PROPOSED REMEDIAL ACTION PLAN
Three Star Anodizing
Village of Wappingers Falls, Dutchess County, New York
Site No. 314058

February 2009

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

PROPOSED REMEDIAL ACTION PLAN

Three Star Anodizing
Village of Wappingers Falls, Dutchess County, New York
Site No. 3-14-058
February 2009

SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the Three Star Anodizing Site. The presence of hazardous waste has created significant threats to human health and/or the environment that are addressed by this proposed remedy. As more fully described in Sections 3 and 5 of this document, over 170 years of industrial activity and improper waste disposal have resulted in the disposal of hazardous wastes, including volatile organic compounds, plating-related wastes, petroleum and manufactured gas plant wastes. These wastes have contaminated the soil, groundwater and sediments at and near the site, and have resulted in:

- a significant threat to human health associated with current and potential exposure to soil, groundwater, sediments, plating-related wastes and asbestos.

- a significant environmental threat associated with the current and potential impacts of contaminants to soil, groundwater and sediments.

To eliminate or mitigate these threats, the Department proposes various remedies for the different areas of the site.

- Excavation of the contaminated soil exceeding SCGs near the Axton Cross building for off site disposal. Soil vapor intrusion testing and, if necessary, mitigation of soil vapor impacts to the Axton Cross building would be conducted.
- Demolition and removal of the former metal plating vats and excavation and off-site disposal of any grossly impacted soil.
- Excavation of contaminated soil from a 10,000 square foot area in the lower raceway to a minimum depth of one foot and covered with a minimum of one foot of clean soil.
- Excavation of contaminated sediment from the Three Star lagoon to be replaced with clean fill to the original depth.
- Removal of surface debris from the manufactured gas plant (MGP) area. Demolition of the gas holder foundations in the MGP area and excavation of the soil within them for off-site disposal. Excavation of a 25-foot buffer along the Wappinger Creek and the Three Star Lagoon to a depth of one foot, after removal of existing trees and vegetation as needed, to be covered with two feet of clean soil, and replanted with native wetland and riparian plants. Covering of the remaining 2.5 acres of the MGP area with one foot of clean soil where surface soil contaminants are above commercial cleanup objectives.

- Covering of approximately 2.5 acres of the site, including the area just west of the Axton Cross building and areas near the other on-site buildings, with a soil cover
- Implementation of institutional controls to include an environmental easement.
- Development and implementation of a site management plan.
- A periodic certification of the institutional and engineering controls.

The proposed remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The Department will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The Department has issued this PRAP as a component of the Citizen Participation Plan developed pursuant to the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375. This document is a summary of the information that can be found in greater detail in the October 2007 "Three Star Anodizing Site Remedial Investigation" (RI) report, the October 2007 "Supplemental Remedial Investigation of Former Metal Plating Vats" (SRI) report, the November 2007 "Three Star Anodizing Site Feasibility Study" (FS), the December 2004 "Fish and Wildlife Impact Analysis, Step IIC - Wappingers Creek, Three Star Anodizing Site, and other relevant documents. The public is encouraged to review the project documents, which are available at the following repositories:

NYSDEC Central Office
625 Broadway
Albany, New York 12233-7016
Attn.: Michael MacCabe
518-402-9774
Mon. - Fri. 8:00 - 4:15

NYSDEC Region 3 Headquarters
21 South Putt Corners Road
New Paltz, NY 12561
Attn.: Michael Knipfing
845-256-3154
Mon. - Fri. 8:30 - 4:45

Village Clerk
Wappingers Falls Village Hall
2628 South Avenue
Wappingers Falls, NY 12590
845-297-8773
Mon.- Fri. 9:00 - 4:30

Grinnell Library
2642 East Main Street
Wappingers Falls, NY 12590
845-297-3428
Mon. - Thurs. 9:30 to 8:00
Fri. & Sat. 9:30 - 5:00
Sunday 1:00 - 4:00

The Department seeks input from the community on all PRAPs. A public comment period has been set from February 28 to March 30, 2009 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for March 19, 2009 at the American Legion Hall on 7 Spring Street, Wappimgers Falls beginning at 7:00 PM.

At the meeting, the results of the RI/FS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP. Written comments may also be sent to Mr. MacCabe at the above address through March 30, 2009.

The Department may modify the preferred alternative or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the Department's final selection of the remedy for this site.

SECTION 2: SITE LOCATION AND DESCRIPTION

The Three Star Anodizing Site is approximately 8.5 acres within the Market Street Industrial Park in a suburban area of the Village of Wappingers Falls, Dutchess County. The site consists of several buildings, remnants of destroyed buildings, weathered paved parking areas and access roadways. (Figures 1 and 2) The site is located on the south bank of Wappinger Creek approximately 1.5 miles up stream from the Hudson River.

The adjacent Wappingers Creek has an approximate four foot tidal cycle that has significant impact on the site groundwater. The site topography is mostly level with surface drainage and general groundwater migration in the direction of the creek and lagoon to the north and west. The depth to groundwater ranges from three to fourteen feet below the ground surface.

The depth to bedrock significantly varies from one foot below the surface grade (bsg) in the manufactured gas plant (MGP) area, to more then 60 ft bsg in the southern portion of the site. Bedrock is at least 40 ft bsg throughout most of the site.

Most of the overburden is sand with some gravel. The overburden consists of various depths of natural fill that consists of silt, sand and gravel. Wastes from the MGP process, cinders, slag, coke and brick fragments, were used as fill along the creek.

A dense organic clay that ranges from 0.4 ft thick to 2.1 ft is present within the upper 5 ft of the native material on the south and west portions of the main site. The organic clay layer was not observed on the MGP area.

Operable Unit (OU) No. 1, which is the subject of this document, consists of the entire upland, on-site area and excludes the off-site Wappinger Creek. An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. The remaining operable unit for this site is the site-related impacts to the Wappingers Creek. Investigations of the Wappingers Creek has found significant metals contamination in the creek sediment.

A subsequent investigation of creek biota directed by the Department's Division of Fish, Wildlife and Marine Resources found that the concentrations of mercury and other metals were not as elevated as expected considering the impacts detected in the creek sediments. Additional sediment sampling will be conducted to confirm the earlier sampling data. Further creek investigation activities, and any necessary remediation, will be conducted under OU2 and will not be addressed in this PRAP.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The site has been the location of industrial activities for over 170 years. Primary past uses of the site included textile dyeing operations, a manufactured gas plant (MGP), and a metal plating facility. A number of other smaller industrial activities also took place at the site.

Dutchess Print Works, also known as the Dutchess Bleachery, operated at the site under several ownerships from 1832 to 1955. The plant was originally located across Wappinger Creek on the north bank and later occupied land that was filled in on the south side of the creek. By the late 1800s, buildings on the north side of the creek were utilized for the manufacture of acids and chemicals associated with the dye operations and the remainder of the operations were performed in buildings located on the south bank.

Operations consisted of dyeing and finishing of rough cotton cloth from other mills. Aniline dye was also made at the facility during World War I. Textiles were bleached and dyed at the bleachery and wastewater was reportedly discharged into a raceway that emptied into the lagoon and subsequently into Wappinger Creek. Long term residents of the Village report that during the first half of the 20th century the lagoon had different colors depending on activities at the mill. Mercuric chloride and arsenic pentoxide may have been used to dye cloth at the facility.

The Dutchess Bleachery and Wappinger Water, Gas, and Electric Companies operated a manufactured gas plant (MGP) on the south bank of Wappinger Creek in the west portion of the site from the late 1800s to approximately 1913. During operation of the MGP, coal was barged up the creek from the Hudson River and stored in large coal sheds located on the north and south banks of the creek as early as the 1870s. Department files indicate that approximately 16 acres, beyond the site boundary, were filled with coal cinders. Most of these areas are either paved or developed. Coal cinders were used to fill behind the retaining wall built on the south bank of the creek at the site and an area downstream in the vicinity of Creek Road. Historic maps indicate topographic changes have occurred in those areas as well as the southwest portion of the former bleachery property on the north bank.

Three Star Anodizing and later Watson Metals Products Corporation operated a metal plating facility at the site from 1958 to approximately 1995. From 1958 to 1980, plating waste was discharged to the lagoon and subsequently Wappinger Creek at a rate of 20,000 to 60,000 gallons per day.

Along with metal plating the facility began reconditioning electronic equipment in 1972. The reconditioning process included paint stripping using caustics and a water rinse of gold components. Plating processes included the use of mild non-etching alkali cleaners, a proprietary mix of sodium dichromate or chromic acid, sulfuric acid with the addition of soda ash to lower pH, and a dying process which required ferric ammonium oxide and synthetic dyes. The paint stripping operation reportedly used chlorinated solvent with fluoride, caustic soda, and kerosene.

The sanitary facilities in the Three Star buildings failed a dye test performed in 1971. At that time, wastewater was found to discharge via floor drains to the lagoon and the creek. Rinse water from plating tanks was discharged to the back of the plant, which subsequently drained into the lagoon via the raceway. A Phase I investigation conducted in the mid 1980s found that the waste stream from the Three Star operations at the site contained sulfuric and phosphoric acids, caustic dyes, soaps, and various trace metals including copper, nickel, chromium, aluminum, and zinc.

In 1975, the facility was required to obtain a SPDES permit to continue discharging via the raceway. In following years (1977-1979), The Department documented that Three Star occasionally exceeded SPDES effluent limitations for nickel and copper.

The Village of Wappinger Falls continues to discharge storm drainage through the raceway/lagoon.

From November 1978 to the summer of 1983, trailers containing powdered raw product in 55-gal drums were stored on-site. The powdered product contained in the 55-gal drums included aluminum oxide, nickel, and cadmium. Reportedly, these materials were from Marathon Battery, formerly of Cold Spring, New York. The trailers were removed under supervision of the Department and the Dutchess County Department of Health in 1983.

An inspection of the facility by the U.S. Environmental Protection Agency (USEPA) in 1993 indicated that it was not in compliance with applicable metal finishing waste water pretreatment standards. The discharge of zinc from the facility was 4.1 mg/L compared to a discharge limit of 2.6 mg/L. A leaking PVC pipe that conveyed wastewater was also identified.

Axton-Cross Company manufactured and distributed chemical products in the building located next to the lagoon. As with the rest of the industrial park, the facility was never hooked up to a public septic system. Although there is no documentation of chemical spills or improper waste disposal, soil and groundwater contamination were observed near the building.

A number of other businesses have operated at the site including auto repair and warehousing. A felt hat manufacturer had operated in building in a portion of the industrial park adjacent to the Three Star site. Mercury was used in the production of felt.

A large fire in May 2004 destroyed Buildings 15, 16, 21 and an unnamed flat-roofed structure. All of these buildings and still-standing Buildings 17 and 22 had all been attached as one structure. Twenty-four metal plating vats are in what was Building 16 and are now exposed to the environment. A remaining, unstable wall from Building 16 parallels the vats and poses a physical hazard.

3.2: Remedial History

In 1983, the Department listed the site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include:

- Milliken & Company. In 1908, Milliken purchased and operated the Dutchess Bleachery at the site and across the creek until they closed the facility in 1956.
- The estate of Sam Iannone. Mr. Iannone owned and operated the Three Star Anodizing facility and was the last to own that portion of the site.
- Watson Metal Products. After Mr. Iannone ceased operation of Three Star Anodizing, he leased the facility to Watson Metal Products.

The PRPs known at the time of the RI/FS were contacted by the Department to determine if they were willing to implement the RI/FS. After the remedy is selected, the PRPs will be contacted to assume responsibility for the remedial program. If an agreement cannot be reached with the PRPs, the Department will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the state for recovery of all response costs the state has incurred.

SECTION 5: SITE CONTAMINATION

A remedial investigation/feasibility study (RI/FS) has been conducted to evaluate the alternatives for addressing the significant threats to human health and the environment.

5.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted between April 2001 and April 2003. The field activities and findings of the investigation are described in the RI report.

Prior to site work, a research of the sites industrial history was conducted. The historical information aided in planning the RI by revealing locations of specific activities and the types of contaminants that may be present.

The RI site activities included a geophysical survey to determine the depth and direction of groundwater, the composition of the overburden, the depth to bedrock. Soil samples were collected throughout the site from soil borings, test pits, and during monitoring well construction. Permanent monitoring wells were constructed to sample groundwater in both the overburden and bedrock. Sediment samples were collected from the on-site lagoon.

A survey of public and private water supply wells in the area around the site was conducted to determine if there were wells that may be close enough to be impacted by the site. The area is on public water and there are no wells that could be impacted by the Three Star site. Also, all other properties in the immediate area are at higher elevations and all on-site groundwater flows toward the Wappinger Creek.

Surface water and aquatic sediment samples were collected from Wappinger Creek and the upstream Wappinger Lake.

A supplemental remedial investigation (SRI) was conducted in November 2005 and April 2006. The SRI focused on the twenty-three plating vats and the groundwater in the immediate vicinity. Due to the May 2004 fire, the vats are exposed to the environment and are accumulating precipitation. The objective of the SRI was to determine what degree of contamination was present in the vats and, if the water in the vats was contaminated, had that contamination leaked into the sub-surface and impacted the soil beneath and the on-site groundwater.

5.1.1: Standards, Criteria, and Guidance (SCGs)

To determine whether the soil, groundwater, sediments, groundwater and surface water contain contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on the Department's "Ambient Water Quality Standards and Guidance Values" and Part 5 of the New York State Sanitary Code.

- Soil SCGs are based on the Department's Cleanup Objectives (6 NYCRR Part 375, Environmental Remediation Programs, Subpart 375-6.8 and Technical Guidance Memorandum 4046 (TAGM 4046))

- Sediment SCGs are based on the Department's "Technical Guidance for Screening Contaminated Sediments."

- Background soil samples were taken from nine locations (Table 2). These locations were off-site, and were unaffected by historic or current site operations. The samples were analyzed for semi-volatile organic compounds (SVOCs) and metals. The results of the analysis were compared to data from the RI (Table 1) to determine appropriate site remediation goals.

- Fourteen background sediment samples were taken from eight locations. These locations were upstream of the site in Wappingers Lake, and were unaffected by historic or current site operations. The samples were analyzed for VOCs, SVOCs, metals, pesticides and PCBs. The results of the analysis were compared to data from the RI (Table 1) to determine appropriate site remediation goals.

- Background surface water samples were taken from five locations. These locations were upstream of the site, and were unaffected by historic or current site operations. The samples were analyzed for VOCs, SVOCs, metals, pesticides and PCBs. The results of the background sample analysis were compared to relevant RI data to determine appropriate creek remediation goals.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized in Section 5.1.2. More complete information can be found in the RI report.

5.1.2: <u>Nature and Extent of Contamination</u>

This section describes the findings of the investigation for all environmental media that were investigated.

As described in the RI report, many soil, groundwater, surface water and sediment samples were collected to characterize the nature and extent of contamination. As seen in Figures 3, 4 and 5 and summarized in Table 1, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and inorganics (metals). For comparison purposes, where applicable, SCGs are provided for each medium.

Chemical concentrations are reported in parts per billion (ppb) for water and parts per million (ppm) for waste, soil, and sediment.

Figures 3, 4 and 5 and Table 1 summarize the degree of contamination for the contaminants of concern in soil, groundwater and the lagoon sediments.

As described in the RI report, many soil, groundwater, surface water and sediment samples were collected to characterize the nature and extent of contamination. As summarized in Table 1, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and inorganics (metals).

The VOCs of concern are 1,1,1-trichloroethane (TCA), tetrachlorethene (PCE), trichloroethene (TCE), cis-1,2-dichlorethene (DCE), toluene, chlorobenzene, ethylbenzene, and xylene.

The SVOCs of concern are acenaphthene, anthracene, benzo(a)pyrene, benzo(a)anthracene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, phenanthrene, and pyrene.

The inorganics of concern are arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, and cyanide.

As discussed below and shown on Figure 2, the Three Star site has independent areas where different types of industrial activity occurred and, consequently, different areas of concern where different types of contaminants have impacted the environment. The Site consists of the following areas: (i) the Axton-Cross area where a chemical distributer had operated; (ii) the Building 15/16/17 area which includes the 23 metal plating vats; (iii) the former water raceway where water had once been directed to drive water wheels early in the industrial revolution and was also used as a conduit for the disposal of liquid wastes; (iv) the Building 21/22 area in front of buildings 15/16/17 where three aboveground petroleum storage tanks are present; (v) the Three Star Lagoon which is a small man-made water body at the terminus of the raceway just before Wappinger Creek; and (vi) the manufactured gas plant (MGP) area. The Building 12 area, which is used as a point of reference to this document, is outside of the designated Three Star Anodizing Class 2 site, but within the Market Street Industrial Park.

The different areas are discussed separately in this section due to the distinct and generally unrelated areas of contamination.

Axton Cross Area

Contamination sources consist of the dry well and former drum storage area located on the south side (in front) of the building and the suspected drain holes on the west side of the building. Specifically, VOCs associated with tetrachloroethene (PCE), dichlorobenzene (DCB) and benzene, toluene, ethylbenzene and xylene (BTEX) were found in groundwater and soil in the vicinity of the dry well.

