Prepared for: Environment

ɜ Industries AECOM
Allison Park, Pennsylvania Piscataway, New Jersey

Project No.

60238842.186.CC.SS

April 2013

Remedial Action Work Plan - Soil

Non-Residential Chromate Chemical Production Waste Sites – Site 186
Jersey City, New Jersey
NJDEP Program Interest Number: G000011477

Prepared for: Environment

ɜ Industries AECOM
Allison Park, Pennsylvania Piscataway, New Jersey

Project No.

60238842.186.CC.SS

April 2013

Remedial Action Work Plan - Soil

Non-Residential Chromate Chemical Production Waste Sites – Site 186, 947 Garfield Avenue Jersey City, New Jersey
NJDEP Program Interest Number: G000011477

Contents

List of Figures

List of Appendices

1 Introduction

1.1 Remedial Action Status and Objectives

This Remedial Action Work Plan ("RAWP") was prepared by AECOM on behalf of PPG Industries, Inc. ("PPG") to provide the proposed scope of work for conducting a Remedial Action ("RA") at Hudson County Chromium ("HCC") Site 186 ("the Site") – 947 Garfield Avenue, Jersey City, Hudson County, New Jersey (Figure 1). Site 186 belongs to Orphan Group 1 and is located at the corner of Union Street and Garfield Avenue in a light industrial and commercial area of Jersey City (Figure 1). The Site occupies tax parcel Block 19802 Lot 2. The Site is bound to the north by Union Street, beyond which are other light industrial properties; to the south by a parking lot, beyond which is the NJ Transit Light Rail; to the east by Garfield Avenue, beyond which is light industrial property and HCC Site 207; and to the west by a medical care facility, beyond which is residential. The Site was identified as a Non-Residential Site by the New Jersey Department of Environmental Protection ("NJDEP"). The NJDEP Site Remediation Program ("SRP") Program Identification Number ("SRP-PI") for Site 186 is G000011477.

In 1990, PPG and the NJDEP entered into an Administrative Consent Order ("ACO") to investigate and remediate locations where chromate chemical production waste ("CCPW") or CCPW-impacted materials related to former PPG operations may be present. On June 26, 2009, NJDEP, PPG, and the City of Jersey City entered into a Judicial Consent Order ("JCO") with the purpose of remediating the soils and sources of contamination at these HCC Sites as expeditiously as possible. The goal of the JCO is to complete the investigation and remediation of the PPG Sites within five years, in accordance with a judicially enforceable master schedule. Priority for the remedial activities will be given to residential locations where CCPW and CCPW-related contamination is present. The provisions of the original ACO remain in effect with the JCO taking precedence where conflicts exist between the two documents.

The objective of this Site 186 – 947 Garfield Avenue RA is to remediate all visible CCPW, including total chromium ("Cr") and hexavalent chromium ("Cr^{+6}") contamination exceeding the NJDEP Chromium Soil Cleanup Criteria (CrSCC) in soil at the Site, as well as remediation of any co-located concentrations of CCPW related metals (antimony, nickel, thallium and vanadium) above NJDEP Residential Direct Contact Soil Remediation Standards (RDCSRS) and/or NJDEP Default Impact to Groundwater Soil Screening Levels (DIGWSSL).

This RAWP is considered a dynamic document that may be revised by addenda where necessary to complete the remediation of the CCPW and associated impacts. Upon completion of the RA, an RA Report ("RAR") will be prepared to present the results of the RA and will be submitted to the court-appointed JCO Site Administrator for review.

1.2 Remedial Action Requirements

This RAWP was prepared in accordance with the following requirements and guidance:

- Technical Requirements for Site Remediation ("TRSR"), N.J.A.C. 7:26E- 5.5 (NJDEP, 2012a);
- Appendix F of the July 19, 1990 NJDEP Administrative Consent Order ("ACO");
- June 26, 2009 Partial Consent Judgment ("JCO");

- NJDEP Site Remediation Program Alternative and Clean Fill Guidance for SRP Sites (December 29, 2011);
- NJDEP Site Remediation Program Technical Guidance for Investigation of Soil, Remedial Investigation of Soil, and Remedial Action Verification Sampling for Soil (August 1, 2012);
- NJDEP Field Sampling Procedures Manual (April 11, 2011).

Soil analytical results were compared to NJDEP Soil Remediation Standards ("SRS") at N.J.A.C. 7:26D (NJDEP, 2012b), promulgated on June 2, 2008, adopted on November 4, 2009, and last amended on May 7, 2012 for soil delineation purposes. Currently there are no SRS for total Cr or Cr^{+6}; however, NJDEP expects to develop SRS for these compounds at some point in the future. Therefore, Cr and Cr^{+6} were compared to the NJDEP's February 8, 2007 and September 2008 CrSCC. The CrSCC of 20 milligrams-per-kilogram ("mg/kg") for Cr^{+6} and 120,000 mg/kg for trivalent chromium ("Cr^{+3}") will be utilized for soil remediation compliance during this RA.

The concentrations of other metals found in association with CCPW were compared to the most stringent SRS or to the DIGWSSL in accordance with the NJDEP *Guidance Document for the Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation* (NJDEP, 2008). Comparison of contaminants to the IGW criteria was conducted only in unsaturated soils in accordance with NJDEP guidance. Available Historic Fill data are from N.J.A.C. 7:26E-4.6, Table 4-2.

Previous investigations (Kimball, 2000) have focused on various forms of chromium (total Cr, Cr^{+6}, and Cr^{+3}) as well as Target Analyte List ("TAL") short list of metals (also referred to as the "TAL subset metals"), specifically, antimony ("Sb"), beryllium ("Be"), cadmium ("Cd"), nickel ("Ni"), thallium ("Tl"), and vanadium ("V"). PPG's responsibilities include five of the TAL metals including Sb, Cr, Ni, Tl, and V, referred to as the CCPW Metals. Applicable evaluation criteria for the CCPW metals include:

Contaminant	RDC SRS	NRDC SRS	Default IGW SSL
Sb	31 mg/kg	450 mg/kg	6 mg/kg
Ni	1,600 mg/kg	23,000 mg/kg	31 mg/kg
Tl	5 mg/kg	79 mg/kg	3 mg/kg
V	78 mg/kg	1,100 mg/kg	No Default SSL

NA – Criterion not available
RDC SRS – Residential Direct Contact Soil Remediation Standard
NRDC SRS – Non-Residential Direct Contact Soil Remediation Standard
IGW SSL – Default Impact to Groundwater Soil Screening Levels

Groundwater results for total Cr were compared to the Total Cr GWQS of 70 micrograms-per-liter ("µg/L"). The groundwater data for other metals were compared to the NJDEP Groundwater Quality Standards ("GWQS") at N.J.A.C. 7:9C (NJDEP, 2010).

A Site-specific Cr^{+6} criterion for the allergic contact dermatitis endpoint is not required for this RA in accordance with NJDEP's February 8, 2007 Chromium Cleanup Policy (NJDEP, 2007a).

1.3 Report Organization

Appendix F of the ACO sets forth information to be included in the RAWP for non-residential CCPW Sites. This RAWP is organized to address these items and the requirements established in the NJDEP TRSR as follows:

- Section 1 provides the introduction and objectives of the proposed RA;
- Section 2 identifies key RA personnel and describes their roles;
- Section 3 provides a summary of remedial activities previously performed at the Site;
- Section 4 provides a summary of the physical setting at the Site and the surrounding area;
- Section 5 presents a technical analysis of RI activities;
- Section 6 provides the findings and conclusions of RI activities;
- Section 7 includes a summary of the procedures utilized during remedial action selection;
- Section 8 includes a description of proposed remedial activities/sampling/monitoring for the Site;
- Section 9 identifies the reference documents used during the preparation of this report; and,
- Section 10 includes the signed and notarized report certification in accordance with N.J.A.C. 7:26C-1.5.

Supplemental information is presented in the RAWP appendices.

2 Project Team

The key RA project personnel are presented in the following table. Their roles and responsibilities are further described below.

Project Team	Personnel	Address	Phone
PPG:			
Project Manager (Non-Garfield Ave. Sites)	Rich Feinberg	PPG Industries, Inc. 4325 Rosanna Drive, Bldg. C Allison Park, PA 15101-2009	C (732) 233-4552
Legal Contact	Joseph F. Lagrotteria	LeClairRyan One Riverfront Plaza 1037 Raymond Boulevard, Sixteenth Floor Newark, NJ 07102	O (973) 491-3516
Facility Contact:			
Owner	Morris Winograd	Hit or Miss, Inc. 2184 Kennedy Blvd. Jersey City, NJ 07305	(201) 433-8900
AECOM:			
Program Manager	Scott Mikaelian, P.E.	30 Knightsbridge Rd., Suite 520 Piscataway, NJ 08854	O (732) 564-3624 C (732) 757-9425
Project Manager (Non-Garfield Ave. Sites)	Al LoPilato	Rusten Corporate Park 100 Red Schoolhouse Rd., Suite B-1 Chestnut Ridge, NY 10990	O (845) 425-4980 C (201) 289-2141
RA Lead	William Spronz	30 Knightsbridge Rd., Suite 520 Piscataway, NJ 08854	O (732) 564-3917 C (908) 377-7226
Field Task Leader/ Site Geologist/Engineer	To be provided when selected	30 Knightsbridge Rd., Suite 520 Piscataway, NJ 08854	O (732) 564-3600
Regional Health & Safety Officer	Peter Sullivan	250 Apollo Drive Chelmsford, MA 01824	C (978) 905-2417
Sampling Technicians	To be provided when selected		
Health & Safety Technicians			
Subcontractors:			
Excavation Surveying Laboratory Waste Hauler (IDW) Disposal Facility (IDW)	To be provided when selected		
JCO Team:			
Site Administrator	Michael McCabe	4 Normandy Drive Chadds Ford, PA19317	O (201) 777-2099
Project Manager	Brian McPeak	208 Winding Way South Little Silver, NJ 07739	O (732) 216-6364
NJDEP	Thomas Cozzi	401 E. State Street Trenton, NJ 08625	O (609) 292-1250

Project Team	Personnel	Address	Phone
Technical Consultant	Weston Solutions	205 Campus Drive Edison, NJ 08837	O (201) 777-2099

Project positions have been established to provide a means of delegating authority and responsibility for the RA. One person may serve in more than one role at any time during the RA, and management may change the roles and responsibilities of the RA team as needed to complete the work.

