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Mr. Pablo N. Valentín
Remedial Project Manager
United States Environmental Protection Agency (USEPA), Region 5
77 W. Jackson Boulevard – SR-6J
Chicago, IL 60604-3590

March 21, 2012
(1665)

RE: Construction Completion Report for Focused NAPL and Sediment Removal Action
Campmarina MGP River Operable Unit
Sheboygan-Campmarina Former Manufactured Gas Plant Site, Sheboygan, Wisconsin
USEPA ID No.: WIN000510058

Dear Mr. Valentín:

On behalf of Integrys Business Support, LLC (IBS), managing Wisconsin Public Service Corporation's Sheboygan-Campmarina Former Manufactured Gas Plant (MGP) Site, please find enclosed the Construction Completion Report associated with the Focused NAPL and Sediment Removal Action. This submittal is in response to the Removal Action Administrative Order on Consent (Removal AOC).

If you have any questions, please contact Mr. Brian Bartoszek at IBS (920-433-2643).

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Eric J. Tlachac, PE
Senior Engineer

Richard H. Weber, PE
Principal Engineer

Encl: (2 hard copies and 2 CDs, Construction Completion Report)

cc: Mr. Victor Pappas, WDNR (hard copy and CD copy)
Mr. Brian Bartoszek, IBS (CD copy)

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SMARTER SOLUTIONS

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VALUE

Construction Completion Report for Focused NAPL and Sediment Removal Action

Wisconsin Public Service Corporations's
Sheboygan-Campmarina
Former Manufactured Gas Plant, River Operable Unit
Sheboygan, Wisconsin

Project Number: 1665

March 21, 2012

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CONSTRUCTION COMPLETION REPORT
FOR
FOCUSED NAPL AND SEDIMENT REMOVAL ACTION

WISCONSIN PUBLIC SERVICE CORPORATION'S SHEBOYGAN-CAMPMARINA FORMER MANUFACTURED GAS PLANT, RIVER OPERABLE UNIT SHEBOYGAN, WISCONSIN

Project No. 1665

Prepared For:

Integrys Business Support LLC
700 N. Adams Street
Green Bay, WI 54307-9001

Prepared By:

Natural Resource Technology, Inc.
23713 West Paul Road, Suite D
Pewaukee, WI 53072

March 21, 2012

Ken R. Mika, EIT
Environmental Engineer

Eric J. Tlachac, PE
Senior Engineer

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 the 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.

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

Acronyms and abbreviations used in this Final Construction Report include the following:

AAC	Acceptable Ambient Concentration
AMP	Air Monitoring Plan
AOC	Administrative Order on Consent
ASTM	ASTM, International
bgs	Below ground surface
cfs	Cubic feet per second
CGC	CGC, Inc.
COC	Contaminant or constituent of concern
CQA	Construction quality assurance
CQAPP	Construction Quality Assurance Project Plan
DMU	Dredge management unit
EI	Envirocon, Inc.
EP	Engineering Partners, Inc.
FEMA	Federal Emergency Management Agency
FEMP	Fugitive Emissions Management Plan
FS	Feasibility Study
FSP	Field Sampling Plan
GGE	Green Globe Environmental, Inc.
Gillen	Gillen Construction Company, Inc.
GLNPO	Great Lakes National Program Office of USEPA
GPS	Global positioning system
GSI	Geo-Synthetics, LLC
IBS	Integrys Business Support, LLC
M&P	McMullen and Pitz Construction Company
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MGP	Manufactured Gas Plant
ng/L	Nanograms per liter
NRT	Natural Resource Technology, Inc.
NTU	Nephelometric turbidity unit
NAPL	Non-aqueous phase liquid
NAVD88	North American Vertical Datum of 1988
OSHA	Occupational Safety and Health Administration
OTIE	Oneida Total Integrated Enterprises
OU	Operable Unit
Pace	Pace Analytical Services
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl

PID	Photoionization detector
PRS	Pollution Risk Services
psi	Pounds per square inch
PUF	Polyurethane foam
QA	Quality assurance
QC	Quality control
RAWP	Remedial Action Work Plan
RCM	Reactive core mat
RI	Remedial Investigation
RTK-GPS	Real-time kinematic global positioning system
ROD	Record of Decision
Removal AOC	Settlement Agreement and Administrative Order on Consent for Removal Action
SAS	Superfund Alternatives Site
Settlement Agreement	Settlement Agreement and Administrative Order on Consent for Remedial Investigation/Feasibility Study
Site	Former Campmarina MGP Site
SR&H	Sheboygan River and Harbor Superfund Site
SOP	Standard operating procedure
STAT	STAT Analysis Corporation
SWAC	Surface-weighted average concentration
TVOC	Total Volatile Organic Compound
TSCA	Toxic Substances Control Act
TSS	Total suspended solids
UCS	Unconfined Compressive Strength
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollution Discharge Elimination System
WPSC	Wisconsin Public Service Corporation

1 INTRODUCTION

Natural Resource Technology, Incorporated, (NRT) prepared this report on behalf of Wisconsin Public Service Corporation (WPSC) to document the Focused Non-Aqueous Phase Liquid (NAPL) and Sediment Removal Action performed in the River Operable Unit (OU) of the former Campmarina Manufactured Gas Plant (MGP) located in Sheboygan, Wisconsin (Figure 1).

1.1 Project Background

Regulatory background for the River OU is as follows;

- WPSC and the U.S. Environmental Protection Agency (USEPA) entered into a Settlement Agreement and Administrative Order on Consent (Settlement Agreement), CERCLA Docket No. V-W-07-C 862, effective January 26, 2007 (Appendix A1), to perform Remedial Investigation/Feasibility Study activities in accordance with the requirements of the Superfund Alternatives Site (SAS) Program.
- NAPL was identified in near shore sediment and under shore soil during the remedial investigation (RI) performed between June and August 2008 as documented in the River OU RI Report, Revision 1 (NRT, July 2009). USEPA approved the RI report on December 11, 2009.
- Remedial alternatives for the River OU were described in the Feasibility Study Report, Revision 2 (NRT, January 2011).
- Plans and Specifications for the Focused NAPL and Sediment Removal Action were submitted to USEPA in April 2011. To maintain schedule, WPSC concurrently solicited bids from contractors using these plans and specifications.
- USEPA summarized their and WDNR's comments on the Focused NAPL and Sediment Removal Action Plans and Specifications in a letter dated May 3, 2011 (Appendix A2)
- USEPA issued correspondence on June 3, 2011 authorizing removal of sediment outside of the temporary sheet pile cofferdam containing elevated polycyclic aromatic hydrocarbons associated with the former Campmarina MGP (Appendix A3).
- WPSC awarded the contract for the Focused NAPL and Sediment Removal Action to Envirocon, Incorporated (EI) on June 3, 2011; EI subsequently mobilized to the site on June 20, 2011 following preparation of a Remedial Action Work Plan (RAWP).
- USEPA issued the formal Time Critical Removal Action Memorandum (Appendix A4) to WPSC in June 23, 2011 authorizing the Focused NAPL and Sediment Removal Action.
- USEPA issued an Administrative Settlement Agreement and Order on Consent for Removal Action (Removal AOC), CERCLA Docket No. V-W-11-C 973, effective June 28, 2011 (Appendix A5), for the Focused NAPL and Sediment Removal Action.

- Responses to USEPA and WDNR comments on the Focused NAPL and Sediment Removal Action Plans and Specifications were summarized in a letter to USEPA on June 29, 2011 (Appendix A6).
- The RAWP was conditionally approved by the USEPA on July 21, 2011 (Appendix A7).

The Campmarina River OU is located within the limits of the Sheboygan River and Harbor (SR&H) Superfund Site. The SR&H Superfund Site is subject to a separate remedial action, unrelated to the former Campmarina MGP Site (Site). A Record of Decision (ROD) was issued by United States Environmental Protection Agency (USEPA) in May 2000 to address sediment impacted by polychlorinated biphenyls (PCB) through removal in the Upper River, additional characterization and monitoring in the Middle River, and additional characterization and potential sediment removal subject to natural and recreational disturbances in the Lower River and Inner Harbor. The party implementing the ROD for the SR&H Superfund Site, Pollution Risk Services (PRS), submitted a Remedial Action Work Plan (RAWP) for the Lower River and Inner Harbor (PRS, March 2011), which was subsequently approved by USEPA. PRS began dredging the Lower River and Inner Harbor in Spring 2011.

PCB sediment impacts were comingled with NAPL impacts in the Campmarina River OU. Because the removal of PCB-impacted sediment in these areas would release NAPL into the water column, presenting an immediate threat to the surrounding environment, WPSC, PRS, and USEPA agreed that WPSC would address PCB impacts within the cofferdam area of the Campmarina River OU during the Focused NAPL and Sediment Removal Action.

1.2 Supporting Documents

Documents prepared to support the design, implementation, and oversight of the Focused NAPL and Sediment Removal Action include the following:

- Multi-Site Field Sampling Plan – (Multi-Site FSP) (IBS, September 2008)
- Remedial Investigation Report – Revision 1 (RI Report) (NRT, July 2009)
- Feasibility Study Report – Revision 2 (FS Report) (NRT, January 2011)
- Focused NAPL and Sediment Removal Action Plans and Specifications (NRT, April 2011)
- Construction Quality Assurance Project Plan – Revision 1 (CQAPP) (NRT, April 2011)
- Remedial Action Work Plan – (RAWP) (EI, June 2011)
- RAWP Amendment 1 – (EI, June 2011)
- RAWP Amendment 2 – (EI, July 2011)
- RAWP Amendment 2A – (EI, July 2011)

- RAWP Amendment 3 – (EI, July 2011)
- RAWP Amendment 4 – (EI, July 2011)
- RAWP Amendment 5 – (EI, August 2011)
- RAWP Amendment 6 – (EI, September 2011)

1.3 Removal Action Project Team Organization

The principal organizations responsible for completing the Focused NAPL and Sediment Removal Action include the following entities:

- **USEPA Oversight Contractor**: Oneida Total Integrated Enterprises (OTIE)
- **Owner**: Wisconsin Public Service Corporation (WPSC)
- **Design Engineer, Owner's Construction Representative, and Quality Assurance/Air Monitoring Consultant**: Natural Resource Technology, Inc., (NRT) with structural and geotechnical engineering support from Engineering Partners International, LLC (EP)
- **Remediation Contractor**: Envirocon, Inc. (EI)
- **Remedial Subcontractors**:
    - Survey and Dredge Control Support: Green Globe Environmental, Inc. (GGE)
    - Waterloo Barrier Support System: Gillen Construction Company (Gillen)
    - Geosynthetic Cover Repair: Geo-Synthetics, LLC (GSI)
    - Temporary Sheet Pile Cofferdam: McMullen and Pitz Construction Company (M&P)

1.4 Site Description

The Sheboygan River drains 427 square miles, with its headwaters located in Fond du Lac County. Near Lake Michigan, the Sheboygan River is a gaining stream that receives groundwater and surface water from the Sheboygan area and discharges into Lake Michigan. Near the Site, the river varies in width from approximately 180 feet on either the east or west side of Boat Island to 300 feet just upstream of Boat Island. Boat Island is in the approximate center of the river resulting in an east and a west channel adjacent to the former MGP. Flow of the Sheboygan River is generally easterly, toward the lake, but southerly past the Site, and is controlled by upstream dams located at Sheboygan Falls and Kohler. A gauging station active from October 1993 through September 1995 recorded an average flow rate of 177 cubic feet per second (cfs) at the mouth of the river (approximately one mile downstream from the Upland OU).