Subsurface Soil

Soil data showed the presence of PCE (42 ppm), in the shallow subsurface soil in this area as well as nickel, chromium, copper and mercury. In the dry well area (SS-10, 1 to 1.2 ft), mercury was detected at 31 ppm. Between the building and the lagoon, (SS-11, surface), nickel was detected at 2,310 ppm. The respective unrestricted SCOs for mercury, nickel and PCE are 0.81 ppm, 30 ppm and 1.3 ppm.

Total VOCs were detected at 280 ppm in MW-9 (10 to 12 ft) in the dry well area of the Axton-Cross Building. The VOCs detected consisted primarily of PCE (140 ppm), trichloroethene (TCE) (49 ppm), and xylene (64 ppm) compared to their respective unrestricted use SCOs of 1.3, 0.47, 0.26 ppm. Adjacent to the west side of the building in SB-3-02 (10 to 12 ft), arsenic (17 ppm), copper (653 ppm) and lead (2,860 ppm) were detected above their respective unrestricted SCOs of 13, 50 and 63 ppm. PAHs were detected at 81 ppm including benzo(a)anthracene (7.8 ppm), benzo(a)pyrene (8.0 ppm), benzo(b)fluoranthene (10.0 ppm), and dibenzo(a,h)anthracene (1.3 ppm). The respective unrestricted SCOs of these PAHs are 1, 1, 1 and 0.33 ppm. The vertical extent of the impacts appears to be limited to a maximum of between 12 and 16 ft below grade as the sample of soil collected from the 16 to 18 ft interval did not contain concentrations that were significantly elevated.

<u>Groundwater</u>

Total VOCs detected in the dry well area adjacent to the south side of the Axton-Cross Building (MW-9) were 20,609 ppb; primary chlorinated VOCs (10,800 ppb) and BTEX (8,400 ppb). The chlorinated VOCs consisted primarily of PCE (7,900 ppb) and TCE (2,900 ppb). The prominent BTEX compounds were xylene (6,600 ppb), ethylbenzene (1,500 ppb) and toluene (270 ppb). The groundwater SCGs for each of these compounds is 5 ppb. Inorganics in the Axton-Cross Area were within the water quality standards.

Also in MW-9, the SVOCs; 1,2-DCB (170 ppb), 1,4-DCB (13 ppb) and 2,4-dimethylphenol (6 ppb) were present above groundwater standards. The respective groundwater SCGs for these SVOCs are 3, 3 and 1 ppb.

The elevated concentrations of VOCs in subsurface soil in the drywell area and the significant impacts to groundwater from the same contaminants in the same location indicate a distinct source area. The groundwater and subsurface soil contamination identified in the drywell area during the RI/FS will be addressed in the remedy selection process. Inorganics are present at concentrations above unrestricted and commercial SCGs in surface soil between the building and the lagoon. The surface soil contamination identified along the west side of the building during the RI/FS will be addressed in the remedy selection process.

<u>Building 15/16/17 Area</u>

Buildings 15 and 16 were destroyed in the 2004 fire. The metal plating vats are within the footprint of what was Building 16. There had been a flat-roofed building just to the east of Building 15 that collapsed under a snow load prior to the fire.

<u>Surface Soil</u>

Adjacent to Buildings 16 and 17, constituents were detected above Part 375 cleanup objectives for unrestricted use at MW-1, SS-06, and MW-07. At MW-1, PAHs consisting of benzo(a)anthracene (15 ppm), benzo(a)pyrene (12 ppm), benzo(b)fluoranthene (18 ppm), and dibenzo(a,h)anthracene (1.4 ppm) were detected above their respective unrestricted SCOs for these compounds of 1, 1, 1, and 0.33 ppm.

At SS-06 (surface) and MW-07 (0 to 0.5 ft), copper was detected at 611 and 483 ppm, respectively. Cadmium was also detected in surface sample SS-06 at 36 ppm. The respective unrestricted SCOs for copper and cadmium are 50 and 2.5 ppm. Lead was detected above its unrestricted SCG (63 ppm) in each of the four surface soil samples from this area with a maximum concentration of 934 ppm.

<u>Subsurface Soil</u>

In shallow soil adjacent to Building 16 (SS-04), cadmium (11 ppm) was detected above the unrestricted SCO of 2.5 ppm. For this area, lead was detected at a maximum concentration of 197 ppm in BMW-2

(10 to 12 ft) compared to its unrestricted SCG of 63 ppm.

Nickel (1,510 ppm) and arsenic (20 ppm) were detected at concentrations above Part 375 cleanup objectives for unrestricted use in MW-15 (10 to 12 ft) just to the north of the plating vats. Arsenic was detected at 27 ppm in SB-16 (10 to 12 ft) near the plating facility loading dock. The respective unrestricted SCOs for nickel and arsenic are 30 and 13 ppm.

Groundwater

Shallow groundwater obtained before the fire from between Buildings 15 and 16 (MW-12) contained antimony (3.6 ppb), arsenic (31 ppb), chromium (72 ppb) and lead (76 ppb) above their respective SCGs of 3, 25, 50 and 25 ppb.

DCA (62 ppb), TCA (33 ppb), and 1,2-dichloropropane (3 ppb) were also detected in shallow groundwater in MW-12 between Buildings 15 and 16. The respective groundwater SCGs of these compounds are 5, 5 and 1 ppb.

Relatively low concentrations of PCE (8 ppb), TCE (19 ppb), DCE (35 ppb), and vinyl chloride (34 ppb) were detected in MW-1 in front of Building 17 during the most recent groundwater sampling round in 2006. Generally, the concentration of these four contaminants were higher in 2001 and 2002. MW-1 showed low level contamination of 1,2-DCB (4 ppb) and phenol (2 ppb) in 2001 and 2002.

Vat Area

The supplemental remedial investigation (SRI) identified the vats as a potential source of metals (primarily zinc, copper, and chromium) and phthalates as contaminants associated with vat liquids and sludge. The detection of elevated levels of metals in groundwater in monitoring wells MW-6, MW-10, MW-14 and MW-16 down gradient of the vats after they were exposed to the environment following the 2004 fire suggests that the vats may have leaked into the subsurface. The elevated metals in groundwater were generally associated with turbidity and particulate matter, not dissolved in the groundwater, which will limit their potential for migration. Although metals may be concentrated in soil under the vats, soil under the vats was not sampled due to access complications.

During the SRI, two additional monitoring wells, MW-14 and MW-15 were constructed adjacent to the vats. The two new wells and three existing monitoring wells, MW-1, MW-6 and MW-10, were sampled in April and December 2006. Higher metals concentrations were detected in the preexisting wells during the SRI sampling events compared to concentrations detected during the RI. The VOC constituents and concentration ranges detected in April 2006 were consistent with those detected during the RI. Metals concentrations detected in MW-14 were higher than detected elsewhere on the Three Star Site.

During RI and SRI sampling events, the depth to groundwater in the monitoring wells adjacent to the vats ranged from 6.3 to 10.8 ft below surface grade (bsg). Based on relative measurements, the bottoms of the vats were approximately 4 to 6 ft bsg, which is close to the water table.

Chromium, nickel, and zinc were the primary inorganic constituents detected at elevated levels in groundwater adjacent to the vats (MW-14, MW-15) or down gradient of them (MW-6, MW-10). Total metals concentrations detected in unfiltered samples exceeded groundwater SCGs for chromium, nickel and zinc by up to approximately 800, 25, and 20 times, respectively. In comparison, concentrations in filtered samples intended to represent the dissolved fraction of the metals detected in groundwater were much lower. Zinc was not detected above SCGs in the filtered samples. Concentrations of chromium and nickel were below the groundwater SCG in three of the four wells. Chromium (242 ppb) was approximately five times its SCG of 50 ppb SCGs in down gradient MW-6. In MW-14 next to the vats, nickel (769 ppb) was less than eight times its SCG of 100 ppb. The much lower concentrations of metals in filtered samples indicate that the metals were primarily associated with the suspended particulate and not dissolved in the groundwater.

Other than naturally occurring metals such as iron and sodium, only arsenic (48 ppb) was detected above its SCG (25 ppb) in the filtered sample obtained from MW-15. The filtered sample from MW-14 had nickel (40 ppb) and arsenic (769 ppb). Down gradient MW-6 had antimony (5.3 ppb), chromium (272 ppb) and nickel (106 ppb) above groundwater SCGs in the filtered sample. The respective SCGs for antimony (3 ppb), chromium (50 ppb) and nickel (100 ppb) are as stated.

At the other two locations sampled (MW-1 and MW-10), metals concentrations detected in groundwater samples were much lower relative to concentrations detected in the other three wells. Metals that appear to be associated with the vats (chromium, nickel, and zinc) were not detected above SCGs in groundwater collected from these locations.

The concentrations of VOCs detected in the monitoring wells in the vat area in April 2006 were similar to previous results providing evidence that exposure of the vats to the environment has not impacted VOC levels in on-site groundwater. Total VOC concentrations ranged from 13 ppb in MW-10 to 88 ppb in MW-1 and consisted primarily of chlorinated VOCs. The VOCs detected above SCGs in groundwater in the vat area during the April 2006 sampling event consisted of PCE (8 ppb), TCE (19 ppb), DCE (35 ppb), and vinyl chloride (34 ppb). The groundwater SCG for PCE, TCE and DCE is 5 ppb. The SCG for vinyl chloride is 2 ppb.

Other VOCs were detected at concentrations below groundwater SCGs and consisted of chlorobenzenes, methyl iodide, and total xylenes. DCA was detected slightly above its SCG in MW-10.

Due to the 2004 fire, the vats are an area of environmental contamination. The data from the SRI show that much of the water and all of the sludge in the vats has contamination at such elevated concentrations that it is classified as a hazardous waste (see Section 5.2). Because some of the vats appear to be leaking, it is assumed that contamination contained within those vats is impacting the soil beneath and may impact groundwater. The grossly contaminated soil associated with the vats that was identified during the RI/FS will be addressed in the remedy selection process.

Raceway

In the area of the former raceway, black stained soils with coal tar odors were observed in the west portion of the former raceway (MW-11, and BMW-2). Observations of soil from those borings included brick and asphalt fragments (MW-11), tarry silt and clay at 6 ft below grade in BMW-2.

Surface Soil

The lower raceway (SS-01) contained some of the highest levels of inorganics detected on site; including chromium (6,260 ppm), copper (2,140 ppm), lead (1,100 ppm), nickel (603 ppm), and cyanide (94 ppm). These inorganics are all well above their respective unrestricted SCOs of 30, 50, 63, 30 and 27 ppm.

Subsurface Soil

The lower raceway soil (MW-11) contained 181 ppm of total PAHs; primarily naphthalene (150 ppm) and benzo(a)pyrene (1.7 ppm) above their unrestricted SCOs of 12 and 1 ppm.

Arsenic (55 ppm), chromium (142 ppm), copper (145 ppm), lead (526 ppm), mercury (41 ppm) and zinc (671 ppm) were detected in MW-11 above there respective SCGs of 13, 30, 50, 63, 0.18 and 109 ppm.. Subsurface soils collected during the construction of BMW-2 in the former raceway contained elevated levels of arsenic (43 ppm) and mercury (8.2 ppm). These data may be indicative of a waste discharge point from the plating facility to the raceway area. It is not clear, whether the material was discharged in soluble form or if waste sludge was disposed of in the former raceway. Concentrations of inorganics were not significantly elevated below 22 ft in BMW-2.

<u>Groundwater</u>

VOCs were below SCGs in shallow groundwater collected from the upper raceway (MW-11) and next to the creek in the Building 12 Area (MW-8). In general, with the exception of naphthalene, VOCs were not detected at significant concentrations within the groundwater and soil within the raceway.

Naphthalene was detected at 160 ppb in shallow groundwater at MW-11 located in the upper raceway. Naphthalene was also present in deep groundwater beneath the MGP area at 77 ppb compared to the SCG of 10 ppb. No other SVOCs were present above SCGs in MW-11. Naphthalene was not detected in significant concentrations in groundwater in other areas of the Site, which suggests that there may have been some discharge of these materials to the former raceway.

In the upper raceway (MW-13) total phenol was detected in shallow groundwater at 11 ppb.

Shallow groundwater in each of the wells, MW-11 and BMW-2, within the former raceway contained up to 13 metals and cyanide above water quality standards in unfiltered samples. The widest range of constituents and highest concentrations were detected in MW-11 in the shallow groundwater under the raceway including concentrations of antimony (1,400 ppb), arsenic (1,100 ppb) cadmium (22 ppb), chromium (1,700 ppb), copper (3,400 ppb), nickel (230 ppb), zinc (6,400 ppb) and cyanide (1,300 ppb) at concentrations well above groundwater standards. The deeper groundwater in this area (BMW-2) contained seven inorganics above water quality standards including antimony and mercury concentrations over 25 times the standards.

Because of the highly elevated inorganics observed in raceway groundwater in the 2002 sampling, an additional sample was obtained from the well in November 2008 for further analysis. The sample was split to allow for analysis of an unfiltered and a filtered sample. In the unfiltered sample, the inorganics detected were all at much lower concentrations than those detected in the 2002 sample. In some cases, inorganics detected in 2002 were undetectable in the filtered 2008 analysis. At 54 ppb, arsenic was the only inorganic detected above its groundwater SCG (25 ppb). The significant decrease in inorganic contaminants in the filtered sample relative to the unfiltered sample shows that the inorganics contamination is predominantly in the form of solids and particulate suspended in the groundwater sample and not dissolved in groundwater. The inorganics are much less mobile as suspended solids, than they would be if dissolved in the water.

The data support the anecdotal information that the lower raceway was used as a conduit for disposal of liquid waste and possibly solids. The data indicate that the inorganics present in the soil in the lower raceway have not impacted groundwater. Surface soil contamination identified during the RI/FS in the lower raceway will be addressed in the remedy selection process.

Building 21/22 Area

Surface Soil

In surface soil sample SS-08, cadmium (6.8 ppm), nickel (40 ppm) and zinc (333 ppm) were detected above their respective unrestricted SCOs of 2.5, 30 and 109 ppm.

Subsurface Soil

Shallow soil (0.5 - 2.5 ft) in MW-1 had lead (127 ppm), mercury (0.25 ppm) and zinc (115 ppm) above unrestricted SCOs. The same sample had total PAHs at 183 ppm, including benzo(a)anthracene (15 ppm), benzo(a)pyrene (12 ppm), benzo(b)fluoranthene (18 ppm) and chrysene (13 ppm) above the unrestricted SCO of 1 ppm for each of these compounds.

Groundwater

Earlier analyses of monitoring wells MW-10 in the loading dock area of Building 21 and MW-6 in front of the buildings showed elevated concentrations of inorganics. The unfiltered sample from MW-6 contained antimony (6 ppb), chromium (265 ppb), lead (35 ppb), nickel (155 ppb), selenium (24 ppb) and thallium (2 ppb) above their respective groundwater SCGs of 3 ppb, 50 ppb, 25 ppb, 100 ppb, 10 ppb and 0.5 ppb. However, analyses of a filtered sample from MW-10 in December 2006 found only selenium (22 ppb) dissolved in groundwater above its SCG (10 ppb).

VOCs were detected in the wells in front of Buildings 21 and 22 at concentrations that were relatively low compared to those detected in some of the other areas of the Three Star Site. During the most recent sampling, TCE and DCE were both detected at 20 ppb in MW-06.

In shallow groundwater next to Building 21 in MW-6, SVOCs were below groundwater standards in 2001. In 2002, benzo(a)pyrene (1 ppb), benzo(a)anthracene (1 ppb), benzo(b)fluoranthene (1 ppb) and chrysene (1 ppb) were above SCGs. The groundwater SCG for each of these compounds is 0.002 ppb. No PAHs were detected above groundwater SCGs in MW-10.

The RI/FS data show no indication of a contamination source in the Building 21/22 area. Therefore, no remedial alternatives need to be evaluated for this area.

Lagoon

The surface area of the lagoon is approximately 200 ft by 40 ft. A black sediment layer was identified along the mid-section of the Three Star lagoon ranging from approximately 4 to 11.5 ft thick with a pudding like consistency. Water depth along the midsection of the Three Star lagoon ranged from approximately 4 to 7.5 ft.

Surface Water

Surface water sampling was completed in the center of the lagoon. Lagoon surface water data is compared to SCGs intended for the protection of surface water bodies.

The concentrations of inorganics detected in surface water in the Three Star lagoon were similar to background levels detected in Wappinger Lake. Aluminum, iron, and silver comprised the inorganics detected at concentrations above the SCGs for surface water quality. Aluminum and iron were slightly above the SCGs, with aluminum and iron concentrations of 194 and 318 ppb, respectively, compared to the SCGs for propagation of fish of 100 and 300 ppb. Silver was detected at 1.6 ppb. The concentration of total silver detected in the surface water of the Three Star lagoon exceeded the SCG of 0.1 ppb for propagation of fish exposed to ionic silver. The concentrations of aluminum, iron, and silver detected in the surface water of the Three Star lagoon were below the maximum background levels detected in Wappingers Lake during a storm event. Other constituents were within SCGs or within levels indicative of acceptable water quality.

