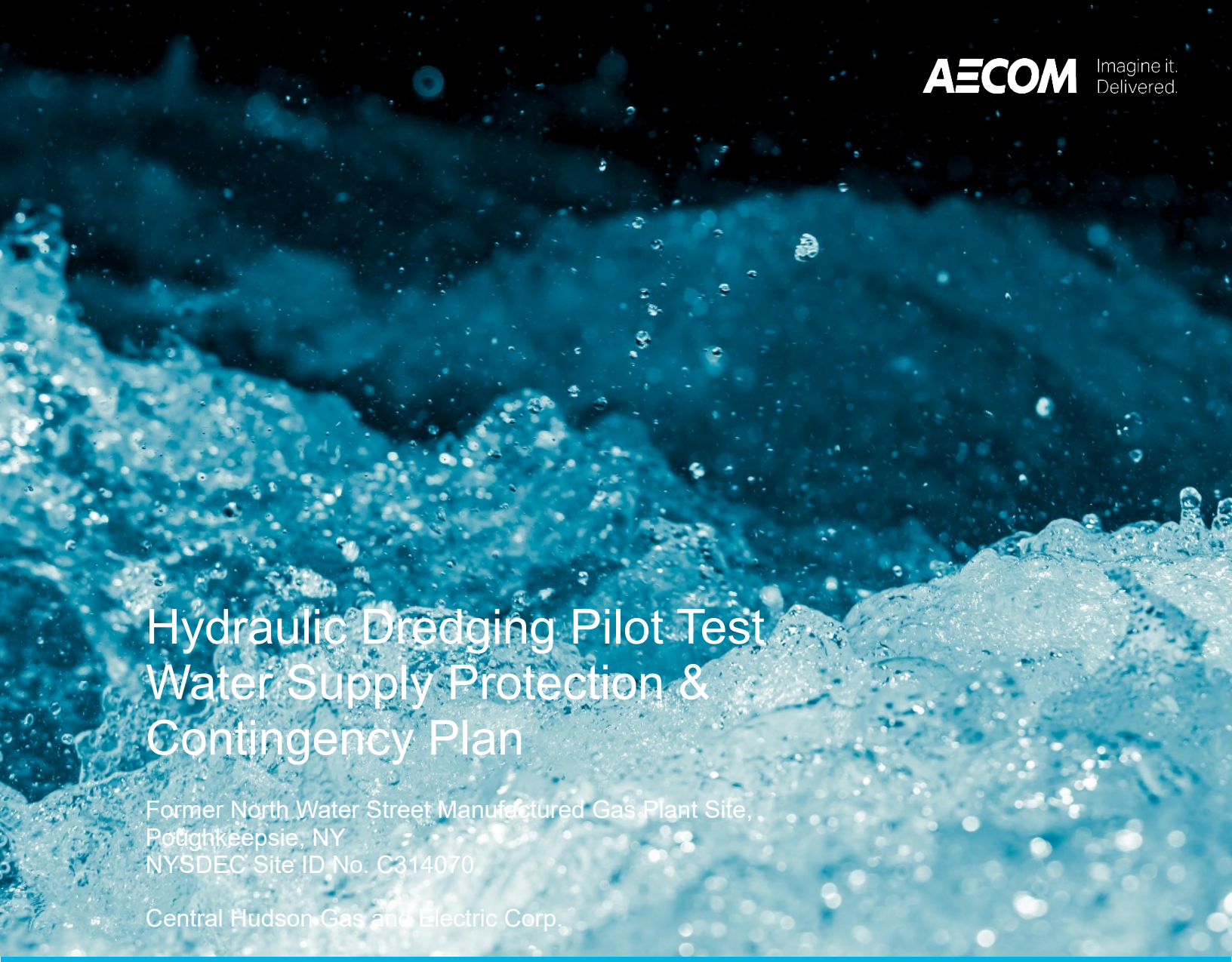

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Hydraulic Dredging Pilot Test Water Supply Protection & Contingency Plan

Former North Water Street Manufactured Gas Plant Site,
Poughkeepsie, NY
NYSDEC Site ID No. C314070

Central Hudson Gas and Electric Corp.

August 28, 2020

Prepared for:

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1. Introduction and Commitment

1.1 Introduction

AECOM USA Inc. (AECOM), on behalf of Central Hudson Gas & Electric Corporation (CHGE), has prepared this Hydraulic Dredging Pilot Test Water Supply Protection & Contingency Plan (HDPT WSPCP) to ensure protection of the Poughkeepsie Water Treatment Facility (PWTF) during the HDPT field activities proposed to be undertaken in the Hudson River adjacent to the former CHGE North Water Street Manufactured Gas Plant (MGP) site located at 2 Dutchess Avenue, Poughkeepsie, New York (the site) during Season 3 (September 1, 2020 through January 31, 2021).

Definable features of the HDPT activities to be implemented include:

- Installation of a perimeter sheen containment system;
- Installation of in-river environmental monitoring devices for turbidity and organics;
- The utilization of four sheen patrol boats;
- An observer positioned on the Walkway Over the Hudson to visually monitor for non-aqueous phase liquid (NAPL) sheens potentially related to HDPT activities;
- Removal of impacted sediment from the site's Central Area via hydraulic dredging;
- Dredged sediment dewatering and water treatment;
- Dredge material transport and off-site disposal.

As noted above, implementation of the HDPT to remove impacted material has the potential to generate sheens, turbidity and affect the water quality in the Hudson River. This WSPCP has been prepared to provide a summary of:

- The lines of controls that will implemented for the protection of the PWTF and all other users of the Hudson River;
- Monitoring to ensure that the controls are effective; and
- Contingency measures, including notifications and responses, in the event the monitoring shows a breach of the control measures implemented.

The remainder of this section will provide a brief overview of the controls that will be implemented during the HDPT. Section 2 provides a summary of the monitoring and response actions that will be implemented during the HDPT.

1.2 Commitment

In addition to implementing these monitoring and control efforts, CHGE will provide technical support, if necessary, to address contamination in the PWTF if HDPT-related contamination is detected within the plant.

1.3 Lines of Control

Lines of control will be implemented during the HDPT to mitigate potential impacts to Hudson River water quality and the PWTF. These lines of control have been selected to limit the migration of potential contaminant releases to within the designated HDPT work area where

such releases can be addressed in a timely manner. The lines of control to be utilized are as follows:

- **Hydraulic Pump Shroud**: The hydraulic pump shroud is specially designed for use in dredging of sediments; this design emphasizes mitigation of suspended sediment releases as opposed to maximizing dredge productivity.
- **Perimeter Sheen Containment System**: Installed for the purpose of providing a line of sheen control at the designated work area “point of compliance”.
- **Sheen Patrol Boats**: To support sheen identification operations, and application of approved sheen mitigation measures.
- **Booms and Absorbent Materials**: To be implemented to mitigate the migration of sheen.
- **Bioremediation Agents**: To be applied to mitigate the generation and migration of sheen.

1.3.1 Hydraulic Pump Shroud

A shroud will be specially fabricated for, and installed on, the hydraulic pump to be used in the HDPT to reduce to the extent possible the migration of suspended sediment beyond the immediate dredging location.

1.3.2 Perimeter Sheen Containment System

A perimeter containment system consisting of a double barrier of oil booms between the designated HDPT work area and other users of the Hudson River will be installed prior to the commencement of intrusive activities. No intrusive in-river work will be permitted to occur without the perimeter sheen containment system in place, regardless of any additional controls specific to those particular items of work.

A perimeter sheen containment system (perimeter system) consisting of a double barrier between the designated work area and other users of the Hudson River will be installed prior to the commencement of the HDPT. The perimeter system that would be utilized for the HDPT will consist of a double row of 18-inch oil boom, connected to the existing anchor block buoys, with a row of absorbent sausage boom between the 18-inch oil booms, and a row of sausage boom connected on the in-board side of this system, as shown in **Figure 1.**

A gate will be installed on the western arm of the perimeter system (parallel to the main river flow direction). This gate will be similar to that used during Season 2, to facilitate vessels (tugs, material scows, etc.) to enter and exit the work area. When the gate is temporarily opened, the oil boom will be secured with dedicated lines at each side of the gate to a buoy.

The perimeter system will be along the same alignment as was utilized for Season 2, which is approximately 100 feet from the farthest areal extents of the HDPT dredging.

1.3.3 Sheen Patrol Boats

Sheen patrols boats will be deployed during operations associated with hydraulic dredging as follows:

- Two patrol boats positioned within the Perimeter Sheen Containment System.
- Two patrol boats positioned outside the Perimeter Sheen Containment System.

These patrol boats will respond as directed to observed sheens and will deploy oil-absorbent materials (such as temporary placement of floating socks/booms, pom-poms, etc.) as required as close to the source as possible. In addition, patrol boats will be fitted with equipment to enable application of bioremediation agents if needed.

1.3.4 Booms and Absorbent Materials

Oil containment booms and absorbent materials will be available during all operations to mitigate and control isolated sheen releases. These materials will be deployed from patrol boats or the dredge barge as required.

1.3.5 Bioremediation Agents

As was done in Season 2, New York State Department of Environmental Conservation (NYSDEC)-approved bioremediation agents will be applied as necessary to mitigate the generation and migration of sheens. The bioremediation agents act to degrade sheens by decomposing the compounds that cause sheens through microbiological and/or enzymatic activity (depending on the product used).

The bioremediation agents that will be used during the HDPT are Oil Spill Eater II and BIOREM-2000 Oil Digester. The data regarding their safety and efficiency are presented **Appendix A** (Bioremediation Agent Information Sheets).

2. Contingency Plan

The implementation of the NYSDEC-required remedial action of sediment dredging has the potential to impact the Hudson River and specifically the near-by PWTF via three mechanisms:

- **Sheen:** sheens are generated during the disturbance of site-related impacted material and sediments. This disturbance will take place primarily during dredging operations. Sheens by themselves contain low-level impacts though can travel far and are indicative of a potential release.
- **Turbidity**: disturbance of site-related impacted material and sediments during remedial action may result in temporary suspension of the sediments and eventual deposition. The turbidity generated as a result of remedial action has the potential to result in exceedance of water quality criteria and sheens.
- **Dissolved phase impacts**: the implementation of remedial action may result in exposure of impacted material and sediments and dissolution into the Hudson River waters potentially resulting in exceedance of water quality criteria.

This WSPCP will be implemented during the HDPT primarily to ensure the lines of controls summarized in **Section 2** are working as designed via routine monitoring and that contingency responses are in place to contain any breach of the line of controls.

Routine monitoring will be employed for the purpose of identifying potential contaminant releases as quickly as possible, and then limiting these releases to the smallest possible area within the work zone in order to maximize the effectiveness of mitigation and clean-up actions.

In order to mitigate a release to the environment, contingency measures, tied to “alert” and “action” levels, will be employed to guide responses depending on the location and/or intensity of conditions observed. Alert and action levels have been designated for sheen, turbidity and water quality with consideration to the following responses:

- **Level I**: **Routine Operations**. This level signifies that the controls are effective and remedial action is progressing.
- **Level II**: **Alert Conditions**. This level signifies that monitoring indicates that there might be a potential breach of controls that requires evaluation and possible corrective action. The remedial activities will continue under this condition with heightened monitoring and controlled operations which may include stoppage of work if needed.
- **Level III**: **Action Conditions**. This level indicates that there was a breach of controls. Stoppage of work has taken place or is imminent.

The *Water Supply Protection Levels* flow chart presented in **Figure 2** provides an overview of conditions and correlating responses for each of the above listed levels.

Table 1 – **Table 3** provides a more detailed overview of the sheen, turbidity and water quality alert and actions levels, and associated responses, respectively. Responses to alerts and actions vary depending on the type of observation as described in the following sections.

Following any stoppage of work resulting from either Level II Alert Conditions or Level III Action Conditions, dredging will not resume until NYSDEC has had an opportunity to review the observations and evaluate whether any changes are required. If changes are deemed necessary, they will be reviewed with and approved by the NYSDEC prior to recommencement of dredging operations.

2.1 Sheen

Sheen can be caused by the release of MGP residuals in the form of NAPL; components of the NAPL separate into lighter fractions which then float as a separate layer atop the water. Typically, in a hydraulic dredging project, release of sheen-causing substances can happen as the result of mechanical disturbance of the sediment (the physical shaking of the sediment releases contaminants that rise through the water column).

2.1.1 Monitoring Plan

Sheens from NAPL that typically cause the “rainbow” effect, observable by the human eye are difficult to detect by instrumentation. The ability to observe sheen is improved by a difference in angle between the observer as compared to the plane in which the sheen exists (i.e., the water surface). Therefore, observation of sheen is most reliably accomplished from an elevated position/location.

2.1.1.1 Visual Observation

An observer will be stationed on the Walkway Over the Hudson (WOTH) bridge during all operating hours, and one-hour post cessation of dredging operations. The WOTH observer will be responsible for:

- Documenting visual observations on an hourly basis, and when changes in activity or weather conditions are noted, on a Daily Observation Field Record Form.
- Communicating via radio with designated site personnel in the event that actual sheen or other abnormal conditions are observed.

2.1.1.2 Sheen Patrol Boats

Sheen patrol boats will be deployed during operations associated with dredging activities. Personnel stationed on these patrol boats will be responsible for support in identifying and reporting actual sheens or other abnormal conditions. In addition, these personnel will respond, as directed, to implement sheen control and mitigation measures as close to the source as possible.

2.1.1.3 Other

All personnel working on site have the responsibility to report actual sheens or abnormal conditions to the Site Construction Manager and CHGE. All personnel will be briefed during site induction and made aware of reporting requirements as well as actions related to sheen control and mitigation measures.

2.1.2 Contingency Plan

Table 1 provides an overview of sheen alert and actions levels, and the associated responses.

Alert and action levels have been established based on whether sheen is observed, and where. For purposes of implementing this plan, it is assumed that an observer will be in place above the work area, on the Walkway Over the Hudson. However, if equipment locations or light conditions (especially at dawn or dusk, when the source of natural light is at a low angle relative to the water surface) may obscure observations, alternative locations may be employed as appropriate based on the cause and duration of the obstruction.

Alert levels will trigger responses to control the observed sheens, but do not require any action by the dredge itself. Action levels will require the dredge to stop temporarily.

2.2 Turbidity

Turbidity is the measure of anything present in the water that impedes transmission of light through the water. Typically, this can be caused by suspended sediments that exist in the water column as the result of natural sediment transport downriver, natural biological activity, and dissolved gases. To that end, the river has a background turbidity level that fluctuates regardless of any remedial work. However, increases in turbidity relative to other locations in the river can be an indicator that sediment, potentially lost by the dredging process, is being transported away from the active work area. That said, monitoring turbidity levels in close proximity to intrusive work activities is an effective method

Monitoring of turbidity can be used to evaluate whether a release is occurring. For example, if turbidity measured at a downstream location increases relative to that level of turbidity being measured at a location upstream of an activity, this may be indicative of a release. Because MGP residuals may be transported as NAPL adhered to sediment particles, relative increases in turbidity compared to background river conditions can be used as a proxy to indicate a release may have occurred.

2.2.1 Monitoring Plan

Turbidity around the work area will be monitored through the deployment of turbidity monitors at locations and depths similar to what was completed in Season 2.

Turbidity is readily measured quantitatively; turbidity meters can be used to measure turbidity in terms of nephelometric turbidity units (NTUs). Turbidity sensors are submersible and can operate autonomously, transmitting data to a central location. Although the turbidity meter cannot identify the cause of turbidity, whether project related actions are causing turbidity can be inferred by comparing simultaneous data from multiple locations. As the Hudson River is tidal, the direction of flow changes several times per day; and by having turbidity monitoring locations adjacent to, upriver and downriver of the work area, at least one location will always be monitoring “background” conditions by virtue of being up gradient of the work. This configuration enables monitoring for a relative increase in turbidity in the river regardless of tidal stage. All sensors will record and transmit turbidity data to a centralized web-based service at 5-minute intervals, and the web site will automatically send email notifications to project staff if specified thresholds are exceeded as described below. A public access website has been created to allow NYSDEC and other interested regulatory agencies the opportunity to review the turbidity data in real-time.

2.2.1.1 Baseline Condition

A pre-remedial action background water quality monitoring event will be conducted to establish baseline water quality levels.

2.2.2 Contingency Plan

Alert and action levels have been established based on whether turbidity is observed in excess of RD/RA Work Plan thresholds. The web interface will send automated notification messages as soon as data indicating an excursion is received. Because the web service does not compare between locations, automated notifications will be sent if the direct measurement at any location exceeds the designated threshold levels on an absolute basis, but this does not necessarily indicate that an alert or action level was reached. For example, if a sensor detects turbidity of 42 NTU at a down gradient station, a notification will be transmitted; however, if the contemporaneous up gradient turbidity reading is 35 NTU, the actual difference of turbidity is only 7 NTU and accordingly the alert level is not triggered. Because turbidity cannot be negative, this approach is conservative in terms of ensuring an alert- or action-inducing turbidity increase is not missed.

In the event that a measurable difference between any two turbidity monitoring locations is confirmed and indicates a possibility that turbidity is escaping from the project area based on the Hudson River's flow direction at that time, **Table 2** provides an overview of turbidity alert and action levels and the associated responses.

2.3 Water Quality - Dissolved

Water quality is a measure of site-related impacts that are dissolved in the Hudson River water as a result of the remedial action. Monitoring activities for the HDPT will be performed in accordance with the NYSDEC/New York State Department of Health (NYSDOH)-approved Season 2 Modifications to the Water Quality Monitoring Plan presented in **Appendix B** (CHGE, 2019) and will include a discrete sampling component (including laboratory analysis) and an optical scanning component.

2.3.1 Discrete Sample Monitoring

The water quality monitoring program includes sampling from the following locations:

- PWTF: Lower Pump House
- PWTF: Effluent
- Town of Lloyd's Highland Water District (HWD) facility: Influent
- Dutchess County Water and Wastewater Authority's (DCWWA) Hyde Park facility: Influent
- Hudson River: In-River North
- Hudson River: In-River South
- Hudson River: Containment System

Water quality sample locations will be the same as they were in Season 2 (refer **Appendix B**).

The following water quality sampling events will be performed as part of the HDPT:

- **Background Event**: Completed prior to the commencement of the HDPT to obtain a background dataset.
- **Trial Area Event**: Completed during the HDPT in the trial area outside of the Perimeter Sheen Containment System to monitor changes in water quality (if any).
- **Normal Operations Event**: Routine monitoring during HDPT operations to monitor changes in water quality (if any).
- **Controlled Sheen Outside Perimeter Sheen Containment System Event**: Completed daily during the HDPT when sheen is identified outside Perimeter Sheen Containment System to assess the nature and extent of dissolved phase impact and inform decision making regarding operation.
- **Uncontrollable Sheen Event or Exceedance of Turbidity Action Levels**: Completed daily during the HDPT during an uncontrolled sheen event to assess the nature and extent of dissolved phase impact and inform decision making regarding remediation operations.

In-river samples will be analyzed for the presence of chemicals of potential concern (CoPC) including target volatile organic compounds (VOCs) and Total Polycyclic Aromatic Hydrocarbons (PAHs). Samples collected from the PWTF will be analyzed for a broader screen to meet the requirements of the New York State Department of Health Subpart 5-1, Public Water Systems (NYSDOH, 2018).

Analytical data collected from the Hudson River must comply with the numeric standards for Class A waters as defined in the NYSDEC Division of Water Technical & Operational Guidance Series TOGS 1.1.1 *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (NYSDEC, 1998), and data screened from samples collected from the PWTF must comply with NYSDOH, 2018.

Monitoring data from the samples collected from the Hudson River and analyzed at the on-site laboratory will be provided to the onsite NYSDEC representative within 2 hours after analyses are complete and results are available.

2.3.1.1 Baseline Condition

A pre-remedial action background water quality monitoring event will be conducted to establish baseline water quality levels.

2.3.2 Optical Scanning Component

Water quality will also be monitored using scanning technologies that can alert the project team and the PWTF staff as to the potential presence of contaminants in the water column on a real-time basis through scanning technologies such as fluorescence. These technologies are employed as a supplemental measure to provide additional information to the project team and may be used to trigger sample collections events, but optical scanning data will not be relied upon, on its own, to make determinations as to compliance with relevant standards. Two separate optical scanning technologies will be employed. One is a submersible fluorometer, capable of detecting and measuring crude and refined oil products. The other technology is a sheen detection device that employs ultraviolet and fluorometer optics installed above the water surface to detect sheens. Both devices will be connected to telemetry and provide remote monitoring capability on a real-time basis. The optical scanning technologies will be deployed as follows:

- **Hudson River (Midpoint between work area and PWTF Intake):** As was conducted during Season 2, submersible fluorometers will be installed adjacent to three turbidity monitoring locations near the bottom of the river, to evaluate presence of potential NAPL components in real time.
- **PWTF Wet Well:** A submersible fluorometer, camera and sheen detection device will be deployed (if not already installed) to this location to evaluate presence of either dissolved or light free-phase contaminants on a continuous basis at the entry point of raw water into the PWTF.

2.3.3 Response Plan

Table 3 provides an overview of water quality alert and action levels, and the associated responses.

Alert and Action levels have been established to ensure appropriate responses to exceedance of dissolved phase water quality CoPC over the NYSDEC and NYSDOH standards. Alert levels are typically a warning threshold (and not exceedance of standards) that requires action to prevent exceedance of regulatory standards.

Table 3 lists the site personnel positions and their responsibilities for making the required notifications. At this time, the specific individuals anticipated to be in those roles are:

- CHGE: Mark McLean
- NYSDEC: Douglas MacNeal

- Construction Manager: Kevin Shaver
- AECOM Engineer: Darrell Kennedy
- Sevenson: Steve Shaw
- PWTF: Randy Alstadt

For all Level II and III notifications, Mark McLean (CHGE) will immediately phone Randy Alstadt (PWTF) first and then Douglas MacNeal (NYSDEC), and Kristin Kulow (NYSDOH).Within one hour of completion of these phone calls, Mark McLean will send each an email of the notification, and then he will contact the NYSDEC Spill Hot Line.

Within one hour of a Level III notification, Mark McLean (CHGE) will also send an email notification to the following:

- George Heitzman (NYSDEC)
- Dan Eaton (NYSDEC)
- Janet Brown (NYSDEC)
- John Petronella (NYSDEC)
- Christine Vooris (NYSDOH)
- Maureen Schuck (NYSDOH)
- Min-Sook Kim (NYSDOH)
- Steve Gladding (NYSDOH)
- Grant Jiang (NYSDOH)
- Minzi Pan (NYSDOH)
- Lee Felshin (Dutchess County DOH)
- James Upright (Dutchess County DOH)
- Marie Brule (Dutchess County DOH)
- Jon Baisley (Town of Poughkeepsie)
- Marc Nelson (City of Poughkeepsie)
- Eric Hoppe (NYS Department of Parks)
- Linda Cooper (NYS Department of Parks)
- Dan Shapely (Hudson River Keeper)
- Bill Carlos (Poughkeepsie Water Board)

3. Start Up Plan

Figures 3a and 3b show the equipment configuration. The plan is to utilize the existing on-site water treatment system to process all of the HDPT filtrate from both the geo tube barges and filter presses. This might require operation of the treatment system on a full-time basis to maintain pace with the hydraulic dredging production.

The selected long reach boom and stick to accommodate the depth of dredging is a Pierce-Pacific-LR-11 105 model. **Figure 4** shows that the range of operation for this model can achieve the dredging depths required for the HDPT.

The selected hydraulic pump system is comprised of a Bell 200 Dredge Pump and a Bell Auger Head.

The pump system will also include a fabricated shroud over the cutter head to mitigate releases. The HDPT will attempt to conduct the dredging to the entire depth currently indicated in the project drawings (see RD/RA Work Plan) for the NAPL-impacted prisms selected.

3.1 HDPT Proof of Concept Dredging Plan

The HDPT sediment dredging will be conducted as follows:

- One week prior to the mobilization of the HDPT equipment to the site, CHGE will notify the NYSDEC, the NYSDOH, the Dutchess County Department of Health, the PWTF, and all other project stakeholders of the planned arrival date of this equipment.
- The dredging equipment will be tested in a proof of concept (POC) mode in an area outside of the Central Area (CA) footprint of impacted sediments in the general area of location PSB 1 as shown on **Figure 5**. The results of a recent geotechnical investigation conducted by CHGE indicate that the PSB 1 samples exhibited similar geotechnical gradations of materials to those areas within the CA footprint of impacted sediments but showed no indications of NAPL impacts.
- The current plan includes operating the hydraulic dredger with the long reach boom and hydraulic pump to excavate material from this area and process it through the ancillary dewatering and filtrate treatment system. This POC will include conducting assessments of maintaining pump control accuracy in vertical and horizontal planes, as well as assessments of dredging depth accuracy.
- This POC will also evaluate variation in pumping rates.
- Although no sheen releases are anticipated from this area, all environmental monitoring and control systems for sheens, turbidity and associated organics, as described below, will be active prior to commencement of any POC activity.
- Once the POC has been completed to the satisfaction of NYSDEC, the dredge barge will be relocated to the first test location within the CA footprint.

