



Environment

Prepared for:  
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Project No. 60154801  
February 2012

# Remedial Investigation Report – Soil

Garfield Avenue Group Non-Residential Chromate Chemical  
Production Waste Sites 114, 132, 133, 135, 137, 143 and 186  
Jersey City, New Jersey





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Production Waste Sites 114, 132, 133, 135, 137, 143 and 186  
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## List of Acronyms

ACO	Administrative Consent Order
AOC	Area of Concern
BEE	Baseline Ecological Evaluation
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CCPW	Chromium Chemical Production Waste
Co.	Company
COCs	Contaminants of Concern
COD	Chemical Oxygen Demand
Consumers	Consumers Gas Company
COPR	Chromite Ore Processing Residue
CrSCC	Chromium Soil Cleanup Criteria
CVOC	Chlorinated Volatile Organic Compounds
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
EDD	Electronic Data Deliverable
EDR	Environmental Data Resources
EM	Electromagnetic Conductivity
ESAs	Environmentally Sensitive Areas
FS	Feasibility Study
FSP	Field Sampling Plan
FSP-QAPP	Field Sampling Plan – Quality Assurance Project Plan
ft bgs	feet below ground surface
FTL	Field Task Leader
GIS	Geographic Information System
gpm	gallons per minute
GPR	Ground Penetrating Radar
GPS	Global Positioning System
GWQC	Groundwater Quality Criteria
GWQS	Groundwater Quality Standards
HASP	Health and Safety Plan
HCC	Hudson County Chromate
HST	Health and Safety Technicians
IDW	Investigation Derived Waste
IGW	Impact to Groundwater
IRM	Interim Remedial Measure
JCO	Judicial Consent Order
JCRA	Jersey City Redevelopment Authority
LCS	Laboratory Control Sample
Light Rail	New Jersey Transit Hudson-Bergen Light Rail
LNAPL	Light Non-Aqueous Phase Liquid
MDL	Method Detection Limit
mg/Kg	milligrams per kilogram
MGP	Manufactured Gas Plant

## List of Acronyms (Cont'd)

MS	Matrix Spike
msl	mean sea level
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAVD 88	North American Vertical Datum of 1988
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJGS	New Jersey Geologic Survey
NRDC	National Resources Defense Council
NWI	National Wetlands Inventory
ORP	Oxidation Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbon
PCBs	Polychlorinated Biphenyls
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	parts per million
PSE&G	Public Service Electric and Gas Company
PVC	Polyvinyl Chloride
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
ROW	Right-of-Way
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SGS	SGS North America, Inc.
SOP	Standard Operating Procedures
SRS	Soil Remediation Standards
SSL	Soil Screening Levels
SSO	Site Safety Officer
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TPI	TPI Environmental
TRSR	Technical Requirements for Site Remediation
TSCA	Toxic Substances Control Act
TSI	Transportation Safety Institute
TSS	Total Suspended Solids
ug/L	microgram per liter
United	United Gas Improvements Company
USCS	Unified Soil Classification System
USDOT	United States Department of Transportation

## List of Acronyms (Cont'd)

USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VI	Vapor Intrusion
VOCs	Volatile Organic Compounds

## List of Definitions

AECOM	AECOM Environment
Accessible Soil	All soils within the Project Area except Inaccessible Soil
Accessible Source Material	All Source Material except Inaccessible Source Material
Bench scale testing	Testing of materials, methods, or chemical processes on a small scale, such as on a laboratory worktable.
Cap	A layer of impermeable material installed on top of impacted soil to prevent direct or airborne exposure to contaminants.
C&D Waste	Construction and demolition waste includes waste building material and rubble resulting from construction, remodeling, repair, and demolition operations on houses, commercial buildings, pavements and other structures, including treated and untreated wood scrap; tree parts, tree stumps and brush; concrete, asphalt, bricks, blocks and other masonry; plaster and wallboard; roofing materials; corrugated cardboard and miscellaneous paper; ferrous and nonferrous metal; non-asbestos building insulation; plastic scrap; dirt; carpets and padding; glass (window and door); and other miscellaneous materials and land-clearing debris.
CCPW	Chromium Chemical Production Waste, a by-product generated from the production of sodium bichromate, including, but not limited to chromium ore processing residue and green gray mud.
Chromium	An element found in nature that is commonly used in manufacturing activities. Chromium may be present in soil or water as trivalent chromium and hexavalent chromium (“Cr <sup>+6</sup> ”). Trivalent chromium is an essential nutrient at trace concentrations. Cr <sup>+6</sup> can be present in many forms, some of which are carcinogenic at high concentrations. Total chromium, as measured in soil or groundwater, is the sum of trivalent and Cr <sup>+6</sup> .
COPR	Chromite Ore Processing Residue is a specific type of CCPW generally characterized as a reddish brown, coarse to fine, gravel with varying amounts of sand and silt particles. The gravel portion of the matrix is typically defined as nodules from the chromium manufacturing process that range in size from 3/4 to 1/8 inches in diameter. However, nodules have been infrequently detected at diameters of over an inch. Different size nodules may be found cemented together to form larger clusters. The matrix of these clusters may consist of cement-like silt. These nodules can be disintegrated easily with a hammer. Occasionally when detected in the saturated zone, COPR nodules may appear as a fine grained material that has been weathered. The permeability of this material is variable. The inner matrix of COPR nodules typically contains higher concentrations of Cr <sup>+6</sup> than the surface of the nodules but lower concentrations than Green-Gray Mud. Typical approximate range of Cr <sup>+6</sup> is between 300 and 5,000 mg/kg.

## List of Definitions (Cont'd)

Environmental media	A major environmental category that surrounds or contacts humans, animals, plants and other organisms, such as surface water, groundwater, soil or air, which may be impacted by contaminants.
Ex-Situ Treatment	Ex-situ technologies are remediation options where the affected medium (soil, water) is removed from its original location and treated on-site or off-site. Examples: bioremediation or soil washing.
Feasibility Study	A study designed to develop and evaluate options for remedial action using data gathered during the remedial investigation to develop the objectives of the remedial action, and to develop possible remedial action alternatives, to evaluate those alternatives and create a list of feasible alternatives, and to analyze the engineering, scientific, institutional, human health, environmental, and cost of each selected alternative.
Green-Gray Mud	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. Typical approximate range of Cr <sup>+6</sup> is greater than 5,000 mg/kg.
Groundwater	The supply of fresh water found beneath the Earth's surface, which can be extracted by wells or through natural springs.
Impacted Soil	Soil that does not contain "Source Material" and contains Cr <sup>+6</sup> in excess of 20 mg/kg.
Inaccessible Areas	Areas within the Project Area that are currently inaccessible to excavation for several reasons including the presence of roads, utilities, buildings and the rail road.
Inaccessible Soil	Soil located in or adjacent to the Project Area where its removal may damage or otherwise compromise nearby properties, structures and/or surface or subsurface infrastructure. Specific locations of inaccessible soil are being determined in cooperation with the NJDEP and will be defined in the Remedial Action Work Plan and/or specific Technical Execution Plan(s) developed for specific areas of the site in proximity to those potential inaccessible areas
Inaccessible Source Material	Source Material located in, or adjacent to the Project Area where its removal may damage or otherwise compromise nearby properties, structures and/or surface or subsurface infrastructure. Specific locations of inaccessible Source Material are being determined in cooperation with the NJDEP and will be defined in the Remedial Action Work Plan and/or specific Technical Execution Plan(s) developed for specific areas of the site in proximity to those potential inaccessible areas.

## List of Definitions (Cont'd)

In-Situ Treatment	In situ technologies are remediation options where the affected medium (soil, water) remains in its original location as it is treated on-site. Examples: soil blending and groundwater injections.
Mixed Fill/COPR	A matrix that in addition to COPR nodules, may contain, soil and miscellaneous fill materials including cinders, brick, glass, metal and concrete fragments. Although isolated samples contain high levels of Cr <sup>+6</sup> , the average Cr <sup>+6</sup> content of this material is much lower than COPR (Cr <sup>+6</sup> concentrations typically found at less than 300 mg/kg).
Meadow Mat	A naturally occurring organic estuarine deposits located at approximately fifteen feet below the ground surface, pre-excavation.
Pilot Scale treatment	A pilot test usually involves at on-site test using the actual treatment processes and data collection process on a small scale to get feedback on whether or not the processes are likely to work as expected in a "real world" situation. These tests are also used to help refine process parameters such as reagent dosing and mixing methods.
Project Area	Sites 114, 132, 133, 135, 137, 143, and 186 as defined in the Administrative Consent Order dated July 19, 1990, inclusive of adjacent areas such as roadways or the light rail where Impacted Soil and/or Source material have come to be located.
Remedial Design	Includes development of engineering drawings and specifications for a site cleanup.
Remediation	Actions to reduce, isolate, or remove contamination with the goal of protecting human health and the environment.
Responsible Party	Individuals, businesses or other entities accountable for remediating a contaminated site.
Site Administrator	Under terms of an agreement among PPG, the New Jersey Department of Environmental Protection and the City of Jersey, this court-appointed individual is responsible for: <ul style="list-style-type: none"><li>• Developing a master schedule;</li><li>• Resolving issues that might arise;</li><li>• Obtaining technical expertise required for the review of PPG's submittals; and</li><li>• Maintaining regular communications with community representatives.</li></ul>
Soil	All solid material above bedrock (other than Source Material) including fill, gravel, sand, silt, and clay.
Source Material	Chromium ore processing residue ("COPR"), green-grey mud ("GGM"), and fill or soil comingled with COPR and/or GGM.



## List of Definitions (Cont'd)

Treatability Study	The purpose of the studies is to demonstrate the feasibility or effectiveness of a treatment technology by testing it at a laboratory or on a small field-scale before applying the technology to the larger field problem. In some cases, these studies are reported in the scientific literature. In other cases, especially with pilot scale studies, the studies would be completed by the consultant for the responsible party or by a subcontractor marketing the technology.
XRF	X-Ray Fluorescence (“XRF”) Spectrometry is a non-destructive analytical technique used to identify and determine the concentrations of elements present in soil. The spectrometer measures the individual component wavelengths of the fluorescent emission produced by a sample when irradiated with X-rays.

## List of Compounds

Ag	Silver
Al	Aluminum
As	Arsenic
Ba	Barium
Be	Beryllium
Ca	Calcium
Cd	Cadmium
CN	Cyanide
Co	Cobalt
Cr	Chromium
Cr <sup>+3</sup>	Trivalent chromium
Cr <sup>+6</sup>	Hexavalent chromium
Cu	Copper
Fe	Iron
Fe <sup>+2</sup>	Ferrous Iron
Hg	Mercury
K	Potassium
Mg	Magnesium
Mn	Manganese
Na	Sodium
Ni	Nickel
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCBs	Polychlorinated biphenyls
PCE	Tetrachloroethene
Sb	Antimony
Se	Selenium
SVOC <sup>+20</sup>	SVOCs plus 20 tentatively identified compounds
TCE	Trichloroethylene
Tl	Thallium
TOC	Total organic carbon
V	Vanadium
VO <sup>+10</sup>	VOCs plus 10 tentatively identified compounds
Zn	Zinc

# 1 Introduction

## 1.1 Remedial Investigation Objectives

This Remedial Investigation Report (“RIR”) for Soil was prepared by AECOM on behalf of PPG Industries, Inc. (“PPG”) to provide a summary of Remedial Investigation work for soil conducted at seven Hudson County Chromate (“HCC”) sites located in Jersey City, Hudson County, New Jersey (**Figure 1-1**). As identified by the New Jersey Department of Environmental Protection (“NJDEP”), these sites include six Non-Residential HCC sites (Sites 114, 132, 133, 135, 137 and 143) and one former orphan chromate waste site, Site 186 (**Figure 1-2 and Table 1-1**). These combined sites are hereinafter referred to as the “Project Area.” This RIR includes data from the Remedial Investigation Work Plan (“RIWP”), dated March 15, 2011, as well as previously collected data from prior soil investigations (AECOM, 2011a). The March 2011 RIWP presented the soil investigation strategy that was designed to further delineate contaminants of concern (“COCs”) emanating from the Project Area, and is included as **Appendix A**. Future submittals, under separate cover, will present the Remedial Investigation (“RI”) strategy and results for groundwater in the Project Area.

In 1990, PPG and the NJDEP entered into an Administrative Consent Order (“ACO”) to investigate and remediate locations where chromium 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 Partial Consent Judgment, also referred to as the “JCO” with the purpose of assessing the soils and sources of contamination at these HCC sites. The goal of the JCO is to complete the investigation and remediation of soils for a defined list of 20 sites within a 5 year period in accordance with a judicially enforceable master schedule. The provisions of the original ACO will remain in effect except as specifically stated within the JCO with the JCO taking precedence where conflicts exist between the two documents.

RI activities at several of the sites in the Project Area have been performed and were detailed in the following reports previously submitted to the NJDEP:

- April 2003 RIWP - Site 114;
- March 2006 Remedial Investigation Report (“RIR”) - Site 114;
- March 2006 RIWP – Site 114 (Offsite);
- September 2006 RIWP – Sites 132, 133, 135, 137 and 143; and
- March 2011 Soil RIWP – Sites 114, 132, 133, 135, 137, 143 and Site 186.

The primary objective of this RIR is to summarize the horizontal and vertical extent of CCPW and CCPW-related impacts in soil within the Project Area. The COCs in soil related to CCPW and CCPW-impacted materials include hexavalent chromium (“Cr<sup>+6</sup>”) and five of the United States Environmental Protection Agency (“USEPA”) Target Analyte List (“TAL”) metals: antimony (“Sb”), chromium (“Cr”), nickel (“Ni”), thallium (“Tl”), and vanadium (“V”). However, additional COCs emanating from Site 114 and related to PPG’s former ownership of Site 114 were also delineated during the RI. These COCs include volatile organic compounds (“VOCs”), semi-volatile organic compounds (“SVOCs”), polychlorinated biphenyls (“PCBs”), and TAL metals.

This RIR was prepared to address the *Technical Requirements for Site Remediation* (“TRSR”), N.J.A.C. 7:26E-4 and the requirements of the ACO and JCO.

Information included in this report represent data collected prior to September 1, 2011, as agreed to during the August 11, 2011 meeting between the NJDEP, Weston (JCO Technical Consultant), PPG and AECOM. Any data collected after September 1, 2011 would be included in an RIR Soil Addendum to be completed at a later date; the future RIR Soil Addendum will complete the RI data presentation and finalize delineation of COCs in soil.

## 1.2 Remedial Investigation Requirements

This RIR was prepared in accordance with the following requirements:

- TRSR, N.J.A.C. 7:26E-4.8 (NJDEP, 2009b);
- Appendix B of the 1990 NJDEP ACO; and
- June 26, 2009 JCO.

This RIR addresses the following applicable requirements in accordance with Appendix B of the ACO:

- Characterize CCPW-related soil impacts in the Project Area;
- Determine the horizontal and vertical extent of CCPW-related impacts in the Project Area, emanating from Site 114, or which have emanated from Site 114;
- Assess potential contaminant migration paths through soil;
- Assess potential soil impacts on human health and the environment;
- Assess potential containment and/or reduction measures to reduce or eliminate human health and environmental impacts related to CCPW or CCPW-related contamination; and
- Further delineate the non-CCPW related compounds on or potentially emanating from Site 114.

Soil analytical results were compared to NJDEP Soil Remediation Standards (“SRS”) at N.J.A.C. 7:26D (NJDEP, 2009a) as well as the Default Impact to Groundwater (“IGW”) soil screening levels (“SSL”) in accordance with the NJDEP December 2008 *Guidance Document for the Development of Site-Specific Impact to Ground Water Soil Remediation Standards Using the Soil-Water Partition Equation* (NJDEP, 2008a). Comparison of contaminants to the IGW criteria was conducted only in unsaturated soils in accordance with NJDEP guidance.

Currently there are no SRS for Cr or Cr<sup>+6</sup>; however, NJDEP expects to develop SRS for these compounds at some point in the future. For the purpose of this assessment, Cr and Cr<sup>+6</sup> were compared to the NJDEP’s February 2007 and September 2008 Chromium Soil Cleanup Criteria (“CrSCC”) of 20 milligrams-per-kilogram (“mg/Kg”) for Cr<sup>+6</sup> and 120,000 mg/Kg for trivalent chromium (“Cr<sup>+3</sup>”) (NJDEP, 2008b).

A site-specific Cr<sup>+6</sup> criterion for the allergic contact dermatitis endpoint is not required for this remedial action in accordance with NJDEP’s February 8, 2007 Chromium Cleanup Policy (NJDEP, 2007a).

The SRS implement the provisions of the Brownfield and Contaminated Site Remediation Act, N.J.S.A. 58:10B-12, and other statutes, by establishing the minimum residential direct contact and non-residential direct contact soil remediation standards (NJDEP, 2009a). Soil Cleanup Criteria such as the CrSCC, are interim soil cleanup levels that are not statutorily promulgated but are enforced by NJDEP until an SRS can be established. Soil screening levels, such as the default IGW SSL, are guidelines for identifying potential issues but are not statutorily promulgated. NJDEP IGW SSL guidance documents provide methodology to formulate site-specific impact to groundwater standards that must be reviewed and approved by NJDEP (NJDEP, 2008a). The IGW-SSL do not apply to historic fill.

### 1.3 Contaminants of Concern

Contaminants of concern for the Project Area were divided into two categories: 1) compounds that are on or emanating from Site 114 and 2) CCPW-related compounds for areas other than Site 114. The compounds that are on or emanating from Site 114 are related to PPG's former ownership of the Site 114 property. These COCs include the following:

- Cr<sup>+6</sup>: Samples analyzed for Cr<sup>+6</sup> were also analyzed for pH and Eh (laboratory-based oxidation reduction potential ("ORP") analysis)
- Metals: TAL metals (silver ("Ag"), aluminum ("Al"), arsenic ("As"), barium ("Ba"), beryllium ("Be"), calcium ("Ca"), cadmium ("Cd"), cobalt ("Co"), Cr, copper ("Cu"), iron ("Fe"), mercury ("Hg"), potassium ("K"), magnesium ("Mg"), manganese ("Mn"), sodium ("Na"), Ni, lead ("Pb"), Sb, selenium ("Se"), Tl, V, and zinc ("Zn"))
- VOCs: Primarily benzene, toluene, ethylbenzene and xylenes ("BTEX") compounds and chlorinated VOCs ("CVOCs")
- SVOCs: Generally polycyclic aromatic hydrocarbons ("PAHs"), but include a few non-PAH compounds
- PCBs: Total PCBs

The COCs for areas other than Site 114 include the following CCPW-Related compounds:

- Cr<sup>+6</sup>: Samples analyzed for Cr<sup>+6</sup> were also analyzed for pH and Eh (laboratory-based ORP analysis)
- Metals: Specific TAL metals (Cr, Ni, Sb, Tl and V)

In addition, the compounds exceeding NJDEP criteria were reviewed for the potential source of the constituent. These sources include historic chrome production operations prior to PPG operations, historic PPG operations, operations of Public Service Electric & Gas Company's ("PSE&G's") predecessor relating to the former manufactured gas plant ("MGP") facility, compounds associated with historic fill material, and compounds to be addressed by PPG as the former property owner, (i.e., compounds that are not directly attributable to PPG chrome operations, MGP operations, or historic fill). These potential sources are summarized on **Table 1-2**.

## 1.4 Remedial Investigation Dataset

This report describes the activities and field methods that were outlined in the NJDEP-approved soil RIWP, dated March 2011. The primary objective of this RIR is to summarize the horizontal and vertical extent of CCPW and CCPW-related impacts in soil on or emanating from the Project Area. This RIR also presents the horizontal and vertical extent of other non-CCPW-related compounds on or emanating from Site 114. The dataset used to evaluate the extent of COCs includes the work proposed in the March 2011 RIWP, a summary of the data collected during previous RI programs, and additional investigations conducted concurrently with the 2011 RI field program. The 2011 field program included the following activities:

- Soil RI Activities (April – August 2011) – This investigation was conducted in accordance with the March 2011 RIWP to delineate the horizontal and vertical extent of COCs on or emanating from Site 114 and CCPW-related impacts throughout the Project Area.
- National Resources Defense Council (“NRDC”) Investigation (May – June 2011) – In February, 2011 PPG signed a consent agreement with the Interfaith Community Organization, Inc., Graco Community Organization, and the Natural Resources Defense Council to characterize CCPW-related COCs within buffer zones adjacent to the Project Area as part of a Civil Lawsuit Settlement. Although the soil borings proposed in this investigation were generally advanced outside of the Project Area, the additional data collected during this program were used to supplement the RI and are included in this RIR. Soil samples proposed under this investigation were analyzed for Cr<sup>+6</sup>, Eh and pH. Fourteen of the 30 borings originally proposed under this program have been completed to date and are included in this RIR. Access agreement negotiations are still pending for the remaining borings.
- Southern Canal Investigation (May 2011) – An investigation of soils located along the former Morris Canal south of Caven Point Avenue was conducted to visually evaluate and characterize the fill material within the former canal. While no analytical data was proposed during this investigation, two of the locations were co-located with borings from the NRDC investigation and the data are provided in this RIR.
- PCB Investigation (May 2011) – A PCB investigation was conducted on Site 114 adjacent to the former 2 Dakota Street building slab to assess a historic PCB sample result potentially exceeding the USEPA TSCA threshold limit. The results of this investigation are included as an appendix to this RIR.
- Geotechnical Investigation (April – July 2011) – Site 114 Interim Remedial Measure (“IRM”) activities included the advancement of soil borings for the evaluation of proposed engineering design for future remedial actions including shoring and sheeting for proposed excavation areas. Several of these borings included laboratory analysis for total Cr, Cr<sup>+6</sup>, Eh, and pH and these results are included in this RIR.

The following historic data from previous investigations are included in this RIR:

- Garfield Avenue Historic RIs (August 2003 – August 2008) – Previous RI activities conducted in the Project Area have been presented under separate cover (see **Section 1.1** above). The data from these historic investigations are included in this RIR.
- PSE&G Historic RI Activities (April 2003 – August 2007) – Previous RI activities associated with the former MGP facility were presented as separate reports prepared and submitted by

PSE&G. The data associated with these investigations are summarized in PSE&G's 2007 RIR and 2008 RIR Addendum.

Relevant field data and analytical data from these investigations are included in the tables, figures, or appendices of this RIR. Copies of historic reports are included in **Appendix B**.

## 1.5 Report Organization

Appendix B, Part II of the ACO sets forth information to be included in the RIR for non-residential CCPW sites. This RIR is organized to address these items and the requirements set forth in the NJDEP TRSR as follows:

- **Section 1** provides the introduction and objectives of the RIR;
- **Section 2** provides the current site conditions and site history, including a summary of previous investigation data;
- **Section 3** provides the physical characteristics of the Project Area, including the environmental setting and the baseline ecological evaluation update;
- **Section 4** provides the field investigation methods conducted for the RI proposed in the soil RIWP (AECOM, 2011a);
- **Section 5** provides the nature and extent of the COCs;
- **Section 6** provides conclusions based on the investigatory findings;
- **Section 7** provides recommendations based on the investigatory findings;
- **Section 8** includes the signed and notarized report certification in accordance with N.J.A.C. 7:26C-1.5; and
- **Section 9** provides references for the report and documents used to prepare the RIR.

Supplemental information is presented in the attached Appendices.

## 2 Current Conditions and Site History

### 2.1 Current Site Conditions

The following sections provide a description of the current conditions of each site located in the Project Area, as shown on **Figure 1-2**. **Table 2-1** provides a summary of the information associated with properties located in the vicinity of the work being conducted at Site 114.

#### 2.1.1 Site 114 – PPG and PSE&G

Site 114 is vacant land located in a commercial and residential area on Garfield Avenue in Jersey City, Hudson County, New Jersey (**Figure 1-1**). Site 114 is described in the ACO as Block 2026.A, Lots 1 and 3A and Block 2026.1, Lots 2A, 3B and 4A and has a total area of 16.6 acres. It is bordered to the west by Garfield Avenue; to the south by Carteret Avenue; to the east by Halladay Street; and to the north by the New Jersey Transit Hudson-Bergen Light Rail (“Light Rail”) and Forrest Street (**Figure 1-2**).

Site 114 is currently vacant land where the foundations and floor slabs of three former warehouse buildings remained after demolition of the warehouse buildings. Until recently, these foundations covered about 6.5 acres of the Site. The 900 Garfield Avenue slab was recently removed as part of an interim remedial measure (IRM #1) conducted in 2010-2011. The slabs of two of the former warehouses at 880 Garfield Avenue and 2 Dakota Street remain in place.

