Beth Williams
Project Manager

October 27, 2008

Mr. Michael Taurino (3HS51)
Work Assignment Manager
U.S. Environmental Protection Agency Region 3
1650 Arch Street
Philadelphia, Pennsylvania 19103

Subject: Draft Amended Soil and Groundwater Sampling and Analysis Plan
Former Lehigh Structural Steel Site
Allentown, Pennsylvania 15646
EPA Contract No. EP-S3-05-02
TDD No. E33-025-08-07-002
Document Tracking No. 0552

Dear Mr. Taurino:

Tetra Tech EM Inc. (Tetra Tech) is submitting the draft amended soil and groundwater sampling and analysis plan (SAP) for the Former Lehigh Structural Steel site located at the intersection of Tilghman and Front Streets in Allentown, Lehigh County, Pennsylvania. The amended SAP summarizes the planned soil sampling event at the site. If you have any questions regarding the draft report, please contact me at (215) 364-2148.

Sincerely,

Beth Williams

Beth Williams
Project Manager

Enclosure

cc: TDD File

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DRAFT AMENDED SOIL AND GROUNDWATER SAMPLING AND ANALYSIS PLAN FOR THE FORMER LEHIGH STRUCTURAL STEEL SITE ALLENTOWN, LEHIGH COUNTY, PENNSYLVANIA

Prepared for

U.S. Environmental Protection Agency Region 3
1650 Arch Street
Philadelphia, Pennsylvania 19103

Prepared by

Tetra Tech EM Inc.
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Boothwyn, Pennsylvania 19061

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Prepared by	Approved by
Beth Williams	Donna Davies
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1.0 INTRODUCTION

Under Eastern Area Superfund Technical Assessment and Response Team (START) Contract No. EP-S3-05-02, Technical Direction Document (TDD) Nos. E23-019-07-11-001 and E33-025-08-07-002, U.S. Environmental Protection Agency (EPA) Region 3 tasked Tetra Tech EM Inc. (Tetra Tech) to conduct a targeted brownfield's assessment (TBA) of the Former Lehigh Structural Steel site located at the intersection of Tilghman and Front Streets in the City of Allentown, Lehigh County, Pennsylvania. Implementation of this sampling and analysis plan (SAP) will be performed in an effort to: (1) verify or eliminate recognized environmental conditions (REC) and business environmental risks associated with the property identified by Moonstone Properties, LLC (Moonstone) Phase I Environmental Site Assessment (ESA) dated April 25, 2007 and Moonstone's Report of Findings dated July 5, 2007: (2) adequately characterize and address potential contamination at the site in accordance with the Pennsylvania Department of Environmental Protection (PADEP) regulations so that the data may be used to obtain a Release of Liability under the Pennsylvania Land Recycling and Remediation Standards Act (Act 2); and (3) support the proposed redevelopment plan, know as "The Waterfront". "The Waterfront" proposes a phased (over 10 years) high-end, mixed use development including 25 townhomes, 535 residential condominiums and apartments, marinas, an amphitheater, a pedestrian and bicycle "river walk", office space, a hotel with reception and conference facilities, public plazas and retail space.

The groundwater sampling described in this SAP was implemented by Tetra Tech in July 2008, in accordance with the Final Groundwater SAP for the Former Lehigh Structural Steel Site submitted to EPA on July 3, 2008. This amended SAP revises the previously submitted SAP to include a description of soil sampling activities to be conducted at the site. This SAP provides site background information in Section 2.0; presents the project objective and data use, proposed field investigation, analytical parameters in Sections 3.0, 4.0, and 5.0; summarizes quality assurance (QA) and quality control (QC) procedures in Section 6.0; identifies project deliverables in Section 7.0; and provides a project schedule in Section 8.0. All references cited in this plan are listed in Section 9.0. Tetra Tech developed this SAP in accordance with the "Quality Assurance Project Plan (QAPP) for START" (Reference [Ref.] 1).

2.0 BACKGROUND

This section describes the site location, presents a description and history of the property, and summarizes previous investigation activities conducted on the Former Lehigh Structural Steel site.

2.1 SITE LOCATION/LAYOUT

The Former Lehigh Structural Steel site is located on the west bank of the Lehigh River, east of Front Street and north and south of the Tilghman Street bridge, in the City of Allentown, Lehigh County, Pennsylvania, as shown in Figure 1, Site Location Map. The geographic coordinates of the center of the property are 40°37’06” north latitude and 75°27’30” west longitude (Ref. 2).

The Former Lehigh Structural Steel site is approximately 26 acres in size and consists of eight legal tax parcels, according to the Lehigh County, Pennsylvania Office of Assessment (Ref. 3). The parcels included in the site are listed in Table 1 below.

TABLE 1

FORMER LEHIGH STRUCTURAL STEEL TAX PARCELS

Assessment Parcel ID No. (PIN)	Size	Property Address / Map Tile
640747392954-1	193’ x 390’; irregular	W S Lehigh River Bridge / G09NE2C-003-013
640747522290-1	3.45 acres	N Front St Rear / G09NE3B-003-037
640746662165-1	4.13 acres	1 Furnace Street / G09NE3B-003-036
640746713805-1	4.5 acres	Foot of Tilghman St. Bridge / G10NW4D-007-001
640745795680-1	1.26 acres	Tilghman Street / G10NW4D-007-002
640745957064-1	9.83 acres (deed) 10.376 acres (tax)	Foot of Tilghman / G10NW4D-001-001
640745538601-1	164’ x 216’; irregular	3 W Sycamore Street / G09NE3C-020-001
640745552838-1	95’ x 219’	6 W Tilghman Street / G09NE3C-016-003

The site is occupied by multiple commercial and industrial occupants, including a steel fabrication shop, an automotive stripping facility, a scrap yard and equipment maintenance facility, two cryogenic tank refurbishing companies, a billboard painting company, a truck

FIGURE 1 SITE LOCATION MAP

leasing company, a tire warehouse, a fencing warehouse and a dog boarding facility. The site is heavily developed with steel frame and/or concrete block buildings and paved and unpaved access roadways and parking areas. Rail lines access the site from the west, with several spurs entering the property. Large empty aboveground storage tanks (tank farms) are present on the northern and southern portions of the site due to the presence of two cryogenic tank refurbishing companies occupying a portion of the property. As shown on Figure 2, the Lehigh River borders the eastern portion of the site.

2.2 OPERATION HISTORY

According to historical Sanborn maps reviewed within Moonstone's April 25, 2007 Phase I ESA, the site was occupied by the Allentown Rolling Mills facility, the Rail Mill, the Pudding Mill, the E. Gough Brass & Iron Foundry and several rail spurs from at least 1885 to 1897. The Lehigh Valley Structural Steel Company and associated galvanizing plant, a fire brick manufacturing facility, the Blanc Stainless Cement Company and several oil tanks occupied the site from at least 1911 through 1932. In 1932, a junkyard also appeared and apparently operated on a portion of the site. From at least 1950 through 1977, the Lehigh Structural Steel Company and associated galvanizing plants, sulfuric acid and fuel oil tanks and the J. J. Hanlen Iron Works facility occupied the site. According to Moonstone, historical galvanizing operations at the site reportedly used sulfuric acid, hydrofluoric acid, zinc ammonium chloride and potassium chloride and ceased in 1978. In addition, anhydrous aluminum chloride was also reportedly manufactured at the site (Ref. 4).

At the time of Moonstone's Phase I ESA, all site parcels were owned by LSS Realty Corporation, Inc. and the site was occupied by the following tenants:

- E. Schnieder & Sons, Inc, an equipment maintenance and scrap storage/handling facility;
- Banner Tire, a tire warehouse;
- Gardner Cryogenic, a pressure tank refurbishing facility;
- A fencing warehouse;

FIGURE 2 SITE LAYOUT MAP

- Woof World, a dog boarding and day care facility;
- RediStrip, an automotive paint stripping establishment;
- Acme Cryogenics, a pressure tank refurbishing facility;
- AIM National Lease, a truck leasing company; and
- Fedor Signs, a billboard design and painting establishment.

According to Moonstone, the Redistrip facility had large, open dip tanks which contained acid and caustic materials. Moonstone stated that these tanks appeared to be maintained in accordance with applicable regulations at the time of their ESA; however, the due to the nature of the stripping process and the poor condition of the concrete floor provided the potential for spills to enter the subsurface. Moonstone stated that the facility's bake-off oven discharged inside the building which could result in the accumulation of heavy metals in the sediments and soil inside and just outside the Redistrip building (Ref. 4).

As part of the Phase I ESA, Moonstone reviewed site-specific records maintained by the City of Allentown Fire Department (AFD). The file review confirmed the historical presence of the following tenants at the site:

- Welland Chemical Ltd – 1 West Allen Street;
- Vanchlor Catalyst – 1 West Allen Street, Unit 11;
- Elementis Catalyst – 1 Allen Street;
- U.S. Catalyst – 1 Allen Street;
- Fiba Mid-Atlantic – 1 Allen Street;
- Lehigh Valley Cryogenics – 1 Allen Street;
- American Carbonation – 1 Allen Street; and
- Harcross Chemicals (a.k.a. Harcross Durham Chemical Inc.) – 1 West Allen Street.

