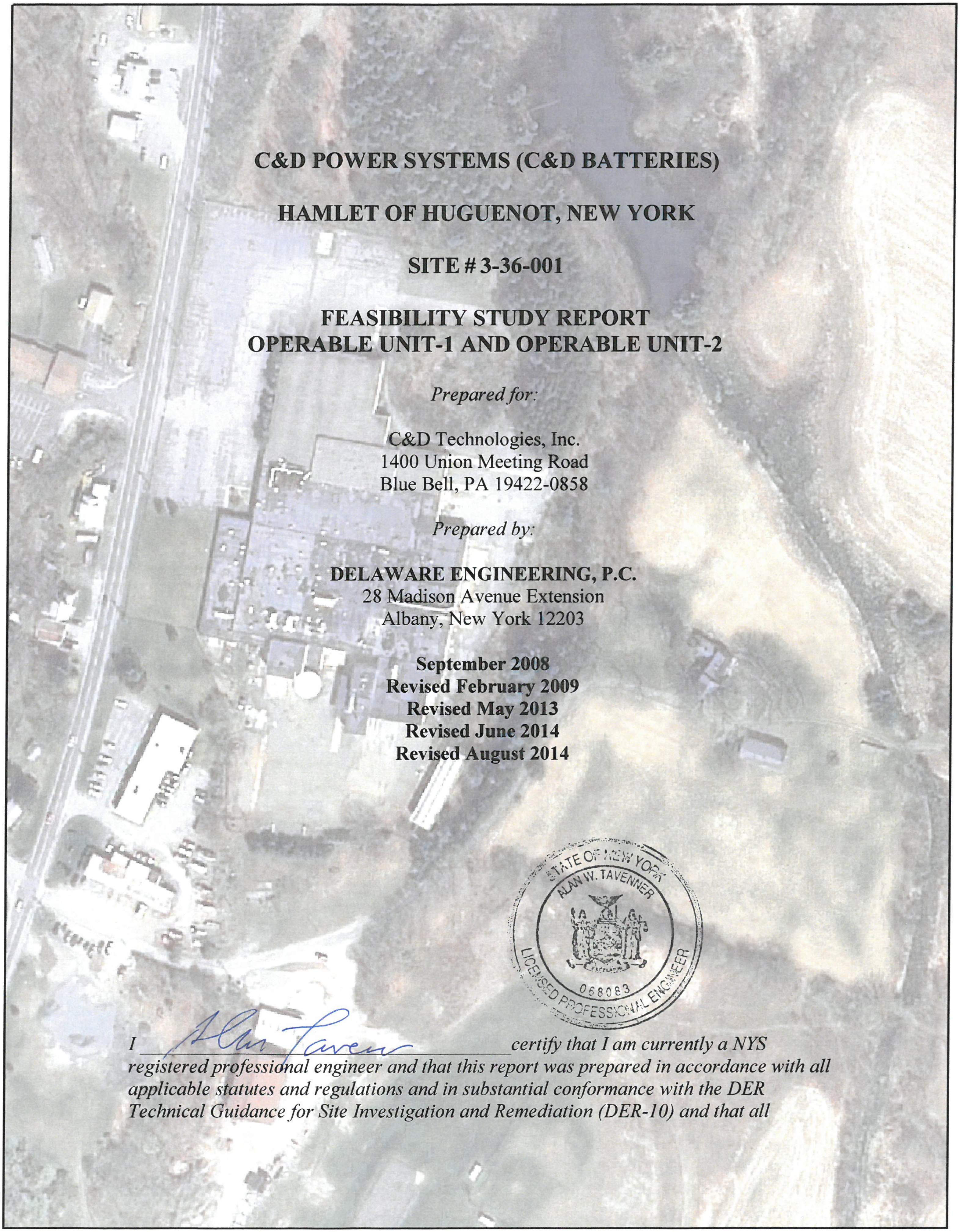

C&D POWER SYSTEMS (C&D BATTERIES)

HAMLET OF HUGUENOT, NEW YORK

SITE # 3-36-001

FEASIBILITY STUDY REPORT
OPERABLE UNIT-1 AND OPERABLE UNIT-2

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STATE OF NEW YORK
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I ________________________________ certify that I am currently a NYS registered professional engineer and that this report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all

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1.0 INTRODUCTION

Pursuant to the New York State Department of Environmental Conservation (NYSDEC) Consent Order, C&D Technologies, Inc. (C&D) has developed a Remedial Investigation (RI) and Feasibility Study (FS) at its facility (NYSDEC site ID, C&D Batteries, site No. 3-36-001) located in the Hamlet of Huguenot, in the Town of Deer Park, Orange County, New York. The RI was conducted as two separate but related investigations; Operable Unit-1 (OU-1) and Operable Unit-2 (OU-2). OU-1 consists of lagoon soils and the water supply at the residential home on Swartwout Road, currently owned by Orange County. OU-2 includes ground water, surface water, sediments and soil (near the former 12" lagoon overflow discharge pipe). An FS Report was prepared and a Record of Decision (ROD) was issued by the NYSDEC for OU-1. Based on the findings of the OU-2 RI, it has been determined that a combined FS report for OU-1 and OU-2 is appropriate. This FS report addresses both OU-1 and OU-2 and includes discussion of ground water, lagoon soils in the saturated and unsaturated zone, on-site and off-site surface soils, tributary D-1-7 surface water and tributary D-1-7 sediment.

1.1 PURPOSE AND ORGANIZATION OF REPORT

The purpose of this FS is to identify and analyze remedial alternatives that are protective of human health and the environment, attain to the maximum extent practicable the applicable or relevant and appropriate requirements (ARARs), and to evaluate cost effectiveness. Accordingly, the FS is based on objectives, methodologies, and evaluation criteria as generally set forth in the following Federal United States Environmental Protection Agency (USEPA) and NYSDEC regulations and guidelines:

- The Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) and the Superfund Reauthorization Act of 1986 (SARA);
- The National Oil and Hazardous Substances Contingency Plan (NCP);
- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, October 1988);
- CERCLA Compliance with Other Laws Manual, 1988, OSWER Directive No. 9234.1-01 and -02;
- NYSDEC DER-10, Technical Guidance for site Investigation and Remediation, May 2010.
- NYSDEC 6NYCRR Part 375, Environmental Remediation Program, December 2006.
- NYSDEC Water Quality Regulations for Surface Waters and Ground waters, 6NYCRR Parts 700-705;

- NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #HWR-89-4022 "Records of Decision for Remediation of Class 2 Inactive Hazardous Waste Disposal Sites";
- NYSDEC TAGM #HWR-89-4025 "Guidelines for RI/FS's";
- NYSDEC TAGM #HWR-90-4030 "Selection of Remedial Actions at Inactive Hazardous Waste Sites";
- NYSDEC TAGM #HWR 94-4046 "Determination of Soil Cleanup Objectives and Cleanup Levels";
- NYSDEC Strategy for Ground water Remediation Decision Making at Inactive Hazardous Waste Sites and Petroleum Contaminated Sites in New York State, April 1996;
- NYSDEC "Technical Guidance for Screening Contaminated Sediments"; and
- NYSDOH Drinking Water Standards.

During the FS, potential remedial alternatives are identified, screened, and evaluated in accordance with EPA and NYSDEC guidance. The FS focuses on the remedial alternatives that can be readily implemented and can achieve the remedial action objectives effectively. Technologies that could prove to be difficult to implement or may not be appropriate based on site specific conditions are eliminated from further consideration. The objective of the FS is to select an alternative that will cost effectively eliminate, to the extent possible, off-site migration of contaminants and the potential for exposure to site related chemistry.

1.2 SITE DESCRIPTION

The facility is approximately ten acres in size, and is located in the Hamlet of Huguenot in the Town of Deer Park, approximately four miles northeast of the City of Port Jervis. The facility is located in the Neversink River Valley, and is bordered on the west by Route 209 and on the east by a tributary to the Neversink River.

1.3 SITE HISTORY

From 1959 to approximately 1970, the facility was owned and operated by Empire Tube Company (ETC), a manufacturer of black and white picture tubes. Hydrofluoric acid was used in the manufacturing process to remove carbon and potassium silicate from the inside of the picture tubes. During this period, industrial wastewater was discharged to a lagoon adjacent to the northeastern corner of the plant building. The lagoon was approximately 150 feet in diameter and 15 feet deep. C&D Batteries, Division of Electra Corporation began operations at the facility in the mid-1970s. C&D manufactures industrial lead batteries used primarily in forklifts. From the mid–1970s until approximately 1982, C&D discharged non-contact cooling water into the lagoon, which resulted in the accumulation of approximately one to two feet of water at the bottom of the lagoon.

1.4 PRIOR INVESTIGATION ACTIVITIES

In 1981, with an interest to expand the plant building over the former lagoon, C&D conducted an investigation to determine the possible nature and extent of soil and ground water contamination at the site. Elevated fluoride concentrations were detected in both ground water and soil samples collected in the vicinity of the former lagoon. The site was classified as a Class 2a site by the NYSDEC in 1983. In July 1990, additional ground water monitoring was requested by the NYSDEC. Results indicated that fluoride levels in the ground water exceeded the New York State ground water standard and were ten times greater than background levels. The site was subsequently reclassified as a Class 2 site. A brief chronology of previous investigations performed at the site is presented below.

<u>May 1964:</u>

ETC's waste disposal system was inspected by the New York State Department of Health (NYSDOH). Monthly sampling of surface water and ground water samples was initiated. Samples collected from a spring emanating from a bank of the lagoon contained, on average, approximately 100 mg/l of fluoride. Samples collected from a nearby production well and the tributary of the Neversink River contained fluoride levels of non-detect to 5.5 mg/l and 8.0 mg/l, respectively.

<u>September 1966:</u>

A complaint was filed by NYSDOH regarding the discharge of untreated or inadequately treated sewage, industrial wastes and other wastes into the waters of the State of New York. The complaint stemmed from the discharge of industrial wastes containing concentrations of approximately 2,500 ppm fluoride and unidentified concentrations of barium and silicates. These discharges had exceeded water quality standards since February 1, 1963.

<u>October 1981:</u>

The NYSDEC directed C&D to conduct soil sampling in the lagoon.

<u>December 1981/January 1982:</u>

With an interest to expand the plant building over the former lagoon, C&D retained Environmental Resources Management, Inc. (ERM) to perform a hydrogeologic assessment of the former lagoon and vicinity. The voluntary investigation was undertaken to determine whether or not the former lagoon could be filled without having an adverse environmental effect on the site and the surrounding area.

Soil samples collected from the site had levels of lead, cadmium and zinc exceeding the common range typically found in soil. Soil samples collected from the bottom of the former lagoon had fluoride concentrations ranging from 28 to 358 mg/Kg. Ground water samples indicated that water in the vicinity of the former lagoon was of "acceptable quality", with the exception of fluoride concentrations (13 to 30 mg/l), which exceeded the New York State sanitary code for fluoride (2.2 mg/l).

The results of the investigation indicated that fluoride was present in both the ground water downgradient of the former lagoon and in soils at the bottom of the former lagoon. Lead was found in only one downgradient well (CD-2) at a concentration above the NYSDEC ground water standard. Additionally, ERM observed that fluoride and barium levels in subsurface soil and ground water attenuated significantly with distance from the former lagoon.

<u>November 1983:</u>

The site was classified as a Class 2a site in the New York Registry of Inactive Hazardous Waste Sites.

<u>July 21, 1988 to January 1989:</u>

A Phase II investigation was conducted by Gibbs & Hill (G&H), which was contracted by the NYSDEC. In addition to a historical record search, ground water, surface water and sediment samples were collected and analyzed. The G&H Phase II investigation reported that there was no evidence of contamination or the migration of contamination from the site.

<u>July 1990:</u>

NYSDEC conducted additional ground water monitoring at the site. Fluoride levels exceeding background levels by more than ten times were detected. The levels also exceeded the New York Class GA ground water standard for fluoride of 1.5 mg/l. Subsequently, the site was reclassified as a Class 2 site and a remedial investigation and feasibility study was recommended.

<u>July 1999:</u>

Order on Consent to develop and implement a Remedial Investigation/Feasibility Study was executed between NYSDEC and C&D.

1.5 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

The following sections summarize site investigation data. Lagoon unsaturated zone soil data, lagoon saturated zone soil data, ground water data, Swartwout residential well data, tributary D-1-7 surface water and tributary D-1-7 sediment data are discussed in sections 1.5.1, 1.5.2, 1.5.3, 1.5.4 and 1.5.5, respectively.

1.5.1 Lagoon Unsaturated Zone Soil Data

The lagoons soils are on average approximately fifteen feet below the surrounding ground surface and any remedy selected for the site will involve the filling of the lagoon with clean fill material, thereby immediately converting the current lagoon surface soils into inaccessible subsurface soils (average below ground depth of fifteen feet). Therefore, there is no potential for direct contact with lagoon soils and the protection of ground water standard is considered the applicable Part 375 Soil Cleanup Objective (SCO). Lagoon unsaturated zone surface soil, test pit and boring data have been depicted on Drawings 2, 3 and 4 provided in the March 2001 Remedial Investigation Report and are included in Appendix B.

The lagoon surface soil (0-12") PCB aroclor 1254 concentrations ranged from 34 mg/Kg to 1,100 mg/Kg (average concentration 348.6 mg/Kg), all of which are above the NYSDEC Part 375 Commercial SCO of 1 mg/Kg and the Part 375 Protection of Ground Water SCO of 3.2 mg/Kg. Lagoon surface soil cadmium concentrations ranged from 32 mg/Kg to 46,000 mg/Kg, which exceed the Part 375 Protection of Ground Water SCO of 7.5 mg/Kg. Lead and barium concentrations in lagoon surface soils ranged from 291 mg/Kg to 6,640 mg/Kg and 1,100 mg/Kg to 4,980 mg/Kg, respectively. Lead concentrations were higher than the Part 375 Protection of Ground Water SCO of 450 mg/kg and barium concentration were higher than the Part 375 commercial use SCO of 400 mg/Kg.

The test pit samples demonstrate that barium, cadmium and lead are present in lagoon soils at concentrations above the Part 375 Protection of Ground Water SCO at depths up to 12 feet. Data from lagoon soil boring samples collected immediately above the ground water table confirm high cadmium levels at depth (12 feet) in lagoon soils.

Fluoride was consistently detected in each test pit at concentrations above the levels reported in the surface (0-12") samples collected along the railroad tracks, which are considered representative of site background fluoride concentrations (<10.19 to <10.42 mg/Kg). In most test pits, elevated fluoride concentrations were detected at depth (12 feet).

The soil boring data demonstrates that the highest PCB concentrations in the lagoon soils are located in the top three feet with one soil boring SB-1 exhibiting a high PCB concentration at a depth of five feet below grade. PCB soil concentrations generally rapidly decrease below three feet as seen in borings SB-2 through SB-6 with concentrations that range from <1 mg/Kg to 31 mg/Kg. These data indicate that most of the PCBs in the lagoon soil are concentrated in the surface soils.

1.5.2 Lagoon Saturated Zone Soil Data

Six soil borings were advanced within the saturated zone of the lagoon (SB-1-05, SB-2-05, SB-3-05, SB-5-05, SB-7-05, SB-8-05) and two borings within the saturated zone adjacent to the lagoon (SB-04-05, SB-06-05). Samples were generally collected from depths just above and within the saturated zone. Soil sample results from within the lagoon indicate that cadmium concentrations in borings SB-1-05, SB-2-05, SB-5-05 and SB-7-05 were higher than the Part 375 Ground Water SCO in the deepest sample from each boring and were generally above the SCO in all samples from each of these borings. Lead concentrations were less than the Part 375 Ground Water SCO and generally, barium concentrations in the deeper samples were below the Part 375 Protection of Ground Water SCO with the exception of boring SB-05. Saturated zone soil boring data were summarized in Table 7 and boring locations were depicted on Figure 8, of the May 2006 Operable Unit 2 Remedial Investigation Report, and are provided in Appendix C.

The cadmium results from boring SB-5-05 (two samples below the ground water table and two above the ground water table collected at depths from 22 feet to 32 feet below ground surface) , boring SB-1-05 (0'-0.6' below the ground water table and 26.5 feet below ground surface) and boring SB-2-05 (0'-2' below the ground water table and 26 feet below ground surface) were above the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit. All other soil boring samples exhibited barium, cadmium and lead concentrations below the respective TCLP regulatory limits.

1.5.3 Ground Water Data

Drawing 3 of the May 2006 Operable Unit 2 Remedial Investigation Report summarized the historical ground water data and is included in Appendix D, herein.

The ground water PCB data indicate that the site has not had a significant impact on downgradient ground water PCB levels. In July 2001, ground water samples from monitoring wells MW-7 and MW-14 (collected using the low flow micro-purging procedure) exhibited PCB concentrations above the ground water standard. However, PCB concentrations in all ground water monitoring well samples collected in August and September 2003 were below the ground water standard. Subsequently, PCBs were detected in the April 2005 ground water samples from monitoring wells MW-6 and MW-14 at concentrations above the ground water standard.

The most recent ground water samples from March/April 2005 and August/September 2003 indicate that barium, cadmium and lead concentrations in all on-site and off-site ground water monitoring wells and the Swartwout Road residence potable well (2003) were below the respective ground water standards. Ground water data indicate that the site has not had a significant impact on the downgradient ground water concentrations of these three metals.

Data indicate that the site has had an impact on ground water fluoride concentrations. However, the off-site ground water data indicate that the downgradient impact is limited in extent. Although fluoride was detected in the ground water samples from monitoring well MW-17 (2003; 1,800 ug/L: 2005; 2,120 ug/L) at concentrations slightly above the NYSDEC ground water standard, the concentration was below the NYSDOH drinking water standard.

As previously noted, fluoride was not detected (reporting limit of 200 ug/L) in the ground water sample from monitoring well MW-17A, which is located downgradient of well MW-17 and 1200 feet downgradient of the lagoon center. Fluoride also was not detected in a sample collected from the Harriet Space Park ladies restroom but was detected, just at the reporting limit (200 ug/L), in a sample collected from the Town of Deer Park Town Hall. The Town Hall and the Harriet Space Park are located approximately 500 and 1,000 feet, respectively, south of the lagoon. The MW-17A, the Town Hall and the Harriet Space Park samples indicate that the off-site extent of ground water with elevated concentrations of fluoride is limited and does not extend much beyond monitoring well MW-17.

1.5.4 Off-Site Residential Potable Well Data

The off-site residential potable well (located at 75 Swartwout Road) data indicate that with the exception of fluoride, contaminants associated with the former lagoon have not impacted water quality at the well location. One sample collected from the residential well (10-minute sample) sampled in February 2000 exhibited a fluoride concentration of 3.85 mg/L. This exceeds the New York State Department of Health drinking water standard (2.2 mg/L) and the NYSDEC ground water standard (1.5 mg/L), but does not exceed the USEPA National Primary Drinking Water Standard (4.0 mg/L). The fluoride concentration in two recent samples, one collected by the Orange County Department of Parks on February 16, 2001 and a second by Delaware Engineering on behalf of C&D Technologies, Inc., on July 31, 2001 exhibited a non-detectable level at a reporting limit of 0.4 mg/L and 0.45 mg/L, respectively. The monitoring wells MW-12 and MW-13, upgradient of the site exhibited fluoride concentrations of 0.521 mg/L and 0.642 mg/L, respectively.

1.5.5 Tributary D-1-7 Stream Sediment Data and Floodplain Soil Data

A drawing summarizing stream sediment data is provided in Appendix E.

1.5.5.1 Barium

Data for samples collected from 0 to 6 inches below the stream bed indicate that the site has not had an impact on stream sediment. All stream sediment samples collected downgradient of the C&D outfall, exhibited barium concentrations less than the reported upstream SED-5 barium level of 97.5 mg/Kg. with the exception of the SED-8, SED-10 and SED-26. Downstream sample SED-10 exhibited a concentration of 137 mg/kg and sample SED-26 exhibited a concentration of 108 mg/Kg, only slightly higher than the upstream sample SED-5 with a concentration of 97.5 mg/Kg. Barium concentrations in samples SED-11 through SED-23 collected downstream of sample SED-10 were consistent with the upstream SED-5 concentration.

Considering the low frequency of samples exhibiting barium concentrations above the upstream background level, data indicate that the site has not had a significant impact on downstream sediments and that the reported downstream barium sediment concentrations do not represent a threat to benthic aquatic life in the tributary D-1-7 aquatic ecosystem.

1.5.5.2 Cadmium

Data indicate all Tributary D-1-7 stream sediment cadmium concentrations were less than the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) Severe Effect Level (SEL) criterion for cadmium (9 mg/Kg).

Eleven of the twenty-six downstream sediment samples collected from 0 to 6" below the stream bed exhibited cadmium concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) Lowest Effect Level (LEL) criterion of 0.6 mg/Kg. Samples collected within 6 to 12 inches below the stream bed exhibited cadmium concentrations below the LEL or were less than the laboratory reporting limit with the exception of SED-24. Sample SED-24 was collected directly adjacent to the former lagoon, in the vicinity of samples SED-9 and SED-10 which also exhibited cadmium, lead and PCB concentrations above NYSDEC sediment criteria.

Cadmium concentrations in SED-22 and SED-23 that were collected approximately 250 feet and 50 feet, respectively upstream of the confluence of Tributary D-1-7 with the Neversink River, were below the LEL.

Tributary D-1-7 sediment data indicate that stream sediments with elevated cadmium concentrations above the LEL are primarily restricted to the top 0 to 6 inches and sediments did not exhibit cadmium concentrations above the SEL. Sediments with cadmium concentrations above the LEL were not detected in the two sediment samples closest to the confluence of Tributary D-1-7 with the Neversink River. Cadmium concentrations above the LEL appear to be randomly located along the length of Tributary D-1-7 and intermixed with stream reaches with concentrations below the LEL.

1.5.5.3 Lead

The stream sediment and stream flood plain lead data that exhibit concentrations above the SEL are limited in extent and restricted to the top 0 to -6 inches. Sediment lead concentrations above the LEL are more widespread, but are also limited to the top 0 to 6 inches. The stream and flood plain sediment samples indicate that historical site activities have potentially had an impact on the stream bed.

Fifteen of the twenty-six downstream sediment samples collected from 0 to 6 inches below the stream bed exhibited lead concentrations above the LEL. Seven of twenty-six samples collected from six locations exhibited lead concentrations above the SEL and all but one of these samples was collected from 0 to 6 inches below the stream bed.

Samples SED-4/SED-9 (collected at the same location at different times) and the SED-25, collected from 0 to 6 inches below the stream bed, exhibited lead concentrations higher than the SEL. Lead concentrations in samples collected from 0 to 6 inches below the stream bed, indicates that samples SED-13, SED-14, SED-15 were above the SEL. These sample locations are downstream of the SED-4/ SED- 9 and SED-25 area.

Samples SED-24, SED-10, SED-11 and SED-12 upstream of sample SED-13 and between SED-13 and SED-4/SED-9 had lead concentrations from 0 to -6 inches below the stream bed that were less than the SEL and three of these samples (SED-24, SED-11, SED-12) were less than the LEL. Sample SED-24 from 6-12 inches below the stream bed exhibited concentrations higher than the SEL. Lead concentrations in samples SED-13, SED-14 and SED-15 were well below LEL.

Sample SED-19 collected from 0 to 6 inches below the stream bed exhibited concentrations higher than the SEL. The lead concentration in sample SED-19 collected from 6-12 inches below the stream bed was less than the LEL. Sample SED-19 is located approximately 1,250 feet downstream of Sample SED-15. Samples SED-16 through SED-18 are located between SED-15 and SED-19. The concentration of lead in samples SED-17 and SED-18 collected from 0 to 6 inches below the stream bed were below the LEL and the lead concentration in the SED-16 collected from 0 to 6 inches below the stream bed was below the SEL. The lead concentration in samples SED-16, SED-17 and SED-18 collected from 6-12 inches below the stream bed were less than the LEL.

The lead concentration in the 0-6 inch and 6-12 inch samples (SED-20 through SED-23) collected downstream of SED-19, between SED-19 and the confluence of Tributary D-1-7 with the Neversink River, was less than the SEL. The 0-6 inch lead concentrations in the two samples collected furthest downstream from the lagoon, approximately 250 feet (SED-22) and 50 feet (SED-23) above the confluence of Tributary D-1-7 with the Neversink River, were below the LEL.

Tributary D-1-7 sediment data indicate that concentrations above the LEL appear to be randomly located along the length of Tributary D-1-7 and intermixed with stream reaches that do not exhibit concentrations above the LEL. Sediments with lead concentrations above the LEL were not detected in the 0-6 inch interval from the two sample locations closest to the confluence of Tributary D-1-7 with the Neversink River. Lead concentrations above the SEL are primarily limited to the top six inches of sediment within a 1,350 foot reach of the stream.

1.5.5.4 Fluoride

The sediment data indicate that the site has not had a significant impact on the stream bed, with concentrations ranging from <3.52 mg/Kg to 53.9 mg/Kg. The concentrations are well below the 290 mg/Kg concentration reported by Metcalfe-Smith (2003) that caused no mortality with an observable effect limited to growth (25% inhibitory concentration) on the amphipod Hyalella azteca, which was the most sensitive of several species tested (Fathead minnow, mayfly, midge and water flea).

1.5.5.5 PCBs

PCBs were detected at concentrations above the site specific human health bioaccumulation and wildlife bioaccumulation sediment criteria values (0.018 ug/kg and 31.5 ug/Kg, respectively) and the SED-5 background sediment value in eighteen of the twenty-two downstream samples collected from 0 to 6 inches below the stream bed and in six of eighteen samples collected from 6 to -12 inches below the stream bed. PCBs were not detected above the laboratory reporting limit in the three samples collected furthest downstream from the lagoon, collected approximately 575 feet (SED-21), 250 feet (SED-22) and 50 feet (SED-23) upstream of the confluence of Tributary D-1-7 with the Neversink River.

Two sediment samples SED-9and SED-10 collected from 0 to 6 inches below the stream bed exhibited total PCB concentrations above the site specific aquatic life chronic toxicity criteria value and were reported at 1,070 ug/Kg and 1,470 ug/Kg, respectively. All PCB sediment sample results were below the site specific aquatic life acute toxicity sediment criteria value. Samples SED-9 and SED-10 total PCB concentrations were slightly above 1 mg/Kg, which is a sediment cleanup value that has been used at other sites throughout New York State.

Only 9% (two of twenty-two) of the sediment samples exhibited PCB concentrations above the site-specific aquatic life chronic toxicity value. All sediment samples were below the aquatic life acute toxicity value. Data indicate that sediment PCB concentrations have most likely only had a minor effect on sediment benthic populations. The highest sediment sample total PCB concentrations reported in the stream were only slightly above 1,000 ug/Kg, which has been used as a cleanup guideline for similar cleanup projects in New York State. All other stream sediment concentrations were well below 1,000 ug/Kg.

All flood plain sediment sample PCB concentrations were above the human health bioaccumulation criteria. Only sample FP-4 exhibited a PCB concentration that was above the wildlife bioaccumulation value. All flood plain concentrations were below the aquatic life chronic and acute toxicity criteria values.

1.5.6 Tributary D-1-7 Surface Water Data

With the exception of fluoride, the site has not had an impact on surface water quality with respect to the site-specific chemicals of concern. The effect the site has had on surface water fluoride concentrations is not significant, as all concentrations are less than the surface water standard. Although the highest fluoride concentration was reported in sample SW-6, which was the most downstream sample collected, surface water fluoride concentrations downstream from SW-6 are expected to rapidly decrease with increasing distance from the lagoon. Data indicate that no remediation of surface water is necessary.

1.5.7 Surface Soil

On-site and off-site surface soil samples were collected and analyzed for lead. All samples were collected from the surface to a depth of two inches following the procedures detailed in the March 2008 "Surface Soil and Pavement Sampling and Analysis Plan". Sample results are summarized on Figure 6 (Map Pocket).

Soil sample analytical data indicate that soil samples with lead concentrations above the NYSDEC Part 375 Commercial Soil Cleanup Objective (SCO) in samples collected outside the fenced area of the facility and outside the property line is limited to one sample (SS-14). Soil samples outside the property line with lead concentrations above the Residential SCO of 400 mg/Kg is limited to four samples (SS-14, SS-56, SS-57, SS-59) collected near the southeast section of the site. The area extent of soils with concentrations above the Residential SCO outside the fenced area of the site has been adequately defined.

The pavement soil samples were generally collected from breaks and cracks in the pavement. The data indicate that most of the samples along the east and south side of the building exhibited lead concentrations above the Part 375 commercial use SCO of 1,000 mg/L.

2.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 121(d) of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA P.L. 96-510), as amended by Superfund Amendments and Reauthorization Act (SARA P.L. 99-499), specifies that Superfund remedial actions must meet any Federal standard, requirement, criteria, or limitation that is a legally applicable or relevant and appropriate requirement (ARAR) under the circumstances of the contaminant release or threatened release. It also specifies that State ARARs must be met if they are more stringent than Federal requirements. The selected remedial measure must attain a level or standard of control that satisfies the ARARs except under certain conditions.

New York State does not have ARARs in its statute and uses Standards, Criteria and Guidelines (SCGs), which are equivalent to ARARs. New York State, in 6 NYCRR Part 375, has developed rules for selecting and designing remedial programs for inactive hazardous waste Sites, which are consistent with the CERCLA requirements. A remedial alternative must conform to NYS standards and criteria that are generally applicable, consistently applied, and officially promulgated, that are either directly applicable, or that are not directly applicable but are relevant and appropriate. The remedial program must conform to Federal Toxic Substances Control Act (TSCA) and Resource Conservation and Recovery Act (RCRA) regulations for waste disposal and treatment.

The site remedial program should also be selected with consideration given to NYS guidance, which is determined to be applicable on a case-specific basis. The Federal equivalent of NYS guidance is "To Be Considered" (TBC) guidance and advisories.

The potentially applicable standards, criteria and guidance (SCG) are identified in the sections below and the associated tables. Standards, criteria and guidance may be specific to the site location, the contaminants present, or the remedial actions planned.

2.1 LOCATION-SPECIFIC SCGS

Location-specific SCGs, which relate to requirements for wetland protection, floodplain management, fish and wildlife conservation, and historic preservation, apply to remedial alternatives within specific geographical locations. A list of potential location-specific SCGs are identified in Table 1.

2.2 CHEMICAL-SPECIFIC SCGS

Chemical-specific SCGs are Federal or State standards or health/risk-based numerical values that are used to establish acceptable amounts or concentrations of constituents in the environment. A list of potential chemical-specific SCGs are identified on Table 2. These site-specific chemicals of concern (COC) are based on the data collected during the OU-1 and OU-2 Remedial Investigations.

2.3 ACTION-SPECIFIC SCGS

Action-specific SCGs apply to specific treatment and disposal activities, and may set controls or restrictions on the design, performance and implementation of the remedial actions taken at a site. For example, RCRA requirements will be applicable if the remediation constitutes treatment, storage or disposal of a hazardous waste as defined under RCRA. Other examples of action-specific requirements are Clean Water Act standards for discharge of treated ground water and New York State regulations at 6 NYCRR Part 703, which establish surface water and ground water quality standards and ground water effluent standards.

Table 3 identifies the action-specific SCGs that are potentially applicable to the site. Since action-specific SCGs apply to discrete remedial activities, their evaluation is presented with the detailed analysis of alternatives for each retained alternative.

2.4 GUIDANCE

There are instances when SCGs do not exist for a particular chemical or remedial action. In these instances, other State and Federal advisories and guidance may be used to aid in the evaluation and selection of a remedial alternative for a site. The guidance or advisories that may be relevant to the site are identified on Table 4.

3.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section identifies the remedial action objectives, general response actions, and remedial technologies for the site. Several remedial technologies are identified as potentially capable of meeting the remedial action objectives. Each remedial technology is evaluated, and the most appropriate technologies are retained for use in developing remedial action alternatives.

3.1 REMEDIAL ACTION OBJECTIVES

Remedial action objectives for the site have been developed based on the constituents of concern, media of concern, identified exposure pathways, and potential receptors. The remedial action objectives, which are media-specific, provide for protection of human health and the environment. They have been selected to minimize or reduce to target levels, the potential for human exposure or environmental damage due to the presence or migration of site-related contaminants. Table 5 presents Federal and State cleanup objectives for the contaminants of concern at the site. The site-specific remedial action objectives are as follows.

Lagoon Saturated and Unsaturated Soils:

- Prevent human exposure (ingestion and direct contact) to lagoon soils that contain elevated concentrations of PCBs, fluoride, barium, cadmium and lead.
- Prevent, to the extent practicable, the contaminants from serving as a potential source of ground water contamination at concentrations in excess of current NYSDOH drinking water standards or, if more stringent, New York State ground water standards.
- Eliminate, to the extent practicable, the migration of site related contaminants off-site via ground water.

Tributary D-1-7 Sediments:

- To the extent practicable, prevent impacts to biota from ingestion/direct contact with sediments with concentrations of cadmium, lead or PCBs that could cause toxicity or impacts from bioaccumulation through the aquatic food chain.
- Prevent direct contact (human health) with contaminated sediments.

Ground Water:

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.

- Restore groundwater aquifer to pre-disposal/pre-release conditions to the extent practicable.

Surface Soil

- Prevent human exposure (ingestion and direct contact) to lagoon soils that contain elevated lead concentrations.

- Prevent, to the extent practicable, the lead from serving as a potential source of ground water contamination at concentrations in excess of current NYSDOH drinking water standards or, if more stringent, New York State ground water standards.

- Eliminate, to the extent practicable, the off-site migration of lead contaminated soil via surface water runoff and wind dispersal.

3.2 GENERAL RESPONSE ACTIONS

General response actions are actions that will satisfy the remedial action objectives. They may include treatment, containment, excavation, extraction, disposal, institutional controls, or monitoring, individually or in combination. The general response actions selected are identified below.

- no action
- institutional controls
- removal
- disposal
- containment/isolation
- treatment

3.3 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

USEPA program guidance recommends screening alternative remedial technologies using the criteria of effectiveness, Implementability, and cost (USEPA 1988). In this section, remedial technologies are identified and screened to eliminate from further consideration those technologies and processes that may be of limited effectiveness, may not be able to be implemented at the site, or may be cost-prohibitive. The purpose of this screening is to better focus the FS on those technologies that offer the greatest potential of being effective and that can be implemented at the site.

The general response actions, remedial technologies and screening comments are presented in Table 6. These remedial technologies are evaluated based on site-specific information and are screened initially for technical applicability. Technologies are considered applicable if, individually or in combination, they would achieve the remedial action objectives. Technologies are not retained for further analysis if the area or volume estimates for the media of concern are such that these technologies can be presumed infeasible.

Furthermore, the technologies are screened for effectiveness, Implementability, and cost. The anticipated effectiveness of a technology refers to the ability of that technology to contribute to a remedial program that is protective of human health and the environment, and capable of meeting the stated remedial action objectives. Implementability is the feasibility and the ease with which the technology can be applied at the site and takes into consideration such practical factors as:

- Are the hazardous substances present at the site compatible with the technology?
- Is there sufficient room at the site to implement the technology?
- Is the technology compatible with site physical conditions?
- Is the use of the technology compatible with surrounding land uses?
- Will application of the technology unacceptably interfere with other ongoing uses of the site?
- What permitting and other regulatory requirements apply to use of the technology?
- Does the technology require resources of a type or in a quantity that is not readily available at the site?
- Are there experienced contractors that can provide, install, and operate the technology?

4.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

In this section, the remedial technologies selected for further consideration are assembled into appropriate remedial alternatives that address the media and areas of concern, and achieve the remedial objectives. As required by the National Contingency Plan (NCP), the "No Action" remedial alternative is included. Other non-technology-based alternatives such as institutional controls and environmental easements are also considered.

The remedial action alternatives are separated into lagoon soil (unsaturated and saturated), ground water and sediment alternatives. The soil remedial alternatives are presented in Section 4.2, the ground water alternatives are provided in Section 4.3 and the sediment alternatives are presented in Section 4.4. The no action alternative has been listed only once and is presented in Section 4.1.

4.1 REMEDIAL ACTION ALTERNATIVE 1: NO ACTION

Under this alternative, no action would be taken.

4.1.1 Lagoon Soils and Surface Soils

The contaminated soil would remain in place and no treatment or monitoring of constituent concentrations would be implemented. Soil containing heavy metals, fluoride, and PCBs would remain in place and it is anticipated that these substances would remain immobile to the extent they are now as indicated by the down gradient monitoring wells.

4.1.2 Ground Water

With the exception of fluoride in one off-site monitoring well (MW-17) all site COC concentrations in ground water samples collected from the off-site monitoring wells have been below the NYSDEC ground water standards. Data indicate that site COC have not significantly affected off-site ground water quality. The no action alternative for ground water would not involve any active or passive ground water treatment and no long or short-term ground water monitoring.

4.1.3 Tributary D-1-7 Surface Water

With the exception of fluoride, the site has not had an impact on the surface water quality in tributary D-1-7 with respect to the site-specific chemicals of concern. The effect the site has had on surface water fluoride concentrations is not significant, as all concentrations were significantly less than the surface water standard. Although the highest fluoride concentration was reported in sample SW-6, which was the most downstream sample collected, surface water fluoride concentrations downstream from SW-6 are expected to rapidly decrease with increasing distance from the lagoon. The no action alternative for tributary D-1-7 surface water would not involve any treatment or long or short-term monitoring.

4.1.4 Tributary D-1-7 Sediment

Only 4% (two of forty-eight) of the sediment samples collected from the stream bed and the flood plain, exhibited PCB concentrations above the site-specific aquatic life chronic toxicity value, however, all sediment samples were below the aquatic life acute toxicity value. Data indicate that sediment PCB concentrations have most likely only had a minor effect on sediment benthic populations. Forty-six percent of the sediment samples exhibited lead concentrations above the LEL and 15% percent of the samples were above the SEL. Twenty-five percent of the sediment samples had cadmium concentrations above the LEL and all cadmium sediment concentrations were below the SEL. The sediment metals data indicate that the combined lead and cadmium concentrations in the tributary D-1-7 sediments have the potential to cause a localized moderate impact on the benthic aquatic community. The sediment data indicate that the site has not had a significant impact on stream sediment fluoride concentrations. The no action alternative for tributary D-1-7 sediments would avoid disturbance of the tributary D-1-7 aquatic habitats by leaving sediments in place.

4.2 ALTERNATIVE 2: UNRESTRICTED USE

Pursuant to the NYSDEC DER-10, Technical Guidance for site Investigation and Remediation, May 2010 (DER-10) this alternative evaluates remediation of the site to unrestricted use (i.e., pre-release conditions).

4.2.1 Lagoon Soils

This alternative would excavate for off-site disposal all soil with barium, lead, cadmium and PCB concentrations above the NYSDEC 6NYCRR Part 375 Unrestricted Use soil cleanup objectives (SCOs).

Lagoon soils would be excavated to a depth of approximately 27 feet below the floor of the lagoon and transported off-site for disposal. Approximately 72.5 cy (109 tons) of soil from ten percent of the lagoon floor from 0-2' around surface soil sample SS-80100 would be transported to a facility for incineration due to TCSA soils with PCB concentrations above 1,000 mg/Kg. Approximately 36 cy (54 tons plus 2.7 tons for increase in weight related to the on-site stabilization) of soil from ten percent of the lagoon floor from 0-1' around surface soil sample SS-30100 with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal. The total estimated volume of soils to be excavated for disposal is approximately 9,788 cy which equals 14,682 tons, plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal.

This alternative would require the installation of an extensive sheet piling system to stabilize the adjacent building foundation and the excavation. Sheet piling would be used to encapsulate the entire lagoon floor area and utilize a poured concrete ring method for bracing. This bracing method would be used in lieu of conventional bracing due to the close proximity to the existing building and because of the nature of the excavation. Sheet piling would be installed to a depth of 54 feet below the floor of the lagoon with six feet of stick up above the lagoon floor. Sheet piling could prove to be extremely difficult to install and problematic due to the nature of the soil. Soils that exhibit blow counts greater than 20 can slow or impede installation of sheet piling. Soil boring logs for SB-1-05 through SB-3-05, SB-5-05, SB-7-05 and SB-8-05 advanced in the floor of the lagoon and SB-4-05 and SB-6-05 advanced just outside the lagoon during the OU-2 Remedial Investigation (RI) exhibited blow counts as high as 60, which could impede pile driving or simply make it infeasible.

Should this be the chosen remedial alternative, further intrusive investigation would be required to determine the practicability of sheet piling.

The excavated area of the lagoon would be backfilled to the existing elevation of the lagoon floor with clean fill.

4.2.2 Surface Soils

The unrestricted use remedial alternative for on-site and off-site surface soils is to excavate twelve inches of soil in the areas that exhibit lead concentrations above the Unrestricted Use Soil Cleanup Objective (SCO) near and outside the facility property line and excavate twelve inches of soil (below the pavement in paved areas) with concentrations above the Unrestricted Use SCO within the property line. Figure 6 depicts the proposed unrestricted use remediation area. Based on an assumed one foot layer of impacted soil, there is an estimated 10,527cubic yards of soil that would be transported off-site for disposal at a NYS Part 373/RCRA Subtitle C approved landfill.

Post excavation samples would be collected to confirm removal of soils with concentrations above the respective SCOs. The lead present in the soil would be stabilized by addition of a stabilizing agent that would immobilize the lead in the soil.

At the completion of all excavation activities, the excavation in soil areas would be backfilled with one foot of clean fill and the area seeded and mulched. Trees would be planted in areas where tree removal was necessary to implement the excavation. The excavated pavement area would be repaved.

4.2.3 Sediment

This alternative would remove all sediments with concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) LEL metal concentrations and the human health bioaccumulation criteria cleanup level for PCBs. This alternative is described in Section 4.4.3 Alternative SED-2, however, unlike alternative SED-2, the sediments in the unrestricted use alternative would not be placed in the lagoon but would be transported off-site to a NYS Part 360 approved landfill.

4.2.4 Ground Water

This alternative (GW-1) would consist of a series of ground water extraction points, a ground water treatment system and discharge to Tributary D-1-7 after treatment. Ground water would be collected using a series of extraction wells and would be treated primarily for fluoride and if necessary, metals and PCBs. Treatment would continue until concentrations were below the New York State Part 703 ground water standards and the New York State drinking water standards. A point of entry treatment system for fluoride would be implemented on the Orange County property well if the well was to be used as a potable water source. This alternative is described in Section 4.6.1 Alternative GW-1.

4.3 LAGOON UNSATURATED AND SATURATED SOIL REMEDIAL ACTION ALTERNATIVES

In March 2002 the NYSDEC issued a Record of Decision (ROD) for Operable Unit No. 1 (OU-1) that selected Alternative Lagoon Soil-1 as the remedy for OU-1, which consists of lagoon soils above the saturated zone. Subsequent to the OU-1 FS and issuance of the ROD for OU-1, subsurface borings have been advanced in the lagoon to depths of up to 24 feet below the lagoon floor (40 feet below surrounding grade). Blow count data from these borings reveal high blow counts that could affect the practicability of installation of the sheet piling associated with Alternative Lagoon Soil-1 and Lagoon Soil-2. Alternative Lagoon Soil-3 does not include sheet piling rather, utilizes methods to stabilize soils in-situ using an excavator to mix a Portland cement/bentonite grout mixture into the soil. The analysis of these alternatives presented in this section includes two unsaturated/saturated zone lagoon soil alternatives (Alternative Lagoon Soil-2 and Alternative Lagoon Soil-3). Alternative Lagoon Soil-3 utilizes in-situ stabilization of the soils and Alternative Lagoon Soil-2 utilizes excavation and ex-situ stabilization of the soils. Alternative Lagoon Soil-1 was presented in the ROD for OU-1 and is discussed herein.

4.3.1 Soil Alternative Lagoon Soil-1 Unsaturated Zone Soils: Excavate, Disposal, Stabilization, Asphalt Cap, Institutional Controls And Long-Term Monitoring

This alternative proposes that the unsaturated zone soils be remediated as presented in the March 2002 NYSDEC ROD. Lagoon soils would be excavated to a depth of 6 feet (approximately 2,177 cubic yards (cy) below the floor of the lagoon which equals 21 to 22 feet below existing grade since the floor of the lagoon is approximately 15 to 16 feet below existing grade. Additionally, 20% of the floor in the vicinity of Test Pit 4 would be excavated to 8 feet (approximately 145 cy) below the floor of the lagoon (approximately 23 to 24 feet below surrounding grade). This would yield approximately 2,322 cy or 3,483 tons of soil. Approximately 72.5 cy (109 tons) would be transported to a facility for incineration due to PCB concentrations above 1,000 mg/Kg (Surface Sample SS-080100). Approximately 36 cy (54 tons plus 2.7 tons for increase in weight related to the on-site stabilization) of soil around surface sample SS-30100 with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal. The total estimated volume of soils to be excavated for disposal is approximately 2,320 cy (3,480 tons) plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal.

The remaining impacted soil would be excavated to a depth of approximately 13 feet below the floor of the lagoon (approximately 28 to 29 feet below surrounding grade) or ground water, whichever is encountered first, and would be stabilized with tri-sodium phosphate to reduce the mobility of barium, cadmium and lead. The excavated soil would be stabilized on-site and would be subsequently placed back into the lagoon. It is estimated that approximately 2,393 cy (3,590 tons) will be excavated and stabilized. Two feet of clean fill would be placed at the bottom of the excavation to provide a buffer between the treated soil and the ground water table. This alternative would also require the installation of sheet piling to stabilize the adjacent building foundation and the excavation during the remediation activities.

This alternative would require the installation of an extensive sheet piling system to stabilize the adjacent building foundation and the excavation. Sheet piling would be used to encapsulate the entire lagoon area and utilize a poured concrete ring method for bracing. This bracing method would be used in lieu of conventional bracing due to the close proximity to the existing building and because of the nature of the excavation. Sheet piling would be installed to a depth of 26 feet below the floor of the lagoon (41 to 42 feet below the surrounding grade) with six feet of stick up above the floor of the lagoon. Sheet piling could prove to be extremely difficult to install and problematic due to the nature of the soil. Soils that exhibit blow counts greater than 20 can slow or impede installation of sheet piling. Soil boring logs for SB-1-05 through SB-3-05, SB-5-05, SB-7-05 and SB-8-05 advanced in the floor of the lagoon and SB-4-05 and SB-6-05 advanced just outside the lagoon during the OU-2 Remedial Investigation (RI) exhibited blow counts as high as 60, which could impede pile driving or simply make it infeasible. Should this be the chosen remedial alternative, further intrusive investigation would be required to determine the practicability of sheet piling.

Since excavation and stabilization would not extend into or below the ground water table, it is anticipated that minimal dewatering or solidification would be necessary. Refer to Figure 2 for a delineation of the excavation area. Following placement of the stabilized soil back into the lagoon, the surface of the stabilized soil will be approximately 21 to 22 feet below the surrounding grade. The remaining area of the lagoon would be backfilled to the existing grade (elevation 471 feet to 474 feet) with a mixture of clean fill, sediments from the tributary D-1-7 remediation and potentially stabilized soils from the surface soil cleanup and graded to blend with the surrounding area.

Since low level PCBs and treated soil would remain in place, an asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for continued leaching of fluoride or other site contaminants. The cap would serve to isolate the contaminants and would eliminate direct and indirect exposure to contaminated soils.

This alternative would also require an environmental easement to limit the use of all property to commercial or industrial use only.

Ground water monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on ground water quality.

The ground water monitoring program would be implemented as part of the selected ground water remedial alternative. Cap maintenance would also be required.

4.3.2 Alternative Lagoon Soil-2: Unsaturated Zone Excavation & Disposal (Top 4-6 ft.), Unsaturated & Saturated Zone Excavation and Ex-Situ Stabilization, Asphalt Cap, Institutional Controls And Long-Term Monitoring

Lagoon soils would be excavated to a depth of 4 feet (approximately 1,450 cubic yards (cy) below the floor of the lagoon which equals 19 to 20 feet below existing grade since the floor of the lagoon is approximately 15 to 16 feet below existing grade. Additionally, 20% of the floor around boring SB-1 would be excavated to 6 feet (approximately 145 cy) below the floor of the lagoon (approximately 21 to 22 feet below surrounding grade).

The selected remedy in the OU-1 Record of Decision (ROD) calls for the excavation and off-site disposal of soil in the top 6-8 feet of the lagoon. However, the primary intent of the soil excavation and off-site disposal is to remove soils with PCB concentrations above 50 mg/Kg with a secondary goal of removing soils with the highest concentrations of cadmium and fluoride. Subsequent analysis of the data indicates that the primary goal of removing soils with PCB concentrations above 50 mg/Kg can be achieved at a lower off-site disposal cost by excavation of 4-6 feet while still removing a high percentage of the estimated mass of cadmium (65%) and fluoride (41%) for off-site disposal.

This alternative would remove approximately 1,595 cy or 2,393 tons of soil from the lagoon. Approximately 72.5 cy (109 tons) would be transported to a facility for incineration due to PCB concentrations above 1,000 mg/Kg. Approximately 36 cy (54 tons plus 2.7 tons for increase in weight related to the on-site stabilization) of soil with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal. The total estimated volume of soils to be excavated for disposal is approximately 1,595 cy (2,393 tons) plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal.

Similar to Alternative Lagoon Soil-1 soil in the unsaturated zone would be excavated for ex-situ stabilization. Alternative Lagoon Soil-2 would include excavation in the saturated zone to remove soils that exhibit TCLP cadmium concentrations above the TCLP regulatory limit. Saturated soils would be excavated to a depth of approximately 20 feet below the existing lagoon floor (approximately 35 to 36 feet below surrounding grade) over an area of approximately twenty percent of the lagoon floor around boring SB-05-05.