2.1 JCO Project Team

The JCO Project Team provides regulatory and legal oversight of the RAs for the PPG HCC Sites. The JCO team includes the Site Administrator, Michael McCabe, and the JCO Project Manager, Brian McPeak, who were appointed by the court to oversee implementation of the RAs under the JCO.

Thomas Cozzi of the NJDEP will provide regulatory oversight for approval of the RAWP and regulatory review and approval of the RA implementation and reporting. Weston Solutions will serve as the NJDEP's technical consultant for review of the RA plans and procedures under the JCO.

2.2 Management

The PPG Project Manager is Richard Feinberg. Mr. Feinberg is the PPG manager responsible for implementation of remedial investigation ("RI")/RA activities at each PPG non-residential HCC Site.

AECOM is PPG's selected environmental consultant for the non-residential HCC Sites. Mr. Scott Mikaelian, P.E., is the AECOM Program Manager responsible for the overall design, scheduling, and implementation of RAs at PPG's non-residential HCC Sites.

Al LoPilato is the AECOM Project Manager in charge of the RA. Mr. LoPilato is responsible for design, scheduling, and implementation of the RA at Site 186.

William Spronz is the AECOM RA Lead. Mr. Spronz is responsible for planning and implementation of the RA at Site 186.

2.3 Field Task Leader/Site Geologist/Engineer

The Field Task Leader ("FTL") is responsible for subcontractor oversight, day to day field operations, and the collection of environmental samples during the RA. The Site geologist will be the FTL for Site 186 RA. The FTL will be responsible for collecting engineering, geological, and environmental data and documenting daily field activities in accordance with the FSP-QAPP and this RAWP. The FTL will be responsible for initiating and documenting changes to field procedures in accordance with the FSP-QAPP when field conditions indicate that revisions are warranted. The FTL reports directly to the FOL.

2.4 Site Safety Officer

The AECOM Site Safety Officer ("SSO") will be responsible for monitoring and enforcing compliance with the Site-Specific Health and Safety Plan ("HASP"). The SSO may delegate responsibility to onsite personnel as appropriate. The SSO authority will also have completed an 8-hour supervisor's health and safety training course.

2.5 Sampling and Health and Safety Technicians

Sampling technicians are responsible for the collection and documentation of environmental samples as described in the FSP-QAPP and RAWP. Sampling technicians may also serve as Health and Safety Technicians ("HST"), and will report directly to the SSO. The SSO and/or the HST will set-up, calibrate, and monitor health and safety instrumentation for field activities in accordance with the HASP. The HST will record events/excursions pertaining to Health and Safety issues in the project field book and on appropriate field forms.

Site personnel will have at least six months of field experience or be supervised by an experienced FTL. Site personnel will have completed the OSHA required 40-hour training program and the requisite current 8-hour annual refresher courses. At least one member of each field crew will have current certifications in first aid and cardiopulmonary resuscitation ("CPR") training.

2.6 Subcontractors

Drilling, excavation, backfilling, grading, direct-push services, surveying, analytical laboratory, data validation, waste hauling, waste disposal, and other RA activities will be conducted by subcontractors selected and supervised by AECOM and PPG. Only subcontractors with the appropriate licenses, credentials, and safety record will work on this RA. The subcontractors for the RA have not yet been identified. AECOM and PPG will submit a list of selected subcontractors to the JCO Site Administrator prior to conducting the RA field work.

3 Remedial Investigation Report

3.1 Background Information

Pursuant to N.J.A.C. 7:26E-5.5, below is a summary of the remedial investigation reports previously submitted to the Department. The following subsections provide information regarding Site history, ownership, previous environmental investigations, RAs, and enforcement actions for HCC Site 186.

There have been three previous investigations and RAs that occurred at the Site, which include:

- New Jersey Department of Environmental Protection ("NJDEP") conducted a soil investigation in 1995 to verify the absence/presence of Cr contamination at the Site.

- L. Robert Kimball and Associates ("Kimball") were retained by the NJDEP to perform a preliminary site characterization ("PSC") and to provide recommendations for final Site characterization (Kimball, 2000).

- The Louis Berger Group, Inc. ("Berger") was retained by the NJDEP to perform a remedial investigation and remedial alternatives selection ("RI/RASE") at Site 186 (Berger, 2003). The Berger Report includes a list of Interim Remedial Measures ("IRMs") installed in 1996 as well as a summary of the information found in the 2000 Kimball report.

- AECOM was retained by PPG to perform a remedial investigation at the Garfield Avenue ("GA") Group Chrome Sites, which included Site 186 (AECOM, 2012). The AECOM report includes a summary of the previous investigation findings as well as data from the 15 soil borings advanced during that RI.

3.1.1 Site History

Site 186 is paved with asphalt and is being used as a parking lot for used cars. An 1896 Sanborn map depicts the property at Site 186 as being occupied by a company that manufactured greenhouse components and greenhouse structures, and a coal yard was present to the south. In 1911, a machine shop was present on the property and the coal yard was present to the south. In 1951, a retail store (Pattern Shop) was located on the property and a dress making company building was located to the west. Sanborn maps from 1979 and 1989 indicate that the Pattern Shop was still present at the Site and an electrical supply company was present to the west. Aerial photographs from between 1961 and 1989 show the property without any structures. Aerial photographs, dated 1994, 1995, and 2006, also show a vacant lot. Sanborn maps are provided in Appendix A and historic aerial photographs are provided in Appendix B.

The historic information confirms that the property was not used for the production and/or storage of CCPW. Site 186 is located about 225 feet northwest of HCC Site 114. Site 114 was used for the production and storage of CCPW.

1.1 Historic Site Investigations and Remedial Actions

3.1.2 1995 NJDEP Investigation

The first investigative activities performed at the Site occurred on August 31, 1995, when the NJDEP conducted soil sampling at the Site (NJDEP, 1995). The investigation consisted of the collection 10 surface soil samples, collected between 0 and 10 inches below ground surface ("bgs"). Surface soil samples were analyzed for total Cr and Cr^{+6} and there were no visible CCPW blooms or nodules encountered during sampling activities. Upon inspection of the Site, NJDEP noted that the original Site topography appeared to have been altered by fill emplacement, additionally it was noted that Site conditions, such as moderate slope and sparse vegetative cover could lead to erosion during heavy precipitation.

Concentrations of total Cr were detected between 34.7 mg/kg at sample location S8 and 797 mg/kg at sample location S2. Concentrations of Cr^{+6} were detected between 0.40 mg/kg at sample location S10 and 169.0 mg/kg at sample location S2. Of these results, only sample S2 had concentrations exceeding the most stringent NJDEP SCC Cr^{+6} concentration of 20 mg/kg. Based on these results the Site was added to the list of known HCC Sites as Site Number 186.

Sample locations are shown on Figures 1 and 2 of the 1995 NJDEP report included in Appendix C to this RAWP. Table 1 provides a soil sample summary including the soil samples collected from the Site. Figure 2 provides a Site Map with the sample locations from the NJDEP, Kimball, and Berger investigations.

3.1.3 1996 – Installation of Interim Remedial Measure – L. Robert Kimball and Associates

In 1996, an interim remedial measure ("IRM") was implemented at the Site based on the results of the NJDEP investigation. The IRM consisted of the installation of a bituminous concrete/gravel/Permalon liner cap over the entire Site and served to reduce direct contact exposure to the Cr and reduce migration by limiting erosion and infiltration (Kimball 2000 and Berger 2003).

3.1.4 1997 – Kimball Preliminary Site Characterization (PSC) – L. Robert Kimball and Associates

A Preliminary Site Characterization ("PSC") was performed by Kimball in September and October of 1997 (Kimball, 2000 and Berger, 2003). The results of the soil and groundwater investigations are summarized below.

3.1.4.1 Kimball Soil Investigation

A total of 22 soil borings were advanced at Site 186 as part of the PSC. Twelve borings were installed using hollow stem auger within the Site boundary and 10 borings were installed at the Site boundary perimeter using a hand auger. Samples were collected from approximately 1 ft. bgs to 16 ft. bgs and analyzed for organic and inorganic parameters, particle size distribution, and waste characteristics. CCPW and/or CCPW-impacted material was encountered in soil borings 186SB07, 186SB08, 186SB10 and 186SB12, at depths up to 2 ft. bgs. A discrete layer of CCPW was observed in 186SB10, which is located in the southeastern portion of the Site, from 2.5 to 3.5 ft. bgs. However, no Cr^{+6} was detected in any of the samples at concentrations greater than the most stringent SCC for Cr^{+6} of 20 mg/kg. Historic soil data from the NJDEP, Kimball, and Berger reports are provided in Table 2.

3.1.4.2 Kimball Groundwater Investigation

Groundwater investigation activities at Site 186 were conducted between September 11 and October 22, 1997. Activities included the installation and sampling of two groundwater monitoring wells (MW-01 and MW-02). Both filtered and unfiltered groundwater samples were collected from each of the groundwater monitoring wells during this time, in addition to duplicate filtered and unfiltered samples.

Groundwater samples were analyzed for TAL metals, Cr^{+6}, Target Compound List ("TCL") organic compounds with a library search (TCL+30), pesticides, polychlorinated biphenyls ("PCBs"), total organic carbon ("TOC"), total solids, and total suspended solids ("TSS"). Total Cr was detected in both wells, MW-01 (unfiltered sample) and MW-02 (both filtered and unfiltered samples), at concentrations below NJDEP Class IIA Groundwater Quality Standards ("GWQS"). Concentrations of Cr^{+6} were not detected above the laboratory method detection limit ("MDL") in any of the samples collected from the groundwater monitoring wells. Groundwater results for the Kimball investigation are provided in Appendix C.

3.1.5 2003 – Berger Final Remedial Investigation Report (RIR) – The Louis Berger Group, Inc.

Between January 4 and February 6, 2002, the second phase of remedial investigation work was completed at Site 186, including the Final Site Characterization ("FSC"), the primary objective of which was to investigate data gaps identified as part of the PSC work. The primary data gap was delineation of several metal exceedences in soil.

