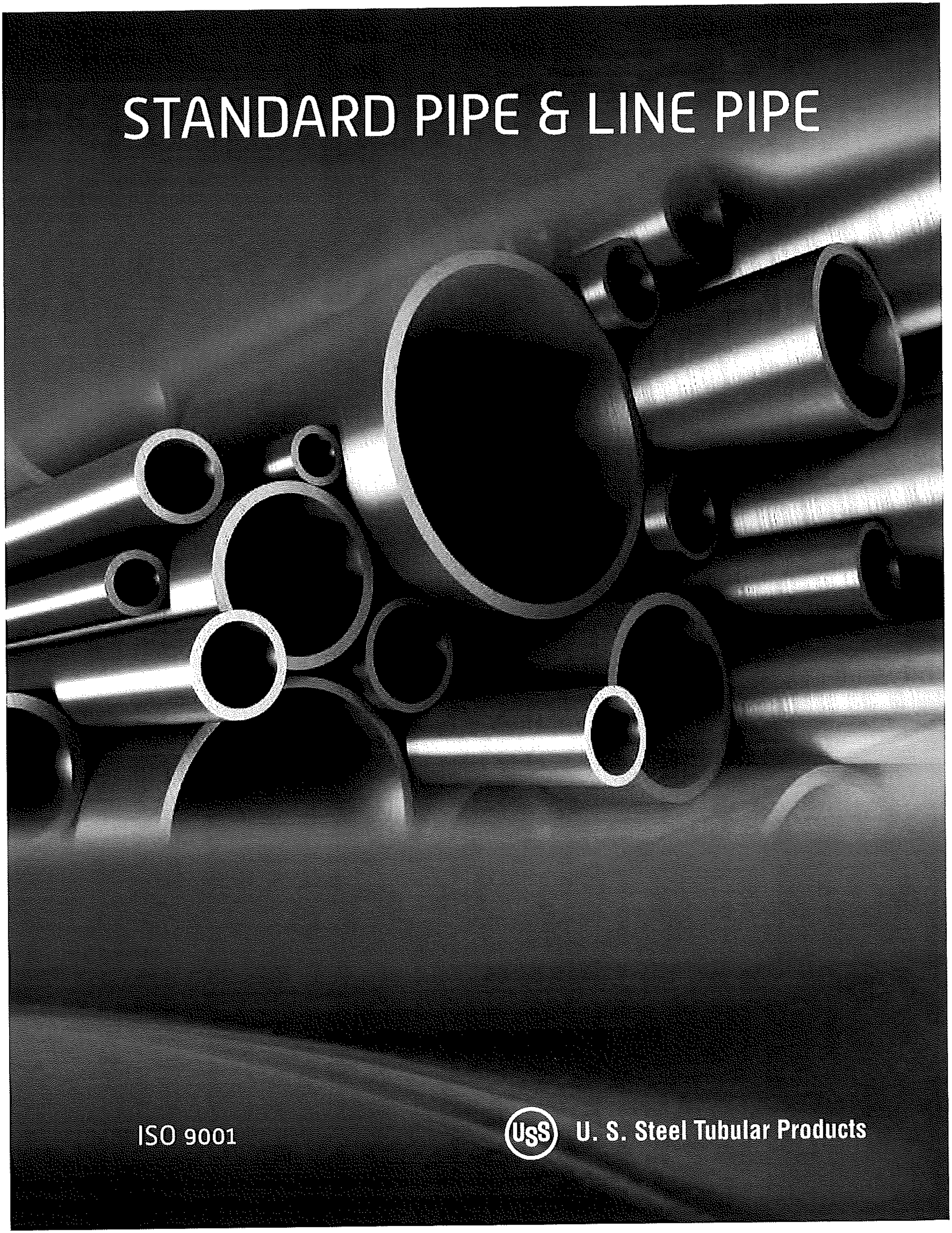
Name: MSH / CEE
Date: 8/30/2018
Page: 2 of 2
Project: West Shore Pipeline
Project No.: 0181302.00
Subject: Buoyancy Calculations

W_T (from $W_p + W_w$) = 56.95 lb/ft ↓

W_f (from $W_B \div FS$) = 174.64 lb/ft ↓

All Forces are down ⇒ Pipe should not float.

STANDARD PIPE & LINE PIPE



ISO 9001

U. S. Steel Tubular Products

STANDARD PIPE & LINE PIPE TABLES

Outside Diameter NPS (inches)	Wall			Weight		Grade	Specified Minimum Strength (psi)		Mill Hydrostatic Test Pressure (psi)		Ultimate Burst (psi)
	Inches	Schedule Number	Class	lb/ft Plain End	Tons/ Mile		Yield	Tensile	Standard	Alternate	
OD 10.750											
NPS 10 OD 10.750 Seamless & ERW	0.438			48.28	127.47	B	35,500	60,200	1,740	2,170	4,910
	0.438			48.28	127.47	C	40,000	70,000	1,960		5,700
	0.438			48.28	127.47	X42	42,100	60,200	2,920	2,920	4,910
	0.438			48.28	127.47	X46	46,400	63,100	3,000	3,210	5,140
	0.438			48.28	127.47	X52	52,200	66,700	3,000	3,620	5,440
	0.438			48.28	127.47	X56	56,600	71,100	3,000	3,920	5,790
	0.438			48.28	127.47	X60	60,200	75,400	3,000	4,170	6,140
	0.438			48.28	127.47	X65	65,300	77,600	3,000	4,520	6,320
	0.438			48.28	127.47	X70	70,300	82,700	3,000	4,870	6,740
	0.438			48.28	127.47	X80	80,500	90,600	3,000	5,580	7,380
	0.500	60	XS	54.79	144.64	B	35,500	60,200	1,980	2,480	5,600
	0.500	60	XS	54.79	144.64	C	40,000	70,000	2,230		6,510
	0.500	60	XS	54.79	144.64	X42	42,100	60,200	3,000	3,330	5,600
	0.500	60	XS	54.79	144.64	X46	46,400	63,100	3,000	3,670	5,870
	0.500	60	XS	54.79	144.64	X52	52,200	66,700	3,000	4,130	6,200
	0.500	60	XS	54.79	144.64	X56	56,600	71,100	3,000	4,480	6,610
	0.500	60	XS	54.79	144.64	X60	60,200	75,400	3,000	4,760	7,010
	0.500	60	XS	54.79	144.64	X65	65,300	77,600	3,000	5,160	7,220
	0.500	60	XS	54.79	144.64	X70	70,300	82,700	3,000	5,560	7,690
	0.500	60	XS	54.79	144.64	X80	80,500	90,600	3,000	6,370	8,430
	0.562			61.21	161.59	B	35,500	60,200	2,230	2,800	6,290
	0.562			61.21	161.59	C	40,000	70,000	2,510		7,320
	0.562			61.21	161.59	X42	42,100	60,200	3,000	3,740	6,290
	0.562			61.21	161.59	X46	46,400	63,100	3,000	4,120	6,600
	0.562			61.21	161.59	X52	52,200	66,700	3,000	4,640	6,970
	0.562			61.21	161.59	X56	56,600	71,100	3,000	5,030	7,430
	0.562			61.21	161.59	X60	60,200	75,400	3,000	5,350	7,880
	0.562			61.21	161.59	X65	65,300	77,600	3,000	5,800	8,110
	0.562			61.21	161.59	X70	70,300	82,700	3,000	6,250	8,650
	0.562			61.21	161.59	X80[1]	80,500	90,600	3,000	7,150	9,470
	0.594	80		64.49	170.25	B	35,500	60,200	2,350	2,800	6,650
	0.594	80		64.49	170.25	C	40,000	70,000	2,650		7,740
	0.594	80		64.49	170.25	X42	42,100	60,200	3,000	3,950	6,650
	0.594	80		64.49	170.25	X46	46,400	63,100	3,000	4,360	6,970
	0.594	80		64.49	170.25	X52	52,200	66,700	3,000	4,900	7,370
	0.594	80		64.49	170.25	X56	56,600	71,100	3,000	5,320	7,860
	0.594	80		64.49	170.25	X60	60,200	75,400	3,000	5,650	8,330
	0.594	80		64.49	170.25	X65	65,300	77,600	3,000	6,130	8,580
	0.594	80		64.49	170.25	X70	70,300	82,700	3,000	6,600	9,140
	0.594	80		64.49	170.25	X80[1]	80,500	90,600	3,000	7,260	10,010
	0.625			67.65	178.59	B	35,500	60,200	2,480	2,800	7,000
	0.625			67.65	178.59	C	40,000	70,000	2,800		8,140
	0.625			67.65	178.59	X42	42,100	60,200	3,000	4,160	7,000
	0.625			67.65	178.59	X46	46,400	63,100	3,000	4,590	7,340

[1] Available in seamless only.

```
Date: 08/30/2018 Time: 11:29
************************************************************
*              RIPRAP DESIGN SYSTEM (RDS)                  *
*                         BY                               *
*                WEST Consultants, Inc.                    *
*                                                          *
*                                                          *
* Version 3.0                               March, 2005    *
*                                                          *
*                                                          *
* COPYRIGHT (c) 2005                                       *
* WEST CONSULTANTS, INC.                                   *
* 16870 WEST BERNARDO DRIVE               PH: 858-487-9378 *
* SUITE 340                               FAX:858-487-9448 *
* SAN DIEGO, CA 92127         WEB:WWW.WESTCONSULTANTS.COM  *
************************************************************


Project: Fox River
Description: Floodway - Buckeye Pipeline Crossing

______________________ USACE Method ______________________

Input Parameters:
-----------------
Velocity Type                                      Average
Channel Shape                                  Trapezoidal
Channel Type                                      Straight
Bend Angle (deg)                                       N/A
Average Channel Velocity                         2.20 ft/s
Bottom Width                                           N/A
Bend Radius                                            N/A
Top Width                                              N/A
Unit Weight of Stone                       155. lbs/cu ft
Riprap Layer Thickness                                1.00
Local Flow Depth                                  17.00 ft
Cotangent of Side Slope                              10.00
Safety Factor                                          1.1
Riprap Placement                              Channel Bank
Rock Type                                          Angular

Output Results:
---------------

Computed D30                                       0.01 ft
Computed Local Depth Averaged Velocity           2.20 ft/s
Local Velocity/Avg. Velocity                          1.00
Side Slope Correction Factor                          1.00
Correction for Layer Thickness                        1.00
Correction for Secondary Currents                     1.00

  *** Using Gradations from COE ETL 1110-2-120 ***


Specific Weight     155.0 lbs/cu ft
Layer Thickness           0.750 ft
Selected Minimum D30       0.37 ft
Selected Minimum D90       0.53 ft
```

```
Date: 08/30/2018 Time: 11:29
************************************************************
*                RIPRAP DESIGN SYSTEM (RDS)                *
*                            BY                            *
*                   WEST Consultants, Inc.                 *
*                                                          *
*                                                          *
* Version 3.0                                  March, 2005 *
*                                                          *
*                                                          *
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* WEST CONSULTANTS, INC.                                   *
* 16870 WEST BERNARDO DRIVE               PH: 858-487-9378 *
* SUITE 340                               FAX:858-487-9448 *
* SAN DIEGO, CA 92127          WEB:WWW.WESTCONSULTANTS.COM *
************************************************************


Project: Fox River
Description: Floodway - Buckeye Pipeline Crossing

______________________   USACE Method ______________________


Input Parameters:
-----------------
Velocity Type                                        Average
Channel Shape                                    Trapezoidal
Channel Type                                        Straight
Bend Angle (deg)                                         N/A
Average Channel Velocity                           2.20 ft/s
Bottom Width                                             N/A
Bend Radius                                              N/A
Top Width                                                N/A
Unit Weight of Stone                          155. lbs/cu ft
Riprap Layer Thickness                                  1.00
Local Flow Depth                                    17.00 ft
Cotangent of Side Slope                                10.00
Safety Factor                                            1.1
Riprap Placement                                Channel Bank
Rock Type                                            Angular


Output Results:
---------------

Computed D30                                         0.01 ft
Computed Local Depth Averaged Velocity             2.20 ft/s
Local Velocity/Avg. Velocity                            1.00
Side Slope Correction Factor                            1.00
Correction for Layer Thickness                          1.00
Correction for Secondary Currents                       1.00


  *** Using Gradations from COE ETL 1110-2-120 ***


Specific Weight     155.0 lbs/cu ft
Layer Thickness            0.750 ft
Selected Minimum D30        0.37 ft
Selected Minimum D90        0.53 ft
```

```
                                          Stone Weight, lbs
Percent Lighter by Weight            Minimum             Maximum
_______________________________________________________________
W100                                     14.                 34.
 W50                                      7.                 10.
 W15                                      2.                  5.

________________________ ASCE Method ________________________


Input Parameters:
-----------------

Local Velocity                                         2.20 ft/s
Cotangent of Side slope                                    10.00
Unit Weight of Stone                              155. lbs/cu ft
Riprap Placement                                    Channel Bank


Output Results:
---------------

Computed D50                                             0.04 ft


  *** Using Gradations from COE ETL 1110-2-120 ***


Specific Weight     155.0 lbs/cu ft
Layer Thickness         0.750 ft
Selected Minimum D30     0.37 ft
Selected Minimum D90     0.53 ft


                                          Stone Weight, lbs
Percent Lighter by Weight            Minimum             Maximum
_______________________________________________________________
W100                                     14.                 34.
 W50                                      7.                 10.
 W15                                      2.                  5.
```

Section 606 Riprap

606.1 Description

(1) This section describes furnishing and placing riprap.

606.2 Materials

606.2.1 Riprap Stone

(1) Furnish durable field or quarry stone that is sound, hard, dense, resistant to the action of air and water, and free of seams, cracks, or other structural defects. Use stone pieces with a length and width no more than twice the thickness. Do not place material without the engineer's approval of the stone quality, size, and shape.

(2) The department will determine the average dimension of stone pieces by averaging measurements of thickness, width, and length. Furnish stones conforming to the size requirements for the riprap grade the plans show. Size requirements are expressed as the percent of the gross in-place riprap volume occupied by stones within average dimension size ranges for each riprap grade as follows:

AVERAGE DIMENSION RANGES FOR EACH RIPRAP GRADE				
LIGHT RIPRAP inches	MEDIUM RIPRAP inches	HEAVY RIPRAP inches	EXTRA-HEAVY RIPRAP inches	FRACTION OF GROSS IN-PLACE RIPRAP VOLUME OCCUPIED BY STONES
>16	>20	>25	>30	0%
11 - 13	14 - 16	18 - 20	22 - 25	10% - 14%
9 - 11	11 - 14	14 - 18	18 - 22	15% - 21%
4 - 9	5 - 11	6.5 - 14	8 - 18	20% - 28%
<4	<5	<6.5	<8	5% - 7%
<1	<1	<1	<1	2% or less

(3) The contractor may substitute waste concrete slabs for stone. Furnish sound concrete, free of protruding reinforcement, and conforming to the size requirements specified for stone.

606.2.2 Riprap Grout

(1) Furnish an air-entrained mortar or concrete to fill the voids between riprap stones in grouted riprap. Conform to the physical requirements for component materials as specified in 501.2 except furnish fine aggregate or a combination of fine and coarse aggregate with a gradation that results in a grout with a consistency that allows complete filling of the riprap voids.

(2) Certify that the grout conforms to the following mixture requirements:

- Contains 470 pounds or more of portland cement per cubic yard of grout. The contractor may substitute class C fly ash for up to 30% of the required portland cement.
- Contains only enough water to achieve a 3-inch slump. Any additional workability required to completely fill the riprap voids must be achieved with admixture without increasing the w/cm ratio.
- Contains 9% or more air for mixes with a nominal top size aggregate less than 3/8 inch or 7% or more air for a mix with 3/8 inch or larger aggregate.

606.3 Construction

606.3.1 General

(1) Prepare the bed for the riprap by excavating, shaping the slopes, and constructing the toe for riprap installation. After placing the riprap, restore the surface of adjacent work and dispose of surplus material.

606.3.2 Placing Light Riprap

(1) If laying stone above the waterline, place it by hand. Lay it with close, broken joints and firmly bed it in the slope and against the adjoining stones. Lay the stones perpendicular to the slope with ends in contact. Compact the riprap thoroughly as construction progresses. Make the finished surface even and tight. Place larger stone in lower courses. Chink spaces between stones by firmly ramming spalls into place. If placing riprap over geotextile, use type R and conform to 645.3.1.6.

(2) Unless specified otherwise, make riprap at least one foot thick, measured perpendicular to the slope.

(3) Do not place riprap against, or in contact with, concrete surface before the end of the concrete's curing and protection period.

606.3.3 Placing Medium, Heavy, and Extra-Heavy Riprap

(1) The contractor may place medium, heavy, and extra-heavy riprap by any mechanical means that produce a completed job within reasonable tolerances of the typical section the plans show. Limit

Attachment H-5

U.S. Venture

Finding a better way™

July 30, 2019

Mr. Paul Spillers
Fox River Cleanup Group
c/o Tetra Tech
2680 Vernon Drive
Green Bay, WI 54304-5374

Re: Capping/Access to Pipeline – Utility 049

Dear Mr. Spillers:

As part of the remedial action for PCB sediment contamination in the Fox River, the Fox River Cleanup Group (“Group”) proposes to cap the area near to and above the U.S. Venture pipeline (referred to as Utility 049 – 2019 Remedial Action Work Plan) (the “Pipeline”) that crosses underneath the Fox River. U.S. Venture agrees to the capping of the Pipeline (the “Cap”) (as opposed to dredging) subject to the following conditions:

(1) The Cap design, construction, construction documentation, maintenance plan and maintenance activities will all be prepared and/or performed in accordance with the directives/approvals of the United States Environmental Protection Agency (“U.S. EPA”) and/or the Wisconsin Department of Natural Resources (“WDNR”) (whichever agency has any jurisdiction over the work), as well as all applicable decrees, orders and/or approved work plans addressing the PCB remedial action, in general, and the Cap, in particular.

(2) Placement of the Cap will not disturb or disrupt the Pipeline. The Group will be responsible for all costs required to repair the Pipeline due to the placement of the Cap.

(3) All required notices to governmental agencies and the public will be made and all applicable documentation will be placed in designated repositories (paper/electronic), including any notices and documents required to be filed and posted on the database maintained in accordance with Wis. Stat. § 292.12(3).

(4) All applicable requirements of Wis. Stat. § 292.12 relating to the Cap will be followed, including but not limited to Wis. Stat. § 292.12(5)(c).

(5) All required financial assurance for Cap maintenance will be maintained in accordance with U.S. EPA and/or WDNR decrees, orders or requirements with no lapse in the financial assurance.

(6) U.S. Venture will be notified 30 days in advance of any Cap maintenance or replacement activities. Cap maintenance/replacement actions may not proceed without U.S. Venture's approval, which will not be unreasonably withheld.

(7) In the event U.S. Venture is required to obtain access to any part of the Pipeline, to the extent practicable, it will notify the Group 30 days prior to disturbing the Cap. However, in an emergency situation, U.S. Venture may take immediate action and provide after-the-fact notice. U.S. Venture will be responsible for obtaining and complying with all required governmental permits, directives and approvals in disturbing the Cap as part of conducting any work on the Pipeline.

Regards,

Elyse Mollner Stackhouse
General Counsel

cc Don Johnston, U.S. Venture, Inc.
Mark Reimer, U.S. Venture, Inc.
Chris Lamirande, U.S. Venture, Inc.
Gary Kincaid, DNR
Pablo Valentin, EPA

Attachment H-6

Tabatabai, Morey

From: George Berken <George.Berken@boldt.com>
Sent: Tuesday, June 16, 2020 12:15 PM
To: RP Contact Group; Hendron, Ben; Coleman, Bill; Weston, Brandon; Jones, Cynthia; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence; Bauer, Eric; Phelps, Gary; Kinnard, Hugh; Edmond, Jacqueline; Miller, Michelle; Tabatabai, Morey; Anschutz, Nathan; plarosa@anchorqea.com; Spillers, Paul; Feeney, Richard; Gifford, Ricky; Sharon Kozicki; Tara Van Hoof; Blackmar, Terri; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; martijn.luth@boskalis.com; Nathan Kainz ; Nathan Wyrowski; rudy.driessen@boskalis.com; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: 0807. 87500 OU2-5 - FW: LFRR-18-0298-R3 Dutil 49 area and SRA-08 Tech Memo
Attachments: EMAIL_2020-05-21_Zuercher.pdf; EMAIL_2020-06-01_Zuercher.pdf; RLSO Revised Final TM_DUTIL-049_SRA-08 20 0612 BERKEN.docx

Morey, on behalf of the Agencies, address the attached comments and RLSOs and resubmit as a draft Final. Also attached are two USACE emails that are to be included in Attachment H.

The Agencies have determined, in consultation with the USACE, that the design elevation of 552.0' in the navigation channel, on an exceptional basis, is acceptable for SRA-08 such that overplacement in the navigation channel does not go above elevation 552.6'. Note, also include this email in Attachment H.

Note, a separate email will be released regarding SRAs-03, 05, and 07 today.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
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SafeThinking: Our Crusade to Eliminate Accidents

From: Tabatabai, Morey <Morey.Tabatabai@tetratech.com>
Sent: Friday, June 12, 2020 1:22 PM
To: George Berken <George.Berken@boldt.com>; gary.kincaid@wisconsin.gov; Larry DeBruin <Larry.Debruin@Boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: jlawson@project-control.com; soconnell@project-control.com; bryan.heath@ncr.com; Gawronski, Troy A <Troy.Gawronski@Foth.com>; PCC Database <database@project-control.com>; bill.coleman@tetratech.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; ricky.gifford@tetratech.com; brandon.weston@tetratech.com; Neuman, Sharon

<Sharon.Neuman@tetratech.com>; Spillers, Paul <Paul.Spillers@tetratech.com>; eci.lfrrpc@tetratech.com
Subject: LFRR-18-0298-R3 Dutil 49 area and SRA-08 Tech Memo

George,
As requested on June 5 email below (under different subject), the RLSO version of draft final TM for the SRA8 area is attached for acceptance.
Please call me with any questions.

Respectfully

Morey Tabatabai, Design/Field Engineer
morey.tabatabai@tetratech.com
Direct: 920.455.1077| Cell: 720-394-3473
2680 Vernon Drive | Green Bay, WI 54304
Tetra Tech, Inc. | **Engineering**
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From: George Berken <George.Berken@boldt.com>
Sent: Wednesday, June 10, 2020 10:21 AM
To: RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Edmond, Jacqueline <Jacqueline.Edmond@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; Tara Van Hoof <Tara.VanHoof@Foth.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; martijn.luth@boskalis.com; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; rudy.driessen@boskalis.com; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 1081. 87500 OU2-5 - FW: LFRR-19-0016 - Request for A/OT acceptance of Management Plan for SRA-08 Top of Cap (Option 4)

Ricky, on behalf of the Agencies, the revised GAC amended sand and ¾-inch armor stone spreader lanes and areas respectively, submitted in your email below for SRA-08 (Option 4), are acceptable.

Thanks,
George…

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307

E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

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SafeThinking: Our Crusade to Eliminate Accidents

From: Gifford, Ricky <ricky.gifford@tetratech.com>
Sent: Wednesday, June 10, 2020 8:43 AM
To: George Berken <George.Berken@boldt.com>; RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; ben.hendron@tetratech.com; bill.coleman@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; Edmond, Jacqueline <Jacqueline.Edmond@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; martijn.luth@boskalis.com; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; rudy.driessen@boskalis.com; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 1081. 87500 OU2-5 - FW: LFRR-19-0016 - Request for A/OT acceptance of Management Plan for SRA-08 Top of Cap (Option 4)

George,

Attached is a revised spreader lanes map based on the WGM yesterday. Please let me know if this satisfies the comments properly.

Thank you,

Ricky E. Gifford | **Sr. Design Supervisor**
Direct Dial: 920.445.0731
Mobile: 920.530.8604
Ricky.Gifford@tetratech.com

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2680 Vernon | Green Bay, WI. 54304 | www.tetratech.com

From: George Berken <George.Berken@boldt.com>
Sent: Tuesday, June 9, 2020 3:13 PM
To: RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Edmond, Jacqueline <Jacqueline.Edmond@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Sharon Kozicki

<Sharon.Kozicki@Foth.com>; Tara Van Hoof <Tara.VanHoof@Foth.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; martijn.luth@boskalis.com; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; rudy.driessen@boskalis.com; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 1081. 87500 OU2-5 - FW: LFRR-19-0016 - Request for A/OT acceptance of Management Plan for SRA-08 Top of Cap (Option 4)

Ricky, on behalf of the Agencies, please address the attached comments and resubmit.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

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SafeThinking: Our Crusade to Eliminate Accidents

From: Gifford, Ricky <ricky.gifford@tetratech.com>
Sent: Tuesday, June 9, 2020 7:53 AM
To: George Berken <George.Berken@boldt.com>; RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; ben.hendron@tetratech.com; bill.coleman@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; Edmond, Jacqueline <Jacqueline.Edmond@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; martijn.luth@boskalis.com; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; rudy.driessen@boskalis.com; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 1081. 87500 OU2-5 - FW: LFRR-19-0016 - Request for A/OT acceptance of Management Plan for SRA-08 Top of Cap (Option 4)

Mr. Berken,

Attached is the revised design package for the above mentioned area. In the design package you can locate the Proposed Top of Cap Design with Cross Sections for Option 4 along with the proposed spreader lanes and overlap map, for A/OT review.

Thank you,

Ricky E. Gifford | **Field Engineering/CADD Manager**
Direct Dial: 920.445.0731
Mobile: 920.530.8604
Ricky.Gifford@tetratech.com

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From: George Berken <George.Berken@boldt.com>
Sent: Friday, June 5, 2020 9:33 AM
To: RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Edmond, Jacqueline <Jacqueline.Edmond@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; Tara Van Hoof <Tara.VanHoof@Foth.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; martijn.luth@boskalis.com; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; rudy.driessen@boskalis.com; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 1081. 87500 OU2-5 - FW: LFRR-19-0016 - Request for A/OT acceptance of Management Plan for SRA-08 Top of Cap (Option 4)

Ricky, on behalf of the Agencies, the response, submitted in your email below regarding placing GAC amended sand and armor stone into SRA-08 (Option 4), is acceptable. However, update the appropriate figures showing more clearly where the GAC amended sand will be placed and more clearly where the armor stone (3/4-inch D50) will be placed. Also include a note in the legend explaining that the GAC amended sand will be place with the JF Brennan spreader and that the armor stone will be mechanically placed due to the varying thicknesses throughout the design. Please resubmit these figures for final review and acceptance.

Morey, on behalf of the Agencies and after the A/OT accepts the above resubmittal, distribute the entire SRA-08 technical memorandum in final form.

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

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SafeThinking: Our Crusade to Eliminate Accidents

From: Gifford, Ricky <ricky.gifford@tetratech.com>
Sent: Thursday, June 4, 2020 10:52 AM
To: George Berken <George.Berken@boldt.com>; RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; ben.hendron@tetratech.com; bill.coleman@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; Edmond, Jacqueline <Jacqueline.Edmond@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; martijn.luth@boskalis.com; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; rudy.driessen@boskalis.com; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 1081. 87500 OU2-5 - FW: LFRR-19-0016 - Request for A/OT acceptance of Management Plan for SRA-08 Top of Cap (Option 4)

George,

Per J.F. Brennan, within the clouded yellow areas JFB would use the spreader for the GAC amended sand. All stone will be mechanically placed due to the varying thicknesses throughout the design.

Please let me know if you have any other questions.

Thank you,

Ricky E. Gifford | **Field Engineering/CADD Manager**
Direct Dial: 920.445.0731
Mobile: 920.940.4077
Ricky.Gifford@tetratech.com

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From: George Berken <George.Berken@boldt.com>
Sent: Tuesday, June 2, 2020 3:26 PM
To: RP Contact Group <rpcontactgroup@theboldtcompany.onmicrosoft.com>; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Edmond, Jacqueline <Jacqueline.Edmond@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; Tara Van Hoof <Tara.VanHoof@Foth.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com;

martijn.luth@boskalis.com; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; rudy.driessen@boskalis.com; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 1081. 87500 OU2-5 - FW: LFRR-19-0016 - Request for A/OT acceptance of Management Plan for SRA-08 Top of Cap (Option 4)

Ricky, on behalf of the Agencies, Option 4, submitted in your email below for SRA-08, is acceptable with the attached comments being adequately addressed. Address these comments and resubmit. Upon resubmittal of these figures, addressing our comments, the entire SRA-08 technical memorandum is to be updated and released in final form.