As with Alternative Lagoon Soil-1, this alternative would also require the installation of an extensive sheet piling system to stabilize the adjacent building foundation and the excavation. Like Alternative Lagoon Soil-1, sheet piling would be used to encapsulate the entire lagoon area as well as for a smaller area within the lagoon. This alternative would require additional sheet pilling to stabilize the excavation into the groundwater table. Sheet piling would extend to a depth of 40 feet below the floor of the lagoon (54 feet below surrounding grade.) over 20 percent of the lagoon floor, which is 14 feet deeper than required by Alternative Lagoon Soil-1. This would substantially increase the difficulty of sheet piling and increase the probability that sheet piling would not be feasible. As discussed in Section 4.2.1, soils that exhibit blow counts greater than 20 can slow or impede installation of sheet piling. Soil boring logs for SB-1-05 through SB-3-05, SB-5-05, SB-7-05 and SB-8-05 advanced in the floor of the lagoon during the OU-2 RI exhibited blow counts as high as 60, which could impede pile driving or simply make it infeasible. Should this be the chosen remedial alternative, further intrusive investigation would be required to determine the practicability of sheet piling.

It is assumed that soils will be gravity dewatered in the lagoon prior to stabilization and that a water treatment system will not be required. The excavated soil would be stabilized on-site and would be subsequently placed back into the lagoon above the ground water table and above the additional two feet of clean fill that will be placed as a buffer.

Existing ground water elevation data indicate that the ground water elevation in the lagoon is approximately 13 feet below the existing floor of the lagoon in the vicinity of boring SB-5-05 (elevation 445 feet below mean sea level). Approximately 508 cy of soil within the saturated zone (twenty percent of the lagoon around boring SB5-05) would be removed and stabilized on-site. A delineation of the proposed area of excavation is provided in Figure 2.

The excavated area in the saturated zone would be backfilled with clean fill. As noted in Alternative Lagoon Soil-1, two feet of clean fill would be placed immediately above the water table to provide a buffer between the treated soil and the ground water table. The on-site stabilized soils would be placed back into the lagoon above the clean fill.

Following placement of the stabilized soils from the unsaturated and saturated zone in the lagoon, the surface of the stabilized soil will be approximately 13 to 14 feet below the surrounding grade. The remaining area of the lagoon would be backfilled to the existing grade with a mixture of clean fill, sediments from the tributary D-1-7 remediation and potentially with stabilized soils from the surface soil IRM, and graded to blend with the surrounding area.

Additionally, since low level PCBs would remain in place, an asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for continued leaching of fluoride or other site contaminants. The cap would serve to isolate the contaminants and would eliminate direct and indirect exposure to contaminated soils.

This alternative would also require an environmental easement to limit the use of all property to commercial or industrial use only.

Ground water monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact to the water quality. The ground water monitoring program would be implemented as part of the selected ground water remedial alternative. Cap maintenance would also be required.

4.3.3 Alternative Lagoon Soil-3 Unsaturated Zone Excavation &Disposal (Top 4-6 ft.), Unsaturated & Saturated Zone In-Situ Stabilization/Solidification, Asphalt Cap, Institutional Controls And Long-Term Monitoring

This alternative was developed as a remedial option to manage lagoon soils in the unsaturated zone and the saturated zone (below the water table) via in-situ technology. This alternative would eliminate the need for excavation, ex-situ stabilization and costly sheet piling that could be difficult to implement due to the site geology.

Lagoon soils would be excavated to a depth of 4 feet (approximately 1,450 cubic yards (cy)) below the floor of the lagoon which is approximately 19 to 20 feet below existing grade since the floor of the lagoon is approximately 15 to 16 feet below existing grade. Additionally, 20% of the floor around boring SB-1 would be excavated to 6 feet (approximately 145 cy) below the floor of the lagoon (approximately 21 to 22 feet below surrounding grade).

Approximately 72.5 cy (109 tons) of soil from 0-2' over ten percent of the lagoon floor around surface soil sample SS-80100 would be transported to a facility for incineration due to PCB concentrations above 1,000 mg/Kg. Approximately 36 cy (54 tons plus 2.7 tons for increase in weight related to the on-site stabilization) of soil from 0-1' over ten percent of the lagoon around surface soil sample SS-30100 with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal.

The total estimated volume of soils to be excavated for disposal and incineration is approximately 1,595 cy (2,393 tons) plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal. The area excavated for off-site disposal of soil and the area from the existing lagoon floor to existing grade would be backfilled with sediment excavated from the remediation of tributary D-1-7, clean fill and potentially stabilized soils from the surface soil remediation and graded to blend with the surrounding area.

Remaining soils in the unsaturated zone and approximately seven feet of soil below the groundwater table in the vicinity of boring SB-5-05 would be solidified in place. The deepest split spoon sample collected from boring SB-5-05 at approximately 3'-5' below the ground water table exhibited a TCLP cadmium concentration of 1.94 mg/L that was above the regulatory limit of 1 mg/L. Since the deepest soil sample exhibited TCLP cadmium concentrations above the regulatory limit, this alternative includes solidification of an additional two feet of soil into the saturated zone to a total depth of approximately seven feet into the saturated zone.

The required excavation depth for this alternative is well above the ground water table and dewatering or solidification would not be necessary. This alternative would not require sheet piling and would therefore avoid the potential problem associated with the sheet piling in Alternatives Lagoon Soil-1 and Lagoon Soil-2.

This alternative would remove a significant quantity of the lagoon soil with elevated cadmium, fluoride, lead and PCBs. However, because low level PCBs and elevated metals would be left in place, an asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for continued leaching of fluoride or other Site contaminants. While on-site and off-site ground water monitoring well data indicate that ground water quality has not been impacted, filling of lagoon with clean soil and placement of the cap would serve to isolate the contaminants and would eliminate direct and indirect exposure to contaminated soils.

An environmental easement would be implemented to limit the use of all property to commercial or industrial use only.

Ground water monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact to the water quality. The ground water monitoring program would be implemented as part of the selected ground water remedial alternative. Cap maintenance would also be required.

4.4 TRIBUTARY D-1-7 SEDIMENTS

Sediment remedial alternatives that have been retained for analysis include no action, two alternatives for the removal of soils from targeted areas and removal of all impacted sediments from the stream bed. The no action alternative for sediments was discussed in Section 4.1.4. A description of alternatives SED-1, SED-2 and SED-3 are provided in Section 4.3.1, 4.3.2 and 4.3.3, respectively.

4.4.1 Alternative SED-1 Targeted Sediment Remediation

This alternative would involve removal of all stream bed sediments between SED-9 and SED-14. Approximately 64% of sediment with lead concentrations above the SEL, 63% of sediment with cadmium concentrations above the LEL and all sediment where PCB concentrations exceed 1 mg/Kg would be removed. The stream bed would be excavated to a depth of 12 inches. The proposed sediment removal area is depicted on Figure 3. The total estimated area and volume that would be removed from Tributary D-1-7 is 61,242 square feet (sf) and 2,270 cy, respectively.

A cofferdam would be constructed upstream of the sediment removal area and the stream flow pumped or diverted around the excavation area. It is anticipated that sediments would be excavated using standard construction equipment (track hoes, backhoes, clamshells etc.) equipped with water tight buckets. Sediments would be transported using water tight trucks and placed in the lagoon as backfill above the stabilized soils.

The area where sediments were excavated would be backfilled to the pre-existing contours using clean run of bank gravel. The disturbed banks of the stream would be stabilized and riparian vegetation reestablished.

4.4.2 Alternative SED-2: Unrestricted Use Alternative: Removal of All Impacted Sediments

This alternative would remove all sediments where the sediment metal concentrations are above the LEL and where PCB concentrations are above 1 mg/Kg. Sediment would be removed to a depth of 12 inches. Figure 4 depicts the estimated areal extent of impacted sediments based on the existing sediment data. The extent of impacted sediment was estimated by splitting the distance between sediment locations that were below a criteria level and locations that were above the specified criteria level. Total estimated area and volume of sediments that would be removed from tributary D-1-7 under this alternative is 114,242 sf and 4,231cy, respectively.

A cofferdam would be constructed upstream of the sediment removal area and the stream flow pumped or diverted around the excavation area. It is anticipated that sediments would be excavated using standard construction equipment (track hoes, backhoes, clamshells etc.) equipped with water tight buckets. Sediments would be transported using water tight trucks and placed in the lagoon as backfill above the stabilized soils.

The area where sediments were excavated would be backfilled to the pre-existing contours using clean run of bank gravel. The disturbed banks of the stream would be stabilized and riparian vegetation reestablished.

4.4.3 Alternative SED-3 Selective Removal of Lead and PCB Impacted Sediments

This alternative would remove all sediment where PCB concentrations are above 1 mg/Kg and sediment where the highest lead concentrations were detected for a total of approximately 33% of the sediment with lead concentrations above the SEL and approximately 32% of the sediment with cadmium concentrations above the LEL. Sediment would be removed to a depth of 12 inches. Figure 5 depicts the estimated areal extent of impacted sediments based on the existing sediment data. The extent of sediment to be removed was estimated by splitting the distance between sediment locations that were below the lead SEL and the nearest sample that was above the SEL (SED-9/SED-2 and SED-10/SED-11). Total estimated area and volume of sediments that would be removed from tributary D-1-7 under this alternative is 21,957 sf and 813 cy, respectively.

A cofferdam would be constructed upstream of the sediment removal area and the stream flow pumped or diverted around the excavation area. It is anticipated that sediments would be excavated using standard construction equipment (track hoes, backhoes, clamshells etc.) equipped with water tight buckets. Sediments would be transported using water tight trucks and placed in the lagoon as backfill above the stabilized soils.
The area where sediments were excavated would be backfilled to the pre-existing contours using clean run of bank gravel. The disturbed banks of the stream would be stabilized and riparian vegetation reestablished.

4.5 SURFACE SOIL ALTERNATIVE

In April 2010, the Department approved a proposed amendment to the OU-1/OU-2 FS recommending a single alternative for the remediation of on-site and off-site surface soils. The surface soil alternative described below recommends ex-situ stabilization and placement of the soils in the lagoon instead of in-situ stabilization in the approved alternative.

The proposed areas of excavation for the surface soil remediation are depicted on Figure 6. The surface soil remediation would consist of excavation of the impacted surface soils and the sub-pavement soils, ex-situ stabilization and placement of the stabilized soils in the lagoon. The surface soil remediation would be conducted following both the lagoon stabilization and the placement of the sediment from the Tributary D-1-7 remediation into the lagoon.

Twelve inches of impacted on-site and off-site surface soils outside the pavement area would be excavated in the areas that exhibit lead concentrations above the Residential Soil Cleanup Objective (SCO) near/outside the facility property line and above the Commercial Use SCO within the property line. Based on an assumed one foot layer of impacted soil, there is an estimated 321cubic yards of surface soil near/outside the property line with concentrations above the Residential Soil lead SCO and approximately 598 cubic yards of surface soil above the Commercial Use SCO within the property line outside the sub-pavement surface soil remediation area. Upon completion of the excavation activities, the area will be backfilled with one foot of clean fill and the area seeded and mulched. Trees would be planted in areas where tree removal was necessary to implement the excavation.

The pavement in the proposed sub-pavement surface soil remediation area will either be stripped off the soil or milled. If stripped, and any excess soil adhered to the pavement would be removed and placed back onto the exposed soils. Once the pavement is removed from all areas, the pavement will be transported to an asphalt recycling facility for disposal or will be used as backfill in the lagoon. Twelve inches of soil beneath the pavement would be excavated, stabilized ex-situ via mixing with a stabilizing agent and placed into the lagoon following stabilization. Based on an assumed twelve inches of soil approximately 2,500 cubic yards of soil would be stabilized. The excavated area would be paved to cover the sub-surface soils. The asphalt pavement would require the installation of approximately 7,500 square yards of asphalt to completely cover the stabilized soils. The asphalt pavement would consist of a 7.5-inch structural sub-base layer, a 3-inch binder course and a 1.5-inch asphalt-wearing surface. If post excavation sampling indicated that sub-surface soil lead concentrations exceeded the lead Commercial Use SCO then orange construction fencing would be placed below the sub-base material to provide a visual demarcation between the cap material and the sub-surface soils.

Post excavation samples would be collected in the off-site soil area to confirm removal of soils with concentrations above the lead Residential Use SCO. If necessary additional soil would be removed until the Residential Use SCO is obtained.

Post excavation soil samples in the on-site soil area and the on-site sub-pavement soil area would be collected to determine if the soil lead concentration at the one foot depth are less than the Commercial Use SCO. If soil lead concentrations at the one foot depth were higher than the Commercial Use SCO an easement and soil management plan would be prepared for this area of the property.

Tri-sodium phosphate based compound (under the trade name Enviroblend, which also contains magnesium oxide) or an equivalent product would be used for treatment of the lead contaminated soil to minimize the volume increase related to stabilization. Stabilization with Enviroblend or equivalent would immobilize the lead by creating insoluble lead phosphate compounds that are not affected by freeze thaw cycles.

Bench and field treatability studies will be conducted to determine the optimal dosing rate. An average tri-sodium phosphate dosing rate of five percent has been assumed for calculating costs. Bench treatability tests would include testing of stabilized soil by the USEPA TCLP (Method 1311). The TCLP method is the regulatory method for determining if a waste is a characteristic hazardous waste based on toxicity pursuant to 40 CFF 261.24.

4.6 GROUNDWATER ALTERNATIVES

Ground water remedial alternatives that have been retained for analysis include no action, a ground water pump and treatment system, a point of entry treatment system, and long-term ground water monitoring. The no action ground water alternative was discussed in Section 4.1.2. A description of alternatives GW-1, GW-2 and GW-3 are provided in Section 4.4.1, 4.4.2 and 4.4.3, respectively. The potential location of ground water extraction wells associated with Alternative GW-1 and the proposed long-term ground water monitoring well locations (associated with all ground water alternatives) are depicted on the drawing provided in Appendix F. All long-term ground water monitoring alternatives would include collection of samples from the following location: MW-6, MW-7, MW-8, MW-9, MW-10, MW-12, MW-13, MW-14, MW-17, MW-17A and the Orange County rental property well.

4.6.1 Alternative GW-1: Ground Water Control and Treatment, Residential Ground Water Treatment System For Fluoride and Long-Term Ground Water Monitoring

This alternative would consist of a series of ground water extraction points, a ground water treatment system and discharge to Tributary D-1-7 after treatment. Ground water would be collected using a series of extraction wells and would be treated primarily for fluoride and if necessary, metals and PCBs.

Ground water would be collected downgradient of the lagoon using two ground water extraction wells. Ground water modeling and step rate pump tests would be conducted on the extraction wells to determine the ground water extraction rate and confirm that two extraction wells would be sufficient to control ground water movement from the lagoon. Activated alumina, precipitation and activated carbon would be used for treatment of ground water for fluoride, and if necessary, metals and PCBs, respectively. A treatment system pilot test would be conducted to determine estimated operational parameters.

A point of entry treatment system would be installed on the Orange County rental (former Swartwout residence) property if the well at the property was to be used as a potable water source. The treatment system would be for fluoride only since metals and PCBs have not been detected above drinking water standards in off-site ground water monitoring wells or the rental property well. The treatment system would include quarterly maintenance of the system. Quarterly monitoring of the potable well for fluoride, barium, cadmium, lead and PCBs would be conducted if the well was to be used as a potable water source.

A long-term ground water monitoring program for all on-site and off-site monitoring wells would be established. Monitoring wells would be sampled semi-annually and samples analyzed for fluoride, barium, cadmium, lead and PCBs.

4.6.2 Alternative GW-2: Residential Ground Water Treatment System For Fluoride And Long-Term Monitoring

This alternative would include long-term, semi-annual monitoring of ground water of the potable well at the Orange County rental property on Swartwout Road if the well was to be used as a potable water source and at the off-site and on-site ground water monitoring wells. All samples would be analyzed for PCBs, cadmium, barium, lead and fluoride.

This alternative would include the design of a point of entry treatment system for fluoride to be installed on the potable well at the Orange County rental property on Swartwout Road if the well was to be used as a potable water source. The treatment system would eliminate the exposure to fluoride concentrations in ground water above the NYSDOH drinking water standard. The system would remain in place until fluoride concentrations in the ground water are below the drinking water standard for eight consecutive quarterly monitoring events.

4.6.3 Alternative GW-3: Long-Term Monitoring

This alternative would consist of the long-term, semi-annual monitoring of the on-site and off-site ground water monitoring wells and the potable well at the Orange County rental property if the well was to be used as a potable water source. All samples would be analyzed for PCBs, cadmium, barium, lead and fluoride.

5.0 PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

The preliminary screening of alternatives is performed to potentially narrow the range of alternatives that will be carried forward for the detailed evaluation. Alternatives are screened on the basis of effectiveness (ability to meet medium-specific remedial action objectives, Implementability (both technical and administrative), and their short-term and long-term effectiveness, which are described below:

- Effectiveness: Each alternative is evaluated in terms of its protectiveness of human health and the environment through reduction in toxicity, mobility and volume. Short-term effectiveness refers to the benefits derived during or immediately after implementation and considers the increased risks resulting from implementation of an alternative. Long-term effectiveness refers to the performance of a remedial measure and the certainty that this performance will be maintained.

- Implementability: Each alternative is evaluated with respect to its technical and administrative Implementability. Technical Implementability relates to the feasibility of constructing the remedial measures, taking into account the availability of equipment and materials, experienced contractors and the overall difficulty of construction. Long-term technical Implementability considers the ability to reliably maintain and monitor the remedial system. Administrative Implementability refers to compliance with applicable rules, regulations, and statutes; the ability to obtain approvals; and the availability of treatment, storage, and disposal services and capacity.

The screening matrix for the remedial alternatives is presented in Table 7. All of the remedial alternatives are considered reasonably effective and implementable and are retained for detailed analysis.

6.0 DETAILED ANALYSIS OF ALTERNATIVES

This section describes the evaluation criteria for the detailed analysis of the alternatives retained after the preliminary screening of alternatives. Section 6.2, 6.3 and Section 6.4 present the detailed analysis of the soil, sediment and ground water remedial alternatives, respectively, and systematically and individually assess each alternative based on the evaluation criteria. The no action alternative is discussed in Section 6.1.

Evaluation Criteria

USEPA guidance on selection of remedial actions (USEPA, 1988 and 1989) presents seven criteria to be used for evaluating remedial alternatives that have passed the preliminary screening process. New York State does not have ARARs in its statute and evaluates alternatives following the criteria in Title 6 NYCRR Part 375, which replaces ARARs with the equivalent SCGs. These criteria are as follows:

- Overall protection of human health and the environment;
- Compliance with SCGs;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility or volume through treatment;
- Short-term effectiveness;
- Implementability;
- Costs (capital, annual operation and maintenance, present worth);
- Land Use; and
- Community acceptance.

The first two criteria are threshold factors; the next seven criteria are primary balancing factors. These criteria are evaluated in the detailed analysis. Descriptions of the criteria are provided below.

Overall Protection of Human Health and the Environment

This evaluation criterion is designed to determine whether a proposed remedial alternative is adequate with respect to protection of human health and the environment. The evaluation focuses on how each proposed alternative achieves protection over time, how site risks are eliminated, reduced, or controlled, and whether any unacceptable short-term impacts would result from implementation of the alternative. The overall protection of human health and the environment evaluation draws on the assessments for long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Compliance With ARARs/SCGs

This evaluation criterion is used to assess compliance with chemical-specific, action-specific, and location-specific ARARs/SCGs, and with other potential guidance, criteria, and advisories. ARARs/SCGs for the site are discussed in Section 2.0. Proposed remedial alternatives are analyzed to assess whether they achieve ARARs/SCGs under Federal and State environmental laws, public health laws, and State facility siting laws.

Long-term Effectiveness and Permanence

This criterion addresses the long-term effectiveness and permanence of the remedial alternative with respect to the quantity of residual chemicals remaining at a site after response goals have been met. The principal focus of this analysis is the adequacy and reliability of controls necessary to manage any untreated media and treatment residuals. Characteristics of the residual chemicals such as volume, toxicity, mobility, degree to which they remain hazardous and permanence of each remedial alternative must also be examined. Specifically, these considerations are:

- Magnitude of residual risk;
- Adequacy of controls;
- Reliability of controls; and,
- Permanence.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion assesses the degree to which the remedial alternative utilizes recycling and/or treatment technologies that permanently decrease toxicity, mobility, or volume of the chemicals as their primary element. It also assesses the effectiveness of the treatment in addressing the predominant health and environmental threats presented by the site. The specific factors considered under this evaluation criterion include:

- Treatment process the remedy would employ and the materials it would treat;
- Quantity of contaminants that would be treated or destroyed;
- Degree of expected reduction in toxicity, mobility, or volume (expressed as a percentage of reduction or order of magnitude);
- Degree to which the treatment will be irreversible;
- Type and quantity of treatment residuals that would remain following treatment accounting for persistence, toxicity, mobility; and
- Whether the alternative would satisfy the statutory preference for treatment as a primary element.

Short-Term Effectiveness

This evaluation criterion is used to assess short-term potential impacts associated with the construction and implementation phase of remediation. Alternatives are evaluated with regard to their effects on human health and the environment. These considerations include:

- Protection of the community during implementation of the proposed remedial action (i.e., dust, inhalation of volatile gases);
- Protection of workers during implementation;
- Environmental impacts that may result from the implementation of the remedial alternative and the reliability of mitigative measures to prevent or reduce these impacts; and;
- Times until remedial response objectives are met, including the estimated time required to achieve protection.

Implementability

This criterion assesses the technical and administrative feasibility of implementing a remedial alternative and the availability of various services and materials that would be required during its implementation. Factors considered include the following:

- Technical feasibility: includes the difficulties and unknowns relating to construction and operation of a technology, the reliability of the technology (including problems resulting in schedule delays), the ease of performing additional remedial actions, and the ability to monitor the effectiveness of the remedy.
- Administrative feasibility: involves coordinating with governmental agencies to obtain necessary permits or approvals.

- Availability of services and materials: includes sufficiency of off-site treatment, storage and disposal capacity; access to necessary equipment, specialists and additional resources; potential for obtaining competitive bids especially for new and innovative technologies, and availability of state-of-the-art technologies.

Costs

This criterion assesses the costs associated with a remedial action. It can be divided into capital costs, direct costs or expenses, annual operation and maintenance (O&M) costs, and net present worth costs.

Capital costs include:

- Construction and equipment costs: materials, labor, and equipment required to install/perform a remedial action that result in a physical asset;

- Land and site-development costs: land purchase and associated expenses, site preparation of existing property; and

- Building and service costs: process and non-process buildings, utility connections, and purchased services.

Direct costs/Expenses include:

- Engineering expenses: administration, design, construction, supervision, drafting, and treatability testing;

- Legal fees and license or permit costs: administrative and technical costs expended to obtain licenses and permits for installation and operation;

- Startup costs incurred during initiation of remedial action;

- Contingency allowances: costs resulting from unpredicted circumstances (i.e., adverse weather, strikes, etc.); and

- Disposal costs: transporting and disposing of materials.

- Annual O&M costs are post-construction costs expended to maintain and ensure the effectiveness of a remedial action. The following annual O&M costs are evaluated:

Labor costs: wages, salaries, training, overhead, and fringe benefits for operational labor;
Maintenance materials and maintenance labor costs: labor and parts, etc. necessary for routine maintenance of facilities and equipment;

Auxiliary materials and utilities: chemicals and electricity needed for treatment plant operations, water and sewer services;

Disposal of residue: disposal or treatment and disposal of residues such as sludge from treatment processes;

Purchased services: sampling costs, laboratory fees, and professional fees as necessary;

Administrative costs: costs associated with the administration of O&M that have not already been accounted for elsewhere;

Insurance, taxes, and licensing costs: liability and sudden and accidental insurance, real estate taxes on purchased land or rights-of-way, licensing fees for certain technologies, permit renewal and reporting costs;

Replacement costs: maintenance of equipment or structures that wear out over time; and cost of periodic site reviews if a remedial action leaves residual contamination.

Net present worth consists of capital and O&M costs calculated over the lifetime of the remedial action and expressed in present day value. The lifetime of the remedial alternative varies depending on the alternative. Cost backup documentation is presented in Appendix A.

Land Use

This criterion is an evaluation of the current, intended and reasonably anticipated future use of the site and its surroundings, as it relates to an alternative or remedy, when unrestricted levels would not be achieved. A final use determination for the site must be made to complete the remedy selection process.

The evaluation must consider the following land use factors:

- Current use and historical and/or recent development patterns:

(1) Understanding the current and reasonably anticipated future land use is a critical element in this determination; and

(2) The current use of the site, if it is presently being fully used is the best guide for future use;

- Consistency of proposed use with applicable zoning laws and maps.

- Brownfield opportunity areas.

  There are no brownfield opportunities associated with the site or surrounding area and therefore this factor is not considered.

- Consistency of proposed use with applicable comprehensive community master plans, local waterfront revitalization plans as provided for in article 42 of the executive law or any other applicable land-use plan formally adopted by a municipality.

  The most reasonable potential future use of the site under all potential alternatives is commercial or light industrial, which is consistent with the Town of Deerpark master plan

- Proximity to real property currently used for residential use and to urban, commercial, industrial, agricultural and recreational areas.

- Any written and oral comments submitted by members of the public on the proposed use as part of citizen participation activities.

- Environmental justice concerns, which for purposes of this evaluation, include the extent to which the proposed use may reasonably be expected to cause or increase a disproportionate burden on the community in which the site is located, including low-income minority communities, or to result in a disproportionate concentration of commercial or industrial uses in what has historically been a mixed use or residential community.

  This factor is not a concern with this site.

- Federal or state land-use designations relating to the property.

  There are no federal land use designations related to the property and state land use designations would be restricted to an environmental easement for alternatives other than unrestricted use.

- Whether the population growth patterns and projections support the proposed use.

- Accessibility to existing infrastructure.

- Proximity of the site to important cultural resources, including federal or state historic or heritage sites or Native American religious sites.

There are no significant cultural resources located in proximity of the site.

- Natural resources, including proximity of the site to important federal, state or local natural resources, including waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species.

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- Potential vulnerability of groundwater to contamination that might migrate from the site, including proximity to wellhead protection and groundwater recharge areas and other areas identified by the state comprehensive groundwater remediation and protection program.

- Proximity to floodplains.

- Geography and geology.

- Current institutional controls applicable to the site.

  There are no current institutional controls applicable to the site.

The site is currently an inactive industrial facility and the Town of Deerpark land use map classifies the property use as industrial. The land uses adjacent to the facility as defined by the Town of Deerpark land use map are summarized below:

- North: Residential.
- East: Residential, however, this area is currently in agricultural production, primarily corn livestock feed.
- Northeast: Agricultural.
- Southeast: Park land.
- South: Community Service (Town of Deer Park Town Hall).
- West: Community Service (Emergency Services) and residential.

The site is located within the Town of Deerpark "Hamlet-Mixed Use" (HM-U) zoning district. This district is intended to provide areas for moderate to high density residential development and compatible commercial and industrial uses. Light industrial and commercial uses are permitted in HM-U districts as special uses. The reasonably anticipated least restrictive use of the site would be commercial. The reasonably anticipated least restrictive land use adjacent to the site would be residential.

Community Acceptance

This criterion is evaluated after the public review of the remedy selection process as part of the final NYSDEC selection/approval of a remedy for a site.

1. Any public comment relative to these criteria will be considered by NYSDEC after the close of the public comment period

2. Documentation of the public comments received will be consistent with the site citizen participation and in accordance with applicable DEC policy.

Since the community acceptance criteria is evaluated after the close of the public comment period on the proposed remedy, no further discussion of this evaluation criteria will be included in the analysis of alternatives.

6.1 ALTERNATIVE 1: NO ACTION

6.1.1 Description

This alternative assumes no action would be taken to control, monitor or remediate the site. The contaminated soil in the lagoon would remain in place, treatment of constituent concentrations would not be implemented, no ground water monitoring would be conducted, no treatment of the potable well at the Orange County rental unit on Swartwout road would be conducted and sediments in tributary D-1-7 would be left in place.

Under this alternative, lagoon soil containing cadmium and lead concentrations above TCLP regulatory limits and PCBs above the New York State SCO would remain in place. It is anticipated that cadmium, lead and PCBs would remain immobile to the extent they are now as indicated by the ground water data obtained from ground water samples collected from downgradient monitoring wells.

The potable well at the Orange County rental house on Swartwout Road is the only off-site residential potable well directly down gradient of the site. Laboratory analysis of samples collected from the well indicates site related metals and PCBs were not detected at or above the laboratory reporting limit. In one sample fluoride was detected at a concentration below the USEPA drinking water standard but above the NYSDOH drinking water standard. Fluoride concentrations in two subsequent samples were below both the USEPA drinking water standard and the NYSDOH drinking water standard.

With the exception of fluoride, site contaminants have not significantly impacted off-site ground water quality. Supporting data from the downgradient ground water monitoring wells has been collected and is presented in the OU-2 Remedial Investigation Report (RI).

Lead concentrations in sediments in tributary D-1-7 would remain above the SEL. A localized impact on stream aquatic life is a potential possibility related to the elevated sediment lead concentrations.

6.1.2 Evaluation of No Action Alternative For Lagoon Soils, Ground Water and Tributary D-1-7 Sediments

Overall Protection of Human Health and the Environment

Although it is anticipated that contaminant constituents in lagoon soils would remain immobile to the extent they are now as indicated by ground water data from off-site downgradient monitoring wells, there would be no long-term mechanism to monitor the extent of the mobility or the attenuation of the contamination. Fluoride could continue to leach via precipitation from lagoon soils to ground water.

The no action alternative would maintain the current conditions in the Tributary D-1-7 stream sediments. Although cadmium, lead and PCB concentrations would remain above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) SCGs, there would be no disturbance of stream ecology that would be associated with any stream sediment remedial action.

Compliance with ARARs/SCGs

Under this alternative the ground water standards for fluoride would not be met. Downgradient monitoring well data indicate that fluoride is the only compound consistently detected in the downgradient monitoring wells at concentrations above the NYSDEC ground standards. PCBs, cadmium, lead and barium in lagoon soils would remain above NYSDEC SCOs and PCBs, cadmium and lead in Tributary D-1-7 sediments would continue to exceed the NYSDEC "Technical Guidance for Screening Contaminated Sediments" SCGs.

Long-Term Effectiveness and Permanence

Since no controls are implemented under this alternative, assessment of the adequacy or reliability of these controls does not apply. This alternative does not provide protection of human and environmental receptors from on-site residuals.

Reduction of Toxicity, Mobility, or Volume through Treatment

No reduction of toxicity, mobility, or volume would occur under this alternative. However, monitoring of the downgradient wells has indicated that with the exception of fluoride, ground water quality has not been significantly impacted.

Short Term Effectiveness

Since no construction activities are proposed for the No Action Alternative, no short-term risks to the community or the environment would occur.

Implementability

No remedial activities are proposed for this alternative and therefore, Implementability does not apply.

Land Use

The site is currently zoned by the Town of Deerpark as HM-U, Hamlet Mixed-Use District. This district is intended to provide areas for moderate to high density residential development and compatible commercial and industrial uses. The site is currently an inactive industrial facility and is compatible with current Town of Deerpark zoning.

The most reasonable future use of the site is commercial or light industrial. Currently the site does not meet the commercial or industrial use NYS Part 375 soil cleanup objectives and is therefore not compliant with the Town of Deer Park zoning regulations.

The lead concentration in four off-site soil samples collected south east of the site exceeded the NYS part 375 Residential Use/Restricted Residential Use SCO. The land use on this property is park land protected by a conservation easement and exceedence of the Restricted Residential Use SCO could be considered incompatible with the intended land use and the Town of Deer Park zoning.

Cost

There are no costs associated with this alternative.

6.2 ALTERNATIVE 2: UNRESTRICTED USE

6.2.1 Description

This alternative would excavate for off-site disposal all soil with barium, lead, cadmium and PCB concentrations above the NYSDEC 6NYCRR Part 375 Unrestricted Use soil cleanup objectives (SCOs).

As discussed in Section 4.2.1 the unrestricted use alternative for the lagoon soils would involve excavation and off-site disposal of all soils to a depth of twenty-seven feet below the floor of the lagoon. This would require extensive sheet piling, which could be infeasible due to the presence of cobbles in the sub-surface soil.

The unrestricted use remedial alternative for on-site and off-site surface soils would excavate twelve inches of soil in the areas that exhibit lead concentrations above the Unrestricted Use Soil Cleanup Objective (SCO) near and outside the facility property line and excavate twelve inches of soil (below the pavement in paved areas) with concentrations above the Unrestricted Use SCO within the property line. The drawing in Appendix G depicts the proposed unrestricted use remediation area. Based on an assumed one foot layer of impacted soil, there is an estimated 10,527cubic yards of soil that would be transported off-site for disposal at a NYS Part 373/RCRA Subtitle C approved landfill.

This alternative would remove all sediments with concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) LEL metal concentrations and the human health bioaccumulation criteria cleanup level for PCBs. This alternative is described in Section 4.4.3 Alternative SED-2.

Ground water would be collected downgradient of the lagoon using two ground water extraction wells. Ground water modeling and step rate pump tests would be conducted on the extraction wells to determine the ground water extraction rate and confirm that two extraction wells would be sufficient to control ground water movement from the lagoon. Activated alumina, precipitation and activated carbon would be used for treatment of ground water for fluoride, and if necessary, metals and PCBs, respectively. A treatment system pilot test would be conducted to determine estimated operational parameters. Treatment would continue until concentrations were below the New York State Part 703 ground water standards and the New York State drinking water standards. This alternative is described in Section 4.6.1 Alternative GW-1.

6.2.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would provide a high level of protection to human health and the environment. All soil with constituent concentrations above the NYS Unrestricted Use SCOs would be completely removed from the site.

Compliance with ARARs/SCGs

This alternative would be compliant with NYS and Federal ARARs and SCGs. All lagoon and on-site and off-site surface soils with concentrations above the Part 375 Unrestricted Use SCOs would be removed from the site. Tributary D-1-7 sediments with concentrations above the NYS metal LELs and the PCB human health bioaccumulation criteria would be removed from stream. Ground water would be captured and treated until fluoride concentrations were below the NYS ground water standards and the NYSDOH drinking water standards

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is extremely low. Lagoon soils, surface soils and tributary D-1-7 sediments would be removed to a permitted landfill. Treated ground water would be discharged to tributary D-1-7 and ground water treatment media would be removed to a permitted landfill.

Permanence: Off-site disposal of lagoon soils, surface soils and tributary D-1-7 soil at an off-site TSCA/RCRA approved facility represents a permanent remedy for this material.

Adequacy and reliability of controls: It is reasonable to assume that a permitted TSCA/RCRA facility would provide an adequate and reliable control for the soils, sediments and ground water treatment media disposed of at an off-site location.

Reduction of Toxicity, Mobility and Volume Through Treatment

Mobility would be reduced by placing the soil, sediment and ground water treatment media in a permitted landfill. Placement in a permitted landfill would not reduce toxicity, however without a potential exposure path, toxicity to humans or the environment is not a concern.

Short-Term Effectiveness

During soil and sediment removal fugitive dust should not be an issue but would be controlled using engineering measures if dust became a concern. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

The impact to the community would be minimal since residences are scarce. Traffic increases due to transportation of soil would have minimal impact on the community, as this is a one-time occurrence with an approximate duration of approximately 12 weeks.

The sediment excavation would have a significant impact on aquatic life within the excavation zone. All invertebrate aquatic life and vegetation within the sediment removal area would be eliminated until natural recolonization of the backfilled excavation occurred. Approximately 1,132 linear feet of streambed and stream bank would be impacted. All stream bank vegetation that prevents stream bank erosion would be eliminated until vegetation planted as part of the restoration measures becomes established. Over story vegetation that provides shading of the stream and thermal protection of stream temperatures would be eliminated. Reestablishment of over story vegetation to an extent that would approach pre-remediation conditions would take several years.

The dwarf wedge mussel (Alasmindonta heterodon) a Federal and New York State endangered species is known to occur in the Neversink River in Orange County. Tributary D-1-7 discharges to the Neversink River and the aquatic habitat of Tributary D-1-7 is consistent with the aquatic habitats preferred by the dwarf wedge mussel. Excavation of 1,132 linear feet of streambed would impact potential dwarf wedge mussel habitat and potentially individual dwarf wedge mussels. Due to the dense streambed vegetation and the silty composition of the stream bed, finding and relocating any dwarf wedge mussels that are potentially present within the proposed 1,132 linear feet of stream bed that would be excavated during implementation of alternative SED-1 is not practicable.

There would be a temporary impact on the movement of aquatic life within tributary D-1-7 during excavation activity.

Implementability

Ability to Construct and Operate:

As discussed in Section 6.3.1.2, excavation of lagoon soil would require an extensive sheet piling system and installation of sheet piling may not be possible considering the physical characteristics of the sub-surface soils. Excavation and removal of the surface soils would utilize common construction equipment. All components of alternative SED-1 utilize relatively common construction equipment and materials. Cofferdams, sediment excavation using water tight buckets utilize routine construction procedures. As discussed in Section 6.5.1.2, the ground water pump and treat system could be implemented provided the pumping rates necessary to capture the ground water fluoride plume is less than 50 gpm. The required time necessary to operate and maintain the ground water treatment system is unknown and is dependent on several factors including but not limited to sub-surface hydrogeological conditions. It may not be possible to lower the ground water concentration of fluoride to less than the NYS ground water standard (1.5 mg/L). Ground water concentration could potentially decrease to a concentration where they reach an equilibrium that is higher than the ground water standard.

Reliability: All aspects of this alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies.

Availability of Materials and Services: All equipment and materials are available and have been demonstrated sufficiently for the purpose for which they are intended. It is anticipated, once the contractor is mobilized to the site, that lagoon and surface soil excavation could be completed in 13 weeks and that sediment excavation and backfilling activities would be completed within a 6 week time frame.

Land Use

This alternative would be consistent with the Town of Deerpark zoning and master plan and the current and reasonable future land use for the site and the adjacent properties.

Cost

The costs associated with the unrestricted alternative have been estimated as shown on Table 14 (Ground Water), Table 18 (Lagoon Soil), Table 19 (Sediment) and Table 20 (Surface Soil). A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are

- Lagoon Soil Unrestricted Use: $7,729,980
- Surface Soil Unrestricted Use: $7,251,748
- Sediment Unrestricted Use: $3,750,739
- Ground water Unrestricted Use (GW-1): $5,073,632
- TOTAL: $23,806,099

The unrestricted use alternative costs are the highest of any alternative without providing any appreciable protection for human health and the environment than other less intrusive and less costly alternatives. The actual long-term cost associated with the ground water pump and treat system is unknown since the time required to reduce the ground water fluoride concentration below the ground water standard cannot be ascertained.

6.3 LAGOON UNSATURATED AND SATURATED ZONE SOIL ALTERNATIVES

6.3.1 Soil Alternative Lagoon Soil-1: Unsaturated Zone Excavation (Top 6-8 ft.), Disposal & Stabilization, Asphalt Cap, Institutional Controls And Long-Term Monitoring

6.3.1.1 Description

Lagoon soils would be excavated to a depth of 6 feet (approximately 2,177 cy) and twenty percent of the floor in the vicinity of Test Pit 4 would be excavated to 8 feet (approximately 145 cy). This would yield approximately 2,322 cy or 3,483 tons of soil.

Approximately 72.5 cy (109 tons) would be transported to a facility for incineration due to PCB concentrations above 1,000 mg/Kg. Approximately 36 cy (54 tons) of soil with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal. The total estimated volume of soils to be excavated for disposal is approximately 2,322 cy (2,392.5 tons) plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal.

The remaining impacted soil would be excavated to a depth of approximately 13 feet (28 to 29 feet below existing grade) or ground water, whichever is encountered first, and would be stabilized with tri-sodium phosphate to reduce the mobility of barium, cadmium and lead. The excavated soil would be stabilized on-site and would be subsequently placed back into the lagoon. It is estimated that approximately 2,393 cy (3,590 tons) will be excavated and stabilized. Two feet of clean fill would be placed at the bottom of the excavation to provide a buffer between the treated soil and the ground water table. This alternative would also require the installation of 11,550 sf sheet piling to stabilize the adjacent building foundation and the excavation.

PCB concentrations are generally below 25 ppm, with an average of less than 10 ppm and would be suitable for placement back into the lagoon. With the exception of 2 samples out of 15 (samples below 6 feet in depth) all concentrations were less than 25 ppm. Sample SB-1 (11.5’ to 12’) exhibited a concentration of 26 ppm and sample SB-4 (11.5’-12’) exhibited a concentration of 31 ppm.

This alternative would require the installation of an extensive sheet piling system that would include 11,550 sf of sheet piling to stabilize the adjacent building foundation and the excavation. Sheet piling would be used to encapsulate the entire lagoon area and would utilize a poured concrete ring method for bracing. This bracing method would be used in lieu of conventional bracing due to the close proximity to the existing building and because of the nature of the excavation. Sheet piling could prove to be extremely difficult to install and problematic due to the nature of the soil, as described in Section 6.3.1.2.

This alternative would remove a significant mass of the fluoride in the unsaturated zone soils from the lagoon. Approximately 55% (334 lbs.) of the fluoride in the lagoon would be removed.

A trisodium phosphate mixture (under the trade name Enviroblend, which also contains magnesium oxide) would be used for treatment of cadmium and lead contaminated soil. Tri-sodium phosphate, utilized as a stabilizing agent, would immobilize the cadmium and lead by creating insoluble metal (cadmium/lead) phosphate compounds.

Bench and field treatability studies will be conducted to determine the optimal dosing rate for the tri-sodium phosphate, the cost effectiveness of each mixture and the effectiveness of each mixture in reducing the leach ability of cadmium and lead in the lagoon soils. An average dosing rate of five percent has been assumed for calculating costs. Bench treatability tests would include testing of stabilized soil by both the USEPA TCLP (Method 1311). The TCLP method is the regulatory method for determining if a waste is a characteristic hazardous waste based on toxicity pursuant to 40 CFR 261.24.

The area of the lagoon excavated for off-site disposal of soils and the area from the existing lagoon floor to the existing grade (elevation 471 feet to 474 feet) would be backfilled with a mixture of stabilized soil, clean fill, sediments from any tributary D-1-7 excavation and potentially stabilized soil from the surface soil IRM, and then graded to blend with the surrounding areas

Although the metal compounds in the treated soil placed back into the lagoon would be assumed insoluble and immobile, an asphalt cap would be installed over the remaining soils to further minimize exposure. The cap would prevent infiltration of precipitation, which would significantly reduce the leaching of fluoride and other site contaminants from the lagoon soils. The cap would require the installation of approximately 3,115 square yards of geomembrane and asphalt to completely cover the lagoon area. The asphalt cap would consist of a 12-inch structural sub-base layer, a 3-inch binder course and a 1.5-inch asphalt-wearing surface.

Institutional controls would be implemented to address future exposure to lagoon soil. The institutional controls would consist of an environmental easement to limit the use of all property to commercial or industrial use. Institutional controls would also include a provision that the existing fence around the plant be maintained to restrict access to the site. A provision to restrict all activities that could impact the integrity of the asphalt cap would be included in property easement. The final design document would contain the specifics of the institutional controls including a legal description of the property where the institutional controls will be implemented, the specific language of the environmental easements and the process for enforcement of the institutional controls against future transferees and successors.

Ground water monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on ground water quality. The ground water monitoring program would be implemented as part of the selected ground water remedial alternative

6.3.1.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would provide a high level of protection to human health and the environment. The upper strata of unsaturated zone soil containing high constituent concentrations would be completely removed from the site.

Metals in the upper unsaturated zone strata would be stabilized and remain in the lagoon as an insoluble compound. Installation of an asphalt cap would further reduce the potential for exposure to lagoon soils. The cap would provide an effective infiltration barrier, would eliminate the potential for erosion and transport of contaminated soil and would minimize the further leaching of fluoride. Stabilization of metals in the soil, combined with a protective cap, would prevent uptake of constituents in vegetation thereby reducing risks to higher order receptors in the food chain, and provide a high level of protection of human health and the environment.

This alternative would not address cadmium and lead concentrations above the respective NYSDEC Part 375 SCOs and cadmium above the TCLP regulatory limit in the saturated zone. However, on-site and off-site ground water monitoring well data indicate that ground water quality has not been impacted with respect to lead and cadmium. Cadmium was detected in only one downgradient sample (MW-7 July 2001) at a concentration above the ground water standard.

The July 2001, MW-7 ground water cadmium concentration of 5.6 ug/L is slightly higher than the NYSDEC ground water standard of 5 ug/L. This sample was collected using a Waterra Inertia pump and the sample exhibited a high turbidity (619 NTUs) indicating a significant sample sediment load and the reported result is not considered representative of the actual ground water cadmium concentration. Sediment present in a sample will have metal ions both sorbed to its surface and as an integral component of the sediment itself. When sediment-laden samples are preserved with acid in the field (per standard protocol), and especially when samples are prepared in the laboratory via hot acid digestion (also per standard protocol), metals will be desorbed from the sediment matrix, resulting in reported ground water metals concentrations that are higher than is actually dissolved in the ground water.

A second sample was collected from monitoring well MW-7 in July 2001 and exhibited a cadmium concentration of 0.47 ug/L which is well below the ground water standard. This sample was collected using the micro purging technique, which minimizes the sediment load in a sample and is considered more representative of the actual concentration of cadmium in the ground water sample that could migrate via ground water flow.

Compliance with ARARs/SCGs

The NYSDEC Part 375 regulations provide a SCO for PCBs of 1 ppm for commercial use. The USEPA TSCA regulations for PCB disposal (40 CFR 761.61) state that bulk PCB remediation wastes may stay at a site at concentrations greater than 25 ppm and less than or equal to 100 ppm provided that a cap is placed over the site and the cap conforms to the requirements of 40CFR 761.61(a)(7) and (a)(8).

The barium, cadmium and lead Part 375 Commercial SCOs are 400, 9.3 and 1,000 mg/Kg respectively, and the Protection of Ground Water SCOs are 820, 7.5 and 450 mg/Kg respectively. The Part 375 regulations require that where the Protection of Ground Water SCO is more stringent than the future use (Commercial, Industrial etc.) SCO, that the Protection of Ground Water SCO be applied where there exists a potential for an impact on ground water.

Removal of the top six to eight feet of lagoon soil would reduce PCB concentrations to a maximum concentration of 31 ppm (actual concentration before dry weight calculation is 23.7 ppm), which would meet the Federal TSCA PCB disposal regulations. Unsaturated zone soils with barium, cadmium and lead concentrations above the NYSDEC Part 375 SCOs would be stabilized with tri-sodium phosphate into insoluble metal compounds. This alternative does not address soils in the saturated zone with cadmium above the TCLP regulatory limit.

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is extremely low. Most of the contaminants would be removed to a permitted landfill. Metals remaining in the lagoon soils would be immobilized through stabilization. Stabilization is a well-documented treatment procedure for metal compounds and has been extensively used for treatment of hazardous wastes. The stabilized soils would be contained and isolated in place below a cap. The cap would significantly eliminate precipitation infiltration and minimize the leaching of fluoride or PCBs from the lagoon soils. The exposure to potential future receptors due to direct dermal contact or incidental ingestion of contaminated soils will be effectively mitigated based upon filling the lagoon with approximately 19 feet of clean fill and the presence of a cap. Migration of residual metal constituents below the cap would be negligible since contaminants would be immobilized through on-site stabilization and infiltration of precipitation would be prevented by the asphalt cap and drainage controls. Cap demarcation and environmental easements would be required to protect the integrity of the asphalt cap. Appropriate land use restrictions would be implemented to assure that the cap is not breached.

Adequacy and reliability of controls: The combination of stabilizing the contaminated soils and installing an asphalt cap would achieve the performance requirement of immobilizing contaminants and preventing direct contact by future potential receptors. Stabilization of metals in soils and hazardous wastes is a proven technology. Implementation of and compliance with land use restrictions and long-term maintenance obligations would aid in preserving cap integrity and limiting exposure. Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity. It is reasonable to assume that a permitted TSCA/RCRA facility would provide an adequate and reliable control for the soils disposed of at an off-site location.

Permanence: Off-site disposal of approximately 2,322 cy of soil at an off-site TSCA/RCRA approved facility represents a permanent remedy for this material. The stabilization of the remaining lagoon soils (above the ground water table) with respect to metals represents a permanent remedy. The stabilization of the metals in the soils with phosphate based compounds creates insoluble metal compounds. This reaction represents a permanent remedy. The bench scale and field scale treatability tests that would be conducted during the remedial design phase would provide data to maximize the effectiveness of the stabilization. The stabilization of the soils and placement of these soils above the ground water table would provide a permanent long-term remedy.

Reduction of Toxicity, Mobility and Volume Through Treatment

Complete removal and off-site disposal of the upper six to eight feet of lagoon soil would effectively reduce contaminant mobility. This is achieved by encapsulation of the removed soils within an approved TSCA/RCRA controlled landfill environment. The constituents in the lower six to eight foot strata in the unsaturated zone would be immobilized by transforming the metals into insoluble metal compounds. The formation of the metal compounds is an irreversible reaction. Therefore, the stabilization of the soils that will remain on-site is considered permanent and irreversible.

Placement of the soils in a controlled landfill environment and stabilization to eliminate leaching will not directly reduce the potential toxicity of the soils. However, since these remedies eliminate exposure, toxicity is not a concern.

Short-Term Effectiveness

During stabilization and excavation activities, fugitive dust would be controlled using engineering measures. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

Workers involved with the soil process could be exposed to the risks associated with dermal contact with contaminated soil and chemicals and inhalation of dust particulate Risks would be mitigated by properly outfitting workers with appropriate personal protection equipment, following proper industrial hygiene procedures, using controlled excavations, and monitoring air quality during soil excavation and mixing activities. All work-associated safety practices would be outlined in a Health and Safety Plan, including a description of the control measures that would be implemented at the site.

The impact to the community and the environment would be minimal since residences are scarce in the surrounding area and controls would be implemented to minimize fugitive dust. Traffic increases due to transportation of soil would have minimal impact on the community, as this is a one-time occurrence with an approximate duration of 12 weeks.

Installation of the asphalt cap would provide no immediate risks to workers, the community or the environment.