AFD records from May 1999 through May 2002 for Elementis Catalysts reportedly indicated that the facility stored anhydrous aluminum chloride, which was hazardous due to its reactivity with water. The facility reportedly piped “chlorine liquid” into the structure and vaporized it to react with pure aluminum ingots to manufacture the anhydrous aluminum chloride. No releases were reported within AFD files for Elementis. AFD records for Vanchlor Catalyst indicated that this facility also used chlorine and stored anhydrous aluminum chloride; however, Vanchlor Catalyst and Elementis were determined to be the same facility. According to Moonstone, U.S. Catalyst Inc. appeared to have manufactured anhydrous aluminum chloride, the same product as Elementis and Vanchlor. AFD records for U.S. Catalyst Inc. indicated that an incident regarding excessive exhausting of chlorine fumes due to a blockage in a bin during the manufacturing process was documented in February 1993 and an incident relating to a reactor explosion resulting in the release of aluminum chloride gas was documented in March 1994. AFD records for the Redistrip of Allentown facility from December 1995, April 1998 and January 2005 document odors and/or smoke being discharged from the paint-stripping oven or boiler of the Redistrip facility. AFD records for the Lehigh Structural Steel Company documented an incident related to burning railroad ties at the Lehigh Structural Steel facility. Moonstone stated that fumes and ashes from burning railroad ties could contain hazardous substances due to the preservative, usually creosote-based, used in the ties. AFD records for unspecified locations associated with the LSS Realty Company property include a February 1991 operations report which indicated that fuel oil was discharged on the site and into the Lehigh River. According to the February 1991 operations report, the appropriate regulatory agencies were notified and the regulatory agencies conducted a site inspection to document conditions following the incident. An August 2000 report for the facility indicated that a shed near the railroad trestle on the northern portion of the site caught fire and burned completely. According to the report, the shed reportedly contained old electrical boxes that may have contained hazardous substances (i.e. polychlorinated biphenyls (PCB) and metals) (Ref. 4).

Moonstone also reviewed site-specific records maintained by the PADEP. A letter within the file dated November 7, 1989 from Lehigh Structural Steel Company to PADEP indicated that all underground storage tanks (UST) had been removed from the facility and that aboveground storage tanks (AST) would either be removed or registered by February 5, 1990. A second letter included in the file dated February 5, 1990 indicated that Lehigh Structural Steel had sold two ASTs and that all the remaining ASTs at their facility were for heating oil consumed on site. Routine inspection reports maintained within the PADEP file dated April 10, 1995, April 21, 1994 and September 24, 1993 for the Redistrip of Allentown facility were also reviewed by Moonstone. The inspection reports indicated that no hazardous wastes had been generated by the facility as of 1995 and the facility's Resource Conservation and Recovery Act (RCRA) status had been changed from a Large Quantity Generator (LQG) to a Small Quantity Generator (SQG). Moonstone stated that the 1993 and 1994 reports described the processes used at the facility and waste streams generated. The 1994 report indicated that liquid discharges, if any occurred, from the facility's dip tanks were directed to Allentown's publicly owned treatment works (POTW). According to the 1994 report, no waste shipment had been made from the facility as of the 1994 inspection; however, the kiln ash was determined to be non-hazardous based on analysis by Hess Environmental's laboratory. Moonstone noted within their Phase I ESA that Hess Environmental has been under investigation by the PADEP for falsifying data and therefore, the ash results may not be reliable. PADEP files indicated that when the dip tanks would require servicing, the sludge from the tanks would have to be analyzed to determine whether it was hazardous waste. The 1995 inspection report indicated that the Redistrip facility had started keeping a log of weekly inspections of the dip tanks (Ref. 4).

2.3 PREVIOUS INVESTIGATIONS

According to a report entitled Environmental Site Assessment for the Lehigh Structural Steel Property, prepared by Environmental Resources Management (ERM) and dated September 20, 1989, ERM conducted a Phase I/Limited Phase II ESA at the Former Lehigh Structural Steel Property. ERM's Phase II portion of the assessment included the collection of soil samples and performance of an asbestos survey. The Phase I portion of ERM's report indicated that the site was built on fill material composed of steel slag. ERM stated that in 1977, the Lehigh Structural Steel Company was cited by PADEP for allowing demolition waste to be disposed of in the northern portion of the property as a permit for such action was not obtained. In addition, Lehigh Structural Steel Company was cited in 1985 for discharging fuel oil, cooling water and boiler blowdown into the adjacent Lehigh River. PADEP indicated that a 500-gallon fuel oil UST was to be removed and inspected for evidence of compromised integrity. According to ERM, the 500-gallon fuel oil UST issue was addressed to PADEP's satisfaction. A total of seven historical USTs containing petroleum products including gasoline, diesel, heating oil, kerosene and naphtha were documented at the site, all of which were reportedly removed in 1989. Historical galvanizing operations at the Former Lehigh Structural Steel site reportedly used sulfuric acid, hydrofluoric acid, zinc ammonium chloride and potassium chloride. Galvanizing operations reportedly ceased at the site in 1978. Qualitative field tests were performed by ERM to evaluate surface soils for the presence of chlorinated organic compounds such as PCBs and solvents. Results of the field tests indicated that chlorinated organic compounds were not present at concentrations above approximately 50 parts per million (ppm). ERM field screened soil gas using an organic vapor analyzer (OVA). The test borings were located in the vicinity of the landfill, the painting area, the sandblasting area, the hot galvanizing area, around a diesel AST situated near the southern end of Fabrication Shop #3, a stained area near a self-propelled crane within the northern end of the Site and the storage area south of the landfill. ERM stated that seventeen of the sampling points produced little OVA response; however, areas of concern were identified south of the landfill (two areas with OVA readings of 1,000 ppm at each location) and at Crane Runway D, located under the Tilghman Street Bridge (OVA reading of 100 ppm). ERM considered the three areas of concern to be localized areas of contamination (Ref. 5).

ERM collected composite soil samples for analysis of Priority Pollutant List (PPL) metals from the following three areas: paint spray area, sand blasting area (Crane Runway D) and the hot galvanizing area. Background samples were collected from the area south of the reported "landfill" within the northern portion of the site, which according to ERM, appeared to be an area which was filled with slag and soil. Analytical results indicated the presence of elevated background concentrations of lead and zinc in soil, possibly a result of slag fill material. Concentrations of chromium, lead, zinc and arsenic were elevated within surface samples collected from the paint spray area. Concentrations of chromium, lead and zinc were elevated within surface soil samples collected from the sand blasting area (Crane Runway D). Elevated levels of zinc and lead were found within samples collected from the hot galvanizing area; however, ERM stated that this portion of the site was paved and that there was not completed exposure pathway (Ref. 5).

ERM collected post-excavation samples from petroleum UST excavations following the removal of the USTs and analyzed for total petroleum hydrocarbons (TPH) for all excavations with the exception of the naphtha excavation, which was analyzed for semi-volatile organic compounds (SVOC). ERM stated that two 3,000-gallon gasoline USTs were removed from the west side of the manufacturing shop. Based on analytical results of the post-excavation samples, TPH was present in soil and had reached the water table. As a result, the results were forwarded to PADEP for review. A 4,750-gallon fuel oil UST was removed from the northern end of manufacturing building #51 and a 500-gallon fuel oil UST was removed from an area near Building #2. Soil sample analytical results for both fuel oil USTs indicated minor concentrations of TPH remained in the post-excavation samples. A 5,000-gallon diesel UST was removed from the north side of the Tilghman Street Bridge. Based on the analytical results, TPH remained in the post-excavation samples which were composited prior to analysis. A 500-gallon kerosene UST was removed from an area adjacent to the northeast corner of the site's Fabrication Shop #1. According to ERM, analytical results indicated "relatively small" to "elevated levels" of TPH remained in post-excavation samples collected from the kerosene UST excavation. ERM stated that post-excavation samples collected from the 500-gallon naphtha UST pit indicated low-levels of residual SVOCs and very low OVA readings, typically less than 5 ppm. ERM did not identify the former location of the naphtha UST. ERM recommended leachability testing for metals in soil from the paint spray and sand blasting areas based on the findings of their September 1989 report (Ref. 5).

According to a report entitled Phase II Environmental Site Assessment for the Lehigh Structural Steel Property, prepared by ERM and dated October 20, 1989, ERM conducted a leachability analysis for soils within the site's sand blast area and paint spray area. ERM collected composite soil samples from both locations for EP-toxicity leaching analysis. A composite soil sample collected from the sand blasting area was also submitted for total metals analysis which included lead, cadmium, chromium, zinc and arsenic. Leachability test results indicated that the site's blast sand was not a hazardous waste while the results of total metals analysis indicated that the blast sand would be categorized as Class III non-hazardous residual waste. Leachability test results for samples collected form the paint spray area indicated that the leachate contained significantly elevated levels of lead (Ref. 6).

