Contract No.: EP-W-09-002
WA #: 054-RICO-A282

Region 2 RAC2
Remedial Action Contract

Final Remedial Investigation Report

Wolff-Alport Chemical Company Site

Remedial Investigation/Feasibility Study

Ridgewood, Queens, New York

July 3, 2017

503724

CDM Smith

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Acronyms

AARST	American Association of Radon Scientists and Technologies
ACM	asbestos containing materials
AEC	Atomic Energy Commission
ARAR	Applicable or Relevant and Appropriate Requirement
ASI	Aqua Survey Inc.
ATD	alpha tracking detectors
ATSDR	Agency for Toxic Substances and Disease Registry
BCG	biota concentration guide
bgs	below ground surface
BVNA	Bureau Veritas North America
BWSO	Bureau of Water and Sewer Operations
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
cm	centimeter
cpm	counts per minute
COPC	chemical of potential concern
CSM	conceptual site model
CSO	combined sewer overflow
CSS	combined sewer system
CT	central tendency
DCE	dichloroethene
4,4'-DDD	4,4'-dichlorodiphenyldichloroethane
4,4'-DDT	4,4'- dichlorodiphenyltrichloroethane
DO	dissolved oxygen
DOE	Department of Energy
dpm/cm^2	disintegration per minute per square centimeter
DPT	direct push technology
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
Equity	Equity Environmental Engineering
ESA	Environmental Site Assessment
ESI	Environmental Site Investigation
°F	degree Fahrenheit
FCN	field change notification
FS	feasibility study
FSS	Final Status Survey
ft	feet or foot
GED	Greenwich Environmental Designs
GIS	geographic information system
GPR	ground penetrating radar
GPS	global positioning system
HHRA	human health risk assessment
HI	hazard index
HRS	Hazard Ranking System

IAEA	International Atomic Energy Agency
ID	inside diameter
IDW	investigation derived waste
ISOCS	In Situ Object Counting System
K	hydraulic conductivity
K_d	soil-water partition coefficient
K-40	potassium-40
LBA	Louis Berger Associates
LBP	lead based paint
LLC	limited liability corporation
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCL	Maximum Contaminant Level
MDA	minimum detectable activity
MDS	mobile detection system
mg/kg	milligram per kilogram
mL/g	milliliter per gram
MRL	minimal risk levels
mrem	milli Roentgen equivalent man, millirem
msl	mean sea level
NaI	sodium iodide
NCRP	National Council on Radiation Protection and Measurements
NFG	National Functional Guidelines
NPL	National Priorities List
NRA	Neighborhood Radiological Assessment
NRC	Nuclear Regulatory Commission
NYCDDC	New York City Department of Design and Construction
NYCDEP	New York City Department of Environmental Protection
NYC DOHMH	New York City Department of Mental Health and Hygiene
NYSDEC	New York State Department of Environmental Conversation
NYSDOH	New York State Department of Health
OD	outer diameter
ORP	oxidation reduction potential
OSWER	Office of Solid Waste and Emergency Response
PAH	polycyclic aromatic hydrocarbons
PBS	petroleum bulk storage
PCB	polychlorinated biphenyl
pCi/g	picocurie per gram
pCi/L	picocurie per liter
PCE	tetrachloroethylene
PID	photoionization detector
PPE	personal protection equipment
ppm	parts per million
PRG	preliminary remediation goal
PS/IS	public elementary and intermediate school
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
QC	quality control
Ra-224	radium-224
Ra-226	radium-226
RAC	Remedial Action Contract

RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
REC	recognized environmental conditions
RESRAD	RESidual RADioactivity, DOE computer model
RI	remedial investigation
Rn-220	radon-220 / thoron
Rn-222	radon-222
RME	reasonable maximum exposure
ROD	Record of Decision
ROPC	radionuclides of potential concern
RSCO	Residential Soil Cleanup Objectives
RSL	Regional Screening Level
RSS	Radiological Scoping Survey
RST 2	Removal Support Team 2
site	Wolff-Alport Chemical Company Site
SLERA	Screening Level Ecological Risk Assessment
SOP	Standard Operating Procedure
SOW	Statement of Work
SU	standard unit
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TAGM	Technical and Administrative Guidance Memorandum
TCE	trichloroethylene
TCL	Target Compound List
the daycare	Audrey Johnson Daycare
the school	Frances E. Carter (384) public elementary and intermediate school
Th-232	thorium-232
UCL	upper confidence limit
USDA	United States Department of Agriculture
USGS	United States Geological Survey
U-238	uranium-238
U(IV)	+4 valent uranium
U(VI)	+6 valent uranium
VOC	volatile organic compound
µg/L	microgram per liter
µg/kg	microgram per kilogram
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
µR/hr	microRoentgen per hour
USDA	United States Department of Agriculture
UST	underground storage tank
UTL	upper tolerance level
VISL	vapor intrusion screening level
WA	work assignment
WACC	Wolff-Alport Chemical Company
Weston	Weston Solutions Inc.

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Executive Summary

CDM Federal Programs Corporation (CDM Smith) received Work Assignment 054-RICO-A282 under the Remedial Action Contract 2 (RAC 2) to perform a Remedial Investigation/Feasibility Study (RI/FS) for the United States Environmental Protection Agency (EPA) Region 2 at the Wolff-Alport Chemical Company (WACC) Site (the site). The overall purpose of the RI report is to present the results of the field investigations, including the results of relevant historical investigations.

Site Location and Description

The WACC site is located in Ridgewood, Queens County, New York, at the county border with Brooklyn. The site includes the former WACC property that is now subdivided into several properties (Lots 31 [partial], 33, 42, 44, 46, and 48) of Queens Borough Block 3725, as well as adjacent areas including streets, sidewalks, buildings, and the sewer system where contaminants have migrated or threaten to migrate from the WACC property.

The WACC property covers approximately 0.75 acre bounded by Irving Avenue to the southwest, Cooper Avenue to the northwest, and an active cabinet manufacturer (5606 Cooper Avenue) to the east. At present, the property is covered with contiguous structures, except along its eastern edge in the former rail spur area. These structures will be referred to as the WACC buildings. A description of the various lots that make up the WACC property and the buildings that occupy each are included in the table below.

Lot	Address	Description
31	NA	The former rail spur adjacent to the WACC buildings is fenced, covered with gravel and used as an automobile storage/parking area by the Primo auto repair shop. The non-fenced portion of the former rail spur, which is not adjacent to the WACC buildings, is partially vegetated.
33	1133-1139 Irving Avenue	A 1-story masonry warehouse formerly owned by Arctic Glacier Losquardo, Inc. The property was recently transferred to Irving Unique Development, Limited Liability Corporation (LLC) and is currently unoccupied.
42	1129 Irving Avenue	A 1-story masonry building, subdivided and occupied by TerraNova Construction and Primo Auto Body. The TerraNova building is primarily used for construction but also has an office that is frequently occupied. The building housing the Primo Auto Body shop is active, with 5-10 employees typically occupying the building during the work day.
44	1127 Irving Avenue	A 1-story masonry building housing the Celtic Bike Shop. The building is active, with 2-5 employees typically occupying the building during the work day. This building was previously occupied by Primo Auto Body.
46	1125 Irving Avenue	A 2-story masonry and frame building housing the Jarabacoa delicatessen/grocery, office space, and three unoccupied residential apartments on the second floor. A second attached one-story masonry building houses Primo Flat Fix and a former mini-all terrain vehicle shop.
48	1514 Cooper Avenue	A 1-story masonry building housing the K&M auto repair shop and office space. The building is actively used.

The neighborhoods surrounding the WACC property contain light industry, commercial businesses, residences, a school, and daycare. An active rail line passes within 125 feet to the southeast of the property; the Cemetery of the Evergreens is located to the east and south of the rail line and covers over 225 acres.

The following nearby properties were investigated (or reviewed) to determine if they have been impacted by WACC processes as part of this RI.

308 Cooper Street – Former residences across Irving Avenue from the WACC property. The building was recently demolished. The property is zoned residential. The former residential structures were in place since at least 1914.

5606 Cooper Avenue – This currently active cabinet manufacturer forms the northeast boundary of the WACC property. The property contains a portion of the former rail spur and a large manufacturing building. The building was constructed sometime between 1954 and 1966.

335 Moffat Street – This former warehouse/ice manufacturing building recently became unoccupied. It was built sometime between 1933 and 1951.

338-348 and 350 Moffat Street – The former warehouses at 338- 348 Moffat Street are now used for residential purposes. An adjacent building at 350 Moffat Street houses a circus training facility. These structures appear to have been constructed between 1954 and 1966.

School and Daycare – The Frances E. Carter (384) public elementary and intermediate school (PS/IS) (the school) is located within ¼ mile southwest of the WACC property on Kings County Tract 409, Block 2002, at 242 Cooper Street. The building appears to have been constructed between 1966 and 1975. Previously the area was filled with residential structures. The Audrey Johnson Daycare (the daycare) is located within ¼ mile south of the WACC property at 272 Moffat Street. The building structure appears to have been in place before 1924.

Site History

WACC operated at the property from the 1920s until 1954, importing monazite sand via rail and extracting rare earth metals from the material. Monazite sand contains approximately 6% to 8% or more of thorium (Th) and 0.1% to 0.3% of uranium (U). The acid treatment process of the monazite sands converts the phosphate and metal component of the monazite to water-soluble species, rendering the rare-earth materials extractable while dissolving the Th and U in an acid waste process liquor and generating tailings. This process concentrated the Th-232 and U-238 present in the sands, with Th at higher concentrations.

Until 1947, WACC disposed of the waste from monazite sand processing in the sewer (process liquors) and possibly by burial/spreading on the property (waste tailings). During its years of operation, WACC occupied three structures under the address of 1127 Irving Avenue (currently lots 42 and 44). The WACC operation included two yard areas: one between the company's buildings at Lot 42 and the other on the eastern end of the property at the northern end of Moffat Street at Lot 33. These former yard areas were reportedly used as staging areas for monazite sands or waste tailings containing Th-232 and U-238. WACC did not operate at Lot 46 or Lot 48, but those properties are affected by the radioactive materials associated with the site.

According to the U.S. Department of Energy (DOE), the Atomic Energy Commission (AEC) ordered WACC to halt sewer disposal of Th waste in the fall of 1947 (Louis Berger and Associates [LBA] 2010c). Thereafter, thorium was precipitated as thorium oxalate sludge and sold to the AEC.

Previous Investigations

The radiological surveys by city, state, and federal agencies have identified radioactivity above background levels within portions of the WACC property, in soils beneath and around the WACC facility and adjacent buildings, and on adjacent sidewalks, streets, and sewers. Data from the following investigations was evaluated as part of the RI:

- 1988 Radiological Survey performed by the EPA and the NYC Bureau of Radiological Control (BRC) (EPA 2000)
- 2007 New York State Department of Environmental Conversation (NYSDEC) Site Visit Report (NYSDEC 2007)
- 2010 New York City Department of Design and Construction (NYCDDC) Phase I/Phase II Environmental Site Assessment (ESA) for the Former Wolff-Alport Chemical Corporation Site (LBA 2010a/b)
- 2010 NYCDDC Final Draft Radiological Scoping Survey (RSS) for the Former Wolff-Alport Chemical Corporation Site (LBA 2010c)
- 2012 Agency for Toxic Substances and Disease Registry's (ATSDR's) Health Consultation (ATSDR 2012)
- 2012 Gamma radiation exposure rate measurements and thoron concentration measurements from locations on and in the vicinity of the Wolff-Alport Chemical Company for EPA (Weston 2012)
- 2012 and 2013 Search for radon and thoron potential gas entry points by EPA (EPA 2013a)
- 2013 Supplemental perimeter radon and thoron gas air concentration sampling by EPA (EPA 2013b)
- 2014 Bureau Veritas North America/New York City Department of Environmental Protection (BVNA/NYCDEP) Assessment of Potential Radiological Impact Within and Adjacent to Combined Sewer System near the Former Wolff-Alport Chemical Corporation Facility (BVNA 2014)
- 2014 Multi-Agency Former Wolff-Alport Chemical Company Neighborhood Radiological Assessment (New York State Department of Health [NYSDOH] et al. 2014)
- 2014 ATSDR's Supplement to the 2012 Health Consultation (ATSDR 2014)
- 2014 Weston Solutions, Inc. (Weston)/EPA Radiation Assessment and Response Action Report for the Former Wolff-Alport Chemical Company Site (Weston 2016)

- 2015 Results of thoron gas air concentration measurements performed inside and behind two buildings located at 338-350 Moffat Street, Brooklyn, NY (EPA 2015).

In April 2013, EPA installed fencing at the site and shielded portions of the radioactive soil with rock and clean fill to reduce accessibility to the waste material. Additional shielding consisting of lead, steel, and concrete was installed within several structures at the WACC property and along a portion of the Irving Avenue sidewalk. A radon mitigation system was also installed within one building. These activities were completed in December 2013. Following completion of these initial investigations and mitigation activities, the site was listed on the National Priorities List (NPL) on May 12, 2014.

Remedial Investigation

Environmental media investigated during the RI included soil, sediment, groundwater, air, and building/sewer construction materials. Samples were primarily collected to delineate the extent of media contaminated by radioactive waste; however, some samples were also analyzed for non-radiological contaminants. Initial RI field activities were performed in 2015 and 2016. Following review of the initial data collected, additional investigations were performed in 2017. The investigation included the following activities:

- Building investigations including building material gamma surveys, wipe and building materials sampling, and hazardous materials survey
- Soil investigations including gamma walk-over surveys and soil sampling
- Hydrogeologic investigations including monitoring well installation and gamma logging, groundwater sampling and synoptic water level measurements, and hydraulic conductivity assessments
- Sewer investigations including fiberscope mapping with in-sewer gamma count and gamma exposure rate surveys, sewer material sampling, sewer soil borings, and sediment sampling in Newtown Creek where the sewers discharge
- Gamma exposure rate confirmation surveys
- School and daycare investigations including soil sampling below and adjacent to the school and daycare, gamma exposure rate surveys, and radon and thoron evaluations.

Physical Characteristics of the Study Area

The WACC property is at an elevation of approximately 70 feet above mean sea level (msl), and the ground surface in the area generally slopes gently to the southwest. The eastern edge of the site is adjacent to an elevated train line parallel to Moffat Street. The ground surface rises sharply toward the train line and continues to rise to the cemetery east of the site to elevations as high as 160 feet above msl.

The site is located in a highly-urbanized area where infiltration of precipitation is largely restricted due to the high percentage of ground surface covered by pavement and buildings. Storm water in the majority of the site area is directed into catch basins which connect to a

combined sewer system (CSS). The WACC property is located at the head of a branch of the sewer system. The sewer flows away from the property to the west down Irving Avenue before turning on Halsey Street and joining larger sewers on Wyckoff Avenue. During large storms, these sewers discharge directly into the East Branch of Newtown Creek

Drilling advanced into the upper portion of the aquifer in this area and encountered two types of unconsolidated material: fill and Upper Glacial Aquifer deposits (till and outwash). Fill near the WACC property is typically 5-15 feet thick and is generally characterized by the presence of man-made materials (brick, coal, various building materials), intermixed with silt, sands, and gravels. Much of the upper layers of the fill in borings at the WACC property and in some borings to the south on Moffat Street was a black, gray, and/or white cinder or ash-like material. This material is likely waste tailings described in previous reports and was found between 0-4 feet bgs near the WACC property and between 0-6 feet bgs along Moffat Street.

Upper Glacial Aquifer soils were found from the bottom of fill (0-15 feet bgs) to beyond the deepest boring performed at the site (75 feet bgs). The upper portion of the glacial deposits (down to approximately 25-37 feet bgs) is made up of glacial till which is yellowish brown dense silty sand and gravel. The material underlying the glacial till is glacial outwash, slightly more uniform and coarse in texture than the till and extends from the bottom of the till to at least 75 feet bgs (total depth of exploration at the site).

Nature and Extent of Contamination

Primary contaminants of concern at the site are the radioactive isotopes Th-232 and radium (Ra)-226. Since the minimum detectable activity using gamma spectroscopy for U-238 is high, gamma spectroscopy results are not used as a first line indicator for U-238. Therefore, Ra-226 is used to indicate U-238 levels, assuming the two isotopes are in equilibrium since Ra-226 is the decay progeny of U-238. Th-232 in combination with Ra-226 are used to determine the nature and extent of contamination associated with WACC. The following discussion summarizes the findings of the investigations by media.

Building Materials - Contamination remains in the building structures at the WACC property, primarily in the buildings that previously operated the kiln/vat in which monazite sands processing took place (Lots 42 and 44), in the basement of the deli (Lot 46), and, to a lesser extent, in the warehouse on Lot 33 constructed above the former yard area. Contaminants are primarily embedded in the building structure with the highest concentration of Th-232 at 415.2 picocuries per gram (pCi/g) on a sample of brick from Lot 44.

Asbestos containing material (ACM) and lead based paint (LBP) and other suspect hazardous materials were also found in the WACC building structures and comparable to a building of its age.

Air – Previous investigations found concentrations of radon and thoron above the screening criteria in indoor and outdoor air at the WACC property. Air sampling conducted prior to radiation mitigation activities in 2012 and 2013 (installation of a radon mitigation system followed by radiation shielding) found the highest levels of air contamination at Lots 31, 42, 44, and 46 where the majority of the WACC processing activities took place (LBA 2010; Weston 2012;

EPA 2013a and b; and EPA 2015). The highest concentration of thoron in air was detected on Lot 31. Following Lot 42 radiation mitigation activities, the radon levels dropped inside the building occupied by TerraNova to below the screening criteria.

Soils – Under the WACC buildings, radiological contamination extends to a depth of 28 feet bgs under Lot 44, the former kiln/vat building, with a Th-232 concentration of 4.3 pCi/g and to 24 feet bgs under Lot 42, the former yard where the monazite sands were loaded into the kiln/vat building for processing, with a Th-232 concentrations of 2.6 pCi/g. The highest Th-232 concentration observed during the RI was found in SB-08, located in Lot 42, at 760 pCi/g from 10 to 12 feet bgs. The highest Th-232 concentration in soil was observed at 1,100 pCi/g during the LBA investigation in 2010.

There is widespread surficial radiological contamination related to storage or filling of tailings or monazite sands and/or surface runoff/erosion from those areas. Surficial contamination was observed in the former rail spur area, at the intersection of Irving Avenue and Moffat Street, the northern portion of Moffat Street and the eastern portion of Irving Avenue, and in the southeastern corner of Lot 31/northern part of 350 Moffat (area adjacent to the Moffat/Irving intersection). The contamination appears to have been primarily due to filling in the area with process tailings, as observed in soil borings. Other surficial contamination was likely caused by stockpiling of the monazite sands and tailings in the former storage yards allowing rainwater to transport contamination to lower topographic areas. This also allowed wind to transport the particulate matter through the air, likely depositing near the WACC property.

Polycyclic aromatic hydrocarbon (PAH) concentrations exceeding the screening criteria were found throughout the shallow soils at the WACC property. PAHs as deep as 7 feet bgs may be related to former underground storage tanks (USTs) or use of the area to store demolished cars. Similar concentrations were also found at the nearby property, 308 Cooper Street. Polychlorinated biphenyls (PCBs) exceeded the screening criteria by at least an order of magnitude in three locations, with a maximum concentration of 100,000 µg/kg. PCBs in the shallow soils can also be related to USTs or a sump below the building in Lot 33. Arsenic and iron concentrations exceeding the screening criteria were found in all samples at all depths and within the range of background levels, indicating the metals are likely associated with urban fill.

Sewers – The sewer investigation found significant radionuclide contamination present in the combined sewer system originating at the WACC property. Gamma count measurements are significantly elevated in the manholes south of the WACC buildings on Irving Avenue where process liquors containing thorium were likely discharged. The elevated gamma counts (>20 times background) continue in the sewer line and manholes on Irving Avenue for approximately two blocks. Radionuclide contamination within the pipes and the manholes is present in sediments and construction materials in the sewer manholes near the WACC property. The maximum radionuclide concentrations in sewer materials were found in manhole I-4, located near the intersection of Irving Avenue and Cooper Avenue, with Th-232 at 2,536.2 pCi/g and Ra-226 at 163.1 pCi/g. The maximum Th-232 concentration in sewer sediments was observed in manhole I2, located south of the WACC property on Irving Avenue, with Th-232 at 1,218.1 pCi/g and Ra-226 at 45.9 pCi/g.

Gamma scan levels generally drop to four times background at the intersection of Irving Avenue and Schaeffer Street and drop to background at the intersection of Irving Avenue and Eldert Street, with sporadic occurrences of gamma levels above four times background continuing in the sewer along Halsey Street to Wyckoff Avenue.

Radionuclide contamination appeared limited to the interior of the sewers as soil borings installed adjacent to the sewer lines found only limited radionuclide contamination. A data gap does remain as the bedding material below the sewers may be contaminated, as the fiberscope survey confirmed that there are breaks in the pipeline along Irving Avenue.

Sediment concentrations at the Newtown Creek outfall were above screening criteria with a maximum concentration of 70.2 pCi/g from 5 to 6 feet bgs. Samples exceeding criteria were limited to the area immediately adjacent to the outfall discharge.

Groundwater – Radionuclide contamination in the groundwater was limited to one groundwater sample that only slightly exceeded the screening criterion for Th-232 during the Round 2 sampling at 11 pCi/g. However, Round 1 and Round 2 samples were analyzed with methods that did not provide a MDA that was below the RI screening criteria. Therefore, additional sampling was necessary to acquire definitive data. Concentrations of Ra-226 and Th-232 in Round 3 and Round 4 were not detected above the RI screening criteria.

Chlorinated volatile organic compounds (VOCs), including tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (cis-1,2-DCE), exceeded screening criteria in the groundwater at each of the five monitoring wells. The maximum concentration of each was 930 micrograms per liter (µg/L), 7.7 µg/L, and 25 µg/L, respectively. However, chlorinated VOCs were not detected in the soil samples at the site, including those from each borehole prior to well installation where samples were collected or screened down to the water table. Additionally, the Phase I report did not indicate the presence of materials currently or in the past that would be associated with chlorinated VOCs. Therefore, to determine if the VOC contamination traveled from an upgradient source, an upgradient monitoring well MW-06 was installed in April 2017.

During Round 4 sampling, which included the upgradient monitoring well, four VOCs including chloroform, cis-1,2-DCE, PCE, and TCE exceeded the screening criteria. PCE was significantly elevated in all six wells, with concentrations ranging from 72 µg/L to 230 µg/L with the maximum concentration in MW-01. TCE also exceeded its RI screening criterion in all six wells with concentrations ranging from 0.95 µg/L to 5.1 µg/L with the maximum concentration also in MW-01. Cis-1,2-DCE ranged from 0.41 µg/L to 19 µg/L with the maximum concentration in MW-02. The results suggest that the chlorinated VOC contamination likely comes from an offsite source upgradient of MW-06.

Gamma Exposure Rate Confirmation Surveys – Gamma exposure rate surveys confirmed the results from the previous gamma exposure rate surveys conducted within the WACC buildings, on sidewalks, and on the streets near the WACC property. Exposure rates remain above background levels throughout each of these areas, but were within the background range outside of a few blocks from the WACC property. The maximum gamma exposure rates observed were collected on the roadway of Irving Avenue, one near the sidewalk curb and one in the middle of the street, south of the WACC property at 220 microRoentgens per hour (µR/hr) and 338 µR/hr,

School and Daycare Investigations – Investigations at the school and daycare did not indicate contamination due to the WACC processes as the data generated was all below or slightly above the RI screening criteria. Results included:

- School – Results of long-term radon and thoron sampling were below the screening criteria. Soil results for Th-232 and Ra-226 from samples collected below the school were also below the screening criteria.
- Daycare – Short-term radon concentrations collected at the daycare were either below or within 0.2 pCi/L of the screening criteria. The 7-day continuous air surveys for radon were below the RI screening criterion and the 5-day continuous air surveys for thoron were slightly above the RI screening criterion. Soil results for samples collected from underneath the daycare were also below the RI screening criteria.
- Gamma exposure rates were also collected from within the school and daycare and were all within or below the background observed for the neighborhood.

Fate and Transport

- The primary source of radionuclides at the site was the processing of imported monazite sands for rare earth elements extraction which formed the process liquor and process tailing byproducts.
- In the process liquors, Th-232 and U-238 are mobile and able to migrate as process liquors were continually discharged to the leaky sewer pipes under the building. These radionuclides would migrate to the subsurface soils. However, when the acid would dilute, the radionuclides would come out of solution, forming insoluble and immobile compounds, preventing the thorium from extending deeper in the soils.
- In the presence of process liquors, Ra-226 would be immobile in particulate form and would not migrate to the subsurface soils.
- The radionuclides would also migrate through the sewers, with Th-232 and U-238 falling out of solution as the acid diluted with the CSS water, a portion of Ra-226 going into solution as the pH increases, and particulate forms sorbing to sewer materials such as sediment.
- The process tailings were stored in the former storage yards uncovered subjecting the exposed tailings to wind and surface water in which they'd travel in particulate form. The process tailings were also disposed of by filling/spreading at the WACC property and the adjacent areas.

Conceptual Site Model

The conceptual site model follows the movement of the primary radionuclides from the monazite sands processing to the site media, including the building structures, soils, sewers, air, and groundwater.

Sources of Radionuclide Contamination

The sources of radionuclide contamination are the monazite sands and the monazite sands processing byproducts. The sands were transported by rail to the rail spur adjacent to the property and were stockpiled in the southern former storage yard. From here, they were moved to the yard adjacent to the former kiln vat building and entered processing through the archways of the kiln vat building that are still present. The monazite sand processing took place in the kiln/vat building.

Byproducts of the production process including process liquors and process tailings, contained high concentrations of radionuclides. The former storage yards were likely used to stockpile these tailings; the tailings were also used to fill low areas in and around the WACC property.

Pathways for Contaminant Release/Transport

Process liquor disposal in soils – The process liquors were disposed into drains leading to the combined sewer systems. The soil contamination is likely attributable to process liquor exfiltration via leaky drains and sewer pipes, and other surficial discharges within or adjacent to the kiln/vat building. Once the process liquor entered the soil matrix, it traveled downward through the soil column. The radionuclides in acid were mobile and were transported to an observed 26 feet bgs in the soils. The tendency is for radionuclides to form insoluble and immobile compounds, except in the presence of low pH. When the acid containing the more soluble and mobile radionuclides became diluted in the subsurface, the radionuclides formed immobile and insoluble complexes adsorbing to soils.

Process liquor disposal in sewers – Upon entering the CSS, the process liquors were diluted with incoming sewer water from other sewer branches. The radionuclides fell out of solution and adsorbed to particulate matter, traveling with the sediment downstream in the sewers or accumulating within the sewers as sludge or sediment within the sewer structures.

Stockpiling, handling, and filling – Monazite sands were unloaded from the rail spur and stockpiled in the former storage yards along with the process tailings. Handling of the sands and tailings likely spread them throughout the yard and rail spur areas. Surficial runoff likely transported the sands and tailings from localized areas in the storage yards to downgradient areas near the property including the former rail spur, the Moffat and Irving Avenue intersection, and 338-340 and 350 Moffat Avenue. Additionally, transport of radionuclide-laden dust and particulates from the uncovered stockpiles in the air likely contributed to the surficial soil contamination found in the nearby properties.

Human and Ecological Receptors

Human receptors may be exposed to the principal radionuclides through the following: direct contact with contaminated buildings materials, contaminated soils, and contamination sewer materials; external radiation in areas of high radiation emanating from the previously mentioned contaminated materials; and, inhalation of radon and thoron contaminated air.

Th-232 was detected in sediment at the Newtown Creek outfall. Ecological receptors, which are only present in Newtown Creek and not at the site, could be exposed to the radionuclides in the aquatic system through direct contact with the sediments at the Newtown Creek outfall.

Summary of Risk Assessments

Human Health Risk Assessment (HHRA)

In general, EPA recommends a target hazard index (HI) value of unity (1) and a target cancer risk range of 1×10^{-6} to 1×10^{-4} as threshold values for human health impacts. Both chemical- and radiation-related risks are higher relative to protective threshold criteria. Chemical risks for future receptors exceed the top of EPA's risk range or approach that level of risk. Chemical risk drivers in soil include PAHs and Aroclor 1260. Radiation risks frequently exceed the top of the risk range, surpass 10^{-3} in several instances, and the highest risks exceed 10^{-2}.

High cancer risk estimates are not unusual for radiological contaminants in an environmental setting. Background levels of radiation exposure in residential settings can be associated with risks approaching and often exceeding EPA's risk range. Risk estimates can also be interpreted in terms of annual radiation dose, which is a common means of assessing health risk in the nuclear physics community. The highest annual dose estimates, which approach or exceed 100 millirems (mrem), also exceed the radiological threshold criterion of 12 mrem/year for residential exposure and the U.S. Nuclear Regulatory Commission (NRC) value of 25 mrem/year for license termination.

The highest site-related risks are due to external exposure to gamma radiation and to inhalation of radon gas that collects indoors. Th-232 is responsible for over 90 percent of external radiation exposure, and Ra-226, as the parent of radon (Rn)-222, is responsible for a similar percentage of risk due to inhalation of radon. Th-232 and Ra-226 are likely to be primary risk drivers for risk management decisions.

Screening Level Ecological Risk Assessment (SLERA)

The site is in an industrial area with no environmentally sensitive areas (e.g., wetlands) and only limited habitat for most types of ecological receptors; thus, adverse exposures for ecological receptors at the site are unlikely. Due to the extremely limited habitat, a full SLERA was not conducted. The purpose of the focused SLERA is to describe the likelihood, nature, and extent of adverse effects in ecological receptors exposed to site-related radionuclides as a result of releases to the environment from past processing activities at the site. Because combined sewer overflow (CSO) discharges at the site may contain thorium waste from monazite sand processing, this evaluation focused on risks to ecological receptors exposed to the site-related CSO discharges in Newtown Creek.

The RESidual RADioactivity (RESRAD)-BIOTA model was used to estimate riparian receptors. Each radionuclide-specific biota concentration guide (BCG) represents the limiting radionuclide concentration in an environmental medium which would not result in recommended dose standards for biota to be exceeded. BCGs define doses below which risks to populations are assumed not to occur.

Maximum and mean radionuclide concentrations measured in sediment were compared to BCGs for riparian animals in the aquatic ecosystem. The results of the screening evaluation verify that radionuclide concentrations in sediment in the East Branch of Newtown Creek are significantly less than BCGs and that dose to receptors is below biota dose limits. The bulk of measured radioactivity in sediment is likely due to natural background of radionuclides except for the

thorium isotopes (i.e., Th-228, Th-230, and Th-232) and their progeny. Further supporting conclusions of low or insignificant risk to ecological receptors are observations that the site and nearby areas provide only limited ecological habitat.

Conclusions

The RI investigation confirmed findings of the previous investigations and provided data adequate to complete the risk assessments and feasibility study. The major conclusions are summarized below.

- Radionuclide contamination remains in the building structures at the WACC property, primarily in the buildings that previously operated as the kiln/vat in which monazite sand processing took place and the storage yard where sands were loaded into the kiln-vat (Lots 42 and 44), in the basement of the deli (Lot 46), and to a lesser extent, in the warehouse on Lot 33 that was constructed above the former yard area.
- Asbestos containing material (ACM), lead based paint (LBP), and other suspect hazardous materials were found in the WACC building structures.
- Under the WACC buildings, radiological contamination extends down to a depth of 28 feet bgs under Lot 44, the former kiln/vat building, and down to 24 feet bgs under Lot 42, the former yard where the monazite sands were loaded into the kiln/vat building for processing.
- There is widespread surficial radiological contamination related to storage or filling of tailings or monazite sands and/or surface runoff/erosion from those areas. Surficial contamination was observed in the former rail spur area, at the intersection of Irving Avenue and Moffat Street, the northern portion of Moffat Street and the eastern portion of Irving Avenue, and in the southeastern corner of Lot31/northern part of 350 Moffat (area adjacent to the Moffat/Irving intersection).
- PAH concentrations exceeding the screening criteria were found throughout the shallow soils at the WACC property. PAHs found as deep as 7 feet bgs may be related to former USTs or use of the area to store demolished cars. Similar concentrations were also found at the nearby property, 308 Cooper Street. PCBs exceeded the screening criteria by at least an order of magnitude in three locations. PCBs in the shallow soils can also be related to USTs or a sump below the building in Lot 33. Arsenic and iron concentrations exceeding the screening criteria were found in all samples at all depths and within the range of background levels, indicating the metals are likely associated with urban fill.
- Radionuclide contamination within the CSS is present near the WACC property in sediments/sludge and materials comprising the sewer pipes and manholes.
- Radionuclide contamination is significantly elevated in the manholes on Irving Avenue adjacent to the WACC buildings where process liquors containing high concentrations of radionuclides were likely discharged. The elevated gamma levels (>20 times background) continue in the sewer line and manholes on Irving Avenue for approximately two blocks to Decatur Street.

- Gamma levels within the CSS generally drop to four times background at the intersection of Irving Avenue and Schaeffer Street and drop to background at the intersection of Irving Avenue and Eldert Street, with sporadic occurrences of gamma levels above four times background continuing in the sewer along Halsey Street to Wyckoff Avenue.

- Radionuclide concentrations in sediment at the Newtown Creek outfall are above screening criteria but limited to the area immediately adjacent to the outfall discharge. However, the ecological risk assessment concluded that radionuclide concentrations in sediment do not pose unacceptable risk to ecological receptors.

- Chlorinated VOCs exceeded screening criteria in the groundwater at each of the five monitoring wells. However, chlorinated VOCs were not detected in the soil samples collected as part of the RI and previous investigations. Additionally, the Phase I report did not indicate the use of materials currently or in the past that would be associated with chlorinated VOCs. Therefore, an upgradient well, MW-06, was installed. Chlorinated VOCs were encountered in the upgradient well, suggesting that the chlorinated VOC contamination likely comes from an offsite source upgradient of MW-06.

- Th-232 was detected in one groundwater sample during Round 2. However, Round 1 and Round 2 samples were analyzed with methods that did not provide a MDA that was below the RI screening criteria. Round 3 and Round 4 sampling events were performed using laboratory methods that provided lower MDAs. Th-232 and Ra-226 were not detected above the RI screening criteria in Round 3 and Round 4.

- Exposure rate surveys confirmed the results from the previous exposure rate surveys conducted within the WACC buildings, on sidewalks, and on the streets near the WACC property are above background levels.

- Investigations at the school and daycare did not indicate there was contamination due to the WACC processes as the data generated was all below or slightly above the RI screening criteria. Results included:

    - School – Results of long-term radon and thoron sampling were below the screening criteria. Soil results from samples collected below the school were also below the screening criteria.

    - Daycare – Short-term radon concentrations collected at the daycare were either below or within 02. pCi/L of the screening criteria. The 7-day continuous air surveys for radon were below the RI screening criterion and the 5-day continuous air surveys for thoron were slightly above the RI screening criterion. Soil results for samples collected below the daycare were also below the RI screening criteria.

    - Gamma exposure rates were also collected from within the school and daycare and were all within or below the background rates observed for the neighborhood.

Data Gaps

- Delineation of radionuclide contamination in soils was not achieved in areas adjacent to the cabinet maker to the north of the WACC property, suggesting potential concentrations above screening criteria may exist below the building.
- The sewer pipeline on Irving Avenue showed potential for exfiltration in several areas as indicated by the fiberscope investigation. Contamination was not observed in soil samples collected adjacent to the pipeline; however, samples were not collected from the bedding material below the sewer. This bedding material has the potential to be contaminated.

Recommendations

- The data collected during the RI are considered to be sufficient to support development of remedial alternatives in the FS and preparation of a Record of Decision (ROD).
- Data gaps can be addressed during the remedial design or remedial action.

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Section 1

Introduction

CDM Federal Programs Corporation (CDM Smith) received Work Assignment (WA) 054-RICO-A282 under Remedial Action Contract (RAC) 2 to complete a remedial investigation (RI) and feasibility study (FS) for the United States Environmental Protection Agency (EPA), Region 2 for the Wolff-Alport Chemical Company (WACC) site (site) located in Ridgewood, Queens County, New York.

1.1 Purpose of Report

The purpose of this RI/FS is to provide data to select a remedy to eliminate, reduce, or control risks to human health and the environment at the WACC site. The objectives of this RI Report are to:

- Review and evaluate the results of relevant historical investigations as described in the CDM Smith Final Work Plan (CDM Smith 2014a)
- Present the results of the field investigations, including the building investigation, the soil investigation, the sewer investigation, the hydrogeologic (groundwater) investigation, the school and daycare investigation, and gamma exposure rate confirmation surveys
- Provide adequate data to support the selection of an approach for site remediation and development of a Record of Decision (ROD)

CDM Smith developed the technical approach for the investigations performed in the RI in accordance with the EPA Statement of Work (SOW) and to ensure that the RI/FS met the requirements of the following documents and policies:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended
- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, EPA/540/G-89/004, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01 (EPA 1988)
- Other applicable federal, state, and local requirements

Due to the presence of radiological contaminants at the site, this investigation was also designed to cover sampling, measurement, and assessment of data in accordance with the guidelines in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (EPA et al. 2000). However, this RI Report is not a Final Status Survey (FSS), and consequently, there was limited application of the MARSSIM statistical methods for placement and assessment of sample points and sample results.

The investigation scope was intended to address data gaps identified through review of previous investigations, in support of characterization of the nature and extent of site contamination. Data gaps on which this investigation is based are included in the Technical Scoping Meeting Minutes (CDM Smith 2014b) submitted August 7, 2014.

1.2 Report Organization

This RI report is organized in the following manner, with tables and figures following Section 8.

Executive Summary	Provides a synopsis of the RI report.
Section 1	Introduction – Presents an overview of the site, summarizes the objectives of the RI, the site history, previous investigations, and report organization.
Section 2	Study Area Investigations – Describes the methodology and sampling rationale for the various investigations that were conducted for the RI.
Section 3	Physical Setting – Describes the physical attributes of the study area, including surface topography, meteorology, surface water hydrology, geology, and hydrogeology. Sections on demography, land use, and ecology describe the potential populations and habitats associated with the site.
Section 4	Nature and Extent of Contamination – Presents key site contaminants, a discussion of RI sampling results, and a comparison against the screening criteria developed for all site media to determine the extent of contamination.
Section 5	Contaminant Fate and Transport – Evaluates the persistence and mobility in the environment of the identified key contaminants and summarizes the fate and transport mechanisms that apply to the site. A conceptual site model (CSM) presents potential receptors and discusses the interaction between site conditions and detected contamination.
Section 6	Risk Assessment Summaries – Summarizes the results of the Human Health Risk Assessment (HHRA) and the Screening Level Ecological Risk Assessment (SLERA).
Section 7	Conclusions – Presents the significant conclusions of the RI and recommends the next steps for the project.
Section 8	References

1.3 Site Background

The following subsections provide a description and history of the site and a summary of previous investigations.

1.3.1 Site Location and Description

The WACC site is located in Ridgewood, Queens County, New York, at the county border with Brooklyn (**Figure 1-1**). The site includes the former WACC property that is now subdivided into several properties, as well as adjacent and nearby areas including streets, sidewalks, buildings and sewer systems where contaminants have migrated or threaten to migrate from the WACC property (**Figure 1-2**).

What is hereafter referred to as the WACC property is the triangular property situated on Lots 31 (partial), 33, 42, 44, 46, and 48 of Queens Borough Block 3725. The WACC property covers approximately 0.75 acre, bounded by Irving Avenue to the southwest, Cooper Avenue to the northwest, and an active cabinet manufacturer (5606 Cooper Avenue) to the east. At present, the property is covered with contiguous structures, except along its eastern edge in the former rail spur area. These structures will be referred to as the WACC buildings throughout this report. A description of the various lots that make up the WACC property and the buildings that occupy each lot are included in the table below.

Lot	Address	Description
31	NA	The former rail spur adjacent to the WACC buildings. It is fenced, covered with gravel and used as an automobile storage/parking area by the Primo auto repair shop. The non-fenced portion of the former rail spur, which is not adjacent to the WACC buildings, is partially vegetated.
33	1133-1139 Irving Avenue	A 1-story masonry warehouse formerly owned by Arctic Glacier Losquardo, Inc. The property was recently transferred to Irving Unique Development, Limited Liability Corporation (LLC) and is currently unoccupied.
42	1129 Irving Avenue	A 1-story masonry building, subdivided and occupied by TerraNova Construction and Primo Auto Body. The TerraNova building is primarily used for construction but also has an office that is frequently occupied. The building housing the Primo Auto Body shop is active, with 5-10 employees typically occupying the building during the work day.
44	1127 Irving Avenue	A 1-story masonry building housing the Celtic Bike Shop. The building is active, with 2-5 employees typically occupying the building during the work day. This building was previously occupied by Primo Auto Body.
46	1125 Irving Avenue	A 2-story masonry and frame building housing the Jarabacoa delicatessen/grocery, office space, and three unoccupied residential apartments on the second floor. A second attached one-story masonry building houses Primo Flat Fix and a former mini-all terrain vehicle shop.
48	1514 Cooper Avenue	A 1-story masonry building housing the K&M auto repair shop and office space. The building is actively used.

The neighborhoods surrounding the WACC property contain light industry, commercial businesses, residences, a school, and daycare. An active rail line passes within 125 feet southeast of the property; the Cemetery of the Evergreens is located to the east and south of the rail line and covers over 225 acres. The sidewalk and street along Irving Avenue adjacent to the WACC buildings are typically filled with vehicles being serviced by the adjacent businesses. The intersection of Irving Avenue and Moffat Street (i.e., the southern corner of the WACC property) is an active area for trailer parking and unloading. There are three currently unoccupied apartments over the delicatessen/grocery, and other occupied housing is present near the WACC

property on Cooper and Irving Avenues and Moffat Street. Most of the area south and west of the WACC property is densely populated and contains multi-family homes and apartments.

Nearby properties that were also investigated (or reviewed) to determine if they have been impacted by WACC processes as part of this RI include residential, commercial, and school properties summarized below and shown on **Figure 1-2**.

308 Cooper Street – Former residences are located across Irving Avenue from the WACC property. The building was recently demolished and the property is under remediation due to soil contamination found at one location by the property owner's consultant. The property is zoned residential and the owner likely plans to redevelop the property. The former residential structures were in place since at least 1914.

5606 Cooper Avenue – This currently active cabinet manufacturer forms the northeast boundary of the WACC property. The property contains a portion of the former rail spur and a large manufacturing building. The building was constructed sometime between 1954 and 1966. Prior to 1954, there was no large structure and the property appeared to be used for storage (likely materials offloaded from the rail spur).

335 Moffat Street – This former warehouse/ice manufacturing building recently became unoccupied. It was built sometime between 1933 and 1951 according to aerial photos and Sanborn maps.

338-348 and 350 Moffat Street – The former warehouses at 338- 348 Moffat Street, in close proximity to the WACC property, are now used for residential purposes. An adjacent building at 350 Moffat Street houses a circus training facility where families with children often spend the day. These structures appear to have been constructed between 1954 and 1966. Previously the property was used for industrial (stone cutting/cloth dyeing/metals manufacturing) and warehousing purposes.

School and Daycare – The Frances E. Carter (384) public elementary and intermediate school (PS/IS) (the school) is located within ¼ mile southwest of the WACC property on Kings County Tract 409, Block 2002, at 242 Cooper Street. The building appears to have been constructed between 1966 and 1975. Previously the area was filled with residential structures. The Audrey Johnson Daycare (the daycare) is located within ¼ mile south of the WACC property at 272 Moffat Street. The building structure appears to have been in place before 1924.

1.3.2 Site History

Sanborn Fire Insurance Maps and city directories were reviewed to understand the history of the property. In 1902, two structures were present on the eastern and western portions of the WACC property in Lot 46 and Lot 33. In 1936, the building at Lot 48 next to three gas tanks appeared, and the central portion of the WACC property was now occupied by WACC. The structure on Lot 33 is gone, and the lot appears undeveloped and unoccupied. In 1980, the structures formerly housing the Wolff-Alport Chemical Company were identified as warehouse and office space. A new grocery warehouse was present at Lot 33 with a construction date of 1961. The table below provides a brief timeline of businesses located at each property based on information provided in Sanborn maps and city directories (LBA 2010a).

Lot	Address	Historical Uses
31	NA	Rail spur
33	1133-1139 Irving Avenue	1902 – Cement novelties manufacturing 1914 – Hay and feed 1961 – 1980 – Grocery warehouse
42	1129 Irving Avenue	1970 – BB Displays Specialty Corporation 1991 – 2000 – Losquadro Ice Company
44	1127 Irving Avenue	1934, 1945 – Wolff-Alport Chemical Corporation 1967 – Viking Knitwear Processors and Viking Yarn Dyeing Corporation 1970 – 1983 – HJ Knitting Mills Inc. 1996 – 2000 – Lord and Ernesto Autobody Repair 2005 – Primo Autobody Repair and Sales
46	1125 Irving Avenue	1902 – Store, dwelling, and stable 1934, 1945 – Evergreen Laundry and various other laundry businesses 1962 – 1976 – Pascales Pants and Brooklyn Clothes Company 1976 – Elmwood Paper Corporation
48	1514 Cooper Avenue	1936 – Building next to three gas tanks 1980 – Gas station

Note: Sanborn maps and city directories were not available for every year.

WACC operated at the property from the 1920s until 1954, importing monazite sand via rail and extracting rare earth metals from the material. Monazite sand contains approximately 6% to 8% or more of thorium (Th) and 0.1% to 0.3% of uranium (U). Monazite sands are susceptible to strong acids at high temperatures. In the acid treatment process used to extract rare-earth materials, finely ground monazite sand was digested with highly concentrated acid at high temperatures. This converts the phosphate and metal contact of the monazite to water-soluble species, rendering the rare-earth materials extractable while dissolving the Th and U in an acid waste process liquor. The process concentrated Th-232 and U-238.

Until 1947, WACC disposed of the thorium waste from monazite sand processing in the sewer (process liquors) and possibly by burial/spreading on the property (waste tailings). During its years of operation, WACC occupied three structures under the address of 1127 Irving Avenue (currently lots 42 and 44). As shown on **Figure 1-3**, the WACC operation included two yard areas: one between the company's buildings facing Irving Avenue and the other on the eastern end of the property at the northern end of Moffat Street. These former yard areas, now occupied primarily by structures, were reportedly used as staging areas for monazite sands or waste tailings containing Th-232 and U-238. WACC did not operate at 1125 Irving Avenue (Lot 46) or 1514 Cooper Avenue (Lot 48), but those properties are affected by the radioactive materials associated with the site.

According to the U.S. Department of Energy (DOE), the Atomic Energy Commission (AEC) ordered WACC to halt sewer disposal of thorium waste in the fall of 1947 (Louis Berger and Associates [LBA] 2010c). Thereafter, thorium was precipitated as thorium oxalate sludge and sold to the AEC. Documents indicate that WACC sold approximately 53,000 pounds and 238 drums of thorium oxalate sludge to the AEC from 1948 to 1954, and offered 400 pounds of thorium nitrate for sale to the AEC in 1954.

1.3.3 Radiological Properties of Site Radionuclides

1.3.3.1 Materials and Processes

Monazite sand contains, by weight per cent, approximately 6% to 8% of Th and 0.1% to 0.3% of U. The Th-232 and U-238 are categorized as decay chain radionuclides and as such their presence is accompanied by the decay progeny which in turn are also radioactive. **Figure 1-4** illustrates the decay chain and components for Th-232 and U-238.

1.3.3.2 Decay Chain and Equilibrium

In the natural state, i.e. no chemical or physically invasive processes, the decay chain radionuclides are in what is termed "secular equilibrium", meaning that for each decay of a parent, there is a corresponding decay of the progeny such that the activity levels of the parent and progeny are approximately equal. Certain processes such as soil disturbance or chemical separation can disrupt this equilibrium resulting in unequal concentrations of the parent and the progeny.

Secular equilibrium thus allows one to estimate the concentration of one radionuclide by knowing the concentration of any other radionuclide in the decay chain. For example, in the Th-232 decay chain, actinium-228 is often measured using gamma spectroscopy while thorium-232 can only be measured by more elaborate radiochemistry analysis. By ascertaining the level of actinium-228 in a sample one also has a measure of thorium-232 and radium-228. Because of this feature, the field remedial investigation work employed an onsite gamma spectroscopy system to aid in rapid identification of sampler radionuclides and concentrations. In this case, the Th-232 and Ra-228 are estimated by identifying Ac-228, progeny within the Th-232 decay chain.

There are two gaseous components of each decay chain, Radon-220 (also known as thoron) from the Th-232 chain and Radon-222 for the U-238 decay chain. Both thoron and radon are inert gasses and as such their principal transport mechanism through soil is via diffusion and unrelated to the chemical composition of the medium. Because of this property, radon and thoron enter through building cracks, drains or other penetrations and become a potential source of exposure to the occupants. The radiological dose to the lungs received from exposure to thoron and radon is due to the particulate short-lived progeny of the radon gas. The level or concentration of thoron and radon progeny is dependent on the concentration of thoron and radon entering the space and speed (or exchange rate) of the gas with the building air intake system. Buildings with low exchange rates tend to produce higher concentrations of thoron and radon and their progeny resulting in higher radiological doses then buildings with high exchange rates.

Radiological doses from radon and thoron occurring in outside environments tend to be significantly less than those indoors because the natural convective forces both remove the radon before progeny build-up occurs and dilutes the level of radon present. In addition, thoron, due to its extremely short half-life of 55 seconds compared to Rn-222's half-life of 3.8 days, tends to produce lower concentrations in work/building spaces because of decay during transport from the media below the building or work space. As such, thoron is seldom a concern for health risk.

1.3.3.3 Principal Radioactive Decay Emissions

The process of radiological decay usually involves nuclear transitions that release energy in the form of waves (gamma rays) or particles (alpha or beta). For the decay chains discussed previously all three forms of energy emissions will be present at the site. The gamma ray emissions can be used in field work to identify the locations of contaminants that exceed typical background radiation levels and identify the nuclide and concentration present.

The beta and alpha emissions are often used to quantify the level of contamination present on a surface of a floor, wall, or piece of equipment. The purpose of measuring surface contaminants is to obtain an estimate of the potential for re-suspending radioactive materials into the surrounding atmosphere with potential for inhalation of ingestion of those particles. EPA's "Radiation: Facts, Risks, and Realities" (EPA 2012) provides a more detailed discussion of radioactive decay, radiation emissions and their interactive mechanisms.

1.3.3.4 Radiological Units

Through-out this document the measure of potential biological damage from exposure to radiation or radiological dose will be referred to using the term millirem (milli Roentgen equivalent man) (mrem). To provide perspective, the amount of dose one receives from background radiation in the United States varies between 200 to 300 mrem per year (mrem/yr). In this report, exposure rates will be expressed as micro Roentgens per hour (μR/hr). A rough rule of thumb is one-thousand μR/hr will be equivalent to one mrem per hour.

The amount of activity in the report will be expressed in picocuries (pCi) or disintegrations per minute (dpm). Those terms provide an expression of how many radioactive decays are occurring per unit of time from soil, water or surface. The equivalent of 2.2 dpm is 1 pCi. Soils in New York State have background concentrations of thorium 232 that range from 0.5 to 2 pCi/gram (pCi/g).

Monitoring instrumentation, except for the type measuring exposure rates, provides measurements in units of counts per minute (cpm). CPM values provide a qualitative indication of the presence of elevated levels of radioactivity when compared against naturally occurring background count rates. Count rates can be converted to pCi or dpm per mass/volume/area units when detection efficiencies are known for the measurement situation. In most cases, such as use of sodium iodide detectors to acquire gross count rates for gamma emissions, a conversion to pCi is not made as it is more accurate to sample the impacted media and analyze by certified laboratory methods or, in the case of the remedial investigation, by a field gamma spectroscopy system.

1.3.4 Previous Investigations and Results

The following sections describe findings and results from previous investigations. Radiological surveys by New York City, state, and federal agencies have identified radioactivity above background levels within portions of the WACC property, in soils beneath and around the WACC facility and adjacent buildings, and on adjacent sidewalks, streets, and sewers. The survey and laboratory data from the investigations listed below have been incorporated into the remainder of this RI Report. **Appendix A** includes copies of these reports.

- 1988 Radiological Survey performed by EPA and the NYC Bureau of Radiological Control (BRC) (EPA 2000)
- 2007 New York State Department of Environmental Conversation (NYSDEC) Site Visit Report (NYSDEC 2007)
- 2010 New York City Department of Design and Construction (NYCDDC) Final Phase I/Phase II Environmental Site Assessment (ESA) Reports for the Former Wolff-Alport Chemical Corporation Site (LBA 2010a/b)
- 2010 NYCDDC Final Draft Radiological Scoping Survey (RSS) for the Former Wolff-Alport Chemical Corporation Site (LBA 2010c)
- 2012 Agency for Toxic Substances and Disease Registry's (ATSDR's) Health Consultation (ATSDR 2012)2012 Gamma radiation exposure rate measurements and thoron concentration measurements from locations on and in the vicinity of the Wolff-Alport Chemical Company for EPA (Weston 2012)
- 2012 and 2013 Search for radon and thoron potential gas entry points by EPA (EPA 2013a)
- 2013 Supplemental perimeter radon and thoron gas air concentration sampling by EPA (EPA 2013b)
- 2014 Bureau Veritas North America/New York City Department of Environmental Protection (BVNA/NYCDEP) Assessment of Potential Radiological Impact Within and Adjacent to Combined Sewer System near the Former Wolff-Alport Chemical Corporation Facility (BVNA 2014)
- 2014 Multi-Agency Former Wolff-Alport Chemical Company Neighborhood Radiological Assessment (New York State Department of Health [NYSDOH] et al. 2014)
- 2014 ATSDR's Supplement to the 2012 Health Consultation (ATSDR 2014)
- 2014 Weston Solutions, Inc. (Weston)/EPA Radiation Assessment and Response Action Report for the Former Wolff-Alport Chemical Company Site (Weston 2016)
- 2015 Results of thoron gas air concentration measurements performed inside and behind two buildings located at 338-350 Moffat Street, Brooklyn, NY (EPA 2015)

A summary of each of these investigations is included in the following subsections.

1.3.4.1 1988 Radiological Survey Performed by EPA and the NYC Bureau of Radiological Control (EPA 2000)

On February 23, 1988, EPA and NYC BRC conducted a radiological survey of 1127 and 1129 Irving Avenue, along Irving Avenue over an indented area where it was assumed the sewer line was located, and in the former rail spur area.

On Irving Avenue, elevated readings from 15-18 μR/hr to 1,000 μR/hr (in front of the doorway of 1129 Irving Avenue [Primo Auto Body]) were observed and average measurements were between 150-200 μR/hr. Maximum readings were obtained at contact with the street (EPA 2000).

In 1127 Irving Avenue, gamma surveys were conducted in two different sections of the building. In one section, readings ranged from 50 μR/hr to 100 μR/hr with elevated readings in the middle of the room at 120 μR/hr to 200 μR/hr and a hotspot of 450 μR/hr. In the second section, readings in the storeroom ranged from 20 μR/hr to 50 μR/hr and readings in the main room ranged from 50 μR/hr to 150 μR/hr with a peak of 200 μR/hr.

In 1129 Irving Avenue, readings ranged from 15 μR/hr to 20 μR/hr towards the front of the building and 30 μR/hr to 50 μR/hr towards the back of the building.

In the former rail spur area, readings ranged from 100 μR/hr to 250 μR/hr with a peak of approximately 1,000 μR/hr behind 1127 Irving Avenue.

As a result, EPA and NYC BRC recommended the following future actions:

- Compilation of a comprehensive site history
- Collection of soil samples from peak areas
- Completion of additional surveys of adjacent buildings
- Notification of the Department of Energy of the existing conditions

1.3.4.2 2007 New York State Department of Environmental Conservation Site Visit Report (NYSDEC 2007)

Initial scoping-level radiological surveys performed by NYSDEC, New York City Department of Mental Health and Hygiene (NYC DOHMH), and EPA in 2007 found radiological impacts throughout the WACC property and the nearby sewer.

On May 5-6, 2007, NYSDEC conducted a scoping-level radiological survey of areas outside the buildings formerly used by WACC, including the sidewalks, the yard behind the buildings, and the sewers that exit the buildings. The survey was conducted using a portable scaler/rate meter with a sodium iodide (NaI) 2x2 detector and a Ludlum stretch scope (Teledector).

Background count rates were taken at the intersection of Decatur and Irving Avenues, which is two blocks from the WACC property. Two background count rates were taken and resulted in average count rates of 7,659 cpm. Since the Department's usual level used to screen elevated radioactivity was 2.5 times background, the screening count rate utilized was 19,000 cpm for May 5, 2007. On May 6, 2007, background count rates were collected from the same location and had an average count rate of 7,058 cpm. Therefore, the screening count rate used for May 6, 2007 was 18,000 cpm.

On May 5, 2007, the survey found contamination present on both sidewalks under Cooper and Irving Avenues. The sidewalk along the side of 1125 Irving, along Cooper Avenue, had observed count rates ranging from 36,000 cpm to 56,000 cpm. The sidewalk in front of building at 1125

Irving Avenue had observed count rates of 65,350 to 135,200 cpm. The sidewalk in front 1127 Irving Avenue had observed count rates of 72,000 to 205,000 cpm. The sidewalk in front of the ice making shop at 1129 Irving Avenue had observed count rates of 130,000 to 448,000 cpm.

On May 6, 2007, the surveyors investigated the former rail spur area and observed count rates near the rail line ranging 12,000 cpm to 20,000 cpm. Closer to the back of 1129 Irving Avenue, counts rates increased to 390,000 cpm two feet from the building. Count rates with 10 feet of the building in the backyard area ranged from 200,000 to 390,000 cpm. Behind 1133 Irving Avenue, count rates between 174,000 to 250,000 cpm were observed a few feet beyond a former doorway.

The soil directly behind 1129 Irving Avenue was observed to have decay product concentrations of approximately 285 pCi/g, and Ra-226 and its decay products at concentrations of approximately 40 pCi/g. The report concluded that the waste is widespread behind the building, appearing to be concentrated closer to the building.

Of the three manholes surveyed, only the manhole at the intersection of Cooper Avenue and Irving Avenue exhibited elevated radiation levels. NYSDEC recommended additional sampling in the sewer and yard areas.

1.3.4.3 2010 NYCDDC Final Phase I Environmental Site Assessment Reports for the WACC Site (LBA 2010a)

LBA conducted a Phase I ESA for the WACC site on behalf of the NYCDDC. The main objective of the Phase 1 ESA was to identify recognized environmental conditions (RECs). The Phase I ESA included a review of environmental agency databases and historical documents; visual observation of the site and adjoining properties; and, interviews with site representatives. An inspection of the site was conducted by LBA on January 29, 2010.

The following RECs were identified:

- Based on a review of regulatory agency records, there is documented radiological contamination above background levels at the site.
- The site has historically been used for commercial, industrial, and manufacturing purposes since approximately 1936. The historic Sanborn fire insurance maps indicate the former presence of chemical manufacturing, laundry facilities, railroad tracks and a filling station with gasoline underground storage tanks (USTs) at the site. It appears that historic site operations involved the use of petroleum products and/or other hazardous materials.
- The debris piles in the open former railway crossing area and in the basement of the Jarabacoa Deli Grocery Corp delicatessen/grocery at 1125 Irving Avenue are possibly hazardous and have the potential to impact the soil and groundwater at the site.
- Petroleum materials or waste oil at the two auto-repair facilities at K&M Auto Repair at 15-14 Cooper Avenue and Primo Auto Body at 1128 Irving Avenue have the potential to impact the soil and groundwater at the site.

- The presence of heavy equipment (hydraulic lifts, car batteries, engine parts, etc.) at the site has the potential for hydraulic fluids and other petroleum products to enter the subsurface, impacting the soil and groundwater at the site.
- The site is listed on the petroleum bulk storage (PBS) UST database for one 250-gallon active waste oil/used UST and historical maps indicate the presence of three USTs on the site - status unknown.
- One empty 55-gallon drum was noted in the basement of the Jarabacoa Deli Grocery Corporation. The drum was slightly corroded and hazardous materials could have possibly been stored in the drums.
- Based on the age of the on-site structures, it is likely that asbestos containing materials (ACM), lead based paint (LBP), polychlorinated biphenyls (PCBs) and/or mercury may be present.

1.3.4.4 2010 NYCDDC Final Phase II Environmental Site Assessment Reports for the WACC Site (LBA 2010b)

Following completion of the NYCDDC Phase 1 ESA, LBA completed a Phase II Environmental Site Investigation (ESI) on behalf of NYCDDC. The objective of the Phase II ESI was to assess the potential presence of subsurface contamination resulting from former WACC operations. The Phase II ESI sampling was performed concurrently with the radiological assessment activities described in **Section 1.3.4.3**, but focused on non-radioactive contaminants that may be present in the underlying soil and groundwater. LBA conducted the Phase II ESI on November 12 and December 15 and 16, 2009.