Implementability

Ability to Construct and Operate: It is expected that Alternative Lagoon Soil-1 would be difficult to implement and would require experienced contractors who specialize in sheet piling and deep excavation. This alternative would require the installation of an extensive sheet piling system to stabilize the adjacent building foundation and the excavation. It would be necessary to install the sheet piling to approximately 26 feet below the floor of the lagoon (41 to 42 feet below the surrounding grade) with six feet of stick up above the floor of the lagoon. Sheet piling will be extremely difficult to install and problematic due to the nature of the soil. Soils that exhibit blow counts greater than 20 can slow or impede installation of sheet piling. Soil boring logs for SB-1-05 through SB-3-05, SB-5-05, SB-7-05 and SB-8-05 advanced in the floor of the lagoon and SB-4-05 and SB-6-05 advanced just outside the lagoon during the OU-2 Remedial Investigation (RI) exhibited blow counts as high as 60, which could impede pile driving or simply make it infeasible. Should this be the chosen remedial alternative, further intrusive investigation would be recommended to determine the practicability of sheet piling.

Although sheet piling is a proven technology in the construction industry, the site specific soils and the deep excavation could be problematic. Soils boring logs indicate high blow counts which could impede pile driving or simply make it impossible.

For the most part, construction methods would utilize relatively common construction equipment and materials. Crane operation could be necessary to lift heavy equipment in and out of the lagoon as excavation progresses. Use of a crane could also be necessary for operation of a clamshell bucket to remove contaminated soils. Soil stabilization would use relatively common soil handling equipment. Geotechnical analysis would be necessary to determine if pile driving is feasible and for the design the sheet pile system to ensure the stability of the excavation.

The contractor would be required to demonstrate experience in sheet piling, deep excavation and soil stabilization. Furthermore, the contractor would be required to determine dosage rates based on available field data and to perform a field demonstration utilizing full-scale equipment, followed by post- treatment testing. The asphalt cap could be installed with little or no difficulty.

The contractor would be required to demonstrate experience in the field of soil stabilization. Furthermore, the contractor would be required to determine dosage rates based on available field data and to perform a field demonstration utilizing full-scale equipment, followed by post- treatment testing. The asphalt cap could be installed with little or no difficulty.

Reliability: All aspects of this alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies. All components of alternative Lagoon Soil-1 utilize common construction materials and procedures, and routine sampling procedures and analyses. However, as previously discussed, installation of the sheet piling is a potential concern due to subsurface conditions. Installation of the asphalt cap would provide added reliability, provided long-term maintenance activities and environmental easements are implemented.

Availability of Materials and Services: This alternative would require a specialty contractor with experience specific to sheet piling and deep excavation. The contractor should also have experience with chemical stabilization, since the contractor would be responsible for determining dosage rates and demonstrating successful field techniques. There are contractors available who are capable of demonstrating their ability to successfully complete the work.

All equipment and materials are available locally and have been demonstrated sufficiently for the purpose for which they are intended. One TSCA/RCRA regulated facility has been identified as potentially capable of receiving such waste. It is anticipated, once the contractor is mobilized to the site, that pile driving, excavation, stabilization, confirmatory sampling, transportation, backfilling activities and installation of the asphalt cap would be completed within a 12 week time frame.

Land Use

This alternative would be consistent with the Town of Deerpark zoning and master plan and the current and reasonable future land use for the site. The alternative would not have any impact on the current or reasonable future use of the adjacent properties.

Cost

The costs associated with alternative Lagoon Soil-1 have been estimated as shown on Table 8. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $3,605,720.

6.3.2 Soil Alternative Lagoon Soil-2: Unsaturated Zone Excavation & Disposal (Top 4-6 ft.), Unsaturated & Saturated Zone Excavation and Ex-Situ Stabilization, Asphalt Cap, Institutional Controls And Long-Term Monitoring

6.3.2.1 Description

This alternative was developed as a remedial option to manage lagoon soils in the unsaturated zone, and the saturated zone (below the water table) that exhibit the hazardous waste toxicity characteristic for cadmium. Lagoon soils would be excavated to a depth of 4 feet below the lagoon floor or approximately 19 to 21 feet below existing grade (approximately 1,450 cy) and twenty percent of the floor in the vicinity of boring SB-1 would be excavated to 6 feet below the lagoon floor or approximately 21 to 22 feet below existing grade (approximately 145 cy) and transported off-site for disposal. This would yield approximately 1,595 cy (2,393) tons of soil. Approximately 72.5 cy (109 tons) would be transported to a facility for incineration due to PCB concentrations above 1,000 mg/Kg. Approximately 36 cy (54 tons) of soil with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal. The total estimated volume of soils to be excavated for disposal and incineration is approximately 1,595 cy (2,393 tons) plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal.

A high percentage by mass of the PCBs, cadmium, lead and fluoride in the lagoon would be removed and transported to an off-site disposal facility. This alternative would remove from the unsaturated zone approximately 65 percent by mass (14,772 pounds) of the total cadmium in the lagoon and 33 percent by mass (8,415 lbs.) of lead in the lagoon (based on available data down to a depth of 24-26 ft. below lagoon floor). Approximately, 41 percent by mass (250 pounds) of the total fluoride in the lagoon (based on available data down to a depth of 10-12ft below lagoon floor) and 77 percent by mass (722 pounds) of the total PCBs in the lagoon (based on available data down to a depth of 15-16 ft. below lagoon floor) would be removed.

The remaining impacted soil in the unsaturated zone would be excavated to a depth of approximately 13 feet (28 to 29 feet below existing grade) for on-site stabilization and disposal. This alternative would include excavation of approximately seven feet of soil below the groundwater table to a depth of approximately 20 feet below the floor of the lagoon (approximately 35 to 36 feet below existing grade) in the vicinity of boring SB-5-05 for on-site stabilization and disposal. The deepest split spoon sample collected from boring SB-5-05 at approximately 3'-5' below the ground water table exhibited a TCLP cadmium concentration of 1.94 mg/L that was above the regulatory limit of 1 mg/L. Since the deepest soil sample exhibited TCLP cadmium concentrations above the regulatory limit, this alternative would include excavation and stabilization of an additional two feet of soil into the saturated zone to a total depth of approximately seven feet into the saturated zone and twenty feet below the floor of the lagoon. Excavated soils would be stabilized on-site and placed back into the lagoon above the saturated zone.

As with Alternative Lagoon Soil-1, an extensive sheet piling system would also be required that would include 14,552 sf of sheet piling to stabilize the adjacent building foundation and the excavation. Sheet piling would be used to encapsulate the entire lagoon area and additionally, used for a smaller area within the lagoon. A poured concrete ring method would be utilized for bracing in lieu of conventional bracing due to the close proximity to the existing building and because of the nature of the excavation. Sheet piling would extend to a depth of 40 feet below the floor of the lagoon (55 to 56 feet below surrounding grade.) over 20 percent of the lagoon floor. The practicability of installing the sheeting is described in Section 6.2.2.2.

Existing ground water elevation data indicates that the ground water elevation in the lagoon is approximately thirteen feet (elevation ~ 445 feet below msl) below the existing floor of the lagoon (28 to 29 feet below surrounding grade) in the vicinity of boring SB-5-05. Approximately seven feet of soil estimated at 508 cy within the saturated zone over twenty percent of the lagoon around boring SB-5-05 would be removed and stabilized on-site. Soils would be stabilized as discussed in Section 6.2.1 for alternative Lagoon Soil-1. A delineation of the proposed area of excavation is provided in Figure 2.

Excavation of soils would be conducted without dewatering. The sheet piling would help to minimize the movement of ground water into the excavation. Excavated soil would be temporarily stockpiled at the far end of the lagoon and allowed to gravity drain before removal and transport to the on-site stabilization area.

The excavated area in the saturated zone would be backfilled with clean fill. As noted in alternative Lagoon Soil-1, two feet of clean fill would be placed at the bottom of the excavation to provide a buffer between the treated soil and the ground water table. The area excavated in the unsaturated zone for off-site disposal of soil and the area from the existing lagoon floor to the existing grade (elevation 471 feet to 474 feet) would be backfilled with a mixture of stabilized soil, clean fill, sediments from any tributary D-1-7 remediation and potentially stabilized soils identified in the surface soil IRM, and then graded to blend with the surrounding area.

A trisodium phosphate mixture (under the trade name Enviroblend, which also contains magnesium oxide) would be used for treatment of cadmium and lead contaminated soil. Tri-sodium phosphate, utilized as a stabilizing agent, would immobilize the cadmium and lead by creating insoluble metal (cadmium/lead) phosphate compounds.

Bench and field treatability studies will be conducted to determine the optimal dosing rate for the tri-sodium phosphate, the cost effectiveness of each mixture and the effectiveness of each mixture in reducing the leach ability of cadmium and lead in the lagoon soils. An average dosing rate of five percent has been assumed for calculating costs. Bench treatability tests would include testing of stabilized soil by both the USEPA

TCLP (Method 1311). The TCLP method is the regulatory method for determining if a waste is a characteristic hazardous waste based on toxicity pursuant to 40 CFR 261.24.

Because soils with low level PCB concentrations, generally below 10 ppm (maximum of 31 ppm with an average of less than 10 ppm) would remain in the lagoon, and although the metal compounds in the treated soil being placed back into the lagoon are insoluble and immobile, an asphalt cap would be installed over the remaining soils to further minimize exposure. The cap would significantly prevent infiltration of precipitation, which would significantly reduce the leaching of fluoride and other site contaminants from the lagoon soils. The cap would require the installation of approximately 3,115 square yards of geomembrane and asphalt to completely cover the lagoon area. The asphalt cap would consist of a 12-inch structural sub-base layer, a 3-inch binder course and a 1.5-inch asphalt-wearing surface.

Institutional controls would be implemented to address future exposure to lagoon soil. The institutional controls would consist of an environmental easement to limit the use of all property to commercial or industrial use. Institutional controls would also include a provision that the existing fence around the plant be maintained to restrict access to the site. A provision to restrict all activities that could impact the integrity of the asphalt cap would be included in the property easement. The final design document would contain the specifics of the institutional controls including a legal description of the property where the institutional controls will be implemented, the specific language of the environmental easements and the process for enforcement of the institutional controls against future transferees and successors.

Ground water monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on ground water quality. The ground water monitoring program would be implemented as part of the selected ground water remedial alternative.

6.3.2.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would provide a high level of protection of human health and the environment. A high percentage by mass of the PCBs, cadmium, lead and fluoride in the lagoon would be removed and transported to an off-site disposal facility. Soils in both the unsaturated zone and soils in the saturated zone with cadmium concentrations that fail TCLP would be stabilized by forming insoluble metal complexes that will significantly reduce the mobility of cadmium and lead. Placement of an asphalt cap over the lagoon would isolate lagoon soils from any human contact and would reduce infiltration, which would function to further reduce the potential for migration of contaminants from the lagoon.

This alternative would not necessarily increase the overall protection of human health or the environment over the level obtained by implementation of alternative Lagoon Soil-1.

Existing ground water data indicate that soils (both unsaturated and saturated zone) in the vicinity of the lagoon do not represent a significant source of cadmium to ground water. All ground water cadmium concentrations in the ground water samples from the off-site monitoring wells have been well below the NYSDEC ground water standard. Although, cadmium concentrations in Tributary D-1-7 sediments are elevated with respect to the upstream sediment sample concentration and are above the LEL sediment screening value, the mechanism for the migration of cadmium from the site to tributary D-1-7 has not definitively been identified and ground water data indicate cadmium is currently not migrating from the lagoon via ground water.

Compliance with ARARs/SCGs

The NYSDEC Part 375 regulations provide a SCO for PCBs of 1 ppm for commercial use. The USEPA TSCA regulations for PCB disposal (40 CFR 761.61) state that bulk PCB remediation wastes may stay at a site at concentrations greater than 25 ppm and less than or equal to 100 ppm provided that a cap is placed over the site and the cap conforms to the requirements of 40CFR 761.61(a)(7) and (a)(8).

The barium, cadmium and lead Part 375 Commercial SCOs are 400, 9.3 and 1,000 mg/Kg respectively, and the Protection of Ground Water SCOs are 820, 7.5 and 450 mg/Kg respectively. The Part 375 regulations require that where the Protection of Ground Water SCO is more stringent than the future use (Commercial, Industrial etc.) SCO, that the Protection of Ground Water SCO be applied where there exists a potential for an impact on ground water.

Removal of the top four to six feet of lagoon soil would reduce PCB concentrations to a maximum concentration of 31 ppm (actual concentration before dry weight calculation is 23.7 ppm), which would meet the Federal TSCA PCB disposal regulations. Unsaturated zone soils with barium, cadmium and lead concentrations above the NYSDEC Part 375 SCOs would be stabilized with tri-sodium phosphate into insoluble metal compounds. Soils in the saturated zone with cadmium above the TCLP regulatory limit would be excavated, stabilized on-site and placed back into the lagoon above the ground water table.

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is extremely low. A significant mass of the contaminants would be removed to a permitted landfill. Metals remaining in the lagoon soils would be immobilized through stabilization. Stabilization is a well-documented treatment procedure for metal compounds and has been extensively used for treatment of hazardous wastes. The stabilized soils would be contained and isolated in place below a cap. The cap would significantly eliminate precipitation infiltration and minimize the leaching of fluoride or PCBs from the lagoon soils. The exposure to potential future receptors due to direct dermal contact or incidental ingestion of contaminated soils will be effectively mitigated based upon filling the lagoon with approximately 12 feet of clean fill and the presence of a cap. Migration of residual metal constituents below the cap would be negligible since contaminants would be immobilized through on-site stabilization and infiltration of precipitation would be prevented by the asphalt cap and drainage controls. Cap demarcation and environmental easements would be required to protect the integrity of the asphalt cap. Appropriate land use restrictions would be implemented to assure that the cap is not breached.

Adequacy and reliability of controls: The combination of stabilizing the contaminated soils and installing an asphalt cap would achieve the performance requirement of immobilizing contaminants and preventing direct contact by future potential receptors. Stabilization of metals in soils and hazardous wastes is a proven technology. Implementation of and compliance with land use restrictions and long-term maintenance obligations would aid in preserving cap integrity and limiting exposure. Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity. It is reasonable to assume that a permitted TSCA/RCRA facility would provide an adequate and reliable control for the soils disposed of at an off-site location.

Permanence: Off-site disposal of approximately 1,595 cy of soil at an off-site TSCA/RCRA approved facility represents a permanent remedy for this material. The stabilization of the remaining lagoon soils (above the ground water table) with respect to metals represents a permanent remedy. The stabilization of the metals in the soils with phosphate based compounds creates insoluble metal compounds. This reaction represents a permanent remedy. The bench scale and field scale treatability tests that would be conducted during the remedial design phase would provide data to maximize the effectiveness of the stabilization. The stabilization of the soils and placement of these soils above the ground water table would provide a permanent long-term remedy.

Reduction of Toxicity, Mobility and Volume Through Treatment

Complete removal of the upper 4 to 6 foot strata from the Site would significantly reduce contaminant mobility through removal of the majority of the contaminants.
Approximately 65 percent by mass (14,772 pounds) of the total cadmium in the lagoon and 33 percent (8,415 lbs.) of lead in the lagoon (based on available data down to a depth of 24-26 ft. below lagoon floor), approximately, 41 percent by mass (250 pounds) of the total fluoride in the lagoon (based on available data down to a depth of 10-12ft below lagoon floor) and 77 percent by mass (722 pounds) of the total PCBs in the lagoon (based on available data down to a depth of 15-16 ft. below lagoon floor) would be removed from the site through the excavation and off-site disposal of the upper 4 to 6 foot strata.
Because the lagoon soils are TCLP characteristic wastes with respect to cadmium, soils will require treatment at the disposal facility to meet the Federal Land Disposal Restrictions (LDRs). This would significantly reduce the mobility of cadmium, lead and barium in the soils that are transported off-Site for disposal.

Further reduction in contaminant mobility is achieved by stabilization of the remaining soils in the unsaturated zone and seven feet of soils in the saturated zone over 20 % of the lagoon in the vicinity of boring SB-5-05. The asphalt cap would significantly reduce infiltration. Lagoon soils would be excavated to a depth of 4 feet below the lagoon floor or approximately 18 feet below existing grade (approximately 1,450 cy) and twenty percent of the floor in the vicinity of boring SB-1 would be excavated to 6 feet below the lagoon floor or approximately 20 feet below existing grade (approximately 145 cy) and transported off-site for disposal.

Soils with contaminant concentrations above cleanup guidelines would remain on-Site and there would be no reduction in the toxicity of these contaminants. However, stabilization and construction of a cap over the stabilized soils reduces the mobility and eliminates any direct exposure pathway and therefore toxicity is not a concern. Stabilization does not reduce the volume of cadmium or lead in the soil.

Short-Term Effectiveness

During stabilization and excavation activities, fugitive dust would be controlled using engineering measures. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

Workers involved with the soil stabilization process could be exposed to the risks associated with dermal contact with contaminated soil and chemicals and inhalation of dust particulate. Risks would be mitigated by properly outfitting workers with appropriate personal protection equipment, following proper industrial hygiene procedures, using controlled excavations, and monitoring air quality during soil excavation and mixing activities. All work-associated safety practices would be outlined in a Health and Safety Plan, including a description of the control measures that would be implemented at the site.

The impact to the community and the environment would be minimal since residences are scarce in the surrounding area and controls would be implemented to minimize fugitive dust. Traffic increases due to transportation of soil would have minimal impact on the community, as this is a one-time occurrence with an approximate duration of approximately 13 weeks. Installation of the asphalt cap would provide no immediate risks to workers, the community or the environment.

Implementability

Ability to Construct and Operate: Alternative Lagoon Soil-2 would be more difficult to implement than Alternative Lagoon Soil-1 because of the deeper excavation and the deeper sheet piling requirement. This alternative would require experienced contractors who specialize in sheet piling and deep excavation. Although sheet piling is a proven technology in the construction industry, the site specific soils and the deep excavation could be problematic

Like Alternative Lagoon Soil-1, sheet piling would be used to encapsulate the entire lagoon area. However, this alternative would require additional sheet pilling to stabilize the excavation into the groundwater table. Sheet piling would extend to a depth of 40 feet

below the floor of the lagoon (55 to 56 feet below surrounding grade.) over 20 percent of the lagoon floor, which is 14 feet deeper than required by Alternative Lagoon Soil-1. This would substantially increase the difficulty of sheet piling and increase the probability that sheet piling would not be feasible. Soils that exhibit blow counts greater than 20 can slow or impede installation of sheet piling. Soil boring logs for SB-1-05 through SB-3-05, SB-5-05, SB-7-05 and SB-8-05 advanced in the floor of the lagoon during the OU-2 RI exhibited blow counts as high as 60, which could impede pile driving or simply make it infeasible. Should this be the chosen remedial alternative, further intrusive investigation would be recommended to determine the practicability of sheet piling.
For the most part, construction methods would utilize relatively common construction equipment and materials. Crane operation could be necessary to lift heavy equipment in and out of the lagoon as excavation progresses. Use of a crane could also be necessary for operation of a clamshell bucket to remove contaminated soils below the ground water table. Soil stabilization would use relatively common soil handling equipment. Geotechnical analysis would be necessary to determine if pile driving is feasible and for the design the sheet pile system to ensure the stability of the excavation.

The contractor would be required to demonstrate experience in sheet piling, deep excavation and soil stabilization. Furthermore, the contractor would be required to determine dosage rates based on available field data and bench scale laboratory tests. The contractor would perform a field demonstration utilizing full-scale equipment, followed by post- treatment testing. The asphalt cap could be installed with little or no difficulty.

Reliability: All aspects of this alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies. All components of alternative Lagoon Soil-2 utilize common construction materials and procedures, and routine sampling procedures and analyses. However, as previously discussed, installation of the sheet piling is a potential concern due to subsurface conditions. Installation of the asphalt cap would provide added reliability, provided long-term maintenance activities and environmental easements are implemented.

Availability of Materials and Services: This alternative would require a specialty contractor with experience specific to sheet piling and deep excavation. The contractor should also have experience with chemical stabilization, since the contractor would be responsible for determining dosage rates and demonstrating successful field techniques. There are contractors available who are capable of demonstrating their ability to successfully complete the work.

All equipment and materials are available locally and have been demonstrated sufficiently for the purpose for which they are intended. One TSCA/RCRA regulated facility has been identified as potentially capable of receiving such waste. It is anticipated, once the contractor is mobilized to the site, that pile driving, excavation, stabilization, confirmatory sampling, transportation, backfilling activities and installation of the asphalt cap would be completed within a 13 week time frame.

Land Use

This alternative would be consistent with the Town of Deerpark zoning and master plan and the current and reasonable future land use for the site. The alternative would not have any impact on the current or reasonable future use of the adjacent properties.

Cost

The costs associated with alternative Lagoon Soil-1 have been estimated as shown on Table 9. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $3,800,727.

6.3.3 Soil Alternative Lagoon Soil-3: Unsaturated Zone Excavation &Disposal (Top 4-6 ft.), Unsaturated & Saturated Zone In-Situ Stabilization/Solidification, Asphalt Cap, Institutional Controls And Long-Term Monitoring

6.3.3.1 Description

This alternative was developed as a remedial option to manage lagoon soils in the unsaturated zone and the saturated zone (below the water table) via in-situ technology. This alternative would eliminate the need for excavation, ex-situ stabilization and costly sheet piling that could be difficult to implement due to the site geology.

Lagoon soils would be excavated to a depth of 4 feet below the lagoon floor (approximately 1,450 cy) and twenty percent of the floor in the vicinity of boring SB-1 would be excavated to 6 feet below the lagoon floor (approximately 145 cy) and transported off-site for disposal.

Approximately 72.5 cy (109 tons) of soil from 0-2' over ten percent of the lagoon floor around surface soil sample SS-80100 would be transported to a facility for incineration due to PCB concentrations above 1,000 mg/Kg. Approximately 36 cy (54 tons plus 2.7 tons for increase in weight related to the on-site stabilization) of soil from 0-1' over ten percent of the lagoon around surface soil sample SS-30100 with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal.

The total estimated volume of soils to be excavated for disposal and incineration is approximately 1,595 cy (2,393 tons) plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal.

A high percentage by mass of the PCBs, cadmium, lead and fluoride in the lagoon would be removed and transported to an off-site disposal facility. This alternative would remove from the unsaturated zone approximately 65 percent by mass (14,772 pounds) of the total cadmium in the lagoon and 33 percent by mass (8,415 lbs.) of lead in the lagoon (based on available data down to a depth of 24-26 ft. below lagoon floor). Approximately, 41 percent by mass (250 pounds) of the total fluoride in the lagoon (based on available data down to a depth of 10-12ft below lagoon floor) and 77 percent by mass (722 pounds) of the total PCBs in the lagoon (based on available data down to a depth of 15-16 ft. below lagoon floor) would be removed from the lagoon. Excavation would be discontinued well above the ground water table and therefore, it is anticipated that dewatering or solidification would not be necessary.

Remaining soils in the unsaturated zone and approximately seven feet of soil below the groundwater table in the vicinity of boring SB-5-05 would be solidified in place. The deepest split spoon sample collected from boring SB-5-05 at approximately 3'-5' below the ground water table exhibited a TCLP cadmium concentration of 1.94 mg/L that was above the regulatory limit of 1 mg/L. Since the deepest soil sample exhibited TCLP cadmium concentrations above the regulatory limit, this alternative includes solidification of an additional two feet of soil into the saturated zone to a total depth of approximately seven feet into the saturated zone.

Soils would be solidified in place using a hydraulic excavator soil mixing technology. Boring logs indicate that cobbles and boulders are prevalent in the lagoon sub-surface soils. Obstructions of this nature could preclude soil mixing using auger mixing and jet grouting technologies. The surface will laid-out into a series of rectangular cells approximately 10-feet wide by 15-feet long. Each cell will be designated with a unique identifier based on its location within the grid. Adjacent cells will be overlapped slightly to ensure complete treatment of the target soil. Cells will be installed in a split-space or primary/secondary orientation, i.e. a primary cell is mixed then the adjacent cell is skipped to leave existing soils between fluid cells. Once primary cells have generated sufficient strength, secondary cells will be installed between the primary cells.

A Portland cement/grout mixture would be used for treatment of cadmium and lead contaminated soil. Portland cement/grout utilized as a stabilizing/solidification agent would create insoluble metal hydroxide compounds. The Portland cement/grout mixture will function as binding agent that locks the contaminated soil in a low permeability matrix that reduces the potential for leaching of lead and cadmium from the surrounding soils to groundwater. The objective is reduced permeability and increased strength of the existing soil. The project objectives are an unconfined compressive strength (UCS) greater than or equal to 25 to 150 PSI and a permeability less than or equal to $1x10^{-5}$cm/s to $1x10^{-6}$cm/s. Because the cement/grout mixture provides a stable substrate, unlike lagoon soil alternatives Soil-1 and Soil-2, this alternative does not involve sheet piling and eliminates the difficulties associated with the deep advancement of sheet piles.

Bench and field treatability studies will be conducted to determine the optimal dosing rate for the Portland cement/grout mixture, the cost effectiveness of each mixture and the effectiveness of each mixture in reducing the leach ability of cadmium and lead in the lagoon soils. An average dosing rate of fifteen percent has been assumed for calculating costs. Bench treatability tests would include testing of stabilized soil by the USEPA

TCLP (Method 1311. The TCLP method is the regulatory method for determining if a waste is a characteristic hazardous waste based on toxicity pursuant to 40 CFF 261.24.

The area excavated for off-site soil disposal and the existing lagoon would be backfilled with clean fill, sediments from the remediation of tributary D-1-7 and stabilized soils from the surface soil cleanup, to the existing grade (elevation 471 feet to 474 feet) and graded to blend with the surrounding areas. Because soils with low level PCB concentrations, generally below 10 ppm (maximum of 31 ppm with an average of less than 10 ppm) would remain in the lagoon and although the metals in the in-situ treated soils would be immobile an asphalt cap consisting of approximately 3,115 square yards of geomembrane and asphalt would be installed over the area to minimize infiltration and eliminate exposure. For placement of the asphalt, the surface would be prepared with a 12-inch structural sub-base layer, a 3-inch binder course and a 1.5-inch asphalt-wearing surface. This cap would significantly eliminate precipitation infiltration and significantly reduce the potential for mobility of the contaminants.

Institutional controls would be implemented to address future exposure to lagoon soil. The institutional controls would consist of an environmental easement to limit the use of all property to commercial or industrial use. Institutional controls would also include a provision that the existing fence around the plant be maintained to restrict access to the site. A provision to restrict all activities that could impact the integrity of the asphalt cap would be included in the property easement. The final design document would contain the specifics of the institutional controls including a legal description of the property where the institutional controls will be implemented, the specific language of the environmental easements and the process for enforcement of the institutional controls against future transferees and successors.

Ground water monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on ground water quality. The ground water monitoring program would be implemented as part of the selected ground water remedial alternative.

6.3.3.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would provide a high level of protection of human health and the environment. A high percentage by mass of the PCBs, cadmium, lead and fluoride in the lagoon would be removed and transported to an off-site disposal facility. Soils in both the unsaturated zone and soils in the saturated zone with cadmium concentrations that fail TCLP would be stabilized by locking the contaminated soil in a low permeability matrix that reduces the potential for leaching of lead and cadmium from the surrounding soils to groundwater. Placement of an asphalt cap over the lagoon would isolate lagoon soils from any human contact and would reduce infiltration, which would function to further reduce the potential for migration of contaminants from the lagoon. Furthermore, a cap would prevent uptake of constituents in vegetation thereby reducing any risks to higher order receptors in the food chain. The asphalt cap would provide an effective infiltration barrier and would significantly reduce contaminant mobility.

Compliance with ARARs/SCGs

The NYSDEC Part 375 regulations provide a SCO for PCBs of 1 ppm for commercial use. The USEPA TSCA regulations for PCB disposal (40 CFR 761.61) state that bulk PCB remediation wastes may stay at a site at concentrations greater than 25 ppm and less than or equal to 100 ppm provided that a cap is placed over the site and the cap conforms to the requirements of 40CFR 761.61(a)(7) and (a)(8).

The barium, cadmium and lead Part 375 Commercial SCOs are 400, 9.3 and 1,000 mg/Kg respectively, and the Protection of Ground Water SCOs are 820, 7.5 and 450 mg/Kg respectively. The Part 375 regulations require that where the Protection of Ground Water SCO is more stringent than the future use (Commercial, Industrial etc.) SCO, that the Protection of Ground Water SCO be applied where there exists a potential for an impact on ground water.

Removal of the top four to six feet of lagoon soil would reduce PCB concentrations to a maximum concentration of 31 ppm (actual concentration before dry weight calculation is 23.7 ppm), which would meet the Federal TSCA PCB disposal regulations. Unsaturated zone soils with barium, cadmium and lead concentrations above the NYSDEC Part 375 SCOs and saturated zone soils with cadmium concentrations above the TCLP regulatory limit would be solidified in-situ with Portland cement.

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is extremely low. A significant mass of the contaminants would be removed to a permitted landfill. Metals remaining in the lagoon soils would be immobilized through stabilization/solidification. Stabilization/solidification is a common treatment procedure for metal compounds and has been extensively used for treatment of hazardous wastes. The stabilized/solidified soils would be contained and isolated in place below a cap. The cap would significantly eliminate precipitation infiltration and minimize the leaching of fluoride or PCBs from the lagoon soils. The exposure to potential future receptors due to direct dermal contact or incidental ingestion of contaminated soils will be effectively mitigated based upon filling the lagoon with approximately 12 feet of clean fill and the presence of a cap. Migration of residual metal constituents below the cap would be negligible since contaminants would be immobilized through on-site stabilization and infiltration of precipitation would be prevented by the asphalt cap and drainage controls. Cap demarcation and environmental easements would be required to protect the integrity of the asphalt cap. Appropriate land use restrictions would be implemented to assure that the cap is not breached.

Adequacy and reliability of controls: The combination of stabilizing/solidifying the contaminated soils and installing an asphalt cap would achieve the performance requirement of immobilizing contaminants and preventing direct contact by future potential receptors. Stabilization/solidification of metals in soils and hazardous wastes is a proven technology. Implementation of and compliance with land use restrictions and long-term maintenance obligations would aid in preserving cap integrity and limiting exposure. Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity. It is reasonable to assume that a permitted TSCA/RCRA facility would provide an adequate and reliable control for the soils disposed of at an off-site location.

Disposal from the unsaturated zone of 65 percent by mass of the cadmium contamination, 41 percent by mass of the fluoride contamination, 33 percent by mass of the lead contamination and 77 percent by mass of the PCB contamination in an off-Site TSCA/RCRA permitted facility effectively isolates a majority of the cadmium, lead, fluoride and PCBs from potential receptors. It is reasonable to assume that a permitted TSCA/RCRA facility would provide adequate and reliable controls.

Permanence: Off-site disposal of approximately 1,595 cy of soil at an off-site TSCA/RCRA approved facility represents a permanent remedy for this material. The stabilization of the remaining lagoon soils (above the ground water table) with respect to metals represents a permanent remedy.

The stabilization/solidification of the metals in the soils with a Portland cement/grout mixture locks the contaminated soil in low permeability matrix that reduces the potential for leaching of lead and cadmium from the surrounding soils to groundwater. This reaction represents a permanent remedy. The bench scale and field scale treatability tests that would be conducted during the remedial design phase would provide data to maximize the effectiveness of the stabilization. The stabilization of the soils and placement of these soils above the ground water table would provide a permanent long-term remedy.

Reduction of Toxicity, Mobility and Volume Through Treatment

Complete removal of the upper 4 to 6 foot strata from the Site would significantly reduce contaminant mobility through removal of the majority of the contaminants. Approximately 65 percent by mass (14,772 pounds) of the total cadmium in the lagoon and 33 percent (8,415 lbs.) of lead in the lagoon (based on available data down to a depth of 24-26 ft. below lagoon floor), approximately, 41 percent by mass (250 pounds) of the total fluoride in the lagoon (based on available data down to a depth of 10-12ft below lagoon floor) and 77 percent by mass (722 pounds) of the total PCBs in the lagoon (based on available data down to a depth of 15-16 ft. below lagoon floor) would be removed from the site through the excavation and off-site disposal of the upper 4 to 6 foot strata. Because the lagoon soils are TCLP characteristic wastes with respect to cadmium, soils will require treatment at the disposal facility to meet the Federal Land Disposal Restrictions (LDRs). This would significantly reduce the mobility of cadmium, lead and barium in the soils that are transported off-Site for disposal.

Further reduction in contaminant mobility is achieved by stabilization/solidification of the remaining soils in the unsaturated zone and seven feet of soils in the saturated zone over 20 % of the lagoon in the vicinity of boring SB-5-05. The asphalt cap would significantly eliminate infiltration.

Soils with contaminant concentrations above cleanup guidelines would remain on-Site and there would be no reduction in the toxicity of these contaminants. However, stabilization/solidification of the soils and construction of a cap over the solidified soils reduces the mobility and eliminates any direct exposure pathway and therefore toxicity is not a concern. Stabilization does not reduce the volume of cadmium or lead in the soil.

Short-Term Effectiveness

During stabilization and excavation activities, fugitive dust would be controlled using engineering measures. Workers involved with the soil stabilization/solidification, excavation and transport and disposal activities could be exposed to the risks associated with dermal contact with contaminated soil and chemicals and inhalation of dust particulate. Risks would be mitigated by properly outfitting workers with appropriate personal protection equipment, following proper industrial hygiene procedures, using controlled excavations, and monitoring air quality during soil excavation activities. All work-associated safety practices would be outlined in a Health and Safety Plan, including a description of the control measures that would be implemented at the Site.

Installation of the asphalt cap would provide no immediate risks to workers, the community or the environment. Traffic increases due to transportation of soil would have minimal impact on the community, as this is a one-time occurrence with an approximate duration of 13 weeks.

Implementability

In-situ excavator mixing and treatment of contaminated soil is a proven technology that is typically more cost effective than excavation and ex-situ stabilization in projects that would require extensive shoring and dewatering. With In-situ soil mixing, the soil is treated in place with no excavation or sheet piling. The technique uniformly mixes hazardous soils with treatment solutions or powders. Sub-surface soils in the lagoon area can be classified as coarse gravel and the maximum depth proposed for in-situ treatment is approximately 20 feet below the bottom of the lagoon. Excavator soil mixing is a proven technology and is feasible to depths of 20 feet given the site specific soil type.

The contractor would be required to document the performance of the proposed dosage rates that were based on available field data and laboratory bench scale tests. The contractor would perform a field demonstration followed by post- treatment testing to confirm the proposed dosing rate. The asphalt cap could be installed with little or no difficulty.

Reliability: All aspects of this alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies. All components of Alternative Lagoon Soil-3 utilize available construction equipment and materials, proven procedures, and routine sampling procedures and analyses. Installation of an asphalt cap would provide a high degree of reliability, provided long-term maintenance activities and environmental easements are implemented.

Availability of Materials and Services: The in-situ excavator mixing technology requires construction equipment that is generally readily available to many national remediation contractors. A TSCA regulated facility has been identified as potentially capable of receiving such waste. It is anticipated that once the contractor is mobilized to the Site, that excavation, stabilization/solidification, confirmatory sampling, transportation, backfilling activities and installation of the asphalt cap would be completed within a 13 week time frame.

Land Use

This alternative would be consistent with the Town of Deerpark zoning and master plan and the current and reasonable future land use for the site. The alternative would not have any impact on the current or reasonable future use of the adjacent properties.

Cost

The costs associated with Alternative Lagoon Soil-3 have been estimated as shown on Table 10. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $2,760,591.

6.4 TRIBUTARY D-1-7 SEDIMENT REMEDIAL ALTERNATIVES

In addition to the no action alternative, three remedial alternatives have been proposed for sediments in Tributary D-1-7; Alternative SED-1 involves removal of approximately 63.6% of the sediments that exhibit lead concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) severe effect level (SEL) and all sediments with PCBs above 1 mg/Kg. Alternative SED-2, which represents the unrestricted use alternative, would remove sediments that contain cadmium and lead at concentrations above the NYSDEC Sediment Criteria Guideline lowest effect level (LEL) and all PCBs above 1 mg/Kg. Alternative SED-3 would remove approximately 33 % of the sediments with lead concentrations above the SEL and would have the least impact on the existing aquatic habitat.

6.4.1 Tributary D-1-7 Sediment Alternative SED-1

6.4.1.1 Description

This alternative would involve removal of all stream bed sediment between sediment sample locations SED-9 and SED-14. Sediments in this area exhibit lead concentrations above the SEL and PCB concentrations that exceed 1 mg/Kg. Sediment would be removed to a depth of 12 inches. The total estimated area and volume of sediments that would be removed from Tributary D-1-7 is 61,242 sf and 2,270 cy, respectively.

A cofferdam would be constructed upstream of the sediment removal areas and the stream flow pumped or diverted around the excavation areas. It is anticipated that sediments would be excavated using standard construction equipment (track hoes, backhoes, clamshells etc.) equipped with water tight buckets. The sediment metals and PCB data indicate that the sediments can be used as backfill in the lagoon. Sediments would be transported using water tight trucks and placed in the lagoon as backfill above the stabilized soils.

The area where sediments were excavated would be backfilled to the pre-existing contours using clean run of bank gravel. The disturbed banks of the stream would be stabilized and vegetation reestablished.

6.4.1.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would improve sediment quality and be protective of the aquatic environment by significantly reducing lead, cadmium and PCB sediment concentrations in Tributary D-1-7 and reducing the overall volume of impacted sediments. Approximately 63.6% of sediment with lead concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) SEL concentrations, 62.4% of sediment with cadmium concentrations above the LEL concentrations and all sediment with PCBs above 1 mg/Kg would be removed from tributary D-1-7.

Eisler (1988) reported that the food chain biomagnification of lead is negligible and therefore consumption of fish from Tributary D-1-7 with respect to lead is not considered a significant concern. Cadmium does not significantly bioaccumulate in the muscle tissue of fish (ATSDR 1999) and consumption of fish from Tributary D-1-7 is not considered a significant concern with respect to cadmium.

Compliance with ARARs/SCGs

This alternative would not remove all sediments with lead concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) SEL concentration. However, this alternative would improve sediment quality and be protective of the aquatic environment by significantly reducing lead, cadmium and PCB sediment concentrations in Tributary D-1-7 and reducing the overall volume of impacted sediments. Approximately 63.6% of sediment with lead concentrations above the NYSDEC Sediment Criteria Guidelines SEL concentration, 62.4% of sediment with cadmium concentrations above the LEL concentration and all sediment with PCBs above 1 mg/Kg would be removed from tributary D-1-7.

Long-Term Effectiveness and Permanence

Removal of sediments from tributary D-1-7 and placement of the sediments in the lagoon above the saturated zone and beneath an asphalt cap represents an effective and permanent remedy with respect to tributary D-1-7 stream sediment quality. Sediment excavation is an established remedial action for addressing contaminated sediments. Excavation of the sediments and replacement with clean fill is an effective and permanent remedy.

Reduction of Toxicity, Mobility and Volume Through Treatment

Mobility would be reduced by placing the stabilized soil in the lagoon above the unsaturated zone beneath an asphalt cap. Construction of a cap over the stabilized soils may not directly reduce the toxicity, however the sediments would be removed from the aquatic environment and therefore aquatic toxicity is not a concern.

Short-Term Effectiveness

During sediment removal fugitive dust should not be an issue but would be controlled using engineering measures if dust became a concern. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

The impact to the community would be minimal since residences are scarce. Traffic increases due to transportation of soil would have minimal impact on the community, as this is a one-time occurrence with an approximate duration of approximately 4 weeks.

The sediment excavation would have a significant impact on aquatic life within the excavation zone. All invertebrate aquatic life and vegetation within the sediment removal area would be eliminated until natural recolonization of the backfilled excavation occurred. Approximately 1,132 linear feet of streambed and stream bank would be impacted. All stream bank vegetation that prevents stream bank erosion would be eliminated until vegetation planted as part of the restoration measures becomes established. Over story vegetation that provides shading of the stream and thermal protection of stream temperatures would be eliminated. Reestablishment of over story vegetation to an extent that would approach pre-remediation conditions would take several years.

The dwarf wedge mussel (Alasmindonta heterodon) a Federal and New York State endangered species is known to occur in the Neversink River in Orange County. Tributary D-1-7 discharges to the Neversink River and the aquatic habitat of Tributary D-1-7 is consistent with the aquatic habitats preferred by the dwarf wedge mussel.

Excavation of 1,132 linear feet of streambed would impact potential dwarf wedge mussel habitat and potentially individual dwarf wedge mussels. Due to the dense streambed vegetation and the silty composition of the stream bed, finding and relocating any dwarf wedge mussels that are potentially present within the proposed 1,132 linear feet of stream bed that would be excavated during implementation of alternative SED-1 is not practicable.

There would be a temporary impact on the movement of aquatic life within tributary D-1-7 during excavation activity.

Implementability

Ability to Construct and Operate: All components of alternative SED-1 utilize relatively common construction equipment and materials. Cofferdams and sediment excavation using water tight buckets utilize routine construction procedures.

Reliability: All aspects of this alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies.

Availability of Materials and Services: All equipment and materials are available and have been demonstrated sufficiently for the purpose for which they are intended. It is anticipated, once the contractor is mobilized to the site, that sediment excavation and backfilling activities would be completed within a 4 week time frame.

Land Use

Tributary D-1-7 flows through land identified as residential and parks by the Town of Deerpark land use map. Part of the area designated as residential and parks land use is currently used for livestock crop production. Alternative SED-2 is consistent with the current and reasonably anticipated future use land use.

Cost

The costs associated with alternative SED-1 have been estimated as shown on Table 11. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $1,629,892.

6.4.2 Tributary D-1-7 Sediment Alternative SED-2

6.4.2.1 Description

This alternative would remove all sediments where the sediment metal concentrations are above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) LEL concentrations and all sediments where PCB concentrations are above 1 mg/Kg. Sediment would be removed to a depth of 12 inches over approximately 3,078 linear feet of stream. Proposed sediment removal areas are depicted on Figure 4. Total estimated area and volume of sediments that would be removed from tributary D-1-7 under this alternative is 114,242 sf and 4,231 cy, respectively.

A cofferdam would be constructed upstream of the sediment removal areas and the stream flow pumped or diverted around the excavation areas. It is anticipated that sediments would be excavated using standard construction equipment (track hoes, backhoes, clamshells, etc.) equipped with water tight buckets. The area where sediments are excavated would be backfilled to the pre-existing contours using clean run of bank gravel.

The sediment metals and PCB data indicate that the sediments can be used as backfill in the lagoon. Sediments would be transported using water tight trucks and placed in the lagoon as backfill above the stabilized soils.

The area where sediments were excavated would be backfilled to the pre-existing contours using clean run of bank gravel. The disturbed banks of the stream would be stabilized and vegetation reestablished.

6.4.2.2

Overall protection of Human Health and the Environment

Excavation of all sediments with concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) LEL concentrations would be protective of human health. The principle human exposure pathway to sediments is direct contact through recreational fishing.

Eisler (1988) reported that the food chain biomagnification of lead is negligible and therefore consumption of fish from Tributary D-1-7 with respect to lead is not considered a significant concern. Cadmium does not significantly bioaccumulate in the muscle tissue of fish (ATSDR 1999) and consumption of fish from Tributary D-1-7 is not considered a significant concern with respect to cadmium.

Compliance with ARARs/SCGs

This alternative would improve the quality of the aquatic habitats associated with Tributary D-1-7. All sediment metal concentrations above the respective the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) LEL concentrations would be removed from the stream, thus eliminating a current potential source of toxicity to invertebrate aquatic life.

Long-Term Effectiveness and Permanence

Removal of sediments from tributary D-1-7 and placement of the sediments in the lagoon above the saturated zone and beneath an asphalt cap represents an effective and permanent remedy. Sediment excavation is an established remedial action for addressing contaminated sediments. Excavation of the sediments and replacement with clean fill is an effective and permanent remedy. Removal of all sediments with lead and cadmium concentrations above the LEL concentrations would reduce the potential for re-suspension and deposition of low level impacted sediments into the remediated area of Tributary D-1-7.

Reduction of Toxicity, Mobility and Volume Through Treatment

Mobility would be reduced by placing the stabilized soil in the lagoon above the unsaturated zone and beneath a cap. Construction of a cap over the sediments may not directly reduce the toxicity. However, the sediments would be removed from the aquatic environment and therefore toxicity would no longer be a concern. This alternative would remove all contaminated sediments from Tributary D-1-7.

Short-Term Effectiveness

During sediment removal fugitive dust should not be a concern but would be controlled using engineering measures if dust became a concern. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

The impact to the community would be minimal since residences are scarce in the surrounding area. Traffic increases due to transportation of soil would have minimal impact on the community, as this is a one-time occurrence with an approximate duration of approximately 6 weeks.

The sediment excavation associated with alternative SED-2 would have a significant impact on aquatic life within the excavation zone. All invertebrate aquatic life and vegetation within the sediment removal area would be eliminated until natural recolonization of the backfilled excavation occurred. Approximately 3,078 linear feet of streambed and stream bank would be impacted. All stream bank vegetation that prevents stream bank erosion would be eliminated until vegetation planted as part of the restoration measures becomes established. Over story vegetation that provides shading of the stream and thermal protection of stream temperatures would be eliminated. Reestablishment of over story vegetation to an extent that would approach pre-remediation conditions would take several years.

The dwarf wedge mussel (Alasmindonta heterodon) a Federal and New York State endangered species is known to occur in the Neversink River in Orange County. Tributary D-1-7 discharges to the Neversink River and the aquatic habitat of Tributary D-1-7 is consistent with the aquatic habitats preferred by the dwarf wedge mussel. Excavation of 3,078 linear feet of streambed would impact potential dwarf wedge mussel habitat and potentially individual dwarf wedge mussels. Due to the dense streambed vegetation and the silty composition of the stream bed, finding and relocating any dwarf wedge mussels that are potentially present within the proposed 3,078 linear feet of stream bed that would be excavated during implementation of alternative SED-2 is not practicable.

There would be a temporary impact on the movement of aquatic life within tributary D-1-7 during excavation activity.

Implementability

Ability to Construct and Operate: All components of alternative SED-2 utilize relatively common construction equipment and materials. Cofferdams and sediment excavation using water tight buckets utilize routine construction procedures.

Reliability: All aspects of this alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies. All components of alternative SED-2 utilize common construction materials and procedures.

Availability of Materials and Services: All equipment and materials are available and have been demonstrated sufficiently for the purpose for which they are intended. It is anticipated, once the contractor is mobilized to the site, that sediment excavation and backfilling activities would be completed within a 6 week time frame.

Land Use

Tributary D-1-7 flows through land identified as residential and parks by the Town of Deerpark land use map. Part of the area designated as residential and parks is currently used for livestock crop production. Alternative SED-2 is consistent with the current and reasonably anticipated future use land use. Lead and cadmium concentrations that would remain in the sediments would be less than the NYS Part 375 Residential Use SCOs, indicating exposure to the sediments is not a human health concern.

Cost

The costs associated with alternative SED-2 have been estimated as shown on Table 12. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $2,674,125.

6.4.3 Tributary D-1-7 Sediment Alternative SED-3

6.4.3.1 Description

This alternative would remove sediments that exhibit the highest lead concentrations and all sediments where PCB concentrations are above 1 mg/Kg. Sediment would be removed to a depth of 12 inches over approximately 278 linear feet of stream. Proposed sediment removal areas are depicted on Figure 5. Total estimated area and volume of sediments that would be removed from tributary D-1-7 under this alternative is 21,957 sf and 813 cy, respectively.

A cofferdam would be constructed upstream of the sediment removal areas and the stream flow pumped or diverted around the excavation areas. It is anticipated that sediments would be excavated using standard construction equipment (track hoes, backhoes, clamshells, etc.) equipped with water tight buckets. The area where sediments are excavated would be backfilled to the pre-existing contours using clean run of bank gravel.

The sediment metals and PCB data indicate that the sediments can be used as backfill in the lagoon. Sediments would be transported using water tight trucks and placed in the lagoon as backfill above the stabilized soils.

The area where sediments were excavated would be backfilled to the pre-existing contours using clean run of bank gravel. The disturbed banks of the stream would be stabilized and vegetation reestablished.

6.4.3.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would significantly improve the quality of the aquatic habitats associated with Tributary D-1-7 by removal of sediments with the highest lead concentrations. Approximately 33% of the sediment with lead concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) SEL concentration and 32% of the sediment with cadmium concentrations above the LEL concentration would be removed from the stream thus eliminating a current potential source of toxicity to invertebrate aquatic life.

Excavation of sediments exhibiting the highest lead concentrations and all sediments with PCB concentrations above 1 mg/Kg would be protective of human health. The principle human exposure pathway to sediments is direct contact through recreational fishing. This alternative would remove all sediments with PCB concentrations above the NYSDEC
Eisler (1988) reported that the food chain biomagnification of lead is negligible and therefore consumption of fish from Tributary D-1-7 with respect to lead is not considered a significant concern. Cadmium does not significantly bioaccumulate in the muscle tissue of fish (ATSDR 1999) and consumption of fish from Tributary D-1-7 is not considered a significant concern with respect to cadmium.

Compliance with ARARs/SCGs

This alternative would not remove all sediments with lead concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and

Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) SEL concentration.

Approximately 33% of the sediment with lead concentrations above the NYSDEC Sediment Criteria Guidelines (NYSDEC, Division of Fish, Wildlife and Marine Resources; Technical Guidance for Screening Contaminated Sediments; July 1994) SEL concentration and 32% of the sediment with cadmium concentrations above the LEL concentration would be removed from the stream thus eliminating a current potential source of toxicity to invertebrate aquatic life.

Long-Term Effectiveness and Permanence

Removal of sediments from tributary D-1-7 and placement of the sediments in the lagoon above the saturated zone and beneath an asphalt cap represents an effective and permanent remedy. Sediment excavation is an established remedial action for addressing contaminated sediments. Excavation of the sediments and replacement with clean fill is an effective and permanent remedy.

Reduction of Toxicity, Mobility and Volume Through Treatment

Mobility would be reduced by placing the stabilized soil in the lagoon above the unsaturated zone and beneath a cap. Construction of a cap over the sediments may not directly reduce the toxicity. However, a significant quantity of contaminated sediments would be removed from the aquatic environment and therefore toxicity would no longer be a concern.

Short-Term Effectiveness

During sediment removal fugitive dust should not be an issue but if dust does become a concern it would be controlled using engineering measures. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

The impact to the community would be minimal since residences are scarce in the surrounding area. Traffic increases due to transportation of soil would have minimal impact on the community, as this is a one-time occurrence with an approximate duration of approximately 3 weeks.

