

**Enbridge Line 6B MP 608 Pipeline Release**

**Marshall, Michigan**

**Work Plan for Permanent Recovery of Submerged Oil and  
Oil-Contaminated Sediments at Priority Locations and  
Ceresco Dam Dredging**

**As an Attachment to the Supplemental Modification of the  
*Response Plan for Downstream Impact Area and the Source  
Area Response Plan***

**Strategy and Tactics for Permanent Recovery of  
Submerged Oil & Oil-Contaminated Sediment**

**October 7, 2010**

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## **1.0 INTRODUCTION**

A Submerged Oil Task Force (SOTF) was created on Tuesday, August 24, 2010, to perform field assessment, characterization, and mapping of submerged oil impacts in surface water and sediments of Talmadge Creek, Kalamazoo River and Morrow Lake (Talmadge Creek to Kalamazoo River to River Mile Post [RMP] 40). The SOTF is comprised of representatives from the United States Environmental Protection Agency (USEPA), the Michigan Department of Natural Resources and the Environment (MDNRE), Stakeholders, and Enbridge and their contractors.

As a result of the initial field assessments, thirty four sites in the Kalamazoo River had been identified as potentially containing accumulations of significant amounts of submerged oil in river sediments. These areas were further investigated, and 18 were identified as high priority areas and were recommended for submerged oil recovery by the SOTF. These 18 priority areas were also subjected to an ecological habitat assessment intended to classify their ecological use and value to help guide cleanup operations. The SOTF discussed the assessment in conjunction with possible cleanup approaches and in a September 21, 2010 memorandum the Task Force Leaders provided recommendations for oil removal for these 18 priority areas.

Talmadge Creek was not included in the Task Force Leaders memorandum. Field assessments have been conducted along the entire 2 miles of Talmadge Creek. These assessments have identified areas in the creek that are candidates for submerged oil recovery using the same recovery techniques recommended by the Task Force Leaders for the 18 Kalamazoo River priority locations.

The purpose of this Work Plan is to describe the process for submerged oil recovery at each of the 18 priority locations and any additional sites that may be identified utilizing the recovery techniques recommended by the Task Force Leaders.

### **1.1 Project Scope**

This project scope has been developed from the Supplemental Modification to the Response Plan for Downstream Impacted Areas (RPDIA) for Permanent Recovery of Submerged Oil and Oil-Contaminated Sediments (submitted to EPA September 11, 2010). To clearly define and present the strategies and tactics for permanent recovery of submerged oil and oil-contaminated sediments, an approach was developed to recognize the multiple types of priority locations and/or geomorphic settings that will require different types of oil recovery efforts. To address the multiple situations at each individual priority location, a “toolbox” of various associated recovery techniques was developed. The project scope covered by this Work Plan includes:

- Recommended Timing of Oil Removal Activities at each Priority Location
- Recommended “Toolbox” Technique for Oil Removal at each Priority Location
- Process for addressing newly identified Priority Locations
- Environmental Protection and Regulatory Compliance
- Mobilization and Site Preparation
- Oil Removal Activities
- Waste Management
- Project Management
- Quality Assurance/Quality Control

## **2.0 SITE HISTORY**

The Line 6B release was reported on July 26, 2010. The oil moved over the upland approximately 1,000 feet to Talmadge Creek and was transported approximately two miles to the confluence with the Kalamazoo River. A significant amount of the oil released has been recovered and the amount of submerged oil in the Kalamazoo River and Morrow Lake systems is not known. The distance from the confluence to the dam at Morrow Lake is approximately 40 river miles. At the time of the Line 6B release the Marshall, Michigan vicinity experienced an approximately 25 -year storm event (4% chance of occurrence per year). The increase of the water elevation varied from between 7 to 9 feet. This storm event resulted in widespread overwash and breaching of the Kalamazoo River's banks, which resulted in the transport of oil into the river's floodplain.

The oil released from Line 6B was a crude oil with an American Petroleum Institute (API) gravity of 11. Generally, oil with an API gravity less than 10 will sink in water. The oil partitioned into various phases when it came into contact with the water. The phases that float have been, and continue to be collected from the water surface. The phase that is non-floating is referred to as submerged oil and this material has moved through the system below the surface and is being collected using near-term containment measures installed in the river. An unknown amount of the submerged oil was transported and deposited in the Kalamazoo River and Morrow Lake system prior to the installation of these measures.

As described in the Supplemental Modification to the RPDIA for Continuing Near-Term Containment of Submerged Oil & Oil-Contaminated Sediment submitted September 6, 2010 to address the August 27, 2010 directive received from the United States Environmental Protection Agency (USEPA), the identification and prioritization of oil deposition areas for sampling and near-term containment were evaluated.

### **2.1 Site Description**

The 18 priority locations identified by the SOTF for permanent oil recovery are the following:

1. RMP 5.55 North and South (Ceresco Dam)
2. RMP 5.63 (Ceresco Dam)
3. RMP 5.75 (Ceresco Dam)
4. RMP 7.75
5. RMP 12.5
6. RMP 14.75
7. RMP 15.25 (Mill Pond)
8. RMP 15.5 (Mill Pond)
9. RMP 21.5
10. RMP 26.0
11. RMP 26.25
12. RMP 26.65
13. RMP 27.9
14. RMP 28.25
15. RMP 33.0
16. RMP 33.25
17. RMP 36.25
18. RMP 36.5 to 37.5 (Morrow Lake Delta)

These 18 sites are described in detail in Appendix A. The information provided for each priority location, which includes figures presenting site features, was developed to better understand site-specific characteristics to implement the recommended oil recovery technique.

In addition, new submerged oil locations identified during refined poling activities will be brought to the SOTF for consideration of containment and removal activities. Site Summaries, as prepared for the 18 priority sites, will be developed for these newly identified sites. Once the SOTF concurs with the findings and recommendations these new sites will be addressed through the removal of submerged oil and/or oil-containing sediment following the protocols developed in this Work Plan.