Concentrations of VOCs in the surface water of the lagoon were not detected above SCGs. TCE, at 0.6 ppb, was the only VOC detected in surface water; this level of TCE is below the SCG of 5 ppb for human consumption of surface water.

SVOCs were not detected in the surface water of the lagoon.

Sediment

The lagoon sediment data were compared to the NYS sediment screening values in units of grams per kilograms of organic carbon (g/KgOC). Chlorobenzene was detected in all of the sediment samples at a maximum concentration of 1,083 g/KgOC. The sediment screening value for chlorobenzene is 3.5 g/KgOC. Xylene was detected in most of the sediment samples at a maximum concentration of 1,167 g/KgOC; compared to its SCG of 92 g/KgOC. Ethylbenzene (42 g/KgOC) and DCE (42 g/KgOC) were each detected in two samples above their respective screening values of 24 g/KgOC and 0.6 g/KgOC. Various VOC TICs were also detected in lagoon sediment.

Inorganic concentrations above the severe effect level (SEL) screening value for sediment consisted of cadmium (122 ppm), chromium (26,300 ppm), copper (10,600 ppm), lead,(9,650 ppm) mercury (54 ppm), nickel (3,890 ppm), zinc (3,710 ppm) and cyanide (69 ppm). The respective screening values for these inorganics are 9, 110, 110, 110, 1.3, 50, 270 and 0.1 ppm.

Pesticides were detected in one of two samples analyzed for pesticides/PCBs. The levels of DDT, Endosulfan II, Heptachlor epoxide, and chlordane were above sediment cleanup objectives. PCBs were not detected in either of the two samples.

TCLP

Results of TCLP analysis of a lagoon sediment sample did not identify concentrations above those that would characterize the sediment as hazardous waste as defined by 6 NYCRR Part 371 and 40 CFR Part 261.

Sediment contamination identified in the Three Star lagoon during the RI/FS will be addressed in the remedy selection process.

MGP area Investigation Results

In general, analytical data indicated that PAHs and inorganics were the primary contaminants detected in surface soil. The PAH concentrations were frequently above SCOs for unrestricted use. Inorganics were generally detected at concentrations below commercial SCOs, although concentrations were frequently above unrestricted SCOs. The highest concentrations of both PAHs and inorganics were located adjacent to the creek.

Surface Soil

Nine surface soil locations were sampled from the MGP area. Trace levels of VOCs detected in surface soil samples, consisting of benzene, PCE, toluene, methylene chloride, were below Part 375 SCOs.

The SVOCs detected in surface soil above SCOs consisted of PAHs. The detections of PAHs included the following above Part 375 SCOs for unrestricted use in the ranges of concentrations stated; benzo(a)anthracene (0.060 - 79 ppm), benzo(a)pyrene (0.056 - 87 ppm), benzo(b)fluoranthene (0.19 - 100 ppm), benzo(k)fluoranthene (0.24 -42 ppm) chrysene (0.20-80 ppm), dibenzo(a,h)anthracene (0.069 - 18 ppm) and indeno(1,2,3-cd)pyrene (0.049 - 53 ppm). The respective unrestricted SCOs for these PAHs are 1, 1, 1, 0.8, 1, 0.33 and 0.5 ppm.

Samples from two locations in the MGP area contained inorganics above SCOs for unrestricted use. Lead (1,160 ppm) and arsenic (37 ppm) were detected in SS-MGP1 and copper (441 ppm) was observed in SS-14 surface soil above their respective unrestricted SCOs of 63, 13, and 50 ppm. Inorganics were present above SCGs for unrestricted use in most of the areas sampled from the MGP area.

Zinc was detected above unrestricted SCOs in all but two of the 11 sample locations in the MGP area. Detectable concentrations of zinc range from 114 ppm to 2,570 ppm in SS-MGP1. All concentrations are above the unrestricted SCO of 109 ppm for zinc. Mercury was also observed in all of the same samples above its unrestricted SCO of 0.18 ppm with a maximum concentration of 2.3 ppm. In addition the zinc and mercury, other inorganics were detected above unrestricted SCOs in surface soil throughout the MGP area. For example, SS-14 also had copper (441 ppm) and lead (666 ppm) above unrestricted SCOs. SS-MGP2 had arsenic (41 ppm), cadmium (55 ppm), trivalent chromium (158 ppm), hexavalent chromium (12 ppm), copper (94 ppm), lead (462 ppm) above unrestricted SCOs. Most of the other surface soil samples from the MGP area had similar levels of inorganic impacts.

Subsurface Soil

Soil borings completed in the former gas holders and the filled area adjacent to the tidal creek exhibited naphthalene odor. Screening of soil from each of the borings advanced in these areas showed PID readings above background. The bottom of the gas holders (SB-3-01 and SB-401) were encountered at approximate depths of 6.5 ft and 9.2 ft below grade based on the appearance of native material at those levels. Gas holders typically had concrete bottoms or used the top of the watertable as the base to retain the gas. It appears that these gas holders were constructed using the latter approach. No coal tar sludge was observed at the apparent bottoms of the gas holders. The borings adjacent to the tidal creek (MW-4 and BMW-1) contained globules of free product in subsurface soil. PID readings up to 108 ppm were detected in soil from MW-4 in the 14 to 16 ft interval. The subsurface materials in that area (MW-4) consisted of soil with bricks and glass observed at approximately 8 ft bgs suggesting that soil in the area was fill.

Eight shallow test pits were completed in the MGP area. Four of the test pits, identified as TP-1, TP-2, TP-3, and TP-4 were completed in the general vicinity of the former gas holders. The remaining four test pits, TP-5, TP-6, TP-11, and TP-12 were completed northwest of the gas holders to characterize the spatial distribution of fill material in this area. Test pits TP-11 and TP-12 were completed in an area where several empty five-gallon drums are exposed at the ground surface.

In general, test pits completed in the MGP area did not demonstrate olfactory or visual evidence of contamination and the PID showed no measurable readings. A total of nine soil samples were collected and submitted for laboratory analysis from test pits completed on the MGP area.

In six of thirteen subsurface locations sampled, contaminants were below unrestricted SCOs. PAHs were detected above SCOs in six of the other seven locations. In general, the highest levels and widest range of contaminants in subsurface soil were detected in five locations sampled from two areas.

PAHs were detected in subsurface soil at concentrations above SCOs throughout the MGP area with the maximum concentration of total PAHs up to 1,448 ppm detected in MW-5 (2 to 4 ft) and in the south gas holder (SB-4, 6 to 8 ft deep) at 2,261 ppm. PAHs detected above unrestricted SCOs in SB-4 consist of anthracene (150 ppm), benzo(a)anthracene (200 ppm), benzo(a)pyrene (170 ppm), benzo(b)fluoranthene (180 ppm), benzo(k)fluoranthene (80 ppm) chrysene (180 ppm), dibenzo(a,h)anthracene (31 ppm), indeno(1,2,3-cd)pyrene (110 ppm), phenanthrene (220 ppm) and pyrene (340ppm)

PAHs detected in MW-4 included acenaphthene (100 ppm), fluoranthene (130 ppm), fluorene (62 ppm), indeno(1,2,3-cd)pyrene (16 ppm), naphthalene (290 ppm) and phenanthrene (210 ppm) above unrestricted SCOs. The respective unrestricted SCOs for these PAHs are 20, 100, 30, 0.5, 12 and 100 ppm. The PAH concentrations detected in SB-4 and MW-4 as discussed above are indicative of concentrations observed in the other locations on the MGP area where PAH impacts were noted.

Cinders were observed in the sample collected for analysis from test pit TP-04.

On the MGP area, the highest concentrations and widest range of inorganics were detected within the south gas holder and the area adjacent to the creek. MW-4, specifically the 14 to 16 ft depth, had the most significant inorganic contamination on the MGP area where arsenic (39 ppm), cadmium (18 ppm), copper (85 ppm), lead (506 ppm), mercury (249 ppm),and zinc (200 ppm) were detected above their respective unrestricted SCOs of 13, 2.5, 50, 63, 0.18 and 109 ppm. Chromium, copper, lead, mercury and zinc were detected above unrestricted SCOs in MW-5 and SB-4. In MW-5 (12 to 14 ft), mercury was detected at 3.7 ppm.

Non-Aqueous Phase Liquid (NAPL) was observed in the deep boring adjacent to the tidal creek (BMW-1) at depths of 26 to 34 feet.

Dibenzofuran was detected above its unrestricted SCO of 7 ppm in MW-4 (54 ppm), MW-5 (25 ppm), SB-4 (15 ppm) and BMW-1 (21 ppm).

VOCs were not detected above SCGs for unrestricted use.

<u>Groundwater</u>

Neither pesticides nor PCBs were detected in groundwater samples collected from the MGP area.

Total VOC concentrations in shallow groundwater ranged from 1 to 160 ppb with benzene, TCE, cis-1,2-DCE, and vinyl chloride above SCGs. Benzene was detected in shallow groundwater adjacent to the tidal creek (MW-4), at up to 3 ppb. TCE (17 ppb) and DCE (110 ppb) were detected in shallow groundwater in the south portion of the site (MW-2). DCE (16 ppb) was also detected in shallow water adjacent to the lagoon (MW-3). Vinyl chloride was also detected in shallow groundwater from MW-2, MW-3 and MW-4 at concentrations of 24, 8 and 8 ppb, respectively. VOC concentrations were below SCGs in deep groundwater adjacent to the tidal creek (BMW-1), except for benzene at 3 ppb and cis-1,2-DCE, at 26 ppb. The respective groundwater SCGs of benzene, TCE, DCE and vinyl chloride are 1, 5, 5 and 2 ppb.

SVOCs were not detected in shallow groundwater samples collected from two of the four wells (MW-2 and MW-3) on the MGP area. Naphthalene (28 ppb), acenaphthene (32 ppb), benzo(a)pyrene (6 ppb), benzo(a)anthracene (9 ppb), benzo(k)fluoranthene (3 ppb), benzo(b)fluoranthene (8 ppb) and chrysene (9 ppb) were detected above groundwater SCGs in MW-4.

In deep groundwater adjacent to the tidal creek (BMW-1), naphthalene was detected at 77 ppb, above its SCG of 10 ppb. SVOC TICs were also detected in groundwater.

Inorganics detected above SCGs generally consisted of elements that are commonly related to local geologic conditions (iron, magnesium, manganese, and sodium), except antimony. Antimony (15 ppb) was detected in shallow groundwater from a single monitoring well adjacent to the tidal creek (MW-4), above its SCG of 3 ppb.

In deep groundwater adjacent to the tidal creek (BMW-1), several inorganics were above SCGs. Thallium (4.1 ppb) and lead (210 ppb) were detected at approximately eight times higher than their respective SCGs of 0.5 and 25 ppb. Arsenic (100 ppb) and chromium (210 ppb) were detected at approximately four times their respective SCGs of 25 and 50 ppb. Beryllium (8.2 ppb), copper (490 ppb), nickel (240 ppb) and mercury (1.5 ppb) were also above their respective SGCs of 3, 200, 100, 1 ppb.

Turbidity can influence the concentrations of inorganics detected in groundwater. In groundwater, higher levels of turbidity tend to be associated with elevated levels of suspended solids and inorganics.

The data show that the MGP that operated in this area created the PAH contamination in surface and subsurface soil typically associated with such operations, in addition to the metals contamination in this area. The data do not show evidence that the PAHs or metals present in the soil have impacted the groundwater in the MGP area. The surface soil contamination identified during the RI/FS will be addressed in the remedy selection process.

5.2: <u>Interim Remedial Measures</u>

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

The Department submitted a request to the EPA to conduct an emergency removal action of a variety of containers containing known and unknown wastes remaining within the on-site buildings. Shortly after the May 2004 fire, an EPA contractor was mobilized to the site to begin the removal action. On July 6, 2004, EPA began to clear debris and to stage the drums and containers. Waste containers were removed from Building 17 and other smaller buildings. Due to the destruction caused by the fire that destroyed or significantly damaged about half of the structures, many of the waste-containing containers were buried by debris. EPA's contractor also determined that many areas where unsafe due to unstable, damaged structures. Demolition of unsafe remnants of the damaged buildings was conducted to allow the contractor to safely complete the removal action.

Approximately 230 waste containers were sampled for hazardous waste categorization. A total of 23 waste streams were categorized. Four composite samples were collected from the vats. Twenty-seven samples were sent to a laboratory for analysis. The wastes were then consolidated in 66 drums. Empty waste containers were crushed and loaded into a roll-off for off-site disposal as non- hazardous waste.

Twenty compressed gas cylinders were removed prior to and during the removal action. An approximately 10,000-gallon storage tank was pumped out and cleaned. The tank remains on-site. Some oil contaminated soil was placed into drums. The EPA removal action concluded on August 6, 2004 and all of the wastes were transported off-site on November 10 for final disposal.

The Department had a chain link fence and signs installed around the former plating vats in May 2005 to prevent exposure to the vats. EPA had labeled the former metal plating vats V-1 through V-23 on the west side of the vats.

Eight composite samples were collected to characterize the vat liquids for off-site disposal. Analytical data indicated that the composite sample of vats 1, 7, and 8 contained chromium levels up to approximately 16,000 ppb. Analytical data associated with the vat liquids are presented in the SRI Report.

Beginning April 3 through April 11, 2006, the liquids were pumped from the vats for off-site disposal. Due to the elevated chromium the 12,105 gallons pumped from vats 1, 7, and 8 were disposed of as hazardous waste. Approximately 127,053 gallons were removed from the remaining vats.

A larger fence was constructed in January 2009 around the remaining buildings, the vats and most of the debris. The new fence will remain in place through the remediation.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 7.3 of the RI report.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

On-site surface soils and lagoon sediments are contaminated with VOCs, SVOCs and/or inorganics. The potential exists for incidental ingestion of contaminated sediments, dermal contact with contaminants present in site soils and the inhalation of contaminated dust by people working on the site, trespassers entering the property, or if site soils are disturbed in the future.

On-site groundwater is contaminated with a combination of SVOCs, VOCs and inorganic contaminants as a result of former site activities. Since site groundwater is not used for any purpose and public water is available to area homes and businesses, there is currently little potential for exposure to site related contaminants that are present in groundwater.   However, exposure to site-related contaminants present in groundwater could occur through ingestion and/or the inhalation of VOCs if on-site groundwater is used as a source for potable water or other purposes in the future. Because the VOC groundwater plume extends beneath the Axton-Cross Building, the potential exists for exposure to building occupants via soil vapor intrusion.

5.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

An on-site Fish and Wildlife Impact Analysis (FWIA), is included as Appendix E of the RI report. The FWIA conducted for Wappinger Creek is presented in Appendix G of the creek RI report. The FWIAs present a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors.

Excluding the MGP area and the raceway, the terrestrial portion of the site is largely developed with buildings, weathered asphalt, compacted fill or maintained lawns. Such conditions will prevent or limit use by transient or residential wildlife species. Ecological receptors are unlikely to utilize such portions of the site due to the lack of and/or poor quality of habitat. Potentially complete exposure pathways to terrestrial and aquatic receptors likely exist in other areas of the site and in Wappinger Creek.

The MGP area, the former raceway, and the southern portion of the site behind Buildings 15, 16, and 17, contain small forested areas and some grassed area that provide adequate natural resources for some ecological receptors such as small mammals and birds. The lagoon areas provide limited habitat for aquatic receptors.

Concentrations of chemical constituents in site media (surface soil, surface water and sediment) were detected above ecologically-based criteria and/or screening values, indicating potential direct contact exposures to soil and benthic macroinvertebrate inhabitants.

Elevated concentrations of metals were found in the surface soil in the lower raceway and next to the Axton Cross building. Elevated PAH concentrations are present in surface and sub-surface soils in the MGP area and behind the remnants of Buildings 15, 16 and 17.

Aquatic areas existing on-site include a portion of Wappinger Creek and the on-site lagoon.

Wappinger Creek provides appropriate habitat for a variety of fish and other wildlife and likely contains high quality habitat for a variety of small mammal, avian, reptilian, amphibian and fish species. Federal and state wetlands were identified on and in the vicinity of the site. Several state regulated wetlands and National Wetland Inventory (NWI) wetland habitats are located within two miles of the site. The Department and the New York National Heritage Program (NYNHP) have identified rare and/or protected flora and fauna and significant natural communities within a two-mile radius of the site. The protected species and communities are primarily associated with the aquatic, open water areas including Wappinger Creek, the Hudson River and the up-stream Wappinger Lake.

Site contamination has also impacted the groundwater resource in the overburden aquifer.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The remediation goals for this site are to eliminate or reduce to the extent practicable:

- exposures of persons at or around the site to VOCs, PAHs and inorganics in soils, groundwater, soil vapor and the lagoon sediments;
- environmental exposures of flora or fauna to PAHs and inorganics in soils and the lagoon sediments;
- the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards;
- the release of contaminants from surface soil into ambient air through wind borne dust; and
- the release of contaminants from on-site soils into Wappinger Creek surface water and sediments through surface run-off and groundwater migration

Further, the remediation goals for the site include attaining to the extent practicable:

- ambient groundwater quality standards through source removal / remediation.

When developing the remedial alternatives presented below, the 170 years of various industrial activities and the expected future use of the site were considered.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Three Star Anodizing Site were identified, screened and evaluated in the FS report which is available at the document repositories established for this site.