The river bed elevation within the River OU ranges from approximately elevation 569 to 577 feet, referenced to the North American Vertical Datum of 1988 (NAVD88), based on the 2008 RI sediment sampling data. Water depths within the River OU ranged from approximately 1.5 to 9.5 feet at the time of the RI. The river water elevation, measured from the Site staff gauge during RI sediment poling, ranged from 578.4 to 578.8 feet (NAVD88). The Lake Michigan Low Water Datum is elevation 578 feet (NAVD88).

The 1991 Federal Emergency Management Agency (FEMA) map indicates the 100 year floodplain is at elevation 584 feet (NAVD88).

1.5 Contaminants of Concern

The primary contaminants of concern (COC) associated with the Removal Action AOC are PAH, NAPL, and PCB. The PAHs and NAPL originated from the former MGP, while the PCBs originated from other sources including former Tecumseh die-casting operations located many miles upriver from the site.

The highest sediment PAH concentrations and most abundant NAPL in the form of oil-coated/oil-wetted sediment were adjacent to the former MGP, at the eastern shore of the Sheboygan River. Approximately 550 feet of the shoreline and 3.0 acres of the river were addressed under the Removal Action AOC. Toxic Substance Control Act (TSCA) level PCB sediment (≥50 mg/kg) was also located in this area. The concentrations and distributions of COCs have been studied and were used as the basis for the cleanup design, including dredge depths and the delineation of the dredge areas.

1.6 Removal Action Summary

The Removal AOC required that PCB-, PAH-, and NAPL-impacted sediments underneath the former MGP shoreline and in the Sheboygan River be mechanically removed. PCB-impacted sediments were defined by grids in accordance with SH&R removal. Several PCB grids contained TSCA-level PCBs. TSCA-level PCB sediments were to be removed independently from the non-TSCA impacted sediments. PAH- and NAPL-impacted sediment areas were defined into dredge management units (DMU) based upon the RI. Each DMU had predetermined dredge outlines and required removal depths based on elevations at the time of the RI. PAH DMUs were considered complete upon achieving the removal elevation in at least 90% of the DMU. NAPL DMUs were considered complete once there was no undisturbed NAPL visually remaining in the DMU, or less than 6 inches of disturbed (generated from dredging) NAPL residuals remaining.

Due to the potential for NAPL and NAPL-impacted sediments migrating downstream during removal operations, a temporary sheet pile cofferdam was installed. The cofferdam was comprised of two segments: one upstream of the removal area and one downstream, with the removal area also contained by Boat Island.

A subsurface containment system comprised of a Waterloo sheet pile barrier and geosynthetic cover was present along part of the shoreline in the Upland OU at the Site (Figure 2). This system was constructed during previous remedial activities for the Upland OU. NAPL-impacted sediments were present along the Waterloo Barrier up to 18 feet below the top of the sheet pile. The Waterloo Barrier was not designed for unbalanced earth pressures that the removal of the NAPL-impacted sediment adjacent to it would cause. Consequently, a system of buttress piles and wales was designed and installed to provide temporary support for the Waterloo Barrier as the NAPL-impacted soil and sediment adjacent to it was removed.

Ground pressure restrictions from construction equipment were imposed in the area of the former upland remedy to prevent damage to the geosynthetic cover. The removal action contractor deployed timber matting in work areas that traversed the geosynthetic cover to meet these restrictions.

Once removed, the impacted sediments were transported to a stabilization pad constructed in the upland support area where they were mixed with a stabilization amendment to meet strength requirements imposed by the approved disposal facility for non-TSCA regulated sediments, Veolia Hickory Meadows Landfill located in Hilbert, Wisconsin. TSCA-regulated sediments were disposed by PRS at Clean Harbors Lone Mountain Landfill located in Waynoka, Oklahoma.

Air sampling was conducted during the removal action to monitor exposure to COCs. EI monitored their construction workers for compliance with permissible exposure levels established by the Occupational Safety and Health Administration (OSHA). NRT monitored the site perimeter for fugitive emissions, dust, and odor to measure public exposure off Site. Action levels were established for perimeter monitoring to conduct removal operations in a manner that minimized public exposure off Site.

Following completion of sediment removal, stabilization, and load-out activities, backfill was imported and placed to restore the shoreline. No backfill was placed in river sediment excavations.

As noted above, EI mobilized to the site on June 20, 2011, and they demobilized following substantial completion of the project on December 21, 2011. Restoration of the upland support area is scheduled to be completed in May 2012.

2 SUMMARY OF REMOVAL ACTION AND CONSTRUCTION QUALITY ASSURANCE ACTIVITIES

The former Campmarina MGP River OU removal action began in June 2011 and was substantially completed in December 2011. The removal action activities were performed in substantial accordance with the Focused NAPL and Sediment Removal Action Plans and Specifications, CQAAP, Removal AOC, and RAWP.

2.1 Removal Action Documentation

Removal action documentation was done through an updated weekly project schedule, weekly meeting minutes, photographs, video recordings, and survey documentation which are shown on record drawings.

2.1.1 Removal Action Schedule

Removal action construction activities began in late June 2011 and were mostly completed by mid-December 2011. Minor restoration work that was unable to be completed in the winter months is scheduled to be completed in May 2012. EI submitted the intended removal action schedule in their proposal/bid in May 2011. The schedule was updated upon award and notice to proceed in June 2011. Throughout the removal action, EI updated their schedule on a weekly basis to keep the project teams up to date. The final removal action schedule, with start and completion dates for general activities, is in Appendix B.

2.1.2 Removal Action Video Recordings

Removal action activities and progress was documented through video recordings. All of the video recordings have been archived in NRT's project files.

2.1.3 Weekly Meeting Minutes

Weekly progress meetings were held every Thursday at 10:00 a.m. in an onsite job trailer. The meetings were held to discuss the following items;

- Completed activities from the previous weeks;
- Issues encountered and resolved;
- Construction quality assurance (CQA) activities;

- Updated removal action construction schedule;
- Coordination of work activities with PRS;
- Submittal status; and
- Work anticipated for the current week and anticipated issues.

Weekly meeting minutes were issued prior to the following week's meeting to project personnel and meeting attendees. Meeting minutes from the removal action are in Appendix D.

2.2 Pre-Mobilization Activities

EI completed pre-mobilization activities from June 3, 2011 to June 21, 2011. EI prepared and submitted a Remedial Action Work Plan (RAWP) for review and comment by WPSC, NRT, and USEPA. Prior to equipment mobilization, NRT and EI documented pre-construction conditions of the site by taking photographs and videos. In addition, NRT collected soil samples to document existing PCB and PAH impacts in the upland support area. EI also took photographs, video recordings, and surveyed the upland support area to document park features for post-construction restoration. The pre-construction upland support area features are shown on Figure 2.

2.2.1 Remedial Action Work Plan

Prior to mobilizing to the site, EI prepared a RAWP in accordance with the requirements of the removal action specifications and submitted it to WPSC, NRT, and USEPA for review. Six amendments were made to the RAWP during the removal action to address modifications as they occurred. These are presented in pertinent sections below. USEPA conditionally approved the RAWP on July 21, 2011 (Appendix A7).

2.2.2 Pre- and Post-Construction Photographs and Video Recordings

The City of Sheboygan granted WPSC access to Campmarina Park and the property adjacent to Campmarina Park to the north and east, owned by the City's Redevelopment Authority, for use as an upland support area for the removal action. NRT and EI took pre-construction photographs and video recordings of the park features, walkways, bike path, facilities, parking lots, sidewalks, curb and gutters, and streets prior to site mobilization in June 2011 for the purpose of documenting pre-construction conditions for reference during restoration activities following the removal action. Representative Construction Photographs 1 and 2 (Appendix C) provide examples of these pre-construction photographs.

Upon substantial completion of the removal action in December 2011, NRT and EI conducted the same survey of the area to document any damage caused by the removal action (Photographs 73 and 74, Appendix C).

2.2.3 Pre- and Post-Construction Soil Samples

Soil samples were collected from 17 locations in the upland support area (Figure 3) on June 21, 2011 utilizing a 4-inch diameter hand auger advanced from the preconstruction land surface to 2 feet below ground surface (bgs). The samples were composited, containerized, and sent to Pace Analytical in Green Bay, WI (Pace) for analysis of PCBs (EPA method 8082) and PAHs (EPA method 8270 SIM). Each sample location was referenced to the Sheboygan County Coordinate System with a differential global positioning system (DGPS) unit (Trimble GeoXH 2005 Series).

Additional soil samples were collected from the same locations following substantial completion in December 2011. Due to disturbed soil from the sediment stabilization pad being left in place, five of the soil sample locations were higher in elevation. At these locations composite samples were collected from the land surface to 2 feet bgs. An underlying, additional composite sample was collected from the estimated pre-construction land surface elevation down 2 feet for comparison to the pre-construction samples. The samples were containerized, labeled, and submitted to Pace.

Pre- and post-construction sampling information and analytical testing results are shown in Table 1. The laboratory reports from both sampling events are provided in Appendix E. The analytical testing results for the post-construction samples showed slightly elevated concentrations of PAHs and PCBs in most samples. These impacts will be addressed as described hereafter is Section 2.7 – Site Restoration.

2.3 Site Mobilization and Dredging Preparations

Upon completion of pre-mobilization activities, EI and NRT began to mobilize equipment to the site. Site mobilization and dredging preparation activities included installation of environmental management controls and construction of the Waterloo Barrier Support System.

2.3.1 Mobilization and Set Up

EI was required by the removal action specifications to preserve and protect site features during the removal action. EI took the following measures to meet these requirements:

- Retaining walls (concrete block) on the southern end of the upland support area were disassembled to allow equipment access in the area.
- The volleyball court was removed; the sand and net posts were reserved for restoration activities.

- Jungle gyms, benches, garbage cans, fencing, and railings were removed to allow equipment access; these materials were stored in a secure area on site for reinstallation during restoration activities.
- Monitoring wells were protected by placing steel plates and concrete slabs over the top of the flush-mount well vaults.
- Park lights were removed in areas where heavy construction traffic was anticipated. Lights were saved for reassembly after construction. Light pole foundations were either removed completely or cut flush with the land surface for later repair during site restoration.
- Sidewalks had crane mats placed over them (Figure 5) to protect the sidewalk and meet ground pressure limitations imposed by the removal action specifications for protection of the geosynthetic cover and to minimize surcharge loads on the Waterloo Barrier. Ground pressures were limited to less than 4 pounds per square inch (psi).
- No excavation or ground penetration was allowed with the limits of the Waterloo Barrier containment system for protection of the geosynthetic cover.

