Report

# Phase 1 Final Report

## Lower Fox River and Green Bay Site
## Operable Units 2-5

**Project I.D.: 17L029**

## NCR Corporation

**May 2018**

Foth

**Green Bay Location**

2121 Innovation Court, Suite 300
P.O. Box 5126 • De Pere, WI 54115-5126
(920) 497-2500 • Fax: (920) 497-8516
www.foth.com

May 31, 2018

Mr. Pablo Valentin
Remedial Project Manager
U.S. Environmental Protection Agency
77 W. Jackson Blvd/SR-6J
Chicago IL 60604-3507

Ms. Beth Olson
Project Coordinator
WI Department of Natural Resources
2984 Shawano Ave.
Green Bay, WI 54313

Dear Mr. Valentin and Ms. Olson:

RE: Phase 1 Final Report
Lower Fox River and Green Bay Site Operable Units 2-5
De Pere, Wisconsin

On behalf of NCR Corporation, attached is the *Phase 1 Final Report, Lower Fox River and Green Bay Site Operable Units 2-5 (Phase 1 Final Report)*. This report has been prepared to comply with the requirements of the *Consent Decree for Performance of Phase 1 of the Remedial Action in Operable Units 2-5 of the Lower Fox River and Green Bay Site (Phase 1 CD)*.

The *Phase 1 Final Report* is a summary of the key activities completed in 2007-2008 by NCR Corporation (NCR) and U.S. Paper Mills Corporation for the Lower Fox River (LFR) Phase 1 Remedial Action (RA) and completed in 2010 and 2013 by Lower Fox River Remediation LLC, within the Phase 1 Project area, in conjunction with the LFR Phase 2 RA in Operable Unit 4.

NCR requests approval of this report by the Agencies as the final requirement for completing the Phase 1 Statement of Work as contained in the *Phase 1 CD*.

Sincerely,

Foth Infrastructure & Environment, LLC

Tara Van Hoof

Tara M Van Hoof, P.E.
*Project Environmental Engineer*

Denis Roznowski

Denis Roznowski, P.E.
*Project Director*

pw:\Lower Fox River Remediation\0017L029.00\10000 Reports\Final Report\R-Final Rpt.docx

# Phase 1 Final Report

## Lower Fox River and Green Bay Site
## Operable Units 2-5

## Distribution

| No. of Copies | Sent To | No. of Copies | Sent To |
|---|---|---|---|
| 1 CD<br>1 HC | Pablo Valentin<br>Remedial Project Manager<br>U.S. Environmental Protection Agency<br>77 W. Jackson Boulevard/SR-6J<br>Chicago IL 60604-3507 | 1 CD<br>1 HC | Beth Olson<br>Project Coordinator<br>WI Department of Natural Resources<br>2984 Shawano Avenue<br>Green Bay WI 54313 |
| 1 CD<br>1 HC | Randy Stone<br>U.S. Department of Justice<br>601 D St. N.W., Room 2121<br>Washington DC 20004 | 1 CD<br>1 HC | Gary Kincaid<br>Wisconsin Dept. of Natural Resources<br>2984 Shawano Avenue<br>Green Bay WI 54313 |
| 1 CD<br>1 HC | George Berken<br>Boldt Technical Services<br>2525 N. Roemer Road<br>Appleton WI 54912 | 1 CD<br>1 HC | Richard Murawski<br>U.S. Environmental Protection Agency<br>77 W. Jackson Boulevard (C-14J)<br>Chicago IL 60604-3590 |
| 1 CD | Jeff Lawson<br>Lower Fox River Remediation LLC<br>c/o Project Control Companies, Inc.<br>20 Trafalgar Square<br>Nashua NH 03063 | 1 CD | Bryan Heath<br>NCR Corporation<br>864 Spring St. NW<br>Atlanta GA 30308-1007 |
| 1 CD | John Heyde<br>Sidley Austin LLP<br>One S. Dearborn<br>Chicago IL 60603 | 1 CD<br>1 HC | Denis Roznowski<br>Foth Infrastructure & Environment, LLC<br>2121 Innovation Court, Suite 300<br>De Pere WI 54115 |
| 1 CD<br>1 HC | Master Project File<br>Foth Infrastructure & Environment, LLC | | |

# Phase 1 Final Report

## Lower Fox River and Green Bay Site
## Operable Units 2-5

Project ID: 17L029

Prepared for

**NCR Corporation**

Prepared by

**Foth Infrastructure & Environment, LLC**

May 2018

**Foth Infrastructure & Environment, LLC 2018**

2121 Innovation Court, Ste. 300 • PO Box 5126 • De Pere, WI 54115-5126 • (920) 497-2500 • Fax: (920) 497-8516 • www.foth.com

# Phase 1 Final Report

## Lower Fox River and Green Bay Site
## Operable Units 2-5

## Table of Contents



## Tables



## Figures



## Appendices

# List of Abbreviations, Acronyms, and Symbols

| | |
|---|---|
| *2003 ROD* | *Record of Decision* |
| *2007 RA Summary Report* | *2007 RA Summary Report – LFR Phase 1* |
| *2007 ROD Amendment* | *Record of Decision Amendment* |
| *2007-2008 RA Summary Report* | *2007-2008 RA Summary Report – LFR Phase 1* |
| *2010 RA Summary Report* | *2010 RA Summary Report – LFR Phase 2 OUs 2-5* |
| *2013 RA Summary Report* | *2013 RA Summary Report – LFR Phase 2 OUs 2-5* |
| *2013 RA Work Plan* | *Final Phase 2B Work Plan for 2013 Remedial Action of Operable Units 2-5* |
| Anchor | Anchor Environmental, L.L.C. or Anchor QEA, LLC |
| A/OT | Agencies Oversight Team |
| CERCLA | Comprehensive Environmental Response Compensation and Liability Act |
| cy | cubic yards |
| DCU | dredge certification unit |
| DMU | dredge management unit |
| Foth | Foth Infrastructure & Environment, LLC |
| LFR | Lower Fox River |
| LLC | Lower Fox River Remediation LLC |
| LTMP | *Long-term Monitoring Plan* |
| MNR | monitored natural recovery |
| NCR | NCR Corporation |
| *Optional SAP Addendum* | *Optional SAP Addendum for Phase 1 Verification of 2007 Project Completion* |
| OU | Operable Unit |
| PCB | polychlorinated biphenyl |
| *Phase 1 CD* | *Consent Decree for Performance of Phase 1 of the Remedial Action in Operable Units 2-5 of the Lower Fox River and Green Bay Site* |
| *Phase 1 Final Report* | *Phase 1 Final Report, Lower Fox River and Green Bay Site Operable Units 2-5* |
| Phase 1 RA | Lower Fox River Phase 1 Project area |
| Phase 2 OU4 RA | Lower Fox River Phase 2 Operable Unit 4 Remedial Action |
| ppm | part per million |
| RA | Remedial Action |
| RAL | remedial action level |
| RDMU | residual dredge management units |
| Response Agencies | USEPA and WDNR |
| SCCU | sand cover certification unit |
| SCMU | sand cover management unit |

| | |
|---|---|
| Shaw | Shaw Environmental & Infrastructure, Inc. |
| SWAC | surface weighted average concentration |
| TSCA | Toxic Substances Control Act |
| TtEC or Tetra Tech | Tetra Tech EC, Inc. |
| USEPA | U.S. Environmental Protection Agency |
| WDNR | Wisconsin Department of Natural Resources |

