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Steve P. Trifiletti
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July 13, 2012

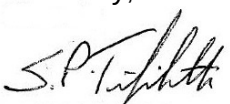
Mr. William T. Ports, PE
Environmental Engineer 2
Remedial Section
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remediation Bureau C, 11th Floor
625 Broadway
Albany, New York 12233 -7014

RE: Response to Comments of June 14, 2012
Final Remedial Design/Remedial Action Work Plan and Site Management Plan
Former Tappan Terminal, Western Parcel, AOC 1
Hastings on Hudson, Westchester County, New York
Site No. 3-60-015

Dear Mr. Ports:

Enclosed are ExxonMobil's response to the Department's comments provided under cover dated June 14, 2012, and two bound copies, one unbound copy, and one electronic copy of the Revised Final Remedial Design/Remedial Action Work Plan and Site Management Plan for AOC1 at the Western Parcel of the Tappan Terminal Site in Hastings-on-Hudson, New York. Please contact me at (718) 383-7374 with any questions or comments pertaining to the enclosed report.

Sincerely,



Steve P. Trifiletti
Respondent's Project Manager

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Response to NYSDEC Comments of June 14, 2012
on the
Final Remedial Design/Remedial Action Work Plan and Site Management Plan
Former Tappan Terminal, Western Parcel, AOC 1
Hastings on Hudson, Westchester County, New York
Site No. 3-60-015

The following response to comments is provide pursuant to the New York State Department of Environmental Conservation (NYSDEC) letter of June 14, 2012 and its review of the Final Remedial Design/Remedial Action Work Plan and Site Management Plan, Western Parcel, AOC 1, dated December 18, 2011 (the Final RDRAWP), prepared by Woodard & Curran for the Tappan Terminal Site regarding soil cover design and a Site Management Plan (SMP). NYSDEC comments are provided in italicized type in their entirety, followed by the response.

1. *The property boundaries will need to be verified. The survey requirements for environmental easements are found at: http://www.dec.ny.govichemica1148242.html.*

   A survey was conducted in advance of producing the Final RDRAWP documents that included property boundaries.

2. *Remedial Action Work Plan needs to include the Community Air Monitoring Plan.*

   The Quality Assurance Project Plan (QAPP), that includes a Standard Operating Procedure for Air Monitoring, Appendix B to the June 15, 2010 Remedial Design and Remedial Action Work Plan, approved by the NYSDEC by letter dated June 17, 2010, is included as Appendix C in the enclosed revised work plan.

3. *Decontamination of Construction Equipment used for grading the site will be performed and the construction equipment will be decontaminated before contacting the clean backfill soil. The location and details of the decontamination pad need to be shown on the drawings.*

   The Quality Assurance Project Plan (QAPP), that includes a Standard Operating Procedure for Equipment Decontamination, Appendix B to the June 15, 2010 Remedial Design and Remedial Action Work Plan, approved by the NYSDEC by letter dated June 17, 2010, is included as Appendix C in the enclosed revised work plan for construction equipment to be decontaminated between grading and capping activities. The decontamination pad will be located near the vehicular entrance to the site as shown on Drawing C-01.

4. *Section 3.2.5 All fill material brought to the site must meet the Standards, Criteria and Guidance values found in Part 375-6 (See Table 375-6.8(b)) for restricted residential or protection of ecological resources soil clean-up objectives (SCO), whichever is the lower SCO. The remedial party must provide documentation of the source of fill to the Department for approval of the source of the material before it is used on the site.*

   Section 3.2.5 and documents in Appendix A have been revised to indicate that fill material brought to the site will be specified to meet the Standards, Criteria and Guidance values for restricted residential site use. Fill material within 50 feet of the shore will additionally meet the Standards, Criteria and Guidance values for protection of ecological resources. Documentation of the fill source will be provided to the NYSDEC for approval before use on site in accordance with DER-10 5.4(e)5 and 6.

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5. *Section 3.2.3 Underground piping identified during the construction of the cap will need to be removed except for existing stormwater pipe(s) which is shown on Drawing C-01 in Appendix A or any other stormwater pipes later discovered. The Village of Hastings on Hudson should be contacted to determine if there are existing additional stormwater pipes that cross the site. The condition of the stormwater pipes going across the site should be documented through video inspection. If the stormwater pipe(s) are in poor condition or blocked, they should be repaired or replaced during the soil cover installation. This is consistent with the remedial elements of the Record of Decision and the future intended use of the site.*

   With the exception of grading, there is no invasive activity associated with the work scope. Piping encountered during grading activities, most likely aboveground piping that may be identified when grading the earthen berms associated with the former terminal, will be removed as described in Section 3.2.3.

   The Village of Hastings on Hudson was contacted for any utilities that traverse the property when the stormwater pipe shown on Drawing C-01 was discovered. The Village records showed a 15" pipe in the vicinity of the pipe shown on Drawing C-01 (possibly replaced by the 42" pipe), and a pipe along the north property boundary where the Village has an easement. The pipe shown on Drawing C-01 was free flowing at the time it was repaired and there were no surface features on property associated with the stormwater pipe shown on Drawing C-01.

6. *Section 3.2.4 The existing wells should remain in place for future groundwater monitoring. If the existing wells will be a hindrance for the placement of the site cap, the wells should be identified in the document and replacement wells may be required.*

   Section 3.2.4 has been modified to indicate that existing wells will be retained.

7. *The document discusses cutting & burying the phragmites that is on site. This will not eliminate the phragmites which is an invasive species. The rhizome will still be on site and will easily come up through the 2 foot soil cap in just a few growing seasons. The Department recommends using herbicide application applied to the cut stems by a licensed applicator. The licensed applicator will know the proper herbicide to use for this location and setting.*

   Section 3.2.2 and documents in Appendix A have been revised to indicate that brush and cuttings will be removed or chipped and spread under the soil cap. Additionally, an herbicide will be applied to areas with phragmites stands by a licensed applicator. Following cap construction, the composition and final grade of the cover will avoid the formation of wet areas, thus further discouraging the redevelopment of Phragmites stands in the future.

8. *Erosion Control must be included in the cover design. Planting seed will not be sufficient in storm events to prevent the cap from washing away. An erosion control barrier must be used on the soil while the plantings take hold. The erosion control should be 100% biodegradable (not photodegradable).*

As shown by Figure C-04, the majority of the site will be graded to a slope of approximately 50:1 or greater (2% or less), which is gentle enough to allow infiltration and drainage without incurring significant erosion. The New York Standards and Specifications for Erosion and Sediment Control (NYSDEC 2005) recommends erosion control for slopes greater than 15%.

Section 3.2.2 and documents in Appendix A have been revised to indicate that erosion control blankets (EBCs) will be added to slopes greater than 15%. EBCs will be laid over the seeded soil to protect the soil surface from precipitation impact while vegetation develops. The EBCs will degrade in place following the growth of vegetation, adding both texture and nutrients to the soil.

Additionally, capped shoreline areas with slopes greater than 15% and greater than 10 feet of sloped surface will be planted with shrubs from the top of the riprap to the top of the slope. Shrubs will consist of native species with a wetland indicator status of FACW or FAC. FACW plants (Speckled alder [*Alnus incana*], or equal) will be used within 10 vertical feet of the riprap on sloped surfaces exceeding 15% and greater than 10 feet of sloped surface, and FAC plants (Black chokeberry [*Aronia melanocarpa*], or equal) will be used greater than 10 vertical feet from riprap on sloped surfaces exceeding 15% and greater than 10 feet of sloped surface if needed. Shrubs will be planted on 5-ft centers as seedlings or as rooted stock in #1 (one-gallon) containers and installed by hand.

Additional erosion control measures shown on contract drawings, including hay bales and silt fences, will be removed "only when the adjacent exposed area is stabilized, i.e., the area has an established grass or mulch cover, and is free from future uncontrolled discharges." (enclosed work plan, Appendix A, 02270 – Erosion Control, Section 3.3.A).

9. *The Department will require a Restoration Plan to identify measures to replant the soil cover area and shoreline to prevent erosion of the soil cover. This will include such measures as designated shrub planting areas, particularly in areas along the shoreline.*

   The vegetative restoration of the site is described in detail in Appendix A of the enclosed revised work plan (also refer to Comment 8 and the response above). Appendix A reflects the requirements of the ROD ("grading and seeding of excavated and/or filled areas") and requirements of the General Construction Stormwater Permit and SMP.

10. *A total vegetative cover of 85% should be achieved within one growing season. The total relative cover of all invasive species should be less than 5% of the entire bank. Monitoring the success of the restoration should occur during the growing season and for a period of 5 years.*

    The planting plan described in the enclosed revised work plan, Appendix A Section 02930 (Seeding and Mulching) is expected to achieve a ground cover of 85% or higher within the first year, with 5% or less of invasive species, as defined by the *Revised Interim List of Invasive Plant Species in New York State* dated May 14, 2012, along the bank (within 50 feet of shore). Monitoring of the soil cover will continue for five years.

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11. *The Contaminated Materials Management Plan should be included in the document.*

    The Contaminated Materials Management Plan (CMMP), Appendix A to the June 15, 2010 Remedial Design and Remedial Action Work Plan, approved by the NYSDEC by letter dated June 17, 2010, is included as Appendix D in the enclosed revised work plan.

12. *Section 5 The environmental easement will restrict the use of groundwater as a source of potable or process water without proper treatment.*

    Section 5 has been revised as requested.

    Appendix A: Technical Specifications and Design Drawings

13. *Conversations at the site on June 4, 2012 indicated that the concrete pads for the tanks have been further demolished, including removing or cutting the rebar, to accommodate this material under the soil cover.*

    As described in Section 2.3 of the Final RDRAWP, the "smaller, northwestern tank pad (Tank Pad 3) was rubblized with a hoe-ram attachment which created hazards with concrete pieces and rebar. The remaining concrete structures were left as they were and test pits were backfilled with their source material." Protruding pieces of rebar were cut level with the concrete pieces from Tank Pad 3.

14. *Grubbing and chipping trees. Decontamination procedures will need to be followed and the personnel must be properly trained to be on a hazardous waste remediation site.*

    It is ExxonMobil's policy that all personnel on-site receive safety training commensurate with their task. Grubbing and clearing activities will be conducted above grade to alleviate the need for decontamination procedures and the potential for personnel exposure to hazardous waste.

15. *Section 02200 — Earthwork, Part 2.1: The Fill Materials should be modified to include the following statement: the top six inches of soil will be of sufficient quality to support vegetation.*

    Earthwork, Part 2.1 has been modified to require organic content in the top six inches of fill material.

16. *The installation and location of the fence next to the shoreline of the Hudson River should be reviewed and reconsidered. The Department recommends keeping the same location as the original fence and prefers posting the property including the shoreline until the site is developed for its intended future use.*

    Fencing has been revised to be located as existing with signage as shown on Drawing C-04 in Appendix A in the enclosed revised work plan.

17. *Sampling and analysis will need to follow an approved QAPP for the soils.*

    The approved QAPP referenced in the responses to Comments 2 and 3 will be used for sampling and analysis of soils per Section 3.2.5 of the enclosed revised work plan.

    Appendix C

18. *A-13 Community Air Monitoring Plan: Attach the NYSDOH's generic CAMP in this section or include it as an appendix to the SMP.*

    The NYSDOH generic CAMP has been appended to the SMP included as Appendix E in the enclosed revised work plan.

    We recommend contacting Chevron to determine and coordinate the proposed grades for the soil cover in the areas where they plan to install the groundwater treatment system.

    ExxonMobil and Chevron consultants have been in contact including a site meeting, to coordinate grading for soil cover for both parcels.

WOODARD &CURRAN

FINAL Remedial Design/ Remedial Action Work Plan and Site Management Plan for AOC 1

Former Mobil Terminal Property
Hastings-on-Hudson, New York
Former Tappan Terminal Site No. 3-60-015

206925
December 27, 2011
Revised July 13, 2012

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APPENDICES

1. INTRODUCTION

On September 8, 2006, a Record of Decision (ROD) was issued by the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation for the former Tappan Terminal in Hastings on Hudson, New York. Pursuant to the ROD, pre-design investigations were conducted on the two properties that comprise the former Tappan Terminal site in preparation for site remediation.

March 14, 2010, Order on Consent No. A3-0612-1208 (the "Order") was finalized that separated the former Tappan Terminal into three Areas of Concern (AOCs): soil at the western former Mobil terminal property (AOC 1), soil at the eastern former Uhlich Color Company property (AOC 2), and groundwater at both properties (AOC 3).

Based on the pre-design investigation, a Remedial Design/Remedial Action Work Plan (RDRAWP) was developed and implemented for AOC 1 in accordance with the ROD and the Order. The Final Remedial Design/Remedial Action Work Plan and Site Management Plan (Final RDRAWP) herein is proposed to complete remedial actions under the ROD at the former Mobil terminal property (AOC 1) in preparation for redevelopment of that property.

1.1 SITE DESCRIPTION

The former Mobil terminal property is 8.13 acres and part of the larger Tappan Terminal site, located along the Hudson River waterfront in the Village of Hastings-on-Hudson, Westchester County, New York. The Tappan Terminal is comprised of two properties, the former Mobil terminal property (the Western Parcel, hereafter referred to as the "Site"), which is located adjacent to the Hudson River (the subject of this report), and the former Uhlich Color Company property (the Eastern Parcel), which is located along the railroad tracks that define the eastern boundary of the Site (not included in this report). **Figure 1** shows the location of the Site, and **Figure 2** shows the boundaries and main features of the Western Parcel.

The Site was used as a petroleum distribution terminal from 1961 until Mobil ceased operations on the Site in 1985. The Site has remained vacant since that time. Mobil Oil Corporation (now ExxonMobil Oil Corporation) remains the Site owner. All former buildings and aboveground storage tanks have been removed from the Site. The Site is relatively flat, located on the eastern shore of the Hudson River.

The northern two-thirds of the Site is surrounded by the remnants of an earthen containment berm that defined the former terminal tank farm and contains the concrete foundations of four former aboveground storage tanks, as depicted in **Figure 2**. A bare concrete pad is located in the former terminal loading area on the southern portion of the Site. A small portion of the extreme southern end of the property was used by the Pioneer Boat Club as a marina.

The Site was historically accessed from Railroad Avenue over the Zinsser Bridge that crosses the railroad tracks at the southeast corner of the Site. This bridge has fallen into disrepair and is no longer open to vehicular traffic. The only vehicular access to the Site currently is from the ARCO property abutting the Site on the north. The Site is secluded by a perimeter chain link fence.

1.2 SITE REGULATORY HISTORY

The Tappan Terminal has a long history of manufacturing and chemical use by several owners and occupants. The landmass of the Site itself was created by disposal of manmade fill into the Hudson River between 1868 and 1970. This fill material typically consisted of sand and gravel mixed with bricks, concrete, stone, timber, ash, slag, shells, and other debris. Filling progressed on the property between 1920 and 1960. Tappan Tanker Terminal purchased the property in 1961 and began operating a petroleum distribution facility on-site. From 1961 to 1971 waste chemicals were stored on the property prior to open ocean disposal. Mobil Oil Company purchased the Site in 1975 and continued petroleum distribution operations until 1985. The Site has been vacant since that time.

On-site sampling of various media was performed between 1985 and 1989. In 1987, the NYSDEC listed the Site as a Class 2 Site in the Registry of Inactive Hazardous Waste Disposal Sites in New York.

During a 1992 repair of a sewer pipe at the Site, evidence of a petroleum release on both the Mobil and abutting Uhlich properties was discovered. The extent of petroleum contamination was investigated between 1992 and 1994. In 1994, an oil remediation plan was approved by the NYSDEC. Mobil and Uhlich entered into a Stipulation Agreement to remediate this spill.

In 1996 Mobil entered into a Voluntary Agreement with the NYSDEC to investigate petroleum contamination on the Site. Multiple phases of investigation were conducted on-site between 1998 and 2008.

The Tappan Terminal site was the subject of a ROD issued by the NYSDEC Division of Environmental Remediation on September 8, 2006. The ROD addressed both the Mobil and Uhlich properties. This report addresses only soil issues on the western Mobil property of the Tappan Terminal site (AOC 1).

The NYSDEC issued draft versions of an Order on Consent in October 31, 2006 and February 13, 2009, and meetings were conducted on November 11, 2007 and March 26, 2009. The NYSDEC requested that work proceed for the pre-design investigation and a work plan was created in parallel with negotiations for the Order. The Order in its final form, Order on Consent No. A3-0612-1208, was signed and became effective March 14, 2010.

In accordance with the Order, ExxonMobil submitted a RDRAWP for AOC 1 on June 15, 2010.

1.3 SITE GEOLOGY AND HYDROGEOLOGY

The Tappan Terminal property is underlain by four geologic units, the upper fill layer, the Marine Grey Silt, the Basal Sand unit, and bedrock. The upper fill layer ranges from 11 to 32 feet in thickness, and consists of sand, silt and gravel variably mixed with ash, slag, glass, metal debris, wood, concrete, crushed stone, paper, coal, sawdust and brick fragments. This material is typical of historic waterfront fill material deposited during the late 19th and early 20th centuries. The historic fill is considered to be relatively permeable; however, intermediate bulkheads were built in stages along the shoreline as filling proceeded. These bulkheads are now buried beneath the property, and in some places act to restrict the flow of groundwater towards the river.

Groundwater flows through the fill layer from east to west and discharges to the Hudson River, subject to the tide stage of the river. At high tide, the groundwater flow direction reverses along the immediate

shoreline and water enters the Site from the river. Generally, tidal fluctuations in the river affect groundwater levels within 100 feet of the shoreline. Site groundwater is generally 2 to 7 feet below grade and quality is influenced by the influx of river/ocean water during tidal cycles.

Beneath the fill unit lies the Marine Grey Silt unit that represents the historic sediment of the Hudson River. This unit consists of grey to black silt with a trace of fine sand and layers of shell fragments. The Marine Grey Silt is at least 8 feet thick beneath the property, and ranges from 10 to 62 feet thick in the local area. The silt unit acts as a confining layer. This unit is believed to be continuous beneath the Site.

The Basal Sand Unit that underlies the silt layer consists of permeable, medium to coarse sands and gravels. Although this unit was not investigated at the Tappan Terminal site, measurements in the vicinity indicate that the Basal Sand Unit is a confined aquifer under artesian conditions. That is, groundwater pressure in the Basal Sand is greater than in the fill unit, and flow would be upward in the absence of the confining silt unit.

The underlying bedrock in the area is reported to be either Inwood Marble or Fordham Gneiss at 50 to 100 feet below grade.

2. PREVIOUS INVESTIGATION HISTORY

A Remedial Investigation/Feasibility Study (RI/FS) was conducted to evaluate alternatives for addressing threats to human health and the environment. The 2006 Record of Decision (ROD) was issued based on this work. A subsequent Pre-Design Investigation was conducted in February and March 2008 to further identify "grossly contaminated" soil on-site requiring removal per the ROD (refer to **Section 2.2**). Additional field and remedial activities were conducted between September 2010 and February 2011 (refer to **Section 2.3**).

2.1 SUMMARY OF THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

The purpose of the Remedial Investigation (RI) was to define the nature and extent of any contamination resulting from previous activities at the Tappan Terminal site. The RI was conducted between July 1998 and September 1999. The field activities and findings of the investigation are described in the "September 1999 Remedial Investigation Report" (RI Report). The RI Report included:

- A compilation of historic data and preparation of a comprehensive map;
- Collection of soil samples from surface and subsurface locations;
- Water level measurements in existing monitoring wells to determine groundwater flow characteristics, and an evaluation of tidal impacts from the Hudson River;
- Sampling of groundwater in existing wells and temporary well points;
- Analysis of all soil and groundwater samples for a comprehensive list of contaminants; and
- Collection and analysis of sediment samples adjacent to the Tappan Terminal site and background locations.

The soil and groundwater data from the RI Reports was compared to the following regulatory criteria:

- Groundwater, drinking water and surface water Standards, Criteria and Guidance (SCGs) are based on NYSDEC "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code;
- Soil SCGs are based on the NYSDEC "Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels;" and
- Sediment SCGs are based on the NYSDEC "Technical Guidance for Screening Contaminated Sediments."

Based on the RI Report results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the Tappan Terminal site were determined to require remediation.

The Feasibility Study (FS) included additional soil and groundwater sampling to determine the volume of soil potentially requiring remediation as well as a pilot test of air sparging, soil vapor extraction and enhanced bioremediation conducted in 2002. ExxonMobil also conducted a pilot test to investigate biosparging in 2004. These studies were performed to further evaluate technologies under consideration in the draft Feasibility Study.

The contaminants of concern included Semivolatile Organic Compounds (SVOCs), Total Petroleum Hydrocarbons (TPH), and metals: arsenic, beryllium, copper, mercury, nickel and zinc. The metals were found throughout the surface and subsurface fill, and are commonly associated with historic fill containing ash and furnace slag.

The potential exposure pathways for soil related to current use or development of the Site include:

- Inhalation of contaminated dust or vapors by workers during on-site excavation activities;
- Inhalation of contaminated vapors in indoor air by future occupants of buildings that may be constructed on the Site;
- Incidental ingestion of contaminated soil by on-site workers or recreational users of the Site;
- Dermal contact with contaminated soil by workers or recreation users; and
- Exposure of wildlife to contaminants in Site surface soils.

2.2 SUMMARY OF THE PRE-DESIGN INVESTIGATION

A Pre-Design Investigation (PDI) for soil at the Site was implemented in early 2008 and was based on historic investigation programs and the requirements of the 2006 Record of Decision (ROD). Soil sampling was conducted on a grid pattern across the Site, with additional sampling locations completed in the central area of the former tank farm to evaluate the potential presence of grossly contaminated soil. Field work commenced February 4, 2008, and was completed on March 31, 2008, with the NYSDEC in attendance. The findings were documented in the Pre-Design Investigation Report dated May 13, 2008, and are summarized below:

- Efforts in the field to visually identify grossly contaminated soil were highly subjective and visual observations were not supported by either field screening or analytical laboratory analysis. The Site mainly consists of fill material which is generally dark in color and includes random debris (glass bottles, etc.). A targeted sample of a discolored, darker layer at the water table had Total SVOCs plus Tentatively Identified Compounds (+TICs) of 198.2 parts per million (ppm), well below criteria in the ROD of 500 ppm. Visual coloration of soil was not a consistent indication of gross contamination.
- Using the criterion established in the ROD of 500 ppm Total SVOCs+TICs, laboratory analytical results were mapped to identify areas that exceeded this criterion. A total of forty-four samples were analyzed, of which only six centralized locations had concentrations of Total SVOCs+TICs in excess of the 500 ppm criteria. These locations that exceeded criteria were proposed to be excavated as part of the RDRAWP.
- Unsuccessful attempts were made to sample below former structures. The former tank pad could not be breached, nor could the interior of the former tank rings. A follow-up investigation of the tank rings was conducted on April 21, 2009. Three borings were spaced throughout each of the four former tank rings and completed using a hand auger. Refusal was encountered between 12 inches and 18 inches below the top of each concrete ring. Based on the sound and feel of the auger on the encountered material, the base was believed to be concrete. These structures were proposed to be demolished in-situ and investigated as part of the RDRAWP.
- Attempts to visually catalogue and map surface and subsurface piping and structures on the Site (refer to Section 8 of the ROD) were incomplete due to dense vegetation and the scattered nature of the piping. Piping was observed to be primarily disconnected pieces on grade with a

red-colored exterior indicative of water piping for fire suppression. Piping was proposed to be removed for scrap value to the extent practicable as part of the RDRAWP.

2.3 SUMMARY OF REMEDIAL ACTIONS

Remedial Activities were conducted and administered on behalf of ExxonMobil by Roux Associates, Inc. and Woodard & Curran. The selected remedy for the Site included excavation and removal of soil that was grossly contaminated with weathered petroleum, and removal of former piping and structures as necessary to allow adequate Site grading in preparation for capping (refer to **Section 3.0**). Remedial actions were conducted in the vicinity of well OW-5A, within the former tank pads/rings, and under the former concrete pad as depicted on **Figure 2**. The following field screening "shake test" method and analytical protocol were used to identify grossly contaminated soil:

- If a soil layer in excess of six inches thick exhibited evidence of a petroleum sheen or petroleum globules, a sample of the soil was placed in a 4-ounce or 9-ounce soil jar and submerged in distilled water. The soil was stirred to break up any clumps and then allowed to settle for five minutes. If a continuous product layer developed, with a meniscus on the surface, the soil was considered "grossly contaminated" and removed.
- When excavation of "grossly contaminated" soil was completed, soil samples at the extent of the excavation (sidewalls and base) were collected and submitted for laboratory analysis of Semi-volatile Organic Compounds (SVOCs)[1]. If the total SVOC results exceeded 500 ppm, additional iterations of excavation and sampling were conducted at those locations until no further exceedances were encountered.

Field work commenced September 24, 2010, and was completed on February 16, 2011. Activities were documented in the Remedial Design Remedial Action Report dated May 31, 2011, and are summarized below (also refer to **Figures 2** and **3**):

- Soil under remaining concrete structures associated with the former terminal was investigated by mechanically breaching the concrete and excavating test pits into the underlying soil. Each test pit was excavated approximately two to three feet into the water table and inspected for evidence of grossly contaminated soil using the shake test method. All shake tests conducted during these test pitting activities were negative for gross contamination. Soil samples collected from each test pit were in compliance with the criterion for Total SVOCs of 500 ppm, with results ranging from no SVOCs detected to 51 ppm Total SVOCs. The smaller, northwestern tank pad (Tank Pad 3) was rubblized with a hoe-ram attachment which created hazards with concrete pieces and rebar. The remaining concrete structures were left as they were and test pits were backfilled with their source material. Protruding pieces of rebar were cut level with the concrete pieces from Tank Pad 3.
- In preparation for a pre-excavation meeting with the NYSDEC, surface soil was removed in accordance with the excavation area proposed in the RDRAWP. On September 27, 2010, a pre-excavation meeting was conducted at the Site. At the time, water in the excavation was deemed to interfere with the ability to determine if the soil was impacted. The NYSDEC and ExxonMobil exchanged correspondence between September 28 and November 8, 2010 regarding

[1] Per discussion with NYSDEC, TICs are applicable only to dye impacts and not required to assess petroleum impacts.

excavation and dewatering needs. Additional delineation of soil in the OW-5A excavation area was conducted by test pit and Geoprobe® and soil samples were screened for evidence of grossly contaminated soil using the shake test method. A temporary dewatering system was constructed on-site on November 15, 2010, including frac tanks, filtration, and treatment by granular activated carbon prior to discharge to the Hudson River under the Petroleum Spill Stipulation Agreement Guidance.

- The excavation was segregated into north, central and south sections by earthen berms constructed from excavated material. Following excavation of the north and central sections, shake test and analytical laboratory results for confirmation samples were in compliance with criteria and these sections were backfilled in December 2010. For the remaining south excavation area, four locations with a shake test that was positive for gross contamination were excavated. The south section was dewatered, excavated and backfilled in January and February 2011.
- Approximately 950 cubic yards of soil were removed from the AOC1 excavation area during the execution of the RDRAWP. All soil confirmation samples were in compliance with the criterion for Total SVOCs of 500 ppm, with results ranging from 0.57 to 53 ppm Total SVOCs.
- During excavation activities, piping and pipe fragments were found within the Site fill. A corrugated metal pipe and a clay pipe were encountered in the south end of the excavation. The corrugated metal pipe contained free-flowing clear water. The shake test for material found in the clay pipe was positive for gross contamination; however, a sample of material in the clay pipe submitted for laboratory analysis was in compliance with[2] the site-specific criteria for Total SVOCs of 500ppm.
- A magnetometer was used to facilitate tracing subgrade pipe. Remnant pieces of pipe in the fill were removed and a 42" corrugated metal pipe was located and traced to a catch basin near the railroad tracks across the Eastern Parcel of the Tappan Terminal site (AOC2) with no surface features on property (AOC1). Attempts were made to locate the clay pipe. To the west, a concrete slab was removed with a 12 inch opening, presumably for the clay pipe; however, the pipe was not found. To the east of the excavation area, two trenches were installed parallel to the excavation; however, the clay pipe was not observed. The clay pipe and other pipes observed, were believed to be remnant pieces in fill material ubiquitous to the excavation area.
- Various additional items were removed from the Site area in preparation of the final remedy and future redevelopment. Removal of derelict boats related to the former Pioneer Boat Club south of the Site was completed on October 19, 2010. Demolition of the former terminal dock was conducted and completed between November 16 and 22, 2011. Roll-offs of scrap metal for recycling were removed on December 17, 2010 and March 8, 2011.

[2] Correction to May 31, 2011 RDRAR.

3. FINAL REMEDIAL DESIGN

The future Site use has not yet been determined and remedial activities for AOC 3 (groundwater for both the Western and Eastern Parcels) have not been implemented. At this time, ExxonMobil proposes to cap the Site in accordance with the ROD and leave the Site vegetated and secured.

The final engineering control will include a demarcation layer, to be placed over the existing on-site soil. The demarcation layer (such as orange plastic snow fence, geotextile filter fabric, or existing concrete surfaces) will identify the presence of potentially contaminated fill beneath it, and provide a physical barrier against unintended penetration. The demarcation layer will be covered with two feet of clean soil capable of supporting vegetation. The soil will be mulched and hydroseeded to promote a suitable native ground cover. The demarcation layer is not intended as an infiltration barrier; however, the soil cap will be graded to promote runoff.

So that future activity at the Site will not compromise the integrity of the engineering control, and to prevent future exposure to contaminated fill, an Environmental Easement will be filed on the property deed. This easement will specify the requirements for conducting intrusive activities beneath the cover system. These requirements will include NYSDEC, NYSDOH and Village of Hastings-on-Hudson notification and approval, health and safety planning, soil management and disposal planning, and barrier repair requirements prior to any work involving disturbance of the final cover. New structures will be permitted at the Site, provided that an effective barrier to subsurface contamination is maintained and building foundations are properly ventilated to mitigate exposure to soil vapors.

Future redevelopment of the Site is likely to include buildings, parking lots, and or paved areas that will render Site soils inaccessible and act as a barrier to incidental or accidental exposure. At that time, these improved features must be incorporated into the soil cap and SMP as described in **Section 5.1.3**.

3.1 REMEDIAL OBJECTIVES

Per the ROD, remedial goals for the Site have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The remedy was selected to eliminate or mitigate all significant threats to the public health and/or the environment presented by the soil contamination identified at the Site, through the proper application of scientific and engineering principles. The remediation goals for this Site are to prevent direct contact with and/or ingestion of impacted Site soil.

The selected remedy for the Site included remedial actions completed for AOC1 in 2010 and 2011 including excavation and removal of soil that was grossly contaminated with weathered petroleum, removal of former piping and any other structures, as necessary, to allow adequate Site grading. Finally, the entire Site is to be covered with an engineered control (i.e., soil cap) to render the Site soils inaccessible.

3.2 SOIL CAP FOR AOC1

Since operations shut-down in 1985, the Site has naturally vegetated. The protective vegetative cover will be cleared and grubbed in preparation for a soil cap to be installed and maintained under a Site Management Plan (SMP) as outlined in the sections below. If the Site is redeveloped, Site improvements such as new pavement or building slabs will be incorporated into the soil cap as alternative barrier surfaces to comprise the cap.

Technical specifications and design drawings for the cap are provided in **Appendix A**. Work will be guided by the project specific Health and Safety Plan for the Site, including ExxonMobil's Loss Prevention System (LPS) and Operations Integrity Management Systems (OIMS) requirements (refer to Appendix B of the November 2007 Pre-Design Investigation Work Scope, or the latest updated version of the project specific Health and Safety Plan for the Site). It is ExxonMobil policy that all personnel working on-site receive safety training commensurate with their task.

3.2.1 Permitting

A review was conducted of potential permitting requirements for the cap installation and the following permits will be required.

Village of Hastings-On-Hudson Tree Removal Permit

Construction of the cap will require that all vegetation be cleared. This clearing will include the removal of trees that are under the jurisdiction of the Village of Hastings-On-Hudson Tree Preservation ordinance. Preservation of these trees is not practical considering the grade changes and fill requirement. Without an established plan for re-development of the Site, tree replacement would be random and temporary until a development plan is implemented. Accordingly, in lieu of tree replacement on-site, an agreement was proposed to fund planting trees elsewhere in the Village of Hastings-On-Hudson. The Village granted the permit on December 6, 2011.

Village of Hastings-On-Hudson Floodplain Development Permit:

A Floodplain Development Permit will be required under the Village of Hastings-on-Hudson Flood Damage Prevention Ordinance. The parcel comprising AOC1 is almost entirely within the 100-year flood hazard zone. The proposed capping project will cover the entire Site with two feet of clean soil. The limit of the cap is planned to be just landward of Mean High Tide. Beginning at that limit, the Site will be uniformly graded to drain to the Hudson River at a shallow slope. Although the Site will be filled, the uniform grading and lowering of the embankments will allow flood waters to more easily enter and leave the Site. Because the adjacent Hudson River is a tidal waterbody, flood storage is not a requirement under the FEMA regulations, and the capping work would not alter the Flood Insurance Rate Map (Panel Number 36119C0307F). Both the Village of Hastings-on-Hudson and regional FEMA office in New York City agree that requirements of the Village's Flood Damage Prevention ordinance, Paragraphs 146-10.B(5) and (6) are satisfied and a formal Floodplain Development Permit application pursuant to the applicable provisions of the Village Code can proceed with this final cap design. The proposed project meets the community's flood damage prevention laws provided that any fill beneath the soil is properly compacted so that it does not potentially erode, the soil is properly vegetated, and drainage is towards the Hudson River and not towards neighboring properties.

NYSDEC State Environmental Quality Review Act (SEQRA) – Not Required

In accordance with 6 NYCRR Part 617.5(c)(29), the project qualifies as a Type II (insignificant) action being a "particular course of action specifically required to be undertaken pursuant to an order". Such actions have been determined not to have a significant impact on the environment or are otherwise precluded from review under the SEQRA.

NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities (the "General Permit")

A NYSDEC General Construction Stormwater Permit will be required for the cap installation. A Stormwater Pollution Prevention Plan (SWPPP) will be drafted by a Qualified Professional in accordance with Part III.B.1 (environmental enhancement project where vegetation will be established) of the General Permit and will incorporate the Contractor's construction phasing plan and sequence of operations (such as special requirements resulting if the area of disturbance at any one time will exceed five acres). The SWPPP will be implemented upon commencement of cap construction activities and will remain in effect until final stabilization.

At least five (5) days prior to mobilizing to the Site to commence cap construction activities, a Notice of Intent (NOI) will be filed with the NYSDEC. A copy of the NOI will be posted on-site and copies of the SWPPP and General Permit will be retained and readily available on-site. Inspections governed by the SWPPP and General Permit will be conducted by a Qualified Professional within 24 hours of a storm event ½" or greater and at least weekly, and documented with a written report and photographic log. Any deficiencies will be reported to the Trained Contractor responsible for implementation of the stormwater pollution prevention measures for remedy. A Notice of Termination will be filed with the NYSDEC upon project completion when all disturbed areas of the Site have achieved final stabilization.

3.2.2 Cap Design

The Site cap required by the ROD has been designed to act as a barrier to prevent incidental exposure to surface soils and to act as a warning layer to prevent accidental contact to soils during future on-site activities. The cap will cover the entire Site and consist of a demarcation layer installed across open, unimproved areas covered by two feet of clean soil. The limit of the cap is planned to be just landward of Mean High Tide and no construction work will be performed below Mean High Tide. Beginning at that limit, the Site will be uniformly graded to drain to the Hudson River at a shallow slope. The existing embankments will be removed and spread into the low areas as part of the regrading process. The progress of work will be determined by the contractor's construction plan and sequence of operation, and is anticipated to be south to north. Erosion control practices will be designed in conformance with the New York State Standards and Specifications for Erosion and Sediment Control (**Drawing C-01** in **Appendix A**).

The Site will be cleared throughout (refer to **Section 3.2.3**) and grubbed. Vegetation (trees, brush and plants) will be removed from the Site or cut, chipped and spread as mulch. An herbicide will be applied to areas with phragmites stands by a licensed applicator. Existing wells will be raised to three feet above proposed grade with steel risers and locking caps (refer to **Section 3.2.4**). The Site will be graded uniformly towards the shore with variations for existing concrete structures to remain as an added barrier to subsurface soils. The former terminal earthen berm will be graded out and augmented by new material (refer to **Section 3.2.5**) to achieve the needed slope. The cap will consist of a layer of orange snow fence or other similar demarcation layer permeable to water and with puncture strength sufficient to prevent penetration with a hand shovel. The demarcation layer will be overlaid by two feet of clean soil (refer to **Section 3.2.5**). The top six inches of soil will be of a quality to support vegetation, and will be spread with seed to protect against erosion until natural vegetation takes over. Seed will be free from invasive species as defined by the *Revised Interim List of Invasive Plant Species in New York State* dated May 14, 2012. Care will be taken to apply seeds at a time when no heavy rainstorms are predicted in the 72 hours following application to reduce the potential for seed loss through erosion prior to rooting.

Biodegradable erosion control blankets (ECBs) will additionally be applied to slopes greater than 15%. ECBs will be laid over the seeded soil to protect the soil surface from precipitation impact while vegetation develops. The EBCs will degrade in place following the growth of vegetation, adding both texture and nutrients to the soil.