The sediment excavation associated with alternative SED-3 would have an impact on aquatic life within the excavation zone. All invertebrate aquatic life and vegetation within the sediment removal area would be eliminated until natural recolonization of the backfilled excavation occurred. However, excavation would be limited to approximately 278 linear feet of streambed and stream bank, which would limit disturbance of stream bank vegetation that prevents stream bank erosion and over story vegetation that provides shading of the stream and thermal protection of stream temperatures.

The dwarf wedge mussel (Alasmindonta heterodon) a Federal and New York State endangered species is known to occur in the Neversink River in Orange County. Tributary D-1-7 discharges to the Neversink River and the aquatic habitat of Tributary D-1-7 is consistent with the aquatic habitats preferred by the dwarf wedge mussel. Due to the dense streambed vegetation and the silty composition of the stream bed, finding and relocating any dwarf wedge mussels that are potentially present within the proposed 278 linear feet of stream bed that would be excavated during implementation of alternative SED-3 is not practicable.

There would be a temporary impact on the movement of aquatic life within tributary D-1-7 during excavation activity.
Implementability

Ability to Construct and Operate: All components of alternative SED-3 utilize relatively common construction equipment and materials. Cofferdams, sediment excavation using water tight buckets utilize routine construction procedures.

Reliability: All aspects of this alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies. All components of alternative SED-3 utilize common construction materials and procedures.

Availability of Materials and Services: All equipment and materials are available and have been demonstrated sufficiently for the purpose for which they are intended. It is anticipated, once the contractor is mobilized to the site, that sediment excavation and backfilling activities would be completed within a 3week time frame.

Land Use

Tributary D-1-7 flows through land identified as residential and parks by the Town of Deerpark land use map. Part of the area designated as residential and park land use is currently used for livestock crop production. A limited area of sediments in tributary D-1-7 would exhibit lead and cadmium concentrations that would exceed the NYS Part 375 Residential Use SCOs, indicating that this alternative may not be consistent with the current and reasonably anticipated future adjacent use land use.

Cost

The costs associated with alternative SED-3 have been estimated as shown on Table 13. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $1,175,727.

6.5 GROUND WATER ALTERNATIVES

This section describes the three ground water alternatives. Alternative GW-1 would address migration of ground water from the site and would provide a ground water pump and treat system and a point of entry treatment system for the Orange County rental property at 75 Swartwout Road if the well was to be used as a potable water source. Alternative GW-2 would provide potable water to the Orange County rental property through the installation of a point of entry treatment system if the well was to be used as a potable water source.

All three ground water alternatives would include a long-term ground water monitoring program for the following on-site and off-site monitoring wells: MW-6 through MW-10, MW-12 through MW-17 and MW-17A. Monitoring wells would be sampled semi-annually and samples analyzed for fluoride, barium, cadmium, lead and PCBs.

Ground water data has indicated that fluoride, at concentrations above the ground water standard, is leaching from lagoon soils and impacting on-site ground water and to a lesser extent off-site ground water. In one sample fluoride was detected in the Orange County rental property well (10-minute sample) at 3.85 mg/L. This exceeds the NYSDOH drinking water standard (2.2 mg/L) and the NYSDEC ground water standard (1.5 mg/L), but does not exceed the USEPA National Primary Drinking Water Standard (4.0 mg/L). The fluoride concentration in two subsequent samples, one collected by the Orange County Department of Parks (2/16/01) and a second by Delaware Engineering on behalf of C&D Technologies, Inc., (7/31/01) were non detect at a reporting limit of 0.4 mg/L and detected at 0.45 mg/L, respectively.

The fluoride data indicate that the site has had an impact on ground water fluoride concentrations. However, the off-site ground water data indicate that the downgradient impact is limited in extent. Although fluoride was detected in the ground water samples from monitoring well MW-17 (2003; 1,800 ug/L: 2005; 2,120 ug/L) at concentrations slightly above the NYSDEC ground water standard, the concentration was below the NYSDOH drinking water standard. Also, fluoride was not detected in the ground water sample from monitoring well MW-17A, which is located downgradient of well MW-17 and 1,200 feet downgradient of the lagoon center. Fluoride also was not detected (reporting limit of 200 ug/L) in a sample collected from the Harriet Space Park ladies restroom and was detected just at the reporting limit (200 ug/L) in a sample collected from the Town of Deer Park Town Hall. The Town Hall and the Harriet Space Park are located approximately 500 feet and 1,000 feet, respectively, south of the lagoon. The MW-17A, the Town Hall and the Harriet Space Park samples indicate that the off-site extent of ground water with elevated concentrations of fluoride is limited and does not extend much beyond monitoring well MW-17.

6.5.1 Alternative GW-1 Ground Water Control, Treatment and Long-Term Monitoring

6.5.1.1 Description

Ground water pumping wells would be installed downgradient of the lagoon, most likely along the bed of the abandoned rail line. For the purpose of cost estimating it was assumed that two pumping wells installed to a depth of fifty feet would be required and eight (four for each pumping well) observation wells would be installed. A ground water model would be performed prior to designing the ground water pump system to provide a more refined estimate of the number of wells and required depths. Following installation of the pumping wells a pump test would be performed to document the radius of pumping influence and the flow rate of the wells.

The on-site treatment system for the pumping wells would consist of activated alumina down flow columns for fluoride, and if necessary, precipitation for lead and cadmium and activated carbon columns for PCBs. Activated alumina is somewhat specific for fluoride and has a high exchange capacity for this ion. The exchange capacity of activated alumina for fluoride is not affected by the sulfate or chloride concentration of the water. The decreasing order of preference for activated alumina is as follows: OH, PO_4^{3-}, $Cr_20_7^{2-}$, F-, SO_3^{2-}, $Cr0_4^{2-}$, NO_2, Cl^-, NO_3, MnO_4 and SO_4^{2-}.

After the alumina bed is exhausted it is regenerated with one percent sodium hydroxide, rinsed with a dilute acid and then rinsed with water. The rinseate would be collected and shipped off-site for disposal.

A pilot test would be performed to optimize the treatment system configuration and design parameters. For the purpose of the cost estimate it was assumed that two activated alumina columns would be operated simultaneously and that a water storage tank would be used to equalize the column effluent and to maximize column run length. Treated water would be discharged to the tributary D-1-7.

The on-site ground water pump and treatment system would eliminate, to the extent possible, the continued off-site movement of ground water with fluoride concentrations above the ground water standard. Ground water monitoring would be performed on a routine basis to document that the pumping system adequately contains ground water movement away from the former lagoon. This alternative assumes that the existing monitoring well network will be sufficient for the long-term monitoring program.

A treatment system would be installed on the Swartwout well if the well was to be used as a potable water source. The treatment system would consist of a reverse osmosis system installed at the point of entry for fluoride removal. These systems are readily available commercially and are suitable for the removal of fluoride. Prior to design of the system a detailed analysis of the well water would be performed to determine if any pre-filtration was required. For the purpose of the cost estimate it was assumed that a standard filter for iron and manganese removal is necessary.

An easement would restrict the on-site use of ground water as a potable water source without prior testing and treatment if testing indicated contaminant concentrations above NYS or federal drinking water standards.

6.5.1.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would provide a high level of protection to human health and the environment. The off-site migration of untreated ground water would be eliminated, to the extent possible, by the capture zone of the pumping wells located downgradient of the lagoon. The filter system on the Orange County rental property well would provide the home with water for drinking and cooking with fluoride concentrations below the NYSDOH drinking water standard.

Compliance with ARARs/SCGs

The NYSDEC ground water standard for fluoride is 1.5 mg/L and the NYSDOH drinking water standard is 2.2 mg/L. The NYSDEC surface water standard for protection of aquatic life is based on the hardness of the receiving water body. Assuming a hardness of 50 mg/L the surface water standard would be 1.13 mg/L. The fluoride concentration in the effluent from the on-site treatment system would effectively remove fluoride from the ground water to concentrations below both the ground water and surface water standard. The residential treatment system would reduce fluoride concentrations to a level below the NYSDOH drinking water standard of 2.2 mg/L.

If treated ground water is discharged to the tributary D-1-7, the construction of an outfall structure would require substantive compliance with the U.S. Army Corps of Engineers Nationwide Permit Program (Title 33 CFR Part 330) under the Clean Water Act, Section 404(b)(1). The US Fish and Wildlife Service would be notified by the Corps of Engineers under the Nationwide Permit Program regarding any potential impact on the stream by the proposed discharge. Compliance with the substantive requirements of the NYSDEC Surface Water and Ground water Discharges (6 NYCRR 750-757) would also be required.

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is low. Ground water with high fluoride concentrations will be captured prior to leaving the site. The fluoride level in drinking water at the Orange County rental property on Swartwout Road will be maintained at a concentration below the NYSDOH drinking water standard.

Adequacy and reliability of controls: Alternative GW-1 endeavors to obtain maximum capture of the fluoride plume through optimum pumping well placement. However, the success of a ground water pumping system to capture the fluoride plume will be dependent on the sub-surface hydrogeology. If ground water modeling and field pump test data demonstrate that required pumping rates are significantly above 50 gpm, then treatment of the fluoride would not be feasible. Ground water monitoring would provide a long-term mechanism for determining if the fluoride continues to migrate off-site. Treatment system monitoring would ensure that the treatment system effluent meets the ground water quality and discharge standards. Periodic ground water and treatment system influent monitoring would provide a basis for evaluating impact of ground water pumping and other remedial measures on ground water fluoride concentrations.

The treatment system on the Orange County rental property potable well would be routinely monitored to insure that fluoride concentrations at the tap are below the NYSDOH drinking water standard. Maintenance would be performed as necessary to keep the system operational. Both reverse osmosis and activated alumina have been demonstrated to effectively remove fluoride on small potable drinking water systems. Monitoring would be performed on the treatment system influent to monitor ground water fluoride concentrations prior to treatment.

Reduction of Toxicity, Mobility and Volume Through Treatment
Ground water treatment at the site would reduce the volume of fluoride leaving the site. Contaminant mobility would be reduced by removing the fluoride from the ground water. Toxicity of the fluoride would not be affected. The fluoride ultimately would be desorbed from the activated alumina and transported off-site for disposal. Fluoride in ground water from the Orange County rental property well would be removed by reverse osmosis or alumina filtration. As cartridges and membranes became saturated they would be properly disposed of.

Short-Term Effectiveness

There would be no significant risks or adverse impacts to the community during implementation of this alternative. Assembling the pumping system and activated alumina treatment system would not pose a substantial risk to workers. The ground water pumping system would pose no adverse impacts on the environment. The cone of influence of the pumping wells would not affect ground water elevations for any significant distance beyond the site boundary. The treatment system that would be installed on the Orange County rental property well would not have any impact on the residents or workers who install the system.

Implementability

Ability to Construct and Operate: Ground water extraction wells and an outfall structure, and the Orange County rental property well treatment system could be readily constructed. A pilot test would be necessary to determine the best design parameters for the ground water treatment system. However, all components of the treatment system are readily available.

Reliability: There are many examples where ground water pump and treat systems have been used to capture a ground water plume, although the ground water pumping rates and required length of operation are variable. However, if ground water modeling and field pump test data demonstrated that pumping rates necessary to capture the fluoride plume are significantly higher than 50 gpm, the treatment of fluoride would not be feasible. Activated alumina has been shown to be effective in removing fluoride, although the process would be cost prohibitive at high flow rates. Reverse osmosis and activated alumina residential treatment systems have been shown to be reliable and effective with proper operation, monitoring and maintenance.

Availability of Materials and Services: There are numerous contractors that can install ground water pumping wells and construct the treatment system. It will require a qualified engineer in water treatment design to design the activated alumina treatment system.

Land Use

This alternative would have no impact on the current or reasonable future use of the site or surrounding area. The alternative would require an easement restricting the on-site use of ground water as a potable water source without prior testing. Treatment would be required if testing indicated contaminant concentrations above NYS or federal drinking water standards.

Cost

The costs associated with alternative GW-1 have been estimated as shown on Table 14. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $5,073,632.

6.5.2 Alternative GW-2: Residential Treatment System And Long-Term Monitoring

6.5.2.1 Description

This alternative consists of a residential treatment system at the Orange County rental property if the well was to be used as a source of potable water. The treatment system would be a reverse osmosis system installed at the point of entry for fluoride removal. The filter system would provide the home with water for drinking and cooking with fluoride concentrations below the NYSDOH drinking water standard.

Although this system would not address the off-site migration of ground water with fluoride concentrations above the NYSDEC ground water standard or the NYSDOH drinking water standard, it would address the limited historical detection of fluoride in the residential potable well. The Orange County rental property is the only nearby downgradient receptor. The lands located southeast of the site, in the direction of ground water flow, were deeded by the Swartwouts to Orange County as conservation lands with restrictions on development, which minimizes future development and ingestion of ground water. Long-term monitoring of the on-site and off-site ground water monitoring wells would be performed on a semi-annual basis. The Orange County rental property well and the treatment system would be monitored on a quarterly basis to insure proper system operation. All samples would be analyzed for PCBs, cadmium, barium, lead and fluoride.

Implementation of the lagoon soil remedial alternative that is ultimately approved will reduce the migration of fluoride from the site by a combination of removal and an asphalt cap. Until fluoride concentrations in ground water from the Orange county rental property potable well consistently fall below the NYSDOH drinking water standard, the residential treatment system would remain operational.

6.5.2.2 Evaluation

Overall protection of Human Health and the Environment

This alternative would provide the occupants of the Orange County rental property with drinking water with fluoride concentrations below the NYSDOH drinking water standard.

Compliance with ARARs/SCGs

This alternative would not reduce fluoride concentrations at the residential potable well to concentrations below the NYSDOH drinking water standard. It would provide for removal of the fluoride prior to consumption.

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is low. The residents would be supplied with a reliable source of potable water. However, the treatment system would require long-term operation and maintenance.

Adequacy and reliability of controls: Residential scale reverse osmosis or activated alumina treatment systems are a proven reliable technology.

Reduction of Toxicity, Mobility and Volume Through Treatment

There would be no reduction in toxicity, mobility and volume of contaminants in the ground water with this alternative. Fluoride concentrations in the ground water would be reduced immediately prior to use of the ground water.

Short-Term Effectiveness

There are no short term risks associated with the implementation of this alternative.

Implementability

This alternative could be readily implemented. Contractors are available who could install and maintain a treatment system.

Reliability: Reliable contractors are available to install and maintain a treatment system.

Availability of Materials and Services: There are numerous contractors that can install and maintain a treatment system.

Land Use

This alternative would have no impact on the current or reasonable future use of the site or surrounding area. Potential future use of the property immediately adjacent to and south east of the site in the direction of ground water flow is restricted by a current conservation easement on development. The alternative would require an easement restricting the on-site use of ground water as a potable water source without prior testing and treatment if testing indicated contaminant concentrations above NYS or federal drinking water standards.

Cost

The costs associated with Alternative GW-2 have been estimated as shown on Table 15. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $401,754.

6.5.3 Alternative GW-3: Long-Term Monitoring:

6.5.3.1 Description

This alternative consists of long-term (semi-annual) monitoring of ground water at both the Orange County rental property potable well and at the off-site and on-site ground water monitoring wells. All samples would be analyzed for PCBs, cadmium, barium, lead and fluoride.

On-site and off-site ground water quality would be monitored on a semi-annual basis to ensure that the site continues to have a minimal impact on ground water quality with respect to barium, cadmium, lead and PCBs and that off-site ground water fluoride concentrations are not increasing. Ground water quality from the Orange County rental property potable well would be monitored on a semi-annual basis to confirm the barium, cadmium, fluoride, lead and PCB concentrations in the potable well remain below NYSDOH drinking water standards.

6.5.3.2 Evaluation

Overall protection of Human Health and the Environment

The long-term ground water monitoring program would provide for protection of human health through continuing documentation that barium, cadmium, fluoride, lead and PCB concentrations in the Orange County rental property potable well remain below NYSDOH drinking water standards. Protection of the environment would be achieved by continuing documentation that off-site ground water barium, cadmium, lead and PCB concentrations remain below NYSDEC ground water standards and that fluoride concentrations do not increase above current concentrations. If data indicate that fluoride concentrations at the Orange County rental property potable well exceed drinking water standards a point of entry treatment system would be installed.

Compliance with ARARs/SCGs

This alternative would not reduce off-site fluoride ground water concentrations in the shallow overburden to a concentration below the NYSDEC ground water standard.

Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is low.

Adequacy and reliability of controls: The ground water flow rate between the lagoon and the closest downgradient monitoring well (MW-7) is approximately 0.785 feet per year. At this flow rate it would take approximately 1 year for ground water from the lagoon area to reach on-site monitoring well MW-7. Therefore, semi-annual monitoring represents an adequate monitoring frequency to evaluate off-site ground water quality with respect to barium, cadmium, fluoride, lead and PCBs.

Reduction of Toxicity, Mobility and Volume Through Treatment

There would be no reduction in toxicity, mobility and volume of contaminants with this alternative. However the removal of contaminated soil for off-site disposal and placement of an asphalt cap associated with the lagoon soil alternatives would over time reduce the mobility of fluoride.

Short-Term Effectiveness

There are no short term risks associated with the implementation of this alternative.

Implementability

This alternative could be readily implemented.

Reliability: Ground water sample collection and analysis is a routine task.

Availability of Materials and Services: There are numerous firms that can conduct the semi-annual monitoring.

Land Use

This alternative would have no impact on the current or reasonable future use of the site or surrounding area. Potential future use of the property immediately adjacent to and south east of the site in the direction of ground water flow is restricted by a current conservation easement on development. The alternative would require an easement restricting the on-site use of ground water as a potable water source without prior testing and treatment if testing indicated contaminant concentrations above NYS or federal drinking water standards.

Cost

The costs associated with Alternative GW-3 have been estimated as shown on Table 16. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $323,590.

6.6 SURFACE SOIL ALTERNATIVE

In April 2010, the Department approved a proposed amendment to the OU-1/OU-2 FS recommending a single alternative for the remediation of on-site and off-site surface soils. The surface soil alternative, which was previously described in Section 4.5, recommends ex-situ stabilization and placement of the soils in the lagoon instead of in-situ stabilization in the approved alternative. An analysis of this alternative is provided in the following sections.

6.6.1 Overall protection of Human Health and the Environment

This alternative would provide a high level of projection for human health and the environment. Off-site surface soils would be remediated to the Part 375 Residential Use SCO. The top foot of on-site surface soils would be removed, chemically stabilized and placed in the lagoon. In areas currently unpaved, one foot of clean fill would be placed in the excavated area. In areas currently paved, new sub-base and pavement would be placed in the excavated area. If on-site soil concentrations in the remediated area below the one foot excavation depth exceeded the Part 375 Commercial Use SCO an environmental easement and soil management plan would be implemented.

6.6.2 Compliance with ARARs/SCGs

This alternative would be compliant with the NYS Part 375 soil cleanup objectives for the current and the reasonable foreseeable future use of the site and adjacent property. Off-site surface soils would be remediated to the Part 375 Residential Use SCO. The top foot of the on-site soils would be remediated to the Part 375 Commercial Use SCOs. If on-site soil concentrations in the remediated area below the one foot excavation depth exceeded the Part 375 Commercial Use SCO an environmental easement and soil management plan would be implemented.

6.6.3 Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for this alternative is low. Chemical stabilization is a well-documented treatment procedure for metal compounds and has been extensively used for treatment of hazardous wastes. The stabilized soils would be contained and isolated in place below a cap.

Adequacy and reliability of controls: The combination of stabilizing the contaminated soils and installing an asphalt cap would achieve the performance requirement of immobilizing contaminants and preventing direct contact by future potential receptors. Stabilization of metals in soils and hazardous wastes is a proven technology. Implementation of and compliance with land use restrictions and long-term maintenance obligations would aid in preserving cap integrity and limiting exposure. Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity

Permanence: The stabilization of the metals in the soils with phosphate based compounds creates insoluble metal compounds. This reaction represents a permanent remedy. The bench scale and field scale treatability tests that would be conducted during the remedial design phase would provide data to maximize the effectiveness of the stabilization. The stabilization of the soils and placement of these soils above the ground water table would provide a permanent long-term remedy.

6.6.4 Reduction of Toxicity, Mobility and Volume Through Treatment

Stabilization of the surface soils and placement in the lagoon above the water table and beneath an asphalt cap will significantly reduce the mobility of lead. Stabilization to eliminate leaching will not directly reduce the potential toxicity or the volume of the soils. However, since these remedies eliminate exposure, toxicity is not a concern.

6.6.5 Short-Term Effectiveness

During stabilization and excavation activities, fugitive dust would be controlled using engineering measures. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

Workers involved with the soil process could be exposed to the risks associated with dermal contact with contaminated soil and chemicals and inhalation of dust particulate. Risks would be mitigated by properly outfitting workers with appropriate personal protection equipment, following proper industrial hygiene procedures, using controlled excavations, and monitoring air quality during soil excavation and mixing activities. All work-associated safety practices would be outlined in a Health and Safety Plan, including a description of the control measures that would be implemented at the site.

The impact to the community and the environment would be minimal since residences are scarce in the surrounding area and controls would be implemented to minimize fugitive dust. Installation of the asphalt cap would provide no immediate risks to workers, the community or the environment

6.6.6 Implementability

Ex-situ stabilization of metals in soils is a common remediation technology. Excavation of the on-site and off-site surface soils and sub pavement soils with subsequent stabilization and placement of stabilized soils in the lagoon is readily implementable.

Backfilling of the surface soils with clean fill and repaving will use common general construction techniques.

The contractor would be required to document the performance of the proposed dosage rates that were based on available field data and laboratory bench scale tests. The contractor would perform a field demonstration followed by post- treatment testing to confirm the proposed dosing rate. The asphalt cap could be installed with little or no difficulty.

Reliability: All aspects of this alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies. All components utilize available construction equipment and materials, proven procedures, and routine sampling procedures and analyses. Installation of an asphalt cap would provide a high degree of reliability, provided long-term maintenance activities and environmental easements are implemented.

Availability of Materials and Services: It is anticipated that once the contractor is mobilized to the Site, that excavation, stabilization/solidification, confirmatory sampling, transportation, backfilling and paving would be completed within a 5 week time frame

6.6.7 Land Use

This alternative is consistent with the Town of Deerpark zoning and master plan. The off-site soils will be remediated to the NYS Part 375 Residential Use SCO and top foot of the on-site soils will be remediated to the NYS Part 375 Commercial Use SCOs. This is consistent with the current and reasonable foreseeable future use of the site and the adjacent property.

6.6.8 Cost

The cost of this alternative has been estimated as shown on Table 17. A summary of these costs and a comparison with the costs associated with other alternatives is provided on Table 21. The estimated total costs associated with this alternative are $1,205,739.

7.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This analysis provides a comparative assessment of the remedial alternatives to evaluate the relative performance of each in relation to the specific evaluation criteria. The results of the individual analyses presented in Section 6.0 are used in this evaluation to determine which alternative best satisfies the evaluation criteria. The purpose is to identify the advantages and disadvantages of each alternative relative to one another so that cost, health and environmental risk factors can be identified.

The comparative analysis focuses mainly on those aspects of the alternatives that are unique for each. A comparison of the alternatives is provided in Table 7. Lagoon soil alternatives are discussed in Section 7.1, Tributary D-1-7 sediment alternatives in Section 7.2 and ground water alternatives in Section 7.3. A summary of costs associated with each remedial alternative is presented in Table 21.

7.1 COMPARISON OF LAGOON SOIL ALTERNATIVES

The lagoon soil alternatives are No Action, Unrestricted Use, Alternative Lagoon Soil-1, Alternative Lagoon Soil-2 and Alternative Lagoon Soil-3. Alternative Lagoon Soil-1 is the remedial alternative selected by the NYSDEC for lagoon unsaturated zone soils. Alternative Lagoon Soil-2 includes removal of 4 to 6 feet of contaminated soil in the unsaturated zone and also includes targeted removal of soil in the saturated zone with TCLP cadmium concentrations above the TCLP regulatory limit. Alternative Lagoon Soil-3 involves removal of 4 to 6 feet of contaminated soil in the unsaturated zone, but avoids the need for the sheet piling associated with Alternatives Lagoon Soil -1 and Lagoon Soil-2, which is potentially problematic.

7.1.1 Protection of Human Health and the Environment

Alternative 1, the No Action Alternative, is the least protective of human health and the environment, as it does not prevent exposure or further reduce potential risks to human health and the environment.

Alternative 2, the unrestricted use alternative would provide the highest level of protection for human health and the environment. All lagoon soils with concentrations above the Part 375 Unrestricted Use SCO would be transported off-site to an approved disposal facility.

Alternative Lagoon Soil-1 involves partial excavation (6-8 ft.) and off-site disposal of soils and ex-situ stabilization and on-site disposal of remaining soils in the unsaturated zone. Alternative Lagoon Soil-1 also includes an asphalt cap, institutional controls and long-term monitoring. Alternative Lagoon Soil-1 would effectively immobilize the metals that would remain in place within the unsaturated zone. Alternative Lagoon Soil-1 would remove PCB impacted soils to concentrations generally less than 25 ppm; two of fifteen samples collected below a depth of six feet exhibited PCB concentrations that were only slightly above 25 ppm (26 ppm and 31 ppm).

Alternative Lagoon Soil-2 and Lagoon Soil-3 would provide a high level of protection to human health and the environment. The upper strata of soil (4-6 ft.) containing higher constituent concentrations would be completely removed. A high percentage by mass of the PCBs, cadmium, lead and fluoride in the lagoon would be removed and transported to an off-site disposal facility. This alternative would remove from the unsaturated zone approximately 65 percent by mass (14,772 pounds) of the total cadmium in the lagoon and 33 percent by mass (8,415 lbs.) of lead in the lagoon (based on available data down to a depth of 24-26 ft. below lagoon floor). Approximately, 41 percent by mass (250 pounds) of the total fluoride in the lagoon (based on available data down to a depth of 10-12ft below lagoon floor) and 77 percent by mass (722 pounds) of the total PCBs in the lagoon (based on available data down to a depth of 15-16 ft. below lagoon floor) would be removed from the lagoon

Alternatives Lagoon Soil-2 and Lagoon Soil-3 would remove PCB impacted soils to concentrations generally less than 25 ppm; two of fifteen samples collected below a depth of six feet exhibited PCB concentrations that were only slightly above 25 ppm (26 ppm and 31 ppm).

Alternatives Lagoon Soil-2 and Lagoon Soil-3 would treat remaining soils in the unsaturated zone and seven feet of soil over 20 percent of the lagoon in the saturated zone in the vicinity of boring SB-5-05 that exhibited TCLP cadmium concentrations above the TCLP regulatory limit. Alternative Lagoon Soil-2 involves excavation and ex-situ stabilization of the remaining soils in the unsaturated zone and the saturated zone soils in the vicinity of SB-5-05. The soils would be excavated, stabilized on-site and placed back into the lagoon above the saturated zone. The removal of soils in the saturated zone with cadmium concentrations above the TCLP regulatory limit would reduce the potential for soils in the saturated zone to leach cadmium to ground water.

Alternative Lagoon Soil-3 would utilize in-situ technologies to treat soils in place to create insoluble metal compound and bind the soil in a solidified matrix. Although the treated soils in the saturated zone in the vicinity of boring SB-5-05 would remain in the saturated zone, the soils would be solidified to form an impermeable matrix and therefore, leaching of cadmium is not a concern. Additionally, with the exception of one sample from monitoring well MW-7 (July 2001), cadmium has not been detected above the NYSDEC ground water standard in any monitoring well located downgradient of the lagoon. Data indicate that cadmium in both the saturated and unsaturated zone soils is apparently present in an immobile form and in place treatment of the soils with a Portland cement/grout mixture would ensure that the metals remain immobile.

All three lagoon soil alternatives include installation of an asphalt cap that would effectively isolate residual constituents and prevent exposure to residual impacted soils. The asphalt cap would provide an effective infiltration barrier and would significantly reduce contaminant mobility. Furthermore, a cap would prevent uptake of constituents in vegetation thereby reducing any risks to higher order receptors in the food chain.

7.1.2 Compliance With ARARs/SCGs

Under Alternative 1, the No Action Alternative, compliance with ARARs/SCGs would not be satisfied because contaminated soil would not be treated or removed and ground water would not be addressed. Alternative 2, the Unrestricted Use alternative would be compliant with ARARs/SCGs without the use on institutional or engineering controls.

Alternatives Lagoon Soil-1, alternative Lagoon Soil-2 and alternative Lagoon Soil-3 would not be completely compliant with NYSDEC Part 375. Alternative Lagoon Soil-1 would leave soils in the saturated zone with cadmium concentrations above the TCLP regulatory limit. Alternatives Lagoon Soil-1 and Lagoon Soil-2 would involve placement of soils with barium, cadmium and lead concentrations above the NYSDEC Part 375 Protection of Ground Water SCO back into the lagoon above the saturated zone, however the soils would have been stabilized with a stabilization agent (Enviroblend or equivalent) to create insoluble metal phosphate compounds. Alternative Lagoon Soil-3 would stabilize in place soils with lead and cadmium concentrations above the TCLP limit in the unsaturated zone.

All three alternatives would leave a minimal volume of soil with PCB concentrations above the NYSDEC Commercial SCO of 1 mg/Kg and the Protection of Ground Water SCO of 3.2 mg/Kg. However, soils with PCB concentrations above the Commercial SCO would be isolated below an asphalt cap and therefore direct contact with soils above the Commercial SCO is not a concern.

All three alternatives would leave barium, cadmium and lead in the saturated zone at concentrations above the respective NYSDEC Part 375 SCO for Protection of Ground Water. Alternative Lagoon Soil-2 chemically stabilizes the saturated zone soils and Lagoon Soil-3 would solidify the saturated zone soils via mixing with a stabilizing/solidification agent to minimize the mobility of barium, cadmium and lead. Also, available ground water data from monitoring wells located downgradient of the lagoon indicate that lagoon soils have not impacted ground water with respect to these metals.

7.1.3 Short-Term Effectiveness

No short-term impacts to human health or the environment would result from the no action alternative since no construction, treatment, removal, or transport of affected soils would take place. The unrestricted use alternative and alternatives Lagoon Soil-1, Lagoon Soil-2 and Lagoon Soil-3 pose similar and only minimal risks to the community, since off-site transport of affected soils would be limited to a one time occurrence. Properly trained workers utilizing appropriate personal protective equipment during excavation, transport, and disposal mitigate exposure risks. Dust would be controlled as necessary using engineering technologies. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

7.1.4 Long-Term Effectiveness and Permanence

The No Action Alternative imposes theoretical long-term risk for exposure to contaminated soils since removal or treatment would not be implemented. The unrestricted use alternative would remove all soil with barium, cadmium, lead and PCB concentrations above the NYS Part 375 Unrestricted Use SCO and represents a permanent remedy.

Alternatives Lagoon Soil-1, Lagoon Soil-2 and Lagoon Soil-3 would remove the majority of PCBs and cadmium from the former lagoon. Alternatives Lagoon Soil-1 and Lagoon

Soil-2 would provide stabilization of residual metals in the unsaturated zone through reaction with trisodium phosphate as an insoluble metal compound.
In addition to treating soils in the unsaturated zone, alternative Lagoon Soil -2 would stabilize soils in the unsaturated zone and alternative Lagoon Soil-3 solidify soils in the unsaturated zone that exhibit TCLP cadmium concentrations above the TCLP regulatory limit. Alternative Lagoon Soil-2 would stabilize soils by excavation, ex-situ stabilization and placement of the stabilized soils back into the lagoon above the ground water table. Alternative Lagoon Soil-3 solidifies soils in-situ.

Stabilization and solidification of metals in soils is a proven technology that is permanent. The stabilization of the metals in the soils with phosphate based compounds creates insoluble metal phosphate compounds. Solidification with a Portland cement/grout mixture creates a low impermeable matrix and low solubility metal hydroxide compounds. These reactions represent a permanent remedy. The bench scale and field scale treatability tests that would be conducted during the remedial design phase would provide data to maximize the effectiveness of the stabilization/solidification.

All three alternatives include installation of an asphalt cap. Implementation of and compliance with land use restrictions and long-term maintenance obligations would aid in preserving cap integrity and limiting exposure. Long-term maintenance activities include annual visual inspection of the cap and crack and surface repair.

7.1.5 Reduction in Toxicity, Mobility and Volume

The no action alternative does not involve any type of treatment or removal for affected soils at the site, and therefore would not reduce the toxicity, mobility or volume of affected soils. None of the three lagoon soil alternatives would reduce the toxicity or volume of contaminants. The unrestricted use alternative would reduce the on-site mobility and volume of contaminants by removal to an off-site disposal facility.

All three lagoon soil alternatives included construction of an asphalt cap that would provide an effective infiltration barrier and would significantly reduce contaminant mobility. Furthermore, a cap would prevent uptake of constituents in vegetation thereby reducing any risks to higher order receptors in the food chain.

Alternative Lagoon Soil-1 significantly reduces mobility of cadmium, lead and barium via chemical stabilization of the metals in the unsaturated zone and removal of the upper six to eight foot strata from the site. In alternative Lagoon Soil-1 the metal constituents in the lower six to eight foot strata would be immobilized by transforming potentially leachable contaminants into insoluble and less mobile metal compounds. Alternative Lagoon Soil-1 would not address saturated zone soils that exhibit TCLP cadmium concentrations above the TCLP regulatory limit.

Both alternative Lagoon Soil-2 and Lagoon Soil-3 involve complete removal of the upper 4 to 6 foot strata from the Site would significantly reduce contaminant mobility through removal of the majority of the contaminants. Approximately 65 percent by mass (14,772 pounds) of the total cadmium in the lagoon and 33 percent (8,415 lbs.) of lead in the lagoon (based on available data down to a depth of 24-26 ft. below lagoon floor), approximately, 41 percent by mass (250 pounds) of the total fluoride in the lagoon (based on available data down to a depth of 10-12ft below lagoon floor) and 77 percent by mass (722 pounds) of the total PCBs in the lagoon (based on available data down to a depth of 15-16 ft. below lagoon floor) would be removed from the site through the excavation and off-site disposal of the upper 4 to 6 foot strata. Because the lagoon soils are TCLP characteristic wastes with respect to cadmium, soils will require treatment at the disposal facility to meet the Federal Land Disposal Restrictions (LDRs). This would significantly reduce the mobility of cadmium, lead and barium in the soils that are transported off-Site for disposal.

Further reduction in contaminant mobility is achieved by stabilization or solidification of the remaining soils in the unsaturated zone and seven feet of soils in the saturated zone over 20 % of the lagoon in the vicinity of boring SB-5-05. The asphalt cap would significantly eliminate infiltration. Alternative Lagoon Soil-2 achieves soil stabilization via excavation, ex-situ stabilization and placement of soils back into the lagoon above the ground water table.

Although Lagoon Soil-3 involves in-situ solidification of soils in the saturated zone with TCLP cadmium concentrations above the regulatory limit and the solidified soils in the saturated zone would remain in place, the solidification process would create a low impermeable monolith and low solubility metal hydroxide compounds which would significantly reduce the mobility of metals in the stabilized area. Also, ground water data indicates that the barium, cadmium and lead in the lagoon unsaturated and saturated zone soils are not mobile. On-site and off-site ground water monitoring well data indicate that ground water quality has not been impacted with respect to barium, lead and cadmium. With the exception of one cadmium sample from monitoring well MW-7 and one lead sample from monitoring well MW-6, all ground water cadmium and lead concentrations have been below the ground water standard.

The July 2001, MW-7 cadmium concentration (5.6 ug/L) and the September 1999 MW-6 lead concentration were slightly higher than the respective NYSDEC ground water standards (Cadmium 5 ug/L: Lead 25 ug/L). The September 1999 and July 2001 samples were collected using a Waterra Inertia pump.

The July 2001 MW-7 sample exhibited a high turbidity (619 NTUs) indicating a significant sample sediment load and the reported result is not considered representative of the actual ground water cadmium concentration. A second sample was collected from monitoring well MW-7 in July 2001 using a micro purging technique. The MW-7 ground water cadmium concentration (0.47ug/L) in the sample collected using the micro purging technique, which minimizes the sediment load in a sample, was well below the ground water standard. The sample collected using the micro purging technique is considered more representative of the actual concentration of cadmium in the ground water sample that could migrate via ground water flow.

The September 1999 MW-6 total matrix lead concentration (29.4 ug/L) was only slightly above the ground water standard of 25 ug/L. However, lead was not detected (at a reporting limit of 3 ug/L) in the September 1999 field filtered sample from MW-6.

Sediment present in a total matrix sample will have metal ions both sorbed to its surface and as an integral component of the sediment itself. When sediment-laden samples are preserved with acid in the field (per standard protocol), and especially when samples are prepared in the laboratory via hot acid digestion (also per standard protocol), metals will be desorbed from the sediment matrix, resulting in reported ground water metals concentrations that are higher than is actually dissolved in the ground water.

7.1.6 Implementability

The no action alternative is readily implementable since no construction or site activities are part of this alternative.

The unrestricted use alternative and the Lagoon Soil-1 and Lagoon Soil-2 alternatives would be difficult to implement and would require experienced contractors who specialize in sheet piling and deep excavation. These alternatives would require the installation of an extensive sheet piling system to stabilize the adjacent building foundation and the excavation. The unrestricted use alternative would be the most difficult to implement due to the required depth and area of sheet piling.

Although sheet piling is a proven technology in the construction industry, the site specific soils and the deep excavation could be problematic. Soils boring logs indicate high blow counts which could impede pile driving or simply make it impossible. Soils that exhibit blow counts greater than 20 can slow or impede installation of sheet piling. Soil boring logs for SB-1-05 through SB-3-05, SB-5-05, SB-7-05 and SB-8-05 advanced in the floor of the lagoon and SB-4-05 and SB-6-05 advanced just outside the lagoon during the OU-2 Remedial Investigation (RI) exhibited blow counts as high as 60, which could impede pile driving or simply make it infeasible. Should either of these alternatives be the chosen remedial alternative, further intrusive geotechnical investigation would be necessary to determine the practicability of sheet piling.

Because of the increased depth of sheet piling associated with Alternative Lagoon Soil-2, this alternative will be more difficult to implement than Alternative Lagoon Soil-1. For Lagoon Soil-2 it would be necessary to install the sheet piling to a depth of approximately 40 feet below the floor of the lagoon (54 feet below surrounding grade.) over 20 percent of the lagoon floor verses the 26 feet below the floor of the lagoon (40 feet below the surrounding grade) for Alternative Lagoon Soil-1.

Alternative Lagoon Soil-3 would not require sheet piling, but will require a contractor experienced with in-situ solidification at depth using hydraulic excavators.

7.1.7 Land Use

All the lagoon soil alternatives would be consistent with the Town of Deerpark zoning and master plan and the current and reasonable future land use for the site. The alternative would not have any impact on the current or reasonable future use of the adjacent properties.

7.1.8 Costs

There are no costs associated with Alternative 1 since it involves no action. The cost associated with the Alternatives Lagoon Soil-1, Lagoon Soil-2 and Lagoon Soil-3 are presented in Tables 8 and 9 and 10, respectively. The cost for the unrestricted use alternative for the lagoon soils is presented in Table 18. The costs for implementation of Alternative Lagoon Soil-1, Lagoon Soil-2 and Lagoon Soil-3 are estimated at $3,605,720, $3,800,727 and $2,760,591, respectively. The cost associated with Alternative Soil-2 assumes that dewatering for excavation of the soils below the ground water table will not be necessary.

The higher cost for Alternatives Lagoon Soil-1 and Lagoon Soil-2 is associated with the sheet piling needed for the excavation and ex-situ stabilization of the lagoon soil. Although the shallow soil mixing associated with alternative Lagoon Soil-3 has a higher per cubic yard cost for stabilization than either Lagoon Soil-1 and Lagoon Soil-2, alternative Lagoon Soil -3 does not require any sheet piling and therefore has an overall lower cost.

7.2 COMPARISON OF TRIBUTARY D-1-7 SEDIMENT ALTERNATIVES

The alternatives for Tributary D-1-7 sediments are the No Action alternative and alternatives SED-1, SED-2 and SED-3. Alternative SED-2 and the unrestricted use alternative are the same except that all sediments would be transported to an off-site location in the unrestricted use alternative. Alternatives SED-1, SED-2 and SED-3 include excavation of impacted sediments from Tributary D-1-7. The only difference between the three alternatives is the quantity of sediments proposed for excavation. Alternative SED-2 involves the highest volume of sediment removal.

7.2.1 Protection of Human Health and the Environment

Sediment quality in the stream with respect to invertebrate aquatic life toxicity would not change under the no action alternative. However, although sediments with lead concentrations above the SEL concentration and cadmium concentrations above the LEL concentration would remain in the stream, there would be no disturbance of the existing aquatic habitats under the no action alternative.

The sediment excavation associated with Alternatives SED-1, SED-2/unrestricted use and SED-3 would have an impact on aquatic life within the excavation zone. All invertebrate aquatic life and vegetation within the sediment removal area would be eliminated until natural re-colonization of the backfilled excavation occurred. All stream bank vegetation that prevents stream bank erosion would be eliminated until vegetation planted as part of the restoration measures becomes established. Over story vegetation that provides shading of the stream and thermal protection of stream temperatures would be eliminated. Reestablishment of over story vegetation to an extent that would approach pre-remediation conditions would take several years. Alternative SED-3 would have the least impact on aquatic life and stream bed and bank vegetation.

The dwarf wedge mussel (Alasmindonta heterodon) a Federal and New York State endangered species is known to occur in the Neversink River in Orange County. Tributary D-1-7 discharges to the Neversink River and the aquatic habitat of Tributary D-1-7 is consistent with the aquatic habitats preferred by the dwarf wedge mussel. Excavation of the streambed would impact potential dwarf wedge mussel habitat and potentially individual dwarf wedge mussels. Due to the dense streambed vegetation and the silty composition of the stream bed, finding and relocating any dwarf wedge mussels that are potentially present within the proposed excavation areas is not practicable.

Alternative SED-1 would improve stream sediment quality by excavation of approximately 63.6% of the sediments with lead concentrations above the SEL concentration and approximately 62.4% of the sediments with cadmium concentrations above the LEL concentration. Alternative SED-2 would remove all sediments with cadmium and lead concentrations above the LEL concentrations. Alternative SED-3 would remove 33 % of the sediments with lead concentrations above the SEL concentration and 32% of the sediments with cadmium concentrations above the LEL concentration.

7.2.2 Compliance With ARARs/SCGs

The no action alternative would not be compliant with NYSDEC guidance for sediment metal concentrations ("Technical Guidance for Contaminated Sediments, January 1999).

Alternative SED-1 would not be completely compliant with NYSDEC guidance for sediment metal concentrations ("Technical Guidance for Contaminated Sediments, January 1999). Approximately 63.6 % of the sediments with lead concentrations above the SEL concentration would be removed from the stream and approximately 62.4 % of sediments with cadmium concentrations above the LEL concentration would be removed from tributary D-1-7. However, alternative SED-1 would have less impact on tributary D-1-7 while removing the majority of sediments with elevated lead and cadmium concentrations and all sediments with PCB concentrations above 1 mg/Kg.

Alternative SED-2 and the unrestricted use alternative would be compliant with the NYSDEC guidance for sediment metal concentrations. However, these alternatives would require largest disturbance (approximately 3,078 linear feet of stream) of tributary D-1-7.

Alternative SED-3 would not be compliant with the NYSDEC guidance for sediment metal concentrations ("Technical Guidance for Contaminated Sediments, January 1999).

Approximately 33 % of the sediments with lead concentrations above the SEL concentration and 32% of the sediments with cadmium concentrations above the LEL concentration would be removed from the tributary D-1-7.

7.2.3 Short-Term Effectiveness

No short-term impacts to human health or the environment are associated with the no action alternative.

Potential short-term impacts to human health associated with alternatives SED-1, SED-2/unrestricted use and SED-3 are similar. Impacts area related to increased truck traffic from transport of excavated sediments. No dust is anticipated during actual excavation of the sediments. Dust generated by truck traffic would be controlled as necessary using engineering technologies. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

The sediment excavation associated with alternatives SED-1 and SED-2/Unrestricted Use would have a significant impact on aquatic life within the excavation zone. All invertebrate aquatic life and vegetation within the sediment removal area would be eliminated until natural recolonization of the backfilled excavation occurred. Alternative SED-1 and SED-2 would impact approximately 1,132 and 3,078 linear feet of streambed and stream bank, respectively. All stream bank vegetation that prevents stream bank erosion would be eliminated until vegetation planted as part of the restoration measures becomes established. Over story vegetation that provides shading of the stream and thermal protection of stream temperatures would be eliminated. Reestablishment of over story vegetation to an extent that would approach pre-remediation conditions would take several years. As previously discussed alternatives SED-1 and SED-2/unrestricted use would impact habitat for the endangered dwarf wedge mussel.

Sediment Alternative SED-3 would also have an impact on aquatic life within the excavation zone and an impact on potential dwarf wedge mussel habitat. However, the extent of impact would be limited to approximately 278 linear feet of stream bed which is significantly less than SED-1 and SED-2.

7.2.4 Long-Term Effectiveness and Permanence

The no action alternative would not remove any impacted sediments from Tributary D-1-7. However, this alternative would also not involve any disturbance to the Tributary D-1-7 aquatic habitat. Alternative SED-1, SED-2/Unrestricted Use and SED-3 are permanent remedies in that impacted sediments would be removed from the stream. Alternative SED-2 and the unrestricted use alternative are more effective in that it removes all sediments with cadmium and lead concentrations above the NYSDEC LEL. However, Alternative SED-2/Unrestricted Use has a significantly larger impact on the existing aquatic habitat than either alternative SED-1 or SED-3

7.2.5 Reduction in Toxicity, Mobility and Volume

Alternative SED-1, SED-2 and SED-3 reduce the mobility of cadmium and lead in the tributary D-1-7 aquatic system by removing contaminated sediments and placing them under an asphalt cap. The unrestricted use alternative would reduce mobility by transporting sediments off-site for disposal at a NYSDEC Part 360 approved landfill Alternative SED-2 removes a greater volume of sediments with cadmium and lead concentrations above the NYSDEC LEL concentration. However, Alternative SED-2 and the unrestricted use alternative have a significantly larger impact on the existing aquatic habitat. Alternative SED-1, SED-2 and SED-3 do not directly reduce the toxicity or volume of cadmium and lead via treatment or recycling. However, the toxicity of the sediments to aquatic life in tributary D-1-7 is reduced by removal of the sediments from the stream.

7.2.6 Implementability

Alternatives SED-1, SED-2 and SED-3 can be implemented using readily available materials, equipment, and construction practices. The sediment removal will require the installation of cofferdams to isolate the sediment removal area. Stream water will be pumped around the sediment removal area and temporary dewatering points would be installed in the area to facilitate dewatering of the sediments prior to excavation. Due to the length of the excavation areas, the sediment removal will most likely be completed in stages.

7.2.7 Land Use

Tributary D-1-7 flows through land identified as residential and parks by the Town of Deerpark land use map. Part of the area designated as residential and parks is currently used for livestock crop production. All the sediment alternatives are consistent with the current and reasonably anticipated future use land use.

7.2.8 Costs

The costs associated with alternatives SED-1, SED-2 and SED-3 are presented in Tables 11, 12 and 13 respectively. The sediment unrestricted use alternative is provided in Table 19 The estimated costs for implementation of alternative SED-1, SED-2 and SED-3 are $1,629,892; $2,674,125 and $1,175,727, respectively.

7.3 COMPARISON OF GROUND WATER ALTERNATIVES

The alternatives for ground water are the no action alternative, alternative GW-1, GW-2 and GW-3. Alternative GW-1 would address migration of ground water from the site. Alternatives GW-1 and GW-2 would provide potable water to the Orange County rental property through installation of a point of entry treatment system. Alternative GW-3, as well as GW-1 and GW-2 would provide for long-term ground water monitoring.

7.3.1 Protection of Human Health and the Environment

Alternative GW-1, which is the unrestricted use alternative would provide a high level of protection to human health and the environment. The off-site migration of untreated ground water with fluoride concentrations above the NYSDEC ground water standard would be eliminated, to the extent possible, by the capture zone of the pumping wells located downgradient of the lagoon.

Alternatives GW-1 and GW-2 would provide a filter system on the Orange County rental property well if the well was to be used as a potable water source, which would provide the home with water for drinking and cooking with fluoride concentrations below the NYSDOH drinking water standard. However, the most recent data indicates that fluoride concentration in the well are below the NYSDOH drinking water standard.

Alternative GW-3 would provide for protection of human health through continuing documentation that barium, cadmium, fluoride, lead and PCB concentrations in the Orange County rental property potable well remain below NYSDOH drinking water standards. Protection of the environment would be achieved by continuing documentation that off-site ground water barium, cadmium, lead and PCB concentrations remain below NYSDEC ground water standards and that fluoride concentrations do not increase above current concentrations.

7.3.2 Compliance With ARARS/SCGs

The Alternative GW-1 ground water extraction and treatment system would effectively remove fluoride from the ground water to concentrations below both the ground water and surface water standard. The residential treatment system that would be included in the GW-1 and GW-2 alternatives if the well on the Orange County property was to be used as a potable water source, would reduce fluoride concentrations to a level below the NYSDOH drinking water standard of 2.2 mg/L. Although Alternative GW-3 would not directly reduce ground water fluoride concentrations to below NYSDEC ground water standards, the lagoon soil removal and off-site disposal and asphalt cap associated with the lagoon soil alternatives would over time reduce fluoride migration from the site.

7.3.3 Short-Term Effectiveness

There are no significant short-term impacts associated with any of the ground water alternatives.

7.3.4 Long-Term Effectiveness and Permanence

The adequacy of Alternative GW-1 is high, ground water with high fluoride concentrations will be captured prior to leaving the site. The reliability of GW-1 is dependent on the capability of the ground water extraction system to adequately capture ground water from the area of the lagoon before it moves off-site and is dependent on the sub-surface hydrogeology. If ground water modeling and field pump test data demonstrate that required pumping rates are significantly above 50 gpm, then treatment of the fluoride would not be feasible.