Twelve composite soil samples were collected to provide representative coverage of the site as determined by review of historical aerial photos, Sanborn fire insurance maps, and Site reconnaissance. Soil was sampled from depths ranging from 0 to 7 feet below the ground surface (bgs). Twelve grab soil samples were collected from the bottom 0.5-foot interval of each boring where a composite sample was taken.

In general, the site is underlain by at least 5 to 10 feet of non-native fill material. The fill material consists of dark grey to moderate yellowish brown silty-sand with coarse to fine gravel and construction debris in the form of concrete, brick, asphalt, glass, and wood pieces. Field screening did not identify any visually impacted soil in any of the soil borings advanced as part of this investigation. Based on the findings of this Phase II ESI, there were no indications that the RECs identified in the NYCDDC Phase I ESA have impacted the subsurface at the site. The results of this investigation are discussed further in **Section 4** of this report.

1.3.4.5 2010 NYCDDC Final Draft Radiological Scoping Survey for the WACC Site (LBA 2010c)

In conjunction with the NYCDDC Phase II ESI, LBA conducted a RSS for the WACC site. This survey was intended to identify locations where radiation dose rates were above background levels and to determine the presence of radioactive contamination in structures, surface soil, subsurface soil, and sewers. It was not designed to provide a full characterization of the site.

The survey included the following:

- Drain and sewer line measurements and sampling
- Gamma radiation measurements on sidewalks, streets and yard areas
- Surface and subsurface soil samples and analysis for specific radionuclides
- Subsurface depth profiling of contamination via downhole gamma logging
- Interior of buildings: gamma and alpha radiation measurements, alpha and beta-gamma contamination surveys and Radon-222 (radon) and thoron integrated concentration measurements

The results are summarized below. In addition, the data have been incorporated into **Section 4** of this report. The summary focuses on thorium contamination detected during surveys and various media sampling.

- **Drain and Sewer Investigation** - found that the sewer under Irving Avenue is internally and/or externally contaminated with thorium extending from the likely WACC connection point near Cooper Avenue westward to Eldert Street.
- **Surficial Contamination –** Much of the areas to the south, east, and west of the original WACC buildings; beneath the WACC property buildings; sidewalks; and, asphalt surfaces were found to have elevated gamma radiation levels due to the presence of a 1- to 4-foot thick layer of contaminated soil. The material in the contaminated soil layer was noted to be black or gray ash-like material, likely the waste tailings from the WACC operations. The depth of contamination was noted to typically be within the top 12 inches of soil under the pavement or ground surface, with occasional deeper areas down to 4 feet.
- **Deep Contamination -** Deeper soils were found to be contaminated under the original WACC buildings down to 15 to 20 feet or more, with Th-232 concentrations ranging from the 100s to 1,100 pCi/g. The upper-most 4 feet of contamination was noted to be similar tailings as observed below the rest of the WACC property. However, the deeper contamination was noted to be likely related to a more soluble, leachable form of thorium, likely process thorium dissolved in acid that was discharged to the subsurface.

  Radiological impacts in the basement of the Jarabacoa delicatessen were noted as likely due to the adjacent bolus of thorium contamination under the original WACC Kiln-Vat building. The adjacent contamination was detectable via gamma measurement through the southern brick wall of the basement.
- **Radon and Thoron -** Integrated radon and thoron concentration measurements in the basement of the Jarabacoa delicatessen conducted over a 3-month period indicated a concentration of 12.7 pCi/L of thoron and 1.4 pCi/L of radon.

1.3.4.6 2012 ATSDR's Health Consultation (ATSDR 2012)

EPA requested that ATSDR review the radiologic data collected at the site, as part of an ongoing removal assessment that was being conducted by the EPA Removal Action Branch. EPA requested that ATSDR evaluate potential health threats through all potential exposure pathways to near-by residents, on-site workers, persons that visit the buildings, and/or pass through the block where the businesses are located.

ATSDR determined the following conclusions based on the radiological surveys of the facilities:

- There is radiological contamination of building structures, including walls and floors as well as city sewers.
- It is unlikely that utility workers who access the sewer system will exceed the ATSDR minimal risk level (MRL) of 100 mrem/yr; however, there are sufficient uncertainties in the sewer line measurements that there may be instances where the MRL could be exceeded.
- Sidewalks along Irving Avenue are contaminated with radiological materials.
- Workers for the auto body shop may have an elevated risk of cancer from exposure to ionizing radiation and their exposures may exceed the ATSDR MRL for ionizing radiation.
- Pedestrians who frequently use the sidewalks of Irving Avenue may have an elevated cancer risk from the exposure to ionizing radiation and their exposures may exceed the ATSDR MRL for ionizing radiation.

1.3.4.7 2012 Gamma Radiation Exposure Rate Measurements and Thoron Concentration Measurements from Locations on and in the Vicinity of the Wolff-Alport Chemical Company (Weston 2012)

On behalf of EPA, Weston collected gamma exposure rate measurements and thoron concentration measurements at locations on and in the vicinity of the WACC property from September 19-21, 2012 (Weston 2012). The gamma radiation exposure rate measurements identified hot spots along the former rail spur and in the sidewalks and streets adjacent to the former facility. The contaminated area (i.e., the source area), defined as the extent to which the gamma radiation exposure rates equal or exceed two times the site-specific background gamma radiation exposure rate, was identified as extending throughout most of the WACC property and in some of the adjacent street and sidewalk areas. Thoron concentration measurement results are discussed in **Section 4.3.1**.

1.3.4.8 2010-2013 Search for Radon/Thoron Potential Gas Entry Points by EPA (EPA 2013a)

A search for gas entry points was performed in TerraNova (Lot 42), Primo Auto Body (Lot 42), Celtic Bike Shop (Lot 44), Jarabacoa Deli (Lot 46), the school, and the daycare. The radon and thoron measurements were performed using a RAD7 Professional Electronic Radon Detector. The measurements were not performed by an Environmental Laboratory Accreditation Program (ELAP)-certified laboratory (EPA 2013a). The results are discussed in **Sections 4.3.1** and **4.8.2**.

1.3.4.9 2013 Supplemental Perimeter Radon and Thoron Gas Air Concentration Sampling by EPA (EPA 2013b)

In July and August of 2013, seven thoron/radon perimeter samples were collected using RAD7 instruments using low intensity sources of thoron and radon (i.e., gas lanterns and soil with slightly elevated radium content) (EPA 2013b). One location was collected about a half-mile from the site to represent background. Two locations were collected on the WACC property. One location was collected on the sidewalk along Irving Avenue a block to the northwest. Another three locations were collected on sidewalks in the school and daycare area with one in the front of the school, another in the back of the school, and one in front of the daycare. The results are discussed in **Section 4.3.1**.

1.3.4.10 2014 BVNA/NYCDEP Assessment of Potential Radiological Impacts Within and Adjacent to Combined Sewer System near the WACC Site (BVNA 2014)

BVNA was contracted by the NYCDEP, Bureau of Water & Sewer Operations (BWSO) to perform an investigation in 2013 to assess potential radiological impact within and adjacent to the CSS in areas downgradient from WACC.

The investigation area was limited to soils, sediments and materials within and adjacent to the CSS. The primary objectives of the CSS investigation were as follows:

- Obtain radiation dose rates at areas potentially impacted by WACC processes and at background locations upgradient or cross gradient to WACC activities.
- Collect downhole boring gamma logging measurements consisting of gross gamma count rate and spectral data. Process spectral data to obtain estimated content of Th-232, U-238, and Ra-226.
- Collect soil samples during boring activities, sediment and brick and mortar samples from certain CSS locations and submit all samples for laboratory gamma spectral analysis (Th-232 and progeny, U-238 and progeny, potassium-40 [K-40]).

The results are summarized below. In addition, the data are discussed further in Section 4 of this report. The summary focuses on thorium contamination detected during surveys and various media sampling.

- Background values for various radiological measurements were established in the following ranges:
  - Gamma dose rate: 9 – 12 μR/hr
  - Gamma logging, soil borings: 33,000 cpm
  - Gamma logging, manholes: 43,000 cpm
- **Soil Boring Investigation**: With the exception of soils on Irving Avenue between Moffat Street and Cooper Street/Avenue (adjacent to the WACC property), no observations of contaminated soils were identified outside the confines of the CSS.

- Downhole field gamma logging measurements showed three soil borings with gamma readings above measured background readings: SB-12/SB-16 as described above (12 times background); SB-13 (8 times background), located at the intersection of Irving Avenue and Moffat Street; and SB-17 (4 times background), located near the intersection of Irving Avenue and Cooper Street/Avenue.
- All other downhole field gamma logging measurements were consistent with background gamma readings.
- Gamma dose rate as measured at waist level above boreholes showed rates consistent with background at all soil boring locations with the exception of the locations on Irving Avenue between Moffat Street and Cooper Street adjoining the WACC property (SB-12/SB-16, SB-13, and SB-17). Those gamma dose rates were up to 20 times background measurements.

- **CSS Manhole Investigation**: Radiological constituents above average background concentrations exist within the CSS at least as far downgradient from the WACC property as the intersection of Irving Avenue and Halsey Street.
  - CSS sediment samples exhibited concentrations consistent with radiological impact. The highest impact (estimated in the report to be 760 times background concentrations) was detected in sediment collected from MH-5 (RI location I-5) (near the WACC property).
  - With the exception of MH-4 located adjacent to the WACC property, no radiological impact above background was identified in any of the manhole locations upstream of the Irving Avenue CSS. MH-4 measurements were approximately 2 times average background concentrations. This manhole is located on Cooper Avenue, adjacent to the WACC property.
  - Manhole gamma logging showed a general trend of decreasing radioactivity at the manhole invert as the distance of the manhole from the WACC property increased.
  - Radiological constituents above background concentrations exist within the CSS at least as far downgradient from the WACC property as location MH-13 (RI location H-1) at the intersection of Irving Avenue and Halsey Street (the downgradient extent of the assessment approximately 0.25 mile from the WACC property).
  - Gamma logging measurements performed at the most downgradient manhole investigated (RI location H-1 at Irving Avenue/Halsey Street) showed impact at about 1.5 times average background level.
  - Gamma dose rate, as measured at waist level above manholes, showed levels consistent with background conditions at all manholes with the exception of MH-8 (RI location M-1) and MH-11 (RI location I-2), located on Irving Avenue and Moffat Street, near the WACC property. Dose rates at MH-8 (RI location M-1) and MH-11 (RI location I-2) were up to approximately 8 times measured background levels.

1.3.4.11 2014 Multi-Agency WACC Neighborhood Radiological Assessment (NYSDOH et al. 2014)

Staff from NYSDOH, NYC DOHMH, and EPA (the agencies) performed an assessment to collect environmental radiation data in the neighborhoods adjacent to the WACC site; the assessment was conducted from July 29 to August 5, 2013.

The site assessment was executed as follows:

- NYSDOH staff performed walk-over gamma radiation surveys of the WACC property and the surrounding 0.5-mile radius.
- NYSDOH staff conducted soil sampling.
- EPA's contractor Weston collected on- and off-site thoron gas measurements.
- NYC DOHMH staff performed gamma surveys using a vehicle equipped with a mobile detection system (MDS), and drove through the streets in the area (within 0.5 mile).

Walk-over Gamma Surveys

The purpose of these surveys was to confirm earlier gamma radiation measurements and to verify that there were no elevated gamma radiation levels in areas outside of the WACC property and adjacent streets and sidewalks. The measurements were taken three feet above ground and at ground level.

Along Irving Avenue in front of the auto body shop, gamma radiation levels reached upwards of 700 μR/hr at ground level and 400 μR/hr at 3 feet. These locations were already known for elevated radiation levels.

At one location (approximately 200 feet from the WACC property) on the sidewalk in front of 1103 Irving Avenue, a gamma radiation level was measured at 210 μR/hr on contact with the ground and 39 μR/hr at 3 feet. The affected area appears to be no larger than 1 square foot. The remaining gamma radiation surveys within the 0.5-mile radius were all within background measurements and ranged from 7-13 μR/hr.

Radionuclide Analysis of Soil

Results from the one soil sample collected at the WACC property indicated elevated levels of Th-232 (approximately by a factor of 8) and Ra-226 (approximately by a factor of 1.5). All other radionuclides from this sample were within normal background concentrations. The results from the two background locations samples were within normal background concentrations in United States soils.

Thoron in Air Measurements

According to the thoron survey information and results provided by Weston, the highest thoron average concentration from a single location was 0.3 ± 0.3 pCi/L. More detailed is provided in Section 4.3.1.

Mobile Detection Survey

The purpose of the MDS was to identify radiation emanating from beneath streets (or nearby structures) that may be due to thorium contamination transported away from the WACC

property. The data suggested the contamination is confined to the area proximal to the WACC property.

Summary

The report concluded that the collaborative radiological data collection from the gamma walk over surveys, soil sampling, thoron measurements, and the MDS suggested there is no significant exposure to the surrounding community from radiological contaminants located at the WACC property. The one small area of contamination away from the WACC property located below the curb at 1103 Irving Avenue was concluded to not provide a significant source of exposure.

1.3.4.12 2014 ATSDR's Supplement to the 2012 Health Consultation (ATSDR 2014)

EPA requested that ATSDR prepare a second public health consultation to evaluate the new data. This public health consultation analyzed the new data for radon, including thoron, and gamma radiation, and determined whether the proposed shielding materials would reduce the radiation exposure to a level protective of public health.

For the WACC site, ATSDR determined three important conclusions based on data collected by the NYC DOHMH, the State of New York, their contractors, and the EPA validated radiation readings previously collected and evaluated by ATSDR in a previous public health consultation. The conclusions of the ATSDR were as follows:

- Radiation exposure levels, adjusted for times spent in specific tasks without appropriate shielding, greatly exceed ATSDR-established recommended levels known as MRLs. Because of the magnitude that the MRL values are exceeded, ATSDR concluded that there is a public health hazard to workers.
- The results of the shielding study showed that, with appropriate shielding in place, the radiation exposures can be reduced significantly, in some cases, over 85%. Applying the shielding to those areas that workers and officer workers most frequent, would reduce their annual exposures and concomitant radiation doses. ATSDR concluded that with the addition of 3.25 inches of steel shielding, the public health urgency would be reduced and there would be no expected harm to exposed individuals.

1.3.4.13 2014 Weston/EPA Radiation Assessment and Response Action Report for the WACC Site (Weston 2016)

This report was prepared by Weston's Removal Support Team 2 (RST 2) to summarize the activities conducted by EPA at the WACC site. The objective of the action was to reduce the potential long-term health risk from radioactive material left by previous operations by WACC. EPA conducted radiation assessment and mitigation operations at the site in three phases: gamma radiation surveying of the properties along Irving Avenue, radon sampling at the WACC property and several nearby properties, and the installation of shielding and mitigation controls, as needed.

The radiation assessment focused on measuring elevated levels of gamma radiation and radon gas concentrations. The source of the radiation was noted to be a combination of Th-232 and U-238, as they are both found in the monazite sand. Radon sampling assessed the radiation exposure associated with radon.

Gamma Radiation Assessment

The survey results are given as exposure rates above background. Background readings in Queens, New York were noted to be approximately 10 μR/hr.

- The highest pre-shielding exposure rates were found on the Irving Avenue sidewalk with 430 and 355 μR/hr for contact and at the waist, respectively.
- The property with the lowest pre-shielding exposure rates was the Jarabacoa Deli basement with maximum readings of 65 μR/hr for contact and 14 μR/hr at the waist.
- The area with the highest post-shielding exposure rates was also the Irving Avenue sidewalk with 90 and 130 μR/hr for contact and at the waist, respectively. Post-shielding waist level readings could potentially be higher than contact level measurement due to shine from building material.
- The property with the lowest post-shielding exposure rates was the Primo Auto warehouse (Lot 44) with background and 4 μR/hr for contact and at the waist, respectively.

Radon Sampling

Radon sampling was conducted to determine the presence of radon inside onsite properties including: Primo Auto Body and the Primo Auto warehouse, TerraNova, the apartments, and Jarabacoa Deli. Sampling was also conducted at the daycare and the school. Analytical results determined radon mitigation controls were only required within portions of the WACC property as described below.

Radiation Mitigation Activities

In April 2013, EPA installed fencing at the WACC property and shielded portions of the radioactive soil with rock and clean fill to reduce accessibility to the waste material. Based on radon results from samples collected in TerraNova (Lot 42), a radon mitigation system was installed in the TerraNova office on June 4, 2013. A radon system was not installed in Primo Auto Body Shop because lead and concrete shielding was already being installed at the property.

Following review of the gamma radiation surveys, shielding consisting of lead, steel, and concrete was installed within the impacted properties (TerraNova - Lot 42 and Primo Auto Body - Lot 44 and the sidewalk in front of those lots). Work was conducted in four stages for the installation of shielding: removing all items and debris from the property floors, preparing the floor for concrete, installing lead sheeting and concrete based on design specifications, and returning all items to their original location after a 14-day cure period. Shielding performance for each property was evaluated based on the effectiveness in reducing exposure rates. Follow up surveys showed exposure rates had been reduced between 69 to 94%. After shielding and radon systems were installed, all radon concentrations dropped by more than half to below 2.0 pCi/L indicating subsequent measurements were not necessary (EPA 2002a).

Following completion of these initial investigations and mitigation activities, the site was listed on the National Priorities List (NPL) on May 12, 2014.

1.3.4.14 2015 Results of Thoron Gas Air Concentration Measurements Performed Inside and Behind Two Buildings Located at 338-350 Moffat Street (EPA 2015)

A supplemental investigation was performed at the 338-348/350 Moffat Street properties by EPA in 2015 for indoor and outdoor radon and thoron to determine the air concentrations at this potentially impacted commercial and residential property. Multiple locations were surveyed based on the available external gamma rate readings, presence of cracks, holes in the floors, joints between floors and walls, and other features conducive to the emanation of gas from soil. A summary of the results is discussed in Section 4.3.2.

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Section 2

Study Area Investigations

This section describes the RI field activities which were conducted in accordance with the EPA-approved Final Quality Assurance Project Plan (QAPP) (CDM Smith 2015a), Final RI/FS Work Plan Volume 1 (CDM Smith 2014a), and Final Work Plan Addendum (CDM Smith 2015b). Deviations from the QAPP were discussed with EPA and are documented in Field Change Notification (FCN) forms, which are provided in **Appendix B.**

Initial RI field activities were performed in 2015 and 2016. Following review of the initial data collected, additional investigations at the school and daycare were conducted and an upgradient well was installed. Two additional rounds of groundwater sampling were performed; Round 3 was completed in 2016 and Round 4 was completed in 2017. RI field activities were performed by CDM Smith personnel assisted by subcontract personnel including the following:

- **Cascade Drilling and Unitech Drilling** – Soil Boring and Well Installation
- **Earth Repair, LLC** – Sewer Surveys
- **Greenwich Environmental Designs** – Radiation Technology Services
- **Geod Corporation** – Civil, Utility, and Topographic Surveys
- **I. C. E. Service Group, Inc.** – Investigation Derived Waste Handling and Disposal Services

Environmental media investigated during the RI included soil, sediment, groundwater, air, and building/sewer construction materials. Samples were primarily collected to delineate the extent of media contaminated by radioactive waste; however, some samples were also collected for non-radiological contaminants to determine the presence of non-radiological contamination and to aid in completion of the HHRA.

Various laboratory services were utilized to analyze samples collected at the site. These include the following:

- **Onsite Canberra In-Situ Gamma Spectroscopy system (ISOCS)** was deployed in the field to provide quick turn-around analysis for the presence of the two principal contaminants (Th-232 and Ra-226) in soils, solids and sewer sediments at the site.
- **American Radiation Services Laboratories** analyzed a sub-set of duplicate soil and sewer sediment samples (10%) collected and sent for independent gamma spectroscopy and isotopic assessment to ensure the use of the ISOCS system would provide a reliable and accurate assessment of contaminants. This laboratory also analyzed samples of creek sediments, building and sewer construction materials, and groundwater.
- **Radon Testing Corporation of America** analyzed charcoal canister samples deployed for radon investigations conducted at the school and daycare.

- **Landauer, Inc.** analyzed alpha-tracking detectors (ATD) deployed for radon and thoron investigations conducted at the school.
- **Shealy Laboratories** analyzed soil and groundwater samples for non-radiological analysis including TCL and TAL parameters.

The RI field activities are described in this section and the results are presented in Section 4. **Figure 2-1** presents a summary of the site areas that will be discussed in the following sections. A general timeline of the activities performed is presented on **Table 2-1** and a summary of the radiological survey equipment used for the investigation is presented on **Table 2-2**.

2.1 Building Investigation

A radiological survey and subsequent sampling of the WACC property building materials was performed to determine if any process or effluent radioactive material became embedded in the building materials. A hazardous building materials survey was also performed to determine the presence of other hazardous materials such as ACM, LBP, mercury, and PCBs.

2.1.1 Radiological Building Materials Surveys

The interior walls, floors, and ceiling and the exterior walls and roofs of the WACC property buildings (including Lot 33, Lot 42, Lot 44, and Lot 46) were scanned with a collimated 2x2 inch NaI detector (Ludlum 44-10 probe/2221 meter) to identify locations with elevated gamma activity to target for sampling. During all gamma surveys, professional judgment was used to focus on suspect areas with visual staining or notable features like floor drains, air vents, or infrequently cleaned or accessed areas where dirt and dust can accumulate. Gamma surveys were performed on the following:

- Floors: Gamma scanning was performed on the floors approximately 10 centimeters (cm) above the surface at a rate of 0.5 meter per second. The floors were spot checked every square meter and the highest gamma count rate was recorded. Floor areas in portions of Lot 42 and Lot 44 were not surveyed due to the presence of lead/concrete shielding installed under the floors by EPA in 2014 to cover areas of known contamination.
- Interior Walls and Ceilings: The interior walls were scanned every square meter on the lower two meters of the walls and every three-square meters on the upper two meters of the walls. The ceilings were spot checked, focusing on areas such as the tops of rafters, pipes, and light fixtures.
- Exterior Walls: The exterior building walls were scanned every square meter on the lower two meters and above two meters only if elevated gamma readings were observed up to two meters.
- Roof: The accessible parts of the roofs of the WACC buildings were scanned using a collimated 2x2 inch NaI detector (Ludlum 44-10 probe/2221 meter) connected to a Trimble GeoXH 7 series handheld global positioning system (GPS) unit for data logging. The roofs over Lot 33 and over Lot 46 Flat Fix are dilapidated and not safe to access and, therefore, were not included in the survey.

2.1.2 Wipe and Building Materials Sampling

Following review of the interior gamma scan data from the WACC buildings, a Ludlum 43-93 probe/2360 meter was used to take direct alpha and beta measurements where the highest gamma counts were recorded. Wipe samples were collected at every alpha/beta measurement location to determine levels of removable contamination. Each wipe sample consisted of a 1.75-inch diameter cloth wipe test kit over a 100 cm^2 area; the wipe's activity was counted on a Ludlum 2929 dual channel scaler. The majority of the original WACC building interior has been either painted over or covered by drywall or cement, so only a limited number of direct readings could be taken.

At each location selected for direct alpha/beta measurements, samples of the building materials were also collected and sent to a subcontract laboratory for gamma spectroscopy analysis for radionuclides. One minute counts were taken with the 43-93 probe/2360 meter at several of the locations pre- and post-sampling. **Table 2-3** presents a summary of the building material sampling including descriptions of the sample locations.

2.1.3 Hazardous Materials Survey

A hazardous materials survey was performed at the WACC property buildings to determine if hazardous building materials including ACM, LBP, mercury, and PCB materials are present. CDM Smith's hazardous materials subcontractor, Athenica Environmental Services, performed the survey in late November and early December 2015. They performed an initial survey of each of the buildings to delineate and identify spaces to be further inspected. Samples were collected from suspect materials to be analyzed for asbestos, lead, PCBs, and mercury. The hazardous materials survey report by Athenica Environmental is included in **Appendix C**.

2.2 Soil Investigation

To supplement historic data and to characterize the nature and extent of contamination at the site, a soil investigation was performed. All soil boring and drilling activities were performed by Cascade Drilling Inc. (Cascade) overseen by CDM Smith personnel. Prior to conducting any intrusive activities Cascade utilized ground penetrating radar (GPR) to mark the sewer lines, other utilities, and buried anomalies in the vicinity of each boring. The investigation included gamma walk over surveys, soil sampling, and background soil sampling. The following sections describe each activity in detail.

2.2.1 Gamma Walk Over Surveys

Gamma walkover surveys were performed at the site using a collimated 2x2-inch NaI detector (Ludlum 44-10 probe/2221 meter), with the exception of the survey at Lot 31, where an uncollimated detector was used. The surveys were performed to identify areas of elevated gamma activity to target for soil sampling. Scanning was performed approximately 10 centimeters above the ground surface at a rate of 0.5 meter per second. All walkovers surveys were logged on a Trimble GeoXH 7 series handheld GPS unit. Gamma walkover surveys were performed in the following areas of the site:

- Lots 31 and 30 (former rail spur) between the WACC buildings and the 5606 Cooper Avenue building, including along the south and east sides of the 5606 Cooper Avenue building
- Exterior asphalt and concrete areas around Lot 48 (K&M Auto)
- Moffat Street (including both shoulders) from Lot 33 at Irving Avenue to the intersection with Knickerbocker Avenue
- 308 Cooper Avenue lot
- North and east outdoor areas of the 338-348/350 Moffat Street buildings

Additional gamma walkover surveys were performed to establish background gamma levels for areas covered by grass/vegetation, asphalt, and concrete, and to identify any anomalous high activity areas that would skew background estimates. No anomalous count rate areas were detected. Background surveys were performed using the methodology described above at the locations of the background soil borings as shown on **Figure 2-2** and described below.

- Knollwood Park Cemetery (approximately 1,200 feet northeast of the WACC property), a 125 square meter rectangle of grass covered soil near BKSB-06 was scanned and 20 one-minute counts were taken at evenly spaced intervals throughout the rectangle to establish background for grass/vegetation covered surfaces. The same 125 square meter rectangle was also scanned and 20 one-minute counts were taken with an uncollimated 2x2-inch NaI detector because Lot 31 at the WACC property was scanned with an uncollimated 2x2-inch NaI detector.
- Knollwood Park Cemetery (approximately 750 feet east of the WACC property), a 100 square meter rectangle of asphalt near BKSB-07 was scanned using a collimated 2x2-inch NaI detector and 20 one-minute counts were taken to establish background levels for asphalt surfaces.
- At Irving Square Park (approximately 1,500 feet west of the WACC property), an approximately 112 square meter area of concrete sidewalk near BKSB-04 was scanned using a collimated 2x2-inch NaI detector and 20 one-minute counts were taken to establish site background levels for concrete surfaces.

2.2.2 Soil Sampling

Soil borings were advanced to collect soil samples using either direct-push technology (DPT) drilling, rotosonic drilling, or hand-augering. At each soil boring location, prior to drilling, a one-minute count was taken at the ground surface with a 1x1-inch NaI detector (Ludlum 44-2 probe/2221 meter) and a surface exposure rate measurement was taken with either a Ludlum Model 19 or a Ludlum Model 9DP. A soil boring investigation summary is presented on **Table 2-4** that includes the location, depth, surficial gamma counts, and surface exposure rates collected at each boring location. Soil borings included the following:

- **Background Soil Borings** – A total of eight borings (four surficial and four deep) were advanced by either hand auger or DPT. Surficial borings were approximately 1 to 2 feet

deep and deep borings were approximately 25 to 30 feet deep. A background soil boring location map is presented on **Figure 2-2**. Background locations were selected based on distance from the site and composition of the background area (physical setting, likelihood of fill materials present, groundwater, etc.).

- **Primary Soil Borings**– A total of 55 borings (44 shallow and 11 deep) were advanced by hand auger, DPT, or rotosonic drilling at the WACC property, the adjacent streets and sidewalks and further south on Moffat Street. Shallow soil borings were 2 to 10 feet deep and deep soil borings were 27 to 75 feet deep. The soil boring location map is presented on **Figure 2-3**.
- **308 Cooper Street Soil Borings** – A total of eight borings (six shallow and two deep) were advanced by DPT on this adjacent empty lot. Shallow soil borings were generally advanced to 10 feet bgs and the deep soil borings were 25 to 30 feet bgs.
- **338-348/350 Moffat Street Soil Borings** – A total of 15 shallow borings were advanced to depths between 1 and 10 feet bgs inside the warehouse and hallways of the apartments, and outside in the open back lot areas.

This bulleted list does not include the sewer soil borings or the school soil borings, which are discussed separately in **Sections 2.4.4** and **2.6.1**, respectively.

DPT Soil Borings

At each of the 86 DPT soil boring locations, five-foot long macrocores were collected from undisturbed soil in advance of the DPT drill rods. To facilitate downhole scanning with a 1x1-inch NaI detector, the first 10 feet of each borehole was drilled using nominal 3-inch outer diameter (OD) macrocores to create a larger borehole. After 10-feet, the drill rig was not powerful enough to continue advancing the 3-inch OD cores, so smaller 2-inch OD cores were collected. Upon retrieval, the lithology of each core was logged by the geologist and the soils were screened for the presence of organic vapors using a photoionization detector (PID). Soil boring logs are presented in **Appendix D**. **Table 2-5** summarizes the types of samples that were collected from each boring. Except where refusal or poor recovery necessitated a modified sampling scheme, samples for analysis by the Canberra In-Situ Object Counting System (ISOCS) and/or laboratory analysis were collected as follows:

- **Background Soil Borings** – Samples for ISOCS analysis and Target Compound List (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), PCBs, pesticides, and Target Analyte List (TAL) metals were collected from 0-2 feet (ft), 4-6 ft, 8-10 ft, 18-20 ft, and 28-30 ft.
- **Primary Soil Borings**– Samples for ISOCS analysis were generally collected every two feet (i.e., 0-2 ft, 2-4 ft, 4-6 ft, etc.). In some cases, where poor recovery occurred or where the soil material indicated possible contamination was isolated to a less than a two-foot area, a 1-foot sample interval was collected. Ten percent of the samples analyzed on the ISOCS were selected for laboratory analysis for gamma spectroscopy of radionuclides. Ten percent of the samples selected for gamma spectroscopy analysis were also selected for isotopic uranium and isotopic thorium analysis. At pre-selected borings near or in the

WACC buildings, or where elevated PID readings were found, samples were also collected for TCL VOCs, TCL SVOCs, PCBs, pesticides, and TAL metals. VOC samples were collected directly from the intact soil core prior to homogenization.

- **308 Cooper Street Soil Borings** - Samples for laboratory analysis for gamma spectroscopy of radionuclides were generally collected every two feet (i.e., 0-2 ft, 2-4 ft, 4-6 ft, etc.).
- **338-348/350 Moffat Street Soil Borings** - Samples for laboratory analysis for gamma spectroscopy of radionuclides were generally collected every two feet (i.e., 0-2 ft, 2-4 ft, 4-6 ft, etc.).

After drilling, downhole gamma logging was performed by taking one-minute counts at one foot intervals from the ground surface to a depth of about 10 feet, refusal or to the bottom of the borehole. The detector was wrapped in a plastic bag and sealed to protect it from water infiltration. Additionally, a maximum count and a duplicate count was taken in each borehole. The downhole gamma logs are included in **Appendix D**. DPT boreholes were abandoned by backfilling with cement-bentonite grout and finishing the surface with the appropriate material, such as asphalt patch, concrete, or topsoil.

Rotosonic Soil Borings

At each of the six rotosonic boring locations (MW-01, SB-01, SB-02, SB-05, SB-20, and SB-35), five-foot long soil cores were collected in a 4-inch inside diameter (ID) sonic core barrel from undisturbed soils in advance of a 5-inch ID casing. Upon retrieval, the lithology of each core was logged by the geologist and the soils were screened for the presence of organic vapors using a PID. Each core was also scanned with a collimated 2x2-inch NaI detector and one-minute counts were taken at one-foot intervals over the length of the cores. Boring logs are included in **Appendix D**.

Samples for ISOCS analysis were collected every two feet (i.e., 0-2 ft, 2-4 ft, 4-6 ft, etc.) to a maximum depth of 30 feet bgs. At pre-selected borings, or where elevated PID readings were found, samples were also collected for TCL VOCs, TCL SVOCs, PCBs, pesticides, and TAL metals. VOC samples were collected directly from the intact soil core prior to any homogenization.

A permanent, two-inch polyvinyl chloride (PVC), monitoring well was installed in each rotosonic borehole, excluding SB-20 where the boring was abandoned at five feet bgs due to refusal. At SB-20, the borehole was backfilled with cement-bentonite grout. Details on well installation can be found in **Section 2.3**.

2.3 Hydrogeologic Investigation

A hydrogeologic investigation was performed at the site to investigate potential contamination in site groundwater. The hydrogeologic investigation included monitoring well installation, gamma logging of wells, well development, slug testing, synoptic water level measurements, and four rounds of groundwater sampling.

2.3.1 Well Drilling and Installation

Six monitoring wells were installed at locations shown on **Figure 2-4** to characterize groundwater quality at the site. Well locations were selected based on the location of soil

contamination at the WACC property and on regional groundwater flow in the vicinity of the site. Wells MW-01 through MW-05 were installed using a mini-rotosonic rig in 2015 by CDM Smith's drilling subcontractor, Cascade Drilling. MW-06 was installed on March 30, 2017 by Unitech Drilling after the first three rounds of groundwater sampling to provide a monitoring well upgradient of the WACC property.

Well construction details are summarized on **Table 2-6**. Monitoring well construction diagrams are included in Appendix D. Each monitoring well was constructed of 2-inch diameter PVC casing with a 10-foot-long, 0.010-inch slot, PVC well screen. The annulus around each well screen was backfilled with FilPro™ #1 sand, which extends approximately two to five feet above the well screen. A minimum two feet thick bentonite seal was placed above the sand pack and the remaining annulus was grouted to the surface. An eight-inch steel protective casing with a locking cap was installed and a concrete pad poured around each well. All wells were developed no sooner than 48 hours following installation. The coordinates and elevations (ground surface, top of inner casing, and top of protective casing) of the newly-installed wells were measured by GEOD Corporation under subcontract to CDM Smith. Survey information is also included on **Table 2-6**.

2.3.2 Monitoring Well Gamma Logging

Downhole gamma logging was performed in MW-01 through MW-05, following completion of well installation and development. Gamma logs are presented in **Appendix E**.

2.3.3 Synoptic Water Level Measurements

Four rounds of synoptic water levels were collected on December 8th, 2015, April 20th, 2016, November 17th, 2016, and April 12th, 2017 from the newly- installed monitoring wells to define the groundwater flow direction at the site. Synoptic water level measurements were collected in conjunction with the groundwater sampling events described in Section 2.3.4, prior to sampling any wells. Water level measurements were referenced to the surveyor's mark at the top of the well's inner casing. Water levels were only collected from four wells during the third sampling round as MW-04 was inaccessible. Synoptic water level data are summarized in **Table 2-7.**

2.3.4 Groundwater Sampling

Three rounds of groundwater sampling were performed at the five monitoring wells installed in 2015 (MW-01 through MW-05) using low-flow purge and sampling methods. Round 1 was performed on December 9th and 10th, 2015. Round 2 was performed on April 20th and 21st, 2016. Round 3 was performed on November 17th, 2016. Round 4 was performed following the installation of MW-06 on April 12 and April 13, 2017.

Monitoring wells were purged and sampled using a two-inch diameter submersible Grundfos pump with dedicated Teflon™-lined polyethylene tubing, following the site-specific, low-flow, minimal drawdown sampling procedure described in the Final QAPP (CDM Smith 2015a). The sampling pumps were placed at the mid-point of the well screen in each well. Dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity, temperature, pH, and conductivity were measured in the field using a YSI 556 MPS and a LaMotte 2020we.

Round 1 and 2 groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, TAL metals and mercury (total and dissolved), and gamma spectroscopy for radionuclides.

In Round 3, samples were unable to be collected from MW-04 as it was inaccessible for sampling due to damaged cars being stored in the former rail spur area. Round 3 samples were only collected and analyzed for Th-232 by isotopic thorium and Ra-226 by EPA 903.0/904.0 to achieve lower detection activities for radiological isotopes. Round 4 samples were collected from all six monitoring wells for VOCs, Ra-226 and Th-232.

Table 2-8 summarizes sample information and analyses. Groundwater sampling field data sheets are included in **Appendix F.**

2.3.5 Slug Tests

Slug tests were performed at MW-01 through MW-05 to estimate the hydraulic conductivity of the upper portion of the aquifer. Slug tests were performed using a weighted cylinder to displace the water and a pressure transducer to measure and record water level changes over time. The pressure transducer was installed near the bottom of the well, and programmed to record depth to water on a logarithmic schedule during the test. The initial logging interval was 0.25 second, and the interval gradually increased as the test proceeded to a maximum interval of five minutes between recorded readings.

The slug was lowered to just above the water level prior to initiating water level logging. Once the slug was in position, logging was initiated and the slug was quickly lowered to beneath the static water level, thereby raising the water level in the well and initiating the falling head test. After the water level recovered to within 10 percent of the static water level, a new log was started, and the slug was pulled to above the static water level thereby lowering the water level and initiating the rising head test. The typical procedure is to perform a single falling head followed by a single rising head test at each well, and reviewing the data to determine if additional tests are necessary. The slug test recovery times at the WACC site were short, ranging from a few seconds to a few minutes. In some cases, recovery was so rapid, such as at MW-03, that the resulting water level curve exhibited very few data points for analysis. As a result of the short test durations, the field crew performed two falling tests and two rising tests at each well in order to assure that the data were repeatable.

Slug test analysis was performed with the aid of Aqtesolv Pro 4.0® (Aqtesolv®), a commercially available software package designed specifically for aquifer test analysis. Aqtesolv® offers a range of analytical solutions that correspond to different aquifer types. Based upon the boring logs at WACC and published geological literature, the wells tested are partially penetrating wells in an unconfined aquifer (discussed below). Therefore, the Bouwer and Rice (1976) analytical solution, designed for such cases, was used.

The boring logs of the WACC monitoring wells indicate consistent lithology across the site from ground surface to the total drilled depth, which ranged from 70 to 76 feet bgs. The strata penetrated during drilling was comprised of fine to medium sand with a trace of gravel and no low permeable layers were observed. Based upon the geologic literature (Soren 1978), the base of the aquifer is assumed to be the Gardiners Clay, which is expected to be present at an elevation 100 feet below mean sea level at the site, or about 170 feet bgs. Therefore, the monitoring wells are considered to be partially penetrating wells in an unconfined aquifer. The monitoring well

screens are generally set 5 to 15 feet below the water table surface; and the saturated thickness of the aquifer is estimated to be about 111-114 feet depending on the depth to water at each well.

2.4 Sewer Investigation

A sewer investigation was performed within and adjacent to the CSS in the area around the WACC property, as well as at the sewer discharge point at Newtown Creek that may have been impacted by the historic discharge of radiological material. The objective of the sewer investigation was to:

- Identify the extent of radiological contamination in the sewers
- Identify the extent of radiological contamination embedded in sewer construction materials
- Identify the concentration and extent of contamination in soils surrounding the sewer
- Identify whether contaminated material disposed of in the sewer has impacted the sediment at the sewer discharge at Newtown Creek (East Branch)

The investigation included fiberscope mapping, sewer construction material sampling, soil borings and sewer outfall sediment sampling.

2.4.1 Fiberscope Mapping

Mapping of the nearby sewer system was performed by CDM Smith's survey subcontractor, GEOD, who used their subcontractor, Earth Repair, to perform the work. A fiberscope camera attached to a remote-controlled pipe crawler were used to identify locations where significant cracks and leaks exist in the sewer line, as well as the construction materials and sizes of the sewers. The lines mapped include:

- The line originating at the site and flowing along Irving Avenue, turning on to Halsey Street, and then on to Wyckoff Avenue. The lines from the smaller, adjoining streets along Irving Avenue were also mapped up to one to two manholes on each street.
- The line originating at the site and flowing along Moffat Street and turning on to Knickerbocker Avenue.
- The line along Cooper Avenue from about halfway between Irving Avenue and Wyckoff Avenue and turning onto Irving Avenue.
- The line along Cooper Street beginning just southwest of Irving Avenue and flowing toward Knickerbocker Avenue.

Figure 2-5 presents the locations of the sewer lines surveyed and **Appendix G** includes the fiberscope survey report.

2.4.2 In-Sewer Gamma and Exposure Rate Measurements

During the fiberscope investigation, CDM Smith collected gamma count and gamma exposure rate measurements. Results of the investigations are presented in **Section 4**.

Manhole Gamma Scans – At each manhole along the path of the sewer lines investigated, the manhole cover was removed and a one-minute count was taken at the surface with a 1x1 inch NaI detector (Ludlum 44-2 probe/2221 meter) and a gamma exposure rate measurement was taken with a Ludlum Model 9DP. The entire depth of the sewer vault was then scanned with the NaI detector and another one-minute gamma count was taken three feet from the bottom of the sewer invert and at the depth of the maximum gamma count rate. In addition to the surface gamma exposure rate measurements taken at each manhole, gamma exposure rates were taken with a Ludlum Model 9DP at three feet from the bottom in manholes that were accessed for sewer construction material samples, discussed in **Section 2.4.3**.

Sewer Line Gamma Scans - A 1x1 inch NaI detector, attached to either a 90-ft or 200-ft cable, was then attached to the pipe crawler and sent through the various sewer lines. The detector was wrapped in plastic and sealed with tape to protect it from water infiltration. The 2221 meter was connected to a Trimble GeoXH 7 series handheld GPS unit for data logging. The meter and GPS remained stationary on the surface, so the GPS was not used for positional data. At approximately 10-ft intervals from manhole to manhole, the fiberscope was stopped and the gamma count rate was recorded.

Background - In-sewer gamma scans and gamma exposure rate measurements were also taken at several background locations to establish background gamma levels. Background in-sewer gamma counts and gamma exposure rate measurements were performed in the same manner as described above. The sewer lines selected as background locations were lines which did not connect directly to the sewer lines originating from the WACC property. In general, CDM Smith attempted to collect background data in sewer lines of varying sizes and materials correlating to the sizes and materials observed in the lines originating from the site. Locations where background data was collected are shown in purple on **Figure 2-5** and include:

- The line originating at the southwest intersection of Decatur Street and Irving Avenue and flowing toward Knickerbocker Avenue
- The line originating on Eldert Street at Irving Avenue and flowing toward Knickerbocker Avenue
- The line running along the northeast side of Wyckoff Avenue at the end of Halsey Street
- The line originating south of Irving Avenue on Cooper Street and flowing toward Knickerbocker Avenue. A connection was not found from this sewer line to the Irving Avenue sewer line.

2.4.3 Sewer Material Sampling

Sewer material samples, including brick, concrete, cast iron, and sediment, were collected from six sewer vaults that are part of the sewer system originating at the WACC property and flowing away from the property along Irving Avenue. The samples were collected to verify the source of gamma radiation in the sewers. A total of 13 samples, including a duplicate, were collected from the sewer vaults and analyzed for gamma spectroscopy for radionuclides. The three sediment samples collected were analyzed for isotopic thorium and isotopic uranium in addition to gamma spectroscopy.

A qualified, confined-space trained employee of Earth Repair physically entered each of the six sewer vaults and, under the direction of CDM Smith, used a collimated 2x2 inch NaI detector (Ludlum 44-10 probe/2221 meter) to determine specific sampling locations. The sampling locations were selected based on where the highest gamma counts with the 2x2 were detected in each vault, as well as material type. One-minute gamma counts were taken at each sampling location pre- and post-sampling.

See **Figure 2-5** and **Table 2-10** for the locations of the sewer material samples and a description of the samples collected.

2.4.4 Sewer Soil Borings

Sewer soil borings were advanced using a DPT rig at nine locations along Irving Avenue, Cooper Avenue, and Halsey Street to determine if radioactive material is present in the soil surrounding the sewer line, either as fill or as the result of a cracked or damaged sewer line. The boring locations were selected based on elevated, in-sewer gamma readings recorded during the fiberscope investigation. CDM Smith's drilling subcontractor, Cascade, used GPR to mark out the sewer line, other utilities, and buried anomalies in the vicinity of each boring prior to drilling. The borings were placed approximately 1 to 2 feet from the sewer line and generally extended a minimum of 3 feet below the bottom of the sewer line (as measured during the fiberscope investigation), ranging in depth from 15 to 25 ft bgs.

Sewer soil boring sampling was performed following the same procedures described under DPT Soil Borings in **Section 2.2.2**. **Figure 2-5** shows sewer soil boring locations and **Table 2-5** is a summary of the samples collected at the sewer soil borings.

2.4.5 Newtown Creek Sediment Sampling

Newtown Creek (East Branch) Sediment Sampling

Sediment samples were collected in the East Branch of Newtown Creek to determine if radioactive material historically disposed in the sewers at the site has discharged to and impacted sediment in Newtown Creek. The sewer line originating at the site discharges to Newtown Creek at outfall NCB-083. The Newtown Creek-East Branch sediment core locations include EB-01 through EB-08 and are presented in **Figure 2-6** and a vibracore boring summary is presented on **Table 2-11**. A pontoon-boat mounted vibracore unit, operated by CDM Smith's vibracore subcontractor, Aqua Survey Inc. (ASI), was used to collect sediment samples from the eight locations in a roughly pyramid-shaped pattern at the NCB-083 discharge point. A 10-foot long, 4-inch diameter, steel barrel attached to a vibracore head was used to collect the sediment cores at each location. The steel barrel and core catcher were thoroughly rinsed and a new, plastic core liner was placed inside the barrel prior to collecting each core. Following extraction of the core from the core barrel, creek sediment cores were scanned with an uncollimated 2x2 inch NaI detector (Ludlum 44-10 probe/2221 meter). The lithology of each core was logged by the geologist and the soils were screened for the presence of organic vapors using a PID. Sediment core logs are presented in **Appendix D**. Samples for gamma spectroscopy, isotopic uranium, and isotopic thorium analysis were collected in one foot intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft, etc.). A creek sediment sample summary is present on **Table 2-12**.

Coney Island Creek Background Sediment Sampling

Sediment samples were collected in Coney Island Creek to establish background sediment data. Two 10-foot sediment cores, CIC-01 and CIC-02, were collected following the same procedure as the sediment cores in Newtown Creek. The Coney Island Creek background sediment core locations include CIC-01 through CIC-08 and are presented in **Figure 2-7.**

Eight one-foot grab samples were also collected using a ponar-type grab sampler. The grab sample locations include CIC-03 through CIC-08. Samples were scanned with an uncollimated 2x2 inch NaI detector (Ludlum 44-10 probe/2221 meter). The lithology of each core was logged by the geologist and the soils were screened for the presence of organic vapors using a PID. Samples for gamma spectroscopy, isotopic uranium, and isotopic thorium analysis were collected in one foot intervals (i.e., 0-1 and 1-2 feet etc.).

2.5 Gamma Exposure Rate Confirmation Surveys

Gamma exposure rates were taken at selected locations with a Ludlum Model 9DP to confirm gamma exposure rates collected during previous investigations and to aid in the risk assessment. The results of this investigation are presented in Section 4.

2.5.1 Gamma Exposure Rate Confirmation Surveys

The meter was allowed to stabilize at each location (1 - 2 minutes) and then a reading was taken every 15 seconds for a total of 4 readings. The final exposure rate was recorded as the average of the four readings. All readings were taken at waist height or approximately three feet above the ground surface. Readings were also taken at the ground surface at certain confirmatory locations, hot spots, and areas where it can be assumed that workers will be performing work on or near the ground (i.e., the auto body shop).

Interior Exposure Rate Surveys

Gamma exposure rate data were collected inside the buildings at the WACC property, including Lot 33 (warehouse), Lot 42 (TerraNova and Primo Auto Body), Lot 44 (Primo Auto Body), Lot 46 (Jarabacoa Deli and Primo Flat Fix), and Lot 48 (K&M Auto Repair).

Exterior Exposure Rate Surveys

Gamma exposure rate data were collected around the outside of the WACC buildings, as well as at points within several blocks of the WACC property where data had been collected during previous investigations. Exterior locations were logged on a Trimble GeoXH 7 series handheld GPS unit.

2.6 School and Daycare Investigation

Soil borings, gamma exposure rate measurements, and radon/thoron sampling were performed to investigate if radioactive contamination has impacted PS/IS 384 (the school) at 242 Cooper Street or the daycare (272 Moffat Street) southwest of the WACC property.

2.6.1 School and Daycare Soil Borings

During the initial RI field investigations soil borings were advanced using a DPT rig at six locations around the school along Moffat Street, Wilson Avenue, and Cooper Avenue to determine if radioactive material is present in the soils near the school (**Figure 2-8)**. CDM Smith's driller,

Cascade, marked out the utilities, and buried anomalies in the vicinity of each boring prior to drilling. School soil borings were advanced to 10 feet bgs and were performed following the same procedure as described under DPT Soil Borings in **Section 2.2.2**. Samples for ISOCS analysis were collected every two feet (i.e., 0-2 ft, 2-4 ft, 4-6 ft, etc.). Ten percent of the ISOCS samples were sent to the subcontract laboratory for gamma spectroscopy analysis to verify the ISOCS data. Ten percent of that 10 percent sent to the subcontract laboratory were analyzed for isotopic uranium and thorium to verify no other uranium and thorium isotopes are present.

CDM Smith performed additional investigations at the school and daycare between March 27 and March 31, 2017 to characterize the soils below and immediately adjacent to the school and daycare buildings. Ten soil borings were installed, five through the basement slab at the school, two through the basement slab at the daycare and three outside the daycare building on the sidewalk or street. Interior borings were completed by cutting the slab with a concrete coring machine. Hand augers were used to collect soil samples to an estimated depth of 4 feet below the slab. Exterior borings were installed using a DPT rig to 8 feet bgs. Thirty continuous 2-foot samples were collected (including duplicates) and sent to the subcontract laboratory for gamma spectroscopy analysis. After drilling, downhole gamma logging was performed by taking one-minute counts at one foot intervals from the ground until refusal or to the bottom of the borehole. The detector was wrapped in a plastic bag and sealed to protect it from water infiltration. The downhole gamma logs are included in **Appendix D**. Boreholes were abandoned by backfilling with cement-bentonite grout and finishing the surface with the appropriate material, such as asphalt patch, concrete, or topsoil. The basement slab was patched to its original condition.

2.6.2 School and Daycare Radon and Thoron Evaluations

Radon and thoron evaluations were also performed at the school and daycare during the RI. A CDM Smith radon specialist, certified by the New Jersey Department of Environment Protection completed radon measurements at both facilities in accordance with EPA's Radon Measurement in Schools Guidance document, dated July 1993.

Short-Term Charcoal Canister Testing

On October 9, 2015, CDM Smith and GED placed a total of 32 charcoal canisters in the school and 17 charcoal canisters in the daycare center for short-term radon testing. The canisters were retrieved from the school on October 12, 2015 and from the daycare on October 13, 2015. They were shipped to Radon Testing Corporation of America for analysis on the same day they were retrieved.

Long Term (6 and 12-month) Testing

On October 9, 2015, CDM Smith and GED also placed a total of 21 ATDs in the school for long-term diffusion-based radon and thoron testing. The six-month ATDs were retrieved from the school on April 27, 2016 and shipped to Landauer, Inc. for analysis. The 12-month ATDs were retrieved on October 13, 2016 and shipped to Landauer, Inc. for analysis.

RAD-7 Testing

Durridge RAD-7 instrument was used to complete radon/thoron screening in conjunction with the basement soil sampling conducted at the school and daycare between March 27-31,2017. Short-term (30 minute) readings were taken at each boring location following penetration of the

concrete slab basement floors in the school and daycare. The screening commenced following removal of a core of the concrete slab prior to advancing the soil boring.

In addition, at the daycare, a five-day continuous thoron measurement and seven-day continuous radon measurement were collected in the basement. The thoron measurement was performed with the Drystik lab drying unit, which is optimized to provide direct thoron data without correction.

Results of the short-term and long-term radon/thoron evaluations, and RAD-7 testing are discussed in **Section 4.8.2**.

2.6.3 School and Daycare Gamma Exposure Rate Measurements

Gamma exposure rates were taken in the basements and outdoor play areas of the school and the daycare. In the basements, readings were taken at a minimum every 100 square meters and at least one in every room. In the outdoor play areas, readings were taken every 100 square meters on a 10-meter by 10-meter grid. Exposure rates were taken with a Ludlum Model 9DP. The meter was allowed to stabilize at each location (1 - 2 minutes) and then a reading was taken every 15 seconds for a total of 3 to 4 readings. The exposure rate was then recorded as the average of the readings. All readings were taken at waist height or approximately three feet above ground surface. Exterior locations were logged on a Trimble GeoXH 7 series handheld GPS unit and interior locations were drawn on a survey map. The results of these measurements are presented in **Section 4**.

2.7 Site Surveys

2.7.1 Site Civil and Topographic Survey

In mid to late 2015, a site civil and topographic survey was completed by GEOD, Inc. under subcontract to CDM Smith. The survey report is provided in **Appendix H**. The survey included a detailed civil survey, including property boundaries, land features, building type and height, and public and private rights-of-way. The survey also included locations of public utilities within streets and sidewalks surrounding the site, including locations of utility features such as manholes, storm drains, culverts, inverts, and sanitary and storm drains. Aerial photogrammetric and topographic surveys were also performed.

2.7.2 Site Underground Storage Tank Survey

In October 2015, GEOD, Inc. performed a survey using ground penetrating radar (GPR) to attempt to locate possible USTs at the site. The tanks were believed to have been located at the northern corner of the site, in the area of the current K&M Auto Repair outdoor area (Lot 48). The survey only found limited detections of buried piping in the area that was previously a filling station. There was no indication of tanks remaining at the WACC property.

2.7.3 Monitoring Well, Soil Boring, and Sediment Boring Survey

On December 18, 2015, the locations and elevations of monitoring wells were surveyed by GEOD Corp., a professional land surveyor under subcontract to CDM Smith. The location coordinates and elevations of the land surface, the protective concrete pad, the top of the outer casing, and the top of the inner PVC casing of monitoring wells were surveyed. The survey data were provided in

an electronic data deliverable (EDD) that was uploaded to the site geographic information system (GIS).

The soil boring and sediment boring locations were surveyed by CDM Smith, GEOD, or ASI field staff using a Trimble GeoXH handheld GPS unit. The GPS locations were recorded electronically, differentially corrected using Trimble Pathfinder™ software, and incorporated in to the site GIS.

2.8 Control of Investigation-Derived Waste

CDM Smith procured the services of I.C.E. Service Group, Inc., a waste disposal subcontractor, to characterize, transport, and dispose of all investigation derived waste (IDW) generated during the field investigation. All IDW, including soil, water (from sonic drilling, well development, well purging, and decontamination), plastic (macrocore liners, sonic core sample liners, and disposable sample spoons), and personal protective equipment (PPE), were placed into steel, 55-gallon drums at the drum staging area. The IDW subcontractor sampled the soil and wastewater to determine the Resource Conservation and Recovery Act (RCRA) characteristics for disposal. Soil and wastewater generated during the field investigation were determined to be T-norm, and due to the radioactive nature of the waste it was determined the waste would be disposed at U.S. Ecology in Idaho. Upon EPA's approval of the disposal facilities, the IDW was properly disposed of by the IDW subcontractor. IDW waste manifests are included in **Appendix I**.

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Section 3

Physical Characteristics of the Study Area

This section describes the physical attributes of the study area, including surface topography, meteorology, surface water hydrology, geology, and hydrogeology. Sections on demography, land use, and ecology describe the potential populations and habitats.

3.1 Topography and Drainage

The WACC property is at an elevation of approximately 70 feet above mean sea level (msl), and the ground surface in the area generally slopes gently to the southwest. The eastern edge of the site is adjacent to an elevated train line parallel to Moffat Street. The ground surface rises sharply toward the train line and continues to rise to the cemetery east of the site to elevations as high as 160 feet above msl. The cemetery areas are elevated as they are in glacial terminal moraine deposits, as discussed in **Section 3.3**. **Figure 3-1** presents a detailed topographic elevation contour map.

The site is located in a highly-urbanized area, where infiltration of precipitation is largely restricted due to the high percentage of ground surface covered by pavement and buildings. The large cemetery just east of the site is mostly unpaved and allows more infiltration of precipitation than surrounding areas. Anecdotal evidence exists that the previous tenant of 335 Moffat Street, the ice warehouse, was discharging its wastewater through a system of PVC pipes to the ground at Moffat Street in the vicinity of MW-05 due to lack of or poor connection to the CSS (**Appendix K**).

Storm water in the majority of the site area is directed into catch basins which connect to a CSS (shown on **Figure 2-5**). The WACC property is located at the head of a branch of the sewer system. The sewer flows away from the property to the west down Irving Avenue before turning on Halsey Street and joining larger sewers on Wyckoff Avenue. During large storms these sewers discharge directly into the East Branch of Newtown Creek which is approximately 1.9 miles from the WACC property.

3.2 Surficial Soil Classification

Surficial soils at the site are classified by the United States Department of Agriculture (USDA) as UtA (urban land, till substratum, 0 to 30 percent slopes) (**Figure 3-2**). Other soil types in the immediate vicinity of the site include UGA (urban land-Greenbelt complex, 0 to 3 percent slopes) and GUAw (Greenbelt – Urban land complex, very deep water table, 0-3 percent slopes, cemetery). The rail tracks just east of the site are classified UGCI (Urban land-Greenbelt complex, 8 to 15 percent slopes, low impervious surface).

3.3 Geology and Hydrogeology

3.3.1 Regional Geology/Hydrogeology

The site is located in the borough of Queens County, New York, at the border with Kings County New York (also known as Brooklyn), at the western end of Long Island. Long Island is comprised of a southeasterly thickening wedge of unconsolidated sediments deposited atop metamorphic bedrock. **Figure 3-3** includes a plan view of the local geology and a generalized cross-section of Long Island.

The bedrock beneath Long Island is primarily Precambrian aged folded and faulted gneiss and schist. The upper 5 to 100 feet of bedrock is weathered to clay (Soren 1978). The gentle dip of the bedrock surface to the southeast results in a southeasterly thickening wedge of the unconsolidated sedimentary deposits that form Long Island. (Soren 1971). The surface of the underlying consolidated bedrock constitutes the bottom of the aquifer system of Queens County; bedrock generally yields no more than a few gallons a minute and few bedrock wells have been used for water supply except at the far western edge of the county (Soren 1978).

The unconsolidated sedimentary deposits comprise a hydrogeologic system consisting of three major aquifers and two confining units. These unconsolidated sedimentary aquifers are described briefly below, from oldest (deepest) to youngest (shallowest).

- Lloyd Aquifer - The Upper Cretaceous Lloyd Sand Member of the Raritan Formation directly overlies the bedrock surface throughout most of Queens County. The unit consists primarily of fine to coarse sand interbedded with gravelly sand with common lower permeability beds of silt and clay common (Buxton et al. 1981). The average horizontal hydraulic conductivity of the Lloyd Sand Aquifer has been estimated at 40 feet/day and it is generally confined by the overlying Raritan Clay and underlying bedrock.

- Raritan Clay - The clay member of the Upper Cretaceous Raritan Formation (Raritan Clay) conformably overlies the Lloyd Sand Member. The Raritan Clay is comprised of clay and silty clay, and some interbedded sand (Buxton et al. 1981), and pyrite and lignite have been found (Soren 1978).

- Magothy Aquifer - The Upper Cretaceous Magothy Formation typically overlies the Raritan Clay and forms a major aquifer throughout much of Queens County. The formation appears has been eroded away in the site area according to regional mapping (Soren 1978).

- Gardiners Clay - This confining layer is present in the southern and western portion of Queens County, where it unconformably overlies the Upper Cretaceous deposits. The vertical hydraulic conductivity of the Gardiners Clay has been estimated at 0.01 foot/day and it is considered a significant confining bed. Where present, it restricts recharge to, and creates confined aquifer conditions in the underlying strata (Buxton et al. 1981).

- Upper Glacial Aquifer - Upper Pleistocene deposits of glacial origin unconformably overly the underlying units and are present at the ground surface throughout most of Queens County. Terminal moraine deposits extend in a band trending approximately east-west from across the southern-central part of Queens County. Upper Pleistocene deposits north

of the terminal moraine are primarily ground moraine, with some outwash deposits also found. Outwash deposits are found south of the terminal moraine (Buxton et al. 1981, Soren 1971). The terminal moraine and ground moraine are till, an unsorted, unstratified mixture of clay, sand, gravel, and boulders. The outwash deposits are comprised of sand and gravel transported away from the glacier in meltwater (Buxton 1981). The glacial deposits are referred to as the upper glacial aquifer. These deposits are upwards of 200 feet thick in southern Queens County (Buxton 1981). The upper glacial aquifer is typically under water table conditions (Soren 1971). Horizontal hydraulic conductivity of the glacial outwash has been estimated at 270 feet/day. Conductivity of till deposits (terminal and ground moraine) is generally much lower conductivity due to the higher silt and clay content.