EI mobilized and set up the following items at the site:

- Construction job trailers;
- Security fence;
- Temporary electrical service for the trailers and equipment;
- Phone and internet service;
- Heavy equipment to complete the construction and dredging requirements, including barges and long-reach excavators;
- A batch wastewater treatment system;
- Access to potable water from the City of Sheboygan;
- Temporary restrooms for site personnel; and
- Garbage pickup from the site.

Due to ground pressure limitations at the site, EI obtained access to a portion of the Mayline property across the river from the site (Figure 4). Barges and dredging equipment were mobilized from the Mayline property.

Mobilization and set up was initiated at the end of June and was finished by the middle of July 2011.

2.3.2 Environmental Management

Environmental management controls were implemented before equipment arrived on site and throughout the removal action. Environmental management activities included:

- Site security;
- Erosion and sediment controls;
- Total Suspended Solids (TSS) and turbidity sampling and monitoring;
- Air monitoring;
- Installation of the sediment stabilization and equipment decontamination pads;
- Cofferdam installation; and
- Set-up of the sediment contact water treatment system.

2.3.2.1 Site Security

Temporary fencing was installed during mobilization activities to separate the removal action activities and the general public. NRT personnel inspected the site security fence daily to confirm the fence intact and functioning as intended. NRT personnel immediately informed EI of any problems identified during these daily inspections so that they could be rectified by EI.

2.3.2.2 Erosion and Sediment Controls

Prior to the start of construction, WPSC applied for and received a City of Sheboygan Erosion Control Permit (Appendix F) to satisfy the requirements of the access agreements for the upland support area. While security fencing was being installed, EI installed the following erosion and sediment control measures;

- Silt fence;
- Silt fabric and sediment socks in storm sewer inlets;
- Haul roads comprised of geotextile fabric and aggregate, (Photograph 6, Appendix C); and
- Tracking pads, comprised of a minimum 12-inch thick layer of 3-inch diameter aggregate on geotextile fabric (Photograph 4, Appendix C), were installed at site entrances to prevent offsite tracking of sediments from vehicles leaving the site.

Silt curtains were also deployed during the removal action for work done outside of the temporary sheet pile cofferdam or after the cofferdam was removed. Following substantial completion, EI deployed erosion control matting on disturbed portions of steep slopes and installed staged erosion control measures to control sediment in other disturbed areas through the winter of 2011-2012.

Throughout the removal action, EI inspected the erosion and sediment controls weekly and after rain events of one-half inch or more. EI documented these inspections and any necessary repairs in a report that was submitted to NRT on a weekly basis. NRT personnel also completed their own inspections and documented these in their daily field reports. When NRT found erosion and/or sediment controls not in compliance, EI was informed of the non-compliance so to rectify it. Inspections are being conducted by WPSC on a monthly basis during the winter shut-down period.

2.3.2.3 TSS and Turbidity Sampling and Monitoring

Water column monitoring was conducted to identify any total suspended solids (TSS) impacts associated with the removal action. Turbidity was measured at 30-minute intervals during each work day through the use of remote monitoring buoys located upstream and downstream of the removal action (Figure 4). The removal action specifications established a turbidity action level of 70 nephelometric turbidity units (NTU) greater than the measured upstream turbidity. Turbidity was correlated to TSS concentrations through periodic sampling and laboratory analysis.

2.3.2.3.1 Prior to Dredging TSS and Turbidity Sampling

Prior to dredge operations commencing, ten surface water grab samples were collected for laboratory turbidity and TSS analyses. Turbidity was also measured in the field as the samples were collected. The turbidity measurements and TSS results were used to develop the site-specific turbidity (NTU) to TSS (mg/L) correlation of 1 to 1. Three additional surface water samples were collected during the removal action to confirm the initial correlation. Surface water samples were collected using a horizontal grab sampler in accordance with the USEPA-approved Multi-Site FSP, September 8, 2008, SOP SAS-03-03. Sample locations were recorded with a hand held differential global positioning system (DGPS) unit (Trimble GeoXH 2005 Series). Samples were submitted under chain of custody to Pace for analysis of TSS (SM 2540D) and turbidity (SM 2130B). Table 2 has a summary of the analytical testing results and a graph depicting the turbidity to TSS correlation. Appendix G1 provides the associated laboratory reports.

2.3.2.3.2 During Dredging Operations

During dredging activities, turbidity measurements were collected from upstream and downstream of the cofferdam (Photographs 19 and 69, Appendix C) at 30-minute intervals with nephelometer sondes mounted on buoys. The results were transmitted via cellular modem to a base station in the NRT construction trailer and uploaded to a website for project team personnel to review. If the average downstream turbidity over four consecutive half-hour readings (i.e., 2 hours) would exceed the 70 NTU above upstream background, and the condition of the elevated turbidity was reasonably attributable to the removal action and no other factors, such as boat propeller wash, EI was to be notified and dredging suspended until operations could be modified to reduce turbidity impacts. This action level was never exceeded throughout the removal action. Monthly reports were generated from the turbidity buoy measurements and are provided in Appendix G2.

A hand-held turbidity meter was used to check the calibration of the turbidity monitoring buoys on a weekly basis (Photograph 23, Appendix C). The logs for these calibration checks are provided in Appendix G3. When calibration errors were indicated by the checks, each piece of equipment was calibrated in accordance with the manufacturer's recommendations and the USEPA-approved SOPs.

2.3.2.4 Air Monitoring

Perimeter air monitoring was done to quantify exposure of the surrounding neighborhoods to vapors associated with the removal action. The Air Monitoring Plan (AMP) contained in the CQAPP was implemented with four air monitoring stations set up at the perimeter of the site (Figure 3, Photograph 14 Appendix C).

The Fugitive Emission Management Plan (FEMP) contained in the CQAPP was implemented as described below.

2.3.2.4.1 Air Monitoring Activities

Air monitoring activities were conducted by NRT to evaluate various emissions:

- Fugitive dust;
- Volatile organic compounds (VOCs);
- Ammonia; and
- PAHs.

The air monitoring program consisted of the following:

- A Davis Vantage Pro2 weather station was established at the site and operated to continuously monitor meteorological conditions during the removal action. Data was recorded on a five-minute interval.
- TSI 8520 DustTraks were deployed and operated to monitor fugitive dust five days per week from June 23, 2011 through August 26, 2011, and three days per week thereafter until all impacted sediments were removed from the site (November 10, 2011).
- Hand-held photoionization detector's (PID's) (miniRae 2000 10.6EV and RAE Ultrarae 3000 9.8EV) were used three times per day, five days per week to quantify ambient air concentrations of total volatile organic compounds (TVOCs) and benzene.

- A hand held ammonia gas detector (RKI Eagle) was used three times per day, five days per week to quantify ambient air concentrations of ammonia.

- Twelve-hour MGP constituent-specific samples were collected once per week using SUMMA canisters for VOCs (EPA Method TO-15), and polyurethane foam (PUF) and Tisch TE-1000 sampling units were used for PAHs (EPA Method TO-13a). Results were compared to risk-based acceptable ambient concentrations (AACs).

MGP constituent-specific air samples were submitted to STAT Analysis, Inc. (STAT) in Chicago, IL for laboratory analysis. Daily logs, meteorological data, DustTrak data, and laboratory analytical reports were reported in monthly air monitoring reports, copies of which are provided in Appendix H.

2.3.2.4.2 Fugitive Emissions Management

Fugitive emission mitigation measures taken by EI included deployment of Rusmar Long Duration Foam (AC-645), tarps, Ecosorb, and water (for dust suppression). Rusmar was used to suppress VOC's, ammonia, and odor on the stabilization pad in the event that ambient air concentrations above the action level specified in the FEMP were detected at the fence line (Photograph 34 and 54, Appendix C). Tarps (Photograph 53, Appendix C) were used to contain odors, VOC's, and ammonia during work stoppages (e.g., evenings, weekends). Ecosorb, an odor neutralizing agent, was sprayed from portable units (Photograph 43, Appendix C) to mitigate odors emitted by the dredged sediment. Water was used to control dust on the site haul roads and parking areas.

Action levels were used in a tiered approach, as described in the FEMP, to determine necessary response actions to different site exposure conditions. In addition to the action levels provided, odor was assessed in a qualitative manner based upon whether or not odors at the site perimeter were perceived to be a present concern as a public nuisance and/or there was a public complaint. Particulates, in addition to having an established numerical action level, were assessed on the basis of whether/or not the site operations were causing visible off-site emissions of fugitive dust.

A total of 29 55-gallon drums of Rusmar and six 5-gallon containers of Ecosorb were used during the project.

Specific action levels reached and engineering controls implemented as response actions are reported in the monthly air monitoring reports (Appendix H).

2.3.2.5 Stabilization Pad Construction

A stabilization pad was constructed in the upland support area (Figure 3) to provide a location to mix dredged sediments with the stabilization amendment and minimize impacts to the soils in the upland support area. Soils on site were graded to create a foundation that promoted drainage of free liquids to one corner of the pad. Site soils were also utilized to create containment berms around the perimeter of the stabilization pad. Soils were also imported for stabilization pad construction to minimize excavation of the site soils. Once the pad foundation was completed, a sump was installed to capture any free liquids. The sump was comprised of a shallow, precast concrete manhole section and integrated base, an open grate on top, and internal electric submersible pump with automatic float controls to pump the captured water to the project water treatment plant. A layer of 30-mil linear low-density polyethylene geomebrane liner between two layers of geotextile was placed over the soil foundation and berms and tied into the sump. A six-inch lift of dense-graded aggregate imported from offsite was placed on the geosynthetics. Upon completing the six-inch lift of aggregate, two 2-inch layers of asphalt pavement were placed on the aggregate as a working surface for the heavy equipment utilized to mix and load out stabilized sediment. Photographs 3, 7, 8, and 11 (Appendix C) show the process of the stabilization pad being built.

2.3.2.6 Equipment Decontamination Pad

Equipment leaving the upland support area was required to be decontaminated in the event that the equipment came in contact with impacted sediment. A gravel decontamination pad was constructed in the upland support area (Figure 3) to facilitate decontamination operations. The pad consisted of a shallow sump installed in the ground with soil sloped around the sump to promote drainage of decontamination water to the sump. A geomembrane liner between two layers of geotextile was placed in a shallow depression excavated in the ground (Photograph 5, Appendix C). Three-inch aggregate was placed over the geosynthetics and an electric submersible pump was placed in the sump to drain the decontamination pad, as needed. Water was pumped to the sediment stabilization pad. Once on the stabilization pad water flowed to the sump and was pumped to the influent water tank of the water treatment system.