Additionally, capped shoreline areas with slopes greater than 15% and greater than 10 feet of sloped surface will be planted with shrubs from the top of the riprap to the top of the slope. Shrubs will consist of native species with a wetland indicator status of FACW or FAC. FACW plants (Speckled alder [*Alnus incana*], or equal) will be used within 10 vertical feet of the riprap on sloped surfaces exceeding 15% and greater than 10 feet of sloped surface, and FAC plants (Black chokeberry [*Aronia melanocarpa*], or equal) will be used greater than 10 vertical feet from riprap on sloped surfaces exceeding 15% and greater than 10 feet of sloped surface if needed. Shrubs will be planted on 5-ft centers as seedlings or as rooted stock in #1 (one-gallon) containers and installed by hand.

Once Site work for capping is complete, the existing Site perimeter fencing will be restored. Signage will be posted to discourage trespassing.

3.2.3 Piping and Other Structures

With the exception of grading, there is no invasive activity associated with the work scope. Aboveground piping and remnant structures encountered during Site activities will be removed from the Site. One boat on the Site belonging to the Pioneer Boat Club will be relocated to that adjacent property. Miscellaneous debris (metal pipe, wood pilings, interior fencing, etc.) will be collected in roll-offs and removed from the Site as scrap. The Site perimeter fence will be removed and stockpiled to enable cap construction, then reset upon completion of the cap. Power poles will be removed from the Site with the exception of poles from the south that will service the AOC 3 groundwater treatment operations (as identified on **Drawing C-01** in **Appendix A**).

The Village of Hastings on Hudson was contacted for any utilities that traverse the property when the stormwater pipe shown on Drawing C-01 was discovered. According to Village records, the Village of Hastings-on-Hudson has a storm sewer easement along the north property line, and a pipe (indicated as a 15" pipe on a 1934 drawing and possibly later replaced by the 42" pipe) in the vicinity of the 42" corrugated metal pipe that actively conveys stormwater and crosses the northern portion of the Site (refer to **Section 2.3** and **Drawing C-01** in **Appendix A**).

3.2.4 Wells

At this time, in advance of implementing and completing system installation, operation and monitoring for AOC3, all ExxonMobil monitoring wells to be retained will be raised to three feet above proposed grade with steel risers and locking caps. A summary of wells and pertinent information is included in **Appendix B** and well locations are shown on **Drawing C-02** in **Appendix A**.

3.2.5 Material Management

All fill material brought to the Site will meet the requirements for the identified Site use as set forth in 6 NYCRR Part 375-6.7(d). Fill material brought to the site will be specified to meet the Standards, Criteria and Guidance values for restricted residential site use. Fill material within 50 feet of the shore will additionally meet the Standards, Criteria and Guidance values for protection of ecological resources.

Documentation of the fill source will be provided to the NYSDEC for approval before use on-site in accordance with DER-10 5.4(e)5 and 6. Required sampling will be in accordance with Table 5.4(e)10 of DER-10/Technical Guidance for Site Investigation and Remediation and guided by the Quality Assurance Project Plan (QAPP) included as Appendix C. Imported fill material is proposed to be transported to the Site by barge at the request of the Village of Hastings-on-Hudson contingent upon identification of usable docking facilities. Supplies and non-fill materials will be transported to the Site by truck with access through the ARCO property.

Where material to be disturbed and/or moved is limited to new or above-grade berm material from the Site, air monitoring will be conducted for fugitive dust (particulate) monitoring. Air monitoring, equipment decontamination, material management and dust suppression will be implemented, as needed, in accordance with the QAPP and Contaminated Materials Management Plan included herein as **Appendices C and D**, respectively. Construction equipment will be decontaminated between grading and capping activities, when equipment will transition from contact with existing site material to contact with clean imported material.

3.3 FINAL REMEDIAL DESIGN/REMEDIAL ACTION REPORT

Once capping activities have been completed, an updated Remedial Action Remedial Design Report will be prepared within ninety (90) days of demobilization from the Site that details the Site activities described herein. An updated survey will be conducted to document the Site topography. Additional follow up activities will be confirmed (i.e. activities under the SMP) and included in the report.

4. SITE MANAGEMENT PLAN (SMP)

4.1 SMP FOR OPEN SPACE

A Site Management Plan (SMP) has been drafted for the Site cap as an engineered control and barrier surface during Site redevelopment. The draft SMP can be found in **Appendix E** and includes:

- An Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- Descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;
- A provision for evaluation of the potential for soil vapor intrusion, if applicable, should the Site be re-developed;
- Provisions for the management and inspection of the Site cap;
- Maintaining Site access controls and Department notification;
- Periodic reviews and certification of the institutional and/or engineering controls; and
- A schedule of monitoring and frequency of submittals to the Department.

4.2 FUTURE REDEVELOPMENT

Upon redevelopment, once the development plan is known, the SMP will be implemented and/or modified for the following circumstances:

- Identification of any new use restrictions on the Site;
- Provisions for the construction of utility corridors;
- Provisions for the continued proper operation and maintenance of the components of the remedy (i.e., those required for AOC1 and AOC3);
- Provisions for evaluating the potential for vapor intrusion to any buildings developed on the Site, including provision for mitigation of such impacts if identified; and
- Update provisions for management of the Site cap to restrict excavation below the demarcation layer. Protocols will be updated and modified to handle necessary excavations including soil handling procedures, protections for the health and safety of workers and the nearby community, and cover restoration subject to approval of the NYSDEC.

5. ENVIRONMENTAL EASEMENT

Environmental Conservation Law [ECL 27-1318(b)] requires that within sixty (60) days of commencement of the remedial design, the owner and/or responsible party of an inactive hazardous waste disposal site where institutional or engineering controls are employed must execute an environmental easement. Upon approval of this Final RDRAWP and within sixty days of application of the final remedy necessitating such institutional and engineering controls, an environmental easement as required by the ROD will provide the following restrictions:

- Limit the use and development of the property to recreational, commercial and industrial uses;
- Require compliance with an approved Site Management Plan (SMP);
- Restrict the use of groundwater as a source of potable or process water without proper treatment;
- Prohibit agriculture or vegetable gardens on-site; and
- Require a periodic certification of the institutional and engineering controls.

NYSDEC will prepare a draft environmental easement form within 60 days of implementing the final remedial design (cover design) when institutional or engineering controls will be employed, including the necessary supporting documentation provided by ExxonMobil as follows:

- Copies of the current deeds;
- Survey drawings, and metes and bounds descriptions of the property;
- Subordination agreements for any existing easements;
- Updated title reports; and
- Title insurance policies naming the NYSDEC as an additional insured.

After NYSDEC accepts the environmental easement and returns the fully executed document to ExxonMobil, ExxonMobil will undertake the following actions:

- Within 30 days of execution, file the easement with the recorder of the county in which the Site is located;
- Provide a copy of the recorded easement to the affected municipalities; and
- Provide NYSDEC with a copy of the easement, a certification by the recording officer that it is a true and faithful copy, and a certification that a copy has been provided to the affected municipalities.

6. SCHEDULE

Milestone tasks are planned as follows:

Task	Proposed Date
Submit RDRAR	June 1, 2011
NYSDEC Review of RDRAR	Pending
Final Remedial Design (Cover Design) and Site Management Plan (SMP)	December 2011
NYSDEC Review and Approval of Final Remedial Design (Cover Design) and SMP	February 29, 2012
Installation of Cover	Anticipated Fall 2012
NYSDEC Prepare Draft Environmental Easement	Within 60 days of Implementing Final Remedial Design (Cover Design)
ExxonMobil Record Environmental Easement	Within 30 days of Environmental Easement Full Execution
Progress Reports	Quarterly commencing January 2012, by the 10th day of January, April, July, and October

The Site is presently in a stabilized state awaiting remedial measures to be constructed and implemented for groundwater at both the Site and the neighboring Uhlich property (AOC3, anticipated by Summer 2012). The final remedial design for the Site (AOC1) will attempt coordination of remedial activities for all properties, and is anticipated by Fall 2012.

Following the final remedy and stabilization, the Site will be maintained under the SMP (**Appendix E**), which includes a description of the activities to be undertaken after the NYSDEC has approved construction of the final remedial design, upon project completion when all disturbed areas of the Site have achieved final stabilization. Annual certification of the institutional and engineering controls will be prepared and submitted by a professional engineer stating that the controls remain in place and continue to protect the public health and the environment. Components of the remedy will continue for a period of five years.

7. REFERENCES

"Ground-water and Soil Quality Investigation at the Mobil Oil Corp. Tappan Terminal"; Leggette, Brashears & Graham, Inc.; Wilton, CT; March 1987.

"Monitor Well Replacement, Mobil Oil Corp. Tappan Terminal No. 31-020"; Leggette, Brashears & Graham, Inc.; Wilton, CT; December 1993.

"Remedial Investigation Report, Tappan Terminal Site"; Dvirka and Bartilucci Consulting Engineers; Syracuse, NY; September 1999.

"Feasibility Study, Tappan Terminal Site"; Dvirka and Bartilucci Consulting Engineers; Syracuse, NY; July 2000.

"New York Standards and Specifications for Erosion and Sediment Control; NYSDEC; August 2005.

"Record of Decision, Tappan Terminal Site"; New York State Department of Environmental Conservation; September 2006.

"Pre-Design Investigation Work Scope, Former Mobil Terminal Property, Hastings-on-Hudson, New York, Former Tappan Terminal Site No. 3-60-015"; Woodard & Curran; Cheshire, CT; November 19, 2007, Rev. 2.

"Pre-Design Investigation Report, Former Mobil Terminal Property, Hastings-on-Hudson, New York, Former Tappan Terminal Site No. 3-60-015"; Woodard & Curran; Cheshire, CT; May 13, 2008.

Letter responding to NYSDEC comments on the May 13, 2008 Pre-Design Investigation Report submitted by ExxonMobil on August 22, 2008.

"Draft Interim Remedial Design Work Plan, Former Mobil Terminal Property, Hastings-on-Hudson, New York, Former Tappan Terminal Site No. 3-60-015"; Woodard & Curran; Cheshire, CT; June 4, 2009.

"CP-43: Groundwater Monitoring Well Decommissioning Policy"; NYSDEC; November 3, 2009.

"SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-10-001"; NYSDEC; effective January 29, 2010.

"Site Management Plan Template"; NYSDEC; March 2010.

"Order on Consent and Administrative Settlement, Index # A3-0612-1208, Site # 360015"; New York State Department of Environmental Conservation; signed March 4, 2010 and effective March 14, 2010.

"DER-10/Technical Guidance for Site Investigation and Remediation"; NYSDEC; May 3, 2010.

Letter to ExxonMobil from NYSDEC with comments on the June 4, 2009 Interim Remedial Design Work Plan sent May 21, 2010.

"Remedial Design/Remedial Action Work Plan, Former Mobil Terminal Property, Hastings-on-Hudson, New York, Former Tappan Terminal Site No. 3-60-015"; Woodard & Curran; Cheshire, CT; June 15, 2010.

Letter to ExxonMobil from NYSDEC approving the June 15, 2010 Remedial Design/Remedial Action Work Plan sent June 17, 2010.

Correspondence between the NYSDEC and ExxonMobil regarding excavation of grossly contaminated soil and dewatering dated September 28, September 29, September 30, November 3, and November 8, 2010.

Letter responding to NYSDEC comments on excavation areas submitted by ExxonMobil on January 18, 2011.

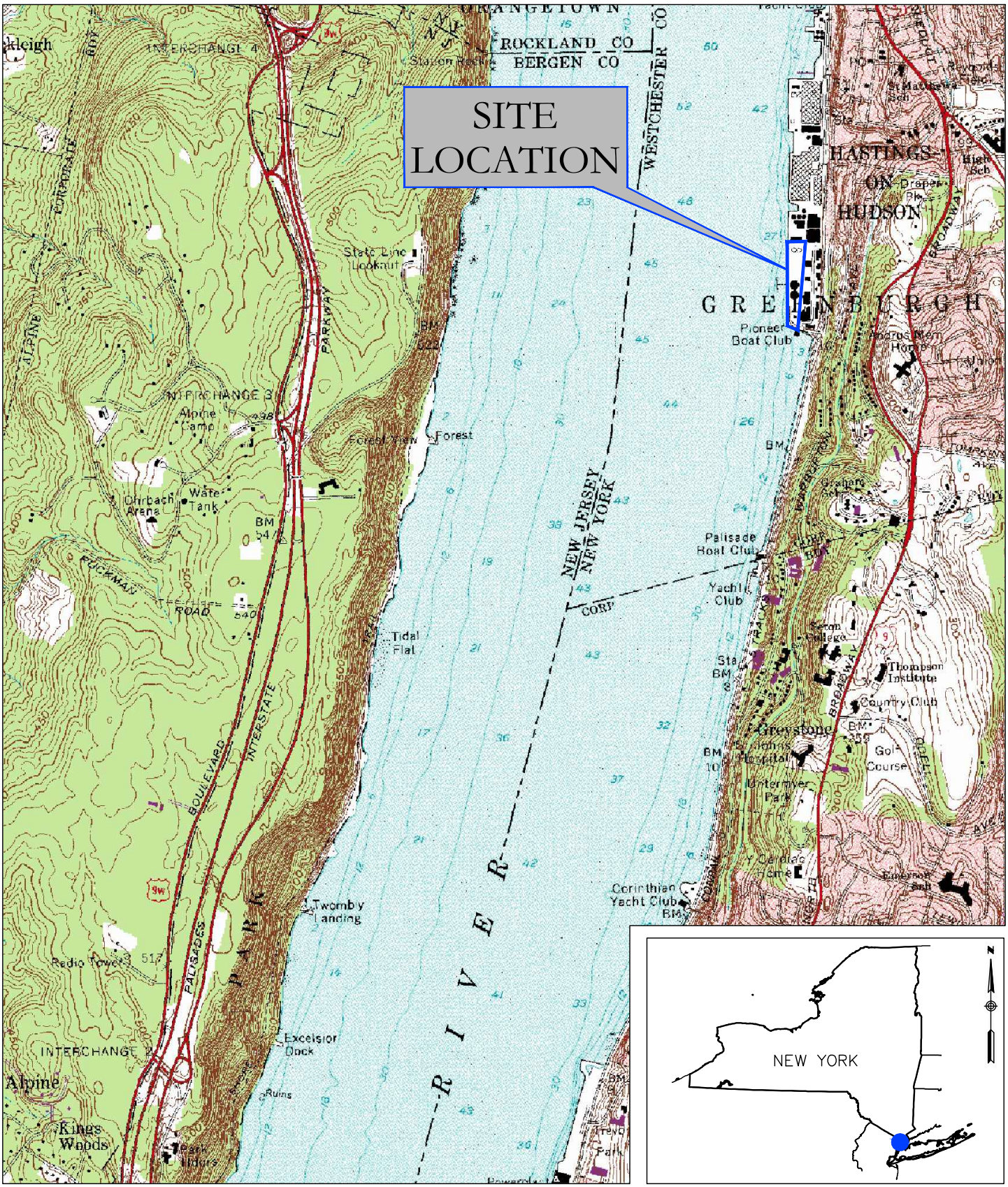
"Remedial Design/Remedial Action Report, Former Mobil Terminal Property, Hastings-on-Hudson, New York, Former Tappan Terminal Site No. 3-60-015"; Woodard & Curran; Cheshire, CT; May 31, 2011. (*Note: To be updated in accordance with* ***Section 3.3*** *of the Work Plan herein*.)

"Final Remedial Design/Remedial Action Work Plan and Site Management Plan"; Woodard & Curran; Cheshire, CT; December 27, 2011. (Revised and resubmitted herein.)

"Revised Interim List of Invasive Plant Species in New York State"; NYSDEC; May 14, 2012.

Letter to ExxonMobil from NYSDEC with comments on the December 27, 2011 "Final Remedial Design/Remedial Action Work Plan and Site Management Plan" sent June 14, 2012.

Response to NYSDEC comments and a revised "Final Remedial Design/Remedial Action Work Plan and Site Management Plan" submitted by ExxonMobil on July 13, 2012.



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COMMITMENT & INTEGRITY DRIVE RESULTS

SITE LOCATION MAP

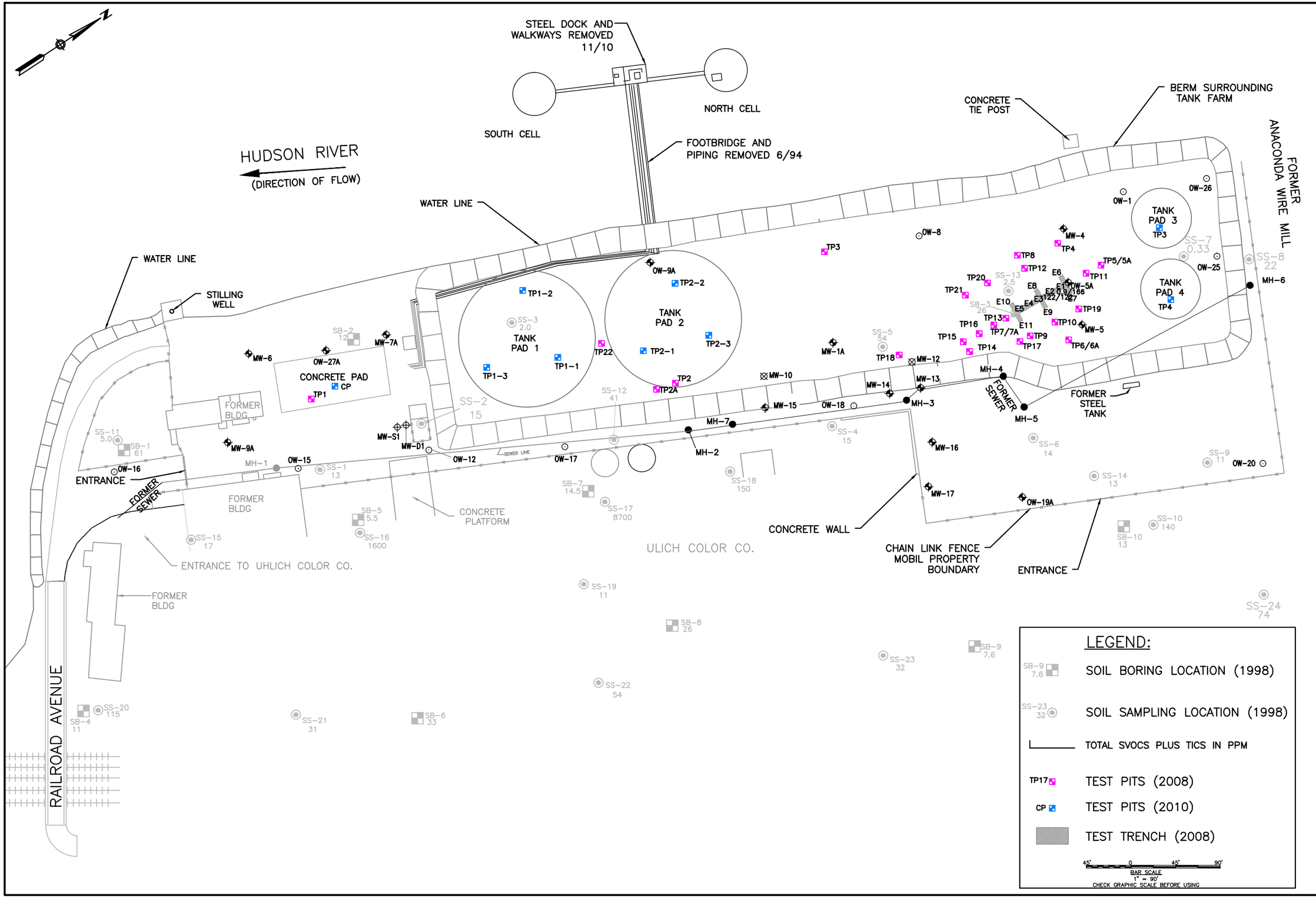
DESIGNED BY: JR	CHECKED BY: AP
DRAWN BY: PFF	206925_U1-RDRAR.dwg

FORMER MOBIL TAPPAN TERMINAL
HASTINGS-ON-HUDSON, NY

TOPO! INTERACTIVE MAPS ON CD
U.S.G.S YONKERS, NY.
7.5 MIN SERIES 1966 PHOTOREVISED 1979

JOB NO:	206925.03
DATE:	MAY 2011
SCALE:	AS NOTED

FIGURE 1



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COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

SITE PLAN

CHECKED BY: AP
206925_U2-RDRAR.dwg
DESIGNED BY: JR
DRAWN BY: PFF

FORMER TAPPAN TERMINAL
HASTINGS-ON-HUDSON, NY

REMEDIAL DESIGN/REMEDIAL ACTION REPORT

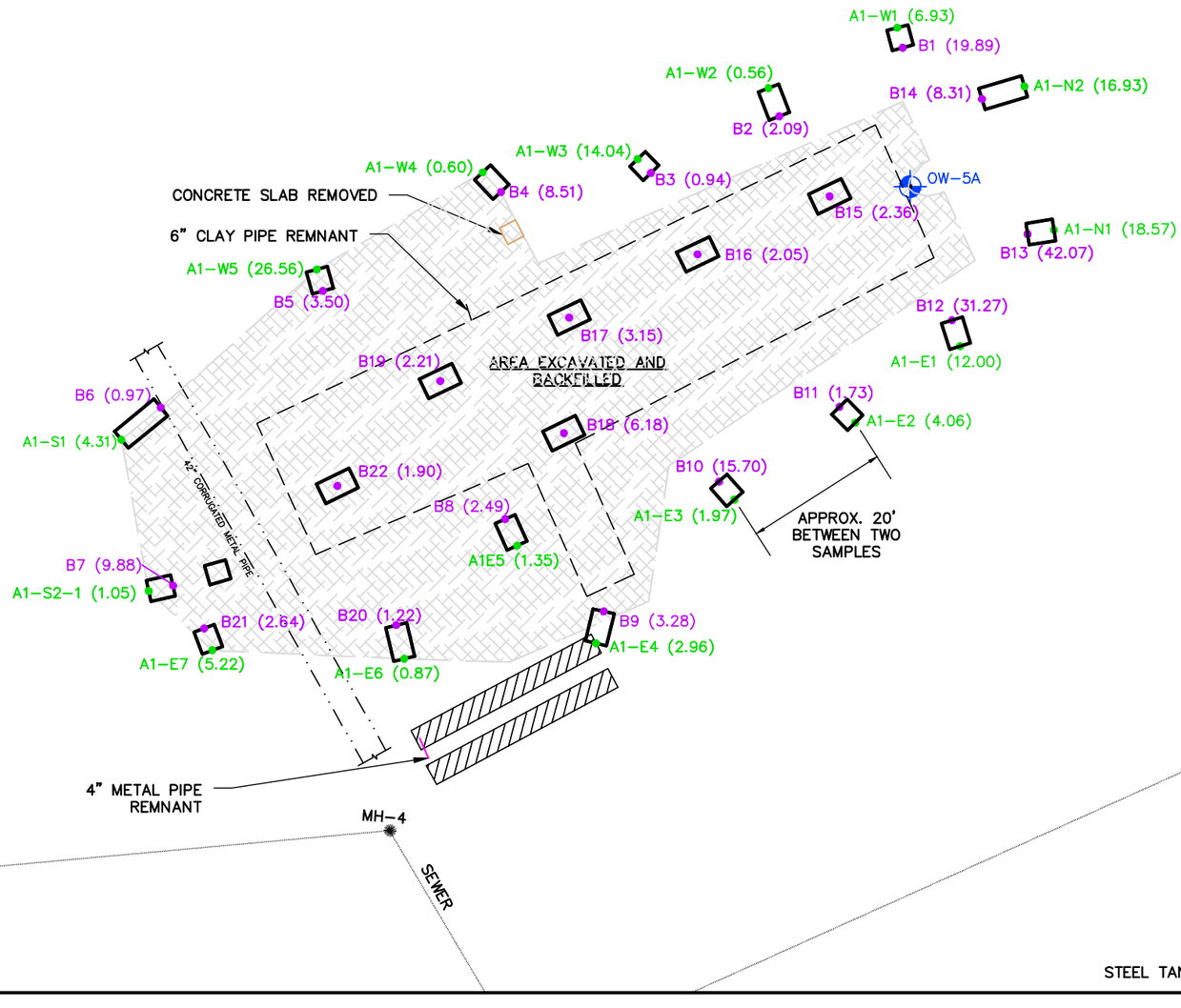
JOB NO: 206925.03
DATE: DECEMBER 2011
SCALE: 1"= 90'

FIGURE 2

206629/wip/fig

NOTE:

1. TEST PITS WERE COMPLETED AROUND THE EXCAVATION APPROXIMATELY 6 FEET FROM THE SIDEWALL LOCATION AT THE TIME OF THE TEST PIT TO COLLECT SIDEWALL AND BOTTOM SAMPLES.



LEGEND:

- OW–5A — EXISTING MONITORING WELL LOCATION AND DESIGNATION
- A1–N2 — SIDEWALL SAMPLE LOCATION AND DESIGNATION
- B14 — BOTTOM SAMPLE LOCATION AND DESIGNATION
- (8.31) — TOTAL SVOCs IN PPM
- TEST PIT FOR SAMPLE COLECTION
- ORIGINAL LIMITS OF AREA PLANNED TO BE EXCAVATED
- ACTUAL AREA EXCAVATED AND BACKFILLED
- EXPLORATORY TRENCH

10' 0 10' 20'
BAR SCALE
1" = 20'
CHECK GRAPHIC SCALE BEFORE USING

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WOODARD &CURRAN

EXCAVATION PLAN

DESIGNED BY: JR
DRAWN BY: PFF
CHECKED BY: AP
206925_U3–RDRAR.dwg

FORMER TAPPAN TERMINAL
HASTINGS–ON–HUDSON, NY

REMEDIAL DESIGN/
REMEDIAL ACTION REPORT

JOB NO: 206925.03
DATE: DECEMBER 2011
SCALE: 1"= 20'

FIGURE 3

APPENDIX A: TECHNICAL SPECIFICATIONS AND DESIGN DRAWINGS

SECTION 02050 – DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

Furnish all labor, equipment and materials, and perform all operations in connection with the demolition and removal of items so indicated on the Drawings and those encountered during the course of construction to be demolished at the direction of the Engineer. Items to be demolished include pavement, concrete foundations and pads, piping, fencing, and other miscellaneous items. The work also includes the off-site disposal of demolition materials.

B. The Owner assumes no responsibility for structures to be demolished.

C. Related Work:
1. Section 02200 – Earthwork
2. Section 02270 – Erosion Control

1.2 REFERENCES

A. American National Standards Institute (ANSI) Standard A10.6: Safety Requirements for Demolition

B. NFPA 241: Standard for Safeguarding Construction, Alteration, and Demolition

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Protective Devices and Barricades: Shall be the Contractor's option, subject to approval of the Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Notify the utility owners or entities having jurisdiction over utilities running to, through or across areas to be disturbed by demolition operations. The Contractor is responsible for the disconnection or removal of utilities in accordance with the requirements governing the utility involved.

3.2 GENERAL

A. Conduct demolition operations in a manner that will prevent damage to adjacent structures, utilities, pavements and other facilities to remain. Provide and maintain all protective devices, including fences, barricades, bracing, shoring, warning lights, and signs as necessary or required for protection against personal injury or damage to property in compliance with the applicable provisions of ANSI A10.6. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from the Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Cease demolition operations immediately if any damage, settlement or other adverse effect on adjacent structures or utilities occurs and immediately notify the Engineer. Do not resume operations until conditions are corrected, damage repaired, and approval has been received from the Engineer.

C. Below grade items that are not in conflict with future work may be permitted to remain in place at the discretion of the Engineer. At a minimum, the following shall apply:

1. Piping allowed to remain in place shall be capped or plugged with non-shrink grout.
2. Bituminous or cement concrete pavement, pads, or vaults allowed to remain in place shall have the bottoms broken to allow free drainage and be filled and compacted in accordance with Section 02200, Earthwork.

D. The use of explosives or burning material or debris on the premises will not be permitted.

3.3 DISPOSAL OF DEMOLISHED MATERIALS

A. All demolition materials shall be disposed of by the Contractor off-site at a facility approved by the Owner and in accordance with all applicable Federal and State laws and regulations relative to the disposal of materials.

3.4 SITE RESTORATION

A. Rough grade below-grade areas in preparation for further excavation or new construction to provide a smooth transition between adjacent existing grades and new grades. Fill below–grade areas and voids resulting from demolition operations with satisfactory soil materials according to requirements in accordance with Section 02200, Earthwork.

B. The Contractor shall leave the site in a safe, clean, and relatively orderly condition upon completion of the work under this section.

END OF SECTION 02050

SECTION 02100 – CLEARING & GRUBBING

PART 1.0 – GENERAL

1.1 DESCRIPTION

A. Work Included:

Furnish all labor, equipment and materials, and perform all operations in connection with the clearing, grubbing, and the preparation of the site within the limits of construction as shown on the Drawings. The work also includes the stockpiling of woodchips from clearing and grubbing operations.

B. Related Work:

1. Section 02050 – Demolition
2. Section 02200 – Earthwork
3. Section 02270 – Erosion Control
4. Section 02930 – Seeding & Mulching

PART 2.0 – PRODUCTS

2.1 HERBICIDE

A. Herbicide shall contain 53-54% glyphosate and must be labeled for wetland use.

B. Low rates of herbicide (1.5-2%) mixed with water and a low toxicity surfactant approved for wetland use, such as X-77® by Loveland Industries or equal, shall be applied to phragmites using a backpack sprayer or power-driven hand sprayer.

PART 3.0 – EXECUTION

3.1 CLEARING

A. Tree clearing shall consist of the felling, trimming, and cutting of trees into sections.

B. Plant vegetation shall be cut at the surface and covered with clean borrow cap material.

3.2 GRUBBING

A. Grubbing, consisting of the removal of stumps and roots, is required only in areas of cut where stumps and roots protrude above the proposed subgrade elevations.

B. Do not grub areas with phragmites until after an herbicide has been applied and enough time has elapsed for the herbicide to be effective based on manufacturer recommendations.

3.3 DISPOSAL OF MATERIALS

A. All timber, stumps, roots, and brush from clearing and grubbing operations shall be disposed of by the Contractor off-site or chipped and covered with clean borrow cap material. The

Contractor shall be responsible for the compliance with all Federal and State laws and regulations relative to the disposal of materials.

3.4 HERBICIDE APPLICATION

A. Herbicide shall be applied to areas with phragmites stands by a licensed applicator.

B. Herbicide application shall be performed between June and early October.

C. Do not spray if plants are under drought stress and not actively growing.

END OF SECTION 02100

SECTION 02200 – EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: The work covered in this Section of the Specifications consists of furnishing all labor, materials, equipment, appliances, transportation, services, and other items necessary to complete all work specified in this Section and shown on the Contract Drawings, including but not limited to excavation, filling, and compaction of soils.

B. Related Work:

1. Section 02050 – Demolition
2. Section 02100 – Clearing and Grubbing
3. Section 02270 – Erosion Control
4. Section 02930 – Seeding & Mulching
5. "Contaminated Materials Management Plan"; Woodard & Curran; June 15, 2010.
6. "Quality Assurance Project Plan"; Woodard & Curran; June 15, 2010.

1.2 DEFINITIONS

A. Earth excavation shall mean the excavation, removal, stockpiling, and/or satisfactory disposal of all materials other than rock or ledge, within the limits set forth or as directed.

B. Materials to be excavated shall include organic and inorganic silts, peat, clays, sand, gravel, pavement, cobbles, and boulders less than 1 cubic yard in volume, soft or disintegrated rock; brick and concrete masonry; and all other obstructions not included in other sections.

1.3 FIELD MEASUREMENTS

A. Survey Benchmark: Verify that survey benchmark and intended elevations for the work are as indicated.

1.4 REFERENCES

A. Occupational Safety and Health Administration (OSHA) Regulation 29 CFR Part 1926 – Occupational Safety and Health.

B. NYSDEC Division of Environmental Remediation, Environmental Remediation Program Soil Cleanup Objectives, Other Considerations and Media: 6 NYCRR Part 375- 6.7(d)

C. "DER-10/Technical Guidance for Site Investigation and Remediation", Table 5.4(e)10; NYSDEC; May 3, 2010.

1.5 QUALITY ASSURANCE

A. Soil Testing and Inspection Service: Soil testing and inspection service for quality control testing of soils from off-site sources and during earthwork operations shall be supplied by the Owner. The Contractor shall bear the cost of testing all materials which fail to conform to the Specifications.

1.6 PROJECT CONDITIONS

A. The site is being remediated under the New York State Department of Environmental Conservation (NYSDEC) Record of Decision for Site No. 360015 dated September 2006. Earthmoving and management of soils must be performed in accordance with the Contaminated Soils Management Plan. Environmental testing of soils from off-site sources is required prior to transport on site. The Contractor shall coordinate with the Owner or Owner's representative for testing and approval of soils from off-site sources. Imported fill materials shall meet the Standards, Criteria and Guidance values for restricted residential site use. Fill material within 50 feet of the shore will additionally meet the Standards, Criteria and Guidance values for protection of ecological resources. Documentation of the fill source shall be provided to the Engineer for NYSDEC approval before use on site in accordance with DER-10 5.4(e)5 and 6.

B. Consult official records of existing utilities, both surface and subsurface, and their connection to be fully informed on all existing conditions and limitations as they apply to this work and its relation to other construction work.

C. Locate and protect existing utilities to remain within the work area in accordance with the requirements of authorities having jurisdiction over same. If utilities are to remain in place, provide adequate means of protection during earthwork operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with the Engineer in keeping respective service and facilities in operation. Repair damaged utilities to satisfaction of the Engineer. Do not interrupt existing utilities serving facilities occupied and used by others.

D. Protection of persons and property: Barricade open excavations as part of this work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and as otherwise required. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1.7 LAWS AND REGULATIONS

A. All work performed under this contract shall be accomplished in accordance with all regulations and laws of local, State, and Federal agencies and utility companies.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Clean Borrow: Friable soil; free of rubbish, ice, snow, tree stumps, roots, and organic matter; no stone greater than 8 inches in diameter. Environmental testing for borrow shall meet regulatory requirements.

B. Top six inches of soil shall have at least 6 percent by weight of fine textured stable organic material, and no greater than 20 percent.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Notify Engineer in writing of unexpected subsurface conditions and discontinue affected work in area until notified to resume work by the Engineer.

C. Identify and flag known utility locations.

D. Maintain and protect existing utilities remaining which pass through work area.

3.2 PROTECTION OF ADJACENT WORK

A. Protect all adjacent structures which may be damaged by excavation work, including service utilities and pipe chases. All construction induced damage shall be repaired by the Contractor at no additional expense to the Owner.

B. Grade excavation top perimeter to prevent surface water run-off into excavation or to adjacent properties.

3.3 EXCAVATION

A. Excavate soil and all other materials required to achieve subgrade as shown on the drawings.

B. In no case should slope height, slope inclination, or excavation depth exceed those specified in local, state and federal safety regulations. Specifically, the current OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926 should be followed. These regulations are strictly enforced by OSHA.

C. The Contractor's "responsible person", as defined in 29 CFR Part 1926, will evaluate the soil exposed in the excavations as part of the Contractor's safety procedures.

D. The Contractor's "responsible person" will establish a minimum lateral distance from the crest of the slope for all vehicles and spoil piles. Likewise, the Contractor's "responsible person" will establish protective measures for exposed slope faces.

E. Correct unauthorized excavations at no additional cost to the Owner.

F. Construction equipment shall be decontaminated between grading and filling activities.

3.4 FILLING AND COMPACTION

A. Maximum loose lift thickness shall be 24-inches. Minimum compaction shall be three passes with a vibratory roller with a weight of 10,000 lbs or greater.

3.5 TOLERANCES

A. Top Surface of final grade: Plus or minus two inches (2").

3.6 FIELD QUALITY CONTROL

A. Quality control testing during construction will be provided by the Owner. The Engineer shall be notified 48 hours prior to any fill, backfill, or compaction operations.

B. Provide Engineer free and safe access to Work at all times. Allow the Engineer sufficient time to make necessary observations.

C. Permit the Engineer to observe all subgrades. Additional fill should not be placed unless the Engineer has approved the subgrade layer.

D. The Engineer's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Engineer nor any observations and testing performed by him, nor any notice or failure to give notice, shall excuse the Contractor from defects discovered in his work.

END OF SECTION 02200

SECTION 02270 – EROSION CONTROL

PART 1.0 - GENERAL

1.1 DESCRIPTION

A. Work Included:

Provide and maintain erosion control measures for the duration of the construction project as shown on the drawings and as specified herein to include all areas disturbed by the Contractors.

B. Related Work:

1. Section 02200 – Earthwork

1.2 REFERENCES

A. New York Standards and Specifications for Erosion and Sediment Control.

B. NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities.

C. Project-specific Stormwater Pollution Prevention Plan

PART 2.0 - PRODUCTS

2.1 MATERIALS

A. Baled Hay Erosion Checks: Baled hay or straw shall be baled within twelve months of use. Bindings shall be sufficiently strong to act as handles when placing bales in position by hand. The minimum dimension of any bale shall be 18-inches. Wood stakes shall be oak, 1-inch by 1-inch in section, and at least 3.0 feet in length.

