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OPERATION, MAINTENANCE AND MONITORING PLAN FOR THE CHEMICAL OXIDATION IRM IN OPERABLE UNIT 4

ExxonMobil Former Mobil Terminal
Buffalo, New York

VOLUME I OF II

STATE OF NEW YORK
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1.0 INTRODUCTION

This Operation, Maintenance and Monitoring (OM&M) Plan has been prepared by Remedial Engineering, P.C. (Remedial Engineering) and Roux Associates, Inc. (Roux Associates) on behalf of ExxonMobil Oil Corporation (ExxonMobil) for the ExxonMobil Former Buffalo Terminal Chemical Oxidation System (ChemOx System) located at 625 Elk Street in Buffalo, New York (Site or Terminal). The Site location is shown on the Site Location Map (Figure 1) and Proposed IRM Chemical Oxidation System and Monitoring Network Layout (Plate 1). The ChemOx System is being operated as an Interim Remedial Measure (IRM) to address an area of separate-phase product at the ExxonMobil Former Buffalo Terminal considering the historic, current and reasonably anticipated future use of OU-4 as industrial.

1.1 Project and Purpose of OM&M Plan

The objective of this OM&M Plan is to ensure the development and implementation of necessary operating, inspection, maintenance and monitoring procedures for the ChemOx System.

The objectives of the OM&M Plan are to describe general procedures that will be followed to:

- properly operate and maintain the ChemOx System equipment and processes;
- prevent system downtime caused by equipment failures;
- allow for safe and effective operation of the ChemOx System;
- evaluate the effectiveness of the ChemOx System; and
- document the required communication between ExxonMobil and regulatory agencies.

This OM&M Plan was prepared pursuant to the New York State Department of Environmental Conservation (NYSDEC) Draft DER-10 Technical Guidance for Site Investigation and Remediation dated December 2002 and ExxonMobil's Global Remediation Operations Integrity Management System (OIMS) 6a: Facility Operation, Inspection and Maintenance Procedures. This OM&M Plan outlines the associated procedures, responsible parties, and updating processes in order to achieve the following objectives:

- Identifying higher risk operations or unique situations where special operation, inspection, and maintenance procedures are required.
- Identifying and developing necessary operation, inspection, and maintenance procedures.

- Establishing specified intervals for updating necessary operation, inspection and maintenance procedures.
- Improving the quality of equipment and facility inspection and maintenance.
- Eliminating incidents resulting from lack of or poor inspection/maintenance of remedial equipment.
- Identifying operating interfaces and assessing risks involved. Defining facility contacts, procedures and communication responsibilities as required to manage identified risks.
- Analyzing inspection and maintenance trends and optimizing equipment based on those trends.
- Identifying requirements for system documentation.
- Preventing system downtime caused by equipment failures.

These objectives will be met for this ChemOx System through an evaluation of the existing ChemOx System and its particular operating procedures and safety precautions. These operating procedures and safety precautions are identified within this OM&M Plan.

2.0 SITE DESCRIPTION

The ExxonMobil Former Buffalo Terminal and offsite areas formerly and currently owned by ExxonMobil, located at 625 Elk Street in Buffalo, New York, are shown on Figure 1. In order to address the environmental conditions, ExxonMobil entered into a Brownfield Site Cleanup Agreement with the NYSDEC on April 3, 2006. Under this agreement, the Site entered into New York State's Brownfield Cleanup Program (BCP). The "Site" is defined, for the purposes of the BCP, as the area within the limits of the five Operable Units (OU) as shown in Figure 2. In addition, the Site was previously divided into nine geographic areas for the purpose of assessing environmental conditions and reporting the results of area-specific activities (Figure 3). These geographic areas were designated according to the historical primary operations that occurred in each portion of the Site.

The separate-phase product plume that is the subject of this OM&M Plan is located in Operable Unit 4 (OU-4) within the area formerly designated as the Eastern Tank Yard Area (ETYA). Plate 1 shows a layout of the ChemOx IRM area within OU-4. A portion of the Site south of Elk Street, including OU-4, is currently operating as a petroleum products storage and distribution facility owned and operated by Buckeye Terminals, LLC (Buckeye) with the surrounding non-operating area (formerly part of historic operations) owned by ExxonMobil.

2.1 Site History

Historically, the major Site refinery and terminal operations occurred south of Elk Street in an area of approximately 89 acres. The petroleum refining operations at the Site began during 1880. The majority of the Site was purchased by Standard Oil Company of New York (SOCONY), ExxonMobil's predecessor, in 1892. In May 1981, the Site terminated all refinery operations. The Site continued as an ExxonMobil distribution terminal, receiving product via a pipeline and barge until May 2005. The active petroleum products storage and distribution terminal portion of the Site was sold on May 4, 2005 and is now owned and operated by Buckeye. The area of Buckeye's active terminal is approximately 35.8 acres. Throughout the Site's history, the areal extent of property owned by ExxonMobil changed as portions of property were acquired or sold for various reasons. The area within the current ExxonMobil property boundary is approximately 43.6 acres.

2.2 Geology

In general, the geology of the entire OU-4 is influenced by the former disposal activities that were conducted in this area and re routing of the Buffalo River. Four unconsolidated deposits exist in the area under consideration. The first is a fill layer that consists of black cinders, concrete, brick, glass, wood, silt, gravel, sand and slag that is consistent with the historical disposal activities. This layer varies in thickness from 7 to 23 feet. The second unit consists of sands; silt (sandy silt to clayey silts); and silts and clays. The thickness of this layer is between 0 and 20 feet throughout the area of interest. The third layer is predominantly comprised of sand and gravel and ranges in thickness from 4 to 11 feet. Underlying the sand and gravel layer is a clay layer. Bedrock was not encountered in any of the wells installed in OU-4. The topography in OU-4 is generally flat, with a steeply sloped embankment to the Buffalo River. The ground surface elevation drops by approximately 22 to 25 feet in a horizontal span of approximately 25 to 30 feet from the top of the embankment to the river level. High water elevations in the Buffalo River prevent access to the shoreline.

2.3 Depth to Groundwater and Groundwater Flow

Depth to groundwater across the entire OU-4 ranges from approximately 6 to 31 feet below grade. In the ChemOx System area within OU-4, the depth to groundwater ranges from approximately 24 to 31 feet below grade. The influence of the eastern leg of the Well Point System (WPS), a separate groundwater extraction system not addressed under this OM&M Plan, can be seen in monitoring wells in OU-3 and the southwest portion of OU-4. A groundwater divide, caused by the operation of the eastern leg of the WPS, exists in the southwestern portion of OU-4. The groundwater flow direction east of the divide is generally southeast toward the Buffalo River. The groundwater flow direction west of the divide, in the southwestern portion of OU-4, is generally west toward the WPS.

3.0 SITE REMEDIAL ACTION

This section provides the remedial action goals and a detailed description of the components of the ChemOx system. The system design and layout are based upon the results of the ChemOx pilot test conducted in 2004. The results of the pilot testing are presented in the document entitled Remedial Action Selection Report (RAS) for the Product Recovery Interim Remedial Measure in the Eastern Tank Yard Area, dated January 5, 2005.

3.1 Remedial Action Goals

As described in Section 4.1 of the Draft BCP Guide, "the goal of the remedy selection process in the BCP is to select a remedy for a site that is fully protective of public health and the environment, taking into account the current, intended and reasonably anticipated future land use of the site." In addition, the draft BCP guide indicates that "Source removal should be the goal of all BCP remedies."

The ChemOx System will protect public health and the environment by reducing the concentrations of petroleum-related hydrocarbons in groundwater, soil and separate-phase product. In addition, operation of the ChemOx System will enhance separate-phase product recovery efforts by making more product available for manual and/or automated recovery efforts, as evidenced by the increase in product recovery during the pilot test. The potential for human and environmental exposure to the petroleum-related contaminants in the remediation OU-4 product plume will be reduced as the source of contamination (i.e., separate-phase product) is recovered and/or degraded and the concentrations of contaminants in groundwater discharging to the river are reduced.

3.2 ChemOx System Layout

The implementation of ChemOx as a ChemOx System in the OU-4 product plume area consists of installation of a network of 25 nested ChemOx injection points in five ChemOx "Cells," eight existing or new supplemental peroxide-only injection points within ChemOx Cells 1 and 2 (additional points may be added in other cells based upon long-term data) and the operation of one mobile injection unit. Operation of the ChemOx system will be in a phased approach within ChemOx Cells consisting of five nested injection points each (one ozone and one hydrogen peroxide point) plus up to four supplemental hydrogen peroxide injection points across the Site.

It should be noted that the number of supplemental hydrogen peroxide points required per cell will be determined based upon long-term monitoring data from Cells 1 and 2.

Monitoring of the progress of the remediation is conducted through a network of newly installed and existing groundwater monitoring wells and membrane interface probe (MIP) borings, with confirmatory soil borings to be collected at select locations. Construction of the monitoring wells is similar to the "VERMW" series wells installed for the ChemOx pilot testing in 2004, except that they will be 4-inch diameter. The locations of ChemOx injection points, supplemental hydrogen peroxide points, monitoring wells and MIP borings are presented on Plate 1. As evident in Plate 1, initially all ChemOx injection points and monitoring wells will be located outside the bermed area, downgradient of the Tank 176. This is to verify the long-term use of the technology prior to entrance into the ongoing active operations within the berm. Five MIP borings (Plate 1) are installed initially within the bermed area to evaluate current conditions and to determine the appropriate need for ChemOx within the tank berm. During the monitoring phase of the ChemOx cells located outside the tank berm, the steps necessary to address impacts that may exist beneath the tank berm will be evaluated.

3.2.1 ChemOx Injection Point Spacing

Based upon the results of the pilot testing, a radius of influence of approximately 20 feet per injection point was calculated. Therefore, in order to provide overlapping coverage of the OU-4 product plume area, the nested ChemOx injection points are spaced at approximately 30 feet apart, except nearest to the Buffalo River bank, which are spaced slightly closer (24 to 28 feet apart). This slightly closer spacing of nested injection points is intended to provide additional treatment of this critical area. Supplemental hydrogen peroxide points screened just below the water table, comprised of four proposed new points and four existing pilot test points (CO-2, CO-3, CO-4 and CO-5) within the first two cells, are staggered between the nested injection points. If, during long-term operation, particularly in the first two cells, it is determined that there are portions of the OU-4 product plume area that are not receiving adequate coverage, additional ChemOx nested injection points or supplemental hydrogen peroxide injection points will be installed in future cells. Conversely, if it is determined that certain portions of the area could be adequately covered by fewer nested or supplemental injection points, fewer points may be installed.

3.2.2 ChemOx Injection Point Construction

The water table, separate-phase product and associated smear zone of residual product throughout the OU-4 product plume area are located within the two upper geologic layers of unconsolidated deposits, namely fill (uppermost layer) and sands/silts/clay (secondary layer). Therefore, these upper two unconsolidated geologic layers comprise the critical zone for treatment via the ChemOx System. The combination of nested ChemOx injection points (one deep ozone injection point and one hydrogen peroxide point) and supplemental hydrogen peroxide injection points screened just below the water table are intended to target this critical zone.

Nested Injection Point Configuration

Typical nested ChemOx injection point construction is provided on Figure 4. The nested ChemOx injection points include two screens, as follows:

- One two-foot air/ozone injection point located just above the clay layer with the bottom of the screen ranging in depth from approximately 33 to 38 feet below grade (actual depths will vary throughout the site and will be determined based on encountering the clay layer) in a nested configuration.

- One two-foot hydrogen peroxide injection point located at the bottom of the second layer of unconsolidated deposits (sands; silt [sandy silt to clayey silts]; and silts and clays), (depths will vary throughout the OU-4 product plume area and will be determined based on the depth of the air/ozone injection point and geology encountered) in a nested configuration with the air/ozone injection point.

The nested ozone injection point configuration is deeper than that used during the pilot test and is therefore expected to provide a wider cone of influence of ozone. The configuration of the nested hydrogen peroxide injection points is also a few feet deeper than the pilot test peroxide injection points. This configuration is intended to maximize the treatment provided in the vicinity of the water table/product table interface and smear zone, while still providing additional treatment to a portion of the deeper contamination that was indicated by the pilot test MIP borings.

In order to ensure compatibility with the chemicals to be injected, the ozone injection wells are constructed of stainless steel. Each "nested" location includes two injection wells constructed by installing two $^{1}/_{2}$–inch diameter stainless steel risers (one riser pipe for oxygen/ozone and one riser pipe for hydrogen peroxide) into a six-inch diameter borehole. Each borehole will be advanced to approximately 33 to 38 ft bls. All wells will be installed above the clay interval (denoting the base of the water table aquifer).

Each nested hydrogen peroxide and ozone injection well will contain a two-foot long by ½-inch diameter section of stainless steel well screen (diffuser), installed at the end of a stainless steel casing into saturated soil. The ozone diffuser will be located at the bottom of the nested injection well boring, approximately 33 to 38 ft bls depending upon the depth at which the clay layer is encountered. Sand pack will be placed surrounding the diffuser and to a depth of one foot above the top of the diffuser. A bentonite seal (minimum of one foot thick) will be located above the sand pack surrounding the ozone diffuser to prevent short-circuiting. The two-foot hydrogen peroxide injection well screen will be installed at bottom of the second layer of unconsolidated deposits, (depths and screen interval will vary throughout the OU-4 product plume area and will be determined based on the geology encountered at each location). Sand pack will surround the well screen to a depth of two feet above the top of the screen. A bentonite seal (minimum of one foot thick) will be located above the sand pack to prevent short-circuiting. Following the installation of the diffuser and the well casing, each borehole will be filled with concrete grout and completed with a stick-up protective casing.