Regional Groundwater Flow

Under natural conditions, a groundwater divide, roughly corresponding to the terminal moraine in the central part of the county, generally drives groundwater flow toward the north and south shores where it then discharges (Buxton et al. 1981, Soren 1971). The WACC site is in close proximity to this divide.

Urbanization has heavily influenced natural groundwater flow patterns and groundwater quality. The density of roads and buildings in Queens County has reduced infiltration, and sewers discharge storm water to the surface waters, greatly reducing recharge (Soren 1971). In addition, by 1900, significant groundwater withdrawals were made for public water supply and industrial uses. Groundwater withdrawals, combined with reduced recharge, lowered the water table and caused intrusion of salt water.

Initially, most pumping was from the Upper Glacial Aquifer; withdrawals from this aquifer peaked in 1910. As demand increased and the aquifer was contaminated by salt water, withdrawals from the deep aquifers increased. These factors have caused major cones of depression in the water table and confined aquifers. The earliest water table contour map available, from 1903 (Buxton et al. 1981) does not yet exhibit a cone of depression (**Appendix A** includes previous water table evaluation maps). There was a major groundwater divide near the WACC site at this time, with flow in the vicinity toward the northwest, southwest, and southeast.

Water table contour maps for 1936, 1943, 1951, 1961, and 1974 (Buxton et al. 1981) initially indicated a cone of depression centered in eastern Brooklyn near the Queens border and then shifting to Queens as pumping there increased while pumping in Brooklyn decreased and eventually ceased in 1947, primarily due to salt water intrusion. The water levels within these cones of depression are below msl and drove groundwater flow at the WACC site westerly in the 1940s and 1950s. The water table contour maps for 1961 and 1974 show a cone of depression centered on the western-central part of the county, and flow at the site had shifted toward the southeast. Subsequent water table maps for 1981, 1997, and 2006 show that the cone of depression in Queens had recovered by 1997, and the WACC site was once again near a major groundwater divide generally similar to that in 1903 (LBA 2010). Groundwater use for public supply was phased out in Queens beginning in the 1990s and ceased completely in 2007. The more recent groundwater contour map prepared by United States Geological Survey (USGS) in 2010 (**Figure 3-4**) is consistent with this reduction in pumping, and shows groundwater flow at the WACC site is generally to the south/southeast in this regional study.

3.3.2 Site Geology

The site is located along the western edge of Queens County, on the Brooklyn border. **Figure 3-5** shows the site area is mapped within the outcrop of the terminal moraine (Soren 1978). **Figure 3-6** presents geologic cross-sections based on the lithologic data collected during drilling at the site. Drilling advanced into the upper portion of the aquifer in this area and encountered two types of unconsolidated material: fill and Upper Glacial Aquifer deposits (till and outwash).

Fill

Fill near the WACC property is typically 5-15 feet thick and is generally characterized by the presence of man-made materials (brick, coal, various building materials), intermixed with silt, sands, and gravels. The distinction between fill and the underlying glacial material was difficult when man-made debris was not present in the soil. This is representative of regrading of native materials within the area.

Much of the upper layers of the fill in borings at the WACC property and in some borings to the south on Moffat Street was a black, gray, and/or white cinder or ash-like material. This material is likely waste tailings described in previous reports and was found between 0-4 feet bgs near the WACC property and between 0-6 feet bgs along Moffat Street. This material corresponds well with intervals of elevated downhole gamma readings collected at the borings and will be discussed further in **Section 4** of this report.

Upper Glacial Aquifer Deposits

Soil borings at the site generally indicate the presence of Upper Glacial Aquifer soils extending from the bottom of fill (0-15 feet bgs) to beyond the deepest boring performed at the site (75 feet bgs). The upper portion of the glacial deposits (down to approximately 25-37 feet bgs) is made up of glacial till which is yellowish brown dense silty sand and gravel. The material underlying the glacial till is glacial outwash, slightly more uniform and coarse in texture than the till and extends from the bottom of the till to at least 75 feet bgs (total depth of exploration at the site).

Based on ground surface topography and the top of geologic surface contour maps of the various units (discussed above) created by Soren (1978), the interpreted total thickness of the Upper Glacial Aquifer soils in the site area is about 170 feet. The Magothy Formation is absent at the site and the Upper Glacial Aquifer is underlain by the Gardiners Clay (approximately 50 feet thick), which is in turn underlain by the Raritan Clay (approximately 130 feet thick). The Lloyd aquifer is approximately 40 feet thick, and the bedrock surface is expected to be encountered at a depth of about 390 feet bgs, although some sources have estimated this depth to be closer to 450 feet bgs.

3.3.3 Site Hydrogeology

Depth to water at the site is about 60 feet bgs. Based on the geologic literature (Soren 1978), the base of the Upper Glacial Aquifer in this area is assumed to be the Gardiners Clay, which is present at elevation 100 feet below msl at the site, or about 170 feet bgs. The saturated thickness of the aquifer is estimated to be about 111-114 feet, based on the depth to water at each well. The monitoring well screens installed during the RI are 5 to 15 feet below the water table surface in partially penetrating wells in the unconfined aquifer.

Four rounds of synoptic water level measurements were collected in December 2015, April and November 2016 and April 2017 and are shown on **Figures 3-7a through 3-7d**. The

potentiometric surface was contoured for each synoptic event and each showed that groundwater flows generally to the south and that the horizontal gradient across the WACC property is gentle, about 0.0006 foot per linear foot. This compares reasonably well to regional water level contours measured by USGS in 2010 as shown on **Figure 3-4.**

Slug Test Results

Hydraulic conductivity estimates were derived from the slug-tests performed on the five wells installed in 2015. The analysis of the slug-tests and a summary of the results are descried below.

Aqtesolv® incorporates details of the aquifer and the well being tested, such as aquifer thickness and well geometry, into each analysis. The results of the slug tests analyses are provided on **Table 3-1**. Data generated during the slug testing is included in **Appendix K**. The results for each well are discussed below.

The Bouwer & Rice method is based on a semi-log plot of time versus hydraulic head, or displacement. Time is plotted on the linear X-axis and head difference is plotted on the logarithmic Y-axis. Data plotted in this fashion should yield a curve with a distinct straight line portion that is used to calculate hydraulic conductivity of the formation material.

Most of the estimated hydraulic conductivities (Ks) ranged from about 10 to 60 feet/day and the hydraulic conductivity at MW-01 was estimated at about 1 feet/day. These results are consistent with the range of published estimates for fine to coarse sand (e.g. Domenico and Schwartz 1990). The rising head tests of MW-03 resulted in estimated hydraulic conductivity of about 147 feet/day, which is consistent with published values for course sand; however, the falling head tests of MW-03 yielded 50 to 60 feet/day, consistent with the majority of the results.

MW-03 exhibited the fastest recovery times of the wells tested, (recovery in as little as 3 seconds), which is generally consistent with its higher hydraulic conductivity results. It is also noted that the water level plots of the MW-03 tests did not exhibit as strong a straight line as data from the remaining wells, and the quantification of K is probably more subject to error than for the other tests. Since the falling head tests of MW-03 are more consistent with the overall data set, these may be more reliable.

While the strata at MW-01 appeared similar to the other wells, all of the MW-01 slug tests resulted in lower computed hydraulic conductivities than for the other wells. MW-01 also exhibited a lower flow rate and siltier water during well development than the other wells. This may indicate the presence of a higher percentage of fine grained soils that would not be unexpected in these heterogeneous glacial soils.

The average of all hydraulic conductivity results is 34 feet/day. The average hydraulic conductivity, excluding outliers results from MW-01 and rising head results from MW-03, is 27 feet/day. This is a small range and a hydraulic conductivity of approximately 30 feet/day is a suitable estimate for the site.

This is consistent with published values for fine to coarse sand, but is much lower than published values for the outwash deposits of the upper glacial aquifer, e.g. 270 feet/day (Soren 1971). Based upon the measured horizontal hydraulic gradient, the estimated hydraulic conductivity and an

assumed porosity of 20 percent, the seepage velocity of the shallow groundwater is estimated to be 0.09 foot per day.

3.4 Meteorology

The WACC site is located on western Long Island, southeastern New York, where the climate is temperate maritime. Climate is more influenced by the ocean than by the adjacent mainland. It is characterized by mild winters and relatively cool summers, and is free from sudden or extreme changes in temperature. The average annual temperature is about 51 degrees Fahrenheit (° F), the average January temperature is about 30° F, and the average July temperature is about 70° F. The maximum annual temperature is 95° F and the minimum annual temperature is 0° F. The maximum and minimum observed temperatures are 102° F and -20° F. The growing season on Long Island is about 180-200 days, from the end of April to the end of October. During the average year, the percentage of possible sunshine ranges from about 50 percent in January to 65 percent in July and averages 62 percent during the growing season. The prevailing winds are from the west, shifting from the southwest in summer to the northwest in winter. Average wind speed is about 12 miles per hour.

Precipitation is the only source of freshwater for streams and groundwater in the site area. Average precipitation is about 42 inches per year; included within this value is an average annual snowfall of 25-30 inches, most of which falls between December and March. The majority of snow storms occur in February.

3.5 Demographics, Land Use and Hazardous Waste Sites

Queens County is an urban area comprised of 108.53 square miles. The estimated population of Queens County for July 2014 was 2,321,580. The borough's population included 28 percent Hispanic or Latino; 26.2 percent white alone, not Hispanic or Latino; 25.8 percent Asian alone; 20.8 percent black or African American alone; 1.3 percent American Indian and Alaska Native alone, 0.2 percent Hawaiian and Other Pacific Islander alone; 2.8 percent two or more races. Slightly over one quarter of the population was less than 18 years old and 13.6 percent of the population was more than 65 years old. For the period 2010-2014, 5.8 percent of the population under the age of 65 report a disability (United States Census Bureau 2016). The median household income in 2014 dollars for the period 2010-2014 was $57,210. Approximately 15 percent of individuals are below the poverty level (US Census Bureau 2016).

Land use in the site area is primarily commercial and residential. A rail line and several large cemeteries border the site to the east.

The following is a summary of potential hazardous waste sites in the vicinity of the WACC site. Additional information is included in the LBA Phase 1 Report (**Appendix A**). The area in the vicinity of the WACC site does not contain any additional EPA Superfund Sites, CERCLIS Sites, RCRA Storage facilities, NYSDEC Inactive Hazardous Waste Sites, NYSDEC or EPA Brownfields Sites or NYSDEC Registered Dry Cleaners within a half-mile of the WACC property. One large quantity and two small quantity generators were found on the RCRA Generator/Transporter list within ¼ mile from the WACC property, but neither were deemed to have potential to impact the site. NYS Spills Information Database and NYSDEC database do indicate numerous sites within 0.5miles of the WACC property with inactive spills or underground petroleum storage tanks.

Additional information regarding potential nearby sites is included in the 2010 NYCDDC Phase I Report (LBA 2010a).

3.6 Ecological Characterization

This section describes the local setting, available habitats, and natural communities at or bordering the WACC site and at the reference area. Due to extremely limited habitat an ecological survey was not performed.

3.6.1 Terrestrial Habitats and Wildlife

The WACC site is a highly-industrialized area. The majority of the site is covered by buildings, cement, and pavement. The small open area of the former rail spur behind the on-Site buildings consists of disturbed soil covered with a layer of rock and clean fill.

Only animals (e.g., rodents, raccoons, bats, birds) capable of surviving in an urban habitat might be found in the area. However, mammals were not observed during the RI sampling events.

3.6.2 Aquatic Habitats and Wildlife

The following information was obtained from investigations conducted for the Newtown Creek Superfund Site. As previously noted the Newtown Creek is 3.8 miles in length and the receptors described below may be more applicable for conditions at some distance from the WACC site.

Aquatic and Wetland Communities

The WACC site is 1.9 miles from the East Branch of Newtown Creek. Newtown Creek and adjacent ecosystems are part of the Newtown Creek Superfund Site. Newtown Creek is a tidal arm of the New York-New Jersey Harbor Estuary that forms the northern border of the borough of Brooklyn and the southern border of the borough of Queens in New York City. Newtown Creek includes the tributaries of Dutch Kills, Maspeth Creek, Whale Creek, East Branch, and English Kills. The entire Creek system is approximately 3.8 miles in length and discharges to the East River near Hunter's Point and Roosevelt Island.

Historically, Newtown Creek drained the uplands of western Long Island and flowed through wetlands and marshes. However, due to heavy industrial development and governmental activities dating from the 1800s, formerly wet areas have been filled, Newtown Creek has been channelized, and its banks have been stabilized with bulkheads and rip rap. The historic development has resulted in changes in the nature of Newtown Creek from a natural drainage condition to one that is governed largely by engineered and institutional systems.

Newtown Creek flows through a highly-industrialized area, is estuarine, and experiences tidal fluctuations of approximately two to six feet (NYCDEP 2011). Currently, factories, warehouse and distribution facilities, petroleum bulk storage facilities, municipal and utility infrastructure and other industrial and commercial facilities still operate along the Creek. Newtown Creek is classified by the New York State Department of Environmental Conservation (NYSDEC) as Class SD saline water, a NYSDEC classification that indicates the best use of this Creek is fishing and that the waters should be suitable for fish survival. However, since 2004, Newtown Creek has been listed on the EPA Clean Water Act 303(d) list as impaired due to oxygen depletion.

The freshwater contribution to flow in Newtown Creek is primarily from groundwater, storm water, combined sewer overflows, and wastewater discharges. Stream velocity ranges from 0.4 feet/sec to 1.2 feet/sec (NYCDEP 2007). A 2004 SF6 (sulfur hexafluoride) tracer study indicated that chemical contaminants in Newtown Creek surface water had traveled over 9 miles, to the Verrazano Bridge, within one day of release into the Creek (Schmieder et al. 2004).

Aquatic Receptors and Endangered Species

Currently, water and sediment quality conditions preclude the diversity and abundance of fish and wildlife resources that would normally be expected in urban estuarine habitat of this type. This is evidenced by the lack of species that are found in the adjacent East River, which provides similar estuarine habitat (United States Department of the Interior 2012). The potentially affected ecological receptors typically are those found and supported by the type of aquatic ecosystem found in the East River.

Fish

Post larval stage fish found in Newtown Creek in the 2007 NYCDEP survey (NYCDEP 2011) were striped bass (*Morone saxatilis*), weakfish (*Cynoscion regalis*), and winter flounder (*Pleuronectes americanus*). Ichthyoplankton, in particular larval fish, included additional species such as American sand lance (*Ammodytes americanus*) and gobies. Few fish eggs were found in the NYCDEP survey, except at the mouth of Newtown Creek, suggesting limited fish spawning within the Creek (NYCDEP 2011). A more diverse fishery exists in the adjacent East River; these include bluefish (*Pomatomus saltatrix*), Atlantic silverside (*Menidia menidia*), Atlantic menhaden (*Brevoortia tyrannus*), scup (*Stenotomus chrysops*), fourbeard rockling (*Enchelyopus cimbrius*), bay anchovy (*Anchoa mitchilli*), silver hake (*Merluccius bilinearis*), grubby (*Myoxocephalus aeneus)*, Atlantic tomcod (*Microgadus tomcod*), tautog (*Tautoga onitis*), blueback herring (*Alosa aestivalis*), northern pipefish (*Syngnathus fucus*), summer flounder (*Paralichthys dentatus*), northern sea robin (*Prionotus carolinus*), and white perch (*Morone americana*).

The shortnose sturgeon (*Acipenser brevirostrum*) is Federally listed as an endangered species in Queens and Bronx counties (United States Fish and Wildlife Service [USFWS] 2010), and has been extensively studied in the Hudson River (DTA 2004). It may occasionally pass through the East River, although the East River is not considered as suitable habitat for this species (Bain 2009).

Benthic Invertebrates

The sampling performed thus far in Newtown Creek revealed a limited number and diversity of benthic invertebrates, most of which were annelid worms and other pollution-tolerant organisms (NYCDEP 2011). The benthic community of the East River was evaluated as part of a license application for the Ravenswood Generating Station. The Ravenswood Generating Station is located on the East River, approximately two miles north of where Newtown Creek discharges to the East River. The Ravenswood benthic community was more diverse than the Newtown Creek benthic community and included sand worms (*Alitta virens*), tunicates (*Tunicata*), clams, mudworms (*Polydora ligni*), polychaetes, nematodes, amphipods, oligochaetes, rock crabs (*Cancer irroratus*), lady crabs (*Ovalipes oscellatus*), horseshoe crabs (*Limulus polyphemus*), mud crabs (*Panopeus herbstii*), spider crabs (*Libinia emarginata*), blue crabs (*Callinectes sapidus*), shrimp, grass shrimp (*Palaemonetes pugio*), blue mussels (*Mytilus edulis*), and dog whelks (*Nucella lapillus*) (TRC Environmental 2000). Benthic macroinvertebrates found in earlier biota surveys from the East River (1980s) are consistent with the assemblage of benthic invertebrates

reported at Ravenswood (DTA 2004). Some of these taxa, and potentially others, such as Eastern oyster, may be expected to occur in Newtown Creek if water and sediment quality improved.

Amphibians and Reptiles

Amphibians and reptile species may occur in the in the vicinity of Newtown Creek and the East River. With the exception of the sea turtles discussed below, information on reptiles and amphibian species that have been observed or may be present in the area was not accessible.

Birds

In spite of impaired aquatic habitat and limited physical habitat, double-crested cormorants (*Phalacrorax auritus*), belted kingfishers (*Magaceryle alcyon*), black-crowned night-herons (*Nycticorax nycticorax*), barn swallows (*Hirundo rustica*), laughing gulls (*Larus atricilla*), peregrine falcons (*Falco peregrinus*) and great egrets (*Ardea* sp.) have been reported along Newtown Creek (Anchor 2011). With improved sediment and water quality, and enhancement of terrestrial and riparian habitat along Newtown Creek, this area is expected to support birds typically found in the lower Hudson River or East River, species such as mallard (*Anas platyrhynchos*), canvasback (*Aythya valisineria*), scaup (*Aythya* spp.), and Canada goose (*Branta canadensis*). The piping plover (*Charadrius melodus*) is a Federally listed endangered species in Queens County that may occur rarely in the vicinity of Newtown Creek (USFWS 2010).

Mammals

Mammals that may be impacted by direct or food chain chemical exposures and habitat degradation in the vicinity of Newtown Creek are those capable of surviving in an urban environment. These mammals include raccoons, skunks, rabbits, muskrats, bats and a variety of rodents. Marine mammals that could be impacted include harbor seals and harbor porpoises.

Threatened and Endangered Species

Federally- or State-listed species that may occur in the East River, and potentially Newtown Creek, include the shortnose sturgeon, sea turtles, including the Kemp's Ridley sea turtle (*Lepidochelys kempii*), loggerhead sea turtle (*Caretta caretta*), leatherback sea turtle (*Dermochelys coriacea*), hawksbill sea turtle (*Eretmochelys imbricata*), green sea turtle (*Chelonia mydas*), and piping plover (*Charadrius melodus*).

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Section 4

Nature and Extent of Contamination

This section discusses the type and distribution of contamination at the site. Section 4.1 discusses the approach to the evaluation, with the use of applicable screening criteria to characterize site contamination. Sections 4.2 through 4.8 present the nature and extent of contamination in site media.

4.1 Approach to the Evaluation of Contamination

The characterization of site conditions emphasizes the spatial distribution of contaminants in site media. All detected contaminations were subject to a media-specific screening process and are presented on the tables and figures in this section. The following evaluation of the nature and extent of contamination focuses on radiological contamination present as Th-232 and Ra-226. Although all detected contaminants were subject to the media-specific screening process, they are not all discussed to the same level of detail in the following sections.

Data used for this evaluation includes data collected in previous investigations discussed in **Section 1.3.4**.

4.1.1 Data Quality

Prior to evaluating the nature and extent of contamination, all analytical data were reviewed to evaluate the usability of the data collected and to determine whether the quality objectives and user requirements outlined in the WACC Site Final QAPP (CDM Smith 2015a) were met. A portion of the data was evaluated in 2016 following the initial investigations; the remainder of the data were evaluated following completion of the 2017 investigations. The data quality assessment for the RI sampling is included as **Appendix L**; the field sampling, validation processes and achievement of the data quality objectives are discussed.

As noted in the data quality reports, only the final qualified data are presented in the RI report. Data that did not meet quality control (QC) criteria were appropriately qualified during data validation as either estimated "J," "J+," "J-," and usable; usable but non-detect "U," "UJ," or as rejected "R" and not usable.

4.1.1.1 Data Usability Assessment 2016

Over 90 percent of the data for the soil, sediment, groundwater and concrete samples validated and reported herein are suitable for the intended use as stated in the QAPP and can be used for the Remedial Investigation (RI) and risk assessment decisions. Data collected during these sampling investigations and validated for this DUAR are usable as reported with the data validation qualifiers added. Sample results that were rejected are not usable for project decisions. A summary of the validation is presented below. Specific details of the validation are provided in the individual data validation reports in Appendix A of **Appendix L-1** along with tables showing the qualified results.

All validation was conducted by CDM Smith for the analytical chemistry data and by VALIDATA Chemical Services, Inc., Duluth, Georgia, for the radiological data. Nine data packages were reviewed for the soil and aqueous samples collected and analyzed for chemical analyses. Sixty-five data packages were reviewed for the soil, aqueous, sediment and concrete samples collected for radiological analyses.

Section 5 in **Appendix L-1** summarizes the reasons some data were rejected during data validation of the RI sampling data. Appendix L-1, Tables 10 to 13 and the completeness tables in Section 5 show the percentages of analyte results that were rejected. The information in the completeness tables includes only environmental samples, whereas the summary below includes all samples (environmental and QC) collected during the RI sampling events.

Appendix L-1, Tables 10 through 13 show the number of sample results qualified as estimated or rejected for the soil, sediment, groundwater, and concrete chemical and radiological data. For the soil samples, 125 results including metal, pesticide, VOC, and SVOC results were rejected. For the sediment samples, 36 radionuclide results were rejected. For groundwater samples, five pesticide results were rejected. For the concrete samples, five radionuclide results were rejected.

The data that were not rejected are considered definitive data collected under an EPA-approved QAPP. The analytical chemistry samples were validated by CDM Smith according to the National Functional Guidelines (NFGs) for Superfund Organic Methods Data Review (August 2014a); EPA NFGs for Inorganic Superfund Data Review (August 2014b); and EPA's Region II validation criteria and standard operating procedures (SOPs). The radiological data were validated by VALIDATA Chemical Services, Inc., Duluth, Georgia according to Greenwich Environmental Designs (GED) SOP 4.8; Data Validation Protocol for Field Data Collected using Canberra's In-Situ Gamma Spectrometer (June 2015); and the Multi-Agency Radiological Laboratory Analytical Protocols Manual (United States Nuclear Regulatory Commission 2004). Any actions taken in those instances for chemical data where the NFG relies on the professional judgement of the validator are noted in the individual data validation narratives.

All estimated data results may be used for their intended purpose to evaluate the nature and extent of contamination and evaluate risks. The final percentages of valid data for the RI sampling are 99 percent for groundwater, 99 percent for soil, 96 percent for sediment, and 91 percent for concrete. Valid data for all media exceeded the completeness goal of 90 percent. The rejected data should not be used for project decisions.

4.1.1.2 Data Usability Assessment 2017

A second data usability was performed for the short-term radon sampling using charcoal canisters completed in 2015, the six-month radon and thoron samples collected in 2015-2016, the long-term radon and thoron samples collected in 2015-2016, soil radionuclide sampling performed in 2017, groundwater radionuclide sampling performed in 2016 (Round 3), and groundwater radionuclide and volatile organic compound sampling form in 2017.

The data usability assessment found that one hundred percent of the data reported and validated in this report are suitable for the intended use in the RI report and the risk assessments as stated in the QAPP. All planned samples were collected. The DQIs identified in the QAPP mainly met

appropriate measurement performance criteria. No sample results were rejected. All data are usable for project decisions with the appropriate qualifiers applied.

A summary of the validation is presented in Section 5. Specific details of the validation are provided in the individual data validation reports in Appendix A of Appendix L-2.

CDM Smith conducted data validation on the VOC data and VALIDATA Chemical Services, Inc., Duluth, Georgia, validated the radiological data. One VOC data package was reviewed for the aqueous samples; and three data packages were reviewed for radiological soil and aqueous samples.

Radon and thoron analysis were performed by a NYSDOH ELAP-certified laboratory, and the results were valid. Per approved QAPP, the radon samples were not validated; however, field duplicates and blanks were collected. A data quality evaluation for radon and thoron was performed for precision, and no issue was noted The field duplicate precision and field blank results were evaluated as part of this DUAR. These results are shown in **Appendix L-2** tables: Table 1-1 (daycare short-term results), Table 1-2 (school short-term results), Table 1-3 (six-month results), and Table 1-4 (one year result). Field duplicates results are discussed in Section 3.

Data were validated by CDM Smith and VALIDATA Chemical Services, Inc. data validators who are not associated with the sampling activities of this project. The data validation was performed in accordance with the following documents: specified analytical methods; the project Final QAPP (CDM Smith 2015); EPA National Functional Guidelines for Superfund Organic Methods Data Review (January 2017); EPA's Region II validation criteria and Standard Operating Procedures (SOP); GED SOP 4.8; Data Validation Protocol for Field Data Collected using Canberra's In-Situ Gamma Spectrometer (June 2015); the Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP) (U.S. Nuclear Regulatory Commission 2004) and professional judgment.

4.1.1.3 Radon and Thoron Results

4.1.2 Use of Data

4.1.2.1 Principal Contaminants

The discussion in the sections below focus on the presence of Th-232 and Ra-226 as these are considered the two principal radiological contaminants identified in this RI as well as previous investigations conducted by EPA and NYSDOH for the WACC site. In general, their decay chain progeny are expected to be at the same activity level as the parent. U-238, the decay chain parent of Ra-226, will also be present. For risk analysis and screening purposes, the U-238 concentrations are assumed to be that of the Ra-226 progeny. This is a conservative assumption in that the acid used as the agent for solubilizing the monazite ores in the rare-earth extraction process would preferentially concentrate the Ra-226 in the waste sludge (Korkisch 1969).

4.1.2.2 Use of ISOCS Data

The Canberra In-Situ Gamma Spectroscopy system known as ISOCS was deployed in the field to provide quick turn-around analysis for the presence of the two principal contaminants (Th-232 and Ra-226) in soils and sewer sediments at the site. Because Th-232 is not a gamma emitter, the decay progeny of Th-232, Ac-228, was used as a surrogate measure for Th-232. Using Ac-228 as a

surrogate for Th-232 is a reasonable assumption because the Th-232 decay chain is in secular equilibrium within the site soils. To ensure the use of the ISOCS system would provide a reliable and accurate assessment of soil contaminants, a sub-set of duplicate (10%) samples were collected and sent to a certified radiochemistry laboratory for an independent gamma spectroscopy assessment.

The 41 samples sent offsite for gamma spectroscopy analysis covered a range of concentrations, with over 80 percent of the selections containing concentrations less than 5 pCi/g (including background) of combined Ra-226 and Th-232. The sample measurement comparison was biased in this range because decisions regarding the extent of contamination and exposure risks will be based on concentrations in the lower range of concentrations for combined Ra-226 and Th-232, as the higher concentrations also found in soils at the Site are well above the screening criteria or any threshold that will likely indicate risk. Consequently, a high level of confidence that the ISOCS onsite laboratory provides reliable data was needed within the lower concentration range. The ISOCS data were compared with the laboratory results using a simple linear regression. As shown in **Figures 4-1** and **4-2**, the correlation coefficients for both Ra-226 and Th-232 were greater than 0.98. This correlation coefficient is statistically considered to be an excellent correlation, indicating that the ISOCS data is accurate with respect to the laboratory analysis data, and can be considered to provide Th-232 and Ra-226 results as reliable as the laboratory data.

4.1.3 Selection of Screening Criteria

4.1.3.1 Chemical

RI screening criteria were selected to evaluate chemical contaminants detected in study area media, as presented in **Tables 4-1 and 4-2**. The selected criteria were used to evaluate the nature and extent of contamination based on the RI analytical data. Whenever possible, established regulatory criteria, known as chemical-specific applicable or relevant and appropriate requirements (ARARs) were used for the screening criteria values. In the absence of ARARs, guidance values, known as “to be considered”, were used.

Soil Screening Criteria

The soil screening criterion for each chemical contaminant is the lowest of the EPA Regional Screening Levels (RSLs) for residential soils, NYSDEC Restricted Use Soil Cleanup Objectives, and NYSDEC Supplemental Soil Cleanup Objectives. Exceedances of the screening criteria are summarized in the remainder of **Section 4**. **Table 4-1** presents the RI soil screening criteria.

Groundwater Screening Criteria

The groundwater screening criterion for each chemical contaminant is the lowest of the Federal Maximum Contaminant Levels (MCLs), EPA RSLs for Tap Water (cancer risk = 1×10^{-6} [1 in 1 million]; noncancer hazard quotient = 0.1), and NYSDEC Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. **Table 4-2** presents the RI groundwater screening criteria.

4.1.3.2 Radiological

The radiological screening criteria are presented in **Table 4-3**. Typically, screening criteria are developed based on a cancer risk of 1×10^{-6}. However, since radiological contaminants exist

naturally within background soils, the cancer risk-based screening values would be less than the corresponding background soil concentrations.

Therefore, as specified in an EPA guidance directive for comparing background and chemical concentrations in soils for CERCLA sites (EPA 2002b), the screening criteria for contaminants with natural background concentrations were determined from the analytical results from background samples collected during the RI. In this specific instance, the upper tolerance levels (UTLs) for the background sample concentrations (soils, sediment, and air), as calculated using ProUCL (EPA 2015a), were used as the screening criteria for the naturally occurring radionuclides (Th-232, U-238, and their respective decay progeny) identified on and around the WACC site.

4.1.4 Development of Site-Specific Background Values

Background soil and sediment samples were collected to provide a baseline comparison for the naturally occurring radionuclides that are the radionuclides of concern at the WACC site (Th-232 and Ra-226 in the soils and uranium and thorium nuclides in the sediment). The background samples provide data to use as a screening tool for identifying areas that are likely to have been impacted from historical site operations.

4.1.4.1 Background Gamma Scans

Background gamma scans were conducted to allow comparison between surficial soil background gamma count rates and potentially-impacted soil gamma count rates. The background data were used to identify hot spots in the site areas and assist in selecting sampling locations to determine the nature and extent of WACC contaminants. Scanned surfaces included asphalt, concrete sidewalk, and grass/dirt. Results are presented in **Table 4-4**.

The average collimated reading for grass/dirt from seven locations was 3,504 cpm while the uncollimated reading for grass/dirt in one location was 8,133 cpm. The collimated readings for asphalt and concrete (one sample of each) were 5,528 cpm and 2,540 cpm, respectively.

4.1.4.2 Background Soil Sampling - Non-Radiological

Twenty-four soil samples were collected offsite at eight locations (**Figure 2-2** and **Table 4-5**) to establish general background concentrations for chemical contaminants in urban soils in the area of the site. The background locations were selected based on distance from the site and composition of the background area (physical setting, likelihood of fill, ground cover, etc.) with the intent to establish soil background concentrations from areas with the least likelihood of impact from site activities and disposal operations. By using soil as the background metric, any contribution from construction-related materials during site sampling would bias the identification of a potentially impacted area in a positive direction.

These background data are used in **Section 4.3** to better understand which contaminants are related to the WACC processes. Background soil concentrations exceeding the site screening criteria were limited to polycyclic aromatic hydrocarbons (PAHs) and metals that are typical of urban fill.

The following four PAHs exceeded the RI screening criteria:

- Benzo(a)anthracene: Background sample concentrations ranged from 5.4 to 670 micrograms per kilogram (µg/kg), exceeding the RI screening criterion of 160 µg/kg, with a median of 190 µg/kg. The maximum concentration was found in the surface soil sample (0 to 1 foot bgs) at BKSB-05.
- Benzo(a)pyrene: Background sample concentrations ranged from 4.8 to 720 µg/kg, exceeding the RI screening criterion of 16 µg/kg, with a median of 185 µg/kg. The maximum concentration was found in the surface soil sample (0 to 1 foot bgs) at BKSB-05.
- Benzo(b)fluoranthene: Background sample concentrations ranged from 7 to 1,100 µg/kg, exceeding the RI screening criterion of 160 µg/kg, with a median of 225 µg/kg. The maximum concentration was found in the surface soil sample (0 to 1 foot bgs) at BKSB-05.
- Indeno(1,2,3-cd)pyrene: Background sample concentrations ranged from 3.1 to 310 µg/kg, exceeding the associated RI screening criterion of 160 µg/kg, with a median of 68 µg/kg. The maximum concentration was found in the surface soil sample (0 to 2 feet bgs) at BKSB-01.

The following inorganics exceeded the RI Screening Criteria:

- Arsenic: Background sample concentrations ranged from 1.2 to 6.5 milligrams per kilogram (mg/kg), exceeding the RI screening criterion of 0.68 mg/kg, with a median of 3 µg/kg. The maximum concentration was found in the surface soil sample (0 to 2 feet bgs) at BKSB-02.
- Barium: Background sample concentrations ranged from 14 to 880 mg/kg, exceeding the RI screening criterion of 350 mg/kg, with a median of 44 µg/kg. The maximum concentration was found in the surface soil sample (0 to 1 foot bgs) at BKSB-05.
- Iron: Background sample concentrations ranged from 6,000 to 43,000 mg/kg, exceeding the RI screening criterion of 2,000 mg/kg, with a median of 13,000 µg/kg. The maximum concentration was found in a deep soil sample (23 to 25 feet bgs) at BKSB-04.

4.1.4.3 Background Soil Sampling (Radiological)

For the eight background borings described above, 27 samples were collected for radiological analysis for Ra-226, Th-232, and U-238 (**Table 4-11**). Observations include the following:

- Th-232: Background sample concentrations ranged from 0.487 pCi/g to 1.132 pCi/g. The maximum concentration was found in a subsurface soil sample (28 to 30 feet bgs) at BKSB-06.
- Ra-226: Background sample concentrations ranged from 0.176 pCi/g to 0.919 pCi/g. The maximum concentration was found in a subsurface soil sample (8 to 10 feet bgs) at BKSB-06.
- U-238: U-238 was not detected in any samples. The minimum detectable concentration of U-238 using the ISOCS system is typically 1 to 1.5 pCi/g.

The results were analyzed using ProUCL (EPA 2015a) and the Shapiro-Wilks goodness of fit for Normality applied to the data set. Use of the "Normality" test is a standard practice to determine if a data set is consistent with a typical background distribution. In addition, the mean and range were reviewed against typical non-impacted site Th-232 and Ra-226 concentrations to ensure consistency with those values. Finally, a 2"x2" NaI detector survey was performed of the selected background site, prior to sampling, to identify any anomalous high activity areas that may skew the calculated 95% Upper Tolerance Limit (UTL); no anomalous count rate areas were detected.

The UTL is commonly used as a means of establishing screening values for radionuclides that occur as part of the natural background. Otherwise, use of EPA risk screening criteria would result in all background levels exceeding the corresponding soil concentration. **Appendix M** presents the upper confidence limit (UCL) calculations.

The results were also evaluated by applying the Shapiro-Wilks goodness of fit for Normality to the data set. Use of the "Normality" test is standard practice to determine if a data set is consistent with a typical background distribution. In addition, the mean and range were reviewed against typical non-impacted site Th-232 and Ra-226 concentrations to ensure consistency with those values.

4.1.4.4 Background Sewer Investigation

The sewer investigation conducted by BVNA in 2013 (BVNA 2014) included four background locations and established a background dose rate between 9 and 12 μR/hr and background gamma counts from manholes at 43,000 cpm.

During the RI, a background gamma count reading was developed for the equipment in use by investigating four portions of sewer lines for background information, including two lines on Wyckoff Avenue, one on Eldert Street, and one on Cooper Street. The Cooper Street line was used for background runs south along Cooper Street originating at C-11 (**Figure 2-4**). No connection was found between the Irving Avenue sewer line and manhole C-11. From C-11 to C-15, all gamma readings were less than 5,000 cpm. The maximum gamma reading recorded in the background sewer lines was 4,900 cpm, collected from W-5 to W-6 which is across Wyckoff Avenue from manhole W-1. **Table 4-6** presents the background data collected from the sewer lines.

Fifteen manhole locations were investigated as part of the RI for background information along the background sewer lines discussed above. The average surface gamma readings for brick were at 1,505 cpm, with a maximum of 2,387 cpm in manhole D-2 located on Decatur Street. The average surface gamma readings for concrete were at 1,506 cpm, with a maximum of 1,900 cpm in manhole C-14 located on Cooper Street, south of Irving Avenue. **Table 4-7** presents the background data collected from the manholes.

4.1.4.5 Background Sediment Sampling - Coney Island Creek

Twenty-eight background sediment samples were collected from eight locations (**Figure 2-6**) in Coney Island Creek to provide a baseline for comparison to evaluate if sediments near the Newtown Creek outfall were impacted by WACC operations. **Table 4-8** presents the isotopic uranium and thorium results of the background sediment samples.

The sediment background samples were not analyzed using the ISOCS system. These samples were sent directly to the independent radiochemistry laboratory for analysis. In addition to gamma spectroscopy analysis for Th-232 and Ra-226, a mass spectroscopy isotopic analysis was performed to determine the levels of thorium and uranium in the sediment. As with the soil samples, ProUCL was used to establish the UTLs for each radionuclide. **Appendix M** presents the UTL calculations.

4.1.4.6 Background Air and Gamma Exposure Rates

No background samples were collected by CDM Smith for radon, thoron, or direct gamma exposure rates. As a result, other survey data sets were used to generate screening values. In the case of indoor radon, a NYSDOH data base (NYSDOH 2016) was used to establish UTLs for a basement and a first-floor area. Because the data were not validated, professional judgment was used to remove outlier data that would tend to bias the UTL to a non-conservative (i.e., higher) screening value.

A perimeter survey study (Weston 2013) performed in 2013 was used to establish screening levels for thoron and direct gamma exposure rates. The thoron data set from the study was modified to remove data points that were within an impacted area such as those on the WACC property or on streets immediately adjacent to the site. The data correction ensured the screening levels established would be biased toward a lower or more conservative value. ProUCL was used to establish the UTL for outdoor thoron. Because no indoor thoron background measurements were made, the outdoor values were used as screening levels for indoor thoron. This assignment would bias the screening level to a conservative or lower level.

For direct gamma exposure rates, the screening level was established at the upper end of the background range of exposure rate levels measured in the 2013 survey. This value was selected because it was the upper background value established by the survey team and NYSDOH, who sponsored the study. Because of complex variance due to geometries and surrounding building/surface materials involved in exposure rate measurements, the use of a statistical UTL would create an overly conservative screening value with no commensurate benefit for identifying potentially impacted areas.

4.1.5 Data Presentation

4.1.5.1 Chemical Data

The chemical analytical results from the Wolff-Alport RI were entered into the site database for evaluation purposes. The data were exported to GIS for graphical analysis and presentation. The data presented on the figures in this section are in units consistent with the data tables (**Tables 4-9 through 4-10**) as follows:

- Organic data for soils are presented in µg/kg
- Inorganic data for soils are presented in mg/kg
- Organic and inorganic data for aqueous samples are presented in micrograms per liter (µg/L)

The full data tables highlight contaminants that exceed the screening criteria.

4.1.5.2 Radionuclide Data

Gamma scans were conducted for the interior and exterior of the WACC property buildings, exterior soils, sewer pipeline, and sewer manholes prior to sample collection. The gamma scan data were used to supplement the sample analytical data results.

Gamma exposure rates were also recorded at selected locations within the WACC property buildings, exterior soils, and the sewer manholes; gamma exposure rates are presented in µR/hr.

The radionuclides of concern at the site are Th-232 and Ra-226. The monazite sands are the parent mineral origin for the radionuclides at the site. The sands contain both Th-232 (parent) and its progeny as well as U-238 (parent) and its progeny which includes Ra-226. Thorium, uranium, and their respective decay chain progeny were re-concentrated from the original ore values as part of the WACC monazite sand processing. Monazite sands contain at least 6 to 8 percent of thorium and 0.1 to 0.3 percent of uranium with a Th-232 to U-238 ratio in the range of 3 to 1 to 10 to 1 (World Nuclear Association 2014).

Ra-226 is produced in the decay series of U-238. The minimum detectable activity (MDA) using gamma spectroscopy for U-238 is high; therefore, gamma spectroscopy results were not able to be used as a first line indicator for U-238. Instead, Ra-226 in combination with Th-232 concentrations were used to determine the nature and extent of contamination associated with WACC. The radionuclide analytical results were entered into the site database for evaluation purposes. The data were exported to a GIS for graphical analysis and presentation. The data presented on the figures in this section are in units consistent with the data tables (**Tables 4-11 through 4-18**) as follows:

- Radionuclide data for building materials, soils, sediment are presented in pCi/g
- Radionuclide data for groundwater are presented in pCi/L

The data tables highlight radionuclides that exceeded the screening criteria.

4.2 Results of the Building Investigation

The investigation of the WACC property buildings included radiological surveys and sampling of the building materials to determine if any process or effluent radioactive material became embedded in the building materials. This included:

- Gamma surveys of all building surfaces (floors, walls, ceilings, and roof) to determine potentially radiologically contaminated areas
- Wipe sampling to determine if radiological contamination is in the form of removable dust
- Building material core samples to confirm if elevated gamma scan readings are due to contamination embedded in the building materials

Data presented in the sections below include the RI data and the historic surveys performed before and after radiation mitigation activities (including installation of lead shielding below portions of the WACC property buildings). The historic reports are provided in **Appendix A** and include surveys completed by LBA, EPA RST 2, and NYCDDC.

In addition, a hazardous building materials survey was performed as part of the RI to determine the presence of hazardous materials such as ACM, LBP, mercury, and PCBs.

4.2.1 Gamma Surveys

LBA (2010) conducted an interior gamma scan of the WACC property buildings prior to installation of the lead shielding in 2012. The investigation found background (6-10 µR/hr) to moderate levels in the survey areas located over the former exterior staging yard (shown in **Figure 1-3**). In aerial photographs, the piles of monazite sands and/or waste tailings are somewhat visible in the yards. The gamma levels indicate the presence of residual monazite sands and/or tailings from the former activities. The survey also found relatively high gamma and subsurface radioactivity levels in the front half of Lot 46 and in Lots 44 and 42, where the WACC processing buildings stood.

The EPA RST 2 (Weston 2016) conducted interior gamma scans at the WACC buildings immediately prior to and after the installation of the shielding as part of the radiation mitigation activities. The survey results were presented as exposure rates above background (10 µR/hr). At contact with the floor, the highest exposure rates (greater than 20 times background) were measured at Lot 44 (Primo Auto Body), Lot 42 (TerraNova), at the former rail spur, and on the Irving Avenue sidewalk in front of Lots 44 and 42. The maximum exposure rates per area prior to shielding ranged from 65 to 430 µR/hr. After shielding was installed, maximum exposure rates per area ranged from 28 to 90 µR/hr. The highest exposure rates (greater than 6 times background) were found at Primo 1, TerraNova, and on the Irving Avenue sidewalk.

2015/2016 RI

During the RI, gamma surveys were conducted to identify locations with elevated gamma counts to target for building materials sampling. The floors, walls, ceilings, and roof were surveyed at the WACC buildings (including Lot 33, Lot 42, Lot 44, and Lot 46). Results are shown in **Figures 4-3a through 4-3f.** Floor areas in Lot 42 and Lot 44 (Primo Auto Body area and the front area of TerraNova) were not surveyed due to the presence of the lead/concrete shielding installed as part of the IRM in 2014 to cover areas of known contamination. A background gamma value of 2,500 cpm was selected for initially screening the building materials based on the background survey of concrete sidewalks.

Interior floor gamma survey results showed gamma readings greater than at least two times background for a majority of the scanned floors. In Lot 33, a warehouse above former yard areas, gamma measurements were greater than 4 times background in the northern corner of Lot 33-1, with the highest readings (8 to 20 times background) adjacent to either the back wall that runs along the former rail spur area or the west wall adjacent to Lot 42. The southwestern corner of Lot 33-1 and the middle of Lot 33-4 found gamma readings with concentrations greater than eight times background. In Lot 46, the deli basement, elevated gamma readings greater than 20 times background were found in the center and in the southeast corner of the basement and is likely due to contaminated soils adjacent to the basement wall.

Interior wall gamma survey results were similar to the floor gamma results. In Lot 33-1, levels were mostly between 2 and 10 times background. Sporadic readings greater than 10 times background were found in the bottom half of the western wall and the northern wall adjacent to the former rail spur area where elevated floor readings were observed. Readings between 5 and

10 times background were also found along the front wall of Lot 33-4. A hotspot of elevated gamma readings greater than 10 times background was observed on the eastern wall of Lot 46 (deli basement) in the southeastern corner adjacent to the WACC processing building (Lot 44).

Floor gamma readings were not collected at Lots 42 and 44 but wall gamma scans were conducted. In the Primo Auto Shop Lot 44, elevated readings were observed along the bottom half of the eastern wall ranging from 5 to 10 times background. At Primo Auto Shop Lot 42, readings greater than four times background were observed in the wall separating the front and rear of the building, and sporadically along the western and eastern walls. At TerraNova in Lot 42, readings between two and four times background were found along the eastern wall and the front wall along Irving Avenue.

The ceiling gamma survey results showed little radioactivity in the ceiling materials. Gamma readings between 5 and 10 times background were found sporadically on the ceiling in the southeastern corner of Lot 44 with a maximum of 17,300 cpm. Gamma readings slightly greater than two times background were also observed in two square-meter plots in Lot 46, Lot 44, Lot 42 (Primo Auto Body), the front half of Lot 42 (TerraNova), along the wall facing Irving Avenue in Lot 33, and in the northern corner of Lot 33.

Gamma readings were only collected from the roofs of Lot 44, Lot 42, and Lot 48 due to the questionable structural integrity of the other buildings' roofs. Gamma readings collected on the roof were only greater than 10 times background in 1 location in the southwestern corner of Lot 44 (Primo Auto Body), which is coincident with the elevated ceiling gamma reading discussed above. The majority of the other gamma readings were less than two times background.

The exterior wall survey results saw the highest gamma readings in the front exterior wall of the WACC buildings. Results for the western wall of Lot 46 showed gamma readings ranging from 4,000 to 8,000 cpm in the brick of Flat Fix and 2,500 to 3,500 cpm in the stucco of Jarabacoa Deli. The highest gamma readings on the rear wall of the WACC buildings were found in the concrete wall of Lot 42 (TerraNova). Gamma readings on the entire rear wall ranged from 3,000 cpm to 12,000 cpm. The eastern exterior wall saw gamma readings ranging from 5,000 to 6,500 cpm. The front wall of the WACC buildings saw gamma readings ranging from 2,500 cpm to 15,000 cpm. The most elevated gamma readings were found on the exterior front walls of Lot 44 and Lot 42 as well as the lots comprising Lot 33.

338-348 and 350 Moffat Street Gamma Scans

A supplemental investigation was performed at the 338-348/350 Moffat Street properties by EPA in 2015. EPA RST 2 completed gamma scans in 12 condos at this property south of the WACC property (EPA 2015b). The highest exposure rate measured at the contact surface of the test location was 12 µR/hr which is slightly greater than the EPA RST 2's designated background of 10 µR/hr. The highest thoron concentrations were also detected in this unit located on the first floor in the shed area behind the building. The air sampling results are discussed in **Section 4.3.2**.

4.2.2 Radiological Building Materials Sampling

During the NYCDDC RSS, seven areas of building surfaces were measured for the presence of removable and fixed alpha contamination. Most of the wipe samples were collected from building floors. The results showed only one wipe sample with elevated alpha results at 106 alpha dpm

per square centimeter (dpm/cm^2); the wipe was located in Primo Auto Body Lot 42 near a floor drain. Repeat sampling in the area did not detect elevated radioactivity.

2015/2016 RI

Locations to conduct additional alpha/beta measurements, wipe sampling, and building material core sampling were selected based on the results of the gamma surveys conducted throughout the WACC buildings. The alpha/beta results were compared to the acceptance criteria for Th-232 from Nuclear Regulatory Commission's (NRC) Regulatory Guide 1.86 (1974) on decommissioning release limits, 1,000 dpm/cm^2, to determine what areas contained elevated alpha. Wipe samples were collected from each alpha/beta direct measurement location to determine removable contamination. The results are presented in **Table 4-19**.

Direct alpha/beta measurements were greater than 1,000 dpm/cm^2 at three locations. At Lot 46 (deli basement) along the eastern wall near the south corner, BRICK-03-LOT46 had an alpha measurement of 10,776 dpm/100 cm^2. Elevated alpha measurements were observed on BRICK-06-LOT44, located in Lot 44, Primo Auto Body at 27,365 dpm/cm^2. The third location was collected in Primo Auto warehouse, in Lot 42. This brick (BRICK-09-LOT42) was underneath concrete and had an alpha measurement of 2,363 dpm/cm^2. The overlying concrete had an alpha measurement of 724 dpm/cm^2. All wipe samples collected at these locations showed no removable contamination.

At each location selected for direct alpha/beta measurements, samples of the building materials were collected and sent to a subcontract laboratory for gamma spectroscopy analysis. The highest results for Th-232 were observed in brick and concrete materials collected from the former kiln-vat building area (Lot 42 and 44). BRICK-09-LOT42, BRICK-06-LOT44, and CONC-07-LOT 42 had Th-232 concentrations of 152.7 pCi/g, 415.2 pCi/g, and 57.6 pCi/g, respectively. BRICK-06-LOT44 was collected from a short brick wall in front of an arch between the two Prime Auto body bays, through which material entered the kiln oven for processing. The other brick sample was collected in the Primo Auto main shop, which operated as a kiln/vat building when used by WACC.

A brick collected from the basement of the deli (Lot 46) from the southern corner along the east wall had a Th-232 concentration of 7.8 pCi/g. The high gamma reading observed in this location was likely due to contaminated soils on the other side of the basement wall.

4.2.2.1 Hazardous Building Materials Survey

The hazardous building materials survey found ACM, assumed ACM, LBP, assumed LBP components, and suspect hazardous materials throughout the WACC building structures. ACM tar was used in the construction of the buildings and found in wire insulation and electrical panels, roofing materials, window caulking, and interior construction materials. LBP was found in the TerraNova, Primo Auto Body, Flat Fix, Jarabacoa Deli, and the second-floor apartment, and the exterior of K&M Auto. Mercury was assumed to be present in all fluorescent light bulbs and wall thermostats throughout.

4.2.3 Conclusions of the Building Investigations

- Contamination remains in the building structures at the WACC property, primarily in the buildings that previously operated the kiln/vat in which monazite sands processing took

place and the storage yard where sands were loaded into the kiln-vat (Lots 42 and 44), in the basement of the deli (Lot 46), and, to a lesser extent, in the warehouse on Lot 33 constructed above the former yard area. Contaminants are primarily embedded in the building structure with the highest concentration of Th-232 at 415.2 pCi/g on a sample of brick from Lot 44.

- ACM, LBP, and suspect hazardous materials found in the WACC building structures were comparable to a building of its age.

4.3 Results of Previous Site Air Sampling

Previous investigations evaluated radon concentrations in the WACC property buildings and the exterior property and neighborhood.

4.3.1 WACC Property

WACC Building Interiors

An investigation conducted in 2010 (LBA 2010) found an elevated thoron concentration of 12.7 pCi/L. The indoor first floor radon screening criterion for the RI is 0.5 pCi/L. No indoor data could be developed for thoron; therefore, the outdoor screening criterion of 0.1 pCi/L is used as a conservative screening measure. This investigation found low levels of radon and thoron at Primo Auto Body, likely due to the large amount of air infiltration in the poorly-sealed buildings.

EPA conducted a search for gas entry points in TerraNova, Primo Auto Body, and the Celtic Bike Shop in December 2012 and the Jarabacoa deli (first and second floors) in February 2013. No gas entry points were identified in TerraNova, Primo Auto Body, or Celtic Bike Shop (EPA 2013a). No indications of elevated levels of thoron were found in the first and second floors of the Jarabacoa deli. However, the average thoron concentration in the basement of the deli was found to be 13.5 pCi/L from short five-minute measurements collected using RAD7 instrument.

A previous investigation was conducted as part of the radiation mitigation activities in 2012 and 2013 in WACC property buildings including TerraNova, the Primo Auto Body, Celtic Bike Shop, and Jarabacoa deli (Weston 2016). As part of this investigation, air samples were collected for radon (only) before and after radiation mitigation measures were installed including installation of a radon mitigation system at TerraNova followed by installation of lead/concrete shielding (Weston 2016). Before mitigation activities began at the Celtic Bike Ship, Primo Auto Body, and TerraNova, the maximum radon concentrations found in these buildings were 4.3 pCi/L, 3.1 pCi/L and 4.6 pCi/L, respectively. Following installation of a radon mitigation system in the office of TerraNova, the maximum radon concentration found in the building was 0.8 pCi/L. Following installation of the lead/concrete shielding at all three buildings, all radon levels dropped below 2 pCi/L with the maximum value observed in TerraNova at a concentration of 1.5 pCi/L. However, radon levels greater than the first-floor radon RI screening criterion (0.5 pCi/L) were still observed in all three buildings. Radon results at the Jarabacoa deli ranged from 1.1 pCi/L to 3.5 pCi/L. No radon mitigation activities were conducted at this property.

Exterior Sampling

In September 2012, thoron measurements were collected on and in the vicinity of the WACC property (Weston 2012) in the former rail spur area, along Cooper Avenue, Moffat Street, and

Irving Avenue. Thoron concentrations in the non-background samples ranged from 0.33 pCi/L to 366 pCi/L. The maximum concentration was detected in the former rail spur area. All samples exceeded the outdoor thoron RI screening criterion of 0.1 pCi/L. The radon measurements ranged from non-detect to 4.85 pCi/L, with the maximum concentration coinciding with the maximum thoron concentration.

The WACC Neighborhood Radiological Assessment (NRA) (NYSDOH et al. 2014) conducted thoron/radon sampling outside of the WACC buildings and in the neighborhood surrounding the WACC property on concrete sidewalks, tree-skirts, and exposed surfaces beneath sidewalks from July 29 to August 5, 2013. Background sampling was conducted with thoron measurements generally collected about 0.5 mile from the WACC property. The maximum thoron concentration of 0.3 ± 0.3 pCi/L was collected from the corner of Irving Avenue and Cooper Street. The report cited the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) for their data indicating thoron concentrations in uncontaminated or non-impacted areas vary by an order of magnitude from 0.02 pCi/L to 2.7 pCi/L (UNSCEAR 2006). The radon data were not available in the report.

Thoron and radon sampling conducted as part of an EPA investigation in 2013 (EPA 2013b) found the highest thoron concentrations at a location near the concrete pad in the former rail spur area. The thoron concentrations in this area ranged from 1.4 pCi/L to 172 pCi/L. The associated radon concentrations ranged from 0.1 pCi/L to 0.3 pCi/L. These relatively low radon concentrations are an indication that the waste material at the WACC site is the source of the elevated thoron concentrations since thoron is a decay product of Th-232, which is present at greater concentrations in the monazite sands.

4.3.2 338-348 and 350 Moffat

A supplemental investigation was performed at the 338-348/350 Moffat Street properties by EPA in 2015 for indoor and outdoor radon and thoron (EPA 2015b) to determine the air concentrations at this potentially impacted commercial and residential property. Multiple locations were surveyed based on the available external gamma rate readings, presence of cracks, holes in the floors, joints between floors and walls, and other features conducive to the emanation of gas from soil.

Twelve condominium units at this property (338-348 Moffat Street) were investigated for indoor radon and thoron using the test instrument's SNIFF mode. Results were presented as the average SNIFF mode reading over the test duration. The maximum average thoron concentration inside of a residential condominium unit was 3.6 pCi/L, with an associated average radon concentration of 0.5 pCi/L. The investigation revealed higher thoron concentrations ranging from 6.5 pCi/L to 8.5 pCi/L in a shed-like structure containing a pottery workshop in the backyard of the property. This shed does not have a concrete slab foundation and is sealed except for the door and has no ventilation system inside. The associated radon concentration was 0.4 pCi/L, which is below the RI first floor radon screening criterion. This is the same location where the maximum gamma readings were observed.

4.4 Results of Soil Investigation

The soils investigation included gamma scan surveys, soil boring downhole gamma scans, and soil sampling to delineate the impacted soils at the WACC property and the surrounding properties. Soil sampling was also conducted for non-radiological parameters to determine if the site had other contamination.

Data presented in the sections below include the RI data, the historic investigations performed before and after radiation mitigation activities, and investigations conducted on neighboring properties.

4.4.1 Non-Radiological Soil Contamination

Samples were collected in the NYCDDC Phase II by LBA and during this RI to determine the extent of non-radiological contamination at the site. In addition, results from investigations at nearby properties are included below. The RI results are presented on **Tables 4-19** and **4-10**.

4.4.1.1 WACC Soil Borings (Non-Radiological)

Previous Investigations

The NYCDDC Phase II investigation included the advancement of 30 soil borings and collection and analysis of soil samples. In the report, soil sample results were compared to NYSDEC Technical and Administrative Guidance Memorandum #4046 (TAGM) Residential Soil Cleanup Objectives (RSCOs). Acetone was the only compound that exceeded the screening criteria in one sample at a location near the western side of Lot 48. Low-level detections of acetone were reported in all other samples except one sample in which acetone was not detected. Low level detections of 2-butanone and methylene chloride were exported in samples collected throughout the site. Arsenic, beryllium, chromium, copper, iron, mercury, nickel, and zinc were all detected above TAGM RSCOs. Low-level detections of 4,4'-dichlorodiphenyldichloroethane (4,4'-DDD) and endrin ketone were reported in one soil sample collected from a sample across Cooper Street from the WACC property.

RI Sampling

Fifty-nine soil borings were advanced at the WACC property with surface and subsurface soil samples collected for TCL VOCs, SVOCs, PCBs, pesticides, and TAL metals at pre-selected borings or where elevated PID readings were encountered. **Figure 4-4** presents the results of the soil sampling that exceeded the RI screening criteria.

SVOCs / PAHs

The majority of SVOC concentrations exceeding RI screening criteria were located in the former rail spur area at SB-31, SB-26, SB-05, SB-44, and SB-32, with the maximum concentrations observed at SB-32 from 5 to 7 feet bgs. PAHs exceeded the screening criteria in the surficial soil sample collected from 0 to 2 feet bgs at nearly every soil boring.

Samples from SB-32 showed elevated PAH and phthalate concentrations (2-methylnaphthalene and bis[2-ethylhexyl]phthalate) exceeding criteria from 5-7 feet bgs. This soil boring location is about 6 to 8 feet downgradient from a potential UST. The soil had visual staining, noted oils within the soils, and elevated PID results. The PAH and phthalate concentrations at SB-31 also notably exceeded the screening criteria by one to three orders of magnitude. This sample was

collected in an area that Primo Auto Body uses to store automobiles. PAHs and the phthalate exceeded their respective RI screening criteria in the samples collected from 20-22 feet bgs at SB-05 and from 20 to 22 feet bgs at SB-35, in addition to the exceedances observed in the respective surficial soil samples.

Polychlorinated Biphenyls, Pesticides, and Mercury
PCB concentrations (Aroclor 1260) exceeding the RI screening criteria (240 µg/kg) were found in three surface soil samples at SB-31, SB-45, and SB-26. The exceedances ranged from 1,200 µg/kg to 100,000 µg/kg, with the maximum concentration observed underneath the warehouse (Lot 33) at SB-45. SB-45 is adjacent to a large sump in the floor of the building at Lot 33; therefore, the contamination is likely not attributed to WACC since this building and the sump was not present during WACC operations. The geophysical survey identified a pipe or a channel leading out of the sump under the concrete heading northwest. SB-31 and SB-26 are located in the former rail spur area.

Concentrations of pesticides (4,4'-dichlorodiphenyltrichloroethane [4,4'-DDT]and dieldrin) only exceeded screening criteria in one sample, at SB-45 from 0-2 feet bgs, collocated with the sample containing the maximum concentration of PCBs.

Mercury concentrations exceeding the RI screening criteria were collocated with the PCB exceedances (SB-31, SB-45, and SB-26) and at three additional locations, SB-44 and SB-05 in the former rail spur area and SB-08 underneath the Primo Auto Shop (Lot 42) building. The maximum concentration of mercury is collocated with the maximum concentration of PCBs at SB-45.