Thanks,
Georg…

BOLDT

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
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SafeThinking: Our Crusade to Eliminate Accidents

From: Gifford, Ricky <ricky.gifford@tetratech.com>
Sent: Tuesday, June 2, 2020 7:59 AM
To: George Berken <George.Berken@boldt.com>; gary.kincaid@wisconsin.gov; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>; Larry DeBruin <Larry.Debruin@Boldt.com>
Cc: jlawson@project-control.com; soconnell@project-control.com; pamontne@gapac.com; bill.coleman@tetratech.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; morey.tabatabai@tetratech.com; Gawronski, Troy A <Troy.Gawronski@Foth.com>; eci.lfrrpc@tetratech.com; roger.kaminski@gapac.com; bryan.heath@ncr.com
Subject: LFRR-19-0016 - Request for A/OT acceptance of Management Plan for SRA-08 Top of Cap (Option 4)

Mr. Berken,

Attached is the design package for the above mentioned area. In the design package you can locate the Proposed Top of Cap Design with Cross Sections for Option 4 along with the proposed spreader lanes and overlap map, for A/OT review.

Thank you,

Ricky E. Gifford | **Field Engineering/CADD Manager**
Direct Dial: 920.445.0731
Mobile: 920.530.8604
Ricky.Gifford@tetratech.com

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George Berken

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Wednesday, November 6, 2019 6:11 PM
To: George Berken; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law); pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; ben.hendron@tetratech.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary; hugh.kinnard@tetratech.com; Boreen, Lee; Vandenberg, Luke; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; Anschutz, Nathan; plarosa@anchorqea.com; Spillers, Paul; rhonda.chierverhagen@tetratech.com; Feeney, Richard; ricky.gifford@tetratech.com; Martin, Sarah; Sharon Kozicki; tara.vanhoof@foth.com; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam; Jim Saric
Subject: RE: 1024.87500 OU2-5 - FW: LFRR-19-0111-R3: Revised Final Tech Memo for CB60/CB60-SRA
Attachments: Final Tech Memo_CB60 and CB60-SRA_AOT_110619.pdf

George,

Attached is the entire final technical memorandum, in one pdf.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
Direct: 630.470.4217 / Home Office: 630-922-8772
Terri.Blackmar@tetratech.com

Tetra Tech | **Fox River Site**
1611 State Street | Green Bay, WI 54304 | www.tetratech.com

From: George Berken <George.Berken@boldt.com>
Sent: Tuesday, October 29, 2019 2:29 PM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; PAMONTNE <PAMONTNE@GAPAC.com>; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; Anschutz, Nathan <Nathan.Anschutz@tetratech.com>; plarosa@anchorqea.com;

Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda <Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Martin, Sarah <Sarah.Martin@tetratech.com>; Sharon Kozicki <Sharon.Kozicki@Foth.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>; Jim Saric <saric.james@epa.gov>
Subject: 1023. 87500 OU2-5 - FW: LFRR-19-0111-R3: Revised Final Tech Memo for CB60/CB60-SRA

⚠ **CAUTION:** This email originated from an external sender. Verify the source before opening links or attachments. ⚠

Terri, on behalf of the Agencies, the revised technical memorandum, submitted in your email below for CB60/CB60-SRA, is acceptable. Distribute the entire technical memorandum in final form.

Thanks,
George…

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
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SafeThinking: Our Crusade to Eliminate Accidents

From: Blackmar, Terri <Terri.Blackmar@tetratech.com>
Sent: Friday, October 25, 2019 1:23 PM
To: Ava Grosskopf <Ava.Grosskopf@boldt.com>; George Berken <George.Berken@boldt.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Kincaid, Gary W - DNR <Gary.Kincaid@wisconsin.gov>; Larry DeBruin <Larry.Debruin@Boldt.com>
Cc: brandon.weston@tetratech.com; eci.lfrrpc@tetratech.com; dbauman@jfbrennan.com; bryan.heath@ncr.com; jlawson@project-control.com; 'soconnell@project-control.com'; Troy Gawronski <Troy.Gawronski@Foth.com>; bjorn.lysne@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; bill.coleman@tetratech.com; ben.hendron@tetratech.com; dbinkney@anchorqea.com; Feeney, Richard <Richard.Feeney@tetratech.com>; ricky.gifford@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>
Subject: LFRR-19-0111-R3: Revised Final Tech Memo for CB60/CB60-SRA

Hi George,

Attached is the revised Tech Memo for cap CB60/CB60-SRA, which describes the slope revisions made to improve the stability for capping the very soft sediment encountered in this area. The attachments are all related to the slope revision, and I have not re-attached the original attachments to the memo except for those that are embedded.

The approach used to evaluate the initial slope conditions and the revisions designed for the slope are described herein. The slope is now an SRA cap with buttress added.

Please review this information and let me know if you have any questions or comments.

Thanks,

Terri

Terri Blackmar, PE | **Vice President, Great Lakes Operations**
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Tetra Tech | **Fox River Site**
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TETRA TECH EC, INC.

ANCHOR QEA

Technical Memorandum

To: George Berken, Jay Grosskopf, and Larry DeBruin (Boldt Oversight Team); Gary Kincaid and Beth Olson (WDNR); and Pablo Valentin (USEPA)

From: Terri Blackmar, Morey Tabatabai, Ben Hendron (Tetra Tech); and Dan Binkney (Anchor QEA)

CC: Jeff Lawson, Sue O'Connell (Project Control Companies for the LLC); Bryan Heath (NCR); Paul Montney, Michael Davis, and Roger Kaminski (Georgia Pacific); Bill Hartman (P.H. Glatfelter); Bill Coleman (Tetra Tech)

Date: August 1, 2019, Revised October 25, 2019

Re: Proposed Design for Cap CB60 and Cap CB60-SRA

Document Control Number: LFRR-19-0111-R3

1. PURPOSE AND SCOPE

This technical memorandum (tech memo) describes the proposed design for cap CB60 and CB60-SRA, which will cover the Wisconsin Public Service Corporation's (WPS) Pulliam Plant abandoned north intake channel, and the analyses performed in support of the design. The abandoned north intake channel is located west of the mouth of the Lower Fox River, along the western shoreline of the Bay of Green Bay. This channel extends from the navigation channel southwesterly and terminates inland in an abandoned intake structure, which is separated from the abandoned channel in the bay by a catwalk (Attachment 1).

The area proposed for dredging and capping is shown in Attachment 1. This area has been discussed with the Agencies/Oversight Team (A/OT) for proposed capping during a series of work group meetings held over the last several months. During these meetings, the proposed cap configuration and design were discussed.

The proposed cap design is based on many factors, including:

- No anticipated future use of the now confirmed abandoned intake channel and intake structure;
- Polychlorinated biphenyl (PCB) concentrations in sediment below the proposed cap, except within the abandoned intake structure;
- A/OT's agreement that Type 2 stone with a D_{50} of 1.5 inches could be used as an armor layer for the CB60 portion of the cap.
- WPS' notice that the WPS Pulliam Plant has been permanently shut down effective 2019.
- A/OT's comments issued on this tech memo on May 30, 2019, which included the following:
    1. "Change the "Modified Cap CB60" designation to an SRA cap because of the potential of vessel straying beyond the original assumptions presented in the TM.

2. Change the D50 6-inch armor layer for the "Modified Cap CB60" to D50 13-inch, to provide more protective armor layer due to vessel straying assumptions identified in item 3 below.
3. Modify the technical memorandum explaining the reason(s) the "Modified Cap CB60" is designated an SRA cap. Reference the attached file *(Attachment 5_Fox River-D54-CB60-Propwash Evaluation-05022019 BERKEN.pdf)* showing the various positions a vessel can achieve that shows bow and stern propwash that are very close to the "Modified Cap CB60)."

The original version of this tech memo was accepted by the A/OT on May 30, 2019, provided the comments noted above are addressed in the revised design.

After these comments were received, an over-the-shoulder meeting was held with the A/OT, which was documented in notes sent via email to the A/OT on June 10, 2019. A copy of these notes is presented in Attachment 2. At this meeting, the A/OT agreed that only the slope area required the stone with D_{50} of 13 inches, and the top of slope could continue to use stone with D_{50} of 6 inches to avoid creating a large hump that would also be at a relatively shallow depth. This stone would continue 45 feet to the west, after which point stone with a D_{50} of 1.5 inches could be used. The design presented herein was revised to reflect these comments and the over the shoulder discussions.

The design originally presented in this tech memo was accepted by the Agencies on August 2, 2019. The area was subsequently dredged to the design slope in preparation for capping. However, during installation of the initial cap layers, sand and small stone, the stone appeared to be missing at approximately mid-slope even though about one foot of stone had been placed, and a bulge was observed at the toe of the slope. This is typically indicative of a shallow rotational failure or a bearing capacity failure. Therefore, before continuing to place additional cap aggregates on the slope, Tetra Tech recommended that additional measures be taken to avoid a more pronounced slope failure. These measures and the resulting design modification are described herein.

2. BACKGROUND

In the 2019 RAWP, caps CB60 and cap CB60-SRA were proposed because there is no evidence of PCB exceeding 50 ppm in the subject area.

The final *100 Percent Design Report Volume 2*, dated October 23, 2012 (Tetra Tech et. al) included propwash calculations for vessels operating in the navigation channel, and also stated that more detailed analyses would be performed for all caps proposed in or near the Operable Unit (OU) 4B navigation channel, and from the Fort Howard Turning Basin (FHTB) to the mouth of the river. The detailed analyses for caps CB60/CB60-SRA were provided in a previous version of this memo, dated May 14, 2019. However, the Agencies' comments of June 30, 2019 directed the use of a larger stone size than was indicated by these analyses, due to the potential of vessels straying beyond the original design assumption(s) presented in the May 14, 2019 version of this memo, so the prior straying distance assumption(s) analysis has been removed in this version.

In November 2018, WPS announced plans to retire the Pulliam Plant by the end of 2018, which meant designing the remedy to accommodate potential future use of the formerly considered inactive north intake channel was no longer needed. This announcement is shown in Attachment 3. This notice and subsequent permanent closure of the Pulliam Power Plant terminated the potential for reactivating the north intake channel, as described below.

3. POTENTIAL FOR FUTURE USE OF THE ABANDONED NORTH INTAKE CHANNEL

Units 1-2 of the Pulliam Plant were retired in 1980. Units 3 and 4 in 2007 and units 5 and 6 were retired in 2015. Units 7 and 8, the power station's final units, were retired at the end of 2018. Plant owner WEC Energy Group cited lower prices for energy alternatives, including wind power, as the basis for the recent decision to retire the last two operating units. There is now no potential for future use of the north intake channel; it has been abandoned.

4. PCB CONCENTRATIONS BELOW THE CAP

PCB concentrations in sediment directly below the cap are typically low throughout the proposed cap footprint. A core summary table is presented in Attachment 4 and shows the PCB concentrations under the cap to range from < 1 to 40.6 ppm and that the higher concentrations are found deeper in the soft sediment. These concentrations confirm that a B cap is appropriate. In addition, this area is depositional in nature so the risk of PCB release to the aquatic environment from this cap area is extremely low.

5. CAP ARMOR PROPWASH ANALYSES

As a vessel moves through the water, the propeller produces an underwater jet of water, known as propwash. If this jet reaches the bottom, it can contribute to resuspension or erosion of bottom sediment. To properly evaluate the potential erosive impacts of propwash on proposed cap areas, site-specific information regarding the types of vessels and operational procedures should be considered.

Information on the vessels currently operating in the Fox River navigation channel, or likely to operate there in the future, was obtained from the Director of the Port of Green Bay, the Lake Carriers Association, and individual vessel operators. These vessels include those servicing commercial/industrial facilities located as far south as the Fort Howard Turning Basin (FHTB) and along the entire reach of river that extends to Green Bay. A summary of the vessel dimensions and operating data obtained for these vessels is presented in Table 1 in Attachment 5.

In 2015, the Design Team contacted vessel operators, boat captains, and other fleet representatives and requested detailed information regarding the vessel characteristics and their operational procedures within the navigation channel. The information obtained included the engine power applied under various operating conditions, as well as proximity to the side slopes while navigating through the channel. Table 2 in Attachment 5 includes a summary of the information obtained for vessels operating in the navigation channel downstream of the Canadian National Rail Road (CNRR) Bridge, Denmark Spur, which were used in the analyses. Based on the information provided by the boat captains and other vessel operators, as a vessel travels along the centerline of the navigation channel (parallel to the side slopes rather than perpendicular to them), the distance between the bow or stern thruster propeller and the side slope is typically at least 100 feet. However, the vessel operators also indicated that a vessel traveling in the navigation channel could stray beyond the limits of the navigation channel boundary under extreme conditions.

In 2016, the LLC held a WebEx meeting on June 28, 2016, with Captain Joseph Hooker, Captain of the *Great Republic*, and Mr. Ken Gerasimos, Manager of the Great Lakes Fleet. Captain Hooker and Mr. Gerasimos are employees of Key Lakes, a company that operates large vessels such as the *Great Republic* on the Lower Fox River. Prior to the meeting, a list of questions for the vessel operators was provided to Captain Hooker and Mr. Gerasimos. Captain Hooker has maneuvered the *Great Republic* in the navigation channel on many occasions, and agreed to provide insight into vessel straying that could result from extreme conditions. These conditions could be weather-related, such as a strong wind and/or seiche; or caused by the opening of upstream dam gates that could result in strong currents. In summary, Captain Hooker and Mr. Gerasimos stated that vessels could stray beyond the navigation channel limits, but this occurs very infrequently. Captain Hooker noted that contact with the river bottom occasionally happened in the past, but is now avoided. The vessel captains use depth charts from the U.S. Army Corps of Engineers (USACE) and maintain at least 18 inches of under-keel clearance for the vessel in the shallowest portion of the channel in which they will operate for that voyage.

A second meeting was held with Captain Paul Joaquin of Grand River Navigation, who has served as Captain of the Manistee and the Calumet when deliveries were made by those vessels to the Georgia-Pacific (GP) Broadway Street Mill. Captain Joaquin had received the list of questions sent in advance of the meeting and had reviewed the information. He stated that the vessel operators make all reasonable attempts to keep the vessels within the navigation channel limits. However, he also stated that under extreme wind or current conditions the vessels may stray slightly off course. He stated that vessel positions are charted electronically, and they never contact the bottom of the river. They typically maintain an under-keel clearance of 18 to 24 inches in areas of hard bottom and as little as 6 inches in areas of soft bottom.

Meeting notes for these meetings were previously submitted to the Agencies.

5.1 Propwash Evaluation Methodology

The propwash analyses for vessels known to operate in the navigation channel near cap CB60 were performed using methods presented in the U.S. Environmental Protection Agency's (USEPA's) Armor Layer Design appendix to the *Guidance for In-Situ Subaqueous Capping of Contaminated Sediment* (Maynord 1998). These methods are based on the relationships developed by Blaauw and van de Kaa (1978) and Verhey (1983). The USEPA method considers physical vessel characteristics (e.g., propeller diameter, depth of propeller shaft, and total engine horsepower) and operating and site conditions (e.g., applied horsepower and water depth) to estimate propeller-induced bottom velocities at various distances behind the propeller of a maneuvering vessel. The model can be used to predict the particle size that would be stable when subjected to the steady-state (i.e., maneuvering vessel where the speed of the vessel is essentially zero) propwash from the modeled vessel. A steady-state result is considered conservative when evaluating moving vessels within the navigation channel, because the actual propwash effects would only impact localized areas for short durations as the vessel moves.

The vessels operate with various loads and may sit higher in the water when unloaded (if ballast is not used), so a range of under keel clearances above the navigation channel depth was evaluated to assess the changes in potential propwash impacts to the proposed caps. The highest authorized bottom elevation in the navigation channel for vessels traveling near these caps is 553.6 feet NAVD88. While deeper water may exist in some locations, the shallowest authorized depth will limit vessel draft throughout the river. Therefore, an evaluation was performed using a vessel keel elevation of 554.6 feet NAVD88 and a Low Water Datum (LWD) elevation of 577.6 feet NAVD88 to represent a minimum of 1 foot of under keel clearance above the authorized channel elevation of 553.6 feet NAVD88. Additionally, an evaluation was performed with the maximum under keel clearance with the tip of the main engine propeller at the high water conditions elevation of 580.0 feet NAVD88, which results in a keel elevation of approximately 562.75 feet NAVD88. Table 2 presented in the subsequent section summarizes the propwash case evaluated.

The operators of the *Great Republic* indicated that up to 100 percent of the available bow thruster engine power may be used if a vessel starts to stray from the navigation channel. Based on preliminary analyses performed, it was determined that the *Great Republic* had the potential to cause the most significant propwash-induced bottom velocities that could potentially impact proposed caps. Given the significantly higher applied power for this vessel compared to the others, the *Great Republic* vessel was considered to represent a conservative design condition for the assessment of these caps based on the vessel and operational parameters evaluated. This vessel has a 4.8-foot, 1,000-horsepower bow thruster.

6. STABLE PARTICLE SIZE FOR CAP ARMORING

As noted in Section 1, the A/OT directed that straying be assumed to result in a vessel position that is within close proximity to the slope, which would result in significantly larger stone sizes that are impractical to install. Because D50 of 13-inch stone had been previously used elsewhere on the project and was readily available, it was considered a practical armor size for this application. This straying is shown in Attachment 5.

Based on the A/OT's comments, stone with a D_{50} of 13 inches will be used for the slope area and stone with a D_{50} of 6 inches will be used for the top of slope and extend to 45 feet beyond this point. For the remainder of cap CB60, including the area extending back into the abandoned north intake channel, armor stone with a minimum D_{50} of 1.5 inches will be used for the cap. Since even D_{50} of 13 inches armor stone size may be insufficient to completely resist potential prop wash from a vessel in close proximity, the cap CB60 slope area is also considered to be an SRA cap, which is an exception to the standard cap configurations for this project. The initially approved design, based on the A/OT's comments, is presented in Attachment 5.

7. SLOPE STABILITY EVALUATION

During installation of the cap, the filter stone appeared to be missing from approximately mid-slope to the toe of slope, even though about one foot of stone had just been placed. A bulge was also observed at the toe of the slope. This observation was based on a review of post-placement bathymetry by J.F. Brennan. The post-placement bathymetry and isopach map for stone thickness is presented in Attachment 7-1. The material in the bulge was sampled by J.F. Brennan, and was soft sediment. The bulge appeared to be the result of a shallow slope failure or bearing capacity failure due to the inability of the soft sediment to support the weight of the stone.

A dredge slope of 3H:1V is typically stable in soft sediment, provided the slope length is limited and the sediment has sufficient strength. Generally, the longer (i.e., higher) the slope the stronger the sediment, which underlies the placed aggregate of the cap, must be to remain stable. This is shown in the parametric analyses presented in Attachment 7-2. The slope height for cap CB60 is approximately 27 feet. Based on the parametric analyses for dredge slopes, sediment with a slope of this height requires a cohesive strength of approximately 95 pounds per square foot (psf) for a factor of safety of 1.3.

Strength data are not available for the sediments underlying the CB60 slope, so Tetra Tech observed archived intervals of sediment from cores obtained in the area. Where these intervals had sufficient strength, they were remolded and tested using a pocket penetrometer. The intervals observed and strengths noted are summarized in a table in Attachment 7-3. In general, very competent clay was encountered in cores at elevations ranging from approximately 540 to 547 feet NAVD88, with this elevation increasing to the north. In some cores, intervals of sediment just above the clay were soft but slightly more competent that the intervals from approximately the top of core to elevation 545 feet NAVD88, which were very soft. The very soft sediment, which could not be remolded because it had very little strength, was tested with a pocket penetrometer. These intervals are shown with a strength of "0", but likely have some minimal strength in the range of 40 to 100 psf.

A slope stability profile was developed for the soft silty sediment and underlying clay, with estimated properties assigned based on the core observations. Even though a slope failure was not evident in the bathymetry obtained after placement of sand and some stone, it appeared that some sediment movement had occurred and caused a bulge at the toe. This was modeled using initial slope stability runs to estimate the sediment strength that would result in a slope with a low FS of about 1. The resulting strength was approximately 50 psf. This strength was increased slightly to account for some consolidation from loading as the cap is placed. In addition, the strength was increased slightly with depth near the competent clay layer. The strengths used are shown on the slope stability results figure presented in Attachment 7-4. To increase the FS for this slope, the Design Team evaluated various revised slope configurations that would add resistance to failure at the toe of slope, while also gradually reducing the load from the cap. The selected slope configuration included a 10-foot wide bench at elevation 560.5 feet NAVD88, sloping down from the bench at a 6:1 slope to the dredged surface at approximately elevation 549 feet NAVD88. This slope revision includes sand and stone buttress, in addition to the SRA cap, at the toe of slope to provide resistance to further slope failure. The buttress includes sand and filter stone, which will also be covered by D_{50} = 14 inch stone. In addition to the placement of added buttress, the thickness of the large armor stone layer on the top portion of the slope was reduced to a target of 20 inches, with anticipated final thickness of approximately 28 inches. This was done to reduce the driving force for instability due to the weight of the rock on the top portion of the slope. The CB60 SRA cap will continue to be considered an SRA cap that covers the entire slope.

The slope configuration described above had a FS of just over 1.2; however, it is anticipated that this will increase with consolidation of the soft sediment and underlying clay till from the cap load, and from accretion that will take place in this area. This slope poses no risk to human life or upland areas if it were to fail, so a lower FS was deemed appropriate.

8. RECOMMENDATIONS

The Design Team has revised the design to reflect a Type B cap (CB60) in the area near the WPS Pulliam Plant shore and abandoned intake structure; and cap CB60-SRA on the outer slope and 45-foot crest area near the slope, given that WPSC has retired the remaining units at the plant and is now dismantling them. This capping remedy is consistent with the ROD Amendment except that the post cap water depth requirement is not met for type 2 stone and will need to be approved on an exception basis. It's very unlikely the cap would be damaged because there are no plans to dredge near the abandoned north intake channel. Furthermore, the risk of PCB release from the capped area is very low because the area is depositional in nature.

The outer slope was revised again during installation to enhance the stability and prevent a potential slope failure due to the weight of the SRA cap on very weak sediment. The revised slope design is shown on the figure in Attachment 7-5.

Although the assumed vessel straying distance is a low-probability, the recommendations summarized below are based on this low-probability of occurring.

Based on the A/OT directive for the vessel straying scenarios, placement of armor stone over the cap surface could begin on the slope, and proceed as follows:

- Install minimum D_{50} of 13-inch stone for the entire cap CB60-SRA cap slope area;
- Install minimum D_{50} of 6-inch stone for the top of slope area, extending from the top of slope 45 feet back into the slip;
- Install D_{50} of 1.5 inches (B2 cap) for the remaining CB60 cap area.

The portion of CB60 being installed south of the catwalk (abandoned intake structure), shown in Attachment 1, will be installed using a method alternative to the usual broadcasting spreading system. The catwalk blocks the entry to the area by the broadcasting spreading system. An alternative installation method is currently under deliberation and will be finalized at a later date. It should also be noted that there are no chemistry cores south of the catwalk; however, just north of the catwalk there are four cores with PCB concentrations that range from < 1 to 27.9 ppm PCB. Therefore, it is assumed that there may be PCB concentrations that exceed the 1 ppm PCB RAL in the area south of the catwalk.

8. RIPARIAN OWNER CONCURRENCE WITH DESIGN

The design for cap CB60/CB60-SRA in the inactive intake at the WPS site was presented to WPSC during a meeting held on May 21, 2019. Correspondence from WPSC to NCR, dated May 23, 2019 and documenting its acceptance of the capping remedy proposed for the inactive intake, has been added to this memo as Attachment 6.

9. REFERENCES

Blaauw, H.G. and E.J. van de Kaa, 1978. "Erosion of Bottom and Sloping Banks Caused by the Screw Race of Maneuvering Ships." Paper presented at the 7th International Harbour Congress, Antwerp, Belgium. May 22-26, 1978.

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Tetra Tech, Anchor QEA, L.L.C., J.F. Brennan Co, Inc., and Stuyvesant Projects Realization, Inc. (Tetra Tech et al.). 2012. *Lower Fox River Remedial Design, 100 Percent Design Report for 2010 and Beyond Remedial Actions.* October 2012.

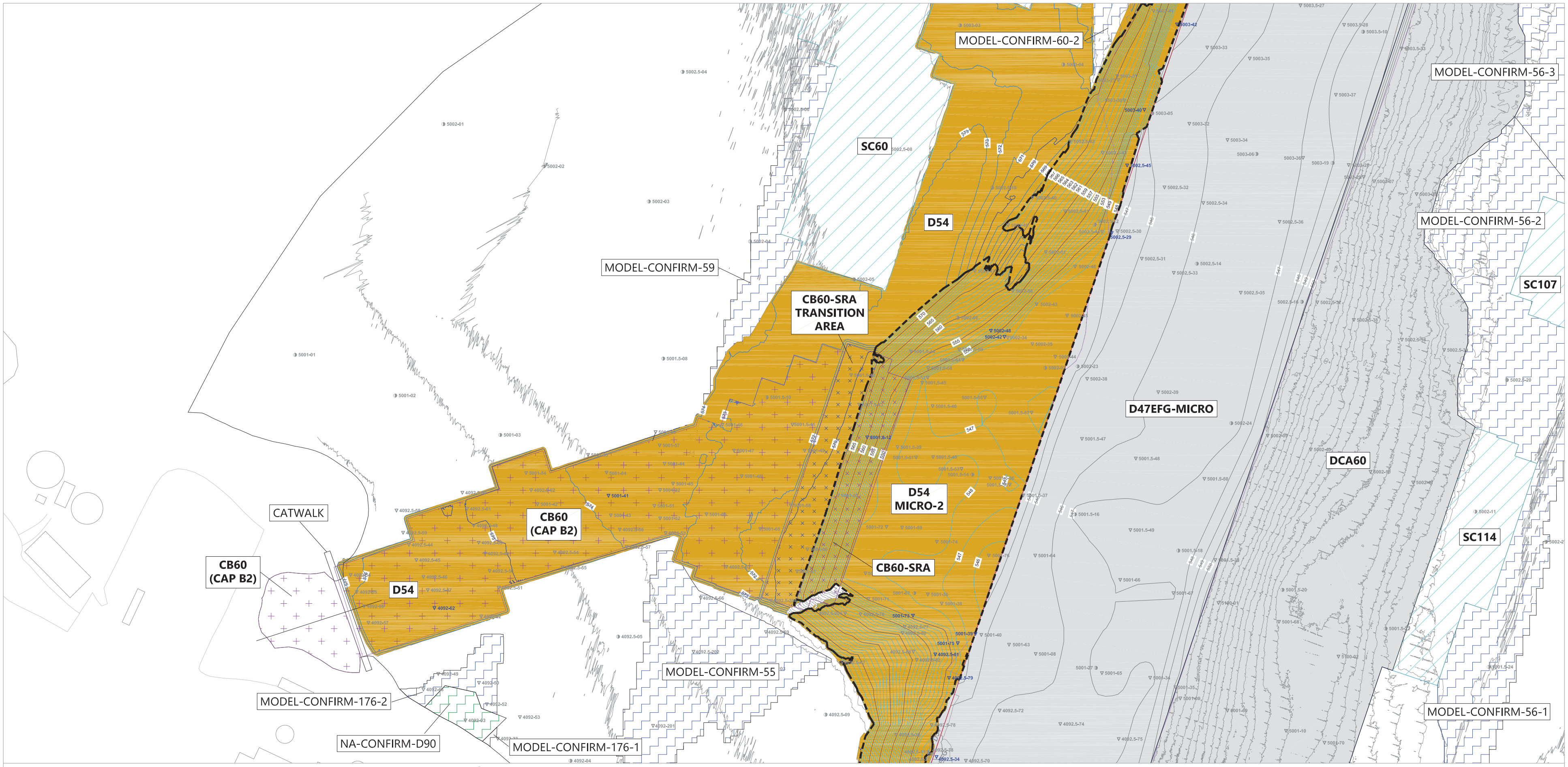
Verhagen, H.J., 2001. "Bowthrusters and the stability of riprap revetments." Proceedings of the 22nd International Conference on Hydrodynamics and Aerodynamics in Marine Engineering. Varna, Bulgaria.

Verhey, H.J., 1983. The Stability of Bottom and Banks Subjected to the Velocities in the Propeller Jet Behind Ships. Delft Publication, No 303, Delft Hydraulics Laboratory, Netherlands.