The GW-1 and GW-2 treatment systems on the Orange County rental would maintain the fluoride concentration in potable water to the house below the NYSDOH drinking water standard. However, the most recent data indicates that fluoride concentrations from the potable well are currently less than the NYSDOH drinking water standard.

Alternative GW-3 consists of semi-annual long-term monitoring, which is also included in alternatives GW-1 and GW-2. The ground water flow rate at the site is approximately 0.785 feet per year and it would take approximately 1 year for ground water from the lagoon area to reach on-site monitoring well MW-7. Therefore, semi-annual monitoring represents an adequate monitoring frequency to evaluate off-site ground water quality with respect to barium, cadmium, fluoride, lead and PCBs.

7.3.5 Reduction in Toxicity, Mobility and Volume

Alternative GW-1 (ground water capture and treatment) would reduce the volume of fluoride leaving the site. Contaminant mobility would be reduced by removing the fluoride from the ground water. Toxicity of the fluoride would not be affected.

Alternatives GW-1 and GW-2 would remove fluoride in ground water from the Orange County rental property well by reverse osmosis or alumina filtration. As cartridges and membranes became saturated they would be properly disposed of. There would be no reduction in toxicity or mobility of fluoride from the site.

There would be no reduction in toxicity, mobility and volume of contaminants with Alternative GW-3. However the removal of contaminated soil for off-site disposal and placement of an asphalt cap associated with the lagoon soil alternatives would over time reduce the mobility of fluoride.

7.3.6 Implementability

Alternatives GW-2 and GW-3 utilize common and readily available technology and services and are easily implemented. Alternative GW-1 will require design of the ground water extraction system and the treatment system and Implementability is dependent on sub-surface hydrogeology.

7.3.7 Land Use

The proposed ground water alternatives would have no impact on the current or reasonable future use of the site or surrounding area. Potential future use of the property immediately adjacent to and south east of the site in the direction of ground water flow is restricted by a current conservation easement on development. The alternatives would require an easement restricting the on-site use of ground water as a potable water source without prior testing and treatment if testing indicated contaminant concentrations above NYS or federal drinking water standards.

7.**3.8 Cost**

The costs associated with alternatives GW-1, GW-2 and GW-3 are presented in Tables 14, 15 and 16, respectively. The estimated costs for implementation of alternative GW-1, GW-2 and GW-3 are $5,073,632; $401,754 and $323,590 respectively.

7.4 SURFACE SOIL ALTERNATIVES

In April 2010, the Department approved a proposed amendment to the OU-1/OU-2 FS recommending a single alternative for the remediation of on-site and off-site surface soils. The surface soil alternative, which was previously evaluated in Section 6.6, recommends ex-situ stabilization and placement of the soils in the lagoon instead of in-situ stabilization in the approved alternative. The other two surface soil alternatives are the no action and the unrestricted use.

7.4.1 Overall protection of Human Health and the Environment

The no action alternative would not be protective of human health or the environment. Lead concentrations in on-site and off-site surface soils would remain above NYS soil cleanup objectives.

Both the approved surface soil and the unrestricted use alternatives would provide a high level of projection for human health and the environment. The approved surface soil alternative would require an environmental easement and soil management plan if on-site soil concentrations in the remediated area below the one foot excavation depth exceeded the Part 375 Commercial Use SCO.

7.4.2 Compliance with ARARs/SCGs

The no action alternative would not be compliant with the NYS Part 375 soil cleanup objectives. The approved alternative would be compliant with the soil cleanup objectives for the current and the reasonable foreseeable future use of the site and adjacent property. Off-site surface soils would be remediated to the Part 375 Residential Use SCO. The top foot of the on-site soils would be remediated to the Part 375 Commercial Use SCOs. If on-site soil concentrations in the remediated area below the one foot excavation depth exceeded the Part 375 Commercial Use SCO an environmental easement and soil management plan would be implemented. The unrestricted use alternative would be compliant with the Part 375 unrestricted use SCO and would not require an easement.

7.4.3 Long-Term Effectiveness and Permanence

Residual Risk: The long-term risk of exposure for the approved alternative is low. Chemical stabilization is a well-documented treatment procedure for metal compounds and has been extensively used for treatment of hazardous wastes. The stabilized soils would be contained and isolated in place below a cap. There is no residual risk associated with the unrestricted use alternative

Adequacy and reliability of controls: The approved alternatives combination of stabilizing the contaminated soils and installing an asphalt cap would achieve the performance requirement of immobilizing contaminants and preventing direct contact by future potential receptors. Stabilization of metals in soils and hazardous wastes is a proven technology. Long-term maintenance obligations would aid in preserving cap integrity and limiting exposure. Long-term maintenance activities including annual visual inspection of the cap and crack and surface repair would ensure cap integrity.

The unrestricted use alternatives proposal for excavation and off-site disposal at a hazardous waste landfill of the soils with lead concentrations above the Part 375 unrestricted use SCO is an adequate and reliable control.

Permanence: The stabilization of the metals in the soils with phosphate based compounds proposed in the approved alternative creates insoluble metal compounds. This reaction represents a permanent remedy. The bench scale and field scale treatability tests that would be conducted during the remedial design phase would provide data to maximize the effectiveness of the stabilization. The stabilization of the soils and placement of these soils above the ground water table would provide a permanent long-term remedy.

The unrestricted use alternative of off-site disposal at a RCRA Subtitle C hazardous waste landfill would provide a permanent long-term remedy.

7.4.4 Reduction of Toxicity, Mobility and Volume Through Treatment

Both the approved alternative of stabilization of the surface soils and placement in the lagoon above the water table and beneath an asphalt cap and the unrestricted use alternative of disposal in a hazardous waste landfill would significantly reduce the mobility of lead. Neither alternative will directly reduce the potential toxicity or the volume of the soils. However, since these remedies eliminate exposure, toxicity is not a concern.

7.4.5 Short-Term Effectiveness

During stabilization and excavation activities associated with the approved alternative and the excavation activities associated with the unrestricted use alternative, fugitive dust would be controlled using engineering measures. Dust levels would be monitored pursuant to the NYSDOH Community Air Monitoring Plan requirements.

Workers involved with the stabilization and excavation activities could be exposed to the risks associated with dermal contact with contaminated soil and chemicals and inhalation of dust particulate. Risks would be mitigated by properly outfitting workers with appropriate personal protection equipment, following proper industrial hygiene procedures, using controlled excavations, and monitoring air quality during soil excavation and mixing activities. All work-associated safety practices would be outlined in a Health and Safety Plan, including a description of the control measures that would be implemented at the site.

The impact to the community and the environment would be minimal since residences are limited in the surrounding area and controls would be implemented to minimize fugitive dust. Installation of the asphalt cap associated with the approved alternative would provide no immediate risks to workers, the community or the environment. Off-site transport of the soils as proposed in the unrestricted use alternative would have a limited impact on the community and environment since it is a one-time event of limited duration.

7.4.6 Implementability

Bothe the approved alternative and the unrestricted use alternative are readily implementable. Ex-situ stabilization of metals in soils is a common remediation technology. Excavation of the on-site and off-site surface soils and sub pavement soils with subsequent stabilization and placement of stabilized soils in the lagoon is readily implementable. Backfilling of the surface soils with clean fill and repaving will use common general construction techniques.

The contractor would be required to document the performance of the proposed dosage rates that were based on available field data and laboratory bench scale tests. The contractor would perform a field demonstration followed by post- treatment testing to confirm the proposed dosing rate. The asphalt cap could be installed with little or no difficulty.

Reliability: All aspects of both the approved alternative and the unrestricted use alternative would be highly reliable in achieving the remedial action objectives, as the alternative involves proven technologies. All components utilize available construction equipment and materials, proven procedures, and routine sampling procedures and analyses. Installation of an asphalt cap would provide a high degree of reliability, provided long-term maintenance activities and environmental easements are implemented.

Availability of Materials and Services: For the approved alternative, it is anticipated that once the contractor is mobilized to the Site, that excavation, stabilization, confirmatory sampling, transportation, backfilling and paving would be completed in 35 days. It is anticipated that the unrestricted use alternative could be completed in 91 days.

7.4.7 Land Use

Both the approved alternative and the unrestricted use alternative are consistent with the Town of Deerpark zoning and master plan. The approved alternative would remediate off-site soils to the NYS Part 375 Residential Use SCO and top foot of the on-site soils to the NYS Part 375 Commercial Use SCOs. This is consistent with the current and reasonable foreseeable future use of the site and the adjacent property.

7.4.8 Cost

The estimated costs of the approved surface soil alternative ($1,205,739) and the unrestricted use surface soil alternative ($7,251,748) are shown on Tables 17 and 20, respectively. The higher estimated total cost for the unrestricted use alternative is primarily related to off-site disposal costs.

8.0 SELECTED ALTERNATIVES

NYSDEC guidance states that the remedial goal for remedial actions is the restoration of a site to pre-disposal/pre-release conditions, to the extent feasible. At a minimum, the remedy should eliminate or mitigate all significant threats to public health and the environment presented by the contaminants disposed at the site through the proper application of scientific and engineering principles. The remedy that is proposed should remove the contamination and/or reduce or eliminate exposure to the contaminants above the SCGs. At a minimum, this should include removal of the source of the contamination, including but not limited to, any free product and any grossly contaminated soils, to the extent technically and practically feasible.

Based on the information presented in the preceding sections of the FS and the data collected during the RI, the selected alternatives are Lagoon Soil-3, SED-1, GW-2 and the surface soil alternative. This report demonstrates that these alternatives are protective of human health and the environment. Figure 7 depicts the OU-1/OU-2 overall proposed site remedy.

Alternative Lagoon Soil-3 would be protective of human health and the environment without the potential problems related to the installation of sheet piling associated with alternatives Lagoon Soil-1 and Lagoon Soil-2. A significant mass of contaminants in the lagoon would be removed from the site through excavation for off-site disposal of soils to a depth of 4 feet below the lagoon floor and excavation to six feet over twenty percent of the floor in the vicinity of boring SB-1. Metals in the remaining unsaturated zone soils and in the saturated zone to a depth of 7 over 20 percent of the lagoon would be rendered immobile through in-situ solidification/stabilization. The installation of an asphalt cap would effectively isolate residual constituents and prevent exposure to residual impacted soils. Furthermore, a cap would prevent uptake of constituents in vegetation thereby reducing any risks to higher order receptors in the food chain. Since residual concentrations would remain in place, cap demarcation and environmental easements would be required to protect the integrity of the asphalt cap. Appropriate land use restrictions would be implemented to assure that the cap is not breached.

Tributary D-1-7 sediment Alternative SED-1 will improve sediment quality in tributary D-1-7 by removing the sediments that exhibit the highest lead and cadmium concentrations and all sediments with PCB concentrations above 1 mg/Kg. This alternative significantly reduces lead, cadmium and PCB sediment concentrations in Tributary D-1-7 and the volume of impacted sediments, and would improve sediment quality within the area of Tributary D-1-7 affected by the site. Approximately 63.6% of sediment with lead concentrations above the SEL concentration and 62.4% of sediment with cadmium concentrations above the LEL concentration would be removed from tributary D-1-7. This alternative will improve sediment quality while minimizing impacts to aquatic habitats, including potential habitat for the endangered dwarf wedge mussel, and impacts to stream bank vegetation.

The approved surface soil alternative would be protective of human health and the environment. Off-site surface soils would be remediated for lead to the NYS Part 375 Residential Use SCO. The top one foot of the on-site surface soils would be remediated for lead to the NYS Part 375 Commercial Use SCO. If on-site soil concentrations in the remediated area below the one foot excavation depth exceeded the Part 375 Commercial Use SCO an environmental easement and soil management plan would be implemented. The on-site surface soils would be stabilized, placed in the lagoon above the ground water table and the lagoon would be asphalt capped.

The long-term ground water monitoring program would ensure protection of the human health and the environment by providing continuing documentation that off-site ground water barium, cadmium, lead and PCB concentrations remain below NYSDEC ground water standards and that fluoride concentrations do not increase above current concentrations. The ground water flow rate between the lagoon and the closest downgradient monitoring well (MW-7) is approximately 0.785 feet per year. At this flow rate it would take approximately 1 year for ground water from the lagoon area to reach on-site monitoring well MW-7. Therefore, semi-annual monitoring represents an adequate monitoring frequency to evaluate off-site ground water quality with respect to barium, cadmium, fluoride, lead and PCBs. Protection of human health at the only potential downgradient ground water receptor would be provided by installation of a point of entry treatment system on the Orange County residential rental property on Swartwout Road if the well was used for potable water. The system would remain in place until fluoride concentrations in the ground water are below the drinking water for eight consecutive quarterly monitoring events.

TABLES

TABLE 1 C&D POWER SYSTEMS SITE (336001)

LOCATION-SPECIFIC ARARs/SCGs

REQUIREMENT	SYNOPSIS
STATE:	
Use and protection of Waters (6NYCRR Part 608; ECL 15-0501 and 15-0505)	A permit is required to change, modify or disturb any protected stream, its bed or banks, sand, gravel, or any other material; or to excavate or place fill in any marsh, estuary or wetland contiguous to any of the navigable waters of the State.
New York State Title 6 NYCRR Part 375	Inactive Hazardous Waste Disposal Sites
New York State Ambient Water Quality Standards (6NYCRR Parts 700-705)	Defines surface water and aquifer classification and lists specific chemical standards.
Endangered and Threatened Species of Wildlife (6NYCRR Part 182)	Site activities must minimize impact on identified endangered or threatened species of fish or wildlife.
Water Quality Certification	State certification is required if a federal permit is needed for discharge into navigable waters.
FEDERAL:	
Clean Water Act Section 404 (b)(1)/US Army Corps of Engineers Nationwide Permit Program (33 CFR 330)	Activities involving dredging or filling, or the construction or alteration of bulkheads or dikes in navigable waters, including wetlands, are regulated by the Corps of Engineers.
Fish and Wildlife Coordination Act (16 USC 662)	Any action that proposes to modify a body of water or wetland requires consultation with the US Fish and Wildlife Service.
Endangered Species Act (50 CFR 200, 402)	Site activities must minimize impacts on identified endangered plant and animal species.

TABLE 2 C&D POWER SYSTEMS SITE (336001)

CHEMICAL-SPECIFIC ARARs/SCGs

REQUIREMENT	SYNOPSIS
STATE:	
New York State DEC Water Quality Regulations for Surface Waters and Groundwaters (6NYCRR Parts 700-705)	Establishes Standards for surface water and groundwater quality.
New York State DEC Identification and Listing of Hazardous Waste (6NYCRR Part 371)	Defines and regulates PCB's in New York State.
New York State DOH Drinking Water Standards (10NYCRR Part 5)	Enforceable drinking water standards.
FEDERAL:	
Toxic Substance Control Act; TSCA (40 CFR 761)	Regulates management and disposal of material containing PCB's.
Resource Conservation and Recovery Act, Land Disposal Restrictions (40 CFR 268)	Regulates management and disposal of hazardous wastes.

TABLE 3 C&D POWER SYSTEMS SITE (336001)

ACTION-SPECIFIC ARARs/SCGs

STATE:
TAGM #HWR 4057 "Administration of Inactive Hazardous Waste Disposal Site Remediation Program."
NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation, May 2010.
New York State DEC Spill Technology and Remediation Series, STARS Memo #1
New York State DEC Division of Fish and Wildlife, "Technical Guidance for Screening Contaminated Sediments"
New York State Analytical Detectability for Toxic Pollutants
New York State Air Guidelines for the control of Toxic Air Contaminats (Air Guide 1)
New York State DEC Strategy for Groundwater Remediation Decision Making at Inactive Hazardous Waste Site and Petroleum Contaminated Sites in New York State, April 1996
FEDERAL:
Polychlorinated biphenyls (PCB's) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (40 CFR 761)
Clean Water Act (CWA) NPDES Permitting Requirements for Discharge of Treatment System Effluent
CWA Discharge to Publicly Owned Treatment Works; POTW (40 CFR 403)
Occupational Safety and Health Standards for Hazardous Response and General Construction Activites (29 CFR 1904, 1910, 1926)

TABLE 4 C&D POWER SYSTEMS SITE (336001)

POTENTIAL GUIDANCE

STATE:
Use and protection of Waters (6NYCRR Part 608; ECL 15-0501 and 15-0505)
New York State Ambient Water Quality Standards (6NYCRR Parts 700-705)
Endangered and Threatened Species of Wildlife (6NYCRR Part 182)
Water Quality Certification
FEDERAL:
United State EPA Office of Water Regulations and Standards, Interim Sediment Criteria Values for Nonpolar Hydrophobic Organic Contaminants: May 1988, updated for specific contaminants in 1993.
United States EPA Health Effects Assessment (HEA's)
Toxicity Substance Control Act (TSCA) Health Data
Toxicological Profiles, Agency for Toxic Substances and Disease Registry, US Public Health Service
Policy for the Development of Water Quality Based Permit Limitations for Toxic Pollutants (49 Federal Register 9016)
Cancer Assessment Group (National Academy of Science Guidance)
United States EPA Soil Screening Guidance (EPA/540/R-94/101)
United States EPA PCB Spill Policy
Fish and Wildlife Coordination Act Advisories
Executive Order 11990, Protection of Wetlands

TABLE 5 C&D POWER SYSTEMS SITE (336001)

STATE AND FEDERAL CLEAN UP OBJECTIVES

COMPOUND	NYSDEC Part 375 Commercial/ Ground Water Protection/Residential/ Unrestricted SCO's (mg/Kg)	USEPA FEDERAL TSCA GUIDELINE (mg/Kg)	NYSDEC GROUNDWATER STANDARDS 6NYCRR PART 5 (ug/L)	NYSDOH DRINKING WATER STANDARDS 10 NYCRR PART 5 (ug/L)	USEPA DRINKING WATER STANDARDS (ug/L)	NYSDEC Surface Water Standards 6NYCRR Part 703	NYSDEC Sediment Criteria "Technical Guidance For Screening Contaminated Sediment LEL/SEL
Barium	400 / 820 / 350 / 350	NA	1,000	2,000	2,000	1000*	NA
Cadmium	9.3 / 7.5/ 2.5 /2.5	NA	5	5	5	0.87 tt	0.6/9.0
Lead	1000 / 450 / 400 / 63	NA	25	15 t	15 t	1.1 tt	31/110
Fluoride	NA	NA	1,500	2,200	4,000	767 tt	NA
PCB's	1.0 / 3.2 / 1 / 0.1	25 - 100 **	0.09 ***	0.5	0.5	1.0×10^{-6} ttt	0.0258/88,898/621.5/ 45.08****

Notes:
1. All units for groundwater and surface water are reported in ug/L.
2. All units for soil and sediment are reported in mg/kg.
3. "NA" designates not applicable.
4. "SB" designates Site Background.
5. * Human Health Water Supply based standard
6. **Restricted access sites with a cap
7. *** Applies to the sum of the isomers
8. ****Human health bioaccumulation / Aquatic life acute toxicity / Aquatic life chronic toxicity / Wildlife bioaccumulation criteria based on average sediment (0-6" sample) organic carbon (SED-11 through SED-27 and FP-1 through FP-4) concentration of 3.22 %
9. t indicates action level not Maximum Contaminant Level
10. tt indicates aquatic life chronic toxicity standard calculate using average hardness value from Tributary D-1-7
11. ttt indicates standard based on human consumption of fish from fresh waters.

TABLE 6 C&D POWER SYSTEMS SITE (336001)

GENERAL RESPONSE ACTIONS REMEDIAL TECHNOLOGY SCREENING

GENERAL RESPONSE ACTION	TECHNOLOGY	DESCRIPTION	SCREENING COMMENTS
NO ACTION	Non-technology based	No action is taken to control or remove the affected soils, treat or capture ground water or remove affected sediment areas from Tributary D-1-7	**Retained**
INSTITUTIONAL CONTROLS	Access restriction. Contracts	Restrictions to future use of selected areas are specified in the property deed. Contract to supply bottled water or maintain residential treatment system. Long-term ground water monitoring	**Retained**
SOIL CONTAINMENT	Cap	Soils exceeding the clean up objectives are covered with asphalt or concrete.	**Retained**
SOIL REMOVAL	Excavation	Affected areas are excavated to remove contamination.	**Retained**
SOIL DISPOSAL	On-site disposal	Excavated soils are disposed of on-site in a designated area. Soils may be treated prior to disposal.	**Retained**
	Off-site disposal	Excavated soils are transported to an appropriate permitted off-site facility for final disposition.	**Retained**
SOIL TREATMENT	Chemical extraction	Similar to soil washing except solvents are used instead of water to extract contaminants.	**Not Retained** due to the limited amount of soil to be treated and due to high project costs. Process also generates waste solvents.
	Soil washing	Excavated soil is mechanically mixed and rinsed with water to remove contaminants.	**Not Retained** due to the limited amount of soil to be treated and due to high project costs.
	Stabilization/Solidification	Soils are treated on-site, either in-situ or ex-situ to limit the contaminate solubility and mobility through the addition of additives.	**Retained**
GROUND WATER CAPTURE AND/OR TREATMENT	Ground water extraction wells and treatment system	Ground water is captured at Site boundary, treated and discharged	**Retained**
GROUND WATER CUTOFF WALL	Cutoff wall installed to retard movementof ground water from Site	Bentonite slurry wall or sheet pile wall	**Not Retained.** Geology indicates no aquitard in which to tie wall.
SEDIMENT CONTAINMENT	Cap affected sediment areas	Covering affected sediments with clean material	**Not Retained.** Capping of sections of a linear stream is not practicable
SEDIMENT REMOVAL	Dredging/Excavation	Affected areas are dredged or excavated to remove contamination.	**Retained**

TABLE 7 C&D POWER SYSTEMS SITE (336001)

REMEDIAL ALTERNATIVE SCREENING

REMEDIAL ALTERNATIVE	DESCRIPTION	SCREENING COMMENTS
ALTERNATIVE 1:	No action is taken to remove, treat, control or monitor the site	Would not provide for protection of environment or exposure to impacted soils.
ALTERNATIVE 2:	Unrestricted Use Alternative	Retained per requirement of DER-10
ALTERNATIVE LAGOON SOIL-1	Contaminated soils would be stabilized down to a depth of 13 feet or ground water whichever is encountered first. The upper six feet and twenty percent of the next two feet (area near TP-4) would be removed for off-site transportation and disposal. The remaining soils would be excavated, stabilized on-site and placed back into the lagoon. Lagoon would be backfilled to grade and and capped.	Would remove significant quantity of hazardous soil and soil contaminants in unsaturated zone minimize infiltration which will reduce contaminant mobility. Mobility of metals in the unsaturated zone soils would be further reduced by stabilization.
ALTERNATIVE LAGOON SOIL-2	Contaminated soils would be stabilized down to a depth of 20 feet (13-20 feet for a total of seven feet into the saturated zone over 20% lagoon). The upper four feet and twenty percent of the next two feet (area near SB-1) would be removed for off-site transportation and disposal. The remaining soils would be excavated stabilized on site and placed back into the lagoon. The lagoon would be backfilled to grade and capped	Would remove a significant quantity of hazardous soils and soil contaminants from both the unsaturated and saturated zone and minimize infiltration which will reduce contaminant mobility. Mobilityof metals in both the unsaturated and saturated zone would be further reduced by stabilization.
ALTERNATIVE LAGOON SOIL-3	Contaminated soils would be stabilized in-situ down to a depth of 20 feet (13-20 feet for a total of seven feet into the saturated zone over 20% lagoon). The upper four feet and twenty percent of the next two feet (area near SB-1) would be removed for off-site transportation and disposal. The remaining soils would be stabilized in place using shallow mixing technology. The lagoon would be backfilled to grade and capped	Would remove a significant quantity of hazardous soils and soil contaminants from both the unsaturated and saturated zone and minimize infiltration which will reduce contaminant mobility. Mobilityof metals in both the unsaturated and saturated zone would be further reduced by stabilization.
GROUND WATER ALTERNATIVE GW1	Ground water extraction and treatment for fluoride at the site boundary and long-term ground water monitoring. Ground water extraction wells would control off-site movement of ground water. Extracted ground water would be treated for fluoride using activated alumina.	Control migration of ground water with fluoride concentrations above the NYSDEC ground water standard.
GROUND WATER ALTERNATIVE GW2	A residential treatment unit for fluoride would be installed on the Swartwout Road residential well. The system would either be reverse osmosis or activated alumina. This alternative would inlcude long-term ground water monitoring	Would provide drinking and cooking water with fluoride concentrations below the NYSDOH standard at the downgradient receptor
GROUND WATER ALTERNATIVE GW3	Long-Term Monitoring.	Would monitor ground water downgradient of site to ensure no increase in concentration of site related contaminants.
TRIBUTARY D-1-7 SEDIMENT ALTERNATIVE SED-1	Targeted Removal of Contaminated Sediments. Contaminated sediments from sample locations SED-9 to SED-14 would be excavated from the stream and placed into the lagoon above the stabilized lagoon soils as backfill.	Would remove sediments with metal concentrations above the SEL and signifcantly reduce volume of contaminated sediments
TRIBUTARY D-1-7 SEDIMENT ALTERNATIVE SED-2	Sediment Removal: Excavation of sediments with metal concentrations above the NYSDEC LEL concentrations. Excavated sediment would be placed in the lagoon above the stabilized lagoon soils as backfill	Would remove sediments with metal concentrations above the LEL and signifcantly reduce volume of contaminated sediments
TRIBUTARY D-1-7 SEDIMENT ALTERNATIVE SED-3	Sediment Removal: Excavation of some sediments with lead concentrations above the NYSDEC SEL concentrations. Stabilized sediments would be placed in the lagoon above the stabilized lagoon soils as backfill	Would remove sediments with highest lead concentrations and all sediments with PCB concentrations above 1 mg/Kg and signifcantly reduce volume of contaminated sediments
SURFACE SOIL ALTERNATIVE	Ex-Situ Stabilization: Exavate to a depth of one foot and stabilize sub-pavement and surface soils. Place stabilized material in lagoon over the in-situ stabilized soils and the Tributary D-1-7 sediments.	Would remove a significant quantity of potentially hazardous soils (lead) from below broken pavement and eliminate exposure to surface soils out side property boundary with lead concentrations higher than the Residential SCO. Mobilityof metals would be significantly reduced by stabilization.

TABLE 8
C&D POWER SYSTEMS SITE (336001)
ALTERNATIVE SOIL-1 EXCAVATION, DISPOSAL (6'-8') & STABILIZATION UNSATURATED ZONE
ASPHALT CAP, INSTITUTIONAL CONTROLS AND LONG TERM MONITORING

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$161,109	ls	$161,109
Construction of soil staging areas	1	$1,725	ls	$1,725
Sheet Pilling (includes concrete ring supports and sheeting remains in-place)	11,550	$56	sf	$646,800
Excavation of soils for disposal	2,320	$20	cy	$46,400
Transportation/disposal of contaminated soils (without on-site stabilization)	3,320	$242	tons	$803,440
Transportation/disposal of contaminated soils (with on-site stabilization)*	54	$242	tons	$13,068
Transportation/Incineration of contaminated soils >1,000 ppm PCB's	109	$1,413	tons	$154,017
Excavation & handling of materials to stabilize contaminated soils includes 36 cy for off-site disposal	2,429	$50	cy	$121,450
Enviroblend Material Cost (dosing rate @ 5% by weight includes the 36 cubic yards for off-site disposal)	182	$700	tons	$127,400
Placement of stabilized soils back into lagoon	2,393	$20	cy	$47,860
Backfill and compaction of excavated areas	2,320	$19	cy	$44,080
Backfill and compaction of former lagoon area	5,806	$19	cy	$110,314
Installation of asphalt cap	1	$185,000	ls	$185,000
Environmental Easement	1	$6,900	ls	$6,900
Decontamination and health & safety facility	1	$5,750	ls	$5,750
Total Direct Capital Costs:				**$2,475,313**
Direct Expenses				
Confirmatory sampling & Health & Safety Sampling	1	$51,250	ls	$51,250
Field oversight	840	$95	hrs	$79,800
Field oversight expenses	84	$250	days	$21,000
Health & Saftey Monitoring	1	$14,400	ls	$14,400
Total Direct Expenses				**$166,450**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$247,531
Contingency (20% total direct capital costs)				$495,063
Total Indirect Capital Costs:				**$742,594**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$3,384,357**
O & M Costs				
Maintenance of Part 360/asphalt cap	1	$14,400	ls	$14,400
Total Annual O & M Costs:				**$14,400**
Present Worth Costs				
Present Worth of Annual O & M Costs (5.0% discount rate, 30 years)				**$221,363**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$3,605,720**

* 54 tons of contaminated soil plus 5% increase in weight from stabilization = 56.7 tons

TABLE 9
C&D POWER SYSTEMS SITE (336001)
ALTERNATIVE SOIL-2 EXCAVATION, DISPOSAL (4'-6'') & STABILIZATION UNSATURATED AND SATURATED ZONE ZONE
ASPHALT CAP, INSTITUTIONAL CONTROLS AND LONG TERM MONITORING

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$250,000	ls	$250,000
Construction of soil staging areas	1	$1,725	ls	$1,725
Sheet Pilling Unsaturated zone (includes concrete ring supports and sheeting remains in-place)	11,550	$56	sf	$646,800
Sheet Pilling Saturated zone (includes concrete ring supports and sheeting remains in-place)	3,002	$56	sf	$168,112
Excavation and handling of contaminated soils for disposal	1,595	$20	cy	$31,900
Transportation/disposal of contaminated soils (without on-site stabilization)	2,230	$242	tons	$539,660
Transportation/disposal of contaminated soils (with on-site stabilization)*	54	$242	tons	$13,068
Transportation/disposal of contaminated soils >1,000 ppm PCB's	109	$1,413	tons	$154,017
Excavation & handling of materials to stabilize contaminated soils (unsaturated zone) includes 36 cy for off-site disposal	3,662	$50	cy	$183,100
Stabilization of soil for off-site disposal Enviroblend Material Cost (dosing rate @ 5% by weight)	2.7	$700	tons	$1,890
Excavation & handling of materials to stabilize contaminated soils (20% saturated zone)	508	$50	cy	$25,400
Placement of stabilized soils back into lagoon	3,626	$20	cy	$72,520
Enviroblend Material Cost (dosing rate @ 5% by weight) for stabilization of soils to be placed back in lagoon	272	$700	tons	$190,365
Backfill and compaction of excavated areas	1,595	$19	cy	$30,305
Backfill and compaction of former lagoon area	5,806	$19	cy	$110,314
Installation of asphalt cap	1	$185,000	ls	$185,000
Environmental Easement	1	$6,900	ls	$6,900
Decontamination and health & safety facility	1	$5,750	ls	$5,750
Total Direct Capital Costs:				**$2,616,826**
Direct Expenses				
Confirmatory sampling & Health & Safety Sampling	1	$51,040	ls	$51,040
Field oversight	910	$95	hrs	$86,450
Field oversight expenses	91	$250	days	$22,750
Health & Saftey Monitoring	1	$17,250	ls	$17,250
Total Direct Expenses				**$177,490**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$261,683
Contingency (20% total direct capital costs)				$523,365
Total Indirect Capital Costs:				**$785,048**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$3,579,364**
O & M Costs				
Maintenance of Part 360/asphalt cap/Site fence	1	$14,400	ls	$14,400
Total Annual O & M Costs:				**$14,400**
Present Worth Costs				
Present Worth of Annual O & M Costs (5% discount rate, 30 years)				**$221,363**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$3,800,727**

* 54 tons of contaminated soil plus 5% increase in weight from stabilization = 56.7 tons

TABLE 10
C&D POWER SYSTEMS SITE (336001)
LAGOON SOIL -3 PARTIAL (4'-6') EXCAVATION, DISPOSAL, IN-SITU STABILIZATION UNSATURATED AND SATURATED ZONE ASPHALT CAP, INSTITUTIONAL CONTROLS AND LONG TERM MONITORING COST ESTIMATE

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$250,000	ls	$250,000
Construction of soil staging areas	1	$1,500	ls	$1,500
Excavation and handling of contaminated soils for disposal	1,595	$20	cy	$31,900
Transportation/disposal of RCRA Metals contaminated soils (without on-site stabilization) PCBS < 500	2,230	$242	tons	$539,660
Transportation/disposal of RCRA Metals contaminated soils (with on-site stabilization)* PCBs >500 <1000	54	$242	tons	$13,068
Transportation/disposal of RCRA Metals contaminated soils >1,000 ppm PCB's	109	$1,413	tons	$154,017
Excavation & handling to stabilize contaminated soils for off-site disposal	36	$40	cy	$1,440
Stabilization of 36 cy soil for off-site disposal Enviroblend Material Cost (dosing rate @ 5% by weight)	2.7	$700	tons	$1,890
In-Situ Stabilization of Soils	3,626	$100	cy	$362,600
In-Situ Stabilization Cement/Bentonite Slurry Cost (dosing rate @ 15% by weight)	816	$150	tons	$122,378
Backfill and compaction of excavated areas	1,595	$19	cy	$30,305
Backfill and compaction of former lagoon area	5,806	$19	cy	$110,314
Installation asphalt cap	1	$185,000	ls	$185,000
Environmental Easement	1	$6,900	ls	$6,900
Decontamination and health & safety facility	1	$5,750	ls	$5,750
Total Direct Capital Costs:				**$1,816,722**
Direct Expenses				
Confirmatory sampling & Health & Safety Sampling	1	$51,040	ls	$51,040
Field oversight	910	$95	hrs	$86,450
Field oversight expenses	91.0	$250	days	$22,750
Health & Saftey Monitoring	1	$17,250	ls	$17,250
Total Direct Expenses				**$177,490**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$181,672
Contingency (20% total direct capital costs)				$363,344
Total Indirect Capital Costs:				**$545,016**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$2,539,228**
O & M Costs				
Maintenance of Part 360/asphalt cap/Site fence	1	$14,400	ls	$14,400
Total Annual O & M Costs:				**$14,400**
Present Worth Costs				
Present Worth of Annual O & M Costs (5% discount rate, 30 years)				**$221,363**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$2,760,591**

* 54 tons of contaminated soil plus 5% increase in weight from stabilization = 56.7 tons

TABLE 11
C&D POWER SYSTEMS SITE (336001)
ALTERNATIVE SED-1 TARGETED EXCAVATION OF ALL SEDIMENTS
APPROXIMATELY BETWEEN STREAM BED SAMPLES SED-9 AND SED-14

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$57,945	ls	$57,945
Stream Diversion (Cofferdam and Pumping)	1	$879,480	ls	$879,480
Removal of Streambed (Earthwork Including Trucking of Spoils to Lagoon)	2,270	$13	cy	$28,375
Installation of Run of Bank in Streambed	2,270	$19	cy	$43,130
Installation of Access Road for Stream Work	1,200	$88	lf	$105,600
Removal of Access Road for Stream Work and Reseeding	1,200	$19	lf	$22,800
Handling and placement of spoils in lagoon	2,270	$13	cy	$29,510
Stream/Site Restoration	1	$50,000	ls	$50,000
Total Direct Capital Costs:				**$1,216,840**
Direct Expenses				
Field oversight	280	$95	hrs	$26,600
Field oversight expenses	28	$250	days	$7,000
Health & Saftey Monitoring	1	$14,400	ls	$14,400
Total Direct Expenses				**$48,000**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$121,684
Contingency (20% total direct capital costs)				$243,368
Total Indirect Capital Costs:				**$365,052**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$1,629,892**
O & M Costs				
				$0
Total Annual O & M Costs:				**$0**
Present Worth Costs				
Present Worth of Annual O & M Costs (5% discount rate, 30 years)				**$0**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$1,629,892**

TABLE 12
C&D POWER SYSTEMS SITE (336001)
ALTERNATIVE SED-2 EXCAVATION OF SEDIMENTS WITH METALS ABOVE LEL AND PCBs ABOVE 1 Mg/Kg
APPROXIMATELT BETWEEN STREAM BED SAMPLES SED-1 AND SED-23

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$53,751	ls	$53,751
Stream Diversion (Cofferdam and Pumping)	1	$1,205,400	ls	$1,205,400
Removal of Streambed (Earthwork Including Trucking of Spoils to Lagoon)	4,231	$13	cy	$55,003
Installation of Run of Bank in Streambed	4,231	$19	cy	$80,389
Installation of Access Road for Stream Work	3,700	$88	lf	$325,600
Removal of Access Road for Stream Work	3,700	$19	lf	$70,300
Handling and placement of spoils in lagoon	4,231	$13	cy	$55,003
Stream/Site Restoration	1	$150,650	ls	$150,650
Total Direct Capital Costs:				**$1,996,096**
Direct Expenses				
Field oversight	420	$95	hrs	$39,900
Field oversight expenses	42	$250	days	$10,500
Health & Saftey Monitoring	1	$28,800	ls	$28,800
Total Direct Expenses				**$79,200**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$199,610
Contingency (20% total direct capital costs)				$399,219
Total Indirect Capital Costs:				**$598,829**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$2,674,125**
O & M Costs				
				$0
Total Annual O & M Costs:				**$0**
Present Worth Costs				
Present Worth of Annual O & M Costs (5% discount rate, 30 years)				**$0**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$2,674,125**

TABLE 13
C&D POWER SYSTEMS SITE (336001)
ALTERNATIVE SED-3 EXCAVATION OF SEDIMENTS WITH THE HIGHEST LEAD CONCENTRATIONS AND PCBs ABOVE 1 mg/Kg
APPROXIMATELY BETWEEN STREAM BED SAMPLES SED 9 AND SED 10

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$25,520	ls	$25,520
Stream Diversion (Cofferdam and Pumping)	1	$716,520	ls	$716,520
Removal of Streambed (Earthwork Including Trucking of Spoils to Lagoon)	813	$13	cy	$10,569
Installation of Run of Bank in Streambed	813	$19	cy	$15,447
Installation of Access Road for Stream Work	650	$88	lf	$57,200
Removal of Access Road for Stream Work	650	$19	lf	$12,350
Handling, stabilization and placement of spoils in lagoon	813	$13	cy	$10,569
Stream/Site Restoration	1	$28,000	ls	$28,000
Total Direct Capital Costs:				**$876,175**
Direct Expenses				
Field oversight	210	$95	hrs	$19,950
Field oversight expenses	21	$250	days	$5,250
Health & Saftey Monitoring	1	$11,500	ls	$11,500
Total Direct Expenses				**$36,700**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$87,617
Contingency (20% total direct capital costs)				$175,235
Total Indirect Capital Costs:				**$262,852**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$1,175,727**
O & M Costs				
				$0
Total Annual O & M Costs:				**$0**
Present Worth Costs				
Present Worth of Annual O & M Costs (5% discount rate, 30 years)				**$0**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$1,175,727**

TABLE 14
C&D POWER SYSTEMS SITE (336001)
ALTERNATIVE GW-1 GROUND WATER TREATMENT SYSTEM, RESIDENTIAL WELL TREATMENT SYSTEM AND LONG TERM MONITORING

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Two recovery wells	2	$17,250	ea	$34,500
Observation Wells	8	$2,300	ea	$18,400
Pump controls and apert. per well	2	$11,500	ea	$23,000
Metering pit and discharge piping	1	$23,000	ea	$23,000
Treatment Building	1,000	$81	sf	$80,500
Activated alumina (AA) treatment system	1	$465,000	ls	$465,000
Discharge piping to outfall	250	$23	lf	$5,750
Outfall Structure	1	$17,250	ls	$17,250
Residential Property Point of Entry (POE) Treatment System	1	$23,000	ls	$23,000
Total Direct Capital Costs:				**$690,400**
Direct Expenses				
AA Treatment System Pilot Test	1	$28,750	ls	$28,750
AA Treatment System Startup	1	$40,250	ls	$40,250
Step rate pump test on recovery wells	2	$11,500	ea	$23,000
Field Oversight	1	$23,000	ls	$23,000
Total Direct Expenses				**$115,000**
Indirect expenses				
Engineering (20% of total direct capital costs)				$138,080
Contingency (20% total direct capital costs)				$138,080
Total Indirect Capital Costs:				**$276,160**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$1,081,560**
O & M Costs				
Residential Property POE treatment system maintenance including regeneration	1	$1,150	ls	$1,150
Residential Property POE treatment system quarterly monitoring	1	$1,840	ls	$1,840
AA treatment system maintenance including regeneration	1	$234,500	ls	$234,500
Semi-annual ground water monitoring sampling and analysis	2	$9,250	ea	$18,500
Monitoring well maintenance	17	$150	ea	$2,550
Recovery well maintenance	2	$575	ea	$1,150
Total Annual O & M Costs:				**$259,690**
Present Worth Costs				
Present Worth of Annual O & M Costs (4.5% discount rate, 30 years)				**$3,992,072**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$5,073,632**

TABLE 15
C&D POWER SYSTEMS SITE (336001)
ALTERNATIVE GW-2 RESIDENTIAL WELL TREATMENT SYSTEM AND LONG TERM MONITORING

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Residential Property Point of Entry (POE) Treatment System	1	$23,000	ls	$23,000
Total Direct Capital Costs:				**$23,000**
Direct Expenses				
Total Direct Expenses				**$0**
Indirect expenses				
Engineering (20% of total direct capital costs)				$4,600
Contingency (20% total direct capital costs)				$4,600
Total Indirect Capital Costs:				**$9,200**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$32,200**
O & M Costs				
Residential Property POE treatment system maintenance	1	$1,150	ls	$1,150
Residential Property POE treatment system quarterly monitoring	1	$1,840	ls	$1,840
Semi-annual ground water monitoring sampling and analysis	2	$9,250	ea.	$18,500
Monitoring well maintenance	17	$150	ea.	$2,550
Total Annual O & M Costs:				**$24,040**
Present Worth Costs				
Present Worth of Annual O & M Costs (5.0% discount rate, 30 years)				**$369,554**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$401,754**

TABLE 16
C&D POWER SYSTEMS SITE (336001)
ALTERNATIVE GW-3 LONG TERM GROUND WATER MONITORING

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Total Direct Capital Costs:				**$0**
Direct Expenses				
Total Direct Expenses				**$0**
Indirect expenses				
Engineering (20% of total direct capital costs)				$0
Contingency (20% total direct capital costs)				$0
Total Indirect Capital Costs:				**$0**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$0**
O & M Costs				
Semi-annual ground water monitoring sampling, analysis and reporting	2	$9,250	ea.	$18,500
Monitoring well maintenance	17	$150	ea.	$2,550
Total Annual O & M Costs:				**$21,050**
Present Worth Costs				
Present Worth of Annual O & M Costs (5% discount rate, 30 years)				**$323,590**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$323,590**

TABLE 17
C&D POWER SYSTEMS SITE (336001)
Surface Soil Alternative Ex-Situ Stabilization and Placement In Lagoon
Estimated Surface Soil Remediation Cost

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$80,000	ls	$80,000
Excavation & handling of Pavement For Off-Site Disposal)	625	$10	cy	$6,250
Excavation of Soil Area Soils For Ex-Situ Stabilization *	3,420	$15	cy	$51,300
Ex-Situ Stabilization (Mixing of Enviroblend Into Soil and Placement In Lagoon)	3,420	$12	cy	$41,040
Enviroblend Material Cost (dosing rate @ 5% by weight)	257	$700	tons	$179,550
Backfill and compaction of excavated soil area	3,420	$35	cy	$119,700
Re-Paving Pavement Excavation Area (7.5" sub-base, 3" binder coarse, 1.5" wearing coarse)*	7,502	$42	sy	$315,084
Decontamination and health & safety facility	1	$50,000	ls	$50,000
Fencing	1	$20,000	ls	$20,000
Revegetation excavated soil area	1	$26,500	ls	$26,500
Pavement Disposal	940	$60	tons	$56,400
Total Direct Capital Costs:				**$945,824**
Direct Expenses				
Confirmatory sampling & Health & Safety Sampling	1	$28,750	ls	$28,750
Field oversight	350	$95	hrs	$33,250
Field oversight expenses	35	$250	days	$8,750
Total Direct Expenses				**$70,750**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$94,582
Contingency (10% total direct capital costs)				$94,582
Total Indirect Capital Costs:				**$189,165**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$1,205,739**
TOTAL ESTIMATED COST				**$1,205,739**

* 919 cubic yards surface soil and 2,501 cubic yards sub-pavement soil

TABLE 18
C&D POWER SYSTEMS SITE (336001)
ALTERNATIVE 2 LAGOON SOIL UNRESTRICTED USE

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$169,212	ls	$169,212
Construction of soil staging areas	1	$1,500	ls	$1,500
Sheet Pilling (includes concrete ring supports sheeting remains in-place)	21,660	$56	sf	$1,212,960
Excavation and handling of contaminated soils for disposal	9,788	$20	cy	$195,760
Transportation/disposal of contaminated soils (without on-site stabilization)	14,519	$242	tons	$3,513,598
Transportation/disposal of contaminated soils (with on-site stabilization)*	54	$242	tons	$13,068
Transportation/disposal of contaminated soils >1,000 ppm PCB's	109	$1,413	tons	$154,017
Excavation & handling to stabilize contaminated soils for off-site disposal	36	$50	cy	$1,813
Stabilization of 36 cy soil for off-site disposal Enviroblend Material Cost (dosing rate @ 5% by weight)	2.7	$700	tons	$1,890
Backfill and compaction of former lagoon	5,806	$35	cy	$203,210
Backfill and compaction of excavated areas	9,788	$35	cy	$342,580
Total Direct Capital Costs:				**$5,809,607**
Direct Expenses				
Confirmatory sampling & Health & Safety Sampling	1	$51,040	ls	$51,040
Field oversight	910	$95	hrs	$86,450
Field oversight expenses	91.0	$250	days	$22,750
Health & Saftey Monitoring	1	$17,250	ls	$17,250
Total Direct Expenses				**$177,490**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$580,961
Contingency (20% total direct capital costs)				$1,161,921
Total Indirect Capital Costs:				**$1,742,882**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$7,729,980**
O & M Costs				
	0	$0	ls	$0
Total Annual O & M Costs:				**$0**
Present Worth Costs				
Present Worth of Annual O & M Costs (5% discount rate, 30 years)				**$0**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$7,729,980**

* 54 tons of contaminated soil plus 5% increase in weight from stabilization = 56.7 tons

TABLE 19
C&D POWER SYSTEMS SITE (336001)
SEDIMENT UNRESTRICTED: EXCAVATION AND OFF SITE DISPOSAL OF SEDIMENTS WITH METALS ABOVE LEL AND PCBs ABOVE 1 Mg/Kg

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	$52,101	ls	$52,101
Stream Diversion (Cofferdam and Pumping)	1	$1,205,400	ls	$1,205,400
Removal of Streambed (Earthwork Including Trucking of Spoils to Lagoon)	4,231	$13	cy	$55,003
Installation of Run of Bank in Streambed	4,231	$19	cy	$80,389
Installation of Access Road for Stream Work	3,700	$88	lf	$325,600
Removal of Access Road for Stream Work	3,700	$19	lf	$70,300
Off-Site Disposal Landfill and Transportation Costs	6,347	$140	ton	$888,510
Site Restoration	1	$150,650	ls	$150,650
Total Direct Capital Costs:				**$2,827,953**
Direct Expenses				
Field oversight	420	$95	hrs	$39,900
Field oversight expenses	42	$250	days	$10,500
Health & Saftey Monitoring	1	$24,000	ls	$24,000
Total Direct Expenses				**$74,400**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$282,795
Contingency (20% total direct capital costs)				$565,591
Total Indirect Capital Costs:				**$848,386**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$3,750,739**
O & M Costs				
				$0
Total Annual O & M Costs:				**$0**
Present Worth Costs				
Present Worth of Annual O & M Costs (5% discount rate, 30 years)				**$0**
TOTAL CAPITAL AND O&M PRESENT WORTH:				**$3,750,739**

TABLE 20
C&D POWER SYSTEMS SITE (336001)
Surface Soil Unrestricted Alternative Off-Site Disposal

ITEM	QUANTITY	UNIT COST	UNIT	COST
Direct Capital Costs				
Mobilization & Demobilization	1	268,165	ls	$268,165
Excavation & handling of Pavement For Off-Site Disposal)	2,780	10	cy	$27,800
Excavation & handling of Soil for Off-Site Disposal	10,527	40	cy	$421,080
Transportation and Disposal Costs	15,791	242	tons	$3,821,301
Backfill and compaction of excavated soil area	3,113	35	cy	$108,955
Re-Paving Pavement Excavation Area (7.5" sub-base, 3" binder coarse, 1.5" wearing coarse)*	22,242	42	sy	$934,164
Decontamination and health & safety facility	1	50,000	ls	$50,000
Fencing	1	20,000	ls	$20,000
Revegetation excavated soil area	1	26,500	ls	$26,500
Pavement Disposal	4,170	60	tons	$250,200
Total Direct Capital Costs:				**$5,928,165**
Direct Expenses				
Confirmatory sampling & Health & Safety Sampling	1	28,750	ls	$28,750
Field oversight	910	95	hrs	$86,450
Field oversight expenses	91	250	days	$22,750
Total Direct Expenses				**$137,950**
Indirect Capital Costs				
Engineering (10% of total direct capital costs)				$592,817
Contingency (10% total direct capital costs)				$592,817
Total Indirect Capital Costs:				**$1,185,633**
TOTAL DIRECT & INDIRECT CAPITAL COSTS:				**$7,251,748**
TOTAL ESTIMATED IRM COST				**$7,251,748**