Arsenic and Iron
Arsenic and iron exceeded the screening criteria in every sample collected. Arsenic concentrations ranged from 0.85 mg/kg to 45 mg/kg, exceeding the screening criteria of 0.68 mg/kg. The median value of this range is 3 mg/kg. The two highest arsenic concentrations of 31 mg/kg and 45 mg/kg were found under the building at SB-07 and SB-08. Iron concentrations ranged from 1,300 mg/kg to 26,000 mg/kg, exceeding the screening criteria of 2,000 mg/kg. The median value of this range is 13,000 mg/kg. The two highest iron concentrations of 22,000 mg/kg and 26,000 mg/kg were found in two soils sampling collected from Lot 31 in the former rail spur area. Arsenic concentrations were mostly comparable to background (maximum background concentration of 6.3 mg/kg) except for some outliers. Iron concentrations were comparable to background. This indicates the metals are likely associated with the urban fill or naturally occurring in the glacial soils.

4.4.1.2 Nearby Properties (Non-Radiological)

308 Cooper Street Soil Borings
Equity Environmental Engineering (Equity) (Equity 2016) collected split soil samples for TCL VOCs, SVOCs, pesticides, PCBs, and TAL metals including mercury at soil boring locations SB-56, SB-58, SB-60, and SB-62. Two soil samples were collected from each boring except SB-56, where three samples were collected (Equity 2016). No VOCs were detected above the screening criteria, similar to the samples collected for this RI. PCBs and pesticides were not detected above the RI screening criteria. Numerous SVOCs, including indeno(1,2,3-cd)pyrene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(a)anthracene, benzo(k)fluoranthene, and

dibenzo(a,h)anthracene, were detected in the majority of samples at concentrations similar to those observed at the WACC property. Some PAHs, including indeno(1,2,3-cd)pyrene and dibenzo(a,h)anthracene, were found at higher concentrations in the 308 Cooper Street borings than those at the WACC. Metals including copper, lead, mercury, and zinc were also detected in all samples at levels within range of or higher than concentrations observed at the WACC property. Copper and lead were found at concentrations higher than those observed at the WACC.

335 Moffat Street Soil Borings

Three samples were collected by the owners' contractor (GFE 2015) at varying depths (19-20 feet bgs, 14-15 feet bgs, and 4-5 feet bgs) at the 335 Moffat Street property for TCL VOCs and TCL SVOCs. Concentrations of VOCs and SVOCs were less than the RI screening criteria. SVOCs were detected in one sample (collected from 4-5 feet bgs). The concentrations were within the lower range of those observed at the WACC property and less than the RI screening criteria.

4.4.2 Radiological Soil Contamination

For simplicity, radiological soil contamination is presented by site areas based on exposure route and property boundaries. The discussion follows the following order:

- Soils Below WACC buildings (Lots 46, 48, 44, 42, and 33)
- Former rail spur area (Lots 30 and 31)
- Adjacent streets and properties – Irving Avenue; Moffat Street, 338-348 and 350 Moffat Street, and 335 Moffat Street; Cooper Street, and 308 Cooper Street

Each section presents information collected during previous investigations followed by the supplemental data collected during this RI. **Figure 4-5a** presents the combined Th-232 and Ra-226 concentration data, while **Figures 4-5b** and **4-5c** present the separate Th-232 and Ra-226 results, respectively. **Figure 4-6** presents the data in cross-section views. **Tables 4-11, 4-12,** and **4-15** present the soil results.

4.4.2.1 Soils Below WACC Buildings (Lots 46, 48, 44, 42, 33)

The NYCDDC RSS identified contamination in soils under the former kiln-vat building (Lots 44 and 42) down to approximately 20 feet, with concentrations of Th-232 up to 1,100 pCi/g. Waste tailing were observed in the upper four feet of soils; however, a lens of contamination was also identified from 8 to 10 feet bgs, indicating that the tailings may have been buried at the site. This contamination was associated with process liquors, which contain a soluble and mobile form of Th-232, and, therefore, allow the Th-232 to leach down through the soil matrix. In 2013, concrete/lead shielding was installed under Lot 44 and half of Lot 42 (Primo Auto Body) and under a portion of the sidewalk along Irving Avenue. Building material contamination (discussed in **Section 4.2.2**) was found in bricks collected from Primo Auto Body, which is currently housed in the kiln/vat building that was used to process the monazite sands and extract thorium. In addition to the high levels of soil contamination previously found where the concrete/lead shielding was installed, the floor gamma surveys showed high levels of gamma in the northern corner of Lot 33-1, in Lot 46, and the middle of Lot 33-4, suggesting additional contamination below the floors.

The 2015/2016 RI found surficial soil contamination (0-2 feet bgs) under Lot 46 (Jarabacoa Deli), Lot 44 (Celtic Bike Shop), Lot 42 (Primo Auto Body and TerraNova), and Lot 33. The samples collected under Lot 33 (SB-44 and SB-45) had surficial Th-232 concentrations of 54.23 pCi/g and 2.62 pCi/g, respectively, with concentrations below screening criteria in samples collected from 2 to 4 feet bgs and deeper. The corresponding Ra-226 concentrations for SB-44 and SB-45 were 62.83 pCi/g and 0.87 pCi/g, respectively, with concentrations below screening criteria at depth. Historical samples collected at Lot 33 showed similar results. Lot 33 was used as a storage yard for WACC. The widespread surficial soil contamination in Lot 33 is likely attributed to stockpiling of waste tailings or monazite sand which was subsequently covered by the warehouse.

Contamination extends deeper under the former kiln/vat building area and former storage yard where the monazite processing took place, which is the current location of Celtic Bike Shop at Lot 44 and Primo Auto Body at Lot 42, respectively. Two borings (SB-07 and SB-08) were installed through the lead shielding in this area. Black/gray ash-like material was observed in the soil borings from 0 to 2 feet in this area, similar to soils in the areas of surficial contamination at the site.

SB-07, located under Lot 44, had a Th-232 concentration of 261.2 pCi/g in the surficial soil sample with a corresponding Ra-226 concentration of 6.79 pCi/g. Ra-226 concentrations in soil samples below 4 feet bgs were below screening criteria. However, Th-232 contamination in this borehole extends to 16 feet bgs with a concentration of 15.89 pCi/g from 14 to 16 feet bgs.

The highest Th-232 concentrations observed during the RI were found in SB-08, located below the former storage yard at Lot 42. A Th-232 concentration over 400 times the screening criterion was observed from 6 to 8 feet bgs at 533.80 pCi/g. The maximum Th-232 concentration in this borehole, 759.99 pCi/g which is over 600 times the screening criteria, was encountered from 10 to 12 feet bgs. Contamination in this borehole extends down to 22 feet bgs with a Th-232 concentration of 120.44 pCi/g. The deepest sample exceeding the Ra-226 screening criteria at 1.58 pCi/g was encountered from 20 to 22 feet bgs. Th-232 concentrations remain above the screening criterion down to 24 to 26 feet bgs with deeper samples having concentrations below the criterion.

Results from both boreholes, SB-07 and SB-08, indicate that the radioactive material migrated downward through the soil, which suggests it was mobilized in the form of process liquors. However, while Th-232 concentrations reach a maximum at 10-12 feet bgs and continue to significantly exceed the screening criteria down to 22 feet bgs, Ra-226 concentrations are highest in the surficial sample and decrease to less than three times the screening criteria below 2 feet bgs. Thorium dissolved in acid (thorium process liquors) was a byproduct of the monazite sands processing which took place in the kiln/vat building. However, sulfuric acid or nitric acid used in the processing would be expected to immobilize radium, which is indicated by the majority of the Ra-226 contamination existing in the top two feet of soils.

4.4.2.2 Former Rail Spur Area (Lot 30 and 31)

The exterior gamma investigation for the NYCDDC RSS (LBA 2010) and associated soil sampling indicated that contamination in the former rail spur area was due to surface deposition of tailings. The appearance of the material was black or gray and ash-like. Most contamination in this area was observed in the upper two feet of soils with no contamination observed deeper than the top

four feet of soils. Most concentrations were greater than 5 pCi/g but less than 55 pCi/g. A hotspot of contamination was observed adjacent the northern corner of Lot 42. The Th-232 concentrations in the two historic soil borings in this area were 99.5 pCi/g and 471.8 pCi/g. These samples were collected where RI soil boring SB-04 is located. One historic sample collected from 2 to 2.5 feet bgs adjacent to the northern corner of Lot 33 had a Th-232 concentration of 207.8 pCi/g. The NYCDDC RSS (LBA 2010) recommended further work to determine the lateral extent of contamination in this area.

In the RI, gamma surveys were conducted to identify areas for soil sampling. In the former rail spur area, elevated gamma readings were observed adjacent to the WACC buildings in Lot 31. Gamma readings in Lot 30, adjacent to the cabinet maker building (5606 Cooper Avenue), were mostly within background levels or just above background.

Hotspots of elevated gamma readings were observed in the former rail spur near the northern corner of Lot 33, extending adjacent to the WACC buildings to Cooper Street and near the southern corner of Lot 31 adjacent to the Irving Avenue/Moffat Street intersection. Two small hotspots of elevated gamma readings were also observed adjacent to the elevated rail line behind 5606 Cooper Avenue. Soil samples were collected in each hotspot area; the results of the soil sampling are discussed in the subsections below.

Lot 31 (Former Rail Spur Area)

Soil sampling showed contamination is primarily surficial (0-2 feet bgs) with higher concentrations closer to the WACC buildings and in the southern corner of Lot 31 (adjacent to the Irving and Moffat intersection). The surficial contamination is likely due to waste tailings present throughout the area from 0 to 2 feet bgs, as observed in the lithologic descriptions and during previous investigations. Soil borings SB-03 and SB-04, in the northern gamma hotspot adjacent to the northern end of Lot 42 confirmed that the gamma readings were associated with elevated levels of surficial contamination of Th-232 at 43.79 pCi/g in SB-04 and at 7.52 pCi/g in SB-03. The associated Ra-226 concentrations in these two samples were 5.62 pCi/g and 2.15 pCi/g, respectively. These borings are located near the elevated Th-232 concentrations found during the NYCDDC RSS.

Soil borings (SB-31, SB-32, SB-79, SB-82, and SB-83) advanced in the southern portion of Lot 31 adjacent to the Irving Avenue/Moffat Street intersection, showed elevated levels of Th-232 in surficial soil samples between 2 and 15 times the screening criteria. The maximum concentration was 19.34 pCi/g at SB-83.

In these areas radionuclide contamination above the screening criteria was only found sporadically below the surficial soils as shown on **Figure 4-5a**. The maximum concentrations in soils 2 to 4 feet bgs were in two samples collected in soil borings SB-31 and SB-83 with Th-232 at 17 pCi/g and 15.6 pCi/g and Ra-266 at 2.7 and 5.26 pCi/g.

In soils deeper than 4 feet bgs, contamination was just slightly above the screening criteria in borings in the southern Lot 31 area adjacent to the Irving/Moffat intersection. The highest concentration in this area at depths below 4 –feet was 11.95 pCi/g at SB-32.

These RI sample results confirmed historic results collected in the vicinity.

Lot 30 (Cabinet Maker – 5606 Cooper Avenue)
Surficial soil concentrations in Lot 30, near the cabinet maker building (5606 Cooper Avenue), were generally slightly above the screening criteria, with the highest concentration of Th-232 at 2.93 pCi/g and Ra-226 at 1.72 pCi/g in SB-28 from 0 to 2 feet bgs. Concentrations were below the screening criteria in samples collected below 2 feet bgs.

Surficial soil contamination was observed in the railroad area behind the cabinet maker building at SB-81 and SB-80 with Th-232 concentrations at 20.18 pCi/g and 24.95 pCi/g and Ra-226 concentrations at 3.83 pCi/g and 8.26 pCi/g. Concentrations were below background in SB-80 at 2-4 feet bgs and in SB-81 at 1-2 feet bgs. Lateral delineation was not achieved in this area with soil sampling, as the samples were collected in two hotspots with elevated gamma readings. The gamma readings, which have been confirmed by soil sampling data, indicate that the extent of contamination is likely delineated in the railroad area. This contamination is likely due to filling of waste tailings as black/gray ash-like material was observed in the top one foot of soil at these two locations.

4.4.2.3 Irving Avenue, Moffat Street, and Cooper Street

The exterior gamma investigation conducted as part of the NYCDDC RSS, found extensive gamma readings greater than 10 times background at the Irving Avenue and Moffat Street intersection and in the portion of Irving Avenue in front of the WACC buildings, with gamma readings dropping to background at the intersection of Irving Avenue and Cooper Street. Elevated gamma measurements greater than three times background continued to be observed toward the south on Moffat Street and dropped off to background approximately 300 feet from the intersection with Irving Avenue.

Irving Avenue and Moffat Street Intersection
In the RI, the corner of Irving Avenue and Moffat Street had the highest gamma readings outside of the WACC property. The gamma walk-over survey measured readings in the majority of this area above background with some hotspots greater than 20,000 cpm (four times background). Soil samples from a soil boring advanced in the middle of the intersection of the two streets (SB-50) found 209.93 pCi/g of Th-232 and 38.65 pCi/g of Ra-226 in the top 1 foot of soil.

Irving Avenue
Along Irving Avenue, moving westward, the contamination decreases significantly but remains surficial. Ash-like material was observed at SB-01 and SB-02 in the top foot of soil. The surficial soil samples at these locations had Th-232 concentration of 2.58 pCi/g and 3.15 pCi/g, respectively. Ra-226 concentrations in these samples were below the screening criterion. In general, concentrations decreased with depth. However, the sample from 10 to 12 feet bgs at SB-01 had Th-232 at 5.01 pCi/g. Two historical sample locations also indicated deeper contamination in the zone from 16 to 20 feet bgs. The elevated deeper contamination may be due to the disposal of contaminated process liquors in the sewer line in this area that may have leaked to the surrounding soils.

Moffat Street
Gamma readings on Moffat Street generally decreased toward the south, away from the Irving Avenue intersection. Gamma surveys showed elevated readings greater than four times background in front of/adjacent to the 338 Moffat Street building, beginning approximately 70

feet south of SB-50 and extending approximately 150 feet. Moving south on the street through the hotspot of gamma readings, readings increased adjacent to the property building but generally decrease on the west side of the street.

Soil samples on Moffat Street with elevated Th-232 concentrations were generally collected from the upper one to two feet of soil. Only three soil borings had Th-232 above background and two soil borings had Ra-226 above background at depth including SB-35 to 8 feet bgs, SB-34 at 6 feet bgs, and SB-51 at 8 feet bgs. These three samples locations are within 75 feet of the Irving Avenue intersection.

A soil boring targeting the northern edge of this gamma hotspot (SB-35) is shown on cross-section D-D' (**Figure 4-6**). Brick fragments and tailings fill was observed to 8 feet bgs. The sample collected from 2 to 4 feet bgs had Th-232 at 10.06 pCi/g and Ra-226 at 2.34 pCi/g. Th-232 and Ra-226 concentrations generally decreased with depth and were below screening criteria below 8 feet bgs.

Toward the south on Moffat Street, two soil borings located in gamma reading hotspots, SB-36 and SB-51, had elevated surficial Th-232 at 28.55 pCi/g and 59.35 pCi/g and Ra-226 at 5.55 pCi/g and 11.13 pCi/g, respectively. Soil observations at these locations showed potential waste tailings in the top foot of soil. Concentrations decreased with depth, with concentrations below screening criteria in samples below 2 feet bgs in SB-36 and 8 feet bgs in SB-51.

Approximately 40 feet south from the hotspot on Moffat Street, gamma readings drop to just above or within background levels. The gamma survey shows three small areas of elevated counts from two to three times background. Soil observations at each of the four borings showed the presence of waste tailings in the top one or two feet. Soil borings targeting these three areas (SB-38, SB-41, SB-53, and SB-54) had surficial Th-232 sample results of 4.21 pCi/g, 4.37 pCi/g, 19.35 pCi/g, and 39.30 pCi/g, respectively. Ra-226 in these surficial samples was 1.87 pCi/g, 1.84 pCi/g, 5.19 pCi/g, and 6.87 pCi/g. Samples from SB-54 and SB-55, further south on Moffat Street, had Th-232 concentrations below the screening criterion at all depths. Gamma readings south of SB-54 and SB-55 were all within the range of background, delineating the extent of contamination on Moffat Street.

338-348 and 350 Moffat Street

The gamma readings at this property were mostly within background levels. Soil samples collected from borings through the floors of the property buildings showed slightly elevated concentrations of both Th-232 and Ra-226 from 0 to 10 feet bgs, but less than 2 times the screening criteria. The maximum concentrations of Th-232 and Ra-226 were 2.39 pCi/g and Ra-226 1.81 pCi/g, respectively.

Several soil samples were collected to the east of the property buildings; similar to inside the building, Th-232 concentrations were slightly elevated, but less than two times the screening criterion, in a majority of the soil samples. However, toward the northeast corner of the building adjacent to the southern corner of Lot 31, soil gamma readings were elevated with counts greater than four times background. A soil sample collected from 0 to 2 feet bgs in this area at SB-65 had Th-232 at 4.91 pCi/g, and Ra-226 at 3.21 pCi/g, confirming the gamma scan reading. The gamma walk over survey shows a thin line of elevated gamma readings greater than four times

background extending from the area of the soil sample to the south. Surficial soil samples at SB-66, SB-67, and SB-68 all contained Th-232 concentrations greater than two times the screening criteria, with the maximum at SB-66 at 2.35 pCi/g. The maximum concentration of Ra-226 was in the surficial sample collected from SB-68 at 1.85 pCi/g. The deepest elevated Th-232 concentration was at 8 feet bgs in SB-67 with a concentration of 2.19 pCi/g. The sample had Ra-226 at 2.39 pCi/g.

These buildings were not present when WACC was in operation. The low levels of soil contamination may indicate that contaminants from the WACC property migrated offsite due to surficial runoff into this area or that contaminated soils were used to grade and fill the area prior to construction of the buildings.

335 Moffat Street

Samples were collected from six soil borings at 335 Moffat Street by the property owner and analyzed for Th-232 and U-238. The maximum Th-232 concentration was 2.62 pCi/g at 5 to 7 feet bgs from the soil boring located underneath the northern portion of the building. The building was built after WACC started production so there is some potential that soils below the building had been contaminated. This sample also had the maximum U-238 concentration at this property at 2.28 pCi/g. Another sample from the northern portion of the property at 1 to 2 feet bgs had Th-232 above the screening criterion at 2.19 pCi/g. These low levels of contamination are potentially due to past surficial runoff from the WACC property.

Cooper Street

Contamination above the screening criteria was observed in soils under Cooper Street near the WACC property. Two samples from 0 to 2 feet bgs on the west side of the street from the WACC property at SB-20 and SB-22 found Th-232 at 2.05 pCi/g in both samples, with Ra-226 at 0.96 and 0.6 pCi/g, respectively. Three historical locations on Cooper Street closer to the WACC property near the former rail spur area detected higher concentrations of Th-232 ranging from 7.8 pCi/g to 13.6 pCi/g with Ra-226 concentrations ranging from 1.3 pCi/g to 3.1 pCi/g. No concentrations were above the screening criteria below 2 feet bgs.

308 Cooper Street

The gamma walk-over survey at 308 Cooper Street showed most of the activity at this property is only slightly above background levels, except the northeastern corner of the property, which had readings at least twice background levels. Results from SB-56 showed Th-232 and Ra-226 concentrations above the screening criteria at 6.44 pCi/g and 1.67 pCi/g, respectively, in the surficial soil sample. Three other surficial soil samples were above the screening criterion for Th-232 at SB-57, SB-58, and SB-59 with the maximum concentration at SB-57 at 1.49 pCi/g. Five samples at depths ranging from 2 to 26 feet bgs had Th-232 concentrations only slightly greater than the screening criterion, with a maximum concentration of 1.88 pCi/g at SB-60 from 2 to 2.6 feet bgs.

4.4.3 Conclusions of the Soil Investigations

- PAH concentrations exceeding the screening criteria were found throughout the shallow soils at the WACC property. PAHs as deep as 7 feet bgs may be related to former USTs or use of the area to store demolished cars. Similar concentrations were also found at the nearby property, 308 Cooper Street. PCBs exceeded the screening criteria by at least an

order of magnitude in three locations, with a maximum concentration of 100,000 µg/kg. PCBs in the shallow soils can also be related to USTs or a sump below the building in Lot 33. Arsenic and iron concentrations exceeding the screening criteria were found in all samples at all depths and within the range of background levels, indicating the metals are likely associated with urban fill or the glacial soils.

- Under the WACC buildings, radiological contamination above screening criteria extends to a depth of 28 feet bgs under Lot 44, the former kiln/vat building and to 24 feet bgs under Lot 42, the former yard where the monazite sands were loaded into the kiln/vat building for processing. The highest Th-232 concentration observed during the RI was found in SB-08, located in Lot 42, at 760 pCi/g from 10 to 12 feet bgs. The highest Th-232 concentration in soil was observed at 1,100 pCi/g during the LBA investigation in 2010.

- There is widespread surficial radiological contamination related to surficial runoff/erosion or filling of tailings or monazite sands. Surficial contamination was observed in the former rail spur area, at the intersection of Irving Avenue and Moffat Street, the northern portion of Moffat Street and the eastern portion of Irving Avenue, and in the southeast corner of Lot31/northern part of 350 Moffat (area adjacent to the Moffat/Irving intersection). This contamination was likely due to filling in the area with process tailings or stockpiling the tailings or the monazite sands in the former storage yards without covering, allowing rainwater runoff to transport the sands and tailings to lower topographic areas.

4.5 Results of Sewer Investigation

Sewer investigations were performed within and adjacent to the CSS in the area around the WACC property. Sewer lines throughout the neighborhood that were, or potentially were, connected to the impacted CSS were investigated as well as the CSS discharge point at Newtown Creek. The investigation included:

- Sewer line fiberscope mapping and gamma rate measurements to identify the extent of radiological impacts within the sewers and the potential for contaminated materials to have leaked out of the sewers.

- Sewer manhole gamma scans, construction material and sewer sediment sampling to identify the extent of radiological impacts within CSS manholes.

- Soil borings to sample soils adjacent to the CSS lines to determine if leaking sewers have impacted soils adjacent to the sewer lines and the concentration and extent of contamination surrounding the sewer.

- Sediment samples at the CSS discharge to identify whether contaminated material disposed in the CSS has impacted the sediment at the sewer discharge at Newtown Creek (East Branch).

Data presented in the sections below include the RI data and historic surveys performed by NYCDDC and EPA RST 2.

4.5.1 Sewer Line and Manhole Gamma and Exposure Rate Measurements

An investigation of the sewer line originating at the WACC property was conducted to evaluate the extent of contaminant transport caused by the process waste disposal into the sewer line. Historic investigations were completed in the sewer manholes downgradient of the WACC property. The RI completed a pipeline fiberscope investigation with pipeline gamma scans. Sewer line and sewer manhole investigation data is summarized on **Tables 4-20 and 4-21** and on **Figure 4-7**.

CSS flows away from the WACC property along Irving Avenue toward the west/northwest in the direction of Halsey Street, where it turns north/northeast onto Halsey Street and subsequently turns west/northwest onto Wyckoff Avenue. Sewer lines on adjacent cross-streets (Cooper Avenue, Decatur Street, Covert Street, and Schaefer Street) discharge into the Irving Ave sewer line. Upstream and downstream directions are used in the discussion of the sewer system and are based on the direction of sewer flow.

Previous Investigations

NYCDDC RSS

Gamma measurements collected in the CSS manholes as part of the NYCDDC RSS found the most elevated gamma readings (ranging from 479 µR/hr to 605 µR/hr) in the manholes closest to the WACC property (C-1, I-2, and M-1 [CDM Smith designations I-3, I-5, and I-2], respectively). Table 3-1 from the NYCDDC RSS shows the results of the 2010 measurements (**Appendix A**). The investigation found a generally decreasing trend of gamma readings within the CSS manholes along Irving Avenue moving downstream from the WACC property, with gamma readings dropping to the identified background of 10 µR/hr at the intersection of Irving Avenue and Eldert Street at 17 µR/hr, approximately 0.2 mile downstream from the WACC property. On Cooper Avenue, elevated gamma readings were found in the two manholes adjacent to the WACC property.

The RSS concluded there is layer of contamination eight feet under the intersection of Cooper Street and Irving Avenue that is not detectable from the surface but is detectable through the manhole walls. It should be noted that the wall scraping samples were not high enough to cause the significantly elevated gamma readings.

Neighborhood Radiological Assessment

A previous investigation conducted by BVNA in 2013 (BVNA 2014) assessed the potential radiological impact within and adjacent to the CSS in areas downgradient of the WACC property. Downhole field gamma logging measurements were collected in 15 manholes and in 20 soil borings.

Downhole gamma logging indicated three locations with readings 4 to 12 times the background dose rate of 12 µR/hr. All locations were on Irving Avenue at the intersection of or between Cooper Street or Moffat Street. Gamma measurements collected from the manholes indicated a generally decreasing trend on Irving Avenue westward from the WACC property.

2015/2016 RI

Sewer Pipeline Gamma Measurements

Main Sewer Line

The main sewer line originating in front of the WACC property runs along Irving Avenue toward the west/northwest in the direction of Halsey Street, where it turns north/northeast onto Halsey Street and subsequently turns west/northwest onto Wyckoff Avenue, continuing to eventually discharge to the Newtown Creek Wastewater Treatment Plant. At times of sewer overflow (storms) the sewer discharges to outfall NC-083 into the East Branch of Newtown Creek. The line starts at the manhole designated as I-1 (**Figure 4-7**), in front of the WACC property. During the 2015/2016 RI, the manhole was unable to be found and, therefore, was not inspected. However, an investigation conducted in 2009 (LBA 2010) found the manhole (M-2 in the 2010 report) under a 6-foot by 6-foot section of asphalt which was opened to complete the investigation. The gamma readings at three feet above the road surface of the manhole were 164 μR/hr, while the gamma readings in the manhole 3 feet from the bottom were 26 μR/hr. The depth of the manhole is 9 feet. The report states that the high aboveground gamma at this manhole was due to the extensive layer of thorium-bearing soils found under the asphalt in front of Primo Auto Body.

The sewers investigated in 2015, including any issues encountered during the fiberscope investigation, are shown on **4-7**. The RI pipeline investigation began on the Irving Avenue sewer line at I-2. Gamma counts at this location were greater than 100,000 cpm. The fiberscope investigation found a longitudinal crack at I-1, indicating the potential for leakage from the pipeline/manhole in this area. To investigate I-1, the field team used I-2 as an entrance for the fiberscope and gamma probe and moved toward I-1 in the sewer line. However, debris in the pipeline about 15 feet upstream of I-2 was impassable.

The sewer line investigation continued downstream from I-2, but was also limited between I-2 and I-6 due to sediment and sediment blockages, impassable debris, and flooding in the I-4 manhole. However, gamma counts from the limited sewer line that was accessed ranged from 40,000 cpm to 386,598 cpm, generally decreasing from I-2 to I-6, moving downstream from the WACC property.

Between I-6 and I-7 (300 to 450 feet from the WACC property), impassable debris was encountered in both directions. On either side of the debris, gamma counts ranged from 10,000 cpm to 125,908 cpm. In these areas of the sewer, high gamma counts may be caused by the blockages as they would prevent the free flow of the radioactive waste through the sewer line, creating radioactive build-up on the upstream side of the blockages. The blockages would also accumulate contaminated particulate matter in the form of sediments and sludge. Additionally, at I-4, the pipe increases in diameter from 12-inch clay pipe to 24-inch concrete pipe. This could increase the chances for waste buildup in the sewer as the increase in pipe diameter would slow the velocity of the wastewater.

Moving from I-7 to I-8 (approximately 450 to 600 feet from the WACC property), gamma counts greater than 100,000 cpm were recorded, but began to decline around I-8 to below 100,000 but above 50,000. Downstream of I-8, the gamma counts dropped to less than 50,000 cpm but remained above 20,000 cpm. Downstream of I-9, gamma counts increased up to 100,000 cpm but declined to below 50,000 cpm after I-10. From I-11 to H-3, gamma counts were generally less than 10,000 cpm, with a few sporadic occurrences above 20,000 cpm with a maximum of 74,426

cpm between I-12 and I-13. This is potentially due to the increase in the pipeline diameter from 24 inches to 36 inches at I-13 which would slow the velocity of the wastewater. The fiberscope showed a broken pipe about 18 feet downstream from I-12, between I-12 and I-13. Due to the length of sewer line between H-2 and H-3, the investigation in the downstream direction was terminated.

From manhole H-3 moving downstream to W-1, the gamma readings were elevated with all locations above 28,000 cpm and a maximum at 69,000 cpm. The gamma readings decreased approximately 10 feet downstream of H-3, eventually declining to between 5,700 cpm and 13,000 cpm in the Wyckoff Avenue line from W-1 to W-2 where the investigation ended. When the radioactive waste moved into the Wyckoff Avenue sewer line, the flow rate of the wastewater would have decreased due to the increase in pipe size, potentially allowing contaminated sediment to accumulate in the sewer line.

Sewer Lines Feeding Main Sewer Line

Four sewer lines flow into the main sewer line along Irving Avenue including lines on Cooper Avenue, Decatur Street, Covert Street, and Schaefer Street. These were investigated due to potential movement of contamination upstream (backing up against flow) into these lines during periods of flooding. On Cooper Avenue, four manholes and the associated sewer line were investigated beginning approximately 1,000 feet upstream from the Irving Avenue intersection. Gamma counts were slightly above background beginning in the most upgradient manhole, C-4. The maximum gamma count measured in the sewer line between C-4 and C-1 was 11,563 cpm. Moving from C-1 to I-3, the recorded gamma counts increased to a maximum of 103,496 cpm approximately 12 feet from I-3. This is potentially due to blockages in the Irving Avenue sewer line creating back-ups into the Cooper line.

Gamma counts recorded in the sewer line on Covert Street that feeds the Irving Avenue sewer line were all within the range of background with the highest recorded gamma count at 4,700 cpm. An investigation for the sewer line on Decatur Street was unable to be performed; the line was filled with water, likely due to a blockage. An investigation was conducted on the sewer line on Schaefer Street from the I-8 manhole. The gamma readings were all below 5,000 cpm. The investigation ended 37 feet upstream of I-8 in the direction of S-1 due to the presence of debris.

Other Sewer Lines

Two other sewer lines flowing away from the WACC property area were investigated for possible contamination. One sewer line flows south down Moffat Street then turns onto Knickerbocker Avenue while the other flows south down Cooper Street. The two lines are joined at the intersection of Knickerbocker Avenue and Cooper Street. The M-1 manhole shown on **Figure 4-7** was not found. The sewer line going upstream from M-2 on Moffat Street was capped, preventing a survey in this northward direction toward the WACC property. The sewer line survey progressed downstream from M-2 toward M-4; gamma readings varied from background to slightly above background with the maximum reading at 6,013 cpm. Gamma readings from M-4 to the Knickerbocker intersection at K-3, ranged from 1,600 cpm to 4,600, all within the range of background values.

Sewer Manhole Gamma Counts and Gamma Exposure Rate Measurements
Table 4-7 presents the gamma counts and gamma exposure rates collected from the investigated manholes. At each manhole along the sewer lines selected for the investigation, the manhole cover was removed and a one-minute count was taken at the surface with a 1x1 inch NaI detector (Ludlum 44-2 probe/2221 meter) and an exposure rate measurement was taken with a Ludlum Model 9DP.

Gamma readings were collected at the ground surface of the manhole, three feet from the bottom of the manhole, and at the point of the highest reading. The maximum gamma reading was collected from manhole I-5 at 482,397 cpm. The most elevated readings were found in manholes I-2 though I-11, confirming results from previous reports that elevated levels begin to decrease approaching the intersection of Irving Avenue and Eldert Street. These data also align with the gamma readings collected from inside the sewer lines. Elevated readings were also recorded in manholes H-3 and W-1, where elevated sewer line gamma readings were also observed.

Exposure rates were collected at the ground surface of the manhole with the manhole lid open. In general, readings collected at the ground surface with the manhole open were above background (12 μR/hr) in manholes I-2, I-3, I-5 through I-10, and H-2. In sewers where entry was made for material sampling (I-2 and I-4 through I-8), exposure rates also were collected near the bottom of the sewer. The highest exposure rate recorded was in manhole I-5 at 310 μR/hr three feet from the bottom and 39 μR/hr at the ground surface.

4.5.3 Sewer Materials Sampling

Sediments and manhole construction materials were collected from impacted manholes during the RI and previous investigations.

Previous Investigations
One sample of sewer materials was collected as part of the NYCDDC RSS (LBA 2010). A composite sample was collected from M-1 (CDM Smith's I-2) of the sediment on the bottom of the manhole and from "scrapings" on the wall for laboratory analysis. Th-232 was detected at 81.3 pCi/g. This manhole had one of the highest gamma measurements during LBA's investigation gamma survey. Therefore, the report discussed the possibility of contamination present outside of the sewer vault in the form of contaminated fill or from leaky sewer pipes.

Sewer sediment sampling conducted by BVNA (2014) found all samples in the Irving Avenue manholes contained radioactivity above two times the screening criteria (0.92 pCi/g). Samples were collected from 15 manholes along the CSS on the Irving Avenue corridor. Sediment radioactivity was highest in the sample collected from the manhole CDM Smith designated I-5, with a Th-232 concentration of 1,460 pCi/g and a Ra-226 concentration of 72 pCi/g. The lowest sediment measurement was from the manhole CDM Smith designated I-8, with Th-232 at 1.23 pCi/g and Ra-226 at 0.27 pCi/g. However, one of the highest gamma logging measurements was collected at this manhole. Two sewer brick/mortar samples were collected from MH-15 (CDM Smith I-12) and MH-11 (CDM Smith I-2) with Th-232 concentrations of 1.34 pCi/g and 12.4 pCi/g, respectively.

2015/2016 RI

During the RI, sewer material samples, including brick, concrete and cast iron, and sediment and muck (scrapings) were collected from six sewer vaults along Irving Avenue. Sampling locations were selected based on the location of the highest gamma counts and material type. **Table 2-10** presents a summary of the sewer material sampling locations. **Table 4-14** presents the sewer material sampling results.

Construction materials at I-2 and I-4 and sewer sediments at I-2, I-5 and I-7 had elevated concentrations of Th-232 and Ra-226 that are likely causing the elevated gamma readings and gamma exposure rates in these manholes.

- **I-2 (in-manhole gamma reading of 113,646 cpm)** - A brick sample collected three feet from the bottom of the manhole vault, near the incoming sewer line from manhole I-1, had a Th-232 concentration of 2,206.4 pCi/g and a Ra-226 concentration of 76.4 pCi/g. The sediment sample collected from I-2 had elevated laboratory results for Th-232 at 1,079.9 pCi/g and Ra-226 at 69.8 pCi/g for the sediment bottom and 1,218.1 pCi/g of Th-232 and 45.9 pCi/g of Ra-226 for the soft material coating walls of the sewer vault (muck).

- **I-4 (in-manhole gamma reading of 20,964 cpm)** - Elevated concentrations were detected in the degraded cast iron sewer pipe material with Th-232 at 2,536.2 pCi/g and Ra-226 at 163.13 pCi/g. This was the highest result of all sewer samples. The concrete sample in this location was three orders of magnitude less than the cast iron, at 4.4 pCi/g of Th-232 and 2.1 pCi/g of Ra-226. The disparity is likely the result of contaminated sludge build-up on the cast iron pipe as compared to the concrete in the vault.

- **I-5 (in-manhole gamma reading of 482,397 cpm)** - A concrete sample was collected due to the elevated gamma reading. The concrete had a Th-232 concentration of 4.67 pCi/g and a Ra-226 concentration of 1.1 pCi/g. The sediment sample collected in this manhole during the BVNA investigation had a Th-232 concentration of 1,460 pCi/g.

- **I-7 (in-manhole gamma reading of 42,843 cpm) -** The laboratory results for the sediment sample had Th-232 at 116.72 pCi/g and Ra-226 at 6.1 pCi/g, one order of magnitude less than at I-2 and I-5, both located upstream and closer to the WACC property.

Based on a comparison of the laboratory results and the gamma count measurements collected in the field, the laboratory results support the gamma count measurements.

4.5.4 Sewer Soil Borings

Previous Investigations

A previous investigation conducted by BVNA (BVNA 2014) targeted sampling for soils, sediments, and materials within and adjacent to the sewer line. Twenty soil borings were advanced adjacent to sewer lines, with four in a background area. Downhole gamma measurements were collected inside the soil borings. Three locations had elevated readings including one in front of the WACC building from 0 to 5 feet bgs and at 17 feet bgs and two other locations from 0 to 4 feet bgs at the intersection of Irving Avenue and Moffat Street and at the intersection of Irving Avenue and Cooper Street. The soil sample results showed one location with significant radioactivity above background: south of the WACC building, at a depth between 15 and 18 feet bgs. This location is

near RI soil boring SB-01, which had Th-232 levels greater than five times background from 10 to 12 feet bgs and greater than three times background from 0 to 2 feet bgs.

2015/2016 RI

To determine if radioactive material exists in the soil surrounding the sewer lines, sewer soil borings were performed using DPT at nine locations along Irving Avenue, Cooper Avenue, and Halsey Street. The boring locations were selected based on elevated, in-sewer gamma readings recorded during the fiberscope investigation. **Figure 4-7** presents the results of the sewer soil borings.

Th-232 was detected above its screening criterion in eight samples while Ra-226 was detected above its screening criterion in two samples. Th-232 concentrations were less than two times background at SW-SB-02 from 0 to 2 feet bgs, SW-SB-04 from 4 to 6 feet bgs, SW-SB-06 from 6 to 8 feet bgs, and SW-SB-08 from 4 to 6 feet bgs. SW-SB-02 is located at the intersection of Irving Avenue and Cooper Street, near an historic boring with elevated gamma readings from 0 to 4 feet bgs (BVNA 2014). Soil lithologic observations from this borehole did not indicate the presence of waste tailings.

The maximum Th-232 and Ra-226 concentrations of the sewer soil borings were detected at SW-SB-03 from 0 to 1 foot bgs with concentrations of 58 pCi/g and 7.77 pCi/g, respectively. SW-SB-03 is approximately 100 feet west of the Irving Avenue and Cooper Street intersection. The shallow nature of this contamination indicates it was not caused by leaking from the sewer. It was likely caused by filling of tailings from the WACC property as the soil boring indicated the presence of probable waste tailings in the upper foot of soils.

4.5.5 Newtown Creek Sediment Sampling

Eight vibracore sediment sampling locations were advanced to varying depths with a maximum of 10 feet bgs near the outfall where the sewer line for WACC discharges (**Table 4-13**). Outfall NCB-083 is very large, with flow diverted to this outfall only during CSO overflow during large storms. Discrete sediment samples were analyzed to determine if radioactive material historically discharged in the sewers at WACC has impacted sediment in Newtown Creek. Sediment samples were also collected in Coney Island Creek to serve as a background data set as described in **Section 4.1.4.5**. **Figure 4-8** shows the results of the sediment sampling.

The majority of sediment samples collected in Newtown Creek were above the RI screening criterion for Th-232 (0.637 pCi/g); fewer were above the criterion for Ra-226 (0.797 pCi/g). Of the eight locations, five surficial sediment samples, those collected from the surface of the sediment layer (0-0.5 foot bgs), had Th-232 concentrations below the RI screening criteria. Sediment collected at the closest locations to the large outfall (EB-01, EB-02, EB-03, and EB-05) had Th-232 concentrations greater than five times the screening criterion (background). The maximum Th-232 concentrations were at EB-01 with Th-232 at 70.211 pCi/g from 5 to 6 feet bgs. This location also contained the maximum Ra-226 concentration at 3.65 pCi/g from 4 to 5 feet bgs. In general, elevated results were isolated to depths of 2 to 8 feet bgs. Elevated Th-232 and Ra-226 concentrations at EB-01 were detected from 3 to 7 feet bgs. Elevated Th-232 concentrations at EB-02 were detected from 0.5 to 5 feet bgs and at EB-03 from 0 to 10 feet bgs.

Elevated Th-232 concentrations at depth could be attributed to the historic disposal of the radioactive material impacting Newtown Creek. However, given the nature of the flows into the area, it is impossible to state with certainty based on the data.

4.5.6 Conclusions of the Sewer Investigation

- Radionuclide contamination is significantly elevated in the manholes south of the WACC buildings on Irving Avenue where process liquors containing thorium were likely discharged. The elevated gamma levels (>20 times background) continue in the sewer line and manholes on Irving Avenue for approximately two blocks.

- Radionuclide contamination within the CSS is present near the WACC property in sediments/sludge and materials comprising the sewer pipes and manholes. The maximum radionuclides concentrations in sewer materials were found in manhole I-4, located near the intersection of Irving Avenue and Cooper Avenue, with Th-232 at 2,536.2 pCi/g and Ra-226 at 163.1 pCi/g. The maximum Th-232 concentration in sewer sediments was observed in manhole I-2, located south of the WACC property on Irving Avenue, with Th-232 at 1,218.1 pCi/g and Ra-226 at 45.9 pCi/g.

- Gamma scan levels generally drop to four times background at the intersection of Irving Avenue and Schaeffer Street and drop to background at the intersection of Irving Avenue and Eldert Street, with sporadic occurrences of gamma levels above four times background continuing in the sewer along Halsey Street to Wyckoff Avenue.

- Radionuclide contamination appeared limited to the interior of the sewers as soil borings installed adjacent to the sewer lines found only limited radionuclide contamination. A data gap does remain since the fiberscope survey showed potential for exfiltration via breaks in the pipeline along Irving Avenue, indicating that the bedding material below the sewers may be contaminated.

- Radionuclide concentrations in sediment at the Newtown Creek outfall were above screening criteria with a maximum concentration of 70.2 pCi/g from 5 to 6 feet bgs. Samples exceeding criteria were limited to the area immediately adjacent to the outfall discharge.

4.6 Results of Hydrogeologic Investigation

This section provides the nature and extent of contamination in groundwater.

4.6.1 Monitoring Well Sampling

Two rounds of groundwater samples were collected from five monitoring wells for TCL VOCs, SVOCs, Pesticides/PCBs, TAL metals, mercury (total and dissolved), and gamma spectroscopy. A third round of samples was collected in November 2016 for isotopic thorium and radium analyses to provide results with lower MDAs. A fourth round of samples was collected from all five wells and a newly installed upgradient well (MW-06) in April 2017 for isotopic radium and thorium and VOCs to confirm previous results and investigate upgradient groundwater quality. Groundwater sampling results that exceeded screening criteria are shown on **Figure 4-9**.

4.6.1.1 Non-Radiological Groundwater Contamination

During Rounds 1 and 2 four VOCs including chloroform, cis-1,2- DCE, PCE, and TCE exceeded the screening criteria. PCE was significantly elevated in all five wells and the highest concentrations were in wells on the upgradient side of the WACC property. The maximum concentrations of PCE (930 µg/L) and TCE (7.7 µg/L) were in MW-04. The maximum concentration of cis-1,2-DCE (25 µg/L) was in MW-02, located south of the WACC property on Irving Avenue. The Round 3 samples were not analyzed for non-radiological parameters.

However, chlorinated VOCs were not detected in the soil samples at the site, including those from each borehole prior to well installation where samples were collected or screened down to the water table. Additionally, the Phase I report did not indicate the presence of materials currently or in the past that would be associated with chlorinated VOCs. Therefore, to determine if the VOC contamination traveled from an upgradient source, an upgradient monitoring well was installed in April 2017.

During Round 4 sampling, which included upgradient monitoring well MW-06, four VOCs including chloroform, cis-1,2-DCE, PCE, and TCE exceeded the screening criteria. PCE was significantly elevated in all six wells with concentrations ranging from 72 µg/L to 230 µg/L with the maximum concentration in MW-01. TCE also exceeded its RI screening criterion in all six wells with concentrations ranging from 0.95 µg/L to 5.1 µg/L with the maximum concentration also in MW-01. Cis-1,2-DCE ranged from 0.41 µg/L to 19 µg/L with the maximum concentration in MW-02. The results suggest that the chlorinated VOC contamination likely comes from an offsite source upgradient of MW-06.

4.6.1.2 Radiological Groundwater Contamination

During the Round 1 groundwater sampling event, no detections of Th-232 or Ra-226 were observed. During the Round 2 groundwater sampling event, Th-232 was detected in one sample, at MW-05, at a concentration of 11 pCi/L. Round 1 and Round 2 samples were analyzed with methods that did not provide a MDA that was below the RI screening criteria. Therefore, additional sampling was necessary to acquire definitive data.

Round 3 and Round 4 sampling events were performed, with samples analyzed by different methods to achieve lower MDAs. Ra-226 and Th-232 were not detected above the RI screening criteria in Round 3 and Round 4. Th-232 was only detected in one well during Round 3 at a concentration of 2.5 pCi/L and was not detected in Round 4. Ra-226 was detected in three wells in Round 3 with a maximum concentration of 0.371 pCi/L and five wells in Round 4 with a maximum of 0.31 pCi/L. All concentration detections in Round 3 and Round 4 were similar to those observed in the upgradient well in Round 4.

The one detection of Th-232 above screening criteria in one of the four sampling rounds is not indicative of radiological contamination impacting the groundwater below the WACC property. Although the one result did exceed the screening criteria, the analytical method used during the Round 2 sampling measured an uncertainty of nearly 50% of the measured activity. Subsequent sampling with more discrete analytical methods did not detect Th-232 above the screening criteria in the following two rounds of sampling. In addition, soil contamination was not detected deeper than 28 feet bgs at the site, and the groundwater table is at approximately 60

feet bgs, under mostly impervious surfaces that limit infiltration. The data and these observations suggest the groundwater at the WACC site is not impacted above the screening criteria.

4.6.2 Perched Groundwater Sampling at 335 Moffat Street

One groundwater sample was collected at 335 Moffat Street, a former ice production building, within a perched groundwater zone at about 10 feet bgs. The sample was only analyzed for VOCs, none of which were detected. Perched groundwater is not unexpected in this area as large amounts of water would have been used in the ice production process. Borings completed adjacent to this area on Moffat Street during the RI did not encounter any perched water.

4.7 Results of Gamma Exposure Rate Confirmation Survey

Previous investigations evaluated the gamma exposure rates related to contamination from the WACC property. The RI conducted gamma exposure rate surveys to confirm the results of the previous investigations. **Figures 4-10a and 10b** present the results of the exposure rate surveys.

4.7.1 Exposure Rate Surveys

Previous investigations showed elevated exposure rates near the WACC property in the portion of Irving Avenue south of the WACC buildings, at the intersection of Irving Avenue and Moffat Street, and in the former rail spur area. Gamma background measurements collected during the BVNA investigation (BVNA 2014) ranged from 9 to 12 µR/hr. Interior measurements collected by LBA (2010) found high levels of gamma radiation (between 20 and 500 µR/hr) in the kiln vat building, now Lot 44, and in the WACC yards and other buildings, now Lot 42.

Pre-shielding measurements collected by Weston (2014) found gamma levels above background in Lots 42, 44, and 46, the former rail spur area, and the Irving Avenue sidewalk immediately south of the WACC buildings, specifically in front of Lots 42 and 44. Post-shielding measurements showed significant reductions in the gamma radiation by several orders of magnitude; however, gamma measurements above background were still found in each area. The NRA found background gamma readings throughout the neighborhood around the WACC property, except for one isolated area in south of 11-03 Irving Ave, which is one block west of the WACC buildings on Irving Avenue. Within the area of the WACC building, the neighborhood assessment found elevated gamma readings up to 470 µR/hr on the Irving Avenue asphalt and sidewalk in front of the WACC buildings and on Moffat Street near the WACC buildings.

In 2015/2016, CDM Smith collected gamma exposure rate data to confirm the data collected in previous investigations. **Figure 4-10a** shows gamma exposure rates collected three feet above ground level from the neighborhood area around the site. **Figure 4-10b** shows exposure rates collected three feet above ground level from the exterior areas of the WACC property area and inside the WACC buildings including the deli basement and the first floor. The second floor was inaccessible. Gamma exposure rate measurement locations and results are presented in **Table 4-22**.

4.7.1.1 Neighborhood

The results of the confirmatory investigation in the neighborhood were similar to the past measurements. The results are presented on **Figure 4-10a**. Half of the gamma exposure rates (10 of 20 measurements) collected in the neighborhood, outside the WACC property, were within the

range of background levels (9 to 12 μR/hr). The isolated elevated reading previously found in front of 11-03 Irving Ave was confirmed by the confirmatory measurements at 49 μR/hr. The remaining locations above background were located on Moffat Street with the maximum gamma exposure rate approximately 175 feet south of the WACC property. Moving south on Moffat Street, away from the WACC property, gamma exposure rates dropped to background approximately 600 feet from the WACC property. An area of measurements slightly above background ranging from 13 to 17 μR/hr was observed at the intersection of Wilson Avenue and Moffat Street and one block west of the intersection on Wilson Avenue. In previous investigations, gamma exposure rates in this area were slightly below 12 μR/hr.

4.7.1.2 Interior

The results of the WACC exterior and interior investigation (**Figure 4-10b**) were similar, confirming the measurements collected in previous investigations. The interior of the WACC buildings had exposure rate measurements above three times background in the northern corner of Lot 33-1, in Lot 42, Lot 44, and in the basement of Lot 46 along the wall bordering Lot 44. Levels within two and three times background were also found in Lot 33-4. All buildings on the property had gamma exposure rates above background.

4.7.1.3 Exterior

In the exterior portions of the WACC property, the highest gamma exposure rates were found on the roadway of Irving Avenue, one near the sidewalk curb and one in the middle of the street, south of Lot 42 and Lot 33-1 (**Figure 4-10b**). Closer to the building, the gamma exposure rates dropped significantly due to the presence of lead shielding, but were still above background. Other gamma exposure rates above background were located south across Irving Avenue on the sidewalk, the intersection of Irving Avenue and Moffat Street, immediately south of Lot 33-4, and the northern area of the former rail spur area.

4.8 Results of School and Daycare Investigation

An investigation was conducted at a nearby school and daycare to evaluate the potential presence of contamination in the soil, the gamma exposures potentially impacting people at the property, and the radon and thoron concentrations in the buildings. The investigation was performed in two phases, one in 2015 and one in 2017.

The 2015 investigation included the following activities:

- Exterior soil borings around the school
- Radon and thoron evaluation at the school and daycare including:
  - Short-term radon samples in the school and daycare
  - Six-month radon and thoron samples in the school
  - One-year radon and thoron samples in the school
- Exposure rate surveys

Following review of the 2015 investigation data, additional sampling was performed to provide additional characterization of the soils below and adjacent to the school and daycare buildings. The 2017 investigation included the following activities:

- Interior soil borings below the school basement and the daycare basement
- Exterior soil borings adjacent to the daycare
- RAD-7 survey for radon and thoron release following penetration of a concrete slab at the school and daycare
- Ambient air measurement in the school basement
- Five-day radon and seven-day thoron measurements in the daycare basement

4.8.1 School and Daycare Soil Borings (SCSB-01 through SCSB-06, SCSB-11 through SCSB-20)

During the 2015 investigation six soil borings were advanced around the school along Moffat Street, Wilson Avenue, and Cooper Street to determine if radioactive material is present in the subsurface near the school. **Figure 4-11** shows the results of the soil sampling investigation. Four of the 30 samples collected from the six borings were just slightly above the RI screening criterion for Th-232 (1.22 pCi/g) with a maximum concentration of 1.55 pCi/g at SCSB-03 from 6 to 8 feet bgs. The highest Th-232 concentrations, between 1.29 and 1.55 pCi/g, were in SCSB-01 through SCSB-03, all located in the sidewalk along Moffat Street.

Of the 10 soil borings advanced as part of the 2017 investigation activities, 5 soil borings were advanced below the school's basement, 2 were advanced below the daycare's basement, and 3 soil borings were advanced outside of the daycare on the sidewalk. Results from soil samples collected below the school's basement and below the daycare's basement were all below the RI screening criteria for Th-232 and Ra-226. In the three borings installed adjacent to the daycare building on the Moffat Street sidewalk, Th-232 exceeded the RI screening criterion in one sample which was collected from 6 to 8 feet bgs at SCSB-19. Ra-226 exceeded the RI screening criterion in three samples, ranging from 0.98 pCi/g to 1.18 pCi/g. The maximum Ra-226 concentration was collected at SCSB-19 from 6 to 8 feet bgs.

In general, out of a total of 47 soil boring samples collected below or adjacent to the school, four samples exceeded the RI screening criterion for Th-232 with a maximum concentration of 1.55 pCi/g. Out of 18 soil boring samples collected below or adjacent to the daycare, one sample exceeded the RI screening criterion for Th-232 with a concentration of 1.30 pCi/g. These concentrations just slightly above the RI screening criterion (developed using the 95% UCL from background data) likely are not representative of contamination due to the WACC property since there is very limited contamination in the soils and sewers on Moffat Street within 600 hundred feet north of this area. This screening criteria was selected to be conservative and these values, although above the criteria, are within 0.3 pCi/g of the background activities developed for the site.

These concentrations are more likely due to varied fill material in the subsurface in this area with naturally occurring higher radionuclide concentrations. The surface soil samples at these locations are all below the RI screening criteria.

4.8.2 Radon and Thoron Evaluations

As part of previous EPA investigations, single gas entry points were identified at the school and the daycare. The 30-minute survey using a RAD-7 meter of the single gas entry point in the school basement indicated a radon concentration of 17.9 pCi/L and a thoron concentration of 24.4 pCi/L (December 2010-January 2011). These investigations also reported elevated levels of thoron above the RI screening criterion in the switch room of the daycare's basement. The 2-hour survey of this single gas entry point indicated a radon concentration of 0.6 pCi/L and a thoron concentration of 2.1 pCi/L (December 2012) (EPA 2013a).

In a subsequent radon investigation conducted at the school and daycare in December 2012, radon was found in the school at a maximum concentration of 0.6 pCi/L and in the daycare at a maximum concentration of 0.6 pCi/L.

As part of the 2015 investigation activities, short-term air samples were collected in charcoal canisters for radon analysis in the school and the daycare located on Moffat Street south of the WACC property. Long-term samples for a 6-month and 1-year duration were collected for radon and thoron using ATDs placed inside the school. **Tables 4-23, 4-24, and 4-25** present the short-term, 6-month, and 1-year air sampling data, respectively.

As part of the 2017 investigation activities, radon and thoron surveys were also performed at each indoor soil boring location immediately following penetration of the concrete slab for approximately 30 minutes using a RAD-7 meter. Additional 5-day radon and 7-day thoron surveys were also performed in the switch room of the daycare. One measurement was also collected for ambient air in the school basement. **Table 4-26** presents the measurements collected during these field activities. **Figure 4-12** presents the first-floor air sampling results and **Figure 4-13** presents the basement air sampling results for both the 2015 and 2017 investigations.

School

Short-term radon measurements in the school ranged from 0.1 ± 0.2 pCi/L to 0.4 ± 0.3 pCi/L. The location of the maximum radon level is on the first floor in Classroom 150 and did not exceed the radon first floor screening criterion (0.5 pCi/L). No radon samples were collected in the basement for short-term measurements.

The six-month average radon measurements evaluated using ATDs ranged from 0.2 ± 0.02 pCi/L to 1.3 ± 0.07 pCi/L. The three radon samples in the basement exceeded their screening criterion of 1.2 pCi/L. Six-month average measurements for thoron were detected in two samples at 0.1 pCi/L and 0.2 pCi/L; one was equal to and one exceeded the screening criteria 0.1 pCi/L. The maximum average radon and thoron measurements were both collected in the basement hallway at the same location.

The one-year average radon measurements ranged from 0.1 pCi/L ± 0.01 pCi/L to 1.2 pCi/L ± 0.05 pCi/L. No samples exceeded the screening criterion; however, one sample collected in the

basement was equal to the screening criterion. Year-long average measurements for thoron were detected in one sample at 0.1 pCi/L which is equal to the screening criterion.

In 2017, the radon screening surveys performed at the slab opening at each soil boring location immediately after slab penetration ranged from 1.3 pCi/L to 10.9 pCi/L. The maximum radon measurement was collected at SCSB-14. The thoron measurements ranged from non-detect to 3.2 pCi/L, with the maximum measurement also collected at SCSB-14. The test duration at this location was 35 minutes. Soil samples collected from these locations contained Ra-226 and Th-232 concentrations below the RI screening criteria.

Daycare

Radon levels measured at the daycare during the 2015 investigation ranged from 0.2 ± 0.2 pCi/L to 0.7 ± 0.2 pCi/L. The maximum radon level was measured on the first floor in Room 4 and exceeded the first-floor radon screening criterion (0.5 pCi/L).

In 2017, the radon screening surveys performed at the two soil boring locations found radon concentrations of 0.4 pCi/L and 0.6 pCi/L and thoron concentrations of 3.6 pCi/L and 3.2 pCi/L. Soil samples collected from these locations contained Ra-226 and Th-232 concentrations below the RI screening criteria. Following the soil boring investigation, a 7-day continuous air survey conducted with the RAD-7 meter measured an average radon concentration of 0.3 pCi/L, which is below the radon basement RI screening criterion of 1.2 pCi/L. A 5-day continuous air survey was also conducted with the RAD-7 meter in thoron test mode; it measured an average thoron concentration of 0.6 pCi/L, which is greater than the RI screening criterion (0.1 pCi/L). This screening criterion is conservative since it is based on outdoor data collected as part of a perimeter survey in the absence of indoor data.

4.8.3 Exposure Rate Surveys

Exposure rates were measured in the basements and outdoor play areas of the school and the daycare. **Figure 4-14** presents the results of the exposure rate measurements. **Section 1.3.4.11** discusses previous gamma exposure rate surveys conducted in 2013. In the basements, readings were taken at a minimum every 100 square meters and at least one in every room. In the outdoor play areas, readings were taken every 100 square meters on a 10-meter by 10-meter grid. The exposure rate was then recorded as the average of the readings. All readings were taken at waist height or approximately three feet above the ground surface.

School

Exposure rates measured at the school ranged from 6 to 11 μR/hr and all were within or below the background observed for the neighborhood (9 to 12 μR/hr).

Daycare

Exposure rates measured at the daycare ranged from 8 to 13 μR/hr and all were within or below the background observed for the neighborhood (9 to 12 μR/hr).

Section 5

Contaminant Fate and Transport

An evaluation of the fate and transport of contamination was performed to identify the mechanisms and pathways by which radionuclides present at the site could be released from their current locations, move through environmental media, and potentially impact human and ecological receptors. The evaluation is based on chemical properties of the radionuclides, the source of the radionuclides, and the physical characteristics of the site. This section includes:

- A summary of the selection of the principal radionuclides
- A summary of the relevant physical-chemical properties and mobility of the contaminants
- A discussion of processes that affect the fate of contaminants in the environment
- A discussion of processes that affect transport potential of contaminants
- A summary of the fate and transport evaluation
- A presentation of the CSM

5.1 Selection of Principal Contaminants

Section 4 discussed the nature and extent of contaminants focusing on those that most frequently exceeded screening criteria. This included the following:

- Radionuclides found in all media throughout the site
- PAHs in soil
- PCBs in soil
- PCE, TCE, and cis-1,2-DCE in groundwater

Section 5 will focus on principal radionuclides (Th-232 and Ra-226 which is the decay progeny of uranium), which are associated with historic site practices, were found in previous investigations, and most frequently detected above the screening criteria.

PCE, TCE, and cis-1,2-DCE in groundwater are not discussed in the fate and transport section because these chemicals are likely attributed to an upgradient source. The other contaminants are not discussed in the fate and transport section because these chemicals were limited in their extent or magnitude of contamination.

5.2 Physical and Chemical Properties Influencing Contaminant Fate and Transport

Based on the nature of operations at the site, significant amounts of Th-232 and U-238, which resulted in Ra-226, were introduced to the soils from the monazite sands and byproducts from the processing of the monazite sands including tailings and process liquors. The monazite sands and tailings were likely stockpiled in the former storage yards while the process liquors were disposed to the CSS. Tailings were also likely buried on site. The presence of high concentrations of thorium in the surface soils indicates that most thorium has been retained in the shallow soil.

Thorium

Thorium, a metallic element of the actinide series, is a naturally-occurring radioactive substance. In the environment, thorium exists in combination with minerals such as silicate minerals. Small amounts of thorium are present in all rocks, soil, water, plants, and animals. Soil contains an average of approximately 6 parts per million (ppm) of thorium. Some rocks in underground mines contain thorium in a more concentrated form. After these rocks are mined, thorium is usually concentrated and changed into thorium dioxide or other chemical forms.

Thorium occurs in nature in four isotopic forms: Th-228, Th-230, Th-232, and Th-234. Thorium, like all radioactive materials, is not stable and breaks down through a decay chain/series of decay products until a stable product is formed. During these decay processes, radioactive substances are produced including radium and radon. These substances give off radiation, including alpha and beta particles and gamma photons. Th-228 is the decay product of naturally occurring Th-232, and both Th-234 and Th-230 are decay products of natural U-238. Of these naturally produced isotopes of thorium, only Th-228, Th-230, and Th-232 have long enough half-lives to be environmentally significant. More than 99.99 percent of natural thorium is Th-232; the rest is Th-228 and Th-230.