# 1 Introduction

Foth Infrastructure & Environment, LLC (Foth) has prepared this *Phase 1 Final Report, Lower Fox River and Green Bay Site Operable Units 2-5 (Phase 1 Final Report)* on behalf of NCR Corporation (NCR) to document completion of Remedial Action (RA) performed in the Lower Fox River (LFR) Phase 1 Project area (referred to as the "Phase 1 RA," located in De Pere, Wisconsin), in compliance with requirements of the *Consent Decree for Performance of Phase 1 of the Remedial Action in Operable Units 2-5 of the Lower Fox River and Green Bay Site (Phase 1 CD)* (USEPA, 2006), and has been prepared in a format agreed upon by members of the Agencies Oversight Team (A/OT), Wisconsin Department of Natural Resources (WDNR), and U.S. Environmental Protection Agency (USEPA) during a meeting with NCR on November 8, 2017. This *Phase 1 Final Report* is a summary of the work completed in 2007-2008 by NCR and U.S. Paper Mills Corporation, collectively the Phase 1 Respondents, as part of the Phase 1 RA and work completed in 2010 and 2013 by Lower Fox River Remediation LLC (LLC), a limited liability company formed by NCR and another company, within the Phase 1 Project area in conjunction with the LFR Phase 2 OU4 RA (herein referred to as "Phase 2 RA"); therefore, the majority of the document consists of references to existing project documents, including the following:

- *Phase 1 CD* (USEPA, 2006)
- *Record of Decision* (*2003 ROD*) (USEPA and WDNR, 2003)
- *Record of Decision Amendment* (*2007 ROD Amendment*) (USEPA and WDNR, 2007)
- *2007 RA Summary Report – LFR Phase 1* (*2007 RA Summary Report*) (Shaw et al., 2008)
- *2007-2008 RA Summary Report – LFR Phase 1* (*2007-2008 RA Summary Report*) (Foth and Shaw, 2009)
- *2010 RA Summary Report – LFR Phase 2 OUs 2-5* (*2010 RA Summary Report*) (TtEC et al., 2012)
- *2013 RA Summary Report – LFR Phase 2 OUs 2-5* (*2013 RA Summary Report*) (TtEC et al., 2014)

## 1.1 Project Background

The USEPA and WDNR (the "Response Agencies") jointly issued a *2003 ROD* selecting a remedy for OUs 2, 3, 4, and 5 of the LFR and Green Bay Site in June 2003. The *2003 ROD* called for dredging, dewatering, and upland landfill disposal of sediments with polychlorinated biphenyl (PCB) concentrations above a remedial action level (RAL) of 1.0 part per million (ppm) PCBs in OUs 3 and 4. Monitored natural recovery (MNR) was selected as the remedy for OU2 (with the exception of a small area directly above the dam at Little Rapids, which was included in the OUs 3-4 dredging remedy) and OU5. The remedial design for OUs 2-5 was prepared under an Administrative Settlement Agreement between the Response Agencies and NCR and Fort James Operating Company, Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Docket No. V-W-'04-C-781 (USEPA, 2004). This Agreement was also referred to as the "Remedial Design Agreement," which is Appendix B in the *Phase 1 CD*. In implementing the Remedial Design Agreement, NCR and Fort James performed additional pre-design sampling. The new data and analyses showed that a 20-acre area, with PCB concentrations in near-surface sediments as high as 3,000 ppm, the highest

known PCB concentrations in the LFR, was found just downstream and west of the De Pere Dam. In response to this new information, an Amended Remedy was adopted and a *2007 ROD Amendment* issued in June 2007. This 20-acre area was identified as the Phase 1 Project area, shown on Figure 1 of the *2007 ROD Amendment* and included in Appendix A of this report, and was estimated to contain approximately 145,000 cubic yards (cy) of PCB-impacted sediment above a 1 ppm PCB RAL, which included an estimated 26,000 cy with PCB concentrations equal to or greater than 50 ppm (Toxic Substances Control Act [TSCA] sediment). The TSCA sediments were the focus of the Phase 1 work. The Response Agencies determined that PCB concentrations in near-surface sediments in the Phase 1 Project area were sufficiently elevated such that an expedited phase of remedial action would be performed in advance of the rest of OUs 2-5 RA.

Consistent with the Statement of Work, which is Appendix A in the *Phase 1 CD*, RA of the Phase 1 Project area was initiated in 2007 with the goal of achieving the cleanup objectives outlined by the *Phase 1 CD* and summarized in Section 1.2.1 of this report, including removal of sediments containing PCBs concentrations of 50 ppm or greater. In 2007, sediments were removed primarily by hydraulic dredging and transported to an on-shore dewatering plant. After dewatering and upon achieving minimum strength requirements for landfill disposal, the sediment was loaded in trucks for offsite disposal at the Hickory Meadows landfill near the Town of Chilton, Wisconsin (currently owned and operated by Advanced Disposal Services) for non-TSCA sediment, and at the EQ Wayne Disposal Landfill in Belleville, Michigan for TSCA sediment. Consistent with the *2007 ROD Amendment*, during the 2007 dredge season, a 6-inch post-dredge sand cover was placed pending the final RA in portions of the Phase 1 Project area as further described in Section 2.

Following dredging in 2007, the Phase 1 Respondents had contemplated applying residual sand cover in 2008 in any other areas where it must be applied pursuant to the *Phase 1 CD*, after any optional re-dredging to meet the *2007 ROD Amendment* objectives was conducted; however, during the winter of 2007-2008, the Phase 1 Respondents proposed, and the Agencies approved, incorporating this contemplated 2008 Phase 1 remediation work into the overall Phase 2 RA as it progressed downstream. Therefore, dredging or sand covering was not conducted in 2008 in the Phase 1 Project area and only demobilization and site restoration work were completed in 2008.

RA in the Phase 1 Project area resumed in 2010 in conjunction with the Phase 2 RA. As part of the Phase 2 RA, the Phase 1 Project area was dredged to the targeted 1.0 ppm PCB RAL design elevations and post-dredge "quasi-verification" samples were collected (i.e., samples for which results are not initially accepted by the Agencies as final, for instance if they were collected downstream of where dredging was not yet considered completed).

Based on post-dredge confirmation sampling performed during the 2013 Phase 2 RA, residual dredging and residual sand cover was completed in the Phase 1 Project area in 2013.

Refer to Section 2 and Section 3 for further details regarding the Phase 1 RA and the Phase 2 RA completed in the Phase 1 Project area, respectively, and results achieved during each phase of RA activities.