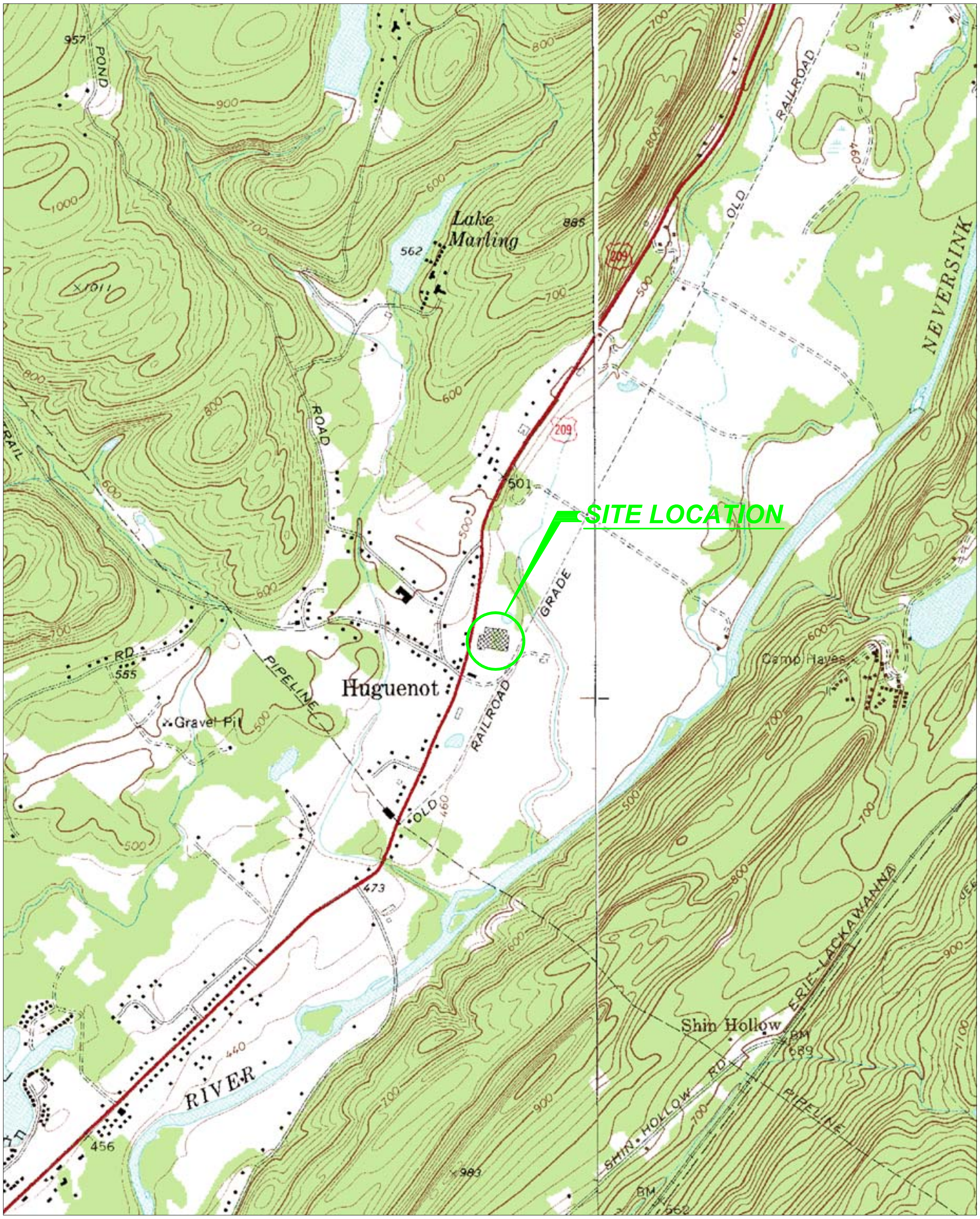
TABLE 21
C&D POWER SYSTEMS SITE (336001)
SUMMARY OF ESTIMATED COSTS FOR THE REMEDIAL ALTERNATIVES

COSTS	ALT. LAGOON SOIL-1	ALT. LAGOON SOIL-2	ALT. LAGOON SOIL-3	ALT. SED-1	ALT. SED-2	ALT. SED-3	ALT. GW-1*	ALT. GW-2	ALT. GW-3
DIRECT & INDIRECT COSTS	$3,384,357	$3,579,364	$2,539,228	$1,629,892	$2,674,125	$1,175,727	$1,081,560	$32,200	$0
ANNUAL O&M COSTS	$14,400	$14,400	$14,400	$0	$0	$0	$259,690	$24,040	$21,050
PRESENT WORTH OF O&M COSTS	$221,363	$221,363	$221,363	$0	$0	$0	$3,992,072	$369,554	$323,590
TOTAL CAPITAL AND O&M PRESENT WORTH	$3,605,720	$3,800,727	$2,760,591	$1,629,892	$2,674,125	$1,175,727	$5,073,632	$401,754	$323,590

COSTS	SURFACE SOIL ALTERNATIVE	LAGOON SOIL UNRESTRICED USE ALTERNATIVE	SEDIMENT UNRESTRICTED USE ALTERNATIVE	SURFACE SOIL UNRESTRICTED USE ALTERNATIVE					
DIRECT & INDIRECT COSTS	$1,205,739	$7,729,980	$3,750,739	$7,251,748					
ANNUAL O&M COSTS	$0	$0	$0	$0					
PRESENT WORTH OF O&M COSTS	$0	$0	$0	$0					
TOTAL CAPITAL AND O&M PRESENT WORTH	$1,205,739	$7,729,980	$3,750,739	$7,251,748					

* ALT GW-1 IS ALSO GROUND WATR UNRESTRICED USE ALTERNATIVE

FIGURES



MAP REFERENCE:
PORT JERVIS NORTH & OTISVILLE
USGS QUAD MAPPING

0' 1000' 2000'

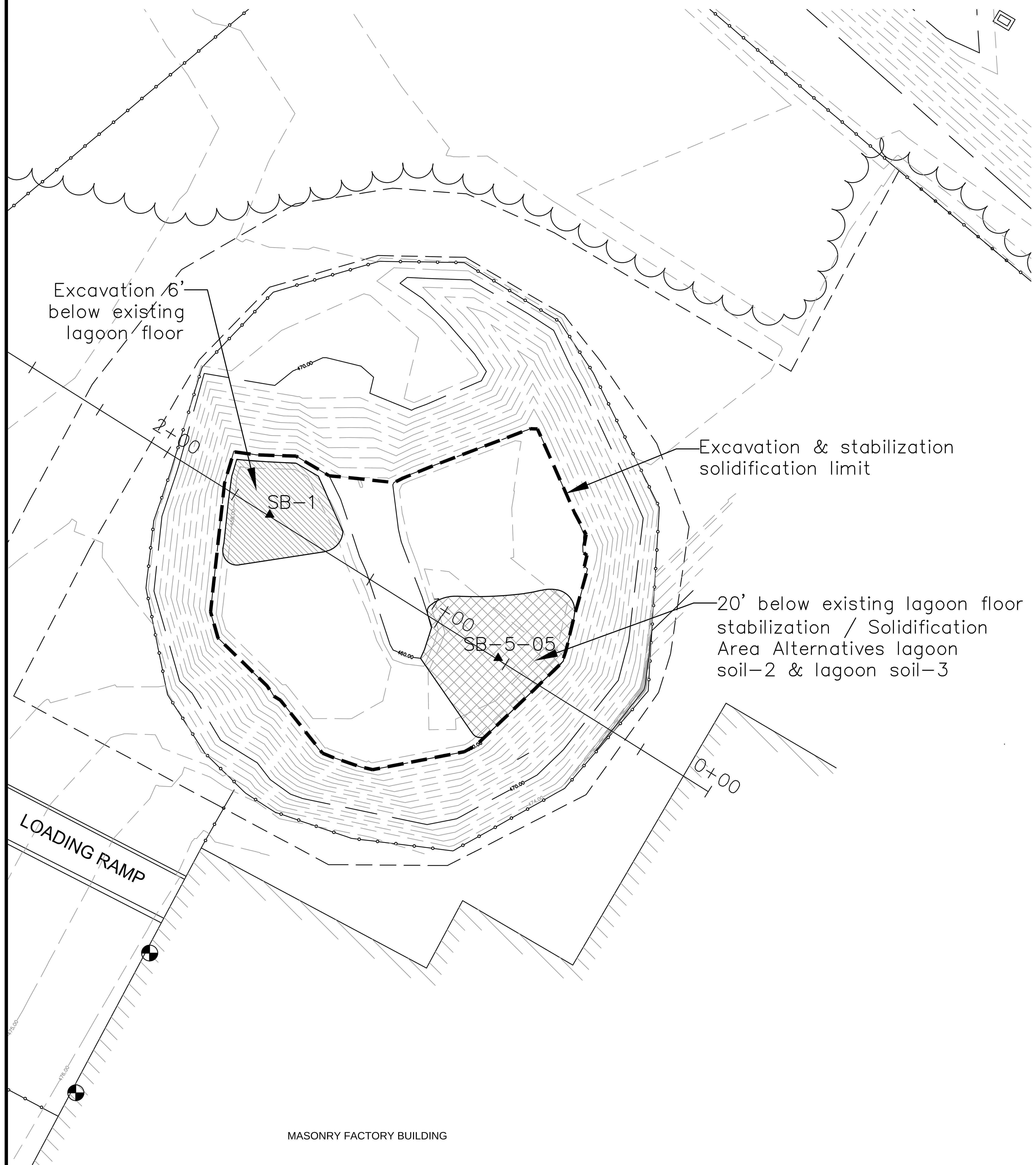
FILENAME: LOCATION.DWG

DELAWARE
ENGINEERING, P.C.
28 Madison Avenue Extension
Albany, New York 12203
Phone 518-452-1290
FAX 518-452-1335

SITE LOCATION MAP

C & D TECHNOLOGIES
NYS ROUTE 209
HUGUENOT, NEW YORK

MAY 26, 00



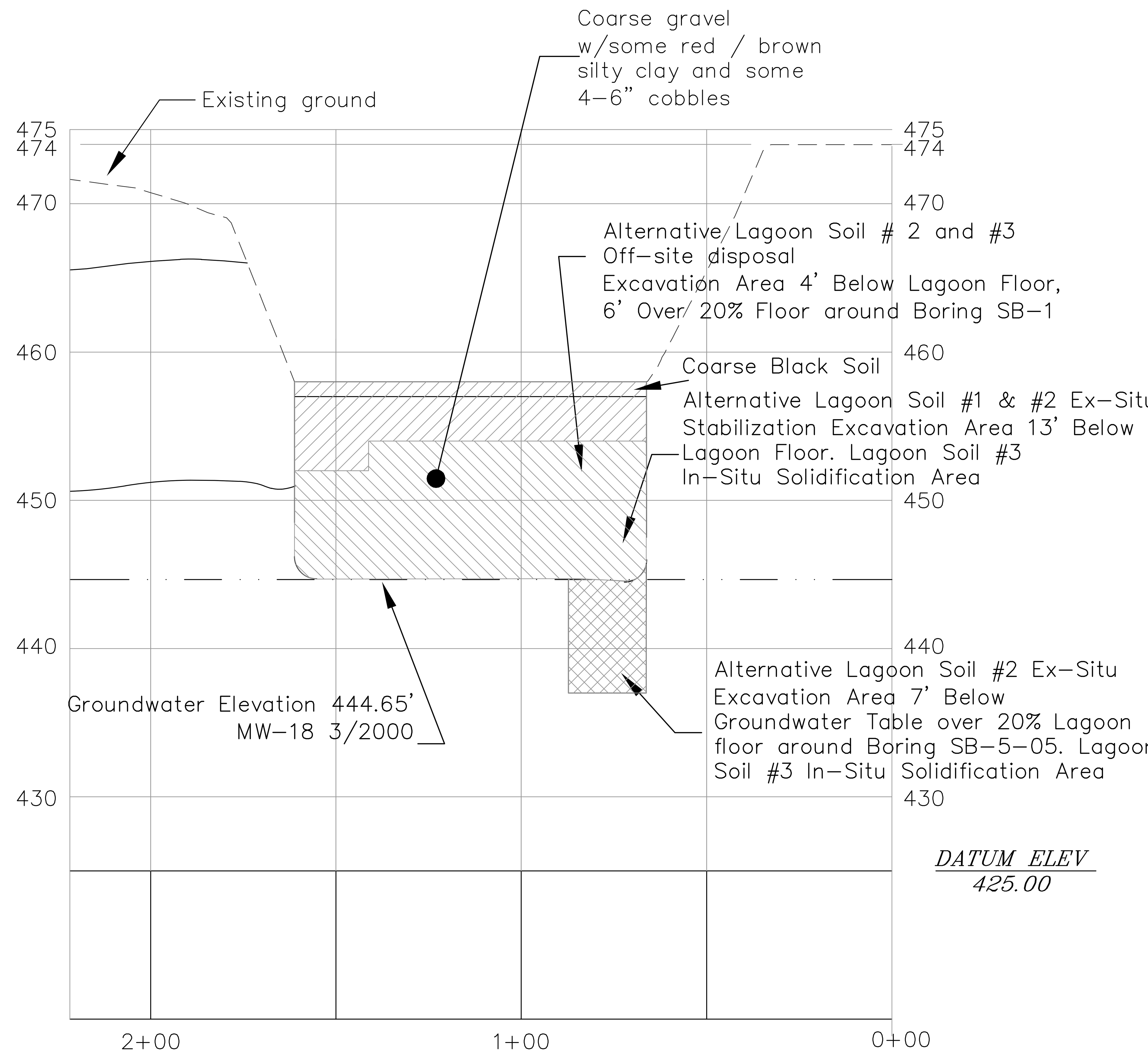
MASONRY FACTORY BUILDING

Notes:

1. Alternative Lagoon Soil -1 Includes excavation & off-site disposal top 6 feet below lagoon floor & 8 foot over 20% lagoon floor around boring SB-1
2. Alternative #2 Unrestricted use, Excavation & off-site disposal.

PLAN

0' 20'



SECTION

5'
0'
0' 10' 20'

FIGURE 2

DATE: 05-09-13
DRAWN BY: KJ
SCALE: AS SHOWN
REVIEWED BY: EF
PROJECT NO.:
FILE:

DELAWARE ENGINEERING, P.C.
ALBANY:
28 Madison Avenue Extension - Albany, NY 12203
Phone: (518) 452-1290 - Fax: (518) 452-1335
ONEONTA:
8-12 Dietz Street, Suite 303 - Oneonta, NY 13820
Phone: (607) 432-8073 - Fax: (607) 432-0432

REVISIONS

NO.	DATE	DESCRIPTION

C & D TECHNOLOGIES
HUGUENOT FACILITY
NYS ROUTE 209
HUGUENOT, NEW YORK

LAGOON SOIL EXCAVATION AREAS PLAN & SECTION

SHEET:
1 of 1

FIGURE 3
C&D Power Systems Site (336001)
Alternative SED-1 Proposed Excavation Area
Proposed Excavation Area
150 75 0 150 Feet


FIGURE 4
C&D Power Systems Site (336001)
Alternative SED-2 Proposed Excavation Area
Proposed Excavation Area
200 100 0 200 Feet

FIGURE 5
C&D Power Systems Site (336001)
Alternative SED-3 Proposed Excavation Area

Figure 6
C&D Former Huguenot, NY Facility
Surface Soil Remediation Alternatives/Areas
And Sample Locations/Results
N
S
E
W
Proposed Remedial Alternative:
The Commercial Use and Residential Use Remediation
Areas Represent The Proposed Remedial Alternative
Residential Use SCO Remediation Area
Commercial Use SCO Remediation Area
Unrestricted Use SCO Remediation Area
IRM Phase III Soil Sample Locations (SS-60 to SS-67) 0-2"
IRM Phase II Soil Sample Locations (SS-48 to SS-59) 0-2"
SS: Soil Sample Outside Fenced Area 0-2"
PS: Pavement Soil Sample Inside Fenced Area 0-2"
NYSDOH Requested Soil Samples 0-2" October 2007
Approximate Property Boundaries (From Orange County Online GIS Data)
Note: Soil Samples 34, 35, 36, 42, 43 45, 46, 47
collected inside fenced area.
Results expressed in mg/Kg
Potential Temporary Sub-Surface Pavement Soil Mixing/Stabilization Area
DELAWARE ENGINEERING, P.C.
50 25 0 50 Feet

FIGURE 7
C&D Power Systems Site (336001)
Proposed Remediation Areas
N
W
E
S
MW-12
MW-13
MW-6
MW-14
MW-7
MW-8
MW-9
MW-10
MW-17
MW-17A
Legend
Long Term Ground Water Monitoring Locations
Lagoon Soil-3
Residential SCO Cleanup Area
Commercial SCO Cleanup Area
SED-1 Alternative
Lagoon Soil Alternative Soil- 3: Excavation with off-site disposal and on-site In-situ solidification/stabilization.
Sediment Alternative SED-1: Removal of all stream bed sediment between sediment sample locations SED-9 and SED-14 and placement in lagoon.
Surface Soil Alternative: Ex-situ stabilization and placement of the soils in the lagoon. On-site soils cleanup to commercial use soil cleanup objective. Off-site soils cleanup to residential use soil cleanup objective.
Ground Water Alternative GW-3 Long-Term Monitoring: Semi-annual collection of ground water samples from ten ground water monitoring wells and the Orange County rental property well.
100 50 0 100 Feet
Proposed Locations of Existing Monitoring Wells to be Included in
Long-Term Monitoring Ground Water Monitoring Program Are Approximate

APPENDIX A

FEASIBILITY COST BACKUP

ALTERNATIVE Lagoon Soil-1

Unsaturated Zone Soils: Excavate and Disposal (6' – 8'), Stabilization, Geomembrane/Asphalt Cap, Institutional Controls and Long-Term Monitoring

This alternative proposes that the unsaturated zone lagoon soils would be excavated to a depth of 6 feet and twenty percent of the floor in the vicinity of Test Pit 4 would be excavated an additional 2 feet, down to 8 feet. This would yield approximately 2,211 cy or 3,317 tons of soil. This soil, because of elevated PCBs (>50 ppm <500 ppm) would then be transported to a TSCA permitted facility for stabilization and landfill disposal. Soils that have PCB concentrations above 500 ppm but less than 1,000 ppm will be treated to stabilize cadmium, barium and lead and would then be transported to a TSCA permitted facility for stabilization and landfill disposal. This would yield approximately 36 cy or 54 tons.

Additionally, it is assumed that some of the soil within the top 2 feet below the existing lagoon floor over an area of approximately ten percent of the lagoon floor near test pit SS-80100 will have elevated concentrations of PCB's in excess of 1,000 ppm and will require incineration at a permitted facility. This would yield approximately 72.5 cy or 109 tons.

The remaining soil from 8 feet to a depth of approximately 13 feet or groundwater, whichever is encountered first, would be stabilized to reduce the mobility of barium, cadmium and lead. This would yield approximately 2,393 cy or 3,590 tons. The excavated soil would be stabilized on-site and would be subsequently placed back into the lagoon.

Trisodium phosphate (under the trade name Enviroblend) or a Portland cement procedure would be used for treatment of cadmium and lead contaminated soil. Tri-sodium phosphate, utilized as a stabilizing agent, would immobilize the cadmium and lead by creating insoluble metal (cadmium/lead) phosphate compounds. Portland cement utilized as a solidification/stabilizing agent would create insoluble metal hydroxide compounds and a low permeable monolith. The cost for Portland cement is initially less expensive than Enviroblend, however, the required bulking rate is generally higher.

Bench and field treatability studies will be conducted to determine the optimal dosing rate for both Portland cement and tri-sodium phosphate, the cost effectiveness of each compound and the effectiveness of each compound in reducing the leachability of cadmium and lead in the lagoon soils. An average dosing rate of five percent using Enviroblend has been assumed for calculating costs. Bench treatability tests would include testing of stabilized soil by the USEPA TCLP (Method 1311). The TCLP method is the regulatory method for determining if a waste is a characteristic hazardous waste based on toxicity pursuant to 40 CFR 261.24.

The soils would be mixed utilizing an excavator or other standard construction equipment. After the soil has been amended, it will be placed back in the lagoon. Two feet of clean fill would be placed at the bottom of the excavation to provide a buffer between the treated waste and the fluctuating groundwater table. Sheet piling would be used to stabilize the excavation. Sheet piling will be embedded a depth equal to twice the excavation depth and will be braced with a poured concrete ring method in lieu of conventional bracing due to close proximity of an existing building and foundation.

Since low level PCBs and treated soil would remain in place, an asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for continued leaching of fluoride and other Site contaminants. The cap would serve to isolate the contaminants and would eliminate direct and indirect exposure to contaminated soils.

This alternative would also require an environmental easement to limit the use of all property to commercial or industrial use only.

Groundwater monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on groundwater quality. The groundwater monitoring program would be implemented as part of the selected groundwater remedial alternative. Well sampling and analysis would be performed on a quarterly basis and 11 wells would be sampled. Cap maintenance would also be required.

Following placement of the stabilized soil in the lagoon, the remaining area of the lagoon would be backfilled to the existing grade (elevation 471 feet to 474 feet) and graded to blend with the surrounding areas. Since excavation and stabilization would be discontinued at the groundwater table it is anticipated that minimal dewatering or solidification would be necessary.

Assumptions:

Excavation in the unsaturated zone only.

Transportation and disposal for landfilling to Model City, New York for soils with heavy metals and up to 500 ppm PCB concentration. If soils with heavy metals above TCLP limits are stabilized on site, soils with PCB concentrations up to 1,000 ppm can be landfilled at Model City (2,247 cy).

Soils with concentrations > 1,000 ppm will be transported to Port Arthur, Texas for incineration (72.5 cy).

Soils with PCB concentrations < 50 ppm will be stabilized and put back in place in the lagoon.
Sheet piling will be used to encapsulate the entire lagoon area. A poured concrete ring method will be used to brace the sheets. Embedment depth is equal to two times the depth of excavation.
Mob/demob is calculated as 3% of construction cost.

ALTERNATIVE LAGOON SOIL-2

Unsaturated Zone and Saturated Zone Soils: Excavate and Disposal (4' – 6'), Stabilization, Geomembrane/Asphalt Cap, Institutional Controls and Long-Term Monitoring

Lagoon soils would be excavated to a depth of 4 feet (approximately 1,450 cubic yards cy) below the floor of the lagoon which equals 18 feet below existing grade since the floor of the lagoon is approximately 14 feet below existing grade. Additionally, 20% of the floor in the vicinity of boring SB-1 would be excavated to 6 feet (approximately 145 cy) below the floor of the lagoon (approximately 20 feet below surrounding grade). This would yield approximately 1,595 cy or 2,393 tons of soil. Approximately 72.5 cy (109 tons) would be transported to a facility for incineration due to PCB concentrations above 1,000 mg/Kg. Approximately 36 cy (54 tons plus 2.7 tons for increase in weight related to the on-site stabilization) of soil with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal. The total estimated volume of soils to be excavated for disposal is approximately 1,595 cy (2,393 tons) plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal.

Similar to alternative Lagoon Soil-1, soil in the unsaturated zone would be excavated for ex-situ stabilization. Alternative Lagoon Soil-2 would include excavation in the saturated zone to remove saturated soils that exhibit TCLP cadmium concentrations above the TCLP regulatory limit. Saturated soils would be excavated to a depth of approximately 20 feet below the existing lagoon floor (approximately 34 feet below surrounding grade) over an area of approximately twenty percent of the lagoon floor around boring SB-05-05.

As with Alternative Lagoon Soil-1, this alternative would also require the installation of an extensive sheet piling system to stabilize the adjacent building foundation and the excavation. Like Alternative Lagoon Soil-1, sheet piling would be used to encapsulate the entire lagoon area as well as for a smaller area within the lagoon. This alternative would require additional sheet pilling to stabilize the excavation into the groundwater table. Sheet piling would extend to a depth of 40 feet below the floor of the lagoon (54 feet below surrounding grade.) over 20 percent of the lagoon floor.

Existing groundwater elevation data indicates that the groundwater elevation in the lagoon is approximately 13 feet (elevation 445 feet below mean sea level) below the existing floor of the lagoon in the vicinity of boring SB-5-05. Approximately 508 cy of soil within the saturated zone (twenty percent of the lagoon around boring SB5-05) would be removed and stabilized on-site. A delineation of the proposed area of excavation is provided in Sheet 1.

The excavated area in the saturated zone would be backfilled with clean fill. As noted in alternative Lagoon Soil-1, two feet of clean fill would be placed immediately above the water table to provide a buffer between the treated waste and the fluctuating groundwater table. The on-site stabilized soils would be placed back into the lagoon above 2 feet of clean fill.

Trisodium phosphate (under the trade name Enviroblend) or a Portland cement procedure would be used for treatment of cadmium and lead contaminated soil. Tri-sodium phosphate, utilized as a stabilizing agent, would immobilize the cadmium and lead by creating insoluble metal (cadmium/lead) phosphate compounds. Portland cement utilized as a solidification/stabilizing agent would create insoluble metal hydroxide compounds and a low permeable monolith. The cost for Portland cement is initially less expensive than Enviroblend, however, the required bulking rate is generally higher.

Bench and field treatability studies will be conducted to determine the optimal dosing rate for both Portland cement and tri-sodium phosphate, the cost effectiveness of each compound and the effectiveness of each compound in reducing the leachability of cadmium and lead in the lagoon soils. An average dosing rate of five percent using Enviroblend has been assumed for calculating costs. Bench treatability tests would include testing of stabilized soil by the USEPA TCLP (Method 1311). The TCLP method is the regulatory method for determining if a waste is a characteristic hazardous waste based on toxicity pursuant to 40 CFR 261.24.

The soils would be mixed utilizing an excavator or other standard construction equipment. After the soil has been amended, it will be placed back in the lagoon. Following placement of the stabilized soil in the lagoon, the remainder of the lagoon would be backfilled to the existing elevation (471 feet to 474 feet) and graded to blend with the surrounding areas. Additionally, since low level PCBs would remain in place, a geomembrane or asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for continued leaching of fluoride or other Site contaminants. The cap would serve to isolate the contaminants and would eliminate direct and indirect exposure to contaminated soils.

This alternative would also require an environmental easement to limit the use of all property to commercial or industrial use only.

Groundwater monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on groundwater quality. The groundwater monitoring program would be implemented as part of the selected groundwater remedial alternative. Well sampling and analysis would be performed on a quarterly basis and 11 wells would be sampled. Cap maintenance would also be required.

Assumptions:

Soils within the saturated zone will be dewatered by placing the spoils at the edge of the excavation allowing drainage back into the excavation. Dewatering does not require treatment.

Sheet piling will be used to encapsulate the entire lagoon area. A poured concrete ring method will be used to brace the sheets. Embedment depth is equal to two times the depth of excavation.

Mob/demob is calculated as 3% of construction cost.

ALTERNATIVE LAGOON SOIL-3

Unsaturated Zone and Saturated Zone Soils: Excavate and Disposal (4' – 6'), In-Situ Stabilization, Geomembrane/Asphalt Cap, Institutional Controls and Long-Term Monitoring

Lagoon soils would be excavated to a depth of 4 feet (approximately 1,450 cubic yards cy) below the floor of the lagoon which equals 18 feet below existing grade since the floor of the lagoon is approximately 14 feet below existing grade. Additionally, 20% of the floor in the vicinity of boring SB-1 would be excavated to 6 feet (approximately 145 cy) below the floor of the lagoon (approximately 20 feet below surrounding grade). This would yield approximately 1,595 cy or 2,393 tons of soil. Approximately 72.5 cy (109 tons) would be transported to a facility for incineration due to PCB concentrations above 1,000 mg/Kg. Approximately 36 cy (54 tons plus 2.7 tons for increase in weight related to the on-site stabilization) of soil with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal. The total estimated volume of soils to be excavated for disposal is approximately 1,595 cy (2,393 tons) plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal.

Remaining soils in the unsaturated zone and approximately seven feet of soil below the groundwater table overt 20 percent lagoon floor in the vicinity of boring SB-5-05 would be stabilized/solidified in place using a hydraulic excavator. The deepest split spoon sample collected from boring SB-5-05 at approximately 3'-5' below the ground water table exhibited a TCLP cadmium concentration of 1.94 mg/L that was above the regulatory limit of 1 mg/L. Since the deepest soil sample exhibited TCLP cadmium concentrations above the regulatory limit, this alternative includes stabilization/solidification of an additional two feet of soil into the saturated zone to a total depth of approximately seven feet into the saturated zone.

Unlike lagoon soil alternatives Soil-1 and Soil-2, this alternative does not involve any sheet piling and avoids potential problems associated with advancement of sheet piling to the required depth associated with lagoon soil alternative Soil-2.

A Portland cement/grout mixture would be utilized as the solidification/stabilizing agent and would create insoluble metal hydroxide compounds and a low permeable monolith. Bench and field treatability studies will be conducted to determine the optimal dosing rate for the Portland cement/grout mixture. An average dosing rate of fifteen percent has been assumed for calculating costs. Bench treatability tests would include testing of stabilized soil by the USEPA TCLP (Method 1311). The TCLP method is the regulatory method for determining if a waste is a characteristic hazardous waste based on toxicity pursuant to 40 CFR 261.24.

The remainder of the lagoon would be backfilled to the existing elevation (471 feet to 474 feet) and graded to blend with the surrounding areas. Additionally, since low level PCBs would remain in place, a geomembrane or asphalt cap would be installed over the area to eliminate precipitation infiltration and significantly reduce the potential for continued leaching of fluoride or other Site contaminants. The cap would serve to isolate the contaminants and would eliminate direct and indirect exposure to contaminated soils.

This alternative would also require a deed an environmental easement to limit the use of all property to commercial or industrial use only. Groundwater monitoring would be implemented to evaluate the long-term effectiveness of the remedial alternative and document that there is no impact on groundwater quality. The groundwater monitoring program would be implemented as part of the selected groundwater remedial alternative. Well sampling and analysis would be performed on a quarterly basis and 11 wells would be sampled. Cap maintenance would also be required.

Assumptions:

Sheetpiling for solidification/stabilization not required.
Solidification can be implemented using a hydraulic excavator

UNRESTRICTED USE LAGOON SOIL ALTERNATIVE

Unsaturated Zone and Saturated Zone Soils: Excavate and Disposal (0' To 27'). Lagoon soils would be excavated to a depth of 27 feet below the floor of the lagoon which equals 41 feet below existing grade since the floor of the lagoon is approximately 14 feet below existing grade. This would yield approximately 9,788 cy or 14,682 tons of soil.

Approximately 72.5 cy (109 tons) would be transported to a facility for incineration due to TSCA soils with PCB concentrations above 1,000 mg/Kg. Approximately 36 cy (54 tons plus 2.7 tons for increase in weight related to the on-site stabilization) of soil with PCB concentrations above 500 mg/Kg that are also a characteristic hazardous waste for metals toxicity, would be stabilized on site and then transported along with the remaining soil to a TSCA permitted facility for disposal. The total estimated volume of soils to be excavated for disposal is approximately 9,788 cy (14,682 tons) plus an additional 2.7 tons for the increase in weight related to the on-site stabilization of 36 cy (54 tons) for off-site disposal.

This alternative would require the installation of an extensive sheet piling system to stabilize the adjacent building foundation and the excavation. Sheet piling would be used to encapsulate the entire lagoon floor area and utilize a poured concrete ring method for bracing. This bracing method would be used in lieu of conventional bracing due to the close proximity to the existing building and because of the nature of the excavation. Sheet piling would be installed to a depth of 54 feet below the floor of the lagoon with six feet of stick up above the lagoon floor.

The remainder of the lagoon would be backfilled with clean fill to the existing elevation (471 feet to 474 feet) and graded to blend with the surrounding areas.

TRIBUTARY SEDIMENT ALTERNATIVE SED-1
Targeted Sediment Removal: Stream Diversion, Excavation and Disposal

This alternative would involve removal of all sediments in Tributary D-1-7 between SED-9 and SED-14 down to a depth of 1 foot. Most sediment with lead concentrations above the Severe Effect Level (SEL) and all sediment with PCB concentrations that exceed 1 mg/Kg would be removed. Approximately 63% percent of the sediment with cadmium concentrations above the LEL, approximately 64% of the sediment with lead concentrations above the SEL and all sediment with PCB concentrations above 1 mg/kg would be removed. The proposed sediment removal area is depicted on Figure 3. The total estimated area and volume of sediment that would be removed from Tributary D-1-7 is 67,525 ft^2 and 2,270 cy, respectively.

A cofferdam would be constructed upstream of the sediment removal area and the stream flow pumped or diverted around the excavation area. It is anticipated that sediments would be excavated using standard construction equipment (trackhoes, backhoes, clamshells etc.) equipped with water tight buckets. The area where sediments were excavated would be backfilled to the pre-existing contours using clean run of bank gravel.

Sediments would be transported using water tight trucks and disposed of in lagoon excavation area. It is assumed that sediment will not be dewatered prior to placement in the lagoon as backfill.

Assumptions:

1. All stream barium, cadmium and lead concentrations are less than the respective commercial use and protection of groundwater SCOs.
2. All PCB concentrations are less than the protection of groundwater SCO. Only two sediment samples (SED-9 and SED-10) exhibit PCB concentrations above the commercial use SCO of 1 mg/Kg (SED-9: 1.1 mg/kg and SED-10: 1.47 mg/Kg). The limited quantity of sediment with PCBs above the commercial use SCO will not represent a public health threat.
3. Sediment metals and PCB data indicate that the sediment can be used as backfill in the lagoon and both sediment alternatives propose to use these sediments as backfill in the lagoon. It is assumed that the sediment will not require dewatering and will be disposed of as fill regardless of the water content.
4. Flow in stream is 3.5 cfs and is approximately 4 feet deep during July.
5. Approximately 2,270 cy of sediment to be excavated.
6. There is no completed exposure pathway since the PCBs will be below grade and covered with an asphalt cap.
7. Mob/demob is calculated as 3% of construction cost.

TRIBUTARY SEDIMENT ALTERNATIVE SED-2
Complete Impacted Sediment Removal: Stream Diversion, Excavation and Disposal

This alternative would involve removal of all sediments in Tributary D-1-7 between approximately SED-1 and SED-23 down to a depth of 1 foot. This alternative would remove all sediments where the sediment metal concentrations are above the LEL and where PCB concentrations are above 1 mg/Kg. Figure 4 depicts the estimated areal extent of impacted sediments based on the existing sediment data. The extent of impacted sediment was estimated by splitting the distance between sediment locations that were below a criteria level and locations that were above the specified criteria level. Total estimated area and volume of sediments that would be removed from tributary D-1-7 under this alternative is 114,242 sf and 4,231cy, respectively.

A cofferdam would be constructed upstream of the sediment removal areas and the stream flow pumped or diverted around the excavation areas. It is anticipated that sediments would be excavated using standard construction equipment (trackhoes, backhoes, clamshells etc.) equipped with water tight buckets. The area where sediments were excavated would be backfilled to the pre-existing contours using clean run of bank gravel.

Sediments would be transported using water tight trucks and disposed of in lagoon excavation area. It is assumed that sediment will not be dewatered prior to placement in the lagoon as backfill.

Assumptions:

1. All stream barium, cadmium and lead concentrations are less than the respective commercial use and protection of groundwater SCOs.
2. All PCB concentrations are less than the protection of groundwater SCO. Only two sediment samples (SED-9 and SED-10) exhibit PCB concentrations above the commercial use SCO of 1 mg/Kg (SED-9: 1.1 mg/kg and SED-10: 1.47 mg/Kg). The limited quantity of sediment with PCBs above the commercial use SCO will not represent a public health threat.
3. Sediment metals and PCB data indicate that the sediment can be used as backfill in the lagoon and both sediment alternatives propose to use these sediments as backfill in the lagoon. It is assumed that the sediment will not require dewatering and will be disposed of as fill regardless of the water content.
4. Flow in stream is 3.5 cfs and is approximately 4 feet deep during July.
5. Approximately 4,231 cy of sediment to be excavated.
6. There is no completed exposure pathway since the PCBs will be below grade and covered with an asphalt cap.
7. Mob/demob is calculated as 3% of construction cost.

TRIBUTARY SEDIMENT ALTERNATIVE SED-3
Targeted Sediment Removal with Highest Concentrations: Stream Diversion, Excavation and Disposal

This alternative would remove all sediment where PCB concentrations are above 1 mg/Kg and sediment where the highest lead concentrations were detected for a total of approximately 33% of the sediment with lead concentrations above the SEL and approximately 32% of the sediment with cadmium concentrations above the LEL. Sediment would be removed to a depth of 12 inches. Figure 5 depicts the estimated areal extent of impacted sediments based on the existing sediment data. The extent of sediment to be removed was estimated by splitting the distance between sediment locations that were below the lead SEL and the nearest sample that was above the SEL (SED-9/SED-2 and SED-10/SED-11) Total estimated area and volume of sediments that would be removed from tributary D-1-7 under this alternative is 21,957 sf and 813 cy, respectively.

A cofferdam would be constructed upstream of the sediment removal areas and the stream flow pumped or diverted around the excavation areas. It is anticipated that sediments would be excavated using standard construction equipment (trackhoes, backhoes, clamshells etc.) equipped with water tight buckets. The area where sediments were excavated would be backfilled to the pre-existing contours using clean run of bank gravel.

Sediments would be transported using water tight trucks and disposed of in lagoon excavation area. It is assumed that sediment will not be dewatered prior to placement in the lagoon as backfill.

Assumptions:

1. All stream barium, cadmium and lead concentrations are less than the respective commercial use and protection of groundwater SCOs.
2. All PCB concentrations are less than the protection of groundwater SCO. Only two sediment samples (SED-9 and SED-10) exhibit PCB concentrations above the commercial use SCO of 1 mg/Kg (SED-9: 1.1 mg/kg and SED-10: 1.47 mg/Kg). The limited quantity of sediment with PCBs above the commercial use SCO will not represent a public health threat.
3. Sediment metals and PCB data indicate that the sediment can be used as backfill in the lagoon and both sediment alternatives propose to use these sediments as backfill in the lagoon. It is assumed that the sediment will not require dewatering and will be disposed of as fill regardless of the water content.
4. Flow in stream is 3.5 cfs and is approximately 4 feet deep during July.
5. Approximately 813 cy of sediment to be excavated.
6. There is no completed exposure pathway since the PCBs will be below grade and covered with an asphalt cap.
7. Mob/demob is calculated as 3% of construction cost.

GROUNDWATER ALTERNATIVE GW-1
Groundwater Control and Treatment, Residential Groundwater Treatment System for Fluoride and Long-Term Groundwater Monitoring

This alternative would consist of two groundwater extraction points, a groundwater treatment system and discharge to Tributary D-1-7. Groundwater would be collected from the extraction well points downgradient of the lagoon and would be treated for fluoride and if necessary, metals and PCBs.

Groundwater modeling and step rate pump tests would be conducted on the extraction wells to determine the groundwater extraction rate and confirm that two extraction wells would be sufficient to control groundwater movement from the lagoon.

Activated alumina, precipitation and activated carbon would be used for treatment of groundwater for fluoride, metals and PCBs, respectively. A treatment system pilot test would be conducted to determine estimated operational parameters.

A point of entry reverse osmosis system would be installed on the Orange County rental property on Swartwout Road that would provide high quality drinking water in all faucets throughout the residence. The treatment system would be for fluoride only since metals and PCBs have not been detected above drinking water standards in off-site groundwater monitoring wells or the rental property well. The treatment system would include quarterly maintenance of the system and quarterly monitoring of the potable well for fluoride, barium, cadmium, lead and PCBs.

A long-term groundwater monitoring program for all on-site and off-site monitoring wells would be established. Although a series of monitoring wells exists, additional wells will be installed. Monitoring wells would be sampled semi-annually and samples analyzed for fluoride, barium, cadmium, lead and PCBs.

Assumptions:

1. Groundwater pump and treat system with (2) recovery wells @ 50 gpm using an activated alumina system.
2. pH= 6.5 to 7.2, fluoride levels 10.9 ppm.
3. Pre-treatment for iron is required.
4. Activated alumina bed is regenerated with a caustic and then an acid. Fluoride from the backwash is precipitated out of solution and pressed to a calcium fluoride cake. Waste disposed of at local municipal solid waste landfill.
5. Discharge to tributary D-1-7.
6. Point of entry residential system in basement, utilizing reverse osmosis.
7. Long term maintenance and monitoring for the groundwater pump and treat system and the residential system.
8. Semi- annual sampling and analysis for existing monitoring wells MW-6 through MW-10, MW-12 through MW-17 and MW-17A for PCB's, cadmium, lead and fluoride.

9. Quarterly sampling and analysis for the residential well and treatment system (3 samples four times per year 12 samples total) for PCB's, cadmium, lead and fluoride.

GROUNDWATER ALTERNATIVE GW-2
Residential Groundwater Treatment System for Fluoride and Long-Term Monitoring

This alternative would consist of the design and construction of a point of entry treatment system for fluoride to be installed at the Orange County rental property on Swartwout Road. This would eliminate the exposure (via consumption) to fluoride concentrations in groundwater above the NYSDOH drinking water standard. The system would remain in place until fluoride concentrations in the groundwater are below the drinking water for eight consecutive quarterly monitoring events. This alternative would include long-term (semi-annual) monitoring of groundwater at both the potable well and at the off-site and on-site groundwater monitoring wells. All samples would be analyzed for PCBs, cadmium, barium, lead and fluoride.

Assumptions:

1. Point of entry utilizing a reverse osmosis system.
2. pH= 6.5 to 7.2, fluoride levels 10.9 ppm.
3. Long term maintenance and monitoring of the residential system.
4. Semi- annual sampling and analysis for existing monitoring wells MW-6 through MW-10, MW-12 through MW-17 and MW-17A for PCB's, cadmium, lead and fluoride.
5. Quarterly sampling and analysis for the residential well and treatment system (3 samples total) for PCB's, cadmium, lead and fluoride.

GROUNDWATER ALTERNATIVE GW-3
Long-Term Monitoring

This alternative would consist of the long-term, semi-annual monitoring of the on-site and off-site groundwater monitoring wells and the potable well at the Orange County rental property to ensure that site related contaminants are not migrating off-site. All samples would be analyzed for PCBs, cadmium, barium, lead and fluoride.

Assumptions:

1. Semi- annual sampling and analysis for existing monitoring wells MW-6 through MW-10, MW-12 through MW-17 and MW-17A for PCB's, cadmium, lead and fluoride.

LAGOON SOIL VOLUME CALCULATIONS

ALTERNATIVE LAGOON SOIL - 1

0 to 1’ 80% of lagoon area no on-site metals stabilization, LF disposal PCBs >50 ppm <500 ppm
0 to 1’ 10% of lagoon area on-site metals stabilization, LF disposal PCBs >500 ppm < 1,000 ppm
0 to 1’ 10% of lagoon area for incineration > PCBs 1,000 ppm
1 to 2’ 10% of lagoon area for incineration > PCBs 1,000 ppm
1 to 2’ 90% of lagoon area no on-site metals stabilization, LF disposal PCBs >50 ppm <500 ppm
2 to 4’ 100% of lagoon area no on-site metals stabilization, LF disposal >50 ppm <500 ppm
4 to 6’ 100% of lagoon area no on-site metals stabilization, LF disposal >500 ppm <1000 ppm
6 to 8’ 20% of lagoon area no on-site metals stabilization, LF disposal <50 ppm
6 to 8’ 80% of lagoon area on-site metals stabilization and put back in excavation
8 to 13’ 100% of lagoon area on-site metals stabilization and put back in excavation

ALTERNATIVE LAGOON SOIL-1

Landfill disposal, no pre-treatment				
(0-1') 9,788 sf X 0.8 X 1 ft = 290 cy	290.01	cy		
(1-2') 9,788 sf X 0.9 X 1 ft = 326 cy	326.27	cy		
(2-6') 9,788 sf X 1.0 X 4 ft = 1,450 cy	1,450.07	cy		
(6-8') 9,788 sf X 0.2 X 2 ft = 145 cy	145.01	cy		
SUB-TOTAL =	2,211.36	cy	3,317.04	Tons
Landfill disposal, with pre-treatment				
(0-1') 9,788 sf X 0.1 X 1 ft = 36 cy = 54 tons	36.25	cy	54.38	Tons
Incineration				
(0-2') 9,788 sf X 0.1 X 2 ft =	72.50	cy	108.76	Tons
Total cy soil excavated for off-site disposal =	2,320.12	cy	3,480.18	Tons
On site stabilization and placement back into excavation				
(6-8') 9,788 sf X 0.8 X 2 ft = 580 cy	580.03	cy	870.04	Tons
(8-13') 9,788 sf X 1.0 X 5 ft =~ 1,813 cy	1,812.59	cy	2,718.89	Tons
SUB-TOTAL = ~ 2,393 CY	2,392.62	cy	3,588.93	Tons

Soils to be excavated = 2,211 + 36 + 72.5 =~ 2,320 cy = 3,480 tons
Soils for off-site disposal = 2,211 + 36 = 2,247 cy = 3,371 tons
Soils for off-site incineration = 72.5 cy = 109 tons
Soils to be stabilized = 2,393 + 36 = 2,429 cy =~ 3,644 tons
Soils to be placed back in lagoon =~ 2,393 cy =~ 3,590 tons

ALTERNATIVE LAGOON SOIL - 2

0 to 1’ 80% of lagoon area no on-site metals stabilization, LF disposal PCBs >50 ppm <500 ppm
0 to 1’ 10% of lagoon area on-site metals stabilization, LF disposal PCBs >500 ppm < 1,000 ppm
0 to 1’ 10% of lagoon area for incineration PCBs > 1,000 ppm
1 to 2’ 10% of lagoon area for incinerationPCBs > 1,000 ppm
1 to 2’ 90% of lagoon area no on-site metals stabilization, LF disposal PCBs >50 ppm <500 ppm
2 to 4’ 100% of lagoon area no on-site metals stabilization, LF disposal PCBs >50 ppm <500 ppm
4 to 6’ 20% of lagoon area no on-site metals stabilization, LF disposal PCBs >500 ppm 1,000 ppm
4 to 6’ 80% of lagoon area on-site metals stabilization and put back in excavation
6 to 13’ 100% of lagoon area on-site metals stabilization and put back in excavation
13 to 20’ 20% of lagoon area on-site metals stabilization and put back in excavation

ALTERNATIVE LAGOON SOIL-2

Landfill disposal, no pre-treatment				
(0-1') 9,788 sf X 0.8 X 1 ft = 290 cy	290.01	cy		
(1-2') 9,788 sf X 0.9 X 1 ft = 326 cy	326.27	cy		
(2-4') 9,788 sf X 1.0 X 2 ft = 725 cy	725.04	cy		
(4-6') 9,788 sf X 0.2 X 2 ft = 145 cy	145.01	cy		
SUB-TOTAL =~ 1,486 cy =~ 2,230 tons	1,486.33	cy	2,229.49	Tons
Landfill disposal, with pre-treatment				
(0-1') 9,788 sf X 0.1 X 1 ft = 36.3 cy = 54 tons	36.25	cy	54.38	Tons
Incineration				
(0-2') 9,788 sf X 0.1 X 2 ft = 72.5 cy = 109 tons	72.50	cy	108.76	Tons
Total cy soil excavated for off-site disposal =	1,595.08	cy	2,392.62	Tons
On site stabilization and placement back into excavation				
(4-6') 9,788 sf X 0.8 X 2 ft = 580 cy	580.03	cy		
(6-13') 9,788 sf X 1.0 X 7 ft = 2,538 cy	2,537.63	cy		
(13- 20') 9,788 sf X 0.2 X 7 ft = 508 cy	507.53	cy		
SUB-TOTAL =~3,626 cy	3,625.19	cy	5,437.78	Tons
Soils to be excavated = 1,486.3 + 36.3 + 72.5 =~ 1,595 cy =~ 2,393 tons	1,595.08	cy	2,392.62	Tons
Soils for off-site disposal = ~1,486.3 + 36.3 =~1,523cy	1,522.58	cy	2,283.87	Tons
Soils for off-site incineration =	72.50	cy	108.76	Tons
Soils to be stabilized =~ 3,662 cy =~ 5,493 tons	3,661.44	cy	5,492.16	Tons
Soils to be placed back in lagoon = ~ 3,626 cy =~ 5,439 tons	3,625.19	cy	5,437.78	Tons

ALTERNATIVE LAGOON SOIL - 3

0 to 1’ 80% of lagoon area no on-site metals stabilization, LF disposal PCBs >50 ppm <500 ppm
0 to 1’ 10% of lagoon area on-site metals stabilization, LF disposal PCBs >500 ppm < 1,000 ppm
0 to 1’ 10% of lagoon area for incineration PCBs > 1,000 ppm
1 to 2’ 10% of lagoon area for incineration PCBs > 1,000 ppm
1 to 2’ 90% of lagoon area no on-site metals stabilization, LF disposal PCBs >50 ppm <500 ppm
2 to 4’ 100% of lagoon area no on-site metals stabilization, LF disposal PCBs >50 ppm <500 ppm
4 to 6’ 20% of lagoon area no on-site metals stabilization, LF disposal PCBs >500 ppm 1,000 ppm
4 to 6’ 80% of lagoon area on-site in-situ metals stabilization
6 to 13’ 100% of lagoon area on-site in-situ metals stabilization
13 to 20’ 20% of lagoon area on-site in-situ metals stabilization

ALTERNATIVE LAGOON SOIL-3

Landfill disposal, no pre-treatment				
(0-1') 9,788 sf X 0.8 X 1 ft = 290 cy	290.01	cy		
(1-2') 9,788 sf X 0.9 X 1 ft = 326 cy	326.27	cy		
(2-4') 9,788 sf X 1.0 X 2 ft = 725 cy	725.04	cy		
(4-6') 9,788 sf X 0.2 X 2 ft = 145 cy	145.01	cy		
SUB-TOTAL =~ 1,486 cy	1,486.33	cy	2,229.49	Tons
Landfill disposal, with pre-treatment				
(0-1') 9,788 sf X 0.1 X 1 ft = ~36 cy = ~54 tons	36.25	cy	54.38	Tons
Incineration				
(0-2') 9,788 sf X 0.1 X 2 ft =~ 72.5 cy = ~109 tons	72.50	cy	108.76	Tons
On site in-situ stabilization				
(4-6') 9,788 sf X 0.8 X 2 ft = 580 cy	580.03	cy		
(6-13' unsaturated zone) 9,788 sf X 1.0 X 7 ft = 2,538 cy	2,537.63	cy		
(13- 20' Saturated Zone) 9,788 sf X 0.2 X 7 ft = 508 cy	507.53	cy		
SUB-TOTAL =~ 3,626 cy	3,625.19	cy	5,437.78	Tons
Soils to be excavated = 1,486 + 36 + 72.5 =~ 1,595 cy =~ 2,393 tons	1,595.08	cy	2,392.62	Tons
Soils for off-site incineration = 72.5cy = 109 tons	72.50	cy	108.76	Tons
Soils to be stabilized on-site for off-site disposal = 36 cy = 54 tons	36.25	cy	54.38	Tons
Total soils for off-site disposal =~ 1,595 cy =~ 2,393 tons	1,595.08	cy	2,392.62	Tons
Total soils for on-site in-situ stabilization =~ 3,626 cy =~ 5,439 tons	3625.185185	cy	5,437.78	Tons

UNRESTRICTED USE ALTERNATIVE LAGOON SOIL

Landfill disposal, no pre-treatment				
(0-1') 9,788 sf X 0.9 X 1 ft = 326.26 cy	326.26	cy		
(1-27') 9,788 sf X 26 ft = 9,425.48				
SUB-TOTAL =~ 9,751.74 cy	1,486.33	cy	2,229.49	Tons
Landfill disposal, with pre-treatment				
(0-1') 9,788 sf X 0.1 X 1 ft = ~36 cy = ~54 tons	36.25	cy	54.38	Tons

Total Landfill disposal =9,788 cy =~ 14,682 tons

Total Includes:

Soils for off-site incineration = 72.5cy = 109 tons

Soils to be stabilized on-site for off-site disposal = 36 cy = 54 tons

Ed Fahrenkopf

From: Brent Zimmer <bzimmer@delawareengineering.com>
Sent: Friday, March 08, 2013 4:25 PM
To: Ed Fahrenkopf
Subject: C&D Soil Disposal at Model City Prices

Ed,

March 8, 2013
Spoke to Dave Porter 716 286-1550 Model City Landfill

Soil Disposal Prices at Model City
<500 ppm Soil and >500 ppm soil same price $141.11 ton (10 ton Min)
Winter time they can take 10 to 20 loads a day summer 20 to 30 loads
The break down of the disposal cost is $120 with a 6% Town tax, 3% environment tax, 8.59% disposal tax=$141.11

Carriers
Bulk waste and Page are two of the carriers that are approved to ship to the landfill.