3.1.5.1 Berger Soil Investigation

Five soil borings were installed in the southeastern portion of the Site (i.e., around the relatively high metals exceedences previously encountered during PSC activities) from which a number of soil samples were collected and analyzed. Soil boring logs from this investigation are found in Appendix C of the Final Remedial Investigation Report ("RIR") (Berger, 2003). These five borings were installed using 2-inch inner diameter Geoprobe macrocores and samples were collected from each one-foot interval, continuously throughout the boring until native soils (sand) were encountered, typically around 10 ft. bgs.

Thirty two samples (including 1 duplicate sample) collected from the five borings were chosen for initial analyses. From each boring, this included a surface sample collected between 0 and 1 ft. bgs, samples where CCPW was suspected based on visual observation, a soil sample immediately above the water table, and a soil samples from immediately above and within the first natural geologic unit. Additionally, other samples were selected such that analyses were performed on one sample every four feet. The remaining samples were archived pending results from the initially selected batch. None of the archived samples were analyzed. CCPW was not observed, so the work plan was amended, with NJDEP approval, so that one sample was analyzed every four feet of depth.

The results of these analyses showed that concentrations of Cr^{+6} did not exceed the most stringent NJDEP SCC of 20 mg/kg. Concentrations of Cr^{+6} were detected in 28 of the 32 samples at concentrations ranging from 1.1 to 11 mg/kg, with an average concentration of 3.1 mg/kg. All of the samples collected at Site 186 during the FSC had Cr^{+3} concentrations well below the most stringent NJDEP SCC of 120,000 mg/kg. Only six samples contained concentrations of total Cr above background levels and these samples were the first collected below ground surface at each of the five borings (i.e., 186S01, 186S02, 186S03, 186S07, and 186S08, from 0 to 1 ft. bgs). Soil sample data from the Berger investigation is provided in Table 1.

3.1.5.2 Berger Groundwater Investigation

Groundwater quality below Site 186 was addressed during the PSC, which indicated that CCPW contamination had not adversely impacted the groundwater collected from each of the two groundwater monitoring wells installed on Site 186. Therefore, additional groundwater investigation work was not performed during the FSC.

3.1.6 PPG Site 186 RI Work - 2011 and 2012

Soil RI work was conducted at Site 186 in April 2011 and January 2012. Groundwater samples were collected for the two Site 186 monitoring wells in June 2011.

3.1.6.1 PPG Soil Investigation

The following information summarizes the 2011 GA Group Soil RI related to Site 186 and the January 2012 Site 186 Soil RI conducted by PPG:

- Hexavalent chromium was detected in two soil samples in the southeastern section of Site 186 at concentrations exceeding the NJDEP CrSCC of 20 mg/kg.
  - One soil sample collected from 1 to 1.5 feet deep beneath the Site 186 IRM cap in boring 186-A1 had a Cr^{+6} concentration of 24.2 mg/kg.
  - One soil sample collected from 0 to 0.5 feet deep beneath the Site 186 IRM cap in boring 186-A3 had a Cr^{+6} concentration of 22.7 mg/kg. This sample was adjacent to the NJDEP's sample S2 collected in 1995.
- There were no CrSCC exceedences of total Cr;
- No visible evidence of CCPW material was observed during the Garfield Avenue ("GA") Group Soil RI or the Site 186 RI;
- One nickel exceedence of the default IGW SSL was detected on the Metro Health property in shallow soils immediately adjacent to the Site 186 property boundary at a depth of 2.5 feet. Nickel is a metal commonly found in fill material throughout the Jersey City area.
- Antimony was detected at a concentration exceeding the IGW SSL in one soil boring on the Metro Health property immediately adjacent to the Site 186 property boundary at a depth of two feet. Antimony is a metal commonly found in fill material throughout the Jersey City area.

Table 3 provides the analytical results for the 2011 and 2012 Site 186 Soil RI work

3.1.6.2 PPG Groundwater Sampling

Groundwater samples were collected from wells 186-MW01 and 186-MW02, shown on the Site Plan in Figure 2, in June 2011 as part of the overall Garfield Avenue Group groundwater sampling effort. One groundwater sample was collected from each 5-foot section of saturated well screen in accordance with NJDEP low-flow groundwater sampling protocols. One sample was collected from 186-MW-1. No Cr^{+6} was detected and no CCPW metals exceeding the GWQS were detected in this sample. Two samples were collected from well 186-MW02. Total chromium exceeding the GWQS of 70 ug/L was detected at 93.1 ug/L in the sample collected from the lower section of well screen. No Cr^{+6} was detected in the

shallow sample and no other CCPW metals exceeding of the GWQS were detected in either of the two 186-MW02 samples.

3.1.7 Raw Material, Products, Hazardous Substances, Wastes, and Pollutants

Based on available information, Site 186 was not used for the production and/or storage of CCPW. Site 186 is in relatively close proximity to Site 114, which was used for the production and storage of CCPW, and it is possible that CCPW may have been moved from Site 114 to Site 186 as fill material; however this fill material has been well delineated during the PSC, RI, and FSC activities performed at the Site (Kimball, 2000 and Berger, 2003)

3.1.8 Present and Past Production Processes

No production processes were identified at Site 186 during previous remedial investigations.

3.1.9 Former and Current Storage Tanks and Bulk Storage Areas

No known above or below ground storage tanks or bulk storage areas were identified on-site during previous surveys and remedial investigations.

3.1.10 Known Discharges

No known discharges were been identified at Site 186.

3.1.11 Previous and Current Remediation Activities

There have been four previous investigations and one RA (consisting of the 1996 IRM) that occurred at HCC Site 186 (Berger, 2003), which include:

- The NJDEP conducted an initial soil investigation in 1995 to assess the presence/absence of Cr at the Site (NJDEP, 1995).
- Kimball was retained by the NJDEP to install an IRM, which consisted of a Permalon liner covering the entire Site in 1996.
- Kimball was retained by the NJDEP to perform a preliminary site characterization (“PSC”) and to provide recommendations for final Site characterization (2000).
- Berger was retained by the NJDEP to perform a remedial investigation and remedial alternatives selection (“RI/RASE”) at Site 186 (Berger, 2003).
- AECOM was retained by PPG to perform a remedial investigation in 2011 at Site 186 (AECOM, 2012).

A summary of previous investigations by NJDEP (1995), Kimball (1997 and 2000), and Berger (2003) is presented above in Sections 3.2.1 through 3.2.4. The 1995 NJDEP memo, 2000 Kimball, and 2003 Berger reports are available in Appendix C to this RAWP, as is the AECOM technical memorandum (2012).

3.1.12 Previously Approved Remedies

Based on the results of the NJDEP investigation, an IRM was implemented at the Site in 1996. This IRM consisted of the installation of a bituminous concrete/gravel/Permalon liner across the entire Site to prevent direct contact with potentially contaminated soils and groundwater.

3.1.13 Existing Environmental Sampling Data

A summary of the soil sampling data from NJDEP, Kimball, Berger, and AECOM investigations is presented in Tables 1, 2, and 3. Appendix C contains sampling results for soil, sediment, groundwater, and surface water investigation by Kimball (2000) and soil investigation by Berger (2003).

3.1.14 Known Changes in Site Conditions

There are no known changes in the Site conditions since the installation of the IRM and subsequent remedial investigations.

3.1.15 Federal, State, and Local Permits

There are no known water discharge permits that apply to Site 186.

3.1.16 Enforcement Actions

NJDEP issued an ACO on July 19, 1990 and a summary of the actions preceding this agreement between PPG and NJDEP is as follows:

January 22, 1985: NJDEP directed PPG, among others, to arrange for the removal of hazardous substances, including Cr and Cr-related compounds, at 42 Sites in Hudson County, and pay for NJDEP's costs of a Remedial Investigation and Feasibility Study ("RI/FS") at those Sites.

July 22, 1986: PPG and NJDEP executed an ACO concerning the RI/FS. Pursuant to the ACO, PPG agreed to participate in the Chromium Sites Study Committee that NJDEP created to oversee and manage the RI/FS.

December 2, 1988: NJDEP issued a Directive to PPG, among others, pursuant to the Spill Compensation and Control Act, to undertake interim remedial actions at 86 Sites in Hudson County. In response to this Directive, PPG agreed to implement IRMs at 10 high priority and 5 medium priority Sites.

December 27, 1988: NJDEP issued an administrative subpoena to PPG to obtain additional information.

July 19, 1990: PPG Industries and NJDEP signed an ACO regarding cleanup of the residential and non-residential Sites. Note that Site 186 had not yet been identified as a HCC Site.

July 26, 2009: PPG Industries, NJDEP, and the City of Jersey City signed a Partial consent Judgment (generally referred to as the JCO) regarding cleanup of the residential and non-residential Sites (including Site 186).

An on-line search of the NJDEP Office of Public Records data for enforcement actions at Site 186 indicated no such cases. However, the IRM was implemented at the Site in 1996 as a result of enforcement actions by NJDEP.

3.1.17 Site Water Process Budget

There is no known current water usage at Site 186.

3.1.18 Summary of Previous ECRA Submissions

There are no known Environmental Cleanup Responsibility Act (“ECRA”) documents previously submitted for Site 186.

4 Physical Setting

The following subsections provide background information for HCC Site 186, located at the corner of Garfield Avenue and Union Street in Jersey City, Hudson County, New Jersey.

1.2 Site Description

Site 186 is located at the corner of Union Street and Garfield Avenue in a light industrial and commercial area of Jersey City (Figure 1). The Site is comprised of Block 19802 Lot 2. The Site is bounded to the north by Union Street, beyond which are other light industrial properties; to the south by grassy area and parking lot, beyond which is the NJ Transit Light Rail; to the east by Garfield Avenue, beyond which is light industrial property and HCC Site 207; and to the west by a medical care facility, beyond which is residential.

As previously stated in Section 3.1.1, Site 186 is paved with asphalt and has recently been used as a parking lot for used cars. An 1896 Sanborn map indicates that the property at Site 186 was historically occupied by a company that manufactured greenhouse components and greenhouse structures, and a coal yard was present to the south. In 1911, a machine shop was present on the property and the coal yard was present to the south. In 1951, a retail store (Pattern Shop) was located on the property and a dress making company building was located to the west. Sanborn maps from 1979 and 1989 indicate that the Pattern Shop was still present at the site and an electrical supply company was present to the west; however, aerial maps from between 1961 and 1989 show the property without any structures. Aerial maps dated 1994, 1995, and 2006 also show a vacant lot.