## 1.2 Project Objectives

### 1.2.1 Consent Decree Objectives

The following cleanup objectives for the Phase 1 project were set forth in the *Phase 1 CD*:

- The final post-dredge confirmatory bathymetric surveys of the Phase 1 Project area must indicate that sediment removal to an agreed-upon set of target elevations (designed to achieve removal of sediment above 1.0 ppm) has been achieved over at least 95% of the Phase 1 Project area.

- The final post-removal confirmatory sediment sampling within the Phase 1 Project area must indicate that all sediments containing PCBs at a concentration of 50 ppm or greater have been removed.

- If final post-removal confirmatory sampling revealed that sediment with PCB concentrations exceeding 1.0 ppm remains within the Phase 1 Project area, the Phase 1 Respondents must place a minimum of 6 inches of "clean sand" over that area, consistent with the *2003 ROD*. Any clean sand used for this purpose must be received from an off-site source. The Phase 1 Respondents also have the option of performing additional dredging to address sediments with PCB concentrations exceeding 1.0 ppm remaining after removal of sediment to the required project limits.

- The Respondents must establish side slopes adjacent to the Phase 1 Project area that are sufficient to ensure the stability of remaining sediments. All side slopes with surface PCB concentrations exceeding 1.0 ppm must be covered with a minimum of 6 inches of clean sand, consistent with the *2003 ROD.*

### 1.2.2 Record of Decision Remedial Goals

While achieving the *Phase 1 CD* objectives was required, the Phase 1 Respondents also had the option of satisfying the remedial goals described in the *2007 ROD Amendment* in the Phase 1 Project area. As presented in the Agency-approved *Optional SAP Addendum for Phase 1 Verification of 2007 Project Completion (Optional SAP Addendum)* (Shaw et al., 2007a), the Phase 1 post-dredge verification sampling and analysis activities performed in the various dredge certification units (DCU) were aimed at determining whether removal (dredging) actions within these areas had achieved the *2007 ROD Amendment* remediation goals.

The *2007 ROD Amendment* used the term "generated residuals" for sediment that was re-suspended during dredging and re-deposited on the surface of newly-dredged areas (assumed to be within the top 6 inches of the sediment), and it used the term "undisturbed residuals" for sediment that was more than 6 inches below the surface of the sediment. If post-removal confirmatory sampling in a sediment removal area revealed generated residuals with PCB concentrations exceeding the 1.0 ppm PCB RAL, then the following requirements could be applied for management of the generated residuals:

- Generated residuals with a PCB concentration between 1.0 ppm and 10.0 ppm must be covered with at least 6 inches of clean sand from an off-site source (referred to as a "residual sand cover") if placement of a residual sand cover in the area was necessary to meet the surface weighted average concentration (SWAC) goal for the OU (i.e., a SWAC of 0.25 ppm PCBs in OU4).

- Generated residuals with a PCB concentration equal to or greater than 10.0 ppm must be the subject of an engineering analysis to determine next steps, which could include:

    1. removal (typically by re-dredging) in accordance with the sediment removal requirements specified above;

    2. capping, if the eligibility criteria for that alternate remedial approach can be met, as specified below; or

    3. placement of a residual sand cover.

For management of undisturbed residuals:

- Undisturbed residuals exceeding the 1.0 ppm PCB RAL must be the subject of an engineering analysis to determine next steps. Unless the Response Agencies approve use of a different residuals management approach in a particular area within an OU, undisturbed residuals with a PCB concentration exceeding the 1.0 ppm PCB RAL must be removed (typically by re-dredging) in accordance with the sediment removal requirements specified above. However, as a result of the engineering analysis, the Response Agencies may approve use of a different residuals management approach (such as a cap or a residual sand cover) for undisturbed residuals in limited areas.

For further details regarding the Phase 1 Project objectives, refer to the *Phase 1 CD, 2003 ROD*, and *2007 ROD Amendment*.

# 2 Summary of Phase 1 RA and Results Achieved

The Phase 1 RA consisted of site mobilization and preparation, sediment dredging, sediment dewatering, water treatment, dewatered sediment transportation and disposal, post-dredging confirmatory surveys and sampling, sand cover placement for residuals management, sand cover thickness confirmation sampling, and environmental monitoring.

The Phase 1 project commenced on July 16, 2006 (start of mobilization to the site), with dredging beginning on May 1, 2007. The sediments within the Phase 1 Project area were removed primarily by hydraulic dredging using 8-inch diameter horizontal auger hydraulic dredges (mechanical dredging methods were used where hydraulic dredging was not practical or effective), transported to an on-shore dewatering plant, dewatered, and loaded in trucks (after achieving the minimum strength requirements for landfilling) for offsite disposal at the Hickory Meadows landfill near the Town of Chilton, Wisconsin, for non-TSCA sediment, and at the EQ Wayne Disposal Landfill in Belleville, Michigan for TSCA sediment. At the end of the 2007 dredge season, approximately 104,030 in-situ cy of non-TSCA and 27,832 in-situ cy of TSCA sediment (based on post-construction bathymetric survey data) were removed from the project area to fulfill the *Phase 1 CD* objectives.

The work was phased such that all sediments requiring TSCA handling and disposal were targeted for dredging prior to any non-TSCA sediment dredging. To control the TSCA sediment dredging, the TSCA dredge areas were divided into five work units (TSCA Units 1, 2, 3a, 3b, and 4), as shown on Figure 2-2 of the *2007 RA Summary Report* and provided in Appendix A of this report. Similarly, the remaining non-TSCA sediment dredging areas were divided into 22 non-TSCA dredge management units (DMUs 1 through 22) as shown on Figure 1, following the main text of this report. For assessing compliance with project objectives following dredging, sets of two to five DMUs were grouped into DCUs, as described in the *Optional SAP Addendum*. Based on the site configuration, six DCUs were used for assessing compliance with the project objectives (DCUs 1 through 6); these DCUs are depicted on Figure 1. Sediment dredging was completed over the entire Phase 1 Project area in 2007 (with the exception of the approved high subgrade areas, shown on Figure 1 and described in the *2007 RA Summary Report*).

Subsequent to post-dredge bathymetric surveys, the data were processed to determine whether the 1.0 ppm PCB RAL target elevation (as required by the *Lower Fox River Phase 1 Remedial Action – Remedial Action Plan* [Shaw et al., 2007b]) had been achieved over at least 95% of the area within a given DCU. The results of the bathymetric surveying indicated that the required elevation was achieved in all DMUs as detailed in Section 2.7.1 of the *2007 RA Summary Report.* Once elevation attainment was verified, confirmation sampling was conducted, as described in Sections 2.7.2 and 2.7.3 of the *2007 RA Summary Report.*

As presented in the *Optional SAP Addendum*, the Phase 1 post-dredge verification sampling and analysis activities performed in DCUs 1 through 6 were aimed at determining whether dredging within this area had achieved remediation goals as described in the *2007 ROD Amendment*. Consistent with the *Optional SAP Addendum*, sample results from each DMU within a given DCU were averaged (arithmetic mean) and compliance with the *2007 ROD Amendment* was

assessed on a DCU basis, results of which are described in Section 2.7.4 of the *2007 RA Summary Report*.