B. Silt Fence: The filter fabric shall be a material suitable for erosion control applications. Wood posts shall be oak, 1½-inch by 1½-inch in section, and at least 4.5 feet in length. Support netting shall be heavy-duty plastic mesh. For prefabricated silt fence, 1-inch by 1-inch wood posts will be permitted.

C. Temporary Seed Mixture: Temporary seed is only to be required when or if it is impractical to establish permanent protective vegetation on disturbed earth by October 15. Use seed mixture and application rates approved by the Engineer.

D. Tackifier: Tackifier shall consist of naturally based material (i.e., wood cellulose, paper or other plant products) used to contain seed and provide stability shallow slopes. Asphalt or chemical based materials shall not be used.

E. Erosion Control Blankets: Erosion control blankets shall be 100% biodegradable natural fiber materials. Netting shall be Leno woven. Blanket matrix shall be a mixture of agricultural straw

and coconut fibers. Acceptable products are North American Green SC150BN, Rolanka BioD-OCF-30, or equal.

PART 3.0 - EXECUTION

3.1 INSTALLATION

A. The erosion controls indicated on the Drawings shall be installed in the areas of work and approved by the Engineer before the commencement of any clearing, grubbing or earthwork.

B. Control of erosion and sedimentation on the site is the Contractor's responsibility. Erosion and sedimentation control measures beyond those shown on the Drawings will be installed and maintained by the Contractor as necessary to stabilize the site.

C. Hay Bales:

Installation. Baled hay erosion checks shall be constructed at the locations, and in accordance with the details indicated on the Drawings, or as directed by the Engineer. The following stipulations also apply:

1. Bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another.

2. The erosion check shall be entrenched and backfilled. The trench shall be excavated the width of the bale and the length of the check to a minimum depth of 3-inches. After the bales are staked and chinked, the excavated soil shall be backfilled against the check.

3. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together.

4. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between bales. Loose straw shall be scattered over the area immediately uphill from the bale erosion check to increase efficiency.

D. Silt Fence:

Silt fence shall be constructed at the locations, and in accordance with the details indicated on the Drawings, or as directed by the Engineer. The following stipulations also apply:

1. A 6-inch x 6-inch minimum trench shall be dug where the fence is to be installed.

2. The fence shall be positioned in the trench with the fence posts set at 8-feet on center (maximum).

3. The sedimentation control fabric and the industrial netting shall be stapled to each post. When joints are necessary, filter fabric shall be spliced together only at support posts. Splices shall consist of a 6-inch overlap, and shall be securely sealed.

4. The trench shall be backfilled and the soil compacted over the filter fabric.

5. The installed height of the fence shall be 2.5 feet (minimum). However, height shall not exceed 36-inches since higher barriers impound volumes of water sufficient to cause failure of the fence structure.

E. Temporary and Permanent Seed and Tackifier:

Seed and tackifier shall be applied at the direction of the Engineer.

F. Erosion Control Blankets:

Erosion control blankets shall be installed on slopes greater than 15% after seeding beginning at the top of the slope by anchoring the tops of the blankets in a 6-inch deep by 6-inch wide trench with approximately 12 inches of blanket extended beyond the up-slope portion of the trench. The blanket shall be anchored with a row of stakes approximately 12 inches apart in the bottom of the trench. The trenches shall be backfilled and compacted. After the blanket is unrolled, they shall be secured to the soil surface by placing stakes at locations as recommended by the manufacturer. The edges of parallel blankets shall be installed with a minimum of 2-inches of overlap.

3.2 MAINTENANCE

A. The Engineer has the authority to verify, enforce, and to specify maintenance activities and to ensure that erosion and pollution controls have been properly maintained. Erosion and pollution controls shall be maintained by the Contractor to the satisfaction of the Engineer.

B. Erosion and pollution controls must be able to prevent, under normal weather conditions, both the movement of soil materials and the intrusion of sediment-laden discharges off-site and into environmentally sensitive areas.

C. Erosion and sedimentation controls shall be routinely inspected and maintained by the Contractor. The Contractor shall conduct inspections of the erosion and sedimentation controls in accordance with reference documents or when directed by the Engineer.

D. The Contractor shall aggressively and expeditiously perform cleaning and maintenance work to remedy identified problems to the complete satisfaction of the Engineer. Damaged controls will be repaired or replaced after each storm events or as directed by the Engineer.

E. At a minimum, erosion and sedimentation controls will be cleaned when sediment deposits reach the 6 inches in height adjacent to the haybales or silt fences.

3.3 REMOVAL

A. Haybales and silt fences will be removed only when the adjacent exposed area is stabilized, i.e., the area has an established grass or mulch cover, and is free from future uncontrolled discharges.

B. Before controls are removed, all accumulated sediment on the upstream side shall be removed and legally disposed of.

END OF SECTION 02270

SECTION 02810 – CHAIN LINK FENCE

PART 1.0 - GENERAL

1.1 WORK INCLUDED

Provide chain link fence, including gates, posts and post foundations, hardware and appurtenances, of the type and configuration, and at the locations indicated on the Drawings.

1.2 RELATED WORK

A. Section 02200 – Earthwork

1.3 REFERENCES

A. Chain Link Fence Manufacturers Institute Product Manual

B. ASTM A123: Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

C. ASTM A392: Zinc-Coated Steel Chain Link Fence Fabric

D. ASTM F567: Installation of Chain Link Fence

E. ASTM F900: Industrial and Commercial Swing Gates

1.4 SUBMITTALS

A. Submit Shop Drawings showing dimensions and details of fencing and gates, including post installation.

B. Submit product data on fabric, posts, and accessories.

C. Submit sample of fence to demonstrate fabric finish, color and gauges. Sample size to be 6-inch x 12-inch minimum.

D. Submit manufacturer's installation instructions.

PART 2.0 – PRODUCTS

2.1 MATERIALS

A. General:

All steel parts shall be hot-dipped galvanized.

B. Fence Fabric:

1. Fence fabric shall be Class 1 zinc-coated steel.
2. Fabric shall consist of No. 9 gauge wire, woven in 2-inch diamond mesh.
3. Fabric shall be knuckled on the top and bottom selvage.

C. Posts:

1. Posts shall be Grade B galvanized steel.
2. Line posts shall be Type II, 2.375-inch O.D. steel pipe.
3. End, corner, and pull posts shall be Type II, 2.875-inch O.D. steel pipe.
4. Gate posts shall be Type II, 4.00-inch O.D. steel pipe.

D. Top and Bottom Rails and Couplings:

1. Top and bottom rails shall be Type II, 1.66-inch O.D. steel pipe, manufacturer's longest lengths.
2. Top and bottom rails shall be fitted with couplings for connecting the lengths into a continuous run. Couplings shall be a minimum of 6 inches long and allow for expansion and contraction of the rail.
3. Fittings shall be provided for attaching top rails securely to each gate corner, pull and end post.

E. Wire Ties:

1. Wire ties shall be 11 gauge galvanized steel.

F. Swing Gates:

1. Swing gates shall conform to ASTM F900.
2. Frame shall be 1.90-inch diameter galvanized steel.
3. Interior bracing shall be 1.66- inch diameter steel.
4. Fabric shall be the same type as used in the fence construction.
5. Hinges shall be non-lift-off type, offset to permit 180 degree gate opening, and sized as required for the gate size.
6. Latch shall be forked type or plunger-bar type to permit operation from either side of the gate, with padlock eye as an integral pert of the latch.
7. Gate stops shall be provided for all double gates.
8. Lock shall be provided for each gate, keyed as directed by the Engineer.

G. Post Brace Assembly:

1. Post brace assemblies shall be provided for each gate, corner, pull, and end post.
2. Post braces shall consist of the same material as the top rail and shall extend to each adjacent line post at approximately mid-height of the fabric.
3. Trusses shall consist of a rod not less than 5/16-inch nominal diameter and shall extend from the line post back to the gate, corner, pull, or end post, with a turnbuckle, or other equivalent provision for adjustment.

H. Post Tops:

1. Post tops shall be galvanized steel and weathertight, with openings to permit passage of the top rail.

I. Tension Bar:

1. Tension bars shall be provided for each gate, end, corner and pull post.

2. Tension bars shall be a minimum of 3/16-inch by 3/4-inch and not less than 2 inches shorter than the normal height of the fabric with which they are used.

J. Tension Wire:

1. Tension wire shall be crimped 7 gauge galvanized steel.

K. Foundations shall be concrete.

PART 3.0 – EXECUTION

3.1 PREPARATION

A. Grade ground along fence line to provide a uniform surface to allow the fence fabric to be installed parallel to the ground and no more than 3 inches above it.

3.2 INSTALLATION

A. Install foundations, posts, fabric, and gates in accordance with the manufacturer's instructions, ASTM F567, and the Drawings.

B. Excavate for concrete post foundations to the dimensions shown on the Drawings. Set posts plumb, and place concrete around posts. Allow concrete to cure a minimum of 72 hours prior to attaching other fence components. Posts may be set mechanically rather than with concrete if approved by the Engineer..

C. Install and secure rails and fabric in accordance with the manufacturer's recommendations and as shown on the Drawings. Install fabric on the face of the posts away from the work site or enclosed area. Install fabric 1-inch above finished grade.

D. Install gates plumb, level, and to allow full opening without interference.

E. Provide a padlock and chain for each gate. Provide two keys with each padlock.

END OF SECTION 02810

SECTION 02930 – SEEDING & MULCHING

PART 1.0 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish all labor, equipment and materials and perform all operations necessary to fine grade loam; and apply seed, lime, fertilizer, and mulch in accordance with the Drawings and Specifications.

2. Maintenance of all seeded areas.

B. Related Work:

1. Section 02100 – Clearing & Grubbing
2. Section 02200 – Earthwork
3. Section 02270 – Erosion Control

1.2 SUBMITTALS

A. Manufacturers Product Data:

Submit manufacturers' material specifications for seed, lime, fertilizer, and hydroseed mixture as appropriate.

B. Certificates of Compliance:

1. Submit manufacturer's Certificate of Compliance to the specifications with each shipment of each type of seed. The certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. Seed shall not be sown prior to submittal of the certificates.

2. Submit a certified statement for the hydroseed mix to be used to include the amounts of fertilizer, grass seed, and processed fiber, per 100 gallons of water. The statement shall also include the amounts and types of grass seed.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to the site in original, unopened containers, showing weight, manufacturer's name and guaranteed analysis.

B. Store materials in a manner that their effectiveness and usability will not be diminished or destroyed. Materials shall remain uniform in composition, dry, unfrozen and free

flowing. Any material that has become caked or otherwise damaged or does not meet specified requirements will be rejected.

1.4 ACCEPTANCE CRITERIA

A. Acceptance shall be given for the entire portion of the seeded area. No partial acceptance will be given.

B. Seeded area shall not exhibit signs of damage from erosion, washouts, gullies, or other causes.

PART 2.0 – PRODUCTS

2.1 SOIL CONDITIONING MATERIALS

A. Fertilizer: Fertilizer for grass seeding shall be a complete, standard product complying with State and Federal fertilizer regulations. Fertilizer shall contain the following minimum percentage of available plant food by weight: 10 percent nitrogen, 6 percent phosphorous, 4 percent potash. At least 50 percent of available nitrogen shall be in a slow-release form as is found in certain urea-form products, or a combination of both.

2.2 SEED

Seed mix shall be fresh, clean, dry, new-crop seed. Weed seed content shall not exceed 1 percent and be free from invasive species as defined by the *Revised Interim List of Invasive Plant Species in New York State* dated May 14, 2012. Seed mix shall conform to the following proportions:

Seed Type	**Proportion by Weight (%)**
Lawn:	
Red Fescue (Festuca rubra)	60
Perennial Ryegrass (Lolium perenne)	30
White Clover (Trifolium repens)	10

2.3 MULCH FOR HYDROSEEDING

A. Mulch to cover hydroseeded areas shall be fiber-processed from whole wood chips manufactured specifically for standard hydraulic mulching equipment. Fiber shall not be produced from recycled material such as sawdust, paper, or cardboard. The mulch shall be dyed green to contrast with the soil on which it is to be applied. It shall be nontoxic to plant life or animal life.

B. Moisture content shall not exceed 10 percent as defined by the pulp and paper industry standards. Fiber shall have a water holding capacity of not less than 31.5 ounces of water per 3.5 ounces of fiber.

C. The mulch shall disperse into a uniform slurry when mixed with water.

2.4 SHRUBS

A. Shrubs will consist of native species with a wetland indicator status of FACW plants (Speckled alder [*Alnus incana*], or equal) and FAC plants (Black chokeberry [*Aronia melanocarpa*], or equal) if needed. Shrubs will be seedlings or as rooted stock in #1 (one-gallon) containers.

PART 3.0 - EXECUTION

3.1 SEED APPLICATION

A. Seeding shall be performed between April 15 and May 31, or August 15 and October 15, except as otherwise authorized in writing by the Engineer.

B. Hydroseeding slurry shall contain fertilizer at a rate of 850 pounds per acre, seed at a rate of 150 pounds per acre, and wood cellulose fiber mulch at a rate of 2 tons per acre. The slurry shall be mixed and kept in an agitated state so the materials are uniformly suspended in the water. The slurry shall be applied evenly over the area to be seeded by an operator thoroughly familiar with this type of seeding operation.

C. Do not apply seed if heavy storms are predicted in the 72 hours following application.

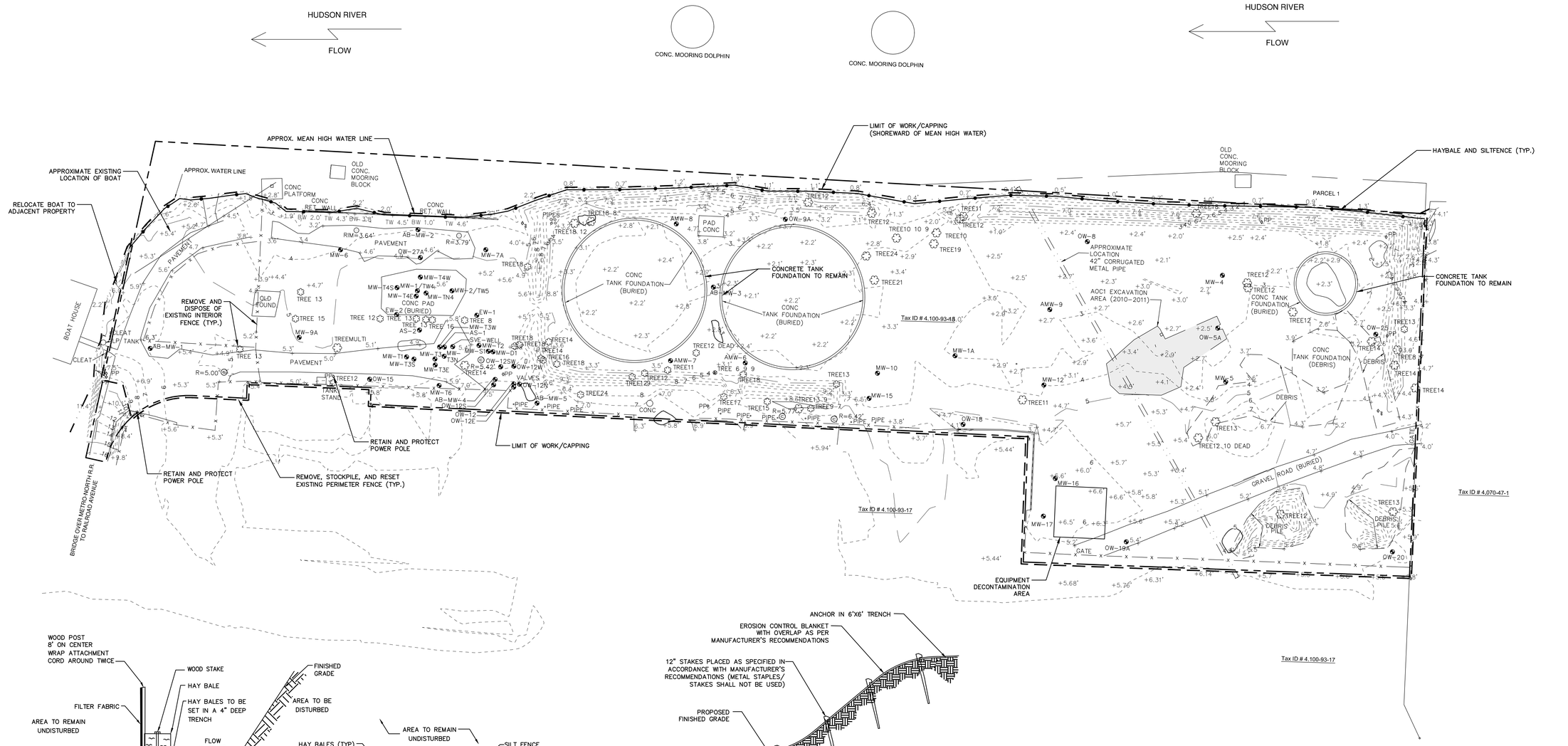
3.2 SHRUB INSTALLATION

A. Plant shrubs in shoreline areas with slopes greater than 15% and greater than 10 feet of sloped surface from the top of the riprap to the top of the slope.

B. FACW plants will be used within 10 vertical feet of riprap and FAC plants will be used greater than 10 vertical feet from riprap.

C. Shrubs will be planted on 5-ft centers and installed by hand.

END OF SECTION 02930



HAYBALE AND SILT FENCE DETAIL

NOT TO SCALE

NOTES:

1. ALL EROSION CONTROL BLANKETS SHALL BE INSTALLED WITH 12" DEEP CHECK SLOTS EVERY 25 FEET OR AT THE MIDPOINT IF BLANKET LENGTH IS LESS THAN 50.
2. INSTALL EROSION CONTROL BLANKETS IN ALL AREAS WHERE SLOPE IS 15% OR GREATER, AFTER SEEDING. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING EROSION CONTROL BLANKET UNTIL SEEDED AREA IS FULLY ESTABLISHED.

EROSION CONTROL BLANKET DETAIL

NOT TO SCALE

LEGEND:

- TREES
- MONITORING WELLS
- 2 CONTOURS
- +2.5 SPOT GRADES
- POWER POLES
- HAYBALES AND SILT FENCE
- LIMIT OF WORK / CAP AREA
- PROPERTY LINE

NOTES:

1. ALL VEGETATION WITHIN THE LIMIT OF WORK SHALL BE CLEARED.
2. OWNER'S EXISTING MONITORING WELLS SHALL BE RAISED TO 3 FEET ABOVE PROPOSED GRADE WITH STEEL RISERS AND LOCKING CAPS. ALL WELLS TO BE PROTECTED.
3. ALL PHRAGMITES SHALL BE CUT AT THE SURFACE AND COVERED WITH CLEAN BORROW CAP MATERIAL.
4. MISCELLANEOUS DEBRIS (METAL PIPE, WOOD PILINGS, ETC.) SHALL BE REMOVED FROM SITE.
5. ALL POWER POLES SHALL BE REMOVED AND DISPOSED OF FROM SITE UNLESS NOTED OTHERWISE.
6. THE PROJECT AREA IS LOCATED WITHIN THE FLOOD HAZARD ZONE AE WITH A 100-YEAR FLOOD ELEVATION OF ELEV. 7 NAVD 88 (REF. FEMA WESTCHESTER COUNTY, NY FLOOD INSURANCE RATE MAP NO. 36119C0307F, DATED SEPTEMBER 28, 2007.)

GRAPHIC SCALE

50 25 0 50 100 150

Woodard & Curran Engineering P.A. P.C.
709 Westchester Avenue | Suite L2
White Plains, New York 10604
800.807.4800 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE
	NYSDEC COMMENTS	7/13/12

DESIGNED BY: JMG
DRAWN BY: HP
CHECKED BY: JMG

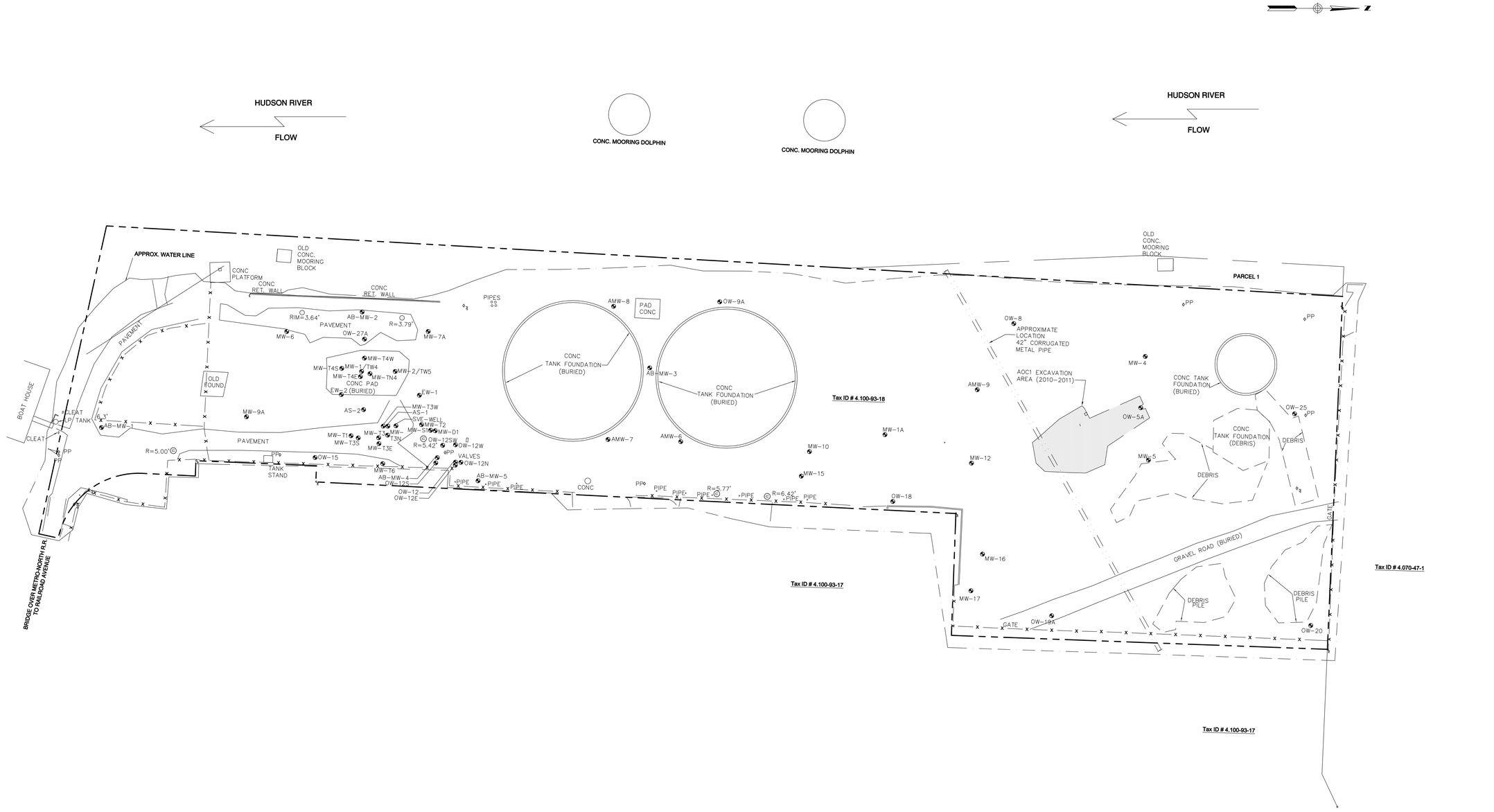
SITE PREPARATION AND DEMOLITION PLAN

FORMER MOBIL TAPPAN TERMINAL PROPERTY
HASTINGS-ON-HUDSON, NEW YORK
FORMER TAPPAN TERMINAL
NYSDEC SITE NO. 3-60-015

CAP DESIGN FOR AOC 1

JOB NO.: 206925.06
DATE: DECEMBER 2011
SCALE: AS SHOWN
SHEET: 1 OF 5

C-01



GRAPHIC SCALE

50 25 0 50 100 150

\\CHESHIRE\Projects\206925 ExxonMobil Tappan Terminal\wip\Final Remedial Design\Cad Files\Civil\206925-C0A.dwg, Dec 16, 2011 2:39pm

Woodard & Curran Engineering P.A.P.C.
709 Westchester Avenue | Suite L2
White Plains, New York 10604
800.807.4000 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE

DESIGNED BY: JMG
DRAWN BY: HP
CHECKED BY: JMG

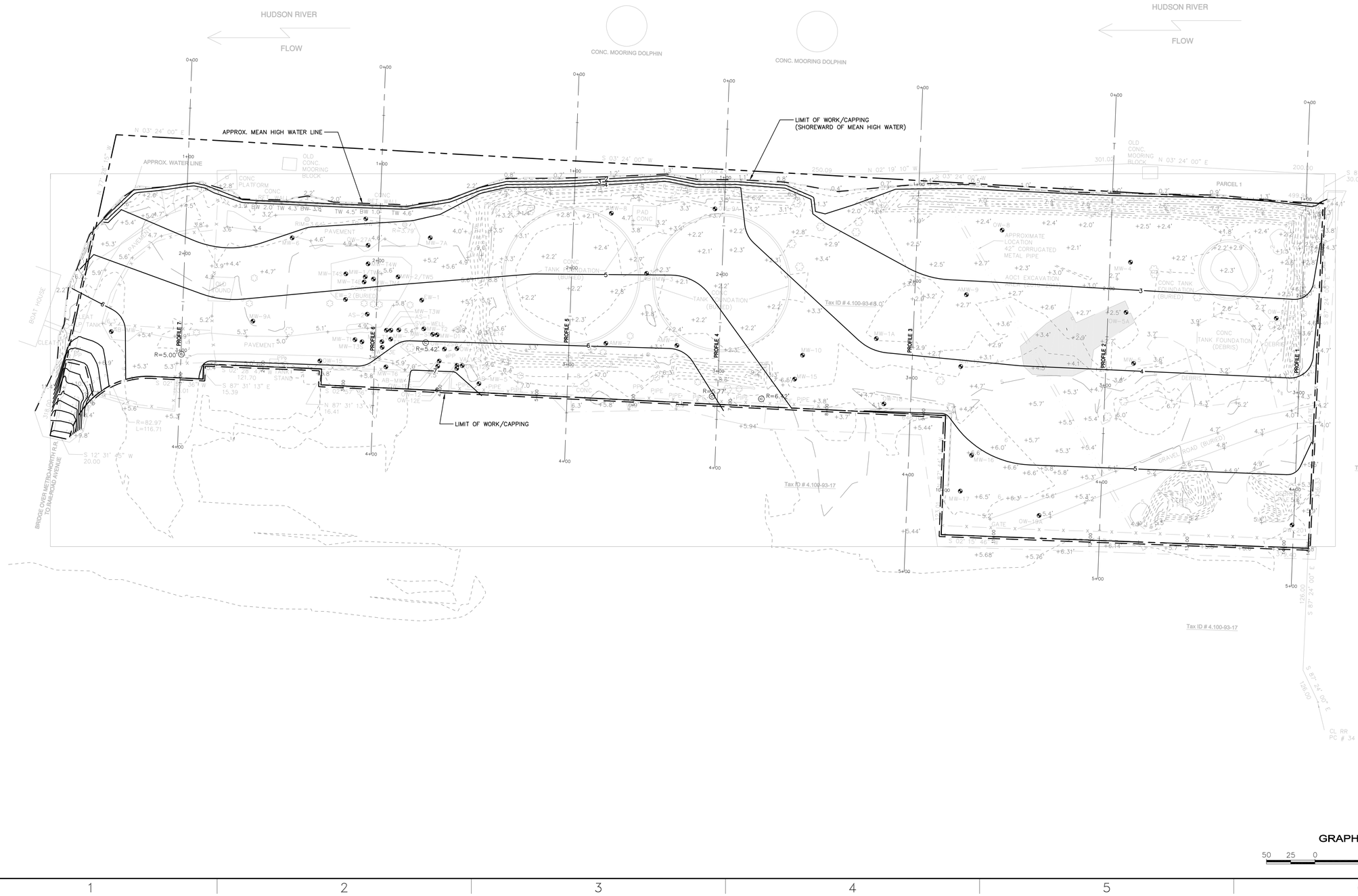
MONITORING WELL LOCATION MAP

FORMER MOBIL TAPPAN TERMINAL PROPERTY
HASTINGS-ON-HUDSON, NEW YORK
FORMER TAPPAN TERMINAL
NYSDEC SITE NO. 3-60-015

CAP DESIGN FOR AOC 1

JOB NO.: 206925.06
DATE: DECEMBER 2011
SCALE: AS SHOWN
SHEET: OF

C-02



GRAPHIC SCALE

50 25 0 50 100 150

Woodard & Curran Engineering P.A.P.C.
709 Westchester Avenue | Suite L2
White Plains, New York 10604
800.807.4000 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE

DESIGNED BY: JMG
DRAWN BY: HP
CHECKED BY: JMG

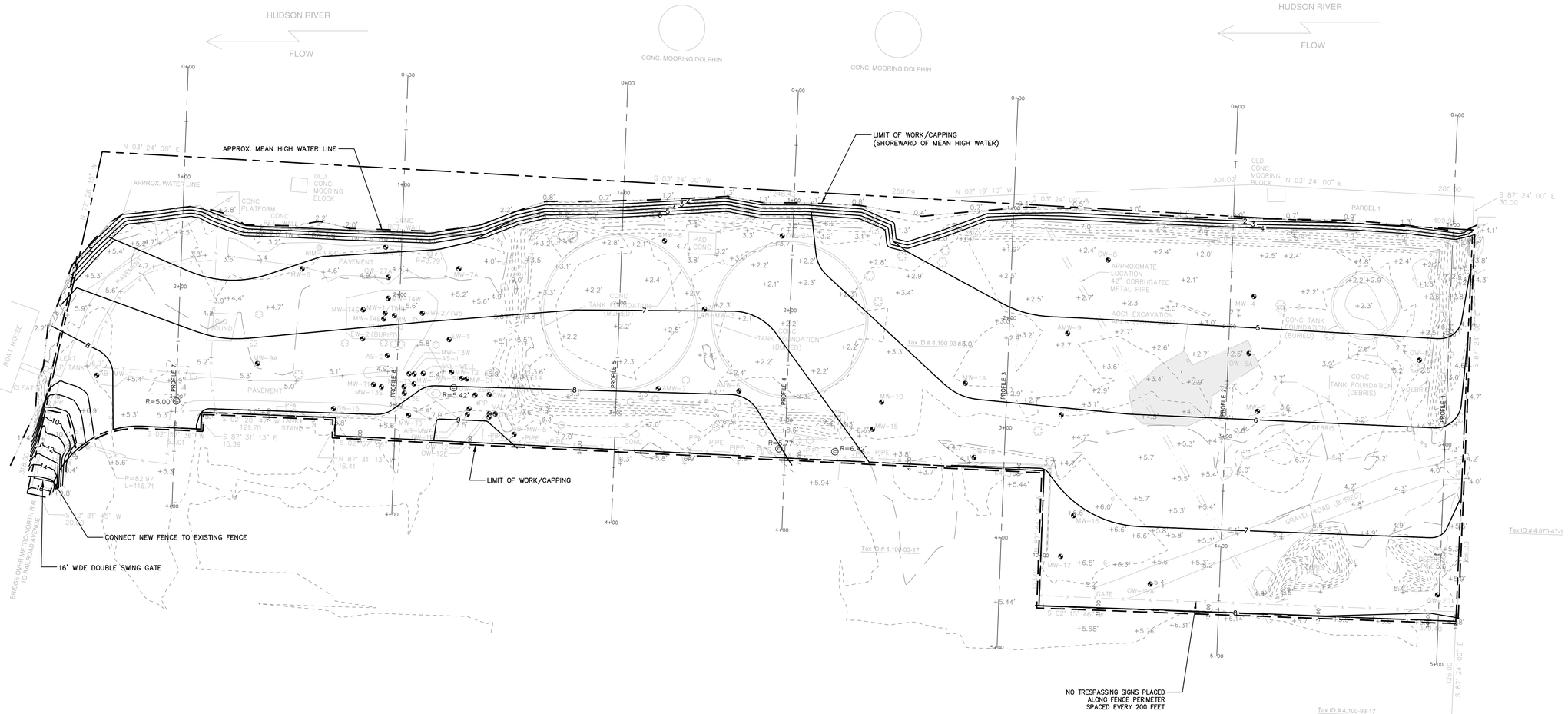
SUB-GRADE PLAN

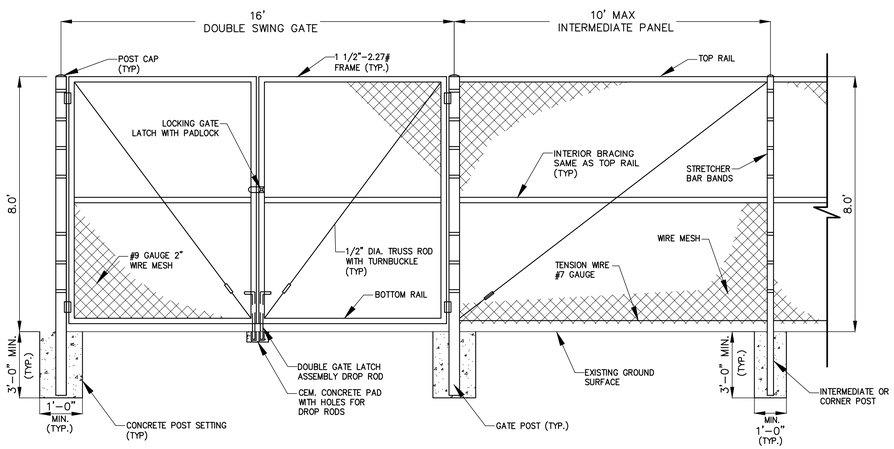
FORMER MOBIL TAPPAN TERMINAL PROPERTY
HASTINGS-ON-HUDSON, NEW YORK
FORMER TAPPAN TERMINAL
NYSDEC SITE NO. 3-60-015

CAP DESIGN FOR AOC 1

JOB NO.: 206925.06
DATE: DECEMBER 2011
SCALE: AS SHOWN
SHEET: OF

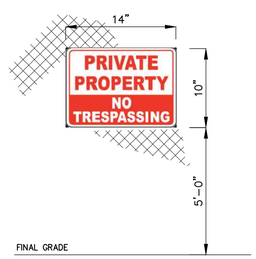
C-03





CHAIN LINK FENCE AND GATE DETAIL

NOT TO SCALE

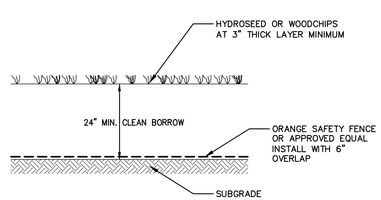


NOTES:

1. CONTRACTOR SHALL PLACE NO TRESPASSING SIGNS ALONG THE PERIMETER FENCE SPACED EVERY 200 FEET.
2. SIGN IS TO BE MADE OF RUST FREE ALUMINUM WITH FOUR MOUNTING HOLES.
3. MOUNT SIGN TO FENCE WITH STAINLESS STEEL FASTENERS.