Site 114 is completely enclosed by a barrier fence as a security measure to restrict unauthorized access to the Site. There are approximately 4 acres of paved roadways and parking areas on Site 114 including the former Dakota Street, which extends east-west and bisects the Site. Dakota Street is no longer a public Right-of-Way (“ROW”) and is included within the fenced restricted area of Site 114. Approximately 1.8 acres of Site 114 consists of landscaped and open areas surrounding the concrete slabs of the former warehouses. The landscaped areas are primarily long and narrow vegetated strips along the edges of the concrete slabs. A 4-acre portion of the Site is capped with stone overlying a polyethylene liner constructed by PPG in 1992 as an IRM. The remaining 0.3 acres consists of open areas on the eastern side of Site 114 between the paved areas.

#### 2.1.2 Site 132 – Town and Country Linen

Site 132 is a 3.2 acre property located at 824 Garfield Avenue, Block 2006.A, Lot 2 in a commercial and residential area Jersey City (**Figure 1-2**). Site 132 is bordered to the west by Garfield Avenue; to the south by an active apparel warehouse; to the east by warehouse and commercial businesses on Site 137, and to the north by Site 143 and Carteret Avenue.

The property is currently owned by the City of Jersey City and consists of a vacant warehouse building constructed circa 1970, bordered by grassy and paved areas. The building was previously occupied by the Town and Country Linen Warehouse.

#### 2.1.3 Site 133 – Ross Wax

Site 133 consists of 2 properties located in a commercial and industrial area on Halladay Street in Jersey City (**Figure 1-2**). The 0.7-acre property located at 15 Halladay Street, Block 2016, Lot 47 is on



the west side of Halladay Street and is bounded by a commercial warehouse property that is part of Site 137 on the north, Halladay Street on the East, Caven Point Avenue on the south, and an active apparel warehouse on the west.

The 1.9-acre property at 22 Halladay Street, Block 2017, Lot PLOT.H, is located on the east side of Halladay and is bounded by Carteret Avenue on the north, commercial businesses and vacant buildings that are part of Site 135 to the east, Caven Point Avenue to the south, and Halladay Street to the west.

#### **2.1.4 Site 135 – Vitarroz**

Site 135 is a 1.4 acre property located at 51-99 Pacific Avenue, Block 2017, Lot 69 in a commercial and industrial area in Jersey City (**Figure 1-2**). Site 135 is bordered to the west by Site 133; to the south by Caven Point Avenue; to the east by Pacific Avenue; and to the north by Carteret Avenue. Several small warehouses and an auto parts business are currently located on the property. According to the ACO, Site 135 does not include Lot 69 at the south end of Block 2017. The site map presented in the March 2011 RIWP erroneously included this lot as part of Site 135.

#### **2.1.5 Site 137 – Rudolf Bass & TSI City Carriers**

Site 137 consists of 2 properties located in a commercial and industrial area on Carteret Avenue and Halladay Street in Jersey City (**Figure 1-2**). The Site is bordered by a vacant former warehouse on Site 132 to the west; vacant land on Site 133 to the south, Halladay Street to the east, and Carteret Avenue to the north.

The northern 2.2-acre property on Site 137 is located at 45 Halladay Street, Block 2016, Lot A.2. The property is currently occupied by an active commercial business and warehouse operated by Rudolf Bass for the storage and resale of industrial machinery. The southern 1.2-acre property is located at 25 Halladay Street, Block 2016, Lot A.1 and is occupied by an active warehouse and cardboard tube manufacturing business.

#### **2.1.6 Site 143 – Talarico Auto**

Site 143 is a 0.6-acre property located at 846 Garfield Avenue, Block 2007, Lot 21A.99 in a commercial and residential area in Jersey City (**Figure 1-2**). Site 143 is bordered to the west by Garfield Avenue, to the south and east by Site 132; and to the north by Carteret Avenue.

A building (constructed between 1963 and 1966) surrounded by pavement is present on the Site. The property is currently operated by Talarico Auto for automobile repair and sale of used automobiles.

#### **2.1.7 Site 186 – 947 Garfield Avenue**

Site 186 is a 0.1-acre property located at 947 Garfield Avenue, Tax Block 1967, Lot A.2. The entire property is paved with an asphalt cap over a Permalon<sup>®</sup> Liner installed by NJDEP in 1996 as an IRM to prevent human exposure to potential CCPW impacted material. Site 186 is currently used as a car storage lot for Hit or Miss, Inc., an automotive business located across the street on Garfield Avenue. A mobile office trailer is located at the northwest corner of the Site.

## 2.2 Site History

Pursuant to N.J.A.C. 7:26E-4.2(b) 3, a historical review for the Project Area and surrounding area was conducted that included the review of other consultants' reports, and the review of historic air photos provided by Environmental Data Resources ("EDR") and other sources (TX Aero & Robinson Aerial Surveys) and Sanborn maps provided by EDR. A total of eight aerial photographs from EDR for the period 1940 to 2006, six aerial photos for the period 1940 to 1989 from other sources, and 71 Sanborn Maps from 1896 to 2006 were reviewed to assess historic development for the Project Area. The Sanborn maps and aerial photos used during this evaluation are included in Appendices C and D of the RIWP (AECOM, 2011a). The RIWPs and RIRs described in **Section 1.1** provided details on site locations, descriptions, ownership, aerial photos, historic releases, enforcement actions, remedial actions, and previous site investigations for Sites 114, 132, 133, 135, 137 and 143. Details for Site 186 were added to the soil RIWP (AECOM, 2011a). A brief summary of this information is provided below.

### 2.2.1 Historical Information

#### 2.2.1.1 Site 114 – PPG and PSE&G

Site 114 is the former location of a chromate chemical production facility and a Manufactured Gas Plant ("MGP"). The former Morris Canal, a man-made surface water body trending northeast/southwest, bisected Site 114 into eastern and western portions. The canal was decommissioned in the 1920s and was later filled. The MGP facility operated on the portion of Site 114 located east of the former Morris Canal between 1886 to the mid-1930s. The western half of Site 114 was the location of the former chromate production facility that operated from about 1911 to 1963. The chromate operation included a large stockpile of CCPW, primarily consisting of COPR, extending from the eastern portion of Site 114 southward onto Site 137. The locations of the former chromate plant and the CCPW storage pile were identified using historic aerial photographs.

Following demolition of above-grade structures associated with the chromate production facility and the MGP facility, the remaining foundations were buried, raising the ground surface elevation by several feet, and three warehouse structures were constructed on the property in the late 1960s. These warehouses were demolished down to the concrete floor slabs between August and December 2002.

##### 2.2.1.1.1 PSE&G Manufactured Gas Plant Operations

Between 1884 and 1886, Consumers Gas Company ("Consumers") purchased property on which the original Site 114 facilities were located. In 1886, facility construction and operations commenced, and Consumers entered into a lease agreement with the United Gas Improvement Company ("United") pursuant to which United assumed operational control and management of a portion of Site 114. The facility was enlarged in 1896, then in 1899 Consumers consolidated with other companies to form the Hudson County Gas Company. In 1903, Public Service Corporation leased the property, plant and franchises of the Hudson County Gas Company, which at that time included Site 114, and the gas manufacturing operation was placed on a "standby" status until 1926 when Site 114 was listed as an auxiliary production facility. From 1926 to 1940, the gas manufacturing facilities were removed, but the facility continued to be used as a gasholder station until 1954, when the gasholder station operations were terminated. In 1955, Public Service Electric and Gas Company, the successor to Public Service Corporation, sold a portion of Site 114 to Columbia Southern Chemical Company, a subsidiary of PPG. Subsequently, the property was sold to Clif Associates, Fred Fishbein, *et al.* in 1964 along with the chromate chemical processing facility on the western portion of Site 114.

The former MGP facility used the coal gas process, the water gas process, and the carbureted water gas process. The potential by-products of coal gasification, removed during purification operations, included ammonia, ammonium sulfate, tar, light oils, coke, and sulfur, all of which could have potentially impacted the Site. The waste by-products from water gas manufacturing typically include ash and clinker and the by-products from the carbureted water gas reaction include clinker, tar, pitch, and light oil.

#### **2.2.1.1.2 PPG Chromate Chemical Production Facility Operations**

Natural Products Refining Company owned and constructed a chromate chemical production facility in the northwest portion of Site 114 in approximately 1915. Natural Products operated at this facility until August 1954. In August 1954, Pittsburgh Plate Glass Company purchased the Jersey City plant and property and operated a chromate chemical production facility in the northwest portion of Site 114. Columbia-Southern Chemical Corporation, a Pittsburgh Plate Glass Company subsidiary, operated the plant from 1954 through 1963. In 1963, Pittsburgh Plate Glass Company shut down its Garfield Avenue chromate chemical product operations. In 1964, the Pittsburgh Plate Glass Company sold its Garfield Avenue chromate chemical production facility to Clif Associates, Fred Fishbein, *et al.*, and the chromate chemical production facility was dismantled. In 1968, the Pittsburgh Plate Glass Company becomes PPG Industries, Inc.

As detailed in the 2003 RIWP, Transvaal chromite ore, a mixed composition of chromium, iron, magnesium, aluminum, vanadium, silicon and calcium, was processed at the Jersey City plant to extract the chromium. Products generated at the plant included aluminum hydrate, sodium chromate, sodium bichromate, sodium sulfate, vanadium pentoxide, and potassium bichromate. All of these compounds were sold in solid form.

The residue remaining after the leaching of the roast constituted the primary waste produced at the chromate plant. Some of this waste material was recycled through the process, but the majority was stockpiled on the southeast corner of Site 114 and on the adjacent property of Site 137 to the south. PPG estimated that approximately 300,000 tons of CCPW was generated during plant operations.

#### **2.2.1.2 Site 132 – Town and Country Linen**

Site 132 was undeveloped until about 1911. Residential buildings were located on the property during the 1950s and by the 1960s, the residential properties were gone and the property was utilized as part of an automobile salvage yard. By the 1970s, the Town and Country Linen Warehouse occupied the property. The warehouse building has been vacant since the mid 1990s and is in disrepair. It is currently owned by the City of Jersey City and will likely be demolished.

#### **2.2.1.3 Site 133 – Ross Wax**

Site 133, the former Ross Wax site consists of two properties divided by Halladay Street. The 15 Halladay Street property located west of Halladay Street was a former varnish manufacturer from the 1950s through the 1970s. The building was razed at some time in the mid-1980s and the lot was later used for drum storage and trailer parking. The property is currently owned by the Ross Wax Company. Ross Wax supplies natural and synthetic wax products to the personal care, pharmaceutical, coatings, adhesives, rubber, plastics and miscellaneous other industries.

The property at 22 Halladay Street located east of Halladay Street consists of seven industrial commercial buildings constructed at various times beginning in the 1950s. Commercial/industrial

businesses included the Ohio Match Company, a plastic products manufacturer, a glass storage building, a Railway Express office, and the Lehman Brothers Paint Manufacturing Corporation. Ross Wax had formerly operated here from about 1983 until about the 1990s. The property is currently owned by a limited liability corporation and the buildings are leased to various commercial businesses, primarily for storage.

#### 2.2.1.4 **Site 135 - Vitarroz**

The property was developed with commercial/industrial buildings circa 1951 and was occupied by a grocery warehouse, the Clorox Chemical Company, and light manufacturing. The buildings were later occupied by Vitarroz, a food packaging and storage facility. Site 135 only includes Block 2017, Lot 69 and does not extend southward onto Lot A.1.

#### 2.2.1.5 **Site 137 – Rudolf Bass & TSI City Carriers**

Historically, Site 137 was associated with the former chromite ore processing facility operated on Site 114. A large portion of Site 137 was utilized for the stockpiling of the waste material that was generated at the adjacent chrome plant. Two large commercial buildings were constructed at the Site in the late 1970s. These buildings included a former trucking company and a warehouse for the storage and sale of used industrial equipment.

#### 2.2.1.6 **Site 143 – Talarico Auto**

Site 143 was vacant land during the 1940s. From the early 1950s, the Site was one of several adjacent properties that were used to store salvaged automobiles until the existing building was constructed during the mid-1960s. Since that time, the property has been used for automobile repair and sales.

#### 2.2.1.7 **Site 186 – 947 Garfield Avenue**

A portion of a horticultural supply company was located on Site 186 in the late 1800s to early 1900s. The onsite building later housed a woodworking and storage facility, and then a barrel manufacturing facility and pattern making shop. The building was demolished in the mid 1990s and the property has been used as a storage area for a nearby auto repair and salvage facility since that time.

### 2.2.2 **Sanborn Maps**

Sanborn Fire insurance maps covering the years 1896 to 2006 were reviewed to provide information pertaining to historical usage of the Project Area sites. The results of this review are summarized below.

#### 2.2.2.1 **Site 114 – PPG and PSE&G**

The 1896 Sanborn indicates that Site 114 was undeveloped west of the Morris Canal. East of the Morris Canal along Halladay Street the Site was occupied by the Consumers Gas Light Co. facility. The facility consisted of six buildings located along Forrest Street and former Van Horne Street. An oil house and a retort house with a coal shed northwest of the oil house were located on the west side of Van Horne Street.

The 1911 Sanborn shows that Natural Products Refining Co. facility, manufacturers of bichromate of soda and potash, was located on the northern portion of the Site. A rail spur from the Newark & New York Railroad entered the property along Garfield Avenue and extended approximately 475 feet.

Several buildings and small structures, including a one- to two-story factory building, boiler building, tank, tank shed and other out-structures, were observed on the map. On the eastern side of the Morris Canal, a former gas manufacturing facility owned by Public Service Gas Co. (formerly Consumers Gas Co.) was observed. The gas plant building and structures were still present onsite, but the facility was not operational. Located west of the Natural Products Refining Co. were the James Spence Iron Foundry and the Cochran Chemical Co., which manufactured waterproof compositions.

The 1951 Sanborn shows that the Natural Products Refining Co. facility had expanded in size from the 1911 Sanborn. A rail spur from the Newark & New York Railroad which entered the property along Garfield Avenue, was expanded in width. The Morris Canal, which formerly bisected the Site, was backfilled by 1951. Located in the northeast corner were one to two-story furnace buildings and two adjacent acid tanks. West of these buildings was a factory building, with adjoining buildings and out structures, including pump house, dryer room, boiler room, tank shed, holding tank, Bichromate of Soda and Potash factory, and two iron tanks. Other structures and Site features included a three-story Mill Building, an “open pit”, furnace building, a one-story Storage Room, and several other one- to two-story warehouses, factory, office, and small storage buildings. The southern portion of the property was unoccupied. Located on the western side of Garfield Avenue was the James Grebbe Foundry with two garages adjacent to it. Located on the eastern side of Halladay Street was the William T. Baker Corporation – Plant No. 2, which manufactured paints and varnishes with a series of seven iron tanks. Located south of the paint facility was a steel and iron works facility, Chas. B. Chrysal Co’s talcum powder facility, a food warehouse, and a watch and clock manufacturer (E. S. Halsted Co., Inc.).

By 1979 the Site was occupied by a photo finishing facility, an adhesives manufacturing facility with an adjacent warehouse, and a second manufacturing building, which was unlabelled. A junkyard had replaced the James Grebbe Foundry on the western side of Garfield Avenue. Located on the eastern side of Halladay Street was an adhesive warehouse. Located south of the adhesive warehouse were Chas. B. Chrysal Co’s talcum powder facility, two iron and steel warehouses, a steel storage yard, and a bag manufacturer (E. S. Halsted Co., Inc.).

The area onsite has remained relatively unchanged since the 1979 map based on a review of the 1989, 1990, 1993, 1994, and 1995 Sanborn maps.

#### 2.2.2.2 Site 132 – Town and Country Linen

In 1896, the subject property was undeveloped, with no structures or buildings present. Several residential lots were shown north of the site on the corner of Garfield Avenue and Carteret Avenue.

In 1911 subject property remained undeveloped. The James Craig Engine Manufacturing facility was present to the west across Garfield Avenue from the subject property.

By 1951, residential dwellings were located on the property. The James Craig Engine Manufacturing facility was replaced by the Vimalert Co Ltd (manufacturer of Airplane Motors) and had been expanded to the north along Garfield Avenue.

By 1979, the subject property was occupied by a large rectangular building constructed in 1970 that was occupied by the Town and Country Linen Warehouse. The north-south running road, marked as “Commercial” on earlier maps, was no longer shown. Its former location was occupied by the building. To the north an auto junk yard and private garage were shown on the corner of Garfield Avenue and Carteret Avenue. The adjacent property to the south was occupied by a large irregularly shaped structure. The Vimalert Co. Ltd. to the west had become the Federal Machine Company, Inc.

### 2.2.2.3 Site 133 – Ross Wax

Site 133 consists of two individual properties. The smaller property located on the west side of Halladay Street north of the intersection with Caven Point Avenue is presently known as 15 Halladay Street. The long rectangular property east of Halladay Street bounded by Halladay Street, Carteret Avenue, Pacific Avenue, and Caven Point Avenue is known as 22 Halladay Street.

The 1896 Sanborn Map indicated that 15 Halladay Street was subdivided into several lots. The southernmost lot was developed with one small structure. The adjacent lots to the north as well as those across Halladay Street to the east (22 Halladay Street) were undeveloped. Fifteen Halladay Street was bordered by Canal Street and the Morris Canal to the west, and to the south by Caven Point Avenue.

By 1911, the appearance of the subject properties and surrounding properties was unchanged. However, the street formerly listed as Canal Street to the west of 15 Halladay Street, was now listed as "Valley". Valley appears to be a "paper street" located adjacent to the former Morris Canal tow path.

By 1951, the small structure at the southernmost corner of 15 Halladay Street was no longer present. A slightly larger building described as a "Varnish Mfg." was shown in the middle of the property with three small structures just off the buildings south side. Valley Street is shown as "not opened" on the 1951 Sanborn Map.

Twenty-two Halladay Street was developed by 1951. The block had been bisected evenly by a rail line running northeast to southwest. Twenty-two Halladay Street to the northwest of the railroad tracks was occupied by several facilities. The Lehman Brothers Corporation Paint Manufacturing facility was on 22 Halladay Street on the southern end of the block. This facility was comprised of several structures and buildings, which included (from south to north): a Scale House, Staging Area, Carton Staging, Manufacturing Facility, Canning and Packing Facility, and a Mixing Facility. North of the Lehman facility along Halladay Street appeared to be a vacant lot followed by a rectangular building marked as "Old Glass Stage." Beyond this to the north was another vacant lot followed by a series of three buildings. The first was the Plastic Products Co. (Putty Mfg.). The next two structures comprised the Ohio Match Company. Beyond 22 Halladay Street to the east was a railroad line extension, which presumably served the facilities. Adjacent to the tracks to the east was (from south to north) the General Grocery W.H.O. Co. Inc., the Clorox Chemical Company, followed by an unidentified manufacturing facility. A tank is shown on the northwest corner of this building, and in-line with the railroad tracks. The purpose of the tank was not specified.

By 1979, 15 Halladay Street remained unchanged except one of the small structures located on the building's south side had been removed and a similar structure had been built off the east side. North of this site, several vacant lots still existed, but two large buildings with associated parking areas had been built to the north of the vacant lots.

At 22 Halladay Street, the southernmost section of Lehman Paint Manufacturing formerly used as a Scale House was labeled as a "Paint Warehouse" in 1979. The Ohio Match Company building on the north end of the block was the Railway Express Agency. To the east of 22 Halladay Street, a manufacturing facility was still present where the Clorox Chemical Company had been. Other surrounding properties have remained consistent since 1951.

By 1989, 15 Halladay Street appeared to be vacant and no structures were present. Valley Street (formerly Canal Street) and the Morris Canal no longer existed and the properties had been developed. The surrounding properties to the north appear unchanged.

At 22 Halladay Street, all facility buildings in 1989 appeared similar to those shown on the 1979 Sanborn Map. However, none of the manufacturer's name designations appear on the map.

#### 2.2.2.4 **Site 135 – Vitarroz**

The 1896 and 1911 Sanborn Maps showed the subject property as vacant and undeveloped. Adjacent properties to the west appeared to be vacant and undeveloped as well.

By 1951 the subject property and most of the surrounding properties had been developed. The subject property was occupied by three large rectangular structures fronting Pacific Avenue between Carteret Avenue and Caven Point Avenue. These properties were designated (from south to north) as: General Grocery W.H.O. Co. Inc., Clorox Chemical Co., and an unidentified manufacturing facility. An unlabeled tank was located off the northwest corner of this building and appeared to intersect a switch track of the adjacent railroad. Abutting these properties to the north, were a series of railroad track extensions that ran north to south bisecting the block. Just north of these tracks, occupying the western half of the block, were several industrial structures fronting Halladay Street. These properties were designated (from south to north): Lehman Brothers Corp. Paint Manufacturing, a vacant lot, a rectangular structure labeled "Old Glass Stage," another vacant lot, Plastic Products Co. (Putty Mxg.), and two buildings comprising the Ohio Match Company.

By 1979, the subject property appeared relatively unchanged since 1951. The former Clorox Chemical Co. building had no designation or label. A small loading dock had been constructed on the north side of the unidentified manufacturing facility. To the west of the subject property across the railroad tracks, the Lehman Brothers Paint Co. had added an additional building on the southern end of the block (corner of Halladay St. and Caven Point Avenue). This area formerly served as a scale house (1951). The new structure was used as a paint warehouse. The former Ohio Match Co. building, on the north side of the block (corner of Halladay St. and Carteret) was occupied by Railway Express Agency.

By 1989, no apparent changes had been identified at the subject property since 1979. The adjacent properties to the west appeared similar to those in the 1979 Sanborn Map; however, none of the manufacturer's name designations appeared on the Sanborn map.

#### 2.2.2.5 **Site 137 - Rudolf Bass & TSI City Carriers**

The 1896 Sanborn Map indicated that Site 137 was subdivided into numerous vacant lots. The subject property was bordered on the west by Canal Street, beyond which was the Morris Canal. Carteret Avenue was shown adjacent and to the north. Halladay Street was depicted adjacent and to the east, beyond which was undeveloped land. Two dwellings were located to the south, beyond which was Caven Point Avenue.

The 1911 Sanborn Map showed Site 137 and the surrounding properties as relatively unchanged, with the exception of a store and some additional small buildings constructed south of the site, at the intersection of Halladay and Caven Point Avenue.

The 1951 Sanborn Map showed Site 137 as vacant land. A varnish manufacturing facility had replaced the store and dwellings located to the south at the intersection of Halladay and Caven Point Avenue. A Match Manufacturing Company, Plastics Company, Canning and Packaging Company, Paint

Manufacturing Company, and the Clorox Chemical Company were shown east of Site 137, across Halladay Street. These businesses were located on Site 133 (Ross Wax) and Site 135 (Vitarroz). Valley Street and the Morris Canal are depicted adjacent to and west of Site 137.

The 1979 Sanborn Map showed Site 137 developed with two large manufacturing buildings and associated parking areas. The varnish manufacturing company continued to operate to the south. Operations to the east across Halladay Street remained relatively unchanged, except that the businesses had expanded onto the previously vacant lots. The Morris Canal had been filled.

The 1989 Sanborn Map showed Site 137 and the surrounding area as relatively unchanged. Buildings had been constructed to the west of Site 132 (Town & Country Linen Warehouse) and on the former Morris Canal. The varnish manufacturing company located to the south was no longer operating. Businesses to the east across Halladay Street had changed from predominantly manufacturing to warehousing.

The 1990, 1993, 1994 and 1995 Sanborn Maps depict Site 137 and the surrounding area as relatively unchanged since 1989.

#### 2.2.2.6 **Site 143 – Talarico Auto**

In 1896 the subject property, located on the southeastern corner at the Garfield Avenue Carteret Avenue intersection, was primarily residential lots. The adjacent properties were also listed as residential at this time. The Morris Canal was located approximately 200 feet to the east of the subject property and ran north-south.

In 1911, Site 143 and the surrounding properties remained the same. To the southwest, across Garfield Avenue, the James Craig Engine Manufacturing facility was present.

In 1951 the subject property and adjacent properties to the south appeared vacant. The James Craig Engine Manufacturing facility was replaced by the Vimalert Co Ltd (manufacturer of Airplane Motors) and had been expanded to the north along Garfield Avenue.

By 1979, the subject property was occupied by a private automobile garage and automobile sales. The adjacent properties to the south were an auto junk yard. The north-south running road identified as "Commercial" on earlier maps was gone. Additional businesses had been constructed to the south of the site. The former Vimalert Co. Ltd. Facility was shown as the Federal Machine Company, Inc.

#### 2.2.2.7 **Site 186 – 947 Garfield Avenue**

The 1896 Sanborn map shows the block bounded by Garfield Avenue on the east, Union Street on the north, Randolph Avenue on the west, and the Newark and New York Railroad and a coal yard to the south. Site 186 is shown as part of the Hitchings & Company Horticultural Works on the 1896 Sanborn map. Several large structures are located within the block. A building about the size of the present Site 186 property area occupies the subject Site.

The 1911 Sanborn map no longer shows the Hitchings & Company Horticultural Works. A two-story brick structure identified as a general storage and woodworking facility is shown covering the majority of the Site 186 property. A large building identified as the Builders Hoist and Machine Company is adjacent to the western side of the Site. Vacant land is shown to the south.