Pre approval
Soil profile is required and approval can take up to 10 days.

Brent Zimmer

Delaware Engineering, P.C.
28 Madison Avenue Extension
Albany, N.Y. 12203
(518) 452-1290 Phone
(518) 852-0598 Cell

Trucking = 100.8 per ton (U.S. Bulk)

$141.11/Ton Disposal + $100.8/ton transportation ≅ 242/ton

2013 COSTS

C&D Waste Disposal

Trucking: US Bulk
Spoke to Keith Warren 1-888 651-8182
$75 a ton 40% fuel surcharge (22 ton Min) 2hr free load average 23 to 25 ton per load.
Keith said $100.80 a ton with the fuel surcharge.

Trucking to Model City

VEOLIA ENVIRONMENTAL SERVICES

March 25, 2013

Mr. Brent Zimmer
Delaware Engineering, P.C.
28 Madison Avenue Extension
Albany, NY 12203

RE: Huguenot, NY TSCA Soil PCBs >1,000 ppm

Dear Mr. Zimmer:

Veolia Environmental Services is pleased to submit an itemized estimate for the transportation and disposal of the TSCA soil located at your client's facility. Based upon our understanding of the scope of work as presented by Delaware Engineering, the following is a summary of the proposed Veolia products and services:

This quotation includes the following activities:

- Completion of associated documentation, manifests and shipping documents.
- Transportation and/or Treatment at a Federally Licensed and Veolia approved disposal facility.

All work performed will be in strict compliance with all federal, state and local regulations and laws. The generator must also comply with all applicable laws and regulations pertaining to generators of chemical wastes. Veolia requires a completed profile for all waste shipped and will not accept improperly identified or unidentified materials. Should waste materials be found to be non-conforming to the profile, additional charges may be incurred.

Dependent upon the method of disposal and the location of the facility, applicable hazardous waste taxes and/or surcharges imposed by the state will be charged and are not included in the quoted prices

The foregoing is an estimate only. Actual costs are contingent upon waste analysis, completion of a Waste Information Profile, disposal site approval, total material removed, freight, labor, material and equipment utilized. This estimate is valid for thirty days. If you require additional time for evaluation or have any questions regarding the above, please feel free to call me at (908) 675-0944.

Sincerely,

Peter Maraziti
Account Manager

Acknowledgement:
Your signature below indicates your acceptance of the pricing and terms detailed in the quote above. Please fax a signed copy of this quote to my attention at (973) 691-7359. Thank you for the opportunity to be of service.

Signature ________ Date ________ PO ________

VeoliaES Technical Solutions, LLC
1 Eden Lane, Flanders, NJ 07836
tel: 973-691-3933 - fax: 973-691-7359
www.VeoliaES.com

QUOTATION WORKSHEET

No. Q717000381

Page 01

VEOLIA ENVIRONMENTAL SERVICES

MANIFEST FROM:	RETURN MANIFEST TO:	CERTIFICATE TO:
Delaware Engineering, P.C. **28 Madison Avenue Extension** **Albany, NY 12203**	***** Same Address *****	***** Same Address *****

CONTACT: **Mr. Brent Zimmer**	QUOTE DATE: **03/25/2013**	TERRITORY: **N09**
PHONE:	FAX:	SALES REP: **PETER J. MARAZITI**

Line	Service	Description	Quantity	Price	Unit	Extension
	Waste Stream:	TSCA Soil for Incineration	224000.00	0.45	EA	$100800.00
	Technology:	Incineration-thermal destruct.				
	Facility:	VEOLIA ES TECHNICAL SOLUTIONS				
	UOM/Container:	POUNDS				
		Stream Specifications: <5000 Btu, must pass paint filter test, flash point >140°F, total mercury <2ppm, tota l arsenic <100 ppm, chlorine <10%, fluorine <1%, sulfur <5%, bromine/iodine <1% (combined), Na/K/Li <1% (combined), boron <5ppm, pH 4-10, debris must be <10% of the load and meet the debris size specifications outlined in the attachment				
		A disposal minimum per load of $4,000.00 will apply.				
					Line Total	**$100800.00**
	Freight:		5.00	8750.00		$43750.00
		Dump trailer from Huguenot, NY to Veolia - Port Arthur, TX. One (1) hour free loading and unloading. A demurrage rate of $95.00/hour will apply for time in excess. $950.00 charge for trucks ordered but not used (no-load fee).				
					Line Total	**$43750.00**
	Miscellaneous:	FUEL SURCHARGE	43750.00	0.30	EACH	$13125.00
		A variable fuel surcharge, currently at 30%, will apply to transportation line items only. Fuel surcharge varies weekly.				
					Line Total	**$13125.00**
		STATE REGULATORY FEES	5.00	20.00	EACH	$100.00
					Line Total	**$100.00**
		TEXAS WASTE DISPOSAL FEE	112.00	4.00	EACH	$448.00

QUOTATION WORKSHEET

No. Q717000381

Page 02

VEOLIA ENVIRONMENTAL SERVICES

MANIFEST FROM:	RETURN MANIFEST TO:	CERTIFICATE TO:
Delaware Engineering, P.C. **28 Madison Avenue Extension** **Albany, NY 12203**	***** Same Address *****	***** Same Address *****
CONTACT: **Mr. Brent Zimmer**	QUOTE DATE: **03/25/2013**	TERRITORY: **N09**
PHONE:	FAX:	SALES REP: **PETER J. MARAZITI**

Line	Service	Description	Quantity	Price	Unit	Extension
		TX out-of-state TSCA fee is $4.00 per ton				
					Line Total	**$448.00**

Quote Notes:

This is a budgetary estimate based on the inventory provided. Pricing is contingent upon receipt and approval of a signed waste profile and final analytical. Unit disposal rate is based on specs outlined in the proposal above. Quantities are based on the information provided. Final invoice will reflect the actual quantities shipped and utilized during performance of this project.

Loading to be performed by others.

All terms and conditions described in the previous pages will apply.

Quote Total **$158223.00**

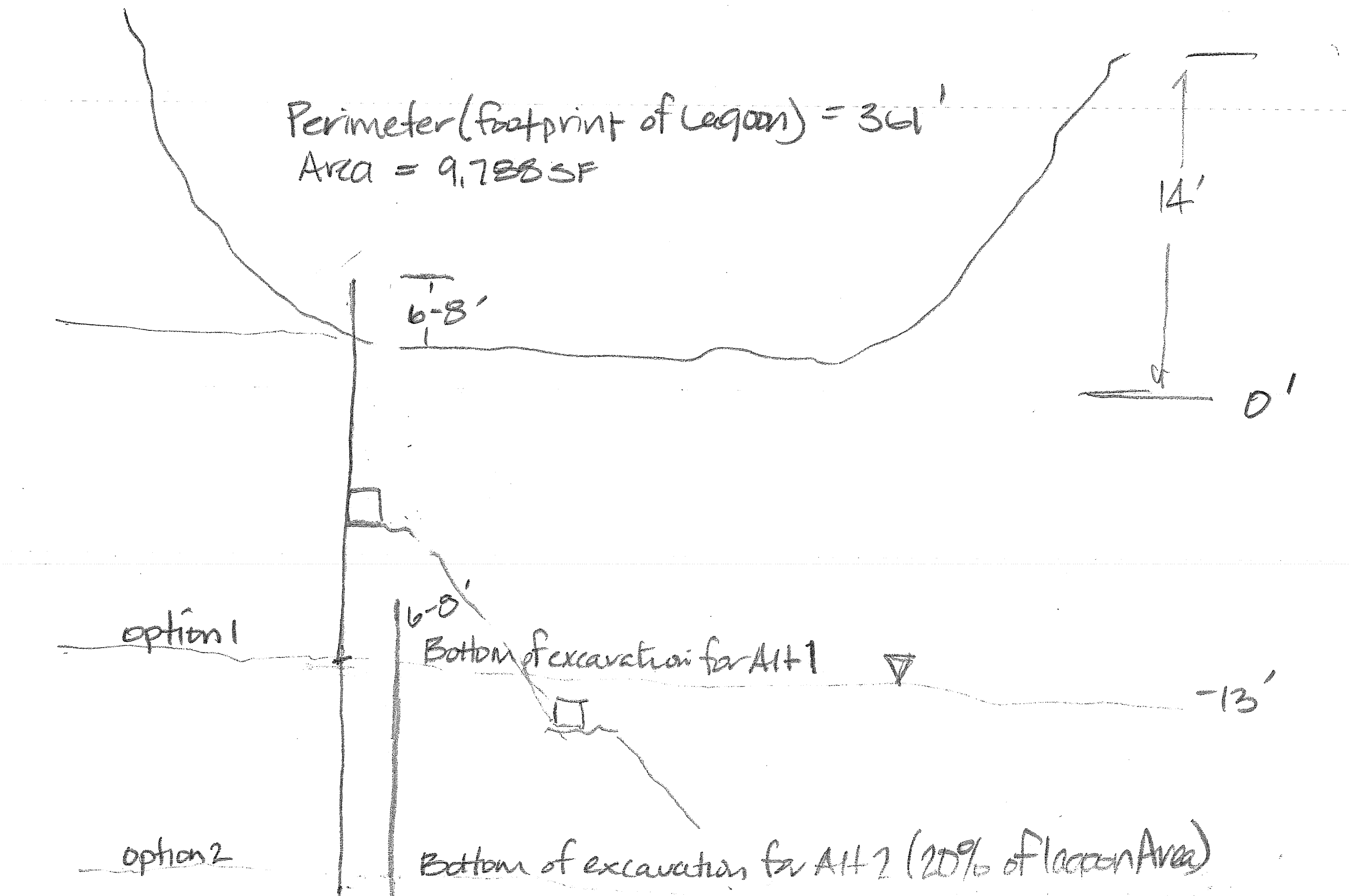
224,000 lbs / 2000 lbs / ton

= 112 tons $\frac{\$158,223}{112 \text{ tons}} \cong \$1,413$ per ton

SHEET PILING

Confirmed Sheet Piling Cost w/
4/5/13 Keith Decker
Land Remediation

1/3
SMV



Alt 1 Sheetpile: stick-up

361' x (26' + 6) = 11,552 SF

Lagoon (Alt 1) - 26'

-27'

Alt 2: Sheetpile: (20% of lagoon area)

150' x (14' + 6') = 3,000 SF

Lagoon (Alt 2) - 40'

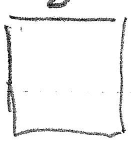
Unrestricted: 100% lagoon Area to Depth of 2.7'

sheetpile

361 x (54' + 6' stickup) = 21,660 SF

Alt: UNRESTRICTED USE 54'

Concrete ring sheetpile support (in leiv of conventiona bracing). Ring is poured inside the ring of sheeting for suppor



Alt 1

2' x 2' x 361 x 2rings = 107 cy

Alt 2

2' x 2' x 150' x 1rings = 25 cy

Alt 1

sheetpile = \$50/sf x 11,552 sf = \$577,600
(material + installation)

support = \$650/cy x 107cy = \$69,550
(reinforced, formed, installed)

\$647,150
= \$56/SF

Alt 2

sheet pile = \$50/sf x 3,000 sf = \$150,000

Supports = \$650/cy x 25 cy = \$16,250

(11,552 + 3,000 = 14,552)

\$166,250
\+ 647,150

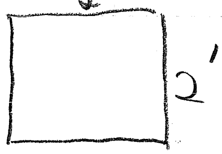
\$813,400
= 56/sf

UNRESTRICTED USE

Sheet Pile \$50/sf × 21,660sf = 1,083,000

Supports (4)

2'



2' × 2' × 361 × 4 Rings = 214 cy

\$650 / cy × 214 cy = \$139,100

Sheetpile = \$1,083,000

Concrete Rings = \$139,000

Total = \$1,222,100 / 21,660sf ≅ \$56.42 / sf use \$56/SF

1/29/2013
C & D Power Systems
In Situ Stabilization with Excavator Mixing Cement/Bentonite Grout

The following Estimates and comments are from a phone conversation with:
Bill Buccille, PE
Chief Estimator
Geo-Con, a trade name of Geo-Solutions Inc.
400 Penn Center Boulevard, Suite 503
Pittsburgh, PA 15235
412-856-7700 ext. 101

Price for Excavator Mixing: $70 to $100 cu/yd

Mobilization: $250,000

Treatment 10% to 12% by weight of cement/slag and 3% bentonite

Current prices for cement/slag are $120 ton

Current prices for bentonite are$240 ton

Per ton soil treatment chemical cost:

Cement: 80 percent cement x $120 cement/ton = $96
Betonite: 20 percent bentonite x $240 bentonite/ton = $48
Totoal = $144 use $150

Recommended that the treat-ability study provide a determination of strength (cement) and permeability (bentonite) that allows the site to pass TCLP to provide contractors with a ball park figure of material required for the project. Alternatively require in specification so many tons of cement/bentontite per cu/yd of soil.

The slurry from the auger yields a 10% to 15% increase in material.

TELEPHONE CONVERSATION ENVIROBLEND, PREMIER MAGNESIA, LLC

February 1, 2013

Derrick Pizarro
610-517-0242

Enviroblend mixture to stabilize Cd, Pb, Ba. TCLP and SSLP regulatory end points

$700/Ton one sack per ton. Shipped via truck each truck carries 22 ton. Granular of milled (powdered)

Anticipated dosage rate 2-5 percent. Will determine exact mixture and dosage rate following treatability study. Treatability study cost ~$2,000.

Mixture high percentage of TSP (tri-sodium phosphate) which will not be affected by freeze thaw cycles.

Lagoon Soil Alt #1

A. Stabilized & placed back in lagoon 2393cy x 1.5 = 3590 tons
B. Stabilized & shipped off-site 54 tons

≅ 3644 tons

Lagoon Soil Alt #2

A. Stabilized & placed back in lagoon 3626cy x 1.5 = 5439 Tons
B. Stabilized & shipped off-site = 54 tons

5,493 Tons

Unrestricted Use Alt.

A. 9,788 cy x 1.5 = 14,682 Tons – shipped off site

B. Stabilized Before shipment = 54 tons

USE 5% by weight Enviroblend

Alt 1 0.05 x 3644 = 182 tons

Alt #2 0.05 x 5493 ≅ 275 tons

Unrestricted 0.05 x 54 = 2.7 tons

Refer to Soil Volume Calculations

Asphalt Cap Installation / Paving Surface Soil Alternatives

2" Wearing Course

3" Binder Course

12" base course crushed stone

geomembrane

Area = 3,115 sy = 28,035 SF

Means

32-11-23.23 0304 — Base Course — 12" of 1½" crushed stone compacted to 4" deep — $17.65/sy

$18/sy x 3,115 sy = **$56,070**

32-12-16.13 0160 — Binder Course — 3" — $10/sy

$10/sy x 3,115 sy = **$31,150**

32-12-16.3 0380 — Wearing course — 2" — $7/sy

$7/sy x 3,115 sy = **$21,805**

33-47-13.53 1200 — 60 mill Membrane — $2/SF

$2/SF x 28,035 SF = **$56,070**

Means

31-23-23.18 Hauling assume 20cy dump
20 mi. round trip $11^15/cy

base course: crushed stone
28,035 SF x 1 Ft = 28,035 CF = 1,038 cy

Asphaltic courses:
28,035 SF x ±0.5' = 14,018 CF = 520 cy

(1,038 + 520 cy) x $11^15/cy = $17,371

TOTAL = $182,466 SAY $~~200,000~~ 185,000

~~Average Cost/sy Paving less geomembrane = $182,466 - $56,070 = $126,396/3115 sy = $40.5~~

Asphalt Cap Maintenance

Means
32-01-13.62 Seal Coating (every 3 years) = 0.87/sy
3320 0.87/sy x 3,115 sy x 10/3 yrs = $9,035

3200 Crack sealing (every 3 years) = $7/sy
7/sy x 3,115 sy x 10/3 yrs = $72,683

Wearing surface (every 7 yrs) = $7/sy
7/sy x 3,115 sy x 10/7 yrs = $31,150

Admin & Engineering 10% = $11,290

$125,500 every 10 yrs

annual Maintenance = $12,500

Asphalt Paving Surface Soil Remediation

1. Average Cost / SY Means = $40.58
2. Average Cost / SY Land & Remediation, Inc Estimate = $42/SY

USE $42 / SY

Surface Soil Remediation Approved Alternative =
7,502 SY x $42 = $315,084

Unrestricted Use Surface Soil Alternative =
22,242 SY x $42 = $934,164

DESCRIPTION	QUANTITY	UNIT	MATERIAL COST	SUBTOTAL MATERIAL COST	ESTIMATED IN PLACE UNIT COST	SUBTOTAL IN PLACE ITEM COST	ESTIMATED IN PLACE ITEM COST
ALTERNATE SED-1							
DEWATERING	**1**	**LS**					**$879,480.00**
Rental and Installation of Aqua Barrier Coffer Dams	2	EA	$5,000.00	$10,000.00	$7,000.00	$14,000.00	
Armoring of Streambed for Influent Bypass Pumping Hose (Stabilization Fabric & Med Stone Fill)	1	EA	$2,000.00	$2,000.00	$5,000.00	$5,000.00	
Bypass Pumping System for Stream	1	MON	$154,133.00	$154,133.00	$175,000.00	$175,000.00	
Pump Set-Up (Contractors Responsibility)	256	EA		$0.00	$600.00	$153,600.00	
HDPE Pipe Rental	1	EA	$47,580.00	$47,580.00	$1,000.00	$1,000.00	
HDPE Pipe Fusion	1	EA	$32,250.00	$32,250.00	$1,000.00	$1,000.00	
HDPE Pipe Fusion (Contractors Responsibility)	120	HRS		$0.00	$250.00	$30,000.00	
Double Containment Fuel Tank for Pumps	1	EA	$1,924.00	$1,924.00	$1,000.00	$1,000.00	
Transportation for Pumps and Piping In and Out	1	EA	$78,950.00	$78,950.00	$1,000.00	$1,000.00	
Fuel for Pumps (3-WEEKS 24/7 145 Gallons Per Day)	73,080	GAL	$5.50	$401,940.00	$6.00	$438,480.00	
Armoring of Streambed for Effluent Hoses (100 LF x 40 LF of Plastic Sheeting)	1	EA	$1,000.00	$1,000.00	$2,000.00	$2,000.00	
24 HR Back-Up Pump Monitoring Labor	504	HR		$0.00	$100.00	$50,400.00	
Removal of Bypass Pumping System	1	EA	$0.00	$0.00	$5,000.00	$5,000.00	
Removal of Aqua Barrier Coffer Dams	2	EA	$0.00	$0.00	$1,000.00	$2,000.00	
INSTALLATION OF ACCESS ROAD FOR STREAM WORK 1200 LF (long) x 12 LF (wide) X 2 VLF (thick)	**1**	**LS**					**$94,933.33**
Earthwork Including Trucking of Spoils to Storage Pile Within 2 Mile Radius of Project	1,067	CY			$12.50	$13,333.33	
Stabilization Fabric	1,600	SY	$2.00	$3,200.00	$3.00	$4,800.00	
Crusher Run Gravel	1,067	CY	$18.00	$19,200.00	$30.00	$32,000.00	
Crushed Size #2 & #3 Stone	1,067	CY	$30.00	$32,000.00	$42.00	$44,800.00	
REMOVAL OF CONTAMINATED STREAMBED		**LS**					**$59,020.00**
Earthwork Including Trucking of Spoils and Placement in Lagoon	2,270	CY			$26.00	$59,020.00	
INSTALLATION OF RUN OF BANK GRAVEL IN STREAMBED		**LS**					**$43,130.00**
Run Of Bank Gravel	2,270	CY	$12.50	$28,375.00	$19.00	$43,130.00	
REMOVAL OF ACCESS ROADS 1200 LF (long) x 12 LF (wide) x 2 VLF (thick)	**1**	**LS**					**$19,733.33**
Earthwork Inc.trucking Stored Native Materials Back (2 Mile Radius) and Reseeding	1,067	CY		$0.00	$18.50	$19,733.33	
TOTAL ESTIMATED COST							**$1,096,296.67**

DESCRIPTION	QUANTITY	UNIT	MATERIAL COST	SUBTOTAL MATERIAL COST	ESTIMATED IN PLACE UNIT COST	SUBTOTAL IN PLACE ITEM COST	ESTIMATED IN PLACE ITEM COST
ALTERNATE SED-2							
DEWATERING	**1**	**LS**					**$1,205,400.00**
Rental and Installation of Aqua Barrier Coffer Dams	2	EA	$5,000.00	$10,000.00	$7,000.00	$14,000.00	
Armoring of Streambed for Influent Bypass Pumping Hose (Stabilization Fabric & Med Stone Fill)	1	EA	$2,000.00	$2,000.00	$5,000.00	$5,000.00	
Bypass Pumping System for Stream	1	MON	$154,133.00	$154,133.00	$175,000.00	$175,000.00	
Pump Set-Up (Contractors Responsibility)	256	EA		$0.00	$600.00	$153,600.00	
HDPE Pipe Rental	1	EA	$47,580.00	$47,580.00	$1,000.00	$1,000.00	
HDPE Pipe Fusion	1	EA	$32,250.00	$32,250.00	$1,000.00	$1,000.00	
HDPE Pipe Fusion (Contractors Responsibility)	120	HRS		$0.00	$250.00	$30,000.00	
Double Containment Fuel Tank for Pumps	1	EA	$1,924.00	$1,924.00	$1,000.00	$1,000.00	
Transportation for Pumps and Piping In and Out	1	EA	$78,950.00	$78,950.00	$1,000.00	$1,000.00	
Fuel for Pumps (Five-Weeks 24/7 145 Gallons Per Day)	121,800	GAL	$5.50	$669,900.00	$6.00	$730,800.00	
Armoring of Streambed for Effluent Hoses (100 LF x 40 LF of Plastic Sheeting)	1	EA	$1,000.00	$1,000.00	$2,000.00	$2,000.00	
24 HR Back-Up Pump Monitoring Labor	840	HR		$0.00	$100.00	$84,000.00	
Removal of Bypass Pumping System	1	EA	$0.00	$0.00	$5,000.00	$5,000.00	
Removal of Aqua Barrier Coffer Dams	2	EA	$0.00	$0.00	$1,000.00	$2,000.00	
INSTALLATION OF ACCESS ROAD FOR STREAM WORK 3700 LF (long) x 12 LF (wide) X 2 VLF (thick)	**1**	**LS**					**$292,711.11**
Earthwork Including Trucking of Spoils to Storage Pile Within 2 Mile Radius of Project	3,289	CY			$12.50	$41,111.11	
Stabilization Fabric	4,933	SY	$2.00	$9,866.67	$3.00	$14,800.00	
Crusher Run Gravel	3,289	CY	$18.00	$59,200.00	$30.00	$98,666.67	
Crushed Size #2 & #3 Stone	3,289	CY	$30.00	$98,666.67	$42.00	$138,133.33	
REMOVAL OF CONTAMINATED STREAMBED		**LS**					**$110,006.00**
Earthwork Including Trucking of Spoils and Placement in Lagoon	4,231	CY			$26.00	$110,006.00	
INSTALLATION OF RUN OF BANK GRAVEL IN STREAMBED		**LS**					**$80,389.00**
Run Of Bank Gravel	4,231	CY	$12.50	$52,887.50	$19.00	$80,389.00	
REMOVAL OF ACCESS ROADS 3700 LF (long) x 12 LF (wide) x 2 VLF (thick)	**1**	**LS**					**$49,333.33**
Earthwork Inc.trucking Stored Native Materials Back (2 Mile Radius)	3,289	CY		$0.00	$15.00	$49,333.33	
TOTAL ESTIMATED COST							**$1,737,839.44**

DESCRIPTION	QUANTITY	UNIT	MATERIAL COST	SUBTOTAL MATERIAL COST	ESTIMATED IN PLACE UNIT COST	SUBTOTAL IN PLACE ITEM COST	ESTIMATED IN PLACE ITEM COST
ALTERNATE SED-3							
DEWATERING	**1**	**LS**					**$716,520.00**
Rental and Installation of Aqua Barrier Coffer Dams	2	EA	$5,000.00	$10,000.00	$7,000.00	$14,000.00	
Armoring of Streambed for Influent Bypass Pumping Hose (Stabilization Fabric & Med Stone Fill)	1	EA	$2,000.00	$2,000.00	$5,000.00	$5,000.00	
Bypass Pumping System for Stream	1	MON	$154,133.00	$154,133.00	$175,000.00	$175,000.00	
Pump Set-Up (Contractors Responsibility)	256	EA		$0.00	$600.00	$153,600.00	
HDPE Pipe Rental	1	EA	$47,580.00	$47,580.00	$1,000.00	$1,000.00	
HDPE Pipe Fusion	1	EA	$32,250.00	$32,250.00	$1,000.00	$1,000.00	
HDPE Pipe Fusion (Contractors Responsibility)	120	HRS		$0.00	$250.00	$30,000.00	
Double Containment Fuel Tank for Pumps	1	EA	$1,924.00	$1,924.00	$1,000.00	$1,000.00	
Transportation for Pumps and Piping In and Out	1	EA	$78,950.00	$78,950.00	$1,000.00	$1,000.00	
Fuel for Pumps (Two-Weeks 24/7 145 Gallons Per Day)	48,720	GAL	$5.50	$267,960.00	$6.00	$292,320.00	
Armoring of Streambed for Effluent Hoses (100 LF x 40 LF of Plastic Sheeting)	1	EA	$1,000.00	$1,000.00	$2,000.00	$2,000.00	
24 HR Back-Up Pump Monitoring Labor	336	HR		$0.00	$100.00	$33,600.00	
Removal of Bypass Pumping System	1	EA	$0.00	$0.00	$5,000.00	$5,000.00	
Removal of Aqua Barrier Coffer Dams	2	EA	$0.00	$0.00	$1,000.00	$2,000.00	
INSTALLATION OF ACCESS ROAD FOR STREAM WORK 650 LF (long) x 12 LF (wide) X 2 VLF (thick)	**1**	**LS**					**$51,422.22**
Earthwork Including Trucking of Spoils to Storage Pile Within 2 Mile Radius of Project	578	CY			$12.50	$7,222.22	
Stabilization Fabric	867	SY	$2.00	$1,733.33	$3.00	$2,600.00	
Crusher Run Gravel	578	CY	$18.00	$10,400.00	$30.00	$17,333.33	
Crushed Size #2 & #3 Stone	578	CY	$30.00	$17,333.33	$42.00	$24,266.67	
REMOVAL OF CONTAMINATED STREAMBED		**LS**					**$21,138.00**
Earthwork Including Trucking of Spoils and Placement in Lagoon	813	CY			$26.00	$21,138.00	
INSTALLATION OF RUN OF BANK GRAVEL IN STREAMBED		**LS**					**$15,447.00**
Run Of Bank Gravel	813	CY	$12.50	$10,162.50	$19.00	$15,447.00	
REMOVAL OF ACCESS ROADS 1200 LF (long) x 12 LF (wide) x 2 VLF (thick)	**1**	**LS**					**$8,666.67**
Earthwork Inc.trucking Stored Native Materials Back (2 Mile Radius)	578	CY		$0.00	$15.00	$8,666.67	
TOTAL ESTIMATED COST							**$813,193.89**

05/01/2013
Phone Conversation
Tara Daniels Laboratory Manager
Adirondack Environmental Services
Albany, New York
518-434-4546

Laboratory Unit Price Analytical Costs for:

PCBs 8082 Soils	$75
PCBs 8082 Ground Water	$95
Cadmium, Lead, Barium Soils	$55
Cadmium , Lead, Barium Ground Water	$45
TCLP Extraction for Cadmium, Lead, Barium	$65
TCLP Analysis Cadmium, Lead, Barium	$40
Fluoride Ground Water/Drinking Water	$30

Ground Water Alternatives

Delaware Engineering, P.C.
28 Madison Avenue Extension
Albany, New York 12203
Phone: (518) 452-1290 Fax: (518) 452-1335

JOB C&D Feasibility Study
SHEET NO. 1 of 2 OF
DRAWN BY CLF DATE 5/1/13
CHECKED BY DATE
SCALE

Cost Estimate Longterm Monitoring.
Alternatives GW-1, GW-2, GW-3

I Groundwater Semi-Annual - Alternatives GW-1, GW-2 & GW-3

17 wells: MW-6 thru MW10, MW12, MW13, MW14, MW-15, MW16, MW-17, MW-17A, Orange County Potable Well

A. Analysis PCBs $95
Cd, Pb, Bu $45
Fluoride $30

$170 per sample

12 wells x 2 samples per year = 24 samples x $170 = $4,080 ≅ $4,100

II Sample Collection

A $100/hr x 32 hrs x 2 events/year = $6,400
B. Expenses 1,500/event x2 = $3000
9,400

III Report $2,500/event x 2 events = $5,000

$18,500 = $9,250/event

IV Well Maintenance

$150/well/year x 17 wells = $2,550

Delaware Engineering, P.C.
28 Madison Avenue Extension
Albany, New York 12203
Phone: (518) 452-1290 Fax: (518) 452-1335

JOB C&D Ground Water/ Alternatives
SHEET NO. 2 OF 2
DRAWN BY ______ DATE ______
CHECKED BY ______ DATE ______
SCALE ______

V Quarterly Monitoring of Residential Point of Entry treatment System and Orange County well (former Swartwout Residence)

A. Sample Analysis - well and before/after treatment System (Well = before) = Two Samples Fluoride

2 samples x $30/sample x 4 = $240

B. Sample Collection: Technician $100/hr x 4 hrs per event x 4 events = $400 x 4 = $1,600

Total $1,840/year

4/30/13: Note Add 15% to listed costs for current Rates

August 6, 2008

CND
Huguenot NY Residence

Stephanie Vetter,

Per our earlier conversation, here is a budgetary quote to reduce fluoride levels at the above residence.

The process to effectively reduce fluorides in the water supply can be done utilizing Reverse Osmosis. There are two ways of providing reverse osmosis water in the home.

1. Culligan can install individual systems within the home where you would want high quality drinking water. With this system you would have a separate faucet at the kitchen or bathroom sinks which would provide high quality drinking water for cooking and drinking purposes. The total cost of these systems would be $999.00 to $1499.00 depending on cartridges, production and reserve capacity. The filters are typically changed yearly at a cost of between $179.00 and $300.00, again depending on the type of cartridges utilized in the R/O system. The R/O module is typically changed every 3 to 5 years at a cost of approximately $150.00. The module is monitored and will let you know when it is required to be replaced.
2. Culligan can also install a whole house Reverse Osmosis system which would provide high quality water throughout all the faucets. A whole house Reverse Osmosis system typically costs between $14,000 and $20,000 depending on quality of the incoming water and the need for pre-treatment. The annual cost to service would depend on the pre-treatment required but would estimate between $500.00 and $1000.00 per year. Culligan also provides optional bi-monthly maintenance contracts starting at $89.95 per visit.

Groundwater Alternatives
GW-1 & GW-2 →
16,100 – 23,000
$1,150

If you have any questions or would like additional information, please feel free to contact me at the numbers below.

Thanks,

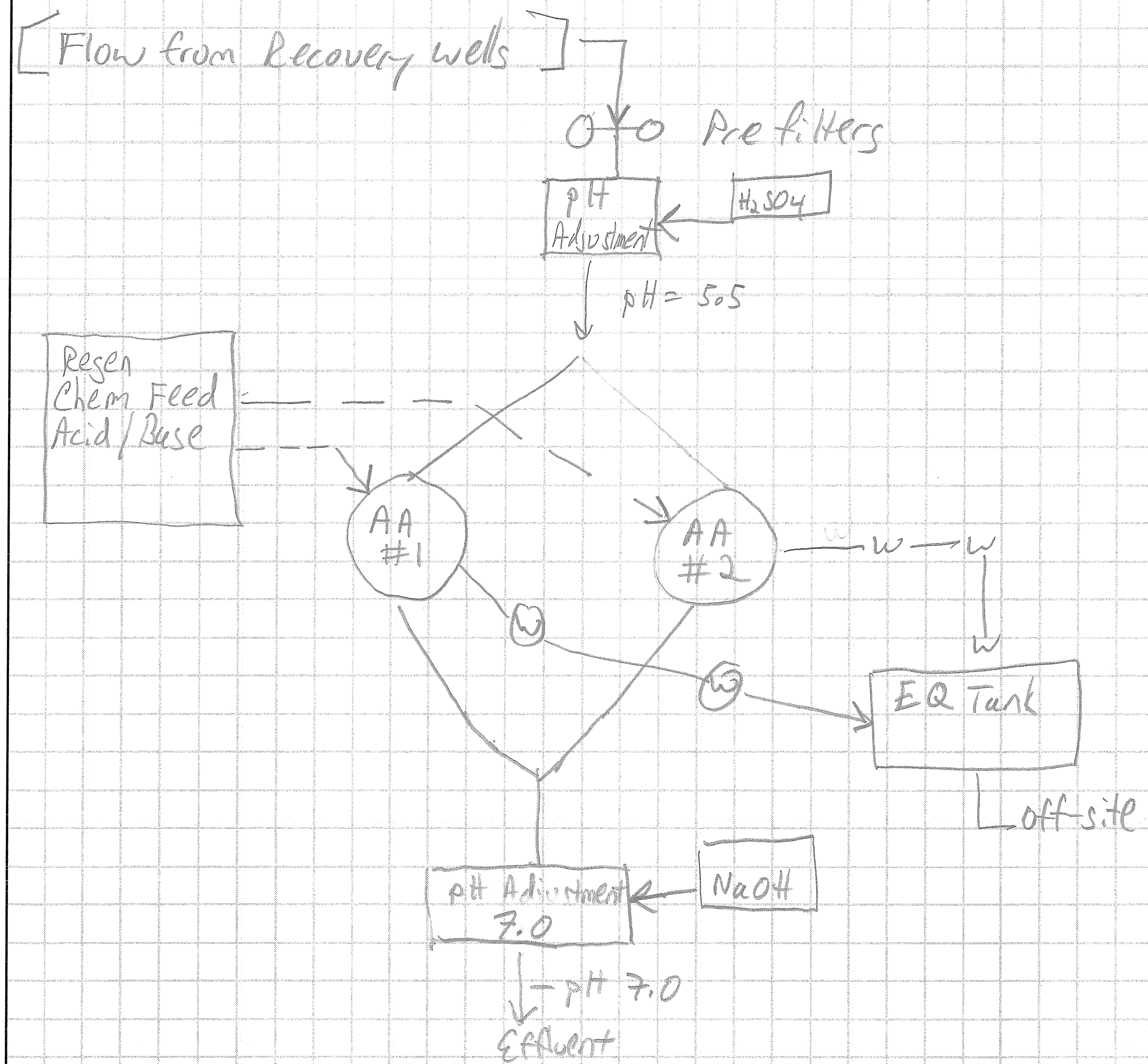
Todd A. Campbell
Branch Manager
Culligan Water Company
845-561-3728 Ext. 101
e-mail- tcampbell@culligan.com

Delaware Engineering, P.C.
28 Madison Avenue Extension
Albany, New York 12203
Phone: (518) 452-1290 Fax: (518) 452-1335

JOB C&D Fluoride Removal GW-2
SHEET NO. 1 OF 4
DRAWN BY ______ DATE ______
CHECKED BY ______ DATE ______
SCALE ______

Alternative G1 Activated Alumina Treatment System

Fluoride Removal Process



Delaware Engineering, P.C.
28 Madison Avenue Extension
Albany, New York 12203
Phone: (518) 452-1290 Fax: (518) 452-1335

Fluoride System Construction Cost

Prefilter: Duplex backwash sand	$34,500
pH Adj System w/ Feed monitor	$23,000
AA Tank 2 @ 10,000 gal (use glass lined AO Smith)	$46,000
Media 2x125 cf @ 45 pcf @ $2/lb	$22,500
Gravel media underlay	$1,150
pH Adj Final	$23,000
Regen Feed Equipment	$34,500
Clarifier Tanks (Equilization) 10,000 gal	$23,000
pumping equipment	$5,750
R&C	$17,500
Electric Primary Service	$2,300
Electric materials	$5,750
Equipment	≅ 238,930
Install 50% of Equipment Costs	119,500
Site Prep/Development	12,500
(Does not include engineering, permits, etc.)	≅ 371,000

Due to preliminary stage of Design 25% Contingency ESTIMATE ≅ 463,625
Use 465,000

Fluoride System O&M

Chem Feed	$250
Labor 4 man days @ $95/hr	$3,040
Electric	$500
pH/Auto dialer	$250
Reporting	$500
lab Analysis	$500
Disposal 20,000 gal @ $0.50/gal	$10,000
	$15,040/month x12 = $180,480/year
Equipment Repair/Depreciation 5% of Construction Cost	$10,000
Contingency	$10,000
Projected Operating Cost	$200,480/year

Delaware Engineering, P.C.
28 Madison Avenue Extension
Albany, New York 12203
Phone: (518) 452-1290 Fax: (518) 452-1335

JOB C&D Fluoride Removal GW?
SHEET NO. 2 OF 2
DRAWN BY ______ DATE ______
CHECKED BY ______ DATE ______
SCALE ______

Fluoride System Sizing

Remove 10 mg/L F^- from 50 gpm stream (Estimate effluent conc 1mg/L)

Loading = 50 × 1440 = 72,000 GPD = 0.072 MGD

wt = 10 × 0.072 × 8.34 = 6.0 lb F × 453 = 2720 g/day

AA capacity = 3,000 - 5,000 g/m^3 ∴ Aproximately 1 m^3/day AA media required

Run 2 beds on 2-week cycles

$$14 d \times 1 m^3 \frac{ft^3}{(0.3048 m)^3} = 494 ft^3 = 500 ft^3 \text{ media}$$

Bed 4' thick = 125 SF Bed Area

$$125 = \frac{\pi d^2}{4} \quad d = 12.6' \cong 12' \text{ bed diameter}$$

12' diameter tank w/ SWD = [4' + 4' HW + 2' FB + 2' UD] = 12'
vol $12 \times \pi \left(\frac{12}{2}\right)^2$ = 1,360 CF = 10,000 gal tank

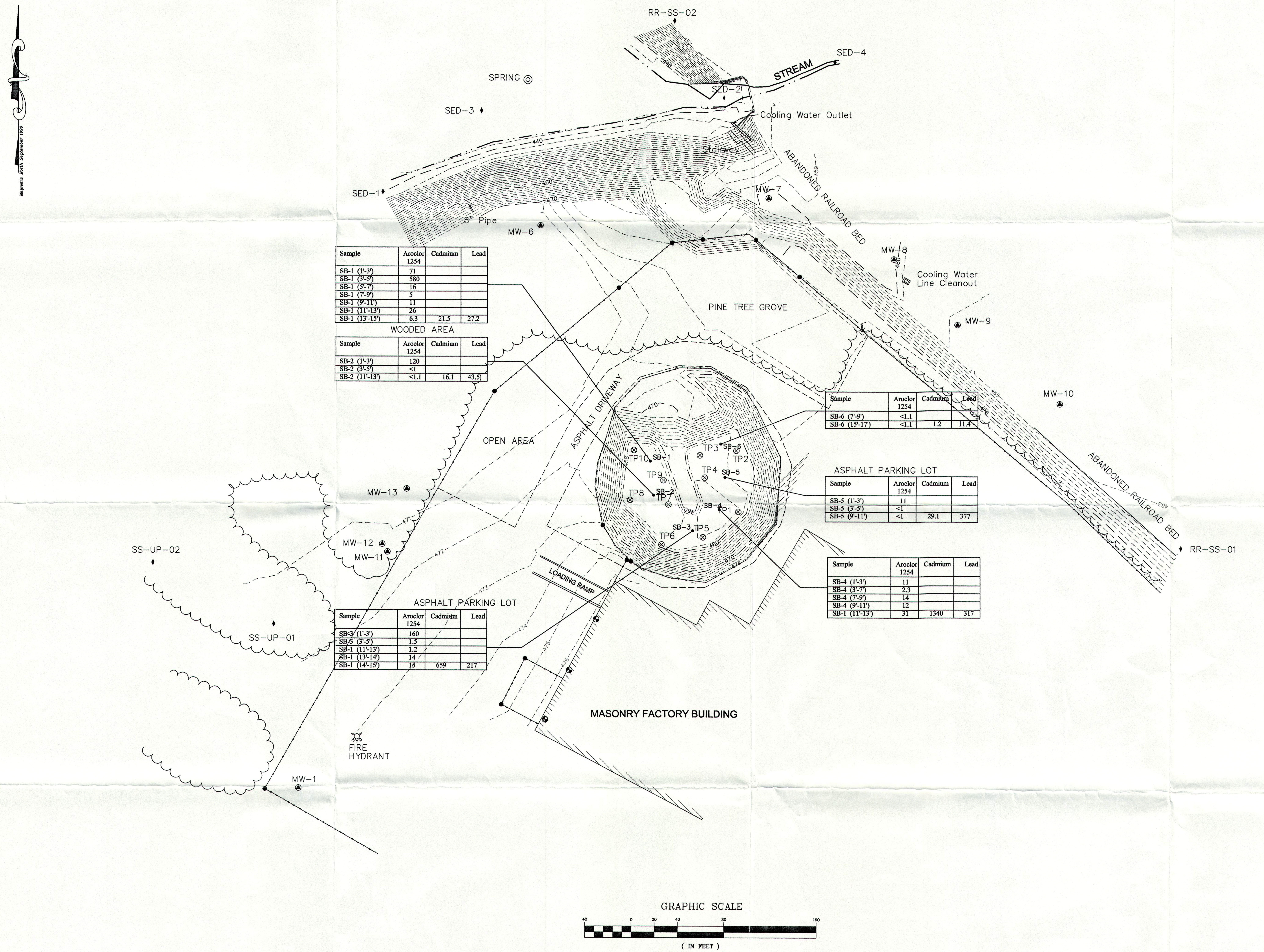
Resin
ALK → 5 Bed volumes = 5 × 125 × 7.48 = 4,700 gal Regen 1% NaOH
Rinse → 2 Bed volumes = 2 × 125 × 7.48 = 1,900 gal water rinse
Acid → 1.5 Bed volumes = 1.5 × 125 × 7.48 = 1,400 gal acid
Rinse → 2 Bed volumes = 2 × 125 × 7.48 = 1,900 gal water rinse

9,900 gal / cycle

19,800 gal waste liquid / month

APPENDIX B

MARCH 2001 REMEDIAL INVESTIGATION REPORT, DRAWINGS 2 (LAGOONTEST PIT DATA), 3 (LAGOON SURFACE SOIL DATA) AND 4 (LAGOON SOIL BORING DATA).



Sample	Aroclor 1254	Cadmium	Lead
SB-1 (1'-3')	71		
SB-1 (3'-5')	580		
SB-1 (5'-7')	16		
SB-1 (7'-9')	5		
SB-1 (9'-11')	11		
SB-1 (11'-13')	26		
SB-1 (13'-15')	6.3	21.5	27.2

Sample	Aroclor 1254	Cadmium	Lead
SB-2 (1'-3')	120		
SB-2 (3'-5')	<1		
SB-2 (11'-13')	<1.1	16.1	43.5

Sample	Aroclor 1254	Cadmium	Lead
SB-3 (1'-3')	160		
SB-3 (3'-5')	1.5		
SB-1 (11'-13')	1.2		
SB-1 (13'-14')	14		
SB-1 (14'-15')	15	659	217

Sample	Aroclor 1254	Cadmium	Lead
SB-6 (7'-9')	<1.1		
SB-6 (15'-17')	<1.1	1.2	11.4

Sample	Aroclor 1254	Cadmium	Lead
SB-5 (1'-3')	11		
SB-5 (3'-5')	<1		
SB-5 (9'-11')	<1	29.1	377

Sample	Aroclor 1254	Cadmium	Lead
SB-4 (1'-3')	11		
SB-4 (3'-7')	2.3		
SB-4 (7'-9')	14		
SB-4 (9'-11')	12		
SB-1 (11'-13')	31	1340	317

LEGEND

- = SOIL SAMPLE
- = TEST PIT
- = MONITORING WELL
- = FIRE HYDRANT
- = FENCE POST
- = CHAIN LINK FENCE
- = 1ST FLOOR ELEVATION
- = EDGE OF PAVEMENT
- = TREE LINE
- = CONTOUR LINE
- = INDEX CONTOUR LINE
- 465 = ELEVATION

NOTES:

Datum : Based on ground elevation of MW-1
Contour Interval = 1'

All values in mg / kg.

DRAWING No. 4

SUMMARY SOIL BORING DATA

SITE AT
C & D TECHNOLOGIES
NYS ROUTE 209
HUGUENOT, NEW YORK

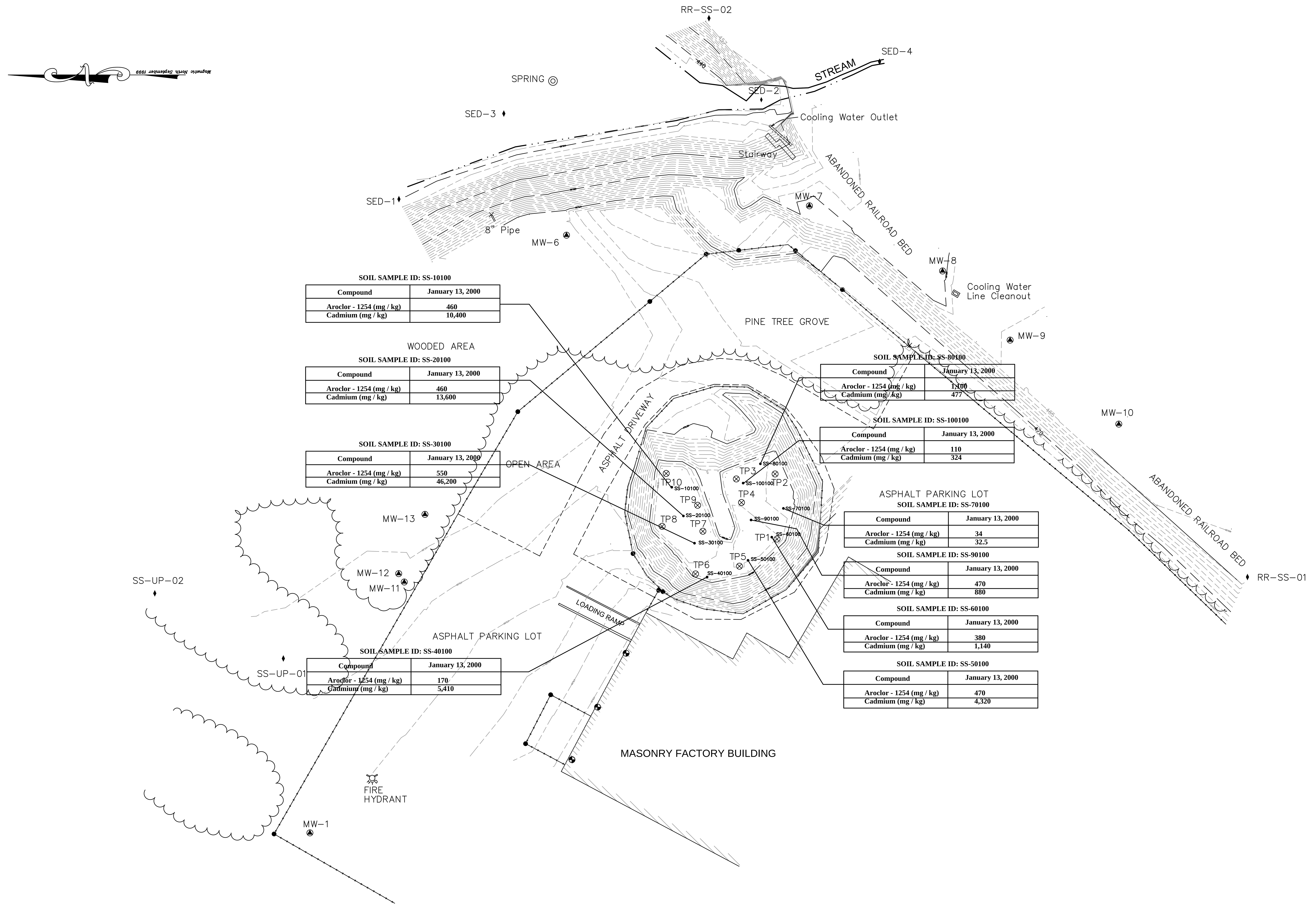
DELAWARE ENGINEERING, P.C.
28 Madison Avenue Extension
Albany, New York 12203
Phone 518-452-1290
FAX 518-452-1335

REVISED

SCALE AS SHOWN
DATE MAY 22, 2000
DRAWN BY KJ
CHECKED BY
APPROVED BY E.F.
FILENAME Soil Boring Data
PROJECT NO.