NO TRESPASSING SIGN DETAIL

NOT TO SCALE



CAP CROSS SECTION

NOT TO SCALE

GRAPHIC SCALE

50 25 0 50 100 150

Woodard & Curran Engineering P.A. P.C.
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White Plains, New York 10604
800.807.4800 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE
	NYSDEC COMMENTS	7/13/12

DESIGNED BY: JMG
DRAWN BY: HP
CHECKED BY: JMG

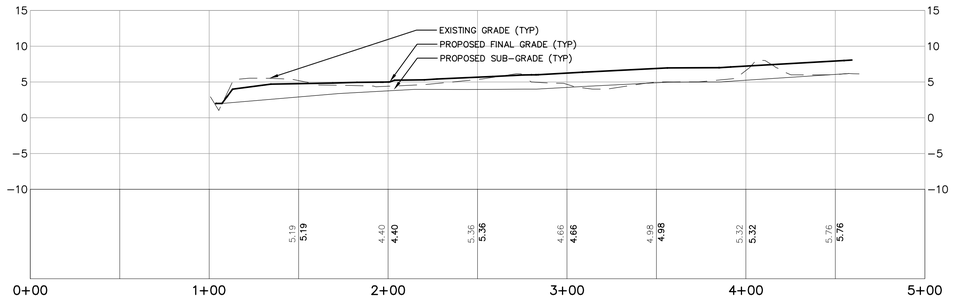
FINAL GRADING PLAN

FORMER MOBIL TAPPAN TERMINAL PROPERTY
HASTINGS-ON-HUDSON, NEW YORK
FORMER TAPPAN TERMINAL
NYSDEC SITE NO. 3-60-015

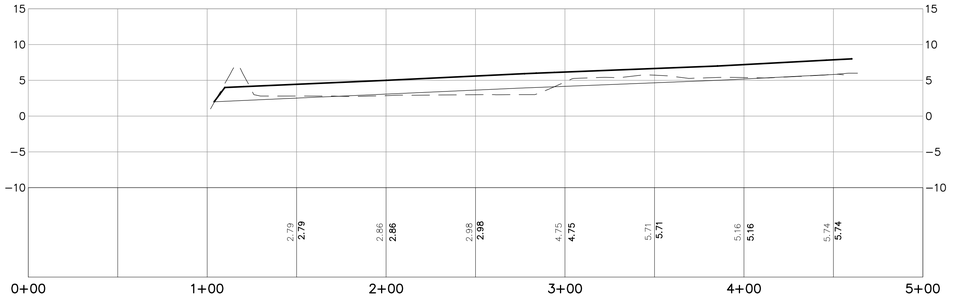
CAP DESIGN FOR AOC 1

JOB NO.: 206925.06
DATE: DECEMBER 2011
SCALE: AS SHOWN
SHEET: 4 OF 5

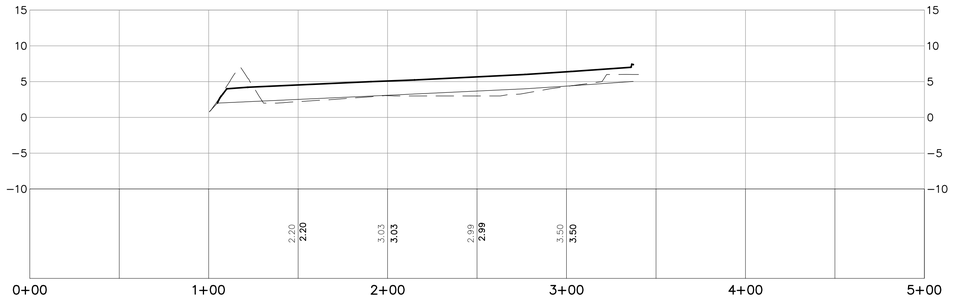
C-04



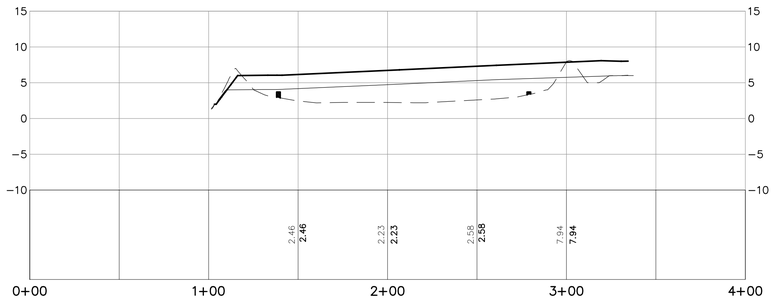
PROFILE 1 STA. 0+00 TO STA. 5+00
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'



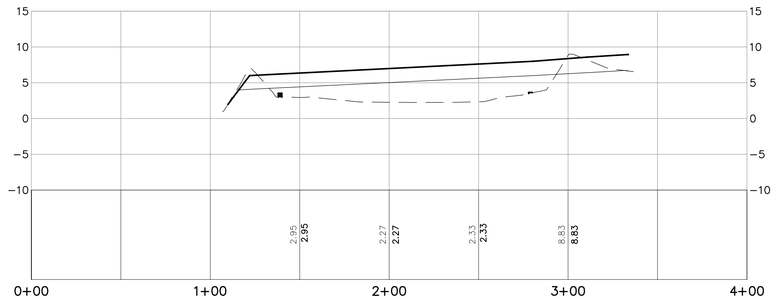
PROFILE 2 STA. 0+00 TO STA. 5+00
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'



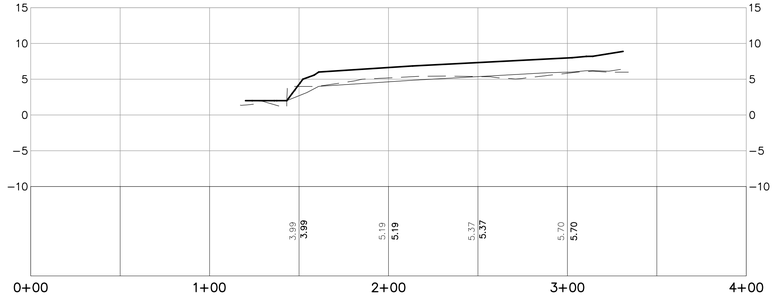
PROFILE 3 STA. 0+00 TO STA. 5+00
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'



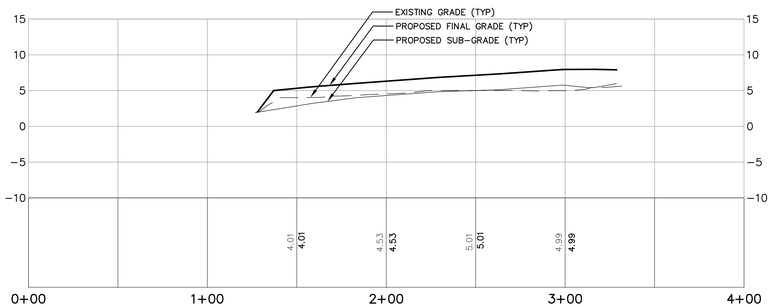
PROFILE 4 STA. 0+00 TO STA. 4+00
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'



PROFILE 5 STA. 0+00 TO STA. 4+00
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'



PROFILE 6 STA. 0+00 TO STA. 4+00
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'



PROFILE 7 STA. 0+00 TO STA. 4+00
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 10'

LEGEND:
- EXISTING GRADE
- PROPOSED SUB-GRADE
- PROPOSED FINAL GRADE

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White Plains, New York 10604
800.807.4080 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV.	DESCRIPTION	DATE

DESIGNED BY: JMG
DRAWN BY: HP
CHECKED BY: JMG

PROFILES

FORMER MOBIL TAPPAN TERMINAL PROPERTY
HASTINGS-ON-HUDSON, NEW YORK
FORMER TAPPAN TERMINAL
NYSDEC SITE NO. 3-60-015

CAP DESIGN FOR AOC 1

JOB NO.: 206925.06
DATE: DECEMBER 2011
SCALE: AS SHOWN
SHEET: OF

C-05

APPENDIX B: WELL CONSTRUCTION INFORMATION

Well Construction Information

Former Mobil Tappan Terminal
AOC1, Former Tappan Terminal
Hastings-on-Hudson, New York

	Well ID	Year Installed	Well Diameter (inches)	Total Depth (feet)	Screen Length (feet)	Comments
ExxonMobil Wells (AOC1)	MW-1A	1993	4	11	10	Well to be extended above cap
	MW-4	1986	4	11	10	Well to be extended above cap
	MW-5	1986	4	10	10	Well to be extended above cap
	MW-6	1986	4	10.5	10	Well to be extended above cap
	MW-7A	1993	4	11	10	Well to be extended above cap
	MW-9A	1993	4	12	10	Well to be extended above cap
	MW-10	1992	4	11.5	10	Well to be extended above cap
	MW-12	1992	4	11.5	10	Well to be extended above cap
	MW-15	1994	4	11	10	Well to be extended above cap
	MW-16	1994	4	11	10	Well to be extended above cap
	MW-17	1994	4	13	10	Well to be extended above cap
	MW-D1	1988	4	66.5	20	Well to be extended above cap
	MW-S1	1988	6	28	20	Well to be extended above cap
	OW-5A	1993	4	11	10	Well to be decomissioned and replaced by others for AOC3
	OW-8	1986	2	12.5	11	Well to be extended above cap
	OW-9A	1994	4	12	10	Well to be extended above cap
	OW-12	1986	2	15	14	Well to be extended above cap
	OW-15	1986	2	16	14	Well to be extended above cap
	OW-18	1986	*Well information not on file.*			Well to be decommissioned by others for AOC3
	OW-19A	1993	4	11	10	Well to be extended above cap
	OW-20	1986	2	12	10	Well to be extended above cap
	OW-25	1986	2	11	10	Well to be extended above cap
	OW-27A	1993	4	11	10	Well to be extended above cap
	SVE Well	2002	4	7	5	Well to be extended above cap
	AS-1	2002	2	23	3	Well to be extended above cap
	AS-2	2004	2	20	5	Well to be extended above cap
	MW-T1	2002	4	20	15	Well to be extended above cap
	MW-T2	2002	2	20	15	Well to be extended above cap
	MW-T3	2002	2	23	20	Well to be extended above cap
	MW-T4 (MW-1/TW4)	2004	2	20	15	Well to be extended above cap
	MW-T5 (MW-2/TW5)	2004	2	20	15	Well to be extended above cap
	MW-T6	2004	2	20	15	Well to be decommissioned by others for AOC3
Wells Installed by Others (AOC3)	AB-MW-1	2008	2	15	4	Well installed by others for AOC3
	AB-MW-2	2008	2	13	10	Well installed by others for AOC3
	AB-MW-3	2008	2	13	10	Well installed by others for AOC3
	AB-MW-4	2008	2	18	15	Well to be decommissioned by others for AOC3
	AB-MW-5	2008	2	18	15	Well to be decommissioned by others for AOC3
	AMW-6	proposed				Well to be installed by others for AOC3
	AMW-7	proposed				Well to be installed by others for AOC3
	AMW-8	proposed				Well to be installed by others for AOC3
	AMW-9	proposed				Well to be installed by others for AOC3
	EW-1	proposed				Well to be installed by others for AOC3
	EW-2	proposed				Well to be installed by others for AOC3
	MW-T3E	2008	2	20	15	Well installed by others for AOC3
	MW-T3S	2008	2	19.5	15	Well installed by others for AOC3
	MW-T3N	2008	2	18	15	Well installed by others for AOC3
	MW-T3W	2008	2	19	15	Well installed by others for AOC3
	MW-T4E	2008	2	19.5	15	Well installed by others for AOC3
	MW-T4N	2008	2	19.5	15	Well installed by others for AOC3
	MW-T4S	2008	2	19.5	15	Well installed by others for AOC3
	MW-T4W	2008	2	19.5	15	Well installed by others for AOC3
	OW-12E	2008	2	18	15	Well to be decommissioned by others for AOC3
	OW-12N	2008	2	18	15	Well to be decommissioned by others for AOC3
	OW-12S	2008	2	19	15	Well to be decommissioned by others for AOC3
	OW-12SW	2009	2	17	15	Well installed by others for AOC3
	OW-12W	2008	2	17	15	Well installed by others for AOC3

APPENDIX C: QUALITY ASSURANCE PROJECT PLAN (APPENDIX B TO THE JUNE 2010 RDRAWP)

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Former Tappan Terminal

Hastings-on-Hudson, New York

June 15, 2010

TABLE OF CONTENTS

ATTACHMENTS

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) includes the following four basic element groups: Project Management, Measurement Data Acquisition; Assessment/Oversight; and Data Validation and Usability. This QAPP follows EPA's Quality Assurance Guidance for Conducting Brownfields Site Assessments (EPA 540-R-98-038) and is incorporated within the remedial design work scope ("Field Work Scope") for the former Mobil terminal property in Hastings-on-Hudson, New York.

This QAPP is applicable only to the work specified. Revisions to the QAPP for additional work or changes to the Field Work Scope will be made and approved in accordance with standard Woodard & Curran Inc. practices and submitted to ExxonMobil Refining & Supply, the present owner of the subject property, for approval. Notification and distribution of any changes will be conducted by Woodard & Curran.

2.0 PROJECT MANAGEMENT

This element group encompasses aspects of project management, objectives and background. It identifies the roles and responsibilities of project personnel, describes communication procedures and details the proposed project schedule.

FORM A

TITLE AND APPROVAL PAGE

Quality Assurance Project Plan (QAPP) for Work Associated with the former Tappan Terminal
Document Title

Anne Proctor **Woodard & Curran**
Prepared by: Preparer's Name and Organizational Affiliation)

1520 Highland Avenue
Cheshire, CT 06410 **(203) 271-0379**
Address and Telephone Number

Day/Month/Year

Project Manager: _____
Signature

Anne E. Proctor - Woodard & Curran
Printed Name/Date

Project Director: _____
Signature

Nicholas A. Hastings – Woodard & Curran
Printed Name/Date

FORM B

PROJECT ORGANIZATION AND RESPONSIBILITY/DISTRIBUTION LIST

Woodard & Curran of Cheshire, Connecticut was retained by ExxonMobil to provide environmental consulting services for the former Tappan Terminal property in Hastings-on-Hudson, New York.

ExxonMobil Refining & Supply			
Steve Trifiletti	Global Remediation	(516) 239-5232	steve.p.trifiletti@exxonmobil.com

NYSDEC			
William Ports	Div. of Environmental Remediation	(518) 402-9667	wfports@gw.dec.state.ny.us

Woodard & Curran			
Nick Hastings	Project Director, Regulatory Specialist	(203) 271-0379 Ext: 2305	nhastings@woodardcurran.com
Anne Proctor	Project Manager, Project QA Officer	(203) 271-0379 Ext: 2327	aproctor@woodardcurran.com

Roux Associates			
Tracy Bispham	Project Field Task Manager	(631) 232-2600	tbispham@rouxinc.com

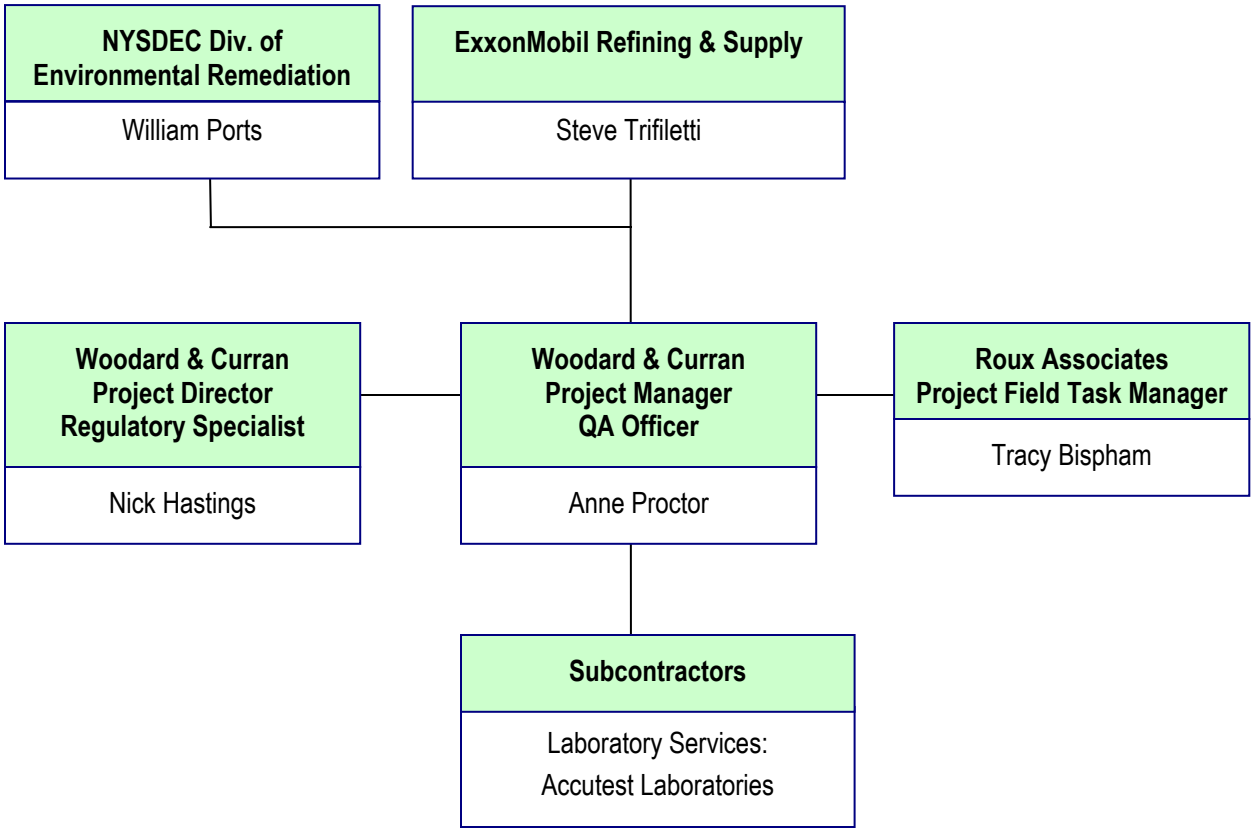
Laboratory			
Accutest Dayton, NJ	Laboratory Services	(732) 329-0200	www.**accutest**.com

Effective communication between all parties will be critical to ensure project goals are met. It will be the responsibility of the Project Manager to maintain communications internally and externally. The Project Manager will be in frequent contact with project personnel to keep the project team informed as to progress and potential changes as project activities are conducted.

All project personnel will communicate frequently to ensure field activities and reporting requirements are in accordance with this QAPP. Daily calls will be conducted to facilitate communication and evaluate progress. During field activities, field personnel will communicate with the Project Field Task Manager as needed.

Scheduling information, billing and any changes to the QAPP or work scope will be communicated to subcontractors by the Project Manager or Project Field Task Manager. Subcontractors must immediately report any problems to the Project Field Task Manager.

Project Organization and Communication Chart



FORM C

PROBLEM DEFINITION

The subject property is owned by ExxonMobil and is presently vacant, pending approval for redevelopment by NYSDEC and ExxonMobil. A Record of Decision (ROD) was issued by the NYSDEC in September 2006. Historic investigation programs and requirements of the ROD were used to develop a Remedial Design/Remedial Action Work Plan (the "Work Plan") for the former Mobil terminal property. The Work Plan was developed to refine delineation and/or remove "grossly contaminated soil" (see Work Plan Section 3.2).

FORM D

PROJECT DESCRIPTION

The Remedial Design/Remedial Action Work Plan includes the following tasks:

- Grossly contaminated soil (as defined in Section 3.2 of the Work Plan) will be excavated by backhoe for characterization and proper offsite disposal. The anticipated excavation area is indicated in Figure 3 in the Work Plan. Limits of the excavation, side walls and bottom, will be sampled and analyzed for SVOCs by EPA Method 8270. Sidewall and base samples will be collected at a rate of one every 20 linear feet of excavation.

- Concrete pads and structures will be rubblized and demolished in place using an excavator with hoe ram attachment, or other appropriate means.

- Nine (9) test pits will be excavated by backhoe or excavator as depicted on Figure 4 in the Work Plan. If visual observations or field screening (shake test results) indicated gross impact, the soil will be removed until no further evidence of gross impact is noted. The limits of the excavation will be sampled as specified above and analyzed for SVOCs by EPA Method 8270.

- Excavations will be fenced off until laboratory results are received and it is confirmed that the end point samples are all less than 500 ppm total SVOCs. If analytical results indicate an exceedance of the SVOC criteria, additional iterations of excavation and sampling will be conducted until all sample results are below criteria.

- Once the excavation results indicate no further grossly contaminated soil, the excavation will be backfilled using clean onsite soil or imported backfill, and the site grade restored.

- Surface and subsurface piping will be identified and removed for offsite recycling or disposal.

- The Site perimeter fence will be restored as able and posted with No Trespassing signs to control access. The Site will be maintained in a secure state until future development plans are finalized, at which time the final remedy will be implemented (see Work Plan Section 4.0).

3.0 MEASUREMENT DATA ACQUISITION

This element group describes the design and implementation of measurement systems that will be used during the project. Sampling procedures, analytical methods/procedures, and data handling and documentation procedures are described in this section. Field sampling SOPs are included in **Attachment A**. Analytical laboratory SOPs are included in **Attachment B**.

FORM E

SAMPLING DESIGN

The proposed Work Plan includes investigative and remedial tasks. The proposed tasks include the following specific and related tasks:

- Removal of grossly contaminated soil and subsequent confirmatory soil sampling;
- Excavation of test pits and the collection of investigative soil samples; and
- Assessment of subsurface piping and structures.

Soil sampling, including the number of samples and analytical parameters, are outlined in the Work Plan. The work is designed to identify the presence/absence of areas where SVOCs exceed 500 ppm. A site map showing the proposed excavation location is included as Figure 3 in the Work Plan. A site map showing the proposed test pit locations is included as Figure 4 in the Work Plan.

Equipment and methods used will be applied consistently from one test pit to another in order to maximize data comparability. If it becomes necessary to deviate from customary methodology, the effects of such change will be examined and documented for future reference.

Individuals responsible for conducting sampling and analysis of soil will be familiar with the Work Plan and QAPP prior to performing their duties. Individuals conducting field work will have completed OSHA 40-hour training. Training records will be provided upon request.

FORM F – 1
METHOD AND SOP REFERENCE TABLE

Analytical Method Reference: Include document title, method name/number, revision number, date	Project Analytical SOPs: [1] Include document title, date revision number, and originator's name
1a. SW-846, Semi-Volatile Organic Compounds, Method 8270C	1b. SOP for Test Method 8270C, Rev. 3, December 1996, Accutest Laboratories

Project Sampling SOPs:[2] Include document title, date, revision number, and originator's name	
1c.	SOP for Test Pit Sampling, SOP No. S-6, Rev. 2, April 2002, W&C
2c	SOP for Equipment Decontamination, SOP No. S-4, Rev. 2, April 2002, W&C
3c.	SOP for Air Monitoring, SOP No. S-9, Rev. 2, April 2002, W&C

Notes:

1. Analytical Laboratory SOPs are included in Attachment B of this document.
2. Project Sampling SOPs are included in Attachment A of this document.

FORM F-2
SAMPLING AND ANALYTICAL METHODS REQUIREMENTS

Parameter	Matrix	Number of Samples (include field QC)	Analytical Method(1)	Sampling SOP(1)	Containers per Sample (number, size and type)	Preservation Requirements (temperature, light, chemical)(2)	Maximum Holding Time at Lab (preparation/ analysis)
SVOCs	Soil	TBD	1a	1c	1, 8oz. glass jar Teflon cap	4°C	Extract in 14 days Analyze in 40 days

Notes:

1. Form F-1 contains the Method and SOP Reference Table
2. Sample containers to be pre-preserved by the laboratory

FORM G

PREVENTIVE MAINTENANCE – FIELD EQUIPMENT (1)

Instrument	Activity	Frequency	SOP Ref.(2)
Photo-ionization detector	Check charge/Battery Replace Filter Clean Lamp Window	Daily As needed As needed	Manual
O2/LEL Meter	Check charge/Battery Replace Filter	Daily As needed	Manual

Notes:

1. Field crews responsible for daily maintenance as per manufacturer's specifications outlined in equipment manuals.
2. All operation and maintenance procedures will be in accordance with manufacturer's specifications as outlined in the equipment manual.

FORM H

CALIBRATION AND CORRECTIVE ACTION – FIELD EQUIPMENT (1)

Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref. (2)
Photo-ionization detector	Field Screening and Air Monitoring	Calibrate beginning and end of day Calibration Checks throughout the day	75 to 125% Response to 100 ppm Isobutylene Calibration Standard	Perform filter change and battery check, recalibrate instrument. If still out of range clean lamp window then recalibrate instrument. Lastly, if still out of range call vendor for troubleshooting guidance or a replacement instrument.	Manual
O2/LEL Meter	Field Screening and Air Monitoring	Calibrate once/day Calibration Checks as needed	75 to 125% Response to Calibration Standard	Perform filter change, battery check, and flow check, then recalibrate instrument. If still out of range call vendor for troubleshooting guidance or a replacement instrument.	Manual

Notes:

1. Field crews responsible for daily maintenance as per manufacturer's specifications outlined in equipment manuals.
2. All operation and maintenance procedures will be in accordance with manufacturer's specifications as outline in equipment manual.

FORM I

PREVENTIVE MAINTENANCE – LABORATORY EQUIPMENT

The purpose of this section is to delineate the SOPs/methods used to ensure the optimum performance of laboratory equipment. All laboratory equipment should be maintained in accordance with each respective instrument manufacturer's operating instructions with all maintenance activities recorded. The selected laboratory, Accutest, will provide the analytical support for Field Work Scope. Consequently, the analytical laboratory is responsible for performing preventative maintenance on the laboratory equipment. The analytical laboratory is required to follow their quality assurance program, including preventative maintenance. Form F-1 of this QAPP contains the Method Reference Table.

FORM J

CALIBRATION AND CORRECTIVE ACTION – LABORATORY EQUIPMENT

The purpose of this section is to define the analytical techniques that will ensure the laboratory instrumentation employed will accurately and precisely quantitate the analytes of concern. The analytical laboratory will provide this information upon request for any target compounds such that the data objectives of the Field Work Scope and QAPP are supported. Additionally, the analytical laboratory will be required to submit and follow their approved quality assurance program, including calibration and corrective action procedures for laboratory equipment. Form F-1 of this QAPP contains the Method Reference Table.

FORM K

SAMPLE HANDLING AND CUSTODY REQUIREMENTS

All samples collected will be immediately placed on ice in a sample cooler to fulfill the necessary preservation requirements. At the end of each work day, samples will be shipped to the analytical laboratory by courier.

A Chain of Custody (COC) program will be utilized during sample collection, handling and transport. The COC program is designed to ensure that each sample is properly handled and accounted for at all times from collection in the field to the analysis at the laboratory. In addition to the COC, sample collection will be documented in site-specific field log books and each sample will be individually labeled. Labeling of each sample will consist of: sample identification, source of sample, date and time collected, the initials of personnel collecting the sample, the analysis required, and the preservation method. The purpose of this program is to ensure that each sample is analyzed for the correct parameters and protected from loss, damage or contamination. COC forms will be placed in the sample coolers with the respective samples for transport to the laboratory.

FORM L

ANALYTICAL PRECISION AND ACCURACY

Analytical precision and accuracy for each method can be found in the SOP referenced in Form F-1 of this document. Applicable information includes the analytical method and equipment required, laboratory decontamination procedures, and specific performance requirements such as detection limits, quantitation limits, precision requirements and accuracy requirements. Detection limits will be based upon the laboratory-calculated detection limits.

FORM M

FIELD QUALITY CONTROL REQUIREMENTS

QC Sample	Frequency	Acceptance Criteria	Corrective Action
Duplicate	One per every 20 samples collected (Blind duplicate)	RPD ≤ 40% for soil/sediment samples	Review field notes and determine if data is useable and/or reanalysis is required.
Matrix Spike/ Matrix Spike Duplicate	One set per 20 samples collected.	RPD ≤ 30% for soil/sediment samples	Results will be qualified or rejected.
Temperature Blank	One per sample cooler	4^0C +/- 2^0	Results will be qualified or rejected.
Equipment Inspection	Each item prior to use	Physical integrity, contains proper preservative.	Discard item.
Reagent/Method Blanks	Each group of samples (Maximum of 20 samples per group). GC/MS spiked with surrogates 1 out of 10.	Positive sample results less than two times (2X) the method detection limit.	Halt analysis. Locate the source of contamination; correct problem; reanalyze method blank.
Replicate Sample	One out of every 15 samples.	Within RPD established control limits.	Reanalyzed for parameter in question.
Laboratory Control Sample (LCS)	Every 20 samples.	Laboratory and/or manufacturer established acceptance ranges.	Reanalyze associated samples.

QC Sample	Frequency	Acceptance Criteria	Corrective Action
Continuing Calibration Verification	Each group of samples.	Within % Recovery control limits.	Locate and correct source of error. Reanalyze check standard.
Matrix Spike	Every 20 samples or every batch whichever is less.	Accuracy, as defined by % Recoveries, within laboratory established quality control limits.	Sample set reanalyzed for parameter in question.
Surrogate Analysis	All method blanks and samples.	% Recovery meet laboratory established control limit acceptance criteria (established quarterly).	Locate and correct source of error. Reanalyze internal standard. Determine if reanalysis is required.
Internal Standards	All samples and method blanks.	% Recovery meet Laboratory Established control limit acceptance criteria (established quarterly).	Locate and correct source of error. Reanalyze internal standard. Determine if reanalysis is required.

FORM N

DATA MANAGEMENT AND DOCUMENTATION

Following receipt of laboratory analytical reports, each report will be reviewed to confirm that relevant laboratory quality control/quality assurance documentation is included. The laboratory will provide the following minimum data with each package:

- Data Results Sheets (include any performance evaluation sample results)
- Surrogate Recoveries and Acceptance Limits
- Matrix Spike/Matrix Spike Duplicate Results and Acceptance Limits
- Spike/Duplicate Results and Acceptance Limits
- Laboratory Control Sample Results and Acceptance Limits
- ICP Serial Dilution Results
- ICP Interference Check Sample Results
- Project Narrative which contains all observations and deviations

All laboratory results will be delivered to Woodard & Curran both electronically (i.e., Excel and GIS/Key electronic data deliverables) and in hard-copy form. Raw data including chromatograms and copies of internal COCs will be maintained by the laboratory.

Field data will be recorded in bound field log books to maintain a permanent record of all field activities. Information will include date, weather conditions, individuals on-site, field screening results, sampling observations and techniques, and any additional relevant information. All field notes and photographs will be maintained and stored in dedicated project files according to the Woodard & Curran Project Records Retention System.

4.0 ASSESSMENT/OVERSIGHT

This element group of the QAPP details procedures used to ensure implementation of the QAPP. It describes minimum requirements for quality assurance for management and final project reports.

FORM O

ASSESSMENT AND RESPONSE ACTIONS

Throughout the course of the project, Woodard & Curran will implement the following procedures to detect and correct problems that may occur:

- project management meetings (daily/weekly calls or as needed);
- peer review of all reports, documents, and correspondence; and
- ongoing communication between Woodard & Curran's project team, ExxonMobil and the NYSDEC.

As warranted, problems that occur will be communicated by project memorandums and telephone conversations. All memorandums and telephone notes will detail the problem encountered and any corrective actions taken. All documentation will be maintained in dedicated project files.

Changes to the QAPP will be made under the direction of the Project Manager and carried out by the appropriate project personnel.

FORM P

PROJECT REPORTS

Following implementation of the Field Work Scope and receipt and analysis of analytical data, a Report will be prepared to document all activities conducted during the Field Work Scope implementation as well as conclusions made and status of the various aspects of the investigation. Additional detailed reports will be prepared to document the conduct and findings of subsurface investigations performed at the site, if warranted.

5.0 DATA VALIDATION AND USEABILITY

This element group details the quality assurance activities that will be performed to ensure that the collected data are scientifically defensible, properly documented, of known quality, and meet the project objectives. Analytical data collected will be validated to 10% by an outside data validation contractor in accordance with the NYSDEC Data Usability Summary Report (DUSR) guidelines.

FORM Q-1

VERIFICATION OF SAMPLING PROCEDURES

Upon completion of the Field Work Scope, all data collected will be verified to ensure that sampling SOPs were adhered to and that specified samples were collected and analyzed for specified parameters. This evaluation will include (but is not limited to) the following:

- identify all samples;
- compare to samples documented in field log books;
- compare to Chain of Custody;
- check analytical parameters with those specified in the Field Work Scope;
- check detection limits with those specified in this QAPP; and
- review laboratory and field quality assurance and quality control (QA/QC) sample results.

FORM Q-2

DATA VERIFICATION AND VALIDATION

This section of the QAPP describes the process that will be followed to verify and validate the project data.

Internal Verification

Prior to release by the off-site laboratory, the data will be reviewed internally against all specific QA/QC parameters. The laboratory will perform analyses and review QA/QC consistent with the requirements of the specific laboratory method SOPs. Any deviations will be documented and explained in the final report. The off-site laboratory is responsible for the final results and overall quality of the data.

External Verification

Data validation to 10% of samples will be performed by an outside data validation contractor in accordance with the NYSDEC DUSR guidelines.

Validation

Validation of measurements is a systematic process of reviewing a body of data to provide assurance that the quality is adequate for the intended use. The validation process includes the following activities, as an example:

- Reviewing QC activities and results;
- Screening data sets and quality control results for outliers;
- Reviewing field sample data records and chains-of-custody;
- Reviewing sample handling and preservation procedures; and
- Verifying the above process.

Quality control results will also be compared against acceptance criteria described on Form M of this QAPP to determine completeness and to assess analytical control, precision, matrix effects or other interferences that could affect the quality of sample results. Specific quality control components, which will be evaluated in the validation procedures, include:

- Sampling and analysis date;
- Sample custody;
- Holding times;
- Sample preservation;
- Field and laboratory duplicate sample results;
- Surrogate recoveries;
- Matrix spike/matrix spike duplicate results;

- Laboratory control standards; and
- Laboratory method blanks and lot assignment reports.

The laboratory will also provide a case narrative indicating that the following parameters were reviewed as part of the sample analyses and the outcome of that review:

- Tune summaries
- Initial Calibration (ICAL)
- Continuing Calibration Verification (CCV)
- Internal standards
- Prep sheets (analytical batch sheets)
- Instrument log sheets

The laboratory case narrative will be reviewed during the data validation process and pending the outcome of that review the Project Manager will determine if additional validation activities are warranted.

DATA QUALIFIERS

Once sample concentrations have been through the data validation process, data qualifiers will be added, as necessary. Data qualifiers indicate that the reported sample concentration is below the detection limit, is estimated, or is rejected depending upon analytical conditions at the time of sample analysis. Specific data qualifiers, which may be applied as a result of data validation, include the following:

U - The analyte was not detected above the quantitation limit (QL).

J - The analyte was detected but the associated reported concentration is approximate and is considered estimated.

R - The reported analyte concentration is rejected due to serious deficiencies with associated quality control results. The presence or absence of the analyte cannot be confirmed.

UJ - The analyte was not detected above the QL. However, due to quality control results that did not meet acceptance criteria, the quantitation limit is uncertain and may not accurately represent the actual limit.

All analyte concentrations will be reported to the QL. Sample detections below the QL will be reported with a "J" qualifier.

DATA REPORTING

After data qualifiers have been added to the data set, an electronic version of the validated off-site laboratory data will be entered into a database in a format that is then available for interpretation.

Information for each sample that is entered into the database will include, but is not limited to the following:

- Sample identification number;

- Date sampled;
- Analytical method;
- Analyte name;
- Reporting units;
- Quantitation limit (QL);
- Analytical results;
- Validation qualifiers; and
- Any required footnotes.

Data validation will be performed by an entity independent of the laboratory generating the data.

FORM R

DATA USABILITY

Assessing data usability involves the process of reviewing and validating laboratory data and assessing whether it meets the prescribed project quality objectives. The environmental quality data to be collected throughout the execution of the Field Work Scope have specific end uses. For example, field screening data will be used to delineate excavation areas or to clear areas for redevelopment. Data will also be incorporated into the body of historical environmental data that has been collected for the property.

The validated data will be evaluated in terms of its precision, accuracy, representativeness, sensitivity, completeness, and comparability (PARCC).

The following subsections describe the measurement performance criteria and data usability for this investigation. In general, if issues with data quality are found in the data sets, they will be discussed and reviewed with the project team (including the laboratory, ExxonMobil and NYSDEC). If data quality is determined to be compromised for any given sampling event, a data quality assessment will be included in the applicable project reports. This assessment will evaluate the potential impact on the project, establish limitations of the data, and propose corrective actions, as appropriate.

Precision

Precision is a measure of the mutual agreement among individual measurements of the same property under prescribed conditions. Precision is measured by performing duplicate measurements in the field or laboratory and is expressed in terms of Relative Percent Difference (RPD).

Field and analytical duplicates have been incorporated into the program to assess the precision of the data. Field duplicate imprecision might be a reflection of several factors including: laboratory imprecision, sampling technique, decontamination procedures, and/or heterogeneity of contaminant distribution within the matrix. Analytical duplicates are a direct indication of laboratory precision.

The QC requirements, acceptance criteria, and potential corrective actions for field and laboratory duplicates are described on Form M. If data validation and assessment indicates that field and/or laboratory duplicates do not meet measurement performance criteria for precision, the potential impact on the project will be evaluated in the data quality assessment included in the applicable project reports. This data quality assessment will establish limitations and potential corrective actions for the affected data. If field duplicates appear to be the source of imprecision, sampling procedures may be re-evaluated and adjusted accordingly for future sampling and analysis events. If poor precision is indicated in analytical duplicates, laboratory QA/QC procedures may need to be reviewed.

Accuracy/Bias

Accuracy/Bias is the degree of agreement of a measurement with an accepted reference or true value and is usually expressed in terms of Percent Difference (%D) or Percent Recovery (%R). Accuracy is a measure of the bias of a system.

Routine calibration checks of field instrumentation are performed to assess the accuracy of field measurements. Equipment and trip blanks collected during field sampling activities measure accuracy by

assessing potential contamination introduced during sample collection and transport. In the laboratory, initial calibrations, initial/continuing calibration verifications (ICVs/CCVs), sample matrix spike/matrix spike duplicates (MS/MSDs), internal standards (IS), sample surrogate recoveries, and laboratory control samples (LCS) are performed/checked to evaluate the accuracy of laboratory instrumentation. The accuracy of laboratory analytical procedures is further evaluated through the analysis of method blanks that can assess potential contamination introduced during sample preparation and/or analysis.

The QC requirements, acceptance criteria, and potential corrective actions for laboratory QC checks that measure accuracy and field and trip blank QC are described on Form M. If data validation and assessment indicates that field and/or laboratory QC checks for accuracy do not meet measurement performance criteria, the potential impact on the project will be evaluated in the data quality assessment included in the applicable project reports. Limitations and potential corrective actions for the affected data will be established in this data quality assessment. If poor accuracy is indicated by analytical QC checks, laboratory procedures may need to be reviewed.

Representativeness

Sample representativeness will be assessed through the measures of precision and accuracy. Field documentation, field duplicate analyses, and laboratory QC sample results will provide indices for the evaluation of data representativeness. Field duplicates will be used to assess heterogeneity within a sampling medium.