The 1951 Sanborn map shows a two-story brick building identified as a barrel storage facility and pattern making shop covering most of the Site. The large building adjacent to the western side of the



Site is identified as the Wallack and Schwalm Dress Manufacturing Company. Vacant land is adjacent to the southern side of the Site.

The 1979 Sanborn map still shows the two-story brick building identified as a barrel storage facility and pattern making shop. The Wagner Electrical Corporation, an electrical supply and distribution company is located in the large building adjacent to the western side of the Site. South of the Site is still shown as vacant land.

The 1989 and 1990 Sanborn maps show the same two-story brick building identified as a barrel storage facility and pattern making shop on the Site. The large building adjacent on the west is identified as a three-story manufacturing facility but no owner or tenant is identified. Vacant land is shown to the south.

The Site 186 property is shown as vacant land on the 1993, 1994, and 1995 Sanborn maps. The large building adjacent on the west is identified as a three-story manufacturing facility but no owner or tenant is identified. Vacant land is shown to the south.

The 1999, 2001, 2002, 2003, 2005, and 2006 Sanborn maps show Site 186 as vacant land. Vacant land is shown south of the Site. The large three-story building adjacent to the western side of the Site is identified as the Family Health Clinic. The property remains relatively unchanged in 2011.

### **2.2.3 Interpretive Aerial History**

#### **2.2.3.1 Site 114 – PPG and PSE&G**

A chromate chemical production facility operated on the western half of Site 114 from approximately 1911 to 1963. The chromate operation included a CCPW storage pile located at the southeastern quadrant of the Site.

The chromate production facility was visible on the April 1940 aerial photograph. Several small buildings and two large storage tanks presumed to be remnants of the MGP were visible on the eastern half of the Site. Accumulation of CCPW waste was visible in piles located on the southeastern portion of Site 114 extending southward onto Site 137. The 1943 aerial photograph shows a similar configuration with a more extensive waste pile extending onto Site 137.

The 1951 and 1953 aerial photographs show that the MGP storage tanks and associated buildings were removed and most of the MGP facility was vacant land. By 1961, the CCPW waste piles had diminished considerably, with the southern-most pile on the Site 137 property across Carteret Avenue to the south completely gone. The 1966 aerial photograph shows that the chromate production facility was demolished, the CCPW piles were gone, and the Site was vacant land.

Three warehouse buildings were subsequently built and were visible on the 1969 aerial photograph. Dakota Street appeared for the first time on the 1969 photograph. From 1970 through 1989, the only changes at the Site that are evident on the aerial photographs were the expansion of one of the warehouses (eastern addition) and the paving of several parking areas.

### 2.2.3.2 Site 132 – Town and Country Linen

Aerial photographs from 1940 and 1943 show two small buildings on the property. Two commercial or manufacturing buildings are located across Garfield Avenue west of the Site in the 1940 photograph but appear as a single connected structure in 1943. The chromate processing plant is located to the north and the CCPW waste pile is located to the east. The property to the south appears mostly undeveloped.

The 1951 and 1953 aerial photographs show that the two small buildings on Site 137 had been razed and approximately five residential buildings appear. The residential properties continue onto the adjacent property to the south. Other area features remain relatively unchanged from 1944.

The 1961 aerial photograph shows that the residential buildings were razed and the property was vacant. By 1966, it appeared that the subject property was also used as an auto salvage yard and for container storage. A small building had been constructed on the adjacent property to the north (Site 143).

By 1969, the subject property appeared cleared and undeveloped. A large warehouse building had been constructed on the adjacent property to the east (Site 137).

The 1976 aerial photograph shows that a warehouse building had been constructed on the subject property. This appears to be the same warehouse that presently exists. A large commercial building was also constructed on the property south of Site 132 and is visible in the 1976 and 1979 aerial photographs. The subject property and surrounding properties appear relatively unchanged on the aerial photographs from 1979 through 2006.

### 2.2.3.3 Site 133 – Ross Wax

Site 133 consists of two individual properties. Fifteen Halladay Street is the smaller property located on the west side of Halladay Street north of the intersection with Caven Point Avenue. Twenty-two Halladay Street is the long rectangular property east of Halladay Street bounded by Halladay Street, Carteret Avenue, Pacific Avenue, and Caven Point Avenue.

Both of the Site 133 properties appear developed in the 1940 and 1943 aerial photographs. A small rectangular structure is visible on 15 Halladay Street and a series of long rectangular buildings are visible on the majority of 22 Halladay Street. Several smaller structures are visible in the southern-most lot of 22 Halladay Street at the intersection of Halladay Street and Caven Point Avenue. A narrow alleyway is visible east of the 22 Halladay Street buildings between Site 133 and a series of long rectangular buildings fronting on Pacific Avenue. Piles of soil or CCPW material are visible north of 15 Halladay Street and west of 22 Halladay Street across Halladay Street on both aerial photographs.

The 1951 and 1953 aerial photographs show basically the same configuration for 15 and 22 Halladay Street. However, the piles of soil or CCPW material are significantly larger on the property north of 15 Halladay Street and west of 22 Halladay Street. The areas south and west of 15 Halladay Street appear undeveloped in the 1951 aerial photograph. However, an automobile salvage yard was visible on the 1953 aerial photograph on the properties west and south of 15 Halladay Street.

Fifteen Halladay Street remained relatively unchanged in the 1961 and 1966 aerial photographs. However, the auto salvage yard appeared to be encroaching onto the western and southern portions of

the property. The majority of 22 Halladay Street was unchanged, but an additional rectangular building replaced the smaller structures that appeared at the southern end of the property at the intersection of Caven Point Avenue and Halladay Street. The large waste soil or CCPW piles were no longer visible north of 15 Halladay Street and west of 22 Halladay Street. The site and surrounding areas remained relatively unchanged through 1966.

The 1969 aerial photograph shows that the auto salvage yard was removed from the properties west and south of 15 Halladay Street. Both 15 and 22 Halladay Street remain relatively unchanged since 1966. A large commercial building or warehouse (present-day Bass building) was constructed on the property west of 22 Halladay Street at the intersection of Halladay Street and Carteret Avenue.

Both 15 and 22 Halladay Street remained relatively unchanged in the 1976 and 1979 aerial photographs. A large commercial building had been constructed on the property abutting the western edge of 15 Halladay Street. A warehouse or commercial building was also constructed north of 15 Halladay Street and west of 22 Halladay Street between 15 Halladay Street and the warehouse at the intersection of Halladay Street and Carteret Avenue. Several small structures had been constructed to the south across Caven Point Avenue.

By 1995, the structure on 15 Halladay Street was gone and the property appeared as vacant land used for storage and/or parking. 22 Halladay Street and the surrounding properties appeared unchanged. By 2006, 15 Halladay Street was vacant land used for trailer parking. No other changes were noted on 15 and 22 Halladay Street.

#### 2.2.3.4 Site 135 – Vitarroz

The southern portion of Site 135 was developed with a long rectangular building by 1940. The northern portion of the property at the intersection of Carteret Avenue and Pacific Avenue appeared as vacant land. Several commercial/industrial buildings were shown north of Site 135 across Carteret Avenue. The area to the east was mostly undeveloped with the exception of two buildings across Pacific Avenue and south of the Site. To the west were several large commercial/ industrial buildings on 22 Halladay Street separated from the subject property by a narrow alley way.

By 1943, a large rectangular building had been constructed on the north corner of the property at the former vacant lot at the corner of Pacific Avenue and Carteret Avenue. The remaining features of the Site and surrounding properties appeared unchanged.

The Site 135 property appeared unchanged on the 1951 aerial photograph. By 1953, a small unidentifiable structure appeared adjacent to the subject property eastward across Pacific Avenue in a formerly vacant lot. The Site and remaining area surrounding the Site appeared unchanged.

The Site 135 property appeared unchanged on the 1961, 1966, and 1969 aerial photographs. Trailers were parked on the lot east of the northern end of the Site across Pacific Avenue in 1961. By 1969, the small buildings, previously present east of Site 135 across Pacific Avenue had been razed and the property appeared vacant.

The subject property and surrounding area appeared unchanged from 1969 through 1985. The property to the east across Pacific Avenue appeared to have been paved and was being used for trailer or container storage on the 1989 aerial photograph. All other area properties appeared unchanged.

No changes were evident on the Site 135 property in the 1994 and 1995 aerial photographs. Building construction appears on the property east of the Site across Pacific Avenue in 1994 and a Commercial building is evident on the 1995 and 2006 aerial photographs. Freight containers and trailers are evident on the site south of the building that is located across Pacific Avenue. Vegetation appears to be growing in the alley between the Site 135 buildings and the Halladay Street buildings on 22 Halladay Street in the 2006 aerial photograph suggesting that some of the buildings may be vacant or poorly maintained.

#### 2.2.3.5 **Site 137 - Rudolf Bass & TSI City Carriers**

A dark-colored material stockpile appeared throughout most of Site 137 on the 1940 and 1943 aerial photographs. This material was likely CCPW waste generated at the former PPG chromate ore processing facility adjacent to the site and to the north. The CCPW appeared to have been stockpiled at Site 137 until about 1961, when the site appeared to be cleared and graded.

Site 137 appeared vacant from 1961 until about 1969, when a large warehouse building (Rudolph Bass) was visible on the north end of the property near the corner of Caven Point Avenue and Halladay Street. The property remained relatively unchanged until the mid-1970s when the TSI Carriers building was constructed adjacent and to the south side of the Rudolph Bass building. The property has remained relatively unchanged since 1976.

#### 2.2.3.6 **Site 143 – Talarico Auto**

From 1940 through 1944, the subject property was undeveloped. It was bordered to the west across Garfield Avenue by residential properties, to the north by the chromate ore processing plant and a soil or waste pile, to the east by a large soil or CCPW pile, and to the south by a relatively undeveloped property with two small buildings.

By 1951, a small fenced area appeared on the northwest corner of the subject property and it appeared to be used for storage of some kind. The adjacent property to the south was developed with several residential size buildings. The soil/waste piles located north and east of the site appeared larger. Other area features remain consistent from 1944.

By 1953, it appeared that the subject property was being used as an automobile salvage yard. By 1961, the soil piles to the north and east of the property were no longer present and the buildings on the adjacent property to the south had been razed.

In 1962, it appeared that Carteret Avenue, which borders the site to the north, had been paved. Sections of the property to the south and east were also being utilized as an auto salvage yard. The subject property and adjacent areas remained unchanged from 1962 until sometime before 1966.

By 1966, a small building had been constructed on the northeast corner of the subject property, but the remainder of the property was still utilized as an auto salvage yard. The warehouse buildings formerly present to the north had been razed and the site appeared vacant.

By 1969, the surrounding properties to the south and east were cleared and no longer in use as a salvage yard. Three large warehouse buildings had been constructed on the Site 114 property to the north across Carteret Avenue. The southernmost warehouse appeared to have been built over the former location of a waste soil pile.

In the 1976 aerial photograph, a large warehouse was visible on the adjacent property south of the Site. All other features of the subject property and surrounding area remained unchanged from 1971 to about 1995. The large commercial building south of the Site appeared vacant on the 2006 aerial photograph with vegetation growing in some of the parking and access areas.

#### **2.2.3.7 Site 186 – 947 Garfield Avenue**

The 1940 and 1943 aerial photographs show a rectangular building covering most of the Site 186 property. Vacant land is adjacent to western and southern sides of the property. A multi-story commercial/industrial building is located across Union Street to the north and a fenced or walled industrial yard is visible across Garfield Avenue to the east.

The 1951, 1953, and 1961 aerial photographs show the same building on Site 186 with a larger, taller building adjacent to the west and a fenced yard to the south. The industrial yard across Garfield Avenue to the east appears to be a car salvage yard in the 1961 aerial photograph.

The property and surrounding area remain relatively unchanged on the aerial photographs from 1961 until the 1994 aerial photograph when the Site 186 building appears to have been demolished and the property vacant. Two buildings are now evident on the auto salvage yard property east of the Site across Garfield Avenue. No significant changes are evident on the 1995 aerial photograph. Site 186 appears to be used as an automobile storage lot on the 2006 aerial photograph. No other changes were observed on the Site or in the Site area.

### **2.2.4 Previous Investigations**

RI activities were conducted at Site 114 between 2003 and 2005, with additional investigation at Site 114 and the southern Garfield Avenue Group Sites (Sites 132, 133, 135, 137 and 143) conducted between 2005 and 2008. The results of these activities were included in the Site 114 RIR (ENSR, 2006), and the Halladay Street Gas Works RIR and RIR Addendum (CMX, 2007; CMX, 2008).

RI activities were conducted at Site 186 between 1995 and 2003. The results of these activities were reported in an NJDEP Technical Memorandum (NJDEP, 1995), a Preliminary Site Characterization Report (Kimball, 2000), and an RIR with Remedial Alternatives Selection Evaluation (Berger, 2003). Site 186 is a former orphan chrome site assigned to PPG by the NJDEP for additional investigation and remediation.

A summary of the findings from previous investigations is provided below.

#### **2.2.4.1 Previous Environmental Investigation Results – Site 114**

The RI activities conducted at Site 114 included sampling for VOCs, SVOCs, PCBs, TAL metals, and Cr<sup>+6</sup>. Past RI activities conducted at Site 114 focused on soil and groundwater investigation within two main AOCs:

1. The former MGP facility (Halladay Street Gas Works); and,
2. The former chromate ore processing facility and related former waste stockpile areas on Site 114 and the southern Garfield Avenue Sites.

The former MGP facility, the Halladay Street Gas Works, operated from 1886 to the mid-1930s in the eastern portion of the Site. CMX (formerly Schoor DePalma), conducted an RI for the MGP portion of the Site on behalf of PSE&G focusing on VOCs, SVOCs, metals, and cyanide (“CN”) related to former MGP operations. The former MGP facility was located on the eastern portion of Site 114 (**Figure 1-2**). The remainder of Site is associated with chromate production and CCPW-related impacts. The RIs for the former chromate production facility and the former MGP facility were implemented concurrently through an agreement between PPG and PSE&G, to ensure the proper identification and sample collection for the CCPW and MGP-related contaminants historically identified at the Site.

PSE&G completed an RIR for the former MGP site in December 2007 and submitted it to the NJDEP (CMX, 2007). An RIR addendum was prepared by PSE&G and submitted to NJDEP in July 2008 (CMX, 2008), a Receptor Evaluation in November 2010 (MACTEC, 2010), and a Vapor Intrusion Investigation Work Plan in March 2010 (CMX, 2010). The PSE&G RI and related reports have been historically submitted by PSE&G directly to the NJDEP Case Management team (separate from the PPG reports).

The RI work conducted by PPG was designed to delineate the compounds on or potentially emanating from Site 114 relating to former chromate ore processing operations and issues related to their former ownership of the Site. These compounds included VOCs, SVOCs, Metals, and Cr<sup>+6</sup>. Soil results from the previous RIs (ENSR, 2006) are discussed below.

#### **2.2.4.1.1** Soils – Total Chromium

Based on the data collected during Site 114 RIs, concentrations of total Cr were typically three to five times higher than concentrations of Cr<sup>+6</sup> in soils. The highest concentrations of total Cr and Cr<sup>+6</sup> were associated with the green-gray mud (Cr-impacted waste mud), COPR, and mixed fill material in shallow soils. The highest concentrations of total Cr and Cr<sup>+6</sup> were reported most frequently between 10 and 12 ft below ground surface (“bgs”), which is where the majority of the green-gray mud, COPR, and mixed fill were observed.

There is currently no NJDEP SRS for total Cr. The interim NJDEP CrSCC for total Cr of 120,000 mg/Kg was used for delineation purposes. Total chromium was detected at concentrations greater than the 120,000 mg/Kg trivalent chromium CrSCC in only five soil samples within the Project Area. The highest total chromium concentration detected was at soil boring E5A on Site 114 at a concentration of 246,000 mg/Kg at a depth of 6 ft bgs.

#### **2.2.4.1.2** Soils - Hexavalent Chromium

There is currently no NJDEP SRS for Cr<sup>+6</sup>. The interim NJDEP CrSCC for Cr<sup>+6</sup> of 20 mg/Kg was used for delineation purposes.

#### Unsaturated Soils

Hexavalent chromium was reported at concentrations as high as 46,400 mg/Kg in unsaturated soil within the Project Area. The highest unsaturated soil sample concentration was observed at soil boring D4 on Site 114 at a depth of 4.0 to 4.5 ft bgs.

Hexavalent chromium is present at concentrations exceeding the CrSCC throughout much of the Project Area in shallow soils where mainly non-native fill material (CCPW) was observed. The highest

concentrations of Cr<sup>+6</sup> on Site 114 were reported in the northwest quadrant of Site. In general, the concentrations of Cr<sup>+6</sup> in the shallow non-native fill are substantially lower along the eastern and western property boundaries of Site 114.

#### Saturated Soils

Hexavalent chromium was reported at concentrations as high as 54,300 mg/Kg in saturated soils. The highest Cr<sup>+6</sup> concentration reported in saturated soils was in soil boring E8 on Site 114 at a depth of 15.0 to 15.5 ft bgs. Note that saturated soil concentrations represent Cr<sup>+6</sup> contributions due to CCPW impacted soil itself as well as the Cr<sup>+6</sup> present within the pore water of the soil.

Hexavalent chromium was detected at concentrations exceeding the CrSCC in the native soils of the intermediate zone, especially where the meadow mat layer is absent, such as the former Morris Canal footprint at the northern end of Site 114. Hexavalent chromium concentrations in the native soils of the intermediate zone are substantially lower than in the fill material of the shallow zone. The CCPW material was deposited within the fill of the shallow zone. The lower permeability silts and clays of the organic sediments and meadow mat at the top of the intermediate zone appear to limit the downward migration of Cr<sup>+6</sup> and CCPW-related contamination.

#### **2.2.4.1.3** Project Area Soil Results - Other

A significant number of soil borings were advanced during previous RI phases and numerous soil samples were analyzed for the Project Area COCs (**Figure 2-1**). The 2011 soil RI was designed to further delineate CCPW and CCPW-impacted materials throughout the Project Area and the non-CCPW COCs emanating from Site 114. In some areas, these additional COCs were detected at concentrations greater than the SRS on Site 114 and include BTEX, CVOCs, SVOCs, metals (including non-CCPW metals), and PCBs.

#### **BTEX**

BTEX compounds were detected at concentrations exceeding the SRS and/or IGW SSL in soil samples from Site 114. Most of these compounds, primarily those located on the eastern portion of Site 114, are related to historic MGP operations and were delineated by PSE&G during their RI. Benzene was also reported at a boring along the northwestern boundary of Site 114 at a concentration exceeding the IGW SSL.

#### **CVOCs**

CVOCs were reported at concentrations exceeding the SRS and IGW SSLs primarily at the northern and northeastern portions of Site 114. These CVOCs consisted of tetrachloroethene ("PCE"), trichloroethylene ("TCE"), and vinyl chloride and were limited to shallow soils.

#### **SVOCs**

SVOCs related to former MGP activities (primarily PAHs) as well as several other SVOCs related to historic operations at Site 114 were reported at concentrations exceeding the SRS and IGW SSLs throughout Site 114. MGP-related SVOCs were delineated by PSE&G during their RI and were found throughout the eastern portion of Site 114. SVOCs, including compounds typically identified in historic

fill, were reported in the western portion of Site 114. SVOCs were reported in the fill material above the meadow mat.

### **Metals and Cyanide**

Metals in addition to Cr<sup>+6</sup> and total Cr were reported throughout the Project Area, generally located in the fill above the meadow mat. These metals are believed to be related to three potential sources: 1) former MGP operations, 2) former chromate ore processing operations, and 3) general site issues and historic fill.

Metals related to historic MGP operations at the former Halladay Street Gas Works include As, Pb and Hg. Cyanide related to the former MGP operations was delineated by PSE&G and has not been investigated by PPG.

Metals potentially related to former chromate processing operations include Sb, Ni, Tl, and V in addition to Cr<sup>+6</sup> and Cr.

Several additional metals related to miscellaneous site issues and historic fill were reported at concentrations exceeding the SRS and/or IGW SSLs. The NJDEP historic fill database provides typical concentrations of historic fill-related metals for As, Be, Cd, Pb, and Zn, although historic fill is known to contain other metals not listed in the NJDEP database.

### **PCBs**

PCBs were reported at concentrations exceeding the SRS and/or IGW SSLs at a few relatively isolated areas at Site 114 in the fill above the meadow mat. Isolated PCB detections were also reported at the western side of Site 114 along Garfield Avenue and the eastern boundary of Site 114 at Halladay Street.

Results from a single PCB soil sample at Site 114 collected during the PSE&G RI from 0 to 0.5 ft bgs in soil boring B1302 reportedly exceeded the USEPA Toxic Substances Control Act (“TSCA”) threshold limits. This location was resampled and a USEPA-compliant PCB investigation was implemented during the 2011 RI to further characterize the PCB results. Details of this investigation are discussed in **Section 4.6** of this RIR. The PCB Soil and Concrete Sampling and Analysis Plan and subsequent report discussing the results of the investigation are provided in Appendix G.

#### **2.2.4.2 Previous Environmental Investigation Results Southern Garfield Avenue Group Sites**

The RI activities conducted for soils at sites 132, 133, 135, 137 and 143 focused primarily on Cr<sup>+6</sup> and the TAL metals. Past RI activities for the southern Garfield Avenue Sites focused on soil and groundwater investigations related to the former chromate ore processing facility.



#### **2.2.4.2.1** Soils - Hexavalent Chromium

##### Unsaturated Soils

Hexavalent chromium is present at concentrations exceeding the CrSCC throughout most of the Project Area in shallow soils consisting mainly of non-native fill material. The highest concentrations of  $\text{Cr}^{+6}$  for the southern Garfield Avenue Sites were reported on Site 137. In general, the concentrations of  $\text{Cr}^{+6}$  in the shallow non-native fill are substantially lower south of Site 137, east of Site 133, and along the eastern and western property boundaries of Sites 132 and 143.

##### Saturated Soils

Hexavalent chromium was reported at concentrations as high as 27,800 mg/Kg in saturated soils of the southern Garfield Avenue Sites. The highest  $\text{Cr}^{+6}$  concentration reported in saturated soils was in soil boring OSB-18 on Site 137 at a depth of 10 to 10.5 ft bgs. Saturated soil concentrations represent both  $\text{Cr}^{+6}$  in the soil itself as well as the  $\text{Cr}^{+6}$  within the pore water of the soil.

Hexavalent chromium was detected at concentrations exceeding the CrSCC in the native soils of the intermediate zone, in limited areas where the meadow mat layer is absent. This was not as prevalent in the southern Garfield Avenue Sites as it was on Site 114. Hexavalent chromium concentrations in the native soils of the intermediate zone are substantially lower than in the fill material of the shallow zone because CCPW material was deposited as a fill layer on top of the native soil or existing historic fill. The lower permeability silts and clays of the organic sediments and meadow mat at the top of the intermediate zone limit the downward migration of  $\text{Cr}^{+6}$  and CCPW-related contamination.

#### **2.2.4.2.2** Soils – Total Chromium

Based on the data collected to date, concentrations of total Cr were typically three to five times higher than concentrations of  $\text{Cr}^{+6}$  in soils. As is the case on Site 114, the highest concentrations of total Cr and  $\text{Cr}^{+6}$  were associated with the green-gray mud, COPR, and mixed fill material in shallow soils. The highest concentrations of total Cr and  $\text{Cr}^{+6}$  were reported at the northern edge of Site 137 and along the filled channel of the former Morris Canal at the western edge of Site 137 and 15 Halladay Street, which is where the majority of the green-gray mud, COPR, and mixed fill were observed.

#### **2.2.4.2.3** Soils – Other Metals

Metals in addition to  $\text{Cr}^{+6}$  and Cr were reported throughout the Project Area, generally in the fill above the meadow mat. The CCPW Metals potentially related to the former chromate ore processing facility that were detected in the southern Garfield Avenue Sites were primarily Sb and V. Thallium was only detected at one location exceeding the SRS on Site 133 in the southern Garfield Avenue portion of the Project Area.

Arsenic, Pb, and Hg were detected throughout the southern Garfield Avenue Sites. These metals may be related to historic MGP operations when they are found at the northern end of southern Garfield Avenue Sites near Carteret Avenue. Non-CCPW metals are attributed to historic fill or site operations related to property owners rather than to PPG when they were detected further south.

#### **2.2.4.3** Previous Environmental Investigation Results – Site 186

A two-story building formerly occupied most of the property on Site 186. Based upon the Sanborn maps, the building was demolished at some time between 1990 and 1993 and the foundation was filled

to grade. Previous reports indicated that the material used to fill the hole left after foundation removal may have included CCPW (Berger, 2003). However, based upon the very limited concentrations of Cr<sup>+6</sup> detected in soil at this site to date, it has not been confirmed by PPG that CCPW is present at this site.