If confirmation sampling indicated residual contamination in excess of 50 ppm within a DCU, additional dredging would have been performed; however, since residual PCB concentrations did not exceed 50 ppm in any of the DCUs, this step was not necessary during the 2007 dredge season. As the *Phase 1 CD* provides, the Phase 1 Respondents, at their discretion, could have elected to perform additional dredging, even if composite results for a DCU were below 50 ppm; however, such additional dredging was not conducted during the 2007 dredge season, primarily due to schedule constraints. The confirmation sampling results are presented in Table 4, in Appendix A, of the *2007 RA Summary Report*; and evaluations of the results by DCU are provided in Section 2.7.4 of the *2007 RA Summary Report*.

In areas where confirmation sampling indicated residual contamination (undisturbed or disturbed) in excess of 1.0 ppm total PCBs, but less than 50 ppm, an initial screening process, and if necessary, an engineering evaluation, were performed to identify if a 6-inch post-dredge sand cover was suitable as the final RA (i.e., achieved the 1.0 ppm PCB RAL throughout the DCU). This initial screening process is described in Section 2.8 of the *2007 RA Summary Report*.

Consistent with the provisions of the *2007 ROD Amendment* and based on an engineering evaluation, the Phase 1 Respondents recommended, and the Agencies approved, the placement of a 6-inch sand cover over the entire area of DCU 1, which comprised DMUs 1 and 2, as well as over the DMU 7 area, to manage the post-dredge residuals. Placement and verification of sand cover to the required thickness and extent was completed in 2007 for these areas (the sand cover area for DMUs 1 and 2 is also referred to as sand cover certification unit [SCCU] 1 and for DMU 7 also referred to as sand cover management unit [SCMU] 7). No other sand cover was placed during 2007. Additional sand cover placement was contemplated for 2008 to meet additional objectives of the *2007 ROD Amendment*. Ultimately, the decision was made by the Phase 1 Respondents, during the winter of 2007- 2008, to not perform optional re-dredging or place additional sand cover as part of the Phase 1 work, but rather to defer final RAs in the remainder of the Phase 1 area to the future Phase 2 work.

As discussed in the Agency-approved *Remedial Design Sampling Plan Addendum for Phase 1 Remedial Action* (Shaw et al., 2007c), placement of the minimum 6-inch specified thickness of sand cover was verified through a combination of sand placement records (i.e., tracking the number of 1.5-cy excavator bucket loads dumped into the hopper to determine quantity of sand placed in a given area), bathymetric survey results, and physical sampling (thickness measurements, as shown on Figures 2-13 and 2-14 and in Table 2-3 of the *2007 RA Summary Report*). Based on the sand thickness verification samples collected, the sand thickness placed in DMUs 1, 2, and 7 met the minimum required thickness. Refer to the *2007 RA Summary Report* for further details regarding sand thickness verification results.

Phase 1 demobilization activities were partial in 2007 due to the then contemplated 2008 remediation work. Demobilization that occurred in 2007 included the removal of marine

equipment from the river and some upland rental equipment including pumps, light plants, pressure washers, etc. Other on-site equipment was winterized.

During the winter of 2007-2008, the Phase 1 Respondents proposed and the Agencies approved, incorporating the potential Phase 1 2008 remediation work into the overall Phase 2 OU 2-5 RA as it progresses downstream. As a result, demobilization of Phase 1 in-river and upland equipment and site restoration was completed in 2008. Refer to the *2007-2008 RA Summary Report* for details pertaining to in-river and upland demobilization and site restoration activities.

Complete documentation details of the 2007-2008 Phase 1 RA can be found in the *2007 RA Summary Report* and *2007-2008 RA Summary Report.*

# 3 Summary of Phase 1 RA Activities Completed During Phase 2 RA and Results Achieved

The Phase 1 RA activities completed during the Phase 2 RA consisted of sediment dredging (which included dredging of residuals management sand cover placed in 2007); sediment desanding and dewatering; dewatered sediment load-out, transportation, and disposal; water treatment; post-dredging confirmatory surveys and sampling; post-removal residuals management; residual sand cover placement operations; sand cover thickness verification sampling; and environmental monitoring.

RA in the Phase 1 Project area resumed during the 2010 Phase 2 RA. The sediments within the Phase 1 Project area were hydraulically dredged using 8-inch and 12-inch diameter articulating swinging ladder hydraulic dredges, pumped as a slurry to an on-shore dewatering plant via pipeline, desanded, dewatered, and loaded in trucks (after achieving the minimum landfill strength requirements) for offsite disposal at the Hickory Meadows Landfill near the Town of Chilton, Wisconsin. During the 2010 dredge season, 67,157 in-situ cy of sediment were dredged from the Phase 1 Project area within 12 DMUs (DMUs 1 through 12). For the Phase 2 RA, DMUs for the Phase 1 Project area were reconfigured and do not correlate with those identified in the Phase 1 RA, except DMU 1. Refer to Figure 4-2 of the *2010 RA Summary Report* for DMU locations. Figure 4-2 is also provided in Appendix A of this report.

The Phase 1 Project area was dredged to the targeted 1.0 ppm PCB RAL design elevations and post-dredge "quasi-verification" samples were collected. In total, 60 core locations were sampled in the Phase 1 area. Five locations were sampled in each of the 12 DMUs. A total of 154 composite samples from 6-inch intervals were sent to Pace Analytical Services, Inc. for PCB analysis. Phase 1 quasi-verification PCB results are presented in Table E-1, in Appendix E, of the *2010 RA Summary Report*. Figure 4-6 and Figures 4-24 through 4-50 of the *2010 RA Summary Report* also show the locations and results of the verification sampling. Sampling performed in the Phase 1 Project area was not considered final, however, due to upstream areas in OU4 that had not been fully remediated at the end of 2010. No sand cover was placed in the Phase 1 Project area during the 2010 Phase 2 RA.

Based on post-dredge confirmation sampling performed during the 2013 Phase 2 RA, after the completion of upstream remediation, residual dredging was completed in Phase 1 residual dredge management units (RDMUs) 3, 3R, 4, and 4R (refer to Figures 4-14 through 4-20 of the *2013 RA Summary Report* for RDMU locations). Similar to the 2010 Phase 2 RA, the residual sediments were dredged, desanded, dewatered, and disposed of in the same manner as described above. During the 2013 dredge season, 8,224 in-situ cy of sediment were removed from the Phase 1 Project area within RDMUs 3, 3R, 4, and 4R.

Following attainment verification of target elevations, post-dredge confirmation sampling was completed. In total, 11 core locations were sampled in the Phase 1 Project area RDMUs 3, 3R, 4, and 4R. Phase 1 Project area post-dredge confirmation PCB results from 2013 are presented in Table E-1, in Appendix E, of the *2013 RA Summary Report*. Figures 4-14 through 4-20 of the

*2013 RA Summary Report* also show the locations and results of the confirmation sampling, as well as the dredge volumes.