According to a report entitled Phase III Environmental Site Assessment for the Lehigh Structural Steel Property, prepared by ERM and dated November 2, 1989, ERM conducted a Phase III environmental assessment which consisted of the collection of additional soil samples from the paint spray area for analysis to delineate the extent of characteristically hazardous soils. ERM collected a total of six soil samples from the paint spray area which were analyzed for all EP-toxicity metals, total lead, chromium and zinc. It was determined that surface soils in the paint spray area produced leachate that contained elevated concentrations of lead. In addition, total metals analysis indicated that lead concentrations within the soils may exceed direct contact standards (Ref. 7).

According to a report entitled Groundwater Investigation at the Lehigh Structural Steel Property, prepared by ERM and dated April 5, 1990, ERM conducted a groundwater investigation at the Former Lehigh Structural Steel Site which included the installation of two monitoring wells. One monitoring well (MW-1) was installed slightly downgradient from the site's former gasoline UST pit while the second monitoring well (MW-2) was reportedly installed within the paint spray area. Groundwater samples collected from the wells were analyzed for purgeable aromatics and hydrocarbons, TPH and RCRA metals. Purgeable aromatics and hydrocarbons, TPH and RCRA metals were not detected within the groundwater sample collected from MW-1. However, the groundwater sample collected from MW-2 contained trichloroethylene (TCE) at a concentration exceeding EPA's maximum contaminant level (MCL) and contained detectable concentrations of tetrachloroethylene (PCE), trans 1, 2-dichloroethene and chromium. The concentrations of PCE, trans 1, 2-dichloroethene and chromium detected within the sample were below applicable MCLs (Ref. 8).

According to a report entitled Report of Findings, Former Lehigh Structural Steel Site, City of Allentown, Lehigh County, Pennsylvania, prepared by Moonstone and dated July 5, 2007, Moonstone performed a preliminary Phase II site characterization in an effort to evaluate reported releases in six former UST excavations, evaluate soil conditions below two ASTs which are not provided with secondary containment, evaluate soil conditions within the RediStrip facility, evaluate soil quality in areas not specifically known to be affected by a release of regulated substances, evaluate groundwater quality at the site based on grab groundwater samples collected from temporary well points, determine if detected impacts to soil and groundwater were above the PADEP non-residential soil and groundwater medium specific concentrations (MSC) and determine if any immediate threat to human health and/or the environment exists at the site. Moonstone established priority areas of potential environmental concern (APEC) at the site based on the findings contained within their Phase I ESA. Moonstone considered the site's former USTs APEC #1, existing ASTs within Building #2 APEC #2, the RediStrip facility APEC #3, site-wide soils APEC #4 and site-wide groundwater APEC #5 (Ref. 9).

Moonstone advanced a total of six soil borings on the site to investigate former on-site UST locations. Two 3,000-gallon gasoline USTs were removed from the west side of the site's manufacturing shop. Analytical results associated with samples collected during previous investigations indicated that petroleum hydrocarbons were present in soil and had reached the water table. One 4,750-gallon fuel oil UST was reportedly removed from the northern end of manufacturing building #51. Analytical results associated with samples collected during previous investigations indicated that minor concentrations of petroleum hydrocarbons remained in post-excavation samples. One 500-gallon fuel oil UST was removed from an area in the vicinity of Building #2. Analytical results associated with samples collected during previous investigations indicated minor concentrations of petroleum hydrocarbons remained in post-excavation samples. One 500-gallon kerosene UST was removed form the northeast corner of Fabrication Shop #1. Analytical results associated with samples collected during previous investigations indicated “relatively small” to “elevated levels” of petroleum hydrocarbons remained in the post-excavation samples. One 500-gallon naphtha UST was removed from an area at the northwest corner of Building #2. Analytical results associated with post-excavation samples collected during a previous investigation indicated low levels of SVOCs in one sample and no detectable SVOCs in a second post-excavation sample collected from the UST pit (Ref. 9).

Moonstone advanced one boring within each of the six former UST excavations. Soil samples collected from each of the borings in the area of the former 3,000-gallon gasoline USTs and screened in the field using a photo-ionization detector (PID) showed that PID readings increasing with depth, to a maximum of 2.3 ppm. A petroleum odor was detected.. Moonstone collected a soil sample at eight feet below the ground surface (bgs) within the boring advanced in the vicinity of the former gasoline USTs. Analytical results of the soil sample indicated that benzene was present within the soil at a concentration of 1.1 milligrams per kilogram (mg/kg), which exceeds the PADEP non-residential statewide health standard (NR-SHS) of 0.5 mg/kg and the USEPA-PA default screening value for nonresidential volatilization to indoor air listed in the PADEP's Land Recycling Program Technical Guidance Manual-Section IV.A.4 – Vapor Intrusion into Buildings from Groundwater and Soil under the Act 2 Statewide Health Standard, effective January 24, 2004. Additional gasoline-related compounds including toluene, ethyl benzene and xylene were also detected, but at concentrations below the NR-SHS and the default screening value for nonresidential volatilization to indoor air. Following soil sample collection, Moonstone extended this borehole to 20 feet bgs and installed a temporary well point (MW-1). Following the extension of the borehole to 20 feet bgs, PID readings in the borehole exceeded the instrument's limits and a strong petroleum odor was noted by Moonstone. Field screening by Moonstone in the area of the former 5,000-gallon diesel UST indicated no PID response and no odors/staining were noted. Moonstone collected a soil sample from a borehole advanced within the former location of the diesel tank. Analytical results of the soil sample indicated that no diesel-related compounds were detected. Field screening by Moonstone in the areas of the former 4,750-gallon and 500-gallon fuel oil USTs indicated no PID responses and no odors/staining were noted. Moonstone collected a soil sample from boreholes advanced within the former location of the 4,750-gallon and 500-gallon fuel oil USTs. Analytical results of the soil samples indicated that no fuel oil-related compounds were detected. Field screening by Moonstone in the area of the former 500-gallon kerosene UST indicated no PID response and no odors/staining were noted. Moonstone collected a soil sample from a borehole advanced within the former location of the kerosene tank. Analytical results of the soil sample indicated that no kerosene-related compounds were detected. Field screening in the area of the former 500-gallon naphtha UST indicated a maximum PID response of 0.6 ppm. No odors or staining were noted by Moonstone. Moonstone collected a soil sample from a borehole advanced within the former location of the naphtha tank. Analytical results of the soil sample indicated that no PADEP petroleum-related compounds were detected (Ref. 9).

Moonstone advanced a single boring near one 275-gallon diesel AST and one 275-gallon waste oil AST in Building #2. The sample collected from the diesel AST borehole was analyzed for PADEP short list diesel compounds and the sample collected from the waste oil AST borehole was analyzed for PADEP short list used motor oil compounds. Field screening in the area of the diesel and waste oil ASTs indicated minimal PID responses near the ground surface where staining was visible to Moonstone, with a maximum PID reading of 0.8 ppm at one foot bgs for the diesel AST and a maximum PID reading of 0.5 ppm at two feet bgs for the waste oil AST. Analytical results of the soil sample collected from the diesel AST borehole indicated that no diesel-related compounds were detected. Analytical results of the soil sample collected from the diesel AST borehole indicated that several SVOCs were detected, but at concentrations below NR-SHS (Ref. 9).

Moonstone advanced two soil borings within the RediStrip facility. From each boring, one soil sample was collected from the shallow zone (0 to 2 feet bgs) and one sample was collected from the deep zone (2 to 15 feet bgs). All four RediStrip soil samples were analyzed for pH to determine whether soil pH had been impacted by a release of acidic or basic solution from the facility's dip tanks. Surface soil samples (0 to 2 feet bgs) were also analyzed for PPL metals in an effort to determine whether exhaust from the facility's burn-off oven had resulted in an accumulation of heavy metals within the building. Field screening associated with boreholes advanced within the northern portion of the RediStrip building indicated no PID response and no odors or staining were noted. Field screening associated with boreholes advanced within the southern portion of the RediStrip building indicated PID responses over the instrument's limit at depths greater than 14 feet bgs. Moonstone stated that the maximum recordable PID reading was 40 ppm at 14 feet bgs. In addition, a visible sheen and strong odor were noted on soils from

15 to 16 feet bgs. However, sampling the deeper interval where odors and sheen were noted was beyond the scope of Moonstone's investigation. The analytical results of the soil sample (1 foot bgs) collected from the northern portion of the RediStrip building indicated that PPL metals were detected, but at concentrations below NR-SHS. The soil sample collected from the 1 foot bgs interval had a pH of 8.04 while the soil sample collected from the 15 foot bgs interval had a pH of 7.33. The analytical results of the soil sample (1 foot bgs) collected from the southern portion of the RediStrip building indicated that cadmium was present at a concentration slightly above the NR-SHS. Additional PPL metals were detected within the soil sample but below their applicable NR-SHS. Analytical results for soil pH within the sample showed pH at 11.2 at 1 foot bgs and pH at 7.09 at 15 feet bgs which indicated that the pH of the surface soil had been elevated within this area of the RediStrip building (Ref. 9).