The initial RI work conducted at the site was surface soil sampling by the NJDEP in 1995 to verify reported surficial evidence of chromium (NJDEP, 1995). A subsequent Preliminary Site Characterization (Kimball, 2000) and a Remedial Investigation and Remedial Alternatives Selection Evaluation (Berger, 2003) were conducted for the Site. The investigations were designed to identify visual evidence of CCPW and delineate Cr<sup>+6</sup> and the CCPW COCs.

Site investigation and RI activities conducted on Site 186 were primarily focused upon Cr<sup>+6</sup> and TAL metals. However, the investigation also included sampling for VOCs and SVOCs. The primary compounds investigated as potential COCs in the Preliminary Site Characterization Report included Cr<sup>+6</sup>, Sb, Be, Cr, Cd, Ni, and V. Copies of the Kimball Site 186 report are included in Appendix A. Copies of the NJDEP and Berger reports are included in Appendix B.

Additional RI activities at Site 186 will be performed in the near future by PPG to evaluate subsurface conditions in more detail. One objective for this future investigation is to confirm or refute previous reports that CCPW may be present at this site.

#### **2.2.4.3.1** Soils – Total Chromium

No Total Cr was detected at concentrations greater than or even approaching the 120,000 mg/Kg trivalent chromium CrSCC in any of the investigations conducted at Site 186 (NJDEP, 1995; Kimball, 2000; Berger, 2003). Total Cr concentrations ranged from less than the method detection limit (“MDL”) up to 2,040 mg/Kg detected at 2.5 to 3 ft bgs in boring SB10 in the southeastern corner of Site 186 (Kimball, 2000; Berger, 2003).

#### **2.2.4.3.2** Soils - Hexavalent Chromium

A single soil sample collected during the NJDEP surface soil sampling event exceeded the CrSCC of 20 mg/Kg at Site 186. A soil sample collected from 0-0.5 feet in NJDEP boring S2 had a Cr<sup>+6</sup> concentration of 169 mg/Kg (NJDEP, 1995). No other soil samples exceeded the CrSCC from any of the three investigations (NJDEP, 1995; Kimball, 2000; Berger, 2003). Future RI activities at this site will include soil sampling at this historic location in an attempt to duplicate this result. Since analytical methods have come a long way since these earlier investigations, it is likely that this early report of Cr<sup>+6</sup> greater than the CrSCC may be a result of lab error, or simply related to the former laboratory method procedures.

#### **2.2.4.3.3** Soils - Other Metals

Antimony and V were reported at concentrations exceeding the SRS and IGW SSL in a few locations in the southeastern portion of Site 186. Nickel was reported at concentrations exceeding the IGW SSL in three borings but did not exceed the SRS (Kimball, 2000; Berger, 2003).

#### **2.2.4.3.4** Visible CCPW Material

Based upon earlier reports, CCPW was reportedly observed in four soil borings within the southeastern quadrant of Site 186; however, these observations were not supported by analytical data. The

maximum depth of this suspect material was reported to be 3.5 ft bgs. Analytical results of soil samples collected at these locations reported no Cr or Cr<sup>+6</sup> greater than the CrSCC (Kimball, 2000; Berger, 2003).

## 2.2.5 Interim Remedial Measures

Interim remedial measures (“IRMs”) were implemented in the Project Area to limit human exposure to CCPW compounds via direct contact and/or inhalation of impacted dust. These were conducted over a period of years as potential hazards were identified during building demolition and site investigation activities. IRM activities conducted at each site are presented on **Figures 2-2 through 2-6**. Details of IRM activities for each site are provided below.

### 2.2.5.1 Site 114 – PPG and PSE&G

IRMs installed at Site 114 to reduce potential exposure to CCPW are shown on **Figure 2-2** and include fencing and demolition of the buildings and structures on Site 114, capping and/or paving areas of exposed CCPW and CCPW impacted materials, and the installation of a groundwater recovery system to collect CCPW-impacted groundwater for offsite disposal.

A large portion of the eastern side of Site 114 was covered with a plastic liner topped with a layer of gravel to prevent direct contact with potentially impacted surface soils at the Site and to prevent particulate matter from blowing offsite.

An IRM was also conducted at Site 114 in 2010 and 2011 to demolish and dispose of the former 900 Garfield Avenue warehouse foundation in the northwestern quadrant of Site 114. This IRM was performed as a mass removal action targeting one of the most impacted portions of the Project Area. CCPW-impacted soil, COPR, and green-gray mud were excavated down to the meadow mat in this area and in portions of the adjacent former Morris Canal channel. The material was disposed of offsite at a permitted hazardous waste facility. The excavated areas were then backfilled with certified clean fill material.

A groundwater IRM was implemented at Site 114 in 2004-2005 to reduce the potential for expression of impacted water seeps along the eastern side of Garfield Avenue.

### 2.2.5.2 Site 132 – Town and Country

A 5,000 square foot area in the northeastern part of Site 132 was graded and paved to prevent direct contact with potential CCPW material observed at the ground surface. This exterior IRM work was started on October 29, 1991. On December 2, 1991, PPG installed fencing at the north yard area. Fencing was completed during the week of June 1, 1992. These IRMs are shown on **Figure 2-3** and are inspected and maintained on a quarterly basis.

### 2.2.5.3 Site 133 – Ross Wax

As shown on **Figure 2-4**, several IRMs were implemented on the 22 Halladay Street portion of Site 133 to prevent direct contact with potential CCPW and/or evidence of chromate impacts in and near the onsite buildings. PPG initiated IRM activities in April 1990 at this site. IRM activities which included interior wall and floor coverings and exterior soil surface coverings began on July 10, 1991, and continued intermittently until they were completed on September 27, 1991.

The exterior IRM consists of a narrow strip of pavement that was installed between the northern end of the 22 Halladay Street building and Carteret Avenue. The interior IRMs installed within the 22 Halladay Street buildings consist of Epoxy floor coatings, plastic sheeting and plywood floor coverings, plastic sheeting and plywood wall coverings, and a concrete/plastic pier column cap to prevent direct contact with potential chromium impacts that were observed on the floor and walls of the buildings. These IRMs are inspected and maintained on a quarterly basis.

#### 2.2.5.4 **Site 135 – Vitarroz**

To date, no IRMs have been implemented at Site 135.

#### 2.2.5.5 **Site 137 – Rudolf Bass & TSI City Carriers**

As shown on **Figure 2-5**, several IRMs have been implemented on the Rudolph Bass property that comprises the northern portion of Site 137 to prevent direct contact with potential CCPW and/or evidence of chromate impacts in and around the onsite building. Remedial actions included the installation of IRMs both inside and outside the Rudolph Bass Building at 45 Halladay Street in the northern portion of Site 137.

Exterior IRM activities included the placement of asphalt pavement or gravel covers in areas containing elevated levels of chromium, visible CCPW, and areas suspected to be impacted by chromium. This exterior IRM work included the installation of a sump at the eastern loading dock area of the building to collect and discharge accumulated storm water. The sump was needed to facilitate the paving of the loading dock area as an IRM. Sixteen truckloads of chromium-impacted soil were removed from the rear fenced lot area of the Rudolph Bass Building during the re-grading of this area to promote surface water drainage away from the building.

IRM activities within the Site 137 building included covering the impacted areas of interior walls with 6-millimeter polyethylene and plywood. This interior IRM work was implemented on November 26, 1991. Wall coverings were installed along the east and west interior walls and a sump situated in the interior building floor was abandoned. The sump was filled with concrete and a metal cap with concrete anchors was installed to cover it. Final IRM activities at the site consisted of covering the below grade loading dock exterior wall at the east side of the building with a 30-millimeter PVC liner and plywood. The interior IRM activity was completed on August 28, 1992.

An additional IRM was implemented in October 2011 to repair an area on an existing IRM on the eastern portion of the 45 Halladay Street loading dock that exhibited chromium impacts. The IRM consisted of an asphalt cap in this area.

Each of these interior and exterior IRMs are inspected and maintained on a quarterly basis. IRMs are maintained or expanded as needed.

#### 2.2.5.6 **Site 143 – F. Talarico Auto**

To date, no IRMs have been implemented at Site 143.

### 2.2.5.7 Site 186 – 947 Garfield Avenue

Based upon the visual identification of potential CCPW material on the southeastern quadrant of Site 186 and a surface soil sample exceeding the CrSCC for Cr<sup>+6</sup>, the NJDEP implemented an IRM at the Site in 1996, as shown on **Figure 2-6**. The Site was graded and a Permalon<sup>®</sup> liner overlain with several inches of gravel was installed across the entire Site. Then a bituminous concrete cap was installed over the entire Site to prevent direct human contact with potentially impacted materials.

## 2.3 Areas of Concern

The Project Area is divided into three AOCs:

1. The former MGP facility (Halladay Street Gas Works);
2. The former chromate ore processing facility and related former waste stockpile areas on Site 114 and the southern Garfield Avenue Sites;
  - a. Fill material above the meadow mat where CCPW and Cr<sup>+6</sup> impacted materials may have been placed; and
  - b. Native soils beneath the meadow mat and/or fill material where no CCPW or Cr<sup>+6</sup> impacted material was placed. Hexavalent chromium in native materials leached downward from the source materials in the fill.
3. HCC Site 186.

### Former MGP Facility (Halladay Street Gas Works)

PSE&G conducted a phased RI at the former MGP facility in the eastern portion of Site 114 (**Figure 1-2**). The RI focused on COCs that included VOCs, SVOCs, metals, and cyanide related to former MGP operations. PSE&G's 2007 RIR (CMX, 2007) stated that the MGP related compounds, oil-impacted material, and tar-impacted material had been horizontally and vertically delineated and recommended no further soil investigation for the MGP COCs. Some, additional delineation was later conducted by PSE&G in limited areas to further refine their delineation (CMX, 2008).

### Former Chromate Ore Processing Facility

PPG conducted several RI phases throughout Sites 114, 132, 133, 135, 137 and 143. The PPG RIs targeted VOCs, SVOCs, PCBs, TAL metals, Cr<sup>+6</sup>, and CCPW on and emanating from Site 114. South of Site 114 on Sites 132, 133, 135, 137 and 143, the RIs focused primarily on TAL metals and Cr<sup>+6</sup>. Based upon the analytical data collected during previous RIs, additional delineation was conducted for VOCs, SVOCs, PCBs, and TAL metals and Cr<sup>+6</sup> on and emanating from Site 114. The soil RIWP for the southern Garfield Avenue Sites focused mainly on refining the delineation of Cr<sup>+6</sup> and CCPW-related metals (Sb, Cr, Ni, V, and Tl) on or emanating from Sites 132, 133, 135, 137 and 143 (AECOM, 2011a).

### HCC Site 186

HCC Site 186 is a former orphan chrome site located near the northwestern corner of Site 114. It is a fenced, paved parking lot located at 947 Garfield Avenue. Until recently, the site was used for storing used and junked cars, possibly related to a nearby salvage yard. The pavement and underlying

Permalon® liner were constructed as an IRM by the NJDEP after CCPW was reportedly observed at the site during a previous site investigation conducted by NJDEP (Kimball, 2000; Berger, 2003). Additional delineation of compounds emanating from Site 186 was conducted as part of the March 2011 Soil RIWP (AECOM, 2011a).

## 3 Physical Characteristics

This section describes the physical characteristics of the Project Area and the surrounding area, including land use, topography, geology, and hydrogeology. This information is important in interpreting the potential impacts of COCs in soil, because the physical characteristics influence the movement of the COCs and how they might affect potential receptors.

### 3.1 Physical Description and Surrounding Land Use

The Project Area is located in a commercial and residential area of Jersey City, Hudson County, New Jersey (**Figure 1-1**). The Project Area consists of seven HCC sites (**Figure 1-2**). Site 114 was the location of a former chromate production facility that operated from approximately 1911 to 1963. A pile of CCPW material from plant operations was stored in the southeastern quadrant of Site 114 and extended southward onto Site 137.

#### 3.1.1 Surrounding Land Use

##### 3.1.1.1 Site 114

The areas adjacent to and across the surrounding streets from Site 114 are characterized generally as commercial and light industrial (**Figure 3-1**). Along the northern Site 114 boundary, a New Jersey Transit Light Rail railroad ROW bounds the site. A Light Rail Transit Station is present to the west-northwest of the site, beyond which is Site 186. Further to the north and beyond the railroad right-of-way, are commercial, light industrial and residential properties. To the east of the Site 114, across Halladay Street, a bag manufacturer/warehouse and an auto body shop are present. Further to the east and southeast are commercial, light industrial, railroad right-of-way, and material recycling facilities. To the west, across Garfield Avenue, an office furniture manufacturer/warehouse and auto repair shop is present. Further to the west, residential areas are present. To the south, an auto body shop/used car dealer, an abandoned warehouse, and light industrial machinery/box manufacturer/general storage warehouses are present. Further to the south, commercial areas exist. The residential areas north and west of Site 114 have been identified as part of the Jersey City Redevelopment Authority (“JCRA”)-approved Morris Canal Redevelopment Plan. Recently, an area to the north of the Light Rail ROW has been designated as the Berry Lane Park Redevelopment project. Investigation and remediation of the Berry Lane Park area is being addressed as a separate area under separate cover. Site 114 is located within the Canal Crossing Redevelopment Area. Final details of these redevelopment areas have not been determined at this time.

##### 3.1.1.2 Site 186

Site 186 is located approximately 200 feet north of the northwestern corner of Site 114. It is located along the western side Garfield Avenue north of the NJ Transit Light Rail ROW. Site 186 is surrounded by residential and commercial properties, including a medical facility located on the north side of Union Street. Toward the northeast and across Forrest Street, warehouse buildings are present. The site is currently paved and used for automobile storage.

##### 3.1.1.3 Southern Garfield Avenue Group Sites

Commercial properties and businesses, including warehousing, scrap metal, recycling, and light manufacturing, as well as automotive service businesses are located to the north, east and south of the

Garfield Avenue Group sites (**Figure 3-1**). Residences are located to the west, across Garfield Avenue. The southern Garfield Avenue Sites are located within the Canal Crossing Redevelopment Area. Final details of this redevelopment area have not been determined at this time.

The southern Garfield Avenue Group sites are situated to the south of Site 114. The chromate operation in the Project Area included a CCPW storage pile, consisting primarily of COPR, located at the southeastern quadrant of Site 114 which extended southward onto Site 137. The location of the plant and CCPW storage pile on Site 114 was previously determined from aerial photographs during an investigation at that site.

## 3.2 Environmental Setting

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

### 3.2.1 Topography

The United States Geological Service (“USGS”) Map (**Figure 1-1**) presents the regional topography for the Project Area. Site 114 has little topographic relief, with ground surface elevation ranging from approximately 9 to 16 feet relative to the North American Vertical Datum of 1988 (“NAVD 88”). However, to the west of Garfield Avenue, the topography rises approximately 30-40 feet within several hundred yards of the Project Area. In general, the former warehouse foundations at Site 114 are elevated two to five feet above the surrounding ground surface. The topography of the Project Area generally ranges in elevation from approximately 9 to 15 feet NAVD 88.

### 3.2.2 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). 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. The regional bedrock geology is illustrated in **Figure 3-2**.

#### 3.2.2.1 Triassic Newark Supergroup

The Triassic Newark Supergroup consists of non-marine sedimentary rocks with diabase intrusives. 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 fossiliferous. 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).

#### 3.2.2.2 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.

Overburden in the area of Site 114 consists of estuarine, salt marsh, and/or deltaic deposits overlying 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 and specifically in the area of Site 114, these marsh deposits were dewatered, excavated and backfilled, resulting in a surface layer of fill material overlying the meadow mat. These fill materials typically overlie the native sediments and consist of sand, gravel, silt, rock, demolition debris, and miscellaneous refuse.

### 3.2.3 Project Area Geology

The Project Area is located on fill material placed on top of the salt marsh (meadow mat) and estuarine native soils for the expansion of Jersey City. A sequence of unconsolidated natural material underlies the fill. The four major units at the Site from surface to bedrock include:

- Shallow Zone: a non-native fill layer that generally includes miscellaneous fill debris, cinders and ash, and CCPW and/or CCPW-impacted materials. These materials are general above the meadow mat;
- Intermediate Zone: native soils consisting of sand, silty sand, and clays generally separated from the fill by organic sediments and/or meadow mat;

- **Deep 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; and,
- **Bedrock Zone:** bedrock of the Lockatong and Stockton Formations with a diabase sill intruding into the Lockatong formation.

The geologic profiles of the Project Area are depicted in the north/south cross section included in **Figure 3-3** and the four east/west cross sections included in **Figure 3-4**.

#### 3.2.3.1 Project Area Overburden

Shallow soils within the Project Area (Shallow Zone) extend from the ground surface to the top of the meadow mat, where the meadow mat is present, or to a similar depth where meadow mat is not present. Based upon lithologic logging/observations during the RI and using modeling software, the depth to the meadow mat in the Project Area was estimated and is presented on **Figure 3-5**.

The extent of the meadow mat was identified via soil borings and excavations throughout the Project Area. Based upon observations from excavations, hollow-stem auger drilling, and direct-push soil borings via GeoProbe<sup>®</sup>, it is evident that GeoProbe<sup>®</sup> borings sometimes pierced the meadow mat without sample recovery within the meadow mat material. This was confirmed during IRM-1 and the geotechnical boring program. Areas were identified where meadow mat was not observed in the GeoProbe<sup>®</sup> samples but was present in an adjacent hollow-stem auger boring, or when the fill was excavated in that boring location. Therefore, meadow mat extent presented in **Figure 3-5** is considered a conservative estimate. Meadow mat is expected to be more extensive through the Project Area. However, meadow mat is expected to be absent in the northern Morris Canal channel due to excavation of the channel and the northeast corner of the Project Area near Forrest Street, based upon historic maps.

In the areas where the meadow mat is not present, other natural materials such as marine sands and silts or glacial materials were observed. The fill materials overlying the meadow mat consist of sand, gravel, silt, construction debris, coal ash and cinders, and CCPW and CCPW-impacted materials beneath Site 114 and extending onto Site 137. The thickness of the shallow fill zone is approximately 12 to 20 feet, and ranges from surface grade to approximately 20 ft bgs.

CCPW can consist of COPR, green-gray mud, or a mixture of these materials with standard 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<sup>+6</sup>.

Estuarine meadow mat deposits (top of Intermediate Zone) were identified at many historic boring locations across the Project Area. The meadow mat was notably absent from portions of the northern and north central portions of Site 114 near where the Morris Canal formerly bisected the Site from north to south. In the southern and central portions, it is possible that the meadow mat was removed during

construction of the former Morris Canal. Historic records indicate that the canal was approximately 40 feet wide and 25 feet deep. The top of meadow mat was generally encountered at depths ranging from 13 to 20 ft bgs. At the northern portion of the Project Area near the Light Rail, the area was historically higher in elevation and not submerged; therefore, conditions that allowed the meadow mat to collect were not present. Meadow mat was also noticeably absent in the northeast corner of Site 114 near Forrest Street. The Forrest Street area was a topographic high that did not appear to be part of the low-lying marsh area on historic topographic maps (Figure 3-13)

The soils of the intermediate zone are found just below the meadow mat layer, where the meadow mat is present, or at about the expected depth of the meadow mat where the meadow mat is absent. Below the meadow mat, the soils are unconsolidated and characterized by fine to medium sand and silt with clay and some gravel, typical of glacial outwash deposits. The soil types range from fairly tight, naturally occurring soils to fine to coarse sand. The bottom of the intermediate soil is generally defined by a low permeability silt or clay zone that is laterally extensive and is found from about 32 to 40 ft bgs. The thickness of the intermediate zone is approximately 20 feet, and generally ranges from the bottom of the meadow mat to 40 ft bgs.

The intermediate and deep zones are separated by a transition zone of low permeability silt or clay that is laterally extensive and generally encountered about 32 and 40 ft bgs. There appeared to be no sharply defined contact between the alluvial, glacial, or lacustrine soils, nor was a distinct till unit identified. The grain size of the soils progressively increases with depth, consistent with the description of regional till. Generally, the deep soils are approximately 50 feet thick, and range from approximately 35 ft bgs (bottom of intermediate zone soils) to 100 ft bgs. Deep zone soils tend to be coarser at increasing depths, and may include isolated gravel lenses. A 15 to 30 foot thick clay layer was found at several borings south-southeast of Site 114, where the bedrock was deeper. The clay layer was generally found near the bedrock surface.

### 3.2.3.2 Project Area Bedrock

The majority of the Project Area is underlain by the Lockatong Formation. The Stockton formation underlies the eastern portion of the Project Area and a diabase sill intrudes the Lockatong to the west of Garfield Avenue. The diabase was encountered during bedrock drilling operations on Site 114 and along Garfield Avenue southwest of Site 114. The diabase consisted of medium to coarse grained intrusions of dark greenish-gray to black diabase.

The bedrock surface slopes noticeably from west to east and is relatively shallow west of Garfield Avenue. Bedrock was observed at depths of less than 10 ft bgs west of and along Garfield Avenue and at depths exceeding 100 ft bgs below Site 114 and areas east of Garfield Avenue.

## 3.2.4 Hydrology

### 3.2.4.1 Surface Water

The only surface water source in the vicinity of the Project Area is the Upper New York Bay, which is located approximately 3,800 feet to the east/southeast. Surface water bodies within ½-mile of the Project Area are shown on **Figure 3-6**. The Morris Canal was a former man-made surface water body that was constructed through former area streams and rivers. The canal trends northeast/southwest along the western property boundary of Site 133 and Site 137 and bisected Site 114. The canal was reportedly drained and decommissioned in the 1920s. Most of the Project Area is covered with

impervious surfaces. 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).

#### 3.2.4.2 Wetlands

**Figure 3-7** illustrates wetlands from the NJDEP 2007 Land Use/Land Cover Geographic Information System (“GIS”) data layer. Forested habitat is shown to the area south of Caven Point Avenue, to the southwest of Site 133. This area is currently not forested and is used by the town of Jersey City as a snow removal storage site. The area identified immediately south of this area is also classified as forested habitat, which is consistent with its current use.

**Figure 3-8** illustrates wetlands from the US Fish and Wildlife Service’s National Wetlands Inventory (“NWI”) maps. Herbaceous wetlands are shown on this figure south and southeast of Sites 133 and 135 and have a designation of being temporarily flooded during the growing season. There are no mapped wetlands on or adjacent to the Project Area.

### 3.2.5 Regional Hydrogeology

Groundwater occurs in the vicinity of the Project Area in four general geologic formations: bedrock (bedrock zone); an unconsolidated native deposit including glacial silt, sand and gravel (deep zone); recent deltaic deposits of alluvium (intermediate zone); and in non-native fill (shallow zone). Each of these is discussed below.

#### 3.2.5.1 Bedrock Zone Hydrogeology

Hydrogeologic properties of the diabase bedrock are not well-documented. Groundwater is extremely sparse and the dikes are variably fractured; therefore, the diabase is generally a poor aquifer. The water-bearing properties of the bedrock aquifer, (i.e., storage capacity and transmissivity) are due to secondary porosity and permeability, which are characterized by flow within fractures. The thickness of the water-bearing zones is small, with estimates ranging from a few inches to 20 feet. Groundwater occurrence and flow is controlled either by vertical or near-vertical fractures (Herpers and Barksdale, 1951). Well yields range from a fraction of a gallon per minute (“gpm”) to five to ten gpm, with yields generally decreasing with depth. Groundwater in these formations primarily occurs under unconfined conditions.

#### 3.2.5.2 Deep Zone Hydrogeology

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. Of the glacial deposits and alluvium, the bedrock, and the fill, 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 minute (Geraghty, 1959).

### 3.2.5.3 Intermediate Zone Hydrogeology

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.

### 3.2.5.4 Shallow Zone Hydrogeology

Groundwater in the fill is typically encountered within 5 to 10 ft bgs. In general, shallow groundwater flow patterns are the result of artificially influenced groundwater elevations, which are controlled by fill, underground structures and utilities. Variations from this can be attributed to factors such as heterogeneities in the fill, subsurface structures, exfiltration from and infiltration to subsurface utilities, spatially variable recharge due to the presence of impervious surfaces, and the former Morris Canal.

### 3.2.5.5 Well Search

An updated well search was conducted as part of the recent Receptor Evaluation, dated September 2011 (AECOM, 2011b). Two non-potable wells were identified:

- A well located at 757 Ocean Avenue, which is approximately 1,600 feet northwest and upgradient from the northwest corner of Site 114 boundary. This well is used for industrial purposes (car wash operations).
- A well located at 500 Grand Street, which is approximately 600 feet west and upgradient of the Site 114 boundary. Water produced by this well is very salty and is used for cooling.

Both wells are located upgradient and outside of the Project Area groundwater plume and neither well is used for potable purposes.

A more detailed discussion of the well search per N.J.A.C 7:26E-1.15(d)1 will be included as part of the groundwater RI report which will be submitted under separate cover.