ATTACHMENT 1

PLAN VIEW CAP CB60 AND CB60-SRA

DRAFT



LEGEND:

HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

—	2019 PRE-CONSTRUCTION BATHYMETRY CONTOURS (1 AND 5 FT. INTERVALS)
—	PROPOSED DREDGING DESIGN CONTOURS (1 AND 5 FT. INTERVALS)
—	SHORELINE
▨	EXISTING DREDGE AREA
▨	PROPOSED DESIGN REFINEMENT DREDGE AREA
+ +	PROPOSED CAP B2 AREA
× ×	PROPOSED CAP B-SRA TRANSITION AREA
▨	PROPOSED CAP B-SRA AREA

0 150
Feet

Publish Date: 2019/07/23 1:20 PM | User: dbinkney
Filepath: \\amesbury1\Greenleaf\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2019\DESIGN\D54\D54 Inactive Intake\Behind the catwalk\Fox-2019-OU5-D54-CB60-Catwalk Area-05142019.dwg AQ-B-Land

ANCHOR QEA

ATTACHMENT 1 - FIGURE 1
OU5-D54-CB60 - PLAN VIEW
2019 DESIGN REFINEMENT
LOWER FOX RIVER REMEDIATION

ATTACHMENT 2

NOTES FROM THE JUNE 10, 2019 OTS MEETING REGARDING CAP CB60 DESIGN

From: George Berken
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law); pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben; Coleman, Bill; Lysne, Bjorn; Weston, Brandon; Jones, Cynthia; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence; Bauer, Eric; Phelps, Gary; Kinnard, Hugh; Francis, Joe; Boreen, Lee; Vandenberg, Luke; Miller, Michelle; Tabatabai, Morey; plarosa@anchorqea.com; Spillers, Paul; ChierVerhagen, Rhonda; Feeney, Richard; Gifford, Ricky; Martin, Sarah; Sharon Kozicki; tara.vanhoof@foth.com; Blackmar, Terri; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth; Nathan Kainz ; Nathan Wyrowski; Rudy Driessen; Sam Crawford
Cc: AgenciesLFRTeam; LFR.OverSightTeam
Subject: 855/830. 87500 OU2-5 - FW: LFRR-19-0111 Technical Memorandum - Proposed Design for Cap CB60 and Modified Cap CB60
Date: Monday, June 10, 2019 4:28:53 PM

Ben, on behalf of the Agencies, the 3:1 slope face of CB60 will be D50 of 13-inches of armor stone, the flat portion of CB60 from the top of the 3:1 slope face for the first approximately 45-feet to the west will be D50 of 6-inches of armor stone, and the remaining portion of the flat area of CB60 will be D50 of 1.5-inches armor stone.

Thanks,
George…

George A. Berken | Engineering Project Manager

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SafeThinking: Our Crusade to Eliminate Accidents

From: Hendron, Ben <Ben.Hendron@tetratech.com>
Sent: Monday, June 10, 2019 2:46 PM
To: George Berken <George.Berken@boldt.com>; william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; brandon.weston@tetratech.com; cynthia.Jones@tetratech.com; dbinkney@anchorqea.com; denis.roznowski@Foth.com; eci.lfrrpc@tetratech.com; eric.bauer@tetratech.com; Phelps, Gary <Gary.Phelps@tetratech.com>; hugh.kinnard@tetratech.com; joe.francis@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; michelle.miller@tetratech.com; morey.tabatabai@tetratech.com; plarosa@anchorqea.com; Spillers,

Paul <Paul.Spillers@tetratech.com>; rhonda.chierverhagen@tetratech.com; richard.feeney@tetratech.com; ricky.gifford@tetratech.com; Martin, Sarah <Sarah.Martin@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>; tara.vanhoof@foth.com
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: RE: 855/830. 87500 OU2-5 - FW: LFRR-19-0111 Technical Memorandum - Proposed Design for Cap CB60 and Modified Cap CB60

George,

This email will document the OTS that was just held between the A/OT, Tara and myself. The CB60/D54 dredge and cap design has 3 distinct portions, a portion that is a type 2 B cap with a bathy offset to accommodate the cap thickness, a portion with a modified B cap with a bathy offset to accommodate the cap thickness, and a portion with a modified B cap that was dredged to slope down from the bathy offset design to the dredge all design. Increasing the D_{50} from 6” to 13” increases the overall modified B cap thickness by approximately 2’. This increase in thickness would create a hump where there is a modified B cap with a bathy offset because the offset design would only accommodate the D_{50}=6” stone. It was agreed to leave that portion of the modified B cap with a D_{50}=6” to avoid creating a hump.

Please let me know if I have accurately captured our OTS in this email.

Thanks,

Ben

From: George Berken <George.Berken@boldt.com>
Sent: Thursday, May 30, 2019 11:41 AM
To: william.hartman@glatfelter.com; bryan.heath@ncr.com; jlawson@project-control.com; jheyde@Sidley.com; Davis, Michael (GP Law) <jmdavis@gapac.com>; pamontne@gapac.com; roger.kaminski@gapac.com; soconnell@project-control.com; Hendron, Ben <Ben.Hendron@tetratech.com>; Coleman, Bill <Bill.Coleman@tetratech.com>; Lysne, Bjorn <Bjorn.Lysne@tetratech.com>; Weston, Brandon <Brandon.Weston@tetratech.com>; Jones, Cynthia <Cynthia.Jones@tetratech.com>; dbinkney@anchorqea.com; denis.roznowski@Foth.com; ECI.LFRR Project Correspondence <ECI.LFRRPC@tetratech.com>; Bauer, Eric <Eric.Bauer@tetratech.com>; Phelps, Gary <Gary.Phelps@tetratech.com>; Kinnard, Hugh <Hugh.Kinnard@tetratech.com>; Francis, Joe <Joe.Francis@tetratech.com>; Boreen, Lee <Lee.Boreen@tetratech.com>; Vandenberg, Luke <Luke.Vandenberg@tetratech.com>; Miller, Michelle <Michelle.Miller@tetratech.com>; Tabatabai, Morey <Morey.Tabatabai@tetratech.com>; plarosa@anchorqea.com; Spillers, Paul <Paul.Spillers@tetratech.com>; ChierVerhagen, Rhonda

<Rhonda.ChierVerhagen@tetratech.com>; Feeney, Richard <Richard.Feeney@tetratech.com>; Gifford, Ricky <ricky.gifford@tetratech.com>; Martin, Sarah <Sarah.Martin@tetratech.com>; tara.vanhoof@foth.com; Blackmar, Terri <Terri.Blackmar@tetratech.com>; tgawronski@foth.com; dbauman@jfbrennan.com; gsmith@jfbrennan.com; Martijn Luth <martijn.luth@boskalis.com>; Nathan Kainz <nkainz@jfbrennan.com>; Nathan Wyrowski <nwyrowski@jfbrennan.com>; Rudy Driessen <rudy.driessen@boskalis.com>; Sam Crawford <scrawford@jfbrennan.com>
Cc: AgenciesLFRTeam <agencieslfrteam@boldt.com>; LFR.OverSightTeam <LFR.OverSightTeam@boldt.com>
Subject: 855/830. 87500 OU2-5 - FW: LFRR-19-0111 Technical Memorandum - Proposed Design for Cap CB60 and Modified Cap CB60

Ben, on behalf of the Agencies, the technical memorandum, submitted in your email below for cap CB60 and modified cap CB60, is acceptable with the following comments being adequately addressed. Submit in draft final form by addressing the following comments.

1. Change the “Modified Cap CB60” designation to an SRA cap because of the potential of vessel straying beyond the original assumptions presented in the TM.
2. Change the D50 6-inch armor layer for the “Modified Cap CB60” to D50 13-inch, to provide more protective armor layer due to vessel straying assumptions identified in item 3 below.
3. Modify the technical memorandum explaining the reason(s) the “Modified Cap CB60” is designated an SRA cap. Reference the attached file *(Attachment 5_Fox River-D54-CB60-Propwash Evaluation-05022019 BERKEN.pdf)* showing the various positions a vessel can achieve that shows bow and stern propwash that are very close to the “Modified Cap CB60).

Thanks,
George…

BOLDT

George A. Berken | Engineering Project Manager

P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

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From: Hendron, Ben <Ben.Hendron@tetratech.com>
Sent: Tuesday, May 28, 2019 5:05 PM

To: George Berken <George.Berken@boldt.com>; Kincaid, Gary W - DNR (Gary.Kincaid@Wisconsin.gov) (Gary.Kincaid@Wisconsin.gov) <Gary.Kincaid@Wisconsin.gov>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; Larry DeBruin <Larry.Debruin@Boldt.com>; Ava Grosskopf <Ava.Grosskopf@boldt.com>
Cc: Gawronski, Troy A <Troy.Gawronski@Foth.com>; jlawson@project-control.com; bryan.heath@ncr.com; soconnell@project-control.com; bill.coleman@tetratech.com; bjorn.lysne@tetratech.com; Boreen, Lee <Lee.Boreen@tetratech.com>; Blackmar, Terri <Terri.Blackmar@tetratech.com>; morey.tabatabai@tetratech.com; ricky.gifford@tetratech.com; dbinkney@anchorqea.com; eci.lfrrpc@tetratech.com; Database User <database@project-control.com>; roger.kaminski@gapac.com; pamontne@gapac.com; Davis, Michael (GP Law) <jmdavis@gapac.com>
Subject: LFRR-19-0111 Technical Memorandum - Proposed Design for Cap CB60 and Modified Cap CB60

George,

Attached is a technical memorandum on the design of CB60 and modified CB60. The technical memorandum also covers, in the recommendations section, the capping south of the catwalk near the abandoned WPS intake. Please review the attached and let me know if the A/OT has any comments.

Thanks,

Ben Hendron | Civil Engineer
Office: 920-445-0715
Ben.Hendron@tetratech.com

Tetra Tech | Fox River Site
1611 State Street | Green Bay, WI 54304 | www.tetratech.com

ATTACHMENT 3

2017 ANNOUNCEMENT THAT THE PULLIAM PLANT IS PLANNED TO BE RETIRED

WPS shutting down coal-powered Pulliam Plant

By Jeff Alexander | Posted: Thu 3:50 PM, Nov 30, 2017 | Updated: Thu 5:35 PM, Nov 30, 2017

GREEN BAY, Wis. (WBAY) - After 90 years in operation, the coal-fired Pulliam power plant in Green Bay is set to be retired.

Pulliam Power Plant in Green Bay (WBAY file photo)

"Really, this is part of our parent company WEC Energy Group's overall efforts to reshape its generation fleet for a clean, reliable energy future," WPS spokesman Matt Cullen said.

Cullen says a number of factors played into the decision to retire the plant late next year or in early 2019.

"Natural gas prices have been sustainably low. We've also had reduced costs, a dramatic reduction in cost, for renewable generation such as utility scale solar and wind energy, and also customer demand, there's been limited to no growth in electricity demand by customers."

The plant was built in 1927 at the mouth of the Fox River.

At its peak, the power plant was home to eight coal-fueled electric generating units.

Today only two remain in operation, producing more than 200 megawatts of electricity.

As for what options will be available for the 46 employees who work at the plant -- or the property that borders the Fox River and Bay of Green Bay- - Cullen says those have yet to be determined.

"I's early on in the process of retiring those two units at the Pulliam Power Plant, and we're still working on a final disposition of the site."

Since 1998, the Pulliam plant has also been home to nesting peregrine falcons. WPS says after this coming spring it will work with a falcon expert to make sure other nesting boxes are located nearby.

ATTACHMENT 4

PCB CONCENTRATIONS BELOW THE PROPOSED CAP

CB60

Core ID	4092-54	4092-55	4092-56	4092-57	4092.5-44	4092.5-45	4092.5-46	4092.5-47	4092-62	4092.5-61	4092.5-48	4092.5-39	4092.5-49	4092.5-50	4092.5-51	5001-54	4092.5-62	5001-42	4092.5-52	4092.5-53	4092.5-54	4092.5-55	5001-04	5001-41	5001-43	4092.5-56	4092.5-57
DE	576.30	575.95	575.82	575.70	575.17	575.10	575.21	575.30	575.30	574.98	575.02	575.10	575.10	575.10	575.13	574.41	574.50	574.58	574.66	574.68	574.70	574.80	573.70	573.82	573.89	573.88	574.02
Bathy	577.60	577.26	577.11	576.98	576.55	576.54	576.57	576.57	576.57	576.28	576.35	576.38	576.36	576.42	576.43	575.68	575.84	575.89	575.94	575.96	576.01	576.00	574.96	575.08	575.19	575.16	575.27
EOC	569.60	561.70	559.08	568.44		566.49	568.54	566.85		576.01	568.83	568.66	565.29	566.77			573.85	570.18	566.40	566.02	565.35				565.39	569.06	
Refusal	554.60	554.60	552.08	554.54		554.49	557.54	559.35		573.51	559.33	561.16	561.29	560.77	574.36	573.39	572.85	560.68	562.90	562.02	562.85	573.87		561.75	561.89	562.06	573.52
Elevation																											
578.0																											
577.5	**TOC**	**TOC**																									
577.0	0.0282	0.0275	**TOC**	**TOC**				**TOC**							**TOC**												
576.5			0.0378	0.0435	**TOC**	**TOC**	**TOC**		**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	0.0268/0.025							**TOC**					
576.0	0.121	0.0251			0.316				0.025	1.72/1.36		0.0251			0.0347	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	**TOC**	0.025					
575.5			0.0389	0.0804					0.0953	0.441					0.169	0.0449/0.0385						0.0662					**TOC**
575.0	0.0555	0.0664			0.195				0.146/0.211	0.64		0.0419			0.025							0.126	**TOC**	**TOC**	**TOC**	**TOC**	0.0517
574.5			0.163	0.197					0.921						0.0251		10.6/10.7					0.0251	0.025	0.047			0.0558/0.0599
574.0	1.01	0.31/0.339			0.0697				2.01			0.339				0.025	8.4						0.17	0.138		0.0371	0.1
573.5	0.734	0.203	0.129/0.131	0.712	0.0251				5.76	0.0251						0.0252	0.0251						0.54/0.025	0.172			
573.0	0.96	0.296	0.184	0.481/0.515	0.025							0.213											0.27	0.227		0.164	
572.5	1.03/1.14	0.693	0.363	1.52	0.0251						1.2	1.21											0.46/0.0251	0.453			
572.0			0.437	1.36	0.0251							1.7/1.46												0.562		0.957	
571.5	1.37				0.0251						2.79/0.724	2.76							0.388	0.636			0.025	0.974			
571.0					0.0251		2.82	4.37				1.59/1.71	1.15					2.01						1.11/2.06	1.12	3.53	
570.5	1.69			5.11	0.025	8.58					3.15/4.77	2.97		1.13				7.02	0.219	1.06	2.87		0.025	4.69			
570.0					0.025		3.46	11.6				3.24	3.77					5.87						2.44/2.76	5.38	11	
569.5	3.84			2.39		9.66					1.97			0.869				0.033		2.9	4.32		0.0252	4.06/4.47			
569.0	0.189						2.97	13.3			1.15	7.63	2.18					0.759	3.99				0.0252	10.3/0.0251	4.02	2.27	
568.5	0.118			1.28		3.22	6.16				0.0253	4.21		1.33							7		0.0251	14.4		0.0357	
568.0				0.151			0.465	18.6				0.612	9.22					0.0258	19.2	5.63					2.4	0.0252	
567.5	0.0376					0.371					0.0254			7.27							11.3						
567.0	0.0325			0.0279			0.0256	7.71				0.64		15.2				0.0255	10.7	7.06					5.97		
566.5				0.03		1.32		0.965			0.0256	0.0251	5.67	0.14					1.15		1.52						
566.0	0.0252					0.168	0.0256	0.889			0.0252	0.0252						0.0256	0.255	10.1					7.55		
565.5	0.0254			0.0574		0.0366	0.0252	0.525			0.0251		6.18	0.0256				0.025	0.0251	0.025	3.17				1.4		
565.0						0.0251	0.0252	0.0252			0.0251		0.0252	0.0252				0.025	0.0251	0.0251	0.0251				0.0252		
564.5	0.0255			0.0587		0.0252							0.0252	0.0252													
564.0		20.2																									
563.5	0.0256		7.97	0.0253																							
563.0		9.75																									
562.5	0.0256		27.9	0.0252																							
562.0		8.16																									
561.5	0.0262	1.64		0.0252																							
561.0		0.492	16.3	0.0251																							
560.5	0.0254			0.025																							
560.0	0.0252	0.165	10.2																								
559.5	0.0251																										
559.0		0.0314	1.77																								
558.5		0.0251	0.768																								
558.0		0.0251	0.115																								
557.5			0.025																								
557.0			0.0251																								
556.5																											
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Created By: B. Hendron
Reviewed By: T.Blackmar
Date: 5/13/2019

CB60

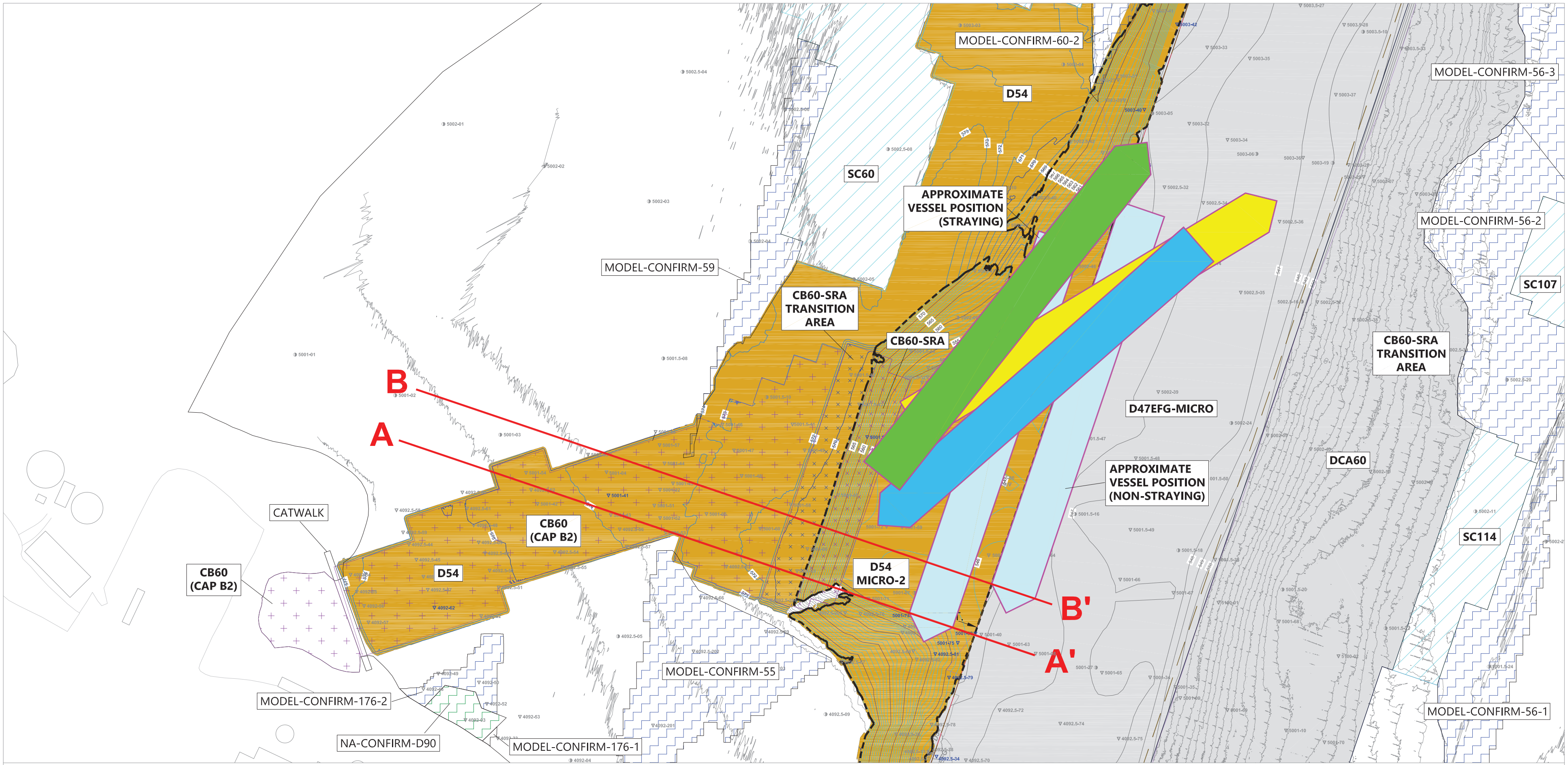
Core ID	5001-57	5001-44	5001-45	5001-22	5001-51	5001-52	5001-53	5001-05	4092.5-63	5001-60	5001-58	5001-46	5001-47	5001-48	5001.5-10	5001.5-41	5001-49	5001.5-42	5001.5-43	5001.5-12	4092.5-204	5001-61	5001-06	5001-50
DE	573.30	573.14	573.10	573.29	573.31	573.26	573.26	572.90	572.30	571.90	571.19	573.07	572.89	572.70	572.89	572.70	572.50	570.69	569.50	559.55	570.38	569.50	569.50	563.50
Bathy	574.57	574.50	574.41	574.55	574.63	574.53	574.48	574.20	573.61	573.18	573.19	574.36	574.17	574.00	574.17	-99999.00	573.84	573.67	569.19	559.09	573.41	569.98	569.19	562.52
EOC		570.83	567.81	567.43	568.32	569.87	573.16		569.54	550.02	554.37	573.67	566.70	561.10	573.77	563.35	550.69	571.06	560.41		572.32	555.26	547.73	552.05
Refusal	571.71	560.83	562.31	571.54	563.32	563.37	571.66	563.79	561.04	546.02	541.87		560.20	557.10		550.85	540.69	545.56	550.41	550.02	560.82	536.26	535.23	535.55
Elevation																								
578.0																								
577.5																								
577.0																								
576.5																								
576.0																								
575.5																								
575.0	TOC		TOC																					
574.5	0.025/0.025	TOC		TOC	TOC	TOC	TOC	TOC							TOC									
574.0	0.0251			0.06		0.0497	0.068					TOC	TOC	TOC	13.1	TOC		TOC						
573.5	0.0252			0.24			0.162	0.17/0.114	TOC			1.89	0.0441	0.0632	0.02	3.93	TOC	3.36	TOC	TOC	TOC			
573.0			0.785	0.506/0.202	0.191	0.184	2.46	0.43	0.245	TOC	TOC	0.189					0.0973/0.0911		0.274	0.38	0.695/0.311	TOC	TOC	
572.5		0.35		0.598			0.625	0.49/2.6/3.38				0.025/0.025	0.796	0.361		8.03		10.8/22.6		0.49/0.41	2.66/1.43		0.43	TOC
572.0		8.27	2.34		0.481		0.0254	0.64/4.47/0.0253	1.05								0.464	8.81	0.841/1.02	0.379	0.0251/0.665		0.58	0.442
571.5				3.02		4.56		3.2/4.58				0.025	0.396/8.73	0.764		3.85		10.7/15.3		0.506	0.025/0.025			
571.0		2.06	7.58		1.89			7.8/0.6/2.45	5.45			0.025/0.025					0.803/0.967	4.62	1.37/1.56	0.562	0.025		1.1	0.382
570.5		0.0674		4.66		7.36		5.9/0.0252				0.0251	1.59/10.4	1.86		0.439/0.568		0.471/0.025		0.579	0.91		0.88	
570.0		0.0279			4.59	6.57		6.1	2.31								1.29	0.191	3.3	1.06			0.8	0.507
569.5			5.94	3.61		0.0251		3.1	1.63				1.57/15.6	3.49		4.46				0.327			0.87	
569.0		0.0252/0.0404			9.72				0.0251							8.41	3.04	0.0911	4.12	0.976			0.721	0.778/0.789
568.5		0.025	12.6	24.2	2.87								10.1/11.6	4.03		0.526				0.852				
568.0		0.0443	2.4		0.0254									3.56		5.02/5.5	2.98	0.445	7	1			0.949/0.982	1.01
567.5			0.11	2.59	0.0251								8.16/10.9						6.96	1.15				
567.0		0.0252	0.0251	0.0252												23.8	3.09			1.3			1.09/1.31	1.24/1.25
566.5		0.0252	0.0252										7.32	4.27						1.35				1.19
566.0													0.914			9.25				0.933			1.74	
565.5													0.025	2.69					8.87	0.944			1.44	
565.0																7.33							2.05	
564.5														5.95					13					
564.0																6.2								
563.5														6.42		1.81			26.7					
563.0																0.0251								
562.5														6.6					8.61					
562.0																								
561.5														5.54					15.7					
561.0														4.54										
560.5														0.042					14.6					
560.0											4.89								0.256					
559.5																								
559.0											4.93											7.6		
558.5																								
558.0											4.16											9.96		
557.5																								
557.0											9.08											12.4		3.77
556.5																				3.14				
556.0											3.05						7.57					40.6		5.69
555.5										2.71										1.84		4.84		
555.0											4.79						8.27					0.798		9.28
554.5										4.84	2.67									3.28				
554.0											0.0252						14.4					0.374		8.71
553.5										10.7										3.41		0.933		
553.0																	15.6					0.0763	11.2	7.75
552.5										6.55										6.32				
552.0																	5.16						8.96	3.51
551.5																				9.2				0.0383
551.0										10.9										11.4			8.58	
550.5																	5.6							
550.0										8.03							0.0404						9.14	
549.5										0.0252														
549.0																							6.69	
548.5																								
548.0																							10.8	
547.5																							6.54	
547.0																							0.0512	
546.5																								

Legend

TOC	Top of Core
▨	Approximate elevation of most recent bathymetry. (Either 2019 pre-season or post dredge)
░	Approximate elevation of contamination.
▩	Approximate cap/cover elevation.
—	Approximate elevation of refusal.

ATTACHMENT 5

A/OT-DIRECTED STRAYING AND CAP DESIGN FOR CB60 AND CB60-SRA



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

NOTES:
1. VESSEL REPRESENTS AN APPROXIMATION OF THE M/V GREAT REPUBLIC.