Post-dredge conditions, following the decision process outlined in the *Construction Quality Assurance Project Plan* (Appendix A of the *Final Phase 2B Work Plan for 2013 Remedial Action of Operable Units 2-5* [*2013 RA Work Plan*] [TtEC et al., 2013]), led to the use of sand cover to address post-dredge residuals in the Phase 1 Project area. Residual sand cover was placed over the entire Phase 1 Project area using a material spreader barge; residual 6-inch sand cover was placed in areas SCPhase1-1, 1-2, 1-3, 1-4, 1-5, 1-6, 1-8, 1-9, and 1-11 and residual 9-inch sand cover was placed in areas SCPhase1-7, 1-10, and 1-12 (see Figure 1 in this report). Figure 10-1 of the *2013 RA Summary Report* also depicts residual sand cover locations in the Phase 1 Project area placed in 2013.

Placement of the minimum 6-inch or 9-inch specified thickness of sand cover was verified through a combination of sand placement records (methods including a belt scale on the spreader barge, a belt scale on the land-based metering hopper, and stockpile surveys combined with tonnages delivered), bathymetric surveys, and sand thickness verification sampling. Refer to Figures 10-8, 10-9, 10-11, 10-13, 10-14, 10-15, 10-17, 10-18, 10-19, 10-11, 10-22, 10-23, and 10-29 in the *2013 RA Summary Report* for as-built sand thickness verification results for SCPhase1-1 through 1-12. Table 10-6, in the *2013 RA Summary Report*, also provides sand cover quality assurance average thickness and placement volume estimates.

Refer to the *Final Phase 2B Work Plan for 2010 Remedial Action of Operable Units 2-5* (TtEC et al., 2011), *2013 RA Work Plan, 2010 RA Summary Report*, and *2013 RA Summary Report* for complete details pertaining to documentation of Phase 2 RA activities completed within the Phase 1 Project area.

# 4 Final Metrics for the Phase 1 Area

## 4.1 Dredging Summary

Sediment volumes removed via dredging operations performed during the 2007 Phase 1 RA, 2010 Phase 2 RA, and 2013 Phase 2 RA in the Phase 1 Project area (including re-dredge and overcut) are summarized in Table 4-1:

### Table 4-1

### Phase 1 In-Situ Volume Dredged

| | TSCA (cy) | Non-TSCA (cy) |
|---|---|---|
| Phase 1 RA (2007): | 27,832 | 104,030 |
| Phase 1 Project Area During Phase 2 RA (2010): | 0 | 67,157 |
| Phase 1 Project Area During Phase 2 RA (2013): | 0 | 8,224 |
| **Total Volume Dredged in Phase 1 Project Area:** | 27,832 | 179,411 |
| **Total TSCA and non-TSCA Dredge Volume:** | | 207,243 |

Note:
Volumes obtained from the associated RA Summary Report for the specified year.

## 4.2 Sand Cover Placement Summary

During the 2007 dredge season, a 6-inch sand cover was placed in SCCU 1 (SCMUs 1 and 2) and SCMU 7. Average sand cover thickness verification measurements are summarized in Table 4-2:

### Table 4-2

### Phase 1 2007 Sand Cover Placement Summary

| SCMU Designation | QA Average Thickness (inches) | Placed Square Footage | Calculated Volume Placed (cy) |
|---|---|---|---|
| SCMU 1 | 7.9 | 24,739 | 599 |
| SCMU 2 | 9.6 | 30,210 | 898 |
| SCMU 7 | 7.7 | 40,887 | 966 |

Notes:
1. Average thickness measurements include the mixing layer.
2. Thicknesses are from Table 6 in the *2007 RA Summary Report*.
3. SCMU 1 is the sand cover area for DMU 1, SCMU 2 is the sand cover area for DMU 2, and SCMU 7 is the sand cover area for DMU 7.

During the 2013 Phase 2 RA, residual sand cover was placed in the Phase 1 Project area in SCPhase1-1 through 1-12 as summarized in Table 4-3:

**Table 4-3**

**Phase 1 Area 2013 Sand Cover Placement Summary**

| SCMU Designation | QA Average Thickness (inches) | Placed Square Footage | Calculated Volume Placed (cy) |
|---|---|---|---|
| **6-inch Residual Sand** | | | |
| SCPhase1-1 | 9.8 | 32,460 | 982 |
| SCPhase1-2 | 8.6 | 77,884 | 2,067 |
| SCPhase1-3 | 7.9 | 82,921 | 2,022 |
| SCPhase1-4 | 8 | 87,172 | 2,152 |
| SCPhase1-5 | 8.6 | 83,087 | 2,205 |
| SCPhase1-6 | 8.2 | 87,572 | 2,216 |
| SCPhase1-8 | 8.3 | 74,669 | 1,913 |
| SCPhase1-9 | 8.6 | 85,156 | 2,260 |
| SCPhase1-11 | 8.7 | 100,472 | 2,698 |
| **9-inch Residual Sand** | | | |
| SCPhase1-7 | 11.6 | 82,486 | 2,953 |
| SCPhase1-10 | 12 | 73,465 | 2,721 |
| SCPhase1-12 | 13.5 | 91,712 | 3,821 |
| | **Total** | 959,056 | 28,010 |

## 4.3 Compliance with Performance Standards

### 4.3.1 Target Elevation

Final post-dredge bathymetric surveys performed during the 2007 Phase 1 RA confirmed that the *Phase 1 CD* objective of achieving target elevations (designed to achieve removal of sediment above 1.0 ppm) over at least 95% of the Phase 1 Project area was fulfilled (as detailed in Section 2.7.1 of the *2007 RA Summary Report*).

### 4.3.2 RAL

Post-construction bathymetric survey and confirmation sampling performed during the 2007 Phase 1 RA confirmed that the *Phase 1 CD* objective of removing all sediments containing PCBs at a concentration of 50 ppm or greater was fulfilled.

In addition, while not required by the *Phase 1 CD*, the LFR Phase 2 OU4 1.0 ppm PCB RAL objective was achieved within the Phase 1 Project area in 2013 through dredging to target elevation, re-dredging, and placement of residual sand covers. Residual dredging was completed in Phase 1 RDMUs 3, 3R, 4, and 4R and then residual sand cover was placed over the entire Phase 1 Project area (SCPhase1-1 through 1-12).

# 5 Future Monitoring and Maintenance

Future monitoring and maintenance for LFR Phase 2 OUs 2-5, which includes the Phase 1 Project area, is described in the *Long-term Monitoring Plan* (*LTMP*) (Anchor et al., 2009). The *LTMP* presents a program for monitoring the post-remediation recovery of surface water and biota in OUs 1-5 and sediment in OUs 2 and 5 of the LFR and Green Bay Site. Long-term monitoring will be performed to assess progress toward achieving the remedial action objectives specified in the *2002 Record of Decision* (USEPA and WDNR, 2002), the *2003 ROD*, and the *2007 ROD Amendment* issued by the Response Agencies under the authority of CERCLA, as amended.