## 3.2.6 Project Area Hydrogeology

Groundwater was not investigated during the 2011 soil RI. An RIWP for groundwater is in preparation and a groundwater RI will be conducted in the near future. Groundwater elevations were measured over the course of several days during a well inventory conducted in May 2011 (**Table 3-1**) and over a few weeks during a low-flow groundwater sampling event conducted in June 2011. These events were conducted to provide information needed for the preparation of a groundwater RIWP. Groundwater elevation contour maps were prepared from the May 2011 groundwater gauging event (**Figures 3-9 through 3-12**).

The previous synoptic round of groundwater elevations was conducted in March 2007.

### 3.2.6.1 Project Area Overburden Hydrogeology

#### Shallow Groundwater

The shallow water-bearing zone includes groundwater present in fill material, from the water table to the top of the meadow mat (typically about 10 to 16 ft bgs). Based upon the May 2011 groundwater elevation contour map (**Figure 3-9**), shallow groundwater flow is multi-directional in the Project Area and was inferred to be flowing eastward from the topographic high west of Garfield Avenue toward the

Site, northwestward from the northwest corner of Site 114,, eastward toward Halladay Street, and northward toward the NJ Transit Light Rail and Forrest Street. Recent remediation and construction activities may also affect the groundwater flow regime on site 114. The vertical groundwater gradient was generally downward from the shallow to the intermediate water-bearing zone throughout most of the Project Area.

Isolated areas of recharge due to paved and impervious surfaces, building foundations, and subsurface structures affect groundwater levels and groundwater flow within the Project Area. Infiltration and exfiltration of water from leaking storm sewers further complicate the shallow groundwater flow regime.

#### Intermediate Groundwater

The intermediate water-bearing zone is a sand unit that extends from the base of the meadow mat unit down to a silt and clay unit of lower hydraulic conductivity. This zone extends from about 16 to 36 ft bgs. Groundwater flows onto Site 114 from the north, south, and east in the intermediate water bearing zone based upon groundwater measurements collected in May 2011 (**Figure 3-10**). However, several of the intermediate monitoring wells needed for a full assessment of groundwater flow were inaccessible during the May 2011 well inventory due to vehicles and/or materials stored on top of the well locations that could not be moved. The results of the March 2007 groundwater gauging event showed that groundwater flowed onto Site 114 from the north, south, and east but flowed offsite toward the southwest and southeast in the southern Garfield Avenue sites (**Appendix A, Figure 9**). Based upon the March 2007 water levels, the vertical groundwater gradient was generally upward from the deep to the intermediate zone on the western side of the Project Area and downward from the intermediate to deep zone on the eastern side.

#### Deep Groundwater

The deep water-bearing zone underlies the lower hydraulic conductivity silt and clay unit that defines the base of the intermediate water-bearing zone. This deep zone consists of sand with gravel lenses and extends from about 36 ft bgs to the top of the bedrock, which is found as deep as 100 feet in the eastern Project Area. May 2011 groundwater elevation data was interpreted to indicate that groundwater generally flows southeastward across the central portion of the Project Area (**Figure 3-11**). However, several of the wells that are needed to fully assess groundwater flow were inaccessible during the May 2011 gauging event due to vehicles and/or materials stored on top of the well locations that could not be moved. Based upon the March 2007 groundwater gauging results, groundwater flow in the deep water-bearing zone is inferred to be southward in the northern Project Area and southeastward in the central and southern Project Area (**Appendix A, Figure 10**).

#### **3.2.6.2 Project Area Bedrock Hydrogeology**

There are four bedrock groundwater monitoring wells within the Project area. Three of these wells are located on the western half of Site 114 and one is located west of Garfield Avenue. Groundwater is found within bedrock fractures and the rock matrix has little to no hydraulic conductivity. Based upon groundwater gauging conducted during the May 2011 monitoring well inventory, groundwater flow within the bedrock is inferred to be toward the east, from Garfield Avenue onto Site 114 (**Figure 3-12**).

### **3.3 Baseline Ecological Evaluation Update**

A Baseline Ecological Evaluation (“BEE”) pursuant to N.J.A.C. 7:26E-3.11 was conducted for the PPG Garfield Avenue Group – Sites 114, 132, 133, 135, 137, 143 and 186, in order to determine whether a

remedial investigation of Ecological Receptors is required pursuant to N.J.A.C. 7:26E-4.7. The BEE was submitted to the NJDEP in May 2011 and prepared in accordance with the NJDEP Technical Requirements for Site Remediation (N.J.A.C. 7:26E) and the USEPA guidance as part of a tiered approach to ecological risk assessment.

The results of the BEE indicated there is potential co-occurrence of all three conditions that are specified under N.J.A.C. 7:26-3.11(a)(4) (i.e., contaminants of ecological concern exist, environmentally sensitive natural resources exist, and potential chemical migration pathways exist). Therefore, in May 2011, AECOM submitted a Receptor Evaluation (“RE”) Report to the NJDEP. This document is currently under review by the NJDEP and AECOM is currently addressing agency comments.

In the BEE, COCs were identified using soil analytical data for the Project Area (collected between August 2003 and March 2007). It was determined in the BEE that migration pathways do not currently exist for contaminated soils to reach offsite Environmentally Sensitive Areas (“ESAs”) via overland sheet flow, primarily due to the extensive impervious surfaces within and adjacent to the Project Area. However, in some areas, soil sample results exceeding applicable standards were found at depths below the groundwater table, indicating a complete migration pathway for soil contaminants to migrate offsite via groundwater. Based upon historic groundwater results, the impacted groundwater plume appears stable and extends only slightly beyond the boundaries of the Project Area.

Additional RI activities were conducted between April and August of 2011 (as described in this RIR) to supplement the data already collected to further delineate the horizontal and vertical extent of CCPW and CCPW-related impacts in soil within the Project Area, and to further assess potential contaminant migration paths through soil. As described in this RIR, the extents of CCPW and CCPW-related impacts in soil were defined during this investigation and no additional potential migration pathways were identified. Based upon these results, no additional changes to the BEE are necessary at this time.

### 3.4 Vapor Intrusion Evaluation

The majority of VOC issues at Site 114 are related to the former MGP operations at the site. Vapor intrusion (“VI”) issues related to former MGP operations are currently being addressed by PSE&G in accordance with their VI Investigation Work Plan (CMX, 2010).

VI issues that may not be MGP-related but that may be related to PPG’s ownership of Site 114 will be assessed upon completion of the Groundwater RI that will be conducted at a later date. Analytical results from the groundwater RI will be compared to NJDEP Groundwater Screening Levels, and a VI Investigation Work Plan will be developed if necessary.

### 3.5 Landfill and Historic Fill Material Investigation

#### 3.5.1 Landfill

There are no active landfills located on or adjacent to the Project Area. No historic landfills were identified on or adjacent to the Project Area.

### 3.5.2 Historic Fill Material

The Jersey City shoreline has changed extensively over the last 125 years in the Project Area. Prior to filling and land reclamation activities, which began in the late 1800's, the shoreline near the Project Area was located slightly east of Garfield Avenue (**Figure 3-13**). The low-lying marshy areas were filled over time using a variety of fill materials transported from various source areas.

Historical maps indicate that the majority of filling activities occurred between 1905 and 1947. Dr. Carmela Karnoutsos, of Jersey City University reported, "to buildup the ground of the marsh land, the Central Railroad of New Jersey ("CRRNJ") brought thousands of tons of garbage from New York City to fill the mudflats in Jersey City's south cove" (Karnoutsos, 2001). A NJDEP Division of Parks and Forestry article discussing the CRRNJ terminal at Liberty State Park stated that, "the CRRNJ terminal was constructed primarily of landfill from New York City and ballast from ocean going vessels" (NJDEP, 2009).

The Morris Canal, which extended from Phillipsburg to Jersey City, was present during the period when filling was conducted. The original Morris Canal route, which terminated in Newark, was extended 12 miles through Jersey City in 1836. The canal was constructed utilizing a stream or river flowing south to north immediately east of what is now Garfield Avenue (**Figure 3-13**). During this period, the area on both sides of the canal was shown as marshland on topographic maps.

Filling of the marshland in and around the Project Area was completed in stages. The 1896 Sanborn Map shows that the area east of the Morris Canal had been filled and was used by Consumer Gas & Light Company for the production of manufactured gas. However, the absence of structures west of the Morris Canal on this same map suggests that the area between the Morris Canal and Garfield Avenue (the western portion of Site 114) may not have been filled.

The 1911 Sanborn Map shows buildings and structures related to bichromate ore processing between the Morris Canal and Garfield Avenue indicating that the area was then filled in probably from sources other than the New York City garbage and ballast.

History indicates that at least two stages of filling were conducted in the Project Area using different types of fill material. As shown on **Figure 3-14**, non-indigenous fill covers the majority of the Project Area. This is supported by boring logs advanced during various RIs which show a variety of fill types and fill layers.



## 4 Field Investigation Methodology

This section provides a description of the activities performed during the soil RI, and the methods used for conducting the field work within the Project Area. Unless otherwise noted in the following sections, the procedures used were consistent with the methods and procedures described in the NJDEP-approved RIWP, Field Sampling Plan- Quality Assurance Plan (“FSP-QAPP”) and Health and Safety Plan (“HASp”). The RI consisted of collecting numerous soil samples for various analyses at locations within and adjacent to the Project Area. The locations of soil borings advanced during the RI are shown on **Figure 2-1**. Details of activities performed during the investigation are provided below.

### 4.1 General Field Procedures

This section describes the overall procedures followed during the field investigation program. Procedures were implemented in accordance with the RIWP (AECOM, 2011a).

#### 4.1.1 Access Agreements and Permits

The Project Area is located in a commercial and light industrial area of Jersey City bordered by residential neighborhoods to the west and northeast. As such, the soil borings were advanced on both public and private properties. For locations on public properties (i.e., individual roads, right-of-ways), appropriate permits were obtained through the City of Jersey City Department of Traffic. For locations on private property, access agreements were negotiated with the property owners. Generally, access agreements were obtained prior to the start of the RI field program. However, some of the agreements took several months to negotiate and were finalized as the program progressed. The access agreement process was dynamic throughout the RI program as additional agreements became necessary when investigation locations were added to the field program (referred to as “step-out” borings). The only remaining access agreement still pending is for the 10 West Apparel property south of Site 132 where delineation is required beneath the on-site building.

Of the original proposed RI borings, only two boring locations (EF-12 and EF-13) could not be completed during the RI due to ongoing access agreement negotiations with the property owner. Negotiations are still ongoing with this owner.

Several step-out borings could not be advanced during the RI due to ongoing access agreement negotiations. These areas include:

- The property at the southwest corner of Halladay Street and the NJ Transit Light Rail;
- Vacant parcel east of Pacific Avenue (step-out borings for EF-17 and EF-18); and
- Access to several interior and exterior boring locations on the 10 West Apparel property located south of Site 132 and north of Caven Point Avenue.

Access agreement negotiations with the owners of these properties are ongoing. Soil borings will be advanced and sampled on these properties when agreements are obtained and the results will be reported in an RIR Addendum.

#### 4.1.2 Subcontractors

Subcontractors were contracted to provide various services as part of the field investigation activities. The following Subcontractors provided services during the Soil RI:

- TPI Environmental, Inc. of New Hope, Pennsylvania provided utility locating for each boring location as well as geophysical services for the Southern Canal Investigation area;
- SGS North America, Inc. of West Creek, New Jersey provided drilling services including advancement of soil borings and soft-dig utility clearance; and
- Test America, Inc. of Edison, New Jersey (“Test America”) provided laboratory services for the RI sampling program.
- Accutest Laboratories of Dayton, New Jersey (“Accutest”) provided laboratory services for the analytical samples collected during the geotechnical investigation program in April-July 2011.
- Accutest also provided laboratory services for waste classification and disposal during RI and IRM Activities.

#### 4.1.3 Access, Control and Security

A field office was maintained within the secured area of Site 114 and served as the central field office during the field investigation. The field office provided temporary office space as well as field equipment storage and sample cooler storage. Additional equipment storage was available in shipping containers located in the vicinity of the field office. The field office and shipping containers were locked and secured overnight when un-manned to maintain security and custody control. Additionally, a private security company was onsite 24 hours a day to secure the property.

Field work was conducted such that all down-hole equipment at each location was removed from the ground each day. Each location was restored to previously-existing conditions (e.g., grass, asphalt, concrete) upon completion of the boring at the end of each day. In some cases, shallow (5 feet) open holes that were utility cleared by soft-dig activities, remained “open” at the end of the day as they were not drilled on the same day. These locations were covered with steel plates and temporarily patched with asphalt until further drilling activities were resumed.

A police detail was coordinated through the Jersey City Police Department, Office of Off-Duty Police Employment, and was present for security and traffic control assistance during offsite sampling activities.

#### 4.1.4 Adjustments and Field Changes

During the implementation of the soil RIWP, minor adjustments and modifications to the RIWP were necessary to facilitate various conditions at the site. When the need for an adjustment was identified, field staff coordinated with the Project Manager to resolve these issues. Other than the need to install additional borings as the field investigation progressed, there were no significant modifications to the overall planned strategy for data collection. A list of the modifications is as follows:

- Originally, 49 borings were proposed in the RIWP. As per the agreement with the NJDEP, if laboratory results indicated that the limits of a COC were not defined, additional step-out borings would be conducted. Fifty-three additional borings were completed as step-out borings

to further delineate COCs during the RI. In total, 102 original and step-out borings were proposed during the RI. However, several of the borings proposed in the original RIWP and a few of the proposed step-out borings could not be completed prior to the submittal of this RI report due to ongoing site access negotiations with property owners.

- In several instances, originally-proposed boring locations needed to be moved slightly from their original proposed locations due to utility clearance, subsurface refusals or access issues. The new locations were deemed sufficiently close to their original proposed location to achieve the original sampling objectives.
- Boring EF-30 was not able to be drilled inside a building and was moved to an outside location and re-labeled as EF-30A.

#### **4.1.5 Utility Protection**

Prior to conducting subsurface activities, utility clearances were obtained from New Jersey One Call a minimum of two business days prior to the start of work. Utility clearances were re-established if greater than 30 days had expired from the previous utility call. In addition, a professional utility locating service was conducted at each boring location. A variety of techniques were used to locate utilities, including ground penetrating radar (“GPR”), electromagnetic conductivity (“EM”), radio frequency, audio frequency, and passive electric surveys. Based on the results of the utility surveys, locations were adjusted to avoid underground (and overhead) utilities.

As an added precaution, soft-dig (air-knife or vacuum boring) was utilized to a depth of approximately five feet at each boring location. The only locations where soft-dig activities were not used included:

- Borings located on Site 114; and
- Several borings located within the buildings at Site 132 and Site 135.

#### **4.1.6 Surveying**

Soil boring locations were surveyed by a portable Global Positioning System (“GPS”) unit. A Trimble® GeoExplorer® 6000 series GeoXT® Differential GPS unit was used to obtain horizontal coordinates (x and y) with an accuracy of  $\pm 0.5$  meters. The data was downloaded, corrected and converted to New Jersey State Plane North American Datum, 1983 (“NAD83”) coordinate system in feet. Coordinates were then added to the project database.

Vertical datum was not collected; however, these data may be collected during the civil survey that will be conducted as part of the groundwater RI. Prior topographic surveys throughout the Project Area provide sufficient resolution to estimate boring elevations.

#### **4.1.7 Investigation Derived Waste Management**

Investigation-derived wastes (“IDW”) generated during the field investigation were handled as detailed in Section 9.0 of the FSP-QAPP (AECOM, 2010a). IDW included drill cuttings, concrete cuttings, contaminated personal protective equipment (“PPE”), decontamination fluids, and trash. Solids such as drill cuttings and decontamination solids were placed into United States Department of Transportation (“USDOT”) approved 55-gallon drums. The drums were staged at Site 114 in designated existing temporary waste storage areas. Existing waste disposal criteria from previous site activities were used to characterize the soil for offsite disposal. The sample results from the PCB investigation were also

used to characterize the soil from that investigation for offsite disposal. Drums from the RI were shipped with other drums from ongoing IRM activities from the site to a licensed facility within 90 days of generation by PPG. Copies of waste manifests for the offsite disposal are located in **Appendix C** and a summary of the shipments is provided below.

Manifest Tracking Number	Total Number of Drums	Shipment Date
008389985	35	4/20/11
008389103	24	5/4/11
008389610	24	5/18/11
008800082	43	6/2/11
008800088	40	6/10/11
008800110	8	6/27/11
008800412	32	8/25/11

Equipment decontamination water was placed in the temporary water storage system associated with onsite IRM operations at Site 114. The water is periodically shipped offsite via tanker truck for disposal and is managed as part of the IRM operations.

#### 4.2 Ambient Air Monitoring: Dust Control and Monitoring

Air monitoring was performed during field activities to provide real-time measurements of total VOCs and particulate (airborne dust) concentrations in air in the work zone and at the downwind perimeter of each designated work area when intrusive investigation activities were in progress. The procedures followed methods described in the project HASP (AECOM, 2010b). Additionally, site personnel monitored the perimeter stations set up as part of the Site 114 IRM activities during RI work conducted on Site 114. The monitoring is designed to provide protection for the workers, as well as for the downwind community from potential releases of airborne constituents resulting from the investigation activities.

Total VOCs were monitored with a MiniRAE 2000 Photoionization Detector (“PID”), and particulates were monitored with a Thermo MIE pDR-1000 dust meter in the work zone and a Thermo MIE DR-4000 dust meter located downwind of each work zone (i.e., boring location). The VOC and particulate levels in the work zone at each location were recorded every 15 minutes. The particulate levels downwind of each work zone were recorded every minute.

Air monitoring action levels were not exceeded as a result of the work conducted during the soil RI program. There were a few instances where background conditions exceeded the action levels prior to, during, and after drilling. However, these instances were due to local issues unrelated to the RI

program. Potential dust generating activities during the RI, such as concrete coring, were minimized by mitigation activities including water spraying to minimize dust generation. No other dust control measures were necessary during RI activities.

### 4.3 Soil Investigation

This section describes the methods implemented for conducting the soil sampling program per the soil RIWP (AECOM, 2011a). The same methods proposed in the RIWP were used for additional step-out borings that were conducted to further delineate impacts based upon ongoing RI results.

#### 4.3.1 Number and Location of Soil Borings

Forty nine soil borings were proposed in the RIWP, including three additional locations (EF-44, EF-45, and 186-B4) that were added to the scope in the RIWP based on agency comments and final approval. Of the 49 borings, two borings (EF-12 and EF-13) were not conducted as access agreements could not be obtained during the RI field program. However, this access agreement has since been finalized and these borings will be completed during a supplemental RI field program that will be reported in a future addendum to this RIR.

During the course of the field work, additional “step-out” borings were added to further delineate the horizontal and vertical impacts based on results from the original boring locations. A total of 53 additional borings were added to the RI program for this purpose (Table 4-1). Of these borings, five borings (EF-91, EF-92, EF-93, EF-95 and EF-96) could not be advanced during the RI field program due to access agreement negotiations. Access agreements have since been finalized and these borings will be completed during a supplemental RI field program that will be reported in a future addendum to this RIR. Note that proposed boring EF-79 was not conducted as it was determined that this location was not needed.

In addition to the borings completed as part of the RI program, several other borings were advanced to support other program data needs. Data obtained from these borings are also presented within this RI report. These programs include:

- NRDC Investigation – A total of 14 borings were advanced as part of this program. Two of these locations (ICO-8 and ICO-10) were co-located with borings from the Southern Canal Investigation (SCB-12 and SCB-10, respectively). Two other locations (ICO-20 and ICO-22) were co-located with borings from the RI program (EF-46 and EF-57, respectively).
- Southern Canal Investigation – A total of 15 borings were advanced as part of this investigation. This effort was performed by PPG voluntarily to evaluate conditions south of Caven Point Avenue in the location of the former Morris Canal. Only the two locations co-located with the NRDC borings were submitted for laboratory analysis (ICO-8/SCB-12 and ICO-10/SCB-10).
- PCB Investigation on Site 114 – A total of 19 borings were advanced as part of this investigation. Only 15 locations were submitted for laboratory analysis, since analysis of some of the contingency samples was not required.
- Geotechnical Investigation on Site 114 – Analytical data were collected from 13 geotechnical borings that were advanced as part of a geotechnical investigation at Site 114.

These borings were advanced/sampled using the same methodologies as described in the RI, with the exception of the PCB and Geotechnical Investigations which have their own separate work plans. Details of these investigations are provided in separate sections below. Historic data from prior PPG and PSE&G programs have been provided under separate cover, and therefore, are not discussed here.

**Table 4-1** summarizes the locations and sampling details for the borings conducted as part of the RI program and the additional investigation programs. The locations of these borings are shown on **Figure 2-1**.

### 4.3.2 Soil Sample Collection Procedures

The RI soil borings were advanced using direct-push (GeoProbe<sup>®</sup>) methods. Macro-cores were used to collect continuous soil samples from the ground surface. The geotechnical borings were advanced via hollow-stem auger drilling with soil samples collected with split spoon samplers. Sample collection methods described in the RIWP indicated that continuous cores would be collected from the ground surface to the top of native material, then every five feet thereafter. A decision was made after NJDEP approved the RIWP to collect continuous cores for the full length of each boring. The only time this continuous cores were not collected was when step-out borings were needed for additional delineation beyond the original borings proposed in the RIWP. In these cases, samples were collected at specific depth intervals to delineate compounds identified in a specific boring or area. Where appropriate, step-out borings were drilled to the targeted depth and continuous cores were then collected over only the specified sample interval.

Upon opening of the macro-cores, the cores were field-screened for VOCs using a PID. PID measurements were recorded on the boring log. The soils were then visually classified using the Unified Soil Classification System (“USCS”) symbols and soil descriptions including visual observations (e.g., staining, oily sheens, etc.) were recorded on the boring log. Soil color was classified by using Munsell Color Charts; however, in cases where CCPW and green-gray mud was observed, trained field staff used color descriptions consistent with the color of CCPW residue. Boring logs are provided in **Appendix D**.

Analytical samples were collected per Table 2 of the RIWP for the initially proposed RI borings. These borings were also analyzed for Cr<sup>+6</sup>, Eh and pH at two foot intervals. This analysis program was added after NJDEP approved the RIWP and resulted in more data being collected than originally proposed.. Analytical samples for the step-out borings were location-specific for the intended delineation based on the results of the original proposed RI locations.

Samples were collected from discrete 6-inch intervals. Sample collection procedures were conducted in accordance with the FSP-QAPP (AECOM, 2010a). Samples were placed in pre-cleaned containers provided by the laboratory no more than two days prior to the time of sample collection. Samples were then labeled, handled and shipped in accordance with protocols described in the FSP-QAPP (AECOM, 2010a). Specific sample details, including the sample name, date, time, and analysis performed are provided on **Table 4-2**. The locations of these borings are shown on **Figure 2-1**. Analytical data packages along with the data validation reports are provided in **Appendix E**.

Upon completion of the soil borings, the boreholes were backfilled with bentonite hole plug to about 2 ft bgs, topped with clean sand, and the ground surface was repaired to match pre-existing conditions (e.g., asphalt, concrete).

#### 4.4 NRDC Investigation

As part of a federal settlement, an agreement was reached to perform additional assessment in areas outside of the boundaries of the HCC sites as identified within the April 2011 Consent Decree. The proposed work included the advancement of 29 borings and analyses of soil samples for Cr<sup>+6</sup>, Eh and pH. Access agreements have been obtained for properties where 14 of the borings are located, and the fieldwork was conducted in May through August 2011. Borings for the NRDC investigation were identified with an ICO-x sample label. Note that some of these borings were co-located with proposed borings for the RI investigation and were given a dual label as identification (e.g., EF-x/ICO-x). Access is still pending for properties where the remaining 15 borings are located. Sampling methodologies for this investigation were the same as described above for the RI. Analytical samples were collected every two feet to approximately two feet below the depth of the observed meadow mat. In locations where the meadow mat was not observed, the total boring depth extended to the approximate depth of where meadow mat would have been expected in the area.

Boring logs from this investigation are included as part of **Appendix D**. Sample details are provided in **Table 4-2** and the locations of these borings are shown on **Figure 2-1**. Analytical data packages are provided along with the data validation reports in **Appendix E**.

#### 4.5 Southern Canal Investigation

The purpose of the Southern Canal investigation was to identify the limits of the former Morris Canal and evaluate whether CCPW materials may have been placed within the canal south of the Project Area. This investigation included advancing three transects of borings south of Caven Point Avenue and conducting a geophysical evaluation in the area of the transects. The utility mark-out work was conducted by TPI Environmental (TPI) on May 6, 2011, and the soft-dig and GeoProbe® drilling were conducted by SGS on May 9 through May 12, 2011. The first transect was located in the grassy area immediately south of Caven Point Avenue, and the two other transects were located at approximately 200 foot intervals to the south. At each transect, five soil borings (15 total borings) were advanced with the methods described in **Section 4.3.2** above. Borings were advanced to approximately two feet below the depth of the meadow mat. In locations where the meadow mat was not observed, the total boring depth extended to the approximate depth of where meadow mat would have been expected in the area. Borings for the Southern Canal Investigation were identified with an SCB-x label.