LEGEND:

—	2019 PRE-CONSTRUCTION BATHYMETRY CONTOURS (1 AND 5 FT. INTERVALS)
—	PROPOSED DREDGING DESIGN CONTOURS (1 AND 5 FT. INTERVALS)
—	SHORELINE
▨	EXISTING DREDGE AREA
▨	PROPOSED DESIGN REFINEMENT DREDGE AREA
+	PROPOSED CAP B2 AREA
×	PROPOSED CAP B-SRA TRANSITION AREA
×	PROPOSED CAP B-SRA AREA

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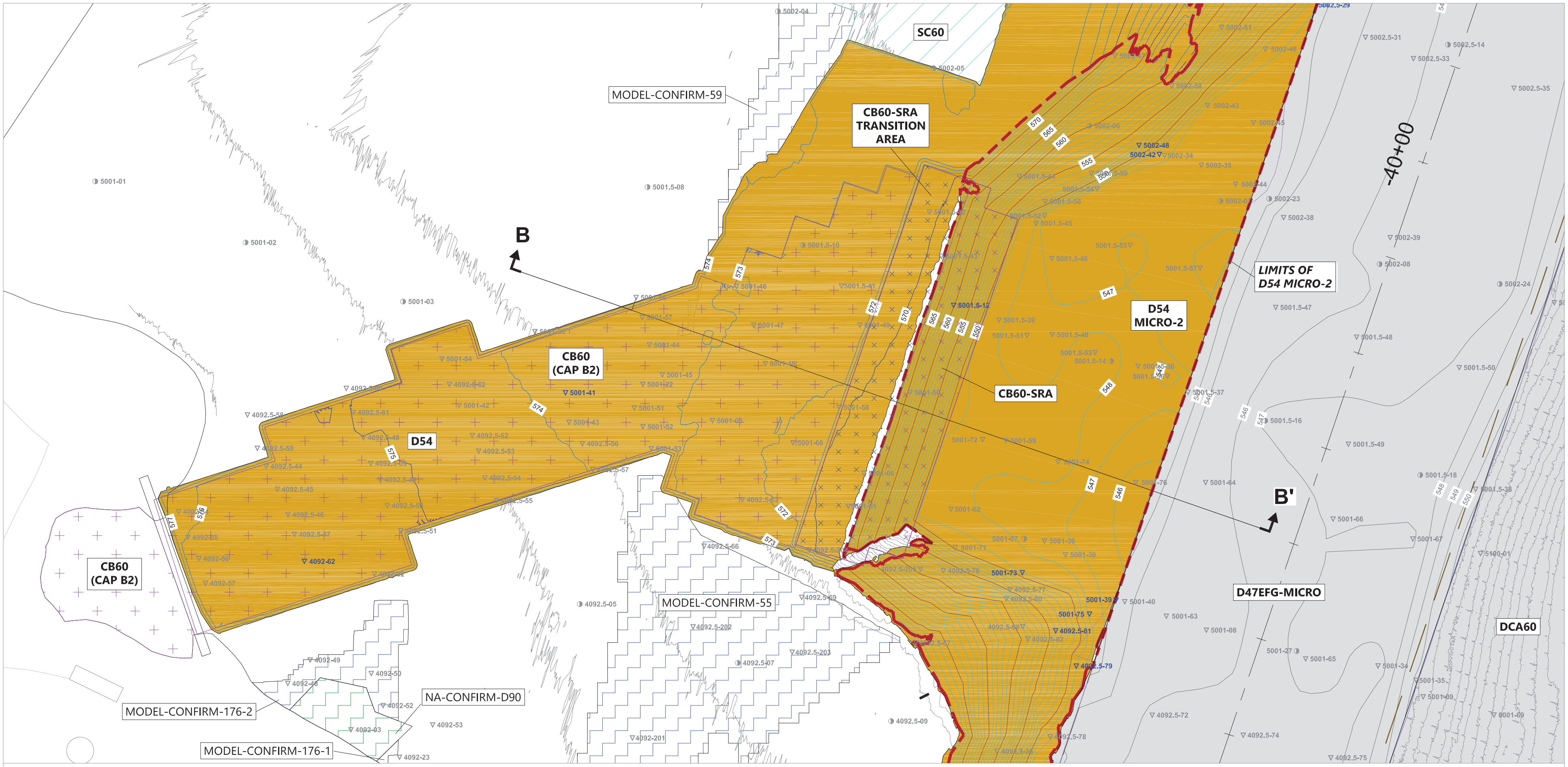
ATTACHMENT 5 - FIGURE 1
OU5-D54-CB60 PROPWASH EVALUATION - PLAN VIEW

2019 DESIGN REFINEMENT
LOWER FOX RIVER REMEDIATION

DRAFT



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

- 2019 PRE-CONSTRUCTION BATHYMETRY CONTOURS (1 AND 5 FT. INTERVALS)
- PROPOSED DREDGING DESIGN CONTOURS (1 AND 5 FT. INTERVALS)
- SHORELINE
- EXISTING DREDGE AREA
- PROPOSED DESIGN REFINEMENT DREDGE AREA
- PROPOSED CAP B2 AREA
- PROPOSED CAP B-SRA TRANSITION AREA
- PROPOSED CAP B-SRA AREA

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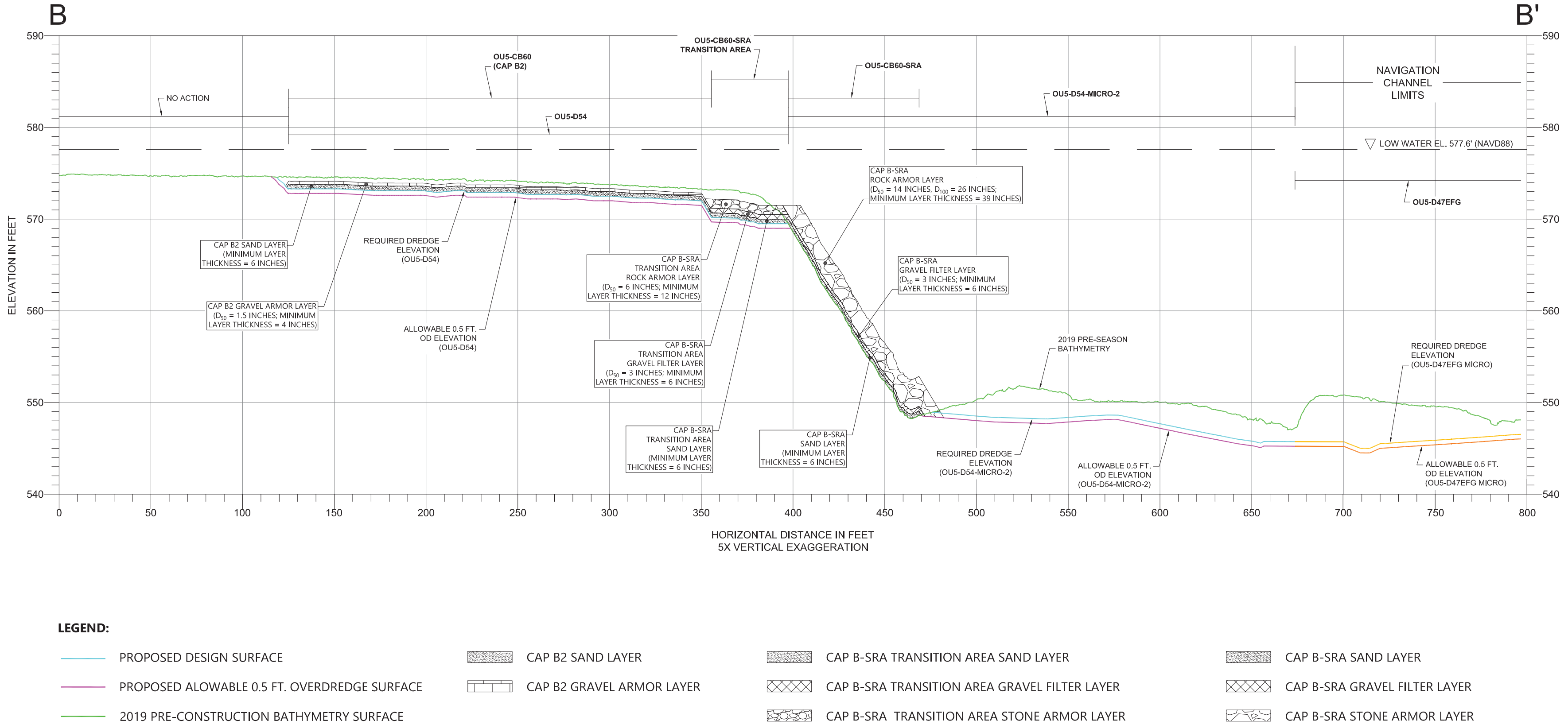
FIGURE 1
D54 MICRO & CB60 PLAN VIEW
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION

DRAFT



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VERTICAL DATUM: NAVD88, FEET.

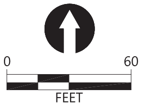

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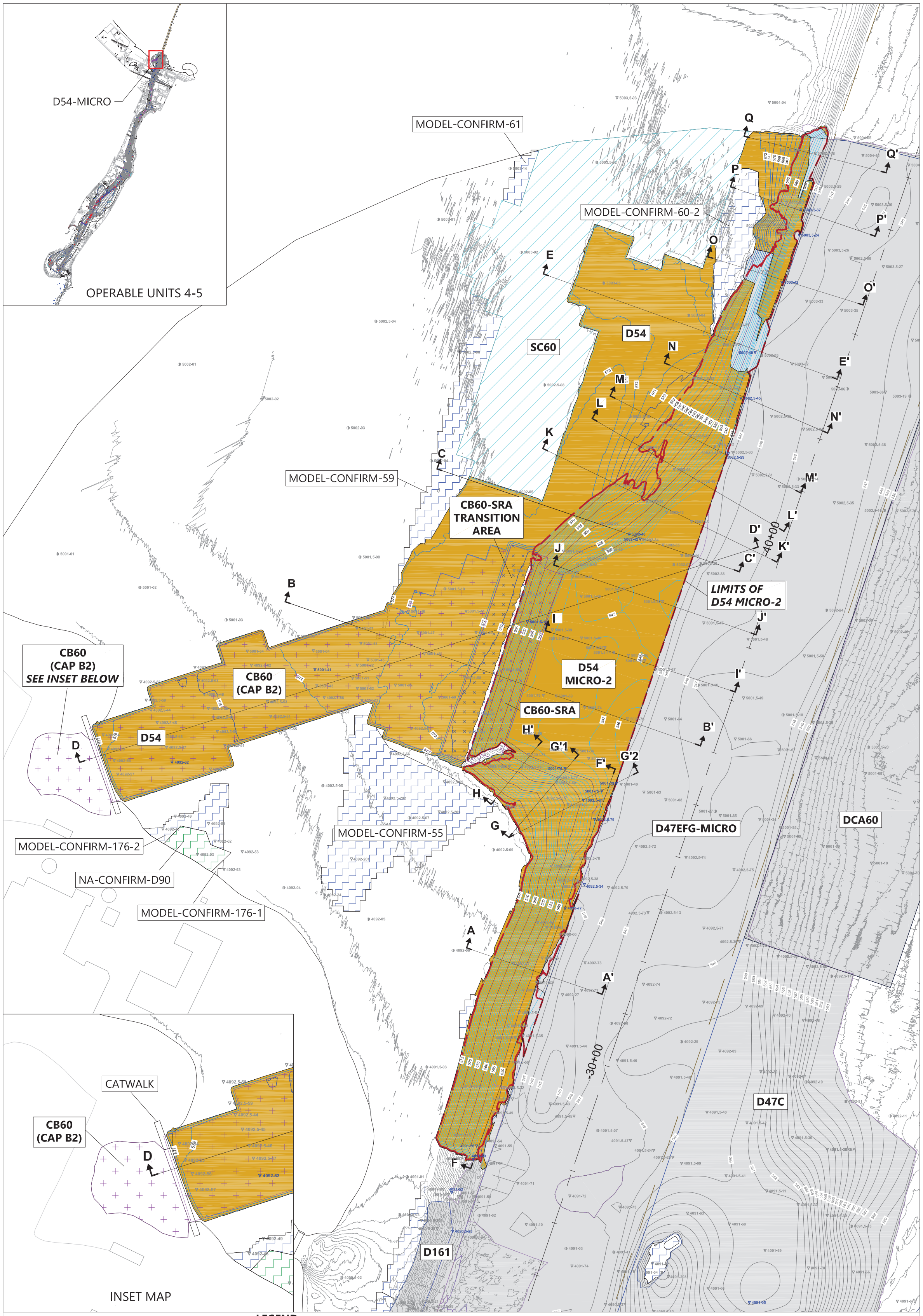
FIGURE 2
SECTION B-B'

DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



LEGEND:

HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

—	2019 PRE-CONSTRUCTION BATHYMETRY CONTOURS (1 AND 5 FT. INTERVALS)
—	PROPOSED DREDGING DESIGN CONTOURS (1 AND 5 FT. INTERVALS)
▨	EXISTING DREDGE AREA
▨	PROPOSED DESIGN REFINEMENT DREDGE AREA
+ +	PROPOSED CAP B2 AREA
× × ×	PROPOSED CAP B-SRA TRANSITION AREA
× × ×	PROPOSED CAP B-SRA AREA

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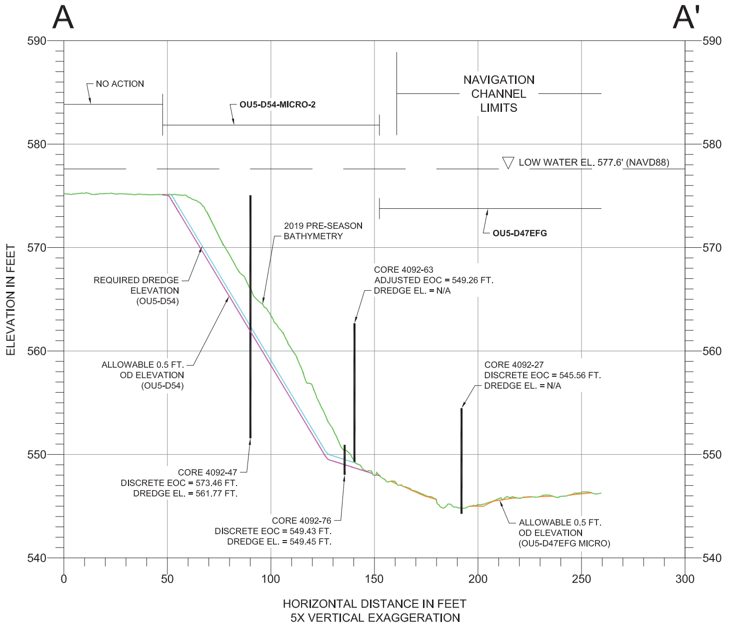
FIGURE 1
D54-MICRO PLAN VIEW
DESIGN REVIEW DOCUMENT DCA60-MICRO
LOWER FOX RIVER REMEDIATION

DRAFT



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

- PROPOSED DESIGN SURFACE
- PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
- 2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
- ADJACENT DREDGE AREA DESIGN SURFACE
- ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

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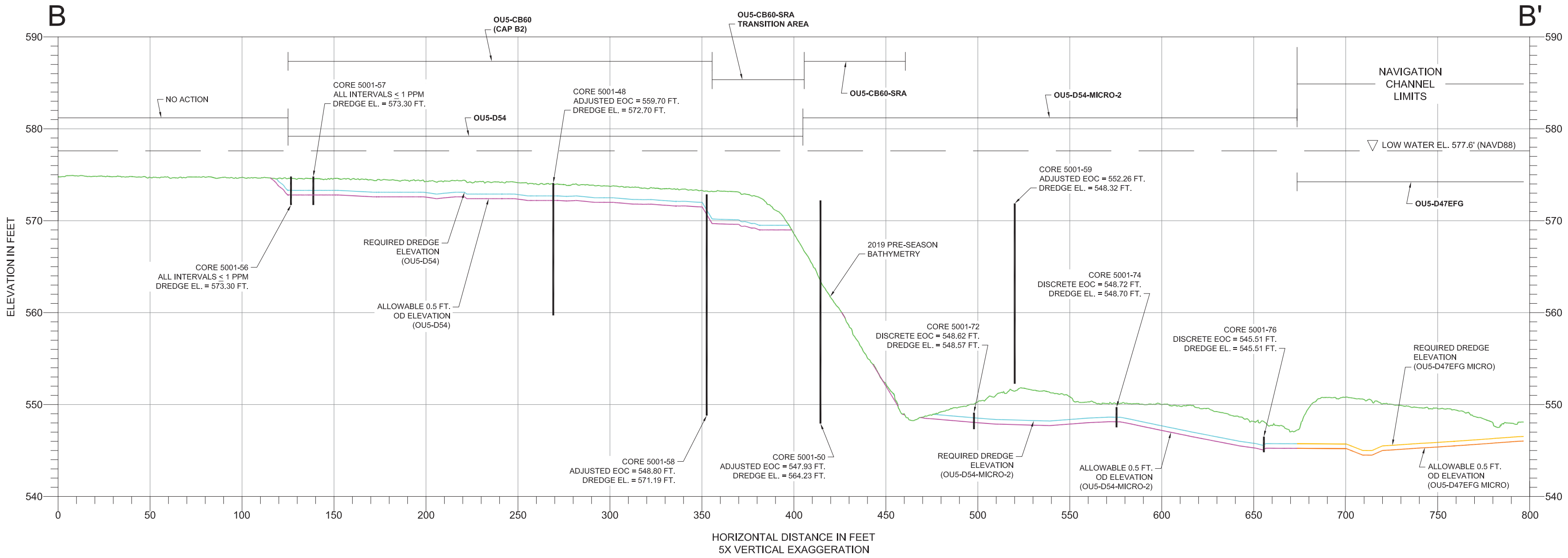
FIGURE 2
SECTION A-A'
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE,
NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

- PROPOSED DESIGN SURFACE
- PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
- 2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
- ADJACENT DREDGE AREA DESIGN SURFACE
- ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

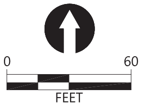


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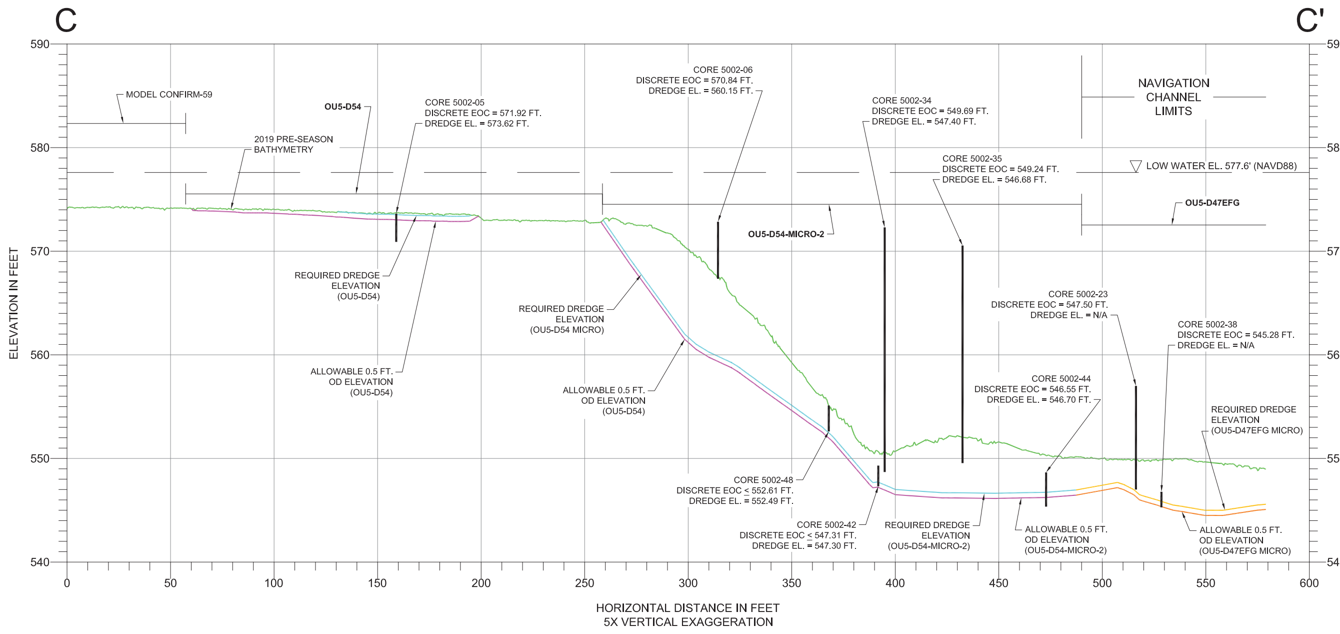
FIGURE 3
SECTION B-B'

DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION

DRAFT



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

- PROPOSED DESIGN SURFACE
- PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
- 2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
- ADJACENT DREDGE AREA DESIGN SURFACE
- ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

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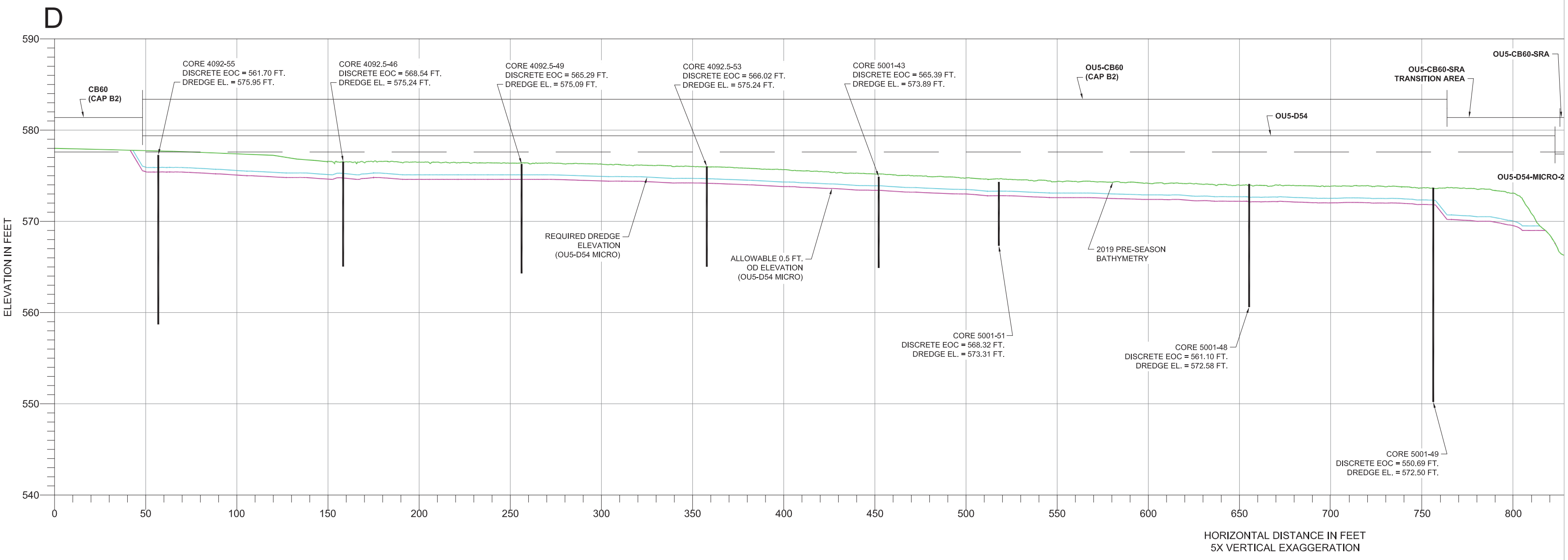
FIGURE 4
SECTION C-C'

DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



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VERTICAL DATUM: NAVD88, FEET.

LEGEND:

PROPOSED DESIGN SURFACE	ADJACENT DREDGE AREA DESIGN SURFACE
PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE	ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE
2019 PRE-CONSTRUCTION BATHYMETRY SURFACE	

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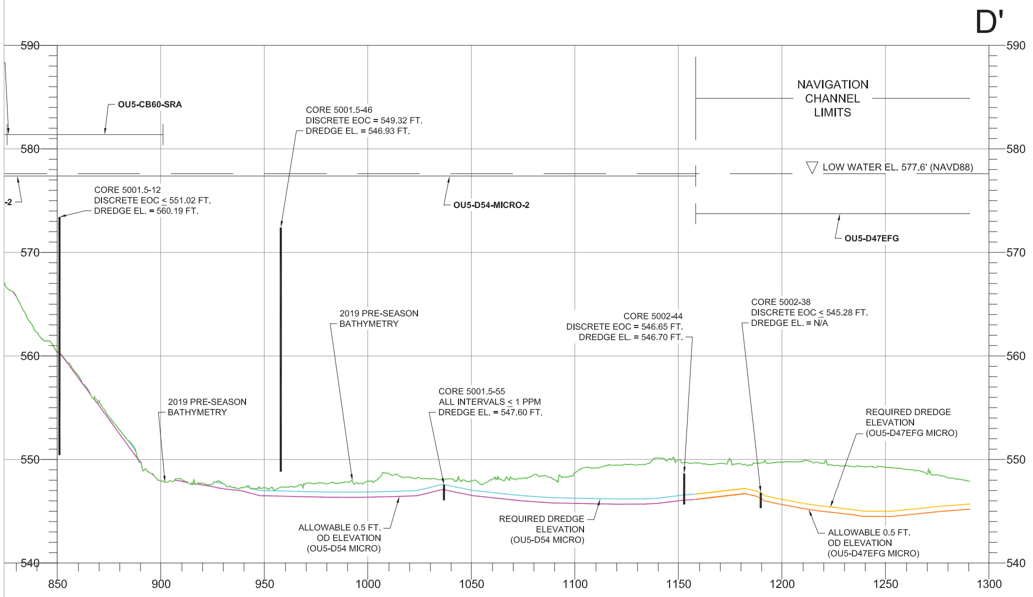
FIGURE 5
SECTION D-D' (CONTINUED ON NEXT FIGURE)
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

—	PROPOSED DESIGN SURFACE
—	PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
—	2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
—	ADJACENT DREDGE AREA DESIGN SURFACE
—	ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

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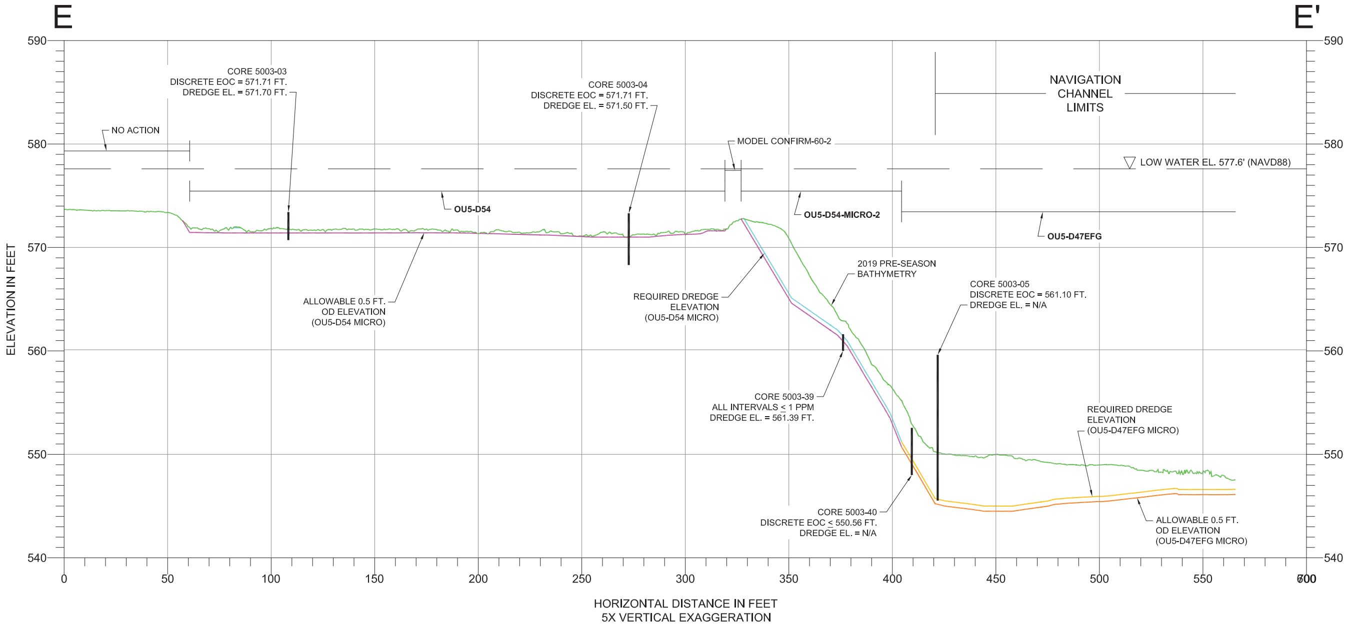
FIGURE 6
SECTION D-D' (CONTINUED ON PREVIOUS FIGURE)
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE,
NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

🟦	PROPOSED DESIGN SURFACE
🟪	PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
🟩	2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
🟨	ADJACENT DREDGE AREA DESIGN SURFACE
🟧	ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

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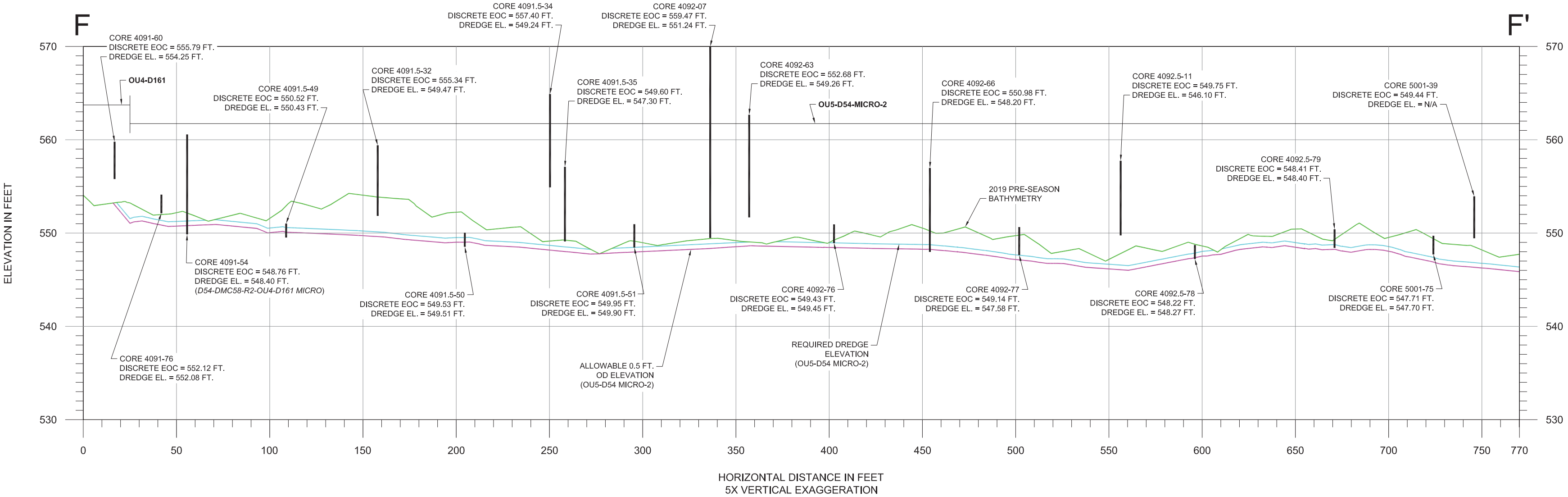
FIGURE 7
SECTION E-E'
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