DRAWING NUMBER No. 4
SHEET NUMBER 1 OF 1

FILENAME: SOIL_BORING_DATA.DWG



SOIL SAMPLE ID: SS-10100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	460
Cadmium (mg / kg)	10,400

SOIL SAMPLE ID: SS-20100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	460
Cadmium (mg / kg)	13,600

SOIL SAMPLE ID: SS-30100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	550
Cadmium (mg / kg)	46,200

SOIL SAMPLE ID: SS-40100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	170
Cadmium (mg / kg)	5,410

SOIL SAMPLE ID: SS-80100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	1,100
Cadmium (mg / kg)	477

SOIL SAMPLE ID: SS-100100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	110
Cadmium (mg / kg)	324

SOIL SAMPLE ID: SS-70100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	34
Cadmium (mg / kg)	32.5

SOIL SAMPLE ID: SS-90100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	470
Cadmium (mg / kg)	880

SOIL SAMPLE ID: SS-60100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	380
Cadmium (mg / kg)	1,140

SOIL SAMPLE ID: SS-50100

Compound	January 13, 2000
Aroclor - 1254 (mg / kg)	470
Cadmium (mg / kg)	4,320

LEGEND

- ♦ = SOIL SAMPLE
- ⊗ = TEST PIT
- = MONITORING WELL
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- • = FENCE POST
- = CHAIN LINK FENCE
- = 1ST FLOOR ELEVATION
- = EDGE OF PAVEMENT
- = TREE LINE
- = CONTOUR LINE
- = INDEX CONTOUR LINE
- 465 = ELEVATION

NOTES:

Datum : Based on ground elevation of MW-1
Contour Interval = 1'

Compound	Commercial Use SCO
PCB	1.0 mg / kg
Cadmium	9.3 mg / kg

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

DRAWING No. 3

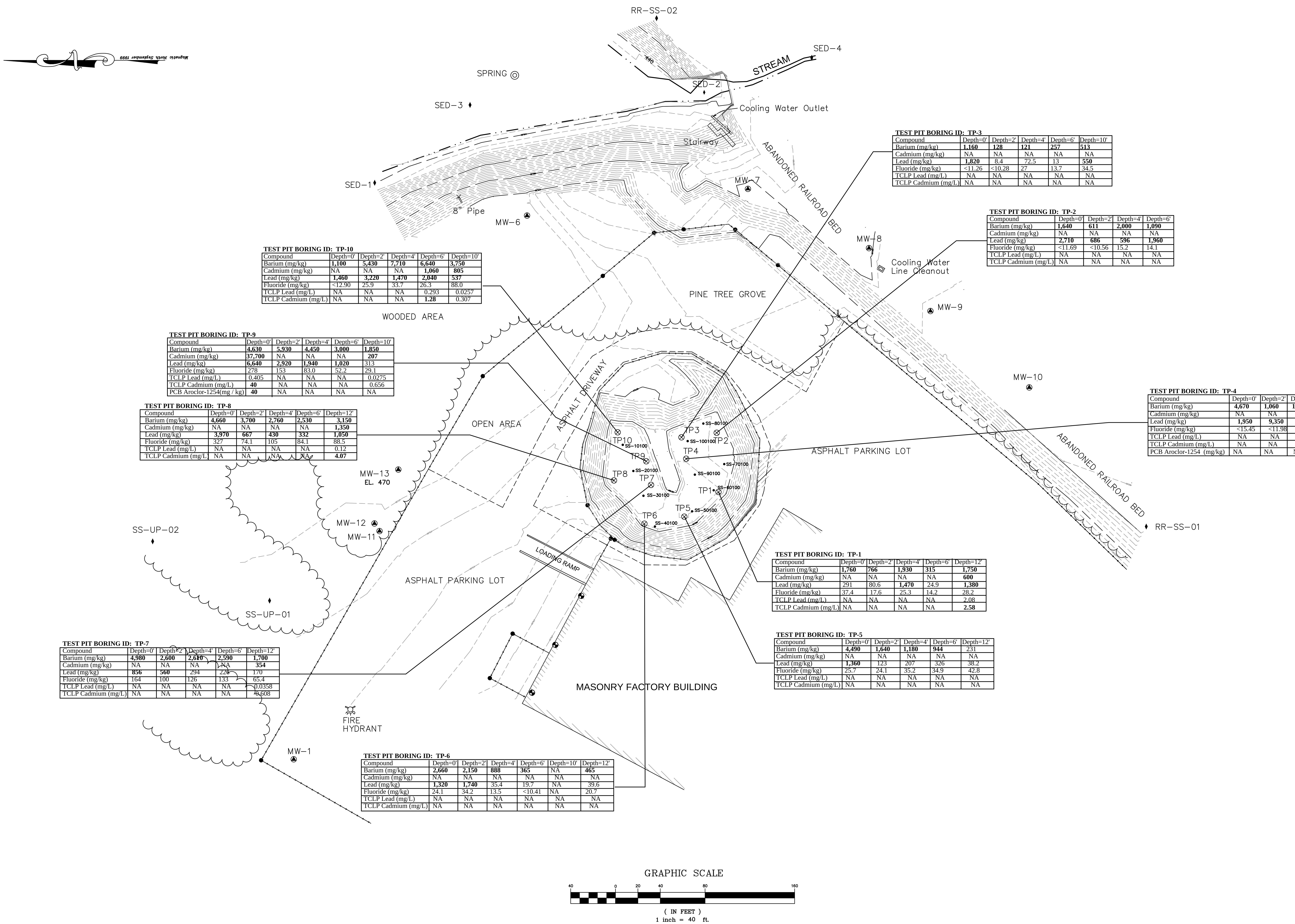
PCB & CADMIUM SURFACE SOIL SAMPLING DATA SUMMARY

SITE AT
C & D TECHNOLOGIES
NYS ROUTE 209
HUGUENOT, NEW YORK

DELAWARE ENGINEERING, P.C.
28 Madison Avenue Extension
Albany, New York 12203
Phone 518-452-1290
FAX 518-452-1335

SCALE AS SHOWN
DATE MAY 22, 2000
DRAWN BY KJ
CHECKED BY
APPROVED BY EF
FILENAME PCB_1.DWG
PROJECT NO.
REVISED

DRAWING NUMBER No. 3
SHEET NUMBER 1 OF 1



TEST PIT BORING ID: TP-3

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'	Depth=10'
Barium (mg/kg)	**1,160**	**128**	**121**	**257**	**513**
Cadmium (mg/kg)	NA	NA	NA	NA	NA
Lead (mg/kg)	**1,820**	8.4	72.5	13	**550**
Fluoride (mg/kg)	<11.26	<10.28	27	13.7	34.5
TCLP Lead (mg/L)	NA	NA	NA	NA	NA
TCLP Cadmium (mg/L)	NA	NA	NA	NA	NA

TEST PIT BORING ID: TP-2

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'
Barium (mg/kg)	**1,640**	**611**	**2,000**	**1,090**
Cadmium (mg/kg)	NA	NA	NA	NA
Lead (mg/kg)	**2,710**	**686**	**596**	**1,960**
Fluoride (mg/kg)	<11.69	<10.56	15.2	14.1
TCLP Lead (mg/L)	NA	NA	NA	NA
TCLP Cadmium (mg/L)	NA	NA	NA	NA

TEST PIT BORING ID: TP-10

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'	Depth=10'
Barium (mg/kg)	**1,100**	**5,430**	**7,710**	**6,640**	**3,750**
Cadmium (mg/kg)	NA	NA	NA	**1,060**	**805**
Lead (mg/kg)	**1,460**	**3,220**	**1,470**	**2,040**	**537**
Fluoride (mg/kg)	<12.90	25.9	33.7	26.3	88.0
TCLP Lead (mg/L)	NA	NA	NA	0.293	0.0257
TCLP Cadmium (mg/L)	NA	NA	NA	**1.28**	0.307

TEST PIT BORING ID: TP-9

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'	Depth=10'
Barium (mg/kg)	**4,630**	**5,930**	**4,450**	**3,000**	**1,850**
Cadmium (mg/kg)	**37,700**	NA	NA	NA	**207**
Lead (mg/kg)	**6,640**	**2,920**	**1,940**	**1,020**	313
Fluoride (mg/kg)	278	153	83.0	52.2	29.1
TCLP Lead (mg/L)	0.405	NA	NA	NA	0.0275
TCLP Cadmium (mg/L)	**40**	NA	NA	NA	0.656
PCB Aroclor-1254(mg / kg)	**40**	NA	NA	NA	NA

TEST PIT BORING ID: TP-8

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'	Depth=12'
Barium (mg/kg)	**4,660**	**3,700**	**2,760**	**2,530**	**3,150**
Cadmium (mg/kg)	NA	NA	NA	NA	**1,350**
Lead (mg/kg)	**3,970**	**667**	**430**	**332**	**1,050**
Fluoride (mg/kg)	327	74.1	105	84.1	88.5
TCLP Lead (mg/L)	NA	NA	NA	NA	0.12
TCLP Cadmium (mg/L)	NA	NA	NA	NA	**4.07**

TEST PIT BORING ID: TP-4

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'	Depth=10'
Barium (mg/kg)	**4,670**	**1,060**	**1,100**	**701**	**2,280**
Cadmium (mg/kg)	NA	NA	NA	NA	**1,260**
Lead (mg/kg)	**1,950**	**9,350**	**7,190**	**13,000**	**6,830**
Fluoride (mg/kg)	<15.45	<11.98	22.1	24.2	31.5
TCLP Lead (mg/L)	NA	NA	NA	NA	**5.46**
TCLP Cadmium (mg/L)	NA	NA	NA	NA	**3.76**
PCB Aroclor-1254 (mg/kg)	NA	NA	NA	NA	6.5

TEST PIT BORING ID: TP-1

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'	Depth=12'
Barium (mg/kg)	**1,760**	**766**	**1,930**	**315**	**1,750**
Cadmium (mg/kg)	NA	NA	NA	NA	**600**
Lead (mg/kg)	291	80.6	**1,470**	24.9	**1,380**
Fluoride (mg/kg)	37.4	17.6	25.3	14.2	28.2
TCLP Lead (mg/L)	NA	NA	NA	NA	2.08
TCLP Cadmium (mg/L)	NA	NA	NA	NA	**2.58**

TEST PIT BORING ID: TP-5

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'	Depth=12'
Barium (mg/kg)	**4,490**	**1,640**	**1,180**	**944**	231
Cadmium (mg/kg)	NA	NA	NA	NA	NA
Lead (mg/kg)	**1,360**	123	207	326	38.2
Fluoride (mg/kg)	25.7	24.1	35.2	34.9	42.8
TCLP Lead (mg/L)	NA	NA	NA	NA	NA
TCLP Cadmium (mg/L)	NA	NA	NA	NA	NA

TEST PIT BORING ID: TP-7

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'	Depth=12'
Barium (mg/kg)	**4,980**	**2,600**	**2,610**	**2,590**	**1,700**
Cadmium (mg/kg)	NA	NA	NA	NA	**354**
Lead (mg/kg)	**856**	**560**	294	226	170
Fluoride (mg/kg)	164	100	126	133	65.4
TCLP Lead (mg/L)	NA	NA	NA	NA	0.0358
TCLP Cadmium (mg/L)	NA	NA	NA	NA	0.608

TEST PIT BORING ID: TP-6

Compound	Depth=0'	Depth=2'	Depth=4'	Depth=6'	Depth=10'	Depth=12'
Barium (mg/kg)	**2,660**	**2,150**	**888**	**365**	NA	**465**
Cadmium (mg/kg)	NA	NA	NA	NA	NA	NA
Lead (mg/kg)	**1,320**	**1,740**	35.4	19.7	NA	39.6
Fluoride (mg/kg)	24.1	34.2	13.5	<10.41	NA	20.7
TCLP Lead (mg/L)	NA	NA	NA	NA	NA	NA
TCLP Cadmium (mg/L)	NA	NA	NA	NA	NA	NA

LEGEND

- ♦ = SOIL SAMPLE
- ⊗ = TEST PIT
- = MONITORING WELL
- = FIRE HYDRANT
- • = FENCE POST
- = CHAIN LINK FENCE
- = 1ST FLOOR ELEVATION
- = EDGE OF PAVEMENT
- = TREE LINE
- = CONTOUR LINE
- = INDEX CONTOUR LINE
- 465 = ELEVATION

NOTES:

Datum : Based on ground elevation of MW-1
Contour Interval = 1'

NA : Indicates Not Analyzed

Values in Bold Exceed R.S.C.O.

Lead Values in Bold Exceed both Site Background and Typical Metropolitan and Suburban Concentrations.

Compound	PART 375 Commercial Use SCO
Barium (mg/kg)	400
Cadmium (mg/kg)	9.3
Lead (mg/kg)	1,000
Fluoride (mg/kg)	NA
TCLP Lead (mg/L)	5
TCLP Cadmium (mg/L)	1
PCB (mg / kg)	1

DRAWING No. 2

TEST PIT SAMPLING DATA SUMMARY

SITE AT
C & D TECHNOLOGIES
NYS ROUTE 209
HUGUENOT, NEW YORK

DELAWARE ENGINEERING, P.C.
28 Madison Avenue Extension
Albany, New York 12203
Phone 518-452-1290
FAX 518-452-1335

SCALE AS SHOWN
DATE MAY 22, 2000
DRAWN BY KJ
CHECKED BY
APPROVED BY EF
FILENAME PCB_1.DWG
PROJECT NO.
REVISED

DRAWING NUMBER No. 2
SHEET NUMBER 1 OF 1

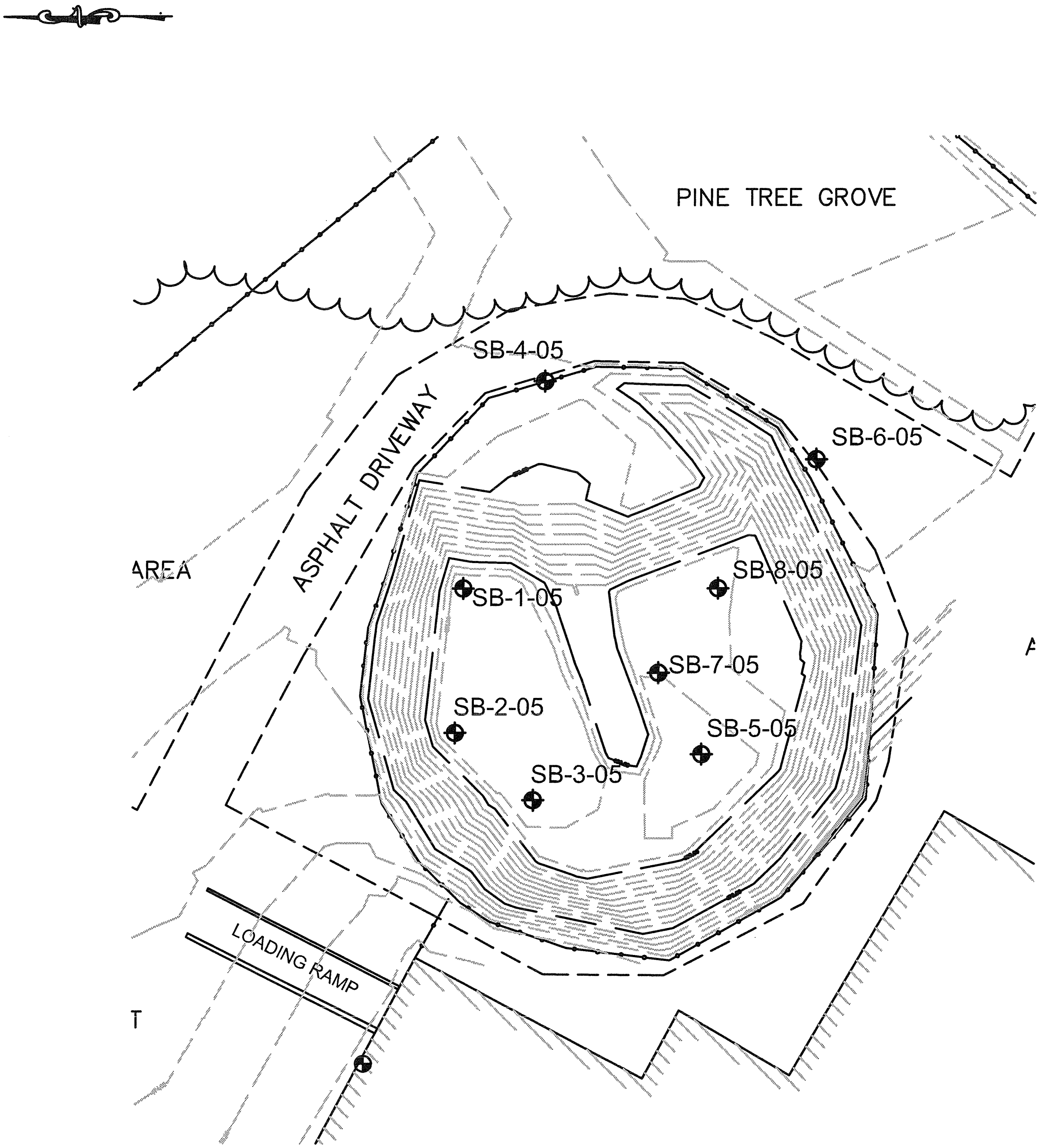
APPENDIX C

MAY 2006 OPERABLE UNIT 2 REMEDIAL INVESTIGATION REPORT, TABLE 7 AND FIGURE 8.

Table 7
C D Technologies, Inc. Facility
Huguenot, New York
Site ID 336001
Lagoon March 2005
Soil Boring Data

PARAMETER	Part 375	Part 375 Protection of	SB-1-05	SB-1-05	SB-1-05	SB-1-05	SB-2-05	SB-2-05	SB-2-05	SB-2-05	SB-3-05	SB-3-05	SB-3-05	SB-3-05	SB-4-05	SB-4-05	SB-4-05	SB-4-05
	Unrestricted Use	Ground Water	0-0.6' BGW (12-12.5'BGS)	2-4' BGW (14-16' BGS)	8-10' BGW (20-22' BGS)	10-11.4' BGW (22-23.4' BGS)	+2 - 0' AGW (10-12' BGS)	2-4' BGW (14-16' BGS)	4-6' BGW (16-18' BGS)	6-8' BGW (18-20' BGS)	0.5 -0.7' BGW (14-14.2' BGS)	2.5-3.1' BGW (16-16.6' BGS)	6.5-8.5' BGW (20-22' BGS)	8.5-10.5' BGW (22-24' BGS)	0-2' BGW (28-30' BGS)	2-4' BGW (30-32' BGS)	4-6' BGW (32-34' BGS)	8-10' BGW (36-38' BGS)
Water Level in Augers			**11.9' BGS**				**11.9' BGS**				**13.5' BGS**				**27.8'BGS**			
Total Results mg/Kg																		
Barium	350	820	**930**	**991**	711	440	**1030**	**1370**	739	673	590	359	666	429	47.4	377	429	53
Cadmium	2.5	7.5	**175**	**112**	**74.9**	**80.8**	**316**	**57.2**	**42.6**	**21.3**	**11.8**	4.14	7.42	3.87	<0.25	2.16	6.25	0.29
Lead	63	450	92.2	72.4	56.2	94.5	**780**	143	73.6	55.4	26	9.39	53.3	18	<0.25	17.3	10	<0.25
TCLP mg/L																		
Barium		100	6.98	8.57	5.86	3.53	4.18	11.8	5.61	6.52	4.51	3.76	5.5	4.17	0.65	2.82	3.47	1.74
Cadmium		1	**1.26**	0.9	0.83	0.39	**1.13**	0.15	0.32	0.24	0.11	0.09	0.06	<0.05	<0.05	<0.05	<0.05	<0.05
Lead		5	0.13	0.14	0.09	0.08	0.66	0.32	0.14	0.15	0.08	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
			SB-5-05	**SB-5-05**	**SB-5-05**	**SB-5-05**	**SB-6-05**	**SB-6-05**	**SB-6-05**	**SB-6-05**	**SB-7-05**	**SB-7-05**	**SB-7-05**	**SB-7-05**	**SB-8-05**	**SB-8-05**	**SB-8-05**	**SB-8-05**
			+5 - +3' AGW (8-10' BGS)	**+3 - +1' AGW (10-12' BGS)**	**0.8 -2.8' BGW (14-16' BGS)**	**2.8 - 4.8' BGW 16-18' BGS)**	**+1.2' - 0.8' AGW (30-32' BGS)**	**0.8 -2.8' BGW (32-34' BGS)**	**2.8' 4.8'' BGW (34'36'' BGS)**	**6.8-8.8' BGW (38-40' BGS)**	**+7.7-+5.7' AGW (6-8' BGS)**	**+5.7-+3.7'AGW (8-10' BGS)**	**+3.7-+1.7' AGW (10-12' BGS)**	**6.3-6.8' BGW (20-20.5' BGS)**	**1.1-3.1' BGW (16-18' BGS)**	**3.1 -5.1' BGW (18-20' BGS)**	**5.1 - 7.1' BGW (20-22' BGS)**	**10.1-11.2' BGW (25-26.2' BGS)**
Water Level in Augers			**13.2' BGS**				**31.2' BGS**				**13.7' BGS**				**14.9' BGS**			
Total Results mg/Kg																		
Barium	350	820	600	775	**909**	**914**	18.5	20.7	24.6	25.9	334	259	236	567	53.6	139	167	229
Cadmium	2.5	7.5	**2,310**	**369**	**286**	**402**	<0.25	<0.25	<0.25	<0.25	5.24	**8.75**	**13.2**	**30.5**	0.26	**7.68**	2.71	3.07
Lead	63	450	**1,020**	240	169	168	<0.25	<0.25	<0.25	<0.25	5.81	35.8	30.1	32.9	<0.25	<0.25	0.84	1.26
TCLP mg/L																		
Barium		100	8.12	11.5	10.9	12.5	<0.10	<0.10	0.11	<0.10	3.13	2.91	2.27	5.42	0.31	1.75	2.14	3.49
Cadmium		1	**5.63**	**5.34**	**1.94**	**1.94**	<0.05	<0.05	<0.05	<0.05	0.1	0.1	0.07	0.4	<0.05	0.1	<0.05	0.08
Lead		5	0.86	0.73	0.15	0.25	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	<0.05	0.06	<0.05	<0.05	<0.05	<0.05

NOTES
BGW - indicates depth below ground water
BGS - indicates depth below surface of lagoon
AGW - indicates distance above ground water
Value In bold exceeds Part 375 Protection of Ground Water Limit
Value outlined in bold exceeds the Part 375 Unrestricted Use Limit
TCLP values in bokd exceed TCLP regulatory limit
SB-1 No recovery from 16' to 20'
SB-2 No recovery from 12 to 14' BGS.
SB-3 No recovery from 16.6 to 20' BGS.
SB-5 No recover from 12 to 14' BGS
SB-7 No recovery from 12' to 20' BGS



LEGEND

SB-2-05 BORING LOCATION

FIGURE 8

LAGOON SATURATED ZONE BORING LOCATIONS		DELAWARE ENGINEERING, P.C.
C & D TECHNOLOGIES, INC. HUGUENOT, NEW YORK	DATE: 11/11/04 DRAWN BY: KJ SCALE: AS SHOWN REVIEWED BY: EF DATE REVISED: 01/05/05	CIVIL AND ENVIRONMENTAL ENGINEERING ALBANY: 28 Madison Avenue Extension - Albany, NY 12203 Phone: (518) 452-1290 - Fax: (518) 452-1335 ONEONTA: 8-12 Dietz Street, Suite 303 - Oneonta, NY 13820 Phone: (607) 432-8073 - Fax: (607) 432-0432

H:\Drawings\CD_TECH\LAGOON_ZONE.dwg 07/21/06

K:\Drawings Archive\CD_TECH\FIG_8_LAGOONSATUR_ZONE 050

APPENDIX D

DRAWING 3 HISTORICAL GROUND WATER DATA, MAY 2006 OPERABLE UNIT 2 REMEDIAL INVESTIGATION REPORT.

H:\Drawings\CD_TECH\03-2005 GROUNDWATER_SAMPLING.dwg 7/18/2006 2:50:24 PM EST

GROUNDWATER MONITORING WELL ID: MW-15

Compound	Aug. 27, 2003	March 30, 2005
Barium	80.6	132
Cadmium	<0.6	<0.3
Lead	<2.1	<2.9
Fluoride	120	<100
PCB s	0.078	<0.065

NOTES:

Datum : Based on ground elevation of MW-1
Contour Interval = 1'

NA : Indicates Not Analyzed

All Results in ug / L

Values in Bold Exceed Ground water Standard.

July 31, 2001: Values in ( ) is field filtered or dissolved value.

July 31, 2001: Value / Value represents sample results from Water Sample obtained with bailer / Sample result from Micro-Purging procedure.

LEGEND

- = SEDIMENT SAMPLE SED 1 THRU SED 4
- = TEST PIT
- = MONITORING WELL
- = FIRE HYDRANT
- = FENCE POST
- = CHAIN LINK FENCE
- = 1ST FLOOR ELEVATION
- = EDGE OF PAVEMENT
- = TREE LINE
- = CONTOUR LINE
- = INDEX CONTOUR LINE
- 465 = ELEVATION
- = SOIL SAMPLE

OU - 2 RI SAMPLING LOCATIONS

- NEW MONITORING WELL LOCATION
- SW-1 THROUGH SW-6
- SED-5 THROUGH SED-10
- SSCMP – SURFICIAL SOIL SAMPLE AT 12" CMP

GROUNDWATER MONITORING WELL ID: MW-8

Compound	Sept. 9,1999	Jan. 13, 2000	March 27, 2000	July 31, 2001	Aug. 27, 2003	March 31, 2005
Barium	26.7	NA	NA	21.6 (14.2)	15.2	12.56
Cadmium	NA	<5.0		<0.2 (<0.2)	<0.6	<0.3
Lead	17.5	NA		<2.8	<2.1	4.8
Lead (dissolved)	<3.0	NA		<2.8	NA	NA
Fluoride	**5,350**	NA		**6,300**	**6,560**	**5,320**
Fluoride (dissolved)	**5,120**	NA		NA	NA	NA
PCB s	NA	<1.0	<0.05	<0.065	<0.065	<0.065

GROUNDWATER MONITORING WELL ID: MW-7

Compound	Sept. 9,1999	Jan. 13, 2000	March 27, 2000	July 31, 2001	Aug, 27, 2003	March 31, 2005
Barium	17.9	NA	NA	855 / 25.4	25.1	9.2
Cadmium	1.0 U	<5.0		**5.6** / 0.47	<0.6	0.67
Lead	15.4	NA		< 2.8 / <2.8	<2.1	<2.9
Lead (dissolved)	<3.0	NA		NA	NA	NA
Fluoride	**10,900**	NA		**8,700 / 8,600**	**7,870**	**6,440**
Fluoride (dissolved)	**10,800**	NA		NA	NA	NA
PCB s	< 1.0	< 1.1	0.067	**0.31 / 0.14**	<0.065	<0.065

GROUNDWATER MONITORING WELL ID: MW-6

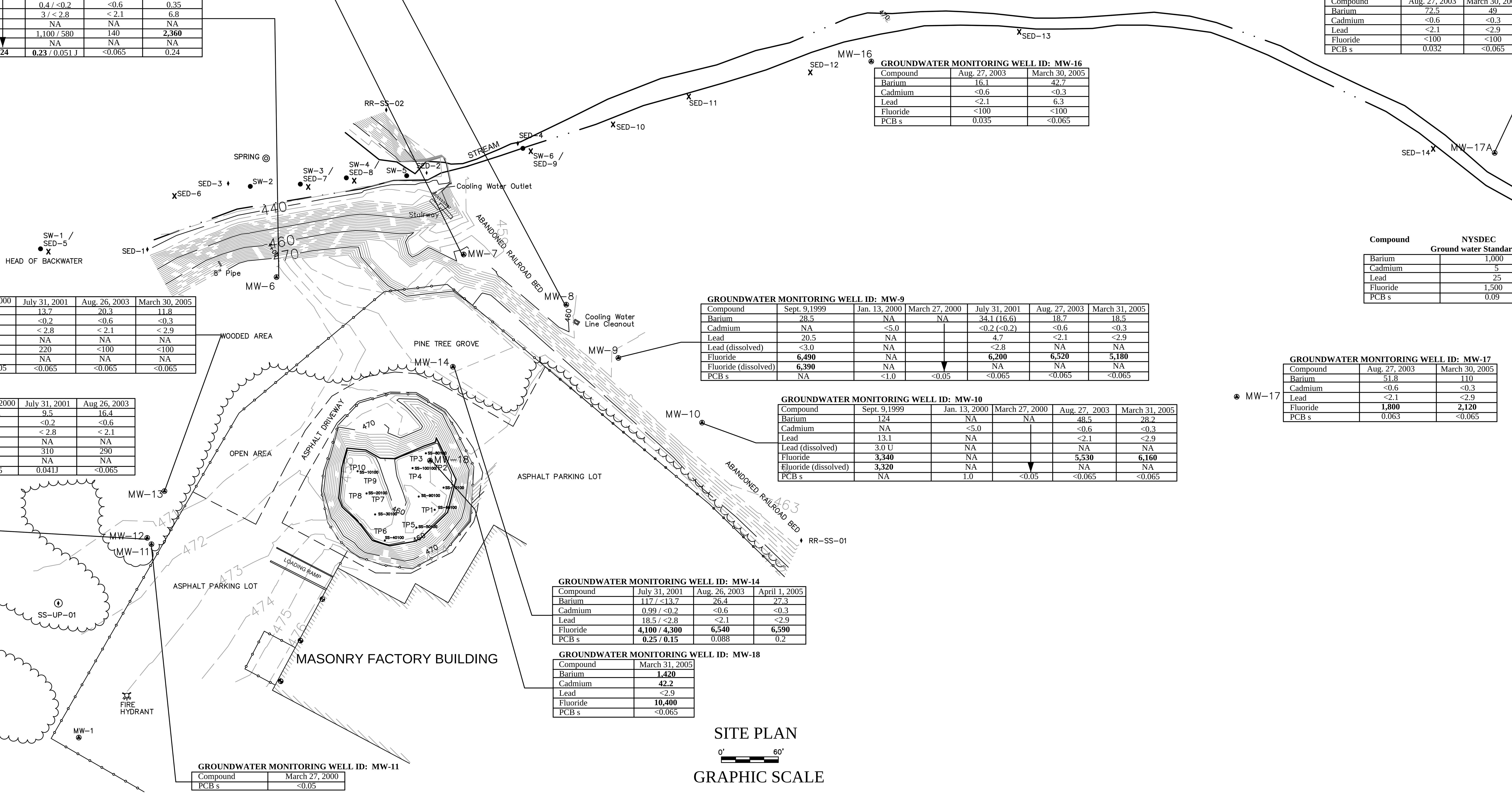
Compound (ug/L)	Sept. 9,1999	Jan. 13, 2000	March 27, 2000	July 31, 2001	Aug 26, 2003	March 31, 2005
Barium	13.0	NA	NA	39.1 / 22.8	7.8	131
Cadmium	<1.0	<5.0		0.4 / <0.2	<0.6	0.35
Lead	**29.4**	NA		3 / < 2.8	< 2.1	6.8
Lead (dissolved)	<3.0	NA		NA	NA	NA
Fluoride	319	NA		1,100 / 580	140	**2,360**
Fluoride (dissolved)	264	NA		NA	NA	NA
PCB s	<1.0	<1.0	**0.24**	**0.23** / 0.051 J	<0.065	0.24

GROUNDWATER MONITORING WELL ID: MW-17A

Compound	Aug. 27, 2003	March 30, 2005
Barium	72.5	49
Cadmium	<0.6	<0.3
Lead	<2.1	<2.9
Fluoride	<100	<100
PCB s	0.032	<0.065

GROUNDWATER MONITORING WELL ID: MW-16

Compound	Aug. 27, 2003	March 30, 2005
Barium	16.1	42.7
Cadmium	<0.6	<0.3
Lead	<2.1	6.3
Fluoride	<100	<100
PCB s	0.035	<0.065



Compound | **NYSDEC Ground water Standard (ug/L)**

Compound	NYSDEC Ground water Standard (ug/L)
Barium	1,000
Cadmium	5
Lead	25
Fluoride	1,500
PCB s	0.09

GROUNDWATER MONITORING WELL ID: MW-13

Compound	Sept. 9,1999	Jan. 13, 2000	March 27, 2000	July 31, 2001	Aug. 26, 2003	March 30, 2005
Barium	24.7	NA	NA	13.7	20.3	11.8
Cadmium	NA	<5.0		<0.2	<0.6	<0.3
Lead	5.2	NA		< 2.8	< 2.1	< 2.9
Lead (dissolved)	<2.0	NA		NA	NA	NA
Fluoride	642	NA		220	<100	<100
Fluoride (dissolved)	636	NA		NA	NA	NA
PCB s	NA	<1.4	<0.05	<0.065	<0.065	<0.065

GROUNDWATER MONITORING WELL ID: MW-9

Compound	Sept. 9,1999	Jan. 13, 2000	March 27, 2000	July 31, 2001	Aug. 27, 2003	March 31, 2005
Barium	28.5	NA	NA	34.1 (16.6)	18.7	18.5
Cadmium	NA	<5.0		<0.2 (<0.2)	<0.6	<0.3
Lead	20.5	NA		4.7	<2.1	<2.9
Lead (dissolved)	<3.0	NA		<2.8	NA	NA
Fluoride	**6,490**	NA		**6,200**	**6,520**	**5,180**
Fluoride (dissolved)	**6,390**	NA		NA	NA	NA
PCB s	NA	<1.0	<0.05	<0.065	<0.065	<0.065

GROUNDWATER MONITORING WELL ID: MW-17

Compound	Aug. 27, 2003	March 30, 2005
Barium	51.8	110
Cadmium	<0.6	<0.3
Lead	<2.1	<2.9
Fluoride	**1,800**	**2,120**
PCB s	0.063	<0.065

GROUNDWATER MONITORING WELL ID: MW-12

Compound	Sept. 9,1999	Jan. 13, 2000	March 27, 2000	July 31, 2001	Aug 26, 2003
Barium	56.8	NA	NA	9.5	16.4
Cadmium	NA	<5.0		<0.2	<0.6
Lead	17.7	NA		< 2.8	< 2.1
Lead (dissolved)	6.8	NA		NA	NA
Fluoride	521	NA		310	290
Fluoride (dissolved)	501	NA		NA	NA
PCB s	NA	<1.0	<0.05	0.041J	<0.065

GROUNDWATER MONITORING WELL ID: MW-10

Compound	Sept. 9,1999	Jan. 13, 2000	March 27, 2000	Aug. 27, 2003	March 31, 2005
Barium	124	NA	NA	48.5	28.2
Cadmium	NA	<5.0		<0.6	<0.3
Lead	13.1	NA		<2.1	<2.9
Lead (dissolved)	3.0 U	NA		NA	NA
Fluoride	**3,340**	NA		**5,530**	**6,160**
Fluoride (dissolved)	**3,320**	NA		NA	NA
PCB s	NA	1.0	<0.05	<0.065	<0.065

GROUNDWATER MONITORING WELL ID: MW-12

Compound	April 1, 2005
Barium	17.7
Cadmium	<0.3
Lead	< 2.9
Lead (dissolved)	NA
Fluoride	170
Fluoride (dissolved)	NA
PCB s	<0.065

GROUNDWATER MONITORING WELL ID: MW-14

Compound	July 31, 2001	Aug. 26, 2003	April 1, 2005
Barium	117 / <13.7	26.4	27.3
Cadmium	0.99 / <0.2	<0.6	<0.3
Lead	18.5 / <2.8	<2.1	<2.9
Fluoride	**4,100 / 4,300**	**6,540**	**6,590**
PCB s	**0.25 / 0.15**	0.088	0.2

GROUNDWATER MONITORING WELL ID: MW-18

Compound	March 31, 2005
Barium	**1,420**
Cadmium	**42.2**
Lead	<2.9
Fluoride	**10,400**
PCB s	<0.065

SITE PLAN

0' 60'

GRAPHIC SCALE

GROUNDWATER MONITORING WELL ID: MW-11

Compound	March 27, 2000
PCB s	<0.05

DATE: 07-18-06
DRAWN BY: KJ
SCALE: AS SHOWN
REVIEWED BY: EF
PROJECT NO.:
FILE:

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REVISIONS

NO.	DATE	DESCRIPTION

OU - 2 RI
C & D TECHNOLOGIES
NYS ROUTE 209
HUGUENOT, NEW YORK

DRAWING No. 3
GROUNDWATER SAMPLING DATA

SHEET:

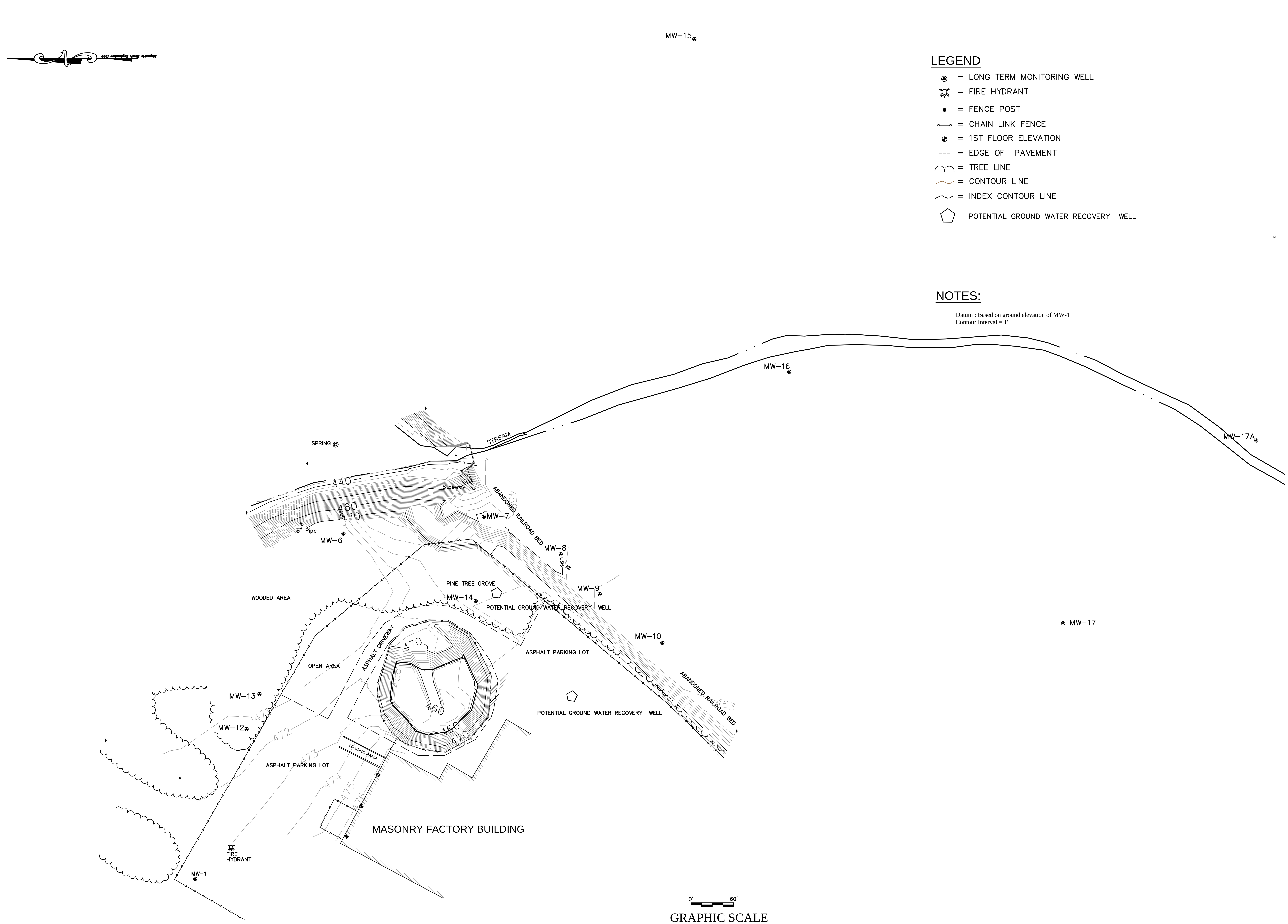
APPENDIX E

STREAM SEDIMENT DATA


C&D Power Systems Site
Site No. 336001
Tributary D-1-7 Sedmiment Data
N
SED-5
Cd <0.076 mg/kg
Pb 24.6 mg/Kg
Total PCBs 31J ug/Kg
SED-1 0-6"
Pb 88.4 mg/Kg
SED-6 0-6"
Cd 0.47 mg/kg
Pb 27.9 mg/Kg
Total PCBs 52J ug/Kg
SED-27 6-12"
Cd <1.0 mg/kg
Pb 33.9 mg/Kg
Total PCBs 88J ug/Kg
SED-27 0-6"
Cd <1.2 mg/kg
Pb 29.1 mg/Kg
Total PCBs 170 ug/Kg
SED-3 0-6"
Pb 58.3 mg/Kg
SED-7 0-6"
Cd 0.58 mg/kg
Pb 38.3 mg/Kg
Total PCBs 320 ug/Kg
SED-26 6-12"
Cd <0.49 mg/kg
Pb 9.6 mg/Kg
Total PCBs 47J ug/Kg
SED-26 0-6"
Cd <0.95 mg/kg
Pb 74 mg/Kg
Total PCBs 130 ug/Kg
SED-8 0-6"
Cd 1.4 mg/kg
Pb 71.9 mg/Kg
Total PCBs 350 ug/Kg
SED-2 0-6"
Pb 24.9 mg/Kg
SED-25 6-12"
Cd <0.53 mg/kg
Pb 11.3 mg/Kg
Total PCBs <59 ug/Kg
SED-25 0-6"
Cd 1 mg/kg
Pb 178 mg/Kg
Total PCBs 71 ug/Kg
SED-9 0-6"
Cd 2.3 mg/kg
Pb 396 mg/Kg
Total PCBs 1070 ug/Kg
SED-4 0-6"
SED-24 0-6"
Cd <0.54 mg/kg
Pb 10.9 mg/Kg
Total PCBs 100 ug/Kg
SED-24 6-12"
Cd 2.8 mg/kg
Pb 400 mg/Kg
Total PCBs 32 J ug/Kg
SED-10 0-6"
Cd 3.7 mg/kg
Pb 48.6 mg/Kg
Total PCBs 1470 ug/Kg
SED-11 6-12"
Cd <0.15 mg/kg
Pb <0.62 mg/Kg
Total PCBs <41 ug/Kg
SED-11 0-6"
Cd <0.16 mg/kg
Pb 6.4 mg/Kg
Total PCBs 68 ug/Kg
SED-12 6-12"
Cd <0.16 mg/kg
Pb 1.3 mg/Kg
Total PCBs <43 ug/Kg
SED-12 0-6"
Cd <0.17 mg/kg
Pb 5.8 mg/Kg
Total PCBs 52 ug/Kg
SED-13 6-12"
Cd <0.13 ug/kg
Pb 7.2 mg/Kg
Total PCBs <37 ug/Kg
SED-13 0-6"
Cd 3.3 mg/kg
Pb 208 mg/Kg
Total PCBs 130 ug/Kg
SED-14 6-12"
Cd 0.23 mg/kg
Pb 13.2 mg/Kg
Total PCBs 170 ug/Kg
SED-14 0-6"
Cd 2 mg/kg
Pb 112 mg/Kg
Total PCBs 72 ug/Kg
SED-15 6-12"
Cd <0.44 mg/kg
Pb 11.7 mg/Kg
Total PCBs 45 J ug/Kg
SED-15 0-6"
Cd 2 mg/kg
Pb 110 mg/Kg
Total PCBs 60 ug/Kg
SED-16 6-12"
Cd <0.43 mg/kg
Pb <0.68 mg/Kg
Total PCBs <47 ug/Kg
SED-16 0-6"
Cd 0.63 mg/kg
Pb 59.2 mg/Kg
Total PCBs <49 ug/Kg
SED-17 6-12"
Cd <0.45 mg/kg
Pb <0.72 mg/Kg
Total PCBs <49 ug/Kg
SED-17 0-6"
Cd <0.48 mg/kg
Pb 4.4 mg/Kg
Total PCBs 100 ug/Kg
SED-18 6-12"
Cd <0.42 mg/kg
Pb 24 mg/Kg
Total PCBs <46 ug/Kg
SED-18 0-6"
Cd <0.44 mg/kg
Pb 15.4 mg/Kg
Total PCBs <49 ug/Kg
SED-19 6-12"
Cd <0.53 mg/kg
Pb 15.4 mg/Kg
Total PCBs 100 ug/Kg
SED-19 0-6"
Cd 1.3 mg/kg
Pb 144 mg/Kg
Total PCBs 62 J ug/Kg
SED-20 6-12"
Cd <0.58 mg/kg
Pb 58.9 mg/Kg
Total PCBs 160 ug/Kg
SED-20 0-6"
Cd 0.98 mg/kg
Pb 79.7 mg/Kg
Total PCBs 99 ug/Kg
SED-21 6-12"
Cd <0.53 mg/kg
Pb 76.8 mg/Kg
Total PCBs <59 ug/Kg
SED-21 0-6"
Cd 1.3 mg/kg
Pb 70.4 mg/Kg
Total PCBs <75 ug/Kg
SED-22 6-12"
Cd <0.4 mg/kg
Pb 11.5 mg/Kg
Total PCBs <45 ug/Kg
SED-22 0-6"
Cd <0.46 mg/kg
Pb 29.6 mg/Kg
Total PCBs <51 ug/Kg
SED-23 6-12"
Cd <0.43 mg/kg
Pb 55 mg/Kg
Total PCBs <48 ug/Kg
SED-23 0-6"
Cd <0.59 mg/kg
Pb 15.7 mg/Kg
Total PCBs <65 ug/Kg
Legend
Sediment Sample Locations
Lead > Lowest Effect Level
Cadmium and Lead > Lowest Effect Level
Values in red exceed the Metals Severe Effect Level Criteria
or the PCB aquatic life chronic toxicity criteria
Prepared by Delaware Engineering, P.C. April 2007
Sources NYS Digital Ortho Imagery 2004
100 50 0 100 Feet

APPENDIX F

POTENTIAL GROUND WATER EXTRACTION WELL LOCATIONSAND LONG-TERM GROUND WATER MONITORING NETWORK.



DATE: 05-09-13
DRAWN BY: KJ
SCALE: AS SHOWN
REVIEWED BY: EF
PROJECT NO.:
FILE:

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REVISIONS

NO.	DATE	DESCRIPTION

OU - 2 RI
C & D TECHNOLOGIES
NYS ROUTE 209
HUGUENOT, NEW YORK

LONG-TERM GROUND WATER MONITORING LOCATIONS & POTENTIAL GROUND WATER EXTRACTION WELL LOCATIONS

SHEET:

APPENDIX G

SURFACE SOIL DATA SUMMARY TABLES

Table 1
C&D Former Huguenot, NY Facility
Pavement Soil Sample Lead Data
Phase II IRM

PS-1	**13,200**
PS-2	**8,370**
PS-3	**5,880**
PS-4	**2,220**
PS-5	**58,600**
PS-6	**5,830**
PS-7	**4,070**
PS-8	**3,280**
PS-9	**1,700**
PS-10	**11,200**
PS-11	**1,690**
PS-12	**4,870**
PS-13	**2,320**
PS-14	**3,910**
PS-15	**3,400**
PS-16	**1,620**
PS-17	**2,190**
PS-18	97.2
PS-19	82.3
PS-20	138
PS-21	88.1
PS-22	29.4
PS-23	224
PS-24	115
PS-25	70.6
PS-26	112
PS-27	**5,950**
PS-28	**7,640**
PS-29	**40,200**
PS-30	**11,200**
PS-31	**2,240**
PS-32	**599**
PS-33	**9,520**
PS-34	**3,620**
PS-35	256
PS-36	**2,710**
PS-37	**11,400**
PS-38	**3,490**
PS-39	**27,200**
PS-40	**7,350**
PS-41	**22,900**
PS-42	425

1) All results in mg/Kg
2) Pavement soil samples shaded exceed the NYSDEC Part 375 Commercial SCO of 1, 000 mg/Kg
3) Pavement soil samples in bold exceed the NYSDEC Part 375
Protection of Ground Water SCO of 450 mg/Kg

Table 2
C &D Former Huguenot, NY Facility
Surface Soil Lead Data
Phase II IRM

Soil Sample Lead Data			
SS-1	138	SS-35	**718**
SS-2	46.2	SS-36	121
SS-3	401	SS-37	342
SS-4	183	SS-38	225
SS-5	222	SS-39	88.2
SS-6	**659**	SS-40	14.3
SS-7	**5,120**	SS-41	**494**
SS-8	**2,120**	SS-42	67.9
SS-9	**1,780**	SS-43	375
SS-10	**751**	SS-44	94.3
SS-11	**1,680**	SS-45	302
SS-12	**523**	SS-46	74.3
SS-13	190	SS-47	222
SS-14	**2,040**	SS-48	254
SS-15	**536**	SS-49	280
SS-16	128	SS-50	**1,070**
SS-17	104	SS-51	**613**
SS-18	99.4	SS-52	**711**
SS-19	149	SS-53	152
SS-20	135	SS-54	**545**
SS-21	**947**	SS-55	192
SS-22	**1,700**	SS-56	**746**
SS-23	**654**	SS-57	**586**
SS-24	177	SS-58	**660**
SS-25	145	SS-59	**633**
SS-26	111	SS-60B	**688**
SS-27	130	SS-61	168
SS-28	101	SS-62	174
SS-29	130	SS-63	108
SS-30	133	SS-64	123
SS-31	69.1	SS-65	149
SS-32	251	SS-66	269
SS-33	33.7	SS-67	233
SS-34	34.7		

1) All results in mg/Kg
2) Soil samples outlined in bold exceed the NYSDEC Part 375 Residential SCO of 400 mg/Kg
3) Soil samples in bold exceed the NYSDEC Part 375
Protection of Ground Water SCO of 450 mg/Kg
4) Soil samples shaded exceed the Commercial Use SCO of 1,000 mg/Kg