## **2.2 Nature and Extent of Submerged Oil and Oil-Contaminated Sediments at the 18 Priority Locations**

Qualitative and quantitative assessments as well as ecological assessments have been completed for all 18 priority locations. As a result of the Task Force Leaders recommendation memorandum, 10 of the 18 priority locations, identified as requiring oil removal efforts (RMP 7.75; 14.75; 26.0; 26.25; 26.65; 27.9; 28.25; 33.0; and 33.25), were described as having limited habitat and/or ecological value. The Task Force Leaders recommended action at these ten locations is “reasonably aggressive steps be taken to remove the oil.” The recommended technique for oil removal in these ten priority locations will rely primarily on sediment aeration, but may also include sediment skimming, flushing, raking or a combination of these. Standard Operating Procedures (SOPs) for sediment aeration for these priority locations are presented in Appendix B.

The other eight locations (RMP 5.55; 5.63; 5.75; 12.5; 21.5; 36.25; 15.25; and 15.5) were identified as having high ecological and habitat values.

Three of these locations (RMP 5.55; 5.63; and 5.75) are located in the vicinity of the Ceresco Dam. The Ceresco Dam area sediments are considered heavily oiled and due to earlier response efforts (such as the cutting of oiled vegetation) the ecological setting of this area has been impacted. Based on the impacted ecological setting the Task Force Leaders have recommended dredging in this area. A Ceresco Dam Dredging Work Plan has been developed for this area and is included in this document.

Locations RMP 12.5, 15.25, 15.5, 21.5, 36.25; and 36.5 to 37.5 (also known as Morrow Lake) are considered to be unique habitat based on the ecological assessment. The Task Force Leaders recommended that no action or less aggressive remediation steps be taken; however, less intrusive alternative actions should be considered such as cautiously raking and flushing to avoid damage to the existing flora and fauna. In addition, the Task Force Leaders recommended that the outlet booms at these locations be removed and downstream collection be adequately maintained to capture any potential releases of oil during oil recovery efforts.

## **3.0 OIL REMOVAL ACTIVITIES**

### **3.1 Pre-Mobilization**

In support of the oil recovery activities at each of the priority locations requiring sediment aeration as the oil removal technique the pre-mobilization activities described in subsections below will be completed. Furthermore, oil recovery pre-mobilization activities at Ceresco Dam (RMP 5.55, 5.63, 5.75N and 5.75S) are discussed in this document.

### *3.1.1 Coordination with Wildlife Environmental/Damage Assessment Branch to Evaluate Sensitive and/or Critical Habitat in Priority Locations*

One of the key tactics to be implemented as part of the permanent recovery of submerged oil and oil-contaminated sediments in priority locations is coordination and communication with the resource agencies. Enbridge has worked with the resource agencies and the SOTF team for each of the 18 priority locations and their ecological use and value has been assessed. Based on the ecological assessments, 13 of the 18 priority locations received clearance for performing permanent oil removal activities. The remaining five priority locations are considered high quality habitat and less aggressive action at this has been recommended by the Task Force Leaders.

### *3.1.2 Landowner and Public Notification of Activities*

Enbridge will coordinate with landowners, as necessary, and manage public notification activities.

## **3.2 Mobilization and Site Preparation**

Key personnel and equipment will be mobilized to each priority location, following the above pre-mobilization activities and as presented in the SOP (Appendix B). Personnel will have received the Enbridge site-specific training. Training will address implementing health and safety, traffic control, spill prevention, and other relevant topics. In addition, equipment operators will be trained in the operation of vessels and aeration equipment being utilized.

Enbridge and its contractors will use the already established on-site office facilities that were set up for the project. Site preparation activities and equipment and manpower are presented in the SOP (Appendix B).

Sorbent boom will be deployed to cover the shoreline perimeter prior to the start of sediment aeration activities. Additional sorbent material will be deployed in areas within a specific priority location that contain identified sensitive habitat (See Appendix A - Community Description and Habitat Quality).

## **3.3 Project Meetings**

### *3.3.1 Pre-Oil Removal by Sediment Aeration Meetings*

Before any sediment aeration work begins at each priority location, the Enbridge project staff, Enbridge contractors performing this work, the USEPA, and the MDNRE will discuss the site-specific priority location. Items to be discussed in this meeting will include access to the site, work hours, site characteristics, specific health and safety issues, and general scheduling of the work.

### **3.3.2 Daily Safety Meeting**

Enbridge and/or Enbridge contractor supervisory personnel will hold daily tailgate safety meetings to advise the workers of proper methods of performing the work planned for the day. The meetings are to be attended by all field staff, craft personnel, and subcontractor personnel. The topics of discussion will be listed on a sign-in sheet and the sheet will be kept as a record of the meeting.

### **3.4 Health and Safety Requirements**

All personnel on the project will have participated in the Enbridge Safety Orientation for the Marshall Line 6B Release Project.

Enbridge and/or Enbridge contractor will provide oversight of activities to ensure conformance with all applicable state, local, federal and Enbridge safety requirements.

Enbridge and/or Enbridge contractor oversight staff will supervise operations and ensure strict safety conditions are maintained throughout the duration of the project. Each contractor will conduct its own site health and safety trainings/briefings during operations, personnel monitoring, enforcing/ modifying levels of Personal Protective Equipment (PPE), ensuring compliance with decontamination procedures, maintaining monitoring equipment, and documenting and reporting all health and safety related accidents or injuries. The Activity Hazard Analysis (AHA) document is attached as Appendix C.

### **3.5 Daily Summary Report**

Enbridge and/or Enbridge contractor will prepare a daily report for each day work is performed documenting the oil recovery efforts. This report will be provided to Operations at the end of the day.

### **3.6 Post-Sediment Aeration Conditions Assessment**

As presented in the SOP, the objective of the aeration process is to sweep the priority areas until there is “no discernable oil present on the surface.” Enbridge will notify the EPA upon completion of a priority location that meets this criteria followed by a two-day “rest” period to allow for site conditions to settle. EPA will then schedule to inspect the priority location for sign off.

An initial conditions assessment was conducted by Tetra Tech for the priority locations to identify areas where submerged oil and oil-contaminated vegetation were located. The assessment was conducted as part of the early response characterization activities to identify areas of “high priority” throughout the river system. The assessment included visual observations of sheen on the water surface, poling to identify submerged oil, and sediment core collection and logging to identify visible oil in the sediment column.