Supplemental Injection Point Configuration

Supplemental hydrogen peroxide points that are staggered laterally from the nested ChemOx injection point will be existing or new wells screened just below the water table.

Each supplemental hydrogen peroxide point will be constructed such that the stainless steel diffuser is located just below the water table interface (approximately 26-28 ft bls). The actual depth will be based upon conditions encountered. Pilot test wells CO-2, CO-3, CO-4 and CO-5 will be utilized during the full scale operation and there will be an additional four supplemental hydrogen peroxide only points installed within the Cells 1 and 2. The construction will be of ½-inch stainless steel diffuser and riser in a 6 inch diameter borehole. Sand pack will surround the diffuser and to a depth of two feet above the top of the diffuser. A bentonite seal (minimum of one foot thick) will be located above the sand pack. The remainder of the well annulus will be filled with concrete grout and completed with a stick-up protective casing. Typical supplemental hydrogen peroxide injection point construction is provided on Figure 4. The supplemental points may be added to the other cells based upon the field observations obtained from the operation within Cells 1 and 2.

3.2.3 Mobile ChemOx Injection Units

The mobile ChemOx injection unit can operate within one or two ChemOx cells simultaneously. The mobile ChemOx injection unit will be installed within the fully fenced area of OU-4 as part of the full-scale ChemOx system. The unit will be stationed in a centralized location in order to maximize the number of cells that can be treated without moving the unit, to the extent possible. The ChemOx system is housed in a 16-foot trailer. The trailer includes the air/ozone and hydrogen peroxide injection systems with individual controls for each well. A Process and Instrumentation Diagram depicting the oxidation system is included as Figure 5 and a Process and Instrumentation Diagram Legend is included as Figure 6.

The ozone components include an air compressor, pressure swing adsorption unit, and dual ozone generators. The air compressor and pressure swing adsorption unit are utilized to generate 90-95% pure oxygen and are commonly used with ozone generators. This approach was selected because it is regarded to be safer than the alternative method of storing oxygen tanks at the site. The air produced by the compressor is directed into a pressure swing adsorption unit that adsorbs the nitrogen naturally present in the air stream, resulting in an oxygen-rich air stream to feed the ozone generator. The nitrogen adsorption unit systematically exhausts small volumes of nitrogen back into the atmosphere. A flow indicator monitors the flow of the oxygen stream. A low flow and high/low pressure alarms will cause the air compressor to shut down to avoid a leak in the system or malfunctioning oxygen generation equipment. The flow is also transmitted to a flow controller, which operates a solenoid valve to ensure a constant flow is delivered to the ozone generator. Downstream of the flow indicator is a pressure indicator with a high pressure alarm and pressure relief valve.

As a safety precaution, the trailer is equipped with an ambient air ozone detector and an exhaust fan with a run light. If at any time the ambient air ozone detector is activated, the system will shut down until manually reset. Additionally the cabinet that houses the valves for the ozone is exhausted to the atmosphere through an ozone destruction media. If an ozone leak is detected (via inline ozone detector), the ozone detector would shut down the system and any ozone in the atmosphere would be destroyed prior to being vented from the trailer.

The hydrogen peroxide system within the trailer includes a holding tank and injection pump. The holding tank is double-walled and is used to store the solution of up to 35% hydrogen peroxide. An exterior hydrogen peroxide holding tank may be used and will be equipped with a secondary containment. A high and low-pressure alarm is in place on the hydrogen peroxide injection line in order to shut down the pump under high pressure or low pressure conditions.

3.2.4 Control Panel

The advanced oxidation system includes a programmable logic controller (PLC) to control the operation of the oxygen, ozone, air, and hydrogen peroxide injection system. The PLC is used to manage the injection flow rates at each point and to pulse the operation of the system to cycle injection wells and flows.

3.2.5 Above Grade Piping

The injection wells will be connected to the ChemOx System trailer, via an above grade piping network. Piping for the advanced oxidation system will include individual Teflon tubes to each oxygen/ozone injection well and Polyvinyl chloride (PVC) lines for hydrogen peroxide delivery (½-inch diameter lines). The Teflon and PVC lines are sleeved within high-density polyethylene tubing (HDPE) for physical protection.

Piping will be connected to the top of each injection well. Since the ozone lines will be individually controlled from the equipment trailer, the Teflon tubing will be connected directly to the stainless steel injection point via a compression fitting. The individual hydrogen peroxide lines will be connected directly to the stainless steel injection points. A check valve will be installed at each hydrogen peroxide well.

3.2.6 Monitoring Network

The monitoring network for the full scale ChemOx system includes existing and proposed ChemOx injection wells, existing and proposed monitoring wells and MIP borings. This monitoring network will be used to assess the progress of the remediation, evaluate temporary shut downs of ChemOx cells, monitor for rebound after shutdown to determine if additional operation is required and to ultimately justify permanent shutdown of the system. Location of the monitoring network is shown on Plate 1. Confirmatory soil borings will also be performed at select locations in the vicinity of MIP borings (locations will be selected based on monitoring data as described in Section 5 and are not shown on the Plate 1).

3.2.6.1 Existing and Proposed Monitoring Wells

In order to monitor water levels and separate-phase product thickness, groundwater quality and groundwater temperature, each ChemOx cell contains at least two monitoring wells (new and/or existing) located within or near the cell boundary. In addition, the hydrogen peroxide injection point at each nested ChemOx injection point and each supplemental hydrogen peroxide point will also be monitored for groundwater temperature. Parameters monitored and monitoring schedules are described in Section 5. The proposed monitoring well network within or near each ChemOx cell is listed below and may be modified for ChemOx Cells 3, 4 and 5 based upon the results of long-term monitoring in ChemOx Cells 1 and 2. The first two cells to be operated will be ChemOx Cells 1 and 2, followed by ChemOx Cells 3 and 4 and then ChemOx Cell 5. A typical monitoring well construction detail is provided in Figure 7.

<u>ChemOx Cell 1</u>

- Existing monitoring wells LF-3 and RW-8R.
- One proposed monitoring well located outside the cell boundary between ChemOx Cells 1 and 2.
- Five hydrogen peroxide points of the proposed nested ChemOx injection points and four supplemental peroxide injection points (two existing hydrogen peroxide injections points [CO-3 and CO-5] and two proposed points) to be monitored for groundwater temperature only.

<u>ChemOx Cell 2</u>

- Existing monitoring wells VERMW-3, VERMW-4, MW-28, SB-75 and LF-6.
- One proposed monitoring well located outside the cell boundary between ChemOx Cells 1 and 2.
- Five hydrogen peroxide points of the proposed nested ChemOx injection points and four supplemental peroxide injection points (two existing hydrogen peroxide injections

points [CO-2 and CO-4] and two proposed points) to be monitored for groundwater temperature only.

ChemOx Cell 3

- Existing monitoring wells RW-8R, LF-5, P-15 and LF-1S.
- No proposed monitoring wells.
- Five proposed ChemOx nested hydrogen peroxide points to be monitored for groundwater temperature only. The number of supplemental hydrogen peroxide injection points to be determined.

ChemOx Cell 4

- Existing monitoring wells MW-3URS, VERMW-1, VERMW-3 and LF-5.
- Two proposed monitoring wells.
- Five proposed ChemOx nested hydrogen peroxide points to be monitored for groundwater temperature only. The number of supplemental hydrogen peroxide injection points to be determined.

ChemOx Cell 5

- Existing monitoring wells LF-4, B-6MW and LF-5.
- One proposed monitoring well.
- Five proposed ChemOx nested hydrogen peroxide points to be monitored for groundwater temperature only. The number of supplemental hydrogen peroxide injection points to be determined.

3.2.6.2 MIP Boring Locations

In order to provide a qualitative assessment of total VOCs in the subsurface prior to, during and after long-term operation of the ChemOx system, MIP borings will be completed within each ChemOx Cell. The locations of proposed MIP borings in the first two cells are shown on Plate 1. As shown, initially, three borings within Cells 1 and 2 will be installed. The number of MIP borings required for monitoring remedial progress in the other cells will be determined based on the performance of the first two cells. The MIP borings will be advanced to the approximate depth of the clay layer that forms the base of the aquifer in the OU-4 product plume area (approximately 33 to 38 feet below grade, which will vary slightly throughout the area).

In addition, during the baseline MIP round, five MIP borings will be completed within the Tank 176 tank berm, as shown on Plate 1. These borings will be used to evaluate current conditions and the potential need for ChemOx within the tank berm. During the monitoring phase of the ChemOx cells located outside the tank berm, steps necessary to address impacts that may exist beneath the tank berm will be evaluated.

The MIP is a percussion-tolerant VOC sensor that can continuously log volatile organics that diffuse through a semi-permeable membrane. Using a carrier gas, the VOCs are brought to the surface through tubing, which is connected to a laboratory grade PID, Flame Ionization Detector (FID), and Electron Capture Detector (ECD) for immediate screening. All three of these detectors are mounted in a Hewlett Packard 5890 Series II Gas Chromatograph cabinet.

As the operator advances the MIP sensor into the subsurface a log is displayed onscreen by the field computer. This log provides information about VOCs in the subsurface using either the PID or FID or any combination of detectors. The real time log also provides a depth/speed graph, electrical log of the formation, and temperature log of the heated sensor onscreen. For this project, the FID and PID will be used.

The data provided is a scan of the subsurface, measured in micro-volts. The higher micro-volts equate to higher VOC concentrations. Generally, the micro- volts translate into a qualitative measurement of the VOCs present in the soil. Since there is no direct correlation between analytical data (measured in parts per million [ppm]) and the micro-voltage measurements at the boring locations, VOC distribution following full scale implementation of ChemOx will be solely based on micro-voltage measurements before and after the completion ChemOx in each cell.

3.3 ChemOx System Phased Operation Sequence

Each ChemOx Cell covers an area of between 3,100 square feet (ChemOx Cell 5) and 3,800 square feet (ChemOx Cell 4). The proposed operation sequence will be to operate in ChemOx Cells 1 and 2, for approximately two months (plus approximately two weeks for receipt of groundwater quality data) and monitor conditions as described below. Once this initial operating period is completed and the monitoring data is evaluated, the injection will either be continued in these cells or will be initiated in Cells 3 and 4 for a two month period (plus or minus), followed by operation in ChemOx Cell 5. If it is determined that pulsing of the system to allow water levels in the area to return to normal conditions may be beneficial to separate-phase product recovery efforts (i.e., if continuous operation is believed to have submerged product), consideration will be given to altering operating parameters accordingly during operation in each cell. This determination will be made after evaluation of long-term water-level data during operation.

4.0 OPERATIONS, INSPECTION AND MAINTENANCE PROCEDURES

The overall responsibility for the operation and maintenance of the ChemOx System will be assumed by ExxonMobil and GES. Roux Associates and Remedial Engineering will be responsible for all reporting regarding system OM&M. Equipment specific maintenance or those activities that would not be considered routine will be contracted out by ExxonMobil, as required.

This OM&M Plan is a reference for operating and maintaining the System in conformance with its design, applicable regulations, and permit requirements. Detailed operation and maintenance manuals prepared by equipment manufacturers for each major component of the System will be kept onsite in the Supplementary O&M Literature Volume II with this OM&M Plan.

The OM&M Plan presents the operation and maintenance (O&M) activities that will occur from the time of System start-up through the operation of the System. Should these activities be changed, modifications to this OM&M Plan shall be documented through the preparation of manual revisions or addenda.

Certain operations, inspection, and maintenance procedures for this ChemOx System have been instituted in order to prevent system malfunction. All mechanical aspects of the ChemOx will be visually inspected as described below, to ensure proper function. Important maintenance tasks and the proposed frequency required to ensure proper system function are described herein. An O&M Schedule for the Site is provided in Appendix A.

4.1 Critical Equipment

In addition to the other inspection and maintenance tasks, monthly documentation of the Critical Equipment (CE) checklist items are performed in accordance with ExxonMobil's health and safety program known as Operations Integrity Management System (OIMS). CEs are devices located at the Site, which are intended to:

- prevent unauthorized discharges, both vapor and liquid phase;
- prevent unauthorized access or modification to the remediation equipment;
- protect individuals from injury such as guards covering other moving components; and

- prevent equipment damage that could result in personal injury or unauthorized discharge.

The CEs for this system are listed in Appendix B and shown in red on the System P&ID (Figure 5).

4.2 Signs

Emergency contact signs and hearing protection required signs are posted at both of the ChemOx System trailer entrances. The integrity of these signs (i.e., ensuring they are still posted and legible) should be noted when visiting and working at the Site. If the signs appear to be in poor condition or are missing, they must be replaced immediately. Additional signs may be added when necessary.

4.3 ChemOx System Operation and Maintenance Tasks

The ChemOx mobile system is a fully automated unit, requiring minimal maintenance. Typical operational and preventative maintenance activities for the system are detailed below. A GES environmental field technician will be on-site daily to perform any preventative maintenance that may be required for the ChemOx System. The CE inspection will be performed at least on a monthly basis and any CE failures will either be immediately fixed or the System will be shut down until the problem can be rectified. All preventative maintenance performed will be documented in the field book, on the O&M Schedule (Appendix A) and reported back to the Field Team leader for tracking purposes.