3.2 HDPT Dredging Plan Within Central Area Footprint

Once all final on-site preparations have been completed, dredging will begin within the CA footprint. Dredging will not be permitted until the following measures, which are in accordance with the applicable plans that have been approved, are in place:

- The visual, turbidity and water quality monitoring personnel and equipment are also in place and functioning correctly;
- Emergency response equipment and personnel (e.g. patrol boats and bioremediation applicators) are in place;
- Appropriate personnel authorized to call for and direct control actions are trained to recognize releases and are in place to observe potential releases during work;
- NYSDEC provides an authorization to commence dredging in impacted areas.

Once all prerequisites are satisfied, dredging work within the CA footprint will begin. The startup procedure for the dredging work might employ reduced-rate dredge cycles at first to allow site personnel to observe the system before production dredging rates are permitted to be tested. The dredge startup test will include the following steps:

- To the extent possible, given the tide cycle at the time dredging is set to commence, the first dredge cycle within the CA footprint would be timed to coincide approximately with slack tide at the site;
- The initial dredge cycle will commence with lowering of the hydraulic pump system to the sediment surface, initiating pumping activities and start-up flow rates as per the POC-determined criteria, and monitoring excavated material transport to the dewatering processes. The following observations will be recorded during this initial dredge cycle:
- AECOM will provide continuous visual monitoring of the surface of the water from the Walkway over the Hudson and will notify and record any observations that can be made as to when or if sheen appeared either within or outside of the perimeter barrier.
- AECOM will continuously monitor the water for turbidity by means of submersible turbidity meters placed near the bottom and at the midpoint of the water column approximately 100 to 200 feet on the downstream (determined by prevailing direction of tide) side of the dredging location for the duration of the startup test.
- Provided no observations during the initial dredge start-up flow rate trigger Level II or Level III response (per the Water Supply Protection and Contingency Plan), the pumping rate will be increased to a prescribed rate agreed upon by CHGE and NYSDEC.

If at any point during the dredge startup test uncontrolled sheen or exceedances of turbidity action levels are present outside of the perimeter system, work will stop immediately. Mitigative measures will continue as the release is being controlled and notification will be made to the NYSDEC, the PWTF and all other stakeholders in accordance with the Water Supply Protection and Contingency Plan (AECOM, 2019). Dredging will **not** resume until NYSDEC, AECOM, SES, and CHGE have had an opportunity to review the observations and evaluate whether any changes to the dredging procedure are required. If changes are deemed necessary, they will be reviewed with and approved by the NYSDEC prior to recommencement of dredging operations.

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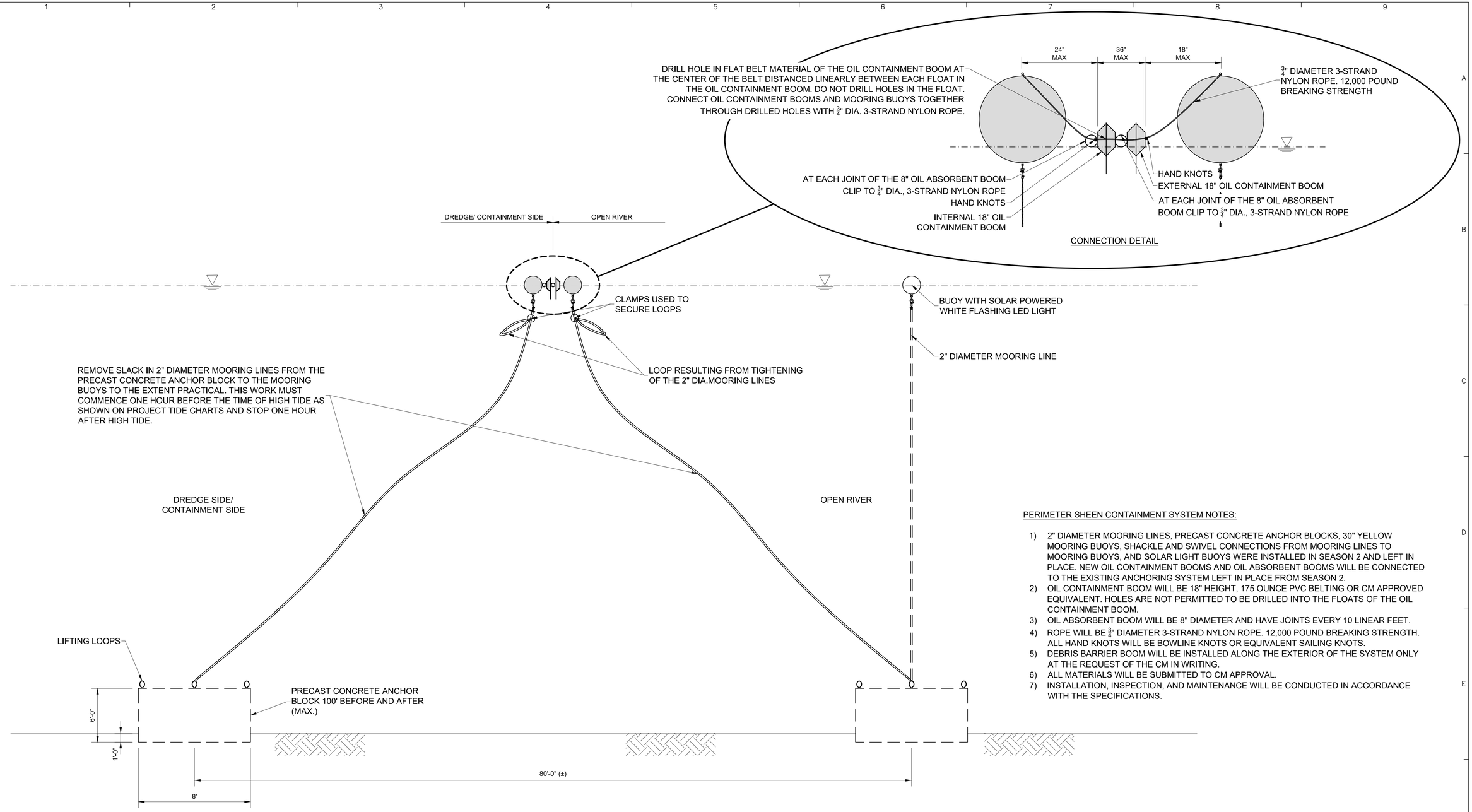
Figures



PERIMETER SHEEN CONTAINMENT SYSTEM NOTES:

1) 2" DIAMETER MOORING LINES, PRECAST CONCRETE ANCHOR BLOCKS, 30" YELLOW MOORING BUOYS, SHACKLE AND SWIVEL CONNECTIONS FROM MOORING LINES TO MOORING BUOYS, AND SOLAR LIGHT BUOYS WERE INSTALLED IN SEASON 2 AND LEFT IN PLACE. NEW OIL CONTAINMENT BOOMS AND OIL ABSORBENT BOOMS WILL BE CONNECTED TO THE EXISTING ANCHORING SYSTEM LEFT IN PLACE FROM SEASON 2.
2) OIL CONTAINMENT BOOM WILL BE 18" HEIGHT, 175 OUNCE PVC BELTING OR CM APPROVED EQUIVALENT. HOLES ARE NOT PERMITTED TO BE DRILLED INTO THE FLOATS OF THE OIL CONTAINMENT BOOM.
3) OIL ABSORBENT BOOM WILL BE 8" DIAMETER AND HAVE JOINTS EVERY 10 LINEAR FEET.
4) ROPE WILL BE ¾" DIAMETER 3-STRAND NYLON ROPE. 12,000 POUND BREAKING STRENGTH. ALL HAND KNOTS WILL BE BOWLINE KNOTS OR EQUIVALENT SAILING KNOTS.
5) DEBRIS BARRIER BOOM WILL BE INSTALLED ALONG THE EXTERIOR OF THE SYSTEM ONLY AT THE REQUEST OF THE CM IN WRITING.
6) ALL MATERIALS WILL BE SUBMITTED TO CM APPROVAL.
7) INSTALLATION, INSPECTION, AND MAINTENANCE WILL BE CONDUCTED IN ACCORDANCE WITH THE SPECIFICATIONS.

NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
7							
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3							
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1							
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POUGHKEEPSIE, NY

PROJ. NUMBER: 60540671

DATE: 07/23/2020

PERIMETER SHEEN CONTAINMENT SYSTEM SEASON 3 WATER SUPPLY PROTECTION AND CONTINGENCY PLAN

FORMER NORTH WATER STREET MGP

DRAWING NUMBER: FIG 1

SHEET NUMBER: 1 of 1

REVISION 0

FIGURE 2 WATER SUPPLY PROTECTION LEVELS

LEVEL I
ROUTINE OPERATIONS

CONDITIONS
- NO SHEEN OUTSIDE PERIMETER OIL BOOM SYSTEM
- TURBIDITY BELOW 40 NTU INCREASE
- NO EXCEEDANCES OF DISSOLVED PHASE WATER QUALITY PARAMETERS

RESPONSE
- ROUTINE MONITORING
- OBSERVATIONS
- LEVEL I CONTROLS

LEVEL II
ALERT CONDITIONS

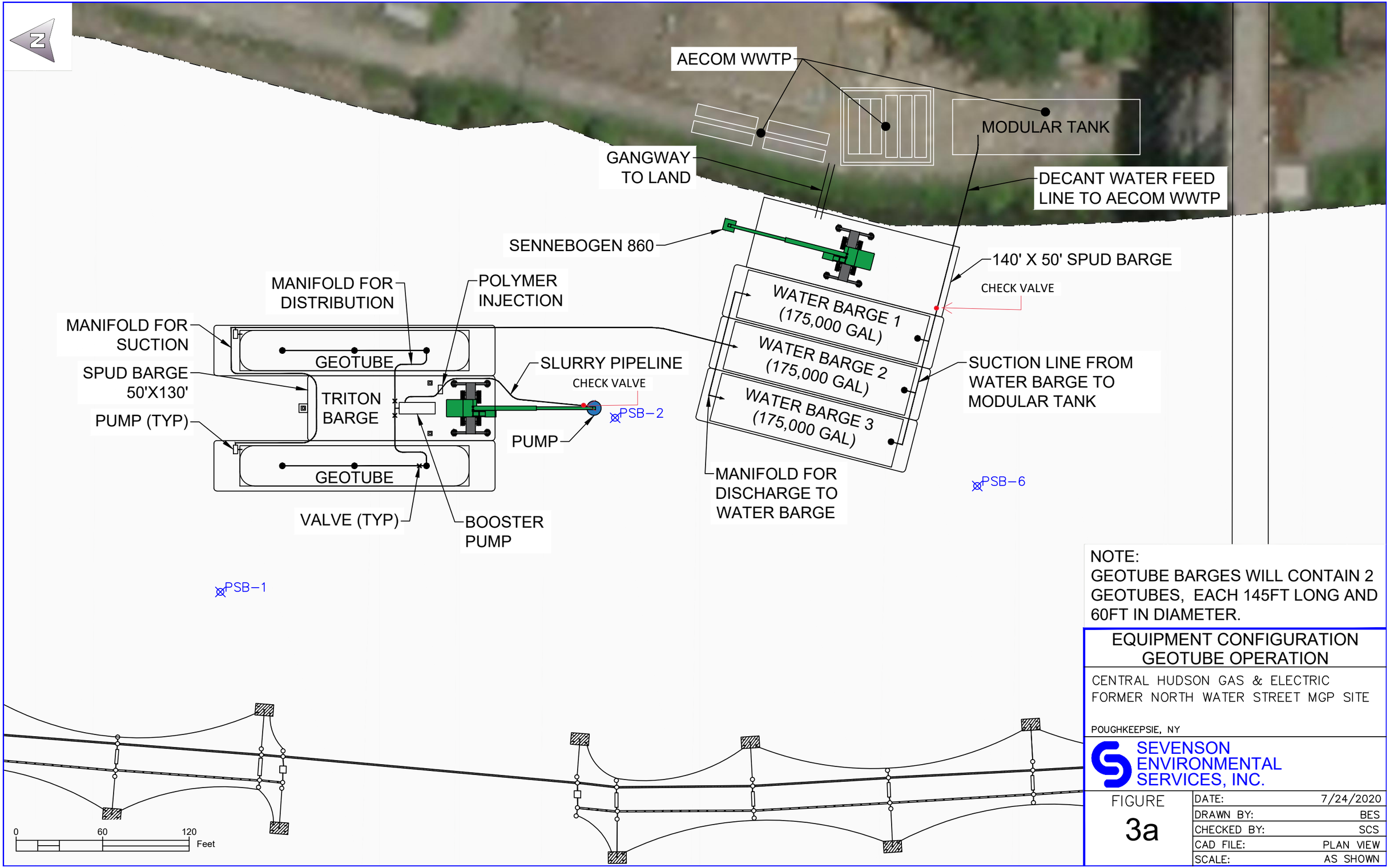
CONDITIONS
- SHEEN OBSERVED OUTSIDE PERIMETER OIL BOOM SYSTEM AND UNDER CONTROL
- TURBIDITY BETWEEN 40 NTU AND 100 NTU INCREASE
- NO EXCEEDANCES OF DISSOLVED PHASE WATER QUALITY PARAMETERS

RES ONSE
- ELEVATED CONTROLS & MITIGATION (PATROL BOATS, BIOREMEDIATION AGENTS)
- ELEVATED MONITORING (OBSERVATION, TURBIDITY AND WATER QUALITY)
- LEVEL II NOTIFICATIONS
- STOP WORK AS NECESSARY

LEVEL III
ACTION CONDITIONS

CONDITIONS
- UNCONTROLLABLE SHEEN OUTSIDE PERIMETER OIL BOOM SYSTEM
- TURBIDITY OVER 100 NTU INCREASE
- EXCEEDANCES OF DISSOLVED PHASE WATER QUALITY

RESPONSE
- STOP WORK
- LEVEL III NOTIFICATIONS
- PWTF RESPONSE
- WATER QUALITY MONITORING AT PWTF



NOTE:
GEOTUBE BARGES WILL CONTAIN 2 GEOTUBES, EACH 145FT LONG AND 60FT IN DIAMETER.

EQUIPMENT CONFIGURATION GEOTUBE OPERATION

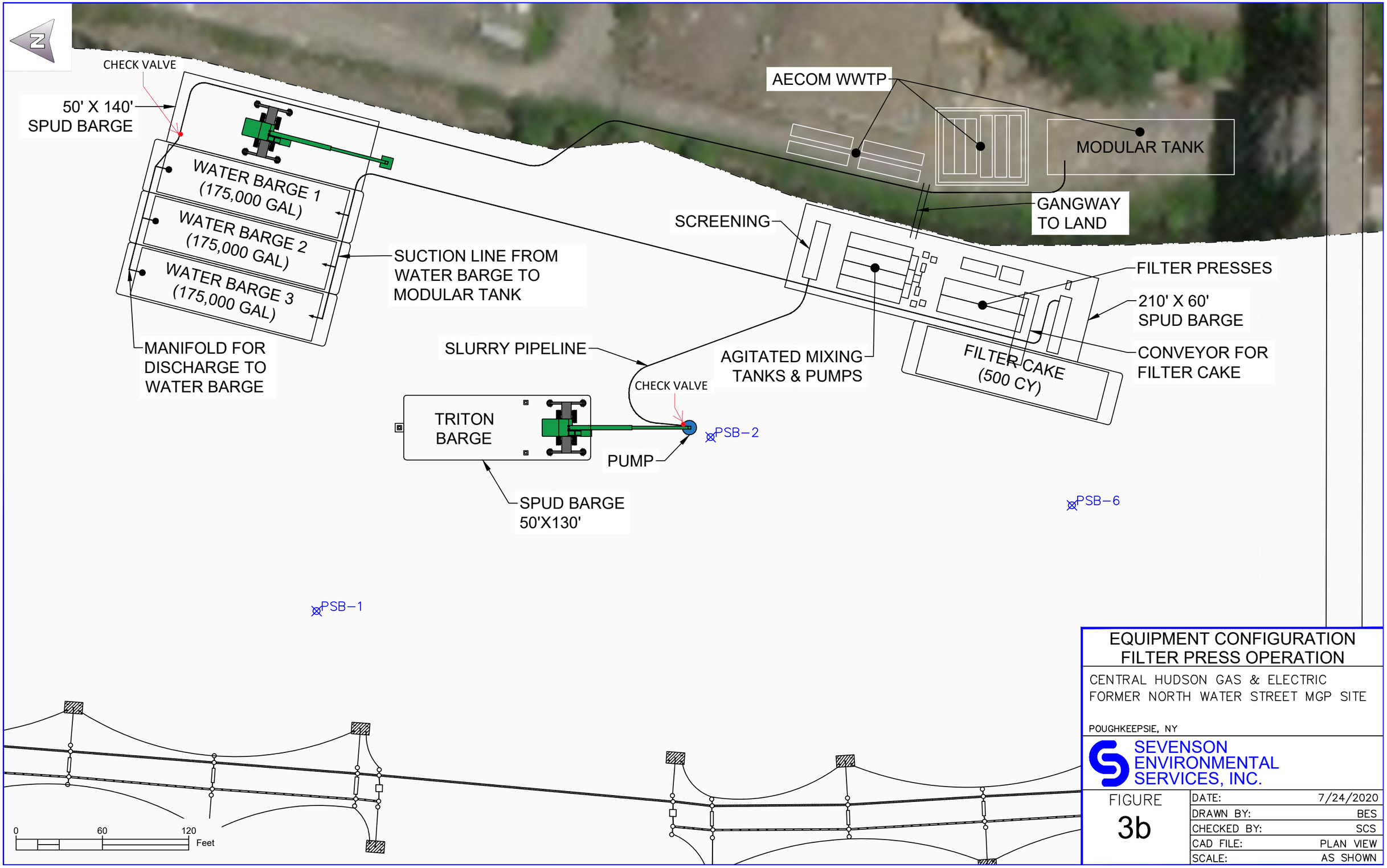
CENTRAL HUDSON GAS & ELECTRIC
FORMER NORTH WATER STREET MGP SITE

POUGHKEEPSIE, NY

SEVENSON ENVIRONMENTAL SERVICES, INC.

FIGURE
3a

DATE:	7/24/2020
DRAWN BY:	BES
CHECKED BY:	SCS
CAD FILE:	PLAN VIEW
SCALE:	AS SHOWN



EQUIPMENT CONFIGURATION
FILTER PRESS OPERATION

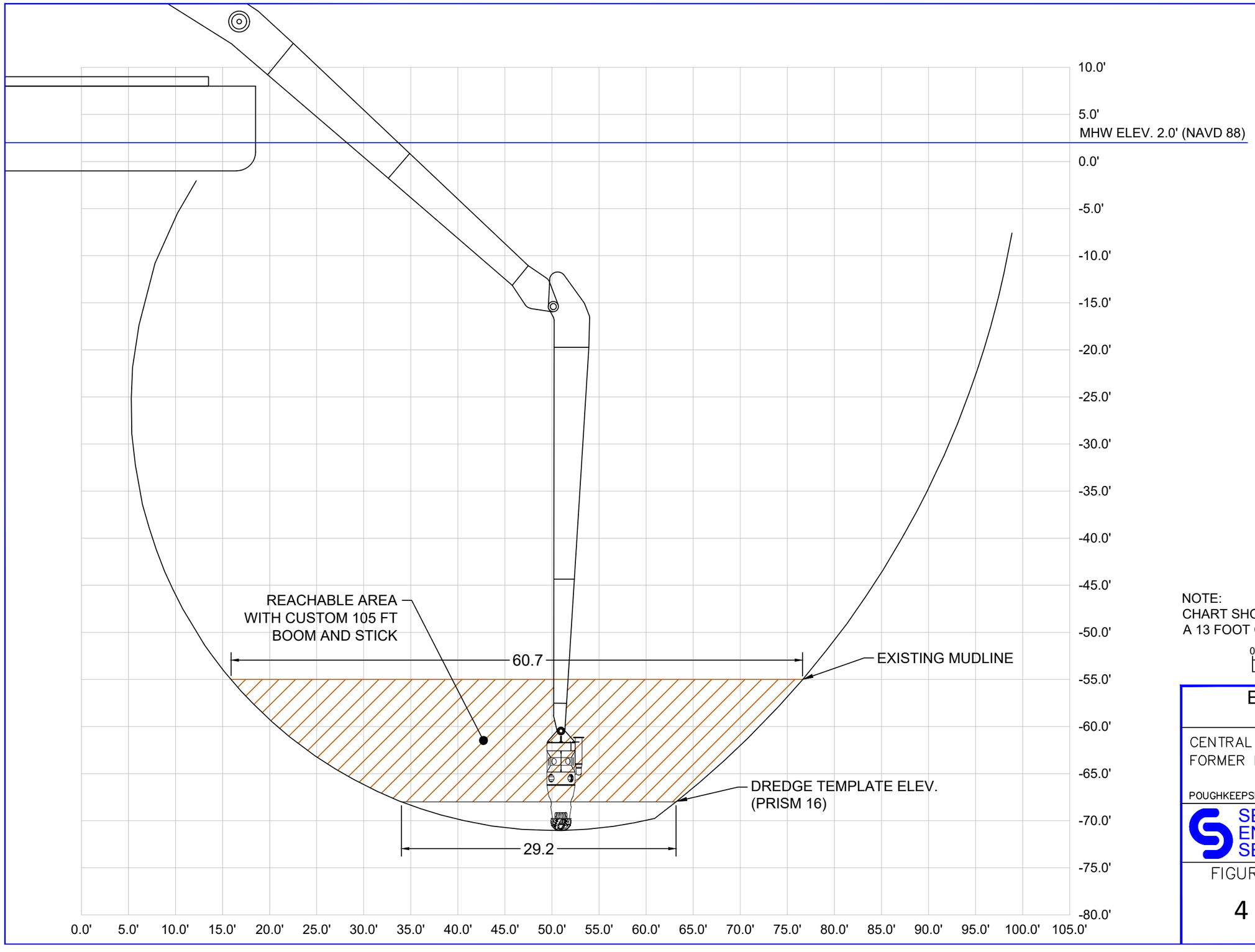
CENTRAL HUDSON GAS & ELECTRIC
FORMER NORTH WATER STREET MGP SITE

POUGHKEEPSIE, NY

SEVENSON
ENVIRONMENTAL
SERVICES, INC.

FIGURE
3b

DATE:	7/24/2020
DRAWN BY:	BES
CHECKED BY:	SCS
CAD FILE:	PLAN VIEW
SCALE:	AS SHOWN



NOTE:
CHART SHOWN IS FOR DREDGE PRISM 16 WITH
A 13 FOOT CUT THICKNESS

0 10 20 Feet

EXCAVATOR PROFILE

CENTRAL HUDSON GAS & ELECTRIC
FORMER NORTH WATER STREET MGP SITE

POUGHKEEPSIE, NY

SEVENSON
ENVIRONMENTAL
SERVICES, INC.