Uranium

Uranium is also a metallic element of the actinide series, a naturally occurring radioactive substance. Uranium has the highest atomic mass of any naturally occurring element. In its refined state, it is a heavy, silvery-white metal that is malleable, ductile, slightly paramagnetic, and very dense. In nature, it is found in rocks and ores throughout the earth. In its natural state, uranium occurs as a component of several minerals, such as carnotite and uraninite, but is not found in the metallic state.

Uranium may also be introduced into the environment as a result of mining and milling activities, by uranium processing facilities, or by burning coal.

Natural uranium is a mixture of the three isotopes U-234, U-235, and U-238. All three are the same chemical, but they have different radioactive properties. The only mechanism for decreasing the radioactivity of uranium is radioactive decay. Because all three of the naturally occurring uranium isotopes have very long half-lives (U-234 = 2.5×10^5 years; U-235 = 7.0×10^8 years; and U-238 = 4.5×10^9 years), the rate at which the radioactivity diminishes is very slow (National Council on Radiation Protection and Measurements [NCRP] 1984). Therefore, the activity of uranium remains essentially unchanged over periods of thousands of years.

By weight, natural uranium is approximately 0.01 percent U-234, 0.72 percent U-235, and 99.27 percent U-238. Approximately 48.9 percent of the radioactivity is associated with U-234; 2.2 percent is associated with U-235; and 48.9 percent is associated with U-238. The shorter half-life makes U-234 the most radioactive, while the longer half-life makes U-238 the least radioactive. Essentially, U-234 will be approximately 20,000 times more radioactive and U-235 will be 6 times more radioactive than U-238 (ATSDR 2013).

When U-238 gives off its radiation, it decays through a series of different radioactive materials, including U-234. This series, or decay chain, ends when it reaches the stable, non-radioactive element lead.

Radium

Radium is a naturally occurring, silvery-white, radioactive metal that can exist as several isotopes. Usually, natural concentrations are very low. However, weathering and other geologic processes can form concentrated deposits of naturally radioactive elements, especially uranium and radium. Radium in soil and sediment does not biodegrade or precipitate in any chemical reactions that alter it into other forms (ATSDR 1990). The only degradation mechanism in air, water, and soil is radioactive decay.

Radium forms when isotopes of uranium or thorium decay in the environment. As a decay product of uranium and thorium, radium is common in virtually all rock, soil, and water. Radium's most common isotopes are Ra-224, Ra-226, and Ra-228. Ra-226 is found in the U-238 decay series, and Ra-228 and Ra-224 are found in the Th-232 decay series. Ra-226, the most common isotope, is an alpha emitter, with accompanying gamma radiation, and has a half-life of approximately 1,600 years. Ra-228 is principally a beta emitter and has a half-life of 5.76 years. Ra-224, an alpha emitter, has a half-life of 3.66 days (EPA 2009). Radium decays to form isotopes of the radioactive gas radon, which is not chemically reactive. Ra-226 decays by alpha particle radiation to an inert gas, Rn-222, which also decays by alpha particle radiation and has a short half-life of 3.8 days. Ra-224 decays by alpha particle radiation to form Rn-220 (thoron), which also decays by alpha particle radiation and has an even shorter half-life of 55 seconds. Stable lead is the final product of this lengthy radioactive decay series.

Physical and Chemical Properties of the Radionuclides

The fate, persistence, and potential transport of the radionuclides are dependent on the physical and chemical properties of the metals (**Table 5-1**), the properties of the medium through which they migrate, and the environmental conditions to which they are exposed.

5.3 Contaminant Fate

Chemical and physical properties that affect the fate and transport of the radiological contaminants include water solubility, speciation, partitioning and sorption, and degradation (or decay) rate. These properties are generally interrelated and are a function of a number of other variables including oxidation-reduction potential, pH, temperature, and the type and concentration of other chemicals capable of bonding with metal ions (e.g. natural organic matter).

Precipitation and Dissolution

Dissolution is the partitioning of a chemical in the liquid phase. Precipitation is the process of precipitating or changing the solution to a solid. Precipitation and dissolution reactions are

government by the solubility of the thorium and uranium and the kinetics of the precipitation/dissolution processes. Solubility of a chemical depends on the solution. Solvation, as defined by the International Union of Pure and Applied Chemistry, is an interaction of a solute with the solvent, which leads to stabilization of the solute species in the solution. Water solubility is the maximum concentration of a chemical that dissolves in a given amount of pure water at a specific temperature and pH. Pure thorium and uranium are insoluble in water; however, complexes with the metal have differing solubilities. Highly insoluble contaminants are unlikely to leach from soil into groundwater and from sediments into surface water. The solubility of chemicals that are not readily soluble in water, such as thorium and uranium, can be enhanced in the presence of organic solvents or under acidic conditions.

Sorption and Partitioning

Partitioning is the distribution of chemicals between a solid such as soil or sediment, liquid, and gas. Sorption is the tendency for contaminants to adsorb to materials in the environment. The degree of sorption is a function of the chemical properties of the contaminant as well as the properties of the media through which the contaminant moves. The presence of organic carbon in the soil, aquifer matrix, or sediment will facilitate the adsorption of compounds.

One type of partitioning coefficient, the partitioning distribution coefficient (K_d), is important in predicting the behavior and mobility of radionuclides in the environment. The K_d value is the ratio of the concentration of a chemical in a solid phase to the corresponding aqueous-phase concentration. The K_d measures the relative mobility of a chemical in the environmental. A high K_d value implies that the contaminant is tightly bound to the soil and will migrate slowly. The most important variables affecting K_d are pH and salinity of water, grain size, and mineralogy of the soil, concentration of competing ions present, and the organic carbon content of the soil.

Table 5-1 shows the wide range of K_d values for the principal contaminants based on literature values. The wide range of K_d values signifies the variation of the radionuclides partitioning between two immiscible phases at equilibrium, the variation in partitioning tendencies in different solutions, and the complexity of the natural environment being replicated with experiments.

Speciation

The fate and transport of metals is primarily driven by chemical speciation. The speciation of an element is determined by defining the chemical form (oxidation state, charge, proportion and nature of the complexed forms) and sometimes the physical form (distribution among soluble, colloidal or particulate forms, and solid phases) in which it occurs (Moulin et al. 2005). Factors influencing speciation include pH, oxidation-reduction potential, ionic strength, and the types and concentrations of ligands and complexing agents. Metals can exist as cations, anions, or neutral species. Their sorption, solubility, and mobility depends on their ionic form.

Radioactive Decay Rate

The decay rate of a radionuclide is expressed in terms of a radionuclide-specific half-life and can be on the order of days, weeks, or years. The half-life of a radioactive substance is the time in which half of the atoms are transformed to another substance or daughter product. Radioactive decay affects the environmental persistence of radionuclides. Decay of radionuclides occurs by the emission of alpha particles (a combination of two protons and two neutrons) and beta

particles (negatively charged high-speed electrons). Decay of many radionuclides is accompanied by the emission of gamma rays. The first radionuclide on the decay chain is called the parent compound. The parent compounds of important at the site are Th-232 and U-238. These parent radionuclides each yield radioactive decay products.

5.3.1 Thorium

The fate and mobility of thorium in soil are governed by sorption and the properties of the soil including pH, ORP, porosity, soil particle size and sorption properties. In most cases, thorium will remain strongly adsorbed to soil and its mobility will be very slow (Torstenfelt 1986). The leaching of thorium to groundwater will not occur in most soils. The presence of ions or ligands (i.e., carbonate ion or humic matter) that can form soluble complexes with thorium are expected to increase thorium's mobility in soil. Normally, thorium compounds will not migrate long distances in soil and will persist in sediment and soil (ATSDR 1990a).

The solubility of thorium in water is low and, therefore, its mobility in water is low. In water, thorium will most likely be present adsorbed to suspended matter and sediment and the concentration of soluble thorium in water will be low (Hunter et al. 1988; Sheppard 1980). The concentration of dissolved thorium in water may increase due to the formation of soluble complexes with carbonate, humic materials, or other ligands in the water (LaFlamme and Murray 1987). Soluble thorium ions that may be present in low pH conditions would hydrolyze at pH values above 5 to form hydroxy precipitates or complexes; these complexes would be adsorbed on particulates (Milic and Suranji 1982; Bodek et al. 1988; Hunter et al. 1988).

Table 5-1 provides a range of predicted site-specific K_d values for thorium based on two important parameters affecting thorium adsorption: soil pH and dissolved thorium concentrations (EPA 1999). The range of K_d values listed for the pH range of 5 to 8 on EPA's lookup table (1,700 – 300,000 milliliters per gram [mL/g]) is appropriate since it is assumed that soils at the site have a neutral pH. The range of K_d values listed for pH less than 3 is appropriate in areas of potential acid disposal. Acid has a pH less than 3 standard units (SUs). Since the soils at the site are sandy silts and gravels, it is likely that the K_d value is an average of the range. The K_d value is high, indicating that thorium would likely adsorb to the soil except in areas where the pH of the soil is significantly lowered by the disposal of acid with the thorium.

5.3.2 Uranium

The mobility of uranium in soil and its vertical transport (leaching) to ground water depend on properties of the soil, as well as on the amount of water available (Allard et al. 1982). The sorption of uranium in most soil is such that it may not leach readily from surface soil to groundwater. However, geological materials such as silica, shale, and granite have poor sorption characteristics (DOE 1992; Erdal et al. 1979; Silva et al. 1979; Ticknor 1994).

Redox conditions are important in the geologic transport and deposition of uranium. Oxidized forms of uranium (uranium in the +6 valence state [U(VI)]) are relatively soluble and can be leached from rocks and migrate in the environment. When strong reducing conditions are encountered (e.g., presence of carbonaceous materials or hydrogen sulfide), precipitation of the soluble uranium will occur (ATSDR 2013). Insoluble uranium is not mobile.

As with soil, factors that control the mobility of uranium in water include ORP, pH, and sorbing characteristics of sediment, and suspended solids in water (Brunskill and Wilkinson 1987). The chemical form of uranium determines its solubility. Uranium behaves differently in oxidizing and reducing waters because of its two valence states (uranium reduced in the +4 valence state [U(IV)] and oxidized in the 6+ valence state[U(VI)]). In the reduced state, uranium is insoluble and relatively immobile. In the oxidized state, uranium readily forms highly soluble complexes such as UO_2 $(CO_3)_2^{2-}$ (McKelvey et al. 1955).

5.3.3 Radium

It has been experimentally demonstrated that radium can be adsorbed by soils and sediments (Benes and Strejc 1986; Landa and Reid 1982), and ferric hydroxide and quartz (Benes et al. 1984; Valentine et al. 1987). Consequently, it is usually not a mobile constituent in the environment. Radium K_d values for sand range from 18 to 1,742 mL/g in a pH range of 7.4 to 8.3 (Benes et al. 1984; Valentine et al. 1987). The magnitude of these adsorption constants indicates that partitioning to solid surfaces is a major removal mechanism of radium from water. Therefore, it is likely that radium in water does not migrate significantly from the area where it is released or generated (EPA 1985). Radium may be transported in the environment in association with particulate matter. Its concentration is usually controlled by adsorption/desorption mechanisms at solid-liquid interfaces and by the solubility of radium-containing minerals.

Some radium salts are soluble in water. Radium in water exists primarily as a divalent radium ion (Ra^{2+}) and has chemical properties that are like barium, calcium, and strontium. The solubility of radium salts in water generally increases with increased pH levels. The removal of Ra^{2+} by adsorption has been attributed to ion exchange reactions, electrostatic interactions with potential determining ions at mineral surfaces.

The adsorptive behavior of Ra^{2+} is like that of other divalent cationic metals in that it decreases with an increase in pH and is subject to competitive interactions with other ions in solution for adsorption sites. In the latter case, Ra^{2+} is more mobile in groundwater that has a high total dissolved solids content. Limited field data also support the generalization that radium is not very mobile in groundwater. It appears that the adsorption of Ra^{2+} by soil and rocks may not be a completely reversible reaction (Benes et al. 1984; Benes et al. 1985; Landa and Reid 1982). Hence, once adsorbed, radium may be partially resistant to removal, which would further reduce the potential for environmental release and human exposure.

As shown on **Table 5-1**, there is a wide range of predicted K_d values for radium (57 – 530,000 mL/g). The range is based on K_d values measured for sands and silts which describe the geology at the site. K_d values based on pH were not available for radium; however, it is expected that for soils of pH < 3, the K_d value for radium would decrease.

5.4 Contaminant Migration

This section discusses the conditions at the site that may affect contaminant transport, potential contaminant transport pathways, potential contaminant transport mechanisms, and transport properties in soil and groundwater. The chemical properties discussed above show that Th-232 is less mobile than U-238 and Ra-226, with Ra-226 the more mobile of the two. However, in the context of the site, all three radionuclides are expected to have low mobility and similar fate in

the site media. However, for areas of the site exposed to process liquors (acid), the mobility characteristics for Th-232 and Ra-226 differ. For the purposes of discussing transport at the site, the three radionuclides are discussed together with separate discussion for characteristics in the presence of acid. Potential migration mechanisms for the contamination include surface water runoff, mobility in the soils, and discharge to the sewer system and sewer outfall sediments. The radionuclides decay to form radon and thoron, inert gases capable of being transported to aboveground air and infiltrating buildings above soils contaminated with Th-232, U-238, and Ra-226.

Based on the nature of the radionuclides and the similar extents of contamination, the three radionuclides are expected to behave similarly in the environment at the site.

5.4.1 Source Media

The primary source of radionuclides at the site was the processing of imported monazite sands for rare earth elements extraction. Monazite, a rare-earth and thorium phosphate material, is the primary source of the world's thorium, containing at least 6 percent to 8 percent thorium and to a lesser degree, uranium, of which monazite contains 0.1 to 0.3 percent. Monazite is very stable chemically, but it is susceptible to strong mineral acids such as sulfuric acid or nitric acid at high temperatures. In the acid treatment for rare earth metals extraction, finely ground monazite sand is digested at 155 to 230 degrees Celsius with highly concentrated acid. This converts both the phosphate and the metal content of the monazite to water-soluble species. The rare-earth metals are extracted, leaving two byproducts: a process liquor consisting of thorium and uranium dissolved in the acid and process tailings containing thorium and uranium.

The kiln-vat building where the processing took place is located on Lot 44 where the Primo Auto Body car storage bay currently exists. The arches of the kilns are still visible. The storage yard to the south of the kiln-vat building was likely used for the loading and unloading of thorium-bearing material to and from the kiln-vat building. Monazite sands and waste tailings were likely stored here and in the larger former storage yards that previously made up Lot 33.

The process liquors, including thorium, were considered a waste product and disposed of in the combined sewer system. The AEC began buying the thorium from WACC in the form of a thorium oxalate sludge in 1954, approximately 30 years after WACC started operations.

5.4.2 Transport of Process Liquors – Disposal in Soils and Sewer

Soils

Following processing, the process liquors were likely disposed into drains that flow underneath the WACC buildings leading to the sewer system. Soil contamination under the WACC buildings is likely attributable to process liquor exfiltration via leaky drains and sewer pipes, and other surficial discharges within or adjacent to the kiln/vat building. The soils at the site are composed of silty sands, sands, and gravel. The sands, composed mostly of silica, have poor sorption characteristics. Additionally, the soil is expected to have low alkalinity and low organic content, therefore, lacking the capability to form soluble complexes. However, since the radionuclides would typically be present as insoluble particles in the soils, they would not be expected to migrate down through the soil matrix via water or rain infiltration. The radionuclides are readily adsorbed by earth materials, rendering them immobile in the environment.

However, the heated acid used during the monazite sands processing at the site acted as a strong oxidizing agent, rendering the Th-232 and U-238 into an oxidized state and thereby, mobilizing the radionuclides to migrate through the subsurface as the process liquors were continually discharged from the kiln/vat building to a potentially leaking drain or sewer. Ra-226, however, would be immobilized in the presence of the acid and would not be expected to travel at high concentrations into the subsurface while in particulate form. The process liquors containing dissolved Th-232 and U-238 would be expected to continue downward through the soil while the force of advection from the disposal continued to have an effect, diffusing into the porosity of the soils. The process liquors would dilute in the presence of water such as rainwater infiltration, which would decrease the viscosity of the process liquors, and would have a net effect of increasing the velocity of the acid downward through the soil. However, the water would also slightly increase the pH of the environment and would react with the radionuclides to form insoluble and immobile compounds. This would prevent the Th-232 and U-238 contamination from extending deeper in the soils. However, in the presence of water, Ra-226 would be expected to be more mobile.

Since the monazite sands processing activities at the site ceased in 1954, the radionuclides would not be expected to leach to groundwater as the water table is approximately 60 feet bgs and the process liquor-related contamination is located below buildings at the site. There is potential for Ra-226 to be transported to deeper soils only in the presence of water to significantly dilute the acid and render the Ra-226 mobile again. However, if Th-232 and U-238 were transported to the groundwater table, it would only happen in the presence of the acid which would lower the pH of the groundwater, potentially mobilizing the radionuclides in the groundwater until the process liquors were sufficiently diluted to return the groundwater pH to neutral, changing the speciation of the radionuclides. At neutral pH, the radionuclides would be expected to precipitate out of solution and adsorb to soils.

Sewers

The process liquors from the rare-earth materials extraction process were disposed in the sewers. The process liquors containing Th-232 and U-238 dissolved in acid and Ra-226 in particulate form flowed toward the west, downgradient in the sewer system. As the liquors were diluted with incoming wastewater and humic material, the acid was neutralized and Th-232 and U-238 formed mobile complexes with humic matter but also, with the neutral pH, precipitated out of solution. The mobile complexes with the humic matter continued down the sewer line, moving to the sewer system outfall. The insoluble and immobile radionuclides adsorbed to particulates and settled out of the sewer water, becoming part of the sewer sediments and sanitary sewer sludge in the pipeline and manholes. Additionally, the radionuclide complexes would diffuse into the pore structure of the sewer building materials.

Some adsorbed radionuclides traveled in particulate form to the CSS outfall during CSO events. At the outfall, the radionuclides would be transported through the water column by advection from the discharging wastewater and sorbed to the sediment at the creek bottom due to the high concentration of organic carbon.

5.4.3 Transport of Monazite Sands and Tailings – Stockpiling, handling, and filling

Monazite sands were unloaded from the rail spur and stockpiled in the former storage yards along with the process tailings. Handling of the sands and tailings likely spread them throughout the former storage yards and rail spur areas.

Filling/Spreading

The tailings from the rare-earth materials extraction process were thought to have been disposed of by filling/spreading at the site and potentially adjacent areas. The radionuclides in the tailings are insoluble and immobile and would not be expected to leach deeper into the soil matrix.

Surface Water Runoff

Surface water runoff from the storage areas and the former rail spur would have eroded monazite sand stockpiles or tailing stockpiles, carrying contaminants to downgradient locations or media via overland runoff water. Topography at the site slopes gently to the southwest. Surficial runoff likely transported the sands and tailings from localized areas in the storage yards to downgradient areas near the property including the former rail spur, the Moffat and Irving Avenue intersection, and 338-340 and 350 Moffat Avenue. The radionuclide contamination is expected to persist in the surface soils consisting of fill material as insoluble compounds due to the neutral pH of the soils. The high partitioning coefficients of the radionuclides and the immobile nature of the insoluble compounds would prevent the contaminants from leaching deeper into the soil column. This is evidenced by the presence of contamination only in the upper four feet of soils in those parts of the site.

Particulate Emissions

The storage yards were likely used to stockpile the monazite sands and the process tailings. These monazite sands contain at least 6 percent to 8 percent thorium while the tailings could contain between 0.02 percent and 0.6 percent thorium (International Atomic Energy Agency [IAEA] 2003). However, this reference regarding the percentage of thorium in tailings most likely refers to tailings resulting from a process where extraction of thorium was the primary goal. Since it was not the goal for the WACC processes, it is expected that thorium was present at higher concentrations in the tailings. The sands and tailings would be mobilized to the air by wind agitation and were then transported by the wind as fugitive airborne dust, traveling in particulate form. This process may have been significant as the former storage yards were open to the air with little to no vegetation visible in the aerial photographs. Additionally, there were no surrounding structures to prevent the wind from carrying the fugitive dust from the stockpiled areas. The particulates would be removed from the atmosphere by dry deposition due to the weight of the particles, settling on soils near the WACC property.

5.4.4 Fate and Transport Summary

- The primary source of radionuclides at the site was the processing of imported monazite sands for rare earth elements extraction which formed the process liquor and process tailing byproducts.

- In the process liquors, Th-232 and U-238 are mobile and able to migrate as process liquors were continually discharged to the leaky sewer pipes under the building. These

radionuclides would migrate to the subsurface soils. However, when the acid would dilute, the radionuclides would come out of solution, forming insoluble and immobile compounds, preventing the thorium from extending deeper in the soils.

- In the presence of process liquors, Ra-226 would be immobile in particulate form and would not migrate to the subsurface soils.
- The radionuclides would also migrate through the sewers, with Th-232 and U-238 falling out of solution as the acid diluted with the CSS water, a portion of Ra-226 going into solution as the pH increases, and particulate forms sorbing to sewer materials such as sediment.

The process tailings were stored in the former storage yards uncovered therefore subjecting the exposed tailings to wind and surface water in which they'd travel in particulate form. The process tailings were also disposed of by filling/spreading at the WACC property and the adjacent areas.

5.5 Conceptual Site Model

This section discussed the current understanding of site conditions, the contaminant release mechanisms, the fate and transport of the site contaminants, and receptors. These elements are illustrated in **Figure 5-1** and described below.

5.5.1 Physical Setting

The WACC property is at an elevation of approximately 70 feet above msl, and the ground surface in the area generally slopes gently to the southwest. The eastern edge of the site abuts an elevated train line that runs parallel to Moffat Street. The ground surface rises sharply toward the train line. Most of the runoff on the property flows to the south and southwest toward Irving Avenue, Moffat Street, and the southern corner of the former rail spur area. Runoff collects in catch basins at the intersection of Irving Avenue and Cooper Street and is routed into the CSS on Irving Avenue. The sewer runs down Irving Avenue, making a turn on Halsey Street before joining larger sewers on Wyckoff Avenue.

Soils at the site are made up of two types of unconsolidated material: fill and Upper Glacial Aquifer deposits (till and outwash). The fill contains man-made materials intermixed with silt, sands and gravels and ranges in thick at the site from 0 to 15 feet bgs. In the absence of man-made debris, it is difficult to distinguish between the two layers of material. This is representative of regrading of native materials.

A significant portion of the upper fill layers observed in borings at the WACC property and in some borings to the south on Moffat Street was a black, gray, and/or white cinder or ash-like material. This material is likely the contaminated waste tailings and was found between 0-4 feet bgs near the WACC property and between 0-6 feet bgs along Moffat St.

Below the urban fill, the upper portion of the glacial deposits is made up of glacial till which is yellowish brown dense silty sand and gravel. Underlying the glacial till is glacial outwash, slightly more uniform and coarse in texture than the till and extending from the bottom of the till to the depth of exploration at the site.

The depth to groundwater at the site is about 60 feet bgs. The saturated thickness of the aquifer is estimated to be about 111-114 feet depending on the depth to water at each well.

5.5.2 Extent of contamination

Contamination is present in WACC building materials, soils, sewer materials, sewer sediments, outfall sediments, and groundwater.

Buildings Materials

Radionuclides contamination was found throughout the WACC property buildings, primarily embedded in the building structures that previously operated as the kiln/vat building where the monazite sand processing occurred and in the basement of the deli next door.

Soils

Under the WACC buildings, high concentrations of Th-232 extend down to a depth of 28 feet bgs under Lot 44, the former kiln/vat building, and down to 24 feet bgs under Lot 42 feet bgs, the former yard where the monazite sands were loaded into the kiln/vat building for processing. However, while Th-232 concentrations reach a maximum at 10-12 feet bgs and continue to significantly exceed the screening criteria down to 22 feet bgs, Ra-226 concentrations are highest in the surficial sample and decrease to less than three times the screening criteria below 2 feet bgs.

There is widespread surficial contamination related to surficial runoff/erosion or filling of tailings or monazite sands. Surficial contamination was observed in the former rail spur area, at the intersection of Irving Avenue and Moffat Street, the northern portion of Moffat Street and the eastern portion of Irving Avenue, and in the northern portion of 338-348/350 Moffat Street. This contamination was likely caused by stockpiling the tailings or the monazite sands in the former storage yards without covers, allowing wind and surface runoff to transport the sands and tailings to lower topographic areas.

Sewers

Gamma counts 20 times background levels (primarily from Th-232 in solids within the structures) begin at the manhole south of the WACC buildings and continue in the sewer pipeline and manholes on Irving Avenue for approximately two blocks (750 feet). Contamination is within the pipes and the manholes with contamination found in sediments/sludge and construction materials in the sewer manhole vaults located near the WACC property.

Gamma counts drop to four times background at the intersection of Irving Avenue and Schaeffer Street and drop to background at the intersection of Irving Avenue and Eldert Street with sporadic occurrences (likely related to areas where sediment/sludge accumulated) of gamma levels above four times background continuing in the sewer along Halsey Street to Wyckoff Avenue. Th-232 contamination was found above its screening criterion in the sediments at the sewer outfall in Newtown Creek.

Groundwater

Th-232 was detected in one groundwater sample during Round 2. However, Round 1 and Round 2 samples were analyzed with methods that did not provide a MDA that was below the RI screening criteria. Round 3 and Round 4 sampling events were performed using laboratory

methods that provided lower MDAs. Th-232 and Ra-226 were not detected above the RI screening criteria in Round 3 and Round 4.

5.5.3 Contaminant Sources and Pathways

This section describes the movement of the primary contaminants from the manufacturing process to the site media, including the building structure, overburden soil, sewer sediment and building materials, and groundwater.

Sources of Radionuclide Contamination

The sources of radionuclide contamination are the monazite sands and the production process byproducts. The sands were transported by rail to the rail spur adjacent to the property and were stockpiled in the southern former storage yard. From here, they were moved to the yard adjacent to the former kiln vat building and entered processing through the archways of the kiln vat building that are still present. The monazite sand processing took place in the kiln/vat building.

The process liquors and tailings were byproducts of the production process and contain high concentrations of radionuclides which were a waste product. The former storage yards were likely used to stockpile these tailings; the tailings were also used to fill areas within the WACC property as well as adjacent areas on Moffat Street.

Pathways for Contaminant Release/Transport

Process liquor disposal in soils – The process liquors were disposed into drains leading to the combined sewer systems. The soil contamination is likely attributable to process liquor exfiltration via leaky drains and sewer pipes, and other surficial discharges within or adjacent to the kiln/vat building. Once the process liquor entered the soil matrix, it traveled down through the soil column with dissolved Th-232 and U-238 and Ra-226 in particulate form. Th-232 and U-238 in acid were mobile and were transported to an observed 26 feet bgs in the soils. However, Ra-226 in acid was immobilized causing a majority of Ra-226 contamination to remain in surficial soils. The tendency for Th-232 and U-238 is to form insoluble and immobile compounds, except in the presence of low pH. When the acid containing the more soluble and mobile Th-232 and U-238 became diluted in the subsurface, the radionuclides formed immobile and insoluble complexes adsorbing to soils.

Process liquor disposal in sewers – Upon entering the CSS, the process liquors were diluted with incoming sewer water from other sewer branches. Ra-226 was present in particulate form while Th-232 and U-238 fell out of solution and adsorbed to particulate matter, traveling with the sediment to the outfall in particulate form or accumulating within the sewers as sediments.

Stockpiling, handling, and filling – Monazite sands were unloaded from the rail spur and stockpiled in the former storage yards along with the process tailings. Handling of the sands and tailings likely spread them throughout the yard and rail spur areas. Surficial runoff likely transported the sands and tailings from localized areas in the storage yards to downgradient areas near the property including the former rail spur, the Moffat and Irving Avenue intersection, and 338-340 and 350 Moffat Avenue. Additionally, transport of radionuclide-laden dust and particulates from the uncovered stockpiles in the air likely contributed to the surficial soil contamination found in the nearby properties.

Human and Ecological Receptors

Human receptors may be exposed to the principal radionuclides through direct contact with the following: contaminated buildings materials in the buildings at Lots 46, 44, and 42; with the radionuclides-contamination soils at the WACC site; and, through direct contact with contaminated sewer materials and sewer sediments.

Human receptors may also be exposed to the principal radionuclides by external radiation in areas where high exposure rates were detected above background concentrations caused by radiation emanating from contamination materials such as building materials, sidewalks, soils, and sewer materials and sediments.

Since the principal radionuclides at the site decay to form radon and thoron, radioactive gases that travel through soils and building materials, human receptors can be exposed to the contaminants through the inhalation of radon and thoron in the air emanating from building materials, soils, and sewer materials and sediments.

Th-232 was detected in sediment at the Newtown Creek outfall. Ecological receptors, which are only present in Newtown Creek and not at the site, could be exposed to the radionuclides in the aquatic system through direct contact with the sediments at the Newtown Creek outfall.

The Human Health and Ecological Risk Assessments provide a full discussion of potential exposure pathways and potentially impacted receptors.

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Section 6

Risk Assessment Summaries

As part of the RI/FS, a baseline HHRA and a focused SLERA were conducted to determine if any threat to public health, welfare, or the environment may exist resulting from the release or threatened release of contaminants at or from the WACC site.

6.1 Human Health Risk Assessment

The HHRA is developed to characterize potential human health risks associated with the site in the absence of any remedial action. The HHRA is conducted in accordance with current EPA guidance outlined in Risk Assessment Guidance for Superfund (RAGS), Parts A, D, E, and F and other EPA guidance pertinent to human health risk assessments (EPA 1986, 1989, 1991, 1992). Key components of the HHRA include data evaluation, exposure assessment, toxicity assessment, risk characterization, and evaluation of uncertainties. Results of the HHRA are summarized below.

6.1.1 Data Evaluation

The data evaluation included an assessment of data usability and suitability for risk assessment purposes and identification of chemicals of potential concern (COPCs) and radionuclides of potential concern (ROPCs). COPCs and ROPCs were identified based on criteria outlined in RAGS, primarily through comparison to risk-based screening levels. COPCs were identified for surface and subsurface soil and groundwater by comparison of maximum detected concentrations in site media to EPA regional screening levels for residential soil and tap water. Maximum detections of radionuclides in site media were compared to EPA preliminary remediation goals for residential soil and tap water to select ROPCs. COPCs and ROPCs were not eliminated based on comparison to background; the contribution of exposure to COPCs and ROPCs at background levels is evaluated in the risk characterization and in the uncertainties section.

Twenty-six chemicals were identified as COPCs in soil and groundwater at the site. COPCs for soil include SVOCs, pesticides, a PCB, and metals. COPCs for groundwater include VOCs and metals. Eight radionuclides were identified as ROPCs in soil and two radionuclides were selected as ROPCs in air.

6.1.2 Exposure Assessment

The exposure assessment describes how people make contact with site-related COPCs and ROPCs and provides equations and parameters to quantify exposure. Results of the exposure assessment are integrated with chemical and radionuclide-specific toxicity information to characterize risks.

Exposure pathways for the site are defined based on possible source areas, COPC/ROPC release mechanisms, receptor behavior, and current and future uses of the site. Each combination of these parameters identifies an exposure scenario, named for the receptor in question. Exposure scenarios in the risk assessment were developed for:

- Current and future commercial indoor workers
- Current and future industrial workers
- Current and future trespassers
- Current and future public users of the WACC property and surrounding area
- Current and future nearby (off-property) residents and workers
- Current and future school children
- Future construction/utility workers
- Future on-property residents

Exposure pathways evaluated for the above receptors include:

- External radiation from surface and subsurface soil, outdoor surfaces, and interior surfaces
- Direct contact with radionuclides in surface soil (i.e., ingestion, inhalation, and external radiation)
- Direct contact with radionuclides in subsurface soil (i.e., ingestion, inhalation, and external radiation)
- Direct contact with radionuclides in sewer sediment (i.e., ingestion, and external radiation)
- Inhalation of ambient air during exposure to sewer sediment
- Inhalation of radon and thoron in indoor air
- Direct contact with chemicals in surface and subsurface soil (i.e., incidental ingestion, dermal contact, and inhalation of particulates)
- Direct contact with chemicals in groundwater used as drinking water (i.e., ingestion, dermal contact, and inhalation)
- Inhalation of vapors emanating from groundwater
- Consumption of homegrown produce

Not all the above exposure pathways are evaluated for every receptor. In addition, some pathways are evaluation only qualitatively (e.g., vapor intrusion).

Risks and hazards are estimated within defined boundaries. These exposure areas consider the spatial scale over which exposure occurs as it relates to current and possible future activities. The WACC site is a complex mixture of individual properties (lots) and facilities. Exposure areas include the WACC property individual lots, Moffat Street, Irving Avenue, and Cooper Street/Avenue. Further, an early action has increased the complexity of assessing exposure due to

the addition of shielding in some but not all areas, and the use of different shielding materials (lead and concrete).

Exposure point concentrations (EPCs) for COPCs or ROPCs are used in the exposure assessment calculations to estimate chemical intake. The EPC is either the UCL on the mean or the maximum detected concentration for chemicals, with the UCL exceeding the maximum concentration. EPCs are calculated using data from each exposure area.

Quantification of exposure includes evaluation of exposure parameters that describe the exposed population (e.g., contact rate, exposure frequency and duration, and body weight). Each exposure parameter in the equation has a range of values. Daily intakes are calculated based on the reasonable maximum exposure (RME) scenario (the highest exposure reasonably expected to occur at a site). The intent is to estimate a conservative exposure case that is still within the range of possible exposures. Central tendency (CT) assumptions are also developed when estimated risks under RME scenario exceed EPA's threshold risk range. CT scenarios reflect more typical exposures. CT exposure estimates are only developed for non-radioactive COPCs because even background concentrations of ROPCs often suggest health impacts at or above EPA's risk range for residential exposure situations.

6.1.3 Toxicity Assessment

COPCs are quantitatively evaluated on the basis of their noncancer and/or cancer potential. ROPCs are quantitatively evaluated based on their cancer potential. The reference dose and reference concentration are the toxicity values used to evaluate noncancer health hazards in humans. Inhalation unit risk and slope factor are the toxicity values used to evaluate cancer health effects in humans. These toxicity values are obtained from various sources following the hierarchy order specified by EPA. Cancer slope factors provided in the Residual Radiation (RESRAD) Onsite Version 7.2 model and the EPA preliminary remediation goal (PRG) Calculator were used for radionuclides.

6.1.4 Risk Characterization

Risk characterization integrates the exposure and toxicity assessments into quantitative expressions of risks/health effects. To characterize potential noncancer health effects, comparisons are made between estimated intakes of substances and toxicity thresholds. Potential cancer effects are evaluated by calculating probabilities that an individual will develop cancer over a lifetime exposure based on projected intakes and chemical-specific dose-response information. In general, EPA recommends target risk values, (i.e., cancer risk of 10^{-6} [1 in 1 million] to 10^{-4} [1 in a 10,000] or a noncancer health hazard index [HI] of unity [1]), as threshold values for potential human health impacts. These target values aid in determining whether remedial action is necessary at the site.

Risks and hazards for all receptors are estimated using RME assumptions. Risks due to exposure to non-radioactive COPCs are also estimated using CT assumptions when the RME assumptions result in risk estimates above EPA's thresholds. Radiological risk to all receptors was assessed using RESRAD onsite model Version 7.2, a model developed and maintained by Argonne National Laboratory. The online EPA PRG Calculator for Radionuclides was used to provide final

radiological risk estimates for exposure scenarios with the highest risk. Estimated risks are summarized below.

Current Receptors Chemical Risk

Direct exposure to COPCs in soil is limited for current receptors due to buildings and hardscape. In addition, groundwater is not currently used for any purpose at or near the site; therefore, direct exposure to contaminants in groundwater was not evaluated for current receptors. However, exposure to VOCs in groundwater via vapor intrusion was qualitatively assessed by comparing maximum concentrations of VOCs in groundwater to EPA Vapor Intrusion Screening Levels (VISLs) for groundwater. Some VOCs are present at concentrations that exceed groundwater VISLs. VISLs use conservative default assumptions that may overestimate vapor intrusion at the site.

Current Receptors Radiation Risk

Complete exposure pathways for current receptors to ROPCs include external radiation from soil, external radiation from outdoor and indoor surfaces, and inhalation of radon and thoron in indoor air. Cancer risks were estimated separately in RESRAD for non-radon-related and radon-related exposure. Non-radon-related cancer risk for commercial indoor workers and industrial workers exceeds EPA's target cancer risk range, primarily due to external exposure to Th-232 (over 90 percent), with the remaining fraction associated with Ra-226. Inhalation of soil particulates and soil ingestion pathways make negligible contributions to total risk. Cancer risk due to exposure to radon gas was estimated to be significantly higher than exposure to external gamma radiation. Data collected during past site investigations indicated that a remedial corrective action was needed to limit worker and public exposures to external radiation. EPA installed a radon mitigation system in one building on the WACC property and shielding in some areas on the WACC property in 2013. Shielding was effective in reducing exposure when only concrete was used, and provided even greater protection when denser steel and lead shielding was used.

High risk estimates (above 1×10^{-4}) for current workers suggest some potential for the general public to experience exposure above regulatory thresholds. The general public would encompass people visiting sidewalks along streets at and near the site where radionuclides have been transported as well as people frequenting businesses at and near the site. Possible exposure for the general public is mitigated by the installation of steel and lead shielding in some sidewalk areas where soil contamination is greatest.

Installed radiation shielding reduced annual external dose to workers and the public to below the annual regulatory public limit of 100 mrem, but not necessarily below a lifetime cancer risk of 10^{-4}. No radiation shielding was installed on the Irving Avenue roadway that is frequently used by pedestrians and auto workers.

People living and working in the neighborhood, particularly people that spend significant time along streets, may be exposed via external gamma radiation. In some locations radionuclides were transported in and, perhaps, around sewer lines. Exposures are likely to be less than exposures for indoor workers at the site for three reasons. First, little near-surface contamination is present and the vadose zone and sidewalks and other hardscape provide shielding. Second, radiological contaminants in the sewer sediments are more diffuse and well shielded by the

piping and overlying street pavement. Third, people spend less time on the streets above site-related contamination than indoors or than industrial workers.

Future Receptors Chemical Risk

Future on-property residents and industrial workers were quantitatively evaluated for exposure to COPCs in surface soil. These exposure scenarios assume that WACC properties will be redeveloped, exposing contaminated soils in some locations. Cancer risks exceed EPA's target threshold for future residents and is at the upper end of EPA's target range for industrial workers. Cancer risks are due primarily to exposure to Aroclor 1260 and benzo(a) pyrene in surface soil. Hot spots for these COPCs are present on the WACC property.

Noncancer health hazards associated with exposure to surface soil for future residents exceed the target threshold due to exposure to Aroclor 1260 which affects the eye, finger nail, and immune system and selenium which affects the nervous system, blood, and skin. Noncancer health hazards associated with exposure to surface soil for future industrial workers exceed the target threshold due to exposure to Aroclor 1260.

Future on-property residents and commercial indoor workers were also quantitatively evaluated for exposure to COPCs in groundwater used as drinking water. Groundwater is not currently used for drinking water at the site. Future potable use of groundwater is unlikely because a municipal water supply is readily available and serves the site and vicinity. Cancer risk exceeds EPA's target threshold for future residents due to exposure to hexavalent chromium assumed to be present in groundwater based on total chromium measurements. Cancer risk for future commercial indoor workers is at the upper end of EPA's target range.

Noncancer health hazards for both future residents and commercial indoor workers exceed EPA's target threshold due to future hypothetical use of groundwater as drinking water. Health hazards are primarily due to exposure to PCE and TCE; PCE affects the liver and TCE affects the kidney.

Cancer risk for future construction/utility workers exposed to COPCs in surface/subsurface soil is within EPA's target range of 1×10^{-6} to 1×10^{-4}. Noncancer health hazards associated with exposure to surface/surface soil for construction/utility workers exceed the target threshold due to exposure to Aroclor 1260.

Future Receptors Radionuclide Risk

The total cancer risk for future on-property residents was estimated to be 7×10^{-3}, excluding radon and consumption of homegrown produce. Similar risks were obtained throughout the 1,000-year time period evaluated, based on the output from RESRAD. Cancer risk was dominated by external exposure to Th-232, which accounts for 80 to 90 percent of the estimated risk. The total cancer risk for exposure to radon (8×10^{-3}) and thoron (7×10^{-5}) is 8×10^{-3}.

Radon-220 (Rn-220), a daughter of Th-232, is also called thoron to distinguish it from radon-222 (Rn-222) in the U-238 decay chain. The term "radon" in this assessment includes both Rn isotopes, but Rn-222, a daughter of Ra-226, is typically responsible for almost all risks associated with radon emanation.

Cancer risk associated with consumption of homegrown produce is 1×10^{-2}. Total cancer risk estimate for all exposure pathways is 3×10^{-2}. Based on RESRAD output, cancer risks are highest at

year 10, where consumption of homegrown produce accounts for about 45 percent of the total risk, exposure to radon accounts for about 32 percent of the risk, and external exposure accounts for about 22 percent of the total risk.

Risks for both indoor commercial and industrial workers are anticipated to be much the same as risks for current workers. Any future commercial or industrial construction is likely to have a substantial on-slab foundation, which should provide much the same shielding as the shielding previously put in place. The total cancer risk for future workers considering shielding from a concrete foundation ranged from 3 to 4×10^{-3}, without and with radon exposure, respectively. Cancer risks for future industrial workers range as high as 5×10^{-3} if no shielding is assumed.

Future development of the site would require construction workers to be on site without benefit of shielding for up 100 work days. Although this exposure is short-term, taking place within a single calendar year, ground shine and contact with contaminated soils would be intimate. Cancer risk for construction workers would be about 5×10^{-5}. For utility workers exposed to sewer sediment, cancer risk would be about 2×10^{-4}.

Future risks for the general public and for offsite receptors are assumed to be similar to current risks for these receptors. No changes to the surrounding neighborhood were contemplated in the conceptual site model for the site, and without remediation, half-lives of radionuclides are long enough to maintain existing exposure levels for an extended period. High risk estimates (above 1×10^{-4}) for workers suggest some potential for the general public to experience exposure above regulatory thresholds.

6.1.5 Summary

The HHRA presents risk estimates for various scenarios whereby people could be exposed to COPCs found in soil and groundwater and for ROPCs found in soil, outdoor and indoor surfaces, air, and sewer sediment.

In general, EPA recommends a target HI value of unity (1) and a target cancer risk range of 1×10^{-6} to 1×10^{-4} as threshold values for human health impacts. Both chemical- and radiation-related risks are high relative to these threshold criteria. Chemical risks for future receptors exceed the top of EPA's risk range or approach that level of risk. Chemical risk drivers in soil include PAHs and Aroclor 1260. Radiation risks frequently exceed the top of the risk range, surpass 10^{-3} in several instances, and the highest risks exceed 10^{-2}. High cancer risk estimates are not unusual for radiological contaminants in an environmental setting. Background levels of radiation exposure in residential settings can be associated with risks approaching and often exceeding EPA's risk range.

Risk estimates can also be interpreted in terms of annual radiation dose, which is a common means of assessing health risk in the nuclear physics community. The highest annual dose estimates, which approach or exceed 100 mrem, also exceed the radiological threshold criterion of 12 mrem/year for residential exposure and the U.S. Nuclear Regulatory Commission (NRC) value of 25 mrem/year for license termination.

The highest site-related risks are due to external exposure to gamma radiation and to inhalation of radon gas that collects indoors. Th-232 is responsible for over 90 percent of external radiation

exposure, and Ra-226, as the parent of Rn-222, is responsible for a similar percentage of risk due to inhalation of radon. Th-232 and Ra-226 are likely to be the primary risk drivers for risk management decisions.

Risks are above EPA' target risk range for consumption of homegrown produce if a significant fraction of the fruits and vegetables ingested by residents are grown in contaminated soil. Exposure to Th-232 via plant uptake is the primary risk driver for this pathway. The inclusion of this exposure pathway likely overestimates risks; the urban location of the site is not conducive to extensive home gardening.

Groundwater is not currently used as drinking water, and it is unlikely to be used as such in the foreseeable future; however, drinking water scenarios were evaluated for future residents and future commercial indoor workers. Chemical risk drivers in groundwater at the site include PCE, TCE, and hexavalent chromium. PCE and TCE contamination likely originates from upgradient sources and is unlikely to be site-related. Risk due to exposure to hexavalent chromium in groundwater is most likely overestimated because the HHRA assumes that hexavalent chromium is present as a fraction of the total chromium measured concentration. K-40 eventually could present a risk via consumption of contaminated groundwater but not for several centuries. Moreover, this nuclide is unlikely to be associated with releases during previous site operations and probably represents naturally occurring K-40 in materials brought to and used at the WACC properties.

6.2 Screening Level Ecological Risk Assessment

The site is in an industrial area with no environmentally sensitive areas (e.g., wetlands) and only limited habitat for most types of ecological receptors; thus, adverse exposures for ecological receptors at the site are unlikely. Due to the extremely limited habitat, a full SLERA was not conducted; instead a focused screening evaluation was conducted. The purpose of this focused SLERA is to describe the likelihood, nature, and extent of adverse effects in ecological receptors exposed to site-related radionuclides as a result of releases to the environment from past processing activities at the site. Because CSO discharges at the site may contain thorium waste from monazite sand processing, this evaluation focused on risks to ecological receptors exposed to the site-related CSO discharges in Newtown Creek (approximately 1.9 miles to the northwest). Newtown Creek is a tidal arm of the New York-New Jersey Harbor Estuary.

Receptors that could be exposed to radionuclides in the aquatic ecosystem include aquatic and riparian vegetation, aquatic animals, riparian animals, and other animals that use aquatic resources. It was determined that the generic riparian animal was the limiting organism for the sediment exposure pathway. External dose exposure pathways for riparian animals include: exposure to radionuclides in sediment and exposure to radionuclides in water. Internal dose exposure pathways include: exposure to radionuclides via ingestion of contaminated vegetation, including water content with dissolved nutrients and minerals, and exposure to radionuclides biomagnified through the food web.

The data used in this analysis consists of results from sediment samples collected from 5 locations at each of the 2 CSOs in Newtown Creek and from 10 locations in Coney Island Creek, a

reference location. These sediment data were used to evaluate potential exposure to aquatic biota by comparing the results to screening criteria determined using the RESRAD-BIOTA model.

The RESRAD-BIOTA model was used to estimate sediment biota concentration guides (BCGs) for riparian receptors. Each radionuclide-specific BCG represents the limiting radionuclide concentration in an environmental medium which would not result in recommended dose standards for biota to be exceeded. BCGs define doses below which risks to populations are assumed not to occur. This definition simplifies those steps conducted in a typical ecological risk assessment that involve assessing the relationship between stressor levels and ecological effect, characterizing, estimating, and assessing risks. Comparison of site concentrations to BCGs essentially characterizes risks for the population of concern.

Maximum and mean radionuclide concentrations measured in sediment were compared to BCGs for riparian animals in the aquatic ecosystem. The results of the screening evaluation verify that radionuclide concentrations in sediment in the East Branch of Newtown Creek are significantly less than BCGs and that dose to receptors is below biota dose limits. The bulk of measured radioactivity in sediment is likely due to natural background of radionuclides except for the thorium isotopes (i.e., Th-228, Th-230, and Th-232) and their progeny. Further supporting conclusions of low or insignificant risk to ecological receptors are observations that the site and nearby areas provide only limited ecological habitat.

Section 7

Conclusions and Recommendations

The significant findings of the RI are summarized below.

7.1 Conclusions

The RI investigation confirmed findings of the previous investigations and provided data adequate to complete the risk assessments and feasibility study. The major conclusions are summarized below:

- Radionuclide contamination remains in the building structures at the WACC property, primarily in the buildings that previously operated as the kiln/vat in which monazite sand processing took place and the storage yard where sands were loaded into the kiln-vat (Lots 42 and 44), in the basement of the deli (Lot 46), and to a lesser extent, in the warehouse on Lot 33 that was constructed above a former yard area.
- ACM, LBP, and other suspect hazardous materials were found in the WACC building structures.
- Under the WACC buildings, radiological contamination extends down to a depth of 28 feet bgs under Lot 44, the former kiln/vat building, and down to 24 feet bgs under Lot 42, the former yard where the monazite sands were loaded into the kiln/vat building for processing.
- There is widespread surficial radiological contamination related to storage or filling of tailings or monazite sands and/or surface runoff/erosion from those areas. Surficial contamination was observed in the former rail spur area, at the intersection of Irving Avenue and Moffat Street, the northern portion of Moffat Street and the eastern portion of Irving Avenue, and in the southeastern corner of Lot31/northern part of 350 Moffat (area adjacent to the Moffat/Irving intersection).
- PAH concentrations exceeding the screening criteria were found throughout the shallow soils at the WACC property. PAHs found as deep as 7 feet bgs may be related to former USTs or use of the area to store demolished cars. Similar concentrations were also found at the nearby property, 308 Cooper Street. PCBs exceeded the screening criteria by at least an order of magnitude in three locations. PCBs in the shallow soils can also be related to USTs or a sump below the building in Lot 33. Arsenic and iron concentrations exceeding the screening criteria were found in all samples at all depths and within the range of background levels, indicating the metals are likely associated with urban fill.
- Radionuclide contamination within the CSS is present near the WACC property in sediments/sludge and materials comprising the sewer pipes and manholes.

- Radionuclide contamination is significantly elevated in the manholes on Irving Avenue adjacent to the WACC buildings where process liquors containing high concentrations of radionuclides were likely discharged. The elevated gamma levels (>20 times background) continue in the sewer line and manholes on Irving Avenue for approximately two blocks to Decatur Street.

- Gamma levels within the CSS generally drop to four times background at the intersection of Irving Avenue and Schaeffer Street and drop to background at the intersection of Irving Avenue and Eldert Street, with sporadic occurrences of gamma levels above four times background continuing in the sewer along Halsey Street to Wyckoff Avenue.

- Radionuclide concentrations in sediment at the Newtown Creek outfall are above screening criteria but limited to the area immediately adjacent to the outfall discharge. However, the ecological risk assessment verified that radionuclide concentrations in sediment do not pose unacceptable risk to ecological receptors.

- Chlorinated VOCs exceeded screening criteria in the groundwater at each of the five initial monitoring wells. However, chlorinated VOCs were not detected in the soil samples collected as part of the RI and previous investigations. Additionally, the Phase I report did not indicate the use of materials currently or in the past that would be associated with chlorinated VOCs. Therefore, an upgradient well (MW-06) was installed. Chlorinated VOCs were encountered in the upgradient well suggesting that the chlorinated VOC contamination likely comes from an upgradient offsite source.

- Th-232 was detected in one groundwater sample during Round 2. However, Round 1 and Round 2 samples were analyzed with methods that did not provide a MDA that was below the RI screening criteria. Round 3 and Round 4 sampling events were performed using laboratory methods that provided lower MDAs. Th-232 and Ra-226 were not detected above the RI screening criteria in Round 3 and Round 4.

- Exposure rate surveys confirmed the results from the previous exposure rate surveys conducted within the WACC buildings, on sidewalks, and on the streets near the WACC property are above background levels.

- Investigations at the school and daycare did not indicate there was contamination due to the WACC processes as the data generated was all below or slightly above the RI screening criteria. Results included:

    - School – Results of long-term radon and thoron sampling were below the screening criteria. Soil results from samples collected below the school were also below the screening criteria.

    - Daycare – Short-term radon concentrations collected at the daycare were either below or within 0.2 pCi/L of the screening criteria. The 7-day continuous air surveys for radon were below the RI screening criterion and the 5-day continuous air surveys for thoron were slightly above the RI screening criterion. Soil results for samples collected below the daycare were also below the RI screening criteria.

- Gamma exposure rates were also collected from within the school and daycare and were all within or below the background observed for the neighborhood.

Data gaps

- Delineation of radionuclide contamination in soils was not achieved in areas adjacent to the cabinet maker to the north of the WACC property, suggesting potential concentrations above screening criteria may exist below the building.
- The sewer pipeline on Irving Avenue showed the potential for exfiltration in several areas as indicated by the fiberscope investigation. Contamination was not observed in soil samples collected adjacent to the pipeline; however, samples were not collected from the bedding material below the sewer. This bedding material has the potential to be contaminated.

7.2 Recommendations

- The data collected during the RI are considered to be sufficient to support development of remedial alternatives in the FS and preparation of a ROD.
- Data gaps can be addressed during the remedial design or remedial action.

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Section 8

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Tables

Table 2-1
Field Activity Schedule
Wolff-Alport Chemical Company Site
Ridgewood, NY

Field Activity	Dates
Sediment Sampling (Newtown Creek)	9/28/15 to 9/29/15
Sediment Sampling (Coney Island Creek)	10/9/15 and 10/21/15
Site Building Gamma Surveys	10/11/15 to 1/7/16 (various dates)
Gamma Walkover (Former Rail Spur)	10/12/15 to 10/15/15 and 2/9/16 to 2/11/16
Site Soil Borings	10/19/15 to 10/30/15, 11/6/15 to 11/9/15, 12/1/15 to 12/3/15, 2/15/16 to 2/19/16
Monitoring Well Installation and Development	10/26/15 to 11/11/15, 3/30/17 to 3/31/17
Background Soil Borings	10/30/15, 12/16/15, and 12/22/15
School Soil Borings	10/31/2015 and 3/31/17
Gamma Walkover Surveys (Moffat Street)	11/2/15 to 11/3/15
Sewer Fiberscoping and Gamma Surveying	11/5/15 to 11/24/15
Monitoring Well Gamma Logging	11/12/2015
Sewer Material Sampling	11/18/2015
Hazardous Building Materials Survey	11/19/15 to 12/4/15 (various dates)
Gamma Walkover Surveys (308 Cooper Street)	11/20/2015
308 Cooper Street Soil Borings	11/30/15 to 12/1/15
Sewer Soil Borings	12/2/15 to 12/4/15
Gamma Dose Rate Surveys (Site)	12/7/15 to 12/9/15
Monitoring Well Sampling and Synoptics	12/8/15 to 12/10/15, 4/12/17 to 4/13/17
Slug Tests	12/11/2015
Building Material Sampling	12/17/15 to 12/18/15
Dose Rate Surveys (School and Daycare)	12/30/15 and 1/15/16
Gamma Walkover (338 Moffat Street)	2/10/2016
338 Moffat Street Soil Borings	2/16/16 to 2/19/16
Round 3 Groundwater Sampling	11/17/2016
Additional School and Daycare Investigation	3/27/17 to 3/31/17
Round 4 Groundwater Sampling	4/12/17 to 4/13/17

Notes:

Site is the Wolff-Alport Chemical Company Site.

Table 2-2
Radiological Survey Equipment List
Wolff-Alport Chemical Company Site
Ridgewood, NY

Manufacturer	Meter Model	Detector Model	Meter Serial Number	Detector Serial Number	Calibration Due	Dates of Use during RI	Comments
Ludlum	2221 (with GPS port)	44-10	117644	PR0011241	6/12/2016; 3/21/2018	10/01/15-01/06/16; 3/27/17-3/31/17	Used for all interior floor surveys, exterior walkover surveys, and the exterior WACC building wall survey. Also used for all sediment and soil core scans.
Ludlum	2221	44-10	134546	206061	6/25/16	10/01/15-01/06/16	Used for all interior wall surveys and ceiling/rafter surveys
Ludlum	2221	44-2	134556	PR185029	10/2/2016; 3/22/2018	10/19/15-12/22/15; 3/27/17-3/29/17, 3/31/17	Used for downhole logging
Ludlum	2221 (with GPS port)	44-2	117644	RN16312	6/12/16	11/05/15-11/24/15	Used with 90 feet and 200 feet cable for sewer investigation. This 2221 meter was used instead of the meter that the probe was calibrated with because this meter has a GPS port.
Ludlum	2360	43-93	274950	PR293951	9/24/16	10/19/15-01/06/16	Primarily kept at ISOCs office for general health and safety scanning
Ludlum	2360	43-93	227402	PR299640	10/2/16	10/19/15-01/06/16	Used for building materials survey and general health and safety scanning
Ludlum	2360	43-93	184905	PR289400	12/22/16	02/08/16-02/23/16	Used from 2/8/16 - 2/23/16 for general health and safety scanning
Ludlum	2360	43-93	227430	PR244506	2/14/18	3/27/17-3/31/17	Used for general health and safety scanning and equipment material release surveys.
Ludlum	2929	43-10-1	102000	PR102299	4/14/16	10/27/2015-01/19/16	Alpha beta wipe counts
Ludlum	2929	43-10-1	91240	PR089986	6/3/17	3/27/17 - 4/2/2017	Alpha beta wipe counts and air filter analysis
Ludlum	Model 9DP	N/A	25011392	N/A	10/21/16	11/05/15-01/17/16	Used for exposure rates after 11/5/15
Ludlum	2221	44-9	127256	PR067630	6/12/2016; 3/21/2018	10/2/15-12/15/15; 3/27/17-3/31/17	Used with 90 feet and 200 feet cable for sewer investigation. This 2221 meter was used instead of the meter that the probe was calibrated with because this meter has a GPS port. Used for general health and safety scanning
Ludlum	Model 19	N/A	214390	N/A	6/4/16	10/19/15-11/05/15	Used for exposure rates up until 11/5/15
Canberra	ISOCS	BEGE 5020	2025454	13051	N/A	10/19/15-11/05/15	Used for analyzing soil samples at the field lab
Durridge	RAD 7	N/A	4217	N/A	3/20/18	3/27/17 - 4/11/17	Used for Radon Thoron monitoring
Durridge	Drystik ADS-3R-48-P2	N/A	216	N/A	3/20/2018	3/27/17 - 4/11/17	Air Drying unit for Rad 7

Notes:

GPS - global positioning system

ISOCS - In Situ Object Counting System

N/A - not applicable

WACC - Wolff-Alport Chemical Company

Table 2-3
Building Material Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Lot ID	Sample ID	Sample Collected (Date/Time)	Analysis: Gamma Spectroscopy*	Material Description	Sample Location Description	Notes
Lot 33	CIND-01-LOT33	12/17/15 11:30	x	cinder block	Cinder block from Lot 33. Located 20.5 feet from north corner on west wall, 1 feet above floor	
Lot 33	BRICK-02-LOT33	12/17/15 10:50	x	brick	Brick from Lot 33. Located 20.5 feet from north corner on west wall, 0.5 feet above floor	
Lot 33	BRICK-902-LOT33	12/17/15 10:50	x	brick	See description for BRICK-02-LOT33	Duplicate of BRICK-02-LOT33
Lot 46	BRICK-03-LOT46	12/17/15 13:30	x	brick	Brick from basement of Jarabacoa deli, located 3.5 feet from south corner along east wall and 2 feet above floor	
Lot 46	WOOD-04-LOT46	12/17/15 13:55	x	wood	Wood from basement of deli (Lot 46). Taken from top of rafeeter located 16.5 feet straight back from bottom step of stairs leading in from Cooper Street, and 7.6 feet above ground	
Lot 46	IBEAM-05-LOT46	12/17/15 14:15	x	rusted steel	Rusted steel from I-beam in basement of Jarabacoa Deli. Beam located 4 feet from south wall and 5 feet from east wall, 7 feet above floor.	
Lot 44	BRICK-06-LOT44	12/17/15 14:50	x	brick	In Celtic Bike Shop (Lot 44). Brick from short brick wall in front of one of the arches, located 21 feet from north wall and 2.1 feet above floor	
Lot 42	CONC-07-LOT42	12/17/15 15:55	x	concrete	In Primo Auto Body main shop (Lot 42). Concrete located 45 feet from garage door and 8 inches above floor on west wall.	
Lot 42	CONC-08-LOT42	12/18/15 11:30	x	concrete	Concrete collected in Primo Auto main shop (Lot 42). Located on second pillar from north corner, on west wall, 1 feet from ceiling	
Lot 42	BRICK-09-LOT42	12/18/15 12:05	x	brick	Brick collected in Primo Auto main shop (Lot 42). Located same place as CONC-08-LOT42, but underneath the overlying concrete.	

Notes:

*Gamma spectroscopy was conducted for Potassium-40, Radium-226, and Thorium-232.