Daily (Monday through Friday)

- Perform a visual inspection of trailer, components and Hydrogen Peroxide tank(s);
- Inspect for gas, water leaks;
- Check/refill peroxide tank;
- Record system operating parameters; and
- Take monitoring well headspace readings with a LEL and PID.

Weekly

- Inspect coolant level, inspect and clean chiller pump strainer;

- Inspect/clean coolant filter;
- Check peroxide tank for gassing (bubble formation);
- Check peroxide pump tube for uneven wear;
- Check oxygen filter;
- Check / replace container ventilation intake filter; and
- Verify operation of drain valves / clean elements.

Monthly

- Check air compressor intake filter;
- Check pressure swing adsorber intake filters; and
- Perform Critical Equipment Testing and Maintenance.

Quarterly

- Calibrate hydrogen peroxide pump;
- Calibrate ozone generator performance;
- Flush coolant heat exchanger;
- Lubricate chiller pump motor; and
- Clean cooling coils (dry air).

Semi-Annually

- Check tension of V-Belts;
- Change A/B rings/valves (at 4000 operating hours); and
- Change peroxide pump tube.

Annually

- Check all safety relief valves;
- Inspect/tighten low voltage wiring terminations; and
- Inspect/tighten power wiring terminations.

Additional maintenance will be performed as necessary in accordance with equipment manufacturers' guidelines.

4.4 Corrective Maintenance

In addition to completing preventative maintenance, corrective maintenance will be completed for the ChemOx system, as needed. These O&M activities include repairs, system troubleshooting, and any other issues that impede proper system operation. All corrective maintenance performed will be documented in the field book and reported back to the Field Team Leader for tracking purposes.

4.5 Disposal of Used Materials and Waste

All waste generated during implementation of the IRM will be transported and disposed of in accordance with all applicable federal, state, and local regulations at a facility selected by ExxonMobil. The remediation-derived waste that may be generated during the IRM include:

- Drill cuttings from installation of monitoring wells and ChemOx wells;
- Personal Protective Equipment (PPE); and
- Decontamination water, if any is generated.

Drill cuttings and PPE generated during the implementation of the IRM will be consolidated and stored in appropriate bulk containers and temporarily staged at the Site waste storage area within the Site limits. Any full or partially filled containers will be appropriately labeled. ExxonMobil will coordinate waste characterization and disposal.

If any is generated, decontamination water will be collected and transported to ExxonMobil's water treatment system, which is located in the main portion of the former terminal south of Elk Street. The water (if any) will be treated through the onsite system or will be disposed of offsite at an ExxonMobil-approved disposal facility.

5.0 CHEMOX SYSTEM MONITORING

The following is the proposed monitoring schedule for the full-scale ChemOx system. Monitoring will be conducted in the monitoring network described above for each operating ChemOx cell. At this time, operation of one or two cells at a time is proposed (Cells 1 and 2 operated together, Cells 3 and 4 operated together and Cell 5 operated individually). The monitoring parameters and frequency described in the OM&M plan will be modified based upon information gathered during the full-scale system operation.

5.1 Injection System Monitoring

Throughout long-term operation, the following parameters will be recorded on a daily basis on the field forms included as Appendix C:

- Record the following operating data on log sheet:
  - System operational (Y/N)
  - Volume of Peroxide within storage tanks (gallons)
  - Hour meter of hydrogen peroxide pump (hours)
  - Hour meter Injection Air Compressor A (hours)
  - Hour meter Injection Air Compressor B (hours)
  - Hour meter of ozone generator OG-1 (hours)
  - Hour meter of ozone generator OG-2 (hours)
  - Hour meter of main air compressor (hours)
  - Peroxide Pump Setting –Signal Percentage (%)
  - Ozone Generator Current Operation – Power Percentage (%)
  - Oxygen Flow (scfh) to ozone generators
  - Oxygen Pressure (PSI) to ozone generators
  - Ozone Pressure (PSI) prior to pressure control
  - Ozone Pressure (PSI) after pressure control
  - Injection Air Pressure (PSI)
  - Hydrogen Peroxide Pressure (PSI) prior to control valve

- Hydrogen Peroxide Pressure (PSI) after control valve
- Chiller Temperature
- Air compressor receiver pressure

Modifications to operating parameters will be made, as necessary, based upon the data collected.

Ambient air measurements for VOCs will also be conducted in the ChemOx area. Periodic measurements of ambient ozone, particularly during startup, will also be conducted. All readings will be recorded on field forms included in Appendix C.

5.2 Baseline Groundwater Sampling within the OU-4 Product Plume and ChemOx Cells

A baseline groundwater sampling event will be conducted from all monitoring wells in the OU-4 product plume (all five cells) prior to startup of the first cell. Samples will be analyzed for VOCs and SVOCs by USEPA methods 8021 and 8270, respectively. This round of sampling will serve as the baseline for the entire OU-4 product plume to assess the progress of the full scale remediation. If all wells throughout the OU-4 product plume are not yet installed at the time operation at the first cell is due to be initiated, all available wells will be sampled.

In addition, prior to initiation of operation in each subsequent cell, the monitoring wells will be sampled for VOCs and SVOCs to evaluate if any reductions from the baseline occurred that could be attributed to operation of adjacent cells. This may indicate that fewer ChemOx injection points need to be operated within a particular area.

5.3 First Day – Startup and Testing

The following parameters will be monitored at monitoring wells, as required, to evaluate radius of influence until optimum operating parameters are established. All data will be recorded on field forms included in Appendix C.

For the first day of operation, the following parameters will be collected:

- Headspace: PID and LEL;
- Groundwater data: temperature;

- Pressure measurements; and
- Liquid levels (water and product).

Groundwater temperature will be monitored at ChemOx nested and supplemental hydrogen peroxide points.

Monitoring wells within adjacent ChemOx cells will be monitored for groundwater temperature during the day of operation in each ChemOx cell to determine the extent of influence from the operating cell(s).

5.4 Long-Term Operation – Weekly Groundwater and Headspace Monitoring

CO injection wells and monitoring wells within each operating ChemOx Cell will be monitored for the following parameters on a weekly basis during long-term operation and recorded on field sheets presented in Appendix C.

- Headspace: PID and LEL; and
- Groundwater data: temperature.

Groundwater temperature will be monitored at ChemOx nested and supplemental hydrogen peroxide points.

5.5 Long-Term Operation – Monthly Groundwater Monitoring

Groundwater quality for VOCs and SVOCs will be sampled monitoring wells within each cell each month during long-term operation.

As described above, the first phase of operation is expected to be approximately two months at each ChemOx cell. Data from the operation of a particular cell may be used to adjust the timeframes of operation for the remaining cells.

5.6 Long-Term Operation – Membrane Interface Probe Borings

After the initial two months of operation, or based on other indications that a shorter timeframe may be appropriate (i.e., elimination of separate phase product, remediated groundwater, etc.) MIP borings will be conducted at each of the locations completed during the baseline round in the active cell(s). This data will provide a qualitative assessment of the total VOCs in the subsurface after the initial operation phase, compared with the baseline data. This data, coupled with the groundwater quality data will be used to evaluate the potential for temporary shutdown of a particular ChemOx Cell.

It should be noted, that MIP borings will be completed at select locations within active cells following any additional operational periods in order to continue to assess the progress of the remediation.

5.7 Temporary Shutdown

If the following criteria are met for a ChemOx Cell, it will be temporarily shut down:

- Groundwater quality data from the first two rounds of sampling indicate that significant reductions of VOCs and SVOCs have been achieved.
- VOC/SVOC removals in groundwater have reached asymptotic levels.
- MIP borings indicate total VOC removals.
- Separate-phase product has been reduced.

Operation in the next ChemOx Cell will then commence (following baseline groundwater sampling in that cell).

If the groundwater quality, MIP data and separate-phase product do not indicate significant remediation has occurred, operation in this ChemOx Cell will continue. Monitoring during any additional operation period will be the same as described above.

5.8 Monitoring for Rebound and Additional Operation

If a ChemOx Cell met the criteria for temporary shutdown, groundwater quality within the monitoring wells in that cell will be sampled to assess if rebound of VOC and SVOC concentrations is occurring. The groundwater sampling will be performed during the next Site-wide quarterly sampling event, unless that event occurs within 30 days of the previous sampling round in the ChemOx cells, in which case the sampling for rebound will occur during the following quarterly event. In addition, water level and separate-phase product thickness measurements will be conducted to evaluate changes in thickness and appearance. The sampling frequency will depend upon field conditions encountered and the data will be used to determine if continued operation is required.

Groundwater quality samples will be collected after temporary shutdown, as described above. If concentrations of VOCs and/or SVOCs increase significantly or if separate phase product thickness increases, this cell will undergo an additional operating period. Monitoring during this additional operation period will be the same as described above.

If, after several consecutive operating periods, the concentrations of VOCs and SVOCs in groundwater continue to rebound, VOCs in the subsurface based on MIP borings do not indicate significant reductions, and separate-phase product has not been remediated, it will be assumed that operation of the ChemOx system within this cell has met the practical limit of its remediation potential. At this time, if conditions within a particular cell still warrant additional remediation, modifications to the ChemOx system will be considered and/or alternative treatment methods will be evaluated.

5.9 Long-Term Monitoring for System Decommissioning

For cells that meet the temporary shutdown criteria (following the initial or subsequent treatment periods), and that do not experience rebound (following the initial or subsequent treatment periods), the following monitoring will be conducted:

- Sample groundwater for VOCs and SVOCs in selected wells during the quarterly sampling rounds;
- Monitor water levels and separate phase product thickness in selected wells during the quarterly sampling rounds;
- Conduct MIP borings at select locations; and
- Sample soil at select locations in the vicinity of MIP borings, with analysis for VOCs and SVOCs by USEPA methods 8021 and 8270, respectively.

These are the parameters that will evaluated to determine if the remediation within the OU-4 product plume has been completed. If conditions remain consistent with the temporary shutdown criteria, indicating that the remediation has been successful in meeting RAOs, monitoring will be discontinued on a cell-by-cell basis.

5.10 Field Book Records and Logs

In order to properly monitor and maintain the ChemOx System in OU-4 and minimize downtime resulting from system shut down, system record keeping must be performed. Recognition of faulty equipment will help avert potential mechanical and environmental problems. The O&M Schedule (Appendix A), Critical Equipment Inspection Checklist (Appendix B), ChemOx Field Forms (Appendix C) will be maintained onsite to record inspection protocols and observations, plus document repairs and troubleshooting activities. In addition, a field book dedicated to the ChemOx System will be kept in the possession of the GES field technician/engineer. The following information will be recorded in the field book:

- Date and time of arrival;
- Personnel present onsite;
- Objective of Site visit;
- Weather conditions;
- Operating status of the ChemOx system;
- O&M activities performed;
- System upgrades or alterations;
- The equipment maintenance required;
- The frequency of the required maintenance;
- The protocols used in performing the equipment maintenance;
- The date when the maintenance was last performed;
- The date the maintenance is required next; and
- The groundwater sampling procedures and protocols.

The Critical Equipment Inspection Checklist, the O&M Schedule and the ChemOx System Field Forms will be updated with new inspection/monitoring tasks, as necessary. In addition, operation manuals of all system components are included in the Supplementary O&M Literature, kept onsite for system troubleshooting reference.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Groundwater and confirmatory soil samples will be submitted to TestAmerica, a NYSDOH ELAP certified laboratory. Category A laboratory data deliverables as defined in the analytical services protocol (ASP) will be requested for all sampling data.

Quality assurance and quality control for all laboratory sampling will be completed in accordance to the site-specific Quality Assurance Project Plan (QAPP) for the ChemOx IRM provided in Appendix C of the Interim Remedial Measure (IRM) work plan. This QAPP was prepared in accordance with the DER-10 Section 2.2.

7.0 SYSTEM REPORTING

System status reports will be prepared on a quarterly basis and will be included with the overall quarterly Site Monitoring Reports (SMR) for the Site.

In addition to the Site-wide monitoring and operation and maintenance data presented in the quarterly SMR, information regarding the performance and operation of the ChemOx system will be presented. The quarterly reports will summarize the ChemOx System performance data collected (i.e., product recovered, MIP data, etc.), monitoring data collected (i.e., groundwater sampling data related to the system), as well as a brief description of O&M activities or system upgrades performed during that reporting period.

Interim Remedial Action Report

At the completion of all remedial activities documented in the IRM work plan, an Interim Remedial Action Report will be prepared in accordance with Section 5.7 of the Draft BCP Guide and Section 5.8 of the Draft DER-10. The Remedial Action Report will describe the work performed as part of the remediation and will include:

- Survey drawings and site maps of the final ChemOx System components.
- Documentation of all gauging, sampling and MIP results.
- A certification by a New York professional engineer that all activities completed during the implementation of the IRM were performed in accordance with the specifications provided in the IRM work plan, as approved by the NYSDEC and that the activities were personally witnessed by a person under the direct supervision of the professional engineer.
- Any changes or modifications to the scope of the IRM.

8.0 CITIZEN PARTICIPATION

A Citizen Participation Plan (CPP) for the ExxonMobil Former Buffalo Terminal was prepared as a result of the Site's enrollment status within the BCP. This CPP, dated April 13, 2006 is available for review at the Document Repository Locations at the Valley Community Center at 93 Leddy Street, Buffalo, New York, and NYSDEC Region 9 Office at 270 Michigan Avenue, Buffalo, New York. There are no specific Citizen Participation activities related to operation of the ChemOx System as an IRM.