- PROPOSED DESIGN SURFACE
- PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
- 2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
- ADJACENT DREDGE AREA DESIGN SURFACE
- ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

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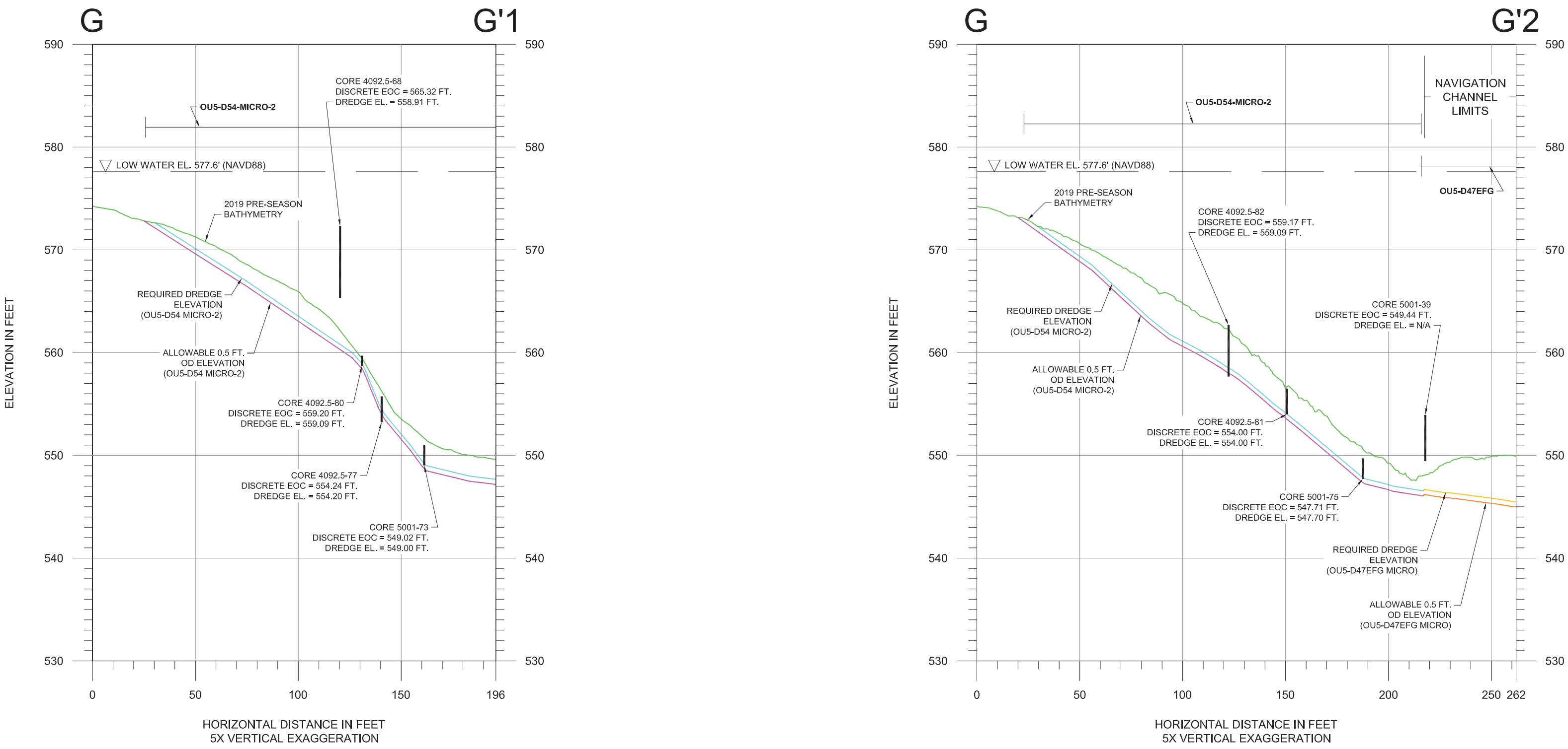
FIGURE 8
SECTION F-F'
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE,
NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

- PROPOSED DESIGN SURFACE
- PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
- 2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
- ADJACENT DREDGE AREA DESIGN SURFACE
- ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

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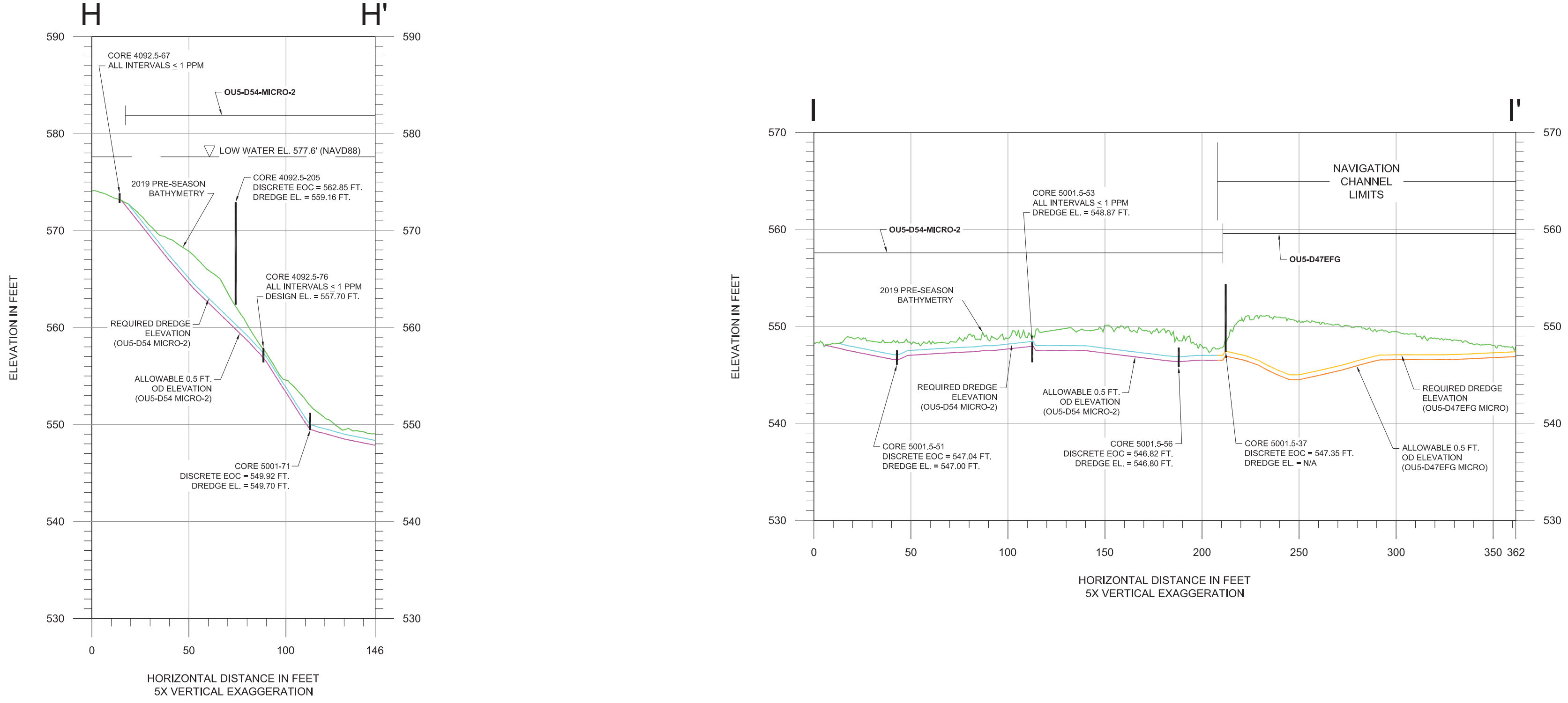
FIGURE 9
SECTIONS G-G'1 & G-G'2

DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



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VERTICAL DATUM: NAVD88, FEET.

LEGEND:

PROPOSED DESIGN SURFACE
PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
ADJACENT DREDGE AREA DESIGN SURFACE
ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

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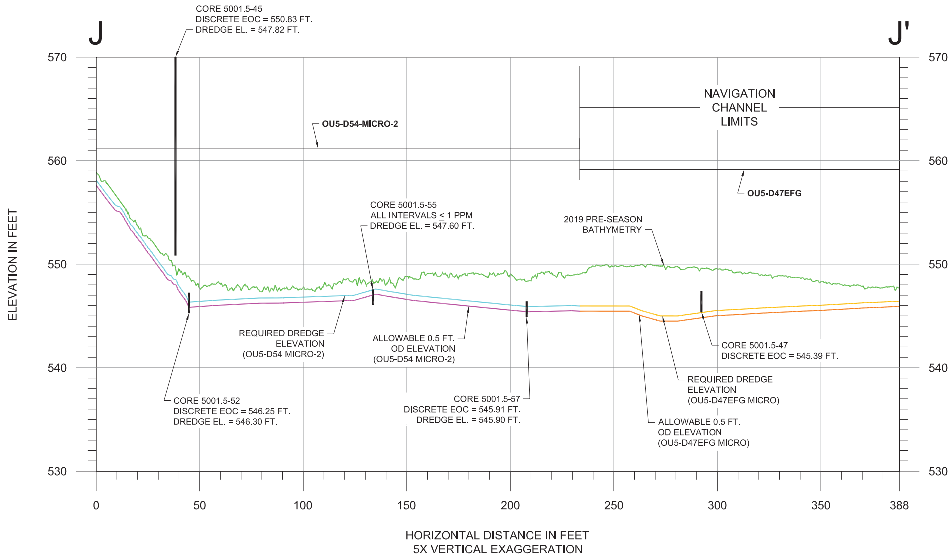
FIGURE 10
SECTIONS H-H' & I-I'
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

- PROPOSED DESIGN SURFACE
- PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
- 2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
- ADJACENT DREDGE AREA DESIGN SURFACE
- ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

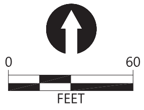


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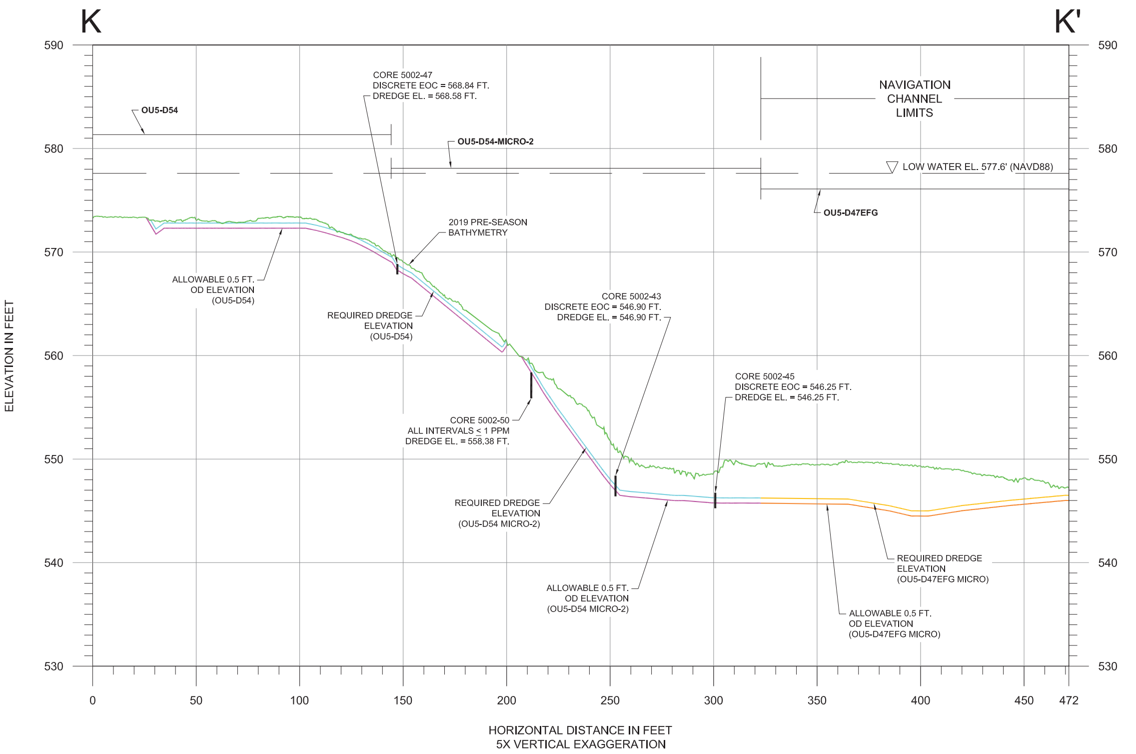
FIGURE 11
SECTION J-J'
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

- PROPOSED DESIGN SURFACE
- PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
- 2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
- ADJACENT DREDGE AREA DESIGN SURFACE
- ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

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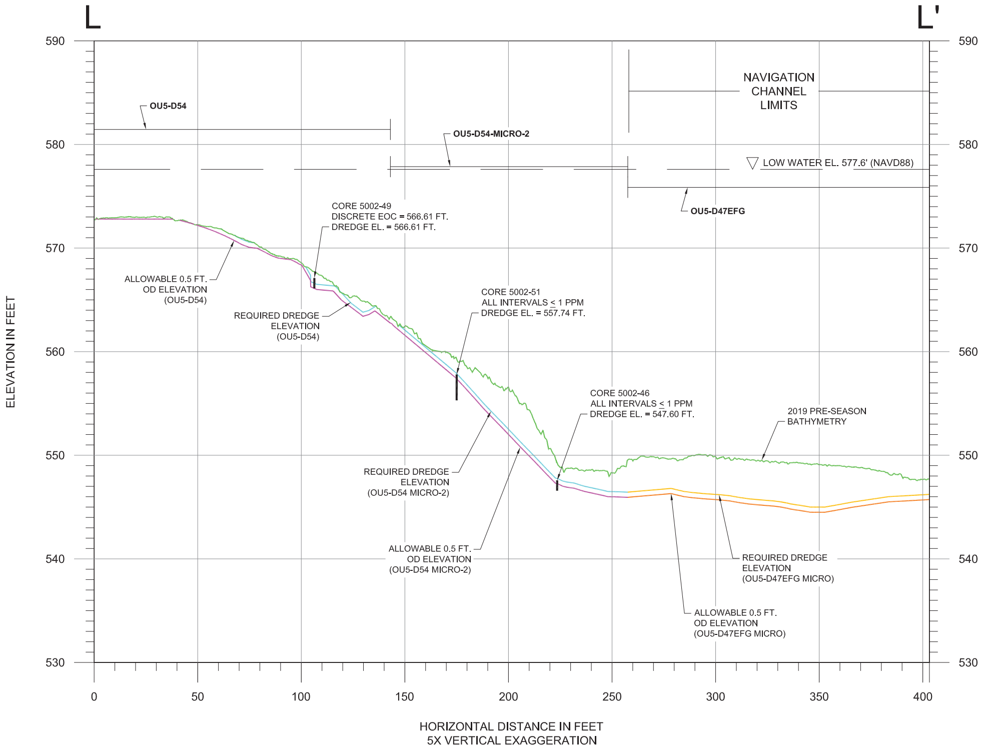
FIGURE 12
SECTION K-K'
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

— PROPOSED DESIGN SURFACE	— ADJACENT DREDGE AREA DESIGN SURFACE
— PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE	— ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE
— 2019 PRE-CONSTRUCTION BATHYMETRY SURFACE	

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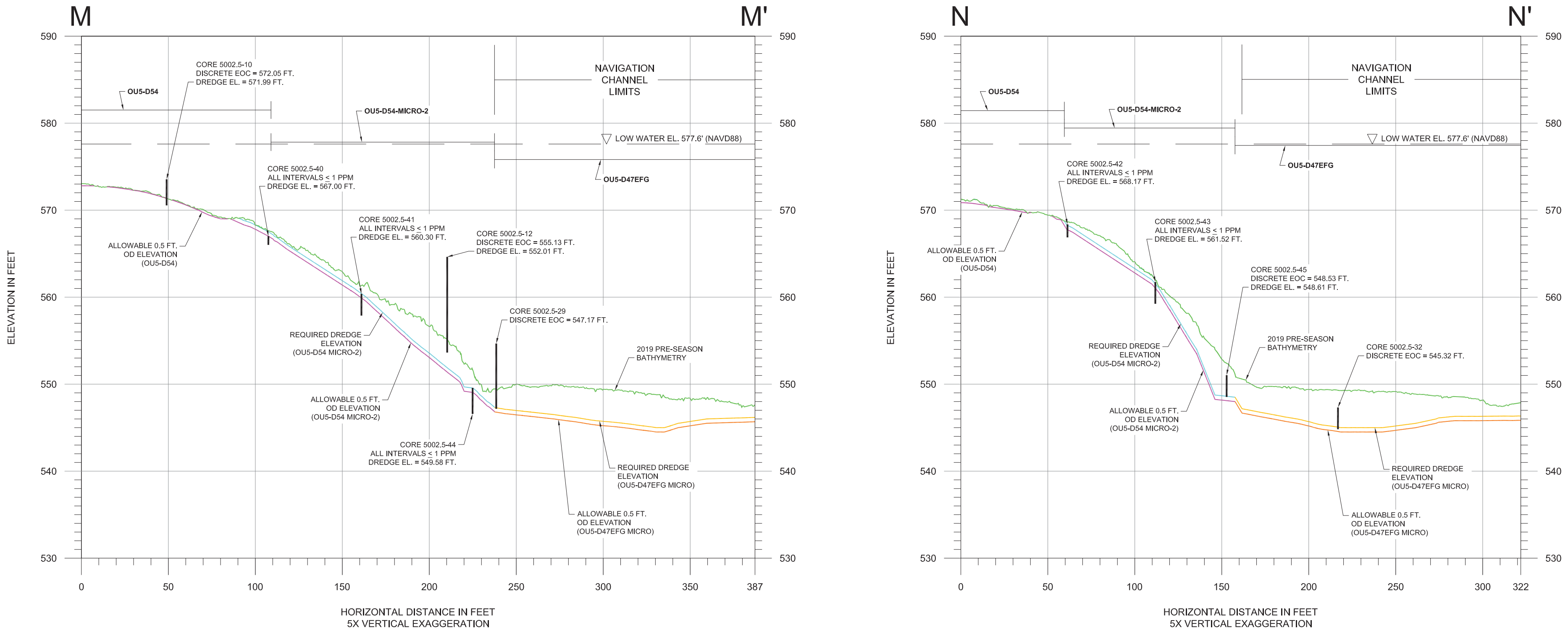
FIGURE 13
SECTION L-L'

DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION

DRAFT



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

- PROPOSED DESIGN SURFACE
- PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE
- 2019 PRE-CONSTRUCTION BATHYMETRY SURFACE
- ADJACENT DREDGE AREA DESIGN SURFACE
- ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE

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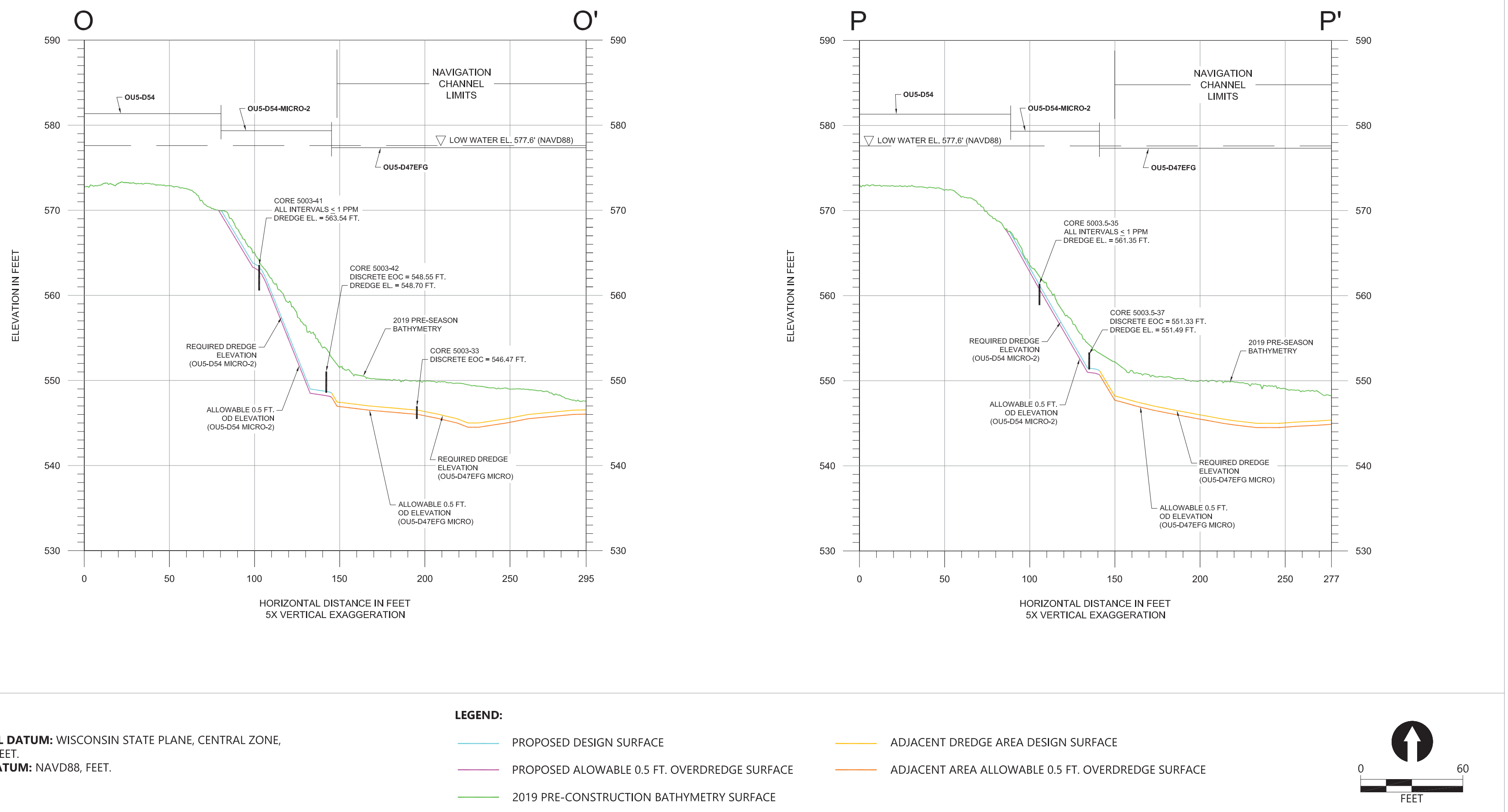
FIGURE 14
SECTIONS M-M' & N-N'
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



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VERTICAL DATUM: NAVD88, FEET.

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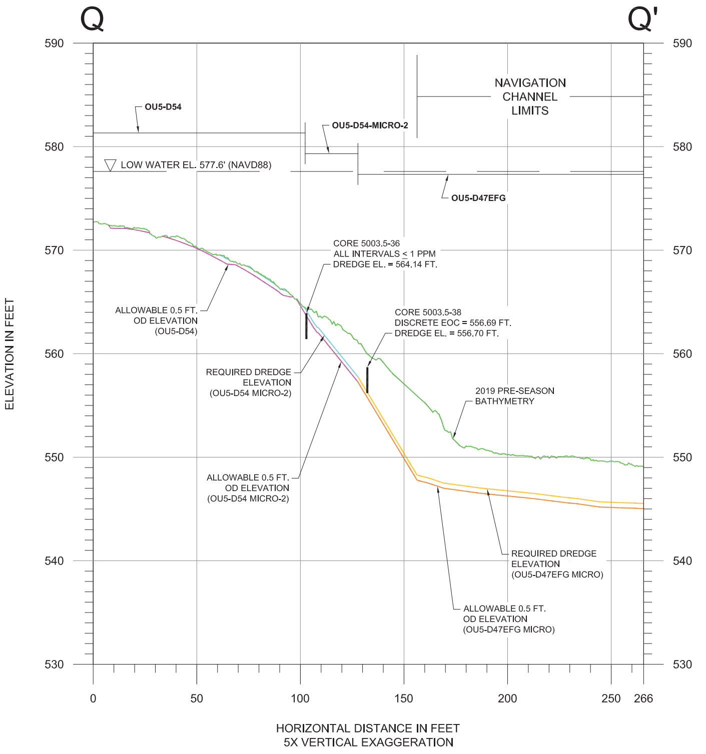
FIGURE 15
SECTIONS O-O' & P-P'
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

LEGEND:

PROPOSED DESIGN SURFACE	ADJACENT DREDGE AREA DESIGN SURFACE
PROPOSED ALOWABLE 0.5 FT. OVERDREDGE SURFACE	ADJACENT AREA ALLOWABLE 0.5 FT. OVERDREDGE SURFACE
2019 PRE-CONSTRUCTION BATHYMETRY SURFACE	

0 60
FEET

Publish Date: 2019/07/23 1:36 PM | User: dbinkney
Filepath: \\amesbury1\Greenleaf\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2019\DESIGN\D54\D54 Inactive Intake\DRD\D54 DRD_6.dwg F16-XS

ANCHOR QEA

TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445-0720 FAX: (920) 445-0719

FIGURE 16
SECTION Q-Q'
DESIGN REVIEW DOCUMENT D54-MICRO
LOWER FOX RIVER REMEDIATION

ATTACHMENT 6

CORRESPONDENCE FROM WPSC TO NCR DOCUMENTING ITS ACCEPTANCE OF THE PROPOSED CAPPING REMEDY FOR THE AREA NEAR THE WPS INACTIVE INTAKE

Appendix F SRA CB60

Wisconsin Public Service Corporation
700 North Adams Street
Green Bay, WI 54301
www.wisconsinpublicservice.com

May 23, 2019

Lower Fox River Remediation LLC
c/o Bryan Heath
Senior Environmental Engineer
NCR Corporation
864 Spring Street. NW
Atlanta, GA 30308-1007

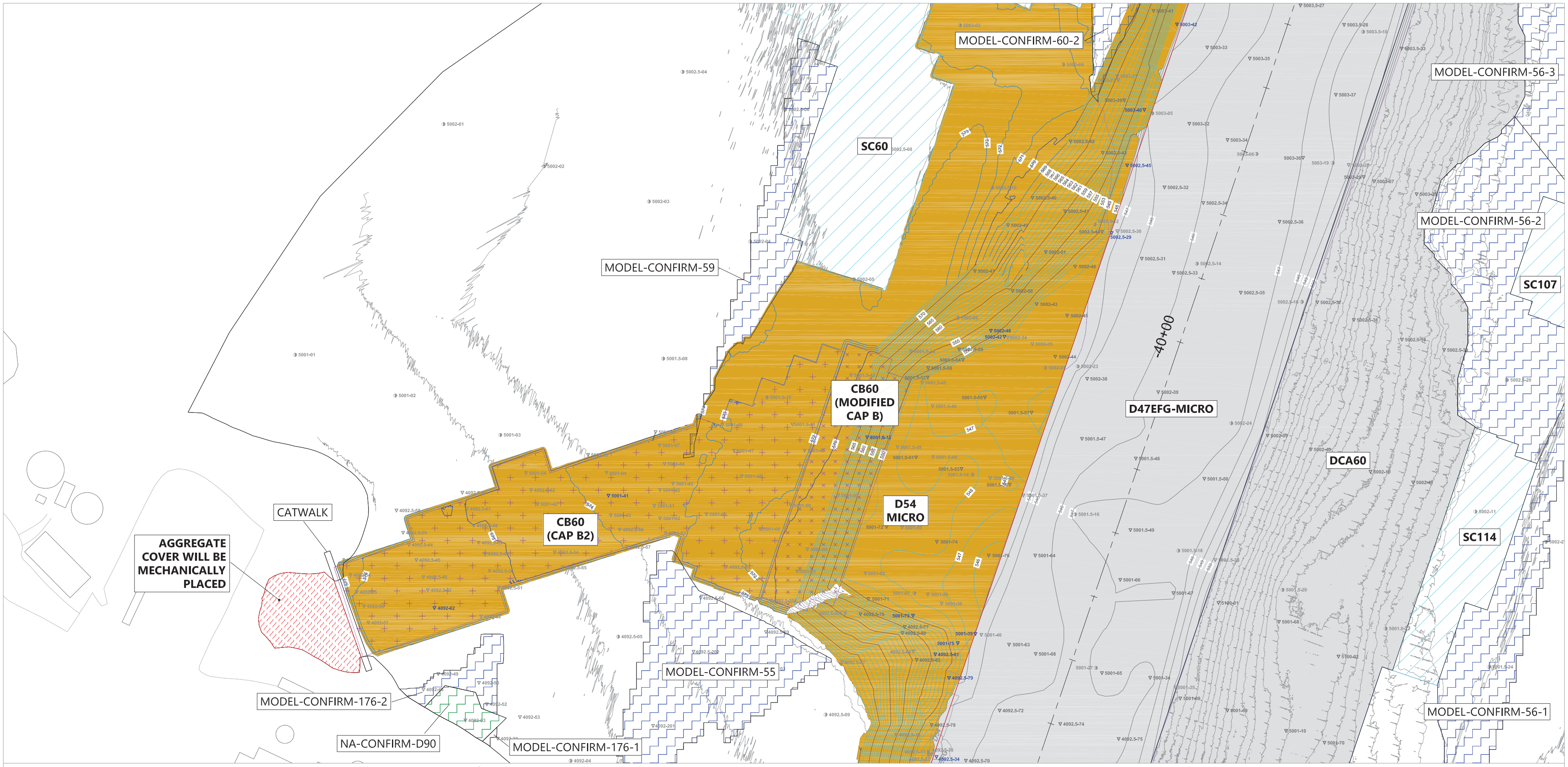
Dear Mr. Heath,

Wisconsin Public Service Corporation (WPSC) has reviewed the design proposed for the cap in the WPSC Pulliam North Intake Channel, described in the draft Figure 1 "OU5-D54-CB60 Pond Area Plan View" which was shared with WPS on May 21, 2019 and attached to this letter. WPSC supports the proposed design and provides "riparian acceptance" for this design.