FIGURE
4

DATE:	6/24/2020
DRAWN BY:	BES
CHECKED BY:	SCS
CAD FILE:	SITE LAYOUT
SCALE:	AS SHOWN

50 FT BUFFER ZONE
(NO DRILLING PERMITTED)

50 FT BUFFER ZONE
(NO DRILLING PERMITTED)

PSB-1
PSB-2
PSB-3
PSB-4
PSB-5
PSB-6
PSB-7
PSB-8
PSB-9

LEGEND

- DREDGE TO 1 FT
- DREDGE TO 2 FT
- DREDGE TO 4 FT
- DREDGE TO 6 FT
- DREDGE TO 8 FT
- DREDGE TO 10 FT
- DREDGE TO 13 FT

SED-### PREVIOUS BORING LOCATIONS

PSB-# PROPOSED SHALLOW BORING LOCATIONS (14 FT)

AECOM

50 0 100
GRAPHIC SCALE IN FEET

CENTRAL HUDSON GAS & ELECTRIC CORP.
FORMER NORTH WATER STREET MGP
POUGHKEEPSIE, NY

GEOTECHNICAL BORING LOCATIONS

DATE: 4/24/2020 | DRWN: | REV: 0

FIGURE 5

File: C:\Users\darnell.kennedy.NW\OneDrive - AECOM Directory\WP_MGP\1910 CAD\25-SKETCHES\Geotech Boring Locations_20200424.dwg Layout: Figure 1 User: Darnell.Kennedy Plotted: Apr 24, 2020 – 11:33am Xref's:

Tables

Table 1
Sheen Response Matrix
CHGE Former North Water Street MGP Site
Poughkeepsie, New York

Level	Response(s)	Responsibilities	Communication
Level I Alert 1 Sheen observed between Dredging Barge and Perimeter Sheen Containment System	1. **OBSERVATION** - track sheen.	1. Observer	1. Notify CM,Sevenson, and CHGE
	2. **ABSORBENT BOOMS** - deploy absorbent materials.	2. Internal patrol boats and Observer	2. Observer directs Internal patrol boats
	3. BIOREMEDIATION AGENTS - apply bioremediation agents by dredging bargel if ABSORBENT BOOMS can contain, but not remove, sheen in 10 minutes.	3. AECOM technician	3. NA
	4. CLOSEOUT - dispose absorbent materials and file sheen log form.	4. Internal patrol boats	4. Observer directs Internal patrol boats
		5. Internal patrol boats and Observer	5. Sheen log is filed
Level II Alert 2 Sheen at Perimeter Sheen Containment System OR Sheen between Dredging Barge and Perimeter Sheen Containment System not controllable/not contained > 20 minutes	1. Continue Alert 1 responses AND	1. As per Alert 1 AND	1. As per Alert 1 AND
	2. **STOP WORK** - minimum 30-minute stoppage of dredge operations.	2. CM and Sevenson	2. NA
	3. **PREPARE** - prepare for water quality sample collection.	3. AECOM technician	3. Notify laboratory regarding potential fast TAT samples. Mobilize Sample Collection boat for sample collection.
	4. **NOTIFY** - alert External Patrol Boat to prepare for potential response operation.	4. CM	4. Observer directs external patrol boat to a location opposite the perimeter containment system from the sheen.
	5. **CLOSEOUT** - dispose absorbent materials and file sheen log form.	5. Internal patrol boats and Observer	5. Sheen log is filed
Level II Alert 3 Sheen outside Perimeter Oil Boom System (Controlled)	1. Continue Alert 2 responses AND	1. As per Alert 2 AND	1. As per Alert 2 AND CHGE makes Level II notifications AND
	2. **ABSORBENT BOOMS + BIOREMEDIATION AGENTS** - external Patrol Boat to deploy absorbent materials and bioremediation agents to control sheen.	2. External patrol boat and Observer	2.Observer directs external patrol boat
	3. **DETECTION** - collect water quality samples in accordance with Water Quality Reponse Table Level II Alert 2 Response	3. AECOM technician and Sample Collection boat	3. Notify laboratory regarding potential fast TAT samples.
	4. **CLOSEOUT** - dispose absorbent materials and file sheen log form.	4. External patrol boats and Observer	4. Sheen log is filed
Level III Action 1 Sheen outside Perimeter Oil Boom System (Uncontrolled)	1. Continue Alert 3 responses AND	1. As per Alert 3 AND	1. As per Alert 3 AND
	2. **STOP WORK** - stoppage of dredge operations.	2. CHGE, CM, and Sevenson	2. CHGE Level III notifications, CM to notify Weeks
	3. **DETECTION** - collect water quality samples in accordance with Water Quality Monitoring Plan (Water Quality Response Table Level III Action 1)	3. AECOM technicians and Sample Collection Boat	3. Notify laboratory regarding fast TAT samples. Notify PWTF
	4.**CAUSE** - evaluate dredge operations and cause of sheen including conditions.	4.CM, Sevenson, CHGE	4. CHGE notifies NYSDEC if evaluation results in change in remedy and/or means and methods
	5. **PWTF ACTION**	5. PWTF	5. PWTF to notify CHGE

Notes:
CHGE - Central Hudson Gas and Electric CM - Construction Manager
NYSDEC - New York State Department of Environmental Conservation PWTF - Poughkeepsies' Drinking Water Treatment Facility

Table 2
Turbidity Response Matrix
CHGE Former North Water Street MGP Site
Poughkeepsie, New York

Level	Response(s)	Responsibilities	Communication
Level I Alert 1 < 40 NTU	1. **OBSERVATION** - Observe and Monitor	1. Engr and CM	1. NA
Level II Alert 2 >40 <100 NTU increase over background at either locations	1. **CAUSE** - Review dredge operation, weather condition, river debris, and turbidity data from all locations.	1. AECOM Engr	1. Inform CHGE, CM, Sevenson, and NYSDEC Field Representative. CHGE to make Level II notifications.
	2. **OBSERVATION** - track observable and real-time measured turbidity.	2. Observer and AECOM Engr	2. Notify CM, patrol boats, and Sevenson
Level III Action 1 >100 NTU increase between north and south monitors	1. Continue Alert 2 response AND	1. As per Alert 2 AND	1. As per Alert 2 AND
	2. **CAUSE** - Review dredge operation, weather condition, river debris, and turbidity data from all locations.	2. AECOM Engr	2. Inform CHGE, CM, Sevenson, and NYSDEC Field Representative
	3. **STOP WORK** - stoppage of dredge operations and monitor turbidity levels if exceedance results from dredge operations.	3. CHGE, CM, and Sevenson	3. CHGE to make Level III notifications, CM to notify Sevenson
	4. **DETECTION** - collect water quality samples in accordance with Water Quality Response Table Level III Action 2	4. AECOM technician and Sample Collection boat	4. Notify laboratory regarding potential fast TAT samples.
	5. **PWTF ACTION**	5. PWTF	5. PWTF to notify CHGE.

Notes:
CHGE - Central Hudson Gas and Electric CM - Construction Manager

NYSDEC - New York State Department of Environmental Conservation PWTF - Poughkeepsies' Drinking Water Treatment Facility

Table 3
Dissolved Phase Water Quality Response Matrix
CHGE Former North Water Street MGP Site
Poughkeepsie, New York

Level	Response(s)	Responsibilities	Communication
Level I Alert 1	1. **DETECTION** - routine monitoring per the Water Quality Monitoring Plan	1. AECOM technicians and Sample Collection Boat	1. NA
Level II ALERT 2 Sheen outside Perimeter Oil Boom System (Controlled) [see Sheen Response Level II Alert 3]	1. **DETECTION** - Collect water quality samples (WQS) from first location (WQSN1) every 30 minutes and analyze in field laboratory:	1. AECOM technicians and Sample Collection Boat	1. CHGE to make Level II Notifications.
	- If BTEX and PAHs detected above baseline, collect WQS from second location (WQSN2) every 30 minutes and analyze in field laboratory **OR** if no detections, continue collection until sheen is removed (with a minimum of two additional rounds after criteria is met)		
	- If BTEX and PAHs detected above baseline at second location (WQSN2), continue sampling every 30 minutes at first (WQSN1) and second location (WQSN2) **AND** initiate collection of WQS from third location (WQSN3) every 30 minutes and analyze in field laboratory **OR** if no detections, continue collection until no detections in samples collected at first location (WQSN1) (with a minimum of two additional rounds after criteria is met)		
	2. **STOP WORK -** stoppage of dredge operations if BTEX and PAHs detected above baseline at second location (WQSN2)	2. Construction Manager (CM) and Sevenson	2. CM notifies Sevenson, CHGE notifies PWTF
	CAUSE - evaluate dredge operations and cause of sheen.	AECOM Engr, CM, Sevenson, CHGE	CHGE notifies NYSDEC if evaluation results in change in remedy and/or means and methods
	DETECTION - collect WQS at PWTF in accordance with Water Quality Monitoring Plan	AECOM technicians and Sample Collection boat	Notify laboratory regarding fast TAT samples. Notify PWTF
	3. **PWTF ACTION**	3. PWTF	3. PWTF to notify CHGE
Level III ACTION 1 Sheen outside Perimeter Oil Boom System (Uncontrolled) [see Sheen Response Level III Action 1]	1. Continue Alert 2 responses AND	1. As per Alert 2 AND	1. As per Alert 2 AND
	2. **DETECTION** - collect water quality samples in accordance with Water Quality Monitoring Plan	2. AECOM technicians and Sample Collection Boat	2. Notify laboratory regarding fast TAT samples. CHGE to make Level III notifications.
	3. **PWTF ACTION**	3. PWTF	3. PWTF to notify CHGE

Table 3
Dissolved Phase Water Quality Response Matrix
CHGE Former North Water Street MGP Site
Poughkeepsie, New York

Level	Response(s)	Responsibilities	Communication
Level III ACTION 2 >100 NTU increase between north and south monitors [see Turbidity Response Level III Action 1]	1. Continue Turbidity Response Action 1 AND	1. As per Turbidity Response Action 1 AND	1. As per Turbidity Response Action 1 AND
	2. **DETECTION** - Collect water quality samples (WQS) from first location (WQSN1) every 30 minutes and analyze in field laboratory:	2. AECOM technicians and Sample Collection Boat	2. NA
	- If BTEX and PAHs detected above baseline, collect WQS from second location (WQSN2) every 30 minutes and analyze in field laboratory **OR** if no detections, continue collection until turbidity is below limits (with a minimum of two additional rounds after criteria is met)		
	- If BTEX and PAHs detected above baseline at second location (WQSN2), continue sampling every 30 minutes at first (WQSN1) and second location (WQSN2) **AND** initiate collection of WQS from third location (WQSN3) every 30 minutes and analyze in field laboratory **OR** if no detections, continue collection until no detections in samples collected at first location (WQSN1) (with a minimum of two additional rounds after criteria is met)		
	3. **STOP WORK** - stoppage of dredge operations if BTEX and PAHs detected above baseline at second location (WQSN2) or third location (WQSN3)	3. CM and WMI)	3. CM notifies WMI, CHGE makes Level III notifications.
	CAUSE - evaluate dredge operations and cause of turbidity.	AECOM Engr, CM, WMI, CHGE	CHGE notifies NYSDEC if evaluation results in change in remedy and/or means and methods
	DETECTION - collect WQS at PWTF in accordance with Water Quality Monitoring Plan	AECOM technicians and Sample Collection boat	Notify laboratory regarding fast TAT samples. Notify PWTF
	4. **PWTF ACTION**	4. PWTF	4. PWTF to notify CHGE
Level III ACTION 3 Dissolved phase detection at in-river location (WQSN2) during routine water quality sampling event	1. **STOP WORK** - stoppage of dredge operations if TCL organics detected above baseline at second location (WQSN2)	1. CHGE, CM and WMI	1. CM notifies WMI, CHGE notifies PWTF
	CAUSE - evaluate dredge operations and cause of detection.	AECOM Engr, CM, WMI, CHGE	CHGE notifies NYSDEC if evaluation results in change in remedy and/or means and methods
	DETECTION - collect WQS at PWTF in accordance with Water Quality Monitoring Plan	AECOM technicians and Sample Collection boat	Notify laboratory regarding fast TAT samples. Notify PWTF
	2. **PWTF ACTION**	2. PWTF	2. PWTF to notify CHGE

Notes:
CHGE - Central Hudson Gas and Electric CM - Construction Manager

NYSDEC - New York State Department of Environmental Conservation PWTF - Poughkeepsies' Drinking Water Treatment Facility

Appendices

Appendix A Bioremediation Agent Information Sheets

TECHNICAL PRODUCT BULLETIN: B-63
USEPA, OEM REGULATIONS IMPLEMENTATION DIVISION
LISTING DATE: DECEMBER 15, 2010
"BIOREM-2000 OIL DIGESTER™"

I. NAME, BRAND, OR TRADEMARK
BIOREM-2000 OIL DIGESTER™
Type of Product: Bioremediation Agent (Biological Additive: Microbiological Culture)

II. NAME, ADDRESS, AND TELEPHONE NUMBER OF MANUFACTURER/CONTACT
Clift Industries, Inc.
P.O. Box 471578
Charlotte, NC 28247
Customer Service:
Phone: (800) 996-9901
Product Management:
Phone: (704) 752-0031
Fax: (704) 544-2532
E-mail: matt@cliftindustries.com
(Mr. Matt Barnhill)

III. NAME, ADDRESS, AND TELEPHONE NUMBER OF PRIMARY DISTRIBUTORS

Clift Industries, Inc.
P.O. Box 471578
Charlotte, NC 28247
Customer Service:
Phone: (800) 996-9901
Product Management:
Phone: (704) 752-0031
Fax: (704) 544-2532
E-mail: matt@cliftindustries.com
(Mr. Matt Barnhill)

Husky Corporation
2325 Husky Way
Pacific, MO 63025
Customer Service:
Phone: (800) 325-3558
Phone: (636) 825-7212
Fax: (636) 825-7300
E-mail: bbaker@husky.com
(Mr. Brad Baker)

IV. SPECIAL HANDLING AND WORKER PRECAUTIONS FOR STORAGE AND FIELD APPLICATION
1. Flammability: Non-flammable
2. Ventilation: No special requirements.
3. Skin and eye contact; protective clothing; treatment in case of contact: No special equipment or clothing is required in the handling, storage and field application of this product. For skin and eye contact, wear gloves and goggles.
4.a. Maximum storage temperature: 140°F
4.b. Minimum storage temperature: 35°F
4.c. Optimum storage temperature range: 85°F
V. SHELF LIFE

The shelf life of the product is two (2) years when stored within the storage temperature range in the original container.

VI. RECOMMENDED APPLICATION PROCEDURE

1. Application Method: Spray from boats, aircraft, fire eductor systems on boats, helicopter buckets, hand-held or backpack sprayers, or from hoses attached to small pumps, water trucks and aerial spray, including typical spreading systems.

2. Concentration/Application Rate:

Shoreline Treatment:

To treat beaches, coarse sand, rocks, rip rap, sea walls, cobble shorelines and rocky shores, oiled pilings and piers use one (1) part BIOREM-2000 OIL DIGESTER™ diluted with five (5) parts water. Use one (1) gallon per 1,500 square feet of contaminated area.

Treating Marine Vegetation/Wetlands:

Dilute one (1) part BIOREM-2000 OIL DIGESTER™ with five (5) parts water and apply with non-pressure, non-impact spraying equipment onto reeds, grasses, trees, and rocks in marsh areas and vegetated wetlands. Use one (1) gallon per 1,500 square feet of contaminated area.

For Treating Water:

Do no dilute BIOREM-2000 OIL DIGESTER™ and apply directly spraying onto the surface of oil.

Small Applications:

BIOREM-2000 OIL DIGESTER™ may be applied with hand sprayers or portable pumps to spray the product directly onto oiled surfaces. Dose rates will vary with the type and amount of petroleum spilled, the extent of weathering, and other site-specific conditions, including temperature, porosity of surface, and residence time available to let the product contact the oil.

3. Conditions for Use: Effective at temperatures above 40°F.

VII. TOXICITY AND EFFECTIVENESS

a. Effectiveness:

Bioremediation Agent Effectiveness Test (40 CFR 300.900), Federal Register September 15, 1994:

Summary Data Table

DAYS	PRODUCT	TOTAL MEAN	RED%	TOTAL MEAN	RED%
	3 REPS/PROD	ALKANES (ppm)	28 DAYS	AROMATICS (ppm)	28 DAYS
0	CONTROL	43163	0	6001	0
	NUTRIENT	36643	0	4813	0
	BIOREM-2000 OIL DIGESTER™	36492	0	4634	0

7	CONTROL	39249	9.0	5067	15.5
	NUTRIENT	2946	91.9	3832	20.0
	BIOREM-2000 OIL DIGESTER™	5390	85.2	4114	11.0
28	CONTROL	33961	21.0	3812	36.0
	NUTRIENT	106	99.7	729	84.0
	BIOREM-2000 OIL DIGESTER™	64	99.8	1324	71.0

Results of Gravimetric Analysis:
Percentage (%) Decrease in Weight of Oil on Day 28

Control	Nutrient	Product
10.7%	68.9%	67.0%

b. Toxicity:
NA

VIII. MICROBIOLOGICAL ANALYSIS
1. Listing of all microorganisms by species and percentages in the composition:
CONFIDENTIAL
2. Optimum pH, temperature, and salinity ranges for use of the additive:
pH: 7.0
Temperature: 85°F
Salinity: <10%
3. Minimum and maximum pH, temperature, and salinity levels below or above which the effectiveness of the additive is reduced to half its optimum capacity:
pH: 3.0 or 11.5
Temperature: <35°F or >125°F
Salinity: >40%
4. Special nutrient requirements: None
5. Test results regarding the determination of the presence of the following:
Salmonella: Negative
Fecal coliform: Negative
Shigella: Negative
Staphylococcus Coagulase positive: Negative
Beta hemolytic Streptococci: Negative
IX. PHYSICAL PROPERTIES
NA

X. ANALYSIS FOR HEAVY METALS, CYANIDE, AND CHLORINATED HYDROCARBONS

NA

OPEN WATER BIOREMEDIATION

pen water spills are a huge problem that affects our environment daily. BioRem-2000 Oil Digester out
:immers, floating barriers, dispersants, solvents, detergents and burning. Uses include shoreline clear
)nds and storm water retention ponds.

Effective on weather oils.
Oil consumption begins instantaneously.
Can be introduced during any phase of the clean-up life cycle.
Non-toxic to marine and wildlife.

WANT TO KNOW MORE?

CONTACT US

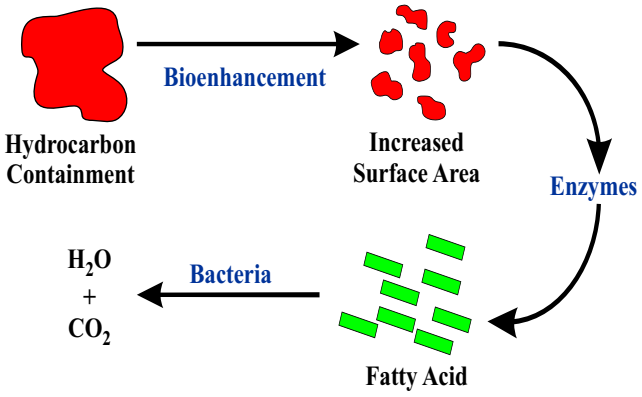
BioRem 2000™ OIL DIGESTER

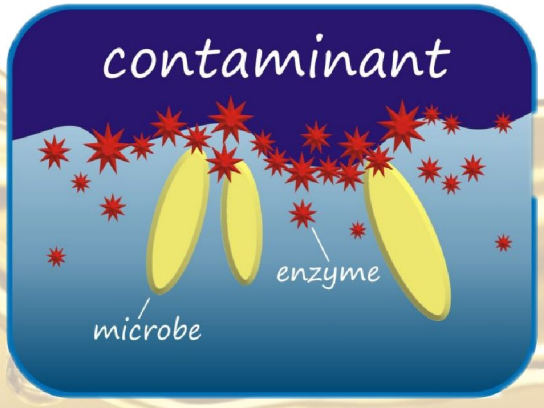
BENEFITS

- Designed to digest hydrocarbons in groundwater, open water and soil remediation applications through a powerful blend of microbes, enzymes and nutrients
- Effective over a wide range of hydrocarbons, including free-product.
- Biologically converts hydrocarbons into carbon dioxide and water.
- Available in a ready-to-use liquid formula.
- Can be combined with other technologies (e.g., bioventing, SVE) to be introduced during any phase of clean-up cycle to enhance site remediation.
- Listed on the EPA's National Contingency Plan Product Schedule as a bioremediation agent.

TECHNOLOGY

- **Biodispersion**: The hydrocarbons are dispersed from macroscopic clumps into smaller droplets.
- **Solubilization**: The surface area of the hydrocarbons is increased, converting them from hydrophobic to hydrophilic, into a soluble state for cell transport.
- **Assimilation**: The microbes secrete extra-cellular and intra-cellular enzymes that begin the process of cleavage chopping the long chains of the solubilized hydrocarbons into two carbon units.
- **Mineralization**: The microbes convert the carbon units into carbon dioxide and water as a source of food for growth and reproduction. Once the reaction is complete, the microbes and enzymes break free and attach to another chain of hydrocarbons in order to repeat the same process.

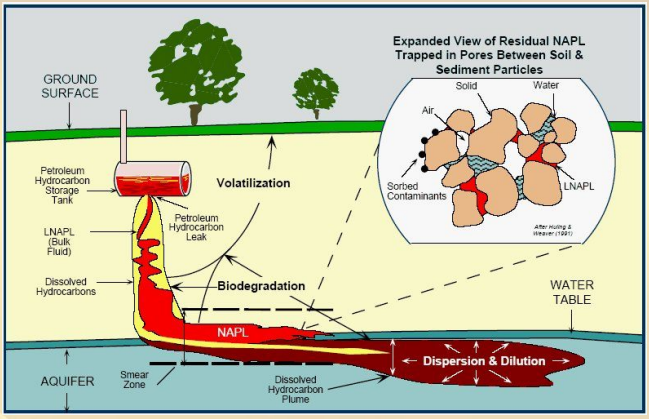




Clift Industries, Inc. • PO Box 471578 • Charlotte, NC 28247 • 800-996-9901 • 704-752-0031 • Fax: 704-544-2532
www.biorem-2000.com • www.cliftindustries.com • info@cliftindustries.com

GROUNDWATER TREATMENT

- Bioremediates both contaminated soil (source) and groundwater (side-effect).
- Highly effective at treating non-aqueous phase hydrocarbons ("NAPL") and dissolved hydrocarbons from the subsurface.
- Assists in the mobilization of non-aqueous phase hydrocarbons ("NAPL") from the vadose zone into the dissolved-phase.
- Sucessful on high sorption where pump-and-treat does not work efficiently.
- It changes the surface of the oil particles from hydrophobic to hydrophilic.
- Compatible with biosparging and multi-phase extraction.



OPEN WATER TREATMENT

- Oil consumption begins instantaneously.
- Effective on weather oils.
- Can be introduced during any phase of the clean-up life cycle.
- Compatible with skimmers, floating barriers, dispersants, solvents, detergents and burning techniques.

Uses:

- Shoreline clean-up.
- Remediation of sheen in ports.
- Contained open water spills.
- Containment ponds.
- Storm water retention ponds.

SOIL TREATMENT

- Designed to rapidly loosen trapped contaminants while imparting stabilized oxygen and nutrients.
- Can be applied topically or injected for bioremediating at any depth on open land or under buildings, pavement, or train tracks.
- Ideal for use in and around pipe racks, tank farms, and leaking underground storage tanks "LUST" sites.
- Applications include land farming, composting, bioreactors and soil washing.

CONTAMINATE TREATMENT LIST

Benzene	Naphthalene	Pentane	Acenaphthene	benz[*a*]anthracene
Xylene	Acrolein	Acetone	Acenaphthylene	benzo[a]pyrene
Toluene	Acryconitrile	Methanol	Anthracene	benzo[e]pyrene
Ethylbenzene	Alkylamine Oxides	dimethylformanide	Diethylene-glycol	benzo[b]fluoranthene
Heptane	Anthracene	Dioxane	MethylEthylKetone	fluoranthene
Hexane	Styrene	Ethylacetate	Methyl Napthalene	fluorene

TECHNICAL INFORMATION

Usage	Dilution Ratio	Ready to use
	Appearance	Liquid
Physical	Color	Amber
Properties	pH	7
	Shelf Life	Minimum 1 Year
Packaging	Primary	5, 15, 55 gal.

TECHNICAL PRODUCT BULLETIN #B-53
USEPA, OEM REGULATIONS IMPLEMENTATION DIVISION
ORIGINAL LISTING DATE: AUGUST 26, 1996
REMOVAL DATE: AUGUST 16, 2005
RELISTING DATE: SEPTEMBER 18, 2009
"OIL SPILL EATER II (OSE II)"

I. NAME, BRAND, OR TRADEMARK
OIL SPILL EATER II (OSE II)
Type of Product: Bioremediation Agent (Biological Enzyme Additive [previously listed as a Nutrient Additive])

II. NAME, ADDRESS, AND TELEPHONE NUMBER OF MANUFACTURER/CONTACT
OSEI Corporation (Formerly Sky Blue Chems)
P.O. Box 515429
Dallas, TX 75251-5429
Phone: (972) 669-3390
E-mail: oseicorp@msn.com
Website: www.osei.us
(Mr. Steven Pedigo, Chairman, CEO, Inventor)

III. NAME, ADDRESS, AND TELEPHONE NUMBER OF PRIMARY DISTRIBUTORS
OSEI Corporation (Formerly Sky Blue Chems)
P.O. Box 515429
Dallas, TX 75251-5429
Phone: (972) 669-3390
E-mail: oseicorp@msn.com
Website: www.osei.us
(Mr. Steven Pedigo, Chairman, CEO, Inventor)

IV. SPECIAL HANDLING AND WORKER PRECAUTIONS FOR STORAGE AND FIELD APPLICATION
1. Flammability: Water-based, non-flammable
2. Ventilation: Needs no ventilation; aqueous-based product; does not emit hazardous vapors
3. Skin and eye contact; protective clothing; treatment in case of contact: OSE II is not a primary dermal irritant. Avoid eye contact, and wear goggles if possible for the spray to come in direct contact with eyes. Facilities for quick and copious eye flushing should be provided and prompt medical attention should be sought if exposure and irritation persists. Protective rubber gloves are suggested during handling. Before mixing the product has a smell of fermentation. The product does not give off any harmful vapors.
4.a. Maximum storage temperature: 120°F
4.b. Minimum storage temperature: None; OSE II can freeze and thaw without adverse effects
4.c. Optimum storage temperature range: 72°F
4.d. Temperatures of phase separations and chemical changes: 120°F

V. SHELF LIFE

OSE II has a recommended shelf life of 5 years. After 5 years at optimum storage temperature, there is an approximate 10% decrease per year in product capability.

VI. RECOMMENDED APPLICATION PROCEDURE

1. Application Method:

A. Use surface spray apparatus, such as small hand held tanks, back pack, large mixing tanks with mechanical pumping devices, vessels with booms for spraying wide paths, or spray devices on airplanes or helicopters.
B. OSE II can be applied by eductor systems from vessels, fire trucks, etc. Set the eductor system to 2% and apply 1 gallon of mixed OSE II to each spilled gallon of hydrocarbon.

2. Concentration/Application Rate:

General – OSE II generally takes 3 to 30 minutes to penetrate the molecular walls of hydrocarbons. However, once you spray OSE II on the hydrocarbons, OSE II attaches itself and will eventually engulf the hydrocarbons regardless of where the hydrocarbons may spread on the surface of salt or fresh water. Additionally, once you spray OSE II, the hydrocarbons cannot attach itself to the shoreline, rocks, or any equipment in its path. OSE II breaks down the adhesion properties of hydrocarbons and causes hydrocarbons to float, thereby, eliminating secondary contamination of the water column or any other areas, and holding the contaminated area to the water's surface, the original contaminated area.