9.0 PERSONNEL

A description of the Chain of Command for the Site, responsibilities and duties of each personnel, and the required training for the Site are provided in the subsections below.

9.1 Chain of Command

The Chain of Command for the Buffalo ChemOx System is to be followed for all Site related issues and questions, except in the case of an emergency or incident. If there is an emergency or incident at the Site, the Incident Response Plan (posted inside the ChemOx trailer and also included in the site-specific HASP) must be followed. The Emergency Contingency Plan is also provided in Section 10.0.

The Chain of Command is as follows:

- Primary Field Technician: Michael Reisch – GES, telephone: (484) 645-2302
- Secondary Field Technician: Brent Miller, GES – telephone: (484) 645-2301
- Field Team Leader: Andrew Janik, GES – telephone: (484) 325-0280
- Remedial Engineering Project Manager: Noelle Clarke – telephone: (631) 232-2600 or (631) 807-6523
- ExxonMobil Project Manager: Joseph Abel – telephone: (401) 434-7356

9.2 Responsibilities and Duties

The overall management structure and a general summary of the responsibilities of key project team members are presented below.

<u>ExxonMobil Project Manager</u>

Joseph Abel is the ExxonMobil Project Manager. The ExxonMobil Project Manager is responsible for defining project objectives, and bears ultimate responsibility for the successful completion of the remedial action. This individual will provide overall management for the implementation of the scope of work and will coordinate all field activities with Remedial Engineering and GES. The ExxonMobil Project Manager is also responsible for all regulatory interaction and correspondence.

Remedial Engineering Project Manager

Noelle Clarke of Roux Associates/Remedial Engineering will serve as Project Manager. The Project Manager is responsible for defining project objectives, and bears responsibility for the successful completion of the remedial action. This individual will provide overall management for the implementation of the scope of work and will coordinate all field activities. The Project Manager is also responsible for data review/interpretation and report preparation. The project manager will also provide the New York State Professional Engineer (P.E.) seal for any documents requiring certification by a P.E.

Field Team Leader

Andrew Janik of Groundwater & Environmental Services, Inc. (GES) will serve as the Field Team Leader. The Field Team Leader bears the responsibility for the successful execution of the field program, as scoped in the IRM Work Plan and this OM&M Plan. The Field Team Leader will direct the activities of the technical staff in the field, as well all subcontractors. He will also assist in the interpretation of data. The Field Team Leader reports to the Project Manager.

Field Technician

The field technician is responsible for performing all routine monitoring and O&M activities at the Site. The field technician is also responsible for recording all data collected in the dedicated field book and field forms and reporting the information collected back to the Field Team leader. Any issues, questions or concerns that arise while at the Site must be discussed with the Field Team Leader and Project Manager prior to deviating from the original scope of work. The field technician is also responsible for implementing the site-specific work permit procedures. The primary field technician for this project is Mike Reisch of GES. Brent Miller is the secondary field technician.

9.3 Training

Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety trained prior to performing work on site per OSHA 29CFR 1910.120(e). In accordance with ExxonMobil health and safety protocols, all personnel working on-site more than one day per quarter must attend the ExxonMobil 8-hour Loss Prevention System (LPS) training. Personnel working on-site less than one day per quarter must attend the one hour LPS training. In addition, the site personnel must review and sign the site-specific HASP, which was submitted under separate cover.

Site-specific training will be provided by the Field Team Leader that will specifically address the activities, procedures, monitoring, and equipment for the site operations to site personnel and visitors, as appropriate. The training will also include the site and facility layout, hazards, and emergency services at the Site. Minimal training of the PLC and system start-up and start down procedures is required and shall be provided to all field personnel working at the ChemOx System. At a minimum, all field personnel regularly working with the equipment specified within this OM&M Plan, must review and sign in Section 12.0 of this site-specific OM&M Plan.

10.0 EMERGENCY CONTINGENCY PLAN

In case there is an emergency or incident at the Site, the Terminal's Emergency Contingency Plan should be referenced. This Plan includes emergency spill response, what to do in case of fire/explosion, personal injury, or toxic exposure, public notification guidelines and emergency contact phone numbers.

10.1 Emergency Spill Response

If possible, the spread of contamination will be controlled or stopped. Personnel onsite must immediately contact police and fire authorities to inform them of the possible or immediate need for nearby evacuation. If a significant release has occurred, the National Response Center and other appropriate groups and agencies will be contacted. Those groups will alert National or Regional Response Teams as necessary. Following these emergency calls, the remaining personnel listed in Table 1 will be notified, as necessary. If there are any questions concerning spill response, the Incident Response Plan, located in the HASP (submitted under separate cover) and also posted inside the ChemOx trailer, should be referenced.

In addition, the Terminal's emergency spill response procedures must be followed. The Terminal spill response procedures shall be provided by the Terminal operator whom issued the daily work permit at the beginning of the work shift. It is available in the HASP, which is located in both the main office and the ChemOx trailer.

10.2 Fire / Explosion

In the event of an emergency situation, such as fire or explosion, all persons in both the restricted and non-restricted areas will evacuate and assemble near the Support Zone or other safe area as identified by the Terminal Operator or Field Team Leader. The Terminal's default Support Zone is located outside of the main entrance gate on Elk Street.

Once the safety of all personnel is established, the fire department and other emergency response groups will be notified by telephone of the emergency. Then, other personnel listed in Table 1 will be notified, as necessary. The advisability and type of further response action will be coordinated and carried out by the Field Team Leader or designee in charge.

If the potential for a fire exists or if an actual fire or explosion occurs, the following procedures will be implemented:

- immediately evacuate the site as described above;
- notify Buckeye personnel onsite;
- notify the ExxonMobil Project Manager; and
- notify fire, security, and police departments.

10.3 Personal Injury

If on-site personnel require emergency medical treatment, the following steps will be taken:

1. Notify the Fire Department or Ambulance service and request an ambulance or transport the victim to the hospital, as appropriate.
2. Decontaminate to the extent possible prior to administration of first aid or movement to emergency facilities.
3. First aid will be provided by emergency medical services (EMS) or by onsite personnel trained in first aid, CPR, and blood borne pathogens, if available.
4. The Field Team Leader will obtain and supply medical data sheets on the victim to appropriate medical personnel.

10.4 Toxic Exposures

If an overt exposure to toxic materials occurs, the exposed person will be treated on site as follows:

Skin Contact:	Remove contaminated clothing. Wash/rinse affected area thoroughly with copious amounts of soap and water, then provide appropriate medical attention. Contact EMS, if necessary. An emergency eyewash/shower is provided in the Main Terminal Utilizing an eyewash, eyes should be rinsed for at least 15 minutes upon chemical contamination.
Inhalation:	Remove from contaminated atmosphere. Contact EMS, if necessary. Transport to hospital.
Ingestion:	Never induce vomiting on an unconscious person. Also, never induce vomiting when acids, alkalis, or petroleum products are suspected. Contact the poison control center. Contact EMS, if necessary.

Puncture Wound or Laceration:	Decontaminate and transport to emergency medical facility or contact EMS. Do not contact blood or bodily fluids. Field Team Leader will provide medical data sheets to medical personnel as requested.

10.5 Emergency Phone Numbers

In the case of any emergency, the appropriate emergency contacts and phone numbers provided in Table 1 should be referenced.

10.6 Material Safety Data Sheets

Material Safety Data Sheets (MSDS) for all chemicals used at the Buffalo ChemOx System should be reviewed prior to starting any work at the Site. The MSDS for: (1) Dowfast heat transfer fluid, (2) Ozone from oxygen, (3) 20%-40% hydrogen peroxide, (4) Carolite oxygen catalyst, and (5) Oxygen, used as part of the ChemOx System is provided in Volume II of this OM&M Plan and also in the site-specific HASP.

11.0 HEALTH AND SAFETY AND WORK PERMIT SYSTEM

This section provides details regarding the Site-specific health and safety requirements to be followed during the implementation of the ChemOx IRM, as well as the Site-specific work permit system that is followed for all work performed on the former Buffalo ExxonMobil Terminal.

11.1 Health and Safety

All OM&M activities will be performed in a manner consistent with 29CFR 1910 and 1926. Each Consultant and Contractor onsite will be covered under a site-specific Health and Safety Plan (HASP) for the project. HASP will be readily available during the Work. During all phases of Site work, the Consultants/Contractor will monitor safety and health conditions and fully enforce the site-specific HASP. The Consultant/Contractor will be responsible for monitoring general Site conditions and for safety hazards. Specifically, monitoring will be performed to verify that all requirements of the Occupational Safety and Health Administration as outlined on 29 CFR Part 1910 and 1926 are adhered to. A copy of the HASP, prepared by Groundwater & Environmental Services Inc. (GES), has been submitted under separate cover.

11.2 Work Permit System

An ExxonMobil work permit will be completed daily for the work activity described in this OM&M manual. The permit will be issued by the Technician or the Field Team Leader with approval from the ExxonMobil Project Manager.

12.0 FIELD TEAM REVIEW/TRAINING SECTION

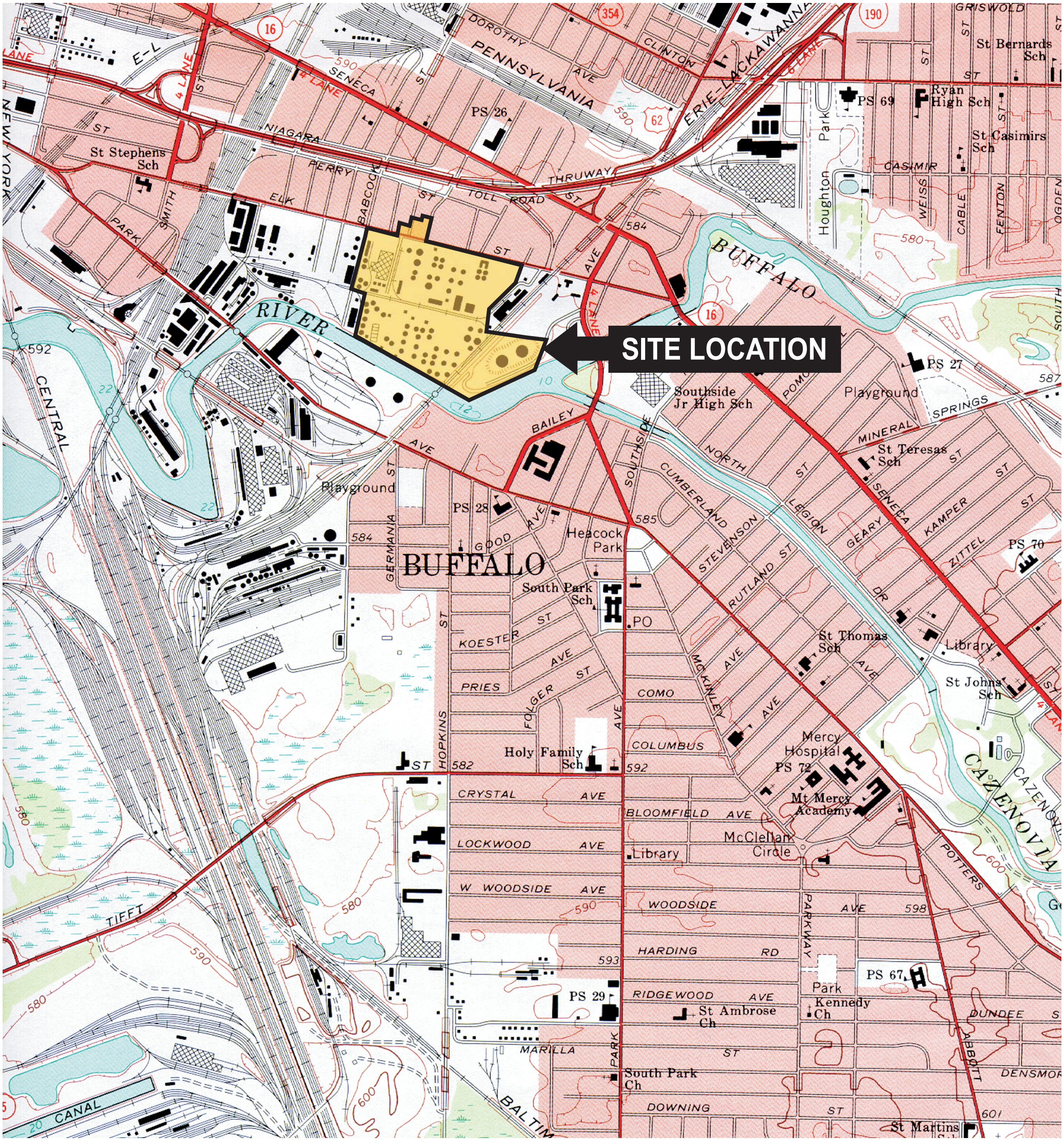
The personnel performing daily activities on the operation of the system shall sign this section after Site-specific training is completed and before being permitted to access the Site.

I have read and understand this Operations, Maintenance and Monitoring Plan. I will comply with the provision contained therein.