Moonstone advanced five soil borings across the site as a preliminary screening to determine the extent and nature of soil and fill material at the site. Soil samples were collected from the tank storage area north of Acme Cryogenics, the area southeast of the Acme Cryogenics building, the area southwest of the Acme Cryogenics building, the area north of Building #1 and an area southeast of Building #2. Moonstone stated that the soil sampling locations were selected to cover areas of the site not otherwise included in a specific APEC. From each of the five borings, one soil sample was collected from the 0 to 2 feet bgs interval (shallow zone) and one soil sample was collected from the 2 to 15 feet bgs interval (deep zone) to provide vertical delineation data. The ten soil samples collected from the site-wide locations were analyzed for VOCs, SVOCs and PPL metals. Field screening of the site-wide soils resulted in little to no PID response and no odors or staining was noted. Fill material, consisting primarily of slag and gravel, was observed to be 6 to 8 feet deep along the western portion of the site and 10 to 14 feet deep along the eastern portion of the site, near the Lehigh River. Analytical results for site-wide soil samples indicated that no VOCs or SVOCs were present at concentrations above the NR-SHS. Several VOCs, including benzene, carbon disulfide, PCE and toluene, were detected within soil samples at concentrations which were several orders of magnitude below the NR-SHS. Several SVOCs, including anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, 2,4-dinitrotoluene, fluoranthene, indeno (1,2,3-cd)pyrene, phenanthrene, and pyrene, were detected at concentrations below the NR-SHS. Several PPL metals, including antimony, arsenic and lead, were detected in three soil samples at concentrations exceeding the NR-SHS. Moonstone stated that none of the samples that produced an exceedance of the NR-SHS contained slag. Additional PPL metals were detected in site-wide soil samples, however, the PPL metals were detected at concentrations below the NR-SHS (Ref. 9).

Moonstone conducted site-wide groundwater sampling at the site as a preliminary screening to determine the presence or absence of site-wide groundwater contamination. Moonstone collected groundwater grab samples from five locations across the site by installing temporary poly vinyl chloride (pvc) well points (MW-1 through MW-5) in soil boreholes. Four of the five temporary well points (MW-2 through MW-5) were installed in site-wide soil boreholes previously advanced by Moonstone. Specifically, MW-2 was installed within a site-wide soil borehole located on the west side of the site while MW-3, MW-4 and MW-5 were installed within site-wide soil boreholes located along the eastern side of the site. The fifth temporary well point (MW-1) was installed in the former gasoline UST location (APEC-01). Groundwater grab samples were analyzed for VOCs, SVOCs and PPL metals (dissolved). Groundwater was typically 15 to 16 feet bgs within the temporary well points during well sampling. Groundwater grab samples collected from well points MW-3, MW-4 and MW-5 contained no detectable VOCs or SVOCs. The groundwater grab sample collected from well point MW-2 contained no detectable VOCs, but contained several SVOCs at concentrations slightly above the NR-SHS. The blind duplicate of the sample collected from well point MW-2 showed only one SVOC, benzo(a)pyrene, at a concentration in exceedance of the NR-SHS. The groundwater grab sample collected from MW-1 contained two VOCs, benzene (5 micrograms per liter [µg/L]) and ethylbenzene (1,300 µg/L), at concentrations equal to or exceeding the NR-SHS of 5 µg/L for benzene and 700 µg/L for ethylbenzene. Xylenes and methy tert butyl ether (MTBE) were detected at concentrations below the NR-SHS in the grab groundwater sample collected from MW-1. None of the VOCs identified in the MW-1 sample were present at concentrations exceeding the USEPA-PA default screening value for nonresidential volatilization to indoor air listed in the Vapor Intrusion guidance. However, three SVOCs (benzo(g,h,i)perylene, dibenzo(a,h)anthracene and naphthalene) were detected within MW-1 at concentrations exceeding the NR-SHS. Groundwater samples contained detectable concentrations of arsenic, copper, lead, nickel selenium and zinc. The only exceedances identified were for lead in samples MW-1, MW-4 and the duplicate of MW-2, MW-22. Concentrations of lead and arsenic in MW-1 were significantly higher than in other groundwater samples (Ref. 9).

Based on Moonstone's investigation, Moonstone formulated the following recommendations and/or conclusions:

- Further investigation would be needed to fully characterize the extent of soil and groundwater affected by the release from the site's former gasoline USTs (APEC-01) and to determine whether VOCs present in soils may impact indoor air quality;
- The soil interval below 14 feet bgs at the RediStrip Facility (APEC-03), where PID readings exceeded the instrument's limits and a strong odor and sheen were observed should be further investigated in an effort to determine the nature and extent of impact;
- Heavy metals in site-wide soils (APEC-04) appeared to have been wide spread but not consistently elevated across the areas which were sampled by Moonstone. As a result, Moonstone recommended additional sampling and analysis for metals to demonstrate a complete site characterization and obtain an Act 2 Release of Liability. Moonstone stated the additional characterization may be required for areas that will not be covered by impermeable surfaces following the redevelopment of the site; and
- Moonstone stated that based on the limited groundwater sampling conducted as part of their preliminary characterization, there does not appear to be a wide-spread groundwater contamination issue at the site. Moonstone stated that pockets of affected groundwater may be present throughout the site in localized areas where releases have occurred (i.e. MW-1). Moonstone stated that in order to obtain an Act 2 Release of Liability for groundwater, properly constructed monitoring wells should be installed in or near known areas of concern, including the area of the former gasoline UST excavation and the RediStrip facility, and in strategic locations along the Lehigh River (downgradient property boundary) and groundwater would have to be sampled using acceptable protocols (Ref. 9).

3.0 OBJECTIVE AND DATA USE

The objective of this SAP is to determine the presence or absence of soil and groundwater contamination issues at the Former Lehigh Structural Steel property.

4.0 PROPOSED ACTIVITIES

This section describes the scope of work; project personnel; methods and procedures for sample collection, sample handling, and delivery to the approved laboratory; and equipment decontamination procedures.

4.1 SCOPE OF WORK

During this sampling investigation, Tetra Tech will be responsible for the coordination and oversight of the installation of eight permanent monitoring wells, the performance of two rounds of groundwater sampling following well development, coordination and oversight during the advancement of approximately 51 soil borings and collection of subsurface soil samples from the soil borings. The groundwater portion of the sampling event will involve the following actions by Tetra Tech:

- Acquire a State of Pennsylvania licensed well drilling contractor to drill, install, complete and develop eight permanent single-screened flush-mounted groundwater monitoring wells to a maximum depth of approximately 20 feet bgs at the site.
- Supervise the well drilling contractor during installation, completion and development of the eight groundwater monitoring wells (MW-1 through MW-8) at the site.
- Collect groundwater level measurements from MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7 and MW-8 at the commencement of each round of groundwater sampling.
- Purge groundwater from the eight groundwater monitoring wells using low-flow groundwater sampling techniques, which include periodically measuring discharge rates and groundwater levels, and monitoring water quality parameters (pH, temperature, dissolved oxygen, specific conductance, reduction-oxidation potential, and turbidity) during two rounds of groundwater sampling.
- Collect groundwater samples from the eight monitoring wells during two sampling events.

- Collect one rinsate blank (if applicable) and one field duplicate, one field blank, one trip blank and a triple sample volume for one assigned matrix spike/matrix pike duplicate (MS/MSD) sample per round of groundwater sampling for QA/QC purposes.

- Collect soil samples from soil cuttings generated and drummed on site as a result of well installation activities during the first round of groundwater sampling for waste characterization and disposal purposes.

- Photo document and record in the site logbook well installation, completion and development activities, sampling activities and sampling locations.

- Package and ship samples for analysis to an approved EPA laboratory assigned through EPA's contract laboratory program (CLP).

The site-wide soil portion of the sampling event will involve the following actions by Tetra Tech:

- Acquire a Geoprobe® contractor to conduct a soil boring investigation consisting of the advancement of 51 soil borings (SB-01 through SB-51) to a maximum depth of approximately 20 feet bgs at the site.

- Supervise the Geoprobe® contractor during the advancement of site-wide soil borings at the site.

- Maintain a log and conduct volatile organic vapor monitoring of soil borings during the subsurface soil investigation.

- Collect a minimum of 100 subsurface soil samples, five field duplicate samples (one per 20 samples, minimum of one per day), a field blank, trip blanks, a rinsate blank (if applicable) and triple sample volume for five assigned matrix spike/matrix pike duplicate (MS/MSD) samples for QA/QC purposes.