A summary of the remedial alternatives that were considered for this site is discussed below. The present worth represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated soils, sediments, and groundwater at the site.

Alternative 1: No Action
The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Alternative 2: Institutional and Engineering Controls, and Groundwater Monitoring
Alternative 2 consists of access restrictions, groundwater monitoring, an environmental easement, and a Site Management Plan.

Access Restrictions. The fence installed in 2009 around the perimeter of the Three Star Site as an engineering control (EC) would be maintained and additional fencing would be installed in other areas of the site. An institutional control (IC) in the form of environmental easements consisting of land use restrictions, groundwater use restrictions and compliance with a site management plan would be placed on the property deeds. The land use restrictions would prohibit activities that would potentially disturb or expose contaminated materials, unless done in accordance with the approved site management plan. Groundwater use restrictions would preclude the use of on-site groundwater without prior approval from the Dutchess County Department of Health.

Groundwater Monitoring. Groundwater monitoring would be implemented to track concentrations of VOCs and inorganic constituents in groundwater and would be instrumental in detecting changes in concentrations. Groundwater monitoring would consist of periodic sampling of wells with analysis of VOCs and inorganic constituents.

Vapor Control. Due to the presence of a chlorinated VOC plume in the vicinity of the currently occupied Axton-Cross Building, an assessment of sub-slab and indoor air conditions would be conducted. If the assessment results indicate a need, a soil vapor mitigation system would be designed and installed in the building.

Site Management Plan. Since impacted soil and contaminated groundwater would remain onsite, a site management plan (SMP) would be implemented to ensure the continuing protection of human health and the environment. The aforementioned ICs and ECs would be documented and detailed in the SMP. Specifically, the SMP for Alternative 2 would consist of continued evaluation of the potential for vapor intrusion in on-site buildings, periodic groundwater monitoring, identification of site use restrictions, fencing to control site access, and provisions for the continued operation and maintenance of the components of the remedy.

Periodic Certification. A periodic certification would be submitted to the Department. The document would certify that the SMP continues to be implemented, that the institutional controls and engineering controls are still in place and unchanged, and that nothing has occurred that would impair the ability of the remedy and site management to protect public health and the environment.

Present Worth: $620,000
Capital Cost: $200,000
Annual Costs: $34,000

Alternative 3: On-Site Treatment and Containment and Vat Containment
Alternative 3 consists of removal and off-site disposal of surface debris, demolition and off-site disposal of the former gas holders, decommissioning of the vats, on-site treatment and containment of soil, containment of lagoon sediment, and indoor vapor control. Alternative 3 also includes the same access restrictions, groundwater monitoring, environmental easement, SMP and, if necessary, indoor vapor control described in Alternative 2.

The on-site treatment and containment of soil would involve treatment of soil from the lower portion of the former raceway and the dry well area and containment of soil in the MGP area and areas of the Main Site.

In-situ soil treatment. Soil treatment in Alternative 3 would be conducted in the lower portion of the former raceway and the dry well area at the Axton-Cross Building. In an area of approximately 10,000 square feet from the bridge over the raceway to about 100 feet east of the bridge, approximately 1,200 cubic yards of metals impacted soil in the lower portion of the former raceway would be treated in-situ (in place) by stabilization through the addition of a stabilizing agent, such as a sulfide-based reagent, into the subsurface. An estimated 7,800 cubic yards of VOC contaminated soil in the dry well area adjacent to the Axton-Cross building would be treated in-situ by chemical oxidation through the injection of an oxygenating agent into the subsurface.

Monitored Natural Attenuation of Groundwater in the Axton Cross Area. The treatment of the source area at the Axton Cross building would remove the contamination over time. This would allow for monitored natural attenuation of the VOCs present in groundwater and the ultimate attainment of groundwater standards for VOCs.

Decommissioning of Former Metal Plating Vats. Twenty-three vats are present within the footprint of what was Building 16, which was destroyed in the May 2004 fire. The vats consist of poured concrete or concrete block structures extending approximately 9 feet deep, with approximately 7 feet below the existing grade and 2 feet above grade, each having an approximate footprint of 5 feet by 38 feet. The remaining south brick wall of Building 16 is close to the vats and is structurally unsound. The wall presents a physical hazard and would require stabilization or demolition prior to any remedial action on the vats. The building debris on and in the vats primarily consists of bricks and wood timbers, but it also contains other miscellaneous debris such as roof shingles, tar paper, mortar, and metal. Roof shingles and tar paper present across the Three Star Site, including within the vats, is presumed to be non-friable asbestos-containing material (ACM). It is anticipated that the debris would be containerized, transported, and disposed in a C&D debris landfill. Liquid and sludge would be removed from the vats. Based on existing data, it is anticipated that the liquid and sludge would be disposed of off-site as hazardous waste and non-hazardous waste at a Department-approved landfill. Following liquid and sludge removal, the vats have areas of non-friable ACM mastic that would be removed. The vats would then be pressure washed. Following the subsurface investigation, the vat walls would be demolished to grade and the vats would be filled with sand and capped with concrete.

On-site containment of lagoon sediment. To allow for placement of a three foot cover over the contaminated lagoon sediment that will remain in the approximately 9,000 square foot lagoon; the top three feet of sediment would be excavated to three feet deep, a geotextile liner placed and covered with the clean fill. To achieve this, the lagoon would be pumped dry and well points would be installed to draw down the water table locally such that excavation work can be performed in the dry to the target depths which are below the observed water table. The excavated sediment would then be characterized and transported off-site for disposal at an acceptable facility.

Removal and disposal of surface debris. To allow for a soil cover, miscellaneous debris present on the ground surface at the MGP area, debris removal is a component of the remedy. The debris would be gathered and disposed off-site at an appropriate disposal facility.

Demolition and Off-Site Disposal of the Former Gas Holders. The ruins of two former gas holders are present on the MGP area. Both circular brick structures are approximately 40 feet in diameter and extend approximately 8 feet above ground surface. Removal of these former gas holders is anticipated to be completed using an excavator. The brick debris would be disposed of off-site at an appropriate disposal facility.

Soil Cover. A vegetated soil cover would be used to contain surface soil areas with concentrations of constituents greater than 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use. The soil cover would consist of a 12-inch thick soil vegetated layer. Based on the concentrations detected in soil samples collected across the Three Star Site, it is anticipated that the vegetated soil cover would cover approximately 5.5 acres of the site, including areas of the MGP area, the lower raceway and areas just west of the Axton Cross buildings and the other buildings on site. Additional soil sampling may be necessary during the design phase to better delineate the extent of surface soil areas at concentrations greater than 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use. Specifically, additional information is required to fill in data gaps for the south border of the MGP area, the area near Buildings 15/16/17 and 21/22 and the raceway, the area adjacent to the eastern side of the lower half of the lagoon, and the area along the creek bank north of the Axton-Cross Building.

Prior to installation of the vegetated soil cover, the ground surface would be graded and surface debris would be removed. The vegetated soil cover would be graded to promote drainage and minimize erosion of the cover. The vegetated soil cover would be routinely inspected to verify integrity.

Because the MGP area is currently a heavily vegetated area with value as a natural resource, the soil cover would incorporate a 25-feet wide buffer area along Wappinger Creek on the MGP area. This portion of the soil cover would be constructed by excavating the soil to a depth of approximately 1 foot. The excavated cinder-containing fill material would be disposed off site, and all or most of the trees and other vegetation would be removed as needed . The excavation would be backfilled with clean fill. The ground surface would be restored using appropriate native plantings.

Groundwater Monitoring. Groundwater monitoring would be implemented to track concentrations of VOCs and inorganic constituents in groundwater and would be instrumental in detecting changes in concentrations. Groundwater monitoring would consist of periodic sampling of wells with analysis of VOCs and inorganic constituents.

Site Management Plan. Since impacted soil and contaminated groundwater would remain onsite, a site management plan (SMP) would be implemented to ensure the continuing protection of human health and the environment. The SMP would consist of management of the final cover system over contaminated soils, the lagoon containment system, and the erosion control system along the creek. The SMP would also include continued evaluation of the potential for vapor intrusion for on-site buildings developed on the site, periodic groundwater monitoring, identification of site use restrictions, and provisions for the continued proper operation and maintenance of the components of the remedy.

Periodic Certification. A periodic certification would be submitted to the Department. The document would certify that the SMP continues to be implemented, that the institutional controls and engineering controls are still in place and unchanged, and would state that nothing has occurred that would impair the ability of the remedy and site management to protect public health or the environment.

Present Worth: $4,520,000
Capital Cost: $3,540,000
Annual Costs: $80,000

Alternative 4: Vat Removal, Lagoon Excavation and Limited Soil Excavation and Cover
Alternative 4 would consist of vat removal, sediment removal from the Three Star lagoon, limited soil excavation with off-site disposal and placement of a soil cover over all areas of the site where surface and shallow soil contamination exceeds commercial SCGs. The areas that would be remediated under Alternative 4 are depicted in Figure 6. Alternative 4 would also include some of the same active remedial actions described in Alternative 3; vapor control, removal and off-site disposal of surface debris, demolition and off-site disposal of the former gas holders, excavation of impacted soil and soil cover over specific areas of the site. Alternative 4 would include the same access restrictions, groundwater monitoring, environmental easement, SMP and, if necessary, indoor vapor control described in Alternatives 2 and 3.

Subsurface soil excavation and off-site disposal. To address the VOC contamination exceeding SCGs, significant soil excavation would be conducted in the dry well area at the Axton-Cross building. Based on analytical results, it is anticipated that excavation of the former dry well area soil would extend to approximately 22 feet below grade and would encompass an approximately 0.2 acre area. An estimated 7,800 cubic yards of soil from the dry well area would be removed.

Due to the depth of the excavations, it is expected that shoring would be necessary. Also, the depth of the excavation may be limited by the building foundation. Additionally, due to the presence of a shallow watertable, it is anticipated that dewatering would be necessary during excavation. Considering the presence of elevated concentrations of VOCs at this location, it is anticipated that the water generated from dewatering activities would require treatment prior to discharge to Wappinger Creek or off-site disposal. Following characterization, excavated soil would be transported off-site for disposal in a Department-approved landfill.

Monitored Natural Attenuation of Groundwater in the Axton Cross Area. The removal of the source area at the Axton Cross building would allow for monitored natural attenuation of the VOCs present in groundwater and the ultimate attainment of groundwater standards for VOCs.

Demolition and off-site disposal of the former metal plating vats. Due to the presence of ACM at greater than 1% of the total volume, all of the debris is considered ACM as per the New York State Department of Labor (DOL), which regulates asbestos in New York. The ACM must be removed by a DOL approved contractor prior to any remedial activity on the vats. It is anticipated that the debris would be containerized, transported, and disposed at an appropriate disposal facility. Liquid and sludge would be removed from the vats. Based on existing data, it is anticipated that much of the liquid and sludge would be disposed of off-site as hazardous waste at appropriate facility. Following liquid and sludge removal, non-friable ACM mastic present in some of the vats would be removed and the vats would then be pressure washed. Following pressure washing, the vats would be completely demolished and disposed of off site. The soil beneath the vats would then be sampled to determine if has been impacted by leaking vats. If the soil beneath the vats is found to be grossly contaminated, it would be excavated and disposed of off site. For cost estimation purposes, it is assumed that the soil under the vats has been impacted to an extent that would require excavation and disposal.

Excavation and Covering of the Lower Portion of the Former Raceway. To address the inorganic contamination present in soil in the lower raceway, approximately 400 cubic yards of soil would be excavated from an area of about 10,000 square feet from the bridge over the raceway to about 100 feet east of the raceway to a minimum depth of one foot and covered with a minimum of one foot of clean fill and topsoil. The covering of this area would serve multiple purposes. The remedy would remove inorganic contaminated material in the surface soil and to cover the area to prevent exposure to inorganics in subsurface soil. Covering the area would prevent migration of inorganics into the downstream lagoon.

Sediment removal and restoration of the lagoon. The Three Star lagoon contains sediment with site-related constituents that varies from approximately 2 to 11 feet in thickness and has an estimated total volume of approximately 2,100 cubic yards. The lagoon would be pumped dry, and well points would be installed to draw down the water table locally such that excavation work can be performed in the dry to the target depths which are below the observed water table. The excavated sediment would then be characterized and transported off-site for disposal at an acceptable facility.

Restoration of the Three Star lagoon would consist of replacing the contaminated sediment with clean backfill to establish a water depth comparable to the current depth to a maximum of approximately 8 feet along the mid section of the lagoon. Along the shorelines, clean sand would be added to a 10 foot width to develop a shallow water maximum depth of approximately 2 feet at average conditions next to the shore sloping toward the mid section. The outlet to the lagoon would be maintained at the current elevation which would allow discharge during storm events, but would not be connected to Wappinger Creek at low water conditions. Native wetland and riparian plants would be planted along soil banks and in the shallow area along the shorelines.

Excavation and covering of the MGP area. Due to the presence of PAHs in surface soil, a soil cover remedy would be implemented of all or most of the entire 2.8 acres of the MGP area. A 25-foot buffer would be excavated along the Wappinger Creek and the Three Star Lagoon to a depth of one foot and covered with two feet of clean fill and topsoil. The rest of the MGP area would be covered with a demarcation barrier and one-foot of clean soil. Along with the removal of the surface debris and the gas holders described above, all or most of the trees and other vegetation would be removed to allow for excavation and the soil cover. The ground surface would be restored using appropriate native plantings.

Installation of a soil cover. Approximately 2.5 acres of the site, including the area just west of the Axton Cross building and areas near the other on-site buildings, that have surface soil impacts above commercial SCGs would be covered with a minimum of one foot of clean fill and top soil. A demarcation barrier would be placed on the existing grade, the clean fill would be placed on top of the barrier and the entire area seeded. The precise areas to be covered would be determined by pre-design surface soil sampling.

Site Management Plan. Since impacted soil and contaminated groundwater would remain onsite, a site management plan (SMP) would be implemented to ensure the continuing protection of human health and the environment. The SMP would consist of management of the final cover system over contaminated soils and the erosion control system along the creek, continued evaluation of the potential for vapor intrusion for on-site buildings developed on the site, periodic groundwater monitoring, identification of site use restrictions, and provisions for the continued proper operation and maintenance of the components of the remedy.

Periodic Certification. A periodic certification would be submitted to the Department. The document would certify that the SMP continues to be implemented, that the institutional controls and engineering controls are still in place and unchanged, and would state that nothing has occurred that would impair the ability of the remedy and site management to protect public health or the environment.

Present Worth: $10,600,000
Capital Cost: $8,720,000
Annual Costs: $148,000

Alternative 5: Vat Removal, Lagoon Excavation and Complete Excavation of All Soil Contamination above 6 NYCRR Part 375 Cleanup Objectives for Unrestricted Use

Alternative 5 would include complete vat removal, excavation of the lagoon, excavation of the drywell area within the Axton Cross area, and removal of trees and vegetation followed by replanting as described in Alternative 4. Alternative 5 would also include complete excavation of all soil with contaminant concentrations above 6 NYCRR Part 375 Cleanup Objectives for Unrestricted Use.

This would include excavation to a depth of 30 feet of about 23,000 cubic yards of soil from a 0.5 acre portion of the MGP area along Wappinger Creek where NAPL had been observed. The excavation would be approximately 20 feet below the median water table and the average elevation of the tidal creek. Based of existing data, the rest of the MGP site would be excavated to depths up to eight feet across most of the remaini5ng 2.3 acres. A total of approximately 53,000 cubic yards from the MGP area would be disposed of off site and replaced with clean fill. To conduct the excavation the creek would be partially diverted with sheet piles in the creek and upland to more than 30 feet below the surface grade of the MGP area and the area would be pumped continuously.

An approximately 45,000 square foot area of inorganics impacted soil in the lower raceway would be excavated to about 20 feet below grade. Approximately 45,000 cubic yards of soil would be excavated, disposed of off site and replaced with clean fill. The excavation in the area would also require shoring and continuous pumping to lower the water table.

Much of the remaining areas of the Three Star site, approximately 2.5 acres, not presently covered by buildings, slabs or pavement would be excavated to about 12 feet below grade. The areas to be excavated including the area just west of the Axton Cross building and portions of the Building 15/16/17 area and the Building 21/22 area. Approximately 48,000 cubic yards would be excavated, disposed of off site and replaced with clean fill.

The final depths and areal extent of the excavations would be determined by pre-excavation soil borings and post excavation sampling where possible

Present Worth: $73,000,000
Capital Cost: $73,000,000
Annual Costs: $5,000

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York State. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the department has determined to be applicable on a case-specific basis.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectivness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are presented in Table 3.

This final criterion is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the department will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative 4, Vat Removal, Lagoon Dredging and Limited Excavation and Covering as the remedy for this site. The elements of this remedy are described at the end of this section.

The proposed remedy is based on the results of the RI and the evaluation of alternatives presented in the FS.

Alternative 4 is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It would achieve the remediation goals for the site by removing the vats and the soils that create the most significant threat to public health and the environment. Subsequently, Alternative 4 would greatly reduce the source of contamination to groundwater, and it would create the conditions needed to protect wildlife and restore groundwater quality to the extent practicable.