Name Printed	Signature	Date

Table 1. Emergency Contact Numbers
Former Buffalo Terminal, ExxonMobil Oil Corporation, Buffalo, New York

Name	Phone Number and/or Address	Comments
Local Police	911	
Local Fire	911	
Local Rescue	911	
Local Hospital	Mercy Hospital 565 Abbott Road Buffalo, NY	Hospital route map is included in the HASP located in the ChemOx trailer.
National Response Center (NRC):	(800) 424-8802	The NRC should be contacted in the event of a significant chemical release. Once notified, the NRC will activate a federal response to the spill. Please confirm with the client and project manager to determine if the spill should be reported.
U.S. Coast Guard:	(800) 424-8802	
NYSDEC Spills Hotline:	(800) 457-7362	NYSDEC should be contacted in the event of a significant chemical release. Once notified, NYSDEC will activate a state response to the spill. Please confirm with the client and project manager to determine if the spill should be reported.
Poison Control Center:	(800) 682-9211	The Poison Control Center should be contacted in the event of accidental poisoning. They will provide information on immediate treatment for the poisoning.
Nearest Onsite Telephone:	(716) 826-1990	On site at the Remediation Building
Groundwater & Environmental Services, Inc. Andy Janik Project Manager Thomas Baylis, CIH Director of Corporate Health and Safety	(800) 287-7857 or (716) 706-0074 Office: (716) 706-0074 Cell Phone: (484) 325-0280 Office: (610) 458-1077 x.124 Pager: (888) 210-1020 Cell Phone: (610) 587-1124	
Joseph Abel ExxonMobil Representative	Office: (401) 434-7356	
Chad Stansiszewski New York State Department of Environmental Conservation	Office: (716) 851-7220	
Mike Miller Buckeye Terminals, LLC Terminal Superindent	Office: (716) 827-5127	
Roux Associates, Inc./Remedial Engineering, P.C. Noelle Clarke Project Manager Wendy Shen Project Engineer	Office: (631) 232-2600 Office: (631) 232-2600 Cell Phone: (631) 807-6523 Office: (631) 232-2600 Cell Phone: (631) 484-1333	



QUADRANGLE LOCATION

N

SOURCE:
USGS; 1965, Buffalo SE, New York
7.5 Minute Topographic Quadrangle

0 2000'

Title:

SITE LOCATION MAP

FORMER BUFFALO TERMINAL

Prepared for:

EXXONMOBIL OIL CORPORATION

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: N.C.	Date: 26MAY06	FIGURE
Prepared by: R.K.	Scale: AS SHOWN	1
Project Mgr.: N.C.	Office: NY	
File No.: MC5230401.CDR	Project No.: 17252Y08	

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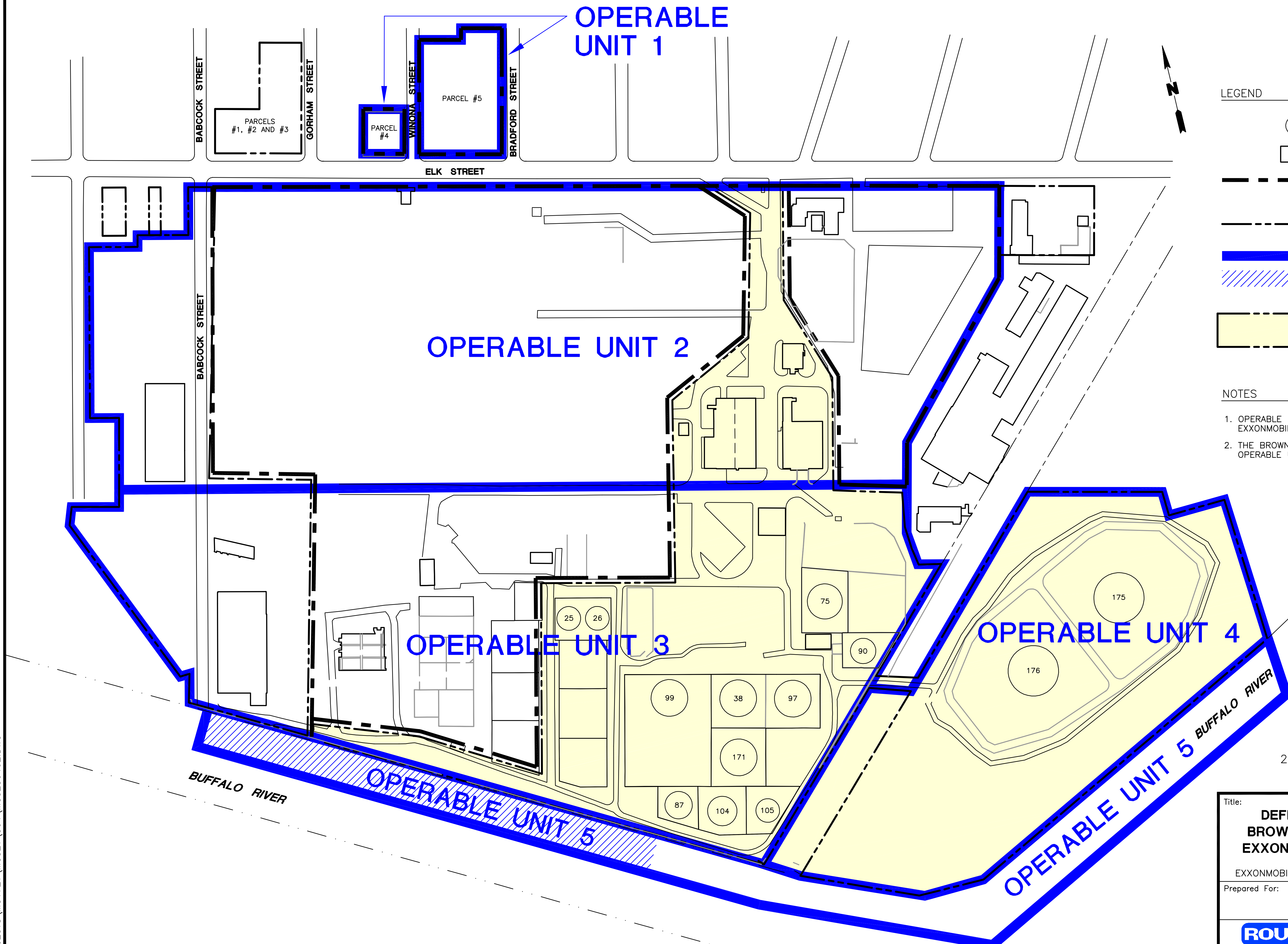


LEGEND

- EXISTING TANK
- EXISTING STRUCTURE
- PROPERTY CURRENTLY OWNED BY EXXONMOBIL (BASED ON DENLUCK–O'NEILL ENGINEERING AND SURVEYING, DEC. 15, 1988; AND NUSSBAUMER & CLARKE, INC. FEBRUARY 6, 1995)
- LIMITS OF PROPERTY FORMERLY OWNED BY EXXONMOBIL OIL CORPORATION
- OPERABLE UNIT BOUNDARY
- AREA WHERE EXXONMOBIL HAS PARTICIPATED IN DREDGING OPERATIONS TO MAINTAIN BARGE ACCESS TO THE SITE
- PROPERTY OWNED AND OPERATED BY BUCKEYE TERMINALS, LLC AS OF MAY 4, 2005

NOTES

1. OPERABLE UNIT 5 IS NOT PART OF THE CURRENT OR FORMER EXXONMOBIL PROPERTY.
2. THE BROWNFIELD SITE IS DEFINED AS ALL AREAS WITHIN THE OPERABLE UNIT BOUNDARIES.

Title:

DEFINITION OF OPERABLE UNITS AND BROWNFIELD SITE BOUNDARIES FOR THE EXXONMOBIL FORMER BUFFALO TERMINAL

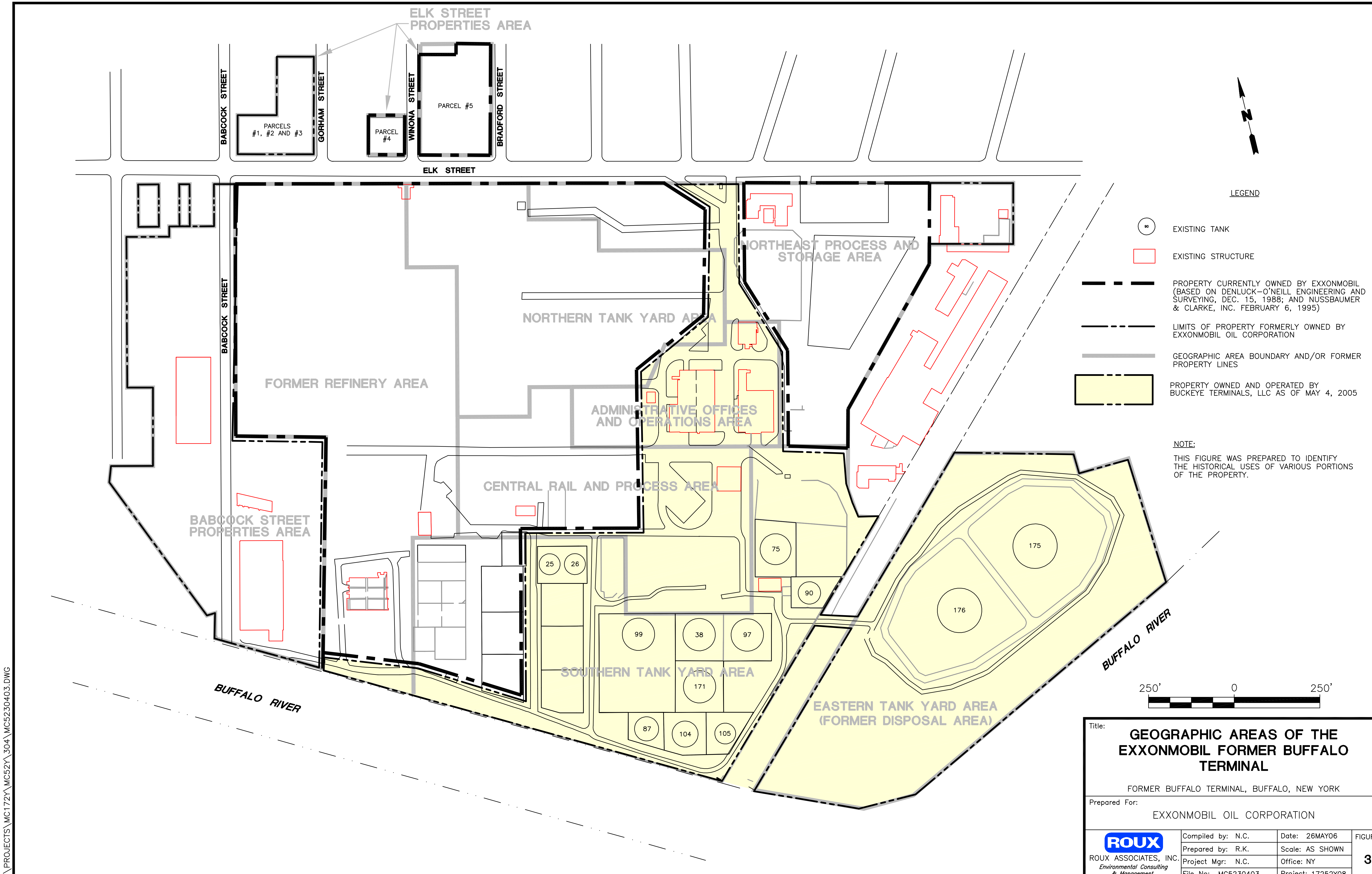
EXXONMOBIL FORMER BUFFALO TERMINAL, BUFFALO, NEW YORK

Prepared For:

EXXONMOBIL OIL CORPORATION

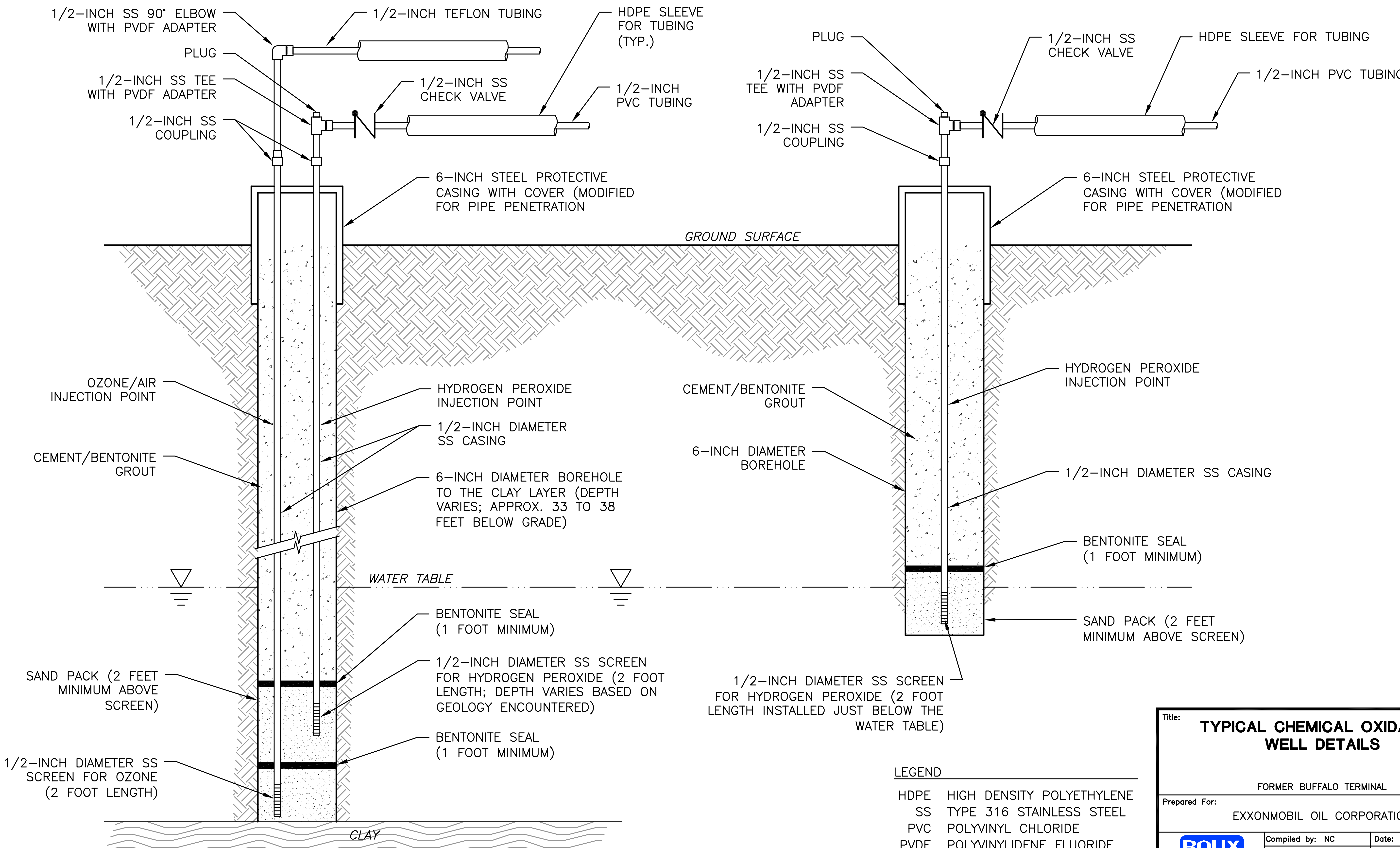
ROUX ASSOCIATES, INC. Environmental Consulting & Management	Compiled by: N.C.	Date: 26MAY06	FIGURE
	Prepared by: R.K.	Scale: AS SHOWN	2
	Project Mgr: N.C.	Office: NY	
	File No: MC5230402	Project: 17252Y08	