- Photo document and record in the site logbook soil boring advancement activities, sampling activities and sampling locations.

- Package and ship soil samples to the assigned EPA CLP laboratory for analysis.

Following the completion of the sampling event and receipt of validated analytical groundwater and soil analytical data, Tetra Tech will submit a trip report which will describe all actions taken and summarize validated groundwater and soil analytical data.

The well drilling subcontractor will provide the necessary materials and personnel to operate the drill rig(s) and install, complete and develop the eight flush-mount permanent monitoring wells. Monitoring well installation and development will be conducted in accordance with Tetra Tech Standard Operating Procedure (SOP) Nos. 020, “Monitoring Well Installation” (Ref. 10), 021, “Monitoring Well Development” (Ref. 11) and the PADEP “Groundwater Monitoring Manual” (Ref. 12). Well specifications for the monitoring wells are included as an attachment to this SAP. The Geoprobe® contractor will provide the necessary materials and personnel to operate the Geoprobe and extract the soil borings.

4.2 KEY PROJECT PERSONNEL

The Tetra Tech project manager for the TDD is Beth Williams. As project manager, Ms. Williams is responsible and accountable for all aspects of the project scope of work, including achieving the technical, financial, and scheduling objectives for the project. Ms. Williams will communicate directly with the EPA Work Assignment Manager (WAM) for this project, Mr. Michael Taurino. Other Tetra Tech personnel proposed for the project are presented in Table 2. The technical or field support personnel working on the project may vary depending on the specific needs of the project, as well as on-site conditions and availability of staff.

TABLE 2

PROPOSED TETRA TECH PROJECT PERSONNEL

Project Function	Name	Role
Project Manager	Beth Williams	Responsible for implementing all activities identified in the TDD; responsible for developing and implementing the site health and safety plan; has authority to commit resources necessary to complete the work; prepares deliverables required by the TDD; communicates directly with the EPA WAM, the project team, and any other personnel needed to complete the project.
Field Support Personnel	Dave Scerbo/Lori Coleman/Beth Williams/ Jordan Vaughn	Performs necessary sampling or monitoring, as well as other tasks defined in the TDD or assigned by the EPA WAM or the Tetra Tech project manager; communicates directly with the Tetra Tech project manager and, when appropriate, the EPA WAM.
Health and Safety Officer	Chris Draper	Oversees and supports development of the site health and safety plan; communicates directly with the Tetra Tech project manager to ensure that all corporate health and safety protocols applicable to the Site are being followed.

TABLE 2

PROPOSED TETRA TECH PROJECT PERSONNEL

Project Function	Name	Role
Chemist	Josh Cope	Coordinates with the Tetra Tech project manager regarding the analytical requirements for the project; solicits and procures necessary laboratory services; reviews and validates analytical data, if necessary; communicates directly with the Tetra Tech project manager, field support personnel, EPA WAM, and START program manager as necessary.
Graphics and Mapping Specialist	Dan Call	Generates maps and other figures for project deliverables or presentations; assists the Tetra Tech project manager or other personnel when global positioning system activities are required.
Financial Manager	Bob Rynkar	Works with the Tetra Tech project manager in planning related to the TDD budget and completion date; enters financial information on the project into the Tetra Tech management information system; prepares regular and special reports to assist the Tetra Tech project manager in managing the project.
Program Manager	Donna Davies	Assists the Tetra Tech project manager as necessary to implement the project; commits or helps obtain all necessary company resources to meet the objectives of the TDD; provides document quality control reviews; addresses and helps resolve project management issues with the Tetra Tech project manager.
Quality Assurance Manager	Andy Mazzeo	Responsible for all quality assurance/quality control aspects of the START contract.

Notes:
EPA = U.S. Environmental Protection Agency
START = Superfund Technical Assessment and Response Team
TDD = Technical Direction Document
Tetra Tech = Tetra Tech EM Inc.
WAM = Work Assignment Manager

4.3 SAMPLE COLLECTION

This section describes the sampling proposed and summarizes the identifiers, quantities, and locations for each sample to be collected as part of this soil and groundwater sampling event. Figure 3 shows the proposed groundwater sampling locations and Figure 4 shows the proposed subsurface soil sampling locations. Groundwater samples will be collected from the eight monitoring wells located on the Former Lehigh Structural Steel site. Two rounds of well sampling will be conducted, a minimum of two weeks apart, as part of this investigation. A minimum of 100 subsurface soil samples, five field duplicate samples (one per 20 samples, minimum of one per day), a field blank, trip blanks a rinsate blank (if applicable) and triple sample volume for five assigned MS/MSD samples, for QA/QC purposes, will be collected during this investigation.

4.3.1 Groundwater sampling

Approximately two weeks after well installation, Tetra Tech will conduct the first round of groundwater sampling to include the collection of groundwater samples from the eight groundwater monitoring wells. Two weeks following the completion of the first round of groundwater sampling, Tetra Tech will conduct the second round of groundwater sampling. Tetra Tech will use a bladder or peristaltic pump to conduct low-flow micropurge groundwater sampling in accordance with Tetra Tech SOP No. 015, "Groundwater Sample Collection Using Micropurge Technology" (Ref. 13). Typically, the discharge rate will be less than 0.5 liter per minute (L/min) (0.13 gallon per minute [gpm]). The maximum purge rate shall not exceed 1 L/min (0.25 gpm) and will be adjusted to achieve minimal drawdown. The purge and rinsate water used at the site will be collected, containerized, and properly disposed of as investigative-derived waste (IDW). The purge and rinsate water will be stored in drums on site until final disposal is determined by EPA. Analytical results of groundwater samples collected from the site will determine the appropriate disposal method for the IDW.

Water quality and purge stabilization parameters (including pH, temperature, dissolved oxygen, specific conductance, and reduction-oxidation potential) will be measured using a water quality meter, such as a Horiba, YSI, or other multi-parameter meter coupled with a flow-through cell.

Turbidity measurements will be recorded concurrently with the other water quality parameters using a portable turbidity meter, such as a LaMotte or HF Scientific turbidity meter in accordance with Tetra Tech SOP No. 88, "Field Measurement of Water Turbidity" (Ref. 14). The water level in the well and effluent flow rate will be periodically monitored throughout the purging of the well at 5-minute intervals.

In accordance with Tetra Tech SOP No. 015, well purging will continue until water quality parameters stabilize so that the monitored chemistry values do not fluctuate by more than the following ranges over three successive readings at 5-minute intervals: ±0.1 pH unit; ±3 percent for specific conductance; ±10 millivolts for reduction-oxidation; and ±10 percent for turbidity and dissolved oxygen (Ref. 13). Once water quality parameters have stabilized, Tetra Tech will collect a groundwater sample directly from the sample/purging tubing after disconnecting the tubing from the flow-through cell. The groundwater sample will be immediately collected from the tubing into the appropriate certified-clean sample containers identified for each analysis.

FIGURE 3 GROUNDWATER SAMPLING LOCATION MAP

Immediately after collection, the samples will be transferred to a cooler containing ice and maintained at 4 °C, ± 2 °C, for shipment to the laboratory. Sample shipment will be conducted in accordance with Tetra Tech SOP No. 019, "Packaging and Shipping Samples" (Ref. 15). The total well depth will be measured after sampling at each well.

Groundwater samples will be sent to an EPA CLP laboratory for Target Compound List (TCL) VOC, TCL SVOC, and Target Analyte List (TAL) metals analyses. The groundwater sample identifier will be designated in accordance with the following format:

FLSS-GW-XXA and FLSS-GW-XXB

The "FLSS" portion of the sample designation refers to the property, Former Lehigh Structural Steel. The "GW" portion identifies the sample as a groundwater sample. The "XX" represents the particular sampling location at the property for this sampling event. The "A" represents a sample collected during the first round of sampling. The "B" represents a sample collected during the second round of sampling.

Table 3 provides a groundwater sampling summary, including sample identifiers, matrix, type, and location description.