- If OSE II is to be used on ocean spills or on intertidal zones OSE II should be mixed with ocean water.
- If OSE II is to be used on lakes, rivers, streams, ponds, or on land mix the product with water from a lake, stream, or pond.
- If you are performing a cleanup, make sure the water used to mix with OSE II, and the water used to keep the area saturated, is the type of water normally associated with that area.
- If you use fresh water in an area normally contacted with salt water or vice versa, the different types of bacteria and competition could occur, not to mention the problems with salinity for fresh water organisms.

[Note: Do not mix tap water with OSE II if possible: Chlorine in tap water slows bacterial enhancement]

Spills on Water:

Dilute each gallon of OSE II with 50 gallons of fresh, brackish, or salt water – depending on the water associated with the area that has been impacted by the spill. Apply OSE II at a ratio of 1 gallon mixed OSE II to each gallon of hydrocarbon spilled. Apply using hand held sprayers, tank sprayers, booms from vessels, helicopters, or airplanes; by spraying the perimeter first then working toward the middle of the spilled area. Next spray the entire surface of the spill. If the spill is very heavy (more than 2 inches thick) it is recommended that OSE II be applied every day until you have met a 1:1 ratio of OSE II and water mixture to spilled oil/hydrocarbons.

- Use 1 gallon OSE II for every 50 gallons of hydrocarbons.
- Use 1 drum of OSE II for every 2,750 gallons of hydrocarbons.
- If you know gallons of hydrocarbons spilled, multiply gallons of hydrocarbons by 0.02 to get amount of OSE II needed [gallons of hydrocarbons x 0.02 = gallons of OSE II].

- If you know barrels of crude oil spilled, multiply barrels of crude oil by 0.015 to0 get drums of OSE II needed [barrels of crude oil x 0.015 = drums of OSE II].
- If you do not know gallons of hydrocarbons or barrels of crude oil, multiply size of spill by 0.0023 to get drums of OSE II needed or by 0.12 to get gallons of OSE II needed [(yards long x yards wide x inches thick) x 0.0.0023 = drums of OSE II or (yards long x yards wide x inches thick) x 0.015 = gallons of OSE II].

Intertidal Zone:
Mix each 55 gallon drum of OSE II with 2,750 gallons of fresh, brackish, or salt water. The water used is determined by the type of water associated with the site. OSE II should be applied as the tide recedes (if there is a tide) and once the tide comes in the application should cease until the tide recedes again. Additional applications should only be warranted if spill has been allowed time to percolate into the depths of the soil.

If there is no tide, but waves have pushed the spill into the intertidal zone, then there will be direct access to the spill at all times. If possible use string or stakes to grid off the beach or intertidal zone area, and then you can calculate how much premixed OSE II to apply to a given area. If unable to grid off an area then calculate how much OSE II to apply and then determine how much premixed OSE II will flow through a nozzle (gallons per minute) then let application technician know how many gallons to apply in a given area and this can be determined by applying product for a certain time period to get the correct amount of OSE II applied to gain the 1:1 ratio.

Note: If the intertidal zone is associated with the sea then mix OSE II with salt water. If the spill area is in an area of brackish water then mix OSE II with brackish water. If the intertidal zone is associated with fresh water such as lakes, rivers, streams, ponds, creeks, aquifers, or drinking water wells then use fresh water to mix OSE II.
3. Conditions for Use:
- OSE II can remediate hydrocarbon-based material including chlorinated hydrocarbons, PCB's, dioxins, and some pesticides.
- As the age of spilled hydrocarbons increases, the time necessary for bioremediation increases. In general, fresh crude, gasoline of BTEX takes from 72 hours to 30 days to completely bioremediate.
- Variations of sea water salinity should have no effect, but as long as microbial life can exist, then OSE II will be effective.
- OSE II bioremediation slows somewhat at temperatures below 40°F. OSE II however, will continue to work at any liquid water temperature that will sustain microbial life.

VII. TOXICITY AND EFFECTIVENESS

a. Effectiveness:

Summary Data Table

DAYS	PRODUCT	TOTAL MEAN	RED%	TOTAL MEAN	RED%
	3 REPS/PROD	ALKANES (ppm)	28 DAYS	AROMATICS (ppm)	28 DAYS
	CONTROL	43,170	-	11,435	-
0	NUTRIENT	40,569	-	11,785	-
	OSE II	41,730	-	12,155	-
	CONTROL	39,250	9.1	10,355	9.4
7	NUTRIENT	34,815	14.2	9,898	16.0
	OSE II	26,316	36.9	8,072	33.6
	CONTROL	35,797	17.1	9,534	16.6
28	NUTRIENT	26,507	34.7	8,938	24.2
	OSE II	4,273	89.8	1,268	89.6

Results of Gravimetric Analysis:

Percentage (%) Decrease in Weight of Oil on Day 28

Control	Nutrient	Product
16.5%	52.0%	85.4%

b. Toxicity: NA

VIII. MICROBIOLOGICAL ANALYSIS

1. Listing of each component of the total formulation, other than enzymes, by chemical name and percentage by weight: CONFIDENTIAL
2. Enzyme Names: CONFIDENTIAL
3. I.U.B.: CONFIDENTIAL
4. Source of Enzymes: Fermentation process
5. Units: No less than 1% and no more than 50% by weight
6. Specific Gravity: 1.05
7. Optimum Conditions:
    a. pH: 7.0
    b. Temperature: 72°F
    c. Salinity Ranges: Fresh water to salt water
    d. Maximum and Minimum pH: 3.5 – 8.0

e. Maximum and Minimum Temperature: 28°F – 128°F
f. Maximum and Minimum Salinity Levels – Salinity level above that will support microbial activity will adversely affect OSE II's performance
g. Enzyme Shelf Life: Up to 5 years when properly stored
h. Enzyme Optimal Storage Conditions: 72°F is optimal, enzyme range is freezing to 120°F, never leave OSE II in direct sunlight for more than a couple of hours

IX. PHYSICAL PROPERTIES
NA

X. ANALYSIS FOR HEAVY METALS, CYANIDE, AND CHLORINATED HYDROCARBONS
NA

Archer, Christine

From:	oseicorp@osei.us
Sent:	Thursday, March 21, 2019 11:52 AM
To:	Archer, Christine
Subject:	RE OSEI 3 21 19 RE: [FWD: OSEI Contact Us [#599]]

Dear Christine Archer,

The OSEI Corporation appreciates your interest in OSE II. The information you requested for toxicity can be found at these links, http://www.osei.us/wp-content/uploads/35-toxicity-tests.pdf which represents 35 toxicity tests, on fresh and salt water species, performed by 9 different countries, showing our average LC 50/LD50 is 1,900 to 10,000 mg/l. The US EPA set a standard of 100 mg/l and greater as being virtually non toxic, therefore OSE II far and away less toxic than the EPA standard.

The toxicity test that should peak your interest is the toxicity test performed for the city of Plano, Texas physical engineer was performed with gasoline on a minnow, being exposed to wash down of gasoline where OSE II had been applied to the gasoline. Not only was the OSE II not toxic to the minnow, the wash down effluent with gasoline was virtually non toxic to the minnow as well. OSE II when added to a hydrocarbon, the first action is to detoxify the hydrocarbon so its impact is diminished in seconds to the environment, and this minnow test shows this happens. See the document emulating mother nature to see the mode of action of OSE II at link, http://www.osei.us/tech-library-pdfs/2011/4-OSEI%20Manual_EmulatingNature.pdf OSE II also causes hydrocarbons to float, and prevents the hydrocarbons from sinking into the water column, which in turn prevents the effluent contaminant from having any effect on water column species or bottom dwelling species as well. In our technical library there is a dispersant test that shows OSE II has zero effect as a dispersant, the test actually showed OSE II developed a negative number, which means OSE II causes the hydraulic lifting of hydrocarbons.

This video is also on our web site, is shows OSE II being applied directly to the surface of a Koy fish pond where the fish actually eat some of the OSE II, see link http://www.osei.us/archives/2142 .

The next item we would like to present is the fact that OSE II is safe for humans as well. In our technical library we have a letter from OSHA that states OSE II is safe for humans see link http://www.osei.us/tech-library-pdfs/2011/9-OSEI%20Manual_OSHA.pdf

The item we would like to present is the efficacy of OSE II on various types of hydrocarbons, we will send you a power point covering emergency response through our app. hightail due to the size of the power point. In the power point there are several slides covering third party efficacy tests from governments, universities, and end users. There is also a peer review of OSE II testing by King Fahd University of Petroleum, and Mineral Institute, where the executive summary stated OSE II should be used in the Kingdom Of Saudia Arabia.

There is also one other document that we would like to present, The Three Basic Parameters For How to Address Oil/Hydrocarbon Based Material Spills, this paper was presented in a conference of the American academy of Science.

This link is to our concise emergency response plan for spills, http://www.osei.us/wp-content/uploads/Attachment-B_Concise-Bioremediation-Response-Plan.pdf

See these video links on you tube as well

https://www.youtube.com/watch?v=7UdhBKUCkhE

https://www.youtube.com/watch?v=Leg7bz51udk

https://www.youtube.com/watch?v=T4tk8W0UqpQ&t=41s

https://www.youtube.com/watch?v=G-7ehqGiLDA&t=3s

OSE II is a sole source product and the only EA, Enzymatic Additive on the US EPA NCP list see link https://www.epa.gov/emergency-response/oil-spill-eater-ii OSE II is also procured by all 5 branches

of the US military, and the rules of Sole Source as well, see link to our Defense Logistics information at this link http://www.osei.us/wp-content/uploads/OSEI-Corp-Defense-Logistics-letter1.pdf you can see on this listing, the US military has been using OSE II for over 27 years.

The OSEI web site has some testing, and numerous case studies as well covering some of the projects and clean ups OSE II has been involved with over the past 29 years. OSE II has now been a part of over 44,000 clean ups. If you have any questions let me know.

Steven Pedigo

NRT SCIENCE AND TECHNOLOGY COMMITTEE

Fact Sheet: Bioremediation in Oil Spill Response

An information update on the use of bioremediation

May, 2000

1. The purpose of this fact sheet is to provide on scene coordinators and other decision-makers with the latest information on evolving technologies that may be applicable for use in responding to an oil spill. Bioremediation is one technique that may be useful to remove spilled oil under certain geographic and climatic conditions. For the purpose of this effort, bioremediation is defined to include the use of nutrients to enhance the activity of indigenous organisms and/or the addition of naturally-occurring non-indigenous microorganisms. This fact sheet is an update of the NRT Science and Technology's 1991 Bioremediation fact sheet.

2. Bioremediation is a technology that offers great promise in converting the toxigenic compounds of oil to nontoxic products without further disruption to the local environment. Bioremediation is typically used as a polishing step, after conventional cleanup methods have been used. Bioremediation products considered for use during spill cleanup operations must be listed in accordance with the requirements of Subpart J of the National Contingency Plan (for further information on product listing, please consult EPA's Oil Program website at www.epa.gov/oilspill). Genetically engineered organisms are not being considered for use at this time by EPA for oil spill and are therefore not discussed in this fact sheet.

REQUIREMENTS FOR SUCCESS

3. Several factors influence the success of bioremediation, the most important being the type of bacteria present at the site, the physical and chemical characteristics of the oil, and the oil surface area. The two main approaches to oil-spill bioremediation are: (1) *bioaugmentation*, in which oil- degrading bacteria are added to supplement the existing microbial population, and (2) *biostimulation*, in which nutrients, or other growth limiting substances, are added to stimulate the growth of indigenous oil degraders.

4. Addition of oil-degrading bacteria has not been shown to have any long-term beneficial effects in shoreline cleanup operations because:

5. The size of the hydrocarbon-degrading bacterial population usually increases rapidly in response to oil contamination, and it is very difficult, if not impossible, to increase the microbial population over that which can be achieved by biostimulation alone[1-4];

6. The carrying capacity of most environments is probably determined by factors such as predation by protozoans, the oil surface area, or scouring of attached biomass by wave activity that are not affected by bioaugmentation; and.

7. Added bacteria seem to compete poorly with the indigenous population.[5,6]

8. Under the appropriate conditions, biostimulation has been shown to have beneficial effects in shoreline cleanup operations. The main challenge associated with biostimulation in oil-contaminated coastal areas or tidally influenced freshwater rivers and streams is maintaining optimal nutrient concentrations in contact with the oil.

NUTRIENT APPLICATON

9. Effective bioremediation requires that (1) nutrients remain in contact with the oiled material, and (2) nutrient concentrations are sufficient to support the maximal growth rate of the oil-degrading bacteria throughout the cleanup operation.

10. Open Water Environments. Bioremediation of open water spills is not considered to be appropriate or achievable because of the above two requirements. When nutrients are added to a floating slick, they immediately disperse into the water column, essentially diluting the background levels. At such levels rapid conversion of the hydrocarbons to biomass, CO_2, and other innocuous end products would not be readily supported.

11. Marine Environments. Contamination of coastal areas by oil from offshore spills usually occurs in the intertidal zone where the washout of dissolved nutrients can be extremely rapid. In 1994 and 1995, studies were conducted on the shorelines of Delaware[7] and Maine[8] to study the rate of nutrient transport in low and high energy sandy beaches. These studies found that surface application of nutrients (including slow-release or oleophilic formulations) is ineffective on high-energy beaches because most of the nutrients are lost to dilution at high tide. However, on low

energy beaches surface application of nutrients was found to be an effective and economical bioremediation strategy. Subsurface application of nutrients might be more effective on high-energy beaches but because crude oil does not penetrate deeply into most beach matrices, it is difficult to insure that the nutrients reach the oil-contaminated area near the surface.

12. Freshwater Environments. An oil spill is most likely to have the greatest impact on wetlands or marshes. Less research has been conducted in these types of environments, so it is not yet known how well bioremediation would enhance oil removal. However, the same principles apply to this type of environment as in the marine environment; nutrients must remain in contact with the oiled material, and nutrient concentrations must be sufficient to support the maximal growth rate of the oil-degrading bacteria. There is an added complication in a wetland; oil penetration is expected to be much lower than on a porous, sandy marine beach. Below only a few centimeters of depth, the environment becomes anaerobic, and petroleum biodegradation is likely to be much slower even in the presence of an adequate supply of nitrogen and phosphorus. Technology for increasing the oxygen concentration in such an environment is still undeveloped, other than reliance on the wetland plants themselves to pump oxygen down through the root system. By the year 2000, however, data will be available from an intentional oil spill study being conducted jointly by the U.S. EPA and Fisheries and Oceans-Canada on a freshwater shoreline of the St. Lawrence River in Quebec. This study is examining bioremediation with nitrate and ammonium in the presence and absence of wetland plant species (Scirpis americanus).

13. Soil Environments. Land-farming techniques have been used extensively by petroleum companies and researchers for treating oil spills on soil. Again, the same principles apply: nutrients must remain in contact with the oiled material, and nutrient concentrations must be sufficient to support the maximal growth rate of the oil-degrading bacteria. For surface contamination, maintenance of an adequate supply of oxygen is accomplished by tilling. The maximum tilling depth is limited to about 15 to 20 inches. If the contamination zone is deeper, other types of technologies are used, such as bioventing, composting, or use of biopiles, all of which require addition of an external supply of forced air aeration.

14. FIELD EVIDENCE FOR BIOREMEDIATION

Demonstrating the effectiveness of oil spill bioremediation technologies in the field is difficult because the experimental conditions cannot be controlled as well as is in the lab. Nevertheless, well-designed field studies can provide strong evidence for the success of a particular technology if one can convincingly show that (1) oil disappears faster in treated areas than in untreated areas and (2) biodegradation is the main reason for the increased rate of disappearance. Convincing demonstration of an increased rate of oil degradation was provided from a field study conducted during the summer of 1994 on the shoreline of Delaware Bay[9]. Although substantial hydrocarbon biodegradation occurred in the untreated plots, statistically significant differences between treated and untreated plots were observed in the biodegradation rates of certain hydrocarbon compounds.

15. To distinguish between oil lost by physical means and oil that has been degraded, biodegradable constituents are normalized to a resistant biomarker compound. Hopanes often serve as this biomarker compound because they are highly resistant to biodegradation and exist in all crude oils. Normalizing to hopane automatically accounts for disappearance of oil by physical washout mechanisms. In refined oils that have no hopanes biodegradation can be confirmed by normalizing to a highly substitute 4-ring PAH or by examining the relative rates of disappearance of alkanes and PAH homologs.

16. It is important to note that some bioremediation products contain surfactants and emulsifiers that change the appearance and mobility of the oil. These processes should be distinguished from true biodegradation.

OTHER RESEARCH

17. Research is ongoing to evaluate bioremediation and phytoremediation (plant-assisted enhancement of oil biodegradation) for their applicability to clean up oil spills contaminating salt marshes and freshwater wetlands. By December of 2000, EPA is planning to produce a draft guidance document detailing the use of bioremediation for sandy marine beaches and freshwater wetlands. EPA is also studying the biodegradability of non-petroleum oils (vegetable oils and animal fats) and their impacts on the environment during biodegradation. Reports will be available some time in 2000 and 2001.

CONCLUSION

18. In conclusion, bioremediation is a proven alternative treatment tool that can be used in certain oil-contaminated environments. Typically, it is used as a polishing step after conventional mechanical cleanup options have been applied. It is a relatively slow process, requiring weeks to months to effect cleanup. If done properly, it can be very cost-effective, although an in-depth economic analysis has not been conducted to date.

18. **(Continued)**

One of the advantages to using bioremediation products is that the toxic hydrocarbon compounds are destroyed rather than simply moved to another environment. The biggest challenge facing the responder is maintaining the proper conditions for maximal biodegradation to take place, i.e., maintaining sufficient nitrogen and phosphorus concentrations in the pore water at all times. Based on field experiments and solid evidence from the literature it has been shown that addition of exogenous cultures of microorganisms will not enhance the process more than simple nutrient addition and that bioremediation is less effective on high energy shorelines.

The NRT S&T Committee technical contact for bioremediation issues is Dr. Albert D. Venosa of the Environmental Protection Agency. He can be reached at venosa.albert@epa.gov.

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OIL SPILL EATER INTERNATIONAL (OSEI, CORP.) EVALUATION OF THE NRT SCIENCE AND TECHNOLOGY COMMITTEE FACT SHEET MAY 20, 2000

Paragraph 1. Is a Statement of the Fact Sheet's Purpose.

It is unfortunate that Dr. Venosa chose to only use nutrients for the tests performed for this Fact Sheet. We agree – nutrients alone will not work – and Dr. Venosa proves this fact in his Fact Sheet. Dr. Venosa keeps pushing nutrients which are very limited as to the spill conditions in which they may be used effectively, as Dr. Venosa points out.

Paragraph 2.

Explains that Bioremediation offers significant promise in converting the toxigenic compounds of oil to non-toxic products without further disruption to the environment. Again, Dr. Al Venosa (EPA Laboratory) keeps pushing nutrients but then proves they do not work. How does this help the On-Scene Coordinators?

Paragraph 3. Requirements for Success.

They describe Biostimulation as nutrients or other growth-limiting substances, but they fail to mention or test those Bioremediation Products that utilize nutrients all the other constituents to emulate Mother Nature.

Paragraphs 4 through 7.

We agree with the EPA Fact Sheet. For eleven years we have stated that using indigenous bacteria to clean up oil spills works faster and more effective than adding bacterial product.

Paragraph 8.

They explain that under the appropriate conditions, biostimulation has been shown to have beneficial effects on shorelines treatments. This statement needs to be qualified as nutrients only (which Dr. Venosa keeps pursuing) are limited as to the conditions in which they may be used.

OIL SPILL EATER II is not limited the way nutrients are. In fact, in a letter dated April 20, 2000, Mr. Venosa agreed to the fact that when OSE II is applied to oil, it adheres to the oil. This means wave action will not wash away OSE II and dilute it. This means OSE II can be used in active inter-tidal zones, as well as open ocean settings and fresh water fast moving rivers.

Paragraph 9. Nutrient Application.

OSEI, Corp. concurs with this paragraph since OSE II does exactly what Dr. Venosa states is necessary for "effective Bioremediation." OSE II (1) adheres to the oil and (2) supplies the concentration of all nutrients necessary for effective Bioremediation.

Paragraph 10. Open Water Environments.

They state that Bioremediation of open waters is not considered appropriate or achievable. What Dr. Venosa is really stating is that what nutrients alone are limited as to where they can be used. This is not true for OIL SPILL EATER II (OSE II), since it molecularly adheres to the oil and Dr. Venosa has so stated and knows that OSE II does.

How does Dr. Venosa explain and ignore the fact that for one and one/half years OSE II has been successfully and effectively used at the Navy Fuel Farm in San Diego, CA for oil spills on U.S. Navigable Waters, with the Coast Guard and the State of California present? The oil is cleaned up and with no adverse effects to the San Diego Bay ECO System.

Furthermore, Dr. Venosa has been fully appraised of these facts. He obviously is choosing to ignore the fact that at least one Bioremediation Product does work effectively on water. Dr. Venosa needs to change this statement in the Fact Sheet since he has misled the NRT, the RRT's and particularly the OSC's.

Paragraph 11. Marine Environments.

OSEI, Corp. concurs with their comments, but they are only applicable to nutrients – not OIL SPILL EATER II.

Paragraph 12. Fresh Water.

OSEI, CORP. agrees with the EPA – nutrients have limited capabilities; however, OSE II breaks up the oil in small droplets, OSE II "floats" the oil (hydraulic lifting) and OSE II molecularly adheres to the oil. OSE II will only minimally increase the BOD (See Enclosure #1 – BOD statement by Dr. Theron Miller). If the BOD becomes a problem in an enclosed environment, simply aerating the oil-covered water with pumps, will allow rapid Biodegradation of the oil and eliminate the BOD problem.

Paragraph 13. Soil Environments.

Again, nutrients (fertilizers) do not adhere to the oil and, how many nutrients do you apply? OSE II has been solving this problem for 11 years. We have been cleaning up soil that is contaminated with hydrocarbons very effectively and at a tremendous savings in cost.

Paragraph 14. Field Evidence for Bioremediation.

The Fact Sheet states that it is difficult to demonstrate Bioremediation in the field vs. the lab. OSE II has cleaned up contaminated soils all over the U.S., Alaska, Korea and Japan.

Using Dr. Venosa's nutrients, it is impossible to demonstrate for the reasons mentioned previously, i.e., nutrients do not adhere to the oil; how much product (nutrients) do you use; and Dr. Venosa's nutrients do not contain all the nutrients necessary for the complete bacterial growth. OSE II provides all the nutrients needed and can tell the user exactly how much OSE II to apply.

Paragraph 15.

OSEI, Corp. has proven that OSE II does, in fact, biodegrade oil. Dr. Brown of the University of Alaska, ran a scientifically valid test to prove that OSE II does biodegrade alkanes and PAH's. Dr. Venosa has this test and is fully aware that OSE II works whereas his nutrients will not. (See Enclosure 2, a copy of Dr. Brown's Test.).

Paragraph 16. BIOREMEDIATION – WHAT IT REALLY IS!

OIL SPILL EATER II
CHEMICAL PROCESS

Once OSE II is applied to a hydrocarbon spill, the enzymes and other product constituents start emulsification and solubilization of the hydrocarbon substrate. Emulsification and solubilization generally take from a few minutes up to a few hours for heavy-end hydrocarbons, once OSE II is applied, with a Temperature of 40 degrees F. or greater. Once solubilization is completed, the hydrocarbon substrate is less toxic (and the hazard of a fire is diminished) the enhanced, naturally occurring bacteria will have a higher affinity for the solubilized, hydrocarbon substrate.

NOTE: There is no hydraulic loading with the use of OSE II and therefore treated hydrocarbons are not pushed into the lower depths of the water column. During these reactions, OSE II offers up a complete nutrient system to promote the rapid growth or colonization of naturally occurring, indigenous bacteria.

OSE II is also formulated so that once application to the hydrocarbon substrate occurs, molecular adhesion takes place. This prevents OSE II from being removed from the hydrocarbons easily. The above reaction forms the substrate complex.

Once the outer molecular walls of the hydrocarbon substrate complex have been weakened or broken, then this allows bacteria better access to the hydrocarbon substrate. The nutrients in OSE II's product matracies (readily available nitrogen, phosphorous, carbon and vitamins), rapidly populates naturally occurring bacteria. There are certain product constituents to enhance various hydrocarbon- degrading bacteria specifically. The naturally enhanced hydrocarbon degrading bacteria rapidly populate until product nutrients are depleted, at which time they readily convert to the only food source left – the weakened or broken hydrocarbon substrate. The transition state complex is when the enhanced naturally occurring hydrocarbon degrading bacteria start converting hydrocarbons to CO_2 and water.

The enhanced naturally occurring hydrocarbon degrading bacteria convert the solubilized hydrocarbons to CO_2 and water which is the end point or the Bioremediation of the hydrocarbon substrate. Any OSE II product components left are 100% biodegradable and will be used up naturally.

Dr. Venosa explains that having surfactants and emulsifiers preclude a product from being true Bioremediation. This is somewhat a misrepresentation of the facts, because in Mother Nature – when bacteria become proximal to a spill they release surfactants and enzymes to help break down hydrocarbon structures (detoxify) so the bacteria can utilize the spilled contaminant as a food source. OSE II has the same nutrients that Mr. Venosa pushes, plus we have all the constituents that occur in Mother Nature to speed up Bioremediation. To call Dr. Venosa's limited, and incomplete nutrients true Bioremediation over complete products that supply all of the constituents up front that are required by Mother Nature renders this fact sheet as nonfactual itself.