This Site was not used for the production and/or storage of CCPW.

1.3 Local and Regional Geology

Topography, geology, soils, surface water, hydrogeology, and well search results for the RIWP Project Area and nearby sections of Jersey City are summarized below.

1.3.1 Topography

The Project Area has little topographic relief, with ground surface elevations generally ranging from 12 to 20 feet above mean sea level (“msl”). Storm water runoff is channeled into the municipal storm sewer system. Figure 1 shows the regional topography near the Site on a USGS Topographic Map.

1.3.2 Regional Geology

The Project Area lies within the glaciated section of the Piedmont Physiographic Province of the Appalachian Highlands, along the eastern edge of the Newark Basin (Killam, 1988), as shown on Figure 3. The area is underlain by formations of Recent and Pleistocene sediments. The Triassic age bedrock throughout the region is comprised of non-marine sedimentary rocks, consisting mainly of sandstone, mudstone, and conglomerate. A diabase sill of regional extent is found west of the Site.

1.3.2.1 Triassic Newark Supergroup

The Triassic Newark Supergroup consists of non-marine sedimentary rocks with diabase intrusions. Generally, the Triassic Newark Supergroup exhibits a slight dip to the northwest with local warping and occasional faulting (Herpers and Barksdale, 1951). The formations generally strike northeast to southwest and dip between 10 to 20 degrees northwest.

The Newark Supergroup is divided into 3 formations on the basis of lithology: (1) the lower unit - the Stockton Formation, (2) the middle unit – the Lockatong Formation, and (3) the upper unit - the Passaic Formation.

The Stockton Formation is a gray to reddish brown sandstone, interbedded with conglomerate, siltstone, and shale. The siltstone may be gray, green, or purple and fossiliferrous. This formation is about 850 feet thick beneath the Project Area (Lyttle and Epstein, 1987).

The Lockatong Formation consists of fossil-rich thinly laminated to thickly bedded gray to black siltstone and shale. A diabase sill of Lower Jurassic Age intrudes the Lockatong Formation west of the Project Area within Jersey City.

The Passaic Formation (formerly the Brunswick Formation) located west of the Project Area is the thickest unit (about 10,000 feet) of the Triassic Newark Supergroup and is found west of the Project Area. The Passaic consists of reddish-brown mudstones, shale, siltstone, and sandstone with interbedded conglomeritic sandstones along the basin margins (Michalski, 1990).

1.3.2.2 Overburden

According to the New Jersey Geologic Survey, surficial deposits in Jersey City include alluvial, estuarine, and eolian deposits of post-glacial age and glacial lacustrine deposits and till of late Wisconsin Age.

The Rahway Till is found directly overlying the Triassic Newark Supergroup. The Rahway Till consists of a glacially-deposited, poorly-sorted, reddish-brown to reddish-yellow, silty sand to sandy silt with some pebbles and cobbles. This unit has a reported thickness of up to 50 feet.

Glacial lake-bottom deposits consisting of a well-sorted and stratified, gray to reddish-brown clay, silt, and fine sand overlie the Rahway Till. This unit can be up to 150 feet in thickness.

Estuarine, salt marsh, and/or deltaic deposits overlie the Lake-Bottom Deposits. The estuarine deposits consist of black, dark brown, and dark gray organic silt and clay, and salt marsh peat (meadow mat), some sand, and occasional shells that range from about 20 to 40 feet thick. The deltaic deposits include well-sorted and stratified reddish-brown, reddish-yellow to gray sand, some gravel, and minor cobbles, and can be up to about 100 feet in the Jersey City area.

In many areas of Jersey City, these marsh areas were dewatered and backfilled, resulting in a surface layer of fill material overlying the meadow mat (ICF Kaiser, 1993). These fill materials typically overlie the native sediments consist of sand, gravel, silt, rock, demolition debris, and miscellaneous refuse.

1.3.3 Project Area Geology

The Project Area is located on fill material placed on top of the salt marsh and estuarine native soils for the expansion of Jersey City. A thick sequence of unconsolidated natural material underlies the fill. The major geologic units at the Site from top to bottom include:

- a non-native fill layer (the shallow zone);
- native soils consisting of sand, silty sand, and clays generally separated from the fill by organic sediments or meadow mat (the intermediate zone);
- till directly above the bedrock to sand with occasional gravel lenses generally separated from the intermediate zone by a layer of lower hydraulic conductivity silts and clayey silts (the deep zone); and,
- bedrock of the Lockatong and Stockton Formations with a diabase sill intruding into the Lockatong formation (bedrock zone).

1.3.3.1 Project Area Overburden

Shallow soils in the vicinity of the Project Area generally extend from the ground surface to between 5.5 and 16 ft. bgs. At Site 186, the deepest soil borings have extended to 16 ft. bgs and the Fill layer was encountered from ground surface to between 5.5 and 16 ft. bgs. Previous drilling has not extended into till or bedrock beneath the Site. The meadow mat, which is present on nearby Site 114 and other HCC sites, was not encountered beneath Site 186 during drilling.

CCPW can consist of chromium ore processing residue ("COPR"), green-gray mud, or a mixture of these materials with fill. COPR is generally reddish-brown waste material generated during the ore processing that is found in nodules ranging from sand to gravel-size. These nodules are often found in clusters loosely cemented together with silt-sized material. The green-gray mud is generally a lime green dense silt, with minor amounts of fine sand and clay. When found in the saturated zone, the grain size of this material may have been affected further due to weathering processes. This can give the material a wet, clayey silt or silty clay appearance with little or no physical or structural integrity. This material has a low permeability. The pH of this material is generally 11 to 12 units. The green-gray mud is often associated with the highest concentrations of Cr^{+6}. The areal extent of the green-gray mud is well defined within Site 114 (located at 900 Garfield Avenue) and it was not found beneath Site 186 during previous phases of the RI.

1.4 Regional Hydrogeology

Regionally, groundwater occurs in four hydrostratigraphic zones:

1. The shallow fill zone (shallow water-bearing unit);
2. The intermediate sand and silty sand zone (intermediate water-bearing zone);
3. The deep sand, till, and gravel lenses (deep water bearing zone); and,
4. Bedrock of the Stockton and Lockatong formations, and diabase sill (bedrock water-bearing zone).

1.4.1.1 Regional Groundwater in Fill Deposits

Groundwater in the fill is typically encountered between 5 to 10 ft. bgs. In general, shallow groundwater flow patterns represent a subdued version of land surface topography. Variations from this can be attributed to factors such as heterogeneities in the fill, subsurface structures, and spatially variable recharge due to the presence of impervious surfaces.

1.4.1.2 Regional Groundwater in Native Unconsolidated Deposits

While there are some more permeable zones of sand and gravel in the intermediate zone, the aquifer below the meadow mat can be characterized as low to moderately permeable because of the high silt content. Observations of clay also support a lower permeability below the meadow mat.

Groundwater flow in the deep zone glacial deposits and alluvium is controlled by primary permeability or flow through the interconnected pore spaces in the soil matrix. Groundwater moves most readily through the glacial deposits. Conceptually, in this stratum, groundwater flows horizontally but is influenced strongly by local recharge and discharge zones (i.e., drainage divides and surface water bodies, respectively). Regionally, glacial deposits can support water supply wells yielding up to 1,500 gallons per minutes ("gpm") (Geraghty, 1959). Locally, much lower yields and the brackish nature of this water bearing zone precludes its use as an aquifer.

1.4.1.3 Regional Groundwater in the Stockton and Lockatong Formations (Bedrock)

Regionally, the unconsolidated native deposits and bedrock are considered part of an aquifer system serving most of the industrialized sections of northern New Jersey. However, locally, the unconsolidated sediments and the bedrock are not considered a viable aquifer. Hydrogeologic properties of the Stockton and Lockatong Formations are not well-documented, but are expected to be similar to the Passaic Formation. Hydraulic conductivity within the rock matrix is virtually nonexistent. Hydraulic conductivity is due to secondary features such as fractures and joints. The thickness of water-bearing zones is limited to fractures or fracture sets ranging from a few inches up to several feet. Groundwater occurrence and flow is controlled by major bedding plane partings and/or intensely fractured seams (Michalski, 1990). Near-vertical fractures are also present but are considered minor flow paths. Groundwater flow within the bedrock is generally anisotropic, with preferential flow northeast or southwest along the strike of the beds. Well yields range from several gallons to several hundred gpm, with yields generally decreasing with depth. Groundwater within the bedrock occurs under both unconfined and confined conditions.

1.4.2 Project Area Hydrogeology

The shallow water-bearing zone includes groundwater present in fill material, from the water table to the top of the meadow mat (typically about 16 ft. bgs). At Site 186, two groundwater monitoring wells were installed to 16 ft. bgs and according to the Kimball report (2000), groundwater was encountered between 6 and 11 ft. bgs across the Site. The relative difference between surface elevation in MW01 and MW02 indicates that the groundwater flows from west or northwest to east or southeast, coinciding with local topography and anticipated flow in the area. Since only two groundwater monitoring wells were installed on the Site, triangulation methods could not be used to determine the groundwater flow direction. (Kimball, 2000)

Since total chromium was detected above NJDEP GWQS (see Section 3.2.5.2) in MW 186-02, additional groundwater remedial investigation is required. At least one additional groundwater monitoring well will be installed on-site in order to determine groundwater flow direction and further investigate and delineate groundwater impacts. The work will be completed after implementation of the soil remedy, and the findings will be reported in a Groundwater Remedial Investigation Report (RIR) addendum.

1.5 Surface Water and Wetlands

1.5.1.1 Wetlands

Figure 4 illustrates wetlands as presented in the NJDEP Geographic Information System ("GIS"). There are no mapped wetlands on or adjacent to Site 186.

1.5.1.2 Surface Water

The only surface water source in the vicinity of the Project Area is the Upper New York Bay, which is not adjacent to the Site and is located to the southeast. Site 186 is with an impervious surface. Therefore, most surface water runoff from precipitation is directed into storm sewers which discharge to the city-owned sewers beneath and along the nearby roadways. In some locations of Jersey City, the storm sewer lines are tied into the sanitary sewer system (combined sewer system). Figure 5 shows surface water within ½ mile of the Site.