TABLE 3

GROUNDWATER SAMPLING SUMMARY

Sample Identifier	Sample Matrix	Sample Type	Location Description
FLSS-GW-01A	Groundwater	Grab	MW-1; first round of sampling
FLSS-GW-01B	Groundwater	Grab	MW-1; second round of sampling
FLSS-GW-02A	Groundwater	Grab	MW-2; first round of sampling
FLSS-GW-02B	Groundwater	Grab	MW-2; second round of sampling
FLSS-GW-03A	Groundwater	Grab	MW-3; first round of sampling
FLSS-GW-03B	Groundwater	Grab	MW-3; second round of sampling
FLSS-GW-04A	Groundwater	Grab	MW-4; first round of sampling
FLSS-GW-04B	Groundwater	Grab	MW-4; second round of sampling
FLSS-GW-05A	Groundwater	Grab	MW-5; first round of sampling
FLSS-GW-05B	Groundwater	Grab	MW-5; second round of sampling
FLSS-GW-06A	Groundwater	Grab	MW-6; first round of sampling
FLSS-GW-06B	Groundwater	Grab	MW-6; second round of sampling

TABLE 3 GROUNDWATER SAMPLING SUMMARY			
Sample Identifier	**Sample Matrix**	**Sample Type**	**Location Description**
FLSS-GW-07A	Groundwater	Grab	MW-7; first round of sampling
FLSS-GW-07B	Groundwater	Grab	MW-7; second round of sampling
FLSS-GW-08A	Groundwater	Grab	MW-8; first round of sampling
FLSS-GW-08B	Groundwater	Grab	MW-8; second round of sampling
FLSS-GW-09A	Groundwater	Grab	Duplicate sample, exact location to be determined in the field.
FLSS-GW-09B	Groundwater	Grab	Duplicate sample, exact location to be determined in the field.
FLSS-FB-01	Aqueous	Grab	Field blank – First round of groundwater sampling
FLSS-TB-01	Aqueous	Grab	Trip blank – First round of groundwater sampling
FLSS-RB-01	Aqueous	Grab	Rinsate blank – First round of groundwater sampling
FLSS-FB-02	Aqueous	Grab	Field blank – Second round of groundwater sampling
FLSS-TB-02	Aqueous	Grab	Trip blank – Second round of groundwater sampling
FLSS-RB-02	Aqueous	Grab	Rinsate blank – Second round of groundwater sampling

Notes:
FLSS = Former Lehigh Structural Steel
FB = Field blank sample
RB = Rinsate blank sample
TB = Trip blank sample
GW = Groundwater

4.3.2 SOIL SAMPLING

As shown on Figure 4, borings will be advanced within and soil samples will be collected from the following seven APECs, identified by Moonstone:

- APEC-001: Former 3,000-gallon Gasoline USTs;
- APEC-002: Sussman Bros. UST Removals;
- APEC-003: Existing AST Outside Acme Cryogenics;
- APEC-004: Historical Acid/Chloride Use;
- APEC-005: RediStrip Facility;
- APEC-006: Storm Drains; and,
- APEC-007: Site-Wide Soil.

FIGURE 4 SUBSURFACE SOIL SAMPLING LOCATION

Soil samples will be collected in accordance with Tetra Tech SOP No. 005 “Soil Sampling” (Ref. 16) and Tetra Tech SOP No. 054 “Using the Geoprobe System” (Ref. 17). The samples will be collected directly from the disposable acetate sleeves generated during the installation of the boring using disposable sampling equipment to minimize the potential for cross-contamination. If the sample is to be analyzed for TCL VOC, Tetra Tech will first collect soil using an Encore® sampling device. After collecting the Encore® samples, Tetra Tech will collect additional soil for the remaining analytical parameters. This soil will be homogenized in a dedicated aluminum pan prior to placement into the appropriate bottleware. The analytical parameters each soil sample will be analyzed for is based on the location of the boring and the potential contamination identified in that area of the site. Section 5 of this SAP details the laboratory analysis of the samples. The subsurface soil boring sample identifiers will be designated in accordance with the following format:

FLSS-SBXX-A or FLSS-SBXX-B

The “FLSS” portion of the sample designation refers to the property, Former Lehigh Structural Steel. The “SB” portion identifies the sample as a subsurface soil boring sample. The “XX” portion identifies the soil borehole from which the soil sample was collected for this sampling event. For boring locations where two samples will be collected, the “A” portion of the sample designation identifies the sample collected from the shallow zone (0-2 feet bgs) and the “B” portion of the sample designation identified the sample collected from the deep zone (2-15 feet bgs).

Soil samples will also be collected from the containerized soil cuttings previously generated during monitoring well installation for waste characterization and disposal. The collection of a maximum of eight soil samples is anticipated as part of the sampling event.

The soil sample identifiers will be designated in accordance with the following format:

FLSS-SS-XX

The “FLSS” portion of the sample designation refers to the property, Former Lehigh Structural Steel. The “SS” portion identifies the sample as a subsurface soil sample. The “XX” portion identifies the soil borehole from which the soil cuttings were generated for this sampling event. The soil samples collected from the soil cutting drums will be sent to an EPA CLP laboratory for TCL VOC, TCL SVOC, PCBs and TAL metals analyses.

Table 4 provides a subsurface soil sampling summary, including sample identifiers, matrix, type, and location description.

TABLE 4

SUBSURFACE SOIL SAMPLING SUMMARY

Sample Identifier	Sample Matrix	Sample Type	Location Description
FLSS-SS-01	Subsurface soil	Grab	Drummed soil cuttings
FLSS-SS-02	Subsurface soil	Grab	Drummed soil cuttings
FLSS-SS-03	Subsurface soil	Grab	Drummed soil cuttings
FLSS-SS-04	Subsurface soil	Grab	Drummed soil cuttings
FLSS-SS-05	Subsurface soil	Grab	Drummed soil cuttings
FLSS-SS-06	Subsurface soil	Grab	Drummed soil cuttings
FLSS-SS-07	Subsurface soil	Grab	Drummed soil cuttings
FLSS-SS-08	Subsurface soil	Grab	Drummed soil cuttings
FLSS-SB01-A / FLSS-SB01-B	Subsurface soil	Grab	SB-01; APEC-001: Former 3,000-gallon Gasoline USTs
FLSS-SB02-A / FLSS-SB02-B	Subsurface soil	Grab	SB-02; APEC-001: Former 3,000-gallon Gasoline USTs
FLSS-SB03-A / FLSS-SB03-B	Subsurface soil	Grab	SB-03; APEC-001: Former 3,000-gallon Gasoline USTs
FLSS-SB04-A / FLSS-SB04-B	Subsurface soil	Grab	SB-04; APEC-001: Former 3,000-gallon Gasoline USTs
FLSS-SB05-A / FLSS-SB05-B	Subsurface soil	Grab	SB-05; APEC-001: Former 3,000-gallon Gasoline USTs
FLSS-SB06-A / FLSS-SB06-B	Subsurface soil	Grab	SB-06; APEC-001: Former 3,000-gallon Gasoline USTs
FLSS-SB07-A / FLSS-SB07-B	Subsurface soil	Grab	SB-07; APEC-001: Former 3,000-gallon Gasoline USTs
FLSS-SB08-A / FLSS-SB08-B	Subsurface soil	Grab	SB-08; APEC-001: Former 3,000-gallon Gasoline USTs
FLSS-SB09	Subsurface soil	Grab	SB-09; APEC-002: Sussman Bros. UST Removals
FLSS-SB10	Subsurface soil	Grab	SB-10; APEC-002: Sussman Bros. UST Removals
FLSS-SB11-A / FLSS-SB11-B	Subsurface soil	Grab	SB-11; APEC-003: Existing AST Outside Acme Cryogenics
FLSS-SB12-A / FLSS-SB12-B	Subsurface soil	Grab	SB-12; APEC-003: Existing AST Outside Acme Cryogenics
FLSS-SB13-A / FLSS-SB13-B	Subsurface soil	Grab	SB-13; APEC-004: Historical Acid/Chloride Use
FLSS-SB14-A / FLSS-SB14-B	Subsurface soil	Grab	SB-14; APEC-004: Historical Acid/Chloride Use