Once submerged oil operations are complete and the site has been signed off by the EPA/Enbridge, a post-sediment aeration conditions assessment will be performed by Tetra Tech. This assessment will follow the same procedures used for initial site assessment upon completion of the post-sediment aeration conditions assessment, Tetra Tech will compare the initial and post-sediment aeration conditions results to determine the effectiveness of the oil removal effort. This comparison results will be summarized in a Completion Report, which will be submitted to Enbridge and EPA.



### **3.7 Oil Removal by Sediment Aeration, Raking, Flushing**

Sediment aeration will be performed using a pond aeration unit with electric motor (explosion proof) with aluminum impeller. A diffuser panel is required at water depths less than 4 ft. The pond unit will be operated from an airboat outfitted with a platform deck. A grid system creating “cells” will be prepared during site preparation activities. A minimum of two sweeps within each grid cell is specified. If there is no discernable oil on the surface after two sweeps, the cell will be flagged as completed with a green flag. If the cell requires further aeration the cell will be flagged with red flags.

In the event that aeration procedure described above and in the SOP cannot be used due to insufficient water depth, the priority location(s) will be manually flushed, raked or a combination of the two. This is consistent with what the Task Force Leaders recommended in their memorandum dated September 21, 2010. These “Secondary Methods” for oil recovery are presented in the SOP (Appendix B). These processes will be repeated until there is no discernable oil visibly released from the cell. This SOP was originally developed for a specific set of priority sites. Please note that this SOP is now intended to cover work beyond the original ten sites referenced. In addition, new techniques may be developed as necessary and approved by the EPA to facilitate the recovery of submerged oil.

#### **3.7.1 Containment of Priority Location**

The total areas to be aerated for each priority location are presented in Appendix A. The areas already have been contained through the installation of near-term containment measures (i.e., hard booms). These existing containment measures will provide overall containment of oil brought to the surface by aeration. The sorbent boom material deployed during site preparation will also serve as containment of floating oil.

#### **3.7.2 Recovery of Floating Oil**

The floating oil will be directed to the containment areas by “leaf blowers” for collection by absorbent materials (i.e., absorbent pads, mops, snares, etc.). See Appendix B for further details on oil recovery methodology.

### **3.8 Decommissioning and Decontamination**

Following completion of sediment aeration activities, personnel, equipment and materials will be removed from the site. Cleaning methods for equipment may include brushing and pressure washing to remove potentially contaminated material, as necessary. Media from the oil absorbing will be disposed off-site. See Appendix B for further details on decommissioning of equipment and waste disposal.

### **3.9 Identification of New Areas**

New submerged oil locations may be identified during operation and maintenance activities around the existing 18 priority areas. These new areas will be identified to the SOTF for consideration of containment and removal activities that will be completed as part of the operation and maintenance plan. If deemed necessary, new sites will be addressed through the removal of submerged oil and/or oil-containing sediment. Site Summaries, as prepared for the 18 priority sites, will be developed for these newly identified sites.

## **4.0 RELEASE/SPILL REPORTING**

Any releases or spills outside the contained boomed area will be immediately communicated to the appropriate Enbridge and EPA personnel. Sediment aeration activities will immediately be ceased until a notice to proceed is given.

## **5.0 PROJECT MANAGEMENT**

The following section describes the project management team and schedule.

### **5.1 Project Team Organization**

Enbridge and the EPA will work in unison to ensure the successful completion of oil removal by sedimentation aeration. Enbridge will direct their contractors operating the vessels and oil recovery equipment and supplies. EPA will provide a minimum of one staff personnel (or EPA START contractor) to accompany the oil removal teams. The Project Team Organization for completion of the Ceresco Dam dredging is presented in the Ceresco Dam Dredging section of this Work Plan.

### **5.2 Project Schedule**

The timing for successful completion of sediment aeration at the priority locations is recommended prior to Winter 2010. Additionally, it is anticipated that dredging activities at the Ceresco Dam area will be completed prior to Winter 2010, which is defined as when local weather conditions would cause unsafe working conditions due to freezing temperatures and the accumulation of ice and snow.

## **6.0 QUALITY ASSURANCE/QUALITY CONTROL**

### **6.1 QC Monitoring**

The overall project objective is removal of submerged oil and oil-contaminated sediments from the 18 priority locations identified in Section 2. The priority locations will be evaluated for sediment aeration effectiveness by using the quantitative assessment techniques utilized to identify the 18 Priority Locations in the river. Tetra Tech field crews will assess the aquatic vegetation for visible oil. Post-flushing assessment conditions will be compared to the pre-flushing assessment conditions and summarized in the final report.

### **6.2 Inspections by Regulatory Agencies**

EPA has developed a written inspection/clearance procedure to guide the evaluation of the effectiveness of permanent oil recovery efforts. Forty-eight hours after the completion of the recovery efforts, Agency inspections will be conducted following these procedures. These inspections will be documented using the Submerged Oil Remediation Closure Form in Appendix D.

### **6.3 Inspections by Third Parties**

Tetra Tech personnel working at the site will not grant site access or answer questions for unauthorized personnel. Any outside party requesting access to the site will be immediately referred to the Tetra Tech

Project Manager, who will initiate the appropriate notification of the Enbridge Project Manager and EPA.

## **7.0 CERESCO DAM DREDGING**

The Submerged Oil Task Force (SOTF) has determined that the Amphibex dredge technology will be used for dredging at the Ceresco Dam Priority Location (MP 5.75 South). In addition, sediment removal activities will be completed in Priority Locations MP 5.55, MP 5.63, and MP 5.75 North. Specialized dredging will be completed by scraping surface sediment along the shoreline into the submerged sediments and subsequent removal. The purpose of this project is to remove the submerged oil and oil-contaminated sediment.

The project scope covered by this section of the Work Plan includes:

- Mobilization of Geotubes for sediment dewatering
- Mobilization and construction of a water treatment system
- Mobilization of material, equipment, and manpower necessary to hydraulically dredge submerged oil and oil-contaminated sediments
- Dewatering of dredged sediment
- Water treatment and discharge
- Air and water quality monitoring program

Submerged oil and oil-contaminated sediment will be removed from the north and south side of the Kalamazoo River just upstream of the Ceresco Dam (Figure 1) using an Amphibex dredge excavator and conveyed to an upland dewatering and treatment area. This process will not require an increase in the Kalamazoo River water elevation to float the equipment.