2.3.2.7 Temporary Cofferdam Installation

A temporary sheet pile cofferdam was installed upstream and downstream of the NAPL dredge area to prevent a release of NAPL during dredging/excavation. Cofferdam installation equipment was mobilized from the Mayline property (Figure 4) due to ground surface restrictions in the upland support area. Barges were assembled to transport the Manitowoc 2900 WC lattice boom crawler crane that installed the sheet pile. A 70-foot by 40-foot barge was pushed up the river from Lake Michigan to transport sheet pile from the Mayline property to the installation areas.

The length of each sheet pile was measured to the nearest 0.1 feet prior to installation to verify conformance with the design length of 35 feet. The sheets were driven by an MKT V-17 vibratory hammer with diesel power pack to a target bottom elevation of 547 and top elevation 582 (NAVD88). Each sheet was numbered sequentially, and the sheet number and drive depth was noted at the top of the sheet with marking paint following installation.

The southern (downstream) segment of the cofferdam was installed first due to barge draft limitations in the river. The northern segment was installed immediately following installation of the southern segment. Drive records were kept during installation and reviewed by NRT to verify compliance with the design plans and specifications. EI surveyed the top of the cofferdam following installation to document the horizontal position (with reference to the Sheboygan County Coordinate System), and top elevation for each sheet. This information is summarized in Table 3 and the installed location of the cofferdam is shown on Figure 4. Photographs 10, 13, and 16 (Appendix C) show the progress of the north and south cofferdams being installed.

As installation progressed temporary buoys, warning signs, and marker lights were also installed to warn boaters of the presence of the cofferdam.

2.3.2.8 MGP Contact Water Management and Discharge

A 50-gallon per minute, batch water treatment system was used to treat water that came into contact with the dredged sediments, referred to as MGP contact water. The system was set up and operated in the asphalt parking lot adjacent to the park and Sheboygan Outboard Motor Club (Figure 3). The temporary, portable water treatment system included in successive order an influent storage tank, sand filters, bag filters, an oil-water separator, granular activated carbon vessels, and an effluent tank. MGP contact water was treated in batch mode to comply with effluent limits established by the Wisconsin Department of Natural Resources (WDNR) in their Substantive Requirements of a Wisconsin Pollution Discharge Elimination System (WPDES) Permit No. WI-0064831-01-0 (Appendix I1), referred to hereafter as the Substantive Requirements.

Water captured from the dredged sediment in the roll off boxes on the barges was first pumped into a geotube inside a roll-off box on the stabilization pad, for initial removal of heavy solids prior to pumping to the influent storage tank. Water was allowed to flow onto the stabilization pad from the roll-off box to flow into the sump. Water that came on the stabilization pad by other means was allowed to flow into the sump and was not sent through the geotube. Water in the sump was pumped to the influent storage tank. The first batch of treated water was held in the effluent tank until laboratory analytical testing of samples of that first batch demonstrated compliance with the Substantive Requirements. After a few batches of treated water confirmed the system was effective in meeting the discharge limitations, effluent was discharged directly into the river following treatment, bypassing the effluent storage tank. The effluent discharge location was within the temporary sheet pile cofferdam associated with the removal action.

MGP contact water was generated from the following sources:

- Free water on top of the excavated sediment that was pumped out of the containers on the barges before sediment was unloaded;
- Precipitation and sediment pore water captured on the stabilization pad;
- Decontamination water; and
- Backwash from the water treatment system.

Samples of influent and effluent (Photograph 28, Appendix C) were collected from each batch treated, as required by the Substantive Requirements. These samples were analyzed for the following parameters by Pace:

- Influent;
  - TSS (Method SM2540D);
  - PCBs (EPA Method 8082); and
  - Site-specific PAHs (EPA Method 8270).
- Effluent;
  - pH (measured in the field);
  - TSS (Method SM2540D);
  - PCB (EPA Method 8082); and
  - Site-specific PAHs (EPA Method 8270).

Additional parameters were required to be analyzed in the first batch. If any of the additional parameters were detected in concentrations greater than 1/5 of the values identified in the Substantive Requirements, monitoring would need to continue for those parameters. Mercury and manganese were detected in the first batch in concentrations above 1/5 of their respective values identified in the Substantive Requirements. WDNR allowed monitoring to be discontinued for manganese because it was not a COC for the removal action. Mercury was also detected in the first batch, but monitoring continued until WDNR concurred through the additional sampling results that the presence of mercury in the effluent was not in violation of water quality standards.

Compliance with the TSS effluent limitation was intermittent throughout the duration of the removal action. When TSS exceedances became known, they were communicated to WDNR in accordance with the Substantive Requirements. In its review of the compliance monitoring results, WDNR considered that effluent discharges from the water treatment system occurred within the temporary sheet pile cofferdam associated with the removal action, or behind silt curtain following removal of the cofferdam.

Electronic discharge monitoring reports (eDMR's) were prepared monthly by NRT and submitted to WDNR, as required by the Substantive Requirements. Over the duration of the removal action, the system treated 287,320 gallons of MGP contact water. The eDMR's and associated laboratory analytical reports are provided in Appendix I2.

2.3.3 Waterloo Barrier Support System Installation

The Waterloo Barrier Support System is comprised of 41 buttress piles, 42-inch diameter drilled steel shafts, 0.75-inch in thickness and 36 feet in length, installed on approximately 12-feet on center and filled with concrete, and 12-inch wide flange steel beam wales installed at two elevations along the planned dredge cuts. The drilled shafts were required to be installed to a bottom elevation of 547 and initial top elevation 583 (NAVD88). Shafts were drilled from July 12 through August 16, 2011. Wales were designed to be installed at elevations of 580 and 572 feet above msl NAVD88. Wales were installed from August 6 through November 3, 2011.

2.3.3.1 Buttress Pile Installation

A bench was cut along the shoreline to elevation 580 (NAVD88) to allow construction personnel to assist in the installation of the buttress piles. Rip rap and shoreline soils were removed and stockpiled on site (Figure 3) for re-use during site restoration (Photograph 9, Appendix C). The geosynthetic cover associated with the upland subsurface containment system was cut to remove the portion of the cover extending over the Waterloo Barrier (Photograph 12, Appendix C).

The buttress piles were installed in a telescopic fashion using a Caldwell drill table attached to a Manitowoc 3000WV 65-ton crawler crane. Twelve-inch thick, timber crane mats were placed over and oriented perpendicular to a layer of 8-inch thick, timber crane mats along the shoreline to distribute the additional loading exerted by the crane. The crane first drilled a 60-inch diameter, 6-foot long casing into the bench (Photograph 15, Appendix C). An auger was attached to the crane to remove soil from inside of the 60-inch diameter casing. Once the soil was removed, a 54-inch diameter, 16-feet long casing was drilled inside of the 60-inch diameter casing. A smaller auger was attached to the crane and soil inside of the 54-inch diameter casing was removed. Following removal of the soil from inside of the 54-inch diameter casing, the 42-inch diameter shaft was drilled inside of the 54-inch diameter casing (Photograph 33, Appendix C) to the target depth/elevation. Another smaller auger was attached to the crane and soil was removed from inside of the 42-inch diameter shaft. The auger cuttings from the buttress piles were loaded into a dump truck and transported to the stabilization pad for temporary storage until enough were generated to fill a truck. Once there were enough spoils on the pad to warrant transportation, they were loaded out (Photograph 36, Appendix C) and transported to Veolia's Hickory Meadows Landfill. A total of 1,087 tons of buttress pile spoils were disposed under waste profile

HML11-110. A spreadsheet summary of the waste manifests for profile HML 11-110 is provided in Appendix J1.

Once two to three buttress piles were drilled in place, concrete was tremmied into the piles to elevation 570 (Photograph 17, Appendix C). Sand was added above the concrete to elevation 580. The portion of the shaft above elevation 581 was later cut off to allow the piles to be buried in the shoreline during restoration activities.

Buttress pile installation was observed and documented by NRT. Specifically, NRT verified that the piles were drilled to their design depths and noted the elevations that native clay was encountered in the boreholes. Table 4 presents a summary of record information for each buttress pile.

Buttress pile locations were surveyed by Envirocon. These locations are depicted on Figure 5.

NRT also made a set of cylinders each day concrete was delivered for compressive strength testing (Photograph 18, Appendix C). The samples were cured overnight in the location where the samples were collected with bags covering the opening of the sample molds. The next day the samples were transported to an onsite cooler with water in the bottom to allow the samples to cure properly for an additional two days. Samples were then delivered to CGC, Inc. (CGC) in Milwaukee, WI. CGC conducted unconfined compressive strength tests (UCS; ASTM C39) at 7- and 28-day intervals from the day the concrete was poured on site. This was done to confirm that the concrete strength met the specification requirements of 3,000 psi after 28-days of cure time. Only one concrete sample out of 20 total samples did not meet the 28-day strength specification. But another cylinder from this set was tested again at 56-days and this result exceeded the 3,000 psi criterion. All concrete cylinder testing results are provided in Appendix K1.

Buttress piles 8 through 10 were spaced closer together than 12 feet on center due to the non-linear alignment of the Waterloo Barrier in this area. This field modification was made with input and approval from Engineering Partners (Appendix K2).

2.3.3.2 Wale Installation

Two rows of horizontal wales were designed to be installed between the vertical buttress piles and the Waterloo Barrier to provide a structural connection between them. The wale design called for 12-inch wide flange beams with shims. In certain locations, 10-, 8-, and 6-inch wide flange beams were used due to narrower clearances caused by the non-linear alignment of the Waterloo Barrier. The associated field modification was documented in a memo by EP provided in Appendix K3.

The design called for individual wale segments to be structurally connected through welded or bolted splice plates to create one contiguous wale. Butt welds were used on the top row of wales, and the wales and steel shims were welded to the buttress piles and the out bays of the Waterloo Barrier. The lower wales were suspended by rods from the top wales, and subsequently lowered into place after the top wales were secured and the soil adhering to the Waterloo Barrier was scraped off during soil and sediment excavation. To eliminate welded or bolted connections for a contiguous lower wale, the design of the lower wale was modified during construction to allow for staggered, individual segments between buttress piles. The ends of the top and bottom members of the lower wales overlapped each other by a minimum horizontal distance of three feet beyond the centerline of the buttress piles. Wood blocks were placed as shims in between the lower wales and out bays of the Waterloo Barrier. Once the wood blocks were in place, a hole was torched into the rib of the wale to pin the shims in place. Shims were not necessary between the buttress piles and the lower wales because the wales were in full contact with the buttress piles. Further information on these design modifications and record documentation generated during wale installation are provided in Appendices K4 through K6. Photographs 40 and 48 (Appendix C) show the upper and lower wales being installed. Photograph 63 (Appendix C) shows Green Globe Environmental (GGE), EI's surveying subcontractor, surveying the elevation of the lower wales.