TABLE 4

SUBSURFACE SOIL SAMPLING SUMMARY

Sample Identifier	Sample Matrix	Sample Type	Location Description
FLSS-SB15-A / FLSS-SB15-B	Subsurface soil	Grab	SB-15; APEC-004: Historical Acid/Chloride Use
FLSS-SB16-A / FLSS-SB16-B	Subsurface soil	Grab	SB-16; APEC-004: Historical Acid/Chloride Use
FLSS-SB17-A / FLSS-SB17-B	Subsurface soil	Grab	SB-17; APEC-004: Historical Acid/Chloride Use
FLSS-SB18-A / FLSS-SB18-B	Subsurface soil	Grab	SB-18; APEC-004: Historical Acid/Chloride Use
FLSS-SB19-A / FLSS-SB19-B	Subsurface soil	Grab	SB-19; APEC-004: Historical Acid/Chloride Use
FLSS-SB20-A / FLSS-SB20-B	Subsurface soil	Grab	SB-20; APEC-004: Historical Acid/Chloride Use
FLSS-SB21-A / FLSS-SB21-B	Subsurface soil	Grab	SB-21; APEC-004: Historical Acid/Chloride Use
FLSS-SB22-A / FLSS-SB22-B	Subsurface soil	Grab	SB-22; APEC-004: Historical Acid/Chloride Use
FLSS-SB23-A / FLSS-SB23-B	Subsurface soil	Grab	SB-23; APEC-005: RediStrip Facility
FLSS-SB24-A / FLSS-SB24-B	Subsurface soil	Grab	SB-24; APEC-005: RediStrip Facility
FLSS-SB25-A / FLSS-SB25-B	Subsurface soil	Grab	SB-25; APEC-005: RediStrip Facility
FLSS-SB26-A / FLSS-SB26-B	Subsurface soil	Grab	SB-26; APEC-005: RediStrip Facility
FLSS-SB27-A / FLSS-SB27-B	Subsurface soil	Grab	SB-27; APEC-006: Storm Drains
FLSS-SB28-A / FLSS-SB28-B	Subsurface soil	Grab	SB-28; APEC-006: Storm Drains
FLSS-SB29-A / FLSS-SB29-B	Subsurface soil	Grab	SB-29; APEC-006: Storm Drains
FLSS-SB30-A / FLSS-SB30-B	Subsurface soil	Grab	SB-30; APEC-006: Storm Drains
FLSS-SB31-A / FLSS-SB31-B	Subsurface soil	Grab	SB-31; APEC-006: Storm Drains
FLSS-SB32-A / FLSS-SB32-B	Subsurface soil	Grab	SB-32; APEC-007: Site-Wide Soil
FLSS-SB33-A / FLSS-SB33-B	Subsurface soil	Grab	SB-33; APEC-007: Site-Wide Soil
FLSS-SB34-A / FLSS-SB34-B	Subsurface soil	Grab	SB-34; APEC-007: Site-Wide Soil
FLSS-SB35-A / FLSS-SB35-B	Subsurface soil	Grab	SB-35; APEC-007: Site-Wide Soil
FLSS-SB36-A / FLSS-SB36-B	Subsurface soil	Grab	SB-36; APEC-007: Site-Wide Soil
FLSS-SB37-A / FLSS-SB37-B	Subsurface soil	Grab	SB-37; APEC-007: Site-Wide Soil
FLSS-SB38-A / FLSS-SB38-B	Subsurface soil	Grab	SB-38; APEC-007: Site-Wide Soil
FLSS-SB39-A / FLSS-SB39-B	Subsurface soil	Grab	SB-39; APEC-007: Site-Wide Soil
FLSS-SB40-A / FLSS-SB40-B	Subsurface soil	Grab	SB-40; APEC-007: Site-Wide Soil
FLSS-SB41-A / FLSS-SB41-B	Subsurface soil	Grab	SB-41; APEC-007: Site-Wide Soil
FLSS-SB42-A / FLSS-SB42-B	Subsurface soil	Grab	SB-42; APEC-007: Site-Wide Soil
FLSS-SB43-A / FLSS-SB43-B	Subsurface soil	Grab	SB-43; APEC-007: Site-Wide Soil
FLSS-SB44-A / FLSS-SB44-B	Subsurface soil	Grab	SB-44; APEC-007: Site-Wide Soil
FLSS-SB45-A / FLSS-SB45-B	Subsurface soil	Grab	SB-45; APEC-007: Site-Wide Soil
FLSS-SB46-A / FLSS-SB46-B	Subsurface soil	Grab	SB-46; APEC-007: Site-Wide Soil
FLSS-SB47-A / FLSS-SB47-B	Subsurface soil	Grab	SB-47; APEC-007: Site-Wide Soil
FLSS-SB48-A / FLSS-SB48-B	Subsurface soil	Grab	SB-48; APEC-007: Site-Wide Soil
FLSS-SB49-A / FLSS-SB49-B	Subsurface soil	Grab	SB-49; APEC-007: Site-Wide Soil
FLSS-SB50-A / FLSS-SB50-B	Subsurface soil	Grab	SB-50; APEC-007: Site-Wide Soil
FLSS-SB51-A / FLSS-SB51-B	Subsurface soil	Grab	SB-51; APEC-007: Site-Wide Soil

TABLE 4

SUBSURFACE SOIL SAMPLING SUMMARY

Sample Identifier	Sample Matrix	Sample Type	Location Description
FLSS-SB52	Subsurface soil	Grab	Duplicate sample, exact location to be determined in the field.
FLSS-SB53	Subsurface soil	Grab	Duplicate sample, exact location to be determined in the field.
FLSS-SB54	Subsurface soil	Grab	Duplicate sample, exact location to be determined in the field.
FLSS-SB55	Subsurface soil	Grab	Duplicate sample, exact location to be determined in the field.
FLSS-SB56	Subsurface soil	Grab	Duplicate sample, exact location to be determined in the field.
FLSS-FB-01	Aqueous	Grab	Field blank
FLSS-TB-01	Aqueous	Grab	Trip blank
FLSS-TB-02	Aqueous	Grab	Trip blank
FLSS-TB-03	Aqueous	Grab	Trip blank
FLSS-TB-04	Aqueous	Grab	Trip blank
FLSS-TB-05	Aqueous	Grab	Trip blank
FLSS-TB-06	Aqueous	Grab	Trip blank
FLSS-TB-07	Aqueous	Grab	Trip blank
FLSS-TB-08	Aqueous	Grab	Trip blank
FLSS-RB-01	Aqueous	Grab	Rinsate blank

Notes:
APEC = Area of potential environmental concern
FLSS = Former Lehigh Structural Steel
FB = Field blank sample
RB = Rinsate blank sample
TB = Trip blank sample
SB = Soil boring
GW = Groundwater

4.4 SAMPLE HANDLING

Sample handling, packaging, and shipment procedures will be conducted in accordance with Tetra Tech SOP No. 019, “Packaging and Shipping Samples” (Ref. 15). All samples will be shipped to a CLP laboratory assigned by EPA Region 3 Office of Analytical Services and Quality Assurance (OASQA). All sampling data, including sample time, date, location, type, and sampler, will be recorded on Forms2Lite chain-of-custody and traffic reports and in the site logbook in accordance with Tetra Tech SOP No. 024, “Recording of Notes in Field Logbook” (Ref. 18).

The Tetra Tech project manager will assure that sample quality and integrity are maintained in accordance with Tetra Tech's QAPP for START (Ref. 1).

4.5 EQUIPMENT DECONTAMINATION

Dedicated sampling equipment and personal protective equipment (PPE) will be double-bagged and disposed of with all other used PPE waste produced at the site. Non-dedicated sampling equipment will undergo a gross decontamination with Alconox and distilled water followed by a double rinse with distilled water, in accordance with Tetra Tech SOP No. 002, "General Equipment Decontamination" (Ref. 19). All IDW will be double-bagged and disposed of as dry industrial waste.

5.0 ANALYTICAL PARAMETERS

Table 5 summarizes analytical parameters, including the sample matrix, analytical parameter, analytical method, sample containers and preservatives, detection limits, and maximum holding times for the groundwater samples, soil samples and aqueous trip and field blank samples proposed for collection during this sampling event.

TABLE 5

ANALYTICAL PARAMETERS AND METHODS

Matrix	Analysis	Analytical Method	Container (per location)	Preservative	Detection Limit	Maximum Holding Time
Aqueous samples and blanks	VOC	CLP SOW SOM01.2	Three 40-mL vials	HCl pH<2 and ice	CRQL	14 days
	SVOC /PCB	CLP SOW SOM01.2	Four 1-L ambers	Ice	CRQL	SVOC and PCBs – 7 days to extraction, 40 days to analysis
	Metals	CLP SOW ILM 05.4 ICPAES+Hg	One 1-L poly	HNO_3 pH<2	CRDL	180 days for all metals (except mercury – 28 days)
8 soil samples (soil cuttings)	VOC	CLP SOW SOM01.2	One 2-ounce clear, wide-mouth glass jar with septum closure	Ice	CRQL	48 hours

TABLE 5

ANALYTICAL PARAMETERS AND METHODS

Matrix	Analysis	Analytical Method	Container (per location)	Preservative	Detection Limit	Maximum Holding Time
		CLP SOW SOM01.2	Three Encore® samplers	Ice	CRQL	48 hours
	SVOC /PCB	CLP SOW SOM01.2	One 8-ounce clear, wide-mouth glass jar	Ice	CRQL	SVOC and PCBs – 14 days to extraction, 40 days to analysis
	Metals	CLP SOW ILM05.4 ICPAES & Hg	One 8-ounce clear, wide-mouth glass jar	Ice	CRDL	180 days for all metals (except mercury – 28 days)
8 subsurface soil samples (APEC-001)	PADEP "short list" compounds for leaded and unleaded gasoline)	CLP SOW SOM01.2 or SW846 8260	One 2-ounce clear, wide-mouth glass jar with septum closure	Ice	CRQL	48 hours
		CLP SOW SOM01.2 or SW846 8260	Three Encore® samplers	Ice	CRQL	48 hours
	Lead (total)	CLP SOW ILM05.4 ICPAES	One 8-ounce clear, wide-mouth glass jar	Ice	CRDL	180 days for all metals (except mercury – 28 days)
2 subsurface soil samples (APEC-002)	Full suite of PADEP "short list" petroleum-related compounds	CLP SOW SOM01.2 or SW846 8260	One 2-ounce clear, wide-mouth glass jar with septum closure	Ice	CRQL	48 hours
		CLP SOW SOM01.2 or SW846 8260	Three Encore® samplers	Ice	CRQL	48 hours
	SVOC /PCB	CLP SOW SOM01.2	One 8-ounce clear, wide-mouth glass jar	Ice	CRQL	SVOC and PCBs – 14 days to extraction, 40 days to analysis
	Metals	CLP SOW ILM05.4 ICPAES & Hg	One 8-ounce clear, wide-mouth glass jar	Ice	CRDL	180 days for all metals (except mercury – 28 days)