Analytical samples were not collected as part of this investigation since it was performed as a voluntary action to screen the area for potential CCPW impacts; however, two of the borings are co-located with borings advanced during the NRDC Investigation (SCB-12/ICO-8 and SCB-10/ICO-10) and two other NRDC borings (ICO-7 and ICO-9) were advanced within this area. Laboratory analyses were performed on soil samples from these four borings. The NRDC investigation is discussed above in **Section 4.4**. Boring logs for the Southern Canal investigation are included as part of **Appendix D**. Sample details are provided in **Table 4-2** and the locations of these borings are shown on **Figure 2-1**. The associated validated analytical data are provided in **Appendix E**.

A geophysical investigation was also conducted south of Caven Point Avenue in the former canal area to identify the limits of the canal using non-invasive methods. The geophysical work was accomplished by employing a Fisher TW-6 electromagnetic metal detection unit ("TW6 EM"), a Geonics EM61-MK2 Time – Domain Electromagnetic Detector unit ("EM61"), a radio frequency line locating unit ("RF"), an AGI SuperString R8 IP Earth Resistivity and IP Meter, and magnetics. The work was conducted by TPI

on May 10, 2011. The geophysical work included four east/west transects and one north/south transect. The locations of these borings are included on **Figure 2-1** and a copy of TPI's report of the work and findings is included in **Appendix F**.

JCRA conducted a Site Investigation in the former Morris Canal area south of Caven Point Avenue in November 2008 (Potomac-Hudson Environmental, 2008). No concentrations of Cr<sup>+6</sup> in soil were detected above the reporting limit or the CrSCC south of Carteret Avenue during this investigation. The JCRA SI Report is included in **Appendix B**.

#### 4.6 PCB Investigation

The purpose of the PCB Investigation on Site 114 was to evaluate the area around historic boring B-1302 where concentrations of PCBs were reported above the 50 mg/Kg TSCA threshold and the results were compared to the NJDEP SRS. The proposed work for this investigation was presented in the Sampling and Analysis Plan ("SAP") prepared by AECOM, dated February 2011 (AECOM, 2011c). The general location of the GeoProbe® borings advanced as part of the investigation was immediately east of former building located at 2 Dakota Street and is shown in **Figure 2-1**. A copy of the SAP is included in **Appendix G**.

As outlined in the SAP, borings were conducted in iterations and soil samples collected were either analyzed immediately or put on "hold" until the need for analysis was determined. GeoProbe® borings were conducted at 19 locations and of the 71 samples collected, 45 were analyzed for PCBs. Borings for the PCB Investigation were identified with the 114-Px-x label. A copy of the report, titled "PCB Soil Sampling and Analysis Report", dated February 2012 (AECOM, 2012), is included in **Appendix G**.

#### 4.7 Geotechnical Investigation

The purpose of the Geotechnical Investigation on Site 114 was to assess the geotechnical composition of soil within the western portion of Site 114 to assist in the design future excavation shoring. The work was conducted in mid March through late July 2011. A total of 30 borings were advanced along the western portion of Site 114. Thirteen of the borings were sampled for various analytical parameters (Cr<sup>+6</sup> and total Cr, Eh, and pH), while the remaining borings were used in the vicinity of the former location of the Morris Canal. Borings for the Geotechnical Investigation were identified with either an AE-x, CHEM-x, or GT-x label. Details of the geotechnical investigation will be presented in a future Remedial Action Work Plan.

Boring logs for the Geotechnical Investigation are included as part of **Appendix D**. Sample details are provided in **Table 4-2** and the locations of these borings are shown on **Figure 2-1**. The associated validated analytical data are provided in **Appendix E**.

#### 4.8 Data Validation and Management

This section details the procedures that were used to document, manage, and review data collected during the RI to ensure data integrity, defensibility, and retrieval. This section also discusses the usability of the analytical results based on the results of the data validation process.



## 4.8.1 Data Validation

Data validation was performed by AECOM to evaluate whether the analytical data collected for the RI were scientifically defensible, properly documented, of known quality, and met RI objectives. **Table 4-3** summarizes the samples collected for each program including the quality control samples, matrix type, analytical methods, sample preservation, sample container, and holding times.

### 4.8.1.1 Validation Procedures

Data validation included the review of analytical procedures, quality control (“QC”), calibration, data reduction and completeness of the laboratory data packages as specified in the soil RIWP (AECOM, 2011a) and FSP-QAPP (AECOM, 2010a). Deficiencies noted were communicated to the laboratory and resolutions were documented in the data validation reports. If appropriate, data were qualified for use as described later in this section.

All laboratory data packages were reviewed in accordance with the FSP-QAPP (AECOM, 2010a), organic validation guidelines from USEPA Region 2, and the NJDEP validation Standard Operating Procedures (“SOP”) for hexavalent chromium and inorganic data. The USEPA Region 2 and NJDEP validation guidelines served as the basis for the actions taken during validation and consisted of:

- Region 2 SOP HW-24 Rev.2 (October 2006), Validating Volatile Organic Compounds by SW846 Method 8260B;
- Region 2 SOP HW-22 Rev.4 (October 2006), Validating Semivolatile Organic Compounds by SW846 Method 8270;
- Region 2 SOP HW-45 Rev.1 (October 2006), Data Validation SOP of Organic Analysis of PCBs by Gas Chromatography SW846 Method 8082A;
- NJDEP Office of Data Quality SOP 5.A.10, Rev 3 (September 2009), SOP for Analytical Data Validation of Hexavalent Chromium – for USEPA SW-846 Method 3060A, USEPA SW-846 Method 7196A and USEPA SW-846 Method 7199; and
- NJDEP Office of Data Quality SOP 5.A.16, Rev 1 (May 2002), Quality Assurance Data Validation of Analytical Deliverables for Inorganics (based on USEPA SW-846 Methods).

The level of validation ranged from a comprehensive validation per the NJDEP guidelines to a limited validation based on QC summary information or completeness reviews, depending on the analyte and matrix. The validation procedures for all Cr+6 data included full validation, which involved a comprehensive review of both summary forms and raw data, whereas the metals and organic data received a QC summary forms limited validation.

Limited validation for organic and metals data was based on information provided by the laboratory on their QC summary forms and did not include raw data review. At a minimum, limited validation included the following data elements:

- Agreement of analyses conducted with COC requests;
- Holding times and sample preservation;
- Method blanks/equipment rinsate blanks/ trip blanks;
- Surrogate spike recoveries;

- Laboratory control Samples (“LCS” or equivalent results);
- Matrix Spike (“MS”)/Matrix Spike Duplicate (“MSD”) results;
- Laboratory duplicate results;
- Field duplicate results; and,
- Quantitation limits and sample results (limited to evaluating dilutions and reanalyses).

Full validation was conducted on all the Cr<sup>+6</sup> data. The review included all the data elements listed for limited validation along with calibrations, review of raw data, and spot check for verification of calculations.

Validation reports were prepared for each data package that was validated. The validation reports are provided in **Appendix E**. The reports summarize the samples reviewed, parameters reviewed, nonconformance with the established criteria, and validation actions (including application of data qualifiers) presented in accordance with the NJDEP “hit list” format. Validation data qualifiers were based on the USEPA Region 2 validation guidelines for organic data and the NJDEP validation SOPs for the Cr<sup>+6</sup> and inorganic data. The qualifiers applied to the data consisted of the following:

Qualifier	Definition
J	Indicates the result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
U	Indicates the analyte was not detected in the sample above the sample reporting limit.
UJ	Indicates the analyte was not detected above the reporting limit and the reporting limit was approximate.
R	The sample result was rejected due to serious deficiencies; the presence or absence of the analyte could not be confirmed.

In addition, non-detect data that exceeded the most stringent of Residential or Nonresidential Direct Contact SRS were flagged with a non-validation “M” flag. This “M” flag indicates that the non-detect data, reported to the method detection limit (“MDL”) exceeds the applicable standard.

#### 4.8.1.2 Data Usability Assessment

##### 4.8.1.2.1 Garfield Avenue Soil Remedial Investigation

Soil samples collected during the Garfield Avenue Soil RI were sent to Test America Laboratories in Edison, NJ, which is a NJDEP certified laboratory (NJ certification 12028). The analyses were performed in accordance with EPA- and NJDEP-approved analytical protocols. Quality assurance analytical measures were implemented in accordance with the NJDEP TRSR (N.J.A.C. 7:26E) and complied with the requirements for a NJDEP-certified laboratory.

Quality control issues identified during validation are provided in the individual data validation reports that are provided in **Appendix E**. Results of the data validation indicated that, in general, the analytical data were of adequate quality to meet the project objectives. There were some quality assurance/quality control (“QA/QC”) issues identified during data validation that resulted in qualifying some of the data as estimated. These issues were related to laboratory blank contamination, LCS results, MS results, laboratory duplicate precision, field duplicate precision, percent solids, and quantitation issues. The majority of the QA/QC non-conformances resulted in potential low bias for reported analytical results for the soil samples. A summary of the validation findings are presented by QC parameter type in the following paragraphs.

Laboratory blanks and blanks related to field activities (i.e., field and trip blanks) were generally free of contamination, indicating no systematic contamination issues in the field or laboratory. For those blanks in which contaminants were detected, action levels were established per the NJDEP validation guidance documents. Associated sample results were qualified accordingly. Hexavalent chromium was detected in one laboratory calibration blank indicating a potential bias high or false positive result for sample EF-B76-4.0. However, since the reported result of 4.9 mg/Kg was below the CrSCC of 20 mg/Kg, there was no impact on data usability.

LCS recovery criteria were not met for three SVOCs (1,2,4,5-tetrachlorobenzene, benzo(b)fluoranthene, and chlorophenols). The LCS percent recoveries for 1,2,4,5-tetrachlorobenzene and chlorophenols were below the established criteria indicating a potential for bias low results. There was no impact on data usability for the 1,2,4,5-tetrachlorobenzene and chlorophenols since the associated results were non-detect and qualified as estimated (flagged as “UJ”) with no associated site standards. Benzo(b)fluoranthene had a high percent recovery indicating a potential for bias high results, thus the detected results in two samples were qualified as estimated (flagged as “J”).

Matrix spike recoveries did not meet the required quality control criteria for several VOCs, SVOCs, TAL metals, and Cr<sup>+6</sup> indicating a potential for bias high or low sample results due to matrix interferences. Selected data points were qualified as estimated (flagged as “J” or “UJ”) with approximately 40% of the soil Cr<sup>+6</sup> results being impacted due to matrix interferences.

Other QC issues related to high moisture content, laboratory duplicate precision, and/or field duplicate precision issues for VOC, PCB, TAL metals, and Cr<sup>+6</sup> resulted in selected data points being qualified as estimated (flagged as “J” or “UJ”).

Analytical dilutions were necessary in certain samples due to the sample matrix (e.g., turbidity, color) or due to high concentration of target or non-target analytes. The results of multiple dilutions were combined in order to report concentrations within the instrument calibration range and the lowest possible detection limits. The detection limits as reported by the laboratory were adjusted to reflect dilution factors.

In summary, all the data were determined to be valid and are considered to be usable and reliable for project decision-making purposes.

#### **4.8.1.2.2** NRDC Investigation

Soil samples collected during the NRDC Investigation were sent to Test America Laboratories in Edison, NJ, which is a NJDEP certified laboratory (NJ certification 12028). The analyses were performed in accordance with EPA- and NJDEP-approved analytical protocols. Quality assurance analytical measures were implemented in accordance with the Technical Requirements for Site Remediation (N.J.A.C. 7:26E) and complied with the requirements for a NJDEP-certified laboratory.

Quality control issues identified during validation are provided in the individual data validation reports that are provided in **Appendix E**. Results of the data validation indicated that, in general, the analytical data were of adequate quality to meet the project objectives. There were some QA/QC issues identified during data validation that resulted in qualifying the data as estimated. The QC issues were related to laboratory blank contamination, MS results, and percent solids issues. The majority of the QA/QC non-conformances resulted in potential low bias for reported analytical results for the soil samples. A summary of the validation findings are presented by QC parameter type in the following paragraphs.

Laboratory blanks and blanks related to field activities (i.e., field and trip blanks) were generally free of contamination, indicating no systematic contamination issues in the field or laboratory. For those blanks in which contaminants were detected, action levels were established per the NJDEP validation guidance documents. Associated sample results were qualified accordingly. Hexavalent chromium was detected in one laboratory calibration blank indicating potential bias high or false positive results for samples ICO-4-10.0 and ICO-17-0.8. However, since the reported results of 0.64 mg/Kg and 1.1 mg/Kg, respectively were below the CrSCC of 20 mg/Kg there was no impact on data usability.

Matrix spike recoveries did not meet the required quality control criteria for antimony and hexavalent chromium indicating a potential for bias low sample results due to matrix interferences. Selected data points were qualified as estimated (flagged as "J" or "UJ") with approximately 60% of the Cr<sup>+6</sup> results being impacted due to matrix interferences.

The only other QC issue was high moisture content in the sample that impacted only the non-detect Cr<sup>+6</sup> result in sample ICO-19-17.5, which was qualified as estimated (flagged as "UJ").

Analytical dilutions were necessary in certain samples due to the sample matrix (e.g., turbidity, color) or due to high concentration of target or non-target analytes. The results of multiple dilutions were combined in order to report concentrations within the instrument calibration range and the lowest possible detection limits. The detection limits as reported by the laboratory were adjusted to reflect dilution factors.

In summary, all the data were determined to be valid and are considered to be usable and reliable for project decision-making purposes.

#### **4.8.1.2.3** Geotechnical Investigation

Soil samples collected during the Geotechnical Investigation on Site 114 were sent to Accutest Laboratories in Dayton, NJ, which is a NJDEP certified laboratory (NJ certification 12129). The analyses were performed in accordance with EPA- and NJDEP-approved analytical protocols. Quality assurance analytical measures were implemented in accordance with the NJDEP TRSR (N.J.A.C. 7:26E) and complied with the requirements for a NJDEP-certified laboratory.

Quality control issues identified during validation are provided in the individual data validation reports that are provided in **Appendix E**. Results of the data validation indicated that, in general, the analytical data were of adequate quality to meet the project objectives. There were some QA/QC issues identified during data validation that resulted in qualifying the data as estimated. The QC issues were related to equipment blank contamination, MS results, percent solids, and field duplicate precision results. The majority of the QA/QC non-conformances resulted in potential low bias for reported analytical results for the soil samples. A summary of the validation findings are presented by QC parameter type in the following paragraphs.

Laboratory blanks and blanks related to field activities (i.e., field and trip blanks) were generally free of contamination, indicating no systematic contamination issues in the field or laboratory. For those blanks in which contaminants were detected, action levels were established per the NJDEP validation guidance documents. Associated sample results were qualified accordingly. Potassium was detected in an equipment blank indicating potential bias high or false positive results for samples CHEM-1-2 and CHEM-5-7. However, since there is no applicable standard for potassium there was no impact on data usability.

Matrix spike recoveries did not meet the required QC criteria for Sb and total Cr indicating a potential for bias low or high sample results, respectively, due to matrix interferences. The Sb results for the four samples showed detectable concentrations of Sb and, therefore, were qualified as estimated biased low (flagged as "J") due to low matrix spike recovery. Select total Cr data points were qualified as estimated biased high (flagged as "J") due to high matrix spike recovery. These affected total Cr results were detected at concentrations well below the CrSCC of 120,000 mg/Kg and, therefore, there was no impact on data usability.

Field duplicate precision did not meet the acceptable criterion for total Cr and Cr<sup>+6</sup>, thus selected data points were qualified as estimated (flagged as "J"). However, these affected total Cr results were detected at concentrations well below the CrSCC and, therefore, there was no impact on data usability. Several Cr<sup>+6</sup> results were qualified as estimated due to the poor field duplicate precision (Relative Percent Differences ("RPDs") ranging from 79-85%). Most of the affected qualified results were detected at concentrations well below or above the CrSCC of 20 mg/Kg and, therefore, there was no impact on data usability. However, the Cr<sup>+6</sup> results in samples AE-2 (5.0-5.5), AE-3 (29.5-30.0), R-AE-1 (3.5-4.0), AE-1(27.5-28.0), AE-1(31.5-32.0), AE-1(33.5-34.0), AE-1(9.5-10.0), AE-4(1.5-2.0), and AE-D-1(39.5-40.0) were detected at concentrations near the CrSCC of 20 mg/Kg and, therefore, these results may have been impacted by the poor field duplicate precision.

Analytical dilutions were necessary in certain samples due to the sample matrix (e.g., turbidity, color) or due to high concentration of target or non-target analytes. The results of multiple dilutions were combined in order to report concentrations within the instrument calibration range and the lowest possible detection limits. The detection limits as reported by the laboratory were adjusted to reflect dilution factors.

In summary, all the data were determined to be valid and are considered to be usable and reliable for project decision-making purposes.

## 4.8.2 Data Management

Data management activities included data collection, handling and management, and tracking and control.

Data related to sample collection and field measurements were recorded on standardized field forms (per the RIWP), in bound logbooks, and as electronic files. Field records were reviewed to ensure the accuracy and completeness of the data. Analytical data were received from the laboratory as hard copy reports and as electronic data deliverables (“EDDs”). Analytical results were validated according to the procedures described in **Section 4.8.1** above.

The EQulS® environmental data management software from EarthSoft, Inc. was used to manage the data for the RI. Subsets of the field data, including spatial data (horizontal coordinates) and geologic information were loaded into the database either directly using an EQulS import utility or via entry into electronic templates. EDDs from the laboratory, provided in the AECOM-specific format, were imported into the project database. Upon completion of validation, data qualifiers were loaded into the database.

Quality control checks were performed through the process to ensure the integrity of the data. These checks included:

- Audits to ensure that laboratories reported all requested analyses;
- Checks that analytes were consistently and correctly identified;
- Reviews to ensure that units of measurement were provided and were consistent;
- Queries to determine that codes used in the database were documented properly;
- Reports to review sample definitions (depths, dates, locations);
- Proofing manually-entered data against the hard copy original; and
- Reports to review groupings of sample locations and coordinate systems.

The database is maintained on a secure network drive which is backed up regularly. Access to the database is limited to authorized users and controlled by password access.

As required per the N.J.A.C. 7:26E-3.13(c)3.v., laboratory data included as part of this RIR has been prepared in the HAZSITE EDD file format. Separate EDD files have been generated for the RI dataset as follows:

- 2011 Data – Data collected from the RIWP, NRDC, PCB and Geotechnical investigations.
- Historic PPG Data – Data collected from previous RI programs.

Historic PSE&G data has not been provided as part of this report as these data have previously been submitted as part of the PSE&G investigation reports.

The HAZSITE EDDs are provided in **Appendix H**.

## 5 Nature and Extent

This section of the RIR provides a description of the COCs and their distribution in soil in and around the Project Area. The data were evaluated based on impacts from PPG operations, former MGP operations, and impacts related to historic fill materials.

The data included in this evaluation are as described in **Section 1.4**. Validated laboratory data packages are provided in **Appendix E**. Analytical summary tables of the data are provided in **Appendix I**. Tables provided in **Appendix I1** compare the data to the NJDEP Residential and Non-Residential SRS and the CrSCC for  $\text{Cr}^{+6}$  and total Cr. Tables provided in **Appendix I2** compare the data to the default IGW SSL. The default IGW SSL apply only to unsaturated soils; therefore, the data presented in the default IGW SSL tables only include unsaturated soils. To be conservative, the unsaturated zone was based upon the greatest depth to groundwater recorded in the onsite monitoring wells from February 2007 through June 2011, or from the depth to saturated soil in borings where no wells were located. The data were gridded and contoured providing an interpolated data set for soil borings throughout the project area and specific depth to water measurements were assigned to each boring location. These depths were then used to determine the unsaturated zone and thus, which soil samples to use for comparison to the default IGW SSLs. These assigned depths are provided on the data tables.

Tables presenting only the results exceeding the regulatory standards or criteria were prepared to supplement the overall data tables. **Tables 5-1 through 5-4** provide data where concentrations exceeded either the RDCSRS, the NRDCSRS, or the CrSCC. **Tables 5-5 through 5-8** provide data where concentrations exceed the default IGW SSLs in the unsaturated zone.

Figures identifying the soil boring locations and with associated sampling results were also created. These figures were generated to graphically present analytical samples for data that exceeded either the CrSCC or SRS for all soils or the default IGW SSLs for unsaturated soils. These figures were grouped into the following categories:

- $\text{Cr}^{+6}$
- CCPW-Related Metals
- Other Metals
- VOCs
- SVOCs
- PCBs

Due to the large volume of data, maps were split into multiple figures as necessary. For each parameter or group of parameters, the Project Area was divided into the following areas:

- a “Northwest” figure showing data for locations north of Carteret Avenue and west of the former Morris Canal (including Site 186);
- a “Northeast” figure showing data for locations north of Carteret Avenue and east of the former Morris Canal; and,
- a “Southern” figure showing data for the area south of Carteret Avenue.

Data for each location are presented in text boxes with the data exceeding the applicable standard shown in red bold font. Non-detect data reported to an MDL that exceeded applicable regulatory standards were not included on the figures. However, these data are included in the data tables and the regulatory exceedance tables. For locations where no exceedances were observed, the location and associated sample depths are presented as a separate table on the figures for reference.

## 5.1 MGP Materials

PSE&G has conducted a series of RIs to delineate materials related to former MGP operations at the former Halladay Street Gas Works. Some of these RI activities were conducted concurrently with PPG's ongoing RI work. The PPG chrome RI and the PSE&G MGP RI each have a distinctive set of contaminants related to former Site operations. Based upon PSE&G's 2007 RIR (CMX, 2007), the MGP related materials that PSE&G focused upon during their RI work included the following:

### MGP Raw Materials:

- Coal
- Coke
- Oil

### MGP Waste Materials:

- Free tars
- Tar separator sludge
- Free oils
- Lampblack
- Ash and clinker
- Ammonia waste
- Spent lime and coke
- Spent oxides

The COCs related to these materials included VOCs (primarily BTEX compounds), SVOCs (primarily naphthalene and PAHs), inorganic compounds (primarily As, CN, Pb, and Hg), and ammonia (**Table 1-2**). PSE&G has accepted responsibility for the MGP-related compounds/materials in the Project Area and stated that these have been delineated during their RI programs. The results of PSE&G's RI activities were reported in PSE&G's 2007 RIR and 2008 RIR addendum (included in **Appendix B**). PPG has included the analytical results of PSE&G's RI work in this RIR. However, PSE&G is ultimately responsible for the MGP-related contamination within the Project Area.

## 5.2 Historic Fill Materials

Based upon numerous soil borings, visual observations, analytical data, and published information from the New Jersey Geologic Survey (NJGS, 2004), the project area (from the ground surface to the meadow mat at approximately 20 ft bgs) is mostly underlain by non-indigenous fill material. Much of



the land along the present-day Jersey City shoreline was land reclaimed from the Upper New York Bay.

In the early 1900s, much of the Jersey City area was identified as viable for development to support the booming industry of this entire region. A review of the historical mapping indicated that the majority of filling activities occurred between late 1800s and 1947. Looking for available land, developers filled in the marshlands and estuarine areas to supply properties for development. Research indicates that fill included construction spoils, silts and sands, demolition debris, garbage from New York City, incinerator ash, coal ash, ship ballast, industrial waste, and other miscellaneous materials. The meadow mat was covered and/or removed for building foundations or other improvement projects. The surface water features disappeared in favor of relatively highly compacted surface soils and other impervious surface features that channeled local surface water flow to subsurface storm water drainage systems.

The NJDEP has acknowledged that some environmental impacts in urban areas are due to the components of the historic fill material. The NJDEP TRSR include a table of common compounds and concentration ranges for these compounds that NJDEP will accept as impacts due to historic fill materials. However, materials impacted by chromate waste are specifically exempt from this allowance, as stated in the TRSR 7:26E-1.8: *“Historic fill material does not include any material which is substantially chromate chemical production waste or any other chemical production waste or waste from processing of metal or mineral ores, residues, slag or tailings.”*

Based upon the boring logs and analytical data collected during the RIs conducted in the Project Area, several of the SVOC compounds and metals detected at concentrations exceeding the SRS or the default IGW SSL are considered a result of historic fill material and not PPG or PSE&G site operations. For many samples that did not exhibit any evidence of CCPW impacts, the observed concentrations of these compounds often fell within the range of concentrations presented in the NJDEP historic fill database (NJDEP, 2009b) and are found within materials identified as fill based upon visual observations. Fill materials impacted by or comingled with CCPW having concentrations of total Cr and/or Cr<sup>+6</sup> exceeding the CrSCC may not be considered historic fill, in accordance with the NJDEP TRSR (NJDEP, 2009b).