Sincerely,

Elizabeth Stueck-Mullane

Elizabeth Stueck-Mullane
Vice President - Environmental
WEC Energy Group – Business Services



HORIZONTAL DATUM: WISCONSIN STATE PLANE, CENTRAL ZONE, NAD83, U.S. FEET.
VERTICAL DATUM: NAVD88, FEET.

NOTES:

1. VESSEL REPRESENTS AN APPROXIMATION OF THE M/V GREAT REPUBLIC.

LEGEND:

─	2019 PRE-CONSTRUCTION BATHYMETRY CONTOURS (1 AND 5 FT. INTERVALS)
─	PROPOSED DREDGING DESIGN CONTOURS (1 AND 5 FT. INTERVALS)
─	SHORELINE
▨	EXISTING DREDGE AREA
▨	PROPOSED DREDGE AREA
▨	AREA BEHIND CATWALK
+ +	PROPOSED CAP B2 AREA
× ×	PROPOSED MODIFIED CAP B AREA

Publish Date: 2019/05/09 12:31 PM | User: dbinkney
Filepath: \\amesbury1\Greenleaf\CAD - Boston\PROJECTS\080295-03 - FOX RIVER\2019\GRADING\D54\D54 Inactive Intake\Behind the catwalk\Fox-2019-OU5-D54-CB60-Catwalk Area-05092019.dwg AQ-B-Land

ANCHOR QEA

FIGURE 1
OU5-D54-CB60 POND AREA PLAN VIEW
2019 DESIGN REFINEMENT
LOWER FOX RIVER REMEDIATION

ATTACHMENT 7

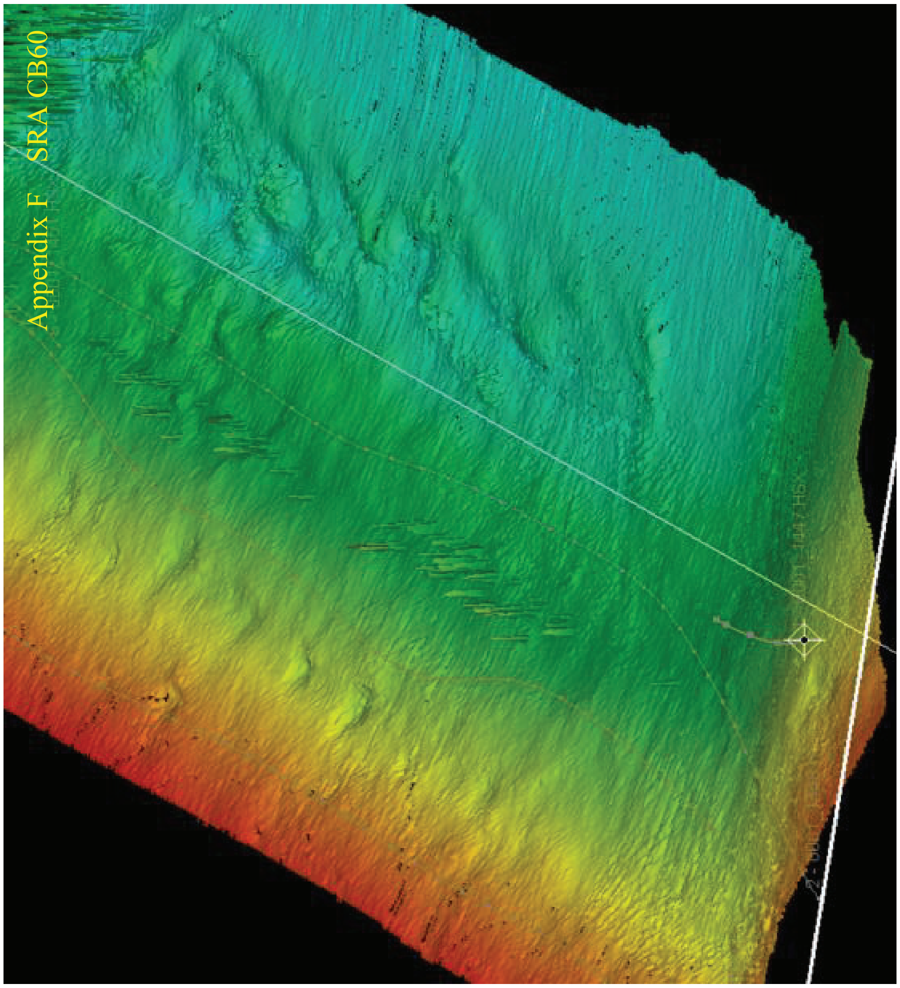
7-1: POST-PLACEMENT BATHYMETRY AND ISOPACH OF STONE THICKNESS FOR FIRST LANE OF FILTER STONE

7-2: PARAMETRIC ANALYSES FOR SEDIMENT SLOPE STABILITY

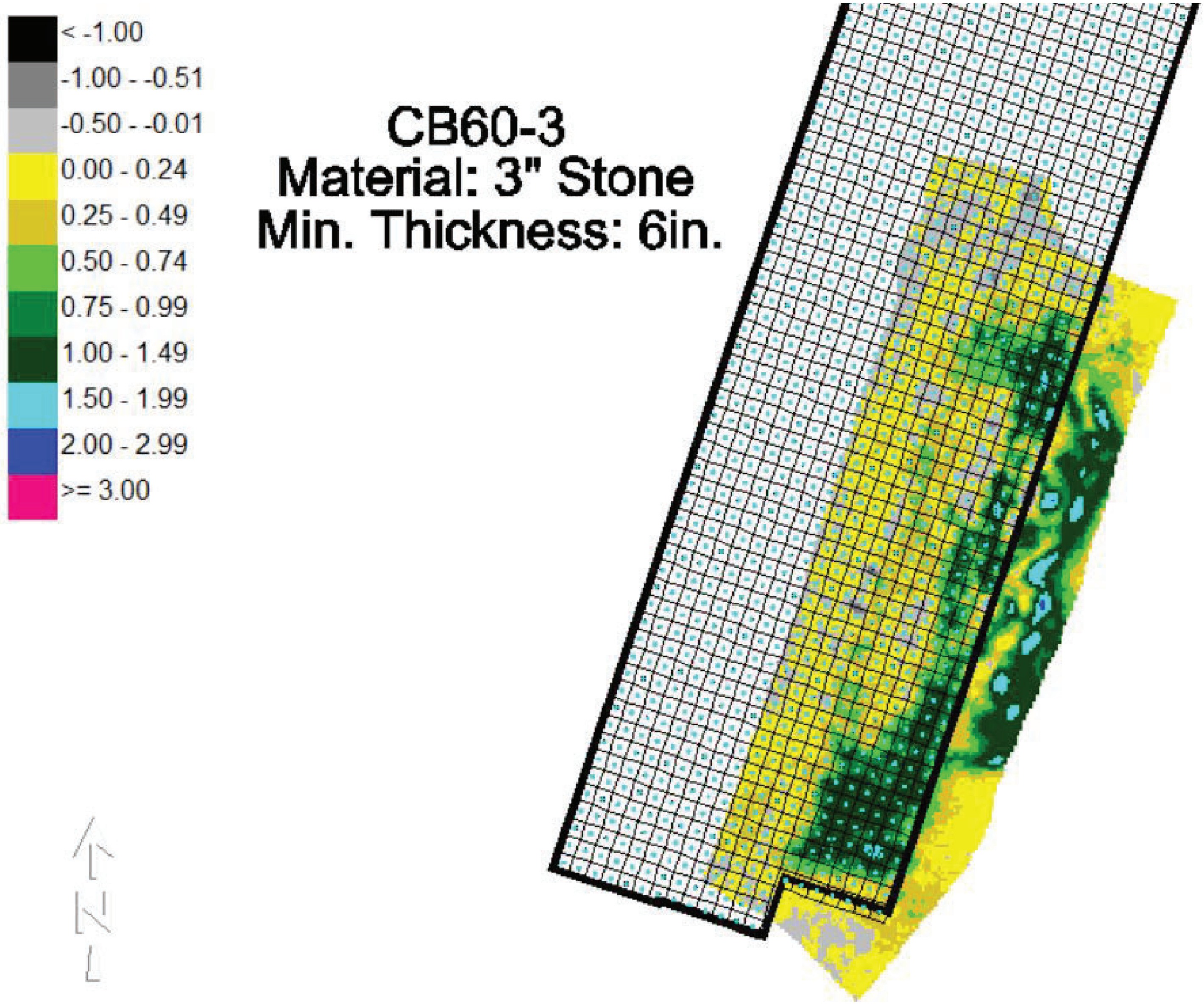
7-3: TABLE OF CORE INTERVAL OBSERVATIONS REGARDING SEDIMENT STRENGTH

7-4: SLOPE STABILITY INITIAL ANALYSES AND REVISED SLOPE ANALYSES

7-5: REVISED SLOPE CONFIGURATION FOR SRA-CB60



Appendix F SRA CB60


< -1.00
-1.00 - -0.51
-0.50 - -0.01
0.00 - 0.24
0.25 - 0.49
0.50 - 0.74
0.75 - 0.99
1.00 - 1.49
1.50 - 1.99
2.00 - 2.99
>= 3.00
CB60-3
Material: 3" Stone
Min. Thickness: 6in.
N

Attachment 7-2 Parametric Analysis

Parametric Dredge Slope Stability Analysis - Sediments with Friction Angle of 0

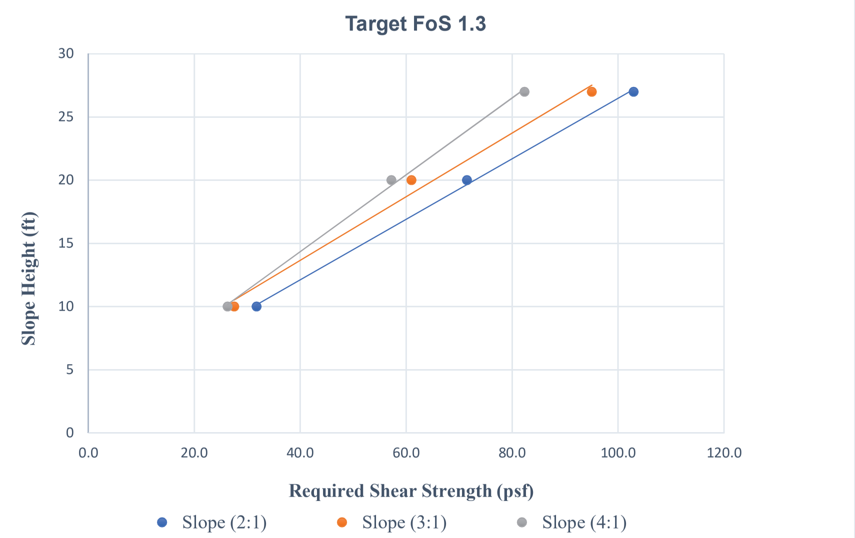
Saturated Unit Weight, ϒ (pcf) = 80
Unit Weight of water, Υ_w (pcf) = 62.4
Submerged Unit Weight of water, Υ' (pcf) = 17.6

Factor of Safety, F	Slope (H:1)	Angle, β (degree)	Slope Height, H (ft)	Depth to Competent Stratum D (ft)	d=D/H	P_d (psf)	Stability Number, N_o (Slope circle)	Stability Number, N_o (Toe circle)	Stability Number, N_o (Deep circle)	Cohesion, C (psf)
1.3	2	26.57	10	30	0.33	176	7.2	6.7	7.2	31.8
1.3			20	30	0.67	352	6.4	6.7	6.4	71.5
1.3			27	30	0.90	475.2	6	6.7	6	103.0
1.3	3	18.43	10	30	0.33	176	8.3	7.3	8.3	27.6
1.3			20	30	0.67	352	7.5	7.3	7.5	61.0
1.3			27	30	0.90	475.2	6.5	7.3	6.5	95.0
1.3	4	14.04	10	30	0.33	176	8.7	7.8	8.7	26.3
1.3			20	30	0.67	352	8	7.8	8	57.2
1.3			27	30	0.90	475.2	7.5	7.8	7.5	82.4

Notes:

No surcharge is assumed at the top of the slopes

Water surface is equal at both sides of the slopes



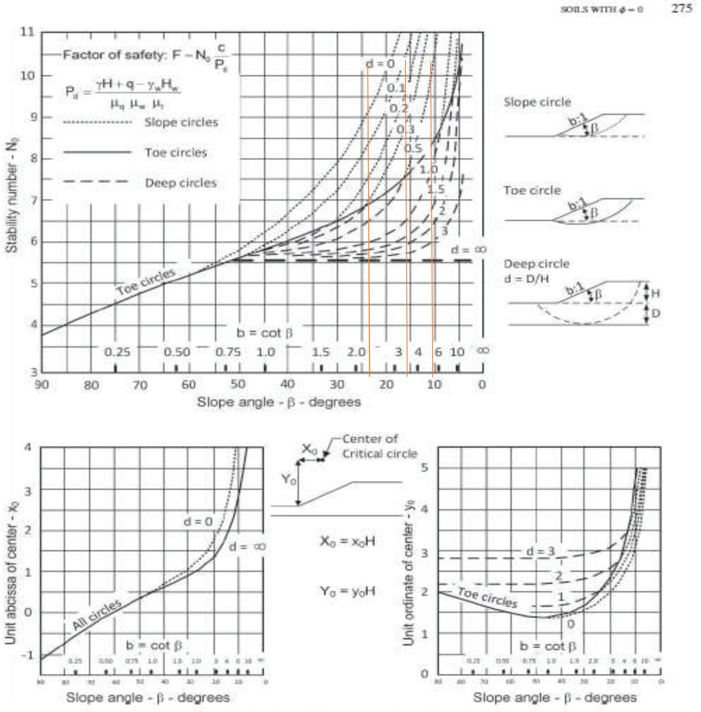


Figure A.1 Slope stability charts for $\phi = 0$ soils (after Janbu, 1968).

Janbu, N. 1968. Slope Stability Computations. Soil Mechanics and Foundation Engineering Report. Technical University of Norway, Trondheim.

Duncan, M.J., Wright, S.G., and Brandon T.L. (2014) Soil Strength and Slope Stability. 2nd Edition. John Wiley and Sons., Inc., New York.

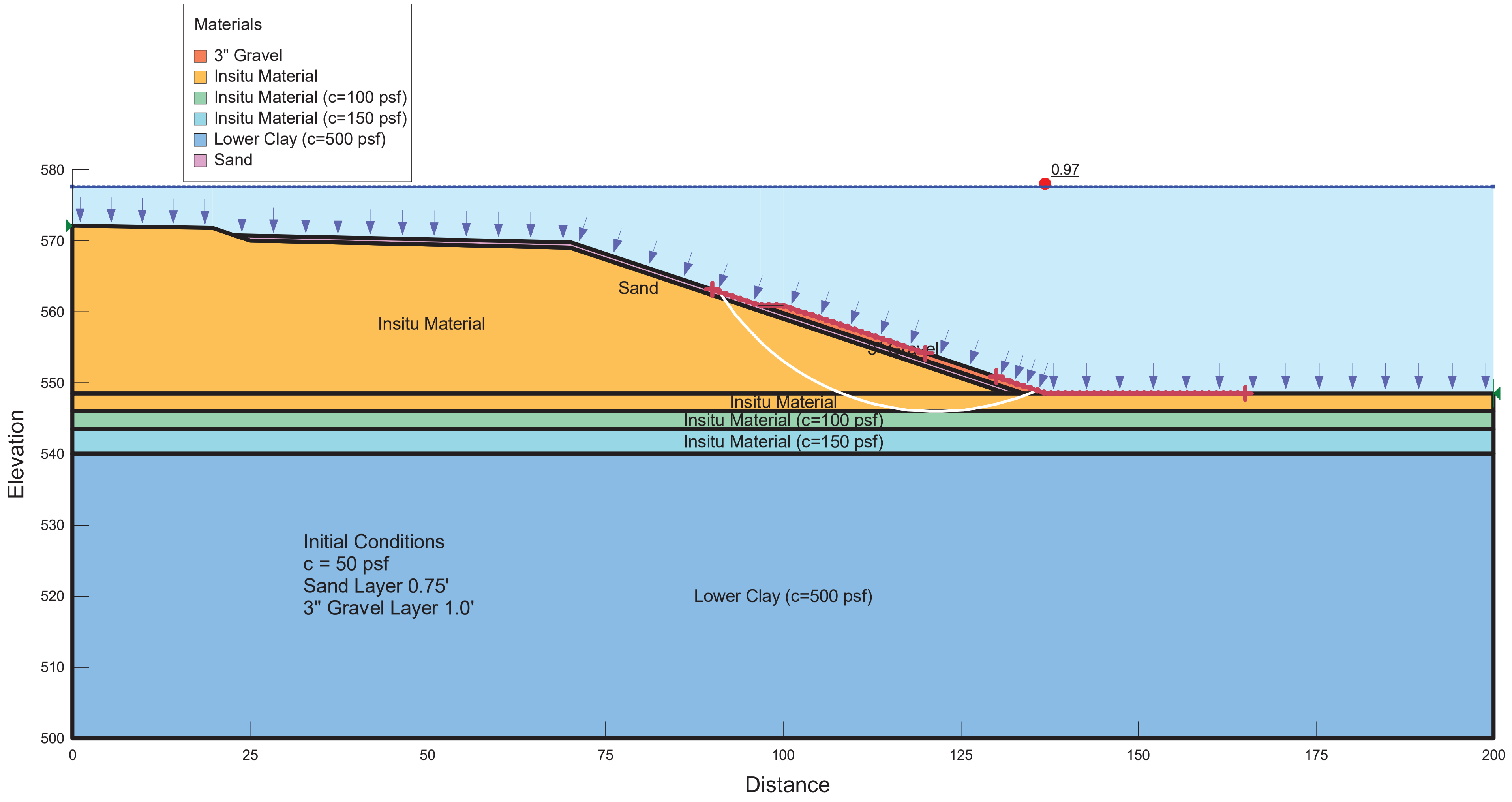
ATTACHMENT 7-3: TABLE OF CORE INTERVAL OBSERVATIONS REGARDING STRENGTH

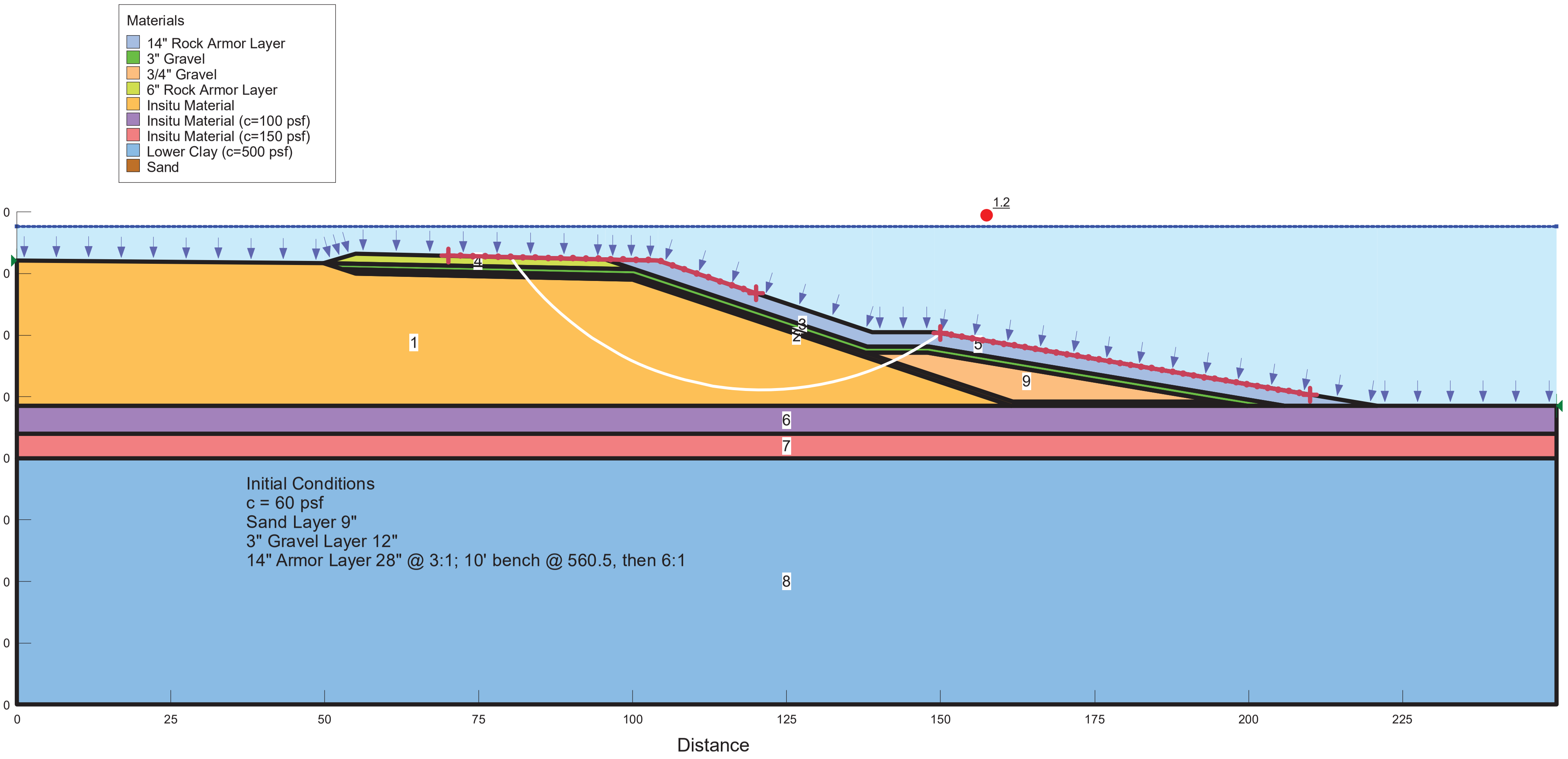
Core ID	Interval	Elevation (NAVD88)	Sediment Type	Pocket Pen Reading (kg)	Cohesive Strength (psf)[1]	Elevation Adjusted for Sonic Core Compression (ft NAVD88)
5001-58	U	563.87	CL/ML	0	0	562.17
	V	563.37	CL/ML	0	0	561.59
	Z	561.37	CL/ML	0	0	559.27
	CC	559.87	CL/ML	0	0	556.93
	GG	557.87	SM	0.3	300	553.81
	LL	555.87	SM/ML	0	0	550.75
	QQ	553.87	TILL-CH	3	3,000	547.85
5001.5-12RVT2	Z	561.52	CL/ML	0	0	559.47
	BB	560.52	CL/ML	0	0	558.43
	CC	560.02	CL/ML	0	0	557.94
	EE	559.02	CL/ML	0	0	556.96
	GG	558.02	SM	0	0	555.98
	MM	555.52	ML	0	0	553.47
	RR	553.52	ML	0	0	551.29
	TT	552.52	SM/ML	0	0	550.20
	UU	552.02	(NO SAMPLE)			549.66
5001-49RVT	DD	560.19	ML	0	0	558.53
	GG	558.69	ML	0	0	556.64
	JJ	557.69	SM/ML	0.05	50	555.38
	RR	554.19	SM/ML	0.15	150	551.49
	WW	551.69	SM	0.4	400	548.99
	ZZ	550.19	(VISCOUS LIQUID)	NOT TESTED		547.49
5001-50RVT	Y	561.55	CL/ML	0	0	558.60
	AA	560.55	CL/ML	0	0	557.48
	CC	559.55	CL/ML	0	0	556.34
	EE	558.55	CL/ML	0	0	555.20
	KK	556.05	ML	0	0	552.35
	PP	554.05	CL/ML	0	0	550.11
	UU	551.55	CL	0.1	100	547.31
5001-60	DD	559.52	CL/ML	0	0	556.72
	GG	558.02	CL/ML	0	0	555.22
	JJ	557.02	ML	0	0	554.22
	MM	555.52	CL/ML	0	0	552.72
	RR	553.52	ML	0	0	550.72
	WW	551.02	CL/ML	0	0	548.22
	ZZ	549.52	TILL-CH	3	3,000	546.62
5001-06RVT2	HH	557.23	ML	0	0	552.95
	LL	555.73	ML	0	0	551.29
	RR	553.23	CL/ML	0	0	548.43
	TT	552.23	CL/ML	0	0	547.11
	XX	550.23	CL	0	0	545.41
	DDD	547.23	CL	0	0	547.06
5001-61	EE	558.76	ML	0	0	556.08
	GG	557.76	ML	0	0	554.92
	JJ	556.76	ML	0	0	553.76
	NN	554.76	ML	0	0	551.48
	SS	552.76	CL/ML	0	0	549.20
	UU	551.76	CL/ML	0	0	548.06
	WW	550.76	CL	0	0	547.06
	ZZ	549.26	CL/ML	0	0	545.56

SAMPLES BELOW WERE PULLED BUT NO OTHER INTERVALS WERE PULLED FOR THIS CORE						
5001.5-39RVT	RR	552.62	CL/ML	0	0	547.64
5001-59	GG	556.88	CL/ML	0	0	551.62
5001.5-40RVT	PP	552.23	CL	0.1	100	547.15
5001-51	Q	567.32	TILL/CH	3.05	3,050	564.24