No-Action Alternative 1 would allow contamination to remain in place with no measures taken to mitigate impacts to human health and the environment. Therefore, Alternative 1 does not meet either of the threshold criteria and is removed from further consideration.

Alternative 2 would mitigate impacts to human health though the implementation of institutional controls that would essentially prohibit access and use of the site in its current state. Because contamination would remain in place, wildlife would continue to be exposed to site contaminants and runoff from the site would continue to impact the creek. Therefore protection of the environment and compliance with New York State SCGs would not be achieved. Therefore, Alternative 2 would not meet the threshold criteria. Based on the inability of Alternative 2 to meet the threshold criteria, Alternative 2 is removed from further consideration.

Alternatives 3, 4 and 5 would meet the threshold criteria by mitigating exposure pathways to protect human health and wildlife receptors and addressing the source area to reduce impacts to groundwater. The soil remedies in Alternative 3 would ultimately achieve SCGs in the Axton Cross area and in surface soil and sediment in other areas addressed. Alternative 3 would ultimately achieve groundwater SCGs for VOC contamination attributed to the soil contamination in the Axton Cross area. The soil remedies in Alternative 4 would be expected to achieve SCGs over a shorter time frame through the physical removal of the source areas; specifically the VOC soil contamination at the Axton Cross building, the former plating vats and the lagoon sediment. Alternative 5 would most quickly meet soil SCGs across the site.

Alternatives 3, 4 and 5 would all have a significant short term impact during the time period to conduct the individual remedies, but the local impacts would be minimized through the use of engineering controls. Because significant contamination would remain on-site, Alternative 3 would require significant operation and maintenance, in both the vat area and the lagoon for the long-term. Alternative 4 would better achieve long-term effectiveness and permanence by permanently removing the worst contamination and therefore requiring less long-term maintenance. Alternative 5 would best meet long term permanence through the complete removal of all contaminated soil, but would have significant short term impact due to the expansive excavations and the associated construction, heavy equipment and truck traffic.

Alternative 3 would reduce the mobility of the contamination in the lagoon and the vat area and would reduce the toxicity of the VOC contamination in the Axton Cross area. By physically removing the contaminated materials in the lagoon and vat area, Alternative 4 would reduce the volume of contaminants and subsequently the toxicity associated with those areas. For both alternatives 3 and 4, installing a soil cover in the lower raceway, the MGP area and the other excavated areas would also reduce mobility of the residual contamination. Alternative 5 would best achieve a reduction in toxicity, volume and mobility of contamination by eliminating the soil contamination and source areas.

The remedies presented in Alternatives 3, 4 and 5 are commonly conducted at contaminated properties and can be readily implemented at the Three Star Site. Alternative 5 would require extensive use of sheet piles and water pumping from the excavations. While this method is often used for deep excavations, the location along the creek in the MGP area would require partial diversion of the creek and placement of sheet piles more that 30 feet below the surface grade of the MGP area.

The cost of Alternative 4 is a little more than double the cost of Alternative 3 while the cost of Alternative 5 is seven times that of Alternative 4. Alternative 4 is much more protective of the environment than Alternative 3, since the highly contaminated Lagoon sediments would be completely removed from the aquatic environment which justifies the additional cost of Alternative 4. While Alternative 5 would allow unrestricted use of the property, the significant short-term local impacts and significant cost of Alternative 5 do not justify the selection of that Alternative.

The estimated present worth cost to implement the remedy is $10,600,000. The cost to construct the remedy is estimated to be $8,720,000 and the estimated average annual operation, maintenance, and monitoring costs for 30 years is $1,880,000.

The elements of the proposed remedy are as follows:

1. A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

2. Approximately 7,800 cubic yards of VOC contaminated soil over the 0.2 acre dry well area at the Axton Cross building would be excavated to about 22 feet below grade and disposed of off site. Groundwater standards for VOCs would be achieved through monitored natural attenuation. Soil vapor intrusion testing and, if necessary, mitigation of soil vapor impacts to the Axton Cross building would be conducted.

3. Asbestos containing material in the Building 15/16/17 area would be removed and appropriately disposed off-site to allow for safe implementation of the vat remedy. Debris, water and sludge would be removed from the 23 plating vats and disposed of at an appropriate facility. The vats would then be cleaned, demolished and disposed of off site. Any grossly contaminated be soil

beneath the vats would be excavated and disposed of off site.

4. Approximately 400 cubic yards of contaminated soil would be excavated from an area of about 10,000 square feet in the lower raceway from the bridge over the raceway to about 100 feet east of the raceway to a minimum depth of one foot and covered with a minimum of one foot of clean fill and topsoil.

5. To provide a safe aquatic habitat, the Three Star lagoon would be pumped dry and approximately 2,100 cubic yards of contaminated sediment would be stabilized and excavated to Department sediment cleanup objectives to a maximum of about eight feet. The excavated sediment would be disposed of off site and replaced with ecologically compliant fill to the original depth.

6. Surface debris would be removed from the manufactured gas plant (MGP) area. The gas holder foundations in the MGP area would be demolished and disposed of at an appropriate facility. The soil within the gas holders and any grossly contaminated soil would be excavated and disposed of off site. Trees and other vegetation would be removed as needed. A 25-foot buffer would be excavated along the Wappinger Creek and the Three Star Lagoon to a depth of one foot and covered with two feet of clean fill and topsoil meeting commercial SCOs. The rest of the MGP area would be covered with a demarcation barrier and one-foot of clean fill and topsoil. Area would be replanted with native plants.

7. Pending pre-design surface soil sampling, approximately 2.5 acres of the site, including the area just west of the Axton Cross building and areas near the other on-site buildings, would be covered with a soil cover. The soil cover would be constructed to prevent exposure to contaminated soils. The one foot thick cover would consist of clean soil underlain by an indicator such as orange plastic snow fence to demarcate the cover soil from the subsurface soil. The top six inches of soil would be of sufficient quality to support vegetation. Clean soil for covers and backfill would constitute soil that meets the Division of Environmental Remediation's criteria for backfill or local site background as set forth in 6 NYCRR 375-6.7(d) and as specifically approved by the Department for this application.

8. Imposition of an institutional control in the form of an environmental easement that would require (a) limiting the use and development of the property to commercial use; (b) compliance with the approved site management plan; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and (d) the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.

9. Development of a site management plan which would include the following institutional and engineering controls: (a) management of the final cover system to restrict excavation below the soil cover's demarcation layer, pavement, or buildings. Excavated soil would be tested, properly handled to protect the health and safety of workers and the nearby community, and would be properly managed in a manner acceptable to the Department; (b) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (c) monitoring of groundwater; (d) identification of any use restrictions on the site; (e) fencing to control site access; and (f) provisions for the continued proper operation and maintenance of the components of the remedy.

10. The property owner would provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. This submittal would: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.

TABLE 1
Nature and Extent of Contamination

SURFACE SOIL Main Site	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	tetrachlorethene	0.001 - 43	1.3	1 / 22
	trichloroethene	0.001 - 2	0.47	1 / 22
Semivolatile Organic Compounds (SVOCs)	benzo(a)pyrene	0.054 - 12	1	8 / 22
	benzo(a)anthracene	0.052 - 15	1	1 / 22
	benzo(b)fluoranthene	0.073 - 18	1	4 / 22
	chrysene	0.07 - 13	1	1 / 22

SURFACE SOIL Main Site	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Inorganic Compounds	antimony	0.3 - 4	0.89[D]	8 / 22
	cadmium	0.29 - 81	2.5	8 / 22
	chromium	12 - 6,260	30	8 / 22
	hexavalent chromium	ND - 13	1	1 / 22
	copper	23 - 2,140	50	9 / 22
	cyanide	0.8 - 94	27	1/ 22
	lead	24 - 1,100	63	15 / 22
	mercury	0.1 - 31	0.18	17 / 22
	nickel	12 - 2,310	30	11 / 22
	silver	0.28 - 6.3	2	1 / 22
	zinc	53 - 558	109	13 / 22

TABLE 1 (continued)
Nature and Extent of Contamination

SUBSURFACE SOIL Main Site	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	1,1,1-trichloroethane	0.0007 - 8	0.68	1 / 42
	cis-1,2-dichlorethene	0.0008 - 0.95	0.33	1 / 42
	ethylbenzene	0.0006 - 14	1	4 / 42
	tetrachlorethene	0.0007 - 140	1.3	3 / 42
	toluene	0.0006 - 4.4	0.7	1 / 42
	trichloroethene	0.0006 - 49	0.47	3 / 42
	xylene	0.0009 - 64	0.26	4 / 42
Semi volatile Organic Compounds (SVOCs)	benzo(a)pyrene	0.047 - 8	1	2 / 42
	benzo(a)anthracene	0.054 - 7.8	1	2 / 42
	benzo(b)fluoranthene	0.06 - 10	1	3 / 42
	benzo(k)fluoranthene	0.049 - 3.3	0.8	2 / 42
	chrysene	0.05 - 7	1	3 / 42
	dibenzo(a,h)anthracene	0.053 - 1.3	0.33	1 / 42
	indeno(1,2,3-cd)pyrene	0.041 - 4.3	0.5	2 / 42
	naphthalene	0.048 - 150	12	1 / 42
	2-nitroaniline	ND - 1.6	0.43	1 / 42
	phenol	0.06 - 0.1	0.33	4 / 42

TABLE 1 (continued)
Nature and Extent of Contamination

SUBSURFACE SOIL **Main Site**	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Inorganic Compounds	antimony	0.4 - 377	0.89[D]	10 / 42
	arsenic	2 - 55	13	9 / 42
	chromium	11 - 475	30	19 / 42
	hexavalent chromium	1.2 - 15	1	4 / 42
	copper	13 - 653	50	4 / 42
	lead	8.4 - 2,860	63	2 / 42
	mercury	0.01 - 41	0.18	15 / 42
	nickel	7.7 - 73	30	9 / 42
	zinc	33 - 671	109	2 / 42

TABLE 1 (continued)
Nature and Extent of Contamination

SURFACE SOIL MGP Area	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	benzo(a)anthracene	0.06 - 79	1	9 / 18
	benzo(a)pyrene	0.056 - 87	1	9 / 18
	benzo(b)fluoranthene	0.069 - 100	1	11 / 18
	benzo(k)fluoranthene	0.11 - 42	0.8	8 / 18
	chrysene	0.06 - 80	1	9 / 18
	dibenzo(a,h)anthracene	0.069 - 18	0.33	9 / 16
	indeno(1,2,3-cd)pyrene	0.049 - 53	0.5	9 / 18
	pyrene	0.1 - 170	100	1 / 18
Inorganic Compounds	antimony	0.7 - 7	0.89[D]	8 / 18
	arsenic	5.3 - 41	13	5 / 18
	cadmium	0.23 - 55	2.5	9 / 18
	chromium	12 - 158	30	3 / 18
	hexavalent chromium	1.5 - 12	1	4 / 18
	copper	22 - 441	50	13 / 18
	lead	27 - 1,160	63	14 / 18
	mercury	0.05 - 2	0.18	12 / 18
	nickel	14 - 40	30	8 / 18
	zinc	62 - 2,570	109	16 / 18

TABLE 1 (continued)
Nature and Extent of Contamination

SUBSURFACE SOIL MGP Area	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	benzene	0.002 - 0.3	0.06	3 / 25
Semivolatile Organic Compounds (SVOCs)	acenaphthene	5 - 100	20	1 / 25
	anthracene	0.04 - 150	100	1 / 25
	benzo(a)anthracene	0.084 - 200	1	13 / 25
	benzo(a)pyrene	0.076 - 190	1	13 / 25
	benzo(b)fluoranthene	0.1 - 250	1	13 / 25
	benzo(k)fluoranthene	0.053 - 100	0.8	13 / 25
	chrysene	0.07 - 180	1	13 / 25
	dibenzo(a,h)anthracene	0.068 - 31	0.33	12 / 25
	fluoranthene	0.04 - 410	100	4 / 25
	fluorene	0.07 - 62	30	3 / 25
	indeno(1,2,3-cd)pyrene	0.048 - 110	0.5	13 / 25
	2-methylnaphthalene	2.5 - 66	36.4	2 / 25
	naphthalene	0.049 - 290	12	3 / 25
	phenanthrene	0.07 - 220	100	4 / 25
	phenol	ND - 1	0.33	1 / 25
	pyrene	0.05 - 340	100	3 / 25

TABLE 1 (continued)
Nature and Extent of Contamination

SUBSURFACE SOIL MGP Area	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Inorganic Compounds	arsenic	3.6 - 39	13	3 / 25
	cadmium	0.15 - 18	2.5	3 / 25
	chromium	8.2 - 257	30	6 / 25
	copper	16 - 201	50	6 / 25
	cyanide, total	1 - 39	27	1 / 25
	lead	9.3 - 1,750	63	11 / 25
	mercury	0.3 - 249	0.18	8 / 25
	nickel	12 - 35	30	1 / 25
	zinc	46 - 2,000	109	10 / 25

Lagoon SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	chlorobenzene	0.47 - 130	3.5	6 / 7
	xylene	0.15 - 140	92	2 / 7
Semivolatile Organic Compounds (SVOCs)	1,4-dichlorobenzene	2.7 - 51	12	4 / 7
	fluorene	1 - 10	6	1 / 7
	phenanthrene	3 - 51	0.5	7 / 7
	phenol	ND - 2	0.6	1 / 7
PCB's and Pesticides	endosulfan II	ND - 0.06	0.03	1 / 2

TABLE 1 (continued)
Nature and Extent of Contamination - Lagoon Sediment

Lagoon SEDIMENTS	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Inorganic Compounds	antimony	8.5 - 362	LEL[c] - 2.0	7 / 7
			SEL[c] - 25	1 / 7
	arsenic	10 - 141	LEL[c] - 6.0	7 / 7
			SEL[c] - 33	2 / 7
	cadmium	8 - 122	LEL - 0.6	7 / 7
			SEL - 9	6 / 7
	chromium	934 - 26,300	LEL - 26	7 / 7
			SEL - 110	7 / 7
	copper	654 - 10,600	LEL -16	7 / 7
			SEL -110	7 / 7
	cyanide	0.7 - 69	NA	
			NA	
	lead	806 - 9,650	LEL -31	7 / 7
			SEL -250	7 / 7
	mercury	1.9 - 54	LEL -0.2	7 / 7
			SEL -2	6 / 7
	nickel	23 - 3,890	LEL -16	7 / 7
			SEL -75	6 / 7
	silver	0.96 - 2.9	LEL -1.0	5 / 7
			SEL -2.2	1 / 7
	zinc	1,220 - 3,710	LEL -120	7 / 7
			SEL -820	7 / 7

TABLE 1 (continued)
Nature and Extent of Contamination

GROUNDWATER (Shallow)	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	benzene	0.5 - 3	1	2 / 21
	chlorobenzene	1 - 100	5	1 / 21
	1,1-dichloroethane	0.8 - 33	5	4 / 21
	cis-1,2-dichloroethene	0.5 - 680	5	8 / 21
	1,2-dichloropropane	ND - 3	1	1 / 21
	ethylbenzene	3 - 1,500	5	1 / 21
	1,1,1-trichloroethane	1 - 730	5	6 / 21
	tetrachlorethene	1 - 7,900	5	3 / 21
	toluene	0.6 - 270	5	1 / 21
	trichloroethene	0.6 - 2,900	5	7 / 21
	vinyl chloride	0.9 - 29	0.3	13 / 21
	xylene	2 - 6,600	5	2 / 21

Semivolatile Organic Compounds (SVOCs)	acenaphthene	2 - 32	20	2 / 21
	benzo(a)anthracene	1 - 9	0.002	3 / 21
	benzo(b)fluoranthene	2 - 8	0.002	3 / 21
	benzo(k)fluoranthene	ND - 3	0.002	1 / 21
	chrysene	1 - 9	0.002	3 / 21
	1,2-dichlorobenzene	2 - 170	3	2 / 21
	14-dichlorobenzene	ND - 13	3	1 / 21
	indeno(1,2,3-cd)pyrene	ND - 2	0.002	1 / 21
	naphthalene	3 - 160	10	2 / 21
	phenol	2 - 11	1	2 / 21

TABLE 1 (continued)
Nature and Extent of Contamination

GROUNDWATER (Shallow)	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Inorganic Compounds	antimony	3 - 1,360	3	5 / 13
	arsenic	2.3 - 1,130	25	4 / 13
	barium	11 - 1,390	1000	1 / 13
	beryllium	0.1 - 6	3	2 / 13
	cadmium	0.6 - 22	1,000	1 / 13
	chromium	1 - 1,730	50	5 / 13
	cobalt	4 - 101	5	4 / 13
	copper	2 - 3,440	200	2 / 13
	amenable cyanide	ND - 1,100	200	1 / 3
	total cyanide	13 - 1,280	200	1 / 13
	lead	0.66 - 7,370	25	4 / 13
	mercury	0.05 - 273	0.7	2 / 13
	nickel	1 - 233	100	2 / 13
	selenium	2 - 30	10	1 / 13
	thallium	4 - 6	0.5	2 / 13
	vanadium	0.58 - 263	14	3 / 13
	zinc	2 - 6,350	2000	1 / 13

TABLE 1 (continued)
Nature and Extent of Contamination

GROUNDWATER (Deep)	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	benzene	3 - 4	1	2 / 3
	chlorobenzene	ND - 34	5	1 / 3
	cis-1,2-dichlorethene	ND - 26	5	1 / 3
	vinyl chloride	ND - 2	0.3	1 / 3
Semivolatile Organic Compounds (SVOCs)	naphthalene	9 - 77	10	1 / 3
Inorganic Compounds	antimony	3 - 74	3	1 / 3
	arsenic	47 - 542	25	3 / 3
	barium	318 - 1,210	1000	1 / 3
	beryllium	3 - 15	3	2 / 3
	cadmium	3 - 14	1,000	1 / 3
	chromium	195 - 575	50	3 / 3
	cobalt	46 - 290	5	3 / 3
	copper	254 - 1,150	200	3 / 3
	lead	212 - 604	25	3 / 3
	mercury	1 - 28	0.7	3 / 3
	nickel	237 - 524	100	3 / 3
	selenium	ND - 27	10	1 / 3
	thallium	4 - 12	0.5	2 / 3
	vanadium	75 - 380	14	3 / 3

[a] ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
ug/m^3 = micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values; {list SCGs for each medium}

[c] LEL = Lowest Effects Level and SEL = Severe Effects Level. A sediment is considered to be contaminated if either of these criteria is exceeded. If both criteria are exceeded, the sediment is severely impacted. If only the LEL is exceeded, the impact is considered to be moderate.