Paragraph 17.

OSE II is ideally suite for all applications – fresh or salt water – open water – beaches and marshes.

Paragraph 18.

Mechanical cleanups (the method of choice) allow 80% of the oil to sink into the water. OSE II, on the other hand, FLOATS the oil, and rapidly detoxifies the oil, thereby protecting the ECO System and by rapidly Biodegrading the oil.

There are cost comparisons available and Dr. Venosa has this data. The Navy at the San Diego Fuel Farm has reduced their mechanical cleanup cost for oil spills on water from $90.00/spilled gallon to $12.00/spilled gallon and only $1.00 of the $12.00 cost is for OSE II.

CONCLUSION – BY: OSEI, CORP.

OSEI, Corp.'s OIL SPILL EATER II, solves all the problems spelled out in this Fact Sheet associated with Dr. Venosa's attempt to use and evaluate only nutrients.

OIL SPILL EATER II is successfully and effectively used on oil spills on soil and U.S. Navigable Waters.

OIL SPILL EATER II (OSE II) should be pre-approved by all RRT's for use on oil spills.

By: Steven R. Pedigo
Chairman

SRP/AJL

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BOD COD SUMMARY
(Biological Oxygen Demand / Concentrated Oxygen Demand)

When a given area receives or becomes contaminated with a given carbon based contaminate the BOD/COD is automatically affected!

Oil Spill Eater II **(OSE II)** in and of itself only slightly affects BOD/COD regardless of the application rates of OSE II. The effect of using OSE II would, at most, be 5% to 10% on the BOD.

In any area where there is water movement or tidal action, the BOD/COD uptakes effects would be minimal to the alternative of leaving an untreated contaminant in place where it could potentially affect the BOD/COD or harm waterfowl, birds, mammals, fish and plant life.

The potential of long-term problems of leaving a contaminant in place should be of more concern than minutely affecting the BOD/COD by using OSE II.

In our experience, BOD and COD problems really only need to be addressed where you want to treat a contaminant in a closed system or a small body of water where there is no inflow of water. Even in these systems, the BOD/COD can be maintained simply by pumping air into the system or pumping the water into the air, or by causing an inflow of water to the area that has become contaminated.

Oil Spill Eater II was used on a 3-acre pond with fish and wildlife swimming in the water where approximately 1 1/2 acres of the pond was covered with crude oil from a pipeline break. We applied our product on the shoreline to remove the crude oil from the grasses, plant life and marsh area. OSE II was then applied to the main body of the spill. A circulation pump was set out in the middle of the pond where water was pumped up in the air. There were fish, snakes and turtles observed swimming in the water away from the spill and no fish or wildlife died. It took 3 days for bacteria growth to be visible to the human eye and in 5 days visible clean patches started appearing in the crude oil where the bacteria was converting the oil to CO_2 and water.

SUMMARY

BOD/COD concerns where there is an open system is minimal, compared to long term problems of leaving a contaminant in place untreated. If you want to or feel addressing the BOD/COD problem is needed, then pumping air into the area or moving the water is easily performed and should be attempted over leaving an untreated contaminant in place.

The RRT/Onscene Commanders require even one gallon spills to be reported and mechanically cleaned up. How can they authorize leaving a large spill (25,000 gallons) in place and untreated. If there is enough contaminate to adversely affect the BOD/COD in any eco system, then the contaminant itself would choke the life out of everything.

We would think that you would want to return any given eco system to it's pre-spill conditions as fast as possible by utilizing a product such as OSEI.

BY: Steven R. Pedigo
Chairman

SRP/AJL

To Whom this may concern,

re: OSEI's product for petroleum hydrocarbon remediation in aquatic environments.

This report is in response to concerns expressed by U.S. EPA regulatory officials about the use of OSEI's product in surface waters for remediation of petroleum hydrocarbon spills. I understand that this concern is for the potential increase in biochemical oxygen demand (BOD) as a result of administering OSEI's product to remediate contaminated water. My research over the last several years has been involved in testing various aeration and management techniques used to overcome severe oxygen depletion in the hypolimnion of eutrophic lakes. I have even evaluated the use of Bact-A-Pur® for its potential to reduce sediment organic matter. Specific goals have included remedial practices for winterkill prevention, maintaining an oxidized microzone at the sediment surface to minimize dissolution of iron, manganese, sulfides, reduced organic acids and methane into the water column of eutrophic lakes. In performing these tests it has been necessary to isolate, measure and model sources of oxygen depletion including sediment chemical and biological oxygen demand, phytoplankton respiration and methanogeneses in anaerobic sediments. This research has culminated in the completion of a Ph.D. thesis under the direction of W.C. Mackay and Dave Schindler at the University of Alberta and several publications have been submitted or are currently being written concerning this aspect of limnology. Further, I was indirectly involved in but have extensively reviewed the data and discussed the results of bioremediation testing with the experts involved in the Exxon Valdez disaster in Alaska.

After review of information provided to me by George Lively, President of OSEI, Inc. I have the following comments.

Bioremediation, and specifically the OSEI product, is undoubtedly an effective and inexpensive approach for the remediation of petroleum hydrocarbon spills. In addition, although the efficacy of earlier tests for bioremediation products in rivers ans streams was questionable the OSEI product particularly appears to emulsify, and maintain the oil at the surface as it proceeds to degrade the spill. This characteristic is particularly beneficial in its use in lentic systems and has and will continue to prove to be an ideal application of this new technology. Specifically, there are several factors which should be pointed out which support this position and explain why this application will have minimal or no impact on the BOD in lentic aquatic systems.

1. The specific species of bacteria which the enzyme and nutrient solution are designed to target are but a tiny minority of the aerobic bacterial community of freshwater and marine ecosystems. Hence, there will be only a minuscule increase in the overall bacterial community with a concomitant minuscule (although not likely measurable), increase in BOD.

The small addition of nutrients may, however, temporarily enhance the phytoplankton population in very small bodies of water.

2. This possibility would be even further reduced for a hydrocarbon spill in freshwater or coastal wetlands. This is because theses systems are inherently hypereutrophic and hence already possess large amounts of organic matter with associated high rates of BOD. (I have observed such water bodies to range in DO from > 15 mg L^{-1} in mid-afternoon to 0 mg L^{-1} for several pre-dawn hours). Hence, an additional small amount of BOD would likely neither be observed nor have any

additional ecological impacts to the present system. Further, the small nutrient additions will likely not exceed background values for nitrogen and phosphorus in these productive systems

3. One of the greatest merits of this product is that, because the oil-degrading bacteria use only petroleum hydrocarbons as substrates, these populations will diminish to pre-spill low abundance once hydrocarbons are oxidized. Hence, after just a few weeks of treatment the aquatic ecosystem will revert to pre-spill conditions.

4. Even an accidental excessive dose of the OSEI product would have no toxicological consequences and would result only in a minor and temporary increase in nutrients and possible phytoplankton growth. In comparison with other remediation techniques which require dredging, pumping and treating or air stripping, the use of this product is much cheaper, incurs minimal collateral ecological damage and leaves no physical, toxicological or ecological impairment.

T. G. Miller

Theron G. Miller
President, Aquatic Solutions, LLC

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Web: http://www.osei.us

OIL SPILL EATER II (OSE II)

PROCEDURE FOR CLEANUP OF HEAVY END HYDROCARBONS ON WATER

1. To determine quantity of Oil Spill Eater II concentrate needed:

A. On a Spill:

1. Use one (1) gallon of OSE II concentrate for every fifty (50) gallons of oil.

2. Use one (1) barrel of OSE II concentrate for every 2,750 gallons of oil.

B. If you know how many gallons of oil:

Multiply Gallons of oil (A) x .02 = OSE II concentrate needed

-OR-

If you know how many barrels of oil:

Multiply Barrels of oil (A) x .015 = Barrels of OSE II concentrate needed

C. If you do not know how many gallons or barrels of oil:

Multiply:	A ( ) Yds Length of Oil Slick	x	B ( ) Yds Width of Oil Slick	x	C ( ) Inches Thickness of Oil

x (.0023) = Barrels of OSE II Concentrate Needed

-Or-

x (.12) = Gallons of OSE II Concentrate Needed

II. Application Procedure:

A. Water temperature above 40° F

1. Dilute each gallon of OSE II concentrate with fifty gallons of fresh or sea water – depending on the area that is contaminated.

2. Using a helicopter or barge with spray booms, eductor system or hand sprayer, spray the mixed OSE II onto the perimeter of the oil spill and work toward the center.

3. Next – spray OSE II over the entire surface of the spill. If the oil spill is very heavy (more than two or three inches deep), you may have to reapply OSE II to gain the one (1) part mixed OSE II to one (1) part heavy end hydrocarbon.

B. Water temperature lower than 40◦ F

1. Cold water reduces the rate at which OSE II enhances biodegradation of crude oil. However, biodegradation will continue to 28◦ F in salt water and 32.5◦ F in fresh water.

III. If Testing is Required:

A. Items needed:

1. An extraction device that will hold 100 ml or 3 ounces of liquid and can be pushed 6 inches or 60 cm below the water's surface.

2. 20 brown 100 ml bottles with teflon sealed caps.

3. Ice chest and ice to transport samples to the lab.

B. Pre OSE II Application Procedures:

1. Keep a daily log of observations.

2. Decide on 3 areas of the spill forming a triangle (△) to extract 3 samples.

3. Extract the 3 samples with the extraction device, pushing the collection vessel just under the surface.

4. Place each extraction in a brown jar and seal with teflon cap.

5. Mark jars (*Initial Untreated Samples*).

6. Place samples in the ice chest.

C. Perform the same steps above except pull 1 sample proximal to the spill but from an area not contaminated, affected, or impacted in any way by the spill. This is to determine what the background level or pre spill conditions are. Note the time and date of extraction.

D. 10 minutes after applying OSE II, perform the next extractions.

1. If possible, using the same triangle extraction points, push extraction device approximately 2 to 3 inches below the surface and pull extraction.

2. Decant extracted sample into a brown jar and mark initial sample 3 minute after applying OSE II, and note the time and date of extraction.

3. Place brown jar samples in the ice chest and transport to the lab.

E. Sampling Times

1. Using procedures in D above, extract samples on day 7, day 15, day 30 and every 15 days thereafter until the acceptable level of cleanup is accomplished. Obviously, testing should cease once the acceptable levels are met.

2. In most cases, within 30 days the acceptable levels will have been accomplished.

F. Lab Tests

1. If the spill is light end hydrocarbons, then either EPA method 8015 or 8030 should be performed.

2. If the spill is heavy end hydrocarbons, then either EPA method 8030 or 8100 should be utilized.

IV. If Toxicity Testing is required:

A. Items Needed

1. An extraction device that will be capable of extracting 100 ml samples 3 meters or 3 feet below the waters' surface.

2. 12 – 100 ml brown jars with teflon seals.

3. Ice chest with ice.

B. Using instructions for extractions and the extraction time / date in III above to perform sampling

1. The 3 samples, once at the lab, should be homogenized and used for a toxicity test.

Note: In the ocean mysids, or mummichogs are generally acceptable species, and in fresh water minnows or rainbow trout are generally acceptable species.

In most cases, one toxicity test just after application of OSE II is required. However, if toxicity sampling is carried out each time efficacy testing is performed, then toxicity reduction will be proven as well.

Note: If spill is on the ocean, use ocean water to mix "OSE II." If spill is on a lake, river, stream, or pond, use lake, river, stream or pond water to mix with "OSE II." To mix ocean water with anything other than ocean water and vice versa may cause adverse competition.

N E V E R mix "Oil Spill Eater II" with <u>tap water</u> – if possible!

OIL SPILL EATER INTERNATIONAL, CORP.

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OIL SPILL EATER II

PROCEDURE FOR CLEANUP OF LIGHT END HYDROCARBONS ON WATER

1. To determine quantity of *Oil Spill Eater II* concentrate needed:

A. On a Spill:

1. One (1) gallon of OSE II concentrate for every one hundred (100) gallons of light end hydrocarbons.

2. One (1) barrel of OSE II concentrate for every 5,500 gallons of light end hydrocarbons.

B. If you know how many gallons of light end hydrocarbons spilled:

Multiply Gallons of spill (A) x .01 = Gallons of OSE II concentrate needed

-OR-

If you know how many barrels of light end hydrocarbons spilled:

Multiply Barrels of spill (A) x .0075 = Barrels of OSE II concentrate needed

C. If you do not know how many gallons or barrels of light end hydrocarbons:

Multiply:	A ( ) Yds Length of Spill	x	B ( ) Yds Width of Spill	x	C ( ) Inches Depth of Spill

(.0012) = Barrels of OSE II Concentrate Needed
(.06) = Gallons of OSE II Concentrate Needed

II. Application Procedure:

A. Water temperature above 40° F

1. Dilute each gallon of OSE II concentrate with one hundred gallons of fresh or sea water. Do not use fresh water on ocean water or vice versa or adverse competition may occur.

2. Using a helicopter or a barge with spray booms, eductor system set at 1%, or any spray system, spray a heavy coat of Oil Spill Eater II on the outside edges of the spill and work toward the center, if possible. This will help keep the spill from spreading.

   As the spray reaches and saturates the light end hydrocarbon molecules, emulsion will start immediately and the fire hazard will be eliminated as quickly as complete emulsion takes place. The light end hydrocarbons will eventually be converted to CO_2 and water.

3. The fire hazard should be eliminated in 4 hours or less, and the hydrocarbons should be eliminated expeditiously also.

B. Water temperature below 40° F

1. Cold water reduces the rate at which OSE II enhances biodegradation of hydrocarbons. However, biodegradation will continue on salt water down to 28° F, and on fresh water down to 32.5° F.

III. If Testing is Required:

A. Items needed:

1. An extraction device that will hold 100 ml or 3 ounces of liquid and can be pushed 6 inches or 60 cm below the water's surface.

2. 20 brown 100 ml bottles with teflon sealed caps.

3. Ice chest and ice to transport samples to the lab.

B. Pre OSE II Application Procedures:

1. Keep a daily log of observations.

2. Decide on 3 areas of the spill forming a triangle (△) to extract 3 samples.

3. Extract the 3 samples with the extraction device, pushing the collection vessel just under the surface.

4. Place each extraction in a brown jar and seal with teflon cap.

5. Mark jars (*Initial Untreated Samples*).

6. Place samples in the ice chest.

C. Perform the same steps above except pull 1 sample proximal to the spill but from an area not contaminated, affected, or impacted in any way by the spill. This is to determine what the background level or pre spill conditions are. Note the time and date of extraction.

D. 10 minutes after applying OSE II, perform the next extractions.

1. If possible, using the same triangle extraction points, push extraction device approximately 2 to 3 inches below the surface and pull extraction.

2. Decant extracted sample into a brown jar and mark initial sample 3 minute after applying OSE II, and note the time and date of extraction.

3. Place brown jar samples in the ice chest and transport to the lab.

E. Sampling Times

1. Using procedures in D above, extract samples on day 7, day 15, day 30 and every 15 days thereafter until the acceptable level of cleanup is accomplished. Obviously, testing should cease once the acceptable levels are met.

2. In most cases, within 30 days the acceptable levels will have been accomplished.

F. Lab Tests

1. If the spill is light end hydrocarbons, then either EPA method 8015 or 8030 should be performed.

2. If the spill is heavy end hydrocarbons, then either EPA method 8030 or 8100 should be utilized.

Note: If spill is on the ocean, mix "OSE II" with ocean water. If spill is on a lake, river, stream or pond, mix "OSE II" with lake, river, stream or pond water.

N E V E R mix "Oil Spill Eater II" with tap water!

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PROCEDURE FOR REMOVAL OF A HYDROCARBON SHEEN ON WATER, CONCRETE, AND ASPHALT

1. To determine quantity of *Oil Spill Eater II* concentrate needed:

Multiply:	A ( ) Ft. Length of Spill	x	B ( ) Ft. Width of Spill	x	.0004

= Gallons of OSE II concentrate needed

II. Application Procedure:

1. Dilute each gallon of OSE II concentrate with 50 gallons of fresh or sea water. Do not use ocean water with fresh water or vice versa because adverse competition may occur.

2. Using a barge with spray booms, hand sprayer or eductor system set at 2%, (depending on the size of sheen), spray a good coating of OSE II over the entire sheen. As soon as the OSE II reaches the sheen, emulsion and solubilization will start immediately and finally conversion to CO_2 and water.

3. The hydrocarbons should be emulsified and solubilized rapidly and any fire hazards will be eliminated rapidly. Conversion to CO_2 and water is expeditious.

Note: In sheen is on ocean water, mix "OSE II" with ocean water. If sheen is on a lake, river, stream or pond, mix "OSE II" with lake, river, stream or pond water.

NEVER mix OSE II with tap water if possible!

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SUMMARY

CHEVRON CRUDE OIL TEST

A client of OSEII requested that we perform a basic test on Chevron crude oil to show the potential for OSEII to bioremediate this oil.

A basic test where crude oil was placed on water and OSEII was applied was performed. The initial TPH count was 95,200 ppm. OSEII was applied on 1-18-91. The next test was performed 12 days later where the TPH had dropped to 7,720 ppm. Then 12 days later, the final test was performed and the TPH had dropped to 690 ppm.

This was a simple test to show the client that indeed OSEII would remediate the type of contamination on their site.

Steven R. Pedigo
Chairman

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Gulf Coast, Inc.
Dallas Division
1548 Valwood Parkway
Suite 118
Carrolton, TX 75006
Tel: (214) 406-8100
Fax: (214) 484-2969

Mailing Address:
P.O. Box 815006
Dallas, TX 75381

ANALYTICAL REPORT

OSE
5545 Harvest Hill Lane
Suite 1116
Dallas, TX 75230

02-04-91
Job No.: 903119
Sample No: 157555-157556
Page: 1

Sample Description: SEE BELOW

Date Received: 01-18-91

157555 Chevron Crude – Sherman TX
Taken: 01-18-91

Total Petroleum Hydrocarbon **952,000* ug/g x density 95,200***

157556(1) Chevron Crude – Remediation Treated
Taken: 01-18-91

Total Petroleum Hydrocarbon **77,100* ug/g x density 7,720***

On January 30, 1991 sample was mixed and total TPH analyzed.

157556(2) Chevron Crude – Remediation Treated
Analyzed 2/12/91

Total Petroleum Hydrocarbon **6,900* ug/g x density 690***

On February 12, 1991 sample was mixed and total TPH was analyzed.

***Freon Extract Discolored.**

Donna L. Bowlin KSD

Donna L. Bowlin, Manager
Dallas Division

STANDARD QUALITY CONTROL DATA REPORT

SAMPLE/PROJECT 157555-157556

PARAMETER	ANALYST	DATE	TIME	METHOD	EXTERNAL STANDARD	BLANK
TPH	DWT	013091	1000	E418.1	1880/1700	BDL
TPH	DWT	021291	1000	E418.1	2270/2440	BDL

Method – Codes, i.e.

A – refers to APHA, Standard Methods for the Examination of Water and Wastewater, 16th Edition

E – refers to EPA's 1979 Methods for Chemical Analysis of Water and Wastes – for Inorganic Analyses

E – refers to EPA's 1979 Methods for Organic Chemical Analysis of Municipal and Industrial Wastes – for Organic Analyses

S – refers to SW846, 3rd edition

D – refers to ASTM

M – Method has been modified

*** – refers to Other Reference**

External Standard – the Actual/Theoretical value for that batch of analysis. Acceptance Criteria – must be within 10% of the true value, except where EPA methods state otherwise.

Blank – samples are not blank corrected by the laboratory

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"OIL SPILL EATER II"

HYDROCARBON REDUCTION TEST

FOR
GAF INDUSTRIES

SUMMARY

GAF Industries in Savannah, Georgia has a site contaminated with Venezuelan crude, #6 fuel oil and diesel fuel. The site has been contaminated for approximately 10 years. Sky Blue Chems designed a lab test that would mimic the actual cleanup plan. The contaminated site had approximately 85% aliphatic (heavy end) hydrocarbons, 6% aromatics (light ends) and 9% asphaltenes (weathered crude).

The initial hydrocarbon count was 100,000 mg/L. Oil Spill Eater II was mixed 50 to 1 with Savannah river water and applied at a 1 to 1 ratio to the hydrocarbons. In 96 hours all the aromatics and all the aliphatics were reduced to CO2 and water. The weathered asphaltenes were the hardest to breakdown and consumed most of the testing time.

GAF asked us to demonstrate that we could mitigate their hydrocarbon contamination to less than 100 ppm so they could meet their NPDES discharge permit needs. This was a rigorous test for Oil Spill Eater II that proves the product is effective on light ends, heavy ends and weathered asphaltenes.

Steven R. Pedigo
Chairman

SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: SO-06430

Received: 24 MAY 90

CC: Pedigo/Franklin

REPORT OF RESULTS Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	SAMPLED BY
06430-1	GAF Waste Comp. Initial Test 6/1/90	Savannah Laboratories

PARAMETER	06430-1
Petroleum Hydrocarbons (418.1), mg/kg	100000
Percent Solids, %	56%

CC: Pedigo/Franklin

REPORT OF RESULTS Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
06430-2	GAF Waste Composite Second Test 6/8/90	Savannah Laboratories
06430-3	GAF Waste Composite Third Test 6/11/90	
06430-4	GAF Waste Composite Fourth Test 6/15/90	

PARAMETER	06430-2	06430-3	06430-4
Petroleum Hydrocarbons (418.1), mg/l	6800	5400	5000

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: SO-06430

Received: 24 MAY 90

CC: Pedigo/Franklin

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
06430-5	GAF Waste Composite Fifth Test 6/22/90	Savannah Laboratories
06430-6	GAF Waste Composite Sixth Test 6/26/90	
06430-7	GAF Waste Composite Seventh Test 6/29/90	
06430-8	GAF Waste Composite Eighth Test 7/3/90	
06430-9	GAF Waste Composite Ninth Test 7/6/90	

PARAMETER	06430-5	06430-6	06430-7	06430-8	06430-9
Petroleum Hydrocarbons (418.1), mg/1	2800	990	1500	1500	1100

Methods: 1) EPA SW-846.
2) Sky Blue Chem Procedure "Testing Proposal OSE Bioremediation of Hydrocarbons."

Note: Extraction protocol described in Method 2 followed. Verbal instructions received on 6/22/90 to maintain volume by replacing each 100 ml aliquot removed for analysis with 100 ml of river water. A total volume of 500 ml OSE was added in seven applications.

SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: SO-06430

Received: 24 MAY 90

CC: Pedigo/Franklin

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION . LIQUID SAMPLES	SAMPLED BY
06430-10	GAF Waste Composite Tenth Test 7/10/90	Savannah Laboratories
06430-11	GAF Waste Composite Eleventh Test 7/13/90	
06430-12	GAF Waste Composite Twelfth Test 7/17/90	
06430-13	GAF Waste Composite Thirteenth Test 7/20/90	

PARAMETER	06430-10	06430-11	06430-12	06430-13
Petroleum Hydrocarbons (418.1), mg/l	700	350	360	41

Methods: 1) EPA SW-846.
2) Sky Blue Chem Procedure "Testing Proposal OSE Bioremediation of Hydrocarbons."

Note: Extraction protocol described in Method 2 followed. Verbal instructions received on 6/22/90 to maintain volume by replacing each 100 ml aliquot removed for analysis with 100 ml of river water. A total volume of 500 ml OSE was added in seven applications.

William D. Sherrod

William D. Sherrod

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SUMMARY

ENVIRONMENT CANADA'S TOXICITY TEST

Environmental Canada performs Toxicity Testing for determining if a product could gain approval for use in Canada. The level that is considered toxic is 1,000 mg/L or less. A product that exceeds this level is deemed acceptable.

Oil Spill Eater II Concentrate, tested at 10,000 mg/L – which shows OSE II Concentrate is virtually non-toxic and far exceeds the level deemed to toxic by Environment Canada.

Rainbow Trout is one of the most sensitive fresh water organisms to test. OSE II proved that even with third party testing by a Foreign Government, OSE II is virtually non-toxic.

By: Steven R. Pedigo
Chairman/OSEI, Corp.

Environment Canada
Conservation and Protection
Emergencies Science Division
River Road Environmental Technology Centre
3439 River Road
Ottawa, Ontario K1A 0H3

May 17, 1993 4808-13-7

Steven R. Pedigo, Chairman,
OSEI Corporation
5545 Harvest Hill
Suite 1116
Dallas, TX 75230
U.S. A.

Dear Mr. Pedigo,

Thank-you for participating in the development of Environment Canada's draft guidelines for assessing the toxicity and effectiveness of oil spill bioremediation agents (OSBAs).

The Tier I toxicity testing is now complete. Our preliminary screening has indicated that the *Daphnia magna* test and the Microtox test were either insensitive or erratic. Therefore, we do not consider these particular tests useful for OSBA evaluation. Comments on the toxicity of your product will thus be limited to those obtained using the 96-hour Rainbow Trout acute lethality test. 'Oil Spill Eater II' had a rainbow trout 96-hour LC50 of greater than 10,000 mg of application solution per litre of water. There was, however, a 23% mean fish mortality at this concentration. Also note that between 24 and 96 hours of exposure to the product, sublethal effects were present. The fish were noted to surface, be on their side, turn dark, exhibit rapid breathing and no swimming. These sublethal effects should be of concern. The effectiveness test analyses are still being performed. You will be notified as soon as those results are available.