# 6 Project Costs

Costs incurred to implement the Phase 1 RA are summarized in Table 6-1:

**Table 6-1**

**Phase 1 RA Cost Summary**

| Cost Category | Amount |
|---|---|
| Payments to Sevenson Environmental Services (general contractor) and other construction and site preparation: | $ 22,650,000 |
| Client oversight contractors: | $ 1,788,000 |
| Agency oversight ("Specified Future Response Costs"): | $ 751,000 |
| **Total** | **$ 25,189,000** |

Notes:
1. Costs rounded to the nearest thousand dollars.
2. Limited to cost incurred for the separate Phase 1 work; excludes cost of Phase 1 area as part of Tetra Tech's work

Additional costs incurred performing RA in the Phase 1 Project area during the Phase 2 RA in 2010 and 2013 will be documented in a forthcoming Phase 2 OUs 2-5 certification of completion request.

# 7 Certification

"Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this *Phase 1 Final Report*, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature Line: _____

Name: Bryan Heath
Title: Respondent Remedial Project Manager

Date: _____

# 8 References


Anchor QEA, LLC; Tetra Tech EC, Inc.; Shaw Environmental & Infrastructure. Inc.; and LimnoTech, Inc., 2009. *Long-term Monitoring Plan* (Appendix I of the *Lower Fox River Remedial Design, 100 Percent Design Report*). Prepared for Appleton Papers Inc., Georgia-Pacific Consumer Products LP, and NCR Corporation. December 2009.

Foth Infrastructure & Environment, LLC and Shaw Environmental & Infrastructure, Inc., 2008. *Lower Fox River Phase 1 2007-2008 Remedial Action Final Summary Report.* Prepared for NCR Corporation and U.S. Paper Mills Corporation. January 12, 2009.

Shaw Environmental & Infrastructure, Inc.; Anchor Environmental, L.L.C.; and Foth Infrastructure & Environment, LLC, 2007a. *Lower Fox River Operable Units 2 to 5 Optional SAP Addendum for Phase 1 Verification of 2007 Project Completion*. Prepared for NCR Corporation and U.S. Paper Mills Corporation. July 2007.

Shaw Environmental & Infrastructure, Inc.; Anchor Environmental, L.L.C., Foth & Van Dyke and Associates, Inc.; and Sevenson Environmental Services, Inc., 2007b. *Lower Fox River Phase 1 Remedial Action – Remedial Action Plan*. Prepared for NCR Corporation and U.S. Paper Mills Corporation. March 2007.

Shaw Environmental & Infrastructure, Inc.; Anchor Environmental, L.L.C.; Foth Infrastructure & Environment, LLC; and Sevenson Environmental Services, Inc., 2007c. *Lower Fox River Operable Units 2 to 5 Remedial Design Sampling Plan Addendum for Phase 1 Remedial Action*. Prepared for Wisconsin Department of Natural Resources and U.S. Environmental Protection Agency. October 2007.

Shaw Environmental & Infrastructure, Inc.; Anchor Environmental, L.L.C.; and Foth Infrastructure & Environment, LLC, 2008. *Lower Fox River Phase 1 2007 Remedial Action Summary Report.* Prepared for NCR Corporation and U.S. Paper Mills Corporation. February 2008.

Tetra Tech EC, Inc.; Anchor QEA, LLC; J.F. Brennan Company, Inc.; and Stuyvesant Dredging, Inc., 2011. *Final Phase 2B Work Plan for 2010 Remedial Action of Operable Units 2-5.* Prepared for Lower Fox River Remediation LLC. LFRR-11-0037. March 2011.

Tetra Tech EC, Inc.; J.F. Brennan Company, Inc.; and Stuyvesant Projects Realization Inc., 2012. *2010 Remedial Action Summary Report - Lower Fox River Operable Units 2-5.* Prepared for Lower Fox River Remediation LLC. October 2012.

Tetra Tech EC, Inc.; Anchor QEA, LLC; J.F. Brennan Company, Inc.; and Stuyvesant Projects Realization Inc., 2013. *Final Phase 2B Work Plan for 2013 Remedial Action of Operable Units 2-5*. Prepared for Lower Fox River Remediation LLC. LFRR-13-0036. February 2013.

Tetra Tech EC, Inc.; J.F. Brennan Company, Inc.; and Stuyvesant Projects Realization Inc., 2014. *2013 Remedial Action Summary Report - Lower Fox River Operable Units 2-5*. Prepared for Lower Fox River Remediation LLC. June 2014.

U.S. Environmental Protection Agency, 2002. *Record of Decision, Operable Unit 1 and Operable Unit 2, Lower Fox River and Green Bay, Wisconsin*. December 2002.

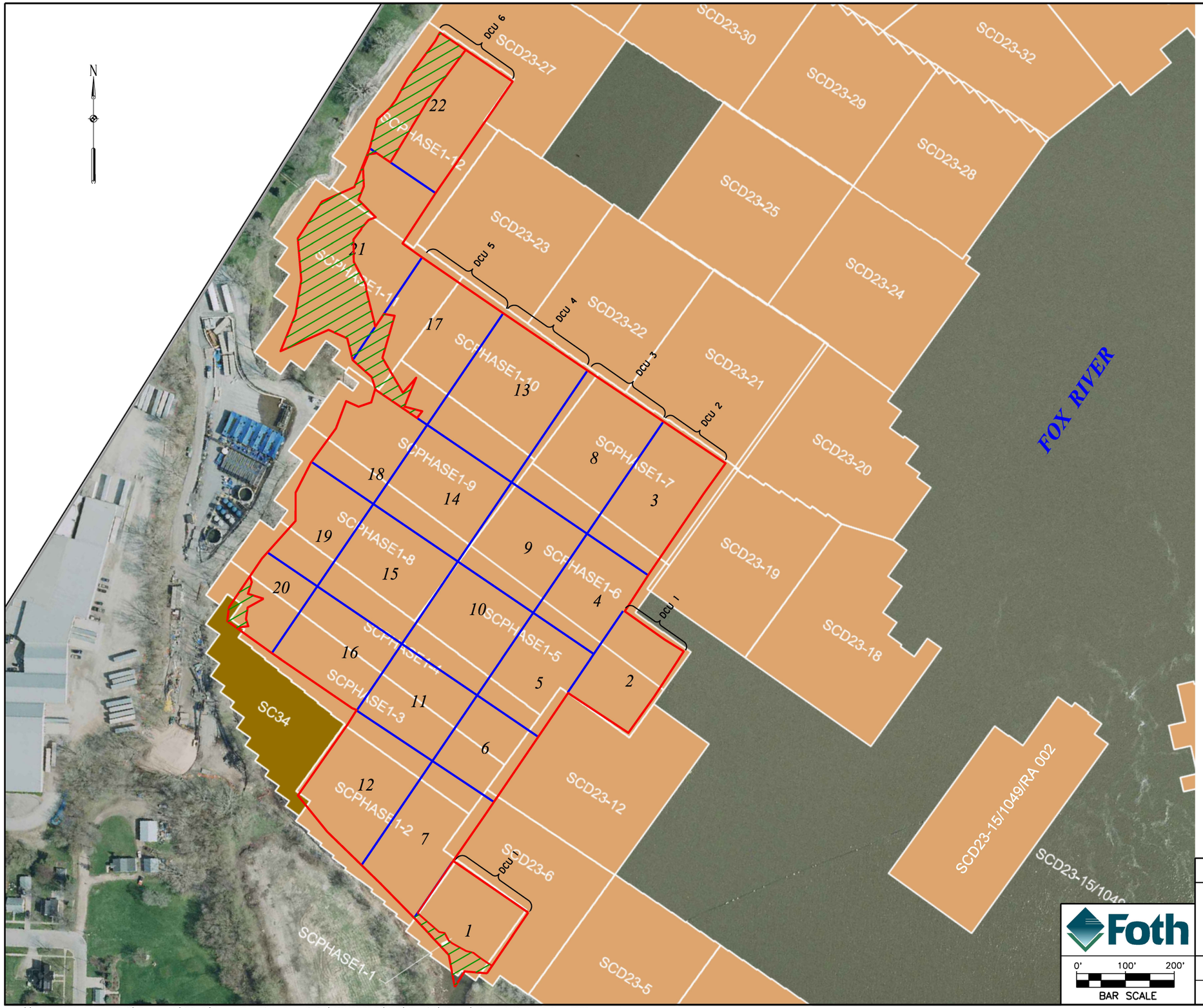
U.S. Environmental Protection Agency, 2004. Administrative Settlement Agreement between the Response Agencies and NCR and Fort James Operating Company, Comprehensive Environmental Response Compensation and Liability Act Docket No. V-W-'04-C-781.