2.3.3.3 Wale Inspection

EP inspected the top wale being installed to confirm proper installation (Photograph 55, Appendix C). The removal action specifications required EI to video tape installation of the lower wales to document that they were installed as designed. Due to the ongoing dredging operations and associated turbidity, videotaping underwater was not feasible because of limited visibility. Consequently, NRT hired a subcontract diver, Veolia ES Marine Division, to inspect the lower wales "by touch" (Photograph 57 and 62, Appendix C). Notes from each of the dive inspections are provided in Appendix K7.

2.3.3.4 Waterloo Barrier Monitoring

The Waterloo Barrier was monitored for deflection in multiple ways. Optical surveys of 23 points at the top of the exposed barrier were conducted on a minimum weekly basis using a robotic total station. Slope inclinometers were installed in four of the buttress piles and also monitored on a weekly basis. Visual inspections of the grouted interlocks in the Waterloo Barrier were also done to physically observe whether there were impacts on the barrier from the removal action.

2.3.3.4.1 Optical Deflection Surveys

To provide monitoring points for the optical deflection surveys, 5/8-inch diameter bolts were tack-welded onto the top of the Waterloo Barrier approximately every 25 linear feet as it was exposed. Weekly surveys were conducted using a robotic total station set up over a control point on Boat Island. Back sights for the total station were established on the island and in the upland support area along Water Street. The optical prism for the robotic total station was screwed onto each bolt to facilitate the survey (Photographs 31 and 35, Appendix C). An initial survey of each bolt was considered the baseline for deflection monitoring. If a bolt was inadvertently broken off during construction, a new bolt was welded onto the Waterloo Barrier at that location and a new baseline was established for that location. Surveys (X, Y, and Z) were done to the nearest 0.01 feet in the Sheboygan County Coordinate System and NAVD88 vertical datum.

During the removal action, the measured deflection via optical survey ranged from no deflection to approximately 10.5 inches. The maximum deflection observed occurred in a short section of the Waterloo Barrier adjacent to an area in which the wakefield wall described in Section 3.1 was removed using a vibratory pile hammer to facilitate installation of the upper and lower wales. The average deflection observed was approximately 2.2 inches. The data generated from the optical deflection surveys are summarized in Appendix K8.

2.3.3.4.2 Slope Inclinometers

Slope inclinometer tubes were installed into four buttress piles (4, 15, 27, and 38) to measure displacement throughout the vertical profile of these buttress piles (Photograph 24, Appendix C). A Geokon GK-603 inclinometer was used on a weekly basis to measure deflection. GTilt Plus software was used to manage and plot the data collected by the GK-603 (Photograph 51, Appendix C). Base readings were established prior to wales being installed (Photograph 30, Appendix C). Essentially no horizontal deflection was measured from top to bottom in the four buttress pile inclinometers throughout the duration of the removal action. Plots from the inclinometer surveys are provided in Appendix K9.

2.3.3.4.3 Interlock Inspections

To supplement the optical surveys and inclinometer measurements, NRT conducted regular visual inspections of the exposed grouted interlocks, between the top of the wall and the soil bench excavation and/or river water surface, for the presence of distress or separation – none were observed over the term of the project.

In addition, the exposed interlock joints below the water surface were inspected "by touch" during the final lower wale dive inspection, to feel for irregularities (Photograph 62, Appendix C). Dive notes (Appendix K7) indicated that no cracks or openings were detected.

2.3.3.4.4 Deflection Summary

Deflections of the top of the Waterloo Barrier measured through the optical surveys were greater at some locations than initially anticipated. However, with the additional information gathered through the vertical slope inclinometer surveys and inspections of the interlocks, this deflection had no apparent effect on the interlocks or hydraulic containment of the Waterloo Barrier.

2.4 Dredging

EI began dredging on July 20, 2011 and was completed by November 8, 2011. The DMUs were grouped into the following four different categories depending upon the dominant COC present in the dredge management unit (DMU): non-TSCA PCB, TSCA PCB, PAH, and NAPL. These are described in the following sections. Dredging operations required pre- and post-dredge quality assurance (QA) bathymetric surveys, post-dredge sampling, and daily quality control (QC) bathymetric surveys to monitor progress.

2.4.1 Bathymetric Surveying

Bathymetric surveying was performed to identify sediment surface elevations and establish elevation contours. Bathymetric surveys were completed prior to commencement of dredging operations (pre-dredge), during dredging operations (daily QC surveys), following completion of a DMU (post-dredge QA survey), and after all dredging was completed (final survey). There were two types of bathymetric surveys performed: QA and QC. QA surveys were performed to demonstrate compliance with dredge target elevations. NRT accompanied GGE on these surveys to confirm that they were done in compliance with United States Army Corps of Engineers (USACE) SOP's. QC surveys were performed on a daily basis to monitor dredging progress.

Surveys were performed using a Hydrolite, single-beam, 200 kHz sonar attached to a 14-foot aluminum boat. The Hydrolite was referenced to land elevations using a Trimble TSC2 RTK-GPS unit (Photograph 38, Appendix C). However, survey via RTK-GPS was not possible in some areas due to overhead obstructions. Robotic total stations were set up in the upland support area and on Boat Island to facilitate survey of the areas that could not be surveyed via RTK-GPS. Surveys were referenced to the Sheboygan County Coordinate System and NAVD88 datum

2.4.2 Pre-Dredge Operations

GGE performed a QA pre-dredge survey of the entire dredge area; this survey occurred in segments over a period of time. This survey was done to confirm pre-dredge elevations shown on the design drawings

(2008 bathymetry during RI) and determine the total amount of sediment required to be removed. The pre-dredge sediment surface elevations are shown on Figures 6, 12, and 17.

2.4.3 Dredging Operations Inside the Cofferdam

Dredging was mechanically performed by EI with a long-reach excavator mounted on a barge. Dredgepak software was installed on the excavator to allow the operator to use a laptop and RTK-GPS to identify the excavator bucket positioning and elevation in each of the DMU's.

An environmental dredging bucket, comprised of a standard excavator bucket modified to have a hydraulically operated lid, was mounted on the dredge excavator to keep sediment from washing out of the bucket as it moved below the water surface (Photograph 45, Appendix C). After dredged sediment was removed from the DMU with the bucket, it was placed into one of two roll-off boxes welded to a transport barge (Photograph 20, 22, Appendix C). When both boxes were filled, the transport barge was pushed to the offload area in the upland support area for unloading and transportation of the dredged sediments to the sediment stabilization pad. At the same time, another transport barge was mobilized to the dredge barge to allow dredging to continue.

The transport barges were offloaded by a long-reach excavator on the shore in the upland support area. Sediment removed from the boxes was placed into the bed of an on-road dump truck. The truck transported the sediment to the stabilization pad. At the stabilization pad, front-end loaders and excavators mixed the dredged sediment with Calciment to reduce the water content by hydration, which also increased the shear strength of the sediment.

Upon completing a DMU, GGE completed a QA bathymetric survey to demonstrate compliance with the specified post-dredge elevations. Figures 7, 8, 13, 14, 18, 19, and 22 show the record dredge contours and elevations. Figures 9, 15, and 20 show the comparisons of the dredged elevations to the design elevations.

During dredging operations, oil booms were placed along the inside of the north and south cofferdams and along Boat Island. This was done to control and collect any NAPL that was released from the sediment during NAPL dredging, and to prevent this NAPL from impacting Boat Island or leaving the interlocks of the cofferdam. During the project, EI would periodically soak up floating NAPL from the water surface inside of the cofferdam with oil booms and pads to help with fugitive odors and visual concerns (Photograph 44, Appendix C).

2.4.3.1 Post-Dredge Sampling

Post-dredge sediment sampling was performed following evaluation of the post-dredge bathymetric survey to confirm that the target elevation had been achieved in 90% or more of the DMU. Sediment sampling was performed in accordance with USEPA-approved RI SOP SAS-07-03 using a push core sampler. Coordinates for sediment sample locations were randomly located within the DMUs and were not provided to EI prior to dredging. The actual sediment sample locations were recorded in accordance with SOP SAS-02-02. Sediment cores were logged in accordance with SOP SAS 07-02.

NRT used $2^{5}/_{8}$-inch inside diameter, polycarbonate clear tubes for sediment sampling, cut to 30 inches in length. The sampling tubes were pushed two feet into the sediment, where possible. Sediment recovery in the tube was targeted to be a minimum of 75% of the push depth to be acceptable for sampling. When sediment recovery was less than 75% of the push depth, the core was saved and another tube was pushed. The additional tube was offset approximately two to five feet from the location of the first tube. Up to three attempts were made to obtain 75% or greater recovery. If 75% or greater recovery was not achieved, the sample having the highest recovery was selected for sampling. Photographs 27, 46, 47, 52, and 56 (Appendix C) show different sampling events during the removal action.

2.4.4 PCB DMUs

There were a total of 16 PCB DMUs identified inside the temporary sheet pile cofferdam. As noted above, the PCB DMUs were established as part of the SR&H project, but dredged as part of the removal action because the cofferdam prevented access by the SR&H contractor. Seven of these contained TSCA-regulated PCBs, which were required to be managed separately.

2.4.4.1 TSCA Dredging

The TSCA DMUs were numbered sequentially by EI (Figure 7). TSCA DMUs 1 through 3 were completed in July 2011 and DMUs 4 through 7 in September 2011. Photograph 25 (Appendix C) shows dredging in TSCA 3. TSCA DMUs were dredged in groups because the dredged sediment was managed separately. In between TSCA dredging, the dredging and handling equipment was decontaminated prior to handling non-TSCA impacted sediments. NRT collected post-dredge QA sediment samples (Figure 10) following completion of TSCA DMU, as determined by post-dredge bathymetric survey by GGE (Appendix L). The total removal volume was 1,191 cubic yards (Table 5).

2.4.4.2 Non-TSCA PCB Dredging

There were a total of 9 DMUs located inside the cofferdam that contained concentrations of PCBs not subject to regulation by TSCA. Six of these were partially or completely located outside, above, or below a TSCA, PAH, or NAPL DMU (Figure 7). Upon completion of a non-TSCA PCB DMU, a post-dredge QA bathymetric survey was completed by GGE (Appendix L), and then NRT collected post-dredge QA sediment samples (Figure 10, Photograph 27 Appendix C) as described below. The total removal volume was 234 cubic yards (Table 5).

2.4.4.3 Post-Dredge Sampling for PCBs

The objectives for post-dredge sampling in the PCB DMUs were to verify the absence of TSCA-regulated PCBs in the top two feet of the post-dredge surface, and to support PRS' surface weighted average concentration (SWAC) calculations.

Each TSCA and non-TSCA PCB DMU was sampled in accordance with PRS' November 2010 Verification Sampling Plan. A two-foot long core was collected at the center of each DMU and one on each side wall, for a total of five cores per DMU. The entire core was composited and submitted to Pace for analysis of PCBs. The PCB concentrations will be used by PRS in their SR&H Mitigation Plan Decision Tree.