ID - identification

Table 2-4
Soil Boring Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Drilling Method	Northing[1] (feet)	Easting[1] (feet)	Total Depth (feet bgs)	Surface Gamma[2] (cpm)	Surface Exposure Rate[2] (µR/hr)	Date Performed	Notes[3]
Background Soil Borings								
BKSB-01	Hand Auger	190668.61	1008896.78	1.7	1,545	9.3	12/16/15	
BKSB-02	Hand Auger	191414.97	1009190.31	2	1,734	9.7	12/16/15	
BKSB-03	Hand Auger	192476.83	1008345.98	0.8	1,495	8	12/16/15	
BKSB-04	DPT	191796.58	1009643.28	25	1,707	7.7	12/22/15	
BKSB-05	Hand Auger	192478.55	1012052.12	1	1,564	9.3	12/16/15	
BKSB-06	DPT	192064.25	1012559.66	30	1,536	7	10/30/15	
BKSB-07	DPT	191336.13	1012765.58	30	1,947	7	10/30/15	
BKSB-08	DPT	191485.79	1012278.77	30	2,105	9	10/30/15	
Site Soil Borings								
MW-01	Sonic	191703.26	1011395.36	70	-	-	11/9/15	no analytical samples collected due to proximity with SB-03
SB-01	Sonic	191455.58	1011383.39	75	-	-	10/29/15	co-located with MW-03
SB-02	Sonic	191522.17	1011277.30	70	-	-	11/6/15	co-located with MW-02
SB-03	DPT	191708.01	1011393.13	30	4,844	20	10/21/15	
SB-04	DPT	191683.99	1011408.45	30	7,884	28	10/21/15	
SB-05	Sonic	191557.17	1011455.00	74.5	-	-	10/26/15	co-located with MW-04
SB-06	DPT	191618.21	1011285.02	30	1,558	7	10/29/15	
SB-07	DPT	191585.20	1011309.46	30	6,158	24	10/26/15	
SB-08	DPT	191569.51	1011321.78	30	2,697	13	10/23/15	
SB-11	DPT	191435.62	1011335.88	9	3,041	15	10/20/15	
SB-12	DPT	191456.55	1011303.85	10	4,695	22	10/20/15	
SB-13	DPT	191488.89	1011266.88	10	3,307	14	10/20/15	
SB-14	DPT	191503.61	1011236.93	10	2,484	10	10/21/15	
SB-15	DPT	191556.49	1011167.94	10	1,588	7	10/28/15	
SB-16	DPT	191626.35	1011159.60	10	1,990	9	10/21/15	
SB-17	DPT	191650.92	1011097.69	10	2,180	11	10/27/15	
SB-18	DPT	191591.16	1011210.40	10	1,596	7	10/27/15	
SB-19	DPT	191593.13	1011264.11	10	2,051	10	10/22/15	
SB-20	Sonic	191666.50	1011268.63	5	4,789	-	11/9/15	
SB-21	DPT	191740.56	1011331.58	10	2,061	9	10/22/15	
SB-22	DPT	191763.09	1011396.00	10	2,360	8	10/22/15	
SB-23	DPT	191711.98	1011450.80	10	2,778	13	2/15/16	
SB-24	DPT	191663.94	1011461.11	10	3,424	17	2/15/16	
SB-25	DPT	191608.96	1011484.78	10	2,380	11.5	2/15/16	
SB-26	DPT	191607.57	1011454.10	7	2,216	9	10/26/15	
SB-27	DPT	191559.43	1011499.94	10	2,449	12	2/15/16	
SB-28	DPT	191500.26	1011503.50	10	2,963	10.8	2/15/16	
SB-29	DPT	191497.67	1011477.94	10	2,204	9	10/20/15	
SB-30	DPT	191453.68	1011494.18	10	2,469	10	2/18/16	
SB-31	DPT	191407.40	1011459.83	10	2,945	9	10/19/15	
SB-32	DPT	191372.51	1011508.48	7.4	7,601	26	2/15/16	
SB-33	DPT	191370.11	1011408.66	10	4,503	19	10/20/15	
SB-34	DPT	191366.03	1011361.31	10	2,834	12	10/20/15	
SB-35	Sonic	191329.64	1011387.15	75	-	-	10/27/15	co-located with MW-05
SB-36	DPT	191286.25	1011336.61	7	5,911	24	10/22/15	
SB-37	DPT	191226.96	1011293.87	9.5	3,904	15	10/22/15	
SB-38	DPT	191175.14	1011256.49	10	3,009	14	10/27/15	
SB-39	DPT	191136.10	1011225.34	10	2,124	8	10/27/15	
SB-40	DPT	191095.59	1011193.54	7	1,631	8	10/27/15	
SB-41	DPT	191047.17	1011158.22	10	1,951	10	10/26/15	
SB-42	DPT	190955.72	1011082.36	10	1,854	8	10/26/15	
SB-43	DPT	191562.79	1011274.59	5.6	6,139	30	10/29/15	
SB-44	DPT	191588.46	1011429.32	10	17,998	75	10/28/15	
SB-45	DPT	191476.50	1011429.37	10	2,300	10	10/28/15	
SB-50	DPT	191399.51	1011416.94	27	26,646	95	12/1/15	

Table 2-4
Soil Boring Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Drilling Method	Northing[1] (feet)	Easting[1] (feet)	Total Depth (feet bgs)	Surface Gamma[2] (cpm)	Surface Exposure Rate[2] (µR/hr)	Date Performed	Notes[3]
Site Soil Borings (cont.)								
SB-51	DPT	191271.52	1011344.58	10	24,082	94.3	12/3/15	
SB-52	DPT	191222.41	1011270.24	10	6,499	28	12/1/15	
SB-53	DPT	191051.93	1011140.94	10	5,222	20	12/1/15	
SB-54	DPT	190945.64	1011094.19	10	9,044	31.6	12/3/15	
SB-55	DPT	190933.84	1011039.21	10	3,103	13.4	12/2/15	
SB-79	DPT	191376.35	1011477.26	10	4,736	22	2/18/16	
SB-80	DPT	191410.30	1011534.72	9	8,208	32	2/18/16	
SB-81	DPT	191480.98	1011597.70	9	13,397	49	2/18/16	
SB-82	Hand Auger	191355.88	1011477.60	2	10,450	38	2/19/16	
SB-83	Hand Auger	191338.71	1011489.14	4	9,080	38	2/19/16	
308 Cooper Street Soil Borings								
SB-56	DPT	191477.68	1011265.63	25	5,269	19.7	11/30/15	
SB-57	DPT	191463.60	1011266.50	10	3,188	14.7	12/1/15	
SB-58	DPT	191483.02	1011248.71	10	3,255	7.6	11/30/15	
SB-59	DPT	191470.53	1011244.27	10	3,152	13.4	11/30/15	
SB-60	DPT	191498.42	1011230.33	10	2,866	11.2	11/30/15	
SB-61	DPT	191483.72	1011231.40	30	3,038	12.9	12/1/15	
SB-62	DPT	191511.42	1011211.71	10	2,444	12.1	11/30/15	
SB-63	DPT	191501.08	1011205.60	10	2,817	10.6	11/30/15	
338 Moffat Street Soil Borings								
SB-64	DPT	191344.08	1011425.50	10	1,490	8	2/17/16	
SB-65	DPT	191303.58	1011436.16	10	6,578	26	2/17/16	
SB-66	DPT	191273.98	1011417.17	10	3,195	13.5	2/17/16	
SB-67	DPT	191229.62	1011382.64	10	1,881	9	2/17/16	
SB-68	DPT	191297.68	1011445.06	10	2,847	12	2/18/16	
SB-69	DPT	191158.42	1011358.54	10	2,064	10.5	2/16/16	
SB-70	DPT	191319.56	1011446.97	10	2,377	11.6	2/18/16	
SB-71	Hand Auger	191082.26	1011303.32	1	2,273	12	2/19/16	
SB-72	Hand Auger	191058.02	1011285.18	2	2,179	12.8	2/19/16	
SB-73	Hand Auger	190971.64	1011234.84	2	2,438	14	2/19/16	
SB-74	DPT	191296.50	1011417.72	9	1,333	7	2/17/16	
SB-75	DPT	191206.67	1011353.97	10	1,411	8	2/17/16	
SB-76	DPT	191203.31	1011322.39	10	1,382	9	2/16/16	
SB-77	DPT	191113.50	1011271.90	7.5	1,103	7.5	2/16/16	
SB-78	DPT	191047.57	1011223.52	6	1,174	9.6	2/19/16	
School Soil Borings								
SCSB-01	DPT	190614.22	1010803.57	10	1,655	8	10/31/15	
SCSB-02	DPT	190493.89	1010709.44	10	1,706	8	10/31/15	
SCSB-03	DPT	190367.00	1010607.57	10	2,643	10	10/31/15	
SCSB-04	DPT	190429.78	1010456.75	10	3,065	13	10/31/15	
SCSB-05	DPT	190544.50	1010481.64	10	1,674	9	10/31/15	
SCSB-06	DPT	190730.02	1010622.91	10	1,705	8	10/31/15	
SCSB-11	Hand Auger			4	2,750	NM	3/27/17	refusal
SCSB-12	Hand Auger			4	3,218	NM	3/27/17	refusal
SCSB-13	Hand Auger			4	2,863	NM	3/27/17	refusal
SCSB-14	Hand Auger			4	2,215	NM	3/28/17	refusal
SCSB-15	Hand Auger			5	2,404	NM	3/28/17	refusal
Daycare Soil Borings								
SCSB-16	Hand Auger			4	2,504	NM	3/29/17	refusal
SCSB-17	Hand Auger			3	2,628	NM	3/29/17	refusal
SCSB-18	DPT			8	2,268	NM	3/31/17	refusal
SCSB-19	DPT			8	2,450	NM	3/31/17	refusal
SCSB-20	DPT			8	2,427	NM	3/31/17	refusal

Table 2-4
Soil Boring Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Drilling Method	Northing[1] (feet)	Easting[1] (feet)	Total Depth (feet bgs)	Surface Gamma[2] (cpm)	Surface Exposure Rate[2] (µR/hr)	Date Performed	Notes[3]
Sewer Soil Borings								
SWSB-01	DPT	1011303.24	191689.81	6	1,227	8.9	12/4/15	Refusal at about 6 feet on three consecutive attempts. Bottom of adjacent sewer line at about 9.7 feet.
SWSB-02	DPT	1011227.83	191551.06	14	2,015	9.7	12/4/15	Bottom of adjacent sewer line at about 10 feet.
SWSB-03	DPT	1011112.67	191629.70	20	2,704	9.9	12/4/15	Bottom of adjacent sewer line at about 13.1 feet.
SWSB-04	DPT	1011036.42	191687.23	20	1,525	6.9	12/3/15	Bottom of adjacent sewer line at about 14.5 feet.
SWSB-06	DPT	1010857.08	191825.50	20	1,645	8	12/3/15	Bottom of adjacent sewer line at about 15.5 feet.
SWSB-07	DPT	1010657.17	191970.74	20	1,864	9.4	12/3/15	Bottom of adjacent sewer line at about 16.7 feet.
SWSB-08	DPT	1010545.80	192054.56	20	1,617	7.2	12/2/15	Bottom of adjacent sewer line at about 16 feet.
SWSB-09	DPT	1010319.17	192222.00	20	1,569	6.6	12/2/15	Bottom of adjacent sewer line at about 16 feet.
SWSB-11	DPT	1010535.76	192864.45	18	1,354	10.4	12/2/15	Refusal at 18 feet. Bottom of adjacent sewer line at about 18 feet.

Notes:

[1] - Horizontal Datum: NAD83 (NY State Plane, Long Island); Vertical Datum: NAVD 88; Units: U.S. Survey Feet

[2] - Surface gamma and surface exposure rates were collected prior to drilling

[3] - Depths of adjacent sewer lines estimated from depth to bottom of invert in nearest manholes

Acronyms:

bgs - below ground surface

cpm - counts per minute

DPT - direct push technology

ID - identification

µR/hr - microRem per hour

NM - not measured

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-01	SB-01-00-02	0	2	10/30/2015	X				X	X	X	X	X	
SB-01	SB-01-02-04	2	4	10/30/2015	X									
SB-01	SB-01-04-06	4	6	10/30/2015	X									
SB-01	SB-01-06-08	6	8	10/30/2015	X									
SB-01	SB-01-08-09	8	10	10/30/2015	X									
SB-01	SB-01-10-12	10	12	10/30/2015	X	X								
SB-01	SB-01-12-14	12	14	10/30/2015	X									
SB-01	SB-01-14-16	14	16	10/30/2015	X									
SB-01	SB-01-16-18	16	18	10/30/2015	X				X	X	X	X	X	MS/MSD for TCL/TAL Analyses
SB-01	SB-01-20-22	20	22	10/30/2015	X									
SB-01	SB-01-22-24	22	24	10/30/2015	X									
SB-01	SB-01-25-27	24	26	10/30/2015	X									
SB-01	SB-01-27-29	26	28	10/30/2015	X									
SB-02	SB-02-00-02	0	2	11/6/2015	X	X			X	X	X	X	X	
SB-02	SB-02-02-04	2	4	11/6/2015	X									
SB-02	SB-02-04-06	4	6	11/6/2015	X									
SB-02	SB-02-06-08	6	8	11/6/2015	X									
SB-02	SB-02-08-10	8	10	11/6/2015	X									
SB-02	SB-02-10-12	10	12	11/6/2015	X									
SB-02	SB-02-12-14	12	14	11/6/2015	X									
SB-02	SB-02-14-16	14	16	11/6/2015	X									
SB-02	SB-02-16-18	16	18	11/6/2015	X									
SB-02	SB-02-18-20	18	20	11/6/2015	X				X	X	X	X	X	MS/MSD for TCL/TAL Analyses
SB-02	SB-02-20-25	20	22	11/6/2015	X									
SB-02	SB-02-26-28	26	28	11/6/2015	X									
SB-02	SB-02-28-30	28	30	11/6/2015	X									
SB-03	SB-03-00-02	0	2	10/21/2015	X	X			X	X	X	X	X	
SB-03	SB-03-02-04	2	4	10/21/2015	X									
SB-03	SB-03-04-06	4	6	10/21/2015	X									
SB-03	SB-03-06-08	6	8	10/21/2015	X									
SB-03	SB-03-08-10	8	10	10/21/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-03	SB-03-10-12	10	12	10/21/2015	X									
SB-03	SB-03-12-14	12	14	10/21/2015	X									
SB-03	SB-903-12-14	12	14	10/21/2015	X									ISOCS duplicate of SB-03-12-14
SB-03	SB-03-14-16	14	16	10/21/2015	X									
SB-03	SB-03-16-18	16	18	10/21/2015	X									
SB-03	SB-03-18-20	18	20	10/21/2015	X									
SB-03	SB-03-20-22	20	22	10/21/2015	X	X								
SB-03	SB-03-22-24	22	24	10/21/2015	X									
SB-03	SB-03-24-26	24	26	10/21/2015	X				X	X	X	X	X	
SB-03	SB-03-26-28	26	28	10/21/2015	X									
SB-03	SB-03-28-30	28	30	10/21/2015	X									
SB-04	SB-04-00-02	0	2	10/21/2015	X	X			X	X	X	X	X	
SB-04	SB-04-02-04	2	4	10/21/2015	X									
SB-04	SB-04-04-06	4	6	10/21/2015	X									
SB-04	SB-04-06-08	6	8	10/21/2015	X									
SB-04	SB-04-08-10	8	10	10/21/2015	X									
SB-04	SB-04-10-12	10	12	10/21/2015	X									
SB-04	SB-04-12-14	12	14	10/21/2015	X									
SB-04	SB-04-14-16	14	16	10/21/2015	X									
SB-04	SB-04-16-18	16	18	10/21/2015	X									
SB-04	SB-904-16-18	16	18	10/21/2015	X									ISOCS duplicate of SB-04-16-18
SB-04	SB-04-18-20	18	20	10/21/2015	X				X	X	X	X	X	
SB-04	SB-904-18-20	18	20	10/21/2015					X	X	X	X	X	TCL/TAL duplicate of SB-04-18-20
SB-04	SB-04-20-22	20	22	10/21/2015	X									
SB-04	SB-04-22-24	22	24	10/21/2015	X									
SB-04	SB-04-24-26	24	26	10/21/2015	X									
SB-04	SB-04-26-28	26	28	10/21/2015	X									
SB-04	SB-04-28-30	28	30	10/21/2015	X									
SB-05	SB-05-00-02	0	2	10/26/2015	X				X	X	X	X	X	
SB-05	SB-05-02-04	2	4	10/26/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-05	SB-05-04-06	4	6	10/26/2015	X									
SB-05	SB-05-06-08	6	8	10/26/2015	X									
SB-05	SB-05-08-10	8	10	10/26/2015	X									
SB-05	SB-05-10-12	10	12	10/26/2015	X									
SB-05	SB-05-12-14	12	14	10/26/2015	X									
SB-05	SB-05-14-16	14	16	10/26/2015	X									
SB-05	SB-05-16-18	16	18	10/26/2015	X									
SB-05	SB-05-18-20	18	20	10/26/2015	X									
SB-05	SB-05-20-22	20	22	10/26/2015	X				X	X	X	X	X	
SB-05	SB-905-20-22	20	22	10/26/2015	X				X	X	X	X	X	duplicate of SB-05-20-22
SB-05	SB-05-22-24	22	24	10/26/2015	X									
SB-05	SB-05-24-26	24	26	10/26/2015	X									
SB-05	SB-05-26-28	26	28	10/26/2015	X									
SB-05	SB-05-28-30	28	30	10/26/2015	X									
SB-05	SB-05-54-55	54	55	10/26/2015	X				X	X	X	X	X	
SB-06	SB-06-00-02	0	2	10/29/2015	X				X	X	X	X	X	
SB-06	SB-06-05-06	5	6	10/29/2015	X									
SB-06	SB-06-06-08	6	8	10/29/2015	X									
SB-06	SB-06-08-10	8	10	10/29/2015	X									
SB-06	SB-06-10-12	10	12	10/29/2015	X									
SB-06	SB-06-12-14	12	14	10/29/2015	X									
SB-06	SB-06-14-16	14	16	10/29/2015	X									
SB-06	SB-06-16-18	16	18	10/29/2015	X									
SB-06	SB-06-18-20	18	20	10/29/2015	X									
SB-06	SB-06-20-22	20	22	10/29/2015	X									
SB-06	SB-06-22-24	22	24	10/29/2015	X									
SB-06	SB-06-24-26	24	26	10/29/2015	X									
SB-06	SB-06-26-28	26	28	10/29/2015	X									
SB-06	SB-06-28-30	28	30	10/29/2015	X				X	X	X	X	X	
SB-07	SB-07-00-02	0	2	10/26/2015	X	X			X	X	X	X	X	

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-07	SB-07-02-04	2	4	10/26/2015	X	X								
SB-07	SB-07-04-06	4	6	10/26/2015	X									
SB-07	SB-07-06-08	6	8	10/26/2015	X									
SB-07	SB-07-08-10	8	10	10/26/2015	X									
SB-07	SB-07-10-12	10	12	10/26/2015	X	X	X	X						
SB-07	SB-07-12-14	12	14	10/26/2015	X									
SB-07	SB-07-14-16	14	16	10/26/2015	X	X								
SB-07	SB-07-16-18	16	18	10/26/2015	X									
SB-07	SB-07-17-19	17	19	10/26/2015					X	X	X	X	X	
SB-07	SB-07-18-20	18	20	10/26/2015	X									
SB-07	SB-07-20-22	20	22	10/26/2015	X									
SB-07	SB-07-22-24	22	24	10/26/2015	X									
SB-07	SB-907-22-24	22	24	10/26/2015	X									ISOCS duplicate of SB-07-22-24
SB-07	SB-07-24-26	24	26	10/26/2015	X									
SB-07	SB-07-26-28	26	28	10/26/2015	X									
SB-07	SB-07-28-30	28	30	10/26/2015	X									
SB-08	SB-08-01-02	0	2	10/23/2015	X				X	X	X	X	X	
SB-08	SB-08-02-04	2	4	10/23/2015	X									
SB-08	SB-08-04-06	4	6	10/23/2015	X									
SB-08	SB-08-06-08	6	8	10/23/2015	X	X								
SB-08	SB-08-08-10	8	10	10/23/2015	X									
SB-08	SB-08-10-12	10	12	10/23/2015	X									
SB-08	SB-08-12-14	12	14	10/23/2015	X									
SB-08	SB-08-14-16	14	16	10/23/2015	X	X	X	X						
SB-08	SB-08-16-18	16	18	10/23/2015	X									
SB-08	SB-08-18-20	18	20	10/23/2015	X									
SB-08	SB-908-18-20	18	20	10/23/2015	X									ISOCS duplicate of SB-08-18-20
SB-08	SB-08-20-22	20	22	10/23/2015	X									
SB-08	SB-08-22-24	22	24	10/23/2015	X									
SB-08	SB-08-24-26	24	26	10/23/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-08	SB-08-26-28	26	28	10/23/2015	X									
SB-08	SB-08-28-30	28	30	10/23/2015	X				X	X	X	X	X	
SB-11	SB-11-00-02	0	2	10/20/2015	X				X	X	X	X	X	
SB-11	SB-11-02-04	2	4	10/20/2015	X									
SB-11	SB-11-04-06	4	6	10/20/2015	X									
SB-11	SB-11-06-08	6	8	10/20/2015	X									
SB-11	SB-11-08-09	8	10	10/20/2015	X				X	X	X	X	X	
SB-12	SB-12-00-02	0	2	10/20/2015	X									
SB-12	SB-12-02-04	2	4	10/20/2015	X									
SB-12	SB-12-04-06	4	6	10/20/2015	X									
SB-12	SB-912-04-06	4	6	10/20/2015	X									ISOCS duplicate of SB-12-04-06
SB-12	SB-12-06-08	6	8	10/20/2015	X									
SB-12	SB-12-08-10	8	10	10/20/2015	X									
SB-12	SB-912-08-10	8	10	10/20/2015	X									ISOCS duplicate of SB-12-08-10
SB-13	SB-13-00-02	0	2	10/20/2015	X	X			X	X	X	X	X	
SB-13	SB-13-02-04	2	4	10/20/2015	X									
SB-13	SB-13-04-06	4	6	10/20/2015	X									
SB-13	SB-13-06-08	6	8	10/20/2015	X									
SB-13	SB-13-08-10	8	10	10/20/2015	X				X	X	X	X	X	MS/MSD for TCL/TAL Analyses
SB-14	SB-14-00-02	0	2	10/21/2015	X									
SB-14	SB-14-02-04	2	4	10/21/2015	X	X								
SB-14	SB-14-04-06	4	6	10/21/2015	X									
SB-14	SB-14-06-08	6	8	10/21/2015	X									
SB-14	SB-14-08-10	8	10	10/21/2015	X									
SB-15	SB-15-00-02	0	2	10/28/2015	X	X								
SB-15	SB-15-02-04	2	4	10/28/2015	X									
SB-15	SB-15-04-06	4	6	10/28/2015	X									
SB-15	SB-15-06-08	6	8	10/28/2015	X									
SB-15	SB-15-08-10	8	10	10/28/2015	X									
SB-15	SB-915-08-10	8	10	10/28/2015	X									ISOCS duplicate of SB-15-08-10

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-16	SB-16-00-02	0	2	10/21/2015	X									
SB-16	SB-16-02-04	2	4	10/21/2015	X									
SB-16	SB-16-04-06	4	6	10/21/2015	X									
SB-16	SB-16-06-08	6	8	10/21/2015	X	X								
SB-16	SB-16-08-10	8	10	10/21/2015	X									
SB-17	SB-17-00-02	0	2	10/27/2015	X									
SB-17	SB-17-02-04	2	4	10/27/2015	X									
SB-17	SB-17-04-06	4	6	10/27/2015	X	X								
SB-17	SB-17-06-08	6	8	10/27/2015	X									
SB-17	SB-17-08-10	8	10	10/27/2015	X									
SB-18	SB-18-00-02	0	2	10/27/2015	X									
SB-18	SB-18-02-04	2	4	10/27/2015	X									
SB-18	SB-18-04-06	4	6	10/27/2015	X	X								
SB-18	SB-18-06-08	6	8	10/27/2015	X									
SB-18	SB-918-06-08	6	8	10/27/2015	X									ISOCS duplicate of SB-18-06-08
SB-18	SB-18-08-10	8	10	10/27/2015	X									
SB-19	SB-19-00-02	0	2	10/22/2015	X	X			X	X	X	X	X	
SB-19	SB-19-02-04	2	4	10/22/2015	X									
SB-19	SB-19-04-06	4	6	10/22/2015	X									
SB-19	SB-19-06-08	6	8	10/22/2015	X									
SB-19	SB-19-08-10	8	10	10/22/2015	X				X	X	X	X	X	
SB-20	SB-20-00-02	0	2	11/9/2015	X	X								
SB-20	SB-20-02-04	2	4	11/9/2015	X									
SB-21	SB-21-00-02	0	2	10/22/2015	X				X	X	X	X	X	
SB-21	SB-21-02-04	2	4	10/22/2015	X									
SB-21	SB-21-04-06	4	6	10/22/2015	X									
SB-21	SB-921-04-06	4	6	10/22/2015	X									ISOCS duplicate of SB-04-04-06
SB-21	SB-21-06-08	6	8	10/22/2015	X									
SB-21	SB-21-08-10	8	10	10/22/2015	X	X			X	X	X	X	X	MS/MSD for TCL/TAL Analyses
SB-22	SB-22-00-02	0	2	10/22/2015	X	X								

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-22	SB-22-02-04	2	4	10/22/2015	X									
SB-22	SB-22-04-06	4	6	10/22/2015	X									
SB-22	SB-22-06-08	6	8	10/22/2015	X									
SB-22	SB-22-08-10	8	10	10/22/2015	X									
SB-23	SB-23-00-02	0	2	2/15/2016		X	X	X						
SB-23	SB-23-02-04	2	4	2/15/2016		X								
SB-23	SB-923-02-04	2	4	2/15/2016		X								Gamma spec. duplicate of SB-23-02-04
SB-23	SB-23-04-06	4	6	2/15/2016		X								
SB-23	SB-23-06-08	6	8	2/15/2016		X								
SB-23	SB-23-08-10	8	10	2/15/2016		X								
SB-24	SB-24-00-02	0	2	2/15/2016		X	X	X						
SB-24	SB-24-02-04	2	4	2/15/2016		X								
SB-24	SB-24-04-06	4	6	2/15/2016		X								
SB-24	SB-24-06-08	6	8	2/15/2016		X								
SB-24	SB-24-08-10	8	10	2/15/2016		X								
SB-25	SB-25-00-02	0	2	2/15/2016		X								
SB-25	SB-25-02-04	2	4	2/15/2016		X								
SB-25	SB-25-04-06	4	6	2/15/2016		X								
SB-25	SB-25-06-08	6	8	2/15/2016		X								
SB-25	SB-25-08-10	8	10	2/15/2016		X								
SB-26	SB-26-00-02	0	2	10/21/2015	X	X			X	X	X	X	X	
SB-26	SB-26-02-04	2	4	10/21/2015	X	X								
SB-26	SB-926-02-04	2	4	10/21/2015	X									ISOCS duplicate of SB-26-02-04
SB-26	SB-26-04-06	4	6	10/21/2015	X									
SB-26	SB-26-05-07	5	7	10/21/2015	X				X	X	X	X	X	
SB-27	SB-27-00-02	0	2	2/15/2016		X								
SB-27	SB-27-02-04	2	4	2/15/2016		X								
SB-27	SB-27-04-06	4	6	2/15/2016		X								
SB-27	SB-27-06-08	6	8	2/15/2016		X								
SB-27	SB-27-08-10	8	10	2/15/2016		X								

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-28	SB-28-00-02	0	2	2/15/2016		X								
SB-28	SB-928-00-02	0	2	2/15/2016		X								Gamma spectroscopy duplicate of SB-28-00-02
SB-28	SB-28-02-04	2	4	2/15/2016		X								
SB-28	SB-28-04-06	4	6	2/15/2016		X								
SB-28	SB-28-06-08	6	8	2/15/2016		X								
SB-28	SB-28-08-10	8	10	2/15/2016		X								
SB-29	SB-29-00-02	0	2	10/20/2015	X	X			X	X	X	X	X	
SB-29	SB-929-00-02	0	2	10/20/2015					X	X	X	X	X	TCL/TAL duplicate of SB-29-00-02
SB-29	SB-29-02-04	2	4	10/20/2015	X									
SB-29	SB-29-04-06	4	6	10/20/2015	X									
SB-29	SB-29-06-08	6	8	10/20/2015	X									
SB-29	SB-29-08-10	8	10	10/20/2015	X				X	X	X	X	X	
SB-30	SB-30-00-02	0	2	2/18/2016		X	X	X						
SB-30	SB-30-02-04	2	4	2/18/2016		X								
SB-30	SB-30-04-06	4	6	2/18/2016		X								
SB-30	SB-30-06-08	6	8	2/18/2016		X								
SB-30	SB-30-08-10	8	10	2/18/2016		X								
SB-31	SB-31-00-02	0	2	10/19/2015	X				X	X	X	X	X	
SB-31	SB-31-02-04	2	4	10/19/2015	X	X								
SB-31	SB-31-04-06	4	6	10/19/2015	X									
SB-31	SB-31-06-08	6	8	10/19/2015	X									
SB-31	SB-31-08-10	8	10	10/19/2015	X				X	X	X	X	X	
SB-32	SB-32-00-02	0	2	2/15/2016		X	X	X						
SB-32	SB-32-05-07	5	7	2/15/2016		X			X	X	X	X	X	oil and elevated PID hits in soil
SB-33	SB-33-00-02	0	2	10/20/2015	X				X	X	X	X	X	
SB-33	SB-33-02-04	2	4	10/20/2015	X									
SB-33	SB-33-04-06	4	6	10/20/2015	X	X								
SB-33	SB-33-06-08	6	8	10/20/2015	X									
SB-33	SB-33-08-10	8	10	10/20/2015	X				X	X	X	X	X	
SB-34	SB-34-00-02	0	2	10/20/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-34	SB-34-02-04	2	4	10/20/2015	X									
SB-34	SB-34-04-06	4	6	10/20/2015	X	X	X	X						
SB-34	SB-34-06-08	6	8	10/20/2015	X									
SB-34	SB-34-08-10	8	10	10/20/2015	X									
SB-35	SB-35-00-02	0	2	10/27/2015	X				X	X	X	X	X	
SB-35	SB-35-02-04	2	4	10/27/2015	X	X								
SB-35	SB-35-04-06	4	6	10/27/2015	X	X								
SB-35	SB-35-06-08	6	8	10/27/2015	X	X	X	X						
SB-35	SB-35-08-10	8	10	10/27/2015	X									
SB-35	SB-35-10-12	10	12	10/27/2015	X									
SB-35	SB-35-12-14	12	14	10/27/2015	X									
SB-35	SB-35-14-16	14	16	10/27/2015	X									
SB-35	SB-35-16-18	16	18	10/27/2015	X									
SB-35	SB-35-18-20	18	20	10/27/2015	X									
SB-35	SB-35-20-22	20	22	10/27/2015	X				X	X	X	X	X	
SB-35	SB-35-22-24	22	24	10/27/2015	X									
SB-35	SB-35-24-26	24	26	10/27/2015	X									
SB-35	SB-35-26-28	26	28	10/27/2015	X									
SB-35	SB-35-28-30	28	30	10/27/2015	X									
SB-36	SB-36-00-02	0	2	10/22/2015	X	X								
SB-36	SB-936-00-02	0	2	10/22/2015	X	X								ISOCS and Gamma spectroscopy duplicate of SB-36-00-02
SB-36	SB-36-02-04	2	4	10/22/2015	X									
SB-36	SB-36-04-06	4	6	10/22/2015	X									
SB-36	SB-36-06-07	6	8	10/22/2015	X									
SB-36	SB-36-08-10	8	10	10/22/2015										
SB-37	SB-37-00-02	0	2	10/22/2015	X	X								
SB-37	SB-37-02-04	2	4	10/22/2015	X									
SB-37	SB-37-04-06	4	6	10/22/2015	X									
SB-37	SB-37-06-08	6	8	10/22/2015	X									
SB-37	SB-37-08-10	8	10	10/22/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-38	SB-38-00-02	0	2	10/27/2015	X									
SB-38	SB-38-02-04	2	4	10/27/2015	X									
SB-38	SB-38-04-06	4	6	10/27/2015	X									
SB-38	SB-38-06-08	6	8	10/27/2015	X									
SB-38	SB-38-08-10	8	10	10/27/2015	X									
SB-39	SB-39-00-02	0	2	10/27/2015	X									
SB-39	SB-39-02-04	2	4	10/27/2015	X									
SB-39	SB-939-02-04	2	4	10/27/2015	X									ISOCS duplicate of SB-39-02-04
SB-39	SB-39-04-06	4	6	10/27/2015	X									
SB-39	SB-39-06-08	6	8	10/27/2015	X									
SB-39	SB-39-08-10	8	10	10/27/2015	X									
SB-40	SB-40-00-02	0	2	10/27/2015	X									
SB-40	SB-40-02-04	2	4	10/27/2015	X									
SB-40	SB-40-04-06	4	6	10/27/2015	X									
SB-40	SB-40-06-07	6	8	10/27/2015	X									
SB-40	SB-40-08-10	8	10	10/27/2015										
SB-41	SB-41-00-02	0	2	10/26/2015	X	X								
SB-41	SB-41-02-04	2	4	10/26/2015	X									
SB-41	SB-41-04-06	4	6	10/26/2015	X									
SB-41	SB-41-06-08	6	8	10/26/2015	X									
SB-41	SB-41-08-10	8	10	10/26/2015	X									
SB-42	SB-42-00-02	0	2	10/26/2015	X	X								
SB-42	SB-42-02-04	2	4	10/26/2015	X									
SB-42	SB-942-02-04	2	4	10/26/2015	X									ISOCS duplicate of SB-42-02-04
SB-42	SB-42-04-06	4	6	10/26/2015	X									
SB-42	SB-42-06-08	6	8	10/26/2015	X									
SB-42	SB-42-08-10	8	10	10/26/2015	X									
SB-43	SB-43-00-02	0	2	10/29/2015	X									
SB-43	SB-43-02-04	2	4	10/29/2015	X									
SB-43	SB-43-04-06	4	6	10/29/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-44	SB-44-00-02	0	2	10/28/2015	X	X			X	X	X	X	X	
SB-44	SB-44-02-04	2	4	10/28/2015	X									
SB-44	SB-44-04-06	4	6	10/28/2015	X									
SB-44	SB-44-06-08	6	8	10/28/2015	X									
SB-44	SB-44-08-10	8	10	10/28/2015	X				X	X	X	X	X	
SB-45	SB-45-00-02	0	2	10/28/2015	X	X			X	X	X	X	X	elevated PID hits (near drain/sump)
SB-45	SB-45-02-04	2	4	10/28/2015	X									
SB-45	SB-45-04-06	4	6	10/28/2015	X									
SB-45	SB-45-06-08	6	8	10/28/2015	X									
SB-45	SB-45-08-10	8	10	10/28/2015	X				X	X	X	X	X	elevated PID hits (near drain/sump)
SB-50	SB-50-00-01	0	1	12/1/2015	X	X	X	X						
SB-50	SB-950-00-01	0	1	12/1/2015		X	X	X						ISOCS and Gamma spectroscopy duplicate of SB-50-00-01
SB-50	SB-50-01-02	0	2	12/1/2015	X	X								
SB-50	SB-50-02-04	2	4	12/1/2015	X									
SB-50	SB-50-04-06	4	6	12/1/2015	X									
SB-50	SB-50-06-08	6	8	12/1/2015	X									
SB-50	SB-950-06-08	6	8	12/1/2015	X									ISOCS duplicate of SB-42-02-04
SB-50	SB-50-08-10	8	10	12/1/2015	X									
SB-50	SB-50-10-12	10	12	12/1/2015	X									
SB-50	SB-50-12-14	12	14	12/1/2015	X									
SB-50	SB-50-14-16	14	16	12/1/2015	X									
SB-50	SB-50-16-18	16	18	12/1/2015	X									
SB-50	SB-50-18-20	18	20	12/1/2015	X									
SB-50	SB-50-20-22	20	22	12/1/2015	X									
SB-50	SB-50-22-24	22	24	12/1/2015	X									
SB-50	SB-50-24-26	24	26	12/1/2015	X									
SB-50	SB-50-26-27	26	27	12/1/2015	X									
SB-51	SB-51-00-01	0	1	12/3/2015	X	X								
SB-51	SB-51-01-02	0	2	12/3/2015	X									
SB-51	SB-51-02-04	2	4	12/3/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-51	SB-51-04-06	4	6	12/3/2015	X									
SB-51	SB-51-06-08	6	8	12/3/2015	X									
SB-51	SB-51-08-10	8	10	12/3/2015	X									
SB-52	SB-52-00-01	0	1	12/1/2015	X	X	X	X						
SB-52	SB-952-00-01	0	1	12/1/2015		X	X	X						Gamma spectroscopy and isotopic duplicate of SB-52-00-01
SB-52	SB-52-01-02	0	2	12/1/2015	X	X								
SB-52	SB-52-02-04	2	4	12/1/2015	X									
SB-52	SB-52-04-06	4	6	12/1/2015	X									
SB-52	SB-52-06-08	6	8	12/1/2015	X									
SB-52	SB-52-08-10	8	10	12/1/2015	X									
SB-53	SB-53-00-01	0	1	12/1/2015	X									
SB-53	SB-53-01-02	1	2	12/1/2015	X									
SB-53	SB-53-02-04	2	4	12/1/2015	X									
SB-53	SB-53-04-06	4	6	12/1/2015	X									
SB-53	SB-53-06-08	6	8	12/1/2015	X									
SB-53	SB-53-08-10	8	10	12/1/2015	X									
SB-54	SB-54-00-01	0	1	12/3/2015	X	X	X	X						
SB-54	SB-54-01-02	1	2	12/3/2015	X									
SB-54	SB-54-02-04	2	4	12/3/2015	X									
SB-54	SB-954-02-04	2	4	12/3/2015	X									ISOCS duplicate of SB-54-02-04
SB-54	SB-54-04-06	4	6	12/3/2015	X									
SB-54	SB-54-06-08	6	8	12/3/2015	X									
SB-54	SB-54-08-10	8	10	12/3/2015	X									
SB-55	SB-55-00-02	0	2	12/2/2015	X									
SB-55	SB-55-02-04	2	4	12/2/2015	X									
SB-55	SB-55-04-06	4	6	12/2/2015	X									
SB-55	SB-55-06-08	6	8	12/2/2015	X									
SB-55	SB-55-08-10	8	10	12/2/2015	X									
SB-56	SB-56-00-02	0	2	11/30/2015	X	X								
SB-56	SB-56-02-04	2	4	11/30/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-56	SB-56-04-06	4	6	11/30/2015	X									
SB-56	SB-56-06-08	6	8	11/30/2015	X									
SB-56	SB-56-08-10	8	10	11/30/2015	X									
SB-56	SB-56-10-12	10	12	11/30/2015	X									
SB-56	SB-56-12-14	12	14	11/30/2015	X									
SB-56	SB-56-14-16	14	16	11/30/2015	X									
SB-56	SB-56-16-18	16	18	11/30/2015	X									
SB-56	SB-56-18-20	18	20	11/30/2015	X									
SB-56	SB-56-20-22	20	22	11/30/2015	X									
SB-56	SB-56-22-24	22	24	11/30/2015	X									Refusal at 25 feet
SB-57	SB-57-00-02	0	2	12/1/2015	X									
SB-57	SB-957-00-02	0	2	12/1/2015	X									ISOCS duplicate of SB-57-00-02
SB-57	SB-57-02-04	2	4	12/1/2015	X									
SB-57	SB-57-04-06	4	6	12/1/2015	X									
SB-57	SB-57-06-08	6	8	12/1/2015	X	X								
SB-57	SB-57-08-10	8	10	12/1/2015	X									
SB-58	SB-58-00-02	0	2	11/30/2015	X									
SB-58	SB-58-02-03	2	3	11/30/2015	X									
SB-58	SB-58-05-06	5	6	11/30/2015	X									
SB-58	SB-58-06-08	6	8	11/30/2015	X									
SB-58	SB-58-08-10	8	10	11/30/2015	X									
SB-59	SB-59-00-02	0	2	11/30/2015	X									
SB-59	SB-59-02-04	2	4	11/30/2015	X									
SB-59	SB-59-04-06	4	6	11/30/2015	X									
SB-59	SB-59-08-10	8	10	11/30/2015	X									
SB-59	SB-959-08-10	8	10	11/30/2015	X									ISOCS duplicate of SB-59-08-10
SB-60	SB-60-00-02	0	2	11/30/2015	X									
SB-60	SB-60-02-2.6	2	4	11/30/2015	X									
SB-60	SB-60-07-08	6	8	11/30/2015	X									
SB-60	SB-60-08-10	8	10	11/30/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-61	SB-61-00-02	0	2	12/1/2015	X									
SB-61	SB-61-02-03	2	3	12/1/2015	X									
SB-61	SB-61-05-06	5	6	12/1/2015	X									
SB-61	SB-61-06-08	6	8	12/1/2015	X									
SB-61	SB-61-08-10	8	10	12/1/2015	X									
SB-61	SB-61-15-16	15	16	12/1/2015	X									
SB-61	SB-61-16-18	16	18	12/1/2015	X									
SB-61	SB-61-18-20	18	20	12/1/2015	X									
SB-61	SB-61-20-22	20	22	12/1/2015	X									
SB-61	SB-61-22-24	22	24	12/1/2015	X									
SB-61	SB-61-24-26	24	26	12/1/2015	X									
SB-61	SB-61-26-28	26	28	12/1/2015	X									
SB-61	SB-61-28-30	28	30	12/1/2015	X									
SB-62	SB-62-00-02	0	2	11/30/2015	X									
SB-62	SB-62-02-04	2	4	11/30/2015	X									
SB-62	SB-62-06-08	6	8	11/30/2015	X									
SB-62	SB-62-08-10	8	10	11/30/2015	X									
SB-63	SB-63-00-02	0	2	11/30/2015	X									
SB-63	SB-63-02-04	2	4	11/30/2015	X									
SB-63	SB-63-04-06	4	6	11/30/2015	X									
SB-63	SB-63-06-08	6	8	11/30/2015	X									
SB-63	SB-63-08-10	8	10	11/30/2015	X									
SB-64	SB-64-01-02	1	2	2/17/2016		X								
SB-64	SB-64-02-04	2	4	2/17/2016		X								
SB-64	SB-64-04-06	4	6	2/17/2016		X								
SB-64	SB-64-06-08	6	8	2/17/2016		X								
SB-64	SB-64-08-10	8	10	2/17/2016		X								
SB-65	SB-65-00-02	0	2	2/17/2016		X								
SB-65	SB-965-00-02	0	2	2/17/2016		X								Gamma spectroscopy duplicate of SB-65-00-02
SB-65	SB-65-02-04	2	4	2/17/2016		X								

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-65	SB-65-04-06	4	6	2/17/2016		X								
SB-65	SB-65-06-08	6	8	2/17/2016		X								
SB-65	SB-65-08-10	8	10	2/17/2016		X								
SB-66	SB-66-00-02	0	2	2/17/2016		X								
SB-66	SB-66-02-04	2	4	2/17/2016		X								
SB-66	SB-66-04-06	4	6	2/17/2016		X								
SB-66	SB-66-06-08	6	8	2/17/2016		X								
SB-66	SB-66-08-10	8	10	2/17/2016		X								
SB-67	SB-67-00-02	0	2	2/17/2016		X								
SB-67	SB-67-02-04	2	4	2/17/2016		X								
SB-67	SB-67-04-06	4	6	2/17/2016		X								
SB-67	SB-67-06-08	6	8	2/17/2016		X								
SB-67	SB-67-08-10	8	10	2/17/2016		X								
SB-68	SB-68-00-02	0	2	2/18/2016		X	X	X						
SB-68	SB-68-02-04	2	4	2/18/2016		X								
SB-68	SB-68-04-06	4	6	2/18/2016		X								
SB-68	SB-968-06-08	6	8	2/18/2016		X								Gamma spectroscopy duplicate of SB-68-06-08
SB-68	SB-68-06-08	6	8	2/18/2016		X								
SB-68	SB-68-08-10	8	10	2/18/2016		X								
SB-69	SB-69-00-02	0	2	2/16/2016		X								
SB-69	SB-69-02-04	2	4	2/16/2016		X								
SB-69	SB-69-04-05	4	5	2/16/2016		X								
SB-69	SB-69-06-08	6	8	2/16/2016		X								
SB-69	SB-69-08-10	8	10	2/16/2016		X								
SB-70	SB-70-00-02	0	2	2/18/2016		X	X	X						
SB-70	SB-70-02-04	2	4	2/18/2016		X								
SB-70	SB-70-04-06	4	6	2/18/2016		X								
SB-70	SB-70-06-08	6	8	2/18/2016		X								
SB-70	SB-70-08-10	8	10	2/18/2016		X								
SB-71	SB-71-00-01	0	1	2/19/2016		X								
SB-72	SB-72-00-02	0	2	2/19/2016		X								

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-73	SB-73-00-02	0	2	2/19/2016		X								
SB-74	SB-74-0.5-03	0.5	3	2/17/2016		X	X	X						
SB-74	SB-74-03-05	3	5	2/17/2016		X								
SB-74	SB-74-05-07	5	7	2/17/2016		X								
SB-74	SB-74-07-09	7	9	2/17/2016		X								
SB-75	SB-75-0.5-03	0.5	3	2/17/2016		X								
SB-75	SB-75-03-04	3	4	2/17/2016		X								
SB-75	SB-75-06-08	6	8	2/17/2016		X								
SB-75	SB-75-08-10	8	10	2/17/2016		X								
SB-76	SB-76-01-06	1	6	2/16/2016		X								
SB-76	SB-76-06-08	6	8	2/16/2016		X								
SB-76	SB-76-08-10	8	10	2/16/2016		X								
SB-77	SB-77-01-03	1	3	2/16/2016		X								
SB-77	SB-77-03-05	3	5	2/16/2016		X								
SB-77	SB-77-06-07.5	6	7.5	2/16/2016		X								
SB-78	SB-78-00-02	0	2	2/19/2016		X								
SB-78	SB-78-02-04	2	4	2/19/2016		X								
SB-78	SB-78-04-06	4	6	2/19/2016		X								
SB-79	SB-79-00-02	0	2	2/18/2016		X	X	X						
SB-79	SB-79-02-04	2	4	2/18/2016		X								
SB-79	SB-79-04-06	4	6	2/18/2016		X								
SB-79	SB-79-06-08	6	8	2/18/2016		X								
SB-79	SB-979-06-08	6	8	2/18/2016		X								Gamma spectroscopy duplicate of SB-79-06-08
SB-79	SB-79-08-10	8	10	2/18/2016		X								
SB-80	SB-80-00-01	0	1	2/18/2016		X	X	X						
SB-80	SB-80-01-02	1	2	2/18/2016		X								
SB-80	SB-80-02-04	2	4	2/18/2016		X								
SB-80	SB-80-04-06	4	6	2/18/2016		X								
SB-80	SB-80-06-08	6	8	2/18/2016		X								
SB-80	SB-80-08-09	8	9	2/18/2016		X								

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SB-81	SB-81-00-01	0	1	2/18/2016		X	X	X						
SB-81	SB-81-01-02	1	2	2/18/2016		X								
SB-81	SB-81-02-04	2	4	2/18/2016		X								
SB-81	SB-81-04-06	4	6	2/18/2016		X								
SB-81	SB-81-06-08	6	8	2/18/2016		X								
SB-81	SB-81-08-09	8	9	2/18/2016		X								
SB-82	SB-82-00-02	0	2	2/19/2016		X	X	X						
SB-82	SB-982-00-02	0	2	2/19/2016		X	X	X						Gamma spectroscopy and isotopic duplicate of SB-82-00-02
SB-83	SB-83-00-02	0	2	2/19/2016		X								
SB-83	SB-83-02-04	2	4	2/19/2016		X	X	X						
Sewer Investigation Soil Borings														
SWSB-01	SWSB-01-00-02	0	2	12/4/2015	X									
SWSB-01	SWSB-01-02-04	2	4	12/4/2015	X	X								
SWSB-01	SWSB-01-04-06	4	6	12/4/2015	X									Refusal at 6 ft. Made 3 attempts.
SWSB-01	SWSB-901-04-06	4	6	12/4/2015	X									ISOCS duplicate of SWSB-01-04-06
SWSB-02	SWSB-02-00-02	0	2	12/4/2015	X									
SWSB-02	SWSB-02-05-06	5	6	12/4/2015	X									No recovery 2.5-5
SWSB-02	SWSB-02-06-08	6	8	12/4/2015	X									
SWSB-02	SWSB-02-08-10	8	10	12/4/2015	X									
SWSB-02	SWSB-02-10-12	10	12	12/4/2015	X									
SWSB-02	SWSB-02-12-14	12	14	12/4/2015	X									
SWSB-03	SWSB-03-00-01	0	1	12/4/2015	X	X	X	X						
SWSB-03	SWSB-03-01-02	1	2	12/4/2015	X									
SWSB-03	SWSB-03-02-04	2	4	12/4/2015	X									
SWSB-03	SWSB-903-02-04	2	4	12/4/2015	X									ISOCS duplicate of SWSB-03-02-04
SWSB-03	SWSB-03-04-06	4	6	12/4/2015	X									
SWSB-03	SWSB-03-06-08	6	8	12/4/2015	X									
SWSB-03	SWSB-03-08-10	8	10	12/4/2015	X									
SWSB-03	SWSB-03-10-12	10	12	12/4/2015	X									
SWSB-03	SWSB-03-12-14	12	14	12/4/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SWSB-03	SWSB-03-14-16	14	16	12/4/2015	X									
SWSB-03	SWSB-03-16-18	16	18	12/4/2015	X									
SWSB-03	SWSB-03-18-20	18	20	12/4/2015	X	X								
SWSB-04	SWSB-04-00-02	0	2	12/3/2015	X									
SWSB-04	SWSB-04-02-04	2	4	12/3/2015	X									
SWSB-04	SWSB-04-04-06	4	6	12/3/2015	X									
SWSB-04	SWSB-904-04-06	4	6	12/3/2015	X									ISOCS duplicate of SWSB-04-04-06
SWSB-04	SWSB-04-06-08	6	8	12/3/2015	X	X								
SWSB-04	SWSB-04-08-10	8	10	12/3/2015	X									
SWSB-04	SWSB-04-10-12	10	12	12/3/2015	X									
SWSB-04	SWSB-04-12-14	12	14	12/3/2015	X									
SWSB-04	SWSB-04-14-16	14	16	12/3/2015	X									
SWSB-04	SWSB-04-16-18	16	18	12/3/2015	X									
SWSB-04	SWSB-04-18-20	18	20	12/3/2015	X									
SWSB-06	SWSB-06-01.5-05	1.5	5	12/3/2015	X									could not collect sample 0-1.5 due to damaged macrocore
SWSB-06	SWSB-06-05-06	5	6	12/3/2015	X									
SWSB-06	SWSB-06-06-08	6	8	12/3/2015	X									
SWSB-06	SWSB-06-08-10	8	10	12/3/2015	X									
SWSB-06	SWSB-906-08-10	8	10	12/3/2015	X									ISOCS duplicate of SWSB-06-08-10
SWSB-06	SWSB-06-10-12	10	12	12/3/2015	X									
SWSB-06	SWSB-06-12-14	12	14	12/3/2015	X	X								
SWSB-06	SWSB-06-14-16	14	16	12/3/2015	X									
SWSB-06	SWSB-06-16-18	16	18	12/3/2015	X									
SWSB-06	SWSB-06-18-20	18	20	12/3/2015	X									
SWSB-07	SWSB-07-00-02	0	2	12/3/2015	X									
SWSB-07	SWSB-07-02-04	2	4	12/3/2015	X	X								
SWSB-07	SWSB-07-04-06	4	6	12/3/2015	X									
SWSB-07	SWSB-07-06-08	6	8	12/3/2015	X									
SWSB-07	SWSB-07-08-10	8	10	12/3/2015	X	X								
SWSB-07	SWSB-07-10-12	10	12	12/3/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SWSB-07	SWSB-07-12-14	12	14	12/3/2015	X									
SWSB-07	SWSB-07-14-16	14	16	12/3/2015	X									
SWSB-07	SWSB-07-16-18	16	18	12/3/2015	X									
SWSB-07	SWSB-07-18-20	18	20	12/3/2015	X									
SWSB-08	SWSB-08-00-02	0	2	12/2/2015	X									
SWSB-08	SWSB-08-02-04	2	4	12/2/2015	X									
SWSB-08	SWSB-08-04-06	4	6	12/2/2015	X	X								
SWSB-08	SWSB-08-06-08	6	8	12/2/2015	X									
SWSB-08	SWSB-08-08-10	8	10	12/2/2015	X									
SWSB-08	SWSB-08-10-12	10	12	12/2/2015	X									
SWSB-08	SWSB-08-12-14	12	14	12/2/2015	X									
SWSB-08	SWSB-08-14-16	14	16	12/2/2015	X									
SWSB-08	SWSB-08-16-18	16	18	12/2/2015	X									
SWSB-08	SWSB-08-18-20	18	20	12/2/2015	X									
SWSB-09	SWSB-09-00-02	0	2	12/2/2015	X									
SWSB-09	SWSB-09-02-04	2	4	12/2/2015	X									
SWSB-09	SWSB-909-02-04	2	4	12/2/2015	X									ISOCS duplicate of SWSB-09-02-04
SWSB-09	SWSB-09-04-06	4	6	12/2/2015	X									
SWSB-09	SWSB-09-06-08	6	8	12/2/2015	X									
SWSB-09	SWSB-09-08-10	8	10	12/2/2015	X									
SWSB-09	SWSB-09-10-12	10	12	12/2/2015	X									
SWSB-09	SWSB-09-12-14	12	14	12/2/2015	X									
SWSB-09	SWSB-09-15-16	15	16	12/2/2015	X									No sample collecteted 14-15 due to poor recovery
SWSB-09	SWSB-09-16-18	16	18	12/2/2015	X									
SWSB-09	SWSB-09-18-20	18	20	12/2/2015	X									
SWSB-11	SWSB-11-00-02	0	2	12/2/2015	X									
SWSB-11	SWSB-11-02-04	2	4	12/2/2015	X									
SWSB-11	SWSB-11-04-06	4	6	12/2/2015	X									
SWSB-11	SWSB-11-06-08	6	8	12/2/2015	X									
SWSB-11	SWSB-11-08-10	8	10	12/2/2015	X									

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SWSB-11	SWSB-11-10-11	10	11	12/2/2015	X									
School Investigation Soil Borings														
SCSB-01	SCSB-01-00-02	0	2	10/31/2015	X									
SCSB-01	SCSB-01-02-04	2	4	10/31/2015	X									
SCSB-01	SCSB-01-04-06	4	6	10/31/2015	X									
SCSB-01	SCSB-901-04-06	4	6	10/31/2015	X									ISOCS duplicate of SCSB-01-04-06
SCSB-01	SCSB-01-06-08	6	8	10/31/2015	X									
SCSB-01	SCSB-01-08-10	8	10	10/31/2015	X									
SCSB-02	SCSB-02-00-02	0	2	10/31/2015	X									
SCSB-02	SCSB-02-02-04	2	4	10/31/2015	X									
SCSB-02	SCSB-02-04-06	4	6	10/31/2015	X									
SCSB-02	SCSB-02-06-08	6	8	10/31/2015	X									
SCSB-02	SCSB-02-08-10	8	10	10/31/2015	X									
SCSB-03	SCSB-03-00-02	0	2	10/31/2015	X									
SCSB-03	SCSB-03-02-04	2	4	10/31/2015	X									
SCSB-03	SCSB-03-04-06	4	6	10/31/2015	X									
SCSB-03	SCSB-03-06-08	6	8	10/31/2015	X									
SCSB-03	SCSB-03-08-10	8	10	10/31/2015	X									
SCSB-04	SCSB-04-00-02	0	2	10/31/2015	X									
SCSB-04	SCSB-04-02-04	2	4	10/31/2015	X									
SCSB-04	SCSB-04-04-06	4	6	10/31/2015	X	X	X	X						
SCSB-04	SCSB-04-06-08	6	8	10/31/2015	X									
SCSB-04	SCSB-04-08-10	8	10	10/31/2015	X	X								
SCSB-05	SCSB-05-00-02	0	2	10/31/2015	X									
SCSB-05	SCSB-05-02-04	2	4	10/31/2015	X									
SCSB-05	SCSB-05-04-06	4	6	10/31/2015	X									
SCSB-05	SCSB-05-06-08	6	8	10/31/2015	X									
SCSB-05	SCSB-05-08-10	8	10	10/31/2015	X									
SCSB-06	SCSB-06-00-02	0	2	10/31/2015	X									
SCSB-06	SCSB-906-00-02	0	2	10/31/2015	X									ISOCS duplicate of SCSB-06-00-02

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SCSB-06	SCSB-06-02-04	2	4	10/31/2015	X									
SCSB-06	SCSB-06-04-06	4	6	10/31/2015	X									
SCSB-06	SCSB-06-06-08	6	8	10/31/2015	X	X								
SCSB-06	SCSB-06-08-10	8	10	10/31/2015	X									
SCSB-11	SCSB-11-2	0	2	3/27/2017		X								
SCSB-11	SCSB-11-3.5	2	3.5	3/27/2017		X								
SCSB-12	SCSB-12-2	0	2	3/27/2017		X								
SCSB-12	SCSB-12-4	2	4	3/27/2017		X								
SCSB-13	SCSB-13-2	0	2	3/27/2017		X								
SCSB-13	SCSB-13-4	2	4	3/27/2017		X								
SCSB-14	SCSB-14-2	0	2	3/28/2017		X								
SCSB-14	SCSB-14-4	2	4	3/28/2017		X								
SCSB-14	SCSB-14-5	4	5	3/28/2017		X								
SCSB-15	SCSB-15-2	0	2	3/28/2017		X								
SCSB-15	SCSB-15-4	2	4	3/28/2017		X								
SCSB-15	SCSB-15-5	4	5	3/28/2017		X								
Daycare Investigation Soil Borings														
SCSB-16	SCSB-16-2	0	2	3/29/2017		X								
SCSB-16	SCSB-16-4	2	4	3/29/2017		X								
SCSB-17	SCSB-17-2	0	2	3/29/2017		X								
SCSB-17	SCSB-17-3	2	3	3/29/2017		X								
SCSB-18	SCSB-18-2	0	2	3/31/2017		X								
SCSB-18	SCSB-918-2	0	2	3/31/2017		X								Duplicate SCSB-18-2
SCSB-18	SCSB-18-4	2	4	3/31/2017		X								
SCSB-18	SCSB-18-6	4	6	3/31/2017		X								
SCSB-18	SCSB-18-8	6	8	3/31/2017		X								
SCSB-19	SCSB-19-2	0	2	3/31/2017		X								
SCSB-19	SCSB-19-4	2	4	3/31/2017		X								
SCSB-19	SCSB-19-6	4	6	3/31/2017		X								
SCSB-19	SCSB-19-8	6	8	3/31/2017		X								

Table 2-5
Site Soil Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analyses									Notes
					ISOCS	Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals	
SCSB-20	SCSB-20-2	0	2	3/31/2017		X								
SCSB-20	SCSB-20-4	2	4	3/31/2017		X								
SCSB-20	SCSB-20-6	4	6	3/31/2017		X								
SCSB-20	SCSB-920-6	4	6	3/31/2017		X								Duplicate SCSB-20-6
SCSB-20	SCSB-20-8	6	8	3/31/2017		X								

Notes:

*Gamma spectroscopy analysis for Potassion-40, Radium-226, and Thorium-232.

bgs - below ground surface
ID - identification
ISOCS - In Situ Object Counting System
MS/MSD - matrix spike/matrix spike duplicate
PCBs - polychlorinated biphenyls
PID - photoionization detector
SVOCs - semi-volatile organic compounds
TAL - Target Analyte List
TCL - Target Compound List
VOCs - volatile organic compounds

Table 2-6
Monitoring Well Construction Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Well ID	Installation Date	Northing (feet)[1]	Easting (feet)[1]	TIC Elevation[1] (feet amsl)	Ground Surface Elevation[1] (feet amsl)	Well Screen Interval (feet bgs)	Well Screen Slot Size	Well Diameter and Material	Well Development Date
MW-01	11/9/2015	191703.26	1011395.36	70.46	70.84	60-70	0.010-inch	2-inch PVC	11/11/2015
MW-02	11/6/2015	191522.17	1011277.30	68.52	68.88	60-70	0.010-inch	2-inch PVC	11/11/2015
MW-03	10/29/2015	191455.58	1011383.39	70.11	70.56	64-74	0.010-inch	2-inch PVC	11/10/2015
MW-04	10/26/2015	191557.17	1011455.00	71.61	71.99	67-77	0.010-inch	2-inch PVC	11/5/2015
MW-05	10/27/2015	191329.64	1011387.15	69.90	70.29	63-73	0.010-inch	2-inch PVC	11/5/2015
MW-06	3/31/2017	191950.08	1011217.71	73.14	NA	65-75	0.010-inch	2-inch PVC	3/31/2017