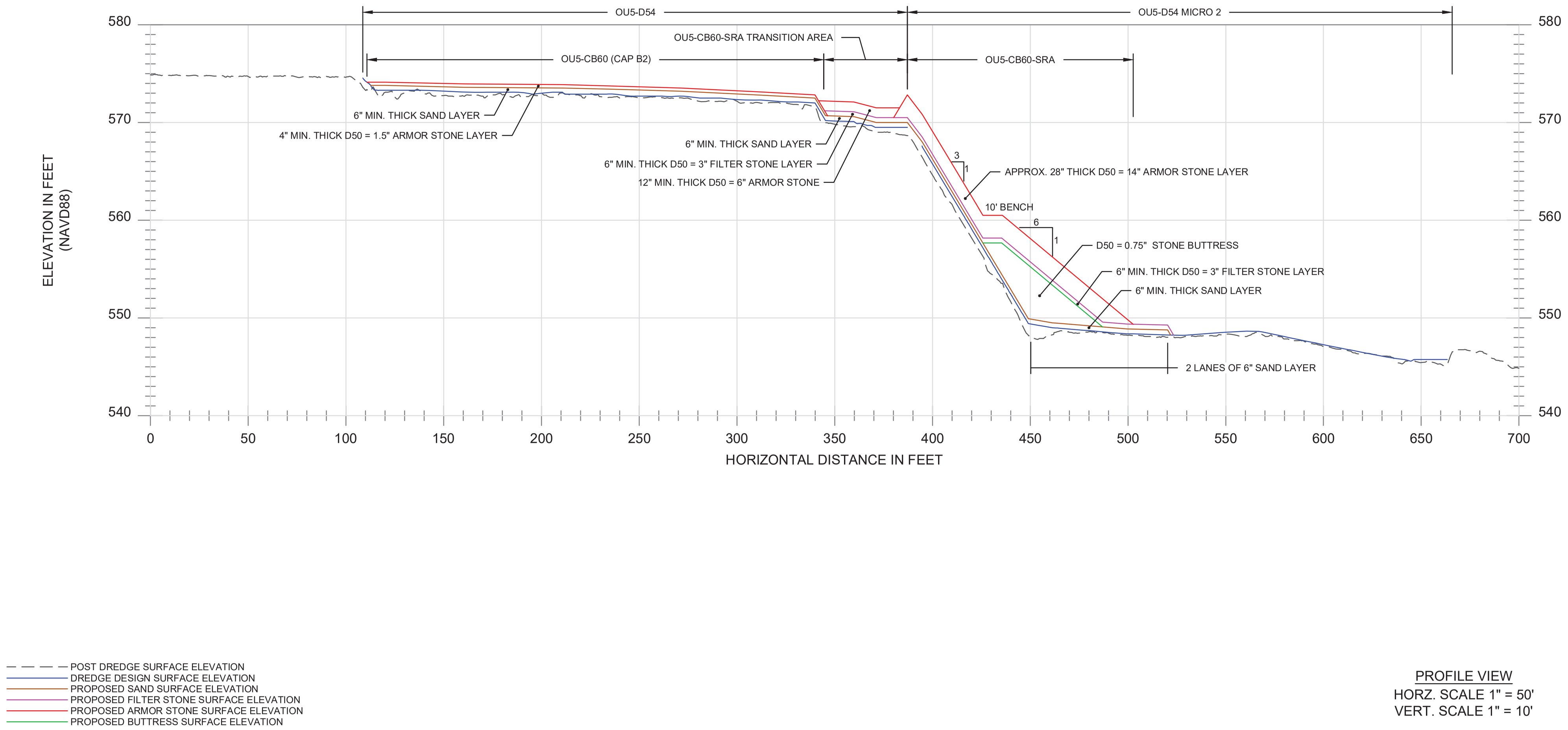
Notes:

1. Multiply kg reading by 1,000 for psf.
2. CB60 core interal review was conducted on November 7 and 8, 2019.


Materials
3" Gravel
Insitu Material
Insitu Material (c=100 psf)
Insitu Material (c=150 psf)
Lower Clay (c=500 psf)
Sand
0.97
Sand
Insitu Material
3" Gravel
Insitu Material
Insitu Material (c=100 psf)
Insitu Material (c=150 psf)
Initial Conditions
c = 50 psf
Sand Layer 0.75'
3" Gravel Layer 1.0'
Lower Clay (c=500 psf)
Elevation
580
570
560
550
540
530
520
510
500
0
25
50
75
100
125
150
175
200
Distance


Materials
🟦 14" Rock Armor Layer
🟩 3" Gravel
🟧 3/4" Gravel
🟨 6" Rock Armor Layer
🟧 Insitu Material
🟪 Insitu Material (c=100 psf)
🟥 Insitu Material (c=150 psf)
🟦 Lower Clay (c=500 psf)
🟫 Sand
1.2
1
2
3
4
5
6
7
8
9
Initial Conditions
c = 60 psf
Sand Layer 9"
3" Gravel Layer 12"
14" Armor Layer 28" @ 3:1; 10' bench @ 560.5, then 6:1
0
0
0
0
0
0
0
0
0
0
25
50
75
100
125
150
175
200
225
Distance

ATTACHMENT 7-5



APPENDIX G

OU3 RIVER FLOW DETERMINATION AND RECURRENCE INTERVALS FOR OU1, OU3, AND OU4

George Berken

From: George Berken
Sent: Tuesday, July 16, 2019 8:55 AM
To: Ava Grosskopf; Becky Frey; Beth Olson; Bill Hartman; Bryan Heath; Denis Roznowski; Gary Kincaid; George Berken; Jay Grosskopf; Jennifer Hagen; John Kern; Jordan Salley; Krystal Clark; Larry DeBruin; Michael Davis; Mike Dickey; Pablo Valentin; Paul Montney; Philip Brochocki; Rick Fox; Roger Kaminski; Scott Janssen; Sharon Kozicki; Tara Van Hoof
Subject: 617/618. 87500 OU2-5 - FW: 19G007 - FR LTM - M-AOT_OU3 Flow_2017 Recurrence Intervals.pdf
Attachments: M-AOT_OU3 Flow_2017 Recurrence Intervals BERKEN.docx

Sharon, on behalf of the Agencies, the Draft OU3 River Flow Determination and Revised Recurrence Intervals for OU1, OU3, and OU4, submitted in your email below, is acceptable. Please address the attached non-substantive RLSOs and submit in final form.

Thanks,
George…

BOLDT.

George A. Berken | Engineering Project Manager
P: 920-225-6141 // **C:** 920-858-5449 // **F:** 920-225-6307
E: George.Berken@Boldt.Com
2525 N. Roemer Road // P.O. Box 419 // Appleton, WI 54912-0419

boldt.com

SafeThinking: Our Crusade to Eliminate Accidents

From: Kozicki, Sharon V <Sharon.Kozicki@Foth.com>
Sent: Friday, March 22, 2019 3:27 PM
To: Ava Grosskopf <Ava.Grosskopf@boldt.com>; beth.olson@wisconsin.gov; william.hartman@glatfelter.com; bryan.heath@ncr.com; Clark, Krystal M <Krystal.Clark@foth.com>; Dickey, Mike <Mike.Dickey@foth.com>; Gary Kincaid <gary.kincaid@wisconsin.gov>; George Berken <George.Berken@boldt.com>; Janssen, Scott D <Scott.Janssen@Foth.com>; Jay Grosskopf <Jay.Grosskopf@Boldt.com>; jennifer.hagen@obg.com; John Kern <kernstat@gmail.com>; jordan.salley@wisconsin.gov; Kozicki, Sharon V <Sharon.Kozicki@Foth.com>; Larry DeBruin <Larry.Debruin@Boldt.com>; Michael Davis <JMDAVIS@GAPAC.com>; valentin.pablo@epa.gov; pamontne@gapac.com; Phil Brochocki <Phil.Brochocki@obg.com>; rick.fox@obg.com; roger.kaminski@gapac.com; denis.roznowski@Foth.com; tara.vanhoof@foth.com
Subject: 19G007 - FR LTM - M-AOT_OU3 Flow_2017 Recurrence Intervals.pdf

Hello,

Attached for your review and approval is the draft OU3 recurrence interval memo.

Please feel free to get in touch with any questions.

Have a nice weekend,

Sharon

Sharon Kozicki, PG, MBA, PMP®
Licensed PG in WI
Sr. Project Manager
Foth Infrastructure & Environment, LLC
2121 Innovation Court, Suite 300
P.O. Box 5126
De Pere, WI 54115-5126
Ph: (920) 496-6737
Cell: (920) 819-8012
http://www.foth.com
Foth

Memorandum

Foth Infrastructure & Environment, LLC

2121 Innovation Court, Suite 300
P.O. Box 5126 • De Pere, WI 54115-5126
(920) 497-2500 • Fax: (920) 497-8516
www.foth.com

July 23, 2019

TO: George Berken, Boldt
Pablo Valentin, EPA
Jennifer Hagen, OBG
Gary Kincaid, WDNR
Larry DeBruin, Boldt
Rick Fox, OBG
John Kern, Kern Statistical Services

CC: Bill Hartman, P.H. Glatfelter
Michael Davis, Georgia Pacific
Bryan Heath, NCR
Beth Olson, WDNR
Jordan Salley, WDNR
Paul Montney, Georgia Pacific
Roger Kaminski, Georgia Pacific
Jay Grosskopf, Boldt
Phil Brochocki, OBG
Denis Roznowski, Foth
Sharon Kozicki, Foth

FR: Tara Van Hoof, Foth
Steve Lehrke, Foth

RE: OU3 River Flow Determination and Revised Recurrence Intervals for OU1, OU3, and OU4

As part of the Lower Fox River (LFR) *Long-Term Monitoring Plan (FR-LTMP)* (Anchor QEA, et al., 2009), *Lower Fox River Operable Unit 1 – Cap Monitoring and Maintenance Plan* (*CMMP*) (Foth and CH2M HILL, 2011), and *Cap Operations, Maintenance, and Monitoring Plan (COMMP*) (Anchor and Tetra Tech, 2012), river flows are monitored on a monthly basis and compared to recurrence intervals developed for each Operable Unit (OU), specifically for OU1, OU3, and OU4. River flows for OU3 were monitored in the past at the Rapide Croche Dam near Wrightstown, Wisconsin (WI), U.S. Geological Survey (USGS) Station Number 04084500 (Rapide Croche station); however, the USGS discontinued monitoring this station as of September 30, 2013. Therefore, on behalf of P.H. Glatfelter and in coordination with the LFR Agencies Oversight Team (A/OT), Foth Infrastructure & Environment, LLC (Foth) is proposing a revised method for determining river flows in OU3. The revised method utilizes historical flow results collected at both the Rapide Croche station and Appleton, WI, USGS Station Number 04084445 (Appleton station) as a basis for forming a river flow estimate in OU3 from currently available Appleton station data.

Additionally, this memo presents updated recurrence intervals provided in the August 2017 USGS Scientific Investigations Report, *Flood-Frequency Characteristics of Wisconsin Streams, Version 2.1* (*2017 USGS Report*). The updated recurrence intervals provided in the

2017 USGS Report are based on a more recent time period than the values given in the *CMMP* and *COMMP*.

OU3 River Flow Determination

Regarding river flow calculations, the *FR-LTMP* (page 109) states the following: *"Daily gaged flows are available at Rapide Croche, and can be scaled according to watershed area ratios to estimate daily flows at the four stations for which loads are to be estimated."* Daily and instantaneous 15-minute gaged flows are available at the Appleton station, which is used to monitor flow for OU1. By using this *FR-LTMP*-approved approach, the Appleton station data can be scaled according to watershed (drainage) area ratios to estimate daily and instantaneous flows for OU3. For example, the Appleton station data can be scaled by a factor of the OU3 discharge area divided by the OU1 discharge area.

Similarly, in the *COMMP*, the recurrence interval flows at the Oil Tank Depot at Green Bay, WI, USGS Station No. 040851385 were estimated by multiplying the recurrence interval flow at Rapide Croche by the ratio of drainage areas between the Oil Tank Depot and the Rapide Croche station. For example, the 20-year return interval flow at Oil Tank Depot was estimated to be 21,000 cubic feet per second (cfs) x (6,330 square miles/6,010 square miles) = 22,118 cfs (rounded to 22,100 cfs), where 6,330 square miles is the drainage area for Oil Tank Depot station and 6,010 square miles is the drainage area for the Rapide Croche station. Refer to Table 3-1 of the *COMMP* for further detail.

Based on our review of the *FR-LTMP* and *COMMP* documents, using a ratio of drainage areas is an accepted method for determining flow in the Fox River; however, Foth determined that using a ratio of only the drainage areas produces underestimated flow values when compared to actual flow values from the Rapide Croche station. Foth performed a side-by-side analysis of the flow data utilizing actual daily discharge results available from the Rapide Croche and Appleton stations for the time period between September 30, 1991 and September 29, 2013. In this analysis, the discharge ratio of 6,010 square miles/5,994.6 square miles = 1.0026 was applied to the Appleton data (where 6,010 square miles is the drainage area for the Rapide Croche station and 5,994.6 square miles is the drainage area for the Appleton station). The results were then compared directly to the observed Rapide Croche data, and were found to underestimate flows on average by approximately 190 cfs.

To take into account variables beyond simply area, a ratio from the actual data was produced (herein referred to as OU3/OU1 ratio). For example, the September 30, 1991 through September 29, 2013, flow data from the Rapide Croche station were divided by the flow data from the Appleton station over the same time period. The results were then averaged to create the OU3/OU1 ratio equal to 1.0475. Rapide Croche flow values for the September 1991 through September 2013 were then estimated using this OU3/OU1 ratio applied to the Appleton dataset, with results much closer on average to the observed flows than what was obtained from applying the discharge ratio.

To evaluate further refinements to the analysis and present a measure for which flow model provides the most accuracy, Foth performed a linear regression analysis using two methods:

one in which a linear trend line predicting the Rapide Croche flow from the Appleton flow takes on the form $y=b_1x$; and a second in which a linear trend line takes on the form $y=b_0 + b_1x$. The difference between the two is that the first form does not have the constant (b_0), and is somewhat similar in construction to the OU3/OU1 ratio method described above.

The four methods (i.e., the drainage area ratio model, the OU3/OU1 ratio model, the linear regression with no constant, and the linear regression with a constant), were evaluated by predicting Rapide Croche flows from the Appleton flow data collected from September 30, 1991 through September 29, 2013, and comparing directly to observed Rapide Croche data collected during this time period. Average and median deviations between the observed and predicted Rapide Croche data were calculated, along with calculation of the root mean square error (RMSE).

As discussed above, the drainage area ratio model was calculated as y=1.0026x, and the OU3/OU1 ratio model was calculated as y=1.0475x, with y being the Rapide Croche flow and x being the Appleton flow in cfs. The regression analysis for a constant of zero gives a model of y=1.034x, and the regression analysis for a nonzero constant gives a model of y=165+1.0088x, with y and x as above. The OU3/OU1 ratio model was selected as performing the best with respect to the measures of mean and median deviation between observed and predicted results, and RMSE. A comparison of the measures for the four models is provided in Table 1:

Table 1
Comparison of Rapide Croche Flow Estimation Methods

Model	Mean Deviation (cfs)	Median Deviation (cfs)	RMSE (cfs)
Drainage Area Ratio	192.7	95.3	782.9
OU3/OU1 Ratio	-8.6	-64.4	767.6
Regression w/o Constant	51.7	-15.9	764.2
Regression w/ Constant	0	-91.9	758.6

Notes:

1. Mean deviation provides the average difference of the observed and predicted Rapide Croche flows between September 30, 1991 and September 29, 2013, while median deviation provides the median of these differences. The RMSE provides the root mean square error, calculated as $\sqrt{\sum}$(observed – predicted)^2.
2. A positive mean or median deviation implies the Rapide Croche flow is being under-predicted, while a negative mean or median deviation implies the Rapide Croche flow is being over-predicted.

The OU3/OU1 ratio model of y=1.0475x is taken to be the preferable model based on performance of the above metrics, as well as ease of calculation. The OU3/OU1 ratio model had only a slight mean deviation over-predicting flow by 8.6 cfs on average. It also had a low RMSE, comparable to the regression methods. While the regression with a constant method had the best mean deviation and RMSE, it also had a larger median deviation over-predicting the flow, and is slightly more complicated to calculate in practice.

An illustration of the observed Rapide Croche flow data collected from September 30, 1991 through September 29, 2013, compared to estimated flows using the OU3/OU1 ratio model with the Appleton station data, is provided on Figure 1. A similar illustration is provided on Figure 2, with the exception that on Figure 2, the estimation errors are presented as a relative percent difference (RPD) compared to the magnitude of the observed flow rate. As illustrated on these figures, the estimated Rapide Croche flow using the OU3/OU1 ratio model fairly well matches the observed Rapide Croche data – with a large majority of the values within a RPD of 20%.

The estimation errors are further evaluated on Figures 3 and 4 – where Figure 3 depicts cumulative distributions of the estimation errors, and Figure 4 depicts the estimation errors plotted against the observed Appleton station flow data. The cumulative distributions on Figure 3 illustrate estimation errors for the OU3/OU1 ratio model based on both daily and monthly average flow data. If daily average flows are utilized in the model, 80% of the estimation errors fall within a range of -605 cfs to +610 cfs. With the data based on monthly average flows, 80% of the estimate errors fall within the interval of -470 cfs to +510 cfs.

The estimation error plotted against the Appleton station flow data on Figure 4 provides an indication of whether the estimate errors are affected by the magnitude of the Appleton flow rates. No such effect appears to be present.

It is important to note that the estimated and actual values will never match perfectly given control structures (dams) and distance between Appleton and the OU3 site. The differences could be influenced by several items that cannot be accounted for in a statistical comparison, including changes in watershed usage, dam operations, structures which impede flow in the river, and discharges and intakes from various industrial processes. However, based on the results of the comparison, it is reasonable to use the OU3/OU1 ratio model to predict Rapide Croche flows from the Appleton station data under the assumption that the maximum estimation error rate will be no greater than approximately +/- 600 cfs 80% of the time. Maximum estimation errors occurring 1% to 20% of the time may be as large as approximately 2,000 cfs. Larger estimation errors occurring less than 1% of the time would not be expected to exceed approximately 5,000 cfs with monthly averages, and approximately 10,000 cfs with daily averages.

Revised Recurrence Intervals for OU1, OU3, and OU4

The *CMMP* and *COMMP* indicate that the recurrence interval flows may be refined/updated in the future, as appropriate. The *2017 USGS Report* provides more updated discharges for 50-, 20-, 10-, 4-, 2-, 1-, 0.5-, and 0.2-percent annual exceedance probability floods for the Appleton, Oil Tank Depot, and Rapide Croche stations. The period of record for the Appleton station is 1986-2010, for the Oil Tank Depot station is 1989-2010, and for the Rapide Croche station is 1918-2010; whereas, the period of record for the Rapide Croche station used in the 1992 USGS Water Resources Investigations Report, *Flood-Frequency Characteristics of Wisconsin Streams* (Krug et al., 1992) was 1918-1988, which is the basis for the values in the *CMMP and COMMP*.

In the *2017 USGS Report*, the Rapide Croche station is a regulated streamflow-gaging station and one flow value is presented for each of the percent annual exceedance probabilities. Foth proposes to use these 2017 values as the recurrence interval flow values going forward for long-term monitoring (LTM) and cap maintenance/monitoring work in OU3.

For each of the unregulated rural streamflow-gaging stations, which includes the Appleton and Oil Tank Depot stations, a weighted estimate of discharges was determined from the results of two types of statistical analyses: the at-site log Pearson type III (LP3) analysis and the multiple regression analysis. The *2017 USGS Report* provides LP3 and weighted discharge values for each percent annual exceedance probability. The weighted estimate generally has a lower uncertainty than either the LP3 or multiple regression estimates (USGS, 2017, page 1); therefore, Foth proposes to use the 2017 weighted discharge estimates as the recurrence interval flow values going forward for LTM and cap maintenance/monitoring work for OU1 and OU4. The 1992 and proposed 2017 recurrence interval flows for OU1, OU3, and OU4 are provided in Table 2:

Table 2

Summary of Lower Fox River Flow Rates[1]

Recurrence Interval (Years)	OU1 Flows at Appleton (cfs) (USGS Station No. 04084445)		OU3 Flows at Rapide Croche (csf) (USGS Station No. 04084500)		OU4 Flows at Oil Tank Depot (cfs) (USGS Station No. 040851385)	
	1992	2017	1992	2017	1992	2017
2	N/A	N/A	12,700	12,800	13,400	14,300
5	15,100	15,000	17,000	16,600	17,900	18,800
10	16,500	16,500	19,200	18,500	20,200	21,900
20	N/A	N/A	21,000	19,800	22,100	23,700
25	18,000	18,300	21,600	20,500	22,800	25,900
50	19,000	19,500	23,000	21,700	24,200	29,000
100	19,900	20,600	24,200	22,800	25,500	32,100

Notes:

1. Flow rates rounded to the nearest one-hundred cfs.

References

Anchor QEA, LLC, Tetra Tech EC, Inc., Shaw Environmental and Infrastructure. Inc., LimnoTech, Inc., 2009a. *Long-Term Monitoring Plan* (Appendix I in the *Lower Fox River Remedial Design 100 Percent Design Report for 2010 and Beyond Remedial Actions*, Volume 2 of 2, dated October 2012). Prepared for Appleton Papers Inc., Georgia-Pacific Consumer Products LP, and NCR Corporation. December 2009.

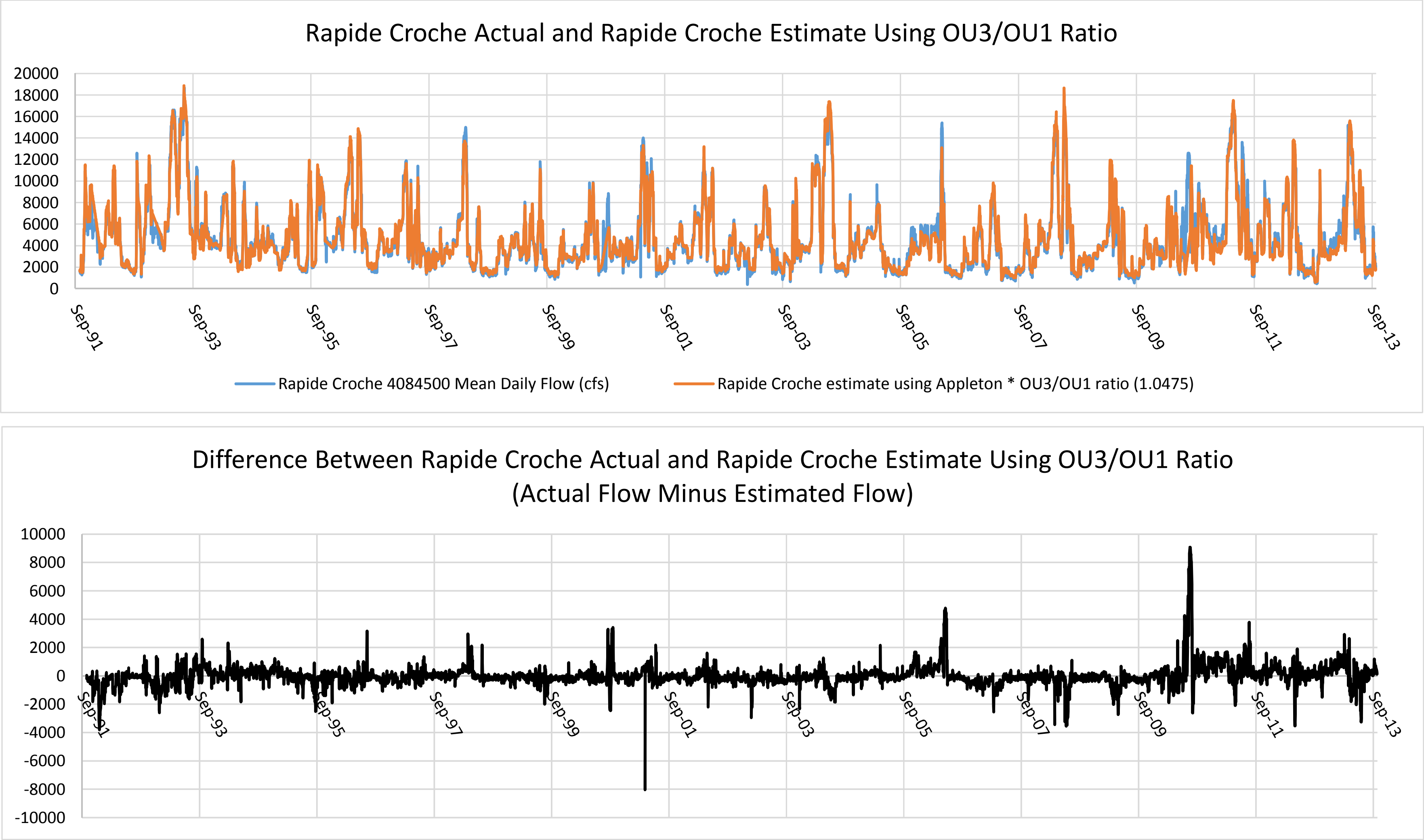
Anchor QEA, LLC and Tetra Tech EC, Inc., 2012. *Lower Fox River Remedial Design Cap Operations, Maintenance, and Monitoring Plan – Revision 1*. October 2012.

Foth Infrastructure & Environment, LLC and CH2M HILL, Inc., 2011. *Integrated Final Design and Remedial Action Work Plan for Post-2009 Response Work,* Appendix G, *Lower Fox River Operable Unit 1 – Cap Monitoring and Maintenance Plan* (*CMMP*). June 2011.

Krug, W.R., D.H. Conger, and W.A. Gebert, 1992. *Flood-Frequency Characteristics of Wisconsin Streams,* Water Resources Investigations Report 91-4128, U.S. Geological Survey, Madison, Wisconsin.

John F. Walker, Marie C. Peppler, Mari E. Danz, and Laura E. Hubbard, 2017. *Flood-Frequency Characteristics of Wisconsin Streams*, Scientific Investigations Report 2016–5140, Version 2.0, U.S. Geological Survey, Restin, Virginia.

Figures

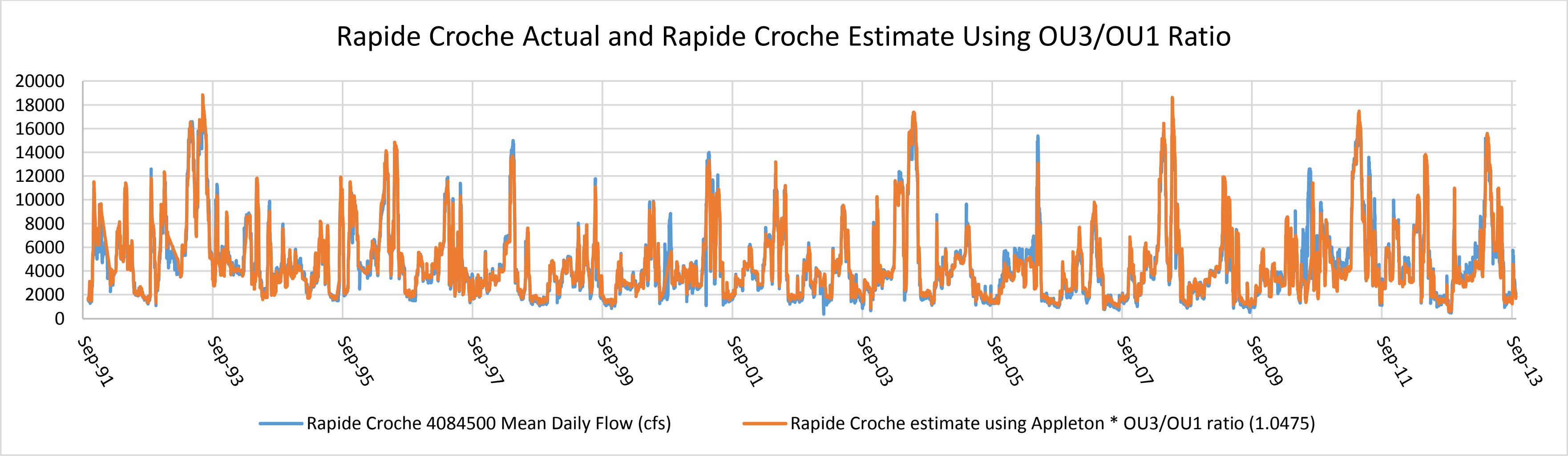


Note: Observed Rapide Croche flow data collected from September 30, 1991 through September 29, 2013 compared to estimated flows using the OU3/OU1 ratio model with the Appleton station data and a multiplication factor of 1.0475.