The representativeness of sample results will be based on the evaluation of precision and accuracy. The data quality assessment included in the applicable project reports will address any issues concerning representativeness that develop upon data review and validation. This data quality assessment will evaluate the potential impact on the project and establish limitations and potential corrective actions for the affected data.

Sensitivity and Quantitation limits

Sensitivity is the ability of the method or instrument to detect the constituents of concern and other target analytes at the project specified quantitation limits (QLs). For this project, the minimum QLs will be based on the laboratory Practical Quantitation Limit (PQL). PQLs represent the minimum concentration that can be routinely identified and quantitated above the method detection limit (MDL) by the laboratory. If problems regarding sensitivity and quantitation limits arise during data review and validation, the potential impact on the project will be evaluated in the data quality assessment included in the applicable project reports. This data quality assessment will establish limitations and potential corrective actions for the affected data.

Comparability

Comparability between data sets will be made qualitatively to indicate the extent to which comparisons among different measurements of the same quantity will yield valid conclusions. The quality assurance objective for comparability is to ensure the comparability of results from each sampling event performed. The assessment of data comparability will begin once multiple sampling events have been performed. The data quality assessment included in the applicable project reports will address any issues concerning data comparability that arise upon data review and validation. The potential impact on the project will be

evaluated in this data quality assessment and will establish limitations and potential corrective actions for the affected data.

Completeness

Completeness is a measure (percentage) of the amount of valid data obtained from a measurement system relative to the amount that would be expected to be obtained under correct, normal conditions. A data set for a specific medium will be considered complete if 85% of the data packages are validatable and fully meet the data quality objectives provided in this QAPP. If data validation and assessment indicates that measurement performance criteria for completeness has not been achieved, the potential impact on the project will be evaluated in the data quality assessment included in the applicable project reports. This data quality assessment will establish limitations and potential corrective actions for the affected data.

Data Limitations and Actions

Data will be assessed with regard to the data quality objectives, measurement performance criteria, PARCC parameters, and the QC requirements included in Form M. If data quality is determined to be compromised for any given sampling event, a data quality assessment will be included in the applicable project report. This assessment will be used to describe and document data limitations based on the qualitative and quantitative performance criteria. Based on how the data are to be used, data that do not meet all the criteria will be appropriately qualified and limited in its use.

During field activities, QA/QC samples designed to assess sampling techniques (duplicates) will be collected and shipped at the frequencies provided on Form M. If the need for corrective action is identified based on data validation and evaluation, actions will be outlined in the data quality assessment included in the applicable project reports. The data assessment process is to be an on-going process, implemented by the project team and the laboratory.

ATTACHMENT A: PROJECT SAMPLING SOPS

SOP-4

STANDARD OPERATING PROCEDURE FOR EQUIPMENT DECONTAMINATION

Woodard & Curran, Inc.

FIELD EQUIPMENT DECONTAMINATION PROCEDURE

Decontamination of field equipment is necessary to ensure the quality of samples by preventing cross-contamination. In addition, decontamination reduces health hazards and prevents the spread of contaminants off-site.

Equipment needed:

Large/heavy Equipment (i.e., Drill rigs, backhoes, augers, drill pipe, bits, casing, and screen):

- High-pressure pump with steam-spray unit.
- Stiff-bristle brushes.

Small/sampling Equipment (i.e., Split spoons, bailers, bowls, and pumps):

- Soap
- Polyethylene sheeting
- Stiff-bristle brushes.
- Wash bottles or manual pump sprayer.
- 10% methanol solution (optional)
- Distilled water
- Tap water

Procedure. The following steps will be followed when decontaminating large/heavy equipment:

1. The field crew or contractor will construct a decontamination area at a designated area on site of 6-mil polyethylene, large enough to capture decontamination fluids. Decontamination of equipment will be performed over the decontamination pad. Depending on site contaminants, equipment may be decontaminated at each drilling location. Decon water will be collected and drummed for proper disposal.
2. Equipment and tools will be cleaned between each location and prior to the initiation of any sampling.
3. Spray areas (rear of rig or backhoe) exposed to contaminated soils using steam or high-pressure sprayer. Be sure to spray down all surfaces, including the undercarriage.
4. Document that decontamination was performed in the appropriate logbook.

Procedure. The following steps will be followed when decontaminating sampling equipment including split-spoons, spatulas, and hand tools that directly contact samples.

1. Set up a decontamination line. The decontamination line should progress from "dirty" to "clean", with an area for drying decontaminated equipment. The decontamination line should be set up on polyethylene sheeting.
2. Wash the item thoroughly in a bucket of soapy water (tap water). Use a stiff-bristle brush to dislodge any clinging dirt. Disassemble any items that might trap contaminants internally before washing. Do not reassemble until decontamination is complete.
3. Rinse the item in a bucket containing clear tap water. Rinse water should be replaced as needed.
4. Document that decontamination was performed in the appropriate logbook.
5. Disposable items will be bagged for disposal as general refuse.
6. Decontamination water will be drummed for proper disposal.

QA/QC

The Project Field Task Manager or designated alternate will oversee decontamination procedures to ensure that they have been completed according to the procedures outlined above. Equipment blanks will be collected and analyzed throughout the program to determine the effectiveness of decontamination procedures. Blank number and frequencies are presented in the QAPP.

References

None.

SOP-6

Revised November 2007

STANDARD OPERATING PROCEDURE FOR TEST PIT SAMPLING

Woodard & Curran, Inc.

Test Pit Sampling Procedure

Test Pits will be excavated with backhoe equipment to provide detailed visual examination of near surface soil, groundwater, and bedrock conditions. Test Pit soil samples may be collected using stainless steel and/or Teflon-lined scoops, trowels, shovels, spoons, or spatulas.

Equipment needed:

- Bound field logbook.
- Sample tags.
- Appropriate sample containers and labels.
- Insulated cooler and ice.
- Decontamination equipment and supplies.
- Personal protective clothing and equipment as required by the site-specific Health and Safety Plan (HASP).
- Stainless steel or aluminum trays or bowls.
- Stainless steel shovels, trowels, spoons, or spatulas.
- Backhoe Equipment

Test Pit Sampling Procedure:

1. Contact DIG SAFELY.NEW YORK at (800) 962-7962 prior to any subsurface investigation. In addition, contact local utilities that may have underground services on or near the Site.
2. Follow the sampling pattern outlined in the QAPP.
3. Mark the location of potential test pits.
4. At the direction of the project staff on-site, the backhoe operator will excavate the test pit in increments.
5. Test pit excavations will cease if any of the following occurs:
    - Distinct changes in stratigraphy or materials
    - Odors
    - Groundwater or fluid phase contaminants
6. The requirements for collecting grab samples of soil are as follows:
    a. Use a clean stainless steel trowel or spoon to collect sufficient material to fill the sample containers.
    b. Fill the sample containers directly from the sampling device, removing stones, twigs, grass, etc., from the sample. Additional sample containers may be required to obtain enough material for a minimum of 30 percent solids.
    c. Immediately secure the caps on the sample container.

d. Label container with the appropriate information. NOTE: Container may be labeled prior to sample collection.
e. Record samples (e.g., sample ID, location, depth, method, etc.) in the bound field logbook.
f. Pack sample in cooler with ice. The only preservation required for soil samples is to cool them to 4 degrees Celsius. A small plastic temperature blank will be filled with water and placed in the cooler with the samples. The temperature of the samples will be determined at the laboratory by measuring the temperature of the temperature blank.
g. Use decontaminated sampling equipment at each sample location to minimize cross-contamination.
h. In the event that a duplicate sample is collected: fill duplicate jars for VOAs as described above. For other parameters, place sufficient sample quantity in a stainless steel bowl and mix. Split the mixed sample into duplicate sampling jars.
i. VOC containers will be preserved with methanol. Pre-measured vials containing the appropriate quantity of methanol will be provided by the laboratory.

Field Log Information:

At a minimum, field logs for test pit excavation will include the following documentation:

- Plan and profile sketches of the test pit showing materials encountered, the depth of material, and sample locations
- Sketch of the test pit and distance and direction from permanent, identifiable location marks as appropriate
- A description of the material removed from the excavation
- A record of samples collected
- The presence or absence of water in the test pit and the depth encountered
- Other readings, or measurements taken during excavation, including field screening reading

Unless otherwise specified and the site-specific HASP discusses appropriate procedures, no personnel will enter the test pit. In addition, all test pits will be backfilled on the day of excavation. In most cases, excavation materials will be stockpiled on polyethylene sheeting and then returned to the test pit as backfill. In the event that grossly contaminated soil is excavated, excavated soils will be placed in roll-offs pending characterization and proper disposal at an appropriate off-site facility. The excavation will then be backfilled with uncontaminated soil pursuant to 6 NYCRR 375-6.7(d), free of extraneous debris or solid waste The backfill will be certified clean or sampled at a frequency of one sample per 50 cubic yards.

QA/QC

QA/QC procedures are outlined in the sampling procedures discussed above. Duplicates, blanks, and spikes have been incorporated into the QAPP to assess potential for sampling, shipping, and laboratory impacts on data quality. Percent solids will also be analyzed for each sediment sample so that proper concentration adjustments can be made.

References

"Soil Covers and Backfill" - 6 NYCRR 375-6.7(d).

SOP-9

Revised November 2007

STANDARD OPERATING PROCEDURE FOR AIR MONITORING

Woodard & Curran, Inc.

AIR MONITORING PROCEDURES - BREATHING ZONE

Air monitoring will be performed during invasive field activities to obtain qualitative volatile organic compound (VOC) and particulate concentrations in order to protect site workers and the community. Air monitoring will be completed upwind, near the activity in the worker's breathing zone, and downwind during sampling and intrusive activities. ***If a detection of total VOCs or particulate above the action levels indicated below is observed, stop work and immediately notify the Project Field Task Manager prior to implementing actions***. Refer to the site-specific HASP for additional health and safety procedures. All monitoring records (readings) and instrument calibration sheets must be available for NYSDEC or NYSDOH personnel to review.

Equipment Needed:

- Two Photoionization Detectors (PIDs) equipped with 10.0 or greater eV lamps, one hand-held and one monitoring station, capable of calculating 15-minute running average concentrations
- Two particulate monitoring stations capable of measuring particulate matter less than 10 micrometers in size (PM-10) integrated over a period of 15 minutes (or less) and equipped with audible alarm
- Calibration Sheets
- Field Log Book
- Personal Protective Equipment as outlined in the HASP

Air Monitoring Steps - PID measurements:

1. Calibrate the PIDs using procedures outlined in the instrument operations manual. The instrument should be calibrated at the beginning of each day of use and a check calibration at the finish of each field day. Consult the instrument operations manual for troubleshooting suggestions.
2. Set-up a monitoring station at the downwind perimeter of the work area or exclusion zone.
3. Using the hand-held instrument, measure upwind/background VOC concentrations at the start of each day and every 4-hours thereafter.
4. Also using the hand-held instrument, approximately every hour near the planned activities, measure VOC concentrations in the breathing zone, approximately 2-5 feet above the ground surface.

If the ambient air concentration of total VOCs at the downwind perimeter of the exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total VOC level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

If total VOC levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total VOC level in the

worker's breathing zone is in compliance with the action level in the site-specific H&SP, and 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

If the VOC level is above the action level for worker safety in the site-specific H&SP, or above 25 ppm at the perimeter of the work area, activities must be shutdown.

Particulate Monitoring Steps:

1. Calibrate the meter using procedures outlined in the instrument operations manual. The instrument should be calibrated at the beginning of each day of use and a check calibration at the finish of each field day. Consult the instrument operations manual for troubleshooting suggestions.
2. Set-up monitoring stations at the upwind/background and downwind perimeter of the exclusion zone.
3. Throughout the day, visually monitor fugitive dust migration.

If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed (for example, wetting selected areas). Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

QA/QC

See above.

References

NYSDOH Generic Community Air Monitoring Plan – Appendix D to the NYSDEC Voluntary Cleanup Program Guide, Draft May 22, 2002.

ATTACHMENT B: ANALYTICAL LABORATORY SOPS

ACCUTEST LABORATORIES
Standard Operating Procedure

Lab Manager_____

QA Manager_____

Effective Date:_____

TEST NAME: METHOD 8270C, SEMIVOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)

REFERENCE: SW846 8270C (Revision 3, December 1996)

Revised Sections: ***Table 9***

1.0 SCOPE AND APPLICATION

1.1 The following method describes the analytical procedure that is utilized by Accutest to analyze semivolatile organic compounds in extracts prepared from all types of solid waste matrices, soils, and water samples. Options are incorporated for the analysis of sixteen (16) polyaromatic hydrocarbons (PAH) and other compounds listed in table 8A by selected ion monitoring GC/MS (GC/MS-SIM).

1.2 Table 1 lists the neutral, acidic, and basic organic compounds that can be determined by this method. The applicable concentration range of this method is compound and instrument dependent. Some compounds may require special treatment due to the limitations caused by sample preparation and/or chromatographic problems.

2.0 SUMMARY OF METHOD

2.1 This method is performed in accordance with the following extraction methodologies in SW846, 3rd Edition: 3510, 3520, 3540, 3550 and 3580.

2.2 The resultant methylene chloride extract is injected into a tuned and calibrated GC/MS system equipped with a fused silica capillary column. The GC column is temperature-programmed to separate the analytes, which are then detected with a mass spectrometer (MS) connected to the gas chromatograph.

2.3 The peaks detected are qualitated by comparison to characteristic ions and retention times specific to the known target list of compounds.

2.4 Once identified, the compound is quantitated by internal standard techniques with an average response factor generated from the calibration curve.

2.5 Additional unknown peaks with a response greater than 10 % of the closest internal standard may be processed through a library search with comparison to a NIST98 database. An estimated concentration is quantitated by assuming a response factor of 1.

2.6 This method includes analytical options for PAHs and other selected compounds by GC/MS-SIM. The extract is fortified with an additional SIM specific internal standard mix and analyzed using selected ions that are characteristic of the compounds of interest following the analysis of lower concentration calibration standards analyzed under the same MS scan conditions. Qualitative and quantitative identification is conducted using the procedures employed for full scan analysis.

3.0 REPORTING LIMIT & METHOD DETECTION LIMIT

3.1 Reporting Limit. The reporting limit for this method is established at either method detection limit or the lowest concentration standard in the calibration curve, depending on the requirements of different regulatory programs. Detected concentrations below this concentration cannot be reported without qualification. See table 9.

3.1.1 Compounds detected at concentrations between the reporting limit and MDL are quantitated and qualified as "J", estimated value. Program or project specifications may dictate that "J" qualified compounds are not to be reported.

3.2 Method Detection Limit. Experimentally determine MDLs using the procedure specified in 40 CFR, Part 136, Appendix B. This value represents the lowest reportable concentration of an individual compound that meets the method qualitative identification criteria.

3.2.1 Experimental MDLs must be determined annually for this method.

3.2.2 Process all raw data for the replicate analysis in each MDL study. Forward the processed data to the QA group for archiving.

4.0 DEFINITIONS

BATCH - a group of samples which behave similarly with respect to the sampling or the testing procedures being employed and which are processed as a unit. For QC purposes, if the number of samples in a group is greater than 20, then each group of 20 samples or less will all be handled as a separate batch.

BLANK - an analytical sample designed to assess specific sources of laboratory contamination.

CONTINUING CALIBRATION - a mid-range calibration check standard run every 12 hours to verify the initial calibration of the system.

EXTRACTED ION CURRENT PROFILE (EICP) - a plot of ion abundance versus time (or scan number) for ion(s) of specified mass (Es).

INITIAL CALIBRATION - analysis of analytical standards for a series of different specified concentrations which cover the working range of the instrument; used to define the linearity and dynamic range of the response of the mass spectrometer to the target compounds.

INTERNAL STANDARDS - compounds added to every standard, blank, matrix spike, matrix spike duplicate, and sample extract at a known concentration, prior to analysis. Internal standards are used as the basis for quantitation of the target compounds and must be analytes that are not sample components.

MATRIX - the predominant material of which the sample to be analyzed is composed.

MATRIX SPIKE - aliquot of a matrix (water or soil) fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

MATRIX SPIKE DUPLICATE - a second aliquot of the same matrix as the matrix spike (above) that is spiked in order to determine the precision of the method.

METHOD BLANK - an analytical control consisting of all reagents, internal standards and surrogate standards, is carried throughout the entire preparatory and analytical procedure. The method blank is used to define the level of laboratory, background and reagent contamination.

METHOD DETECTION LIMITS (MDLs) - The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. MDLs should be determined approximately once per year for frequently analyzed parameters.

PERCENT DIFFERENCE (%D) - As used to compare two values, the percent difference indicates both the direction and the magnitude of the comparison, i.e., the percent difference may be either negative, positive, or zero. (In contrast, see relative percent difference.)

PRIMARY QUANTITATION ION - a contract specified ion used to quantitate a target analyte.

REAGENT WATER - water in which no interferant is observed at or above the minimum detection limit of the parameters of interest.

RECONSTRUCTED ION CHROMATOGRAM (RIC) - a mass spectral graphical representation of the separation achieved by a gas chromatograph; a plot of total ion current versus retention time.

RELATIVE PERCENT DIFFERENCE (RPD) - As used to compare two values, the relative percent difference is based on the mean of the two values, and is reported as an absolute value, i.e., always expressed as a positive number or zero. (In contrast, see percent difference.)

RELATIVE RESPONSE FACTOR (RRF) - a measure of the relative mass spectral response of an analyte compared to its internal standard. Relative Response Factors are determined by analysis of standards and are used in the calculation of concentrations of analytes in samples.

RELATIVE RETENTION TIME (RRT) - the ratio of the retention time of a compound to that of a standard (such as an internal standard).

RESOLUTION - also termed separation or percent resolution, the separation between peaks on a chromatogram, calculated by dividing the depth of the valley between the peaks by the peak height of the smaller peak being resolved, multiplied by 100.

SECOND SOURCE CALIBRATION CHECK STANDARD - a standard from a separate source than the calibration curve that is used to verify the accuracy of the calibration standards. An external check must be run whenever an initial calibration is performed.

SURROGATES - pure analytes added to every blank, sample, matrix spike, matrix spike duplicate, and standard in known amounts before extraction or other processing; used to evaluate analytical efficiency by measuring recovery. Surrogates are brominated, fluorinated, or isotopically labeled compounds not expected to be detected in environmental media.

5.0 HEALTH & SAFETY

5.1 The analyst must follow normal safety procedures as outlined in the Accutest Health and Safety Plan and Personal Protection Policy, which include the use of safety glasses and lab coats. In addition, all acids are corrosive and should be handled with care. Flush spills with plenty of water. If acids contact any part of the body, flush with water and contact the supervisor.

5.2 The toxicity or carcinogenicity of each reagent used in this method has not been precisely determined; however, each chemical should be treated as a potential health hazard. Exposure to these reagents should be reduced to the lowest possible level. The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of data handling sheets is made available to all personnel involved in these analyses.

5.3 The following analytes covered by this method have been tentatively classified as known or suspected human or mammalian carcinogens: benzo(a)anthracene, benzidine, 3,3'-dichlorobenzidine, benzo(a)pyrene, dibenzo(a,h)anthracene, N-nitrosodimethylamine, and 4,4'-DDT. Prepare primary standards of these toxic compounds in a hood. A NIOSH/Mass approved toxic gas respirator must be worn when the analyst handles high concentrations of these toxic compounds.

6.0 INTERFERENCES

6.1 The data from all blanks, samples, and spikes must be evaluated for interferences.

6.2 Method interferences may be caused by contaminants in solvents, reagents, glassware, and other stages of sample processing. Refer to "The Preparation of Glassware for Extraction of organic contaminants" SOP for practices utilized in the extraction department.

6.3 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature and diversity of the industrial complex or municipality being sampled.

6.4 To reduce carryover when high-concentration samples are sequentially analyzed, the syringe must be rinsed out between samples with solvent. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of solvent to check for cross contamination.

7.0 SAMPLE COLLECTION, PRESERVATION, & HOLDING TIMES

7.1 Water samples may be collected in 1-liter glass bottles with Teflon insert in caps. Soil samples may be collected in 250-ml widemouth amber glass bottles.

7.1.1 Sample should be taken with care so as to prevent any portion of the collected sample coming in contact with the sampler's gloves, thus avoiding possible phthalate contamination.

7.2 Test all aqueous samples for residual chlorine using test paper for free and total chlorine. If the sample tests positive for residual chlorine, add 80 mg of sodium thiosulfate to each liter of sample.

7.3 The samples must be protected from light and refrigerated at 4° C from the time of receipt until extraction and analysis.

7.4 Store the sample extracts at -10 °C in amber vials (protected from light), in sealed vials equipped with unpierced PTFE-lined septa.

7.5 HOLDING TIME

7.5.1 Aqueous samples must be extracted within 7 days of sampling.

7.5.2 Soil, sediments and concentrated waste samples must be extracted within 14 days of sampling.

7.5.3 Extracts must be analyzed within 40 days following extraction.

8.0 APPARATUS & MATERIALS

8.1 GAS CHROMATOGRAPH/MASS SPECTROMETER SYSTEM

8.1.1 Gas Chromatograph. HP-5890, HP-6890, or Agilent 6890-N which includes an analytical system that is complete with a temperature programmable gas chromatograph and all required accessories including syringes, capillary chromatographic columns, and gases.

8.1.1.1 The injection port is designed for splitless injection with capillary columns.

8.1.1.2 The capillary column is directly coupled to the source.

8.1.2 Column.

8.1.2.1 30 m x 0.25 mm fused silica (0.25 μm film thickness) DB-5MS or equivalent capillary column. Condition the column as per manufacture's directions.

8.1.3 Mass Spectrometer (HP-5972, HP-5973 or Agilent 5975).

8.1.3.1 Full Scan Mode -Capable of scanning from 35-500 amu every 1 second or less utilizing 70 volt (nominal) electron energy in the electron impact ionization mode.

8.1.3.2 SIM Mode- Capable of selective ion grouping at specified retention times for increased compound sensitivity (table 2a).

8.1.3.3 Capable of producing a mass spectrum which meets all the EPA performance criteria in Table 3 when injecting 50 ng of Decafluorotriphenyl phosphine (DFTPP).

8.2 DATA SYSTEM

8.2.1 Acquisition and Instrument Control: HP Chemstation. A computer system is interfaced to the mass spectrometer that allows the continuous acquisition and storage on machine readable media (disc) of all mass spectra obtained throughout the duration of the chromatographic program.

8.2.2 Data Processing: HP Enviroquant. The software accommodates searching of GC/MS data files for analytes which display specific fragmentation patterns. The software also allows integrating the abundance of an EICP between specified time or scan number limits. The data system includes the NIST98 spectra library for qualitative searches of non-target compounds

present in the chromatogram. It flags all data files that have been edited manually by laboratory personnel.

8.2.3 Offline Magnetic Tape Storage Device (Lagato Networker) - the magnetic tape storage device copies data for long term, offline storage.

8.3 SYRINGE

8.3.1 10 μl graduated, auto sampler (Hamilton or equiv.).

9.0 REAGENTS AND STANDARDS

9.1 Solvents - Ultra pure, chromatography grade methylene chloride and acetone.

9.2 Stock Standard Solutions.

9.2.1 Certified, commercially prepared standards, from two separate sources are used.

9.2.1.1 Base Neutrals.

- Base/Neutrals Mix #1 (Absolute: Semivolatile Organics Standard Mix # 1).
- Base/Neutrals Mix #2 (Absolute: Semivolatile Organics Standard Mix # 2).
- PAH Mix (Absolute: Semivolatile Organics Standard Mix # 7).
- PAH Mixture #2 (Ultra).
- PAH Selected Ion Monitoring Mixture
- Benzidines Mix (Absolute: Semivolatile Organics Standard Mix # 6).
- Toxic Substances #2 (Absolute: Semivolatile Organics Standard Mix # 5).
- Pyridines Mixture (Ultra).
- Additonal requested compound(s) mix (Absolute).
- Base Neutral Mixture (2^{nd} Source).

Acids.

- Phenols Mix (Absolute: Semivolatile Organics Standard Mix # 8).
- Toxic Substances #1(Absolute: Semivolatile Organics Standard Mix # 4).
- Acid Mixture (2^{nd} Source).

9.2.2 Internal Standard Mixtures.

9.2.2.1 Ultra (or equivalent) at a concentration of 4,000 μg/ml for each of the following compounds.

Full Scan

- 1,4-Dichlorobenzene-d4
- Naphthalene-d8
- Acenaphthene-d10
- Phenanthrene-d10
- Chrysene-d12
- Perylene-d12

SIM

- 1,2-Dichlorobenzene-d4
- 1-Methylnaphthalene-d10
- Fluorene-d10
- Fluoranthene-d10
- Benzo(a)pyrene-d12

9.2.2.2 The internal standards should permit most of the components of interest in a chromatogram to have retention times of 0.8 - 1.20 relative to one of the internal standards.

9.2.2.3 Each 1 ml sample extract, and standard undergoing analysis should be spiked with 10 μl of the internal standard mixtures, resulting in a concentration of 40 μg/ml of each internal standard for full scan analysis and 4 ug/ml for SIM analysis.

9.2.3 Surrogate Standard Mixture.

9.2.3.1 B/N Surrogate Standard Mix: RESTEK (or equivalent) at a concentration of 5,000 μg/ml each surrogate compound.

- Nitrobenzene-d5.
- 2-Fluorobiphenyl.
- p-Terphenyl-d14.

9.2.3.2 Acid Surrogate Standard Mix: RESTEK (or equivalent) at a concentration of 7,500 μg/ml each surrogate compound.

- Phenol-d5.
- 2-Fluorophenol.
- 2,4,6-Tribromophenol.

9.2.4 DFTPP Tune Stock.

9.2.4.1 Protocol (or equivalent) at a concentration of 2,500 μg/ml for the following compounds.

- Decafluorotriphenylphosphine.
- 4,4'-DDT.
- Benzidine.
- Pentachlorophenol.

9.2.5 Store at -10 ^{o}C or less when not in use or according to the manufacturer's documented holding time and storage temperature recommendations. Stock standard solutions must be replaced after 1 year or sooner if manufacture's expiration date comes first or comparison with quality control check samples indicates degradation.

9.3 Surrogate Spiking Solutions.

9.3.1 Two surrogate spiking solutions, base/neutral surrogate solution and acid surrogate solution, at a concentration of 100 μg/ml are prepared in Extraction. Spike each sample, and blank with 0.5 ml of each solution, prior to extraction, for a final concentration of 50 μg/l of each surrogate compound in the extract.

9.3.2 A calibration range must be constructed for the surrogate compounds. Accordingly, appropriate amounts of surrogates are mixed with each calibration solution to define a range similar to the target compounds.

9.3.3 Store at -10 °C or less or according to the manufacturer's documented storage temperature recommendations. Prepare fresh surrogate spiking solutions every year, or sooner, if the manufacturer's expiration dates come first or if the solution has degraded or evaporated.

9.4 Intermediate Calibration Standard Solution.

9.4.1 The calibration stock solution is prepared by adding an appropriate amount of each stock and surrogate compounds into a 10 ml volumetric flask. Dilute the solution to the volume with methylene chloride and mix thoroughly. Refer to Table 7A for details.

9.5 Calibration Standards.

9.5.1 Initial Calibration Standards.

9.5.1.1 Calibration standards containing the surrogate compounds should be made by quantitative dilutions of the above intermediate solution. The calibration standards are prepared at a minimum of five concentrations to cover the range of 2 - 100 μg/ml for full scan and 0.2 – 15ug/ml for SIM, depending upon project specific requirements. Suggested levels and preparations are shown in Table 7B.

9.5.2 Continuing Calibration Verification.

9.5.2.1 The concentration of the mid range standard used for continuing calibration verification is alternated between 25 and 50 μg/ml for full scan and 2.5 and 5.0 for SIM.

9.5.3 Store the calibration standards in a refrigerator at 4 °C and prepare every 6 months or before the manufacturer's expiration date, whichever is sooner. Standards must be replaced immediately if the analysis of check standards indicates degradation.

9.6 Second Source Calibration Check Standard.

9.6.1 Second source calibration check standard is prepared per Table 7C, using the intermediate solutions prepared in Extraction.

9.6.2 A second source calibration check standard is analyzed after each initial calibration.

9.7 Daily GC/MS Performance Checks.

9.7.1 The solution is prepared at 50 μg/ml by making a 1:50 dilution of DFTPP stock solution (Section 9.2.4) in methylene chloride.

9.8 Matrix Spike Solutions.

9.9.1 The matrix spike solutions for both Base/Neutral and Acid are prepared in Acetone at a concentration of 100 μg/ml for each compound. Prepare the matrix spike, matrix spike duplicate and blank spike by spiking the selected sample and the blank with 0.5 ml of these solutions for a final concentration of 50 μg/l of each compound.

9.10 All organic new standard solutions are analyzed prior to use to verify the accuracy of the prepared concentration.

9.10.1 The prepared standard solution is analyzed using the determinative (instrumental) technique for the method.

9.10.2 The solution is analyzed following the completion of instrument calibration or a calibration check.

9.10.3 The concentration of the standard solution is determined using the software routines used in determining the acceptability of calibration verification.

9.10.4 The data is evaluated and the percent difference determined. The standard solution is approved for use if all designated compounds are present in the solution and the percent difference is less than the established criteria (±20%).

10.0 CALIBRATION

10.1 Initial Calibration.

10.1.1 The calibration range covered for routine analysis under RCRA employs standards of 2, 5, 10, , 25, 50, 80, 100 μg/ml for full scan and 0.2, 1, 2.5, 5, 10, and 15 ug/ml for SIM. A minimum of five standards must be run sequentially. The reporting limit is established by the concentration of the lowest standard analyzed during the initial calibration. Lower concentration standard may be needed to meet the reporting limit requirements of state specific regulatory program. The linear range covered by this calibration is the highest concentration standard.

10.1.2 A calibration range must be constructed for each surrogate compound. Accordingly, add appropriate amounts of surrogate spiking solutions to the calibration solution to define a range similar to the target compounds.

10.1.3 Aliquot 1 ml of each calibration standard into a 2 ml crimp top vial.

10.1.4 Prior to analysis, add 10 μl of the applicable (Full acan and/or SIM) internal standard solution (Section 9.2.2) to each standard. This results in a concentration of 40 μg/ml (Full scan) and 4ug/ml (SIM) for each internal standard.

10.1.5 Analyze the standard solutions using the conditions established in Section 11.0. Each analyte is quantitatively determined by internal standard technique using the closest eluting internal standard and the corresponding area of the major ion. See Table 6.

10.1.6 The Response Factor (RF) is defined in Section 13.1. Calculate the mean RF for each target analyte, using minimum of five RF values calculated from the initial calibration curve.

10.1.7 For the initial calibration to be valid, the following criteria must be met.

10.1.7.1 The System Performance Check Compounds (SPCCs) (Table 5) must be checked for a minimum average response factor. The minimum mean response factor for these compounds is 0.05. If the initial calibration criteria for SPCCs are not achieved, perform corrective action before completing the calibration.

10.1.7.2 The % RSD for each individual Calibration Check Compound (CCC) (Table 5) must be less than 30 %. This check is used to identify gross instrument operating problems. If the initial calibration criteria for CCCs are not achieved, perform corrective action before completing the calibration.

10.1.7.3 The percent relative standard deviation (% RSD) (see Section 13.2) of all target analytes must be less than 15 %.

10.1.7.4 If the %RSD of any individual (non CCC) compound is >15%, employ an alternative calibration linearity model. Specifically, linear regression using a least squares approach may be employed.

10.1.7.4.1 If a linear regression is employed, select the linear regression calibration option of the mass spectrometer data system. Do not force the regression line through the origin and do not employ 0,0 as a sixth calibration standard.

10.1.7.4.2 The correlation coefficient (r value) must be $\geq$0.99 for each compound to be acceptable.

10.1.7.4.3 Perform corrective action and recalibrate if the calibration criteria cannot be achieved.

10.1.7.5 The initial calibration criteria for this method applies to all additional compounds of concern specified by the client.

10.1.7.6 The relative retention times of each target analyte in each calibration standard should agree within 0.06 relative retention time units.

10.2 Second Source Calibration Check Standard.

10.2.1 The calibration is verified with a calibration check standard at 50 μg/ml (Full scan) or 5ug/ml (SIM) from an external source (Section 9.6). It must be analyzed immediately following the initial calibration.

10.2.2 The percent difference (% D) (Section 13.3) for this standard must meet the criteria of 20% for all the target compounds.

10.2.2.1 If % D is greater than 20%, reanalyze the second source check. If the criteria cannot be met upon re-injection, re-prepare the second source solution using a fresh ampoule and repeat the process.

10.2.2.2 If the %D criteria cannot be achieved after re-preparation of the second source, prepare a third source and repeat the process. Make fresh calibration standards using one of the two standard sources that match each other.

10.3 Continuing Calibration Verification Standard.

10.3.1 A calibration verification standard at close mid-level concentration of the initial calibration range at alternating 25 and 50ug/ml for full scan and 2.5ug/ml and 5ug/ml for SIM must be acquired every 12 hrs.

10.3.1.1 Vary the concentration of calibration verification standard on alternate verifications (i.e. every other calibration verification) using an alternative concentration standard. The standard selected must be lower than the midpoint calibration standard.

10.3.2 For the continuing calibration to be valid, all of the following specified criteria must be met.

10.3.2.1 The minimum RF for SPCC compounds must be 0.05. Each SPCC compound in the calibration verification standard must meet its minimum response factor. The percent difference (% D) for CCC compounds must be less than 20%.

10.3.2.1.1 If the CCCs are not part of the target list, then all targeted analytes must meet the 20% D criteria. All non-CCC compounds should also meet the 20% D criteria.

10.3.3 If the first continuing calibration verification does not meet criteria, a second standard may be injected after notify the team leader/manager and checking the system for defects.

10.3.3.1 A continuing calibration check is allowed to be repeated only once; if the second trial fails, a new initial calibration must be performed. In situations where the first check fails to meet the criteria, the instrument logbook should have clear documented notations as to what the problem was and what corrective action was implemented to enable the second check to pass.

10.3.4 If the verification criteria cannot be achieved, a new initial calibration must be performed.

10.3.5 If any of the internal standard areas change by a factor of two (- 50% to + 100%) or the retention time changes by more than 30 seconds from the midpoint standard of the last initial calibration, the mass spectrometer must be inspected for malfunctions and corrections must be made, as appropriate.

10.3.5.1 Reanalyze the continuing calibration standard. New initial calibration is required if reanalyzed standard continues to fail the internal standard requirements.

10.3.5.2 All samples analyzed while the system was out of control must be reanalyzed following corrective action.

11.0 PROCEDURE

11.1 Instrument Conditions.

11.1.1 Recommended instrument conditions are listed in Table 2 and 2a (SIM only). Modifications of parameters specified with an asterisk are allowed as long as criteria of calibration are met. Any modification should be approved by team leader/manger.

11.2 Daily GC/MS Performance Checks.

11.2.1 Mass Spectrometer Tuning. Every 12-hour, inject 1 μl of 50 ng/μl or 2 μl of 25 ng/μl DFTPP solution directly on to the column.

11.2.2 The GC/MS system must be checked to verify that acceptable performance criteria are achieved (see Table 3).

11.2.3 This performance test must be passed before any sample extracts, blanks or standards are analyzed. Evaluate the tune spectrum using three mass scans from the chromatographic peak and a subtraction of instrument background.

11.2.3.1 Select the scans at the peak apex and one to each side of the apex.

11.2.3.2 Calculate an average of the mass abundances from the three scans.

11.2.3.3 Background subtraction is required. Select a single scan in the chromatogram that is absent of any interfering compound peak and no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the tuning compound peak.

11.2.4 If all the criteria are not achieved, the analyst must retune the mass spectrometer with team leader/manager and repeat the test until all criteria are met.

11.2.4.1 Alternatively, an additional scan on each side of the peak apex may be selected and included in the averaging of the mass scans. This will provide a mass spectrum of five averaged scans centered on the peak apex. NOTE: The selection of additional mass scans for tuning may only be performed with supervisory approval on a case by case basis.

11.2.5 The injection time of the acceptable tune analysis is considered the start of the 12-hour clock.

11.2.6 In order to assess GC column performance and injection port inertness, the DFTPP tune standard also contains appropriate amount of 4,4'-DDT, benzidine and pentachlorophenol.

11.2.6.1 Injection Port Inertness Check.

11.2.6.1.1 The injection port inertness of the GC portion of the GC/MS is evaluated by the percent breakdown of 4,4'-DDT. DDT is easily degraded in the injection port. Breakdown occurs when the injection port liner is contaminated by high boiling residue from sample injection or when the injector contains metal fittings. Check for degradation problems by injecting a GC/MS tune standard

containing 4,4'-DDT every 12 hour, regardless of whether DDT is a target analyte. The degradation of DDT to DDE and DDD should not exceed 20%, in order to proceed with calibration procedures. Refer to Section 13.7 for calculation.

11.2.6.2 Column Performance Check.

11.2.6.2.1 The condition of the GC column is evaluated by the tailing of benzidine and pentachlorophenol every 12 hour. Benzidine and pentachlorophenol should be present at their normal responses, with no visible peak tailing, as demonstrated by the peak tailing factors. The tailing factor criteria for benzidine (base-neutral fraction) must be < 3 and for pentachlorophenol (acid fraction) must be < 5.