### 5.3 PPG Related Materials

Section 1.3 of this report identifies the COCs related to the former PPG operations and/or ownership of Site 114 and the stockpiling of CCPW material in the Project Area. COCs related to compounds on or emanating from Site 114 include Cr<sup>+6</sup>, CCPW-related metals, TAL metals, VOCs, SVOCs and PCBs. COCs related to the areas outside of Site 114 beyond the limits of compounds that can be considered as emanating from Site 114 include only Cr<sup>+6</sup> and CCPW-related metals. This section provides a description of COCs and their distribution in soil in and around the Project Area. The analytical results were compared to appropriate regulatory criteria and standards as described in **Section 1.2**.

#### 5.3.1 Hexavalent Chromium

Hexavalent chromium has been sampled extensively throughout the Project Area and is associated with historic chromate ore processing operations at Site 114 as discussed in **Section 2.2.1.1**. The highest concentrations of Cr<sup>+6</sup> were detected on and adjacent to the former chromate ore processing

areas on Site 114, the location of the former CCPW stockpiles on Sites 114 and 137, and sections of the former Morris Canal where CCPW appears to be a component of the fill material used to abandon the canal. Generally, the subsurface materials that were directly impacted by CCPW are fill that was placed on top of native materials and/or preexisting historic fill. Soil impacts that were detected within native materials beneath the fill or meadow mat were impacted by Cr<sup>+6</sup> within the pore water of the material that has leached downward from the waste materials placed as fill.

Although a few areas need refinement as detailed below, the extent of Cr<sup>+6</sup> has been delineated throughout the Project Area. Hexavalent chromium exceedances of the NJDEP CrSCC are reported in **Table 5-1** and illustrated on **Figures 5-1 through 5-5**.

#### Hexavalent Cr Exceeding the NJDEP CrSCC – Site 114 and the Southern Garfield Avenue Sites

Hexavalent Cr was detected throughout Site 114 and in some locations southward onto the southern Garfield Avenue Sites. With a few exceptions in localized areas needing further delineation or refinement of the existing delineation, Cr<sup>+6</sup> has been delineated along the western side of the Project Area from the NJ Transit Light Rail down to Caven Point Avenue (**Figures 5-1 and 5-3**). The impacted area generally extends eastward across Site 114 to Halladay Street adjacent to Site 114, and to Pacific Avenue along the eastern edge of Sites 133 and 135 (**Figures 5-2 and 5-3**). The southern extent of Cr<sup>+6</sup> impact is located about 100 feet north of Caven Point Avenue, in the southern portion of Site 133 and south of Site 135 (**Figure 5-3**). To the north, Cr<sup>+6</sup> impacts extend to the NJ Transit Light Rail (**Figures 5-1 and 5-2**). The area to the north of the NJ Transit Light Rail property (Berry Lane Park area) is being investigated and remediated under a separate effort.

Additional delineation is required in several areas along the borders of the Project Area to further refine the extent of Cr<sup>+6</sup> impacts. These areas include the following:

- West of the southwest corner of Site 143 at Garfield Avenue;
- East of Halladay Street just north of Carteret Avenue (Halstead Building);
- In the area west of Halladay Street, and between Forrest Street and the NJ Transit Light Rail;
- West from the southwest corner of Site 114 at the intersection of Garfield and Carteret Avenue; and,
- Refinement of the delineation is needed to define the western edge of the former Morris Canal and to determine whether Cr<sup>+6</sup> impacts extend beneath the commercial building located at the corner of Carteret and Garfield Avenue (10 West Apparel).

#### Hexavalent Cr Exceeding the NJDEP CrSCC – Site 186

Historic soil borings conducted at Site 186 by the NJDEP and NJDEP contractors detected a single CrSCC exceedance of Cr<sup>+6</sup> in a surface soil sample collected in the southeastern portion of Site 186 (**Appendix B**). No other Cr<sup>+6</sup> exceedances were detected at Site 186 and subsequent investigations by Kimball and Berger on behalf of the NJDEP were unable to verify this reported exceedance. No Cr<sup>+6</sup> was detected during this 2011 RI conducted by PPG. Hexavalent chromium on Site 186 is limited to this single detection of Cr<sup>+6</sup> located within the boundaries of Site 186 and is currently covered by an IRM cap. Additional soil RI activities are planned for Site 186 to better characterize the

1995 Cr<sup>+6</sup> exceedance reported by NJDEP and more comprehensively identify and delineate potential CCPW impacts at this Site.

#### Vertical Delineation of Cr<sup>+6</sup>

Additional mapping was prepared to illustrate the nature and extent of Cr<sup>+6</sup> impacts, due to the pervasive nature of this compound in the Project Area and the need to fully understand the distribution of Cr<sup>+6</sup> to facilitate future remediation. **Figures 5-4 and 5-5** illustrate the northern and southern portions of the Project Area, respectively. Hexavalent Cr impacts greater than the CrSCC are presented in 5-foot depth intervals to illustrate both the horizontal and vertical distribution of Cr<sup>+6</sup> in the Project Area.

Most of the Cr<sup>+6</sup> detected at concentrations greater than the CrSCC was found within the fill material that was placed on top of the meadow mat or on top of native materials. Hexavalent chromium on Site 114 was mostly found at depths less than 20 feet, roughly corresponding to the depth of the meadow mat (**Figures 5-4 and 3-5**). Some areas where the meadow mat was missing or discontinuous exhibit Cr<sup>+6</sup> concentrations exceeding the CrSCC, even where CCPW material was not directly placed or mixed with the soil. This is due to Cr<sup>+6</sup> leaching from the source material placed on top of the meadow mat or native material. With a few exceptions, these areas generally include the northern end of Site 114 at the NJ Transit Light Rail, the former Morris Canal, and a few areas at the edges of the Site 114 where meadow mat is discontinuous.

Concentrations of Cr<sup>+6</sup> greater than the CrSCC within the southern Garfield Avenue Sites are limited to depths shallower than 20 ft bgs (**Figure 5-5**). There were no Cr<sup>+6</sup> exceedances below 20 feet deep in the Project Area located south of Carteret Avenue.

### **5.3.2 CCPW Metals**

The CCPW metals include five of the TAL metals considered most likely to be associated with CCPW and Cr<sup>+6</sup> impacts in the Project Area. These metals include Sb, Cr, Ni, Tl, and V. Data for these metals were compared to the most stringent NJDEP SRS and the NJDEP default IGW SSL. In general, CCPW metal exceedances, particularly Sb and V, were coincident with Cr<sup>+6</sup> exceedances throughout the Project Area. Thallium exceedances were few and co-located within the CCPW-impacted areas. Since none of the data evaluated during the RI had Ni concentrations that exceeded the NJDEP SRS of 1,600 ppm, no Ni exceedances are presented on **Figures 5-6, 5-7, and 5-8**. Currently, there are no default IGW SSLs for Cr or V. Therefore, these compounds do not appear on the IGW SSL maps presented in **Figures 5-9, 5-10, and 5-11**.

#### CCPW Metals Exceeding the NJDEP SRS

CCPW Metals exceedances of the NJDEP SRS are presented in **Table 5-1** and illustrated on **Figures 5-6, 5-7, and 5-8**.

Antimony was detected at concentrations exceeding the SRS at locations throughout Site 114, generally consistent with Cr<sup>+6</sup> exceedances of the CrSCC (**Figures 5-6 and 5-7**). Antimony exceedances were much less prevalent south of Carteret Avenue on the southern Garfield Avenue sites and with a few exceptions, were mainly limited to Site 137 (**Figure 5-8**). The Sb exceedances detected at borings 135-B15 and 135-B19 do not appear related to the Project Area and have not

emanated from Site 114 (**Figure 5-8**). With a single exception, it appears that Sb exceeding the SRS has been fully delineated in the Project Area. One Sb exceedance at the southwestern corner of Site 137 will need delineation westward, coincident with a Cr<sup>+6</sup> exceedance at that same location (**Figure 5-8**).

Total Cr was detected at concentrations exceeding the SRS at four locations (**Figures 5-6 and 5-7**). One of these locations was remediated by excavation and disposal as part of IRM#1. The remaining three exceedances located on the eastern half of Site 114, are fully delineated, and are not emanating from Site 114 (**Figure 5-7**). Both of these locations are within the area proposed for CCPW remediation.

Nickel was not detected at concentrations exceeding the SRS at any location within the project area.

Thallium was detected at concentrations exceeding the SRS at a few locations on Site 114 (**Figures 5-6 and 5-7**). With a single exception on Site 133, TI exceedances are limited to Site 114, and are fully delineated and not emanating from Site 114. All of the TI exceedances fall within the proposed CCPW remediation area. Offsite from Site 114, TI was detected above SRS in a single soil boring in the northwestern portion of the 15 Halladay Street side of Site 133 (**Figure 5-8**). It is fully delineated and falls within the proposed CCPW remediation area.

Vanadium was detected at concentrations exceeding the SRS throughout the Project Area and was generally coincident with Cr<sup>+6</sup> exceedances of the CrSCC (**Figures 5-6, 5-7, and 5-8**). As was the case with Cr<sup>+6</sup>, V concentrations exceeding the SRS were detected on and adjacent to the former chromate ore processing areas on Site 114, the location of the former CCPW stockpiles on Sites 114 and 137, and sections of the former Morris Canal where CCPW appears to be a component of the fill material used to abandon and fill the canal. Generally, the subsurface materials that were directly impacted by V are found within the fill that was placed on top of the native materials and/or preexisting historic fill in the same locations as Cr<sup>+6</sup>.

With a few exceptions, V appears to be delineated within the Project Area to the area bounded by Garfield Avenue on the west, Caven Point Avenue on the south, the area between Halladay Street and Pacific Avenue on the East and abutting the NJ Transit Light Rail on the north. This falls within the areal extent of the Cr<sup>+6</sup> delineation.

Additional delineation is required in several areas along the borders of the Project Area to further refine the extent of V impacts. These areas include the following:

- East of Halladay Street just north of Carteret Avenue (Halstead Building);
- West of the southwest corner of Site 143 at Garfield Avenue; and,
- Westward from the northwest corner of the 15 Halladay Street portion of Site 133 (onto the 10 West Apparel property).

### CCPW Metals Exceeding the NJDEP IGW SSL

The NJDEP default IGW SSL apply to unsaturated soils above the water table. For the purpose of this RI, the greatest depth to water at each monitoring well recorded during PPG RI activities was used to determine the applicable depths for the comparison of analytical results to the default IGW SSL. The applicable depth for each soil boring is shown within the default IGW SSL data tables (**Appendix I2**).

CCPW Metals concentrations exceeding the NJDEP default IGW SSL are presented in **Table 5-5** and illustrated on **Figures 5-9, 5-10, and 5-11**.

Antimony was detected at concentrations exceeding the IGW SSL throughout Site 114 (**Figures 5-9 and 5-10**). RI analytical results indicated that most of the Sb concentrations exceeding the IGW SSL at Site 114 have been delineated to within the Site 114 boundaries. However, one location near the northwestern corner of Site 114 requires additional delineation westward (**Figure 5-9**) and a few locations along Halladay Street require additional delineation eastward (**Figure 5-10**). Two soil borings (EF-12 and EF-13) were proposed for this delineation during the RI but could not be completed due to property access issues. These soil borings will be completed upon resolution of these access issues and the results reported in an RIR addendum. A single IGW SSL Sb exceedance at the northwestern corner of the 15 Halladay Street portion of Site 133 (10 West Apparel property) requires westward delineation (**Figure 5-11**). Antimony concentrations exceeding the IGW SSL appear to be delineated throughout the rest of the southern Garfield Avenue sites.

Nickel was detected at concentrations exceeding the IGW SSL throughout the Project Area (**Figures 5-9, 5-10, and 5-10**). Several areas require additional Ni delineation to the IGW standard. These include the following locations:

- West from the northwest corner of Site 114;
- North of the northeast corner of Site 114 toward Forrest Street;
- East of a few locations along Halladay Street;
- West from the southwest corner of Site 143;
- West from the northwest corner of the 15 Halladay Street portion of Site 133 (10 West Apparel property);
- South of a single location at Site 132 (10 West Apparel property); and
- East of a single location along the eastern border of Site 135.

There are four IGW SSL Ni exceedances east of Site 135 along Pacific Avenue that do not appear to be emanating from the Project Area and require no further delineation (**Figure 5-11**).

Thallium was detected at concentrations exceeding the IGW SSL in a few locations within the boundaries of Site 114 that are fully delineated and within the proposed CCPW remediation area (**Figures 5-9 and 5-10**). A single TI exceedance located in the northwest corner of the 15 Halladay Street portion of Site 133 is fully delineated and is within the planned CCPW remediation area (**Figure 5-11**).

Currently, there is no default IGW SSL for V.

### 5.3.3 Other Site 114 Impacts

Historically, the main focus of RI activities in the project area has been the delineation of Cr<sup>+6</sup>, CCPW, and CCPW-related materials. However, based upon PPG's former ownership of Site 114, the RI activities have also included sampling and analysis for other compounds and materials on or emanating from Site 114. PSE&G has accepted responsibility for the former MGP operations on the eastern portion of Site 114 and has conducted a comprehensive RI program to identify the nature and extent of the former MGP impacts. Therefore, while PPG's testing and analyses have included VOCs, SVOCs, and metals attributed to MGP activities, PSE&G has reported extensively on these materials and PPG will reference PSE&G's reports to address delineation of MGP related impacts.

Potential impacts related to PPG or subsequent Site owners include VOCs, SVOCs, TAL metals, and PCBs. These impacts include compounds that may not be indicative of the former MGP or chromate processing operations, but may be emanating from Site 114. Some of these non-CCPW compounds may also be found on neighboring sites resulting from sources unrelated to former PPG or MGP operations. PPG's responsibility for these compounds is limited to those found on or emanating from Site 114 and does not include exceedances of the regulatory criteria in offsite areas that are not clearly emanating from Site 114.

Based upon the data, it appears that most of the non-chrome issues related to COCs on or emanating from Site 114 are co-located with Cr<sup>+6</sup> and CCPW-related impacts that will be addressed during RI activities.

#### 5.3.3.1 TAL Metals

Although the CCPW-related metals Sb, Cr, Ni, Ti, and V are included in the TAL metals analytical suite, they were discussed separately in **Section 5.3.2** because they were generally related to chromate processing operations where they are co-located with CCPW or Cr<sup>+6</sup> impacted materials.

The remaining 18 TAL metals include six metals that were detected at concentrations exceeding the NJDEP SRS and 12 metals at concentrations exceeding the NJDEP default IGW SSLs within the Project Area. Five of these 12 metals exceeding the IGW SSL also exceeded the NJDEP SRS. Mercury and CN, two MGP-related compounds, are also discussed in this section.

The TAL metals detected on or emanating from Site 114 at concentrations exceeding the NJDEP SRS include the following:

- Al
- As
- Cu
- Pb
- Mn
- Hg

The TAL metals and CN detected on or emanating from Site 114 at concentrations exceeding the NJDEP default IGW SSLs include the following:

- Al
- As
- Ba
- Be
- Cd
- Co
- CN
- Pb
- Mn
- Hg
- Se
- Ag
- Zn

#### TAL Metals Exceeding the NJDEP SRS

TAL metals exceedances of the NJDEP SRS are reported in **Table 5-1** and illustrated on **Figures 5-12, 5-13, and 5-14**. For the purpose of this RIR, the discussion of Hg will be included with the TAL metals. Note that there were no exceedances of the SRS for CN.

Aluminum exceeded the SRS in shallow soil samples at six locations within the boundaries of Site 114 (**Figures 5-12 and 5-13**), is fully delineated, and is not emanating from Site 114. All six of these locations are within the area of proposed remediation for CCPW impacts. There were no Al exceedances in the southern Garfield Avenue Sites (**Figure 5-14**).

Arsenic was detected at concentrations exceeding the NJDEP SRS throughout the Project Area (**Figures 5-12, 5-13, and 5-14**). Although As may be associated with former MGP operations, the majority of the As in the Project Area is attributable to the historic fill that is ubiquitous throughout this area of Jersey City. In general, As is delineated along the western boundary of Site 114 and in the northeastern portion of Site 114. It is not delineated to the south and southeast areas of Site 114. The concentrations of As detected along the southern Site 114 boundary and Carteret Avenue fall within the range presented in the NJDEP Historic Fill Database and boring logs confirm that the material is fill. Therefore, As is not considered to be emanating from Site 114 southward and no additional delineation is proposed. For remediation purposes, fill material that is impacted by CCPW at concentrations exceeding the CrSCC does not qualify as historic fill under the NJDEP TRSR (NJDEP, 2009b) and will be addressed during CCPW remediation.

Copper did not exceed the NJDEP SRS at any location on or emanating from Site 114. Two Cu exceedances of the SRS were detected outside the eastern and southeastern boundaries of Site 114

but are not emanating from Site 114 (**Figure 5-13**). Three exceedances were observed on the southern Garfield Avenue Sites (**Figure 5-14**); however, these are not related to and are not emanating from Site 114.

Lead was detected at concentrations exceeding the NJDEP SRS throughout the project area (**Figures 5-12, 5-13, and 5-14**). Although Pb may be associated with former MGP operations, the majority of this Pb is generally attributable to the historic fill that is ubiquitous throughout this area of Jersey City. In general, Pb is delineated along the western boundary of Site 114 and in the northeastern portion of Site 114. It is not delineated in one area at the southwest border, one area at the south-central border, and one area at the eastern borders of Site 114. The concentrations of Pb detected along southern Site 114 boundary and Carteret Avenue fall within the range presented in the NJDEP Historic Fill Database. Therefore, Pb is not considered to be emanating from Site 114 southward and no additional delineation is proposed. For remediation purposes, fill material that is impacted by CCPW at concentrations exceeding the CrSCC does not qualify as historic fill under the NJDEP TRSR (NJDEP, 2009b) and will be addressed during CCPW remediation.

Manganese exceeding the NJDEP SRS was detected at one soil boring location outside the western border of Site 114 (**Figure 5-12**) and one within Carteret Avenue outside the southeastern border of Site 114 (**Figure 5-13**). Neither of these Mn exceedances were on or emanating from Site 114. There were no Mn exceedances in the southern Garfield Avenue Sites that emanated from Site 114 (**Figure 5-14**).

Mercury was detected at concentrations exceeding the NJDEP SRS at three locations on Site 114 (**Figure 5-13**). The Hg detected at these soil borings is likely related to former MGP operations, is fully delineated, and is not emanating from Site 114. These three locations are within the proposed CCPW remediation area. There are several Hg SRS exceedances on the southern Garfield Avenue sites but these are clearly unrelated to Site 114 operations and are not emanating from Site 114 (**Figure 5-14**).

#### TAL Metals Exceeding the NJDEP IGW SSL

The NJDEP default IGW SSL apply to unsaturated soils above the water table. The applicable depth for each soil boring is shown within the IGW SSL data tables (**Appendix I2**).

TAL metals concentrations exceeding the NJDEP default IGW SSL are presented in **Table 5-5** and illustrated on **Figures 5-15 through 5-23**.

Although As was detected at concentrations exceeding the default IGW SSLs on Site 114, it appears to be fairly well delineated to the IGW SSL within the unsaturated soils and does not appear to be emanating from Site 114 (**Figures 5-15 and 5-16**). Arsenic was detected at concentrations greater than the IGW SSL at several areas outside the Site 114 boundaries along Carteret Avenue and Halladay Street, a single location along Garfield Avenue, and at concentrations greater than the IGW SSL throughout portions of southern Garfield Avenue Sites 132, 133, 135, and 137. However, these detections on the southern Garfield Avenue Sites appear unrelated to Site 114 and have not emanated from Site 114 onto these properties (**Figure 5-17**). All concentrations of As in the unsaturated zone were within the limits for historic fill presented in the NJDEP Historic Fill Database and the borings logs confirm the material as historic fill. Therefore, no additional delineation is proposed for As. Fill material that is impacted by CCPW at concentrations exceeding the CrSCC



does not qualify as historic fill under the NJDEP TRSR (NJDEP, 2009b) but will be addressed during CCPW remediation.

Barium was detected at two soil boring locations within the former MGP area of Site 114 (**Figure 5-16**). It is fully delineated, is not emanating from Site 114, and is within the proposed CCPW remediation area. Barium was also detected at several locations south of Site 114 but did not emanate from Site 114 to these areas and is unrelated to Site 114 (**Figure 5-17**).

Beryllium was detected at concentrations exceeding the IGW SSL at several locations in the southern and western portions of Site 114 (**Figures 5-15 and 5-16**). Beryllium IGW SSL exceedances are well delineated within the southeastern half of Site 114 and are not emanating from Site 114. Two locations along the southwestern boundary of Site 114 were delineated to the IGW SSL within the northern half of Carteret Avenue. However, a single Be exceedance at the western boundary of Site 114 at Garfield Avenue require further delineation (**Figures 5-15**). Beryllium was also detected at concentrations exceeding the IGW SSL at several offsite locations to the northwest, northeast, and southeast of Site 114 and within several of the southern Garfield Avenue sites south of Carteret Avenue (**Figure 5-17**). However, these offsite exceedances of the IGW SSL are not a result of Be emanating from Site 114.

Lead was detected at concentrations exceeding the NJDEP IGW SSL throughout the Project Area (**Figures 5-18, 5-19, and 5-20**). These Pb IGW SSL exceedances within the unsaturated soils are generally attributable to the historic fill that is ubiquitous throughout this area of Jersey City and therefore; could not be delineated to the IGW SSL. However, these concentrations of Pb fall within the range of historic fill presented in the NJDEP Historic Fill Database (NJDEP, 2009b) and boring logs from the PPG and PSE&G RIs confirm the presence of historic fill. Therefore, no additional delineation is proposed for Pb. Fill material that is impacted by CCPW at concentrations exceeding the CrSCC does not qualify as historic fill under the NJDEP TRSR (NJDEP, 2009b) but will be addressed during the CCPW remediation.

Aluminum, Cd, Co, Hg, Mn, and Zn were found throughout the Project Area and as such, could not be delineated to the IGW SSL (**Figures 5-15 through 5-23**). Cadmium and Zn results fall within the range of NJDEP Historic Fill Database ( NJDEP, 2009b) and these exceedances are considered as Historic Fill where they are not co-located with CCPW or Cr<sup>+6</sup> exceeding the CrSCC. Although Co, Hg, and Mn are not included in the NJDEP Historic Fill Database, their geographical extent is coincident with the pattern of non-indigenous fill within this area of Jersey City and is likely attributable to the coal residue, incinerator ash, and miscellaneous waste materials placed in this area as fill. The relatively low concentrations of these compounds were generally consistent with background concentrations of compounds commonly identified in fill material.

Silver and Se were found less frequently but could not be attributed to specific operations or issues related to Site 114 (**Figures 5-21, 5-22, and 5-23**). Silver and Se are fully delineated on Site 114, are not emanating from the Site, and will eventually be addressed during the CCPW remediation. Concentrations of Ag and Se detected outside of the Site 114 boundaries and on the southern Garfield Avenue Sites have not emanated from Site 114 and are unrelated to Site ownership or former Site operations.

Cyanide was detected at several locations, primarily in the former MGP area (**Figure 5-19**) and at one location just north of the former MGP area (**Figure 5-18**). Cyanide is fully delineated on Site 114, is

not emanating from the Site, and will eventually be addressed during the CCPW remediation. There were no CN exceedances in the southern Garfield Avenue Sites (**Figure 5-20**).

#### 5.3.3.2 SVOCs

Thirteen SVOCs were detected at concentrations exceeding the NJDEP SRS and 13 SVOCs were detected at concentrations exceeding the NJDEP default IGW SSLs within the Project Area. Nine of the 13 SVOCs exceeding the IGW SSL also exceeded the NJDEP SRS.

The SVOCs detected on or emanating from Site 114 at concentrations exceeding the NJDEP SRS include the following:

- 2-Methylnaphthalene
- 3+4-Methylphenol
- Acetophenone
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Carbazole
- Chrysene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Pyrene

The SVOCs detected on or emanating from Site 114 at concentrations exceeding the NJDEP default IGW SSLs include the following:

- 2-Methylnaphthalene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Naphthalene
- 1,2,4-Trichlorobenzene
- 1,4-Dichlorobenzene
- 3,5,5-Trimethyl-2-cyclohexene-1-one (isophorone)

- Acenaphthene
- Chrysene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

#### SVOCs Exceeding the NJDEP SRS

SVOC exceedances of the NJDEP SRS are reported in **Table 5-3** and illustrated on **Figures 5-24, 5-25, and 5-26**. Sampling for SVOCs was conducted to identify compounds on or emanating from Site 114, based upon PPG's former ownership of the Site. Therefore, SVOC sampling was not conducted offsite or on the southern Garfield Avenue sites except to address SVOC compounds emanating from Site 114. However, PSE&G conducted some soil sampling offsite and on the southern Garfield Avenue sites to delineate SVOCs related to their former MGP operations.

The compound 3,4-methylphenol was detected at a concentration exceeding the NJDEP SRS at a single location at the southeast corner of Site 114, is fully delineated, and is not emanating onto adjacent properties (**Figure 5-25**). This location falls within the CCPW remediation area and will likely be addressed during CCPW remediation.