The dredged sediment will be pumped through hosing to Geotubes for dewatering with the use of polymers to enhance settling of suspended solids. Within the dewatering and treatment area, weep water will be captured in a sump, which will then be pumped to the water treatment system for treatment prior to discharge into the Kalamazoo River in accordance with a Michigan Department of Natural Resources and Environment (MDNRE) General National Pollution Discharge Elimination System (NPDES) Permit.

Additional discharge and treatment system monitoring will be required and directed on an as needed basis by the lead EPA OSC for the Ceresco Dredging Operation.

A separate work plan for air and water sampling will be submitted for review as a supplement to the existing Sampling and Analysis Plan (Revised August 17, 2010) and Quality Assurance Project Plan (Revised August 15, 2010).

### **7.1 Overview of Work**

This work presents the proposed implementation of the submerged oil and oil-contaminated sediment removal activities at the Ceresco Dam.

### **7.2 Ceresco Dam Site Description**

The Ceresco Dam is located between Mile Post (MP) 5.55 and 5.75, between the towns of Marshall and Battle Creek. This is one of several dams on the river operated by the Commonwealth Power Company. Ceresco Power and Light owns Ceresco Dam.

This portion of the Work Plan covers the area (as shown on Figure 1) along the left descending bank (also referred to as south shore) of the Kalamazoo River starting at the Ceresco Dam SE for approximately 1,000 feet upstream in length by 200 feet in width. The potential dredging scope of the project could include up to 6.75 acres of area as shown in Figure 1. Attempts will be made to reduce the potential dredging footprint and thus volume thru the use of alternative techniques such as aeration and raking. It is expected that newer improved versions of these techniques may develop and it is the intent of the lead EPA OSC to incorporate them as needed in consult with the SOTF. Additional dredging scope and/or the use of alternative techniques will be determined as appropriate by the lead EPA OSC for the Ceresco Dredging Operation in consult with the SOTF.

### **7.3 Nature and Extent of Submerged Oil and Oil-Contaminated Sediments at Ceresco Dam**

Qualitative and quantitative assessments have been completed in the vicinity of Ceresco Dam and an area between approximately 2 and 3 acres in size has been identified as a high priority location requiring significant removal of submerged oil and oil-contaminated sediments. As a result of SOTF discussions, it was determined that dredging was the preferred methodology to remove these impacted sediments. This area could vary based on site conditions and overall project path forward. The depth of impacted sediments is anticipated to be variable, ranging from 0.3 feet to 1.5 feet below the mud-line.

### **7.4 Ceresco Dam Dredge Removal Activities**

#### *7.4.1 Mobilization*

In support of dredging at the Ceresco Dam, the following pre-mobilization activities will be completed.

#### *7.4.2 Coordination with Wildlife Environmental/Damage Assessment Branch to Evaluate Sensitive and/or Critical Habitat in Priority Locations*

One of the key tactics to be implemented as part of the permanent recovery of submerged oil and oil-contaminated sediments in priority locations is coordination and communication with the resource agencies [e.g., US Fish and Wildlife Service (USFWS)]. Enbridge has worked with the resource agencies and visited and evaluated this priority location. It has been determined that the recovery technique proposed in this work plan is appropriate to the habitat. The following options have been evaluated:

- Avoiding destruction of sensitive/critical habitat
- Adjusting recovery technology accordingly, as necessary
- If permanent recovery activities destroy sensitive/critical habitat, document existing conditions prior to recovery activities for future restoration

#### *7.4.3 Ecological Risk Assessment*

It is not anticipated that an Ecological Risk Assessment will be completed prior to commencement of the dredging at Ceresco Dam.

#### *7.4.4 Cultural Resources Assessment*

Enbridge will coordinate all Cultural Resource Assessments as necessary to support this dredging effort.

#### *7.4.5 Landowner and Public Notification of Activities*

Enbridge will coordinate with the appropriate landowners and manage public notification activities. The EPA OSC lead for the Ceresco Dredging Operation will be notified of all public notifications. In addition, all public notifications will be coordinated thru the EPA Command Structure (i.e., JIC).

### **7.5 Mobilization and Site Preparation**

Key personnel and equipment will be mobilized to the project location, following the above pre-mobilization activities. Personnel, including Tetra Tech employees and other Enbridge contractors, will have received the Enbridge site-specific training. Training will address implementing health and safety, traffic control, spill prevention, and other relevant topics. In addition, equipment operators will be trained and certified in the operation of vehicles and equipment being utilized. Prior to conducting on-site work, operators will be required to demonstrate operating abilities to the satisfaction of Tetra Tech oversight personnel.

Tetra Tech will oversee the specialty contractors, which have been procured by Enbridge:

- Dredging contractor
- Geotube and polymer provider
- Water treatment system construction and operation

Tetra Tech will use the already established on-site office facilities located at Incident Command and Brooks Airfield that were set up for the project. A site inspection will be conducted with Enbridge to determine the site preparation requirements for the project. The following site preparation will be conducted:

- Installation of Site Security and Access Controls
- Establishment of Survey Controls
- Installation of Erosion and Sediment Controls throughout the Project Work Area
- Establishment of Dewatering Pad
- Establishment of Wastewater Collection Tanks / Structures

PCi Sediment Removal and Dredging Services, Inc. (PCi) has mobilized its Amphibex amphibious excavator to the vicinity of Ceresco Dam. Support equipment includes the following:

- 2006 Mack truck with an 8500 Serco loader which will assist in the laydown of pipe as well as the launching and rigging of the dredge equipment.
- Pick-up truck and trailer is included for moving personnel and other support equipment.
- Freightliner service truck equipped with tools, supplies, welder, air compressor, crane, hydraulic hose maker, and all other equipment required to maintain and keep the mobilized equipment and operations moving efficiently.
- Other equipment will be brought in as needed.

Equipment will be staged at the equipment laydown area as shown on Figure 2. The dredge site will be staked out and sectioned off with a grid layout using polyvinyl chloride (PVC) pipe to track progress of the work. GPS point collection will be used for mapping purposes.