11.2.6.3 If degradation is excessive and/or poor chromatography is observed, the injector port may require cleaning. It may also be necessary to break off the first 6-12 in. of the capillary column.

11.3 Initial Calibration

11.3.1 Refer to Section 10.1.

11.4 Second Source Calibration Check

11.4.1 This standard must at least be analyzed when initial calibration provided. Refer to Section 10.2.

11.5 Continuing Calibration Checks

11.5.1 Refer to Section 10.3.

11.6 Sample Analysis.

11.6.1 Allow the sample extract to warm to room temperature. Spike 10 μl of the appropriate internal standard mix (4,000 μg/ml for full scan and 400ug/ml for SIM) into 1 ml sample extract, just prior to analysis. This is equivalent to a concentration of 40 μg/ml (full scan) and 4ug/ml (SIM) of each internal standard.

11.6.2 Inject 1 μl aliquot of the sample extract into the GC/MS system. A splitless injection technology is used.

11.6.3 If the response for any ion of interest exceeds the working range of the GC/MS system, dilute the extract and reanalyze.

11.6.4 When the extracts are not being used for the analyses, store them at -10^{o}C, protected from light, in sealed vials equipped with unpierced PTFE-lined septa.

11.7 Sample Dilution

11.7.1 Establish dilution of sample in order to fall within calibration range or to minimize the matrix interference.

- Utilize screen data (specific project only).
- Utilize acquired sample data.
- Utilize the history program or approval from client/project.
- Sample characteristics (appearance, odor).

11.7.2 If no lower dilution has been reported, the dilution factor chosen should keep the response of the largest peak for a target analyte in the upper half of the initial calibration range of the instrument.

11.7.3 Preparing Dilutions.

11.7.3.1 Prepare sample dilutions quantitatively. Dilute the sample extract with methylene chloride using logical volume to volume ratios, i.e., 1:5, 1:10, 1:50, etc. Large dilutions may require serial dilutions or the use of a Class A 10 ml volumetric flask.

11.7.3.2 Syringe dilutions. – Calibrated syringes are used to prepare dilutions. Add the appropriate amount of methylene chloride to a clean autosampler vial. Add the proper amount of sample using a calibrated syringe of the appropriate volume for the dilution. Add sufficient internal standard to maintain a concentration of 40ug/ml. Cap the vial and gently shake to disperse the sample through the solvent.

11.7.3.3 Volumetric Flask Dilutions – Large dilutions may require the use of a 10 ml Class A Volumetric flask.

11.8 Establishing Search Criteria. Search criteria for each compound listed in the method must be entered into the method quantitation/identification file in the Enviroquant software package. This activity must be performed before attempting qualitative and quantitative analysis on any acquired data file. The search criteria are based on compound retention time and the characteristic ions from the reference mass spectrum. Characteristic ions are defined as the three ions of greatest relative intensity, or any ions over 30% relative intensity, if less than three such ions occur in the reference spectrum. The number of secondary ions displayed for each compound search varies between compounds.

11.8.1 Select the primary ion for the target compound from the characteristic ions in Table 6. If multiple characteristic ions are listed, the first ion is the major (primary) ion. Enter this ion as the search ion. Enter the relative abundance of this ion (100% for base peak ions) and set the relative abundance window at ± 30%.

11.8.1.2 Alternate primary ions may be selected when interferences exist from ion abundance contribution from close eluting compounds.

11.8.2 Enter the remaining ions as secondary ions. Secondary ions are not be used to locate peaks within the search window, but are be used to support the qualitative identification of selected peaks. The number of secondary ions displayed for each compound search varies

between compounds depending on the number of ions in the spectra >30% relative abundance.

11.8.3 Set the relative abundance windows for the secondary ions at ± 30%.

11.8.4 Establish the relative retention window for each compound. Because it is a relative retention window the same width window applies to all compounds on the quantitation list. The window must be established at a minimum of 0.06 relative retention time units.

11.9 Data Interpretation.

11.9.1 Executing Qualitative Searches. The target compounds shall be identified by analyst with competent knowledge in the interpretation of mass spectra by comparison of the sample mass spectrum to the mass spectrum of a standard of the suspected compound.

11.9.1.1 The search procedure will identify peaks within the search window using the primary ion only. Secondary ions and the relative retention are used to determine "the best match". If the best match contains secondary ions outside the relative abundance window, they will be flagged with a # sign.

11.9.2 Qualitative Identification. The qualitative identification of compounds determined by this method is based on retention time and on comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. Compounds are identified when the following criteria are met.

11.9.2.1 The intensities of the characteristic ions of a compound must maximize in the same scan or within one scan of each other.

11.9.2.2 The sample component must elute at the same relative retention time (RRT) as the daily standard. Criterion is the RRT of sample component must be within ± 0.06 RRT units of the standard.

11.9.2.3 The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%.)

11.9.2.3.1 If a chromatographic peak exhibits a spectrum containing an ion with relative abundance outside the relative abundance window is selected for reporting, the analyst must annotate the spectra that the compound qualified based on his/her best judgement. This circumstance will most often occur from coeluting compounds with similar ions or background matrix interferences.

11.9.3 Quantitative Analysis.

11.9.3.1 Once a target compound has been identified, its concentration (Section 13.4) will be based on the integrated area of the quantitation ion, normally the base peak (Table 6). The compound is quantitated by internal standard technique with an average response factor generated from the initial calibration curve.

11.9.3.2 If the sample produces interference for the primary ion, use a secondary ion to quantitate. This may be characterized by an excessive background signal of the same ion, which distorts the peak shape beyond a definitive integration. Also interference could severely inhibit the response of the internal standard ion. The secondary ion must be used to generate a new response factor.

11.10 Library Search for Tentatively Identified Compounds.

11.10.1 If a library search is requested, the analyst should perform a forward library search of the NIST98 mass spectral library to tentatively identify 10 to 15 non-reported compounds (15 for base, 10 for acid, 25 for base/acid fraction).

11.10.2 Guidelines for making tentative identification are listed below.

11.10.2.1 These compounds should have a response greater than 10% of the nearest internal standard. The response is obtained from the integration for peak area of the Total Ion Chromatogram (TIC).

11.10.2.2 The search is to include a spectral printout of the 3 best library matches for a particular substance. The results are to be interpreted by analyst.

11.10.2.3 Molecular ions present in the reference spectrum should be present in the sample spectrum.

11.10.2.4 Relative intensities of major ions in the reference spectrum (ions > 10 % of the most abundant ion) should be present in the sample spectrum.

11.10.2.5 The relative intensities of the major ions should agree within ± 20 %. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must between 30 and 70%).

11.10.2.6 Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.

11.10.2.7 Ions present in the reference spectrum but not in the sample spectrum should be verified by performing further manual background subtraction to eliminate the interference created by coeluting peaks and/or matrix interference.

11.10.3 Quantitation of the tentatively identified compounds is obtained from the total ion chromatogram based on a response factor of 1 and is to be tabulated on the library search summary data sheet.

11.10.4 The resulting concentration should be reported indicating: (1) that the value is estimate, and (2) which internal standard was used to determine concentration. Quantitation is performed on the nearest internal standard.

11.11 Selected Ion Monitoring (SIM) Option

11.11.1 Instrument Set-Up: Modify the method for SIM analysis and define ion groups with retention times, ions and dwell times to include base peak ion for the target compounds of

interest, surrogates, and internal standards (Table 2a, Table 8a) Select a mass dwell time of 50 milliseconds for all compounds.

11.11.2 Calibration: Calibrate the mass spectrometer in the selected ion monitoring mode using 6 calibration standards of 0.2, 1.0, 2.5, 5.0, 10.0 and 15.0 ug/ml. Spike each standard with the SIM specific internal standard solution at 4ug/ml. Calculate individual response factors and response factor RSDs using the procedures and criteria described in Section 10.1.6, 10.1.7.3 and 10.1.7.4.

11.11.3 Initial Calibration Verification. Verify the initial calibration after its completion using a 5.0 ug/ml calibration standard purchased or prepared from a second standards reference materials source. The initial calibration verification must meet the criteria of Section 10.2.2.

11.11.4 Continuing Calibration Verification. Verify the initial calibration every 12 hours using a 5.0 ug/ml calibration. The continuing calibration verification must meet the criteria of Section 10.3.

11.11.5 Sample Extract Analysis: Each extract has been previously spike with the SIM internal standard at 4 ug/ml. Analyze the sample extracts for the compounds of interest using the SIM scan parameters employed for the calibration standards.

11.11.6 Surrogate Standard Calculation.. Report surrogate spike accuracy for the surrogates spiked for the full scan GC/MS analysis at 40 ug/ml.

12.0 QUALITY CONTROL

12.1 QC Requirements Summary.

Daily GC/MS Performance Checks	Beginning of the analytical shift and every 12 hours
Initial Calibration	Whenever needed.
Second Source Calibration Check	Following initial calibration
Continuing Calibration Verification	Every 12 hours.
Method Blank	One per extraction batch*.
Blank Spike	One per extraction batch*.
Matrix Spike	One per extraction batch*.
Matrix Spike Duplicate	One per extraction batch*.
Surrogate	Every sample extract and standard.
Internal Standard	Every sample extract and standard.

*The maximum number of samples per batch is twenty or per project specification.

12.2 Daily GC/MS Performance Checks.

12.2.1 Refer to Section 11.2.

12.3 Initial Calibration.

12.3.1 Refer to Section 10.1.

12.4 Second Source Calibration Check.

12.4.1 Refer to Section 10.2.

12.5 Continuing Calibration Verification.

12.5.1 Refer to section 10.3.

12.6 Method blank.

12.6.1 The method blank is either reagent water or anhydrous sodium sulfate (depending on the sample matrix) which must be extracted with each set of 20 or less samples. For a running batch, a new method blank is required for each different extraction day. The method blank is then extracted and carried through all stages of the sample preparation and measurement.

12.6.2 If the method blank contains a target analyte above its MDL (Appendix I), the entire batch must be re-extracted and re-analyzed.

12.6.3 Surrogate compounds are added to the method blank prior to extraction. If the surrogate accuracy in the method blank does not meet in house criteria (Appendix I), it must be reanalyzed. If the reanalysis confirms the original data, the entire batch should be re-extracted.

12.7 Blank Spike

12.7.1 A blank spike must be extracted with each set of 20 or less samples. For a running batch, a new blank spike is required for each different extraction day. The blank spike consists of an aliquot of a clean (control) matrix similar to the sample matrix and of the same volume. It is spiked with the same analytes at the same concentrations as the matrix spike/matrix spike duplicate.

12.7.1.1 An additional blank spike is prepared for sample batches that contain samples which are analyzed for Polynuclear aromatic hydrocarbons. The concentration of tye bl;ank spike is prepared at

12.7.2 The blank spike recoveries should be assessed using in house limits specified in Appendix I.

12.7.3 If a blank spike is out of control, the following corrective actions must be taken and all the associated samples must be re-extracted and reanalyzed. The exception is if the blank spike recovery is high and no hits reported in associated samples and QC batch. In that case, the sample results can be reported with footnote (remark) and no further action is required.

12.7.3.1 Check to be sure that there are no errors in the calculations, or spike solutions. If errors are found, recalculate the data accordingly.

12.7.3.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample batch.

12.7.3.3 If no problem is found, re-extract and reanalyze the sample batch.

12.8 Matrix Spike(MS) / Matrix Spike Duplicate(MSD)

12.8.1 One sample is randomly selected from each extraction batch and spiked in duplicate to assess the performance of the method as applied to a particular matrix and to provide information on the homogeneity of the matrix. Both the MS and MSD are carried through the complete sample preparation, and determinative procedures.

12.8.2 Matrix spikes are prepared by spiking an actual sample at a concentration of 50 μg/l for both base/neutral and acids.

12.8.3 Assess the matrix spike recoveries (% R) (Section 13.5) and relative percent difference (RPD) (Section 13.6) against the control limits in Appendix I.

12.8.4 If the matrix spike accuracy of any individual compound is out of control, the accuracy for the compound in the blank spike must be within control. In such case, matrix interference is assumed and the data is reported with footnote (e.g., spike recovery indicates possible matrix interference). No further corrective action is required.

12.9 Surrogates

12.9.1 All standards, blanks, sample extracts, and matrix spikes contain surrogate compounds which are used to monitor the performance of the extraction and analytical system.

12.9.2 The recoveries (Section 13.5) of the surrogates must be evaluated to determine whether or not they fall within surrogate control limits (Appendix I) developed by the laboratory annually.

12.9.3 If the recovery of any surrogate compound does not meet the control limits, the calculation must be checked for possible error. The surrogate solution should be checked for degradation. Contamination and instrument performance should also be reviewed.

12.9.3.1 Reanalyze the extract if no calculation errors are detected. If the surrogate recoveries for the reanalyzed extract are in control, report the data from the reanalysis only.

12.9.3.2 If the data from the reanalysis is also out of control, re-extract and reanalyze the sample.

12.9.3.3 If, upon reanalysis, the surrogate recoveries are acceptable, report the reanalysis data. If the holding time has expired prior to the reanalysis, report both the original and reanalysis results and note the holding time problem.

12.9.3.4 If the recovery is again not within limits, the problem is considered to be matrix interference. Submit both data sets with the original analysis being reported.

12.9.4 If the sample exhibits matrix interference, defined as excessive signal where target or non-target responses are greater than the response of the internal standards. In this case, reanalysis may not be required following team leader/manager approval; the surrogates will be qualified as outside the limits due to matrix interference. Alternatively, sample may be reanalyzed on dilution, if the reanalysis is again not within the limit, the sample should be reported with a footnote indicating that there were possible matrix interference.

12.10 Internal Standards.

12.10.1 Retention time for all internal standards must be within ± 30 seconds of the corresponding internal standard in the latest continuing calibration or 50 μg/ml standard of initial calibration.

12.10.2 The area (Extracted Ion Current Profile) of the internal standard in all analyses must be within 50 to 200 % of the corresponding area of the latest calibration standard (12 hr. time period).

12.10.3 If the area of internal standard does not meet control limits, the calculations must be checked. If a problem is not discovered, the sample must be reanalyzed.

12.10.4 If the areas are acceptable upon reanalysis, the reanalysis data is reported.

12.10.5 If the areas are unacceptable upon reanalysis, then both sets of data are submitted with the original analysis reported.

13.0 CALCULATION

13.1 Response Factor (RF).

$$RF = \frac{A_s \times C_{is}}{A_{is} \times C_s}$$

where:

A_s = Area of the characteristic ion for the compound being measured.
A_{is} = Area of the characteristic ion for the specific internal standard.
C_s = Concentration of the compound being measured (μg/ml).
C_{is} = Concentration of the specific internal standard (μg/ml).

13.2 Percent Relative Standard Deviation (%RSD).

$$\%RSD = \frac{SD}{RF_{av}} \times 100$$

where:

SD = Standard Deviation.
RF_{av} = Average response factor from initial calibration.

13.3 Percent Difference (%D).

$$\%\ D = \frac{|\ RF_{av} - RF_{cv}\ |}{RF_{av}} \times 100$$

where: RF_{cv} = Response factor from Calibration Verification Standard.

13.4 Concentration (Conc.).

13.4.1 <u>for water:</u>

$$\text{Conc. } (\mu g/l) = \frac{A_s \times C_{is} \times V_f \times D \times 1000}{A_{is} \times RF_{av} \times V_i}$$

13.4.2 <u>for soil/sediment</u> (on a dry weight basis):

$$\text{Conc. } (\mu g/kg) = \frac{A_s \times C_{is} \times V_f \times D \times 1000}{A_{is} \times RF_{av} \times W_s \times S}$$

where:

V_f = Final Volume of total extract (ml).
D = Secondary dilution factor.
V_i = Initial volume of water extracted (ml).
W_s = Weight of sample extracted (g).
S = (100 - % moisture in sample) / 100.

13.5 Percent Recovery (%R).

$$\%\ R = \frac{\text{Concentration found}}{\text{Concentration spiked}} \times 100$$

13.6 Relative Percent Difference (RPD).

$$RPD = \frac{|MSC - MSDC|}{(1/2)(MSC+MSDC)} \times 100$$

where:

MSC = Matrix Spike Concentration.
MSDC = Matrix Spike Duplicate Concentration.

13.7 Percent Breakdown.

$$\%\ \text{Breakdown for DDT} = \frac{\text{Total DDT degradation peak area}}{\text{Total DDT peak area}} \times 100$$

where:

Total DDT degradation peak area = DDE + DDD
Total DDT peak area = DDT + DDE + DDD.

13.8 Linear regression by the internal standard technique.

$$C_s = \left(\frac{\frac{A_s}{A_{is}} - b}{a} \right) \times C_{is}$$

Where:
Cs = concentration of target analyte
As = Area of target analyte
Cis = concentration of the internal standard
b = Intercept
a = slope of the line

$$a = \frac{N \Sigma xy - \Sigma x \Sigma y}{N \Sigma x^2 - (\Sigma x)^2}$$

$$b = \frac{\Sigma y - a \Sigma x}{N}$$

N = number of points
x = amount of analyte
y = response of instrument

13.9 Correlation Coefficient

$$r = \frac{\Sigma(x - \bar{x})(y - \bar{y})}{\sqrt{\Sigma(x - \bar{x})^2 \Sigma(y - \bar{y})^2}}$$

Where r = correlation coefficient
x = amount of analyte
y = response of instrument

$\bar{x}$ = average of x values

$\bar{y}$ = average of y values

14.0 DOCUMENTATION

14.1 The Analytical Logbook is a record of the analysis sequence; the logbook must be completed daily. Each instrument will have a separate logbook.

14.1.1 If samples require reanalysis, a brief explanation of the reason must be documented in this log.

14.2 The Standard Preparation Logbook must be completed for all standard preparations. All information requested must be completed, the page must be signed and dated by the respective person.

14.2.1 The Accutest Lot Number must be cross-referenced on the standard vial.

14.3 The Instrument Maintenance Logbook must be completed when any type of maintenance is performed on the instrument. Each instrument has a separate log.

14.4 Any corrections to laboratory data must be done using a single line through the error. The initials of the person and date of correction must appear next to the correction.

14.5 Unused blocks of any form must be X'ed and Z'ed by the analyst before submitting the data for review.

14.6 Supervisory (or peer) personnel must routinely review (at least once per month) all laboratory logbooks to ensure that information is being recorded properly. Additionally, the maintenance of the logbooks and the accuracy of the recorded information should also be verified during this review.

15.0 DATA REVIEW AND REPORTING

15.1 Initial and continuing calibration check. Verify that all calibration and continuing calibration criteria have been achieved. If the criteria had not been achieved, corrective action must be performed to bring the system in control before analyzing any samples.

15.1.1 If samples had been analyzed under non-compliant calibration criteria, all sample extracts must be re-analyzed once the system is brought into control.

15.2 Quality Control Data Review. Review all QC data. If QC criteria were not achieved, perform corrective action before proceeding with analysis.

15.2.1 In some situation, corrective action may demand that the entire sample batch be re-extracted and re-analyzed before processing data.

15.3 Chromatogram Review. The chromatogram of each sample is evaluated for target analytes.

15.3.1 Each sample may require the reporting of different target analytes. Review the login to assure that the correct target compounds are identified.

15.3.2 Manual integration of chromatographic peaks must be identified by the analysts by initialing and dating the changes made to the report.

15.4 Transfer to LIMS. Following the initial screen review, transfer the processed data to the LIMS.

15.4.1 Print the processed data and compare the printed values to the original values to verify transfer accuracy.

15.4.2 If transfer errors occurred, the errors must be corrected before the data is re-submitted.

15.5 Hardcopy Print & Data Package Assembly.

15.5.1 After successful transfer is verified, approve the data and print a hard copy.

15.5.2 Assemble the data package combining the LIMS output and instrumental data.

15.5.3 Pass the entire package forward to the supervisor for final review and release approval.

16.0 POLLUTION PREVENTION & WASTE MANAGEMENT

16.1 Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards, reagents, and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids to the environment must be followed. All method users must be familiar with the waste management practices described in section 16.2.

16.2 Waste Management. Individuals performing this method must follow established waste management procedures as described in the waste management SOP, ESM003. This document describes the proper disposal of all waste materials generated during the testing of samples as follows:

16.2.1 Non hazardous aqueous wastes.

16.2.2 Hazardous aqueous wastes

16.2.3 Chlorinated organic solvents

16.2.4 Non-chlorinated organic solvents

16.2.5 Hazardous solid wastes

16.2.6 Non-hazardous solid wastes

17.0 ADDITIONAL REFERENCES

17.1 No additional references are required for this SOP.

Table 1 – Target Compounds by SW846 8270C			
Benzenethiol (1)	4-Bromophenyl phenyl ether	Di-n-octyl phthalate	5-Nitro-o-toluidine
Benzoic Acid	Butyl benzyl phthalate	Diethyl phthalate	Naphthalene
2-Chlorophenol	Benzyl Alcohol	Dimethyl phthalate	Nitrobenzene
4-Chloro-3-methyl phenol	1,1'-Biphenyl (1)	2,3-Dichloroaniline (1)	n-Nitrosodimethylamine
2,4-Dichlorophenol	Butyl Stearate (1)	Decane	4-Nitroquinoline 1-Oxide
2,4-Dimethylphenol	2-Chloronaphthalene	Octadecane (1)	N-Nitroso-di-n-propylamine
2,4-Dinitrophenol	4-Chloroaniline	bis(2-Ethylhexyl)phthalate	N-Nitrosodi-n-butylamine
2,6-Dichlorophenol	Carbazole	Ethyl methanesulfonate	N-Nitrosodiethylamine
4,6-Dinitro-2-methylphenol	Caprolactam (1)	Famphur	N-Nitrosodiphenylamine
Dinoseb	Chlorobenzilate	Fluoranthene	N-Nitrosomethylethylamine
2-Methylphenol	Chrysene	Fluorene	N-Nitrosomorpholine
3&4-Methylphenol	Cumene (1)	Hexachlorobenzene	N-Nitrosopiperidine
2-Nitrophenol	bis(2-Chloroethoxy)methane	Hexachlorobutadiene	N-Nitrosopyrrolidine
4-Nitrophenol	bis(2-Chloroethyl)ether	Hexachlorocyclopentadiene	O,O,O-Triethyl phosphorothioat
Pentachlorophenol	bis(2-Chloroisopropyl)ether	Hexachloroethane	2-Picoline
Phenol	4-Chlorophenyl phenyl ether	Hexachlorophene	Parathion
2,3,4,6-Tetrachlorophenol	1,2-Dichlorobenzene	Hexachloropropene	Pentachloroethane (1)
2,4,5-Trichlorophenol	1,2-Diphenylhydrazine	Indene (1)	Pentachlorobenzene
2,4,6-Trichlorophenol	1,3-Dichlorobenzene	Indeno(1,2,3-cd)pyrene	Pentachloronitrobenzene
2-Acetylaminofluorene	1,4-Dichlorobenzene	Isodrin	Phenacetin
4-Aminobiphenyl	2,4-Dinitrotoluene	Isophorone	Phenanthrene
Acenaphthene	2,6-Dinitrotoluene	Isosafrole	Phorate
Acenaphthylene	3,3'-Dichlorobenzidine	Kepone	Pronamide
Acetophenone	3,3'-Dimethylbenzidine	1-Methylnaphthalene	Pyrene
Aniline	1,4-Dioxane (1)	2-Methylnaphthalene	Pyridine
Anthracene	7,12-Dimethylbenz(a)anthracene	3-Methylcholanthrene	p-Phenylenediamine
Aramite	Dimethylnaphthalenes (total) (1)	4,4'-Methylenebis(2-chloroaniline)	Quinoline (1)
Atrazine (1)	Diallate	Methapyrilene	Safrole
alpha-Terpineol	Dibenz(a,h)acridine	Methyl methanesulfonate	1,2,4,5-Tetrachlorobenzene
A,A-Dimethylphenethylamine	Dibenzo(a,h)anthracene	Methyl parathion	1,2,4-Trichlorobenzene
Benzidine	Dibenzofuran	6-Methyl Chrysene (1)	1,2,3-Trichlorobenzene (1)
Benzaldehyde (1)	Dimethoate	1,4-Naphthoquinone	1,3,5-Trichlorobenzene (1)
Benzo(a)anthracene	Diphenylamine	1-Naphthylamine	Thionazin
Benzo(a)pyrene	Disulfoton	2-Naphthylamine	o-Toluidine
Benzo(b)fluoranthene	m-Dinitrobenzene	2-Nitroaniline	sym-Trinitrobenzene
Benzo(g,h,i)perylene	p-(Dimethylamine)azobenzene	3-Nitroaniline	Tetraethyl dithiopyrophosphate
Benzo(k)fluoranthene	Di-n-butyl phthalate	4-Nitroaniline	

(1) NELAC Accreditation is not offered for this compound. Results may not be useable for regulatory purposes in States where this accreditation option is not offered.

Table 2 - RECOMMENDED OPERATING CONDITIONS: Gas Chromatograph/ Mass Spectrometer	
Injection Type	Splitless
Carrier Gas (linear velocity)	Helium at 30 cm/sec*
Mass range	35-500 AMU
Electron Energy	70 volts (nominal)
Scan time	not to exceed 1 sec. per scan
Injection port temperature	200-300 °C
Source temperature	220-270 °C
Transfer line temperature	250-300 °C
Analyzer temperature	220-250 °C
Gas Chromatograph Temperature Program*	
Initial temperature	40-50 °C*
Time 1	2-4 minutes*
Column temperature rate	8-25 degrees/min*
Final temperature	290-320 °C according to column type*
Total run time	*20-40 minutes*

***** Parameter modification allowed for performance optimization as long as QC criteria are achieved.

Table 2a – SIM Group Parameters		
Group No.	**Retention Time (minutes)**	**Ions**
1	0 – 7.8	150, 64, 93, 82, 152, 99, 63, 128, 112, 42, 95
2	7.8 – 11	150, 128, 225, 142, 172, 152, 129, 223, 141, 171, 122, 127, 227, 115, 170
3	11 – 13.8	172, 152, 166, 182, 334, 266, 176, 153, 165, 330, 284, 264, 174, 154, 77, 332, 286, 268
4	13.8 – 18	266, 179, 202, 122, 268, 212, 203, 284, 178, 213, 244, 286
5	18 – 22	244, 229, 167, 122, 226, 202, 228, 149, 203
6	22 – 34.7	264, 149, 253, 278, 263, 150, 250, 139, 265, 252, 276, 138

Table 3 - DFTPP KEY IONS AND ION ABUNDANCE CRITERIA	
Mass	**Ion Abundance Criteria**
51	30-60 of mass 198
68	<2 % of mass 69
70	<2 % of mass 69
127	40-60 % of mass 198
197	<1 % of mass 198
198	Base peak, 100 % relative abundance
199	5-9 % of mass 198
275	10-30 % of mass 198
365	>1 % of mass 198
441	Present but less than mass 443
442	>40 % of mass 198
443	17-23 % of mass 442

Table 4 - INTERNAL STANDARDS	
Internal Standard (Full Scan)	**Prim/Sec. ions**
1,4-Dichlorobenzene-d4	152 / 150, 115
Naphthalene-d8	136 / 68
Acenaphthene-d10	164 / 162, 160
Phenanthrene-d10	188 / 94, 80
Chrysene-d12	240 / 120, 236
Perylene-d12	264 / 260, 265
Internal Standard (SIM)	**Prim/Sec. ions**
1,2-Dichlorobenzene-d4	152/ 150
1-Methylnaphthalene-d10	150/ 152, 122
Fluorene-d10	174/ 176
Fluoranthene-d10	212/ 213
Benzo(a)pyrene- d12	264/ 263, 265

Table 5 - Criteria for CCC and SPCC	
Initial Calibration: CCC % RSD is ≤ 30 %.	Continuing Calibration: CCC % D is ≤ 20 %
Calibration Check Compounds (CCC)	
Base Neutral	**Acid**
1,4-Dichlorobenzene	Phenol
Hexachlorobutadiene	2,4-Dichlorophenol
Acenaphthene	2-Nitrophenol
Fluoranthene	4-Chloro-3-methylphenol
N-Nitrosodiphenylamine	2,4,6-Trichlorophenol
Di-n-octyl phthalate	Pentachlorophenol
Benzo (a) pyrene	
System Performance Check Compounds (SPCC)	
Base Neutral	**Acid**
N-Nitroso-di-n-propylamine	2,4-Dinitrophenol
Hexachlorocyclopentadiene	4-Nitrophenol
Minimum acceptable average relative response factor (RRF) is 0.050 for SPCC.	

Table 6 – Full Scan Semivolatile Internal Standards with Corresponding Analytes Assigned for Quantitation			
1,4-Dichlorobenzene-d4	**Ions**	**Acenaphthene-d10**	**Ions**
Aniline	(93/66,65)	Acenaphthene	(154/153,152)
Benzaldehyde	(105)	Acenaphthylene	(152/151,153)
*Benzenethiol	(110)	*1-Chloronaphthalene	(162/127,164)
Benzyl alcohol	(108/79,77)	2-Chloronaphthalene	(162/127,164)
Bis(2-chloroethyl)ether	(93/63,95)	4-Chlorophenylphenyl ether	(204/206,141)
Bis (2-chloroisopropyl)ether	121	Dibenzofuran	(168/139)
2-Chlorophenol	(128/64,130)	Diethyl phthalate	(149/177,150)
Cumene	(105,120)	Dimethyl phthalate	(163/149,164)
Decane	(43)	*m-Dinitrobenzene	(168)
1,3-Dichlorobenzene	(146/148,111)	2,4-Dinitrophenol	(184/63,154)
1,4-Dichlorobenzene	(146/148,111)	2,4-Dinitrotoluene	(165/63,89)
1,2-Dichlorobenzene	(146/148,111)	2,6-Dinitrotoluene	(165/63,89)
1,4 Dioxane	(88)	Fluorene	(166/165,167)
*Ethyl methanesulfonate	(79/109,97)	Hexachlorocyclopentadiene	(295/237,142)
2-Fluorophenol (SURR.)	(112)	*1,4 – Naphthoquinone	(158)
Hexachloroethane	(117/201,199)	*1- Naphthylamine	(143/115,116)
Indene	(116)	*2- Naphthylamine	(143/115,116)
*Methyl methanesulfonate	(80/79,64)	2-Nitroaniline	(65/92,138)
2-Methylphenol	(108/107,79)	3-Nitroaniline	(138/108,92)
4-Methylphenol	(108/107,79)	4-Nitroaniline	(138/108,92)
*N-Nitrosodiethylamine	(102)	4-Nitrophenol	(139/109,65)
N-Nitrosodimethylamine	(74/42)	* 5 Nitro-o-toluidine	(152)
N-Nitroso-di-n-propylamine	(70/101,130)	Pentachlorobenzene	(250/252,248)
*N-Nitrosomethyethylamine	(42)	*Pentachloronitrobenzene	(237/235,272)
* N-Nitrosomorpholine	(56)	*Phenacetin	(108/109,179)
* N-Nitrosoptrrolidine	(41)	*Phorate	(75)
*O-Toluidine	(106)	*Pronamide	(173/175,145)
* Petachloroethane	(167)	*1,2,4,5-Tetrachlorobenzene	(216/214,218)
Phenol	(94)	*2,3,4,6-Tetrachlorphenol	(232/230,131)
Phenol-d5 (SURR.)	(99)	*Tetraethyldithiopyrophosphate	(322)
*2-Picoline	(93/66,92)	*Thioazin	(143)
Pyridine	(79)	2,4,6-Trichlorophenol	(196/198,200)
		2,4,5-Trichlorophenol	(196/198,200)

Table 6 (cont'd) – Full Scan Semivolatile Internal Standards with Corresponding Analytes Assigned for Quantitation

Naphthalene-d8	**Ions**	**Phenanthrene-d10**	**Ions**
*A,A-Dimethylphenethylamine	(58)	*4-Aminobiphenyl	(169/168,170)
*Acetophenone	(105/77,51)	Anthracene	(178/176,179)
Benzoic acid	(184/92,185)	Atrazine	(58)
Bis(2-chloroethoxy)methane	(93/95,123)	4-Bromophenyl phenyl ether	(248/250,141)
Caprolactam	(55)	Carbazole	(167)
4-Chloroaniline	(127)	*Diallate	(86)
4-Chloro-methylphenol	(107/144)	*Dimethoate	(87)
2,3 Dichloroaniline	(161)	Di-n-Butyl phthalate	(149/150)
2,4-Dichlorophenol	(162/164,98)	4,6-Dinitro-2-methylphenol	(198/51,105)
*2,6-Dichlorophenol	(162/164,98)	*Dinoseb	(211)
Dimethylnaphthalene	(156)	*Diphenylamine	(169/168,167)
2,4-Dimethylphenol	(122/107)	1,2-Diphenylhydrazine	(77/105)
*a,a-Dimethyl-phenethylamine	(58/91,42)	*Disulfoton	(88)
Hexachlorobutadiene	(225/223,227)	Fluoranthene	(202/101,203)
*Hexachloroprene	(213)	2-Fluorobiphenyl (SURR)	(172)
Isophorone	(82/95,138)	Hexachlorobenzene	(284/142,249)
*Isosafrole	(127)	*Isodrin	(193)
1-Methylnaphthalene	(142)	*Methapyriline	(58)
2-Methylnaphthalene	(142/141)	*Methyl Parathion	(125)
Naphthalene	(128/129,127)	N-Nitrosodiphenylamine	(169/168,167)
Nitrobenzene	(77/123,65)	*4-Nitroquinoline 1-oxide	(190)
Nitrobenzene-d5 (SURR.)	(82)	Octadecane	(57)
N-Nitroso-di-n-butylamine	(84/57/41)	*Parathion	(109)
2-Nitrophenol	(139/109,65)	Pentachlorophenol	(266/264,268)
Quinoline	(129)	Phenanthrene	(178/179,176)
*N-Nitrosopiperidine	(42/114,55)	*Pronamide	(173)
*p-Phenylenediamine	(108)	sym- Trinitrobenzene	(213)
*O,O,O-Triethylphosphorthioat	(198)	2,4,6 Tribromophenol (SURR)	(330)
*Safrole	(162)		
alpha –Terpineol	(128)	**Perylene-d12**	**Ions**
1,2,3-Trichlorobenzene	(180/182,145)	Benzo(b)fluoranthene	(252/125)
1,2,4-Trichlorobenzene	(180/182,145)	Benzo(k)fluoranthene	(252/125)
1,3,5-Trichlorobenzene	(180/182,145)	Benzo(g.h.i)perylene	(276/138,277)
		Benzo(a)pyrene	(252/253,125)
Chrysene-d12	**Ions**	*Dibenz(a,j)acridine	(279/280)
2 –Acetylaminofluorene	(181)	Dibenz(a,h)anthracene	(278/139,279)
*Aramite	(194)	*7,12-Dimethylbenz(a)anthracene	(256/241,257)
Benzidine	(184)	Di-n-Octyl Phthalate	(149)
Benzo(a)anthracene	(228/229/226)	Hexachlorophene	(196)
Bis(2-ethylhexyl)phthalate	(149/167,279)	Indeno(1,2,3-d)pyrene	(276)
Butylbenzyl phthalate	(149/91)	*3-Methylchloanthrene	(268/253)
*Chlorobenzilate	(251)	* non-routine target compound	
Chrysene	(228/226,229)		
3,3'-Dichlorobenzidine	(252/254,126)		
*p-Dimethylaminoazobenzene	(120/225,77)		
*3,3 Dimethylbenzidine	(212)		
*Famphur	(218)		
*Kepone	(272)		
* Methyl Chrysene	(242)		
Pyrene	(202/200,203)		
Terphenyl-d14 (SURR.)	(244)		

Table 6a – SIM Semivolatile Internal Standards with Corresponding Analytes Assigned for Quantitation			
1,4-Dichlorobenzene-d4	**Ions**	**Fluoranthene-d10**	**Ions**
2-Fluorophenol (Surr)	(112)	Fluoranthene	202, 101, 203
Phenol-d5 (Surr)	(99)	Pyrene	202, 203
Bis-(2-chloro-ethyl)ether	93, 63, 95	Terphenyl-d14 (Surr)	(244)
Nitrobenzene-d5 (Surr)	(82)	Benzo(a)anthracene	228, 229, 226
		Chrysene	228, 226, 229
1-Methylnaphthalene-d10	**Ions**	Bis(2-ethylhexylphthalate	149, 167, 279
Naphthalene	128, 129, 127		
Hexachlorobutadiene	225, 223, 227	**Benzo(a) pyrene-d12**	**Ions**
2-Methyl Naphthalene	142, 141, 115	Di-n-octyl phthalate	149, 150, 43
2-Fluorobiphenyl (Surr)	(172)	Benzo(b)fluoranthene	252, 253
		Benzo(k)fluoranthene	252, 125
Fluorene-d10	**Ions**	Benzo(a)pyrene	252, 253, 125
Acenaphthylene	152, 151, 153	Indeno(1,2,3-cd)pyrene	276, 277, 138
Acenaphthene	153, 152, 154	Dibenzo(a,h)anthracene	278, 139, 279
Fluorene	166, 165, 167	Benzo(g,h,i)perylene	276, 138, 277
1,2-Diphenylhydrazine	77, 105, 182		
2,4,6-Tribromophenol (Surr)	(330)		
Hexachlorobenzene	284, 286		
Pentachlorophenol	266, 264		
Phenanthrene	178, 179, 176		
Anthracene	178, 176, 179		