In addition to the two-foot long sediment cores, 7 sediment surface samples (0 to 6 inches) were also collected with a push core sampler (Figure 10) in the center of each PCB DMU. These samples were submitted for PCB analysis and will be used by PRS in their post-dredge SWAC calculations. Laboratory analytical results are summarized in Table 6. Sample logs and laboratory analytical reports are provided in Appendices M1 and M2.

2.4.5 PAH DMUs

There were a total of 3 PAH DMUs located inside the cofferdam. Upon completion of a PAH DMU, a post-dredge QA bathymetric survey was completed by GGE (Appendix L) to verify at least 90% of the DMU had attained the target elevation, and then NRT collected post-dredge QA samples as described below. The total removal volume for the PAH DMUs was 2,172 cubic yards (Table 5).

2.4.5.1 Documentation Sampling for PAHs

The objective of post-dredge sampling in the areas where PAH dredging was completed was to document the residual PAHs in the new surface sediment. A total of five PAH sediment cores were collected from inside the temporary cofferdam (Figure 10). Each two-foot core was subdivided into a 0- to 6-inch sample and a 6- to 24-inch sample. Sample intervals were composited and submitted to Pace for analysis of PCBs and PAHs. Laboratory analytical results are summarized in Table 6. Sample logs and laboratory analytical reports are provided in Appendices M1 and M2.

2.4.6 NAPL DMUs

There were a total of 5 NAPL DMUs located inside the cofferdam. Design/target elevations in the NAPL DMUs were set based on the observed bottom of NAPL in nearby RI cores, but the goal was to remove visual NAPL within reason based on actual depths/elevations. Upon EI achieving the target elevation, or encountering native clay above the target elevation in a NAPL DMU, NRT would collect visual post-dredge QC cores (Figure 11) to confirm the presence or absence of NAPL. The same methodology of $2^5/_8$-inch inside diameter, by 30-inch long polycarbonate clear tubes, was used for sampling. If there was visual evidence of undisturbed NAPL in the QC cores, the elevation of the remaining impacts was determined from the QC cores, and, if lower than the specified dredge target elevation, the target elevation was modified accordingly. EI then continued dredging to the modified target elevation. NRT collected additional QC samples once the new elevation was achieved. If there were visual evidence of either undisturbed NAPL or disturbed (generated) residuals greater than 6 inches in thickness, dredging would continue deeper. When the QC cores demonstrated the absence of undisturbed NAPL residuals, or disturbed NAPL residuals less than 6 inches in thickness, the NAPL DMU was considered complete. NRT then collected post-dredge QA sediment samples for laboratory PAH analysis (Figure 10) as described below. GGE also completed a bathymetric survey of the final NAPL sediment elevation (Appendix L). The total removal volume was 14,789 cubic yards (Table 5).

2.4.6.1 Post-Dredge Sampling in NAPL DMUs

The objective for post-dredge sampling in the NAPL DMUs was to characterize residual PAH concentrations following removal of the NAPL. One to two sediment cores were collected in each of the NAPL dredge DMUs. Each core was photographed and observations of NAPL were noted in the sampling logs. Each core was subdivided into a 0- to 6-inch sample and a 6- to 24-inch sample. Sample intervals were composited and submitted to Pace for analysis of PAHs to document PAH residuals in the sediment. Laboratory analytical results are summarized in Table 6. Sample logs and laboratory analytical reports are provided in Appendices M1 through M3. Photographs of the NAPL Visual QC cores are provided in Appendix M4.

2.4.7 Dredging Outside of Cofferdam

Six PAH DMUs were located outside of the temporary sheet pile cofferdam: three to the north and three to the south. EI dredged the three PAH DMUs north of the cofferdam concurrent with dredging operations inside of the cofferdam. Due to time constraints and work area conflicts with the SR&H project, WPSC entered into an agreement with PRS to hydraulically dredge the three PAH DMUs located south of the cofferdam.

2.4.7.1 NPAH DMUs

EI completed the PAH DMUs located north of the cofferdam, referred to as "NPAH," in August 2011 (Photograph 39 and 42, Appendix C). Prior to dredging, EI completed a pre-dredge bathymetric survey both north and south of the cofferdam (Figures 12 and 17, respectively). It was determined that dredging done by PRS as part of the SR&H project had already removed some of the PAH-impacted sediment north of the cofferdam. EI only had to remove the remaining PAH-impacted sediment to the specified elevations. EI deployed silt curtains around their dredge operations to prevent migration of impacted sediment downstream.

The same method of dredging inside the cofferdam was used by EI outside the cofferdam, but with a second backhoe and transport barge. A separate offload area was established for the NPAH dredging just upstream of the north cofferdam because the cofferdam prevented movement of the transport barges to the primary offload area inside of the cofferdam. Once EI completed NPAH dredging, a bathymetric survey was done by GGE (Appendix L). Upon NRT's confirmation that EI had met the target elevation in at least 90% of the DMU, NRT collected post-dredge QA samples using the same methods as inside the cofferdam for analytical testing of PAHs and PCBs. Results are summarized in Table 6.

Final dredge elevations, actual sediment elevations, comparisons of design, and QA sampling locations are shown in Figures 12, 13, 14, 15, and 16, respectively. The total removal volume for the three northern PAH DMUs was 892 cubic yards (Table 5).

2.4.7.2 SPAH DMUs

PRS hydraulically dredged the three southern PAH DMUs, referred to as "SPAH", in October and November of 2011 concurrent with their own PCB removal operations in this area. The sediment and water were pumped upstream to PRS' staging site, where the material was discharged into geotubes for passive dewatering. Eventually, PRS loaded the SPAH sediment with their non-TSCA sediment and transported it to their contracted disposal facility, which we understand was Waste Management's Ridgeview Recycling & Disposal Facility near Whitelaw, Wisconsin.

Upon completion of the SPAH DMUs, PRS completed a bathymetric survey (Appendix L) and submitted it to NRT for evaluation of compliance with the requirement for achievement of the target elevation in at least 90% of the DMU. Once a survey was submitted that met this requirement, NRT collected post-dredge QA sediment samples using the same methods as the other PAH DMUs.

Figures showing post-dredge elevations, actual sediment elevations, comparison of design, and sampling locations are Figures 17, 18, 19, 20, and 21, respectively. The total removal volume removed from the SPAH DMUs was 3,846 cubic yards (Table 5). Appendix L has the individual bathymetry figures for each of the PAH DMUs. Table 6 has the summary of QA laboratory results. Appendices M1 and M2 have the sample logs and laboratory reports.

2.4.7.3 Backfill Placement and Sampling

The removal action specifications called for backfill to be placed in dredged areas where analytical results from post-dredge QA confirmation samples were above the cleanup goal of 45 mg/kg PAH(13). However, during the course of the project, USEPA Superfund decided backfill placement was not necessary due to plans for additional dredging in 2012 by the USEPA Great Lakes National Program Office (USEPA-GLNPO). This was documented in a letter contained in Appendix A8.

2.5 Sediment Stabilization, Transport, and Disposal

After sediment was dredged from the river, it was placed in barge containers that were transported to the offload areas on the shoreline of the upland support area. On the shoreline, an excavator removed the sediment from the barges and placed it into an on-road dump truck that transported it to the stabilization pad. Once on the pad, the sediment was amended with Calciment to increase its shear strength (photograph 21, 26, and 50, Appendix C). Calciment was supplied to EI by Mintek Resources, Beavercreek, Ohio. A total of 1,236 tons of Calciment bed ash and 988 tons of Calciment fly ash were used to stabilize sediment (Appendix N). Based the final total wet tons of sediment disposed, an average of 7.6% Calciment amendment was used on this project (dry tons of additive divided by wet tons of disposed sediment).

Veolia's Hickory Meadows Landfill was the identified for disposal of the stabilized non-TSCA sediment. Prior to sending the first load to the landfill, analytical and geotechnical testing was done for profiling purposes. A sample of un-stabilized sediment was containerized and submitted to Pace for paint filter testing to confirm the material had no free liquids and PCB analysis to demonstrate that it contained less than 50 mg/kg of PCBs. A sample of stabilized sediment was containerized (Photograph 29, Appendix C) and sent to CGC, Inc. of Madison, WI where it was tested for:

- Percent solids/moisture content (ASTM D2216);
- Grain size distribution (ASTM D422);
- Undrained shear strength (ASTM D4767);
- Liquid limit, plastic limit, and plasticity index of soils (ASTM D4318); and
- Hydraulic conductivity testing (ASTM D5084).

NRT measured unconfined compressive strength in the field using a pocket penetrometer and undrained shear strength using a field torvane. Once the associated laboratory results were received, a data package was submitted to Veolia for disposal approval.

Veolia required analytical and geotechnical testing on the stabilized sediment during the project. Non-stabilized sediment had to be sampled every 5,000 cubic yards for PCB's. For geotechnical testing, one sample of stabilized sediment per every 1,000 cubic yards for the first 10,000 cubic yards, and then at a rate of one sample every 5,000 cubic yards thereafter, were analyzed for:

- Percent solids/moisture content (ASTM D2216 or D2974);
- Unconfined compressive strength (pocket penetrometer); and
- Undrained shear strength (field torvane).

Additional laboratory testing was performed at a minimum frequency of one sample every 10,000 cubic yards for the first 30,000 cubic yards, and then at a rate of one sample every 30,000 cubic yards thereafter, for:

- Grain size distribution (ASTM D422); and
- Undrained shear strength (ASTM D4767, CU-triaxial).

Furthermore, laboratory consolidation tests (ASTM D2435) were performed at a frequency of one sample per 30,000 cubic yards.

One sample per every 1,000 tons for the first 5,000 tons of stabilized sediment transported to the landfill, and then at a rate of one sample every 2,500 tons thereafter, was characterized for:

- Percent solids/moisture content (ASTM D2216);
- Grain size distribution (ASTM D422); and
- Liquid limit, plastic limit, and plasticity index of soils (ASTM D4318).

Hydraulic conductivity testing (ASTM D5084) of stabilized sediment was also performed at a frequency of one sample every 2,500 tons.

Results from the analytical and geotechnical testing are summarized in Table 7. Laboratory reports are in Appendices O1 (PCB analytical testing) and O2 (geotechnical testing).

Sediment typically remained on the pad for two to four days to allow for gravity dewatering and curing. Upon sufficient curing, the non-TSCA sediments were loaded (Photograph 37 and 64, Appendix C) and hauled to Veolia's Hickory Meadows Landfill for disposal. Sediment was manifested as non-TSCA dredge material - MGP sediments (HML11-126). A total of 29,225 tons of non-TSCA sediment was disposed at Hickory Meadows Landfill (Appendix J2).