## **7.6 Project Meetings**

### *7.6.1 Pre-construction*

Before any dredging begins at the site, the Tetra Tech project staff, Enbridge, Enbridge contractors performing this work, the USEPA, and the MDNRE will meet to discuss coordination of the project. Items to be discussed in this meeting will include access to the site, work hours, specific health and safety issues, and general scheduling of the work. This meeting will also include a discussion of any known underground utilities in the proposed dredging area.

### *7.6.2 QC/Progress Meeting*

Quality Control/Progress Meetings will be conducted once per day. These meetings will be held at the site unless otherwise requested. Any interested project team member or their designee may attend the progress meeting. Meeting minutes will be distributed by e-mail or facsimile within 24-hours of the meeting. Prior to the start of the project, an e-mail will be sent to the project team to identify persons who wish to be included on the meeting minute e-mail distribution list.

### *7.6.3 Daily Safety Meeting*

Tetra Tech supervisory personnel will hold daily tailgate safety meetings to review hazards and advise the workers of proper methods of performing the work planned for the day. The meetings are to be attended by all field staff, craft personnel, and subcontractor personnel. The topics of discussion will be listed on a sign-in sheet and the sheet will be kept as a record of the meeting.

## **7.7 Health and Safety Requirements**

All personnel on the project will have participated in the Enbridge Safety Orientation for the Marshall Line 6B Release Project.

Tetra Tech will provide oversight of activities to ensure conformance with all applicable state, local, federal and Enbridge safety requirements.

Tetra Tech oversight staff will supervise operations and ensure strict safety conditions are maintained throughout the duration of the project. Each contractor will conduct its own site health and safety trainings/briefings during operations, personnel monitoring, enforcing/modifying levels of Personal Protective Equipment (PPE), ensuring compliance with decontamination procedures, maintaining monitoring equipment, and documenting and reporting all health and safety related incidents or injuries. The Activity Hazard Analysis (AHA) document is attached as Appendix E.

Daily health and safety reports will also be prepared by the dredge contractor's superintendent and submitted to Tetra Tech each day of operation with the daily report.

## **7.8 Daily Summary Report**

Tetra Tech will prepare and submit a daily report to Enbridge and EPA for each day work is performed. The report will be submitted to Enbridge and EPA by 5:00 p.m. the following business day and will include air monitoring, surface water, and water treatment data.

## **7.9 Post-Dredge Conditions Assessment**

An initial conditions assessment was conducted by Tetra Tech for the Ceresco Dam to identify areas where submerged oil and oil-contaminated sediments were located. The assessment was conducted as part of the early response characterization activities to identify areas of “high priority” throughout the river system. The assessment included visual observations of sheen on the water surface, poling to identify submerged oil, and sediment core collection and logging to identify visible oil in the sediment column. Based on the results of the initial conditions assessment for the Ceresco Dam area, it was characterized as a “high” priority location by the SOTF. Subsequently, the Task Force Leaders recommended dredging in these Priority Locations in a September 21, 2010 memorandum.

Upon completion of the dredging activities, a post-dredge conditions assessment, similar to the initial conditions assessment, will be performed within the dredged area to document the final post-dredge conditions. Upon completion of the post-dredge conditions assessment, Tetra Tech will compare the initial and post-dredge conditions results to determine the effectiveness of the dredge removal efforts. This comparison results will be summarized in a Completion Report, which will be submitted to Enbridge and EPA. A running report of the pre and post assessments will be submitted to the EPA OSC on an ongoing basis as part of the daily report.

## **7.10 Sediment Removal by Hydraulic Dredging**

Dredging will be performed using an Amphibex dredge, which is an amphibious excavator hybrid dredge that integrates a hydraulic cutter head dredge with a positive-displacement pump for high-solids dredged material transport. The Amphibex is versatile in its portability by flat bed truck and ability to move over ground, in shallow water, and in deeper water under its own power.

The Amphibex is 38 feet long, weighs approximately 50,000 pounds, and is powered by a 250-HP Detroit Diesel engine equipped with a silencing system which allows it to operate at low noise levels. The Amphibex is self-propelled and can sail at 8 knots. It does not require any cables for operation and it is able to move itself utilizing spuds and the bucket. The Amphibex utilizes a unique articulating arm with the dredge pump head mounted to it, allowing 3 dimensions of controlled movement. The dredge head itself is able to rotate in and out much like a bucket on an excavator, which allows for precise placement of the pumping head. The maximum digging radius is approximately 27 feet for 154 degrees. The Amphibex is also unique in its ability to work in any depth of water ranging from dry land operation to 20-feet of depth. It can “walk”, “crawl”, or float to the work area.

By carefully positioning the dredge and utilizing the 3 dimensions of movement, contaminated material can be removed in an efficient and safe manner. It is anticipated that the Amphibex operator will have to adapt to many unique situations as they are encountered. Several differing site conditions are expected to be encountered including, but limited to:

- Water depth
- Depth of the sediment
- Matrices of sediment

- Plants and Roots
- Debris ranging from logs, branches, stumps, rocks, trash, and other debris.

The project team has carefully reviewed the available launch sites at Ceresco Dam with consideration to the steepness of the bank, location of utilities, and other safety factors. At this time, an existing launch site at C 0.5 will be used or if needed a launch site will be constructed in conjunction with the laydown area for the Geotubes and water treatment system. The Amphibex is capable of self launching/loading provided there is reasonable slope and access to the water. The dredge is loaded onto a low-boy trailer and transported to the project site. The Amphibex is then raised up off the trailer onto spuds and outriggers; the trailer is pulled out, and the dredge is placed on the ground allowing it to push itself out into the water.

The primary area to be dredged is MP 5.75 South and located along the left descending bank of the Kalamazoo River starting at the Ceresco Dam SE for approximately 1000 feet with a width of 200 feet. This total area is approximately 2.5 acres. An attempt will be made to remove a lift of six inches of sediment from most of the oil-containing areas. Removing a precise 6-inch layer is difficult using any type of dredging method, and it is likely that 1 to 1.5 feet will be removed including an overdredge allowance of 1 foot. Additionally, sediment removal activities will be completed in Priority Locations MP 5.55, MP 5.63, and MP 5.75 North. Specialized dredging will be completed by scraping surface sediment along the shoreline (approximately 1,500 feet) into the submerged sediments and subsequent removal. It is anticipated that a minimal amount of surface sediment will be dredged along the right descending bank. The potential volumes for sediment removal of 6 inches, 1 foot and 1.5 feet is shown in the table below based on approximate acreage of each area. The potential removal volumes at MP 5.55, MP 5.63, and MP 5.75 North are not anticipated with limited surface scraping.