Table 7. STANDARD PREPARATION

Table 7A – Intermediate Calibration Standard Solution				
Stock Solution	**Stock Conc., µg/ml**	**Volume Added, µl**	**Final Vol. in $MeCl_2$, ml**	**Final Conc. µg/ml**
Semivolatile Standard Mix # 1	2,000	500	10	100
Semivolatile Standard Mix # 2	2,000	500	10	100
Semivolatile Standard Mix # 4	2,000	500	10	100
Semivolatile Standard Mix # 5	2,000	500	10	100
Semivolatile Standard Mix # 6	2,000	500	10	100
Semivolatile Standard Mix # 7	2,000	500	10	100
PAH Mixture #2	2,000	500	10	100
Semivolatile Standard Mix # 8	2,000	500	10	100
Additional Requested Compound(s) Mix	2,000	500	10	100
Pyridines Mixture	2,000	500	10	100
1,2,3-Trichlorobenzene	1,000	1,000	10	100
1,3,5-Trichlorobenzene	1,000	1,000	10	100
Butyl Stearate	10,000	200	10	200
Pentachlorophenol	1,000	1,000	10	100
B/N Surrogate Standard Mix	5,000	200	10	100
Acid Surrogate Standard Mix	7,500	134	10	100.5

Table 7A – Intermediate Calibration Standard Solution -SIM				
Stock Solution	**Stock Conc., µg/ml**	**Volume Added, µl**	**Final Vol. in $MeCl_2$, ml**	**Final Conc. µg/ml**
Semivolatile Standard Mix # 1	2,000	500	10	100
Semivolatile Standard Mix # 2	2,000	500	10	100
PAH Mixture #2	2,000	500	10	100
Semivolatile Standard Mix # 8 (Acids)	2,000	2,500	10	500
Additional Requested Compound(s) Mix	2,000	500	10	100
B/N Surrogate Standard Mix	5,000	200	10	100
Acid Surrogate Standard Mix (Full Scan)	7500	66.7	10	500

Table 7B – Initial Calibration Standards Preparation Scheme						
Standard Solution	**Intermediate Conc., µg/ml**	**Intermediate added, µl Full Scan**	**Intermediate added, µl SIM**	**Final Volume in $MeCl_2$, ml**	**Final Conc., µg/ml – Full Scan**	**Final Conc., µg/ml – SIM Scan**
STD 1	100	1,000	150	1	100	15/75 (Acids)
STD 2	100	800	100	1	80	10/50 (Acids)
STD 3	100	500	50	1	50	5/25 (Acids)
STD 4	100	250	25	1	25	2.5/12/5 (Acids)
STD 5	100	200	10	1	20	1/5 (Acids)
STD 6	100/10 (SIM)	100	20	1	10	0.2/1 (Acids)
STD 7	100	50	10	1	5	
STD 8	100	20	-	1	2	-

Table 7C – Second Source Calibration Check Standard				
Intermediate	**Intermediate Conc., µg/ml**	**Volume Used, µl (Full/SIM)**	**Final Volume in Acetone, ml**	**Final Conc., µg/ml (Full/SIM)**
Base Neutrals Mixture	100	500/ 50	1	50/ 5
Acid Mixture	100	500/ 50	1	50/ 5

Table 8a –Selected Ion Monitoring: Masses and Dwell Times		
Compound	**Mass Ion (m/z)**	**Dwell Time (ms)**
Acenaphthene	153, 152, 154	50
Acenaphthylene	152, 151, 153	50
Anthracene	178, 176, 179	50
Benzo(a)anthracene	228, 229, 226	50
Benzo(a)pyrene	252, 253, 125	50
Benzo(b)fluoranthene	252, 253	50
Benzo(g,h,i)perylene	276, 138, 277	50
Benzo(k)fluoranthene	252, 125	50
Chrysene	228, 226, 229	50
Dibenzo(a,h)anthracene	278, 139, 279	50
Fluoranthene	202, 101, 203	50
Fluorene	166, 165, 167	50
Indeno(1,2,3-cd)pyrene	276, 277, 138	50
Naphthalene	128, 129, 127	50
Phenanthrene	178, 179, 176	50
Pyrene	202, 203	50
2-Methyl Naphthalene	142, 141, 115	50
Bis-(2-chloro-ethyl)ether	93, 63, 95	50
Pentachlorophenol	266, 264	50
Hexachlorobutadiene	225, 223, 227	50
1,2-Diphenylhydrazine	77, 105, 182	50
Bis(2-ethylhexylphthalate	149, 167, 279	50
Di-n-octyl phthalate	149, 150, 43	50
Hexachlorobenzene	284, 286	50
2-Fluorophenol	112, 64, 63	50
Phenol-d5	99, 42	50
Nitrobenzene-d5	82, 128	50
2-Fluorobiphenyl	172, 171, 170	50
2,4,6-Tribromophenol	330, 332, 334	50
Terphenyl-d14	244, 122	50

Table 9. REPORTING LIMITS

Compound	Water	Soil	Compound	Water	Soil
	µg/l	µg/kg		µg/l	µg/kg
Benzoic Acid	20	667	Carbazole	5	167
2-Chlorophenol	5	167	Chlorobenzilate	5	167
4-Chloro-3-methylphenol	5	167	Chrysene	5	167
2,4-Dichlorophenol	5	167	bis(2-Chloroethoxy)methane	5	167
2,4-Dimethlyphenol	5	167	bis(2-Chloroethyl)ether	5	167
2,4-Dinitrophenol	20	667	Bis(2-Chloroisopropyl)ether	5	167
4,6-Dinitro-o-cresol	20	667	4-Chlorophenyl phenyl ether	5	167
Dinoseb	5	167	1,2-Dichlorobenzene	5	167
2-Methylphenol	5	167	1,3-Dichlorobenzene	5	167
4-Methylphenol	5	167	1,4-Dichlorobenzene	5	167
2-Nitrophenol	5	167	2,4-Dinitrotoluene	5	167
4-Nitrophenol	20	667	2,6-Dinitrotoluene	5	167
Pentachlorophenol	20	667	3,3'-Dichlorobenzidine	5	167
Phenol	5	167	3,3’-Dimethylbenzidine	5	167
2,3,4,6-Tetrachlorophenol	5	167	7,12-Dimethylbenz(a)anthracene	5	167
2,4,5-Trichlorophenol	5	167	Diallate	5	167
2,4,6-Trichlorophenol	5	167	Dibenzo(a,h)anthracene	5	167
2-Acetylaminofluorene	5	167	Dibenzofuran	5	167
4-Aminobiphenyl	5	167	Dimethoate	5	167
Acenaphthene	5	167	Diphenylamine	5	167
Acenaphthylene	5	167	Disulfuton	5	167
Acetophenone	5	167	m-Dinitrobenzene	5	167
Aniline	2	67	p-(Dimethylamine)azobenzene	5	167
Anthracene	5	167	Di-n-butyl phthalate	5	167
Aramite	5	167	Di-n-octyl phthalate	5	167
A,A-Dimethylphenethylamine	5	167	Diethyl phthalate	5	167
Benzo(a)anthracene	5	167	Dimethyl phthalate	5	167
Benzo(a)pyrene	5	167	bis(2-Ethylhexyl)phthalate	5	167
Benzo(b)fluoranthene	5	167	Ethyl methansulfonate	5	167
Benzo(g,h,i)perylene	5	167	Famphur	5	167
Benzo (k)fluoranthene	5	167	Fluoranthene	5	167
4-Bromophenyl phenyl ether	5	167	Fluorene	5	167
Butyl benzyl phthalate	5	167	Hexachlorobenzene	5	167
Benzyl Alcohol	5	167	Hexachlorobutadiene	5	167
2-Chloronaphthalene	5	167	Hexachlorocyclopentadiene	20	667
4-Chloroaniline	5	167	Hexahloroethane	5	167

Compound	Water	Soil	Compound	Water	Soil
	µg/l	µg/kg		µg/l	µg/kg
Hexachlorophene	5	167	N-Nitrosodiethylamine	5	167
Hexachloropropene	5	167	N-Nitrosodiphenylamine	5	167
Indeno(1,2,3-cd)pyrene	5	167	N-Nitrosomethylethylamine	5	167
Isodrin	5	167	N-Nitrosomorpholine	5	167
Isophorone	5	167	N-Nitrosopiperidine	5	167
Isosafrole	5	167	N-Nitrosopyrrolidine	5	167
Kepone	5	167	O,O,O Triethylphosphorothioat	5	167
2-Methylnaphthalene	5	167	2-Picoline	5	167
3-Methylcholanthene	5	167	Parathion	5	167
Methapyrilene	5	167	Pentachlorobenzene	5	167
Methyl Methanesulfonate	5	167	Pentachloronitrobenzene	5	167
Methyl Parathion	5	167	Phenacetin	5	167
1,4 Naphthoquinone	5	167	Phenanthrene	2	67
1-Naphthylamine	5	167	Phorate	5	167
2-Naphthylamine	5	167	Pronamide	5	167
2-Nitroaniline	5	167	Pyrene	2	67
3-Nitroaniline	5	167	Pyridine	2	67
4-Nitroaniline	5	167	p-Phenylenediamine	5	167
5-Nitro-o-toluidine	5	167	Safrole	5	167
Naphthalene	5	167	1,2,4,5 Tetrachlorobenzene	5	167
Nitrobenzene	5	167	1,2,4-Trichlorobenzene	2	67
n-Nitrosodimethylamine	2	67	Thionazin	5	167
4-Nitroquinoline-1-Oxide	10	333	o-Toluidine	5	167
N-Nitroso-di-n-propylamine	2	33	sym-Trinitrobenzene	5	167
N-Nitrosodi-n-butylamine	5	167	Tetraethyl dithiopyrophosphate	5	167

Table 10. Selected Ion Monitoring Reporting Limits

Compound	Water	Soil	Compound	Water	Soil
	µg/l	µg/kg		µg/l	µg/kg
Pentachlorophenol	1.0	33	Fluoranthene	0.2	3.3
Acenaphthene	0.2	6.6	Fluorene	0.2	6.6
Acenaphthylene	0.2	6.6	Hexachlorobenzene	0.2	6.6
Anthracene	0.2	6.6	Hexachlorobutadiene	0.2	6.6
Benzo(a)anthracene	0.2	6.6	Indeno(1,2,3-cd)pyrene	0.2	6.6
Benzo(a)pyrene	0.2	6.6	2-Methylnaphthalene	0.2	6.6
Benzo(b)fluoranthene	0.2	6.6	Naphthalene	0.2	6.6
Benzo(g,h,i)perylene	0.2	6.6	Phenanthrene	0.2	6.6
Benzo (k)fluoranthene	0.2	6.6	Pyrene	0.2	6.6
Chrysene	0.2	6.6	bis(2-Chloroethyl)ether	0.2	6.6
Dibenzo(a,h)anthracene	0.2	6.6	Bis (2-ethylhexyl) phthalate	0.2	6.6

1,2-Diphenylhydrazine	0.2	6.6	Di-n-octyl phthalate	0.2	6.6

APPENDIX D: CONTAMINATED MATERIALS MANAGEMENT PLAN (APPENDIX A TO THE JUNE 2010 RDRAWP)

Contaminated Materials Management Plan

Former Mobil Terminal Property
Hastings-on-Hudson, New York
Former Tappan Terminal
Site No. 3-60-015

206925.03
ExxonMobil Former Tappan Terminal
June 15, 2010

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1. INTRODUCTION

This Contaminated Materials Management Plan (CMMP) has been prepared for the former Mobil terminal property at the Tappan Terminal Site, located in Hastings-on-Hudson, New York (the "Site"). The CMMP is a companion document to the Remedial Design/Remedial Action Work Plan (the Work Plan), dated June 15, 2010. The proposed Site work includes the rubblizing of several onsite remnant concrete structures, sampling of subsurface soils, removal of any grossly contaminated soils as defined in the Work Plan, removal of any piping encountered during the Site work, and restoring excavations. A portion of the removed material (soil and piping) will require removal offsite. It is anticipated that all concrete structures will be rubblized and left in place. Any concrete required to be removed to gain access to underlying soils will be stockpiled onsite until the remedial work is complete and then returned to the area from which it came. This CMMP addresses procedures for the proper management of wastes generated during Site work.

1.1 OBJECTIVES

This CMMP will address the handling, storage, characterization, transportation, and off-site recycling, treatment or disposal of waste materials to be conducted in accordance with applicable federal, state and local regulations. In addition dust suppression, stockpile management, dewatering and decontamination procedures are addressed.

1.2 RESPONSIBILITIES

The Contractor conducting the Site work shall be responsible for understanding the contents of this CMMP and adhering to all requirements stated herein. The Contractor shall also comply with the direction of ExxonMobil's Environmental Professional in the field with regard to the identification, characterization, handling and management of contaminated or potentially contaminated materials. The Contractor's responsibilities shall include, but not be limited to the following:

- Responsible for all removal, handling, management, transportation and disposal of contaminated and potentially contaminated soil, concrete, structures and other materials in accordance with this CMMP.
- Establish and maintain contaminated and potentially contaminated material stockpiles in accordance with Section 5 of this CMMP.
- To notify the ExxonMobil's Environmental Professional of all fill sources to be used for the project. No fill materials shall be brought onsite until the ExxonMobil's Environmental Professional has reviewed and approved it for use as fill.
- Construct a decontamination pad in accordance with Section 7 of this CMMP prior to the start to Site work.
- Responsible for decontamination of equipment in accordance with Section 7.
- Manage decontamination wastewater generated during the course of the Site work in accordance with Section 9.
- Conduct excavation dewatering as necessary in accordance with Section 8.
- Provide ExxonMobil's Environmental Professional with disposal/recycling documentation for all contaminated or potentially contaminated material disposed offsite.

The ExxonMobil's Environmental Professional will provide a field representative who will be present in the field to observe the soil excavation and test pitting activities. He/she shall be responsible for the identification of contaminated or potentially contaminated materials in accordance with the protocols contained in the Work Plan, including any sampling or other characterization activities. He/she will also be responsible for directing the segregation and stockpiling of contaminated and potentially contaminated materials in accordance with the CMMP.

The specific responsibilities of the Environmental Professional's field representative will be:

- To observe the Site work as it proceeds and identify contaminated and potentially contaminated materials.
- To observe the removal and management of contaminated and potentially contaminated materials.
- To dictate the segregation of contaminated and potentially contaminated materials.
- To sample and analyze contaminated and potentially contaminated materials insitu or in stockpiles/staging areas to identify contaminants and concentrations as necessary.
- To review documentation of all proposed clean fill material identified by the Contractor before it is brought onsite. No fill materials shall be brought onsite until ExxonMobil's Environmental Professional has approved it for use as fill.
- To maintain a field log book and to record relevant observations and information.
- To conduct site boundary air monitoring as warranted.
- To calibrate and maintain the field screening equipment used during the project.
- To collect and manage documentation of contaminated waste disposal and/or onsite placement, as relevant.

2. EXCAVATION AND STRUCTURE REMOVAL PROCEDURES

All activities associated with the excavation or removal of contaminated or potentially contaminated concrete, soil, piping or structures shall be conducted in accordance with the procedures outlined in this CMMP. The Environmental Professional's field representative shall be present to observe all surface and subsurface Site work to the extent necessary to confirm compliance with this CMMP.

3. DUST SUPPRESSION

The Contractor shall control dust and air-borne materials generated during the Site work to protect the health of onsite workers and to minimize the release of dust into the surrounding area. General Site dust control (e.g. roadways, uncovered soils, rubblized concrete) shall be conducted using a water truck or other approved devices capable of applying a uniform spray of water. This spray shall be applied so as to minimize the amount of runoff water generated. A suitable device for regulating the flow and positive shutoff of water shall be provided by the Contractor.

Stockpiles of contaminated and potentially contaminated materials shall be maintained in a covered condition at all times when not in active construction/removal to minimize wind-blown dust as specified

in Section 5. Dust generated from the disturbance or handling of contaminated or potentially contaminated materials will be controlled to the satisfaction of the Environmental Professional's field representative.

4. EXCAVATED MATERIALS MANAGEMENT

Contaminated or potentially contaminated material that is disturbed, excavated or removed shall be initially managed (i.e. segregated, screened and stockpiled) as directed by the Environmental Professional's field representative. Any soil or other material that does not meet criteria for onsite re-use shall be considered a waste. Any subsurface structures/utilities and any non-soil material (e.g. wood, bricks, sediment) generated during the excavation that cannot be reused onsite, shall be considered waste and handled in accordance with this CMMP.

4.1 SOIL

Soils will be segregated based on visual observation and field testing as outlined in the Work Plan and proposed for re-use or disposal. Soils with documented or suspected contamination shall be stockpiled and managed adjacent to the excavation, or transported to a designated onsite area for stockpiling or loading into DOT-approved containers. The most efficient and cost effective method of onsite storage shall be evaluated based on the available capacity of onsite storage areas, the type and amount of contamination present, weather conditions, and the volume of material being managed. Stockpile management will be conducted as described in Section 5 and container management will be conducted as described in Section 6.

Soil will not be transported offsite for disposal until the results of the waste characterization (see Section 10) have been reviewed and the material has been properly classified. Offsite recycling, treatment and/or disposal destinations for these materials will be arranged for in accordance with applicable regulations as described in Section 11.

4.2 PIPES, CONDUITS, STRUCTURES

Pipes, conduits and other structures encountered during the Site work shall be removed as specified in the Work Plan. If these items are suspected by the Environmental Professional's field representative to be potentially contaminated, the items shall be handled at his/her direction in accordance with the Work Plan. Pipe, conduits or structures containing liquid, sediment or sludge of unknown contents shall be handled so as to minimize breakage and contain the material. Prior to moving the structures, intact pipes shall be tapped and drained with the contents containerized and managed in accordance with Section 6. If the pipe cannot be drained, the pipe ends shall be sealed with 6 mil polyethylene sheeting and duct tape, or equivalent, to contain the contents in the pipes. The sealed pipes shall be stockpiled on polyethylene sheeting until the pipe can be cleaned in the Decontamination Pad (Section 7).

At the Decontamination Pad, items shall be cleaned with a biodegradable detergent, such as Simple Green, and triple rinsed. Then the items shall be stockpiled by material type pending arrangements for transportation and offsite recycling. Wastewater shall be handled in accordance with Section 9.

5. STOCKPILE MANAGEMENT

All waste solid materials that are not placed in containers shall be managed in stockpiles either adjacent to the excavations, in staging areas in close proximity to the excavations, or in other staging areas, depending upon the excavation sequencing and access limitations around the excavations. In all cases, general stockpile management procedures listed below shall be followed for all contaminated or potentially contaminated materials:

- The stockpile staging area(s) shall be prepared prior to excavation.
- Stockpiles shall be placed no closer than 2 feet from the edge of an excavation.
- No stockpile shall be located where access to a work area by emergency equipment would be prevented.
- Stockpile area(s) shall be clearly delineated in order to prevent possible exposure to workers at the Site.
- Each stockpile of material shall be labeled to identify the area from which the materials were removed and the date on which the material was first placed in the stockpile. These markers shall remain in place until the material is ready for backfilling or transportation for offsite recycling or disposal.
- The following materials shall be stockpiled and covered by a single layer of 6 mil (minimum) polyethylene sheeting: soils excavated from non-suspect areas; subsurface structures/utilities not suspected to be contaminated; and other non-soil materials not managed in containers, including asphalt, uncontaminated concrete, rocks, and other debris.
- Contaminated or potentially contaminated materials shall be placed on two layers of 6 mil (minimum) polyethylene sheeting, bermed, and covered with one layer of 6 mil (minimum) polyethylene sheeting.
- No excavated contaminated or potentially contaminated material is to be left uncovered or unsecured at the end of the work day. The polyethylene sheeting cover shall be secured with either hay bales, sand berms, tires, rope, or other method sufficient to withstand a sustained wind of up to 25 mph. The stockpiled material shall be kept covered at all times, except for a stockpile to which material is being added to or removed from on a particular day, to prevent formation of leachate from rainwater and the generation of dust on dry windy days. The plastic covers shall be inspected daily to evaluate whether the cover remains intact (i.e., cannot be blown off). Repairs to the covers and berms shall be made as necessary to maintain the stockpiles in good condition and to prevent contact with stormwater or blowing of the stockpiled material.
- Sediment and erosion control measures shall be in place prior to stockpiling and shall be maintained until the stockpiles have been removed.
- Separate stockpiles shall be maintained for each type of material.
- The Environmental Professional's field representative will be responsible for evaluating whether a material is contaminated and the nature of the contamination, and directing stockpile segregation. For materials that are to be transported and disposed of at an off-site facility, the Professional's field representative will be responsible to comply with any characterization requirements of the disposal facility.
- Unless specific knowledge indicates otherwise, all stockpiled materials shall be managed as non-hazardous until characterization is completed. Upon completion of characterization, any

necessary adjustments shall be made to meet applicable labeling, handling, and storage requirements.

6. CONTAINER AND TANK MANAGEMENT

Waste solid materials that are not stockpiled, and liquids and other waste materials generated (e.g., utility/structure contents, decontamination water, excavation water, and supplies used in the handling of contaminated materials that can't be disposed of with their associated materials) shall be placed in containers and/or tanks. These containers/tanks shall be stored in staging area(s), but may be temporarily staged in areas in close proximity to the excavations/activities generating the waste (depending upon the excavation sequencing and access and/or available space limitations at the Site) prior to being moved to a waste management area. The general container/tank management procedures listed below shall be followed:

- All empty containers (drums, tanks, roll-offs) shall be visually inspected upon arrival at the Site to determine that the containers are clean and in good condition. Containers that have residual material or are in poor condition (i.e., rusted) will not be used.
- Container management areas shall be constructed on stable surfaces (i.e., sufficient distance from open excavations). The Contractor shall be responsible for overseeing container storage, for instructing workers on requirements and prohibitions, and for exercising controls sufficient to achieve compliance.
- Materials shall be segregated into containers based on contaminant and material.
- Decontamination fluids and groundwater from dewatering operations may be held in separate containers/tanks based on suspected contamination as determined by the Environmental Professional's field representative.
- All liquid storage containers/tanks in staging areas will be managed to minimize the risk of spillage to the ground. Transferring of liquids to or between drums, containers, or tanks shall be conducted over a secondary containment structure (polyethylene sheeting) unless in an emergency situation. Any spill or release shall be immediately cleaned up to the satisfaction of the Environmental Professional's field representative.
- All containers/tanks shall be labeled as to their contents and satisfy the applicable regulatory requirements for the materials being stored. At a minimum, the label shall identify the contents of the container, the source location of the contents, and the date on which material was first placed in the container.
- All containers shall remain closed at all times except when material is being added or removed from them. Storage containers shall be used that are structurally compatible with the material stored and designed to prevent direct contact between the materials and the elements. Open top containers, such as roll-offs, will be covered with either an integral cover or one layer of 6 mil (minimum) polyethylene sheeting sloped to provide positive drainage of stormwater off of the cover. For short-term outdoor storage, this may be accomplished by the container alone, whereas the use of tarps or other suitable coverage may be used for long term outdoor storage. In the event rainwater accumulates inside roll-offs or other containers used for storing solid materials, the water will be pumped out and handled similarly to excavation water (see Sections 8 and 9). Roll-offs containing free liquids shall not be allowed offsite.

- The Environmental Professional's field representative shall conduct characterization of any containerized materials in accordance with disposal facility requirements.

7. DECONTAMINATION

7.1 EQUIPMENT DECONTAMINATION

All equipment used for excavation and/or handling of contaminated or potentially contaminated materials shall be cleaned/decontaminated between uses at different areas of the Site, and/or prior to removal from the Site. The purpose of equipment cleaning/decontamination is to reduce the likelihood of cross-contamination (i.e., transport of potential contaminants) between work areas and/or off of the Site. This shall include excavator buckets, loader blades, tracks and undercarriage and any other parts of the equipment that could reasonably be expected to be contaminated, truck tires, and hand tools. As much dirt/material as possible shall be scraped and removed from the equipment before moving it from the contaminated area where it was in use. The equipment will then be steam cleaned prior to subsequent use or transport offsite.

7.2 ESTABLISHMENT AND MAINTENANCE OF DECONTAMINATION PAD

The Contractor shall be responsible for establishing and maintaining a decontamination pad for heavy equipment. The decontamination pad shall be constructed in an area of the Site approved by the Contractor and that meets the following criteria:

- free from Site traffic
- available throughout the duration of the project
- away from work areas
- readily accessible

The design and construction of the decontamination pad shall be subject to the approval of the Environmental Professional's field representative, and shall meet or exceed the following design criteria:

- The base shall consist of multiple sheets of polyethylene liner or equivalent with a minimum 12-inch high supported perimeter berm.
- The pad shall be of adequate size to accommodate the width and length of the largest piece of equipment that will come into contact with the impacted material.
- The pad will be sloped to a low point water-tight sump for collection of decontamination water. During periods of precipitation, the decontamination pad will be covered with an impermeable tarp to divert stormwater runoff from the surface of the pad.
- Following completion of project activities requiring the use of the decontamination pad, the pad will be removed and all pad materials properly disposed.

The contractor shall maintain a water source at the decontamination pad to provide an adequate volume of clean water for equipment decontamination. Equipment decontamination will be conducted using a power washing unit capable of cleaning the largest piece of equipment in use on the Site.

In addition to the decontamination pad described above, remote decontamination of excavation equipment may be performed at or near the excavation locations where excavation equipment is used. This will be accomplished using a steam cleaner and an appropriate container for collection of decontamination water. Collected decontamination water shall be containerized and managed in accordance with Section 9

Liquids (wash water) and sediments or sludges removed during cleaning shall be pumped or drained from the decontamination pad and collected in either U.S. Department of Transportation (DOT)-approved 55-gallon drums (solids and/or liquids) or holding tanks (liquids only). To the extent possible, the amount of liquids in the sludge collection drums shall be kept to a minimum. Any disposable cleaning items (i.e., single use rags, mops, brushes) shall be decontaminated (as appropriate), collected in sealed plastic bags (with the bags labeled as to contents), and placed in DOT-approved containers. The containers of decontamination liquids and sludges shall be managed as described in Section 6.

The Environmental Professional's field representative shall be responsible for collecting and analyzing samples of the containerized wash water and arranging for appropriate disposal.

8. DEWATERING

Dewatering of excavations may be required during the Site work. If dewatering is necessary, the Contractor shall provide appropriate pumps, hoses, and drums, tanks or other suitable containers as required based on the estimated volume of water to be managed. Dewatering shall be conducted so as to minimize the amount of sediment in the water. Water generated by dewatering operations shall be containerized until it can be characterized and the proper method of disposal determined in accordance with Section 9.

9. WASTEWATER MANAGEMENT

Wastewater that may potentially be generated during the work includes:

- Groundwater removed from excavations; and
- Decontamination fluids and wastewater from the decontamination pad.

Wastewater streams shall be containerized and maintained based on the anticipated wastewater content. Wastewater streams that would require different protocols for treatment or disposal shall not be mixed. The wastewater containers shall be managed as described in Section 6.

If it is anticipated that onsite treatment and disposal (to the public sanitary sewer or a surface water body) of all or a portion of the containerized water will occur, ExxonMobil's Environmental Professional shall be responsible for obtaining all necessary approvals, treatment equipment and discharge permits prior to initiation of the treatment and/or discharge.

10. WASTE CHARACTERIZATION

All contaminated waste materials designated for disposal shall be characterized to determine the proper handling and disposition procedures for the materials. Materials will be characterized based on one or more of the following data items:

- Available analytical results from the in place materials prior to removal;
- Analytical results for additional samples collected from stockpiles, tanks, or containers to characterize waste in accordance with applicable regulations and the requirements of the offsite recycling, treatment, and/or disposal facility to receive the waste.

The number of samples and analytical testing parameters for the purpose of waste characterization will vary depending upon the specific waste material, previous analytical testing, suspected contaminants, and the specific destination facility requirements.

Sample identification, chain of custody procedures, data management, and tracking for waste characterization samples will be conducted in accordance with the applicable laws, regulations, and standards of practice.

The stockpiles and containers of materials which require characterization sampling and analysis shall be sampled at a minimum frequency of one sample for every type of segregated material, or at the frequency required by the destination recycling, treatment, and/or disposal facility. Composite and/or discrete samples shall be collected from the materials in the stockpile(s)/container(s) following an appropriate protocol. All analyses shall be conducted in a manner consistent with USEPA analytical methods appropriate for the waste.

Based on the results of the waste characterization, the materials shall be classified as either regulated waste or unregulated material in accordance with applicable regulations.

All wastes will initially (prior to waste characterization) be considered and managed as non-hazardous. Based on the results of the waste characterization, the handling and management of some materials may need to be adjusted (i.e., some materials may be classified as regulated waste). If the waste is determined to be a regulated waste, the labels on containers and/or placard identification on stockpiles shall be changed, as necessary, and management procedures modified (e.g., stockpiled hazardous soils will be immediately placed in containers) in accordance with applicable regulations. The resulting classification will also be used to select the appropriate method for transportation, the appropriate documentation requirements, and the recycling, treatment, and/or disposal facility as described in Section 11.

11. OFFSITE RECYCLING, TREATMENT OR DISPOSAL

The handling, transportation, and ultimate disposition of all contaminated waste materials shall be the responsibility of ExxonMobil's Environmental Professional. The information presented in this section should be considered as guidance and does not remove the Contractor's responsibility to comply with all applicable laws, regulations, and standards of practice.

Following contaminated waste characterization, an evaluation shall be conducted to determine the most appropriate offsite transportation and recycling, treatment, and/or disposal options for impacted soil and

wastewater. The disposal facility shall be an approved ExxonMobil vendor and/or meet ExxonMobil's approval prior to the impacted material leaving the Site.

Workers, transportation companies, and recycling, treatment, and/or disposal facilities used for the handling, transport, or disposal of impacted soil and wastewater shall be certified, licensed, insured, and fully capable of handling and/or accepting the impacted materials from the Site. These efforts shall comply with laws, ordinances, rules and regulations of federal, state, and local authorities regarding the handling, storing, transporting, and disposing of these materials. Where specification requirements and referenced documents vary, the most stringent applicable requirement will be applied.

Copies of the waste characterization analysis shall be provided to the destination recycling, treatment, and/or disposal facility for acceptance, if applicable. No transport or disposal of any impacted material shall be conducted until acceptance/approval for the material has been received from the destination facilities.

All roll-off containers and dump trucks will be inspected following loading of the impacted material to ensure that the load is covered and secured. All containers shall be properly loaded, packaged, labeled, placarded, and transported in accordance with applicable federal and state laws and regulations.

All documentation required for the characterization, transportation, and disposal of the impacted materials (i.e., laboratory analytical data, bills of lading, manifests) shall be generated and maintained as required by applicable regulations. Copies of all transport manifests, bills of lading, and certified weigh tickets for recycling and/or disposal of all materials shall be forwarded to ExxonMobil's Environmental Professional. Receipts shall indicate (at a minimum) the following information: date; driver; treatment, recycling, and/or disposal facility; quantity and type of material delivered; and facility permit number (as appropriate). All chain of custody information, including volume or quantity delivered; facility location and phone number; and the method of recycling, treatment, and/or disposal shall be included in the documentation. Certified quantity receipts shall indicate weight of solid wastes in tons and liquid wastes in gallons. A recycling certificate from the recycling firm, if applicable, shall be obtained for all materials processed.

The number of roll-off containers and/or dump trucks which transport excavated materials from the Site will be tracked each day and recorded. All supporting documentation (analytical results, weigh tickets, transportation documentation, certificates of destruction/recycling) will be maintained with the tracking forms.

12. CLOSURE OF WASTE MANAGEMENT AREAS

Following removal of all waste materials from the stockpile and container management area(s), the polyethylene sheeting and materials used for staging and secondary containment shall be removed. Staging and secondary containment materials known or suspected to have come in contact with contaminated materials shall be disposed with the associated materials (if accepted by the destination facility) or placed in DOT-approved containers and characterized by the Environmental Professional's field representative as required by the destination facility.

All waste management areas shall be closed, materials removed, and site restoration completed prior to the dismantling of the decontamination pad. Potentially contaminated materials from the

decontamination pad shall be properly containerized and shipped off-site with other like waste materials. Any remaining non contaminated materials shall be disposed by the Contractor.

APPENDIX E: DRAFT SITE MANAGEMENT PLAN

Former Tappan Terminal, AOC1

Former Mobil Terminal Property
Village of Hastings-on-Hudson, Westchester County, NEW YORK

Site Management Plan

NYSDEC Site Number: 3-60-015

Prepared for:
ExxonMobil Environmental Services Company
38 Varick Street
Brooklyn, NY 11222

Prepared by:
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Revisions to Final Approved Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date

December 2011
Revised July 2012

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1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

1.1 INTRODUCTION

This document is required as an element of the remedial program at The Former Mobil Terminal Property (Former Tappan Terminal AOC1, hereinafter referred to as the "Site") under the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program administered by New York State Department of Environmental Conservation (NYSDEC). The Site was remediated in accordance with Order on Consent No. A3-0612-1208 which was executed on March 14, 2010.

1.1.1 General

ExxonMobil Environmental Services Company (ExxonMobil) entered into an Order on Consent with the NYSDEC to remediate an 8.13 acre property located in the Village of Hastings-on-Hudson, Westchester County, New York. This Order on Consent required the Remedial Party, ExxonMobil, to investigate and remediate contaminated media at the Site. A figure showing the Site location and boundaries of this 8.13-acre Site subject to this plan is provided in Figure 1. The boundaries of the Site are more fully described in the metes and bounds Site description that will be part of the Environmental Easement.

After completion of the remedial work described in the Remedial Action Work Plan, some contamination was left in the subsurface at this Site, which is hereafter referred to as 'remaining contamination." This Site Management Plan (SMP) was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

This SMP was prepared by Woodard & Curran, on behalf of ExxonMobil Environmental Services Company, in accordance with the requirements in NYSDEC Record of Decision, dated September 2006, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the Environmental Easement for the Site.

1.1.2 Purpose

The Site contains contamination left after completion of the remedial action. Engineering Controls have been incorporated into the Site remedy to control exposure to remaining contamination during the use of the Site to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Westchester County Clerk, will require compliance with this SMP and all ECs and ICs placed on the Site. The ICs place restrictions on Site use, and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the Environmental Easement for contamination that remains at the Site. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of all procedures required to manage remaining contamination at the Site after completion of the Remedial Action, including: (1) implementation and management of all Engineering and Institutional Controls; and (2) performance of periodic inspections, certification of results, and submittal of Periodic Review Reports. To address these needs, this SMP includes an Engineering and Institutional Control Plan for implementation and management of EC/ICs.

This plan also includes a description of Periodic Review Reports for the periodic submittal of data, information, recommendations, and certifications to NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the environmental easement, which is grounds for revocation of the Certificate of Completion (COC);

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the Order on Consent No. A3-0612-1208 for the Site, and thereby subject to applicable penalties.

1.1.3 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.2 SITE BACKGROUND

The former Mobil terminal property is 8.13 acres and part of the larger Tappan Terminal site, located on 15 acres along the Hudson River waterfront in the Village of Hastings-on-Hudson, Westchester County, New York. The Tappan Terminal is comprised of two properties, the former Mobil terminal property (the Western Parcel, herein referred to as the "Site"), which is located adjacent to the Hudson River (the subject of this SMP), and the former Uhlich Color Company property (the Eastern Parcel), which is located along the railroad tracks that define the eastern boundary of the Site (not included in this SMP). **Figure 1** shows the location of the Site, and **Figure 2** shows the boundaries and main features of the Western Parcel.

The Site was used as a petroleum distribution terminal from 1961 until Mobil ceased operations on the Site in 1985. The Site has remained vacant since that time. Mobil Oil Corporation (now ExxonMobil Oil Corporation) remains the Site owner. All former buildings and aboveground storage tanks have been removed from the Site. The Site is relatively flat, located on the eastern shore of the Hudson River.

Remedial Activities were conducted and administered on behalf of ExxonMobil by Roux Associates and Woodard & Curran. The selected remedy for the Site included excavation and removal of soil that was grossly contaminated with weathered petroleum, removal of former piping and any other structures as necessary to allow adequate Site grading, and application of a Site cap including a demarcation layer and 24 inches of clean fill. Field work commenced in 2010 is to be completed in 2012.

1.2.1 Site Location and Description

The Site is located in the Village of Hastings-on-Hudson, Westchester County, New York and is identified as Section 10, Sheet 4, Lot 58A on the Town of Greenburgh Tax Map. The Site is an approximately 8.13-acre area bounded by the Hastings-on-Hudson Operable Unit 1 (former ARCO facility) to the north, the Pioneer Boat Club to the south, the Hudson River to the east, and the Former Tappan Terminal AOC2 (the former Uhlich facility) to the west (see Figure 1). The boundaries of the Site will be more fully described in the Environmental Easement.