{For marine and estuarine sediments, change LEL to ER-L and SEL to ER-M in Table 1 and replace the above footnote with:
[c] ER-L = EffectRange - Low and ER-M = Effect Range - Moderate. A sediment is considered to be contaminated if either of these

criteria is exceeded. If both criteria are exceeded, the sediment is severely impacted. If only the ER-L is exceeded, the impact is considered to be moderate.}

D - Soil cleanup object determined by site background

ND - non-detect

NA - There is no applicable standard, criterion or guidance value for this contaminant in this medium.

Table 2
Soil Background Concentrations
18 Off-Site Samples

	Compound	Range of Concentrations (ppm)
Semivolatile Organic Compounds (SVOCs)	anthracene	ND - 0.17
	benzo[a]anthracene	0.074 - 0.6
	benzo[a]pyrene	0.076 - 0.59
	benzo[b]fluoranthene	0.061 - 0.94
	benzo[g,h,i]perylene	0.041 - 0.44
	benzo[k]fluoranthene	ND - 0.22
	chrysene	0.07 - 0.45
	dibenz[a,h]anthracene	0.042 - 0.14
	dibenzofuran	ND - 0.063
	indeno[1,2,3-cd]pyrene	0.043 - 0.38
	naphthalene	ND - 0.81
	phenol	ND

Table 2
Soil Background Concentrations
18 Off-Site Samples

	Compound	Range of Concentrations (ppm)
Inorganic Compounds	antimony	ND - 0.89
	arsenic	5.8 - 22
	cadmium	0.41 - 5.4
	calcium	971 - 41,000
	cyanide, total	ND - 2.9
	lead	36 - 497
	mercury	0.1 - 0.18
	sodium	43 - 188
	zinc	72 - 525

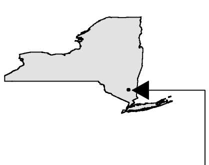
Table 3
Remedial Alternative Costs

No.	Remedial Alternative	Capital Cost	Annual OM&M	Total Present Worth
1	No Action	$0	$0	$0
2	Institutional and Engineering Controls, and Groundwater Monitoring	$200,000	$34,000	$620,000
3	On-Site Treatment and Containment and Vat Containment	$3,540,000	$80,000	$4,520,000
4	Vat Removal, Lagoon Dredging and Limited Excavation and Covering	$8,720,000	$148,000	$10,600,000
5	Vat Removal, Lagoon Excavation and Complete Excavation of All Soil Contamination above 6 NYCRR Part 375 Cleanup Objectives for Unrestricted Use	$73,000,000	$5,000	$73,000,000

I:\DIV82\PROJECTS\10653\27258\DWG\MAR05\SITE_LOC.MXD

PLOT DATE: 02/09/05 DIV. 84 JPS

ADAPTED FROM: WAPPINGER FALLS,NY USGS QUADRANGLE



QUADRANGLE LOCATION

NEW YORK STATE
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
THREE STAR ANODIZING SITE
WAPPINGERS FALLS, NEW YORK

SITE LOCATION

0 1,000 2,000 4,000 6,000 8,000
Feet

10653.27258
NOVEMBER 2007

1:24,000

O'BRIEN & GERE ENGINEERS, INC.

Map Source: Orthophoto Image, 2004, OCSCIC.

New York State
Department of Environmental Conservation

Division of Environmental Remediation

Investigation Areas

Figure 2

Three Star Anodizing
(Site #314058)
Wappingers Falls
New York

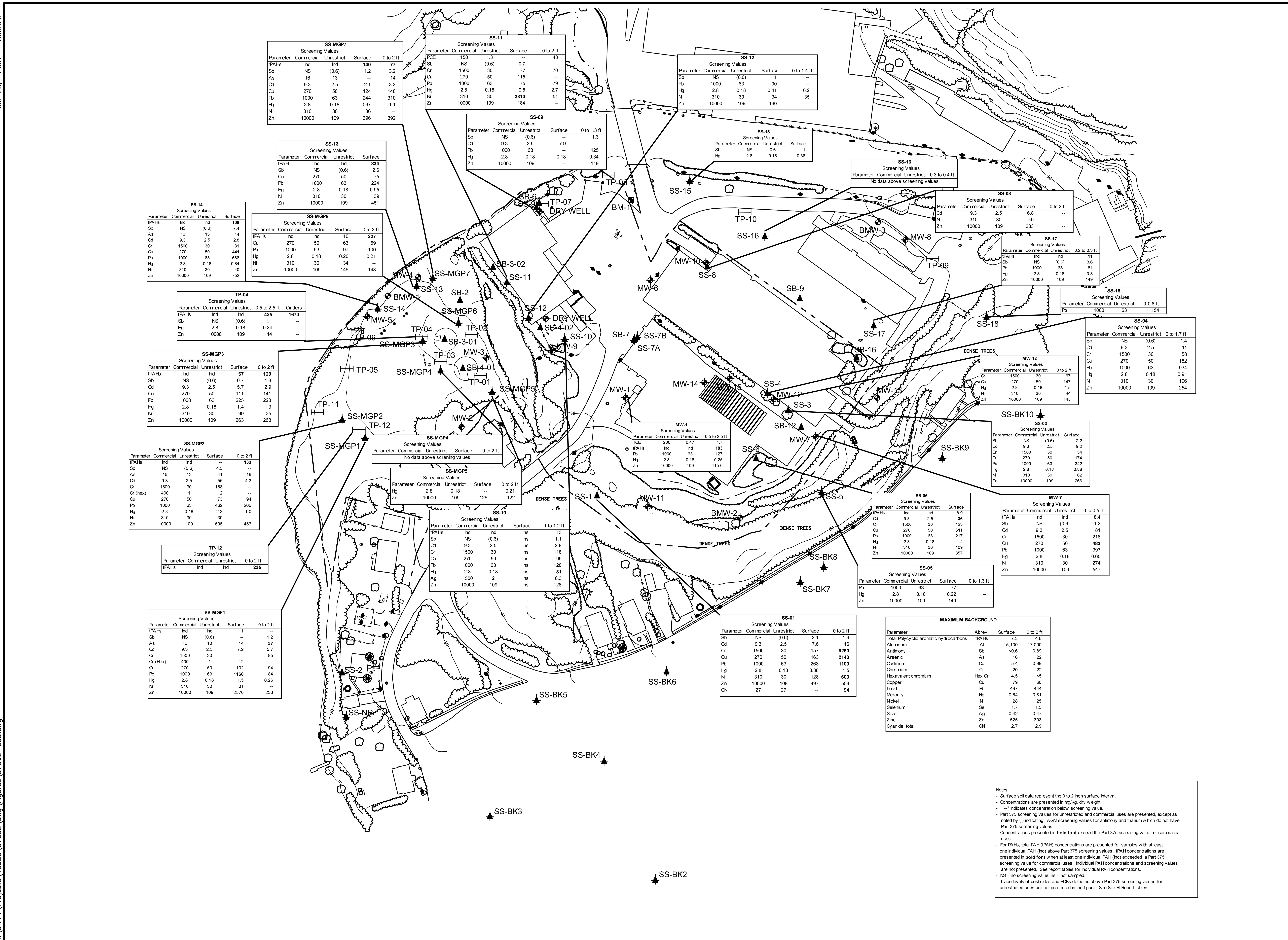
Legend

Site Investigation Areas

Former Gas Holder

0 25 50 100 150 200

Feet



SS-MGP7

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
tPAHs	Ind	Ind	**140**	**77**
Sb	NS	(0.6)	1.2	3.2
As	16	13	--	14
Cd	9.3	2.5	2.1	3.2
Cu	270	50	124	148
Pb	1000	63	244	310
Hg	2.8	0.18	0.67	1.1
Ni	310	30	36	--
Zn	10000	109	396	392

SS-11

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
PCE	150	1.3	--	43
Sb	NS	(0.6)	0.7	--
Cr	1500	30	77	70
Cu	270	50	115	--
Pb	1000	63	75	79
Hg	2.8	0.18	0.5	2.7
Ni	310	30	**2310**	51
Zn	10000	109	184	--

SS-09

Parameter	Commercial	Unrestrict	Surface	0 to 1.3 ft
Sb	NS	(0.6)	--	1.3
Cd	9.3	2.5	7.9	--
Pb	1000	63	--	125
Hg	2.8	0.18	0.18	0.34
Zn	10000	109	--	119

SS-13

Parameter	Commercial	Unrestrict	Surface
tPAH	Ind	Ind	**834**
Sb	NS	(0.6)	2.6
Cu	270	50	75
Pb	1000	63	224
Hg	2.8	0.18	0.95
Ni	310	30	39
Zn	10000	109	451

SS-14

Parameter	Commercial	Unrestrict	Surface
tPAHs	Ind	Ind	**109**
Sb	NS	(0.6)	7.4
As	16	13	14
Cd	9.3	2.5	2.8
Cr	1500	30	31
Cu	270	50	**441**
Pb	1000	63	666
Hg	2.8	0.18	0.84
Ni	310	30	40
Zn	10000	109	752

SS-MGP6

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
tPAHs	Ind	Ind	10	**227**
Cu	270	50	63	59
Pb	1000	63	97	100
Hg	2.8	0.18	0.20	0.21
Ni	310	30	34	--
Zn	10000	109	146	148

TP-04

Parameter	Commercial	Unrestrict	0.5 to 2.5 ft	Cinders
tPAHs	Ind	Ind	**425**	**1670**
Sb	NS	(0.6)	1.1	--
Hg	2.8	0.18	0.24	--
Zn	10000	109	114	--

SS-MGP3

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
tPAHs	Ind	Ind	**67**	**129**
Sb	NS	(0.6)	0.7	1.3
Cd	9.3	2.5	5.7	2.9
Cu	270	50	111	141
Pb	1000	63	225	223
Hg	2.8	0.18	1.4	1.3
Ni	310	30	39	35
Zn	10000	109	263	263

SS-MGP2

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
tPAHs	Ind	Ind	--	**133**
Sb	NS	(0.6)	4.3	--
As	16	13	41	18
Cd	9.3	2.5	55	4.3
Cr	1500	30	158	--
Cr (hex)	400	1	12	--
Cu	270	50	73	94
Pb	1000	63	462	266
Hg	2.8	0.18	2.3	1.0
Ni	310	30	30	--
Zn	10000	109	606	456

TP-12

Parameter	Commercial	Unrestrict	0 to 2 ft
tPAHs	Ind	Ind	**235**

SS-MGP1

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
tPAHs	Ind	Ind	11	--
Sb	NS	(0.6)	--	1.2
As	16	13	14	**37**
Cd	9.3	2.5	7.2	5.7
Cr	1500	30	--	85
Cr (Hex)	400	1	12	--
Cu	270	50	102	94
Pb	1000	63	**1160**	184
Hg	2.8	0.18	1.5	0.26
Ni	310	30	31	--
Zn	10000	109	2570	236

SS-MGP4

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
No data above screning values				

SS-MGP5

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
Hg	2.8	0.18	--	0.21
Zn	10000	109	126	122

SS-10

Parameter	Commercial	Unrestrict	Surface	1 to 1.2 ft
tPAHs	Ind	Ind	ns	13
Sb	NS	(0.6)	ns	1.1
Cd	9.3	2.5	ns	2.9
Cr	1500	30	ns	118
Cu	270	50	ns	99
Pb	1000	63	ns	120
Hg	2.8	0.18	ns	**31**
Ag	1500	2	ns	6.3
Zn	10000	109	ns	126

SS-12

Parameter	Commercial	Unrestrict	Surface	0 to 1.4 ft
Sb	NS	(0.6)	1	--
Pb	1000	63	90	--
Hg	2.8	0.18	0.41	0.2
Ni	310	30	34	35
Zn	10000	109	160	--

SS-15

Parameter	Commercial	Unrestrict	Surface
Sb	NS	0.6	1
Hg	2.8	0.18	0.38

SS-16

Parameter	Commercial	Unrestrict	0.3 to 0.4 ft
No data above screening values			

SS-08

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
Cd	9.3	2.5	6.8	--
Ni	310	30	40	--
Zn	10000	109	333	--

SS-17

Parameter	Commercial	Unrestrict	0.2 to 0.3 ft
tPAHs	Ind	Ind	**11**
Sb	NS	(0.6)	3.6
Pb	1000	63	81
Hg	2.8	0.18	0.8
Zn	10000	109	149

SS-18

Parameter	Commercial	Unrestrict	0-0.8 ft
Pb	1000	63	154

SS-04

Parameter	Commercial	Unrestrict	0 to 1.7 ft
Sb	NS	(0.6)	1.4
Cd	9.3	2.5	**11**
Cr	1500	30	58
Cu	270	50	182
Pb	1000	63	934
Hg	2.8	0.18	0.91
Ni	310	30	196
Zn	10000	109	254

MW-12

Parameter	Commercial	Unrestrict	0 to 2 ft
Cr	1500	30	67
Cu	270	50	147
Hg	2.8	0.18	1.5
Ni	310	30	44
Zn	10000	109	145

MW-1

Parameter	Commercial	Unrestrict	0.5 to 2.5 ft
TCE	200	0.47	1.7
tPAHs	Ind	Ind	**183**
Pb	1000	63	127
Hg	2.8	0.18	0.25
Zn	10000	109	115.0

SS-03

Parameter	Commercial	Unrestrict	Surface
Sb	NS	(0.6)	2.2
Cd	9.3	2.5	9.2
Cr	1500	30	34
Cu	270	50	174
Pb	1000	63	342
Hg	2.8	0.18	0.88
Ni	310	30	62
Zn	10000	109	266

SS-06

Parameter	Commercial	Unrestrict	Surface
tPAHs	Ind	Ind	8.9
Cd	9.3	2.5	**36**
Cr	1500	30	123
Cu	270	50	**611**
Pb	1000	63	217
Hg	2.8	0.18	1.4
Ni	310	30	109
Zn	10000	109	357

MW-7

Parameter	Commercial	Unrestrict	0 to 0.5 ft
tPAHs	Ind	Ind	8.4
Sb	NS	(0.6)	1.2
Cd	9.3	2.5	81
Cr	1500	30	216
Cu	270	50	**483**
Pb	1000	63	397
Hg	2.8	0.18	0.65
Ni	310	30	274
Zn	10000	109	547

SS-05

Parameter	Commercial	Unrestrict	Surface	0 to 1.3 ft
Pb	1000	63	77	--
Hg	2.8	0.18	0.22	--
Zn	10000	109	149	--

SS-01

Parameter	Commercial	Unrestrict	Surface	0 to 2 ft
Sb	NS	(0.6)	2.1	1.6
Cd	9.3	2.5	7.6	16
Cr	1500	30	157	**6260**
Cu	270	50	163	**2140**
Pb	1000	63	263	**1100**
Hg	2.8	0.18	0.88	1.5
Ni	310	30	128	**603**
Zn	10000	109	497	558
CN	27	27	--	**94**

MAXIMUM BACKGROUND

Parameter	Abrev.	Surface	0 to 2 ft
Total Polycyclic aromatic hydrocarbons	tPAHs	7.3	4.8
Aluminum	Al	15,100	17,000
Antimony	Sb	<0.6	0.89
Arsenic	As	16	22
Cadmium	Cd	5.4	0.99
Chromium	Cr	20	22
Hexavalent chromium	Hex Cr	4.5	<5
Copper	Cu	79	66
Lead	Pb	497	444
Mercury	Hg	0.64	0.81
Nickel	Ni	28	25
Selenium	Se	1.7	1.5
Silver	Ag	0.42	0.47
Zinc	Zn	525	303
Cyanide, total	CN	2.7	2.9

Notes:
- Surface soil data represent the 0 to 2 inch surface interval.
- Concentrations are presented in mg/Kg, dry weight;
- "--" indicates concentration below screening value.
- Part 375 screening values for unrestricted and commercial uses are presented, except as noted by ( ) indicating TAGM screening values for antimony and thallium which do not have Part 375 screening values.
- Concentrations presented in **bold font** exceed the Part 375 screening value for commercial uses.
- For PAHs, total PAH (tPAH) concentrations are presented for samples with at least one individual PAH (Ind) above Part 375 screening values. tPAH concentrations are presented in **bold font** when at least one individual PAH (Ind) exceeded a Part 375 screening value for commercial uses. Individual PAH concentrations and screening values are not presented. See report tables for individual PAH concentrations.
- NS = no screening value; ns = not sampled.
- Trace levels of pesticides and PCBs detected above Part 375 screening values for unrestricted uses are not presented in the figure. See Site RI Report tables.