Notes:

[1] Horizontal Datum: NAD83 (NY State Plane, Long Island); Vertical Datum: NAVD 88; Units: U.S. Survey Feet

Acronyms:

amsl - above mean sea level
bgs - below ground surface
ID - identification
PVC - polyvinyl chloride
TIC - top of inner casing

Table 2-7
Synoptic Water Level Measurements
Wolff-Alport Chemical Company Site
Ridgewood, NY

Well ID	Screened Interval as Installed (feet amsl)	Depth to bottom (feet below TIC)	TIC Elevation[1] (feet amsl)	Round 1: 12/8/2015 Groundwater Level (feet below TIC)	Round 1: 12/8/2015 Groundwater Elevation (feet amsl)	Round 2: 4/20/2016 Groundwater Level (feet below TIC)	Round 2: 4/20/2016 Groundwater Elevation (feet amsl)	Round 3: 11/17/2016 Groundwater Level (feet below TIC)	Round 3: 11/17/2016 Groundwater Elevation (feet amsl)	Round 4: 4/12/2017 Groundwater Level (feet below TIC)	Round 4: 4/12/2017 Groundwater Elevation (feet amsl)
MW-01	60-70	69.97	70.46	57.65	12.81	58.03	12.43	58.35	12.11	58.45	12.01
MW-02	60-70	69.56	68.52	55.85	12.67	56.15	12.37	56.45	12.07	56.55	11.97
MW-03	64-74	73.97	70.11	57.45	12.66	57.79	12.32	58.10	12.01	58.13	11.92
MW-04	67-77	76.55	71.61	58.91	12.70	59.22	12.39	NA	NA	59.82	11.96
MW-05	63-73	72.01	69.90	57.31	12.59	57.65	12.25	58.01	11.89	58.12	11.78
MW-06	65-75	75	73.14	NA	NA	NA	NA	NA	NA	60.72	12.42

Notes:

[1] Horizontal Datum: NAD83 (NJ State Plane); Vertical Datum: NAVD 88; Units: U.S. Survey Feet

Acronyms:

amsl - above mean sea level

bgs - below ground surface

ID - identification

TIC - top of inner casing

Table 2-8
Groundwater Sampling Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Well ID	Sample ID	Well Screened Interval (feet bgs)	Sample Collected (Date/Time)	Final Groundwater Quality Parameter Readings						Analyses						Notes
				pH	Temp (°C)	Specific Conductance (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	TCL VOCs	TCL SVOCs	TCL PCBs	TCL Pesticides	TAL Metals (total and dissolved)	Gamma Spectroscopy*	
Round 1																
MW-01	MW-01-R1	60-70	12/10/2015 9:50	7.32	19.14	0.951	-107.2	1.25	12.1	x	x	x	x	x	x	MS/MSD
MW-02	MW-02-R1	60-70	12/9/2015 15:25	6-7[1]	21.00	0.714	-12.8	1.48	9.7	x	x	x	x	x	x	
MW-03	MW-03-R1	64-74	12/9/2015 11:30	6-7[1]	20.03	0.674	-27.7	2.82	13.5	x	x	x	x	x	x	
MW-03	MW-903-R1	64-74	12/9/2015 11:30	6-7[1]	20.03	0.674	-27.7	2.82	13.5	x	x	x	x	x	x	Duplicate of MW-03-R1
MW-04	MW-04-R1	67-77	12/9/2015 14:50	7.12	20.14	0.977	-89.5	0.75	12.1	x	x	x	x	x	x	
MW-05	MW-05-R1	63-73	12/9/2015 11:25	6.92	20.57	1.217	-169.8	1.36	11.7	x	x	x	x	x	x	
Round 2																
MW-01	MW-01-R2	60-70	4/21/2016 12:15	7.09	22.52	1.044	2.73	2.72	7.1	x	x	x	x	x	x	
MW-02	MW-02-R2	60-70	4/21/2016 9:30	6.73	20.05	1.051	24.0	2.89	8.4	x	x	x	x	x	x	
MW-03	MW-03-R2	64-74	4/20/2016 14:00	6.45	20.46	0.852	70.0	3.83	69.7	x	x	x	x	x	x	
MW-04	MW-04-R2	67-77	4/21/2016 11:55	6.65	19.53	0.949	78.1	1.19	8.75	x	x	x	x	x	x	
MW-04	MW-904-R2	67-77	4/21/2016 11:55	6.65	19.53	0.949	78.1	1.19	8.75	x	x	x	x	x	x	Duplicate of MW-04-R2
MW-05	MW-05-R2	63-73	4/20/2016 13:50	6.52	19.54	1.059	54.0	3.19	6.19	x	x	x	x	x	x	MS/MSD
Round 3																
MW-01	MW-01-R3	60-70	11/17/2016 16:45	6.91	23.67	1.061	-5.70	2.26	46.0						x	
MW-02	MW-02-R3	60-70	11/17/2016 14:45	6.52	23.32	0.981	30.30	3.55	29.3						x	
MW-02	MW-902-R3	60-70	11/17/2016 14:15	6.52	23.32	0.981	30.30	3.55	29.3						x	Duplicate of MW-02-R3
MW-03	MW-03-R3	64-74	11/17/2016 12:20	6.28	24.00	0.742	109.2	5.55	59.3						x	
MW-04	NA	67-77	NA	NA	NA	NA	NA	NA	NA						x	Inaccesible
MW-05	MW-05-R3	63-73	11/17/2016 10:30	6.53	21.10	1.025	30.3	3.82	30.50						x	
Round 4																
MW-01	MW-01-R4	60-70	4/13/2017 14:00	6.81	21.15	1.133	151.40	3.69	26.5	x					x	
MW-02	MW-02-R4	60-70	4/12/2017 15:15	6.49	20.73	1.065	110.7	4.40	5.4	x					x	
MW-02	MW-902-R4	60-70	4/12/2017 15:15	6.49	20.73	1.065	110.7	4.40	5.4	x					x	Duplicate of MW-02-R4
MW-03	MW-03-R4	64-74	4/12/2017 15:40	6.33	20.51	0.896	124.3	5.41	25.80	x					x	MS/MSD
MW-04	MW-04-R4	67-77	4/13/2017 13:12	6.67	19.21	1.168	100.5	3.56	8.12	x					x	
MW-05	MW-05-R4	63-73	4/13/2017 10:20	6.61	20.29	1.211	69.8	4.91	4.28	x					x	
MW-06	MW-06-R4	65-75	4/13/2017 10:00	7.29	20.30	0.821	194.9	6.15	38.40	x					x	

Notes:
*Gamma spectroscopy was completed for Potassium-40, Radium-226, and Thorium-232.
[1] pH data collected using litmus paper due to malfunctioning pH meter

Acronyms:
°C - degrees Celcius
DO - Dissolved Oxygen
ID - identification
mg/L - milligrams per liter
mS/cm - microseimens per centimeter
MS/MSD - matrix spike / matrix spike duplicate
mV - milliVolts
NTU - Nephelometric Turbidity Unit
PCBs - polychlorinated biphenyls
SVOCs - semi-volatile organic compounds
TAL - target analyte list
TCL - target compound list
Temp - temperature
VOCs - volatile organic compounds

Table 2-9
Slug Test Results Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

MW ID	Test	Aquifer Type	Solution	K (feet/day)
MW-01	Falling - 1	Unconfined	Bouwer & Rice	1.2
MW-01	Falling - 2	Unconfined	Bouwer & Rice	1.8
MW-01	Rising -1	Unconfined	Bouwer & Rice	1.1
MW-01	Rising -2	Unconfined	Bouwer & Rice	1.0
MW-02	Falling - 1	Unconfined	Bouwer & Rice	51.2
MW-02	Falling - 2	Unconfined	Bouwer & Rice	38.1
MW-02	Rising -1	Unconfined	Bouwer & Rice	42.2
MW-02	Rising -2	Unconfined	Bouwer & Rice	35.4
MW-03	Falling - 1	Unconfined	Bouwer & Rice	51.0
MW-03	Falling - 2	Unconfined	Bouwer & Rice	59.2
MW-03	Rising -1	Unconfined	Bouwer & Rice	146.3
MW-03	Rising -2	Unconfined	Bouwer & Rice	148.8
MW-04	Falling - 1	Unconfined	Bouwer & Rice	10.9
MW-04	Falling - 2	Unconfined	Bouwer & Rice	10.9
MW-04	Rising -1	Unconfined	Bouwer & Rice	9.6
MW-04	Rising -2	Unconfined	Bouwer & Rice	9.6
MW-05	Falling - 1	Unconfined	Bouwer & Rice	13.8
MW-05	Falling - 2	Unconfined	Bouwer & Rice	12.4
MW-05	Rising -1	Unconfined	Bouwer & Rice	15.7
MW-05	Rising -2	Unconfined	Bouwer & Rice	16.8
			Average:	33.8

Acronyms:
feet/day - feet per day
ID - identification
K - hydraulic conductivity
MW - monitoring well

Table 2-10
Sewer Material Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Manhole ID	Sample ID	Sample Collected (Date/Time)	Analyses			Material Description	Sample Location Description	Notes
			Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium			
I8	CONC-I8	11/18/15 9:30	x			concrete	concrete from ledge ~2 feet from bottom on northeast corner of sewer vault	
I7	CONC-I7	11/18/15 10:25	x			concrete	concrete from invert ~6 inches above invert bottom at south corner near incoming pipe	
I7	SED-I7	11/18/15 10:30	x	x	x	sediment	sediment from bottom of invert	
I6	CONC-I6	11/18/15 11:20	x			concrete	concrete from ~1 feet above bottom on northeast corner of invert ledge (left of incoming pipe)	
I6	CONC-I906	11/18/15 11:20	x			concrete	see description for CONC-I6	Duplicate of CONC-I6
I6	BRICK-I6	11/18/15 11:25	x			brick	brick from ~4 feet above sample CONC-I6 location	
I5	CONC-I5	11/18/15 12:30	x			concrete	concrete from top of invert ledge on north side of vault	
I4	CASTIRON-I4	11/18/15 13:16	x			cast iron	degraded cast iron sewer pipe material from the 10-inch southerly incoming sewer line	
I4	CONC-I4	11/18/15 13:20	x			concrete	concrete from directly in between the two 10-inch incoming sewer lines	
I2	BRICK-I2	11/18/15 14:10	x			brick	brick from ~3 feet above bottom on wall above and to the left of line incoming from manhole I-1	
I2	SED-I2-BOTTOM	11/18/15 14:20	x	x	x	sediment	sediment from bottom of invert	
I2	SED-12-COATING	11/18/15 13:55	x	x	x	sediment	soft material coating walls of sewer vault	

Acronyms:

*Gamma spectroscopy was conducted for Potassium-40, Radium-226, and Thorium-232.

~ - approximately

ID - identification

Table 2-11
Creek Sediment Boring Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Northing (feet)	Easting (feet)	Total Depth (feet bgs)	Date Performed
Newtown Creek - East Branch				
SED-EB01	199481	1005231	10	9/28/2015
SED-EB02	199472	1005251	5.2	9/28/2015
SED-EB03	199488	1005267	10	9/28/2015
SED-EB04	199469	1005257	8	9/29/2015
SED-EB05	199472	1005286	10	9/29/2015
SED-EB06	199486	1005260	10	9/29/2015
SED-EB07	199487	1005243	10	9/29/2015
SED-EB08	199512	1005253	10	9/29/2015
Coney Island Creek				
SED-CIC01	150500	987822	10	10/9/2015
SED-CIC02	150857	989694	10	10/21/2015
SED-CIC03	150227	987501	0.5	10/9/2015
SED-CIC04	151041	988067	0.5	10/9/2015
SED-CIC05	151713	988760	0.5	10/9/2015
SED-CIC06	150615	990012	0.5	10/9/2015
SED-CIC07	150869	990542	0.5	10/9/2015
SED-CIC08	151236	989301	0.5	10/21/2015

Notes:

[1] - Horizontal Datum: NAD83 (NY State Plane, Long Island); Vertical Datum: NAVD 88; Units: U.S. Survey Feet

Acronyms:

bgs - below ground surface

ID - identification

Table 2-12
Creek Sediment Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analysis			Notes
					Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	
Newtown Creek - East Branch								
SED-EB01	SED-EB01-00-0.5	0	0.5	9/28/2015	X	X	X	
SED-EB01	SED-EB01-0.5-01	0.5	1	9/28/2015	X	X	X	
SED-EB01	SED-EB01-01-02	1	2	9/28/2015	X	X	X	
SED-EB01	SED-EB01-02-03	2	3	9/28/2015	X	X	X	
SED-EB01	SED-EB01-03-04	3	4	9/28/2015	X	X	X	
SED-EB01	SED-EB01-04-05	4	5	9/28/2015	X	X	X	
SED-EB01	SED-EB01-05-06	5	6	9/28/2015	X	X	X	
SED-EB01	SED-EB01-06-07	6	7	9/28/2015	X	X	X	
SED-EB01	SED-EB01-07-08	7	8	9/28/2015	X	X	X	
SED-EB01	SED-EB01-08-09	8	9	9/28/2015	X	X	X	
SED-EB01	SED-EB901-08-09	8	9	9/28/2015	X	X	X	duplicate of SED-EB01-08-09
SED-EB01	SED-EB01-09-10	9	10	9/28/2015	X	X	X	
SED-EB02	SED-EB02-00-0.5	0	0.5	9/28/2015	X	X	X	
SED-EB02	SED-EB02-0.5-01	0.5	1	9/28/2015	X	X	X	
SED-EB02	SED-EB02-01-02	1	2	9/28/2015	X	X	X	
SED-EB02	SED-EB02-02-03	2	3	9/28/2015	X	X	X	
SED-EB02	SED-EB02-03-04	3	4	9/28/2015	X	X	X	
SED-EB02	SED-EB902-03-04	3	4	9/28/2015	X	X	X	duplicate of SED-EB02-03-04
SED-EB02	SED-EB02-04-05	4	5	9/28/2015	X	X	X	
SED-EB03	SED-EB03-00-0.5	0	0.5	9/29/2015	X	X	X	
SED-EB03	SED-EB03-0.5-01	0.5	1	9/29/2015	X	X	X	
SED-EB03	SED-EB03-01-02	1	2	9/29/2015	X	X	X	
SED-EB03	SED-EB03-02-03	2	3	9/29/2015	X	X	X	
SED-EB03	SED-EB03-03-04	3	4	9/29/2015	X	X	X	
SED-EB03	SED-EB03-04-05	4	5	9/29/2015	X	X	X	
SED-EB03	SED-EB03-05-06	5	6	9/29/2015	X	X	X	
SED-EB03	SED-EB03-06-07	6	7	9/29/2015	X	X	X	
SED-EB03	SED-EB03-07-08	7	8	9/29/2015	X	X	X	
SED-EB03	SED-EB03-08-09	8	9	9/29/2015	X	X	X	
SED-EB03	SED-EB03-09-10	9	10	9/29/2015	X	X	X	
SED-EB04	SED-EB04-00-0.5	0	0.5	9/29/2015	X	X	X	
SED-EB04	SED-EB04-0.5-01	0.5	1	9/29/2015	X	X	X	
SED-EB04	SED-EB04-01-02	1	2	9/29/2015	X	X	X	
SED-EB04	SED-EB04-02-03	2	3	9/29/2015	X	X	X	
SED-EB04	SED-EB904-02-03	2	3	9/29/2015	X	X	X	duplicate of SED-EB04-02-03
SED-EB04	SED-EB04-03-04	3	4	9/29/2015	X	X	X	
SED-EB04	SED-EB04-04-05	4	5	9/29/2015	X	X	X	
SED-EB04	SED-EB04-05-06	5	6	9/29/2015	X	X	X	
SED-EB04	SED-EB04-06-07	6	7	9/29/2015	X	X	X	
SED-EB04	SED-EB04-07-08	7	8	9/29/2015	X	X	X	
SED-EB05	SED-EB05-00-0.5	0	0.5	9/28/2015	X	X	X	
SED-EB05	SED-EB05-0.5-01	0.5	1	9/28/2015	X	X	X	
SED-EB05	SED-EB05-01-02	1	2	9/28/2015	X	X	X	

Table 2-12
Creek Sediment Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analysis			Notes
					Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	
SED-EB05	SED-EB05-02-03	2	3	9/28/2015	X	X	X	
SED-EB05	SED-EB05-03-04	3	4	9/28/2015	X	X	X	
SED-EB05	SED-EB05-04-05	4	5	9/28/2015	X	X	X	
SED-EB05	SED-EB05-05-06	5	6	9/28/2015	X	X	X	
SED-EB05	SED-EB05-06-07	6	7	9/28/2015	X	X	X	
SED-EB05	SED-EB05-07-08	7	8	9/28/2015	X	X	X	
SED-EB05	SED-EB05-08-09	8	9	9/28/2015	X	X	X	
SED-EB05	SED-EB05-09-10	9	10	9/28/2015	X	X	X	
SED-EB06	SED-EB06-00-0.5	0	0.5	9/29/2015	X	X	X	
SED-EB06	SED-EB06-0.5-01	0.5	1	9/29/2015	X	X	X	
SED-EB06	SED-EB06-01-02	1	2	9/29/2015	X	X	X	
SED-EB06	SED-EB06-02-03	2	3	9/29/2015	X	X	X	
SED-EB06	SED-EB06-03-04	3	4	9/29/2015	X	X	X	
SED-EB06	SED-EB06-04-05	4	5	9/29/2015	X	X	X	
SED-EB06	SED-EB06-05-06	5	6	9/29/2015	X	X	X	
SED-EB06	SED-EB06-06-07	6	7	9/29/2015	X	X	X	
SED-EB06	SED-EB906-06-07	6	7	9/29/2015	X	X	X	duplicate of SED-EB06-06-07
SED-EB06	SED-EB06-07-08	7	8	9/29/2015	X	X	X	
SED-EB06	SED-EB06-08-09	8	9	9/29/2015	X	X	X	
SED-EB06	SED-EB06-09-10	9	10	9/29/2015	X	X	X	
SED-EB07	SED-EB07-00-0.5	0	0.5	9/29/2015	X	X	X	
SED-EB07	SED-EB07-0.5-01	0.5	1	9/29/2015	X	X	X	
SED-EB07	SED-EB07-01-02	1	2	9/29/2015	X	X	X	
SED-EB07	SED-EB07-02-03	2	3	9/29/2015	X	X	X	
SED-EB07	SED-EB07-03-04	3	4	9/29/2015	X	X	X	
SED-EB07	SED-EB07-04-05	4	5	9/29/2015	X	X	X	
SED-EB07	SED-EB07-05-06	5	6	9/29/2015	X	X	X	
SED-EB07	SED-EB07-06-07	6	7	9/29/2015	X	X	X	
SED-EB07	SED-EB07-07-08	7	8	9/29/2015	X	X	X	
SED-EB07	SED-EB07-08-09	8	9	9/29/2015	X	X	X	
SED-EB07	SED-EB07-09-10	9	10	9/29/2015	X	X	X	
SED-EB08	SED-EB08-00-0.5	0	0.5	9/29/2015	X	X	X	
SED-EB08	SED-EB08-0.5-01	0.5	1	9/29/2015	X	X	X	
SED-EB08	SED-EB08-01-02	1	2	9/29/2015	X	X	X	
SED-EB08	SED-EB08-02-03	2	3	9/29/2015	X	X	X	
SED-EB08	SED-EB08-03-04	3	4	9/29/2015	X	X	X	
SED-EB08	SED-EB08-04-05	4	5	9/29/2015	X	X	X	
SED-EB08	SED-EB08-05-06	5	6	9/29/2015	X	X	X	
SED-EB08	SED-EB08-06-07	6	7	9/29/2015	X	X	X	
SED-EB08	SED-EB08-07-08	7	8	9/29/2015	X	X	X	
SED-EB08	SED-EB08-08-09	8	9	9/29/2015	X	X	X	
SED-EB08	SED-EB08-09-10	9	10	9/29/2015	X	X	X	

Table 2-12
Creek Sediment Sample Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location ID	Sample ID	Start Depth (feet bgs)	End Depth (feet bgs)	Sample Collection Date	Analysis			Notes
					Gamma Spectroscopy*	Isotopic Thorium	Isotopic Uranium	
Coney Island Creek (Background)								
SED-CIC01	SED-CIC01-00-0.5	0	0.5	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-0.5-01	0.5	1	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-01-02	1	2	10/9/2015	X	X	X	
SED-CIC01	SED-CIC901-01-02	1	2	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-02-03	2	3	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-03-04	3	4	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-04-05	4	5	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-05-06	5	6	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-06-07	6	7	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-07-08	7	8	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-08-09	8	9	10/9/2015	X	X	X	
SED-CIC01	SED-CIC01-09-10	9	10	10/9/2015	X	X	X	
SED-CIC02	SED-CIC02-00-0.5	0	0.5	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-0.5-01	0.5	1	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-01-02	1	2	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-02-03	2	3	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-03-04	3	4	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-04-05	4	5	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-05-06	5	6	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-06-07	6	7	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-07-08	7	8	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-08-09	8	9	10/21/2015	X	X	X	
SED-CIC02	SED-CIC02-09-10	9	10	10/21/2015	X	X	X	
SED-CIC03	SED-CIC03-00-0.5	0	0.5	10/9/2015	X	X	X	
SED-CIC04	SED-CIC04-00-0.5	0	0.5	10/9/2015	X	X	X	
SED-CIC05	SED-CIC05-00-0.5	0	0.5	10/9/2015	X	X	X	
SED-CIC06	SED-CIC06-00-0.5	0	0.5	10/9/2015	X	X	X	
SED-CIC06	SED-CIC906-00-0.5	0	0.5	10/9/2015	X	X	X	duplicate of SED-CIC06-00-0.5
SED-CIC07	SED-CIC07-00-0.5	0	0.5	10/9/2015	X	X	X	
SED-CIC08	SED-CIC08-00-0.5	0	0.5	10/21/2015	X	X	X	

Notes:

[1] - Horizontal Datum: NAD83 (NY State Plane, Long Island); Vertical Datum: NAVD 88; Units: U.S. Survey Feet

*Gamma spectroscopy was conducted for Potassium-40, Radium-226, and Thorium-232.

Acronyms:

bgs - below ground surface

ID - identification

ft - feet

Table 4-1a
RI Soil Screening Criteria - VOCs
Wolff-Alport Chemical Company Site
Ridgewood, Queens, NY

Volatile Organic Compounds (All units: µg/kg)	CAS Number	Standards					RI Screening Criteria (4)
		Federal	New York				
		EPA RSLs for Residential Soils (1)	NYSDEC Residential Use SCOs (2)	NYSDEC Commercial Use SCOs (2)	NYSDEC Industrial Use SCOs (2)	NYSDEC CP-51 Soil Cleanup Guidance: Residential (3)	
1,1,1-Trichloroethane	71-55-6	8,100,000	100,000	500,000	1,000,000	NL	**100,000**
1,1,2,2-Tetrachloroethane	79-34-5	600	NL	NL	NL	35,000	**600**
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	40,000,000	NL	NL	NL	100,000	**100,000**
1,1,2-Trichloroethane	79-00-5	1,100	NL	NL	NL	NL	**1,100**
1,1-Dichloroethane	75-34-3	3,600	19,000	240,000	480,000	NL	**3,600**
1,1-Dicholoroethene	75-35-4	230,000	100,000	500,000	1,000,000	NL	**100,000**
1,2,3-Trichlorobenzene	87-61-6	63,000	NL	NL	NL	NL	**63,000**
1,2,4-Trichlorobenzene	120-82-1	24,000	NL	NL	NL	NL	**24,000**
1,2-Dibromo-3-chloropropane	96-12-8	5	NL	NL	NL	NL	**5**
1,2-Dibromoethane	106-93-4	36	NL	NL	NL	NL	**36**
1,2-Dichlorobenzene	95-50-1	1,800,000	100,000	500,000	1,000,000	NL	**100,000**
1,2-Dichloroethane	107-06-2	460	2,300	30,000	60,000	NL	**460**
1,2-Dichloropropane	78-87-5	1,000	NL	NL	NL	NL	**1,000**
1,3-Dichlorobenzene	541-73-1	NL	17,000	280,000	560,000	NL	**17,000**
1,4-Dichlorobenzene	106-46-7	2,600	9,800	130,000	250,000	NL	**2,600**
2-Butanone	78-93-3	27,000,000	100,000	500,000	1,000,000	100,000	**100,000**
2-Hexanone	591-78-6	200,000	NL	NL	NL	NL	**200,000**
4-Methyl-2-pentanone	108-10-1	33,000,000	NL	NL	NL	NL	**33,000,000**
Acetone	67-64-1	61,000,000	100,000	500,000	1,000,000	NL	**100,000**
Benzene	71-43-2	1,200	2,900	44,000	89,000	NL	**1,200**
Bromochloromethane	74-97-5	150,000	NL	NL	NL	NL	**150,000**
Bromodichloromethane	75-27-4	290	NL	NL	NL	NL	**290**
Bromoform	75-25-2	19,000	NL	NL	NL	NL	**19,000**
Bromomethane	74-83-9	6,800	NL	NL	NL	NL	**6,800**
Carbon Disulfide	75-15-0	770,000	NL	NL	NL	100,000	**100,000**
Carbon tetrachloride	56-23-5	650	1,400	22,000	44,000	NL	**650**
Chlorobenzene	108-90-7	280,000	100,000	500,000	1,000,000	NL	**100,000**
Chloroethane	75-00-3	14,000,000	NL	NL	NL	NL	**14,000,000**
Chloroform	67-66-3	320	10,000	350,000	700,000	NL	**320**
Chloromethane	74-87-3	110,000	NL	NL	NL	NL	**110,000**
cis-1,2-Dichloroethene	156-59-2	160,000	59,000	500,000	1,000,000	NL	**59,000**
cis-1,3-Dichloropropene	10061-01-5	NL	NL	NL	NL	NL	**NL**
Cyclohexane	110-82-7	6,500,000	NL	NL	NL	NL	**6,500,000**
Dibromochloromethane	124-48-1	8,300	NL	NL	NL	NL	**8,300**
Dichlorodifluoromethane	75-71-8	87,000	NL	NL	NL	NL	**87,000**
Ethylbenzene	100-41-4	5,800	30,000	390,000	780,000	NL	**5,800**
Isopropylbenzene	98-82-8	1,900,000	NL	NL	NL	100,000	**100,000**
m, p-Xylene *	1330-20-7	580,000	100,000	500,000	1,000,000	NL	**100,000**
Methyl acetate	79-20-9	78,000,000	NL	NL	NL	NL	**78,000,000**
Methyl tert-butyl ether	1634-04-4	47,000	62,000	500,000	1,000,000	NL	**47,000**

Table 4-1a
RI Soil Screening Criteria - VOCs
Wolff-Alport Chemical Company Site
Ridgewood, Queens, NY

Volatile Organic Compounds (All units: µg/kg)	CAS Number	Standards					RI Screening Criteria (4)
		Federal	New York				
		EPA RSLs for Residential Soils (1)	NYSDEC Residential Use SCOs (2)	NYSDEC Commercial Use SCOs (2)	NYSDEC Industrial Use SCOs (2)	NYSDEC CP-51 Soil Cleanup Guidance: Residential (3)	
Methylcyclohexane	108-87-2	NL	NL	NL	NL	NL	**NL**
Methylene chloride	75-09-2	57,000	51,000	500,000	1,000,000	NL	**51,000**
o-Xylene *	95-47-6	650,000	100,000	500,000	1,000,000	NL	**100,000**
Styrene	100-42-5	6,000,000	NL	NL	NL	NL	**6,000,000**
Tetrachloroethene	127-18-4	24,000	5,500	150,000	300,000	NL	**5,500**
Toluene	108-88-3	4,900,000	100,000	500,000	1,000,000	NL	**100,000**
trans-1,2-Dichloroethene	156-60-5	1,600,000	100,000	500,000	1,000,000	NL	**100,000**
trans-1,3-Dichloropropene	10061-02-6	NL	NL	NL	NL	NL	**NL**
Trichloroethene	79-01-6	940	10,000	200,000	400,000	NL	**940**
Trichlorofluoromethane	75-69-4	23,000,000	NL	NL	NL	NL	**23,000,000**
Vinyl Chloride	75-01-4	59	210	13,000	27,000	NL	**59**

Notes:

1. EPA RSL Summary Table for Resident Soil, (http://www.epa.gov/region9/superfund/prg/) November 2015.
2. NYSDEC Subpart 375-6: Table 375-6.8(b): Restricted Use Soil Cleanup Objectives, http://www.dec.ny.gov/docs/remediation_hudson_pdf/part375.pdf. December 14, 2006.
3. NYSDEC CP-51/Soil Cleanup Guidance: Table 1 - Supplemental Soil Cleanup Objectives: Residential, http://www.dec.ny.gov/docs/remediation_hudson_pdf/cpsoil.pdf. October 21, 2010.
4. The RI Soil Screening Criteria is selected from the lowest of the EPA and NYSDEC soils standards.

* Criteria are reported for Xylenes in the absence of a separate listed criteria.

Acronyms:

EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
SCO - Soil Cleanup Objectives
RSL - Regional Screening Level
NL - Not listed or chemical name listed but no value available
VOC - volatile organic compound
µg/kg - micrograms per kilogram

Table 4-1b
RI Soil Screening Criteria - SVOCs
Wolff-Alport Chemical Company Site
Ridgewood, NY

Semi-Volatile Organic Compounds (All units: µg/kg)	CAS Number	Standards					RI Screening Criteria (4)
		Federal	New York				
		EPA RSLs for Residential Soils (1)	NYSDEC Residential Use SCOs (2)	NYSDEC Commercial Use SCOs (2)	NYSDEC Industrial Use SCOs (2)	NYSDEC CP-51 Soil Cleanup Guidance: Residential (3)	
1,1'-Biphenyl	92-52-4	47,000	NL	NL	NL	NL	**47,000**
1,2,4,5-Tetrachlorobenzene	95-94-3	23,000	NL	NL	NL	NL	**23,000**
1,4-Dioxane	123-91-1	5,300	9,800	130,000	250,000	NL	**5,300**
2,2'-Oxybis (1-chloropropane)	108-60-1	3,100,000	NL	NL	NL	NL	**3,100,000**
2,3,4,6-Tetrachlorophenol	58-90-2	1,900,000	NL	NL	NL	NL	**1,900,000**
2,4,5-Trichlorophenol	95-95-4	6,300,000	NL	NL	NL	100,000	**100,000**
2,4,6-Trichlorophenol	88-06-2	49,000	NL	NL	NL	NL	**49,000**
2,4-Dichlorophenol	120-83-2	190,000	NL	NL	NL	100,000	**100,000**
2,4-Dimethylphenol	105-67-9	1,300,000	NL	NL	NL	NL	**1,300,000**
2,4-Dinitrophenol	51-28-5	130,000	NL	NL	NL	100,000	**100,000**
2,4-Dinitrotoluene	121-14-2	1,700	NL	NL	NL	NL	**1,700**
2,6-Dinitrotoluene	606-20-2	360	NL	NL	NL	1,030	**360**
2-Chloronapthalene	91-58-7	4,800,000	NL	NL	NL	NL	**4,800,000**
2-Chlorophenol	95-57-8	390,000	NL	NL	NL	100,000	**100,000**
2-Methylnapthalene	91-57-6	240,000	NL	NL	NL	410	**410**
2-Methylphenol	95-48-7	3,200,000	100,000	500,000	1,000,000	NL	**100,000**
2-Nitroaniline	88-74-4	630,000	NL	NL	NL	NL	**630,000**
2-Nitrophenol	88-75-5	NL	NL	NL	NL	NL	**NL**
3,3'-Dichlorobenzidine	91-94-1	1,200	NL	NL	NL	NL	**1,200**
3-Nitroaniline	99-09-2	NL	NL	NL	NL	NL	**NL**
4,6-Dinitro-2-methylphenol	534-52-1	5,100	NL	NL	NL	NL	**5,100**
4-Bromophenyl-phenylether	101-55-3	NL	NL	NL	NL	NL	**NL**
4-Chloro-3-methylphenol	59-50-7	6,300,000	NL	NL	NL	NL	**6,300,000**
4-Chloroaniline	106-47-8	2,700	NL	NL	NL	100,000	**2,700**
4-Chlorophenyl-phenyl ether	7005-72-3	NL	NL	NL	NL	NL	**NL**
4-Methylphenol	106-44-5	6,300,000	34,000	500,000	1,000,000	NL	**34,000**
4-Nitroaniline	100-01-6	27,000	NL	NL	NL	NL	**27,000**
4-Nitrophenol	100-02-7	NL	NL	NL	NL	NL	**NL**
Acenaphthene	83-32-9	3,600,000	100,000	500,000	1,000,000	NL	**100,000**
Acenaphthylene	208-96-8	NL	100,000	500,000	1,000,000	NL	**100,000**
Acetophenone	98-86-2	7,800,000	NL	NL	NL	NL	**7,800,000**
Anthracene	120-12-7	18,000,000	100,000	500,000	1,000,000	NL	**100,000**
Atrazine	1912-24-9	2,400	NL	NL	NL	NL	**2,400**
Benzaldehyde	100-52-7	7,800,000	NL	NL	NL	NL	**7,800,000**
Benzo (a) anthracene	56-55-3	160	1,000	5,600	11,000	NL	**160**
Benzo (a) pyrene	50-32-8	16	1,000	1,000	1,100	NL	**16**
Benzo (b) fluoroanthene	205-99-2	160	1,000	5,600	11,000	NL	**160**
Benzo (g,h,i) perylene	191-24-2	NL	100,000	500,000	NL	NL	**100,000**
Benzo (k) fluoroanthene	207-08-9	1,600	1,000	56,000	110,000	NL	**1,000**
Bis (2-chloroethoxy) methane	111-91-1	190,000	NL	NL	NL	NL	**190,000**
Bis (2-ethylhexyl) phthalate	117-81-7	39,000	NL	NL	NL	50,000	**39,000**

Table 4-1b
RI Soil Screening Criteria - SVOCs
Wolff-Alport Chemical Company Site
Ridgewood, NY

Semi-Volatile Organic Compounds (All units: µg/kg)	CAS Number	Standards					RI Screening Criteria (4)
		Federal	New York				
		EPA RSLs for Residential Soils (1)	NYSDEC Residential Use SCOs (2)	NYSDEC Commercial Use SCOs (2)	NYSDEC Industrial Use SCOs (2)	NYSDEC CP-51 Soil Cleanup Guidance: Residential (3)	
bis-(2-chloroethyl) ether	111-44-4	230	NL	NL	NL	NL	**230**
Butylbenzylphthalate	85-68-7	290,000	NL	NL	NL	100,000	**100,000**
Caprolactam	105-60-2	31,000,000	NL	NL	NL	NL	**31,000,000**
Carbazole	86-74-8	NL	NL	NL	NL	NL	**NL**
Chrysene	218-01-9	16,000	1,000	56,000	110,000	NL	**1,000**
Dibenzo (a,h)-anthracene	53-70-3	16	330	560	1,100	NL	**16**
Dibenzofuran	132-64-9	73,000	14,000	350,000	1,000,000	NL	**14,000**
Diethylphthalate	84-66-2	51,000,000	NL	NL	NL	100,000	**100,000**
Dimethylphthalate	131-11-3	NL	NL	NL	NL	100,000	**100,000**
Di-n-butylphthalate	84-74-2	6,300,000	NL	NL	NL	100,000	**100,000**
Di-n-octylphthalate	117-84-0	630,000	NL	NL	NL	100,000	**100,000**
Fluoranthene	206-44-0	2,400,000	100,000	500,000	1,000,000	NL	**100,000**
Fluorene	86-73-7	2,400,000	100,000	500,000	1,000,000	NL	**100,000**
Hexachlorobenzene	118-74-1	210	330	6,000	12,000	410	**210**
Hexachlorobutadiene	87-68-3	1,200	NL	NL	NL	NL	**1,200**
Hexachlorocyclo-pentadiene	77-47-4	1,800	NL	NL	NL	NL	**1,800**
Hexachloroethane	67-72-1	1,800	NL	NL	NL	NL	**1,800**
Indeno (1,2,3-cd)-pyrene	193-39-5	160	500	5,600	11,000	NL	**160**
Isophorone	78-59-1	570,000	NL	NL	NL	100,000	**100,000**
Napthalene	91-20-3	3,800	100,000	500,000	1,000,000	NL	**3,800**
Nitrobenzene	98-95-3	5,100	NL	69,000	140,000	3,700	**3,700**
N-Nitroso-di-n propylamine	621-64-7	78	NL	NL	NL	NL	**78**
N-Nitrosodiphenylamine	86-30-6	110,000	NL	NL	NL	NL	**110,000**
Pentachlorophenol	87-86-5	1,000	2,400	6,700	55,000	NL	**1,000**
Phenanthrene	85-01-8	NL	100,000	500,000	1,000,000	NL	**100,000**
Phenol	108-95-2	19,000,000	100,000	500,000	1,000,000	NL	**100,000**
Pyrene	129-00-0	1,800,000	100,000	500,000	1,000,000	NL	**100,000**

Notes:

1. EPA RSL Summary Table for Resident Soil, (http://www.epa.gov/region9/superfund/prg/) November 2015.
2. NYSDEC Subpart 375-6: Table 375-6.8(b): Restricted Use Soil Cleanup Objectives, http://www.dec.ny.gov/docs/remediation_hudson_pdf/part375.pdf. December 14, 2006.
3. NYSDEC CP-51/Soil Cleanup Guidance: Table 1 - Supplemental Soil Cleanup Objectives: Residential, http://www.dec.ny.gov/docs/remediation_hudson_pdf/cpsoil.pdf. October 21, 2010.
4. The RI Soil Screening Criteria is selected from the lowest of the EPA and NYSDEC soils standards.

Acronyms:

EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
SCO - Soil Cleanup Objectives
RSL - Regional Screening Level
NL - Not listed or chemical name listed but no value available
SVOC - semi-volatile organic compound
µg/kg - micrograms per kilogram

Table 4-1c
RI Soil Screening Criteria - PCBs (Aroclors)
Wolff-Alport Chemical Company Site
Ridgewood, NY

Aroclors (All units: µg/kg)	CAS Number	Standards				RI Screening Criteria (3)
		Federal	New York			
		EPA RSLs for Residential Soils (1)	NYSDEC Residential Use SCOs (2)	NYSDEC Commercial Use SCOs (2)	NYSDEC Industrial Use SCOs (2)	
Aroclor-1016	12674-11-2	4,100	1,000	1,000	25,000	**1,000**
Aroclor-1221	11104-28-2	200	1,000	1,000	25,000	**200**
Aroclor-1232	11141-16-5	170	1,000	1,000	25,000	**170**
Aroclor-1242	53469-21-9	230	1,000	1,000	25,000	**230**
Aroclor-1248	12672-29-6	230	1,000	1,000	25,000	**230**
Aroclor-1254	11097-69-1	240	1,000	1,000	25,000	**240**
Aroclor-1260	11096-82-5	240	1,000	1,000	25,000	**240**
Aroclor-1262	37324-23-5	NL	1,000	1,000	25,000	**1,000**
Aroclor-1268	11100-14-4	NL	1,000	1,000	25,000	**1,000**

Notes:

1. EPA RSL Summary Table for Resident Soil, (http://www.epa.gov/region9/superfund/prg/) November 2015.
2. NYSDEC Subpart 375-6: Table 375-6.8(b): Restricted Use Soil Cleanup Objectives, http://www.dec.ny.gov/docs/remediation_hudson_pdf/part375.pdf. December 14, 2006.
3. The RI Soil Screening Criteria is selected from the lowest of the EPA and NYSDEC soils standards.

Acronyms:

EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
SCO - Soil Cleanup Objectives
RSL - Regional Screening Level
NL - Not listed or chemical name listed but no value available
PCB - polychlorinated biphenyl
µg/kg - micrograms per kilogram

Table 4-1d
RI Soil Screening Criteria - Pesticides
Wolff-Alport Chemical Company Site
Ridgewood, NY

Pesticides (All units: µg/kg)	CAS Number	Standards					RI Soil Screening Criteria (4)
		Federal	New York				
		EPA RSLs for Residential Soils (1)	NYSDEC Residential Use SCOs (2)	NYSDEC Commercial Use SCOs (2)	NYSDEC Industrial Use SCOs (2)	NYSDEC CP-51 Soil Cleanup Guidance: Residential (3)	
4,4'-DDD	72-54-8	2,300	2,600	92,000	180,000	NL	**2,300**
4,4'-DDE	72-55-9	2,000	1,800	62,000	120,000	NL	**1,800**
4,4'-DDT	50-29-3	1,900	1,700	47,000	94,000	NL	**1,700**
Aldrin	309-00-2	39	19	680	1,400	NL	**19**
alpha-BHC	319-84-6	86	97	3,400	6,800	NL	**86**
alpha-Chlordane*	5103-71-9	1,700	910	24,000	47,000	NL	**910**
beta-BHC	319-85-7	300	72	3,000	14,000	NL	**72**
delta-BHC	319-86-8	86	100,000	500,000	1,000,000	NL	**86**
Dieldrin	60-57-1	34	39	1,400	2,800	NL	**34**
Endosulfan*	115-29-7	470,000	NL	200,000	920,000	NL	**200,000**
Endosulfan I	959-98-8	470,000	4,800	200,000	920,000	NL	**4,800**
Endosulfan II	33213-65-9	470,000	4,800	200,000	920,000	NL	**4,800**
Endosulfan sulfate	1031-07-8	470,000	4,800	200,000	920,000	NL	**4,800**
Endrin *	72-20-8	19,000	2,200	89,000	410,000	NL	**2,200**
Endrin aldehyde *	7421-93-4	19,000	2,200	89,000	410,000	NL	**2,200**
Endrin ketone *	53494-70-5	19,000	2,200	89,000	410,000	NL	**2,200**
gamma-BHC (Lindane)	58-89-9	570	280	9,200	23,000	NL	**280**
gamma-Chlordane*	5103-74-2	1,700	NL	NL	NL	540	**540**
Heptachlor	76-44-8	130	420	15,000	29,000	NL	**130**
Heptachlor epoxide	1024-57-3	70	NL	NL	NL	77	**70**
Methoxychlor	72-43-5	320,000	NL	NL	NL	100,000	**100,000**
Toxaphene	8001-35-2	490	NL	NL	NL	NL	**490**

Notes:

1. EPA RSL Summary Table for Resident Soil, (http://www.epa.gov/region9/superfund/prg/) November 2015.
   *Screening value for chlordane is applied to alpha-chlordane and gamma-chlordane.
   *Screening value for alpha-BHC is applied to delta-BHC.
   *Screening value for endosulfan is applied to endosulfan I, endosulfan II, and endosulfan sulfate.
   *Screening value for endrin is applied to endrin aldehyde and endrin ketone.
2. NYSDEC Subpart 375-6: Table 375-6.8(b): Restricted Use Soil Cleanup Objectives, http://www.dec.ny.gov/docs/remediation_hudson_pdf/part375.pdf.
   *Screening value for chlordane is applied to alpha-chlordane and gamma-chlordane.
   *Screening value for endosulfan is applied to endosulfan I, endosulfan II, and endosulfan sulfate.
   *Screening value for endrin is applied to endrin aldehyde and endrin ketone.
3. NYSDEC CP-51/Soil Cleanup Guidance: Table 1 - Supplemental Soil Cleanup Objectives: Residential, http://www.dec.ny.gov/docs/remediation_hudson_pdf/cpsoil.pdf. October 21, 2010.
4. The RI Soil Screening Criteria is selected from the lowest of the EPA and NYSDEC soils standards.

Acronyms:

EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
SCO - Soil Cleanup Objectives
RSL - Regional Screening Level
NL - Not listed or chemical name listed but no value available
µg/kg - micrograms per kilogram

Table 4-1e
RI Soil Screening Criteria - Inorganics
Wolff-Alport Chemical Company Site
Ridgewood, NY

Inorganics (All units: mg/kg)	CAS Number	Standards					RI Screening Criteria (4)
		Federal	New York				
		EPA RSLs for Residential Soils (1)	NYSDEC Residential Use SCOs (2)	NYSDEC Commercial Use SCOs (2)	NYSDEC Industrial Use SCOs (2)	NYSDEC CP-51 Soil Cleanup Guidance: Residential (3)	
Aluminum	7429-90-5	77,000	NL	NL	NL	NL	**77,000**
Antimony	7440-36-0	31	NL	NL	NL	NL	**31**
Arsenic	7440-38-2	0.68	16	16	16	NL	**0.68**
Barium	7440-39-3	15,000	350	400	10,000	NL	**350**
Beryllium	7440-41-7	160	14	590	2,700	NL	**14**
Cadmium	7440-43-9	71	2.5	9.3	60	NL	**2.5**
Calcium	7440-70-2	NL	NL	NL	NL	NL	**NL**
Chromium*	7440-47-3	NL	NL	NL	NL	NL	**NL**
Cobalt	7440-48-4	23	NL	NL	NL	30	**23**
Copper	7440-50-8	3,100	270	270	10,000	NL	**270**
Cyanide	57-12-5	2.7	27	27	10,000	NL	**2.7**
Iron	7439-89-6	55,000	NL	NL	NL	2000	**2,000**
Lead	7439-92-1	400	400	1,000	3,900	NL	**400**
Magnesium	7439-95-4	NL	NL	NL	NL	NL	**NL**
Manganese	7439-96-5	NL	2000	10,000	10,000	NL	**2,000**
Mercury	7439-97-6	11	0.81	2.8	5.7	NL	**0.81**
Nickel	7440-02-0	1,500	140	310	10000	NL	**140**
Potassium	7440-09-7	NL	NL	NL	NL	NL	**NL**
Selenium	7782-49-2	390	36	1,500	6,800	NL	**36**
Silver	7440-22-4	390	36	1,500	6,800	NL	**36**
Sodium	7440-23-5	NL	NL	NL	NL	NL	**NL**
Thallium	7440-28-0	0.78	NL	NL	NL	NL	**0.78**
Vanadium	7440-62-2	390	NL	NL	NL	100	**100**
Zinc	7440-66-6	23,000	2200	10,000	10,000	NL	**2,200**

Notes:
1. EPA RSL Summary Table for Resident Soil, (http://www.epa.gov/region9/superfund/prg/) November 2015.
2. NYSDEC Subpart 375-6: Table 375-6.8(b): Restricted Use Soil Cleanup Objectives,
3. NYSDEC CP-51/Soil Cleanup Guidance: Table 1 - Supplemental Soil Cleanup Objectives: Residential, http://www.dec.ny.gov/docs/remediation_hudson_pdf/cpsoil.pdf. October 21, 2010.
4. The RI Soil Screening Criteria is selected from the lowest of the EPA and NYSDEC soils standards.

*Chromium based on EPA MCL for total chromium.

Acronyms:
EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
SCO - Soil Cleanup Objectives
RSL - Regional Screening Level
NL - Not listed or chemical name listed but no value available
mg/kg - miiligrams per kilogram

Table 4-2a
RI Groundwater Screening Criteria - VOCs
Wolff-Alport Chemical Company Site
Ridgewood, NY

Volatile Organic Compounds (All units: µg/L)	CAS Number	Standards			RI Screening Criteria (4)
		Federal		New York	
		EPA National Primary Drinking Water Standards (1)	EPA RSLs for Tap Water (2)	NYSDEC Standards and Guidance Values for Class GA Groundwater (3)	
1,1,1-Trichloroethane	71-55-6	200	8,000	5	**5**
1,1,2,2-Tetrachloroethane	79-34-5	NL	0.076	5	**0.076**
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NL	55,000	5	**5**
1,1,2-Trichloroethane	79-00-5	5	0.280	1	**0.28**
1,1-Dichloroethane	75-34-3	NL	2.8	5	**2.8**
1,1-Dicholoroethene	75-35-4	7	280	5	**5**
1,2,3-Trichlorobenzene	87-61-6	NL	7	5	**5**
1,2,4-Trichlorobenzene	120-82-1	70	1.2	5	**1.2**
1,2-Dibromo-3-chloropropane	96-12-8	0	0.00033	0.04	**0.00033**
1,2-Dibromoethane	106-93-4	0	0.00750	0.0006	**0.0006**
1,2-Dichlorobenzene	95-50-1	600	300	3	**3**
1,2-Dichloroethane	107-06-2	5	0.17	0.6	**0.17**
1,2-Dichloropropane	78-87-5	5	0.44	1	**0.44**
1,3-Dichlorobenzene	541-73-1	NL	NL	3	**3**
1,4-Dichlorobenzene	106-46-7	75	0.48	3	**0.48**
2-Butanone	78-93-3	NL	5,600	50	**50**
2-Hexanone	591-78-6	NL	38	50	**38**
4-Methyl-2-pentanone	108-10-1	NL	6,300	NL	**6,300**
Acetone	67-64-1	NL	14,000	50	**50**
Benzene	71-43-2	5	0.46	1	**0.46**
Bromochloromethane	74-97-5	NL	83	5	**5**
Bromodichloromethane	75-27-4	80	0.13	50	**0.13**
Bromoform	75-25-2	80	3.3	50	**3.3**
Bromomethane	74-83-9	NL	8	5	**5**
Carbon Disulfide	75-15-0	NL	810	60	**60**
Carbon tetrachloride	56-23-5	5	0.46	5	**0.46**
Chlorobenzene	108-90-7	100	78	5	**5**
Chloroethane	75-00-3	NL	21,000	5	**5**
Chloroform	67-66-3	80	0.22	7	**0.22**
Chloromethane	74-87-3	NL	190	5	**5**
cis-1,2-Dichloroethene	156-59-2	70	36	5	**5**
cis-1,3-Dichloropropene	10061-01-5	NL	NL	0.4	**0.4**
Cyclohexane	110-82-7	NL	13,000	NL	**13,000**
Dibromochloromethane	124-48-1	80	0.87	50	**0.87**
Dichlorodifluoromethane	75-71-8	NL	200	5	**5**
Ethylbenzene	100-41-4	700	2	5	**1.5**
Isopropylbenzene	98-82-8	NL	450	5	**5**
m, p-Xylene *	1330-20-7	10,000	190	5	**5**
Methyl acetate	79-20-9	NL	20,000	NL	**20,000**
Methyl tert-butyl ether	1634-04-4	NL	14	10	**10**
Methylcyclohexane	108-87-2	NL	NL	NL	**NL**
Methylene chloride	75-09-2	5	11	5	**5**
o-Xylene *	1330-20-7	10,000	190	5	**5**
Styrene	100-42-5	100	1,200	5	**5**
Tetrachloroethene	127-18-4	5	11	5	**5**
Toluene	108-88-3	1,000	1,100	5	**5**
trans-1,2-Dichloroethene	156-60-5	100	360	5	**5**
trans-1,3-Dichloropropene	10061-02-6	NL	NL	0.4	**0.4**
Trichloroethene	79-01-6	5	0.49	5	**0.49**
Trichlorofluoromethane	75-69-4	NL	5,200	5	**5**
Vinyl Chloride	75-01-4	2	0.019	2	**0.019**

Notes:

1. EPA National Primary Drinking Water Standards (web page http://water.epa.gov/drink/contaminants/index.cfm#List), EPA 816-F-09-0004, May 2009.
2. EPA RSL Summary Table for Tap Water, (http://www.epa.gov/region9/superfund/prg/) November 2015.
3. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.
   Class Type: Protection for Source of Drinking Water - H(WS)
   Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
   Includes revisions in Part 703 effective February 16, 2008.
4. The RI Groundwater Screening Criteria is selected from the lowest of the EPA and NYSDEC groundwater standards.

* Xylene (total) was used for o-xylene and m,p-xylene criteria.

Acronyms:

EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
RSL - regional screening level
VOC - volatile organic compound
µg/L - micrograms per liter
NL - Not listed or chemical name listed but no value available

Table 4-2b
RI Groundwater Screening Criteria - SVOCs
Wolff-Alport Chemical Company Site
Ridgewood, NY

Semi-Volatile Organic Compounds (All units: µg/L)	CAS Number	Standards			RI Screening Criteria (4)
		Federal		New York	
		EPA National Primary Drinking Water Standards (1)	EPA RSLs for Tap Water (2)	NYSDEC Standards and Guidance Values for Class GA Groundwater (3)	
1,1'-Biphenyl	92-52-4	NL	0.83	5	**0.83**
1,2,4,5-Tetrachlorobenzene	95-94-3	NL	1.7	5	**1.7**
1,4-Dioxane*	123-91-1	NL	0.46	NL	**0.46**
2,2'-Oxybis (1-chloropropane)	108-60-1	NL	710	5	**5**
2,3,4,6-Tetrachlorophenol	58-90-2	NL	240	NL	**240**
2,4,5-Trichlorophenol	95-95-4	NL	1,200	NL	**1,200**
2,4,6-Trichlorophenol	88-06-2	NL	4.1	NL	**4.1**
2,4-Dichlorophenol	120-83-2	NL	46	5	**5**
2,4-Dimethylphenol	105-67-9	NL	360	50	**50**
2,4-Dinitrophenol	51-28-5	NL	39	10	**10**
2,4-Dinitrotoluene	121-14-2	NL	0.24	5	**0.24**
2,6-Dinitrotoluene	606-20-2	NL	0.049	5	**0.049**
2-Chloronaphthalene	91-58-7	NL	750	NL	**750**
2-Chlorophenol	95-57-8	NL	91	NL	**91**
2-Methylnaphthalene	91-57-6	NL	36	NL	**36**
2-Methylphenol	95-48-7	NL	930	NL	**930**
2-Nitroaniline	88-74-4	NL	190	5	**5**
2-Nitrophenol	88-75-5	NL	NL	NL	**NL**
3,3'-Dichlorobenzidine	91-94-1	NL	0.13	5	**0.13**
3-Nitroaniline	99-09-2	NL	NL	5	**5**
4,6-Dinitro-2-methylphenol	534-52-1	NL	1.5	NL	**1.5**
4-Bromophenyl-phenylether	101-55-3	NL	NL	NL	**NL**
4-Chloro-3-methylphenol	59-50-7	NL	1,400	NL	**1,400**
4-Chloroaniline	106-47-8	NL	0.37	5	**0.37**
4-Chlorophenyl-phenyl ether	7005-72-3	NL	NL	NL	**NL**
4-Methylphenol	106-44-5	NL	1,900	NL	**1,900**
4-Nitroaniline	100-01-6	NL	3.8	5	**3.8**
4-Nitrophenol	100-02-7	NL	NL	NL	**NL**
Acenaphthene	83-32-9	NL	530	NL	**530**
Acenaphthylene	208-96-8	NL	NL	NL	**NL**
Acetophenone	98-86-2	NL	1,900	NL	**1,900**
Anthracene	120-12-7	NL	1,800	50	**50**
Atrazine	1912-24-9	3	0.3	7.5	**0.3**
Benzaldehyde	100-52-7	NL	1,900	NL	**1,900**
Benzo (a) anthracene	56-55-3	NL	0.012	0.002	**0.002**
Benzo (a) pyrene	50-32-8	0.2	0.0034	NL	**0.0034**
Benzo (b) fluoroanthene	205-99-2	NL	0.034	0.002	**0.002**
Benzo (g,h,i) perylene	191-24-2	NL	NL	NL	**NL**
Benzo (k) fluoroanthene	207-08-9	NL	0.34	0.002	**0.002**
Bis (2-chloroethoxy) methane	111-91-1	NL	59	5	**5**
Bis (2-ethylhexyl) phthalate	117-81-7	6	5.6	5	**5**
Bis (2-chloroethyl) ether	111-44-4	NL	0.014	1	**0.014**
Butylbenzylphthalate	85-68-7	NL	16	50	**16**
Caprolactam	105-60-2	NL	9,900	NL	**9,900**
Carbazole	86-74-8	NL	NL	NL	**NL**
Chrysene	218-01-9	NL	3.4	0.002	**0.002**
Dibenzo (a,h) anthracene	53-70-3	NL	0.0034	NL	**0.0034**
Dibenzofuran	132-64-9	NL	7.9	NL	**7.9**
Diethylphthalate	84-66-2	NL	15,000	50	**50**
Dimethylphthalate	131-11-3	NL	NL	50	**50**
Di-n-butylphthalate	84-74-2	NL	900	50	**50**
Di-n-octylphthalate	117-84-0	NL	200	50	**50**
Fluoranthene	206-44-0	NL	800	50	**50**

Table 4-2b
RI Groundwater Screening Criteria - SVOCs
Wolff-Alport Chemical Company Site
Ridgewood, NY

Semi-Volatile Organic Compounds (All units: µg/L)	CAS Number	Standards			RI Screening Criteria (4)
		Federal		New York	
		EPA National Primary Drinking Water Standards (1)	EPA RSLs for Tap Water (2)	NYSDEC Standards and Guidance Values for Class GA Groundwater (3)	
Fluorene	86-73-7	NL	290	50	**50**
Hexachlorobenzene	118-74-1	1	0.0098	0.04	**0.0098**
Hexachlorobutadiene	87-68-3	NL	0.14	0.5	**0.14**
Hexachlorocyclo-pentadiene	77-47-4	50	0.41	5	**0.41**
Hexachloroethane	67-72-1	NL	0.33	5	**0.33**
Indeno (1,2,3-cd) pyrene	193-39-5	NL	0.034	0.002	**0.002**
Isophorone	78-59-1	NL	78	50	**50**
Naphthalene	91-20-3	NL	0.17	NL	**0.17**
Nitrobenzene	98-95-3	NL	0.14	0.4	**0.14**
N-Nitrosodi-n propylamine	621-64-7	NL	0.011	NL	**0.011**
N-Nitrosodiphenylamine	86-30-6	NL	12	50	**12**
Pentachlorophenol	87-86-5	1	0.041	2	**0.041**
Phenanthrene	85-01-8	NL	NL	50	**50**
Phenol	108-95-2	NL	5,800	2	**2**
Pyrene	129-00-0	NL	120	50	**50**

Notes:

1. EPA National Primary Drinking Water Standards (web page http://water.epa.gov/drink/contaminants/index.cfm#List), EPA 816-F-09-0004, May 2009.
2. EPA RSL Summary Table for Tap Water, (http://www.epa.gov/region9/superfund/prg/) November 2015.
3. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.
   Class Type: Protection for Source of Drinking Water - H(WS)
   Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
   Includes revisions in Part 703 effective February 16, 2008.
4. The RI Groundwater Screening Criteria is selected from the lowest of the EPA and NYSDEC groundwater standards.

* 1,4-Dioxane will be requested for SVOC analysis.

Acronyms:

EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
RSL - regional screening level
SVOC - volatile organic compound
µg/L - micrograms per liter
NL - Not listed or chemical name listed but no value available

Table 4-2c
RI Groundwater Screening Criteria - PCBs (Aroclors)
Wolff-Alport Chemical Company Site
Ridgewood, NY

Aroclors (All units: µg/L)	CAS Number	Standards			RI Screening Criteria (4)
		Federal		New York	
		EPA National Primary Drinking Water Standards (1)	EPA RSLs for Tap Water (2)	NYSDEC Standards and Guidance Values for Class GA Groundwater (3)*	
Aroclor-1016	12674-11-2	0.5	0.22	0.09	**0.09**
Aroclor-1221	11104-28-2	0.5	0.0047	0.09	**0.0047**
Aroclor-1232	11141-16-5	0.5	0.0047	0.09	**0.0047**
Aroclor-1242	53469-21-9	0.5	0.0078	0.09	**0.0078**
Aroclor-1248	12672-29-6	0.5	0.0078	0.09	**0.0078**
Aroclor-1254	11097-69-1	0.5	0.0078	0.09	**0.0078**
Aroclor-1260	11096-82-5	0.5	0.0078	0.09	**0.0078**
Aroclor-1262	37324-23-5	0.5	NL	0.09	**0.09**
Aroclor-1268	11100-14-4	0.5	NL	0.09	**0.09**

Notes:

1. EPA National Primary Drinking Water Standards (web page http://water.epa.gov/drink/contaminants/index.cfm#List), EPA 816-F-09-0004, May 2009.
2. EPA RSL Summary Table for Tap Water, (http://www.epa.gov/region9/superfund/prg/) November 2015.
3. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.
   Class Type: Protection for Source of Drinking Water - H(WS)
   Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
   Includes revisions in Part 703 effective February 16, 2008.
   * Applies to the sum of all polychlorinated biphenyls.
4. The RI Groundwater Screening Criteria is selected from the lowest of the EPA and NYSDEC groundwater standards.