1.6 Well Search

A potable and high capacity well search was conducted through the NJDEP Division of Water Resources Office of Records for the area within a one-mile radius of the Project Area. Well records indicated that two industrial wells are within the 1-mile well search radius. These wells are located at 500 Grand Street and 757 Ocean Avenue. The well at 500 Grand Street is near the intersection of Grand Street and the Hudson Extension of the New Jersey Turnpike, approximately one mile from the Site. The well record indicated that it was installed by Berkeley Industries in 1956 to a depth of 335 feet. This well was screened in the fine sand and gravel formation and had a yield of 60 gallons per minute ("gpm"). The quality of the groundwater was described as clear and very salty. This well is most likely no longer in use. The second well, located at 757 Ocean Avenue, is approximately 1,400 feet northwest of the Site. It was installed by Flores Car Wash in May 2000 to a depth of 855 feet and had a well yield of 10 gpm. The quality of the groundwater was not reported.

No public community water supply wells, public non-community water supply wells, potable wells, or domestic wells are located within the well search radius.

1.7 Surrounding Land Use

The future land use for the area is designated as commercial and light industrial. (T&M Associates, 2009)

1.8 Ecological Investigation

There are no environmentally sensitive areas at or adjacent to Site 186, which is located in a fully urbanized area of Jersey City. The nearest surface water body is the Upper New York Bay, located approximately 5,000 feet to the southeast. Additionally, there are no reported wetlands within 2 miles of the Site. (Berger, 2003)

1.9 Baseline Ecological Evaluation

Baseline Ecological Evaluations ("BEE") were completed by both Kimball (Section 3.6 of Kimball [2000]) and Section 4.6 Berger (2003). The results are presented in Appendix C. The Kimball BEE concluded:

> Based on lack of environmentally sensitive areas and contaminant migration pathways within the area of influence of the site's contaminants of concern as defined by N.J.A.C. 7:26E, 3.11, no further ecological investigations are warranted (Kimball, 2000).

Based on the Kimball analytical data, Berger (2003) updated the BEE and concluded:

> Based on the lack of environmentally sensitive areas at or immediately adjacent to the site, in addition to the limited potential migratory pathways, the likelihood that adverse ecological effects may occur or are occurring is considered insignificant. Thus, no further ecological assessments are warranted (Berger, 2003).

4.1.1 Contaminants of Ecological Concern

Contaminants of ecological concern ("COEC"s) are those Site-specific contaminants that exhibit the ability to biomagnify or bioaccumulate, or contaminants with concentrations that exceed applicable standards recommended for use in conducting ecological assessments and investigations (NJAC 7:26E-3.11). Based on a review of soil data and applicable ecological criteria, CCPW-related COECs at Site 186 are Cd, Cr, and Ni.

Based on the absence of environmentally sensitive natural resources immediately adjacent to Site 186, ecological impacts from Site contamination were expected to be minor. Based on these results, no further ecological evaluations for the Site were considered necessary (Berger, 2003).

4.2 Potential Areas of Concern

As described in detail below, two potential Areas of Concern (AOC) were identified at the Site during the investigations of CCPW and related materials; AOC-1 (Soils) and AOC-2 (Groundwater)

4.2.1 AOC 1 – Hexavalent Chromium Exceedences and Visible CCPW in Soil

Based on the findings from all site and remedial investigation activity to date, AOC-1 has been identified to include the following:

- The site-wide presence of historic fill material, as defined in NJAC 7:26E-1.8, including brick, glass, concrete, wood, etc., at depths ranging from the ground surface to 9-feet bgs:
- The presence of hexavalent chromium above NJ CrSCC in three soil borings: 186-A3, Boring S2 and 186-A1 (see Figure 6 and Figure 9);
- The presence of visible CCPW in borings 186-SB07, 186-SB08, 186-SB10 and 186-SB12 (see Figure 9);
- The presence of CCPW related metals (antimony and vanadium) above NJDEP RDCSRS (see Figure 7);
- The presence of CCPW related metals (antimony and nickel) above NJDEP Default IGWSSL (see Figure 8).

The overall approach to remedial action at AOC-1 is to excavate soils impacted with hexavalent chromium at concentrations above the NJCSCC of 20 mg/kg and to excavate all areas where visible CCPW is identified. Soils that are impacted with other CCPW metals above their respective RDCSRS and/or DIGWSSL will also be excavated, to the extent that they are co-located with visible CCPW or

hexavalent chromium exceedences. A depiction of the areas proposed to be excavated during the remedial action, which have been designated as Zone 1, Zone 2 and Zone 3, is presented in Figure 9.

As documented in the soil boring logs, historic fill material was observed across most of the Site. A number of soil borings, specifically boring locations situated outside of the proposed remedial action area, indicated exceedences of CCPW metals co-located with the presence of historic fill material, and which lacked evidence of the presence of visible CCPW and Cr+6 exceedences. Based on this finding, it is apparent that the RDCSRS exceedence for Vanadium at Boring 186-SB05, and the DIGWSSL exceedences for Antimony and Nickel at Borings 186-HA04, 186-HA05, 186-HA06, 186-HA11, 186-SB01, 186-S01, 186-S03 and 186-B4 are associated with the prior placement of historic fill material and not associated with the presence of CCPW. **Therefore, PPG does not propose to remediate soils at these locations.**

To further strengthen the evidence and argument for no remedial action at these locations, the Table below provides a cross-reference for each of the boring locations referenced above, including the depth of RDCSRS or DIGWSLL exceedence observed, and whether historic fill was observed at that corresponding depth. Also, indication is made as to whether or not visible CCPW was observed at any depth interval within that boring (see Figures 7 and 8).

Boring ID	Exceedence Depth (bgs)	Vanadium (V)	Nickel (Ni)	Antimony (Sb)	Historic Fill at Corresponding Exceedence Depth?	CCPW Present at any depth interval in boring?
186-SB05	1-2’		48.6		Yes (Kimball)	No
	8-9’	263	232	25.1	Yes (Kimball)	No
186-SB08	1-3’		32		Yes (Kimball)	YES (1.0-1.2’)
186-HA11	1-1.6		40.5		Yes (Kimball)	No
186-SB01	1-2		31.5		Yes (Kimball)	No
186-HA04	1-1.8		37.1		Yes (Kimball)	No
186-HA05	0-1		48.3		Yes (Kimball)	No
	1-2		333		Yes (Kimball)	No
	2-2.5		65.5		Yes (Kimball)	No
186-S03	0-1			9.4	Yes (Berger)	No
186-S01	0-1		41		Yes (Bergerl)	No

186-HA06	2-2.8			13.2	Yes (Kimball)	No
186-B4	2.5-3		31.8		Yes (AECOM)	No
186-B5	2.5-3		31.6		Yes (AECOM)	

4.2.2 AOC 2 - Groundwater

Groundwater samples were collected from wells 186-MW01 and 186-MW02, shown on the Site Plan in Figure 2, in June 2011 as part of the overall Garfield Avenue Group groundwater sampling effort. One groundwater sample was collected from each 5-foot section of saturated well screen in accordance with NJDEP low-flow groundwater sampling protocols. One sample was collected from 186-MW-1. No Cr^{+6} was detected, and no CCPW metals exceeding the GWQS were detected in this sample.

Two samples were collected from well 186-MW02. Total chromium exceeding the GWQS of 70 ug/L was detected at 93.1 ug/L in the sample collected from the lower section of well screen. No Cr^{+6} was detected in the shallow sample and no other CCPW metals exceeding of the GWQS were detected in either of the two 186-MW02 samples.

Since total chromium was detected above NJDEP GWQS (see Section 3.2.5.2) in MW 186-02, additional groundwater remedial investigation is required. At least one additional groundwater monitoring well will be installed on-site in order to determine groundwater flow direction and further investigate and delineate groundwater impacts. The work will be completed following implementation of the soil remedy, and the findings will be reported in a Groundwater Remedial Investigation Report (RIR) addendum.

5 Technical Overview

5.1 Sampling, Laboratory Analysis, and Data Quality Objectives

5.1.1 Previous Investigations

Sampling methodology, laboratory analysis and data quality control for the Preliminary Site Characterization by Kimball (2000) are included in Appendix C.

Sampling methodology, laboratory analysis, and data quality control for the Remedial Investigation and Remedial Alternatives Selection by Berger (2003) are included in Appendix C.

Sampling methodology, laboratory analysis, and data quality control for the Remedial Investigations by AECOM (2012) followed the procedures outlined in the AECOM Field Sampling Plan – Quality Assurance Project Plan ("FSP-QAPP") provided as Appendix D to this work plan.

5.1.2 Proposed Site 186 Remedial Action

Based on the results of previous investigations at Site 186, the overall approach to remedial action at AOC-1 is to excavate soils impacted with hexavalent chromium at concentrations above the NJCSCC of 20 mg/kg and to excavate all areas where visible CCPW is identified. Soils that are impacted with other CCPW metals above their respective RDCSRS and/or DIGWSSL will also be excavated, to the extent that they are co-located with visible CCPW or hexavalent chromium exceedences. A depiction of the areas proposed to be excavated during the remedial action, which have been designated as Zone 1, Zone 2 and Zone 3, is presented in Figure 9.

Zone 1 will be 20 ft. by 20 ft. by 2 ft. deep and approximately 800 cubic ft. of soil will be removed. Zone 2 will be 20 ft. by 40 ft. by 4 ft. deep and approximately 3,200 cubic ft. of soil will be removed. Zone 3 will be approximately 5 ft. by 5 ft. by 2 ft. deep and approximately 50 cubic ft. of soil will be removed. Post-excavation confirmation sampling, as shown on Figure 10, will be completed and data compared with the NJDEP CrSCC and the applicable Soil Remediation Standards ("SRS"). Table 5 provides post-excavation sampling locations and rationale. Soil samples will be collected and analyzed for Cr^{+6} and total Cr. Post-excavation samples will also be collected for analysis CCPW-related metals including total Sb, Ni, Tl, and V. Table 5 provides proposed sampling locations and rationale.

Additionally, all visible CCPW will be removed during the remedial action. Based on observations in the field during excavation activity as described above, additional material may need to be excavated in the event visible CCPW is encountered.