U.S. Environmental Protection Agency and Wisconsin Department of Natural Resources, 2003. *Record of Decision, Operable Units 3, 4, and 5. Lower Fox River and Green Bay Wisconsin*. June 2003.

U.S. Environmental Protection Agency and Wisconsin Department of Natural Resources, 2006. *Consent Decree for Performance of Phase 1 of the Remedial Action in Operable Units 2-5 of the Lower Fox River and Green Bay Site*. March 2006.

U.S. Environmental Protection Agency and Wisconsin Department of Natural Resources, 2007. *Record of Decision Amendment: Operable Unit 2 (Deposit DD), Operable Unit 3, Operable Unit 4, and Operable Unit 5 (River Mouth).* Lower Fox River and Green Bay Superfund Site. June 2007.

# Figures




LEGEND

- PHASE 1 DREDGE LIMITS
- 9 — PHASE 1 2007 DMU
- DCU 4 — PHASE 1 DREDGE CERTIFICATION UNIT
- PHASE 1 HIGH SUBGRADE AREAS
- SCPHASE1-7 — PHASE 2 SAND COVER MANAGEMENT UNIT
- SC34 — PHASE 2 REMEDIAL SAND COVER AREA

NOTES:

1. HORIZONTAL DATUM: NAD83 WISCONSIN STATE PLANE CENTRAL.

Foth

0' 100' 200'

BAR SCALE

LOWER FOX RIVER REMEDIATION LLC

# FIGURE 1

PHASE 1 NON-TSCA
DMU & DCU DESIGNATIONS/
PHASE 2 SAND COVER DESIGNATIONS

| | | |
|---|---|---|
| Date: DECEMBER, 2014 | Revision Date: DECEMBER, 2017 | |
| Drawn By: JRB2 | Checked By: TMK1 | Project: 17L029 |

pw:\\PW-APS1.foth.com:PW_IE\Documents\Clients\Lower Fox River Remediation\0017L029.00\CAD\Capping\Figures\Figure 1 Phase 1 Non TSCA areas.dgn
6/12/2018 9:59:02 AM JRB2