PRS coordinated transportation and disposal of TSCA-regulated PCB sediment. Trucks were loaded at the site (Photograph 32, Appendix C) and the sediment was taken by truck to a rail yard in Milwaukee for transfer to rail cars for shipment to Clean Harbors' Lone Mountain Landfill, Waynoka, Oklahoma for disposal. The sediments were manifested under profile #WID980996367. A total of 1,925 tons of TSCA sediment were disposed at Lone Mountain Landfill.

2.6 Equipment Decontamination

Upon completion of dredging activities, EI removed equipment from the cofferdam (Photograph 58, Appendix C). Equipment was staged on the stabilization pad to be decontaminated (Photograph 59, Appendix C). Once equipment was decontaminated, the equipment was hauled off site. Decontamination water was pumped through the site water treatment system and discharged into the river.

2.7 Site Restoration

Site restoration activities began in November 2011 along the shoreline upon completion of NAPL DMUs, and were substantially completed in December 2011. Site restoration activities included;

- Placing general fill, two-inch aggregate, toe stones, and rip rap along the shoreline;
- Repair of geosynthetic cover associated with the Waterloo Barrier system;
- Removal of the temporary cofferdam;
- Removal of the temporary construction facilities;
- Removal of some of the construction haul roads, stabilization pad materials, decontamination pad materials, and tracking pads; and
- Initial restoration of the upland site to previous conditions.

The remaining upland site restoration activities, described below, are scheduled to be completed in May 2012.

2.7.1 North Area Shoreline Restoration

Site restoration began at the north off load area on November 1, 2011. EI prepared the shoreline for installation of CETCO reactive core mat (RCM; 0.8 pounds per square foot of organic clay) in this area (Figure 23). Because of observations of NAPL in the upper fill soils during installation of the northernmost buttress piles inside the cofferdam containment area, there was uncertainty whether the NAPL extended further north under the shoreline beyond the northern cofferdam. Historic soil borings in the vicinity of this upland area were reviewed for the presence of NAPL, and none was noted on the boring logs. Further, no NAPL was observed during NPAH DMU excavation along this shoreline. As a precautionary measure, however, RCM was installed to attenuate any possible NAPL that may exist under this shoreline segment. The RCM was placed on the shore from the top of slope to 12 feet out into the river (Photograph 60, Appendix C), and extending along the shoreline a distance of approximately 80 feet from the northern cofferdam to the southern end of the pile-supported walkway (Figure 24). A total of 3,000 square feet of RCM was installed. Geotextile was installed above and below the RCM to provide cushion protection. One foot of 2-inch aggregate was installed on top of the geotextile, and salvaged rip rap was placed over the aggregate.

2.7.2 Cofferdam Area Shoreline Restoration

USEPA approved shoreline backfill within the cofferdam (Appendix A9) following completion of NAPL dredging. EI began importing and placing general fill along the shoreline on November 3, 2011, and completed on November 16, 2011 (Photograph 61 and 65, Appendix C). The general fill borrow source was B.R. Amon and Sons, Inc. in Elkhorn, WI. Based on scaled truck weights at the borrow source, a total of 12,212 tons of general fill was placed along the shoreline in the cofferdam area (Appendix P1). The general fill was poorly graded gravel with cobbles, sand, silt, and very little fines (3%).

Once shoreline backfill was completed, Geo-Synthetics Inc. (GSI) was subcontracted by EI to repair and replace the portion of the geosynthetic cover that was cut to facilitate exposure of the Waterloo Barrier (Photograph 67, Appendix C). The geomembrane component was repaired by extrusion welding on new pieces of 60-mil HDPE geomembrane to the existing 40-mil HDPE geomembrane. Repairs were done to approximately 480 feet of liner material along the shoreline. In a couple short areas where the geomembrane was not able to be extrusion welded due to the presence of pockets of perched water in depressions of the liner, butyl tape was placed between the old and new HDPE and then covered with granular bentonite to seal the cover system. GSI attached new pieces of drainage geocomposite with the use of plastic ties.

A one foot thick layer of two-inch aggregate was placed on the top slope of the general fill (Figure 24, Photograph 70, Appendix C). The aggregate borrow source was Fred Radandt Sons located in Kaukauna, WI. Based on scaled truck weights, a total of 1,865 tons of aggregate was placed (Appendix P2). Salvaged toe stones and rip rap were then placed back on the shoreline over the two-inch aggregate (Photograph 71, Appendix C). 174 tons of rip rap were imported (Appendix P3) to supplement that salvaged at the beginning of the removal action. The rip rap borrow source was Anderson Brothers and Johnson, Inc. located in Brownsville, WI. EI replaced the toe stones at roughly the same elevation as they were encountered prior to construction, elevation 576 (NAVD88). EI surveyed the different layers of shore line backfill as they were completed.

2.7.3 Temporary Cofferdam Removal

Following completion of dredging activities inside of the temporary cofferdam in mid-November, EI had M&P re-mobilize to begin the removal of the cofferdam. Due to concerns for ice impacts on the cofferdam, NRT solicited and received approval from USEPA (Appendix A9) to remove the cofferdam following completion of dredging but prior to completion of shoreline restoration. The northern segment was removed first due to draft limitations for the barges removing the cofferdam (Photograph 66, Appendix C), and the southern segment followed (Photograph 68, Appendix C). Silt curtains were deployed in areas of active shoreline backfill to minimize turbidity impacts associated with backfill operations. Sheet pile from the cofferdam was brought to the shoreline by barge and decontaminated on the stabilization pad prior to being demobilized from the site. The final sheet pile was removed by mid-December 2011.

2.7.4 Temporary Facilities

Temporary facilities were removed in mid-December 2011 when site restoration activities were being suspended due to winter weather. All of the temporary facilities were removed from the site except for the following;

- Security fence;
- Electrical service;
- Crane mats; and
- Erosion controls.

Because the site was not being fully restored, security fence and erosion controls were requested to remain in place over the winter. The crane mats were left on site for use during restoration activities in May 2012. The electrical service was left because of GLNPO’s desire to use a portion of the upland support area during their Great Lakes Legacy Act project in 2012.

2.7.5 Upland Support Area Restoration

Prior to demobilizing in December 2011, EI completed the following restoration activities in the upland support area;

- Removal of the asphalt and aggregate from the stabilization pad and haul roads (Photograph 72, Appendix C). 2,058 tons of materials were transported and disposed at Veolia Hickory Meadows Landfill under waste profile HML11-135 (Appendix J3);
- Crane mats were staged on site, in proximity to the intersection of New York Avenue and 10th Street; and
- Silt fences, hay bales, and erosion mats were installed along the perimeter of the site and in areas subject to heavy channel flow.

In May of 2012, the following restoration activities are scheduled to be completed;

- Removal and replacement of upland surficial soils impacted by project operations, based on the pre-and post-project soil sampling summarized in Table 1 and shown on Figure 3. These removed soils will likely be disposed at Veolia Hickory Meadows Landfill under an existing waste profile. The area to be addressed in May 2012 may only encompass the vicinity of surficial soil samples SS13, SS14, and SS15. The remaining area documented by SS01 to SS12, and SS16 and SS17, is the project area formerly used for the stabilization pad, parking lot, and construction trailers. GLNPO requested this area not be restored because of their intention for using it in 2012. WPSC and GLNPO will discuss responsibilities and schedule for restoration of this area before GLNPO's work begins this spring;
- Seeding and sodding of disturbed soils;
- Concrete repair work for the "lookout area," the primary location for sediment offloading within the cofferdam;
- Asphalt repair work for the bike path;
- Tree, bush, and shrub planting;
- Repairing and painting black vinyl fence along river;
- Concrete foundation repair for the park lights and reinstallation of the park lights;
- Repair of the steel railing on the look area; and
- Reinstallation of park amenities, i.e. benches, bike racks, and the basketball hoop.

3 DEVIATIONS FROM REMOVAL ACTION DESIGN AND WORK PLANS

3.1 Wakefield Wall Removal

A buried, historic, wakefield wall was encountered during dredging operations along the shoreline (Figure 5). The wakefield wall was comprised of tightly-fit wood boards supported by wooden pilings and rectangular, wooden piers filled with stone on the ends.

To facilitate installation of the lower wale of the Waterloo Barrier Support System and removal of NAPL-impacted sediments against the Waterloo Barrier, portions of the wakefield wall had to be removed. Removal of the wakefield wall began at the south end of the Waterloo Barrier using a sheet pile hammer attached to a Manitowoc 3000WV, 65-ton crawler crane. The jaws of the pile hammer were attached to the wood boards. Once attached, the vibratory action of the pile hammer was activated to vibrate the board as it was pulled out by the crane. As the vibration energy was transferred from the hammer to the boards, the soil surrounding the piles would be loosened to ease removal (Photograph 41, Appendix C).

After approximately 115 feet of the wakefield wall was removed, deflection of the Waterloo Barrier greater than normal was observed in the area where the wakefield wall had been removed. EI was directed to stop wakefield wall removal activities and a different method was devised for removal of the wakefield wall. The alternate method agreed to by EI, NRT, and IBS utilized a hydraulic demolition shear attached to an excavator to reach down into the river and cut the wakefield wall at a desired elevation. This method avoided vibratory action near the Waterloo Barrier, which could have caused the deflection observed around the Waterloo Barrier in this area.

EI removed sediment from the river side of the wakefield wall to the specified dredge elevations and the shear cut the boards and pilings at that elevation. The excavator then removed the sheared timbers floating on the water. Once removed, the boards were placed into roll off boxes and transported to Veolia Hickory Meadows Landfill for disposal (Photograph 49, Appendix C). Ninety tons of project debris were disposed under profile HML11-135.

3.2 Lower Wale Installation

The lower wale of the Waterloo Barrier Support System was designed to be contiguous by structurally connecting individual beam segments through either welds or bolted splice plates. Due to the need to construct this item under water, concerns were raised by Gillen regarding the complexity of this approach in light of the difficult work environment. Gillen, EI, EP, and NRT worked together to modify the design to address these concerns. The modified design called for individual wale segments supported by two buttress piles, with adjacent segments overlapping by a minimum horizontal distance of three feet. Wood blocks were placed as shims in-between the lower wales and out bays of the Waterloo Barrier to provide a structural connection to the barrier. Once the wood blocks were in place, a hole was torched into the rib of the wale to pin the shims in place. Shims were not necessary between the buttress piles and the lower wales because the wales were in full contact with the buttress piles. Further information on these design modifications and record documentation generated during wale installation are provided in Appendix K4 through K7.

3.3 NAPL Dredging

NAPL was encountered in DMU PCB1, located along the shoreline north of the anticipated NAPL footprint just inside the north cofferdam, during collection of the post-dredge QA samples. NRT directed EI to continue dredging deeper in this area until NAPL was no longer visibly present, as determined by QC cores. Upon visual confirmation (via QC cores) that no undisturbed NAPL or disturbed NAPL greater than 6 inches in thickness remained, post-dredge QA samples were collected to document remaining PAH and PCB concentration in this DMU.