N:\PROJECTS\MC172Y\MC52Y\304\MC5230402.DWG


ELK STREET PROPERTIES AREA
BABCOCK STREET
GORHAM STREET
WINONA STREET
BRADFORD STREET
PARCELS #1, #2 AND #3
PARCEL #4
PARCEL #5
ELK STREET
NORTHEAST PROCESS AND STORAGE AREA
NORTHERN TANK YARD AREA
FORMER REFINERY AREA
ADMINISTRATIVE OFFICES AND OPERATIONS AREA
CENTRAL RAIL AND PROCESS AREA
BABCOCK STREET PROPERTIES AREA
SOUTHERN TANK YARD AREA
EASTERN TANK YARD AREA (FORMER DISPOSAL AREA)
BUFFALO RIVER
BUFFALO RIVER
75
90
25
26
99
38
97
171
87
104
105
175
176
N
LEGEND
EXISTING TANK
EXISTING STRUCTURE
PROPERTY CURRENTLY OWNED BY EXXONMOBIL (BASED ON DENLUCK–O'NEILL ENGINEERING AND SURVEYING, DEC. 15, 1988; AND NUSSBAUMER & CLARKE, INC. FEBRUARY 6, 1995)
LIMITS OF PROPERTY FORMERLY OWNED BY EXXONMOBIL OIL CORPORATION
GEOGRAPHIC AREA BOUNDARY AND/OR FORMER PROPERTY LINES
PROPERTY OWNED AND OPERATED BY BUCKEYE TERMINALS, LLC AS OF MAY 4, 2005
NOTE:
THIS FIGURE WAS PREPARED TO IDENTIFY THE HISTORICAL USES OF VARIOUS PORTIONS OF THE PROPERTY.
250'
0
250'
Title:
GEOGRAPHIC AREAS OF THE EXXONMOBIL FORMER BUFFALO TERMINAL
FORMER BUFFALO TERMINAL, BUFFALO, NEW YORK
Prepared For:
EXXONMOBIL OIL CORPORATION
ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management
Compiled by: N.C.
Prepared by: R.K.
Project Mgr: N.C.
File No: MC5230403
Date: 26MAY06
Scale: AS SHOWN
Office: NY
Project: 17252Y08
FIGURE
3
N:\PROJECTS\MC172Y\MC52Y\304\MC5230403.DWG

TYPICAL NESTED CHEMOX INJECTION WELL

TYPICAL PROPOSED SUPPLEMENTAL HYDROGEN PEROXIDE INJECTION WELL



LEGEND

HDPE	HIGH DENSITY POLYETHYLENE
SS	TYPE 316 STAINLESS STEEL
PVC	POLYVINYL CHLORIDE
PVDF	POLYVINYLIDENE FLUORIDE

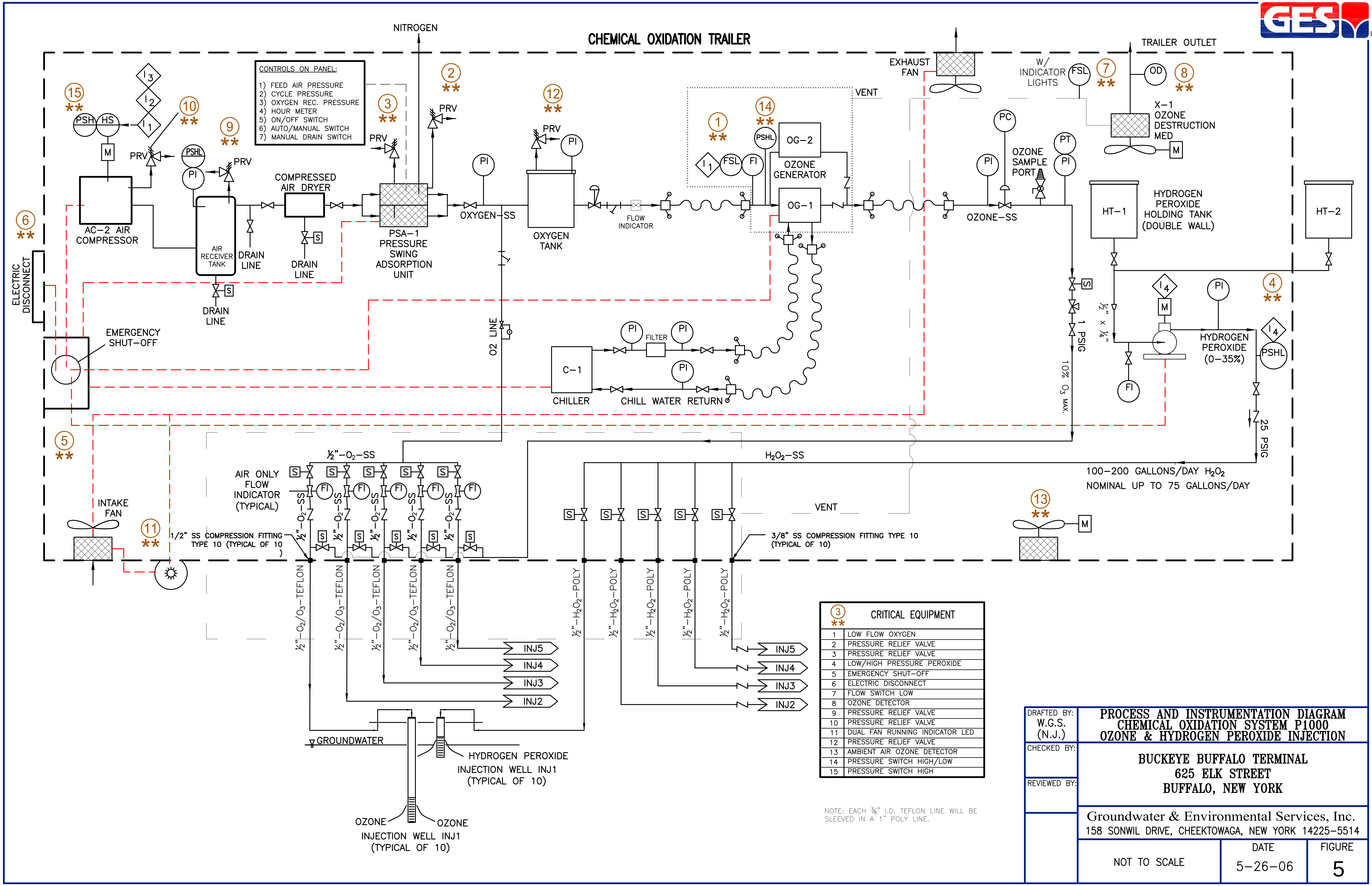
Title: **TYPICAL CHEMICAL OXIDATION WELL DETAILS**

FORMER BUFFALO TERMINAL

Prepared For: EXXONMOBIL OIL CORPORATION

ROUX ASSOCIATES, INC. *Environmental Consulting & Management*

Compiled by: NC	Date: 30MAY06	FIGURE
Prepared by: GM	Scale: AS SHOWN	4
Project Mgr: NC	Office: NY	
File No: MC5230409	Project: 17252Y08	



CRITICAL EQUIPMENT

1	LOW FLOW OXYGEN
2	PRESSURE RELIEF VALVE
3	PRESSURE RELIEF VALVE
4	LOW/HIGH PRESSURE PEROXIDE
5	EMERGENCY SHUT–OFF
6	ELECTRIC DISCONNECT
7	FLOW SWITCH LOW
8	OZONE DETECTOR
9	PRESSURE RELIEF VALVE
10	PRESSURE RELIEF VALVE
11	DUAL FAN RUNNING INDICATOR LED
12	PRESSURE RELIEF VALVE
13	AMBIENT AIR OZONE DETECTOR
14	PRESSURE SWITCH HIGH/LOW
15	PRESSURE SWITCH HIGH

NOTE: EACH ⅜" I.D. TEFLON LINE WILL BE SLEEVED IN A 1" POLY LINE.

DRAFTED BY: W.G.S. (N.J.)

CHECKED BY:

REVIEWED BY:

PROCESS AND INSTRUMENTATION DIAGRAM
CHEMICAL OXIDATION SYSTEM P1000
OZONE & HYDROGEN PEROXIDE INJECTION

BUCKEYE BUFFALO TERMINAL
625 ELK STREET
BUFFALO, NEW YORK

Groundwater & Environmental Services, Inc.
158 SONWIL DRIVE, CHEEKTOWAGA, NEW YORK 14225–5514

NOT TO SCALE

DATE 5–26–06

FIGURE 5

M:\Graphics\0900-Buffalo\Mobil\00Terminals\31010 Buffalo\31010 Buffalo Terminal PID (chemox).dwg, 5/26/2006 7:46:57 AM, WShea

CONTROL VALVE BODIES

- BALL VALVE
- GATE VALVE
- GLOBE VALVE
- BUTTERFLY VALVE
- SWING CHECK VALVE
- DIAPHRAGM VALVE
- BALL CHECK VALVE
- NEEDLE VALVE
- 3 WAY VALVE
- 4 WAY VALVE
- FOOT VALVE

ACTUATORS/ REGULATORS

- GEAR ACTUATOR
- PRESSURE RELIEF
- DIAPHRAGM ACTUATOR
- HYDRAULIC ACTUATOR
- SOLENOID ACTUATOR
- MOTOR ACTUATOR
- DIGITAL ACTUATOR
- WATER ACTUATOR
- REGULATOR
- FLOW INDICATOR
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE

MEASURING DEVICE SYMBOLS:

- SINGLE PORT PITOT TUBE
- AVERAGING PITOT TUBE
- POSITIVE DISPLACEMENT FLOW INDICATOR
- VORTEX SENSOR
- SONIC FLOW METER
- ROTAMETER FLOW INDICATOR
- TARGET TYPE SENSOR
- WEIR
- VENTURI TYPE FLOW ELEMENT
- FLOW NOZZLE
- ORIFICE PLATE FLOW ELEMENT

FITTINGS & PIPING

- VICTAULIC CONNECTOR
- FLANGED CONNECTION
- SCREWED CONNECTION
- UNION
- COUPLING
- RUPTURE DISK
- REDUCER
- STRAINER
- FLOW RESTRICTOR
- FLEX HOSE
- CAM LOCK
- REMOVABLE CLEAR PIPE
- EXPANSION JOINT/SLEEVE
- HOSE CONNECTION
- PNEUMATIC QUICK CONNECT
- PLUG
- PIPE CAP
- SLIP UPDRAFT VENT CAP
- ELBOW – TURNED UP
- ELBOW – TURNED DOWN
- ELBOW – 90°
- ELBOW – 45°
- ELBOW – LONG RADIUS
- REDUCING ELBOW
- TEE REDUCING
- TEE (OUTLET UP)
- TEE (OUTLET DOWN)
- TEE

LINE DESIGNATION:

2 – VR – 01 – PV

SIZE IN INCHES / PROCESS / LINE NUMBER / MATERIAL SPECIFICATION

SECTION CUT — INDICATES SECTION NUMBER; INDICATES DRAWING SHEET ON WHICH SECTION IS SHOWN

SYMBOL & LEGEND SHEET EQUIPMENT

- LEVEL SWITCH FLOATS
- BAG FILTER
- LIQUID RING PUMP
- CENTRIFUGAL PUMP
- ROTARY VANE COMPRESSOR
- DISPLACEMENT PUMP
- PRODUCT DRUM
- AIR FILTER
- POSITIVE DISPLACEMENT BLOWER
- BLOWER
- PROPORTIONING PUMP
- CENTRIFUGAL BLOWER PUMP
- HEAT EXCHANGER/ CONDENSER
- HEATER
- OIL WATER SEPARATOR
- PACKED COLUMN AIR STRIPPING TOWER
- PISTON COMPRESSOR
- WELL WITH PUMP
- SKIMMER PUMP
- DIAPHRAGM PUMP
- SILENCER
- VAPOR PHASE CARBON
- LIQUID PHASE CARBON FRP
- LIQUID PHASE CARBON (STEEL)
- MOISTURE SEPARATOR
- LOW PROFILE AIR STRIPPER
- LIQUID RING PUMP HOLDING TANK (MAKEUP WATER SOURCE)

INSTRUMENTATION:

INSTRUMENT TYPE → PI; SYSTEM DESIGNATION → VE1; ← SYSTEM POSITION NUMBER

- REFERENCE POINT FOR DESIGN ONLY NOT ACTUAL INSTALLED INSTRUMENT. OPTIONAL FIELD MOUNTED INSTRUMENT TO BE INSTALLED AT THIS LOCATION IF CHOSEN.
- LOCAL MOUNTED INSTRUMENT
- INSTRUMENTS WITH INPUTS OR OUTPUTS AT THE SITE CONTROL PANEL
- PILOT LIGHT OR ALARM INDICATOR

INSTRUMENT TYPE/DESIGNATION:

CP	CAPACITIVE SENSOR/PROBE
DPS	DIFFERENTIAL PRESSURE SWITCH
DPI	DIFFERENTIAL PRESSURE INDICATOR
FI	FLOW INDICATOR
FM	FLOW METER
FQI	FLOW METER (TOTALIZING)
FS	FLOW SWITCH
LAL	LEVEL ALARM LOW
LAH	LEVEL ALARM HIGH
LSLL	LEVEL SWITCH LOW LOW
LSL	LEVEL SWITCH LOW
LSM	LEVEL SWITCH MIDRANGE
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH HIGH
PAH	PRESSURE ALARM HIGH
PAL	PRESSURE ALARM LOW
PC	PRESSURE CONTROL
PI	PRESSURE INDICATOR
PS	PRESSURE SWITCH
PSH	PRESSURE SWITCH HIGH
PSL	PRESSURE SWITCH LOW
S	SAMPLE PORT
TAH	TEMPERATURE ALARM HIGH
TAL	TEMPERATURE ALARM LOW
TI	TEMPERATURE INDICATOR
TSH	TEMPERATURE SWITCH HIGH
TSL	TEMPERATURE SWITCH LOW
TT	TEMPERATURE TRANSDUCER

SYSTEM DESIGNATION:

ASB	AIR SPARGE POSITIVE DISPLACEMENT BLOWER
ASV	AIR SPARGE ROTARY VANE COMPRESSOR
ASW	AIR SPARGE WELL & MANIFOLD
DPB	DUAL PHASE POSITIVE DISPLACEMENT BLOWER
DPL	DUAL PHASE LIQUID RING PUMP
DPO	DUAL PHASE SEALED LIQUID RING PUMP
DPW	DUAL PHASE WELL & MANIFOLD
ERW	ELECTRIC RECOVERY WELL & PUMP
LC	LIQUID PHASE CARBON
OW	OIL– WATER SEPARATOR SYSTEM
PRW	PNEUMATIC RECOVERY WELL & PUMP
STL	AIR STRIPPER LOW PROFILE
VC	VAPOR PHASE CARBON
VEP	VAPOR EXTRACTION POSITIVE DISPLACEMENT
VER	VAPOR EXTRACTION REGENERATIVE BLOWER
VEW	VAPOR EXTRACTION WELL & MANIFOLD

VALVE ABBREVIATIONS

- N.C. – NORMALLY CLOSED
- N.O. – NORMALLY OPEN
- MAN – MANUAL

MATERIAL SPECIFICATION:

- PV – POLYVINYL CHLORIDE
- GM – GALVANIZED
- RC – RIGID COPPER
- IR – IRON
- ABS – ACRYLONITRILE BUTADIENE STYRENE
- FL – FLEX

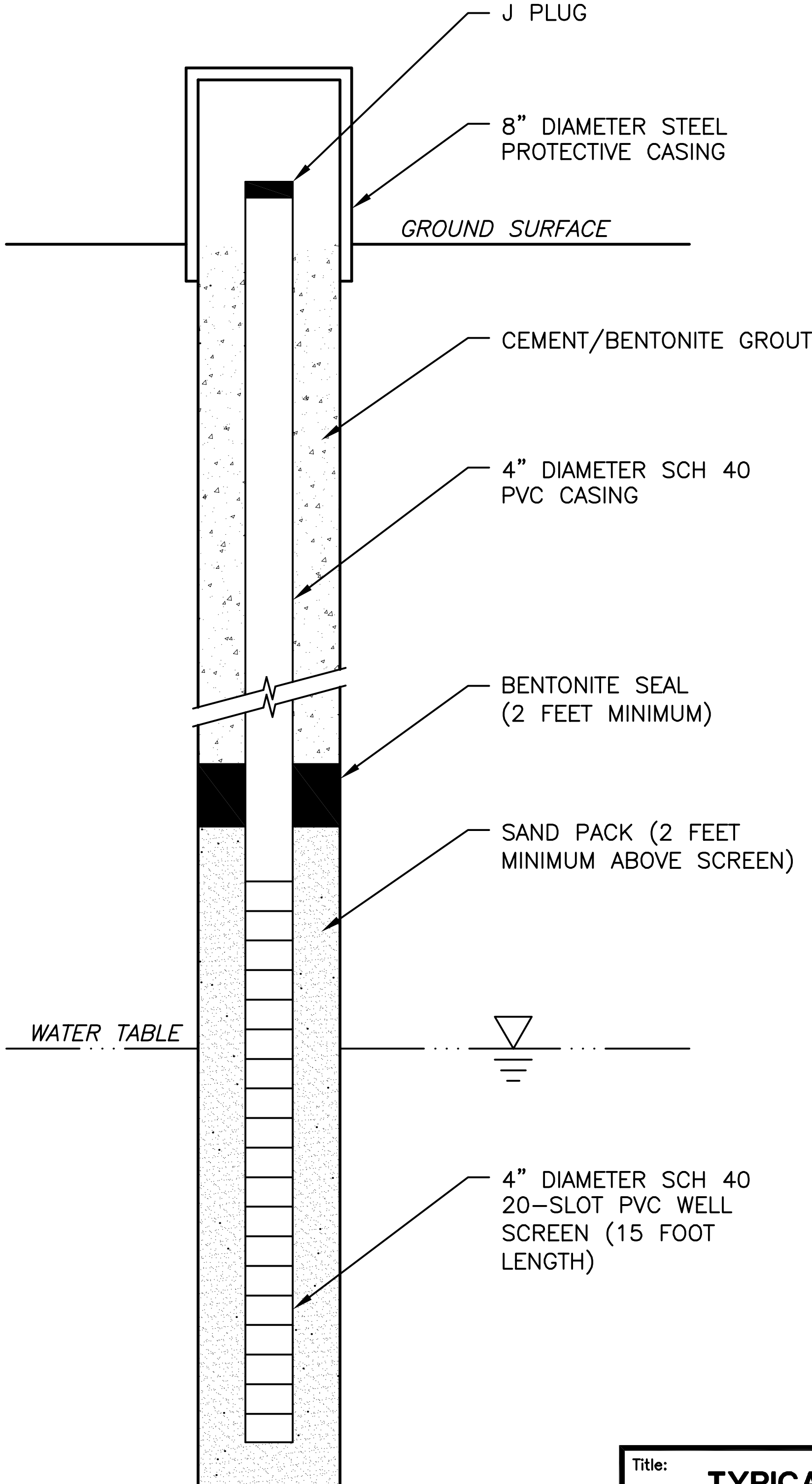
PROCESS LINE INDICATORS

- FLOW DIRECTION
- MAJOR PROCESS
- MINOR PROCESS
- WATER/AIR PIPING
- AIR PIPING
- INSTRUMENTATION CONTROLS
- PNEUMATIC LINE
- CONNECTING LINE
- CROSSOVER LINE

PROCESS LINE ABBREVIATIONS

- ES – ELECTRIC SUPPLY
- GS – GAS SUPPLY
- HS – HYDRAULIC SUPPLY
- NS – NITROGEN SUPPLY
- SS – STEAM SUPPLY
- W – WATER SUPPLY
- V – VACUUM
- VR – VAPOR REMOVAL
- TF – TOTAL FLUIDS
- AP – ACCESS PIPE / CONDUIT
- SA – SPARGE AIR
- PN – PNEUMATIC SUPPLY

DRAFTED BY: W.G.S. (N.J.)	PROCESS & INSTRUMENTATION DIAGRAM LEGEND
CHECKED BY:	FORMER MOBIL BUFFALO TERMINAL #31010 625 ELK STREET BUFFALO, NEW YORK
REVIEWED BY:	
	Groundwater & Environmental Services, Inc. 158 SONWIL DRIVE, CHEEKTOWAGA, NEW YORK 14225-5514
	NOT TO SCALE · DATE 5-17-06 · FIGURE 6



Title:

TYPICAL CHEMICAL OXIDATION MONITORING WELL DETAIL

FORMER BUFFALO TERMINAL, BUFFALO, NEW YORK

Prepared For:

EXXONMOBIL OIL CORPORATION

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: NC	Date: 18AUG06	FIGURE
Prepared by: GM	Scale: N.T.S.	7
Project Mgr: NC	Office: NY	
File No: MC5230409	Project: 17252Y08	

APPENDIX A

Operations and Maintenance Schedule

ExxonMobil Former Buffalo Terminal
OU-4 ChemOx IRM System
Operation and Maintenance Schedule

Operation & Maintenance Activity	Schedule					
	Daily	Weekly	Monthly	Quarterly	Semi-annually	Annually
Visual inspection of trailer, components and Hydrogen Peroxide tank(s)	X					
Inspect Chem Ox System for gas, water leaks	X					
Check/refill peroxide tank	X					
Record system operating parameters	X					
Take monitoring well headspace readings with a LEL and PID	X					
Inspect coolant level, inspect and clean chiller pump strainer		X				
Inspect/clean coolant filter		X				
Check peroxide tank for gassing (bubble formation)		X				
Check peroxide pump tube for uneven wear		X				
Check oxygen filter		X				
Check / replace container ventilation intake filter		X				
Verify operation of drain valves / clean elements		X				
Check air compressor intake filter			X			
Check pressure swing adsorber intake filters			X			
Perform Critical Equipment Testing and Maintenance			X			
Calibrate hydrogen peroxide pump				X		
Calibrate ozone generator performance				X		
Flush coolant heat exchanger				X		
Lubricate chiller pump motor				X		
Clean cooling coils (dry air)				X		
Check tension of V-Belts					X	
Change A/B rings/valves (at 4000 operating hours)					X	
Change peroxide pump tube					X	
Check all safety relief valves						X
Inspect/tighten low voltage wiring terminations						X
Inspect/tighten power wiring terminations						X

APPENDIX B

Critical Equipment Inspection and Testing List

ExxonMobil Former Buffalo Terminal ChemOx IRM Monthly Critical Equipment Inspection and Testing Checklist

ExxonMobil

Revision - 0

Date of Revision – 8/8/2006

Reason for Inspection Check: ______________________ Date: __________ Time: ________

Name: ____

Reason for Inspection Check: ______________________ Date: __________ Time: ________

Name: ____

Reason for Inspection Check: ______________________ Date: __________ Time: ________

Name: ____

Reason for Inspection Check: ______________________ Date: __________ Time: ________

Name: ____

Reasons for Completing Critical Equipment Inspection Checks:

- Initial system start-up
- System re-start following temporary shutdown (does not include routine O&M shutdown)
- Immediately following any significant system modifications
- Manufacturer recommended inspection interval
- Annual (this check is required on all CE at least once a year)
- Monthly
- Other (detail above)

Critical Equipment	**P&ID CE Designation**	**Date**	**Date**	**Date**	**Date**
Signs	--				
Locks	--				
Fire Extinguishers	--				
Health and Safety Plan	--				
First Aid Kit	--				
Piping and Injection Wells	--				
Low Flow Oxygen - Ozone Generator Cabinet	1				
Pressure Relief Valve - PSA Side A	2				
Pressure Relief Valve - PSA Side B	3				
Low Pressure Switch - Peroxide Pump	4				
High Pressure Switch - Peroxide Pump	4				
Emergency Shut-Off Pilot Device	5				
Electric Disconnect Switch	6				
Low Flow Switch - Manifold Cabinet Exhaust Fan	7				
Ozone Detector - Manifold Cabinet Exhaust Fan Trunk	8				
Pressure Relief Valve - Air Receiver	9				
Pressure Relief Valve - Air Compressor	10				
Exhaust Fan Running Indicator Light	11				
Pressure Relief Valve - Oxygen Tank	12				
Ambient Air Ozone Detector	13				
Pressure Switch High - Oxygen Line in Ozone Generator Cabinet	14				
Pressure Switch Low - Oxygen Line in Ozone Generator Cabinet	14				
Pressure Switch High - Air Compressor	15				
Electrical Ground	--				

Initial when completed.

If CE fails, the system should be shut off until the CE component or components are repaired, or a decision to disarm, deactivate or by-pass has been approved.