<b>Mile Post Area</b>	<b>Approximate Acreage</b>	<b>6 inch Removal Volume (Est. Cubic Yards) Range Based on 30 – 50 % Solids</b>	<b>12 inch Removal Volume (Est. Cubic Yards) Range Based on 30 – 50 % Solids</b>	<b>18 inch Removal Volume (Est. Cubic Yards) Range Based on 30 – 50 % Solids</b>
5.75 South	2.5	605 – 1009	1,210 – 2,018	1,815 – 3,027
5.75 North	1.5	363 - 605	726 – 1,210	1,089 – 1,815
5.63 - South	1.0	242 - 404	484 - 808	726 – 1,210
5.55 North	1.75	424 - 706	848 – 1,412	1,272 – 2,118
<b>TOTAL</b>	<b>6.75</b>	<b>1,634 – 2,724</b>	<b>3,268 – 5,448</b>	<b>4,902 – 8,170</b>

The material removed with the Amphibex will be conveyed hydraulically to Geotubes, which will serve as the preliminary method for dewatering. The dredge head is designed to take a thicker cut of material in deeper water. However, a heavy rubber skirt will be constructed on the dredge head, which will allow PCi to dredge a thinner layer of material. This will allow for the dredging operations to remove material in a more efficient operation. The pumping capabilities will fluctuate depending on the characteristics of the material, the quantity of the debris, pumping distance, and thickness of the material being moved.

Sediment will be removed, working from the shore toward the center of the river, working in 20-foot wide areas, which will be marked using a grid system with buoys or poles to track progress. PCi will also visually monitor, control, and record the depths to which sediment removal is conducted. Dredging will commence upstream and proceed downstream to reduce the potential of recontamination of a previously dredged area.

Sediment aeration was performed on September 20 and 21, 2010, in a 1 acre area at the east side of the project footprint. This work was accomplished using a pneumatic aerator. The objective of aerating this area was to prepare a relatively “clean” area for the Amphibex to enter the containment area, and to minimize mobilization of contaminants into the sediment column by the dredge.

The Amphibex will initiate removal of sediment by working outside the containment area by reaching over the hard boom. The Amphibex will enter the work area once this has been accomplished by opening the hard boom and entering the containment area where the sediment aeration and removal activity was initiated. The hard boom will be reconnected to the shoreline behind the Amphibex to provide the necessary containment for the work to proceed.

The potential dredging scope of the project could include up to 6.75 acres of area as shown in Figure 1. Attempts will be made to reduce the potential dredging footprint, and thus volume, through the use of alternative techniques such as aeration and raking. It is expected that new and improved versions of these techniques may develop and it is the intent of the lead EPA FOOSC to incorporate them, as needed, in consultation with the SOTF. Additional dredging scope and/or the use of alternative techniques will be determined as appropriate by the lead EPA FOOSC for the Ceresco Dredging Operation in consult with the SOTF.

### *7.10.1 Containment of Dredging Footprint*

The proposed dredging footprint is 6.75 acres in size. Depths of submerged oil and oil-contaminated sediments are expected to range from 0.3 feet to 1.5 feet. Although the dredging footprint has been contained through the installation of near-term containment measures, sections may be bolstered by installing reinforced silt curtains, as necessary. An offset will be established at the hard boom and at the face of the bulkhead wall located on the southwest side of the dredge area. This offset is intended to minimize the potential contact of the dredge with the boom or wall.

Additional containment (skirts, booms, curtains, etc) is likely to be required by the EPA OSC lead for this action and will be directed as appropriate.

### **7.11 Transfer of Dredged Material**

Once the Amphibex dredge is positioned inside the containment area, the slurry transfer piping connections will be made at the Amphibex and manifold at the Geotubes. Adequate piping attachments will be delivered to the staging area to support the dredging project. Booster pumps will be installed and staged on dry land at the near shore area, to be used as necessary.

### **7.12 Dewatering of Sediment**

Sediment dredged from the vicinity of the Ceresco Dam will be pumped to geotextile tubes for dewatering, situated on a dewatering pad located in the soil handling area (Figure 2). The proposed dewatering pad is approximately 360 feet by 200 feet. The dewatering pad will be constructed by compaction of the existing soil base, installation of an impermeable liner, and placing a layer of drainage aggregate as a working surface. Approximately 12 Geotubes will be delivered to the site to facilitate the dewatering process. A geocomposite may potentially be substituted for the aggregate and used as the working surface.

#### *7.12.1 Geotube Operations*

Geotubes will be factory rolled and delivered to the site on flatbed trucks. The Geotubes will be individually wrapped and labeled for length and direction of unroll. Forklifts and/or All-Terrain Vehicles (ATVs) will be used to deploy the Geotubes in the dewatering pad. Site personnel will inspect the unrolled Geotubes for evidence of damage prior to its intended use. Figure 4 and 5 provide layout details regarding the Geotubes.

The dredged sediment will consist of an approximate 8 percent slurry mixture. The mixture is pumped into a header pipe then distributed into a manifold system with valves to direct the flow of the slurry into non-woven textile tubes, also referenced as Geotubes. This system, located at 13200 12 Mile Road, utilizes a flocculent to settle out the solids while a pump is connected to the other end to aid in the removal of water. The material safety data sheet for the flocculent is provided in Appendix G. Once a Geotube is full, flow is diverted to another Geotube while the full Geotube dewateres. The Geotubes will go through “fill and rest” cycles until it reaches its full capacity as per the manufacture’s specifications. Operators will continuously monitor the Geotubes during filling and will also monitor shrinkage in Geotubes prior to fill cycles to evaluate the remaining capacity of each Geotube.

Once the Geotube is full of sediment and dewatering is sufficient, it will be cut open to allow an

excavator to place the sediment into an appropriate transportation container. Depending on the nature of the sediment, the material will either be directed to an appropriate landfill for disposal or be taken to Project Site A for appropriate solidification prior to being sent offsite for disposal.