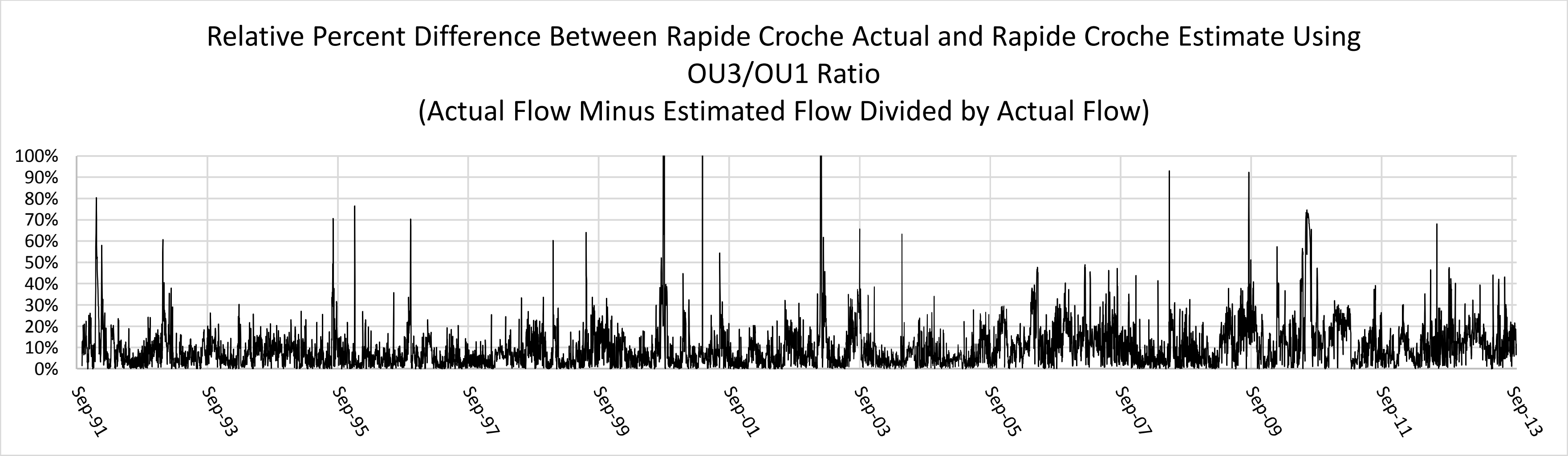
P.H. GLATFELTER COMPANY

FIGURE 1
RAPIDE CROCHE OBSERVED VS. PREDICTED FLOW

Date: SEPTEMBER 2018	Revision Date:	
Drawn By: SGL	Checked By: TMK1	Scope: 18G007



Rapide Croche Actual and Rapide Croche Estimate Using OU3/OU1 Ratio



Relative Percent Difference Between Rapide Croche Actual and Rapide Croche Estimate Using OU3/OU1 Ratio
(Actual Flow Minus Estimated Flow Divided by Actual Flow)

Note: Observed Rapide Croche flow data collected from September 30, 1991 through September 29, 2013 compared to estimated flows using the OU3/OU1 ratio model with the Appleton station data and a multiplication factor of 1.0475.

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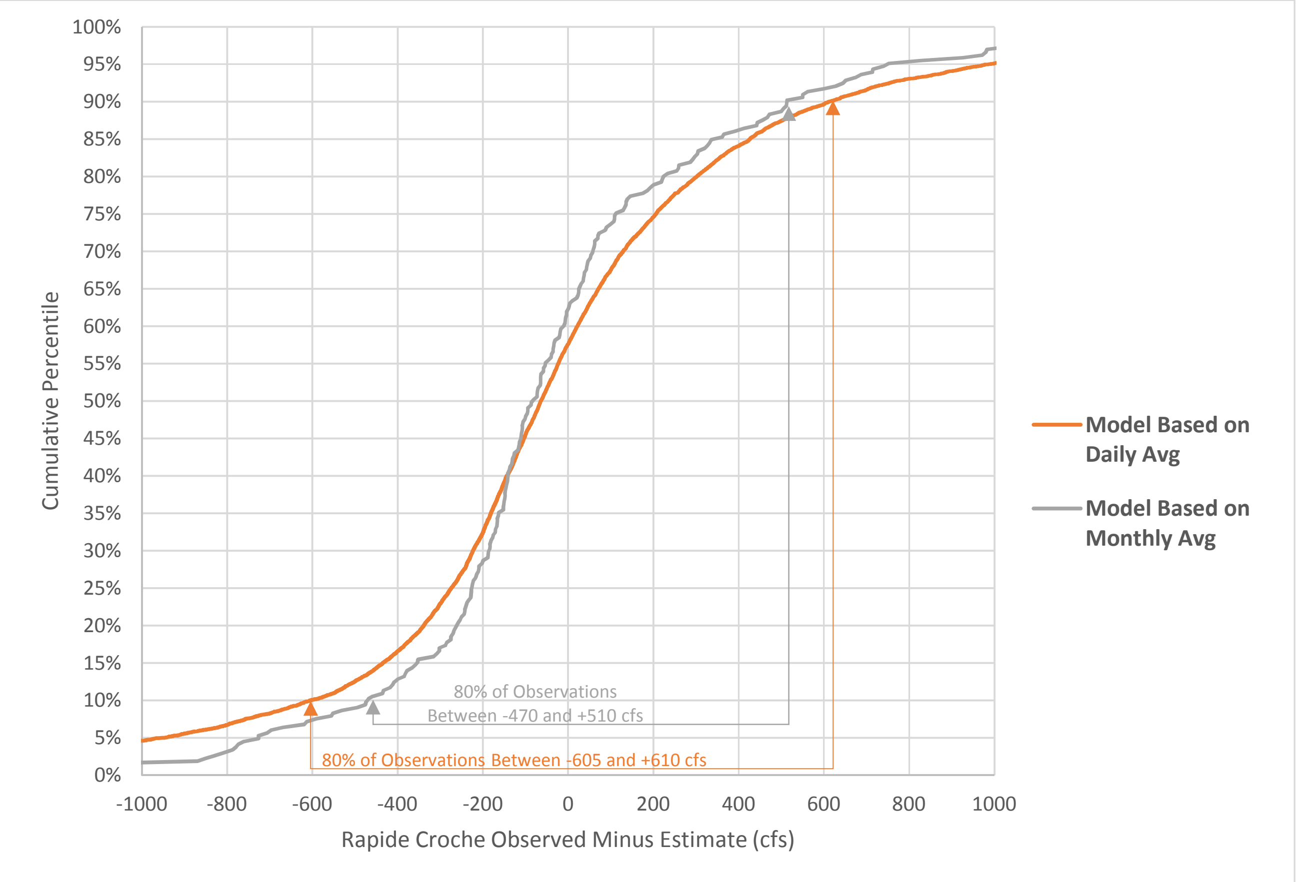
FIGURE 2
RAPIDE CROCHE OBSERVED VS. PREDICTED FLOW
WITH RELATIVE PERCENT DIFFERENCE

Date: SEPTEMBER 2018
Revision Date:

Drawn By: SGL
Checked By: TMK1
Scope: 18G007



Notes: Estimate error is calculated from the observed Rapide Croche flow data collected from September 30, 1991 through September 29, 2013 compared to estimated flows using the OU3/OU1 ratio model with the Appleton station data and a multiplication factor of 1.0475.

The cumulative percentiles illustrate the distribution of the estimate errors using both daily flow averages and monthly flow averages. With the data based on daily average flow rates, 80% of the estimate errors fall within the interval of -605 cfs to +610 cfs. With the data based on monthly average flows, 80% of the estimate errors fall within the interval of -470 cfs to +510 cfs.

Foth

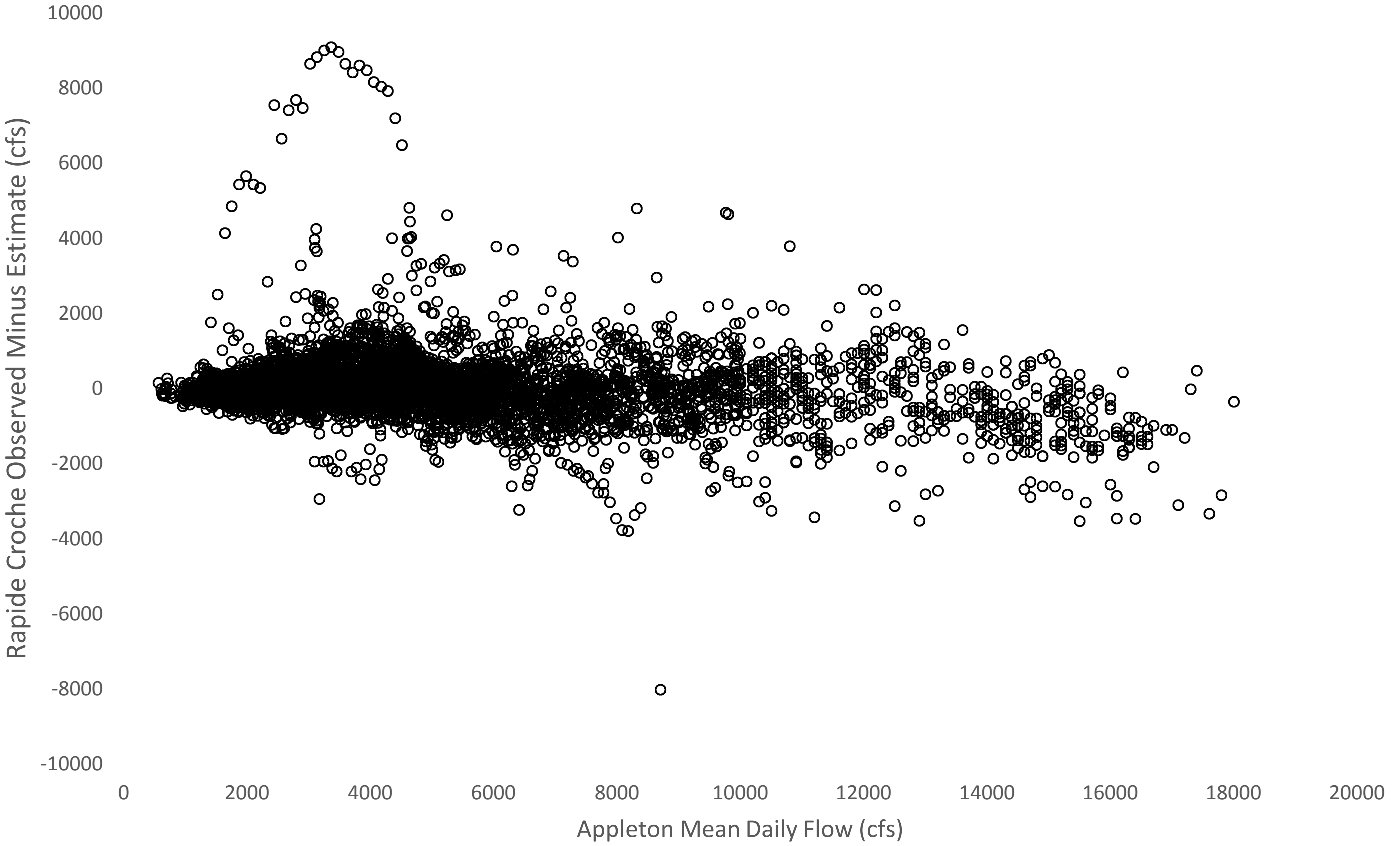
P.H. GLATFELTER COMPANY

FIGURE 3
CUMULATIVE PERCENTILE DISTRIBUTION
ESTIMATE ERROR (OBSERVED MINUS PREDICTED FLOW)
DAILY AND MONTHLY AVERAGE

Date: SEPTEMBER 2018
Revision Date:

Drawn By: SGL
Checked By: TMK1
Scope: 18G007

pw:\\Clients\Glatfelter\0018G007.00\4000 Regulatory Agency Correspondence\Rapide Croche vs Appleton daily flow.xlsx



Notes: The Rapide Croche estimates are calculated using the September 30, 1991 through September 29, 2013 data and OU3/OU1 ratio model with the Appleton station data and a multiplication factor of 1.0475.

The Rapide Croche observed minus estimated data plotted against the Appleton station data provides an indication of whether the estimate errors are affected by the magnitude of the Appleton flow rates. No such effect appears to be present.

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FIGURE 4

ESTIMATE ERROR (OBSERVED MINUS PREDICTED FLOW)
PLOTTED AGAINST THE APPLETON STATION DATA

Date: SEPTEMBER 2018	Revision Date:

Drawn By: SGL	Checked By: TMK1	Scope: 18G007

APPENDIX H
BULKHEAD MONITORING AGREEMENTS AND CORRESPONDENCE

2121 Innovation Court, Suite 100
De Pere, WI 54115
(920) 497-2500
foth.com

April 14, 2021

Mr. Al Leisgang
Vice President / Chief Financial Officer
RGL Logistics
1401 State Street
Green Bay, WI 54304

RE: Bulkhead Wall Monitoring Agreement

Dear Mr. Leisgang:

On behalf of Georgia-Pacific LLC (GP) Foth Infrastructure & Environment, LLC (Foth) is sending the following agreement for Bulkhead Wall Monitoring on your property.

GP is conducting monitoring of engineered caps installed as part of the Lower Fox Remediation project. These caps are covered by the Cap Operations, Monitoring and Maintenance Plan (COMMP) for caps placed in the Lower Fox River as part of the remediation of polychlorinated biphenyls (PCBs) in the Lower Fox River and Green Bay. This work is being performed under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §§ 9601-9675 and an Administrative Order on Consent, EPA Docket #V-W-04-781 (AOC) with the United States Environmental Protection Agency (EPA). We appreciate the cooperation that you have afforded us to date to implement this program.

As you are aware, a portion of the bulkhead wall on the RGL Logistics' (RGL) property has been designated as a "cap" due to the presence of sediment containing PCBs behind the wall and therefore requires long-term monitoring as set forth in the COMMP. We will provide you with a copy of COMMP for your records.

The COMMP requires GP to monitor the bulkhead if any of the following events occur. These type of events may trigger immediate monitoring of the bulkhead wall cap:

- Vessel impact
- New construction
- Upland surcharge greater than design specifications

If warranted, event-based monitoring may include the following techniques and methods:

- Use of existing inclinometers
- Installation of new inclinometers
- Topographic surveying of monitoring points established on the bulkhead wall caps in 2020

- Topographic surveying of select areas of the upland behind the bulkhead wall adjacent to the monitoring points
- Visual observations and photography
- Diver inspection of the bulkhead wall cap

GP will need notification from RGL if any of the above cited events does occur. That notification should be made within 48 hours following the event via email to GP and GP's consultant, Foth, to the contacts listed below:

- Email to:
  - Sharon Kozicki (Sharon.Kozicki@Foth.com)
  - Tara Van Hoof (Tara.VanHoof@Foth.com)

- With Copies to:
  - Roger Kaminski (roger.kaminski@gapac.com)
  - Paul Montney (pamontne@gapac.com)
  - Michael Davis, Esq. (jmdavis@gapac.com)
  - Dave Massengill (dgmassen@gapac.com)
  - Dan Binkney (dbinkney@anchorqea.com)

GP will send an annual letter to RGL as a reminder of GP's monitoring requirements.

RGL is not subject to specific reporting requirements under CERCLA and the associated AOC for this monitoring; therefore, this letter is intended for RGL to acknowledge its agreement to notify GP if any of the events listed above occur so GP can conduct the required monitoring.

Thank you in advance for your cooperation.

Sincerely,

Foth Infrastructure & Environment, LLC

Sharon Kozicki

Sharon V. Kozicki, PG, MBA, PMP
Sr. Project Manager
Licensed in WI

Steve Laszewski

Steve Laszewski, Ph.D.
Principal

cc: Dave Massengill, Georgia-Pacific, LLC
Michael Davis, Georgia-Pacific, LLC

Agreement Approved for:

RGL Holdings

By

Printed Name ALAN LEISGANG

Title VP /CFO

Date 4/26/2021

Georgia-Pacific, LLC

By

Printed Name DAVID MASSENGILL

Title Sr Director

Date 05/04/21

2121 Innovation Court, Suite 100
De Pere, WI 54115
(920) 497-2500
foth.com

April 14, 2021

Mr. Christian Zuidmulder
Vice President
C. Reiss Coal Company, LLC
111 West Mason Street
Green Bay, WI 54304

RE: Bulkhead Wall Monitoring Agreement

Dear Mr. Zuidmulder:

On behalf of Georgia-Pacific LLC (GP) Foth Infrastructure & Environment, LLC (Foth) is sending the following agreement for Bulkhead Wall Monitoring on your property.

GP is conducting monitoring of engineered caps installed as part of the Lower Fox Remediation project. These caps are covered by the Cap Operations, Monitoring and Maintenance Plan (COMMP) for caps placed in the Lower Fox River as part of the remediation of polychlorinated biphenyls (PCBs) in the Lower Fox River and Green Bay. This work is being performed under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §§ 9601-9675 and an Administrative Order on Consent, EPA Docket #V-W-04-781 (AOC) with the United States Environmental Protection Agency (EPA). We appreciate the cooperation that you have afforded us to date to implement this program.

As you are aware, a portion of the bulkhead wall on the C. Reiss property has been designated as a "cap" due to the presence of sediment containing PCBs behind the wall and therefore requires long-term monitoring as set forth in the COMMP. We will provide you with a copy of COMMP for your records.

The COMMP requires GP to monitor the bulkhead if any of the following events occur. These type of events may trigger immediate monitoring of the bulkhead wall cap:

- Vessel impact
- New construction
- Upland surcharge greater than design specifications

If warranted, event-based monitoring may include the following techniques and methods:

- Use of existing inclinometers
- Installation of new inclinometers
- Topographic surveying of monitoring points established on the bulkhead wall caps in 2020

- Topographic surveying of select areas of the upland behind the bulkhead wall adjacent to the monitoring points
- Visual observations and photography
- Diver inspection of the bulkhead wall cap

GP will need notification from C. Reiss if any of the above cited events does occur. That notification should be made within 48 hours following the event via email to GP and GP's consultant, Foth, to the contacts listed below:

- Email to:
    - Sharon Kozicki (Sharon.Kozicki@Foth.com)
    - Tara Van Hoof (Tara.VanHoof@Foth.com)

- With Copies to:
    - Roger Kaminski (roger.kaminski@gapac.com)
    - Paul Montney (pamontne@gapac.com)
    - Michael Davis, Esq. (jmdavis@gapac.com)
    - Dave Massengill (dgmassen@gapac.com)
    - Dan Binkney (dbinkney@anchorqea.com)

GP will send an annual letter to C. Reiss as a reminder of GP's monitoring requirements.

C. Reiss is not subject to specific reporting requirements under CERCLA and the associated AOC for this monitoring; therefore, this letter is intended for C. Reiss to acknowledge its agreement to notify GP if any of the events listed above occur so GP can conduct the required monitoring.

Thank you in advance for your cooperation.

Sincerely,

Foth Infrastructure & Environment, LLC

Sharon Kozicki

Sharon V. Kozicki, PG, MBA, PMP
Sr. Project Manager
Licensed in WI

Steve Laszewski

Steve Laszewski, Ph.D.
Principal

cc: Dave Massengill, Georgia-Pacific, LLC
Michael Davis, Georgia-Pacific, LLC

Agreement Approved for:

C. Reiss Coal Company, LLC	Georgia-Pacific, LLC
By	By
Printed Name CHRISTIAN L. ZUIDMULDER	Printed Name DAVID MASSENGILL
Title V.P. of Operations	Title Sr Director
Date 04/20/21	Date 05/04/21

February 22, 2017 Email from GP to A/OT

From: Montney, Paul A.
Sent: Wednesday, February 22, 2017 4:02 PM
To: Kincaid, Gary W - DNR <Gary.Kincaid@wisconsin.gov>
Cc: Heath, Bryan (Bryan.Heath@ncr.com) <Bryan.Heath@ncr.com>; Davis, Michael (GP Law) <JMDAVIS@GAPAC.com>
Subject: COMMP Comments 022117

Enclosed please find Georgia Pacific's comments on the COMMP. Please feel free to contact me if you wish to discuss them.

February 22, 2017 Email from GP to A/OT - Attachment

Comments on the COMMP

The following comments are submitted in response to the AOT amended version of the COMMP for the Fox River. These comments are preliminary and may be amended once the LLC and AOT come to an agreement on a common version.

The current version of the COMMP contains a monitoring and damage/failure response program for Bulkhead Walls. This addition to the normal cap monitoring and maintenance program is unprecedented and has no basis in EPA regulation or guidance. As discussed in the LLC comments (Technical Memorandum, Options for Interstitial Sediment at RGL Wall, July 10, 2015) numerous superfund sites across the country have used sheet pile walls to contain PCB contaminated soils. As they also point out, the nature of the PCBs is such that there is little chance of any significant contamination coming from the walls. Further, a bulkhead wall is not a cap or a cover, but is instead a standalone, engineered wall, which functions very differently from a cap or cover and which is subject to vastly different uses, stresses and controls. There is no remedial basis or technical rationale for including the walls in the COMMP. We incorporate the LLC comments by reference.

The RGL wall is a prime example of why bulkhead walls should be handled differently and by the party or parties that contracted for and built the walls. The wall was not properly constructed and was then subject to external pressure that resulted in failure. If the party constructing the wall and the party conducting the monitoring and repair were the same, these concerns would be addressed. For the Fox site, however, those parties are not the same and thus an undue burden will be placed on the monitoring party if the bulkhead walls are included in the COMMP. This situation is further problematic due to the ROD terms that allow for limited dredging and capping in the areas near bulkhead walls, and the fact that this option was not exercised in several instances resulting in the placement of the new bulkheads. Placing the responsibility for bulkhead monitoring and repair on parties who did not install the walls and who most likely would not have agreed to the walls is arbitrary and capricious. The replacement wall concept is outside of the Superfund process. The ROD provides that walls that are unstable can be capped to contain the PCBs. If the LLC and the Riparian, with the approval of the AOT, reach an agreement to replace an unstable wall or create a new bulkhead in front of an unstable wall, it is an agreement between private parties for mutual benefit. The agencies have a right to make sure that process is protective and work with those parties to make sure they understand their obligations, but this is still an agreement between the private parties and should not involve superfund and certainly not be part of the COMMP.

The appropriate remedy for contamination along unstable walls is a shoreline cap. Anything other than that is outside of superfund and is not consistent with intent of the ROD. It may be within the AOT's discretion to allow this to occur, but it not within their discretion to place obligations on a third party to take responsibility for an arrangement between private parties.

The 100 percent design made no mention of including walls in the COMMP and there is no precedent for doing so. Bulkhead walls are not caps; they carry a different set of requirements and they were not subjected to the same ROD mandated cost effectiveness review that the other caps require. The better approach would be to assign responsibility for the bulkhead walls to the party or parties that installed the walls as a continuing part of the remedial action and not as part of the COMMP.

February 16, 2018 Email from GP to A/OT

From: Montney, Paul A. [mailto:PAMONTNE@GAPAC.com]
Sent: Friday, February 16, 2018 5:11 PM
To: Kincaid, Gary W - DNR <Gary.Kincaid@wisconsin.gov>; Valentin, Pablo <valentin.pablo@epa.gov>
Cc: Heath, Bryan (Bryan.Heath@ncr.com) <Bryan.Heath@ncr.com>; Davis, Michael (GP Law) <JMDAVIS@GAPAC.com>
Subject: GP COMMP comments 021618.pdf

Enclosed please find Georgia Pacific’s comments on the draft COMMP. We would be happy to discuss them with you after you have had a chance to review them.

February 16, 2018 Email from GP to A/OT

Georgia Pacific submitted comments on the COMMP last year focusing on the inclusion of the bulkhead walls as caps. While we see you have included some language regarding an agreement with the wall owners in your recent comments, we still believe that the bulkhead walls are not caps and it is an inappropriate to include them in the COMMP or LTMP for several reasons. First and foremost bulkheads are not and never have been considered “caps” at any remediation site we are aware of. Caps contemplate the covering and isolation of elevated concentrations of contaminates in a submerged setting in open waterways. The two bulkheads on the Fox River currently contain less than 330 cubic yards of PCB containing material with a mass of just over 2 kgs of PCBs, most of which is behind the failed RGL Wall. Requiring elaborate monitoring of these bulkheads for this small amount of PCBs is not productive or warranted from a human health or ecological standpoint. Further, the bulkheads are on private property used for commercial purposes. Absent use restrictions and provisions for the landowner to maintain the bulkheads, it is unreasonable to ask the PRPs at the site to be liable for the monitoring and maintenance of these bulkheads as if they were caps in the river. These are issues that must be addressed and we are concerned that we have not received a response to our original comments and would like you to do so. If you would like me to send you a copy, I would be happy to do so. At this point we think a meeting to discuss these issues makes the most sense, so please let me know if you would like to discuss this matter further.

Georgia Pacific reserves its rights to comment on the next version of the LTMP and COMMP including, but not limited to the final SRA language, especially if the bulkhead walls are not removed from the documents.

October 5, 2018 Email from A/OT to GP

George Berken

From: Valentin, Pablo <valentin.pablo@epa.gov>
Sent: Friday, October 5, 2018 1:10 PM
To: pamontne@gapac.com; Kincaid, Gary W - DNR
Cc: bryan.heath@ncr.com; Davis, Michael (GP Law); Kincaid, Gary W - DNR; beth.olson@wisconsin.gov; Jay Grosskopf; Ava Grosskopf; George Berken; randall stone; Murawski, Richard; Frey, Rebecca; Short, Thomas; Judith.Mills@wisconsin.gov; William.Nelson@wisconsin.gov
Subject: RE: GP COMMP comments 021618.pdf

Good Afternoon Mr. Montney:

The U.S. Environmental Protection Agency (EPA) and the Wisconsin Department of Natural Resources (WDNR) (collectively, the "Response Agencies" or "Agencies") received your email dated February 16, 2018 with comments on the draft COMMP on behalf of Georgia Pacific (GP). The Response Agencies have evaluated your comments and our response follows.

GP's original comments from February 22, 2017 were taken into consideration and reviewed with the Agencies' management and legal staff. The Agencies' management and legal staff confirmed the bulkhead walls in question were properly designated as caps requiring inclusion in the COMMP as a condition of approval and as originally required and agreed to by the LLC/NCR and the property owner, RGL.

The Agencies' preferred option was to remove all RAL sediment prior to the installation of the bulkhead walls. However, the LLC/NCR chose instead to install the new wall and then remove the interstitial RAL sediment, which unfortunately was unsuccessful, resulting in leaving both non-TSCA and TSCA sediment behind. As a result, the LLC/NCR requested the Agencies' approval to leave the RAL sediment in place. The Agencies and RGL agreed to this request on the condition that the bulkhead walls be considered caps and included in the COMMP.

The interstitial sediment now contained between the walls was originally part of the river bed sediment targeted for removal and only became part of the upland structure (which GP refers to as "private property") after the bulkhead was installed. RGL was an integral part of the bulkhead wall design, review, and approval process and did not agree to leaving the interstitial RAL sediment in place unless it was clearly documented that they did not carry any long-term liability for the RAL sediment and that the RPs would be responsible for long-term monitoring and maintenance of the bulkhead. GP was included in all correspondence on this matter but made no comments during the discussion and development of these bulkhead plans.

As discussed above, inclusion of bulkhead walls in the COMMP as caps was the Agencies' condition for approval and RGL's acceptance, which was agreed to by all actively involved parties (LLC/NCR, Agencies, and RGL). GP had opportunities to provide comments throughout the entire design and COMMP development process and has been copied on all correspondence, but chose not to provide input or comments until February 22, 2017. GP's request to override the entire previous design, review, and approval process is not appropriate or reasonable.

The LLC/NCR did not object to the inclusion of these bulkhead caps in the COMMP and in fact included specific monitoring metrics in their revised submittal which documented their understanding and agreement.

The ROD requires the removal of RAL sediment as the primary remedial action and permits capping of RAL sediment that is not removed. Whether this RAL sediment is isolated by a typical aggregate cap or a sheet pile wall does not alleviate the need for properly containing, monitoring and maintaining the containment structure. Long-term monitoring and maintenance of caps are identified in the ROD: "*… the Amended Remedy includes specific requirements for monitoring and maintaining any caps that are installed, to ensure that the long-term objectives of the Amended Remedy are* *achieved. Engineered caps are considered to be a method to contain contaminants on a long-term basis*" and "*The Amended Remedy requires long-term monitoring of any caps that are installed at the Site to ensure their long-term integrity and protectiveness.*"

As always, the Response Agencies are willing to meet with GP to discuss any issues. GP has had – and continues to have – the opportunity to participate in the COMMP development process. However, GP's comments dated February 22, 2017 and February 16, 2018 have not changed the Agencies' position that the bulkhead walls must remain in the COMMP as caps that must be monitored and maintained long term as originally approved.

October 5, 2018 Email from A/OT to GP

Regards,

Pablo N **Valentin**
Remedial Project Manager
US EPA Region 5
Superfund Division
RRB 1 *Section* 2
77 W. Jackson Blvd (SR-6J)
Chicago, IL 60604
312-353-2886

From: Montney, Paul A. [mailto:PAMONTNE@GAPAC.com]
Sent: Friday, February 16, 2018 5:11 PM
To: Kincaid, Gary W - DNR <Gary.Kincaid@wisconsin.gov>; Valentin, Pablo <valentin.pablo@epa.gov>
Cc: Heath, Bryan (Bryan.Heath@ncr.com) <Bryan.Heath@ncr.com>; Davis, Michael (GP Law) <JMDAVIS@GAPAC.com>
Subject: GP COMMP comments 021618.pdf

Enclosed please find Georgia Pacific's comments on the draft COMMP. We would be happy to discuss them with you after you have had a chance to review them.