Critical Equipment	P&ID CE Designation	Inspection/Testing Procedure
Signs	--	Ensure that all warning, emergency and PPE signs are legible, securely fastened, and accurate. Repair or replace the signs as required.
Locks	--	Check that all trailer accesses have functioning hasps and have workable locks. Replace locks as required with GES keyed-alike style only.
Fire Extinguishers	--	Verify, in accordance with manufacturer's recommendations, that extinguishers are in their designated location, that they have not been actuated or subjected to tampering, and that there are no obvious physical damage or condition to prevent their operation. Replace as necessary.
Health and Safety Plan (HASP)	--	Ensure that the HASP is available onsite within the ChemOx trailer and that all appropriate personnel have reviewed and signed the HASP.
First Aid Kit	--	Ensure that the first aid kit is onsite in its designated location and that it is fully stocked with all required supplies. Replace supplies as necessary.
Piping and Injection Wells	--	Visually inspect all above grade piping and connections to injection wells to ensure that they are not damaged or leaking. Repair or replace as necessary.
Low Flow Oxygen - Ozone Generator Cabinet	1	Close oxygen inlet valve to ozone generator cabinet. Reopen after shutdown is activated. Repair or replace as necessary.
Pressure Relief Valve - PSA Side A	2	Close oxygen inlet valve to oxygen tank. The relief valve should open at the set point (specify value). Replace the valve if it does not function properly. Reopen after test.
Pressure Relief Valve - PSA Side B	3	Close oxygen inlet valve to oxygen tank. The relief valve should open at the set point (specify value). Replace the valve if it does not function properly. Reopen after test.
Low Pressure Switch - Peroxide Pump	4	Close peroxide pump suction valve. Repair or replace as necessary. Reopen after shutdown is activated.
High Pressure Switch - Peroxide Pump	4	Close peroxide pump discharge valve. Repair or replace as necessary. Reopen immediately after shutdown is activated.
Emergency Shut-Off Pilot Device	5	Activate mushroom pilot device by depressing. Pull out after shutdown is activated. Repair or replace as necessary.
Electric Disconnect Switch	6	Throw disconnect into the off position. Throw back to the open position after disconnect is verified. Ensure lights-only load is on the bus while testing this shutdown.
Low Flow Switch - Manifold Cabinet Exhaust Fan	7	Close off suction port inside distribution panel. Remove barrier after shutdown is activated. Repair or replace as necessary.
Ozone Detector - Manifold Cabinet Exhaust Fan Trunk	8	Briefly expose detector to ozone. Use O3 meter to check ambient air while testing this shutdown. Refer to HASP for action levels associated with ozone concentrations and PPE use. Repair or replace as necessary.

Critical Equipment	P&ID CE Designation	Inspection/Testing Procedure
Pressure Relief Valve - Air Receiver	9	Close air receiver discharge valve. The relief valve should open at the set point (specify value). Replace the valve if it does not function properly. Reopen after test.
Pressure Relief Valve - Air Compressor	10	Close air compressor discharge valve. The relief valve should open at the set point (specify value). Replace the valve if it does not function properly. Reopen after test.
Exhaust Fan Running Indicator Light	11	Visually ensure lamp is lit while operating. Secure exhaust fan and verify that light goes out. Repair or replace as necessary.
Pressure Relief Valve - Oxygen Tank	12	Close oxygen tank discharge valve. The relief valve should open at the set point (specify value). Replace the valve if it does not function properly. Reopen after test.
Ambient Air Ozone Detector	13	Briefly expose detector to ozone. Use O3 meter to check ambient air while testing this shutdown. Refer to HASP for action levels associated with ozone concentrations and PPE use. Repair or replace as necessary.
Pressure Switch High - Oxygen Line in Ozone Generator Cabinet	14	Close ozone generators' discharge valves. Reopen after shutdown is activated. Repair or replace as necessary.
Pressure Switch Low - Oxygen Line in Ozone Generator Cabinet	14	Close ozone generators' inlet valves. Reopen after shutdown is activated. Repair or replace as necessary.
Pressure Switch High - Air Compressor	15	Close air compressor discharge valve. Reopen after shutdown is activated. Repair or replace as necessary.
Electrical Ground	--	Visually check grounding wire connections for damage, continuity, and connection tightness. Tighten, repair or replace grounding wire connections as required.

If CE fails, the system should be shut off until the CE component or components are repaired, or a decision to disarm, deactivate or by-pass has been approved.

APPENDIX C

ChemOx System Field Forms

ExxonMobil Former Buffalo Terminal
OU-4 ChemOx IRM System Monitoring Data
Groundwater Temperature in ChemOx Injection Wells

Name: ______________________

ChemOx Cell(s) Operating: ______________________

		Well Desination														
Date	Time															

ft bls - feet below land surface

DTW - depth to water

ExxonMobil Former Buffalo Terminal
OU-4 ChemOx IRM System Monitoring Data

Name: ____________________

Well Designation/Chemox Cell: ____________________

ChemOx Cell(s) Operating: ____________________

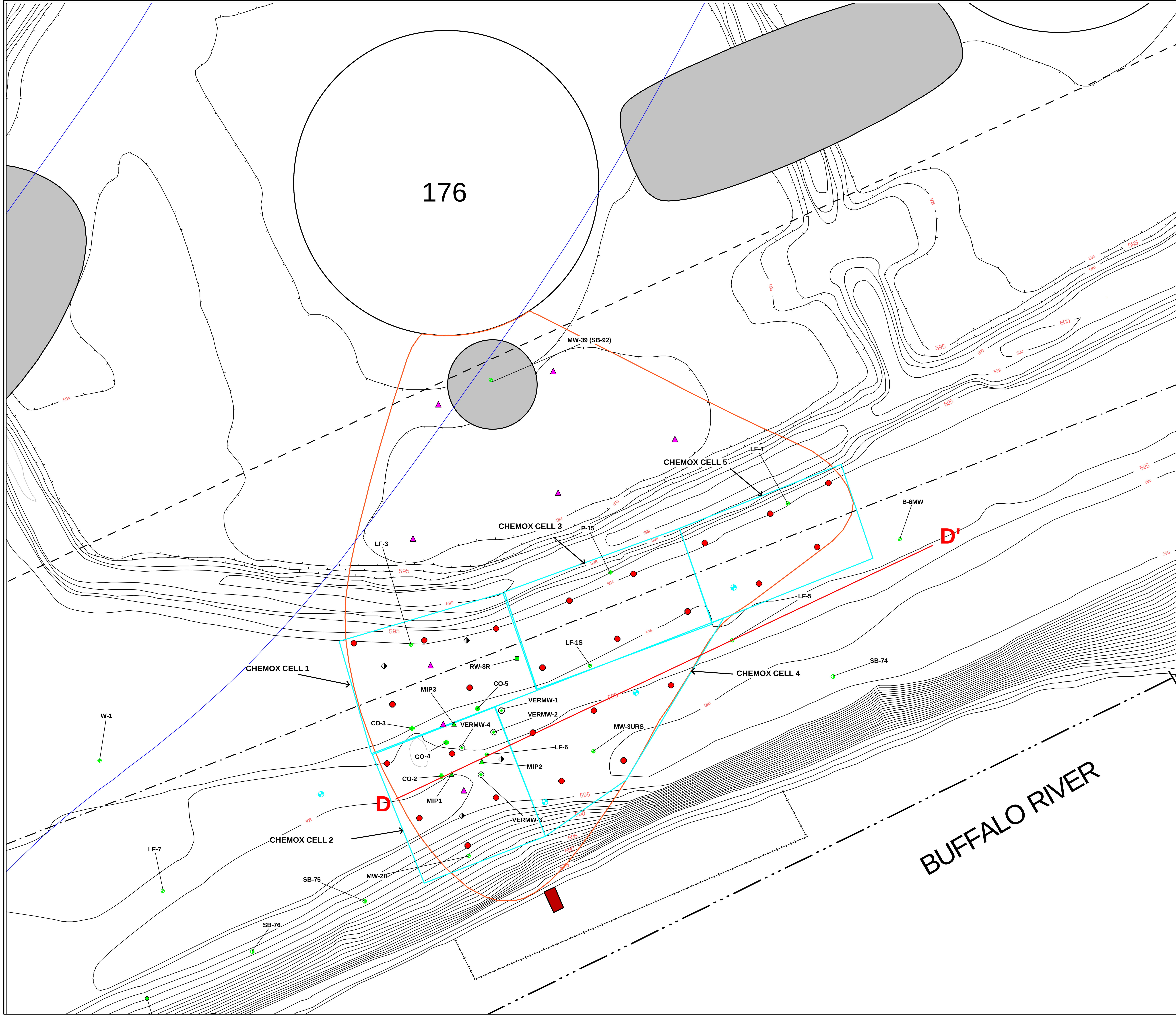
		Pressure at Wellhead	Headspace		Groundwater				
Date	Time	(in of water)	LEL (%)	PID (ppm)	Temp (degrees C)	DTW (feet bls)	DTP (feet bls)	DTB (feet bls)	Sampled (Y/N)

ft bls - feet below land surface DTP - depth to product DTW - depth to water DTB - depth to bottom

ExxonMobil Former Buffalo Terminal
OU-4 ChemOx IRM System Daily Inspection Form

Month: ____________________

			Hydrogen Peroxide (H_2O_2)					Ozone Generator (O_3)							Compressors					Chiller
				H_2O_2 Pump		H_2O_2 Pressure		Ozone Generator			Oxygen to ozone generators		Ozone Pressure							
Date	Operator	System On?	Volume H_2O_2 in tank	H_2O_2 pump Setting	H_2O_2 pump hour meter	Prior to Control Valve	After Control Valve	OG-1 hour meter	OG-2 hour meter	Power Percentage	Flow	Pressure	Prior to Pressure Control	After Pressure Control	Main Air Comp. hour meter	Air Comp. Receiver Pressure	Injection Air Comp. A	Injection Air Comp. B	Injection Air Pressure	Temp.
		Y/N	gal	Signal %	hours	psi	psi	hours	hours	%	scfh	psi	psi	psi	hours	psi	hours	hours	psi	degrees F



LEGEND

- PROPSOED NESTED CHEMOX INJECTION WELL (ONE OZONE AND ONE HYDROGEN PEROXIDE POINT)
- PROPSOED SUPPLEMENTAL HYDROGEN PEROXIDE INJECTION WELL (ONE HYDROGEN PEROXIDE POINT JUST BELOW THE WATER TABLE)
- PROPOSED MEMBRANE INTERFACE PROBE LOCATION
- PROPOSED CHEMOX GROUNDWATER OBSERVATION WELL
- EXISTING CHEMOX PILOT TEST NESTED INJECTION WELL (ONE OZONE AND ONE HYDROGEN PEROXIDE POINT). EXISTING PEROXIDE INJECTION POINTS CO-2, CO-3, CO-4 AND CO-5 TO BE USED DURING FULL SCALE OPERATION
- EXISTING MEMBRANE INTERFACE PROBE LOCATION
- EXISTING PILOT TEST OBSERVATION WELL
- EXISTING RECOVERY WELL
- EXISTING MONITORING WELL
- EXISTING SOIL BORING/ MONITORING WELL
- PROPOSED CHEMOX CELL BOUNDARY
- D —— D' LOCATION OF HYDROGEOLOGIC CROSS SECTION D-D' THROUGH THE CHEMOX IRM TARGET AREA
- HISTORICAL WASTE HANDLING AREAS
- LIMITS OF SORBENT BOOM (proportions exaggerated for clarity)
- AREA OF PRODUCT SEEPAGE OBSERVED ON OCTOBER 26, 2000 (proportions exaggerated for clarity)
- LIMIT OF CURRENT AND HISTORICAL SEPARATE-PHASE PRODUCT OBSERVED IN MONITORING WELLS
- APPROXIMATE COURSE OF FORMER BUFFALO RIVER CHANNEL

CHEMOX = CHEMICAL OXIDATION

- EXXONMOBIL OIL CORP.'S FORMER ABANDONED BURIED PRODUCT PIPELINE (CURRENTLY OWNED BY BUCKEYE TERMINALS LLC) (Line purged and abandoned in place)
- LAKEHEAD PIPELINE CO.'S, BURIED PRODUCT PIPELINE (Line reportedly purged and filled with nitrogen in 1982)
- APPROXIMATE FORMER EXXONMOBIL (CURRENT BUCKEYE PIPELINE, LLC) PROPERTY LINE AND OU-4 BOUNDARY

NOTES:

1. PILOT TEST CHEMICAL OXIDATION WELL C0-1 HAD BEEN LOCATED IN CHEMOX CELL 2. DURING THE PILOT TEST, IT WAS DISCOVERED THAT THE WELL WAS INOPERABLE DUE TO A BLOCKAGE IN THE HYDROGEN PEROXIDE POINT. THIS WELL WILL NOT BE USED DURING FULL SCALE CHEMOX SYSTEM OPERATION AND IS NOT SHOWN FOR CLARITY.

20' 0 20'

N

Title:

PROPOSED IRM CHEMICAL OXIDATION SYSTEM AND MONITORING NETWORK LAYOUT

Prepared For:

EXXONMOBIL OIL CORPORATION

REMEDIAL ENGINEERING, P.C. 209 Shafter Street Islandia, New York 11479	Compiled by: N.C.	Date: 7/27/06	PLATE 1
	Prepared by: N.C.	Scale: AS SHOWN	
	Project Mgr: N.C.	Office: N.Y.	
	File No: MC5230402.WOR	Project: 17252Y08	