Prior to the dewatered sediment being removed for disposal, waste characterization will be required. Sediment waste characterization of each Geotube will be determined by dividing each Geotube into four quadrants based on the actual dimensions of the Geotube (200 ft long and 60 ft in circumference). Composite sediment samples will be collected from each quadrant by collecting sediment from four unique locations in the quadrant utilizing an excavator bucket. A total of four composite samples per Geotube will be collected and submitted to Merit Laboratories, East Lansing, MI, for chemical analyses. The complete analyte list is summarized below and will include percentage solids composition.

- TCLP metals
- TCLP VOC
- TCLP Semi-VOC
- Paint filter test for free liquids
- pH
- Flashpoint
- TPH (DRO-GRO)
- Oil & Grease
- PCBs
- Percent solids
- Analyte criteria for solidification versus disposal at landfill

Total Petroleum Hydrocarbon/Oil & Grease sampling will be conducted according to the SAR and QAPP.

### *7.12.2 Containment and Collection of Weep Water*

The dewatering pad will be designed with a berm to contain water. It will also be designed to slope towards a 30-foot by 65-foot by 5-foot deep sump which represents approximately 72,935 gallons of capacity (one hour of water treatment system capacity). The water drained to the dewatering pad (i.e., weep water), along with stormwater, will be collected in this sump and treated in an on-site temporary water treatment plant. The 2-acre containment area pad with the associated berm will allow for a containment capacity of approximately 400,000 gallons which can be used for storage should the dredging operation produce more water than the system is capable of handling. The water treatment system can then be operated beyond the timeframe of the day's dredging activities should it be needed to treat the water from that day's dredging work.

## **7.13 Water Treatment and Discharge**

Water collected in the sump will be pumped to a water treatment system which includes bag filters with oil grabbing bags, oil absorbing pressure vessels (i.e., organoclay cans), and Granular Activated Carbon (GAC) vessels as presented in Figure 3. The treatment system will be sized to meet the discharge requirements of <20 parts per billion (ppb) of total benzene, toluene, ethyl benzene, and xylene (BTEX). The water treatment contractor will provide a licensed Wastewater Treatment Operator and treatment system operators to assure that the discharge requirements are met as per the NPDES permit as follows:

- Total benzene, toluene, ethyl benzene, and xylene (BTEX) - 20 ug/l
- Dissolved oxygen (DO) - 4.0 mg/l

- pH 6.5 to 9 S.U.

The anticipated flow rate is to between 1,500 and 2,000 gallons per minute (gpm) with a maximum capacity of 2,250 gpm. This flow rate can be adjusted manually based on the level of water within the dewatering pad and the efficiency of the downstream equipment. Figure 3 illustrates the Process Flow Diagram for the maximum permitted capacity of 2,250 gpm.

There are two bag filters arranged in parallel, which utilize fabric filters to physically separate solids and oil from the stream of water. The effluent from the bag filters is passed through a vessel filled with organoclay, which removes additional oil from the water stream. The two oil absorbing vessels are piped in series (lead-lag). The bag filters and organoclay cans act as a buffer for the GAC vessels, intercepting contaminants that would otherwise foul the GAC filter media and shorten their service life.

The GAC vessels will provide tertiary water treatment prior to discharge back to the Kalamazoo River. Two GAC vessels are piped in series (lead-lag) for a single treatment train. Each vessel contains 10,000 pounds of GAC and the series of two vessels is designed to treat 750 gpm. Three treatment trains identified as A, B, and C are connected to operate in parallel to treat between 1,500 and 2,000 gpm with a maximum capacity of 2,250 gpm. The differential pressure across the GAC vessels is monitored for signs of plugging and/or physical fouling due to suspended solids and/or biological growth. Backwash of the bed is initiated when the differential pressure across the vessel reaches 15 pounds per square inch, or twice that of a clean bed. The backwash water will be returned to the sump for treatment and ultimate discharge.

This treatment plant will discharge treated water back to the Kalamazoo River and operate under a NPDES Certificate of Coverage (No. MIG081158) issued by MDNRE. Treated water will be continuously discharged in accordance with the NPDES permit. Effluent will be discharged into the Kalamazoo River using a vertical riser pipe with a dispersion cap. The discharge pipe and vertical riser will be mounted to a floating dock approximately 40 feet from shore. The discharge point will be monitored at least three times per week to confirm no riverbed erosion is occurring. In the event that allowable levels in the NPDES permit are exceeded, the dredging, dewatering, and filtration systems will be turned off while the cause of the exceedances is investigated and corrective actions are taken.

Additional discharge and treatment system monitoring will be required and directed on an as needed basis by the lead EPA FOSSC for the Ceresco Dredging Operations.

An odor masking agent will be procured and used on-site to ameliorate potential odor issues associated with materials handling. The Material Safety Data Sheet (MSDS) for this product will be submitted to the EPA FOSSC for this project for approval prior to initiation of its use.

## **7.14 Demobilization and Decontamination**

Following completion of dredging/dewatering activities, temporary facilities and utilities, personnel, equipment and materials will be removed from the site. Construction equipment will be decontaminated before leaving the site. Cleaning methods for equipment may include brushing and pressure washing to remove potentially contaminated material, as necessary. As part of decontamination efforts, all non-porous surfaces (e.g., pipes, fittings, appurtenances, pumps, vessels) that have come into contact with sediment and/or filtrate will be cleaned as follows:

- All portions of the sediment dewatering and water treatment systems will be flushed in place with river water supplied by the Amphibex dredge. Rinsing will be considered complete when at least one hour's pumping of river water has passed through the system.
- After rinsing is complete, the system will be drained and discharged to the river.
- Media from the oil absorbing and GAC vessels will be disposed off-site at an approved facility.
- Rental equipment will be demobilized from the site.

Wastes generated during decontamination will be managed in accordance with the approved Waste Transportation and Disposal Plan.

### **7.15 Completion Report**

A Completion Report will be prepared and submitted to Enbridge, EPA and MDNRE upon completion of the dredging/dewatering activities. The report will include at a minimum a summary of the work performed, pre- and post-dredge condition assessment information, daily field reports, and photographic documentation.