1.2.2 Site History

The Tappan Terminal has a long history of manufacturing and chemical use by several owners and occupants. The landmass of the Site itself was created by disposal of manmade fill into the Hudson River between 1868 and 1970. This fill material typically consisted of sand and gravel mixed with bricks, concrete, stone, timber, ash, slag, shells, and other debris. Filling progressed on the property between 1920 and 1960. Tappan Tanker Terminal purchased the property in 1961 and began operating a petroleum distribution facility on-site. From 1961 to 1971 waste chemicals were stored on the property prior to open ocean disposal. Mobil Oil Company purchased the Site in 1975 and continued petroleum distribution operations until 1985. The Site has been vacant since that time.

On-site sampling of various media was performed between 1985 and 1989. In 1987, the NYSDEC listed the Site as a Class 2 Site in the Registry of Inactive Hazardous Waste Disposal Sites in New York.

During a 1992 repair of a sewer pipe at the Site, evidence of a petroleum release on both the Mobil and abutting Uhlich properties was discovered. The extent of petroleum contamination was investigated between 1992 and 1994. In 1994, an oil remediation plan was approved by the NYSDEC. Mobil and Uhlich entered into a Stipulation Agreement to remediate this spill.

In 1996 Mobil entered into a Voluntary Agreement with the NYSDEC to investigate petroleum contamination on the Site. Multiple phases of investigation were conducted on-site between 1998 and 2008.

The Tappan Terminal site was the subject of a ROD issued by the NYSDEC Division of Environmental Remediation on September 8, 2006. The ROD addressed both the Mobil and Uhlich properties. This report addresses only soil issues on the western Mobil property of the Tappan Terminal site (AOC 1).

The NYSDEC issued Order on Consent No. A3-0612-1208 effective March 14, 2010.

1.2.3 Geologic Conditions

The Tappan Terminal property is underlain by four geologic units, the upper fill layer, the Marine Grey Silt, the Basal Sand unit, and bedrock. The upper fill layer ranges from 11 to 32 feet in thickness, and consists of sand, silt and gravel variably mixed with ash, slag, glass, metal debris, wood, crushed stone, paper, coal, sawdust and brick fragments. This material is typical of historic waterfront fill material deposited during the late 19th and early 20th centuries. The historic fill is considered to be relatively permeable; however, intermediate bulkheads were built in stages along the shoreline as filling proceeded. These bulkheads are now buried beneath the property, and in some places act to restrict the flow of groundwater towards the river.

Groundwater flows through the fill layer from east to west and discharges to the Hudson River, subject to the tide stage of the river. At high tide, the groundwater flow direction reverses along the immediate shoreline and water enters the Site from the river. Generally, tidal fluctuations in the river affect groundwater levels within 100 feet of the shoreline. Site groundwater is generally 2 to 7 feet below grade and quality is influenced by the influx of river/ocean water during tidal cycles.

Beneath the fill unit lies the Marine Grey Silt unit that represents the historic sediment of the Hudson River. This unit consists of grey to black silt with a trace of fine sand and layers of shell fragments. The Marine Grey Silt is at least 8 feet thick beneath the property, and

ranges from 10 to 62 feet thick in the local area. The silt unit acts as a confining layer. This unit is believed to be continuous beneath the Site.

The Basal Sand Unit that underlies the silt layer consists of permeable, medium to coarse sands and gravels. Although this unit was not investigated at the Tappan Terminal site, measurements in the vicinity indicate that the Basal Sand Unit is a confined aquifer under artesian conditions. That is, groundwater pressure in the Basal Sand is greater than in the fill unit, and flow would be upward in the absence of the confining silt unit.

The underlying bedrock in the area is reported to be either Inwood Marble or Fordham Gneiss at 50 to 100 feet below grade.

1.3 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

A Remedial Investigation (RI) was performed to characterize the nature and extent of contamination at the Site. The results of the RI are described in detail in the "Remedial Investigation Report, Tappan Terminal Site"; Dvirka and Bartilucci Consulting Engineers; Syracuse, NY; September 1999.

Generally, the RI determined that the contaminants of concern included Semivolatile Organic Compounds (SVOCs), Total Petroleum Hydrocarbons (TPH), and metals: arsenic, beryllium, copper, mercury, nickel and zinc. The metals were found throughout the surface and subsurface fill, and are commonly associated with historic fill containing ash and furnace slag.

The potential exposure pathways for soil related to current use or development of the Site include:

- Inhalation of contaminated dust or vapors by workers during on-site excavation activities;

- Inhalation of contaminated vapors in indoor air by future occupants of buildings that may be constructed on the Site;

- Incidental ingestion of contaminated soil by on-site workers or recreational users of the Site;

- Dermal contact with contaminated soil by workers or recreation users; and

- Exposure of wildlife to contaminants in Site surface soils.

Below is a summary of Site conditions when the RI was performed in 1998 and 1999:

Soil

Levels of SVOCs were generally lower in subsurface soils than in surface soils with one notable exception at location SB-3, on the Mobil property, where a thick, oil-like material was encountered that exhibited a strong petroleum odor. Samples from that location contained many TICs that were identified generally as hydrocarbon SVOCs, which is consistent with the presence of a residual petroleum product.

PCBs were found to slightly exceed the1 ppm cleanup guideline in 8 surface soil samples, mostly located along the Harbor at Hastings site boundary and the access road that formerly connected the properties. The highest detected concentration was 5 ppm of combined Aroclors 1254 and 1260at a location along the Harbor at Hastings property boundary.

The volatile organic compounds (VOCs) of concern in soils were all found in subsurface soil samples. These include chlorobenzene, which was found centrally to the Former Tappan Terminal eastern/western (Mobil/Uhlich) properties at a maximum value of 31 ppm, compared to its cleanup guideline of 1.7 ppm.

Throughout the Site, beryllium, copper, mercury and zinc were found at levels exceeding their cleanup guidelines in subsurface soil.

Groundwater

The highest levels of chlorobenzene in groundwater were found near the suspected source area along the abandoned sewer line that runs along the approximate Mobil/Uhlich property line. In these areas, chlorobenzene was found at concentrations up to 11,000 ppb with a groundwater standard for chlorobenzene of 5 ppb.

Within the chlorobenzene plume, in the area of the abandoned sewer line, is an area of benzene groundwater contamination. In this area, concentrations range from 5 ppb to 170 ppb, compared to the SCG of 1 ppb. Also within the chlorobenzene plume are zones of naphthalene, chlorophenol, 4-chloroaniline, and dichlorobenzene contamination. The maximum levels of these contaminants are 650 ppb of naphthalene, 61 ppb of 2-chlorophenol, 25 ppm of 4-chloroaniline, and 170 ppb of 1,4-dichlorobenzene, compared to their SCGs of 10 ppb, 3 ppb, 5 ppb and 1 ppb, respectively.

Metal contaminants were found at greater frequencies and higher concentrations in unfiltered samples compared to filtered samples. This indicates that, to some degree, metals are present in particulate rather than dissolved form. Iron and manganese were found to exceed their SCGs in a high percentage (68% to 79%) of filtered samples taken from the Site. Barium, antimony and selenium were found to exceed their SCGs in 26% to 37% of filtered samples. Concentrations of lead and copper in only one well (OW-17) exceeded their SCGs. At this location, along the Mobil/Uhlich property line and sewer line, lead and copper were 261 ppb and 506 ppm, compared to their respective water quality standards of 25 ppb and 200 ppb.

1.4 SUMMARY OF REMEDIAL ACTIONS

The Site was remediated in accordance with the NYSDEC Record of Decision and Remedial Design/Remedial Action Work Plan dated July 2012. The following is a summary of the Remedial Actions performed per the selected remedy for the Site (Former Tappan Terminal AOC1):

1. Excavation and removal of soil/fill that was grossly contaminated with weathered petroleum.

2. Removal of former piping and any other structures as necessary to allow adequate Site grading.

3. Construction and maintenance of a soil cover system consisting a demarcation layer and 24 inches of clean soil to support re-vegetation and to prevent human exposure to remaining contaminated soil/fill remaining at the Site.

4. Execution and recording of an Environmental Easement to restrict land use and prevent future exposure to any contamination remaining at the Site.

5. Institutional Controls including:

- The property may only be used for non-residential (commercial, light industrial, or recreational) use provided that the long-term Engineering and Institutional Controls included in this SMP are employed.

- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with this SMP;

- The use of the groundwater underlying the property is prohibited;

- The potential for vapor intrusion must be evaluated for any buildings developed on-site and any potential impacts that are identified must be monitored or mitigated; and

- Vegetable gardens and farming on the property are prohibited

6. Development and implementation of a Site Management Plan for long term management of remaining contamination as required by the Environmental Easement, which includes plans for: (1) Institutional and Engineering Controls, (2) inspections, (3) maintenance and (4) reporting;

Remedial activities are to be completed at the Site in 2012. *Note: Groundwater remediation will be conducted under AOC3 and governed by a separate SMP.*

1.4.1 Removal of Contaminated Materials from the Site

Approximately 950 cubic yards of grossly contaminated soil as determined by field and laboratory screening were removed from the AOC1 excavation area near well OW-5A (refer to Figure 3). All soil confirmation samples were in compliance with the ROD-specific criterion for Total SVOCs of 500 ppm, with results ranging from 0.57 to 53 ppm Total SVOCs. Various miscellaneous items were removed from the Site in preparation of the final

remedy and future redevelopment. Removal of derelict boats related to the former Pioneer Boat Club south of the Site was completed. Demolition of the former terminal dock was completed. Two roll-offs of scrap metal for recycling were removed.

1.4.2 Site-Related Treatment Systems

AOC3 includes a treatment system for groundwater as part of the Former Tappan Terminal site remedy and will be governed by a separate SMP.

1.4.3 Remaining Contamination

Soil confirmation samples were in compliance with the ROD-specific criterion for Total SVOCs of 500 ppm, and results ranged from 0.57 to 53 ppm Total SVOCs. Refer to Section 1.3 for additional information on contaminants potentially to be found on-site. The Site is to be overlain by a two foot cap with orange snow fence and concrete pads at an approximate depth of two feet below grade that demark the bottom of the cap and location of Site material that may potentially be impacted.

2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN

2.1 INTRODUCTION

2.1.1 General

Since remaining contaminated soil and groundwater/soil vapor potentially exists beneath the Site, Engineering Controls and Institutional Controls (EC/ICs) are required to protect human health and the environment. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of all EC/ICs at the Site. The EC/IC Plan is one component of the SMP and is subject to revision by NYSDEC.

2.1.2 Purpose

This plan provides:

- A description of all EC/ICs on the Site;
- The basic implementation and intended role of each EC/IC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the features to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site; and
- Any other provisions necessary to identify or establish methods for implementing the EC/ICs required by the Site remedy, as determined by the NYSDEC.

2.2 ENGINEERING CONTROLS

Exposure to remaining contamination in soil/fill at the Site is to be prevented by a soil cover system placed over the Site. This cover system is to be comprised of a minimum of 24 inches of clean soil. The Excavation Work Plan that appears in Appendix A outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection and maintenance of this cover are provided in the Monitoring Plan included in Section 4 of this SMP. The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity.

2.3 INSTITUTIONAL CONTROLS

A series of Institutional Controls is required by the ROD to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (3) limit the use and development of the Site to non-Residential uses only. Adherence to these Institutional Controls on the Site is required by the Environmental Easement and will be implemented under this Site Management Plan. These Institutional Controls are:

- Compliance with the Environmental Easement and this SMP by the Grantor and the Grantor's successors and assigns;
- All Engineering Controls must be maintained as specified in this SMP;
- All Engineering Controls on the Controlled Property must be inspected at a frequency and in a manner defined in the SMP.
- Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in this SMP;

Institutional Controls identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The Site has a series of Institutional Controls in the form of Site restrictions. Adherence to these Institutional Controls is required by the Environmental Easement. Site restrictions that apply to the Controlled Property are:

- The property may only be used for non-residential (commercial, light industrial, or recreational) use provided that the long-term Engineering and Institutional Controls included in this SMP are employed.

- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with this SMP;

- The use of the groundwater underlying the property is prohibited;

- The potential for vapor intrusion must be evaluated for any buildings developed on-site and any potential impacts that are identified must be monitored or mitigated; and

- Vegetable gardens and farming on the property are prohibited.

The Site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP.

NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

2.3.1 Excavation Work Plan

The Site will be remediated for non-Residential use. Any future intrusive work that will penetrate the soil cover or cap, or encounter or disturb the remaining contamination, including any modifications or repairs to the existing cover system will be performed in compliance with the Excavation Work Plan (EWP) that is attached as Appendix A to this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP, refer to Appendix B) prepared for the Site that is in current compliance with DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State and local regulations. Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section A-1 of the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 5).

The Site owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation de-water, control of runoff from open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations and bridge footings). The Site owner will ensure that Site development activities will not interfere with, or otherwise impair or compromise, the engineering controls described in this SMP.

2.3.2 Soil Vapor Intrusion Evaluation

Prior to the construction of any enclosed structures on-site, an SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure. Alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive sub-slab depressurization system that is capable of being converted to an active system.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York". Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

Preliminary (unvalidated) SVI sampling data will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation. If the property is owned by a third party, validated SVI data will be transmitted to the property owner within 30 days of validation. If any indoor air test results exceed NYSDOH guidelines, relevant NYSDOH fact sheets will be provided to all tenants of the property within 15 days of receipt of validated data. SVI sampling results, evaluations, and follow-up actions will also be summarized in the next Periodic Review Report.

2.4 INSPECTIONS AND NOTIFICATIONS

2.4.1 Inspections

Inspections of all remedial components installed at the Site will be conducted at the frequency specified in the SMP Monitoring Plan schedule. A comprehensive site-wide inspection will be conducted annually, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether Engineering Controls continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- If Site records are complete and up to date; and
- Changes, or needed changes, to the remedial or monitoring systems and/or reporting.

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (Section 5).

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the EC/ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

2.4.2 Notifications

Notifications will be submitted by the property owner to the NYSDEC as needed for the following reasons:

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the Order on Consent, 6NYCRR Part 375, and/or Environmental Conservation Law.

- • 7-day advance notice of any proposed ground-intrusive activities pursuant to the Excavation Work Plan.

- Notice within 48-hours of any damage or defect that reduces or has the potential to reduce the effectiveness of Engineering Controls and likewise any action to be taken to mitigate the damage or defect.

- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of Engineering Controls in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the Order on Consent and all approved work plans and reports, including this SMP

- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing.

2.5 CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions.

2.5.1 Emergency Telephone Numbers

In the event of any environmentally related situation or unplanned occurrence requiring assistance the Owner or Owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. Prompt contact should also be made to [qualified environmental professional]. These emergency contact lists must be maintained in an easily accessible location at the Site.

Table 1: Emergency Contact Numbers

Medical, Fire, and Police:	911
One Call Center:	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362
Owner: ExxonMobil Environmental Services Co.	(718) 404-0652
Qualified Professionals: Roux Associates Woodard & Curran	 (631) 232-2600 (203).271-0379

2.5.2 Map and Directions to Nearest Health Facility

Refer to the H&SP for a map and directions from the Site to the Community Hospital at Dobbs Ferry.

2.5.3 Response Procedures

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. The emergency telephone number list is found in Table 1 above. The list must also be posted prominently at the Site and made readily available to all personnel at all times. Refer to the H&SP for additional emergency procedures.

3.0 SITE MONITORING PLAN

3.1 INTRODUCTION

3.1.1 General

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the soil cover system. Monitoring of other Engineering Controls is described in Chapter 4, Operation, Monitoring and Maintenance Plan. This Monitoring Plan may only be revised with the approval of NYSDEC.

3.1.2 Purpose and Schedule

This Monitoring Plan describes the methods to be used for:

- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for the various monitoring activities. To adequately address these issues, this Monitoring Plan provides information on:
  - Reporting requirements; and
  - Annual inspection and periodic certification.

Quarterly monitoring of the performance of the remedy will be conducted for the first year. The frequency thereafter will be determined by NYSDEC.

3.2 SOIL COVER AND SITE-WIDE INSPECTION

Site-wide inspections of the soil cover will be performed on a regular schedule at a minimum of once every quarter for the first year, and yearly thereafter for five years. Site-wide inspections will also be performed after all severe weather conditions that may affect Engineering Controls. During these inspections, an inspection form will be completed (Appendix C). The form will compile sufficient information to assess the following:

- Compliance with all ICs, including Site usage;

- An evaluation of the condition and continued effectiveness of ECs;
- General Site conditions at the time of the inspection;
- The Site management activities being conducted including, where appropriate, a health and safety inspection;
- Compliance with permits and schedules included in the Operation and Maintenance Plan; and
- Confirm that Site records are up to date.

3.3 MONITORING REPORTING REQUIREMENTS

Forms and any other information generated during regular inspections will be kept on file and readily available on request. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be (1) subject to approval by NYSDEC and (2) submitted at the time of the Periodic Review Report, as specified in the Reporting Plan of this SMP.

4.0 OPERATION AND MAINTENANCE PLAN

The Site remedy does not rely on any mechanical systems, such as sub-slab depressurization systems or air sparge/ soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

5. INSPECTIONS, REPORTING AND CERTIFICATIONS

5.1 SITE INSPECTIONS

5.1.1 Inspection Frequency

All inspections will be conducted at the frequency specified in the schedules provided in Section 3 Monitoring Plan and Section 4 Operation and Maintenance Plan of this SMP. At a minimum, a site-wide inspection will be conducted annually. Inspections will also be conducted whenever a severe condition has taken place, such as an erosion or flooding event that may affect the ECs.

5.1.2 Inspection Forms, Sampling Data, and Maintenance Reports

All inspections will be recorded on the appropriate forms which are contained in Appendix C. Forms are subject to NYSDEC revision.

All applicable inspection forms and other records generated for the Site during the reporting period will be provided in electronic format in the Periodic Review Report.

5.1.3 Evaluation of Records and Reporting

The results of the inspection will be evaluated as part of the EC/IC certification to confirm that the:

- EC/ICs are in place, are performing properly, and remain effective;
- Maintenance activities are being conducted properly; and, based on the above items,
- The Site remedy continues to be protective of public health and the environment and is performing as designed in the RARDWP and ROD.

5.2 CERTIFICATION OF ENGINEERING AND INSTITUTIONAL CONTROLS

After the last inspection of the reporting period, a qualified environmental professional or Professional Engineer licensed to practice in New York State will prepare the following certification:

For each institutional or engineered control identified for the Site, I certify that the following statements are true:

- The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;
- The institutional control and/or engineering control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;
- Nothing has occurred that would impair the ability of the control to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any Site management plan for this control;
- Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;
- If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;
- Use of the Site is compliant with the environmental easement; To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices; and
- The information presented in this report is accurate and complete.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative].

The signed certification will be included in the Periodic Review Report described below.

5.3 PERIODIC REVIEW REPORT

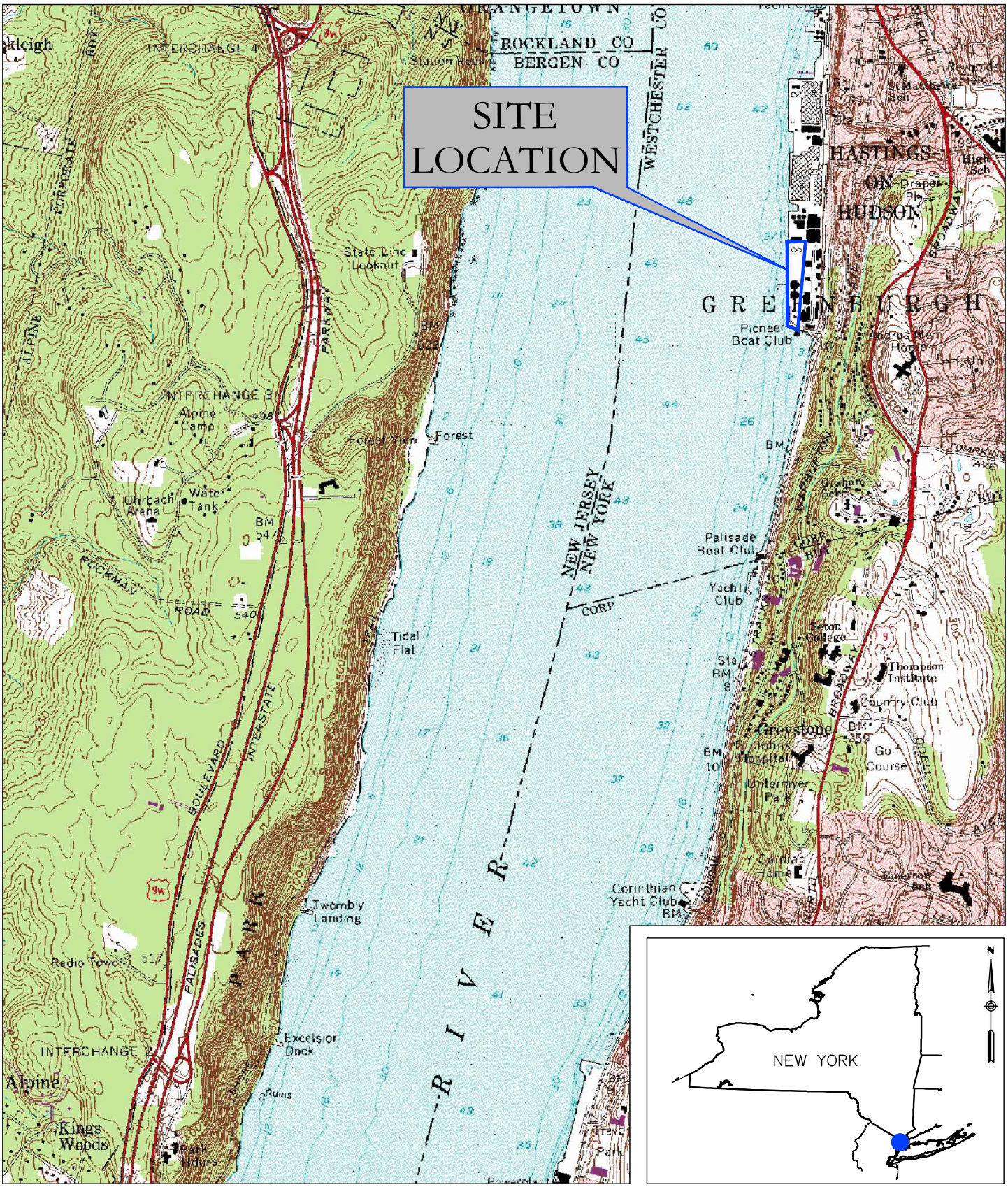
A Periodic Review Report will be submitted to the Department every year, beginning eighteen months after the Certificate of Completion is issued. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the Site described in the Environmental Easement. The report will be prepared in accordance with NYSDEC DER-10 and submitted within 45 days of the end of each certification period. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site;
- Results of the required annual Site inspections and severe condition inspections, if applicable;
- All applicable inspection forms and other records generated for the Site during the reporting period in electronic format;
- A Site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific ROD or Decision Document;
    - Any new conclusions or observations regarding Site contamination based on inspections;
    - Recommendations regarding any necessary changes to the remedy; and
    - The overall performance and effectiveness of the remedy.

The Periodic Review Report will be submitted, in hard-copy and electronic format, to the NYSDEC Regional Office in which the Site is located and the NYSDOH Bureau of Environmental Exposure Investigation.

5.4 CORRECTIVE MEASURES PLAN

If the remedy is found to have failed, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.



WOODARD &CURRAN
709 WESTCHESTER AVE., SUITE L2
WHITE PLAINS, NEW YORK 10604
800.426.4262 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

SITE LOCATION MAP

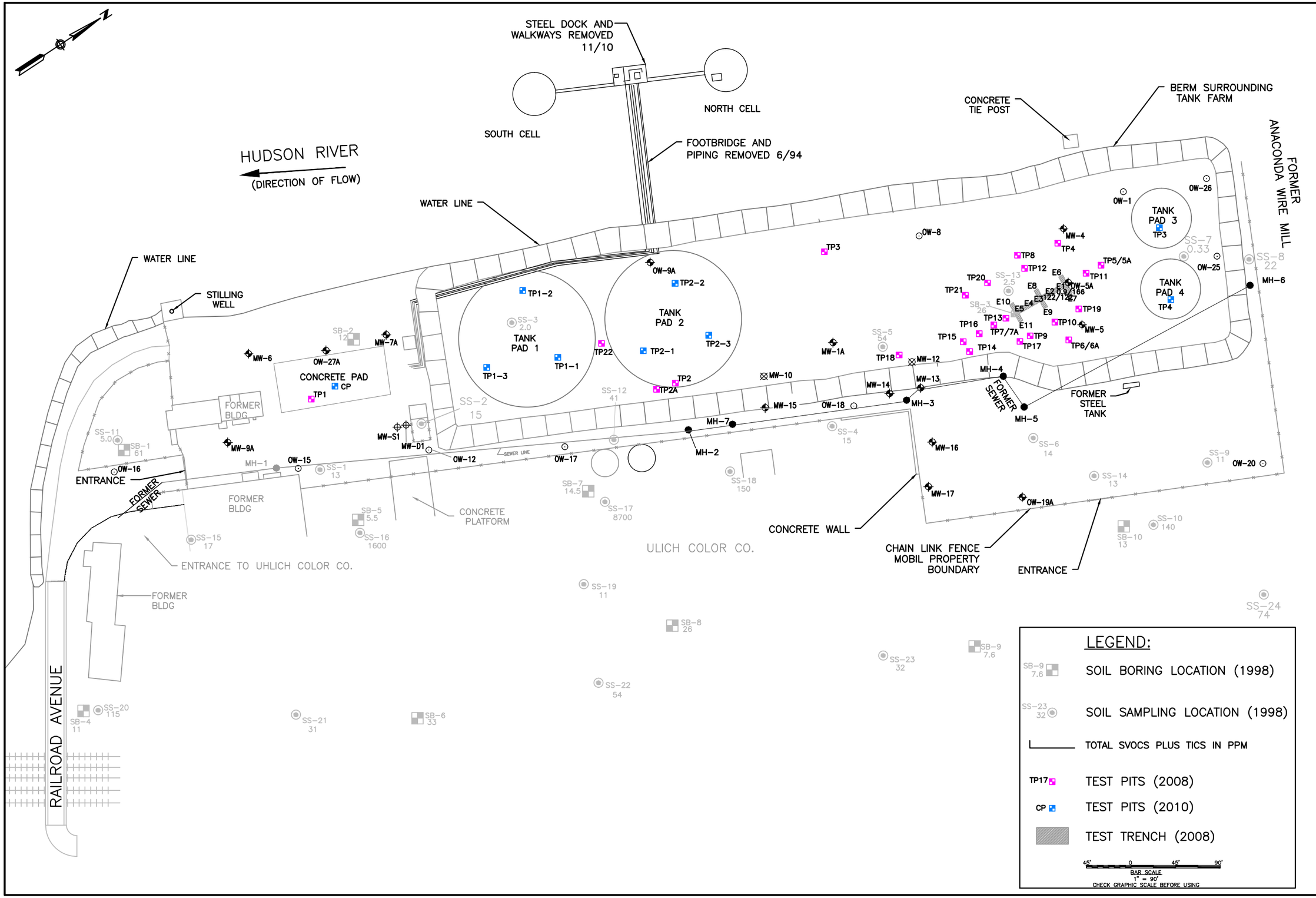
DESIGNED BY: JR	CHECKED BY: AP
DRAWN BY: PFF	206925_U1-RDRAR.dwg

FORMER MOBIL TAPPAN TERMINAL
HASTINGS-ON-HUDSON, NY

TOPO! INTERACTIVE MAPS ON CD
U.S.G.S YONKERS, NY.
7.5 MIN SERIES 1966 PHOTOREVISED 1979

JOB NO:	206925.03
DATE:	MAY 2011
SCALE:	AS NOTED

FIGURE 1



1520 HIGHLAND AVENUE
CHESHIRE CONNECTICUT 06410
888.265.8969 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

SITE PLAN

CHECKED BY: AP
206925_U2-RDRAR.dwg
DESIGNED BY: JR
DRAWN BY: PFF

FORMER TAPPAN TERMINAL
HASTINGS-ON-HUDSON, NY

REMEDIAL DESIGN/REMEDIAL ACTION REPORT

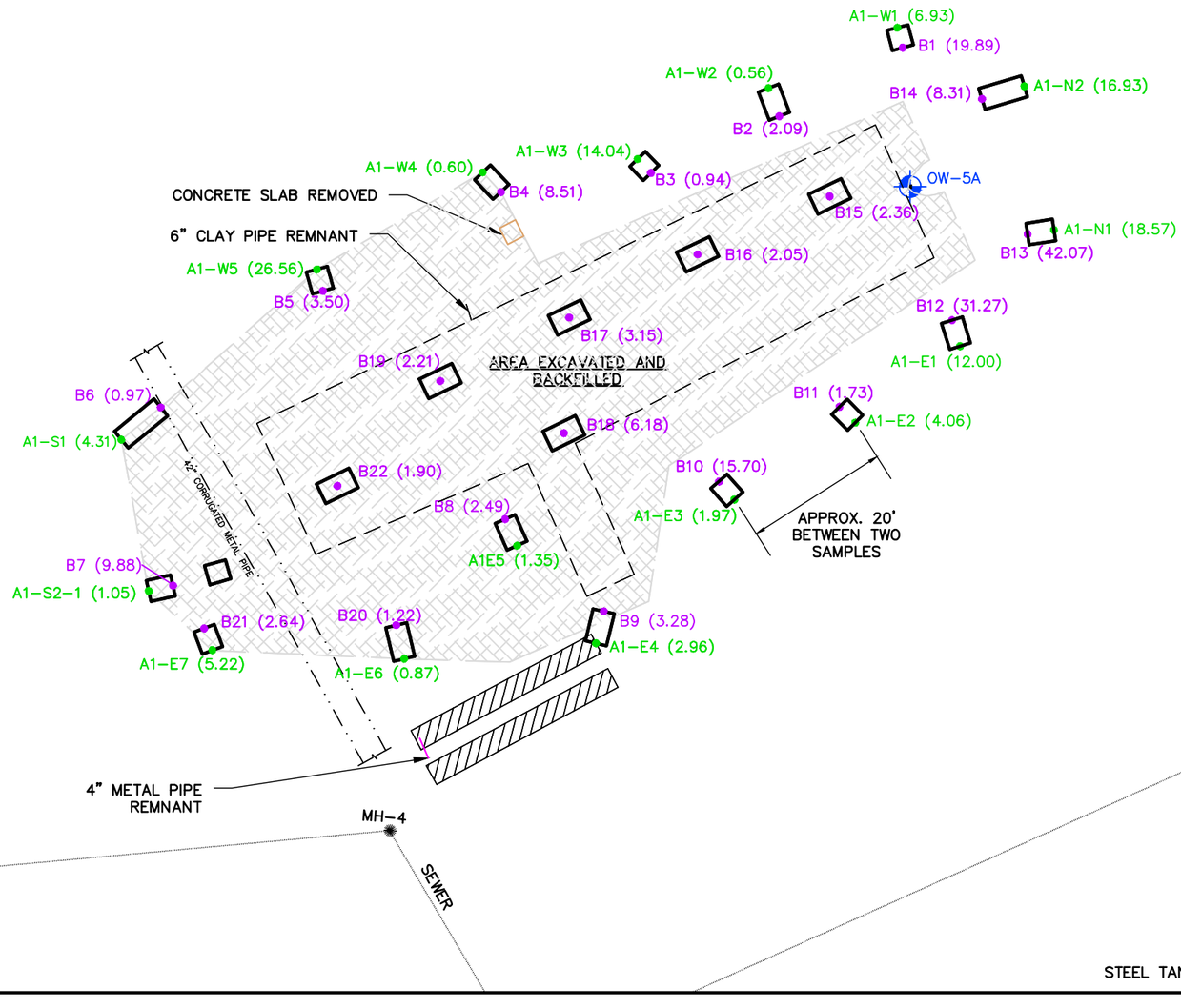
JOB NO: 206925.03
DATE: DECEMBER 2011
SCALE: 1"= 90'

FIGURE 2

206629/wip/fig

NOTE:

1. TEST PITS WERE COMPLETED AROUND THE EXCAVATION APPROXIMATELY 6 FEET FROM THE SIDEWALL LOCATION AT THE TIME OF THE TEST PIT TO COLLECT SIDEWALL AND BOTTOM SAMPLES.



LEGEND:

- OW–5A — EXISTING MONITORING WELL LOCATION AND DESIGNATION
- A1–N2 — SIDEWALL SAMPLE LOCATION AND DESIGNATION
- B14 — BOTTOM SAMPLE LOCATION AND DESIGNATION
- (8.31) — TOTAL SVOCs IN PPM
- TEST PIT FOR SAMPLE COLECTION
- ORIGINAL LIMITS OF AREA PLANNED TO BE EXCAVATED
- ACTUAL AREA EXCAVATED AND BACKFILLED
- EXPLORATORY TRENCH

10' 0 10' 20'
BAR SCALE
1" = 20'
CHECK GRAPHIC SCALE BEFORE USING

1520 HIGHLAND AVENUE
CHESHIRE CONNECTICUT 06410
888.265.8969 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS
WOODARD &CURRAN

EXCAVATION PLAN

DESIGNED BY: JR
DRAWN BY: PFF
CHECKED BY: AP
206925_U3–RDRAR.dwg

FORMER TAPPAN TERMINAL
HASTINGS–ON–HUDSON, NY

REMEDIAL DESIGN/
REMEDIAL ACTION REPORT

JOB NO: 206925.03
DATE: DECEMBER 2011
SCALE: 1"= 20'

FIGURE 3

APPENDIX A: EXCAVATION WORK PLAN

APPENDIX A – EXCAVATION WORK PLAN

A-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the Site owner or their representative will notify the Department. Currently, this notification will be made to:

Mr. William Ports
Regional Hazardous Waste Remediation Engineer
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233 -7014

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for Site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control,
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work,
- A summary of the applicable components of this EWP,
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120,
- A copy of the contractor's health and safety plan, in electronic format,

- Identification of disposal facilities for potential waste streams, and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

A-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based soil screening will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal, material that requires testing, material that can be returned to the subsurface, and material that can be used as cover soil.

A-3 STOCKPILE METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC.

A-4 MATERIALS EXCAVATION AND LOAD OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the Site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

A-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the Site. Truck wash waters will be collected and

disposed of off-site in an appropriate manner.

Truck transport routes and times will be in accordance with requirements of the Village of Hastings on Hudson. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

A-6 MATERIALS DISPOSAL OFF-SITE

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed at an ExxonMobil-approved disposal facility and in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this Site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at

minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

A-7 MATERIALS REUSE ON-SITE

Chemical criteria for on-site reuse of material must be approved by NYSDEC. The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for re-use on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-site without NYSDEC prior approval.

A-8 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including excavation dewatering and groundwater monitoring well purge and development waters, will be handled, transported and disposed at an ExxonMobil-approved disposal facility and in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Site, but will be managed off-site.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

A-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will

be restored in a manner that complies with the SMP and ROD. The demarcation layer, consisting of orange snow fencing material or equivalent material will be replaced to provide a visual reference to the top of the 'Remaining Contamination Zone', the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this Site Management Plan. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the 'Remaining Contamination'. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the Site Management Plan.

A-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the Site.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

A-11 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

A-12 CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for full a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the Site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the periodic reports prepared pursuant to Section 5 of the SMP.

A-13 COMMUNITY AIR MONITORING PLAN

A figure showing the location of air sampling stations based on generally prevailing wind conditions will be provided by the Qualified Professional to the NYSDEC for approval. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

A-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site, if there are tenants on the property. Specific odor control methods to be used will be developed by the Qualified Professional for the task subject to the approval of the NYSDEC. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the property owner's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils; if odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods, and other measures as necessary.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and

handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

A-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved though the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.

- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.

- Gravel will be used on roadways to provide a clean and dust-free road surface.

- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

A-16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX B: NYSDOH GENERIC COMMUNITY AIR MONITORING PLAN (APPENDIX 1A TO NYSDEC DER-10)

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

APPENDIX C: SITE-WIDE INSPECTION FORM

Site Inspection Form – Open Space

Former Tappan Terminal, AOC1
Former Mobil Terminal Property
Village of Hastings-on-Hudson, Westchester County, NEW YORK

Date/Time of Inspection: _____ Weather: _____

On-site Inspection Checklist	Yes	No
1. The previous Site Inspection Form (dated:_____) has been reviewed?	____	____
2. Actions identified in the previous Site Inspection Form have been completed?	____	____
3. Positive drainage from site is maintained?	____	____
4. Vegetation coverage is [complete] [increasing] appropriate to the time of year?	____	____
5. Evidence of erosion on land?	____	____
6. Evidence of erosion to the Hudson River?	____	____
7. Fencing is secure and in good repair?	____	____
8. Evidence of trespassing/vandalism?	____	____
9. Evidence of dumping?	____	____
10. The site remains unimproved and open space only?	____	____
11. The site is snow covered?	____	____
12. The last rain fall event was on date:_____ with _____ inches of rain.		
13. A marked-up map is included with this report highlighting findings of this inspection?	____	____
14. Photographs are included with this report highlighting findings of this inspection?	____	____
15. Additional pages with Comments are included with this report?	____	____

Comments (*attach additional pages as necessary*)

_____

_____

_____

_____ _____

Signature of Inspector Name of Inspector Date

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law"

_____ _____

Signature of Qualified Professional Name of Qualified Professional Date