5.1.3 Sample Analysis and Quality Assurance

Soil samples for laboratory analysis will be placed in pre-cleaned containers provided by the analytical laboratory. The containers will be labeled with the sample identification, depth, date of collection, and analysis to be performed. Standard chain-of-custody procedures will be followed. At least one waste classification will be collected. Waste characterization parameters will be based on the requirements of the selected offsite disposal facility.

Sample analyses will be performed by a NJ-certified laboratory. Analyses will be performed in accordance with EPA- and NJDEP-approved analytical protocols and the revised FSP-QAPP

(Appendix D). Quality assurance analytical measures will be implemented in accordance with the *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E-2) and will comply with the requirements for a NJDEP-certified laboratory. Quality assurance samples (field blanks and field duplicates) will be collected in accordance with the NJDEP FSPM. Quality assurance samples are not required for waste classification sampling activities.

In general, validation of the post-excavation in-situ characterization sample data will be conducted using NJDEP validation Standard Operating Procedures ("SOP"s) as discussed in the FSP-QAPP. Guidelines will be adapted for SW-846 methodologies where appropriate.

5.2 Significant Events

Based on the available information, AECOM is not aware of any significant environmental events that have occurred on Site 186 following the issuance of the RI report by Berger in 2003.

5.3 Rationale for Variances

Berger's deviations from the Final Remedial Investigation Work Plan ("RIWP") during the RI field activities are presented in the Final RI Report (Appendix C) and outlined in Section 3.2.4.1, above. (Berger, 2003)

No variations were noted during groundwater sampling and surface water sampling by Kimball (2000).

5.4 Treatability, Bench Scale, and Pilot Studies

AECOM is not aware of any treatability, bench scale, or pilot studies with the purpose of CCPW remediation have been completed to date at Site 186.

5.5 Data Results to Develop Permit Limitations

AECOM is not aware of any information was collected at the Site 186 for the purpose of developing permit limitations.

5.6 Receptor Evaluations

There are no environmentally sensitive areas and/or sensitive receptors located on or adjacent to the Site. However, the Metropolitan Family Health Network facility is located adjacent to Site 186. Potential human receptors include people working in or going to the Metropolitan Family Health Network facility.

5.7 Updated Baseline Ecological Evaluation

An updated BEE is being prepared in accordance with the N.J.A.C.7:26-3.11 and will be presented to NJDEP under separate cover.

6 Findings/Recommendations

This section was prepared pursuant to 7:26E-4.7(b)5.

6.1 Soil

6.1.1 AOC 1 – Hexavalent Chromium Exceedences and Visible CCPW in Soil

Based on the results of previous investigations at Site 186, the overall approach to remedial action at AOC-1 is to excavate soils impacted with hexavalent chromium at concentrations above the NJCSCC of 20 mg/kg and to excavate all areas where visible CCPW is identified. Soils that are impacted with other CCPW metals above their respective RDCSRS and/or DIGWSSL will also be excavated, to the extent that they are co-located with visible CCPW or hexavalent chromium exceedences. A depiction of the areas proposed to be excavated during the remedial action, which have been designated as Zone 1, Zone 2 and Zone 3, is presented in Figure 9.

Zone 1 will be 20 ft. by 20 ft. by 2 ft. deep and approximately 800 cubic ft. of soil will be removed. Zone 2 will be 20 ft. by 40 ft. by 4 ft. deep and approximately 3,200 cubic ft. of soil will be removed. Zone 3 will be approximately 5 ft. by 5 ft. by 2 ft. deep and approximately 50 cubic ft. of soil will be removed. Post-excavation confirmation sampling, as shown on Figure 10, will be completed and data compared with the NJDEP CrSCC and the applicable Soil Remediation Standards ("SRS"). Table 5 provides post-excavation sampling locations and rationale. Soil samples will be collected and analyzed for Cr^{+6} and total Cr. Post-excavation samples will also be collected for analysis CCPW-related metals including total Sb, Ni, Tl, and V. Table 5 provides proposed sampling locations and rationale.

Additionally, all visible CCPW will be removed during the remedial action. Based on observations in the field during excavation activity as described above, additional material may need to be excavated in the event visible CCPW is encountered.

6.2 Groundwater

1.9.1 AOC 2 - Site-Wide Groundwater

Since total chromium was detected above NJDEP GWQS (see Section 3.2.5.2) in MW 186-02, additional groundwater remedial investigation is required. At least one additional groundwater monitoring well will be installed on-site in order to determine groundwater flow direction and further investigate and delineate groundwater impacts. The work will be completed following implementation of the soil remedy, and the findings will be reported in a Groundwater Remedial Investigation Report (RIR) addendum.

7 Remedial Action Selection Report

7.1 Proposed Remedial Activities

Based on the locations and concentrations of CCPW-related impacts, remedial actions were evaluated for Site 186. The following remedial actions were evaluated.

Remedial Action – Soil (permanent/non-permanent)	Cost	Short-Term Effectiveness	Implementability	Community Benefit
Excavation and Disposal	*High*	*High*	*Medium*	*High*
Deed Restriction w/ Engineering Controls	Low	Medium	Low	Medium
No Action	Low	Low	High	Low

7.1.1 AOC 1 – Hexavalent Chromium Exceedences and Visible CCPW in Soil

Excavation in Zones 1, 2 and 3 will remove visible CCPW and impacted materials with Cr^{+6} exceeding the CrSCC from the site. The goal of this soil RA is to excavate impacted soil, restore the parking lot and underlying base material to pre-excavation conditions, and request an NFA designation for the remaining Site 186 soils.

7.1.2 AOC 2 - Site-Wide Groundwater

Since total chromium was detected above NJDEP GWQS (see Section 3.2.5.2) in MW 186-02, additional groundwater remedial investigation is required. At least one additional groundwater monitoring well will be installed on-site in order to determine groundwater flow direction and further investigate and delineate groundwater impacts. The work will be completed following implementation of the soil remedy, and the findings will be reported in a Groundwater Remedial Investigation Report (RIR) addendum.

7.2 Applicable Remedial Standards

The objective of this RA is to remediate visible CCPW and co-located CCPW-related impacts that exceed the NJDEP CrSCC and/or RDCSCC in soil at Site 186. The COCs in the soil include visible CCPW, Cr^{+6}, Vanadium, Antimony and Nickel.

The CrSCC of 20 mg/kg for Cr^{+6} and 120,000 mg/kg for Cr^{+3} will be utilized for soil remediation compliance during this RA.

The concentrations of other metals found in association with CCPW were compared to the most stringent SRS, in accordance with the NJDEP *Guidance Document for the Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation* (NJDEP, 2008) as depicted in the table below:

Contaminant	RDC SRS	NRDC SRS	Default IGW SSL
Sb	31 mg/kg	450 mg/kg	6 mg/kg
Ni	1,600 mg/kg	23,000 mg/kg	31 mg/kg
Tl	5 mg/kg	79 mg/kg	3 mg/kg
V	78 mg/kg	1,100 mg/kg	No Default SSL

NA – Criterion not available
RDC SRS – Residential Direct Contact Soil Remediation Standard
NRDC SRS – Non-Residential Direct Contact Soil Remediation Standard
IGW SSL – Default Impact to Groundwater Soil Screening Levels

Groundwater results for total Cr were compared to the total Cr GWQS of 70 µg/L.

7.3 Satisfaction of NJAC 7:26E-5.1(c) through (e)

This RAWP is in compliance with N.J.A.C. 7:26E-5.1 (c) through (e) and satisfies the requirements therein. Specifically, this RAWP:

- has selected a remedial action that removes all visible CCPW and reduces co-located CCPW-related contamination to below applicable remediation criteria standards or eliminates exposure to contamination above the applicable remediation criteria and standards based on the current and future land use for the Site; and

- has determined the appropriate remedial action that will reduce or eliminate exposure to contaminants above the applicable remediation criteria and standards that is based on protection of public health, safety, and the environment.

7.4 Protectiveness of Remedial Alternative

The proposed remedial action for Site 186 will address CCPW-related impacts and reduce the potential for direct contact, inhalation, or ingestion of contaminated soils. The proposed RA will also reduce the potential for future impact to groundwater from CCPW-impacted materials.

8 Remedial Action Work Plan

8.1 Post-Remedial Soil Sampling Summary Table

Pursuant to N.J.A.C. 7:26E-4.2, a post-remedial action soil sampling summary table has been prepared and is included as Table 5, Proposed Confirmation Sample Summary and Rationale.

8.2 Remedial Action Requirements pursuant to NJAC 7:26E-6

This RAWP was prepared in accordance with the following requirements:

- Technical Requirements for Site Remediation (TRSR), N.J.A.C. 7:26E-6 (NJDEP, 2009b);
- Appendix F of the July 19, 1990 NJDEP ACO; and,
- The June 26, 2009 JCO.

8.3 Applicable Remedial Standards

The CrSCC of 20 mg/kg for Cr^{+6} and 120,000 mg/kg for Cr^{+3} will be utilized for soil remediation purposes. Additional CCPW-related contaminants of concern include the following metals where these metals are co-located with visible CCPW:

Contaminant	RDC SRS	NRDC SRS	Default IGW SSL
Sb	31 mg/kg	450 mg/kg	6 mg/kg
Ni	1,600 mg/kg	23,000 mg/kg	31 mg/kg
Tl	5 mg/kg	79 mg/kg	3 mg/kg
V	78 mg/kg	1,100 mg/kg	No Default SSL

NA – Standard not available
RDC SRS – Residential Direct Contact Soil Remediation Standard
NRDC SRS – Non-Residential Direct Contact Soil Remediation Standard
IGW SSL – Default Impact to Groundwater Soil Screening Levels

8.4 Remedial Action Description

8.4.1 AOC 1 – Hexavalent Chromium Exceedences and Visible CCPW in Soil

Based on the results of previous investigations at Site 186, the overall approach to remedial action at AOC-1 is to excavate soils impacted with hexavalent chromium at concentrations above the NJCSCC of 20 mg/kg and to excavate all areas where visible CCPW is identified . Soils that are impacted with other CCPW metals above their respective RDCSRS and/or DIGWSSL will also be excavated, to the extent that they are co-located with visible CCPW or hexavalent chromium exceedences. A depiction of the areas proposed to be excavated during the remedial action, which have been designated as Zone 1, Zone 2 and Zone 3, is presented in Figure 9.