### **7.16 Waste Management**

Waste generated during the dredging and dewatering activities will be handled accordance to the EPA approved Waste Management Plan for Dredging Operations Located at MP 5.75 South.

### **7.17 Field Sampling and Analysis Plan**

The media to be sampled for this project (as covered under this Work Plan) will be water treatment system effluent, in compliance with the NPDES permit, dewatered sediment and debris for landfill disposal characterization. Initial influent and effluent water samples will be collected during the first day of operation to ensure treatment effectiveness. Water samples will be collected in accordance with the NPDES permit. Additional discharge and treatment system monitoring will be required and directed on an as needed basis by the lead EPAOSC for the Ceresco Dredging Operation.

At treatment plant start-up, a water sample will be taken of the influent, effluent, and the intermediate stages between the carbon vessels and chemically analyzed for BTEX, total lead, dissolved oxygen (DO) and pH. Thereafter, the intermediate and effluent stage of the carbon vessels will be sampled once a week for BTEX. The effluent maximum concentration limit for BTEX is 20 ug/l. The intermediate concentration is to be measured and reported, but does not have a limit. The concentration levels will be reported to the state on a weekly and monthly average basis. The samples will be sent to Merit Laboratories, East Lansing, MI, with duplicate, lab Matrix Spike and Matrix Spike Duplicate (MS/MSD) and rinsate samples collected for every 10 samples collected in the field.

Total lead, DO, and pH will be tested on a weekly basis. Dissolved Oxygen has a minimum concentration level limit of 4.0 mg/l; pH level between 6.5–9 must also be maintained. Total lead testing is required for reporting and has a total quantification level of 1.0 ug/L, but is not subject to concentration limitations.

The samplings for BTEX, DO, pH and total lead at the effluent will be taken prior to mixing with the surface water. The intermediate stage monitoring will be taken prior to the final activated carbon stage.

Flow will be monitored daily in MGD and logged on a daily and monthly basis. The water treatment equipment, the discharge point and the receiving waters will be inspected at a minimum three times a week.

The discharged water will not contain any turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits of unnatural quantities which are or may be harmful to the receiving water bodies.

<b>NPDES PERMIT SAMPLING PARAMETERS AND FREQUENCY</b>				
<b>Parameter</b>	<b>Minimum Limits for Quality and Concentration</b>	<b>Maximum Limits for Quality and Concentration</b>	<b>Frequency of Analysis</b>	<b>Sample Type</b>
<b>Intermediate Total BTEX</b>	-	(report)	Weekly	Grab
<b>Final Effluent BTEX</b>	-	20 ug/L	Weekly	Grab
<b>Total Lead</b>	-	(report)	Weekly	Grab
<b>Dissolved Oxygen</b>	4.0 mg/l	-	Weekly	Grab
<b>pH</b>	6.5	9.0	Weekly	Grab
<b>Equipment and Outfall Inspections</b>	-	(report)	3X Weekly	Visual

These test parameters are in accordance with, or exceed, the NPDES Wastewater Discharge General Permit for Petroleum Contaminated Wastewater Permit Certificate of Coverage Number MIG081158.

Waste characterization of construction debris consisting of the Geotubes and PPE will be analyzed for the following analytes:

- TCLP metals
- TCLP VOC
- TCLP Semi-VOC
- Paint filter test
- pH
- Flashpoint
- TPH (DRO-GRO)
- Oil & Grease
- PCBs
- Percent solids

Once the debris has been appropriately characterized for disposal, the debris waste generated from the sedimentation removal operations will be managed in accordance with the Enbridge Contaminated Soil Pile Management and Sampling Plan Revised 09012010 Rev3.

## **7.18 Environmental Protection and Regulatory Compliance**

This section summarizes the regulatory requirements applicable to the project.

### **7.18.1 Michigan NPDES Permit**

The NPDES Certificate of Coverage (No. MIG081158) was issued by the MDNRE on September 22, 2010.

### *7.18.2 Michigan Part 303 Wetlands Protection Permit*

The Michigan Part 303 Wetlands Protection Permit is currently being prepared. The permit application also includes the Part 301 Water Quality Permit.

### *7.18.3 Release/Spill Reporting*

Any releases or spills outside the contained bermed area will be immediately communicated to the appropriate Enbridge and EPA personnel.

A project-specific Ceresco Dam Dredging response plan for potential spills resulting from dredge pipe releases will be developed.

## **7.19 Project Management**

The following section describes the project management team and schedule.

### *7.19.1 Project Team Organization*

As the oversight contractor, Tetra Tech will be responsible for ensuring the successful completion of the Ceresco Dam dredging work. Tetra Tech will retain overall project responsibilities from management through safety and quality oversight. The team structure will include the following:

- Dredging – Pci Sediment Removal and Dredging Services/Young’s Environmental Cleanup, Inc.
- Geotube and polymer provider – Infrastructure Alternatives, Inc.
- Water treatment system construction and operation
- Oversight – Tetra Tech

## **7.20 Project Schedule**

See Appendix E for a project schedule.

## **7.21 Quality Assurance/Quality Control**

### *7.21.1 Organization and Responsibilities*

Tetra Tech’s oversight personnel will supervise the dredging project to ensure it is performed in accordance with this Work Plan and applicable local, state, and federal requirements.

### *7.21.2 QC Monitoring*

The overall project objective is removal of recoverable oil from this priority location. The priority

location will be evaluated for dredge effectiveness by using the identical quantitative assessment techniques utilized to identify the 18 Priority Locations in the river. Tetra Tech field crews will assess the water surface for visible sheen. Poling will be conducted to identify presence of submerged oil. Hand sampling will be performed to collect subsurface sediment cores for logging in an attempt to identify visible oil in the sediment column. Post-dredge assessment conditions will be compared to the pre-dredge assessment conditions and summarized in the final report.

#### *7.21.3 Inspections by Regulatory Agencies*

Regulatory personnel will be onsite frequently and made aware of project activities through daily planning and progress meetings.

#### *7.21.4 Inspections by Third Parties*

Tetra Tech personnel working at the site will not grant site access or answer questions for unauthorized personnel. Any outside party requesting access to the site will be immediately referred to the Tetra Tech Project Manager, who will initiate the appropriate notification of the Enbridge Project Manager and EPA.