FIGURE 3

LEGEND

- TP-04 TEST PIT
- SS-14 SURFACE SOIL SAMPLE
- SB-9 SOIL BORING
- MW-8 MONITORING WELL LOCATION
- BMW-3 DEEP MONITORING WELL LOCATION

NEW YORK STATE
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

THREE STAR
ANODIZING SITE
WAPPINGERS FALLS,
NEW YORK

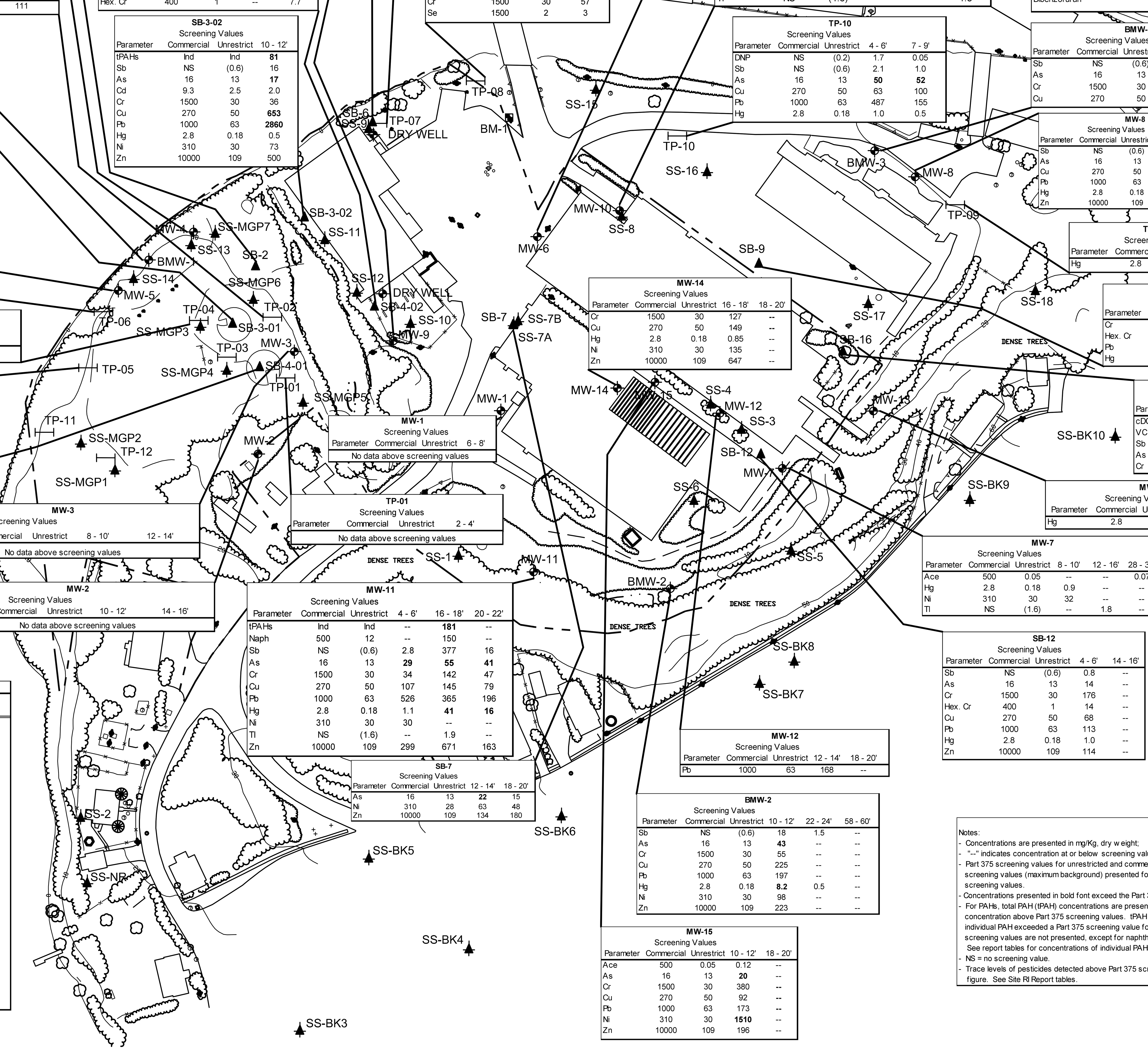
SURFACE SOIL
DATA

1"=80' 80 0 80

FILE NO.10653.37062.005
OCTOBER 2007

O'BRIEN & GERE
ENGINEERS, INC.

I:\DIV71\Projects\10653\37062\dwg\Figures\37062-006.dwg Oct 25, 2007 - 7:59am



MW-4

Parameter	Screening Values Commercial	Unrestrict	12 - 14'	14 - 16'	18 - 20'
Ben	44	0.06	--	0.25	0.065
tPAHs	Ind	Ind	**288**	**1242**	--
Naph	500	12	--	290	--
DBF	350	7	--	54	--
Sb	NS	(0.6)	1.2	180	1.2
As	16	13	--	**39**	--
Cd	9.3	2.5	**14**	**18**	--
Cr	1500	30	--	257	129
Cu	270	50	85	201	--
Pb	1000	63	115	506	86
Hg	2.8	0.18	**6.7**	**249**	**16**
Zn	10000	109	473	2000	243
Total CN	27	27	--	39	--

SB-2

Parameter	Screening Value	6 - 8'
No data above screening values		

BMW-1

Parameter	Screening Values Commercial	Unrestrict	20 - 22'	28 - 30'	38 - 40'
Ben	44	0.06	0.26	0.27	--
Xyl (total)	500	0.26	--	3.1	--
tPAHs	Ind	Ind	--	**419**	--
Naph	500	12	--	78	--
DBF	350	7	--	21	--

TP-02

Parameter	Screening Values Commercial	Unrestrict	3 - 5'
Zn	10000	109	111

SB-3-01

Parameter	Screening Values Commercial	Unrestrict	8 - 10'	10 - 14'	24 - 28'
No data above screening values					

MW-5

Parameter	Screening Values Commercial	Unrestrict	2 - 4'		12 - 14'	14 - 16'	16 - 18'
Ace	500	0.05	--	--	--	0.09	--
tPAHs	Ind	Ind	**1448**		**795**	**395**	**213**
Naph	500	12	30		--	--	--
DBF	350	7	25		16	--	--
Sb	NS	(0.6)	1.1		0.7	--	--
As	16	13	15		14	--	--
Cr	1500	30	37		150	33	--
Cu	270	50	63		54	--	--
Pb	1000	63	191		90	--	--
Hg	2.8	0.18	2.1		**3.7**	1.8	--
Ni	310	30	--		35	--	--
Zn	10000	109	253		174	--	--

TP-06

Parameter	Screening Values Commercial	Unrestrict	5 - 7'
Sb	NS	(0.6)	0.8
Cd	9.3	2.5	2.9
Cu	270	50	85
Pb	1000	63	242
Hg	2.8	0.18	0.3
Zn	10000	109	272

TP-04

Parameter	Screening Values Commercial	Unrestrict	cinders
tPAHs	Ind	Ind	**1670**

TP-05

Parameter	Screening Values Commercial	Unrestrict	4 - 6'	9.5 - 10.5'
tPAHs	Ind	Ind	**379**	--
Pb	1000	63	80	101
Zn	10000	109	132	--

SB-4-01

Parameter	Screening Values Commercial	Unrestrict	6 - 8'	8 - 9.2'	10 - 12'
Ben	44	0.06	--	--	0.16
Xyl	500	0.26	--	--	0.37
Ace	500	0.05	--	0.06	0.11
tPAHs	Ind	Ind	**2261**	**388**	**575**
Naph	500	12	14	--	--
Phenol	500	0.33	--	--	0.9
DBF	350	7	15	8.2	9.5
Sb	NS	(0.6)	2.5	--	--
Cr	1500	30	57	--	--
Cu	270	50	94	--	--
Pb	1000	63	**1750**	155	520
Hg	2.8	0.18	1.3	--	--
Zn	10000	109	278	--	--

MW-3

Parameter	Screening Values Commercial	Unrestrict	8 - 10'	12 - 14'
No data above screening values				

MW-2

Parameter	Screening Values Commercial	Unrestrict	10 - 12'	14 - 16'
No data above screening values				

Soil Background Reference Concentrations

Parameter		Soil Background Reference Values low	high	Local Background low	high	Screening Value
Aluminum	Al	ND	33,000	6,300	17,000	NS
Antimony	Sb	ND	ND	<0.6	0.6	NS
Arsenic	As	3	12	6	22	13
Barium	Ba	15	600	45	135	350
Beryllium	Be	ND	1.75	0.4	0.8	7.2
Cadmium	Cd	0.1	1	0.4	5.4	2.5
Calcium	Ca	130	35000	971	41,000	NS
Chromium	Cr	1.5	40	13	22	30
Hex. Chrom.	Hex Cr	ND	ND	<5	4.5	1
Cobalt	Co	2.5	60	6	10	NS
Copper	Cu	1	50	22	79	50
Iron	Fe	200	550,000	20,600	32,300	NS
Lead	Pb	200	500	36	497	63
Magnesium	Mg	100	5000	3330	25,700	NS
Manganese	Mn	50	5000	330	1,290	1600
Mercury	Hg	0.001	0.2	0.1	0.8	0.18
Nickel	Ni	0.5	25	17	28	30
Potassium	K	8500	43000	550	1,090	NS
Selenium	Se	0.1	3.9	<0.5	1.7	3.9
Silver	Ag	ND	ND	<0.3	0.5	2
Sodium	Na	6000	8000	43	188	NS
Thallium	Tl	ND	ND	<0.9	2.0	NS
Vanadium	Vn	1	300	19	48	NS
Zinc	Zn	9	50	72	525	109
Cyanide, total	Total CN	ND	ND	<0.7	2.9	27
Cyanide, amen.	Amen CN	ND	ND	<0.7	<0.7	NS

MW-9

Parameter	Screening Values Commercial	Unrestrict	6-8'	10-12'	16-18'
tVOCs	NS	NS	27	280	--
EB	390	1	2.1	14	--
Tol	500	0.7	--	4.4	--
Xyl (total)	500	0.26	10	64	0.41
PCE	150	1.3	14	140	--
TCE	200	0.47	0.66	49	--
cDCE	500	0.25	--	0.95	--
TCA	150	0.68	--	8.4	--
MC	500	0.05	--	1.7	--
As	16	13	--	14	--
Cr	1500	30	32	37	--
Hex Cr	400	1	4.1	--	--
Hg	2.8	0.18	0.4	--	--

SB-4-02

Parameter	Screening Values Commercial	Unrestrict	10 - 12'	20 - 22'
tVOCs	NS	NS	12	--
EB	390	1	1.3	--
Xyl (total)	500	0.26	4.3	0.75
PCE	150	1.3	2.7	--
TCE	200	0.47	2.4	0.97
cDCE	500	0.25	0.67	0.37
Cr	1500	30	58	34
Hex. Cr	400	1	--	7.7

SB-3-02

Parameter	Screening Values Commercial	Unrestrict	10 - 12'
tPAHs	Ind	Ind	**81**
Sb	NS	(0.6)	16
As	16	13	**17**
Cd	9.3	2.5	2.0
Cr	1500	30	36
Cu	270	50	**653**
Pb	1000	63	**2860**
Hg	2.8	0.18	0.5
Ni	310	30	73
Zn	10000	109	500

MW-1

Parameter	Screening Values Commercial	Unrestrict	6 - 8'
No data above screening values			

TP-01

Parameter	Screening Values Commercial	Unrestrict	2 - 4'
No data above screening values			

MW-11

Parameter	Screening Values Commercial	Unrestrict	4 - 6'	16 - 18'	20 - 22'
tPAHs	Ind	Ind	--	**181**	--
Naph	500	12	--	150	--
Sb	NS	(0.6)	2.8	377	16
As	16	13	**29**	**55**	**41**
Cr	1500	30	34	142	47
Cu	270	50	107	145	79
Pb	1000	63	526	365	196
Hg	2.8	0.18	1.1	**41**	**16**
Ni	310	30	30	--	--
Tl	NS	(1.6)	--	1.9	--
Zn	10000	109	299	671	163

SB-7

Parameter	Screening Values Commercial	Unrestrict	12 - 14'	18 - 20'
As	16	13	**22**	15
Ni	310	28	63	48
Zn	10000	109	134	180

SB-6

Parameter	Screening Values Commercial	Unrestrict	8 - 10'	18 - 20'
Cr	1500	30	49	--

TP-07

Parameter	Screening Values Commercial	Unrestrict	4-6'	6-8'
Sb	NS	(0.6)	1.4	--
Cu	270	50	--	63
Cr	1500	30	--	41
Pb	1000	63	353	214
Hg	2.8	0.18	1.4	--
Zn	10000	109	--	141

TP-08

Parameter	Screening Values Commercial	Unrestrict	6 - 7'
Cu	270	50	71
Cr	1500	30	57
Se	1500	2	3

MW-6

Parameter	Screening Values Commercial	Unrestrict	6 - 8'	12 - 14'	24 - 26'	36 - 38'
Ace	500	0.05	2	0.35	0.11	0.22
VC	13	0.02	--	--	0.05	--
Ni	310	30	--	46	--	--

MW-10

Parameter	Screening Values Commercial	Unrestrict	2 - 4'	10 - 12'	16 - 18'
Ace	500	0.05	--	--	0.32
Cr	1500	22	36	475	115
Pb	1,000	63	70	404	87
Tl	NS	(1.6)	--	--	1.8

TP-10

Parameter	Screening Values Commercial	Unrestrict	4 - 6'	7 - 9'
DNP	NS	(0.2)	1.7	0.05
Sb	NS	(0.6)	2.1	1.0
As	16	13	**50**	**52**
Cu	270	50	63	100
Pb	1000	63	487	155
Hg	2.8	0.18	1.0	0.5

Organic Compound Abbreviations

Compound name	Abbreviation
Total Volatile Organic Compounds	tVOCs
Acetone	Ace
Benzene	Ben
cis-1,2-Dichloroethene	cDCE
Etylbenzene	EB
Methyelene Chloride	MC
Methyl Ethyl Ketone	MEK
Trichloroethene	TCE
Tetrachlorothene	PCE
Toluene	Tol
1,1,1-Trichloroethane	TCA
Vinyl Chloride	VC
Xylene, total	Xyl
Total Polycyclic Aromatic Hydrocarbons	tPAHs
Naphthalene	Naph
2,4-Dinitrophenol	DNP
Dibenzofuran	DBF

BMW-3

Parameter	Screening Values Commercial	Unrestrict	12 - 13'	18 - 20'
Sb	NS	(0.6)	0.7	0.7
As	16	13	14	15
Cr	1500	30	--	31
Cu	270	50	58	56

MW-8

Parameter	Screening Values Commercial	Unrestrict	2 - 4'	8 - 10'
Sb	NS	(0.6)	--	0.9
As	16	13	**28**	**33**
Cu	270	50	--	58
Pb	1000	63	129	236
Hg	2.8	0.18	0.5	--
Zn	10000	109	--	111

TP-09

Parameter	Screening Values Commercial	Unrestrict	7 - 9'
Hg	2.8	0.18	0.4

SB-9

Parameter	Screening Values Commercial	Unrestrict	4 - 6'	18 - 19.5'
Cr	1500	30	--	49
Hex. Cr	400	1	--	10
Pb	1000	63	423	--
Hg	2.8	0.18	2.4	--

MW-14

Parameter	Screening Values Commercial	Unrestrict	16 - 18'	18 - 20'
Cr	1500	30	127	--
Cu	270	50	149	--
Hg	2.8	0.18	0.85	--
Ni	310	30	135	--
Zn	10000	109	647	--

SB-16

Parameter	Screening Values Commercial	Unrestrict	10 - 12'	20 - 22'
cDCE	500	0.25	0.9	--
VC	13	0.02	0.04	--
Sb	NS	NS	15	--
As	16	13	**27**	--
Cr	1500	30	150	--

MW-13

Parameter	Screening Values Commercial	Unrestrict	18 - 20'	26 - 28'
Hg	2.8	0.18	0.19	--

MW-7

Parameter	Screening Values Commercial	Unrestrict	8 - 10'	12 - 16'	28 - 30'
Ace	500	0.05	--	--	0.07
Hg	2.8	0.18	0.9	--	--
Ni	310	30	32	--	--
Tl	NS	(1.6)	--	1.8	--

SB-12

Parameter	Screening Values Commercial	Unrestrict	4 - 6'	14 - 16'
Sb	NS	(0.6)	0.8	--
As	16	13	14	--
Cr	1500	30	176	--
Hex. Cr	400	1	14	--
Cu	270	50	68	--
Pb	1000	63	113	--
Hg	2.8	0.18	1.0	--
Zn	10000	109	114	--

MW-12

Parameter	Screening Values Commercial	Unrestrict	12 - 14'	18 - 20'
Pb	1000	63	168	--

BMW-2

Parameter	Screening Values Commercial	Unrestrict	10 - 12'	22 - 24'	58 - 60'
Sb	NS	(0.6)	18	1.5	--
As	16	13	**43**	--	--
Cr	1500	30	55	--	--
Cu	270	50	225	--	--
Pb	1000	63	197	--	--
Hg	2.8	0.18	**8.2**	0.5	--
Ni	310	30	98	--	--
Zn	10000	109	223	--	--

MW-15

Parameter	Screening Values Commercial	Unrestrict	10 - 12'	18 - 20'
Ace	500	0.05	0.12	--
As	16	13	**20**	--
Cr	1500	30	380	--
Cu	270	50	92	--
Pb	1000	63	173	--
Ni	310	30	**1510**	--
Zn	10000	109	196	--

Notes:
- Concentrations are presented in mg/Kg, dry w eight;
- "--" indicates concentration at or below screening value.
- Part 375 screening values for unrestricted and commercial use are presented, except as noted by ( ) indicating TAGM screening values (maximum background) presented for antimony and thallium w hich do not have Part 375 screening values.
- Concentrations presented in bold font exceed the Part 375 screening value for commercial uses.
- For PAHs, total PAH (tPAH) concentrations are presented for samples w ith at least one individual PAH (Ind) concentration above Part 375 screening values. tPAH concentrations are presented in **bold font** w hen at least individual PAH exceeded a Part 375 screening value for commercial uses. Individual PAH concentrations and screening values are not presented, except for naphthalene w hich is presented as an indicator of potential PAH mobility. See report tables for concentrations of individual PAHs.
- NS = no screening value.
- Trace levels of pesticides detected above Part 375 screening values for unrestricted uses are not presented in the figure. See Site RI Report tables.