Zone 1 will be 20 ft. by 20 ft. by 2 ft. deep and approximately 800 cubic ft. of soil will be removed. Zone 2 will be 20 ft. by 40 ft. by 4 ft. deep and approximately 3,200 cubic ft. of soil will be removed. Zone 3 will be approximately 5 ft. by 5 ft. by 2 ft. deep and approximately 50 cubic ft. of soil will be removed. Post-excavation confirmation sampling, as shown on Figure 10, will be completed and data compared with the NJDEP CrSCC and the applicable Soil Remediation Standards (“SRS”). Table 5

provides post-excavation sampling locations and rationale. Soil samples will be collected and analyzed for Cr^{+6} and total Cr. Post-excavation samples will also be collected for analysis CCPW-related metals including total Sb, Ni, Tl, and V. Table 5 provides proposed sampling locations and rationale.

Additionally, all visible CCPW will be removed during the remedial action. Based on observations in the field during excavation activity as described above, additional material may need to be excavated in the event visible CCPW is encountered.

Post excavation confirmation sampling will be conducted, with disposal of the excavated material at an approved off-site disposal facility.

8.5 Conceptual Engineering Design

The conceptual engineering design outlined for AOC-1 below, discusses the excavation and disposal of visible CCPW and co-located CCPW impacted materials.

8.5.1 Phase I – Excavation and Disposal

The RA will include the excavation of material from Zones 1, 2 and 3 (Figure 9). Post-excavation confirmation samples will be collected and analyzed as presented in Figure 10. All visible CCPW previously identified or encountered during excavation will be removed.

8.5.2 Phase II – Surface Restoration

The Site will be restored to current conditions, for use as a parking lot. This will require proper filling of the excavations with clean fill material and replacement of asphalt. No further surface restoration will likely be necessary. Fill material will be sampled at the sampling frequencies and for analytical parameters specified in the NJDEP Alternative and Clean Fill for SRP Sites Guidance Document ((December 29, 2011).

8.6 Soil Reuse Plan

The impacted material excavated from AOC-1 disposed of at a permitted, offsite disposal facility. Therefore, a Soil Reuse Plan is not required.

8.7 Permits

New Jersey One-Call will be notified prior to intrusive actives to mark out buried utilities. A private utility location/geophysical contractor will be contracted to locate buried utilities in and adjacent to the excavation area.

Since the area of disturbance is less than 5,000 square feet, a Soil Erosion and Sediment Control Plan is not required.

The excavation Contractor will be licensed and registered with the State of New Jersey and/or the City of Jersey City.

PPG will consult with the Jersey City Office of the Construction Code Official and Division of Zoning to determine if a Construction Code Permits (or other Permits) are required for the planned excavation and asphalt replacement activities. If required, PPG will apply for the appropriate permit prior to construction.

1.10 Construction Activity Summary

1.10.1 Site Preparation and Mobilization

Upon selection of the remediation contractor, contractor-specific documents pertaining to remedial activities will be forwarded to NJDEP. A program-wide HASP is included as Appendix E to this RAWP.

8.7.1 Buried Utilities: Location and Handling

Copies of sewer and water utility and maps provided by the Jersey City Municipal Utilities Authority ("JCMUA") will be used to identify buried utilities prior to RA implementation. Availability utility maps are provided as Appendix F. New Jersey One-Call will be notified prior to the implementation of invasive activities at the Site to mark-out subsurface utilities. A geophysical contractor specializing in subsurface utility location will be hired to provide a more detailed utility survey, particularly in and adjacent to the proposed excavation area in AOC-1. Subsurface utility locations will be clearly marked in the field to avoid damage and to provide the information needed for temporary decommissioning or stabilization where needed.

If necessary, the Site engineer will meet utility company representatives onsite to discuss the project before beginning the excavation. The remediation manager will have emergency phone numbers for each utility readily available during invasive activities.

8.7.2 Field Screening, Sampling, and Analysis

Excavated soils will be field-screened for volatile organic compounds ("VOCs") using a photoionization detector ("PID"). Post-excavation samples will be field-screened immediately upon collection. Field screening results will be recorded in the field book for future reference and elevated VOC readings will be provided to NJDEP in a timely manner.

Sampling will be performed in accordance with the current version of the project FSP-QAPP using hand tools (i.e. hand augers, dedicated trowels, etc.). Analytical samples will be placed in pre-cleaned containers provided by the laboratory. The containers will be clearly labeled with the sample identification, depth, date of collection, and analyses to be performed. Analytical samples will be collected, handled and shipped in accordance with chain-of-custody protocol described in the FSP-QAPP.

Soil samples will be analyzed for the compounds presented in Table 5. Samples collected for Cr^{+6} will also be analyzed for pH and Eh (laboratory-based oxygen-reduction potential). Data will be provided by the laboratory as full New Jersey Tier I data deliverables ("CLP-I"). The number of samples, type of analysis, analytical methods, container (bottle) requirements and holding times are presented in the FSP-QAPP.

In cases where the Cr^{+6} analysis of soils (or other solids) prepared using EPA Method 3060A fails the analytical quality control criteria, those samples will be reanalyzed for Cr^{+6} and additional parameters including ferrous iron ("Fe^{+2}"), TOC, sulfide and, if necessary, chemical oxygen demand ("COD") and biological oxygen demand ("BOD") to assist in the interpretation of the data usability. All samples are analyzed for oxidation-reduction potential ("ORP") and pH as required by NJDEP regulations and the results of the Eh-pH plot for each sample is also used to interpret the data and assess data usability.

8.7.3 Disposal

Soils to be excavated will be pre-characterized for waste classification disposal purposes prior to excavation. Once excavated, the soils will be direct-loaded into trucks for transport to an approved disposal facility. Waste personal protective equipment (PPE), sampling equipment, etc., will be placed in 55-gallon drums and securely stored within the fenced area on Site 186 awaiting analysis of waste characteristics and subsequent off-site disposal. Following receipt of analytical data, drums will be hauled offsite by a NJ-approved waste hauler to an appropriate disposal facility.

8.8 Soil Erosion, Sediment Control, and Air Monitoring

Due to the limited extent of the proposed excavation, a Soil Erosion and Sediment Control Plan is not required. However, prudent soil erosion and sediment control procedures will be implemented during remedial activities.

Air monitoring and dust control programs will be implemented to verify that excavation and intrusive activities pose no air quality hazard. The program will consist of perimeter monitoring prior to commencement of field activities to establish baseline conditions, and perimeter, exclusion zone, and personnel monitoring during the excavation. Each monitoring procedure is described briefly below.

1.10.2 Air Monitoring Procedures

An air monitoring and dust control program will be implemented for the RA and is included as Appendix G to this RAWP. The program will consist of perimeter and personnel monitoring during the ground-intrusive activities. Exclusion zone and personnel air monitoring procedures are outlined in HASP.

1.10.3 Dust Control Procedures

As the intrusive activities are expected to occur above the water table, dusty conditions may be encountered. Therefore, the following Dust Control Procedures (“DCP”) will be used for Site 186 remedial activities.

8.8.1.1 Potential Sources of Dust

A minimal amount of soil will be removed from the Site. As such, the potential for dust is also minimal, however the table below describes dust control measures to be conducted during the remedial activities:

Activity	Proposed Controls
Excavation	Water spray/mist, adjust excavation rate, suspend work under unfavorable conditions (very dry/high winds)
Clean Backfill Placement	Water spray/mist

8.8.1.2 DCP Goal

The goal of the DCP is to reduce potential dust generation from Site activities to the extent feasible. A tiered approach will be used for dust/air monitoring with specialized equipment. Exclusion zone and perimeter monitoring units will be utilized for dust monitoring and to initiate control activities (Figure 9). The exclusion zone unit will collect 5-minute dust averages which will be compared to the Site-Specific

Action Levels and will be considered a first line of defense for managing dust control at the Site. The perimeter air monitoring locations will collect 15-minutes dust averages which will also be compared to the Site-Specific Dust Action Levels.

If the action level at the exclusion zone is exceeded, additional dust control measures will be implemented. Should action levels at the perimeter be exceeded at a sustained level (15-minute average above background) due to onsite activities, the work will be terminated until controls can be enacted which to rectify the situation. Should any visible dust be seen within the exclusion zone or at the Site perimeter, control measures will be implemented immediately, even if action levels have not been exceeded. Air monitoring personnel will be monitoring the perimeter for visible dust emissions.

8.8.1.3 Identification of Proactive and Responsive Controls

Excavation, post excavation sampling, and decontamination will be conducted on Site 186. If high winds and/or dry conditions cause dust problems that cannot be mitigated using dust control measures, Site activities will be postponed until more favorable weather conditions return.

8.8.1.4 Dust Control Application Protocols

Workers will be trained to identify potential sources of dust and responsive controls for dust mitigation. Dedicated dust control personnel will operate dust suppression equipment. The work area will be kept clean and free of debris to reduce fugitive dust and dust suppression equipment will be maintained in a proper working order and in assigned work areas. The following general procedures will be implemented to control the generation and migration of dust during remedial activities:

- Water or water/surfactant mixture will be applied directly to the excavation area, so that fugitive dust is minimized. Water spray/mist will be applied via a typical garden hose nozzle with mister setting.

- Spilled soil material within the work area will be immediately collected and managed.

8.8.1.5 Personnel

The HST on-site will be familiar with dust mitigation protocols, equipment, materials, and methods of application relating to the control of dust at the Site.

1.11 Health and Safety Plan and Field Sampling Plan/Quality Assurance Project Plan

A program-wide HASP and FSP-QAPP were prepared for investigation and remediation work within the HCC sites under PPG jurisdiction. These are available as Appendices D and E of this RAWP.

The HASP establishes general health and safety protocols to be followed by Site personnel during implementation of the RAWP. The HASP describes training, medical surveillance, personnel hygiene practices, hazard exposure monitoring, and monitoring equipment maintenance requirements. It is a dynamic document, which will be updated as needed to address issues that may be encountered during the RA.

The FSP-QAPP establishes the overall quality assurance (“QA”) objectives for the RA program and documents sampling and analytical procedures to be used for collecting and analyzing environmental samples. It describes procedures for equipment decontamination, sample handling, sample chain-of-

custody protocols, and standard QA procedures for conducting the RA. The FSP-QAPP will be updated as conditions warrant. The FSP-QAPP was prepared to address the requirements presented the ACO.