The MGP-related compound 2-methylnaphthalene was detected at concentrations exceeding the NJDEP SRS in several soil borings located on the eastern portion of Site 114 near the former PSE&G MGP area (**Figures 5-24 and 5-25**). A single offsite exceedance of this compound was detected at the northeast corner of Carteret Avenue and Halladay Street. The extent of 2-methylnaphthalene exceedances is mainly confined to Site 114 and is fully delineated.

The compound acetophenone was detected at a concentration exceeding the NJDEP SRS at a single location (boring 4F) at the northeast corner of Site 114. This compound is fully delineated and is not emanating onto adjacent properties. This location falls within the CCPW remediation area and will likely be addressed during CCPW remediation.

Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene are polycyclic aromatic hydrocarbon ("PAH") compounds that are related to both former PSE&G MGP operations and historic fill throughout the Jersey City area. These SVOCs are delineated around much of Site 114 but SRS exceedances of these compounds are still evident in several areas along the Site 114 borders (**Figures 5-24, 5-25 and 5-26**). The concentrations of these SVOCs fall within the range of historic fill as presented in the NJDEP Historic Fill Database and the soil boring logs support the designation of historic fill. Therefore, no further delineation is needed for these compounds. Fill material that is impacted by CCPW at concentrations exceeding the CrSCC does not qualify as historic fill under the NJDEP TRSR (NJDEP, 2009b) but will be addressed during CCPW remediation.

Carbazole was detected at concentrations exceeding the NJDEP SRS at only two locations on Site 114 (**Figure 5-26**). One location is on the western side of Site 114 at Dakota Street and one location is within the southern portion of the former MGP area. Carbazole is fully delineated in both of these areas and is not emanating from Site 114.

Naphthalene and chrysene, two MGP-related compounds, were detected at concentrations exceeding the NJDEP SRS throughout the eastern half of Site 114 in and around the former PSE&G MGP area (**Figure 5-26**). Chrysene appears to be delineated and, with a single exception at the intersection of Carteret Avenue and Halladay Street, is confined to Site 114. Naphthalene was detected above the SRS throughout the eastern half of Site 114 and within a limited area along the northwestern boundary of Site 114. Additional delineation for naphthalene is required off the northeast corner of Site 114 on Halladay Street and at the southern border of Site 114 on Carteret Avenue just west of Halladay Street.

Pyrene, an MGP-related compound, was detected at a concentration exceeding the NJDEP SRS at a single location on Site 114 near the western end of Forrest Street (**Figure 5-26**). This compound is fully delineated and is not emanating from Site 114.

#### SVOCs Exceeding the NJDEP IGW SSL

SVOC exceedances of the NJDEP IGW SSL are reported in **Table 5-7** and illustrated on **Figures 5-27 and 5-28**. As discussed above, the NJDEP default IGW SSL apply to unsaturated soils above the water table. The applicable depth for each soil boring is shown within the IGW SSL data tables (**Appendix I2**).

The MGP-related PAH compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were detected at concentrations exceeding the IGW SSL in the northeastern portion of Site 114 in the former MGP area. Several of these compounds were also detected sporadically across the western half of Site 114 and southwestward onto Site 143 (**Figures 5-27 and 5-28**). The concentrations of these compounds fall within the range of historic fill as presented in the NJDEP Historic Fill Database and the soil boring logs support the designation of historic fill. Therefore, no further delineation is needed for these compounds. Fill material that is impacted by CCPW at concentrations exceeding the CrSCC does not qualify as historic fill under the NJDEP TRSR (NJDEP, 2009b) but will be addressed during CCPW remediation.

The MGP-related compound 2-methylnaphthalene was detected at concentrations exceeding the NJDEP IGW SSL at four locations within the former MGP area on Site 114 (**Figure 5-27**). One location at the northeastern corner of Site 114 requires additional delineation.

The MGP-related compound naphthalene was detected at concentrations exceeding the NJDEP IGW SSL at a few locations within the former PSE&G MGP area (**Figure 5-27**). These locations appear to be fully delineated and confined to Site 114.

Chrysene was detected at a concentration exceeding the IGW SSL at a single location at the former Dakota Street on the western portion of Site 114 (**Figure 5-28**). It is fully delineated and confined to Site 114.

The MGP-related compound acenaphthene was detected at concentrations exceeding the NJDEP IGW SSL at two locations within the former MGP area of Site 114 (**Figure 5-28**). These locations are fully delineated and are confined to the Site 114.

The compounds 1,4-dichlorobenzene and 1,2,4-trichlorobenzene were each detected in single boring locations at the northeast corner of Site 114 near the intersection of Forrest and Halladay Streets at concentrations exceeding the IGW SSL (**Figure 5-28**). Additional delineation to the northeast is required for each of these compounds.

The compound 3,5,5-trimethyl-2-cyclohexene-1-one (isophorone) was detected at a concentration exceeding the IGW SSL at a single location on the northern edge of Carteret Avenue outside of the southwestern Site 114 border (**Figure 5-28**). It is not on or emanating from Site 114 so no further delineation is planned for this compound.

#### 5.3.3.3 VOCs

VOCs on or emanating from Site 114 are related to PPG's former ownership of Site 114 or PSE&G's former MGP operations. Generally, the VOCs detected on Site 114 appear related to incidental solvent use, fuel, or former MGP operations. Five VOCs were detected at concentrations exceeding the NJDEP SRS and 11 VOCs were detected at concentrations exceeding the NJDEP default IGW SSLs within the Project Area. Three of the 11 VOCs exceeding the IGW SSL also exceeded the NJDEP SRS.

The VOCs detected on or emanating from Site 14 at concentrations exceeding the NJDEP SRS include the following:

- 1,4-Dichlorobenzene
- Benzene
- Tetrachloroethene
- Trans-1,3-Dichloropropene
- Vinyl Chloride

VOCs detected on or emanating from Site 114 at concentrations exceeding the NJDEP default IGW SSLs include the following:

- 1,1,1-Trichloroethane
- 1,2,4-Trichlorobenzene
- 1,4-Dichlorobenzene
- Chlorobenzene
- Dichloromethane
- Styrene
- Tetrachloroethene
- Benzene
- Ethylbenzene
- Toluene

- Xylenes

#### VOCs Exceeding the NJDEP SRS

VOC exceedances of the NJDEP SRS are reported in **Table 5-2** and illustrated on **Figure 5-29**. VOCs exceeded the NJDEP SRS are primarily at locations within the former MGP facility, extending onto the southern portion of Site 114 (**Figure 5-29**). Most of these VOC exceedances were delineated and confined to Site 114.

The only exceedance of the NJDEP SRS for 1,4-dichlorobenzene was at a location at the northeast corner of Forrest and Halladay Streets just outside of the Site 114 boundary (**Figure 5-29**). This VOC was not detected at any other location in the Project Area, and this compound is not related to any activities associated with Site 114. Therefore, this VOC is not related to materials on or emanating from Site 114.

Benzene, an MGP-related compound, was detected at concentrations exceeding the NJDEP SRS in several borings located on the eastern portion of Site 114 near the former PSE&G MGP area (**Figure 5-29**), a few locations offsite to the east along the eastern side of Halladay Street, and at one location on the southern side of Carteret Avenue. The extent of benzene exceedances on Site 114 has been fully delineated and falls within the area of proposed remediation for CCPW impacts. Three borings located outside of Site 114 along Halladay Street have been delineated by borings located in the alley between Halladay Street and Pacific Avenue. A boring located outside of Site 114 along Carteret Avenue has been delineated by borings located at the northern end of Site 137.

Tetrachloroethene (“PCE”) was detected at concentrations exceeding the NJDEP SRS at two locations in the northern portion of Site 114 and at one location east of Site 114 on the eastern side of Halladay Street just south of Forrest Street (**Figure 5-29**). The two locations on Site 114 are fully delineated and are not emanating from Site 114. The location on Halladay Street just south of Forrest Street did not emanate for Site 114 and no further delineation is proposed at this location.

The only exceedance of the NJDEP SRS for trans-1,3-dichloropropene was at a location in the central portion of Site 114 (**Figure 5-29**). Based on nearby borings, trans-1,3-dichloropropene is isolated to this one location and is fully delineated.

The only exceedance of the NJDEP SRS for vinyl chloride was at a location in the northeast corner of Site 114 (**Figure 5-29**). This vinyl chloride exceedance is fully delineated and is not emanating from Site 114.

#### VOCs Exceeding the NJDEP IGW SSL

VOC exceedances of the NJDEP IGW SSL are reported in **Table 5-6** and illustrated on **Figures 5-30 and 5-31**. As discussed above, the NJDEP default IGW SSL apply to unsaturated soils above the water table. The applicable depth for each soil boring is shown within the IGW SSL data tables (**Appendix I2**).

The only exceedances of the NJDEP IGW SSL for 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, and chlorobenzene were at a location at the northeast corner of Forrest and Halladay Streets just outside of Site 114 (**Figure 5-30**). These VOCs were not detected at any other locations and this compound

is not related to any activities associated with Site 114. Therefore, these compounds are not VOCs related to materials on or emanating from Site 114.

The only exceedances of the NJDEP IGW SSL for 1,1,1-trichloroethane were at two locations in the northern portion of Site 114 (**Figure 5-30**). One location has been excavated as part of the IRM#1 activities at Site 114. The other exceedance is located just east of the excavation area, within the former Morris Canal. Based on nearby borings, 1,1,1-trichloroethane is isolated to this one location. This boring is located within the area of proposed remediation for CCPW impacts.

The only exceedance of the NJDEP IGW SSL for dichloromethane was at a location at the northern end of Forrest Street outside of the Site 114 boundary (**Figure 5-30**). Dichloromethane was not detected at any other location and this compound is not related to any activities associated with Site 114. Therefore, this compound is not a VOC related to materials on or emanating from Site 114.

Styrene was detected at a concentration exceeding the IGW SSL at a single location in the eastern portion of Site 114 (**Figure 5-30**). It is fully delineated and confined to Site 114.

PCE was detected at concentrations that exceeded the NJDEP IGW SSL at several locations on Site 114, primarily located in the northern portion of the Site (**Figure 5-30**). This compound is fully delineated on most of Site 114. However, additional delineation is required at the northern Site 114 boundary west of Forrest Street.

As shown on **Figure 5-31**, BTEX compounds were detected at concentrations exceeding the NJDEP IGW SSL primarily located in the eastern half of the former MGP area on Site 114. The locations within Site 114 have been delineated with the exception of one benzene exceedance on Site 114 along the eastern boundary of Halladay Street. These BTEX exceedances are related to the former MGP operations. BTEX compounds (primarily benzene) were detected in three locations on Forrest Street and one on Halladay Street; however, these locations are not emanating from Site 114. Two other benzene exceedances are located on the western portion of Site 114, one located along the northern boundary of Garfield Avenue west of the remediation area, and one located south in the former Morris Canal area. These exceedances are fully delineated and are not emanating from Site 114.

#### 5.3.3.4 PCBs

PCBs on or emanating from Site 114 are related to PPG's former ownership of Site 114 and were not part of the former chromate ore processing operation. Total PCBs were compared to the NJDEP SRS and the NJDEP default IGW SSL.

##### Total PCBs Exceeding the NJDEP SRS

Total PCB exceedances of the NJDEP SRS are reported in **Table 5-4** and illustrated on **Figure 5-32**.

Total PCBs exceeded the NJDEP SRS at 12 locations within Site 114 (**Figure 5-32**). Most of these PCB exceedances were delineated and confined to Site 114. However, three areas required further delineation during the 2011 Soil RI:

- Total PCBs exceeding the NJDEP SRS were detected on Site 114 near the northern end of Forrest Street. Soil borings were advanced during the RI to complete the delineation of PCBs in this area.
- Total PCBs exceeding the NJDEP SRS were detected on the eastern boundary of Site 114 near Halladay Street. A soil boring was advanced at the eastern side of Halladay Street to delineate this exceedance.
- Total PCBs exceeding the NJDEP SRS were detected in a single boring along the western border of Site 114. A soil boring was advanced at the western edge of Garfield Avenue to delineate this exceedance.

Based upon the results of the borings advanced during the RI, PCBs are fully delineated within or close to the borders of Site 114 (**Figure 5-32**).

One historic soil sample result indicated that PCBs exceeding the USEPA TSCA threshold may be present east of the 2 Dakota Street slab that was previously remediated by PSE&G. A separate PCB Investigation was conducted in May 2011 to verify and delineate this potential issue, as discussed in **Section 4.6** of this RIR. PCBs related to this exceedance were delineated during this investigation and none of the samples collected for PCB analysis exceeded or even approached the TSCA threshold. The strategy and results of this investigation are presented in a separate report included in **Appendix G**.

#### Total PCBs Exceeding the NJDEP IGW SSL

Total PCB exceedances of the NJDEP IGW SSL are reported in **Table 5-8** and illustrated on **Figure 5-33**. As discussed above, the NJDEP default IGW SSL apply to unsaturated soils above the water table. The applicable depth for each soil boring is shown within the IGW SSL data tables (**Appendix I2**).

Total PCBs exceeding the IGW SSL were primarily at the same locations as those that exceeded the SRS. However, the location of the SRS exceedance along Halladay Street was in the saturated zone and the IGW SSL was not applicable to this sample (**Figure 5-33**). The total PCB concentrations exceeding the IGW SSL have been fully delineated.



## 6 Conclusions

The data from the Soil RI show with some identified exemptions, the COCs in soil have been delineated vertically and horizontally in and adjacent to the Project Area. A few areas remain where additional delineation or refinement of the delineation is required to better define potential remediation areas. This RI was conducted to address COCs in the soils of the Project Area. A separate RI will be conducted to address groundwater issues. This Soil RI was conducted with two purposes:

1. Define the environmental impacts in soils related to former chromate ore processing operations in and adjacent to the Project Area; and,
2. Define the environmental impacts in soils on or emanating from Site 114 that are related to PPG's former ownership of Site 114

Based upon the results of the RI, PPG concludes the following:

### Former Chromate Ore Processing Operations:

In general, Cr<sup>+6</sup> and CCPW metals related to former chromate ore processing operations have been delineated to the limits defined by the appropriate regulatory standards/criteria in the Project Area. Although refinement of the delineation may be needed in a few areas, the delineation of Cr<sup>+6</sup> and CCPW Metals is as follows:

- The western limit of Cr<sup>+6</sup> and CCPW metals is Garfield Avenue, extending from the NJ Transit Light Rail at the northern end to Caven Point Avenue at the southern end;
- The eastern limit of Cr<sup>+6</sup> is along Halladay Street for Site 114 and Pacific Avenue for the southern Garfield Avenue sites;
- The eastern limit of CCPW metals is along Halladay Street for Site 114 and along the alley between Halladay Street and Pacific Avenue for the southern Garfield Avenue Sites;
- The northern limit for Cr<sup>+6</sup> and CCPW metals is the NJ Transit Light Rail (the area to the north of the NJ Transit Light Rail is part of separate investigation);
- The southern limit of Cr<sup>+6</sup> and CCPW metals is about 100 feet north of Caven Point Avenue.
- The vertical limit for Cr<sup>+6</sup> and CCPW metals on Site 114 is generally about 20 feet in depth throughout most of Site 114, corresponding to where the CCPW-impacted fill was placed;
- Cr<sup>+6</sup> as deep as 65 feet was detected in several Site 114 locations where the meadow mat was missing or discontinuous and Cr<sup>+6</sup> appears to have leached downward from the CCPW source material;
- The vertical limit of Cr<sup>+6</sup> and CCPW metals throughout the southern Garfield Avenue Sites was at depths of less than 20 feet, roughly corresponding to the depth of the meadow mat;
- The CCPW metals Sb and V were found as deep as 25 feet in a few isolated areas on Site 114 where the meadow mat is missing or discontinuous. A single exceedance of Sb and V was detected at a depth of 28 ft bgs in the southeastern portion of Site 114;
- A single V exceedance was detected at 21 feet deep in the northeast corner of Site 137; and,

- Several areas require additional delineation in the unsaturated zone for IGW SSL Ni exceedances.

Additional refinement of the delineation to more precisely define remediation limits may be needed within a few selected areas.

#### Compounds on or Emanating from Site 114

The non-CCPW-related compounds on or emanating from Site 114 have been delineated to the limits defined by the appropriate regulatory standards/criteria. Several SVOC and TAL metals compounds were delineated to the limits allowed for historic fill within areas outside of the CCPW-impacted materials. Although refinement of the delineation may be needed in a few areas, the extent of the compounds on or emanating from Site 114 is as follows:

#### TAL Metals, Mercury, and Cyanide:

TAL metals exceedances were generally identified on or immediately adjacent to Site 114.

- The western limit of non-CCPW TAL metals exceedances on Site 114 is Garfield Avenue;
- The eastern limit of most TAL metals exceedances is Halladay Street;
- A limited area of As and Pb exceedances east of Site 114 fall within the NJDEP Historic Fill range and are considered historic fill where they are not co-located with CCPW impacts.
- The northern limit of TAL metals is the NJ Transit Light Rail and Forrest Street. Arsenic north of the western end of Forrest Street falls within the NJDEP Historic Fill range where it is not co-located with CCPW impacts;
- With a few exceptions, the southern boundary of TAL metals exceedances is Carteret Avenue. A few As and Pb exceedances south of Carteret Avenue that are emanating from Site 114 would fall within the NJDEP Historic Fill range if they were not co-located with CCPW impacts.
- Cyanide is fully delineated within the former MGP area on Site 114;
- The vertical extent of CN is generally less than one foot deep but one exceedance was noted at 6 feet deep in the former MGP area;
- The vertical limit of TAL metals and Hg is about 20 feet deep. However, the vertical extent of these compounds was generally much shallower throughout the Project Area;
- Concentrations of Al and Hg exceeding the IGW SSL were found on and adjacent to the Project Area, coincident with the historic fill material found throughout this section of Jersey City;
- Concentrations of Co exceeding the IGW SSL were found on Site 114 and the southern Garfield Avenue Sites generally within the former chromate ore processing and CCPW stockpile areas; and
- Concentrations of Cd and Zn exceeding the IGW SSL were detected on and adjacent to the Project Area. Concentrations of these compounds fall within the range of NJDEP Historic Fill where they are not coincident with CCPW or Cr<sup>+6</sup> greater than the CrSCC.

### SVOCs:

TAL metals exceedances were detected throughout the Project Area, coincident with the fill materials used to develop the land in this part of Jersey City.

- The extent of SVOC exceedances on or emanating from Site 114 is generally limited to the CCPW-impacted areas on and immediately adjacent to the Site. The remaining SVOC exceedances outside of the CCPW-impacted areas fall within the range of the NJDEP Historic Fill and require no further delineation;
- MGP-related SVOCs are generally concentrated in the eastern portion of Site 114;
- The vertical extent of SVOC exceedances on Site 114 is generally limited to about 20 feet deep, the depth of fill material at the Site; and
- The vertical extent of SVOCs is less than 20 feet deep throughout much of Site 114.

### VOCs:

VOC exceedances were generally identified on or immediately adjacent to Site 114.

- The western limit of VOC exceedances of the SRS on Site 114 is the former Morris Canal;
- One IGW benzene exceedance is located on the western Site 114 boundary at IRM #1;
- The eastern limit of VOC exceedances is about 50 feet east of Halladay Street;
- The northern limit of VOC exceedances is Forrest Street;
- The southern limit of VOC exceedances is Carteret Avenue;
- The vertical limit of VOC exceedances is generally less than 20 feet deep; and
- There are three benzene exceedances in the southern MGP area that were detected at depths approaching 50 feet.

### PCBs:

PCB exceedances were detected within four isolated areas on Site 114.

- The horizontal extent of PCBs is limited to three areas on Site 114 and a single offsite exceedance. All of these four locations are minimal in area and are well delineated (**Figure 5-32**);
- The vertical extent of PCB exceedances is less than six feet deep in all but a few samples;
- PCBs were detected at concentrations greater than the SRS at 12 feet in one boring and 17 feet in two separate borings. However, these exceedances are likely due to the material falling into the borehole during GeoProbe<sup>®</sup> sampling;
- The vertical limit of PCBs is within the fill material at Site 114; and
- No PCBs were found exceeding or even approaching the TSCA threshold limit.

## 7 Recommendations

The results of the RI indicate that remediation is necessary within the Project Area. Nearly all of Site 114 and a portion of the remaining Project Area will require some form of remediation. A Soil Remedial Action Work Plan (“RAWP”) is being prepared in parallel with this RIR. The specific means and methods appropriate for remediating the Project Area will be selected and proposed in this RAWP to effectively protect human health and ecological receptors in and around the Project Area. Despite the need for additional delineation, remediation of soil impacts within the Project Area can be implemented in the near term; the areas where additional delineation is required will not significantly impact the overall remedial strategy for the Project Area. Recommendations for additional delineation or refinement of delineation to facilitate proposed remediation activities are as follows:

### 7.1 Recommendations Based On COC Categories

Based upon the results of the Soil RI, additional delineation is required. These recommendations are identified based upon COC categories (i.e. VOC, SVOC, etc.) and discussed below.

#### 7.1.1 Hexavalent Chromium

Additional Cr<sup>+6</sup> delineation is proposed in the following areas:

- West from the southwest corner of Site 114 near the intersection of Garfield and Carteret Avenues;
- West of the southwest corner of Site 143 at Garfield Avenue;
- East of Halladay Street north of Carteret Avenue (Halstead Building);
- In the area bounded to the east by Halladay Street, to the south by Forrest Street and to the north by the NJ Transit Light Rail;
- West of the 15 Halladay Street portion of Site 133 beneath the 10 West Apparel building; and,
- South of Caven Point Avenue within the profile of the former Morris Canal to confirm visual observations during the southern Canal Boring Program.

#### 7.1.2 CCPW Metals

Additional CCPW metals delineation based upon the NJDEP SRS is proposed in the following areas:

- West of the southwest corner of Site 137;
- West of the southwest corner of Site 143 at Garfield Avenue;
- East of Halladay Street just north of Carteret Avenue (Halstead Building); and
- West of the 15 Halladay Street portion of Site 133 beneath the 10 West Apparel building.

Additional delineation based upon the IGW SSL is proposed in the following areas:

- West from the northwest corner of Site 114;

- North of the northeast corner of Site 114 toward Forrest Street;
- West from the southwest corner of Site 143;
- Westward from the northwest corner of the 15 Halladay Street portion of Site 133 (onto the 10 West Apparel property);
- South of a single location at Site 132 (10 West Apparel property); and
- East of a single location along the eastern border of Site 135.

### 7.1.3 TAL Metals

The vertical and horizontal extent of TAL metals based upon the SRS require no further delineation. Additional TAL metals delineation based upon the IGW SSL is recommended in the following area:

- West of Site 114 on Garfield Avenue.

### 7.1.4 SVOCs

Additional delineation based upon the SRS is proposed in the following areas:

- Northeast of Site 114 on Halladay Street; and
- South of Site 114 on Carteret Avenue west of Halladay Street.

Additional delineation based upon the IGW SSL is proposed in the following area:

- Northeast of Site 114 on Halladay Street.

### 7.1.5 VOCs

The vertical and horizontal extent of VOCs based upon the SRS require no further delineation. Additional delineation of VOCs based upon the IGW SSL is proposed in the following areas:

- Northeast of Site 114 west of Forrest Street.

### 7.1.6 PCBs

The vertical and horizontal extent of PCB impacts have been delineated based upon the SRS and the IGW SSL. No further delineation of PCBs is proposed.

## 7.2 Schedule

Based upon the additional delineation proposed above, a supplemental RI field program will be implemented. PPG will implement this field program upon receipt of NJDEP's comments on this RI report and agreement upon the additional delineation required. A tentative schedule for this work is as follows:

- Mobilization – two to three weeks from finalization of the scope of work;
- Completion of the supplemental soil borings – two to three weeks;

- Receipt of analytical data – about three weeks from submittal to the laboratory;
- Data validation – about four weeks from receipt of final analytical results from the laboratory;  
and,
- The RI Report Addendum – about six weeks from the completion of data validation.

### 8. Certification

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

Regarding the Remedial Investigation Report dated February 2012, for PPG Hudson County Chromate Sites 114, 132, 133, 135, 137, 143, and 186, located in the 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 and 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 true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties."*

MARK E. TEERL

Typed/Printed Name

CORPORATE DIRECTOR ENVIRONMENTAL AFFAIRS/PPG INDUSTRIES, INC

Title/Firm

Mark E. Teerl

Signature

2/2/2012

Date

Sworn to and subscribed before me on this 2 day of FEBRUARY, 2012.

Mary Ann Woodrow

Notary Public

Stamp and Seal/Commission Expiration Date

COMMONWEALTH OF PENNSYLVANIA  
 Notarial Seal  
 Mary Ann Woodrow, Notary Public  
 Hampton Twp., Allegheny County  
 My Commission Expires June 11, 2013  
 Member, Pennsylvania Association of Notaries

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