# Appendix A

# Relevant Figures from Existing Documents

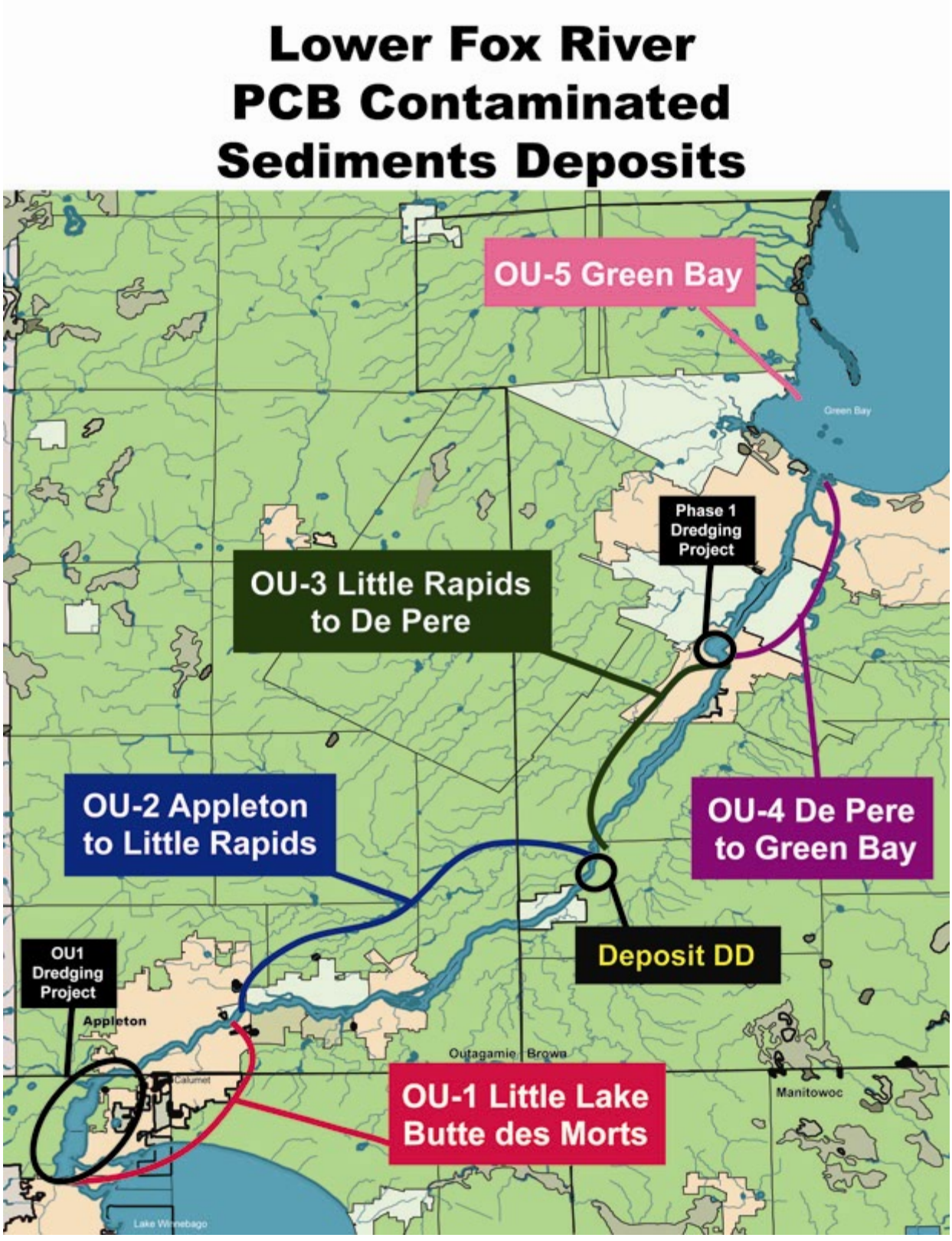



**Figure 1. Lower Fox River PCB-contaminated sediment deposits and Operable Units.**

N

FOX RIVER

UNIT 4

UNIT 3B

UNIT 3A

UNIT 2

UNIT 1

U.S. MILLS

SHORELINE

SHORELINE

BIRCH ST

LEGEND

PHASE 1 DREDGE LIMITS

TSCA AREA

NOTES:

1. HORIZONTAL DATUM: NAD83 WISCONSIN STATE PLANE CENTRAL.
2. VERTICAL DATUM: IGLD85, U.S. SURVEY FEET.

Foth Infrastructure & Environment, LLC

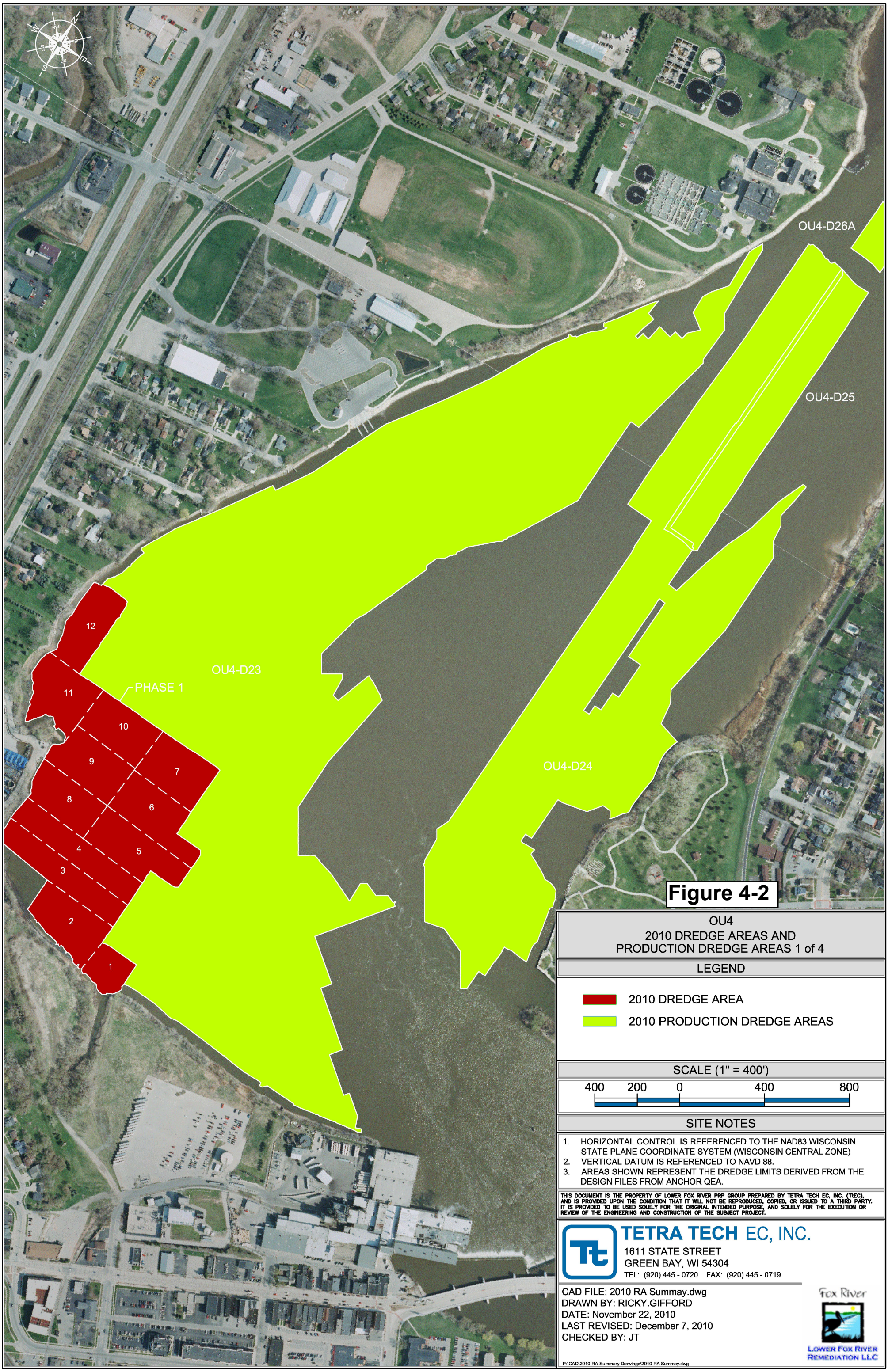
NCR & U.S. PAPER MILLS CORP.

**FIGURE 2-2**

PHASE 1 TSCA UNIT DESIGNATIONS

| | | | |
|---|---|---|---|
| Scale: 0 100' 200' | | Date: DECEMBER, 2007 | |
| Prepared By: JRB2 | Checked By: JBH1 | 06N001 | |

L:\06n001\2007 YEAR END SUMMARY\figure 2-2 tsca areas.dgn
2/15/2008 mrs




# Figure 4-2

OU4
2010 DREDGE AREAS AND
PRODUCTION DREDGE AREAS 1 of 4

LEGEND

- 2010 DREDGE AREA
- 2010 PRODUCTION DREDGE AREAS

SCALE (1" = 400')

400 200 0 400 800

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.
3. AREAS SHOWN REPRESENT THE DREDGE LIMITS DERIVED FROM THE DESIGN FILES FROM ANCHOR QEA.



TETRA TECH EC, INC.
1611 STATE STREET
GREEN BAY, WI 54304
TEL: (920) 445 - 0720 FAX: (920) 445 - 0719

CAD FILE: 2010 RA Summay.dwg
DRAWN BY: RICKY.GIFFORD
DATE: November 22, 2010
LAST REVISED: December 7, 2010
CHECKED BY: JT

Fox River
LOWER FOX RIVER REMEDIATION L.L.C

P:\CAD\2010 RA Summary Drawings\2010 RA Summay.dwg