If your product meets both the effectiveness and toxicity criteria it will be placed on our Standard List of Oil Spill Bioremediation Agents. Placement on this list is not an indication that the product will be used in the event of an oil spill. The list and test results are public information. They may be provided to oil spill response personnel to enable them to make informed decisions.

Please take note that the placement of a product on our Standard List does not constitute an approval or certification or licensing of your product for use in Canada. Your product may be required to comply with the New Substances Notification Regulations (NSNR) for biotechnology products under the Canadian Environmental Protection Act (CEPA). For information on the draft regulations, please contact the Chief of the New Substances Division at (819) 997-4336 or at the following address: Chief, New Substances Division, CCB, Environmental Canada, P.V.M. 14th Floor, Ottawa, Ontario, K1A 0H3, CANADA.

Sincerely,

Merv Fingas
Chief, Emergencies Science Division

ENVIRONMENT CANADA

TIER I TOXICITY TESTING

FOR EVALUATION OF DRAFT OSBA GUIDELINES

The testing was performed as follows. An application solution of the OSBA was prepared based on instructions provided by the manufacturer/supplier. The highest strength of solution tested was 10,000 mg of application solution per litre of water (approx. a 1:100 dilution). For products in which solids are normally added to the water, suspensions comprised of 10,000 mg of product/combined product per litre of water were prepared for use in the toxicity tests. (If several solids were to be added, they were combined in the appropriate ratio). This initial screening concentration was tested in triplicate. If this concentration was toxic to greater than 50% of the organisms, lower concentrations were tested. Sub-lethal effects on the behavior and/or appearance of the organisms were also made. The toxicity of the product in water was assessed using each of the following three biological test methods, developed and standardized by Environment Canada for these and other applications:

Environment Canada, 1990a. **Biological test method: acute lethality test using rainbow trout.** Environment Canada, Conservation and Protection, Ottawa, Ontario. Report EPS 1/RM/9, 51 pp.

Environment Canada, 1990b. **Biological test method: acute lethality test using *Daphnia* spp.** Environment Canada, Conservation and Protection, Ottawa, Ontario. Report EPS 1/RM/11, 57 pp.

Environment Canada, 1992. **Biological Test method: toxicity test using luminescent bacteria (*Photobacterium phosphoreum*).** Environment Canada, Conservation and Protection, Ottawa, Ontario. Report EPS 1/RM/24, 61 pp.

May 17, 1993

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TOXICITY TEST SUMMARY USING

CITGO GASOLINE, OIL SPILL EATER II

AND FATHEAD MINNOWS

To prove OIL SPILL EATER II rapidly detoxifies hydrocarbons once OSE II is applied, a Toxicity Test was set up with the Physical Engineer of the City of Plano, Texas.

One half gallon of gasoline was poured onto a concrete surface, where ½ gallon of OSE II (pre-diluted 100 to 1 was immediately applied. The treated gasoline was allowed to set for two (2) minutes at which time two (2) gallons of fresh water were used to wash this effluent into a catch basin. Approximately 1 ½ gallons were recovered and sent to Bio-Aquatic Laboratory.

Bio-Aquatic Laboratory performed a Static 48 Definitive Toxicity Test using Fathead Minnows (*Pimphales promeas*). The LC50 was 9,300 mg/L which is a relatively low toxicity level.

This test shows that OSE II when applied to a toxic constituent rapidly reduces toxicity. This detoxifying action of OSE II limits the toxicity of a spill to marine organisms, and will allow Mother Nature's Bacteria to rapidly attack this detoxified spill. The rapid detoxification of a spill shows that OSE II is a beneficial tool for first response cleanup for a spill. This test also shows that if OSE II is used to clean up a parking lot and washed into the storm drain there would be no adverse environmental impact.

By: Steven R. Pedigo
Chairman/OSEI, Corp.

OSEI CORPORATION

OSE II/GASOLINE/WATER

Toxicity Test Report

DECEMBER 7, 1991

BIO-AQUATIC TESTING, INC.

Prepared by: _____

David Smith,
Aquatic Toxicologist

BIO-AQUATIC TESTING, INC.

1555 Valwood Parkway, Ste. 100
Carrollton, Texas 75006
Tel: (214) 247-5928
Fax: (214) 241-4474

TOXICITY TEST REPORT – ACUTE

Client . . . . . .OSEI Corporation
Sample . . . . . OSE II/Gasoline/Water
Laboratory I.D. BO-12-91-2239
Date . . . . . December 7, 1991

Results: The 48-hour LC50 for *Pimephales promelas* exposed to a mixture of OSE II, gasoline, and water was 9,300 mg/L.

SAMPLE COLLECTION

Approximately one and a half gallons of runoff grab sample from an OSEI Corporation product demonstration was delivered to Bio-Aquatic Testing on December 5, 1991. The sample was manually collected by OSEI personnel. One toxicity test was requested: a static 48-hour definitive toxicity test using the fathead minnow (*Pimephales promelas*).

CHEMICAL MEASUREMENTS

The sample was analyzed for residual chlorine (EPA Method 330.1, Amperometric Titration Method) and was determined to contain <0.10 mg/L. Sample and laboratory dilution water pH, temperature, conductivity, hardness, alkalinity and D.O. were analyzed and recorded daily.

TEST PROCEDURES
Pimephales promelas

The 48-hour fathead minnow larval survival test was initiated at 1450 hours, December 6, 1991. Five concentrations were established for testing (200 mg/L, 800 mg/L, 3,000 mg/L, 9,000 mg/L, and 30,000 mg/L) utilizing reconstituted distilled, deionized water as dilution water. The test was set up using distilled water rinsed 500 mL plastic cups as test chambers. Four replicate cups containing five organisms each in 250 mL of test solution were used per dilution. All organisms used were laboratory reared and less than 24 hours old at test initiation. The test was allowed to proceed for 48 hours during which mortality was recorded daily.

A control of four replicate chambers containing five organisms each in 100% synthetic laboratory water was conducted concurrently with the test. There was 100% survival in the control. Data on surviving organisms as well as water quality measurements were recorded on the data sheet. The test ended at 1450 hours, December 8, 1991. The acute toxicity data analysis program provided by the EPA was employed to determine the LC50 values.

LC50 RESULTS
Pimephales promelas

LC50 value calculated using the Binomial Method:

CONC. (mg/L)	# EXPOSED	# DEAD	% DEAD	BINOMIAL %
30,000	20	20	100	0.0001
9,000	20	6	30	5.7659
3,000	20	1	5	0.0020
800	20	0	0	0.0001
200	20	0	0	0.0001

The Binomial Test shows that 3,000 and 30,000 can be used as statistically sound conservative 95 percent confidence limits since the actual confidence level associated with these limits is 99.99791 percent.

An approximate LC50 for this set of data is 11,800 mg/L.

LC50 value calculated using the Trimmed Spearman-Karber Method:

Trim	Var. of Ln Est.	LC50	95% Conf. Limits
0.00%	0.17396D-01	9,300 mg/L	7,100 to 12,100 mg/L

SUMMARY

The 48-hour LC50 for *Pimephales promelas* exposed to a mixture of OSE II, gasoline, and water was 9,300 mg/L.

BIO-AQUATIC TESTING, INC.

48 – HOUR *PIMEPHALES PROMELAS* ACUTE TOXICITY TEST

CLIENT OSEI Corporation
SAMPLE OSE II, Gasoline, Water
LAB ID # **BO-12-91-2239B**
DATE COLLECTED 12/05/91
DATE RECEIVED 12/05/91
SAMPLE TYPE Grab
TEST TYPE Acute

BEGIN DATE 12/06/91
END DATE 12/08/91
TEST ORGANISM *Pimephales promelas*
TEST TEMPERATURE (°C) 25° ± 1
PHOTO PERIOD 16 hour light / 8 hour dark
LIGHT INTENSITY 75 FT-C
ANALYST W. Smith

SURVIVAL SUMMARY

% EFFLUENT CONC	NUMBER LIVE PER REP												x LIVE PER CONC
	START				24 HOURS				48 HOURS				
	a	b	c	d	a	b	c	d	a	b	c	d	x % Surv.
Control	5	5	5	5	5	5	5	5	5	5	5	5	100
200 mg/L	5	5	5	5	5	5	5	5	5	5	5	5	100
800 mg/L	5	5	5	5	5	5	5	5	5	5	5	5	100
3,000 mg/L	5	5	5	5	5	5	5	5	5	4	5	5	95
9,000 mg/L	5	5	5	5	3	3	5	5	3	1	5	5	70
30,000 mg/L	5	5	5	5	0	0	0	0	0	0	0	0	0

EFFLUENT MEASUREMENTS

D.O. @ 30,000 mg/L[1] 8.6/6.6
pH @ 30,000[1] 8.3/8.4
CONDUCTIVITY @ 30,000 (µMHOS) 500
HARDNESS (mg/L as CaCO3) 272.4 ALKALINITY (mg/L as CaCO3) 625.0

DECHLORINATION

RESIDUAL Cl_2 (mg/L) <0.10 ANALYSIS METHOD Amperometric Titration Method (330.1)
DECHLORINATION REAGENT Not Applicable

DILUTION WATER MEASUREMENTS

D.O. @ 100% (mg/L)[1] 8.6/6.9
pH @ 100%1 8.4/8.3
RECEIVING WATER DILUTION WATER Laboratory adjusted
HARDNESS (mg/L as CaCO3) 160.0 ALKALINITY (mg/L as CaCO3) 107.0

[1] Recorded at the beginning and end of each 24-hour exposure period.

I. Summary

The acute toxicity of the dispersant – Batch #9820, No. 2 fuel oil, and a 1:10 mixture of dispersant and No. 2 fuel oil to *Artemia salina*, is described in this report. The test was conducted for corp for 48 hours during October 3 to 5, 1990, at the EnviroSystems Division of Resource Analysts, Inc. in Hampton, New Hampshire.

The test was performed under static conditions with five concentrations of each test substance and a dilution water control at a temperature of 20 $\pm$ 1°C. The dilution water was sea water adjusted to a salinity of 20 parts per thousand. Aeration was not employed to maintain dissolved oxygen concentrations above an acceptable level. Nominal concentrations of all three test substances were: 0 mg/L (control), 10 mg/L, 25 mg/L, 40 mg/L, 60 mg/L and 100 mg/L. Nominal concentrations were used for all calculations.

Artemia salina used in the test were 24 hours old at the start of the test and they were all in good condition at the beginning of the study. *Exposure of Artemia salina* to the test substances resulted in the following 48 hours median lethal concentrations (LC50): dispersant 100 mg/L, No. 2 fuel oil – 12.6 mg/L (95% confidence interval = 10.0- 25.0 mg/L), and a 1:10 mixture of dispersant and No. 2 fuel oil-29.4 mg/L (95% confidence interval = 25.0 – 40.0 mg/L).

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Web www.osei.us

Date June 30, 2008

Fresh Water Marine Toxicity Test Summary
South Korea (Minnows)

The OSEI Corporation performed a toxicity test for the Korean Government approval process involving minnows (Pimephales promelas). The toxicity test was a 24 hour acute toxicity test. The LC50 value for this test was 707.11 mg/l at a 20% concentration, which is the concentration the Korean government test required. If you extrapolate the test value, had the test been performed at the OSE II application concentration of 2% instead of 20%, then the LC50 would have been over 1337.11 mg/l which proves OSE II to be virtually non toxic. There are several government agencies around the world that try to force specific tests to be performed at a single concentration without allowing for the application rate of a product. So while they come up with a value at a certain concentration it may, or may not be applicable to every product, which is why we point out the extrapolation calculation for OSE II at the recommended application rate.

Steven Pedigo
Chairman/CEO OSEI Corporation

OIL SPILL EATER II (2%)
ACUTE PRODUCT TEST

June 2008

24-Hour Acute Toxicity Test Results

Pimephales promelas

Prepared for:

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Prepared by:

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ACUTE LC50 PRODUCT REPORT

Client . . . . . OSEI, Corporation
Sample . . . . . .Oil Spill Eater II
Project No. OS457
Test Date . . . . . June 2008

Results:

24-hr. *P. Promelas* LC50: **5,856.34 mg/L**
95% Upper Confidence Limits: 6,265.67 mg/L
95% Lower Confidence Limits: 5,473.76 mg/L

INTRODUCTION

A product identified as Oil Spill Eater II, Concentrate was delivered to Huther and Associates, Inc. on June 26, 2008. One acute toxicity test was conducted: a static acute 24-hour definitive toxicity test using *Pimephales promelas* (fathead minnow). Test procedures followed recommended methods contained in "*Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition*", EPA-821-R-02-012, October 2004.

P. promelas are a freshwater aquatic indicator organism frequently used to evaluate the potential toxicity of a compound or an effluent. The acute toxicity of a compound or effluent is generally measured using a multi-concentration, or definitive test, consisting of a control water and a minimum of five increasing concentrations of product added to control water. The test is designed to provide dose-response information, expressed as the concentration that is lethal to 50% of the test organisms (LC50).

SAMPLE PREPARATION

Oil Spill Eater II was initially prepared for definitive testing by adding the product to distilled, deionized water at a ratio of 50 parts water to 1 part product (2% concentration; stock solution). Seven test concentrations of stock solution were prepared in distilled, deionized water reconstituted to 104 mg/L as $CaCO_3$. The seven concentrations were 250, 500, 1000, 2000, 4000, 8000 and 16,000 mg/L. Dissolved oxygen, pH and conductivity were measured in each concentration prior to test initiation and at 24-hours. The test was conducted at 25^{0}C in a photoperiod of 16 hours light and 8 hours dark.

TEST DESIGN
Pimephales promelas

The definitive *Pimephales promelas* test was conducted in 300 mL beakers containing 250 mL of test solution. The test was initiated June 28, 2008. Ten *P. promelas* larvae were added to each of two replicate beakers per concentration. Larvae originated from laboratory cultures and were 48-hours old at test initiation. Larvae were fed *Artemia* nauplii prior to test initiation.

A control of two replicate beakers containing ten *P. promelas* larvae each in laboratory water was conducted concurrently with the test. Survival data were statistically analyzed using the Trimmed Spearman-Karber point estimate test to determine the LC50.

RESULTS

Pimephales promelas

The following LC50 value was determined for Oil Spill Eater II (2%):

24-Hour Definitive Test

Conc. (mg/L)	# exposed	# alive	#dead	% survival
Control	20	20	0	100.0
250	20	20	0	100.0
500	20	20	0	100.0
1000	20	20	0	100.0
2000	20	20	0	100.0
4000	20	20	0	100.0
8000	20	1	19	5.0
16000	20	0	20	0.0

Percent Spearman-Karber Trim:	0.00%
Estimated LC50 (mg/L):	**5,856.34**
95% Lower C.L. (mg/L):	5,473.76
95% Upper C.L. (mg/L):	6,265.67

The pH in all solutions was within the organism's tolerance range.

DISCUSSION AND CONCLUSIONS

One LC50 determination was made for Oil Spill Eater II tested at a 2% concentration: 24-hour *Pimephales promelas* LC50: 5,856.34 mg/L. The acute test was conducted from June 28, 2008 to June 29, 2008.

Huther and Associates, Inc.

environmental toxicologists, biologists, consultants

24-HOUR *PIMEPHALES PROMELAS* SURVIVAL

CLIENT: OSE - 2%

PROJECT #: 05457

CONC.	NUMBER ORGANISMS, 0 HRS A	NUMBER ORGANISMS, 0 HRS B	NUMBER ORGANISMS, 24 HRS A	NUMBER ORGANISMS, 24 HRS B
Con	10	10	10	10
250 mg/L	10	10	10	10
500	10	10	10	10
1000	10	10	10	10
2000	10	10	10	10
4000	10	10	10	10
8000	10	10	10	10
16,000	10	10	10	10
DATE/TIME	MM		MM	
TECHNICIAN	6/28/08 1430		6/29/08 1430	

1156 North Bonnie Brae Denton, Texas 76201 Ph: (940) 387-1026 Fax: (940) 387-1036

OIL SPILL EATER

Test @ 2%

CHEMISTRY MEASUREMENTS

Date	Client	Sample #	ST pH 24hr	ST DO 24hr	Hardness	Alkalinity	Cond.*	~~Ammonia~~	Salinity	Analyst
6/28/05										
			ST | 24hr	ST | 24hr				pH @ 96hr	D.O @ 96hr	
	LAB CONTROL		7.84 | 8.60	8.23 | 7.43			390	7.91	7.92	
	250 mg/L		7.86 | 8.59	8.22 | 7.38			389	7.94	8.14	
	500		7.85 | 8.52	8.20 | 7.44			387	7.95	8.27	
	1000		7.85 | 8.48	8.15 | 7.38			387	7.94	8.26	
	2000		7.86 | 8.42	8.10 | 7.53			388	7.93	8.20	
	4000		7.86 | 8.42	8.15 | 7.28			390	7.92	8.21	
	8000		7.85 | 8.31	8.05 | 7.31			393	7.92	8.05	
	16,000		7.81 | 8.14	7.87 | 7.12			399	7.94	8.03	
	LAB WATER CONTROL		7.84		104	64				

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: JUNE 200 TEST NUMBER: 1 DURATION: 24 H
TOXICANT : OSE II
SPECIES: P. PROMELAS

RAW DATA: Concentration (MG/L)	Number Exposed	Mortalities
.00	20	0
1000.00	20	0
2000.00	20	0
4000.00	20	0
8000.00	20	19
******* 16000.00 BK	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES: LC50: 5856.34
95% LOWER CONFIDENCE: 5473.76
95% UPPER CONFIDENCE: 6265.67

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Email oseicorp@msn.com
Web www.osei.us

Date June 30, 2008

Toxicity Test Summary for a Ceridaphnia Dubia
Fresh Water Flea

The OSEI Corporation performed a toxicity test for a land, water, and airborn based species a Ceriodaphnia Dubia (water flea). The estimated LC 50 for this species even at a higher concentration 20%, than OSE II is applied was 2199.62 which shows that OSE II is also virtually non toxic to bugs as well. The extrapolated value for the LC 50 at OSE II normal application rate of 2% would have been over 4000 mg/l, which shows OSE II is virtually non toxic to water fleas.

Steven Pedigo
Chairman/ CEO OSEI Corporation

OIL SPILL EATER II (2%)
ACUTE PRODUCT TEST

June 2008

24-Hour Acute Toxicity Test Results

Ceriodaphnia dubia

Prepared for:

Oil Spill Eater International, Corporation
13127 Chandler Drive
Dallas, Texas 75243
Tel: 972-669-3390

Prepared by: _____

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huther@flash.net

TABLE OF CONTENTS

ACUTE LC50 PRODUCT REPORT

Client . . . . . OSEI, Corporation
Sample . . . . . 2% Oil Spill Eater II
Project No. OS457
Test Date . . . . . June 2008

Results:

24-hr. *C. dubia* LC50: **>16,000.00 mg/L**
95% Upper Confidence Limits: N/A
95% Lower Confidence Limits: N/A

INTRODUCTION

A product identified as Oil Spill Eater II, Concentrate was delivered to Huther and Associates, Inc. on June 26, 2008. One acute toxicity test was conducted: a static acute 24-hour definitive toxicity test using *Ceriodaphnia dubia* (water flea). Test procedures followed recommended methods contained in "*Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition*", EPA-821-R-02-012, October 2004.

C. dubia are a freshwater aquatic indicator organism frequently used to evaluate the potential toxicity of a compound or an effluent. The acute toxicity of a compound or effluent is generally measured using a multi-concentration, or definitive test, consisting of a control water and a minimum of five increasing concentrations of product added to control water. The test is designed to provide dose-response information, expressed as the concentration that is lethal to 50% of the test organisms (LC50).

SAMPLE PREPARATION

Oil Spill Eater II was initially prepared for definitive testing by adding the product to distilled, deionized water at a ratio of 50 parts water to 1 part product (2% concentration; stock solution). Seven test concentrations of stock solution were prepared in distilled, deionized water reconstituted to 104 mg/L as $CaCO_3$. The seven concentrations were 250, 500, 1000, 2000, 4000, 8000 and 16,000 mg/L. Dissolved oxygen, pH and conductivity were measured in each concentration prior to test initiation and at 24-hours. The test was conducted at 25°C in a photoperiod of 16 hours light and 8 hours dark.

TEST DESIGN *Ceriodaphnia dubia*

The definitive *Ceriodaphnia dubia* test was conducted in 25 mL beakers containing 15 mL of test solution. The test was initiated June 28, 2008. Five C. *dubia* neonates were added to each of four replicate beakers per concentration. Neonates originated from laboratory cultures and were 24-hours old at test initiation. Neonates were fed *Selenastrum capricornutum* prior to test initiation.

A control of four replicate beakers containing five *C. dubia* each in laboratory water was conducted concurrently with the test. Survival data were statistically analyzed using the Trimmed Spearman-Karber point estimate test to determine the LC50.

RESULTS
Ceriodaphnia dubia

The following LC50 value was determined for Oil Spill Eater II (2%):

24-Hour Definitive Test

Conc. (mg/L)	# exposed	# alive	#dead	% survival
Control	20	20	0	100.0
250	20	20	0	100.0
500	20	20	0	100.0
1000	20	20	0	100.0
2000	20	20	0	100.0
4000	20	19	1	95.0
8000	20	20	0	100.0
16000	20	17	3	85.0

Percent Spearman-Karber Trim:	0.00%
Estimated LC50 (mg/L):	**>16,000.00**
95% Lower C.L. (mg/L):	N/A
95% Upper C.L. (mg/L):	N/A

The pH in all solutions was within the organism's tolerance range.

DISCUSSION AND CONCLUSIONS

One LC50 determination was made for Oil Spill Eater II tested at a 2% concentration: 24-hour *Ceriodaphnia dubia* LC50: >16,000.00 mg/L. The acute test was conducted from June 28, 2008 to June 29, 2008.

Huther and Associates, Inc.

environmental toxicologists, biologists, consultants

24-HOUR *CERIODAPHNIA DUBIA* SURVIVAL

CLIENT: OSE 2%

PROJECT #: 05457

CONC.	NUMBER ORGANISMS, 0 HRS A	B	C	D	NUMBER ORGANISMS, 24 HRS A	B	C	D
CON	5	5	5	5	5	5	5	5
250 mg/L	5	5	5	5	5	5	5	5
500	5	5	5	5	5	5	5	5
1000	5	5	5	5	5	5	5	5
2000	5	5	5	5	5	5	5	5
4000	5	5	5	5	5	5	5	4,
8000	5	5	5	5	5	5	5	5
16,000	5	5	5	5	4,	4,	5	4,
DATE/TIME	6/28/08 1245				6/29/08 1245			
TECHNICIAN	mm				mm			

OIL SPILL EATER

Test @ 2%

CHEMISTRY MEASUREMENTS

Date	Client	Sample #	ST pH 24hr	ST DO 24hr	Hardness	Alkalinity	Cond. *	~~Ammonia~~	Salinity	Analyst
6/28/05										
			ST | 24hr	ST | 24hr				pH@96hr	D.O@96hr	
	LAB CONTROL		7.84 | 8.60	8.23 | 7.43			390	7.91	7.92	
	250 mg/L		7.86 | 8.59	8.22 | 7.38			389	7.94	8.14	
	500		7.85 | 8.52	8.20 | 7.44			387	7.95	8.27	
	1000		7.85 | 8.48	8.15 | 7.38			387	7.94	8.26	
	2000		7.86 | 8.42	8.10 | 7.53			388	7.93	8.20	
	4000		7.86 | 8.42	8.15 | 7.28			390	7.92	8.21	
	8000		7.85 | 8.31	8.05 | 7.31			393	7.92	8.05	
	16,000		7.81 | 8.14	7.87 | 7.12			399	7.94	8.03	
	LAB WATER CONTROL		7.84		104	64				

ACUTE REFERENCE TOXICANT TEST RESULTS

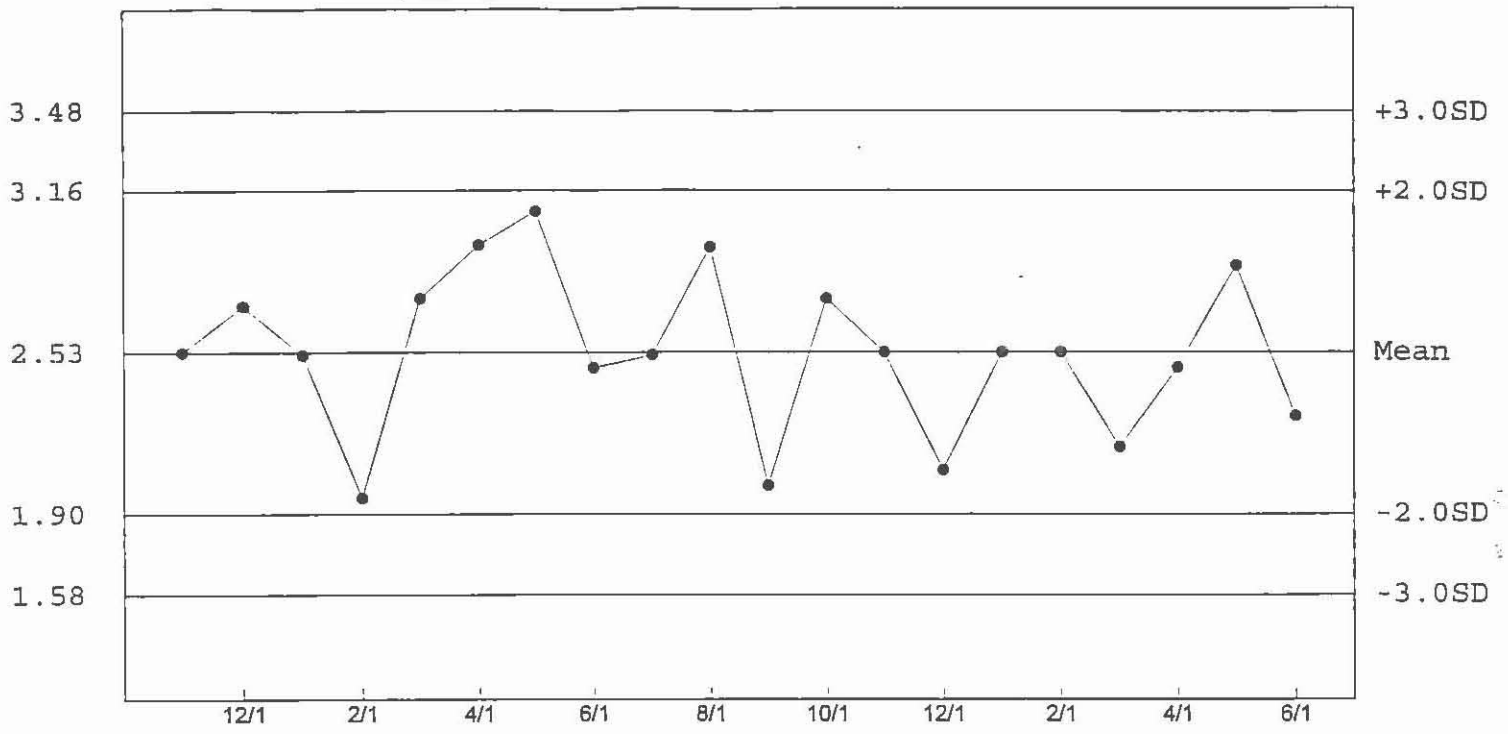
SPECIES:	*Ceriodaphnia dubia*
CHEMICAL:	Sodium Chloride
DURATION:	48-Hours
TEST NUMBER:	6
TEST DATE:	June 2008
STATISTICAL METHOD:	Spearman-Karber

CONCENTRATION (g/L)	NUMBER EXPOSED	NUMBER DEAD
1.0	10	0
1.5	10	0
2.0	10	0
2.5	10	9
3.0	10	10
4.0	10	10

LC50	95% LOWER CONFIDENCE LIMITS	95% UPPER CONFIDENCE LIMITS
2.28 g/L	**2.20 g/L**	**2.37 g/L**

Ref. Toxicant Sodium chloride g/L

Ceriodaphnia dubia LC50



n= 20 Mean= 2.53 SD= 0.32 CV= 12.49% Min= 1.96 Max= 3.08

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MARINE TOXICITY TEST SUMMARY
35 Toxicity Tests

By Third party governments US EPA, South Korea,
Environment Canada, Australian Government lab, UK government lab, ect.