3.4 Backfill Placement

On September 1, 2011, USEPA issued a letter (Appendix A8) to WPSC instructing not to backfill any DMUs, other than shoreline restoration, due to the fact that USEPA GLNPO is planning to dredge additional sediment from this area of the Sheboygan River in 2012. .

3.5 Odor Control Measures

It was determined early in the project during NAPL dredging that the engineering controls designed to prevent fugitive odors from leaving the site were not completely effective. Tarps and RUSMAR were effective when the site was inactive, such as nights and weekends. However, when sediments were being actively mixed with Calciment, use of RUSMAR and tarps was not practical to control emission of fugitive odors. EI proposed the use of Ecosorb deployed through portable misting fans to neutralize odors as they were emitted. NRT and WPSC agreed to try this approach for at least a one month period. EI mobilized Ecosorb and associated deployment equipment to the site and set it up around the perimeter of the stabilization pad (Photograph 43, Appendix C), where the majority of odors were emitted, and the sediment offload area inside of the cofferdam. The system became active on August 25, 2011. The Ecosorb was effective at neutralizing fugitive odors before they reached the fence line therefore, operation of the system continued until the end of sediment excavation and stabilization activities.

3.6 Reduced Site Restoration Scope

USEPA GLNPO asked WPSC to leave a portion of the upland site for their use during their 2012 dredging project. Consequently, EI's upland restoration scope was reduced to exclude the parking lot, haul roads, stabilization pad, and northern sediment offload area. These areas will be restored by USEPA-GLNPO upon completion of their 2012 dredging project.

4 TOTAL COST

The total cost from the Focused NAPL and Sediment Removal Action was approximately $9.4 million. The removal action required remedial investigation, reporting, agreements, and design, in addition to dredging and associated construction. The total Cost reported above accounts for the following items:

- Removal action design;
- Contractor procurement and selection;
- Contractor construction cost;
- Construction management and quality assurance costs; and
- Disposal fees.

5 REFERENCES

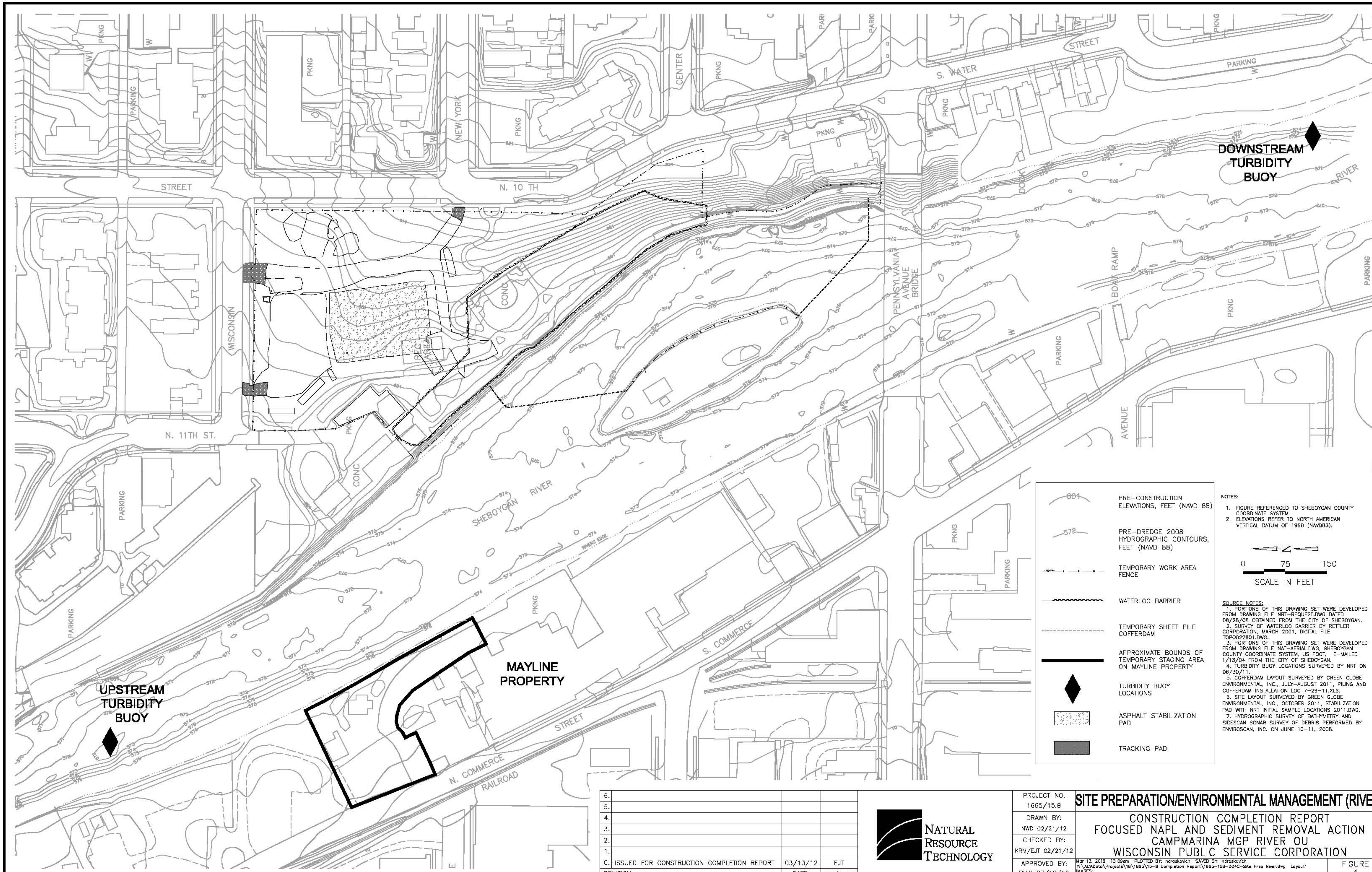
2008 September, *Multi-Site Field Sampling Plan Revision 4*, prepared for Integrys.

2009 July 21, Natural Resource Technology, Inc., *Remedial Investigation River Operable Unit, Revision 1,* Wisconsin Public Service Corporation's Former Sheboygan Campmarina Manufactured Gas Plant, Sheboygan, Wisconsin, USEPA Site ID: B5DA, Project Number 1665.

2011 January 10, Natural Resource Technology, Inc., *Feasibility Study River Operable Unit, Revision 2,* Wisconsin Public Service Corporation's Former Sheboygan Campmarina Manufactured Gas Plant, Sheboygan, Wisconsin, USEPA Site ID: B5DA, Project Number 1665.

2011 April 6, Natural Resource Technology, Inc., *Focused NAPL and Sediment Removal Action,* Wisconsin Public Service Corporation's Former Sheboygan Campmarina Manufactured Gas Plant, Sheboygan, Wisconsin, USEPA Site ID: B5DA, Project Number 1665.

2011 June 29, Natural Resource Technology, Inc., *Construction Quality Assurance Project Plan, Focused NAPL and Sediment Removal Action,* Wisconsin Public Service Corporation's Former Sheboygan Campmarina Manufactured Gas Plant, Sheboygan, Wisconsin, USEPA Site ID: B5DA, Project Number 1665.



DOWNSTREAM TURBIDITY BUOY
UPSTREAM TURBIDITY BUOY
MAYLINE PROPERTY
SHEBOYGAN RIVER
S. WATER STREET
N. 10 TH STREET
N. 11TH ST.
WISCONSIN
NEW YORK
CENTER
PENNSYLVANIA AVENUE BRIDGE
BOAT RAMP
S. COMMERCE
N. COMMERCE STREET
RAILROAD
PARKING
PKNG
CONC
RIVERS EDGE
PRE-CONSTRUCTION ELEVATIONS, FEET (NAVD 88)
PRE-DREDGE 2008 HYDROGRAPHIC CONTOURS, FEET (NAVD 88)
TEMPORARY WORK AREA FENCE
WATERLOO BARRIER
TEMPORARY SHEET PILE COFFERDAM
APPROXIMATE BOUNDS OF TEMPORARY STAGING AREA ON MAYLINE PROPERTY
TURBIDITY BUOY LOCATIONS
ASPHALT STABILIZATION PAD
TRACKING PAD
NOTES:
1. FIGURE REFERENCED TO SHEBOYGAN COUNTY COORDINATE SYSTEM.
2. ELEVATIONS REFER TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
N
0 75 150
SCALE IN FEET
SOURCE NOTES:
1. PORTIONS OF THIS DRAWING SET WERE DEVELOPED FROM DRAWING FILE NRT-REQUEST.DWG DATED 08/28/08 OBTAINED FROM THE CITY OF SHEBOYGAN.
2. SURVEY OF WATERLOO BARRIER BY RETTLER CORPORATION, MARCH 2001, DIGITAL FILE TOPO022801.DWG.
3. PORTIONS OF THIS DRAWING SET WERE DEVELOPED FROM DRAWING FILE NAT-AERIAL.DWG, SHEBOYGAN COUNTY COORDINATE SYSTEM, US FOOT, E-MAILED 1/13/04 FROM THE CITY OF SHEBOYGAN.
4. TURBIDITY BUOY LOCATIONS SURVEYED BY NRT ON 06/30/11.
5. COFFERDAM LAYOUT SURVEYED BY GREEN GLOBE ENVIRONMENTAL, INC., JULY-AUGUST 2011, PILING AND COFFERDAM INSTALLATION LOG 7-29-11.XLS.
6. SITE LAYOUT SURVEYED BY GREEN GLOBE ENVIRONMENTAL, INC., OCTOBER 2011, STABILIZATION PAD WITH NRT INITIAL SAMPLE LOCATIONS 2011.DWG.
7. HYDROGRAPHIC SURVEY OF BATHYMETRY AND SIDESCAN SONAR SURVEY OF DEBRIS PERFORMED BY ENVIROSCAN, INC. ON JUNE 10-11, 2008.
6.
5.
4.
3.
2.
1.
0. ISSUED FOR CONSTRUCTION COMPLETION REPORT 03/13/12 EJT
REVISION: DATE: APP'D BY:
NATURAL RESOURCE TECHNOLOGY
PROJECT NO. 1665/15.8
DRAWN BY: NWD 02/21/12
CHECKED BY: KRM/EJT 02/21/12
APPROVED BY: RHW 03/12/12
SITE PREPARATION/ENVIRONMENTAL MANAGEMENT (RIVER)
CONSTRUCTION COMPLETION REPORT
FOCUSED NAPL AND SEDIMENT REMOVAL ACTION
CAMPMARINA MGP RIVER OU
WISCONSIN PUBLIC SERVICE CORPORATION
Mar 13, 2012 10:09am PLOTTED BY: ndraskovich SAVED BY: ndraskovich
Y:\ACAData\Projects\16\1665\15-8 Completion Report\1665-158-D04C-Site Prep River.dwg Layout1
IMAGES:
XREFS:
FIGURE 4