TABLE 5

ANALYTICAL PARAMETERS AND METHODS

Matrix	Analysis	Analytical Method	Container (per location)	Preservative	Detection Limit	Maximum Holding Time
4 subsurface soil samples (APEC-003)	PADEP "short list" compounds for diesel fuel	CLP SOW SOM01.2 or SW846 8260	One 2-ounce clear, wide-mouth glass jar with septum closure	Ice	CRQL	48 hours
		CLP SOW SOM01.2 or SW846 8260	Three Encore® samplers	Ice	CRQL	48 hours
20 subsurface soil samples (APEC-004)	PPL Metals	CLP SOW ILM05.4 ICPAES & Hg	One 8-ounce clear, wide-mouth glass jar	Ice	CRDL	180 days for all metals (except mercury – 28 days)
	Sulfides	SW846 9030B	One 4-ounce clear, wide-mouth glass jar	Zinc Acetate and Sodium Hydroxide pH>9		7 Days
	Sulfates	SW846 9038	One 4-ounce clear, wide-mouth glass jar	Ice		14 Days
	Chloride	CLP 325.2 Modified	One 4-ounce clear, wide-mouth glass jar	Ice		28 Days
20 subsurface soil samples (APEC-004)	Corrosivity (pH)	SW 846 9045D	One 4-ounce clear, wide-mouth glass jar	Ice	NA	None
8 subsurface soil samples (APEC-005)	Corrosivity (pH)	SW 846 9045D	One 4-ounce clear, wide-mouth glass jar	Ice	NA	None
4 deep subsurface soil samples (APEC-005)	VOC	CLP SOW SOM01.2	One 2-ounce clear, wide-mouth glass jar with septum closure	Ice	CRQL	48 hours
	VOC	CLP SOW SOM01.2	Three Encore® samplers	Ice	CRQL	48 hours

TABLE 5

ANALYTICAL PARAMETERS AND METHODS

Matrix	Analysis	Analytical Method	Container (per location)	Preservative	Detection Limit	Maximum Holding Time
	SVOC /PCB	CLP SOW SOM01.2	One 8-ounce clear, wide-mouth glass jar	Ice	CRQL	SVOC and PCBs – 14 days to extraction, 40 days to analysis
10 subsurface soil samples (APEC-006) and 40 soil samples (APEC-007)	VOC	CLP SOW SOM01.2	One 2-ounce clear, wide-mouth glass jar with septum closure	Ice	CRQL	48 hours
	VOC	CLP SOW SOM01.2	Three Encore® samplers	Ice	CRQL	48 hours
	SVOC /PCB	CLP SOW SOM01.2	One 8-ounce clear, wide-mouth glass jar	Ice	CRQL	SVOC and PCBs – 14 days to extraction, 40 days to analysis
	PPL Metals	CLP SOW ILM05.4 ICPAES & Hg	One 8-ounce clear, wide-mouth glass jar	Ice	CRDL	180 days for all metals (except mercury – 28 days)

Notes:
APEC = Area of Potential Environmental Concern
CLP = Contract Laboratory Program
CRDL = Contract-required detection limit
CRQL = Contract-required quantitation limit
HCl = Hydrochloric acid
Hg = Mercury
ICPAES = Inductively coupled plasma atomic emission spectroscopy
ILM = Inorganic low to medium
L = Liter
mL = Milliliter
PADEP = Pennsylvania Department of Environmental Protection
Poly = Polyethylene bottle
SW = Solid Waste
PPL = Priority Pollutant List
PCB = Polychlorinated biphenyl
SOM = Superfund Organic Method
SOW = Statement of Work
SVOC = Semi-volatile organic compound
VOC = Volatile organic compound

6.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

This section describes the QA/QC procedures for personnel during the site sampling event, including responsibilities, field QC, laboratory QC, and data validation and evaluation and management.

6.1 RESPONSIBILITY

The Tetra Tech project manager, Beth Williams, will be responsible for ensuring that sample quality and integrity are maintained in accordance with the EPA "Quality Assurance/Quality Control Guidance for Removal Actions" (Ref. 20) and that sample labeling and documentation procedures are in accordance with Tetra Tech's QAPP for START (Ref. 1).

6.2 FIELD QUALITY CONTROL

Field QC measures will consist of collecting field duplicates, field blanks, trip blanks, rinsate blanks (if applicable), and triple sample volume for assigned MS/MSD samples and documenting sampling activities in the site logbook during each round of sampling as described in the Tetra Tech "QAPP for START" (Ref. 1) and Tetra Tech SOP No. 024, "Recording of Notes in Field Logbook" (Ref. 18). The field duplicate samples will be collected to test the reproducibility of sampling procedures and results. The field and trip blank samples will be collected to verify that the samples were properly handled during sample collection, sample shipment, and laboratory analysis. The rinsate blank samples, if applicable, will be collected to verify that non-dedicated sampling equipment was adequately decontaminated.

6.3 LABORATORY QUALITY CONTROL

Samples will be shipped to the EPA CLP laboratory assigned by the EPA Region 3 OASQA. Laboratory QC measures will consist of all QC elements identified in the laboratory procurement Statement of Work (SOW) and will include all forms and deliverables required in the SOW.

6.4 DATA VALIDATION

All data will be validated in accordance with EPA Region 3 modifications to the CLP National Functional Guidelines for data review and will be validated to the inorganic IM2 and the organic M2 level (Ref. 21, Ref. 22, and Ref. 23).

6.5 DATA EVALUATION AND MANAGEMENT

This section describes how Tetra Tech will: (1) evaluate the data generated from the sampling event, (2) determine whether the data are representative of site conditions and collect enough for use in making confident risk management decisions, and (3) ensure that the data are secure and retrievable.

6.5.1 Data Evaluation

Tetra Tech will review the analytical packages to determine whether any major deficiencies were encountered during analysis and to ensure that the data are interpreted correctly. The data gathered during this sampling event will be forwarded to the EPA WAM for further evaluation. The data will be presented by Tetra Tech to the EPA in the form of a trip report that summarizes field activities and analytical data obtained from the sampling and analysis described in this SAP.

6.5.2 Data Representativeness and Completeness

This SAP is designed to obtain data representative of site conditions. If sampling activities vary significantly from this plan because of unexpected conditions in the field or other unforeseeable factors, Tetra Tech will discuss how those variations affect data representativeness with the EPA WAM and will include a discussion of the matter in the trip report.

6.5.3 Data Management

Tetra Tech will request that the laboratory submit the analytical data in electronic form as well as in the required hard copy analytical data package. Tetra Tech will compare the electronic data deliverables with the hard copy data package to ensure their consistency. When the Tetra Tech chemist has approved the data set with the appropriate data qualifiers, the electronic data will be released to the Tetra Tech project manager for reporting. Tetra Tech will use the data to prepare the trip report for the project. All electronic data will be stored in a Microsoft (MS) Excel or Access database for future retrieval and reference based on the WAM’s requirements. If the analytical data are not available from the laboratory in electronic form, Tetra Tech will manually enter the data into an MS Excel or Access database. Each hard copy data package will be kept in the project file in the Tetra Tech office in Boothwyn, Pennsylvania, until the data package is officially transferred to EPA.

7.0 DELIVERABLES

When sampling and the appropriate QA/QC procedures are complete, Tetra Tech will submit a trip report to EPA that summarizes field activities and the analytical results obtained from the sampling event and will include data collection methods, sampling locations, data summary tables, and maps.

8.0 SCHEDULE

Tetra Tech completed the groundwater activities detailed in this SAP in July 2008. It is anticipated that Tetra Tech will begin the soil boring installation and sampling activities in November 2008. Table 6 below provides the anticipated project schedule.

TABLE 6

PROJECT SCHEDULE

Task	Completion Time Frame
Develop site health and safety plan	Week of October 13th
Submit daft SAP	Week of October 27th
Submit final SAP	Week of November 3rd
Mobilize to site to oversee soil boring activities and collect subsurface soil samples	Week of November 10th and 17th
Receipt of unvalidated data from subsurface soil sampling	Week of December 8th
Receipt of validated data from subsurface soil sampling	Week of December 22nd
Submit draft trip report documenting actions taken and summarizing analytical data from both rounds of groundwater sampling and subsurface soil sampling	January 2008
Submit final revised trip report	January 2008

Notes:
SAP = Sampling and analysis plan WAM = Work assignment manager

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