OSEI Corporation, i *"Oil Spill Eater II"* is virtually non-toxic, presents the following toxicity tests on salt water , fresh water species, as well as land based species. These tests were performed by the US EPA, Environment Canada, for the South Korea government, and by industry:

The **MYSIDOPSIS BAHIA (or Mysid)** is one of the more sensitive marine organisms found in the oceans. LC50's (Lethal Concentration) is the level in which there is mortality with 50% of the species being tested. The lethal concentration calculated for OSEII on the Mysid was calculated once 10% of the test species showed equilibrium problems or mortality. At 96 hours, only 10% of the test species showed equilibrium problems or mortality at a calculated level of 2100 mg/L or 2,100 parts per million. This shows OSEII to have a low toxicity level, and had a true LC50 been performed the toxicity level would have been even lower.

The **MUMMICHOG (Fundulus Heteroclitus)** a somewhat larger organism (1 to 1.5 inches long) was tested to see how toxic OSEII was to it. 5,258 mg/L was established. 5,285 parts per million shows a very little toxicity for the Mummichog when exposed to Oil Spill Eater II.

OSEI Corporation had two (2) fresh water toxicity tests run also. Environmental Canada, the U.S. EPA's equivalent in Canada, performed a toxicity test on rainbow trout. Rainbow trout are very sensitive fresh water species. The LC50 was greater than 10,000 mg/L. This shows OSEII to have virtually no toxicity in fresh water as well as salt water.

The other fresh water test was run on fathead minnows for the physical engineer in Plano, Texas, USA. We were attempting to prove that hydrocarbons which have had

OSEII applied to them and then washed in the storm drain would not add any toxicity to the storm drain.

Environment Canada performed toxicity tests with OSE II Two gallons of gasoline was poured onto a low area in a commercial business parking lot, and OSEII was applied, allowed to set 3 minutes, and then washed to another low area for collection.

Approximately 1 ••• gallons of runoff was collected and taken to the lab where a 48 hour fathead minnow survival test was initiated. The resulting LC50 test was 9,300 mg/L which shows that gasoline which has had OSEII applied to it is rendered virtually non-toxic.

This helped alleviate the physical engineer's concerns for adding anything toxic to the storm drain and ultimately to a creek, river or lake. This test shows that using OSEII would help reduce the toxicity to storm drains from rain water runoff. If OSEII is used periodically to clean the parking lot allowing the site to stay within its NPDES permitted discharge levels.

Sincerely,
Steven Pedigo
Chairman

SP/eem99 OIL SPILL EATER INTERNATIONAL, CORP.

SUMMARY
EPA/NETAC TOXICITY TEST
MYSIDOPSIS BAHIA

The Environmental Protection Agency in Gulf Breeze, Florida tested OIL SPILL EATER II Concentrate, for toxicity using a sensitive species named "Mysidopsis Bahia". This test was in conjunction with Efficacy Tests performed by the EPA and NETAC.

The LC50 for the acute (96 hr.) test was greater than 1,900 and up to 10,000 mg/L which shows OSE II to be virtually non-toxic.

The EPA allowed the use of Inipol during the Valdez Spill and Inipol's LC50 was 135 mg/L which would seem to OSEI, Corp to be somewhat toxic considering Environmental Canada's cut off is 1,000 mg/L.

A second LC50 was performed at 7 days to see if there was any problem with chronic toxicity. The LC50 was 2,500 mg/L, which once again shows OSE II to be virtually non-toxic even when the species was exposed in a closed environment for 7 days. It would be extremely difficult for a species to be exposed to OSE II for 7 days in an open system due to currents, wind and tidal actions.

This 3rd party, U.S. EPA Toxicity Test absolutely proves OSE II is virtually non-toxic.

By: Steven R. Pedigo
Chairman/OSEI, Corp.

SRP/AJL100

OIL SPILL RESPONSE BIOREMEDIATION AGENTS
EVALUATION METHODS VALIDATION TESTING
DISCUSSION OF RESULTS

The following data are provided for the oil spill response bioremediation agent producer as a means to begin to assess how this bioremediation agent may behave in response to an oil spill in the environment.
The Tier II 96-hour toxicity test data was conducted with Mysidopsis bahia test species. Mortality was the single measure response, therefore, survival data were used to calculate the 96-hour LC50. LC50 is the lowest concentration effecting 50% mortality of the test organism during a 96 hour exposure period. Sub-lethal and lethal responses were noted at concentrations between 1,000-10,000 mg/L (> 1,900 mg/L) following acute exposure of M.bahia to your bioremediation product.
Oil Spill Eater II was shown to cause a statistically significant reduction (p = 0.05) in the survival of Mysidopsis when animals were exposed during a chronic estimator test for a 7 day period. In general, 7 day exposure (2,500 mg/L) correlated well with values calculated following the 96 hour exposure (> 1,900 mg/L).NETAC101

TIER II TOXICITY DATA
TABLE 1

ACUTE TOXICITY VALUES FOR 96 HOUR LC_{50} – MYSIDOPSIS BAHIA

LC_{50} = Lethal concentration of product that will cause the death of 50% of the test species population within a defined exposure time.
a = LC50 presented as a range of test concentrations since data were from 96-hour acute range-finding test.
b = LC50 presented as a single, numerical value since data were from a definitive 96-hour acute toxicity test.
ND = Not Determined

TABLE 2
CHRONIC TOXICITY VALUES FOR 7 DAY LC_{50} – ***MYSIDOPSIS BAHIA***

NOEC = No Observable Effect Concentration
LOEC = Lowest Observable Effect Concentration
CI = Confidence Interval
NE = No Effect
Fecundity = Egg Production

As we indicated prior and to better understand the data presented above we are including a copy of the Evaluation Methods Manual. The Statistical Method Summary is found in Section 4, Method #8, page 40, of the manual and is intended to help a scientist understand the basis of the experimental objectives developed for this test.

Max. Test
Concentration
(mg/L)
Confidence
Interval

(95%)
96 hour LC50
(mg/L)
Product
1,000-10,000[a]
>1,900[b]
Oil Spill
Eater II
10,000
ND
7 Day LC50
(mg/L)
(95% CI)
Endpoints
(mg/L)
Effects
Measurement
Product

NOEC LOEC

5,700
NE
1,900
1,900
1,900
633
Survival
Growth
Fecundity
2,500(mg/L)
(2,225-3,313)

Oil Spill
Eater II NETAC102
Static Acute Toxicity of
Oil Spill Eater II, Batch 329,

To the Mysid, Mysidopsis bahia
Study Completed
March 9, 1990
Performing Laboratory
EnviroSystems Division

Resource Analysts, Incorporated
P.O. Box 778
One Lafayette Road
Hampton, New Hampshire 03842

I. SUMMARY

The acute toxicity of Oil Spill Eater II, batch 329 to the mysid, Mysidopsis bahia, is described in this report. The test was conducted for Incorporated for 96 hours during March 5-9, 1990 at the EnviroSystems Division of Resource Analysts, Inc. in Hampton, New Hampshire. It was conducted by Jeanne Magazu, Peter Kowalski, Robert Boeri, and Timothy Ward.

The test was performed under static conditions with five concentrations of test substance and a dilution water control at a mean temperature of 19.5◦C. The dilution water was filtered natural seawater collected from the Atlantic Ocean at Hampton, New Hampshire. Aeration was not required to maintain dissolved oxygen concentrations above an acceptable level. Nominal concentrations of Oil Spill Eater II were: 0 mg/L (control), 1 mg/L, 10 mg/L, 100 mg/L, 1,000 mg/L, and 10,000 mg/L. Nominal concentrations were used for all calculations.

Mysids used in the test were less than 5 days old at the start of the test. They were produced at Resource Analysts, Inc. and acclimated under test conditions for their entire life. All mysids were in good condition at the beginning of the study.

Exposure of mysids to the test substance resulted in a 96 hour LC50 of 2,100 mg/L Oil Spill Eater II, with a 95 percent confidence level of 100 – 10,000 mg/L. The 96 hour no observed effect concentration is estimated to be 100 mg/L.

IV. METHODS AND MATERIALS

TEST SUBSTANCE:

Oil Spill Eater II (EnviroSystems Sample Number 2351E) was delivered to EnviroSystems on March 5, 1990. It was contained in a 500 ml plastic bottle that was labeled with the following information: Oil Spill Eater II, Batch 329. The sample was supplied by Incorporated. Prior to use the test material was stored at room temperature. Nominal concentrations were added to test media on a weight/vol basis and are reported as mg/L.

DILUTION WATER:

Water used for acclimation of test organisms and for all toxicity testing was seawater collected from the Atlantic Ocean at EnviroSystems in Hampton, New Hampshire. Water was adjusted to a salinity of 11-17 ppt (parts per thousand) and stored in 500-gallon polyethylene tanks, where it was aerated.

TEST ORGANISM:

Juvenile mysids employed as test organisms were from a single source and were identified using an approximate taxonomic key. They were produced and acclimated at the Resource Analysts, Inc. facility for their entire life. During acclimation mysids were not treated for disease and they were free of apparent sickness, injuries, and abnormalities at the beginning of the test. Mysids were fed newly hatched Artemia salina nauplii (EnviroSystems lot number BS01) once or twice daily before the test.

TOXICITY TESTING:

The definitive toxicity test was performed during March 5-9, 1990. It was based on procedures of the U.S. Environmental Protection Agency (1986, 1987). The test was conducted at a target temperature of 20 ± 2◦C with five concentrations of test substance and a dilution water control. A stock solution was prepared by combining 20.0 g of test substance with 2,000 ml of dilution water. The stock solution was added directly to dilution water contained in the test vessels without the use of a solvent. Nominal concentrations of the test material were: 0 mg/L, 10 mg/L, 100 mg/L, 1,000 mg/L, and 10,000 mg/L.

Twenty mysids were randomly distributed among a single replicate of each treatment. The test was performed in 2 liter glass dishes (approximately 25 cm in diameter and 8 cm deep) that contained 1.0 liter of test solution (water depth was approximately 4 cm). Test vessels were randomly arranged in an incubator during the 96 hour test. A 16 hour light and 8 hour dark photoperiod was automatically maintained with cool-white fluorescent lights that provided a light intensity of 40 $eEs^{-1}m^{-2}$. Aeration was not required to maintain dissolved oxygen concentrations above acceptable levels. Mysids were fed newly hatched Artemia salina nauplii once per day during the test.

The number of surviving organisms and the occurrence of sublethal effects (loss of equilibrium, erratic swimming, loss of reflex, excitability, discoloration, or change in behavior) were determined visually and recorded initially and after 24, 48, 72, and 96 hours. Dead test organisms were removed when first observed. Dissolved oxygen (YSI Model 57 meter; instrument number PRL-3), pH (Beckman model pHI 12 meter; instrument number PRL-4), salinity (Labcomp SCT meter, instrument number PRL-6), and temperature (ASTM mercury thermometer; thermometer number 2211) were measured and recorded daily in each test chamber that contained live animals.

STATISTICAL METHODS:

Results of the toxicity test were interpreted by standard statistical techniques. Computer methods (Stephan, 1983) were used to calculate the 96 hour median lethal concentration (LC50). The no observed effect level is the highest tested concentration at which 90% or more of the exposed organisms were unaffected.

V. RESULTS

No insoluble material was observed in any test vessel during the test. Biological and water quality data generated by the acute toxicity test are presented in Table 1 and Appendix A, respectively. One hundred percent survival occurred in the control exposure.

The dose – response curve for organisms exposed to the test substance for 96 hours is presented in Figure 1. Exposure of mysids to the Oil Spill Eater II, batch 329, resulted in a 96 hour LC50 of 2,100 mg/L, with a 95 percent confidence interval of 100 – 10,000 mg/L. The 96 hour no observed effect concentration is estimated to be 100 mg/L.

Table 1. Survival data from toxicity test

Nominal Concentration (mg/L)	Number Alive 0hr	24hr	48hr	72hr	96hr	Number Affected 0hr	24hr	48hr	72hr	96hr
0 (control)	1	10	10	10	10	10	0	0	0	0
1	1	10	10	9	9	9	0	0	0	0
10	1	10	10	9	9	9	0	0	0	0
100	1	10	10	10	9	9	0	0	0	0

1,000 1 10 9 9 8 8 0 0 0 0 0
10,000 1 10 0 0 0 0 0 - - - -

Resource ana

TOXICITY TEST
FOR ARTEMIA SALINA

To gain acceptance on the U.S. EPA's National Contingency Plan List, we were requested to perform an additional Toxicity Test on Artemia Salina using EPA's Standard Dispersant Toxicity Test.
OSE II Concentrate was presented to the laboratory, but the laboratory refers to the product as a Dispersant instead of OSE II throughout the write-up, since it was a Dispersant Toxicity Test. The Test proved that OSE II Concentrate is once again virtually non-toxic. This particular test proved OSE II helps to detoxify oil. The fuel oil had a higher toxicity rate than did the fuel and OSE II, which shows OSE II to immediately starts reducing the toxicity of hydrocarbons once OSE II is applied. The fuel oils toxicity was 12.4 ppm, and the fuel oil and with OSE II applied showed a drop in the fuel oils toxicity to 29.4, over a 100 percent reduction of the toxicity of the fuel oil. This shows real value in utilizing OSE II since the toxicity of the spilled contaminant would be reduced immediately lesoning the impact of a spill to the associated environment and marine species.
OSE II gained acceptance to the EPA's National Contingency Plan once this test was presented to the EPA.

By: Steven R. Pedigo
Chairman, OSEI, Corp.

Standard Dispersant Toxicity Test with the

OSE II, Batch #9820 and Artemia salina

Authors
Timothy J. Ward
Robert L. Boeri
Performing Laboratory
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One Lafayette Road
Hampton, New Hampshire 03842
October, 1990

II. TABLE OF CONTENTS

III. Index of Tables

IV. INTRODUCTION

The objective of the study was to determine the acute toxicity of the dispersant – Batch # 9820, No. 2 fuel oil, and a 1:10 mixture of dispersant and oil to *Artemia salina*, a marine invertebrate. The report contains sections that describe the methods and materials employed in the study, and the results of the investigation. The report also contains an appendix that presents the water quality data collected during the tests.

V. METHODS AND MATERIALS

TEST SUBSTANCE:

The dispersant – Batch # 9820 (EnviroSystems Sample Number 2591E) was delivered to EnviroSystems on August 17, 1990. It was contained in two 1,000 ml plastic bottles that were labeled with the following information: “Batch # 9820”. The No. 2 fuel oil (EnviroSystems Sample Number 2599E) was delivered to EnviroSystems on August 28, 1990. It was contained in a 1,000 ml plastic bottle that was labeled with the following information: “# 2 fuel oil”.

DILUTION WATER:

Water used for hatching and acclimation of test organisms and for all toxicity testing was formulated at EnviroSystems in Hampton, New Hampshire. Water was diluted to a salinity of 20 parts per thousand and stored in polyethylene tanks where it was aerated.

TEST ORGANISM:
Juvenile *Artemia salina* employed as test organisms were from a single source and were identified using an appropriate taxonomic key. *Artemia salina* used in the test were produced from an in-house culture and were 24 hours old at the start of the test. Prior to testing, *Artemia salina* were maintained in 100% dilution water under static conditions. During acclimation *Artemia salina* were not treated for disease and they were free of apparent sickness, injuries, and abnormalities at the beginning of the test. They were not fed before or during the tests.
TOXICITY TESTING:
Screening tests with the test substances were conducted during October 1 to 3, 1990. The definitive toxicity tests were performed with the dispersant, No. 2 fuel oil, a 1:10 mixture of dispersant and oil, and the standard toxicant, dodecyl sodium sulfate during October 3 to 5, 1990, according to procedures of the U.S. EPA (1984). The tests were conducted at a target temperature of 20 ± 1◦C with five concentrations of each test substance and a dilution water control.

The dispersant and oil stock solutions were prepared by combining 550 ml of sea water and 0.55 ml of test substance in a glass blender jar and mixing the solution at 10,000 rpm for 5 seconds. The combined dispersant and oil stock solution was prepared by mixing 550 ml of sea water at 10,000 rpm and adding 0.5 ml of oil and 0.05 ml of dispersant. This combined mixture was then mixed for 5 seconds. Nominal concentrations of each test material were: 0 mg/L (control), 10 mg/L, 25 mg/L, 40 mg/L, 60 mg/L, and 100 mg/L. Media in each test vessel was added at the beginning of the test and not renewed.
Twenty *Artemia salina* were randomly distributed to each of 5 replicates of each treatment. The tests were performed in 250 ml glass Carolina culture dishes that contained 100 ml of test solution (water depth was approximately 2.5 cm). Test vessels were randomly arranged in an incubator during the 48 hour test. A 24 hour light and 0 hour dark photoperiod was maintained below the dishes. Aeration was not required to maintain dissolved oxygen concentrations above acceptable levels. *Artemia salina* were not fed during the tests.
The number of surviving organisms was determined visually and recorded initially and after 24 and 48 hours. Dead test organisms were removed when first observed. Dissolved oxygen (YSI Model 57 meter; instrument number PRL-18), pH (Beckman model pHI 12 meter; instrument number PRL-4), salinity (Refractometer, instrument number PRL-6), and temperature (ASTM mercury thermometer; thermometer number 2211) were measured and recorded at the beginning and end of each test in one test chamber of each concentration.
STATISTICAL METHODS:
Results of the toxicity test were interpreted by standard statistical techniques (Stephen, 1983). The binomial method was used to calculate the median lethal concentration (LC50) values.

VI. RESULTS

All test vessels containing dispersant appeared clear throughout the test and all test vessels containing oil or oil and dispersant had an oil slick on the surface of the test media throughout the

test. Biological and water quality data generated by the acute toxicity tests are presented in Table 1 and Appendix A, respectively. Ninety-nine percent survival occurred in the control exposure. The 48 hour LC50 for *Artemia salina* exposed to the reference toxicant dodecyl sodium sulfate is 38.7 mg/L.

The 24 and 48 hour LD50s from the three toxicity tests are presented in Table 2. The 48 hour LC50s for *Artemia salina* exposed to the test substances are: dispersant/OSE II - >100 mg/L, No. fuel oil – 12.6 mg/L (95% confidence interval = 10.0 – 25.0 mg/L), and a 1:10 mixture of dispersant/OSE II and
No. 2 fuel oil – 29.4 mg/L (95% confidence interval = 25.0 – 40.0 mg/L).

Table 1. Survival data from toxicity tests

Number Alive

Nominal Concentration (mg/L)	rep.	Dispersant/OSE II 0hr	24hr	48hr	No. 2 fuel oil 0hr	24hr	48hr	Oil + Dispersant/OSE II 0hr	24hr	48hr
0 (control)	1	20	20	20	20	20	20	20	20	20
	2	20	20	19	20	20	19	20	20	20
	3	20	20	20	20	20	20	20	20	20
	4	20	20	20	20	20	20	20	20	20
	5	20	20	20	20	20	20	20	20	20
10	1	20	19	17	20	20	17	20	20	19
	2	20	20	17	20	20	19	20	20	18
	3	20	20	20	20	20	12	20	18	18
	4	20	20	19	20	20	9	20	20	17
	5	20	19	18	20	18	10	20	20	16
25	1	20	20	16	20	18	0	20	19	19
	2	20	19	17	20	19	3	20	18	15
	3	20	20	18	20	19	2	20	20	16
	4	20	19	12	20	20	2	20	20	17
	5	20	19	15	20	20	0	20	19	14
40	1	20	19	16	20	20	0	20	19	0
	2	20	20	14	20	19	0	20	20	0
	3	20	20	19	20	20	0	20	20	0
	4	20	20	15	20	18	0	20	14	0
	5	20	20	17	20	17	0	20	18	2
60	1	20	19	18	20	18	0	20	18	0
	2	20	19	16	20	19	0	20	19	0
	3	20	19	19	20	16	0	20	19	0
	4	20	20	17	20	19	0	20	16	0
	5	20	20	16	20	14	1	20	16	1
100	1	20	20	18	20	13	0	20	20	0
	2	20	20	18	20	8	0	20	20	0
	3	20	19	13	20	9	0	20	20	0
	4	20	20	19	20	10	0	20	20	0
	5	20	20	16	20	8	0	20	20	0

VII. REFERENCES

Stephen, C.E. 1983. Computer program for calculation of LC50 values. Personal communication.

U.S. EPA. 1984. Revised Standard Dispersant Toxicity Test. Federal Register, Volume 49, Number 139, Wednesday, July 18, 1984, pages 29204 to 29207.

Appendix A. WATER QUALITY DATA FROM TOXICITY TESTS

I. Summary

The acute toxicity of the dispersant – Batch #9820, No. 2 fuel oil, and a 1:10 mixture of dispersant/OSE II and No. 2 fuel oil to *Artemia salina*, is described in this report. The test was conducted for OSEI corp for 48 hours during October 3 to 5, 1990, at the EnviroSystems Division of Resource Analysts, Inc. in Hampton, New Hampshire.

The test was performed under static conditions with five concentrations of each test substance and a dilution water control at a temperature of 20 ± 1◦C. The dilution water was sea water adjusted to a salinity of 20 parts per thousand. Aeration was not employed to maintain dissolved oxygen concentrations above an acceptable level. Nominal concentrations of all three test substances were: 0 mg/L (control), 10 mg/L, 25 mg/L, 40 mg/L, 60 mg/L and 100 mg/L. Nominal concentrations were used for all calculations.

Artemia salina used in the test were 24 hours old at the start of the test and they were all in good condition at the beginning of the study. Exposure of *Artemia salina* to the test substances resulted in the following 48 hours median lethal concentrations (LC50): dispersant/OSE II >100 mg/L, No. 2 fuel oil – 12.6 mg/L (95% confidence interval = 10.0- 25.0 mg/L), and a 1:10 mixture of dispersant/OSE II and No. 2 fuel oil-29.4 mg/L (95% confidence interval = 25.0 – 40.0 mg/L).

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EPA in Cooperation with NETAC a Group out of
Pittsburgh University performed Efficacy and ToxicityTesting
on OSE II for the EPA NCP Protocol Development.
The Summary follows

The OSEI Corporation supplied OSE II to Hap Prichard of the US EPA in 1992. The EPA performed two separate tests a 48 hour exposure test and a 96 hour exposure test, on two different species Mysidopsis Bahia, and Menidia beryllina. The Mysidopsis Bahia tests also contained a static renewal LC50 for 48 hours and 96 hours with OSE II, and a 7 day toxicity test as well.