1.12 Site Restoration

Following excavation, the site will be restored “in-kind” for continued use as an asphalt paved parking lot.

1.13 Demolition, Demobilization and Removal of Remedial Structures

This RAWP does not require the installation of remedial structures. Therefore, demolition, demobilization, and removal of structures will not be necessary.

1.14 Treatment and Disposal Methods

Waste characterization sampling will be conducted during the soil boring program. Impacted soils and construction/debris waste (“C&D”) will be staged on Site 186 until analytical results are available. Soil and IDW will then be collected and hauled offsite to a permitted solid waste facility.

1.15 Remedial Action Schedule

The RA schedule will consist of the following activities in accordance with N.J.A.C. 7:26E-6.5:

- Pre-excavation waste characterization sampling and characterization;
- Soil excavation and disposal;
- Site restoration
- Remedial Action Report ("RAR") will be submitted to NJDEP.

A more detailed schedule will be provided after approval of this RAWP and selection of the remediation contractors. The schedule is contingent upon NJDEP approval, Site access issues, weather conditions, and contractor availability.

1.16 Draft Deed Notice

A Deed Notice will not be required. PPG intends to remove CCPW materials that are impacted at concentrations greater than the NJDEP CrSCC and/or NJDEP SRS.

1.17 Classification Exception Area

Groundwater issues will be addressed as part of the overall Garfield Avenue Group Groundwater RI and RA.

1.18 Engineering and Institutional Control Monitoring Plan

CCPW-impacted soils encountered during RA sampling will be removed from the Site and disposed of during the RA and the Site will be restored to pre-excavation conditions. Therefore, no engineering or institutional controls will be necessary.

There is one IRM currently onsite. One of the IRMs, the Permalon liner and asphalt cap is located across the entire Site. Since contaminated material will be removed from Zones 1, 2 and 3 (Figure 9), an IRM will no longer be necessary in those areas. Therefore, the excavated areas will be restored as a parking lot, keeping the remaining IRM in place and undisturbed. Properly following these procedures will maintain the integrity of the IRM and a liner repair crew will not be needed to cut the asphalt to expose and repair the Permalon liner in other areas of the Site.

1.19 Engineering Design, Construction, Operation, and Maintenance Schedule

The previously placed Interim Remedial Measure (IRM) (Permalon Liner) will remain in place at areas located outside the proposed remedial action excavation areas. The use of the liner will not be incorporated into the remedial action, nor re-installed or replaced in excavated areas. Any future inspection or maintenance activity associated with the remaining liner is not the responsibility of PPG. Therefore, no design, construction, operation, or maintenance schedule will be necessary.

1.20 Satisfaction of Permit Requirements

Copies of permits and compliance requirements will be included as appendices to the RAR which will be submitted following the completion of RA field activities.

1.21 Operation, Maintenance, Monitoring and Reporting Requirements

1.21.1 Soil

If unrestricted residential use goals are achieved, no long-term post remedial monitoring will be required. In the event that remedial goals are not met and an engineering control is used, the updated Deed Notice provided in the forthcoming RAR will define the monitoring and certification requirements. However, at this time, it is PPG's intention to meet the criteria for unrestricted use.

1.21.2 Groundwater

Groundwater issues will be addressed as part of the overall Garfield Avenue Group Groundwater RI and RA.

1.22 Performance Evaluation

Compliance with the NJDEP CrSCC and/or SRS will be addressed using the analytical data from the post excavation confirmation samples. The analytical samples collected from these locations will serve as the confirmation samples for RA compliance. In the event that analytical results indicate that no CCPW-impacted material, Cr^{+6}, or total Cr exceeding the NJDEP CrSCC is present on Site 186, then a Soil RA Report presenting the results of the remediation will be submitted to NJDEP with a request for a No Further Action ("NFA") determination for the Site 186 Soils..

Performance and effectiveness of the proposed remedial actions will be demonstrated through the evaluation of analytical data and submittal of the RAR.

1.23 Historic Fill Compliance Statement

Previous remedial investigations performed at the Site have identified non-indigenous urban fill material across the Site. CCPW-impacted fill will be removed and disposed during the RA. The remaining fill material is unrelated to CCPW material and will be the responsibility of the Site owner.

9 References

AECOM, 2010a, *Field Sampling Plan-Quality Assurance Field Sampling Plan / Quality Assurance Project Plan Non-Residential Chromium Sites, Hudson County, New Jersey,* February 2010.

AECOM, 2010b, *Health & Safety Plan, Environmental Site Investigations, PPG Sites, Jersey City, New Jersey*, September 2010.

AECOM, 2012, *Hudson County Chrome Site 186 Site History and Site Investigation Summary*, March 2012.

Berger (The Louis Berger Group, Inc.), 2003. Final Remedial Investigation Report, Hudson County Chromate Orphan Sites Group I: Site 186 – 947 Garfield Avenue. Remedial Investigation and Remedial Alternatives Selection Evaluation. Submitted to NJDEP, November 2003.

Environmental Data Resources, Inc., January 2006. *Certified Sanborn® Map Report, 880-900 Garfield Avenue, Jersey City, New Jersey 07304, Inquiry Number 1592757.1s*

Environmental Data Resources, Inc., January 2010. *EDR Aerial Photo Decade Package, 900 Garfield Avenue, Jersey City, New Jersey 07305, Inquiry Number 2678557.5*. January 15, 2010.

Kimball (L. Robert Kimball and Associates, Inc.), 1997. Final Background Investigation Report, Site 186 – 947 Garfield Avenue, Hudson County, New Jersey. Prepared for NJDEP by L. Robert Kimball & Associates, Inc. September 1997.

Kimball, 2000. Final Preliminary Site Characterization Report with Final Site Characterization Recommendations, Site 186 – 947 Garfield Avenue, Hudson County, New Jersey. Prepared for NJDEP by L. Robert Kimball & Associates, Inc., February 2000.

Kimball, 2001. Final Preliminary Site Characterization Report with Final Site Characterization Recommendations, Site 186 – 947 Garfield Avenue, Hudson County, New Jersey, Submitted to NJDEP in February 2000.

Lyttle, P.T., and Epstein, J.B., 1987. *Geologic Map of the Newark 1 x 2 Quadrangle, New Jersey, Pennsylvania, and New York* U.S. Geological Survey Miscellaneous Investigations Map 1715, 2 sheets, Scale 1:250,000.

Michalski, A. 1990. *Hydrogeology of the Brunswick (Passaic) Formation and Implications for groundwater Monitoring Practice*. Groundwater Monitoring Review *10:4* 137-143.

Nationwide Environmental Title Research LLC (NETR), 2011, collection of historic aerial photographs.

NJDEP, 2012a. *New Jersey Administrative Code Chapter 26E, Technical Requirements for Site Remediation,* N.J.A.C. 7:26E, last amended on May 7, 2012.

New Jersey Department of Environmental Protection (NJDEP), 2012b. *New Jersey Administrative Code Chapter 26D, Remediation Standards,* N.J.A.C. 7:26D, last amended on May 7, 2012.

NJDEP, 2010. *New Jersey Administrative Code Chapter 9C, Groundwater Quality Standards,* N.J.A.C. 7:9C, last amended on July 22, 2010

NJDEP, 2009e. *New Jersey Administrative Code Chapter 26C, Administrative Requirements for the Remediation of Contaminated Sites,* N.J.A.C. 7:26C.

NJDEP, 2008. *Guidance Document for the Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation,* revised December 2008.

NJDEP, September 2008. *Chromium Soil Cleanup Criteria*.

NJDEP, 2007a. *NJDEP Commissioner Jackson's February 8, 2007 Memorandum Regarding Chromium Moratorium.*

NJDEP, 2007b. *New Jersey Administrative Code Chapter 7:9D, Well Construction and Maintenance; Sealing of Abandoned Wells.* N.J.A.C. 7:9D.

NJDEP, 2006. New Jersey Integrated Water Quality Monitoring and Assessment Report 2006, Trenton, New Jersey. December.

NJDEP, August 2005. *Field Sampling Procedures Manual*.

NJDEP, 1999. *Bedrock Geology for New Jersey*, NJDEP, Office of Geographic Information Systems (OGIS), Trenton, New Jersey, 1999.

NJDEP, 1995. Memorandum dated November 14, 1995, regarding Hudson County Chromate Site 186.

NJDEP, 1986. Wetlands of Hudson County, New Jersey, NJDEP, Trenton, New Jersey.

New Jersey GIS, 2007. *2002 Land Use/Landcover of New Jersey Web Map Service,* Trenton, New Jersey, 2007.

New Jersey Office of Information Technology (NJOIT), 2009. *New Jersey 2007-2008 High Resolution Orthophotography*, NJOIT, Office of Geographic Information Systems, Trenton, New Jersey, 2007.

T&M Associates, 2009. *Jersey City Master Plan Circulation Element,* Amended July 14, 2009.

USGS, 1967. *Jersey City-NJ-NY Jersey City Topographic Quadrangle*, 7.5 Minute Series, Photo revised 1981.

USGS, 1898, *Staten Island-New Jersey Topographic Quadrangle*, 15 Minute Series.

10 Certification

The following certifications are included pursuant to N.J.A.C. 7:26C-1.5(b):

Regarding the Remedial Action Work Plan dated January 2013, for PPG Hudson County Chromate Site 186, located in Jersey City, Hudson County, New Jersey:

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

_____ _____

Typed/Printed Name Title/Firm

_____ _____

Signature Date

Sworn to and subscribed before me on this ___ day of _____, 2013.

_____

Notary Public - State of Pennsylvania

Stamp and Seal/Commission Expiration Date

Tables

Figures

Appendices

Appendix A

Sanborn Maps

Appendix B

Historic Aerial Photos

Appendix C

Selected Information from Previous Investigations

Appendix D

Field Sampling Plan – Quality Assurance Project Plan

The project FSP-QAPP is under a separate cover and is available on request.

Appendix E

Health and Safety Plan

The project HASP is under a separate cover and is available on request.

Appendix F

Utility Maps

Appendix G

Air Monitoring Plan

Appendix H

Project Schedule

The Project Schedule will be developed upon selection of a Contractor and award of the Remedial Action work.