FIGURE 4

LEGEND

- TP-04 TEST PIT
- SS-14 SURFACE SOIL SAMPLE
- SB-9 SOIL BORING
- MW-8 MONITORING WELL LOCATION
- BMW-3 DEEP MONITORING WELL LOCATION

NEW YORK STATE
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

THREE STAR
ANODIZING SITE
WAPPINGERS FALLS,
NEW YORK

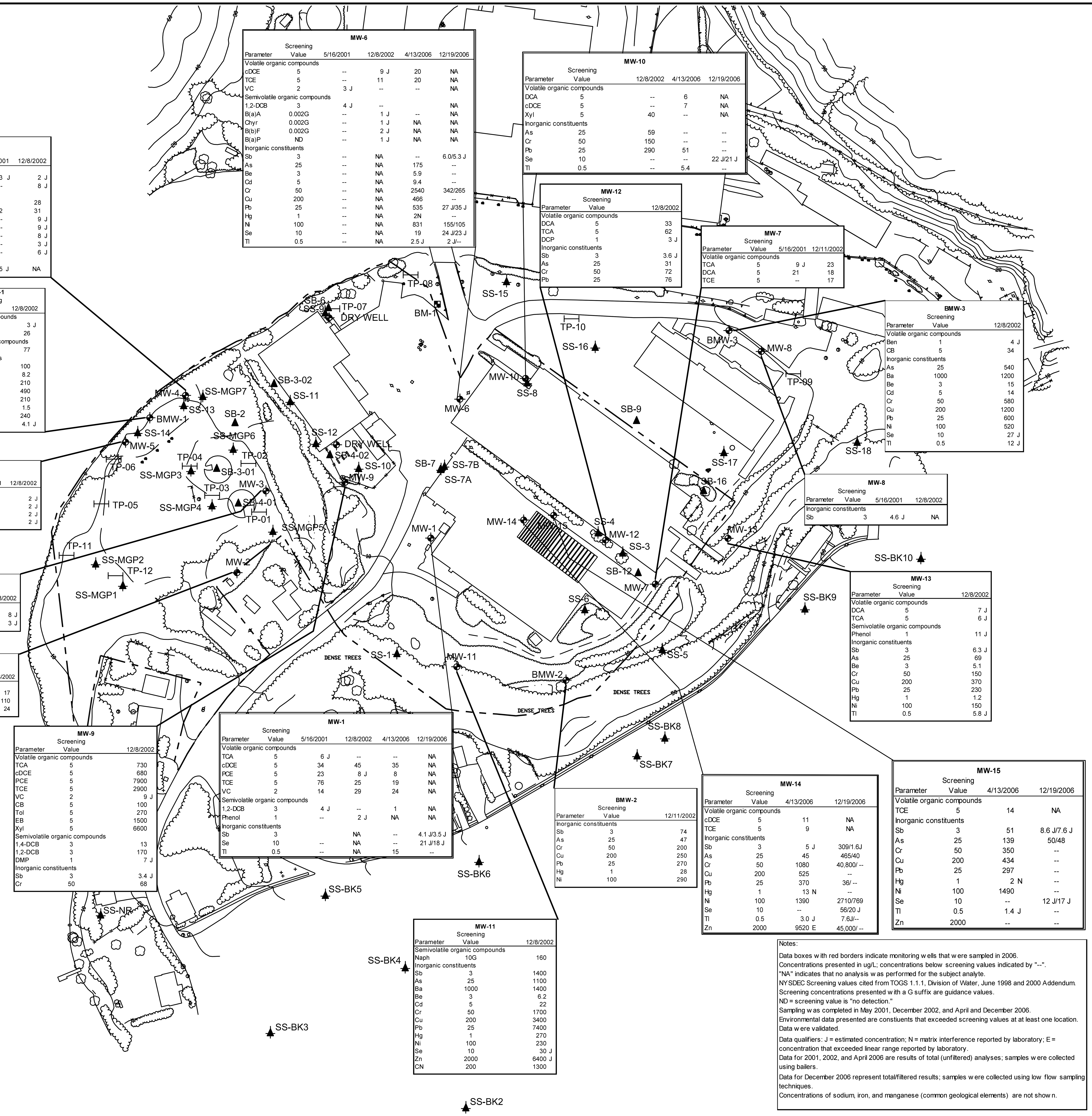
SOIL BORING DATA

1"=80' 80 0 80

FILE NO.10653.37062.006
OCTOBER 2007

O'BRIEN & GERE
ENGINEERS, INC.

FIGURE 5



MW-4

Parameter	Screening Value	5/16/2001	12/8/2002
Volatile organic compounds			
Ben	1	3 J	2 J
VC	2	--	8 J
Semivolatile organic compounds			
Naph	10G		28
AcNe	20G	32	31
B(a)A	0.002G	--	9 J
Chry	0.002G	--	9 J
B(b)F	0.002G	--	8 J
B(k)F	0.002G	--	3 J
B(a)P	ND	--	6 J
Inorganic constituents			
Sb	3	15 J	NA

MW-6

Parameter	Screening Value	5/16/2001	12/8/2002	4/13/2006	12/19/2006
Volatile organic compounds					
cDCE	5	--	9 J	20	NA
TCE	5	--	11	20	NA
VC	2	3 J	--	--	NA
Semivolatile organic compounds					
1,2-DCB	3	4 J	--		NA
B(a)A	0.002G	--	1 J	--	NA
Chyr	0.002G	--	1 J	NA	NA
B(b)F	0.002G	--	2 J	NA	NA
B(a)P	ND	--	1 J	NA	NA
Inorganic constituents					
Sb	3	--	NA	--	6.0/5.3 J
As	25	--	NA	175	--
Be	3	--	NA	5.9	--
Cd	5	--	NA	9.4	--
Cr	50	--	NA	2540	342/265
Cu	200	--	NA	466	--
Pb	25	--	NA	535	27 J/35 J
Hg	1	--	NA	2N	--
Ni	100	--	NA	831	155/105
Se	10	--	NA	19	24 J/23 J
Tl	0.5	--	NA	2.5 J	2 J/--

MW-10

Parameter	Screening Value	12/8/2002	4/13/2006	12/19/2006
Volatile organic compounds				
DCA	5	--	6	NA
cDCE	5	--	7	NA
Xyl	5	40	--	NA
Inorganic constituents				
As	25	59	--	--
Cr	50	150	--	--
Pb	25	290	51	--
Se	10	--	--	22 J/21 J
Tl	0.5	--	5.4	--

MW-12

Parameter	Screening Value	12/8/2002
Volatile organic compounds		
DCA	5	33
TCA	5	62
DCP	1	3 J
Inorganic constituents		
Sb	3	3.6 J
As	25	31
Cr	50	72
Pb	25	76

MW-7

Parameter	Screening Value	5/16/2001	12/11/2002
Volatile organic compounds			
TCA	5	9 J	23
DCA	5	21	18
TCE	5	--	17

BMW-1

Parameter	Screening Value	12/8/2002
Volatile organic compounds		
Ben	1	3 J
cDCE	5	26
Semivolatile organic compounds		
Naph	10G	77
Inorganic constituents		
As	25	100
Be	3	8.2
Cr	50	210
Cu	200	490
Pb	25	210
Hg	1	1.5
Ni	100	240
Tl	0.5	4.1 J

BMW-3

Parameter	Screening Value	12/8/2002
Volatile organic compounds		
Ben	1	4 J
CB	5	34
Inorganic constituents		
As	25	540
Ba	1000	1200
Be	3	15
Cd	5	14
Cr	50	580
Cu	200	1200
Pb	25	600
Ni	100	520
Se	10	27 J
Tl	0.5	12 J

MW-5

Parameter	Screening Value	5/16/2001	12/8/2002
Semivolatile organic compounds			
B(a)A	0.002G	--	2 J
Chry	0.002G	--	2 J
B(b)F	0.002G	--	2 J
B(a)P	ND	--	2 J

MW-8

Parameter	Screening Value	5/16/2001	12/8/2002
Inorganic constituents			
Sb	3	4.6 J	NA

MW-3

Parameter	Screening Value	5/16/2001	12/8/2002
Volatile organic compounds			
cDCE	5	16	8 J
VC	2	8 J	3 J

MW-13

Parameter	Screening Value	12/8/2002
Volatile organic compounds		
DCA	5	7 J
TCA	5	6 J
Semivolatile organic compounds		
Phenol	1	11 J
Inorganic constituents		
Sb	3	6.3 J
As	25	69
Be	3	5.1
Cr	50	150
Cu	200	370
Pb	25	230
Hg	1	1.2
Ni	100	150
Tl	0.5	5.8 J

MW-2

Parameter	Screening Value	5/16/2001	12/8/2002
Volatile organic compounds			
TCE	5	8 J	17
cDCE	5	67	110
VC	2	20	24

MW-9

Parameter	Screening Value	12/8/2002
Volatile organic compounds		
TCA	5	730
cDCE	5	680
PCE	5	7900
TCE	5	2900
VC	2	9 J
CB	5	100
Tol	5	270
EB	5	1500
Xyl	5	6600
Semivolatile organic compounds		
1,4-DCB	3	13
1,2-DCB	3	170
DMP	1	7 J
Inorganic constituents		
Sb	3	3.4 J
Cr	50	68

MW-1

Parameter	Screening Value	5/16/2001	12/8/2002	4/13/2006	12/19/2006
Volatile organic compounds					
TCA	5	6 J	--	--	NA
cDCE	5	34	45	35	NA
PCE	5	23	8 J	8	NA
TCE	5	76	25	19	NA
VC	2	14	29	24	NA
Semivolatile organic compounds					
1,2-DCB	3	4 J	--	1	NA
Phenol	1	--	2 J	NA	NA
Inorganic constituents					
Sb	3		NA	--	4.1 J/3.5 J
Se	10	--	NA	--	21 J/18 J
Tl	0.5	--	NA	15	--

BMW-2

Parameter	Screening Value	12/11/2002
Inorganic constituents		
Sb	3	74
As	25	47
Cr	50	200
Cu	200	250
Pb	25	270
Hg	1	28
Ni	100	290

MW-14

Parameter	Screening Value	4/13/2006	12/19/2006
Volatile organic compounds			
cDCE	5	11	NA
TCE	5	9	NA
Inorganic constituents			
Sb	3	5 J	309/1.6J
As	25	45	465/40
Cr	50	1080	40,800/ --
Cu	200	525	--
Pb	25	370	36/ --
Hg	1	13 N	--
Ni	100	1390	2710/769
Se	10	--	56/20 J
Tl	0.5	3.0 J	7.6J/--
Zn	2000	9520 E	45,000/ --

MW-15

Parameter	Screening Value	4/13/2006	12/19/2006
Volatile organic compounds			
TCE	5	14	NA
Inorganic constituents			
Sb	3	51	8.6 J/7.6 J
As	25	139	50/48
Cr	50	350	--
Cu	200	434	--
Pb	25	297	--
Hg	1	2 N	--
Ni	100	1490	--
Se	10	--	12 J/17 J
Tl	0.5	1.4 J	--
Zn	2000	--	--

MW-11

Parameter	Screening Value	12/8/2002
Semivolatile organic compounds		
Naph	10G	160
Inorganic constituents		
Sb	3	1400
As	25	1100
Ba	1000	1400
Be	3	6.2
Cd	5	22
Cr	50	1700
Cu	200	3400
Pb	25	7400
Hg	1	270
Ni	100	230
Se	10	30 J
Zn	2000	6400 J
CN	200	1300

NYSDEC Screening Values (ug/L)

Volatile Organic Compounds		
1,1,1-Trichloroethane	TCA	5
1,1-Dichloroethane	DCA	5
cis-1,2-Dichloroethene	cDCE	5
Tetrachloroethene	PCE	5
Trichloroethene	TCE	5
Vinyl Chloride	VC	2
Chlorobenzene	CB	5
Benzene	Ben	1
Toluene	Tol	5
Ethylbenzene	EB	5
Xylene	Xyl	5
1,2-Dichloropropane	DCP	1
Semivolatile Organic Compounds		
Phenol	Phenol	1
1,4-Dichlorobenzene	1,4-DCB	3
1,2-Dichlorobenzene	1,2-DCB	3
2,4-Dimethylphenol	DMP	1
Naphthalene	Naph	10G
Acenaphthene	AcNe	20G
Benzo(a)anthracene	B(a)A	0.002G
Chrysene	Chry	0.002G
Benzo(b)fluoranthene	B(b)F	0.002G
Benzo(a)pyrene	B(a)P	ND
Inorganic Constituents		
Antimony	Sb	3
Arsenic	As	25
Barium	Ba	1000
Beryllium	Be	3
Cadmium	Cd	5
Chromium	Cr	50
Copper	Cu	200
Lead	Pb	25
Mercury	Hg	1
Nickel	Ni	100
Selenium	Se	10
Thallium	Tl	0.5
Zinc	Zn	2000
Cyanide	CN	200

Notes:

Data boxes with red borders indicate monitoring wells that were sampled in 2006.
Concentrations presented in ug/L; concentrations below screening values indicated by "--".
"NA" indicates that no analysis was performed for the subject analyte.
NYSDEC Screening values cited from TOGS 1.1.1, Division of Water, June 1998 and 2000 Addendum.
Screening concentrations presented with a G suffix are guidance values.
ND = screening value is "no detection."
Sampling was completed in May 2001, December 2002, and April and December 2006.
Environmental data presented are constiuents that exceeded screening values at at least one location.
Data were validated.
Data qualifiers: J = estimated concentration; N = matrix interference reported by laboratory; E = concentration that exceeded linear range reported by laboratory.
Data for 2001, 2002, and April 2006 are results of total (unfiltered) analyses; samples were collected using bailers.
Data for December 2006 represent total/filtered results; samples were collected using low flow sampling techniques.
Concentrations of sodium, iron, and manganese (common geological elements) are not shown.

LEGEND

- TP-04 — TEST PIT
- SS-14 — SURFACE SOIL SAMPLE
- SB-9 — SOIL BORING
- MW-8 — MONITORING WELL LOCATION
- BMW-3 — DEEP MONITORING WELL LOCATION

NEW YORK STATE
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

THREE STAR
ANODIZING SITE
WAPPINGERS FALLS,
NEW YORK

GROUND WATER DATA

1"=80' 80 0 80

FILE NO.10653.37062.007
OCTOBER 2007

O'BRIEN & GERE ENGINEERS, INC.

Map Source: Orthophoto Image, 2004, OCSCIC.

New York State
Department of Environmental Conservation

Division of Environmental Remediation

Remediation Areas

Figure 6

Three Star Anodizing
(Site #314058)
Wappingers Falls
New York

Legend

- Dry Well
- Monitoring Wells
- Soil Boring
- Soil Sample
- Vats
- Axton Cross Excavation Limits
- Lagoon Dredging Limits
- Lower Raceway Excavation Limits
- Site Boundary
- Soil Cover Limits
- Tank Holder

0 25 50 100 150 200
Feet