The test information is contained in the five pages following this summary, as well as the freedom of information request that was honored over five (5) years after it was requested for these tests shows the OSEI Corporation received this information from the US EPA. The test information with the redacted black outs, is as the OSEI Corporation received them, from the US EPA.

Toxicity tests are performed to show the potential effects of a product to marine species. The larger or higher the number the less toxic the product is. LC 50, the LC means lethal concentration, or the concentration of a product to produce death of the test species.

The US EPA 's first toxicity test of OSE II was on Mysidopsis Bahia for 48 hours of exposure, and for 96 hours of exposure. The 48 hour exposure toxicity test showed OSE II 's toxicity value to be between 5,661 to 7,927 for an average of 6,698. The 96 hour exposure toxicity test showed OSE II 's toxicity value to be between 3,125 to 6,250 for an LC 50 of 5,970. These two test shows the US EPA has proven OSE II to be virtually non toxic.

The US EPA static renewal LC 50 with OSE II and the Mysidopsis Bahia was >5,700 for the 48 hour exposure, and >5,700 for the 96hr as well. The EPA established values for OSE II with this species for both exposure times proves OSE II is virtually non toxic.

The US EPA went on to perform a seven (7) day toxicity test with OSE II and the Mysidopsis Bahia. The LC 50 was 2,225 to 3,133, for an LC 50 value of 2,500 which for a seven (7) day toxicity test is phenomenally non toxic.

The US EPA performed toxicity tests on a second species for the EPA/NETAC testing Menidia beryllina. The first test on this species was for an exposure time of 48 hours, and the LC 50 value was 6,250 to 12,500 for an LC 50 value of 8,839. The second test with the Menidia beryllina was for the exposure time of 96 hours, and the value was

between 6,250 and 12,500 as well for an LC 50 of 8,839. These two test show the US EPA proving OSE II is virtually non toxic on a second species

These toxicity tests associated with the US EPA/NETAC testing as well as the numerous other toxicity tests that have been performed with OSE II by the US EPA and other governments, and for other governments by the OSEI Corporation overwhelmingly prove OSE II is safe for any marine environments species. These toxicity tests show that when OSE II is utilized for a spill there is real value obtained by using OSE II since it converts a spill to CO 2 and water while limiting and or reducing the toxicity of the spill to the environment.

Steven Pedigo
OSEI Corporation

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HEALTH AND ENVIRONMENTAL EFFECTS
RESEARCH LABORATORY
RESEARCH TRIANGLE PARK, NC 27711

June 25, 2003

OFFICE OF
RESEARCH AND DEVELOPMENT

Mr. George Lively
Oil Spill Eater International Corp.
13127 Chandler Drive
Dallas, Texas 75243

RECEIVED
BY ORL | DATE 6-30-03

re: Freedom of Information Act Request HQ-RIN-01971-02

Dear Mr. Lively:

In response to your request for records under the Freedom of Information Act, we were asked to search for and provide data generated using Product C at the Gulf Ecology Division (GED) during the development of oil spill bioremediation protocols. The research involved several laboratories, both within the Office of Research and Development and outside of the Agency.

We are providing these data as an enclosure to this letter, at no cost to you. We also offer a quick explanation of these data in the hopes that it will facilitate your understanding and use .

It is important to note that we used a variety of commercial bioremediation products (CBAs) to develop and evaluate test systems and protocols for the purpose of assessing the efficacy and environmental safety (toxicity) of current and future oil spill bioremediation agents; thus, any data generated with a particular (CBA) was not primarily for the intent of evaluating the product but rather for the purpose of evaluating the test systems under development. These CBAs were provided to us, blind coded, by NETAC–at no time during the collection of these data did we know the actual name of the vendor or product, and thus none of the data will have a vendor's name or product identification associated with it.

In our data, we sometimes refer to Product C as Product 1 - 3 or as CBA C; we have also referred to it by another letter (see manuscript information, below). Data generated at GED was developed through collaborative studies (two cooperative agreements) with the University of West Florida. Throughout the course of evaluating the tests systems, data from more than one CBA might be discussed in notebooks on the same day. Where we have included copies of this data, we have crossed through information that does not respond to FOIA Request HQ RIN-01971-02.

In order to put the data provided in its proper perspective, a copy of a publication and parts of a manuscript are provided to serve as entry points to understanding the data, logs, and materials in this package.

Protocol development utilized a tiered approach of increasingly complex test systems for product evaluation, which is described in more detail in the EPA publication EPA/600/X-93/001 (mentioned below). There were three primary aspects of this research which were conducted at GED that generated data with CBA C:

TOXICOLOGY

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MENIDIA BERYLLINA 96-H STATIC TEST WITH PRODUCT C (CBA C)

Table 3. 48, 96 h, and 7-d LC50 values (95% conf. lim.)[a] for CBAs in static and static-renewal tests using *M. beryllina* and *M. bahia*.

	static LC50		static-renewal LC50		
CBA	48-h	96-h	48-h	96-h	7-d
Mysidopsis bahia					
B	6,698 (5,661-7,927)	5,970 (3,125-6,250)	>5,700	>5,700	2,500 (2,225-3,133)
Menidia beryllina					
B	8,839 (6,250-12,500)	8,839 (6,250-12,500)	---[b]		

[a]Nominal concentrations (mg/L).
[b]Short-term chronic test not conducted.

Marine
Management
Organisation

Marine Pollution Response Team, Marine Management Organisation,
Lancaster House, Hampshire Court, Newcastle-upon-Tyne, NE4 7YH
Tel: 0191 376 2511
Fax: 0191 376 2682
Email: dispersants@marinemanagement.org.uk

Approval for the use of oil spill treatment products in the sea under the provisions of the Marine and Coastal Access Act 2009

Approval reference number ODA 241/2015

Name and address of approval holder

Mr SRP Pedigo
Oil Spill Eater International Corporation (OSEI Corporation)
P.O. BOX 515429
Dallas, Texas 75251 USA

Postcode

The Secretary of State for Environment, Food and Rural Affairs (referred to as "the licensing authority") in exercise of the power conferred by Section 15 of the Marine Licensing (Exempted Activities) Order 2011 approves the use of Oil Spill Eater II as a bioremediation product within United Kingdom controlled waters (other than waters adjacent to Scotland and Northern Ireland).

This approval shall remain in force for a period of 5 years from the date given below subject to the following conditions.

1. The product shall not be used except as stated at the time of application for approval, or in accordance with any subsequent instructions issued by the manufacturer or approval holder and approved by the licensing authority.
2. Only the product label provided by the approval holder and accepted by the licensing authority shall be used on supplies of the product marketed in the United Kingdom.
3. The approval holder shall not change the composition of the product, or the source of its raw material from that given in the application for approval without the prior notification to and the agreement of the licensing authority. If any change in any respect is made without the agreement of the licensing authority the product must be withdrawn from use. In such cases the agreement of the licensing authority must be obtained before the product is put back into use.
4. Any changes to the name and address details must also be brought to the attention of the Marine Management Organisation.

Signature K Morton Date 23/01/2015

Katherine Morton

Marine Pollution Response Team
Marine Management Organisation
for and on behalf of the licensing authority

Appendix B Modifications to the Water Quality Monitoring Plan

November 1, 2019

Mr. Doug MacNeal
Project Manager, Department of
Environmental Remediation
New York State Department of
Environmental Conservation
Albany, New York

Modifications to the Water Quality Monitoring Plan
North Water Street Former MGP Site
2 Dutchess Avenue, Poughkeepsie, New York
NYSDEC ID: C31-40-70

The purpose of this letter is to present the modifications proposed to the Water Quality Monitoring Plan detailed in the New York State Department of Environmental Conservation (NYSDEC)-approved Remedial Design/Remedial Action (RD/RA) Work Plan (AECOM, 2018) for the Central Hudson Gas and Electric Corporation (CHGE) former North Water Street Manufactured Gas Plant (MGP) Site (Site) located at 2 Dutchess Avenue, Poughkeepsie, New York. The proposed modifications are intended to supplement the water quality measures summarized in Section 5.2.1.2 of the RD/RA Work Plan and incorporate requirements received from the NYSDEC and New York State Department of Health on April 22, 2019, September 30, 2019, and October 8, 17, and 24, 2019.

Objectives

The purpose of the modifications to the Water Quality Monitoring Plan is to monitor the water quality of the Hudson River in and around the in-water remedial action area, and to monitor the incoming river water at the Poughkeepsies' Water Treatment Facility (PWTF), the Town of Lloyd's Highland Water District (HWD) facility, and the Dutchess County Water and Wastewater Authority's (DCWWA) Hyde Park facility.

Locations

Collection of water quality analytical samples will take place at the following locations:

- Lower pump house of the PWTF (lower pump house location)
- Effluent chamber of the PWTF (effluent location)
- Influent sampling tap of the HWD facility (HWD facility location)
- Influent sampling tap of the DCWWA Hyde Park facility (DCWWA facility location)
- Halfway between the northernmost extent of the dredge area and intake of the PWTF (in-river high tide location)
- Approximately 500 feet south of the southernmost extent of the dredge area (in-river low tide location)

- Within the dredge containment cell “moon pool” (moon pool)
- Approximately 100 to 200 feet away from the moon pool in the direction of the prevailing tide (perimeter system)

Samples at the in-river locations will be collected concurrently at two depths - one surface sample and another located mid-point between the surface and bottom of Hudson River. Samples at the moon pool and perimeter system locations will be collected at two depths – one bottom sample and another located mid-point of the water column. **Figure 1** presents the water quality sample collection locations.

Analysis

The samples from the lower pump house, the HWD facility, and the DCWWA facility locations will be analyzed in accordance with the most current Analytical Services Protocol (ASP) for Target Compound List plus 30 (TCL+30) at an New York State Department of Health Environmental Laboratory Approval Program (ELAP) certified laboratory. The samples from the effluent location will be analyzed using 10NYCRR Part 5 approved methodology and the ASP for TCL+30. The detection limits will allow for comparisons with the Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 for drinking water sources.

The samples at the in-river, moon pool, and perimeter system locations will be analyzed for benzene, toluene, ethylbenzene, and total xylene and polycyclic aromatic hydrocarbons (PAHs) using on-site analytical equipment (FROG-5000™ and PAH immunoassay or similar). A subset of samples collected from the in-river locations will also be analyzed for TCL+30 at an ELAP certified laboratory.

Frequency

Samples will be collected, during normal work hours, at select frequencies for different events as summarized below and presented in **Table 1**. Sampling will take place when active work is being performed during each phase of the work (i.e. river bank re-sloping, capping, and dredging).

Lower Pump House Location

At the start of each phase (i.e., river bank re-sloping, capping, and dredging), two samples will be collected daily for a week. One sample will be collected at low tide and the other at high tide. If results do not indicate any significant change when compared to background sample results, then a sample will be collected once a week at high tide as presented in **Table 1**. All sampling will be biased to any visual contamination observed, if possible.

In the event a sheen escapes the western or northern portion of the perimeter curtain and is not controlled by support boats, a water quality sample will be collected as soon as practicable and submitted to the laboratory for analysis on an expedited turn-around. A second sample will be collected four to six hours following the observation of the sheen condition and collection of the initial sample. The exact time of collection of the second sample will depend on the tide cycle when the sheen was observed and on the results of the hydrodynamic model results.

Effluent Location

In the event a sheen escapes the western or northern portion of the perimeter curtain and is not contained by support boats, a water quality sample will be collected as soon as practicable and submitted to the laboratory for analysis on an expedited turn-around. The timing of the collection of the first sample will be based on the collection of the first Lower Pump House Location sample

and the residence time within the PWTF. A second sample will be collected four to six hours following the collection of the initial sample. The timing of the collection of the second sample will be based on the collection of the second Lower Pump House Location sample and the residence time within the PWTF.

HWD and DCWWA Facility Locations

One sample will be collected at low tide and the other at high tide once a week as presented in **Table 1**.

In the event a sheen escapes the western or northern portion of the perimeter system and is not controlled by support boats or exceedance of turbidity action limits outside the perimeter system or if contaminants of concern (benzene, toluene, ethylbenzene, toluene, and polycyclic aromatic hydrocarbons) are detected at the Lower Pump House Location, a water quality sample will be collected as soon as practicable and submitted to the on-site laboratory and off-site at an ELAP certified laboratory for analysis on an expedited turn-around. Additional sampling will be conducted following consultation with NYSDEC and NYSDOH.

Note that the HWD facility only periodically uses the Hudson River intake. No sampling will take place when the intake is not in use.

In-River Locations

At the start of each phase (i.e., river bank re-sloping, capping, and dredging), two samples will be collected daily for a week at each of the high tide and low tide locations in conjunction with the PWTF samples. If results do not indicate any significant change when compared to background results, then samples will be collected once a week either during high tide (one sample at the surface and the second at mid-depth at the high tide location) or low tide (one sample at the surface and the second at mid-depth at the low tide location) as presented in **Table 1**.

In the event a sheen escapes the perimeter curtain, two water quality samples (one sample at the surface and the second at mid-depth) will be collected from the high tide location (during high tide) or low tide location (during low tide) and analyzed using on-site analytical equipment. A second set of samples will be collected (one sample at the surface and the second at mid-depth) at a pre-determined time (to be determined following completion of the hydrodynamic modelling) from the high tide and low tide locations.

Moon Pool and Perimeter System Locations

Two water quality samples will be collected, at the bottom and middle depths in the water column, during and after the moon pool relocation start-up test (as detailed in the 2019 Construction Season Startup Plan [AECOM, 2019]) at the moon pool and perimeter system locations. The analytical samples will be analyzed using on-site analytical equipment. Split samples will also be sent to an ELAP-certified off-site laboratory.

Two water quality samples (one sample at the bottom and the second at mid-depth) will be collected from the moon pool location on a weekly basis and analyzed using on-site analytical equipment. Two water quality samples (one sample at the bottom and the second at mid-depth) will be collected, in the direction of the prevailing tide, at the perimeter system location on a weekly basis and analyzed using on-site analytical equipment.

Background Monitoring

Collection of background analytical samples will take place over a two to three-day period at the four locations (Lower Pump House, Effluent, In-River High Tide, and In-River Low Tide) discussed above prior to the start of in-river remedial activities, and will be collected during high tide, mid-outgoing flow, low tide, and mid-incoming tide. Collection of background analytical samples will take place at high tide and low tide at the HWD and DCWWA facilities prior to the start of in-river remedial activities.

Submittals

Monitoring data from the on-site laboratory will be provided to the onsite NYSDEC representative within 2 hours after analyses are complete and results are available. Monitoring data from the off-site ELAP laboratory will be provided within 5 days of receipt from the laboratory.

Please contact me at (845) 486-5461 or mmclean@cenhud.com if you have any questions.

Yours sincerely,

Mark L. McLean
Senior Project Manager

enclosures: Figures
Tables

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Table 1 Sample Summary
CHGE Former North Water Street MGP Site
Poughkeepsie, New York

AECOM

Location	Event	Frequency	Duration	Period/Time	Daily # of samples	Analysis	Comments
Lower Pump House	Background[1]	Start of each season	2 days	High Tide, Low Tide, mid outgoing flow, mid incoming tide	4	ASP Target Compound List plus 30	Standard TAT, Offsite laboratory
	Start-up	Daily[2]	5 days	High Tide, Low Tide	2	ASP Target Compound List plus 30	Expedited TAT, Offsite laboratory
	Normal Operations	Weekly	River Bank Re-Slope, Capping, and Dredging Activities	High Tide	1	ASP Target Compound List plus 30	Expedited TAT, Offsite laboratory
	Uncontrollable Sheen outside Perimeter System, Exceedance of Turbidity Action Level or Detections of COCs at Lower Pump House	Daily[3]	Per Event	ASAP, TBD	2	ASP Target Compound List plus 30	Expedited TAT, Offsite laboratory
Effluent	Background	Start of each season	1 day	High Tide, Low Tide, midoutgoing flow, mid incoming tide	4	Chapter 5 and ASP Target Compound Lost plus 30	Standard TAT, Offsite laboratory
	Uncontrollable Sheen outside Perimeter System, Exceedance of Turbidity Action Level or Detections of COCs at Lower Pump House	Daily[3]	Per Event	TBD	2	Chapter 5 and ASP Target Compound List plus 30	Expedited TAT, Offsite laboratory
HWD Facility	Background	Start of each season	1 day	High Tide, Low Tide	2	ASP Target Compound List plus 30	Standard TAT, Offsite laboratory
	Normal Operations	Weekly	River Bank Re-Slope, Capping, and Dredging Activities	High Tide	1	ASP Target Compound List plus 30	Expedited TAT, Offsite laboratory
	Uncontrollable Sheen outside Perimeter System, Exceedance of Turbidity Action Level or Detections of COCs at Lower Pump House	Daily[3]	Per Event	ASAP, TBD	1	ASP Target Compound List plus 30; BTEX + PAHs	Expedited TAT, Onsite and Offsite laboratory
DCWWA Facility	Background	Start of each season	1 day	High Tide, Low Tide	2	ASP Target Compound List plus 30	Standard TAT, Offsite laboratory
	Normal Operations	Weekly	River Bank Re-Slope, Capping, and Dredging Activities	High Tide	1	ASP Target Compound List plus 30	Expedited TAT, Offsite laboratory
	Uncontrollable Sheen, Exceedance of Turbidity Action Level or Detections of COCs at Lower Pump House	Daily[3]	Per Event	ASAP, TBD	1	ASP Target Compound List plus 30; BTEX + PAHs	Expedited TAT, Onsite and Offsite laboratory
In-River High Tide	Background[4]	Start of each season	2 days	High Tide, Low Tide, midoutgoing flow, mid incoming tide	8	ASP Target Compound List plus 30	Standard TAT, Offsite laboratory
	Start-up	Daily[2]	5 days	High Tide	2	ASP Target Compound List plus 30	Expedited TAT, Offsite laboratory
	Normal Operations	Weekly	River Bank Re-Slope, Capping, and Dredging Activities	High Tide	2	BTEX + Total PAHs	Expedited TAT, Onsite laboratory
	Uncontrollable Sheen outside Perimeter System, Exceedance of Turbidity Action Level or Detections of COCs at Lower Pump House	Daily[3]	Per Event	ASAP, High Tide[5]	4	BTEX + Total PAHs	Expedited TAT, Onsite laboratory
In-River Low Tide	Background[4]	Start of each season	2 days	High Tide, Low Tide, midoutgoing flow, mid incoming tide	8	ASP Target Compound List plus 30	Standard TAT, Offsite laboratory
	Start-up	Daily[2]	5 days	Low Tide	2	ASP Target Compound List plus 30	Expedited TAT, Offsite laboratory
	Normal Operations	Weekly	River Bank Re-Slope, Capping, and Dredging Activities	Low Tide	2	BTEX + Total PAHs	Expedited TAT, Onsite laboratory
	Uncontrollable Sheen outside Perimeter System, Exceedance of Turbidity Action Level or Detections of COCs at Lower Pump House	Daily[3]	Per Event	ASAP, Low Tide[5]	4	BTEX + Total PAHs	Expedited TAT, Onsite laboratory
Moon Pool	Moon Pool Relocation Startup Test	During and Following the test[6]	1 day	NA	4	ASP Target Compound List plus 30; BTEX + Total PAHs	Expedited TAT, Onsite and Offsite laboratory
	Normal Operations	Weekly[6]	River Bank Re-Slope, Capping, and Dredging Activities	NA	2	BTEX + Total PAHs	Expedited TAT, Onsite laboratory
Containment System	Moon Pool Relocation Startup Test	During and Following the test[6]	1 day	Direction of Prevailing Tide	4	ASP Target Compound List plus 30; BTEX + Total PAHs	Expedited TAT, Onsite and Offsite laboratory
	Normal Operations	Weekly[6]	River Bank Re-Slope, Capping, and Dredging Activities	Direction of Prevailing Tide	2	BTEX + Total PAHs	Expedited TAT, Onsite laboratory

Notes:

1 Four background samples will be collected daily over two days
2 Two start-up samples will be collected daily for one week at the start of each phase (i.e. River Bank re-slope, capping, and dredging)
3 Sampling will be conducted daily till sheen/turbidity/water quality outside the perimeter curtian is under control
4 Two samples (one at surface and other at mid-point to bottom) will be collected for two days
5 Samples will be collected at either high tide or low tide location depending on when within the tide cycle the event was observed
6 Two samples (one at the mid-point and other at the bottom) will be collected

TAT Turnaround Time
ASP Analytical Services Protocol
BTEX benzene, toluene, ethylbenzene, and total xylene
PAHs polycyclic aromatic hydrocarbons
COC Constituents of Concern (BTEX and PAHs)
Onsite Laboratory is the instrument located on-Site to instantaneously analyze collected samples for BTEX and Total PAHs

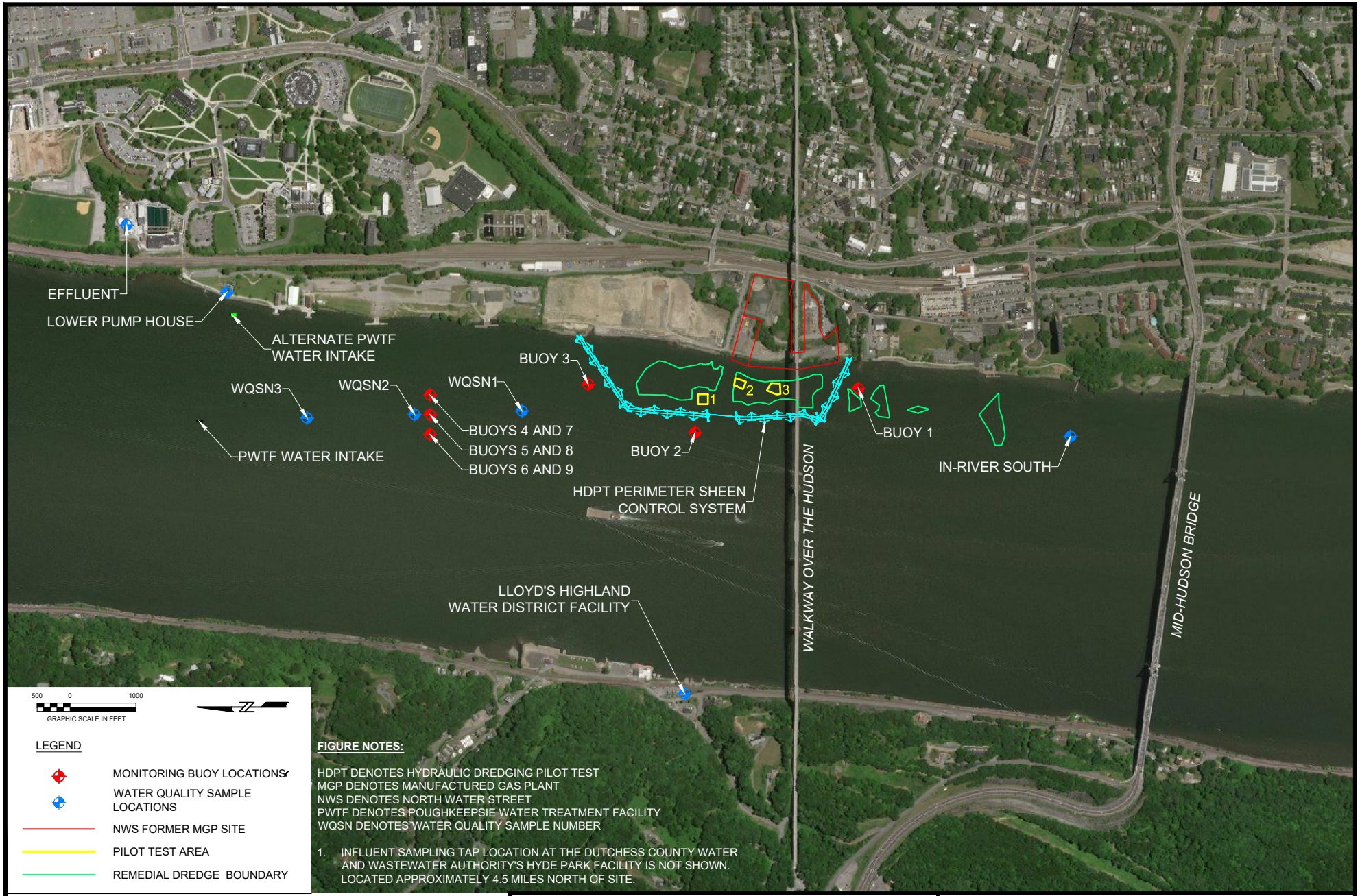

FIGURE NOTES:

HDPT DENOTES HYDRAULIC DREDGING PILOT TEST
MGP DENOTES MANUFACTURED GAS PLANT
NWS DENOTES NORTH WATER STREET
PWTF DENOTES POUGHKEEPSIE WATER TREATMENT FACILITY
WQSN DENOTES WATER QUALITY SAMPLE NUMBER

1. INFLUENT SAMPLING TAP LOCATION AT THE DUTCHESS COUNTY WATER AND WASTEWATER AUTHORITY'S HYDE PARK FACILITY IS NOT SHOWN. LOCATED APPROXIMATELY 4.5 MILES NORTH OF SITE.

AECOM

CENTRAL HUDSON GAS & ELECTRIC CORP.
NORTH WATER STREET MGP
60540671

DATE: 07/17/2020 | DRWN: DSK

SEASON 3
MONITORING LOCATIONS

FIGURE 1

AECOM USA, Inc.

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