Acronyms:

EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
RSL - regional screening level
PCB - polychlorinated biphenyl
µg/L - micrograms per liter
NL - Not listed or chemical name listed but no value available

Table 4-2d
RI Groundwater Screening Criteria - Pesticides
Wolff-Alport Chemical Company Site
Ridgewood, NY

Aroclors (All units: µg/L)	CAS Number	Standards			RI Screening Criteria (4)
		Federal		New York	
		EPA National Primary Drinking Water Standards (1)	EPA RSLs for Tap Water (2)	NYSDEC Standards and Guidance Values for Class GA Groundwater (3)	
4,4'-DDD	72-54-8	NL	0.032	0.3	**0.032**
4,4'-DDE	72-55-9	NL	0.046	0.2	**0.046**
4,4'-DDT	50-29-3	NL	0.23	0.2	**0.2**
Aldrin	309-00-2	NL	0.00092	NL	**0.00092**
alpha-BHC	319-84-6	NL	0.0072	0.01	**0.0072**
alpha-Chlordane	5103-71-9	2	NL	0.05	**0.05**
beta-BHC	319-85-7	NL	0.025	0.04	**0.025**
delta-BHC	319-86-8	NL	NL	0.04	**0.04**
Dieldrin	60-57-1	NL	0.0018	0.004	**0.0018**
Endosulfan I	959-98-8	NL	NL	NL	**NL**
Endosulfan II	33213-65-9	NL	NL	NL	**NL**
Endosulfan sulfate	1031-07-8	NL	NL	NL	**NL**
Endrin	72-20-8	2	2.3	NL	**2**
Endrin aldehyde	7421-93-4	NL	NL	5	**5**
Endrin ketone	53494-70-5	NL	NL	5	**5**
gamma-BHC (Lindane)	58-89-9	0.2	0.042	0.05	**0.042**
gamma-Chlordane*	5103-74-2	2	NL	0.05	**0.05**
Heptachlor	76-44-8	0.4	0.0014	0.04	**0.0014**
Heptachlor epoxide	1024-57-3	0.2	0.0014	0.03	**0.0014**
Methoxychlor	72-43-5	40	37	35	**35**
Toxaphene	8001-35-2	3	0.071	0.06	**0.06**

Notes:

1. EPA National Primary Drinking Water Standards (web page http://water.epa.gov/drink/contaminants/index.cfm#List), EPA 816-F-09-0004, May 2009.
2. EPA RSL Summary Table for Tap Water, (http://www.epa.gov/region9/superfund/prg/) November 2015.
3. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.
   Class Type: Protection for Source of Drinking Water - H(WS)
   Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
   Includes revisions in Part 703 effective February 16, 2008.
4. The RI Groundwater Screening Criteria is selected from the lowest of the EPA and NYSDEC groundwater standards.

Acronyms:

EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
RSL - regional screening level
µg/L - micrograms per liter
NL - Not listed or chemical name listed but no value available

Table 4-2e
RI Groundwater Screening Criteria - Inorganics
Wolff-Alport Chemical Company Site
Ridgewood, NY

Inorganics (All units: µg/L)	CAS Number	Standards			RI Screening Criteria (4)
		Federal		New York	
		EPA National Primary Drinking Water Standards (1)	EPA RSLs for Tap Water (2)	NYSDEC Standards and Guidance Values for Class GA Groundwater (3)	
Aluminum	7429-90-5	NL	20,000	NL	**20,000**
Antimony	7440-36-0	6	7.8	3	**3**
Arsenic	7440-38-2	10	0.052	25	**0.052**
Barium	7440-39-3	2,000	3,800	1,000	**1,000**
Beryllium	7440-41-7	4	25	3	**3**
Cadmium	7440-43-9	5	NL	5	**5**
Calcium	7440-70-2	NL	NL	NL	**NL**
Chromium	7440-47-3	100	NL	50	**50**
Cobalt	7440-48-4	NL	6	NL	**6**
Copper	7440-50-8	1,300	800	200	**200**
Cyanide	57-12-5	200	1.5	200	**1.5**
Iron	7439-89-6	NL	14,000	300	**300**
Lead	7439-92-1	15	15	25	**15**
Magnesium	7439-95-4	NL	NL	35,000	**35,000**
Manganese	7439-96-5	NL	NL	300	**300**
Mercury	7439-97-6	2	0.63	0.7	**0.63**
Nickel	7440-02-0	NL	390	100	**100**
Potassium	7440-09-7	NL	NL	NL	**NL**
Selenium	7782-49-2	50	100	10	**10**
Silver	7440-22-4	NL	94	50	**50**
Sodium	7440-23-5	NL	NL	20,000	**20,000**
Thallium	7440-28-0	2	0.2	0.5	**0.2**
Vanadium	7440-62-2	NL	86	NL	**86**
Zinc	7440-66-6	NL	6,000	2,000	**2,000**

Notes:

1. EPA National Primary Drinking Water Standards (web page http://water.epa.gov/drink/contaminants/index.cfm#List), EPA 816-F-09-0004, May 2009.
2. EPA RSL Summary Table for Tap Water, (http://www.epa.gov/region9/superfund/prg/) November 2015.
3. NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.
   Class Type: Protection for Source of Drinking Water - H(WS)
   Includes April 2000 and June 2004 Addendum values. (http://www.dec.ny.gov/regulations/2652.html)
   Includes revisions in Part 703 effective February 16, 2008.
4. The RI Groundwater Screening Criteria is selected from the lowest of the EPA and NYSDEC groundwater standards.

Acronyms:

EPA - United States Environmental Protection Agency
CAS - Chemical abstract service
NYSDEC - New York State Department of Environmental Conservation
RSL - regional screening level
µg/L - micrograms per liter
NL - Not listed or chemical name listed but no value available

Table 4-3
RI Screening Criteria - Radiological Analyses
Wolff-Alport Chemical Company Site
Ridgewood, NY

Radionuclide	RI Screening Criteria	Unit	Basis
Solids[1]			
Ra-226	**0.919**	pCi/g	based on 95% UTL from the soil background dataset
Th-232	**1.22**	pCi/g	based on 95% UTL from the soil background dataset
Sediments (creek sediments)			
Ra-226	**0.797**	pCi/g	based on 95% UTL from the sediment background dataset
Th-228	**0.759**	pCi/g	based on 95% UTL from the sediment background dataset
Th-230	**0.697**	pCi/g	based on 95% UTL from the sediment background dataset
Th-232	**0.637**	pCi/g	based on 95% UTL from the sediment background dataset, this value is the lower between the two datasets generated from gamma spectroscopy and isotopic
U-234	**1.279**	pCi/g	based on 95% UTL from the sediment background dataset, excluding outlier
U-235	**0.117**	pCi/g	based on minimum detected concentration from the sediment background dataset since only two results in the dataset were detected
U-238	**1.061**	pCi/g	based on 95% UTL from the sediment background dataset
Aqueous[2]			
Ra-226/Th-232	**5**	pCi/L	Combined Ra-226 and Ra-228 can not exceed 5 pCi/L. In this case the Th-232 is used as a surrogate measure of the Ra-228 likely to be present.
Radon/Thoron			
Radon-Indoors - Basement	**1.2**	pCi/L	Development of screening criteria is based on the 95% UCL calculated from NYSDOH on-going radon data collection study[3].
Radon-Indoors First Floor	**0.5**	pCi/L	Development of screening criteria is based on the 95% UCL calculated from NYSDOH on-going radon data collection study[3].
Radon-Outdoors	**0.1**	pCi/L	Calculated from Weston 2013 Report[4]
Thoron-Outdoors	**0.1**	pCi/L	Calculated from Weston 2013 Report[4] - no indoor data developed so use outdoor data as conservative screening measure
Direct Exposure Rate			
Ground and 3 feet readings	**13**	uR/hr	Upper range of background readings determined by Weston[4]

Notes:
1. Solids will include soils and other materials sampled excluding creek sediments, groundwater, and air samples.
2. 40 CFR.141.15, Maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity in community water system
3. https://health.data.ny.gov/Health/Radon-Test-Results-By-Town-Beginning-1987/hbu9-xsrx
4. - Weston, Perimeter Survey Report, Wolff-Alport Site (Draft September 2013)

Acronyms:

RI - remedial investigation
UTL - upper tolerance limit
UCL - upper confidence limit
pCi/g - picoCuries per gram
pCi/L - picoCuries per liter
New York State Department of Health
Ra - radium
Th - thorium
U - uranium

Table 4-4
Background Gamma Scan Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Sample location	Description	Material	Gamma Counts (cpm)
BKSB-01	Collected in grassy area along curb of Central Avenue	Grass/Dirt*	3,239
BKSB-02	Collected in grassy area in southwest corner of Irving Square Park	Grass/Dirt*	3,418
BKSB-04	Collected in grassy area in northeast corner of Irving Square Park	Grass/Dirt*	3,669
BKSB-04	Collected on concrete sidewalk in Irving Square Park	Concrete	2,540
BKSB-05	Collected in grassy area along curb of Cody Avenue	Grass/Dirt*	3,239
BKSB-06	Collected in grassy area in Knollwood Park Cemetery	Grass/Dirt*	3,497
BKSB-06	Collected in grassy area in Knollwood Park Cemetery	Grass/Dirt#	8,133
BKSB-06	Collected on access road in Knollwood Park Cemetery	Asphalt	5,528
BKSB-07	Collected in grassy area in Knollwood Park Cemetery	Grass/Dirt*	3,512
BKSB-08	Collected in grassy area in Knollwood Park Cemetery	Grass/Dirt*	3,950

Notes:

The readings were collected at the groundwater surface at each background soil boring location prior to boring advancement.

* An average of the collimated grass/dirt results was used for comparison.

This reading was collected using an uncollimated detector.

Table 4-5
Soil Chemical Analytical Results - Background
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample Location	BKSB-01		BKSB-02		BKSB-03		BKSB-04		BKSB-04		BKSB-04		BKSB-04		BKSB-04		BKSB-05		BKSB-06		BKSB-06		BKSB-06	
	Sample ID	BKSB-01-00-02		BKSB-02-00-02		BKSB-03-00-01		BKSB-04-00-02		BKSB-04-04-06		BKSB-04-08-10		BKSB-04-18-20		BKSB-04-23-25		BKSB-05-00-01		BKSB-06-00-02		BKSB-06-04-06		BKSB-06-08-10	
	Parent Sample ID																								
	Sample Date	12/16/2015		12/16/2015		12/16/2015		12/22/2015		12/22/2015		12/22/2015		12/22/2015		12/22/2015		12/16/2015		10/30/2015		10/30/2015		10/30/2015	
	Depth	0-2 feet		0-2 feet		0-1 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		23-25 feet		0-1 feet		0-2 feet		4-6 feet		8-10 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Volatile Organic Compounds (µg/kg)																									
1,1,1-Trichloroethane	100000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,1,2,2-Tetrachloroethane	600	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,1,2-Trichloro-1,2,2-trifluoroethane	100000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,1,2-Trichloroethane	1100	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,1-Dichloroethane	3600	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,1-Dichloroethene	100000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,2,3-Trichlorobenzene	63000	5	U	6.2	U	5.4	UJ	4.8	U	5.1	U	5.4	U	5	UJ	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,2,4-Trichlorobenzene	24000	5	U	6.2	U	5.4	UJ	4.8	U	5.1	U	5.4	U	5	UJ	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,2-Dibromo-3-chloropropane	5.3	5	U	6.2	U	5.4	UJ	4.8	U	5.1	U	5.4	U	5	UJ	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,2-Dibromoethane	36	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,2-Dichlorobenzene	100000	5	U	6.2	U	5.4	UJ	4.8	U	5.1	U	5.4	U	5	UJ	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,2-Dichloroethane	460	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,2-Dichloropropane	1000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,3-Dichlorobenzene	17000	5	U	6.2	U	5.4	UJ	4.8	U	5.1	U	5.4	U	5	UJ	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,4-Dichlorobenzene	2600	5	U	6.2	U	5.4	UJ	4.8	U	5.1	U	5.4	U	5	UJ	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
1,4-Dioxane	5300	50	R	62	R	54	R	48	R	51	R	54	R	50	R	42	R	54	R	49	U	55	U	53	U
2-Butanone	100000	10	U	12	U	11	U	9.6	U	10	U	11	U	10	U	8.3	U	11	U	9.7	U	11	U	11	U
2-Hexanone	200000	10	U	12	U	11	U	9.6	U	10	U	11	U	10	U	8.3	U	11	U	9.7	U	11	U	11	U
4-Methyl-2-pentanone	33000000	10	U	12	U	11	U	9.6	U	10	U	11	U	10	U	8.3	U	11	U	9.7	U	11	U	11	U
Acetone	100000	20	U	25	U	22	U	19	U	8.2	J	22	U	15	J	17	U	22	U	90		22	UJ	21	UJ
Benzene	1200	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Bromochloromethane	150000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Bromodichloromethane	290	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Bromoform	19000	5	U	6.2	U	5.4	UJ	4.8	UJ	5.1	U	5.4	U	5	UJ	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Bromomethane	6800	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Carbon Disulfide	100000	5	UJ	6.2	UJ	5.4	UJ	4.8	UJ	5.1	UJ	5.4	UJ	5	UJ	4.2	UJ	5.4	UJ	4.9	U	5.5	U	5.3	U
Carbon Tetrachloride	650	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Chlorobenzene	100000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Chloroethane	14000000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Chloroform	320	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Chloromethane	110000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
cis-1,2-Dichloroethene	59000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
cis-1,3-Dichloropropene	NL	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Cyclohexane	6500000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Dibromochloromethane	8300	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Dichlorodifluoromethane	87000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Ethylbenzene	5800	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Isopropylbenzene	100000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
m,p-Xylene	100000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Methyl acetate	78000000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Methyl tert-Butyl Ether	47000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Methylcyclohexane	NL	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Methylene Chloride	51000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
o-Xylene	100000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Styrene	6000000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Tetrachloroethene	5500	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Toluene	100000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
trans-1,2-Dichloroethene	100000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U

Table 4-5
Soil Chemical Analytical Results - Background
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample Location	BKSB-01		BKSB-02		BKSB-03		BKSB-04		BKSB-04		BKSB-04		BKSB-04		BKSB-04		BKSB-05		BKSB-06		BKSB-06		BKSB-06	
	Sample ID	BKSB-01-00-02		BKSB-02-00-02		BKSB-03-00-01		BKSB-04-00-02		BKSB-04-04-06		BKSB-04-08-10		BKSB-04-18-20		BKSB-04-23-25		BKSB-05-00-01		BKSB-06-00-02		BKSB-06-04-06		BKSB-06-08-10	
	Parent Sample ID																								
	Sample Date	12/16/2015		12/16/2015		12/16/2015		12/22/2015		12/22/2015		12/22/2015		12/22/2015		12/22/2015		12/16/2015		10/30/2015		10/30/2015		10/30/2015	
	Depth	0-2 feet		0-2 feet		0-1 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		23-25 feet		0-1 feet		0-2 feet		4-6 feet		8-10 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Volatile Organic Compounds (µg/kg) (continued)																									
trans-1,3-Dichloropropene	NL	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Trichloroethene	940	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Trichlorofluoromethane	23000000	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Vinyl Chloride	59	5	U	6.2	U	5.4	U	4.8	U	5.1	U	5.4	U	5	U	4.2	U	5.4	U	4.9	U	5.5	U	5.3	U
Semivolatile Organic Compounds (µg/kg)																									
1,1'-Biphenyl	47000	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
1,2,4,5-Tetrachlorobenzene	23000	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
2,2'-Oxybis(1-chloropropane)	3100000	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
2,3,4,6-Tetrachlorophenol	1900000	150	U	150	U	160	U	150	UJ	70	UJ	71	UJ	73	UJ	73	UJ	150	U	75	UJ	73	UJ	81	UJ
2,4,5-Trichlorophenol	100000	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
2,4,6-Trichlorophenol	49000	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	UJ	36	UJ	40	UJ
2,4-Dichlorophenol	100000	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
2,4-Dimethylphenol	1300000	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
2,4-Dinitrophenol	100000	370	UJ	380	UJ	410	UJ	380	R	180	R	180	R	190	R	190	R	390	UJ	190	UJ	180	UJ	210	UJ
2,4-Dinitrotoluene	1700	150	U	150	U	160	U	150	UJ	70	UJ	71	UJ	73	UJ	73	UJ	150	U	75	U	73	U	81	U
2,6-Dinitrotoluene	360	150	U	150	U	160	U	150	U	70	U	71	U	73	U	73	U	150	U	75	U	73	U	81	U
2-Chloronaphthalene	4800000	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
2-Chlorophenol	100000	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
2-Methylnaphthalene	410	15	UJ	15	U	16	U	15	U	7	U	7.1	U	7.3	U	7.3	U	28		7.5	U	7.3	U	8.1	U
2-Methylphenol	100000	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
2-Nitroaniline	630000	150	U	150	U	160	U	150	U	70	U	71	U	73	U	73	U	150	U	75	U	73	U	81	U
2-Nitrophenol	NL	150	UJ	150	U	160	U	150	U	70	U	71	U	73	U	73	U	150	U	75	U	73	U	81	U
3,3'-Dichlorobenzidine	1200	370	UJ	380	U	410	U	380	U	180	U	180	U	190	U	190	U	390	U	190	U	180	U	210	U
3-Nitroaniline	NL	150	UJ	150	U	160	U	150	U	70	U	71	U	73	U	73	U	150	U	75	U	73	U	81	U
4,6-Dinitro-2-methylphenol	5100	370	UJ	380	UJ	410	UJ	380	R	180	R	180	R	190	R	190	R	390	UJ	190	UJ	180	UJ	210	UJ
4-Bromophenyl-phenylether	NL	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
4-Chloro-3-methylphenol	6300000	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	UJ	36	UJ	40	UJ
4-Chloroaniline	2700	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	UJ	75	U	37	U	36	U	40	U
4-Chlorophenyl-phenylether	NL	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
4-Methylphenol	34000	150	U	150	U	160	U	150	U	70	U	71	U	73	U	73	U	150	U	75	U	73	U	81	U
4-Nitroaniline	27000	150	UJ	150	U	160	U	150	U	70	U	71	U	73	U	73	U	150	U	75	U	73	U	81	U
4-Nitrophenol	NL	370	U	380	U	410	U	380	U	180	U	180	U	190	U	190	U	390	U	190	U	180	U	210	U
Acenaphthene	100000	32		15	U	13	J	15	U	7	U	7.1	U	7.3	U	7.3	U	46		7.5	U	7.3	U	8.1	U
Acenaphthylene	100000	45	J	15	U	10	J	15	U	7	U	7.1	U	7.3	U	7.3	U	74		4.5	J	7.3	U	8.1	U
Acetophenone	7800000	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Anthracene	100000	120	J	9.2	J	20		20		7	U	7.1	U	7.3	U	7.3	U	180		16		7.3	U	8.1	U
Atrazine	2400	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Benzaldehyde	7800000	72	UJ	74	UJ	80	UJ	75	U	35	U	35	U	36	U	36	U	75	UJ	37	U	36	U	40	U
Benzo(a)anthracene	160	**520**	J	45		97		92		7	U	7.1	U	7.3	U	7.3	U	**670**		120		7.3	U	8.1	U
Benzo(a)pyrene	16	**580**	J	**52**		**130**		**110**		7	U	7.1	U	7.3	U	7.3	U	**720**		**150**	J	7.3	UJ	8.1	UJ
Benzo(b)fluoranthene	160	**720**	J	67		**220**		**170**		7	U	7.1	U	7.3	U	7.3	U	**1100**		**210**		7.3	U	8.1	U
Benzo(g,h,i)perylene	100000	340	J	34		78		31	J	7	UJ	7.1	UJ	7.3	UJ	7.3	UJ	240		48		7.3	UJ	8.1	U
Benzo(k)fluoranthene	1000	270	J	27		61		58		7	U	7.1	U	7.3	U	7.3	U	180		84	J	7.3	UJ	8.1	UJ
Bis(2-chloroethoxy)methane	190000	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Bis(2-chloroethyl)ether	230	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Bis(2-ethylhexyl)phthalate	39000	150		180		21000		410		36		35	U	36	U	270		260		26	J	21	J	40	UJ
Butylbenzylphthalate	100000	150	U	150	U	150	J	150	U	37	J	71	U	73	U	73	U	74	J	75	UJ	73	UJ	81	UJ
Caprolactam	31000000	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U

Table 4-5
Soil Chemical Analytical Results - Background
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample Location	BKSB-01		BKSB-02		BKSB-03		BKSB-04		BKSB-04		BKSB-04		BKSB-04		BKSB-04		BKSB-05		BKSB-06		BKSB-06		BKSB-06	
	Sample ID	BKSB-01-00-02		BKSB-02-00-02		BKSB-03-00-01		BKSB-04-00-02		BKSB-04-04-06		BKSB-04-08-10		BKSB-04-18-20		BKSB-04-23-25		BKSB-05-00-01		BKSB-06-00-02		BKSB-06-04-06		BKSB-06-08-10	
	Parent Sample ID																								
	Sample Date	12/16/2015		12/16/2015		12/16/2015		12/22/2015		12/22/2015		12/22/2015		12/22/2015		12/22/2015		12/16/2015		10/30/2015		10/30/2015		10/30/2015	
	Depth	0-2 feet		0-2 feet		0-1 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		23-25 feet		0-1 feet		0-2 feet		4-6 feet		8-10 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Semivolatile Organic Compounds (µg/kg) (continued)																									
Carbazole	NL	54	J	74	U	80	U	75	U	35	U	35	U	36	U	36	U	63	J	37	U	36	U	40	U
Chrysene	1000	550		52		130		100		7	U	7.1	U	7.3	U	7.3	U	680		140		7.3	U	8.1	U
Dibenzo(a,h)anthracene	16	15	U	15	U	16	U	15	U	7	U	7.1	U	7.3	U	7.3	U	15	U	7.5	U	7.3	U	8.1	U
Dibenzofuran	14000	72	UJ	74	UJ	80	UJ	75	U	35	U	35	U	36	U	36	U	24	J	37	U	36	U	40	U
Diethylphthalate	100000	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Dimethylphthalate	100000	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Di-n-butylphthalate	100000	72	U	74	U	900		75	U	20	J	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Di-n-octylphthalate	100000	150	UJ	150	UJ	160	J	150	UJ	70	UJ	71	UJ	73	UJ	73	UJ	150	UJ	75	U	50	J	81	U
Fluoranthene	100000	980	J	95		230		190		7	U	7.1	U	7.3	U	7.3	U	1200		200		7.3	U	8.1	U
Fluorene	100000	31		15	U	12	J	15	U	7	U	7.1	U	7.3	U	7.3	U	45		7.5	U	7.3	U	8.1	U
Hexachlorobenzene	210	72	U	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Hexachlorobutadiene	1200	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Hexachlorocyclopentadiene	1800	370	R	380	R	410	R	380	R	180	R	180	R	190	R	190	R	390	R	190	UJ	180	UJ	210	UJ
Hexachloroethane	1800	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Indeno(1,2,3-cd)pyrene	160	**310**	J	31		56		29		7	U	7.1	U	7.3	U	7.3	U	**230**		37		7.3	U	8.1	U
Isophorone	100000	72	UJ	74	U	80	U	75	UJ	35	UJ	35	UJ	36	UJ	36	UJ	75	U	37	U	36	U	40	U
Naphthalene	3800	8.1	J	15	U	16	U	15	U	7	U	7.1	U	7.3	U	7.3	U	26		2.6	J	7.3	U	8.1	U
Nitrobenzene	3700	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
N-Nitroso-di-n-propylamine	78	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
N-Nitrosodiphenylamine	110000	72	UJ	74	UJ	80	UJ	75	UJ	35	UJ	35	UJ	36	UJ	36	UJ	75	UJ	37	U	36	U	40	U
Pentachlorophenol	1000	370	U	380	U	410	U	380	U	180	U	180	U	190	U	190	U	390	U	190	U	180	U	210	U
Phenanthrene	100000	450	J	43		140		87		7	U	7.1	U	7.3	U	7.3	U	700		81		7.3	U	8.1	U
Phenol	100000	72	UJ	74	U	80	U	75	U	35	U	35	U	36	U	36	U	75	U	37	U	36	U	40	U
Pyrene	100000	920	J	84		190		170		7	U	7.1	U	7.3	U	7.3	U	1200		180		7.3	U	8.1	U
Polychlorinated Biphenyls (µg/kg)																									
Aroclor 1016	1000	11	U	11	U	12	U	11	U	11	U	10	U	10	U	10	U	11	U	10	U	11	U	12	U
Aroclor 1221	200	11	U	11	U	12	U	11	U	11	U	10	U	10	U	10	U	11	U	10	U	11	U	12	U
Aroclor 1232	170	11	U	11	U	12	U	11	U	11	U	10	U	10	U	10	U	11	U	10	U	11	U	12	U
Aroclor 1242	230	11	U	11	U	12	U	11	U	11	U	10	U	10	U	10	U	11	U	10	U	11	U	12	U
Aroclor 1248	230	11	U	11	U	12	U	11	U	11	U	10	U	10	U	10	U	11	U	10	U	11	U	12	U
Aroclor 1254	240	11	U	11	U	12	U	11	U	11	U	10	U	10	U	10	U	29		10	U	11	U	12	U
Aroclor 1260	240	7.8	J	7.8	J	12	UJ	24	J	11	U	10	U	10	U	10	U	11	U	10	U	11	U	12	U
Aroclor 1262	1000	11	U	11	U	12	U	11	U	11	U	10	U	10	U	10	U	11	U	10	U	11	U	12	U
Aroclor 1268	1000	11	U	11	U	12	U	11	U	11	U	10	U	10	U	10	U	11	U	10	U	11	U	12	U
Pesticides (µg/kg)																									
4,4'-DDD	2300	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	3.4	J	10	U	1.1	U	1.2	U
4,4'-DDE	1800	4.2	J	22		12	U	5.8	J	1.1	U	1	U	1	U	1	U	11	UJ	10	U	1.1	U	1.2	U
4,4'-DDT	1700	13		33		5.6	J	20		1.1	U	1	U	1	UJ	1	U	12		5	J	1.1	U	1.2	U
Aldrin	19	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
alpha-BHC	86	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
alpha-Chlordane	910	11	U	11	U	12	U	11	U	1.1	U	1	U	0.31	J	1	U	11	U	10	U	1.1	U	1.2	U
beta-BHC	72	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
delta-BHC	86	11	U	11	U	4.2	J	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
Dieldrin	34	11	U	11	UJ	12	U	11	U	1.1	U	1	U	1	U	1	U	11	UJ	10	U	1.1	U	1.2	U
Endosulfan I	4800	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
Endosulfan II	4800	11	U	11	U	12	UJ	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
Endosulfan Sulfate	4800	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
Endrin	2200	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U

Table 4-5
Soil Chemical Analytical Results - Background
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample Location	BKSB-01		BKSB-02		BKSB-03		BKSB-04		BKSB-04		BKSB-04		BKSB-04		BKSB-04		BKSB-05		BKSB-06		BKSB-06		BKSB-06	
	Sample ID	BKSB-01-00-02		BKSB-02-00-02		BKSB-03-00-01		BKSB-04-00-02		BKSB-04-04-06		BKSB-04-08-10		BKSB-04-18-20		BKSB-04-23-25		BKSB-05-00-01		BKSB-06-00-02		BKSB-06-04-06		BKSB-06-08-10	
	Parent Sample ID																								
	Sample Date	12/16/2015		12/16/2015		12/16/2015		12/22/2015		12/22/2015		12/22/2015		12/22/2015		12/22/2015		12/16/2015		10/30/2015		10/30/2015		10/30/2015	
	Depth	0-2 feet		0-2 feet		0-1 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		23-25 feet		0-1 feet		0-2 feet		4-6 feet		8-10 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Pesticides (µg/kg) (continued)																									
Endrin aldehyde	2200	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
Endrin Ketone	2200	4.8	J	11	U	11	J	11	U	1.1	U	1	U	1	U	1	U	5.8	J	10	U	1.1	U	1.2	U
gamma-BHC (Lindane)	280	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
gamma-Chlordane	540	11	U	2.5	J	12	U	11	U	1.1	U	1	U	1	U	1	U	11	UJ	10	U	1.1	U	1.2	U
Heptachlor	130	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
Heptachlor Epoxide	70	11	U	11	U	12	U	11	U	1.1	U	1	U	1	U	1	U	11	U	10	U	1.1	U	1.2	U
Methoxychlor	100000	42	U	44	UJ	46	U	43	UJ	4.2	U	4.1	U	4.1	U	4.1	U	46	U	6.6	J	4.4	U	4.7	U
Toxaphene	490	110	U	110	U	120	U	110	U	11	U	10	U	10	U	10	U	110	U	100	U	11	U	12	U
Inorganics (mg/kg)																									
Aluminum	77000	5500		8000		7200		7800		7000		7600		5100		5000		6600		3800		9300		22000	
Antimony	31	1	U	1.1	U	1.1	U	1.1	U	0.98	U	1	U	1.1	U	2.2	U	1.1	U	1.1	UJ	1.1	UJ	1.1	UJ
Arsenic	0.68	**2.1**		**6.5**		**4.8**		**5.4**		**1.2**		**1.6**		**1.8**		**2.3**		**4.1**		**2.5**	J	**1.9**	J	**1.7**	J
Barium	350	77		37		120		44		14		26		22		25		**880**		24	J-	30	J-	120	J-
Beryllium	14	0.14	J	0.15	J	0.11	J	0.25	J	0.17	J	0.22	J	0.17	J	0.23	J	0.17	J	0.1	J	0.14	J	0.14	J
Cadmium	2.5	0.23	J	0.12	J	0.27	J	0.27	J	0.064	J	0.055	J	0.048	J	0.097	J	0.58		0.044	J	0.27	U	0.28	U
Calcium	NL	3000		710		3100		640		350		420		2100		2400		9800		1200		1200		750	
Chromium	NL	11		17		17		11		15		13		11		15		16		7.7	J-	16	J-	33	J-
Cobalt	23	2.9		5.1		4.1		3		3.7		4.6		5.9		4.3		4.4		2.4	J-	4.7	J-	2.6	J-
Copper	270	16		25		25		2.3		9.4		12		14		12		59		13	J-	13	J-	16	J-
Iron	2000	**9400**		**13000**		**15000**		**11000**		**9500**		**12000**		**16000**		**43000**		**14000**		**6000**		**11000**		**7800**	
Lead	400	80		51		120		150		3.2		3.8		3.6		4.8		340		73		4.2		9	
Magnesium	NL	1600		1800		1600		1000		1700		1600		2700		2300		2200		830		1800		1600	
Manganese	2000	190		320		270		170		130		200		310		580		200		84		120		100	
Mercury	0.81	0.074	J	0.1	J	0.29	J	0.17		0.079	U	0.089	U	0.085	U	0.091	U	0.49	J	0.26		0.087	U	0.024	J
Nickel	140	7.6		9.7		9.2		7.5		8.6		7.7		9.6		8.2		12		6.2	J-	9.6	J-	12	J-
Potassium	NL	670		910		930		450		420		680		760		870		890		410		690		970	
Selenium	36	1	U	1.1	U	1.1	U	1.1	U	0.98	U	1	U	1.1	U	1.1	U	1.1	U	1.1	UJ	1.1	UJ	1.1	UJ
Silver	36	0.52	U	0.55	U	0.57	U	0.56	U	0.49	U	0.5	U	0.53	U	0.54	U	0.11	J	0.55	U	0.54	U	0.57	U
Sodium	NL	130	J	170	J	67	J	620		380		280		220	J	160	J	120	J	95	J	180	J	120	J
Thallium	0.78	2.6	U	2.7	U	2.8	U	2.7	U	2.5	U	2.5	U	2.6	U	13	U	2.7	U	2.8	UJ	2.7	UJ	2.8	UJ
Vanadium	100	15		24		24		18		15		17		22		21		20		11	J-	24	J-	28	J-
Zinc	2200	78		100		450		53		24		22		21		19		330		31		20		29	
Miscellaneous																									
Solids, Percent	NL	91.1		86.7		82.3		87.8		93.6		92.7		91.6		90.2		86.1		88		89.4		82.1	

Notes:
ID - identification
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
Q - qualifier
J - estimated value
J- - estimated value, biased low
J+ - estimated value, biased high
U - not detected
R - rejected value
Highlighted cell and bold format indicates an exceedance of the RI screening criteria.

Table 4-5
Soil Chemical Analytical Results - Background
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample Location	BKSB-06		BKSB-06		BKSB-07		BKSB-07		BKSB-07		BKSB-07		BKSB-07		BKSB-08		BKSB-08		BKSB-08		BKSB-08		BKSB-08		BKSB-08	
	Sample ID	BKSB-06-18-20		BKSB-06-28-30		BKSB-07-00-02		BKSB-07-04-06		BKSB-07-08-10		BKSB-07-18-20		BKSB-07-28-30		BKSB-08-00-02		BKSB-908-00-02		BKSB-08-04-06		BKSB-08-08-10		BKSB-08-18-20		BKSB-08-28-30	
	Parent Sample ID																	BKSB-08-00-02									
	Sample Date	10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015	
	Depth	18-20 feet		28-30 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		28-30 feet		0-2 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		28-30 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Volatile Organic Compounds (µg/kg)																											
1,1,1-Trichloroethane	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,1,2,2-Tetrachloroethane	600	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,1,2-Trichloro-1,2,2-trifluoroethane	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,1,2-Trichloroethane	1100	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,1-Dichloroethane	3600	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,1-Dichloroethene	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,2,3-Trichlorobenzene	63000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,2,4-Trichlorobenzene	24000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,2-Dibromo-3-chloropropane	5.3	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,2-Dibromoethane	36	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,2-Dichlorobenzene	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,2-Dichloroethane	460	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,2-Dichloropropane	1000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,3-Dichlorobenzene	17000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,4-Dichlorobenzene	2600	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
1,4-Dioxane	5300	42	U	47	U	48	U	72	U	59	U	52	U	46	U	52	U	47	U	48	U	42	U	39	U	40	U
2-Butanone	100000	8.5	U	9.3	U	9.7	U	14	U	12	U	10	U	9.2	U	10	U	9.4	U	9.6	U	8.4	U	7.9	U	8.1	U
2-Hexanone	200000	8.5	U	9.3	U	9.7	U	14	U	12	U	10	U	9.2	U	10	U	9.4	U	9.6	U	8.4	U	7.9	U	8.1	U
4-Methyl-2-pentanone	33000000	8.5	U	9.3	U	9.7	U	14	U	12	U	10	U	9.2	U	10	U	9.4	U	9.6	U	8.4	U	7.9	U	8.1	U
Acetone	100000	17	UJ	19	UJ	19	U	29	U	24	UJ	21	UJ	18	UJ	21	U	19	U	100		17	UJ	16	UJ	16	U
Benzene	1200	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Bromochloromethane	150000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Bromodichloromethane	290	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Bromoform	19000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Bromomethane	6800	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Carbon Disulfide	100000	4.2	UJ	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Carbon Tetrachloride	650	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Chlorobenzene	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Chloroethane	14000000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Chloroform	320	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Chloromethane	110000	4.2	UJ	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
cis-1,2-Dichloroethene	59000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
cis-1,3-Dichloropropene	NL	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Cyclohexane	6500000	4.2	UJ	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Dibromochloromethane	8300	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Dichlorodifluoromethane	87000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Ethylbenzene	5800	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Isopropylbenzene	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
m,p-Xylene	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Methyl acetate	78000000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Methyl tert-Butyl Ether	47000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Methylcyclohexane	NL	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Methylene Chloride	51000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
o-Xylene	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Styrene	6000000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Tetrachloroethene	5500	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Toluene	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
trans-1,2-Dichloroethene	100000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U

Table 4-5
Soil Chemical Analytical Results - Background
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample Location	BKSB-06		BKSB-06		BKSB-07		BKSB-07		BKSB-07		BKSB-07		BKSB-07		BKSB-08		BKSB-08		BKSB-08		BKSB-08		BKSB-08		BKSB-08	
	Sample ID	BKSB-06-18-20		BKSB-06-28-30		BKSB-07-00-02		BKSB-07-04-06		BKSB-07-08-10		BKSB-07-18-20		BKSB-07-28-30		BKSB-08-00-02		BKSB-908-00-02		BKSB-08-04-06		BKSB-08-08-10		BKSB-08-18-20		BKSB-08-28-30	
	Parent Sample ID																	BKSB-08-00-02									
	Sample Date	10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015	
	Depth	18-20 feet		28-30 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		28-30 feet		0-2 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		28-30 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Volatile Organic Compounds (µg/kg) (continued)																											
trans-1,3-Dichloropropene	NL	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Trichloroethene	940	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Trichlorofluoromethane	23000000	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Vinyl Chloride	59	4.2	U	4.7	U	4.8	U	7.2	U	5.9	U	5.2	U	4.6	U	5.2	U	4.7	U	4.8	U	4.2	U	3.9	U	4	U
Semivolatile Organic Compounds (µg/kg)																											
1,1'-Biphenyl	47000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
1,2,4,5-Tetrachlorobenzene	23000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
2,2'-Oxybis(1-chloropropane)	3100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
2,3,4,6-Tetrachlorophenol	1900000	73	UJ	74	UJ	76	UJ	72	UJ	74	UJ	75	UJ	74	UJ	75	UJ	75	UJ	74	UJ	76	UJ	74	UJ	75	UJ
2,4,5-Trichlorophenol	100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
2,4,6-Trichlorophenol	49000	36	UJ	36	UJ	37	UJ	36	UJ	36	UJ	37	UJ	36	UJ	37	UJ	37	UJ	36	UJ	37	UJ	37	UJ	37	UJ
2,4-Dichlorophenol	100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
2,4-Dimethylphenol	1300000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
2,4-Dinitrophenol	100000	190	U	190	U	190	UJ	180	UJ	190	U	190	U	190	U	190	UJ	190	UJ	190	UJ	190	U	190	U	190	U
2,4-Dinitrotoluene	1700	73	U	74	U	76	U	72	U	74	U	75	U	74	U	75	U	75	U	74	U	76	U	74	U	75	U
2,6-Dinitrotoluene	360	73	U	74	U	76	U	72	U	74	U	75	U	74	U	75	U	75	U	74	U	76	U	74	U	75	U
2-Chloronaphthalene	4800000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
2-Chlorophenol	100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
2-Methylnaphthalene	410	7.3	U	7.4	U	7.6	U	7.2	U	7.4	U	7.5	U	7.4	U	14		6	J	7.4	U	7.6	U	7.4	U	7.5	U
2-Methylphenol	100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
2-Nitroaniline	630000	73	U	74	U	76	U	72	U	74	U	75	U	74	U	75	U	75	U	74	U	76	U	74	U	75	U
2-Nitrophenol	NL	73	U	74	U	76	U	72	U	74	U	75	U	74	U	75	U	75	U	74	U	76	U	74	U	75	U
3,3'-Dichlorobenzidine	1200	190	U	190	U	190	U	180	U	190	U	190	U	190	U	190	U	190	U	190	U	190	U	190	U	190	U
3-Nitroaniline	NL	73	U	74	U	76	U	72	U	74	U	75	U	74	U	75	U	75	U	74	U	76	U	74	U	75	U
4,6-Dinitro-2-methylphenol	5100	190	U	190	U	190	UJ	180	UJ	190	U	190	U	190	U	190	UJ	190	UJ	190	UJ	190	U	190	U	190	U
4-Bromophenyl-phenylether	NL	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
4-Chloro-3-methylphenol	6300000	36	UJ	36	UJ	37	UJ	36	UJ	36	UJ	37	UJ	36	UJ	37	UJ	37	UJ	36	UJ	37	UJ	37	UJ	37	UJ
4-Chloroaniline	2700	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
4-Chlorophenyl-phenylether	NL	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
4-Methylphenol	34000	73	U	74	U	76	U	72	U	74	U	75	U	74	U	75	U	75	U	74	U	76	U	74	U	75	U
4-Nitroaniline	27000	73	U	74	U	76	U	72	U	74	U	75	U	74	U	75	U	75	U	74	U	76	U	74	U	75	U
4-Nitrophenol	NL	190	U	190	U	190	U	180	U	190	U	190	U	190	U	190	U	190	U	190	U	190	U	190	U	190	U
Acenaphthene	100000	7.3	U	7.4	U	7.6	U	7.2	U	7.4	U	7.5	U	7.4	U	56	J	21	J	7.4	U	7.6	U	7.4	U	7.5	U
Acenaphthylene	100000	7.3	U	7.4	U	7.6	U	7.2	U	7.4	U	7.5	U	7.4	U	10		9.7		7.4	U	7.6	U	7.4	U	7.5	U
Acetophenone	7800000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Anthracene	100000	7.3	U	7.4	U	4.6	J	7.2	U	7.4	U	7.5	U	7.4	U	120	J	59	J	7.4	U	7.6	U	7.4	U	7.5	U
Atrazine	2400	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Benzaldehyde	7800000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Benzo(a)anthracene	160	7.3	U	7.4	U	23		5.4	J	7.4	U	7.5	U	7.4	U	**330**		**210**		7.4	U	7.6	U	7.4	U	7.5	U
Benzo(a)pyrene	16	7.3	UJ	7.4	UJ	**25**	J	4.8	J	7.4	UJ	7.5	UJ	7.4	UJ	**340**	J	**240**	J	7.4	UJ	7.6	UJ	7.4	UJ	7.5	UJ
Benzo(b)fluoranthene	160	7.3	U	7.4	U	32		7	J	7.4	U	7.5	U	7.4	U	**500**		**340**		7.4	U	7.6	U	7.4	U	7.5	U
Benzo(g,h,i)perylene	100000	7.3	U	7.4	U	16		4.1	J	7.4	U	7.5	U	7.4	U	100		62		7.4	U	7.6	U	7.4	U	7.5	U
Benzo(k)fluoranthene	1000	7.3	UJ	7.4	UJ	10	J	7.2	UJ	7.4	UJ	7.5	UJ	7.4	UJ	170	J	140	J	7.4	UJ	7.6	UJ	7.4	UJ	7.5	UJ
Bis(2-chloroethoxy)methane	190000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Bis(2-chloroethyl)ether	230	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Bis(2-ethylhexyl)phthalate	39000	36	UJ	36	UJ	37	UJ	36	UJ	36	UJ	37	UJ	36	UJ	60	J	79	J	36	UJ	19	J	87	J	37	UJ
Butylbenzylphthalate	100000	73	UJ	74	UJ	76	UJ	72	UJ	74	UJ	75	UJ	74	UJ	75	UJ	75	UJ	74	UJ	76	UJ	74	UJ	75	UJ
Caprolactam	31000000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U

Table 4-5
Soil Chemical Analytical Results - Background
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample Location	BKSB-06		BKSB-06		BKSB-07		BKSB-07		BKSB-07		BKSB-07		BKSB-07		BKSB-08		BKSB-08		BKSB-08		BKSB-08		BKSB-08		BKSB-08	
	Sample ID	BKSB-06-18-20		BKSB-06-28-30		BKSB-07-00-02		BKSB-07-04-06		BKSB-07-08-10		BKSB-07-18-20		BKSB-07-28-30		BKSB-08-00-02		BKSB-908-00-02		BKSB-08-04-06		BKSB-08-08-10		BKSB-08-18-20		BKSB-08-28-30	
	Parent Sample ID																	BKSB-08-00-02									
	Sample Date	10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015	
	Depth	18-20 feet		28-30 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		28-30 feet		0-2 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		28-30 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Semivolatile Organic Compounds (µg/kg) (continued)																											
Carbazole	NL	36	U	36	U	37	U	36	U	36	U	37	U	36	U	53	J	27	J	36	U	37	U	37	U	37	U
Chrysene	1000	7.3	U	7.4	U	22		3.3	J	7.4	U	7.5	U	7.4	U	330		230		7.4	U	7.6	U	7.4	U	7.5	U
Dibenzo(a,h)anthracene	16	7.3	U	7.4	U	7.6	U	7.2	U	7.4	U	7.5	U	7.4	U	7.5	U	7.5	U	7.4	U	7.6	U	7.4	U	7.5	U
Dibenzofuran	14000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	26	J	37	U	36	U	37	U	37	U	37	U
Diethylphthalate	100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Dimethylphthalate	100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Di-n-butylphthalate	100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	22	J	37	U	36	U	37	U	37	U	21	J
Di-n-octylphthalate	100000	73	U	74	U	76	U	72	U	74	U	75	U	74	U	75	U	75	U	74	U	76	U	74	U	75	U
Fluoranthene	100000	7.3	U	7.4	U	43		5.7	J	7.4	U	7.5	U	7.4	U	720		470		7.4	U	7.6	U	7.4	U	7.5	U
Fluorene	100000	7.3	U	7.4	U	7.6	U	7.2	U	7.4	U	7.5	U	7.4	U	45	J	20	J	7.4	U	7.6	U	7.4	U	7.5	U
Hexachlorobenzene	210	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Hexachlorobutadiene	1200	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Hexachlorocyclopentadiene	1800	190	U	190	U	190	UJ	180	UJ	190	U	190	U	190	U	190	UJ	190	UJ	190	UJ	190	U	190	U	190	U
Hexachloroethane	1800	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Indeno(1,2,3-cd)pyrene	160	7.3	U	7.4	U	15		3.1	J	7.4	U	7.5	U	7.4	U	100		62		7.4	U	7.6	U	7.4	U	7.5	U
Isophorone	100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Naphthalene	3800	7.3	U	7.4	U	7.6	U	7.2	U	7.4	U	7.5	U	7.4	U	22	J	9.7	J	7.4	U	7.6	U	7.4	U	7.5	U
Nitrobenzene	3700	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
N-Nitroso-di-n-propylamine	78	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
N-Nitrosodiphenylamine	110000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Pentachlorophenol	1000	190	U	190	U	190	U	180	U	190	U	190	U	190	U	190	U	190	U	190	U	190	U	190	U	190	U
Phenanthrene	100000	7.3	U	7.4	U	11		7.2	U	7.4	U	7.5	U	7.4	U	530	J	270	J	7.4	U	7.6	U	7.4	U	7.5	U
Phenol	100000	36	U	36	U	37	U	36	U	36	U	37	U	36	U	37	U	37	U	36	U	37	U	37	U	37	U
Pyrene	100000	7.3	U	7.4	U	39		5.5	J	7.4	U	7.5	U	7.4	U	610		410		7.4	U	7.6	U	7.4	U	7.5	U
Polychlorinated Biphenyls (µg/kg)																											
Aroclor 1016	1000	11	U	11	U	10	U	11	U	11	U	11	U	11	U	10	U	11	U	11	U	10	U	10	U	11	U
Aroclor 1221	200	11	U	11	U	10	U	11	U	11	U	11	U	11	U	10	U	11	U	11	U	10	U	10	U	11	U
Aroclor 1232	170	11	U	11	U	10	U	11	U	11	U	11	U	11	U	10	U	11	U	11	U	10	U	10	U	11	U
Aroclor 1242	230	11	U	11	U	10	U	11	U	11	U	11	U	11	U	10	U	11	U	11	U	10	U	10	U	11	U
Aroclor 1248	230	11	U	11	U	10	U	11	U	11	U	11	U	11	U	10	U	11	U	11	U	10	U	10	U	11	U
Aroclor 1254	240	11	U	11	U	10	U	11	U	11	U	11	U	11	U	10	U	11	U	11	U	10	U	10	U	11	U
Aroclor 1260	240	11	U	11	U	10	U	11	U	11	U	11	U	11	U	4.5	J	4.7	J	11	U	10	U	10	U	11	U
Aroclor 1262	1000	11	U	11	U	10	U	11	U	11	U	11	U	11	U	10	U	11	U	11	U	10	U	10	U	11	U
Aroclor 1268	1000	11	U	11	U	10	U	11	U	11	U	11	U	11	U	10	U	11	U	11	U	10	U	10	U	11	U
Pesticides (µg/kg)																											
4,4'-DDD	2300	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
4,4'-DDE	1800	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	18		22	J	1.1	U	1	U	1	U	1.1	U
4,4'-DDT	1700	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	8.4	J	12	J	1.1	U	1	U	1	U	1.1	U
Aldrin	19	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
alpha-BHC	86	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
alpha-Chlordane	910	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
beta-BHC	72	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
delta-BHC	86	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
Dieldrin	34	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	13	J	16	J	1.1	U	1	U	1	U	1.1	U
Endosulfan I	4800	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
Endosulfan II	4800	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
Endosulfan Sulfate	4800	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
Endrin	2200	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U

Table 4-5
Soil Chemical Analytical Results - Background
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample Location	BKSB-06		BKSB-06		BKSB-07		BKSB-07		BKSB-07		BKSB-07		BKSB-07		BKSB-08		BKSB-08		BKSB-08		BKSB-08		BKSB-08		BKSB-08	
	Sample ID	BKSB-06-18-20		BKSB-06-28-30		BKSB-07-00-02		BKSB-07-04-06		BKSB-07-08-10		BKSB-07-18-20		BKSB-07-28-30		BKSB-08-00-02		BKSB-908-00-02		BKSB-08-04-06		BKSB-08-08-10		BKSB-08-18-20		BKSB-08-28-30	
	Parent Sample ID																	BKSB-08-00-02									
	Sample Date	10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015		10/30/2015	
	Depth	18-20 feet		28-30 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		28-30 feet		0-2 feet		0-2 feet		4-6 feet		8-10 feet		18-20 feet		28-30 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Pesticides (µg/kg) (continued)																											
Endrin aldehyde	2200	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
Endrin Ketone	2200	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
gamma-BHC (Lindane)	280	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
gamma-Chlordane	540	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
Heptachlor	130	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
Heptachlor Epoxide	70	1.1	U	1.1	U	1	U	1.1	U	1.1	U	1.1	U	1.1	U	11	U	11	U	1.1	U	1	U	1	U	1.1	U
Methoxychlor	100000	4.3	U	4.4	U	1.5	J	0.37	J	4.3	U	4.5	U	4.4	U	20	J	16	J	4.4	U	4.2	U	4.2	U	4.2	U
Toxaphene	490	11	U	11	U	10	U	11	U	11	U	11	U	11	U	110	U	110	U	11	U	10	U	10	U	11	U
Inorganics (mg/kg)																											
Aluminum	77000	5100		5600		8600		10000		8500		4600		5300		8800		9300		8400		6900		5500		5400	
Antimony	31	1	UJ	1.1	UJ	1.1	UJ	1.1	UJ	1	UJ	1.1	UJ	1.1	UJ	1.1	UJ	1	UJ	1.1	UJ	1.1	UJ	1.1	UJ	1.1	UJ
Arsenic	0.68	**1.8**	J	**1.4**	J	**3.2**	J	**1.9**	J	**1.4**	J	**1.8**	J	**1.8**	J	**4.7**	J	**4.4**	J	**1.3**	J	**1.5**	J	**1.2**	J	**1.5**	J
Barium	350	23	J-	28	J-	36	J-	42	J-	35	J-	48	J-	36	J-	57	J-	53	J-	28	J-	26	J-	24	J-	21	J-
Beryllium	14	0.12	J	0.11	J	0.2	J	0.14	J	0.094	J	0.079	J	0.073	J	0.22	J	0.19	J	0.058	J	0.13	J	0.13	J	0.098	J
Cadmium	2.5	0.25	U	0.27	U	0.051	J	0.032	J	0.025	J	0.038	J	0.27	U	0.19	J	0.16	J	0.27	U	0.27	U	0.26	U	0.037	J
Calcium	NL	1400		2100		1300		660		790		1200		1600		1400		2300		520		660		1000		1600	
Chromium	NL	14	J-	13	J-	14	J-	19	J-	20	J-	11	J-	13	J-	15	J-	21	J-	20	J-	23	J-	14	J-	16	J-
Cobalt	23	4.9	J-	5.1	J-	4.4	J-	5.6	J-	3.6	J-	4.4	J-	4	J-	4.2	J-	4.7	J-	2.1	J-	5.5	J-	3.9	J-	4.1	J-
Copper	270	12	J-	16	J-	15	J-	16	J-	13	J-	10	J-	9.7	J-	37	J-	38	J-	8.1	J-	16	J-	12	J-	11	J-
Iron	2000	**11000**		**15000**		**13000**		**11000**		**8800**		**10000**		**11000**		**12000**		**13000**		**8200**		**8500**		**9400**		**9400**	
Lead	400	3.7		4		26		7.1		4		3.4		3.3		95		110		4.8		3.3		3.2		3.4	
Magnesium	NL	1700		1900		1500		1900		1600		1500		2300		1500		2000		1200		1200		1200		1900	
Manganese	2000	150		260		230		260		130		500		250		300		280		68		180		110		110	
Mercury	0.81	0.085	U	0.083	U	0.062	J	0.043	J	0.092	U	0.084	U	0.084	U	0.44		0.35		0.09	U	0.092	U	0.084	U	0.093	U
Nickel	140	8.3	J-	12	J-	9.5	J-	11	J-	10	J-	9.3	J-	9	J-	11	J-	13	J-	7.1	J-	9.7	J-	7.6	J-	9.2	J-
Potassium	NL	810		1100		790		970		670		980		1200		730		800		500		470		740		1100	
Selenium	36	1	UJ	1.1	UJ	0.48	J-	1.1	UJ	1	UJ	1.1	UJ	1.1	UJ	0.69	J-	0.66	J-	1.1	UJ	1.1	UJ	1.1	UJ	0.46	J-
Silver	36	0.51	U	0.54	U	0.57	U	0.54	U	0.51	U	0.54	U	0.54	U	0.56	U	0.52	U	0.54	U	0.53	U	0.53	U	0.53	U
Sodium	NL	180	J	210	J	54	J	66	J	100	J	94	J	150	J	82	J	180	J	40	J	44	J	71	J	100	J
Thallium	0.78	2.5	UJ	2.7	UJ	2.8	UJ	2.7	UJ	2.5	UJ	2.7	UJ	2.7	UJ	2.8	UJ	2.6	UJ	2.7	UJ	2.7	UJ	2.6	UJ	2.6	UJ
Vanadium	100	23	J-	41	J-	20	J-	25	J-	20	J-	17	J-	17	J-	25	J-	30	J-	23	J-	20	J-	21	J-	20	J-
Zinc	2200	19		26		41		28		26		19		21		57		59		17		15		20		20	
Miscellaneous																											
Solids, Percent	NL	90.6		89.3		88.2		90.2		90		89.5		90		88.3		89.3		88.6		88		89.1		89	

Notes:
ID - identification
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
Q - qualifier
J - estimated value
J- - estimated value, biased low
J+ - estimated value, biased high
U - not detected
R - rejected value
Highlighted cell and bold format indicates an exceedance of the RI screening criteria.

Table 4-6
Background Sewer Line Gamma Data Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Sewer Run (Manhole to Manhole Downstream)	Dates	Pipe Size (inch) and Material	Total Length between Manholes (ft)	Maximum Gamma Reading[1] (cpm)	Maximum Gamma Location[2]	Minimum Gamma Reading[1] (cpm)	Minimum Gamma Location[2]	Comments
E-1 to E-2	11/23/15	12 inch clay	185	4,400	E1_DS_10	4,100	E1_DS_60	Background
W-3 to W-4	11/17/15	18 inch fiberglass lined	116	4,700	W3_DS_107	3,800	W3_DS_17	Background
W-5 to W-6	11/23/15	24 inch clay	N/A	4,900	W5_US_25	3,900	W5_US_2	Background. Run ended at 25 feet due to debris in pipeline.
C-11 to C-12	11/6/15	15 inch Clay	140	3,500	C11_DS_67	2,800	C11_DS_27	
C-12 to C-13	11/6/15	15 inch Clay	142	3,800	C12_DS_57	3,200	C12_DS_7	
C-13 to C-14	11/6/15	18 inch Clay	221	1,900	C13_DS_67	1,400	C14_US_67	Due to overall distance between C-13 and C-14 being over two times greater than the length of the 1x1 cable, there is a 67 feet length of sewer between the two manholes that could not be surveyed.
C-14 to C-15	11/6/15	18 inch Clay	130	2,300	C14_DS_57	1,450	C15_US_17	

Notes:

[1] Gamma readings taken with Ludlum 2221 Meter and Ludlum 44-2 Probe

[2] Manhole ID_direction upstream (US) or downstream (DS)_distance (ft)

Acronyms:

bgs - below ground surface
cpm - counts per minute
DS - downstream
ID - identification
N/A - not applicable
US - upstream

Table 4-7
Background Sewer Manhole Data Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Manhole ID	Date	Depth (feet bgs)	Vault Material	Surface Exposure Rate[1] (µR/hr)	3 feet from Bottom Exposure Rate[1] (µR/hr)	Surface Gamma Reading[2] (cpm)	3 feet from Bottom Gamma Reading[2] (cpm)	Maximum Reading[2] (cpm)	Depth of Maximum (feet bgs)	Comments
D-2	11/19/15	11.7	Brick	10.8	N/A	2,387	4,864	4,864	8.7	
E-1	11/23/15	8.8	Concrete	9.7	N/A	1,808	2,248	3,787	8.8	
I-14	11/19/15	12	Brick	4	N/A	1,552	3,303	3,303	9	
M-5	11/19/15	12	Brick	7.5	N/A	947	2,723	2,723	12	
M-6	11/19/15	12	Concrete	7	N/A	762	1,041	1,537	12	Clay pipe invert.
M-7	11/19/15	12	Concrete	7	N/A	1,784	2,188	3,933	12	Clay pipe invert.
M-8	11/19/15	11.8	Concrete	6.7	N/A	1,653	2,554	4,477	11.8	Clay pipe invert.
S-1	11/19/15	13.5	Brick	11	N/A	863	1,868	2,065	13.5	
W-3	11/17/15	20.1	Concrete	6.6	N/A	1,251	2,486	2,486	17.1	
W-6	11/23/15	17.2	Brick	6.5	N/A	1,774	3,631	3,683	17.2	
C-11	11/6/15	11	Concrete	6	N/A	1,200	1,300	1,400	5	Upstream line capped at invert. Not connected to Irving Avenue line.
C-12	11/6/15	11	Concrete	5	N/A	1,600	2,100	2,100	8	
C-13	11/6/15	11.3	Concrete	6	N/A	1,500	1,400	1,600	3	
C-14	11/6/15	10.3	Concrete	6	N/A	1,900	1,650	1,900	0	
C-15	11/6/15	10.3	Concrete	5	N/A	1,600	1,500	1,650	5	
Average values for materials										
Brick				7.96	N/A	1504.6	3277.8	3327.6	N/A	
Concrete				6.5	N/A	1505.8	1846.7	2487	N/A	

Notes:

[1]Dose rates taken with Ludlum Model 9DP. Dose rates were only taken 3 feet from the botton in manholes accessed for sewer material sampling.

[2]Gamma readings taken with Ludlum 2221 Meter and Ludlum 44-2 Probe. Readings are one minute counts unless otherwise noted.

Acronyms:

ID - identification

bgs - below ground surface

µR/hr - microrem per hour

cpm - counts per minute

N/A - not available

Table 4-8
Background Sediment Sampling Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Thorium-228				Thorium-230				Thorium-232			
					Result (pCi/g)	CSU (+/-2 s)	MDA	Q	Result (pCi/g)	CSU (+/-2 s)	MDA	Q	Result (pCi/g)	CSU (+/-2 s)	MDA	Q
Sediment Coney Island Creek (Background)																
SED-CIC01	10/9/2015	0	0.5		0.702	0.184	0.066		0.434	0.138	0.073		0.408	0.134	0.081	
SED-CIC01	10/9/2015	0.5	1		0.444	0.135	0.025		0.338	0.126	0.114		0.366	0.129	0.106	
SED-CIC01	10/9/2015	1	2		0.747	0.196	0.048		0.475	0.151	0.08		0.436	0.142	0.059	
SED-CIC01	10/9/2015	1	2	SED-CIC01-01-02	0.583	0.149	0.04		0.417	0.121	0.055		0.489	0.133	0.055	
SED-CIC01	10/9/2015	2	3		0.549	0.168	0.051		0.506	0.161	0.085		0.263	0.139	0.174	
SED-CIC01	10/9/2015	3	4		0.416	0.138	0.059		0.355	0.14	0.14		0.313	0.136	0.151	
SED-CIC01	10/9/2015	4	5		0.521	0.154	0.052		0.601	0.167	0.079		0.416	0.135	0.077	
SED-CIC01	10/9/2015	5	6		0.558	0.156	0.042		0.459	0.139	0.067		0.485	0.143	0.066	
SED-CIC01	10/9/2015	6	7		0.584	0.154	0.053		0.443	0.131	0.069		0.434	0.13	0.077	
SED-CIC01	10/9/2015	7	8		0.448	0.127	0.045		0.527	0.141	0.081		0.486	0.132	0.055	
SED-CIC01	10/9/2015	8	9		0.539	0.148	0.038		0.478	0.136	0.052		0.58	0.153	0.055	
SED-CIC01	10/9/2015	9	10		0.59	0.151	0.021		0.561	0.149	0.085		0.315	0.108	0.076	
SED-CIC02	10/21/2015	0	0.5		0.344	0.136	0.035		0.467	0.165	0.108		0.284	0.128	0.107	J
SED-CIC02	10/21/2015	0.5	1		0.211	0.096	0.029		0.225	0.104	0.089		0.23	0.101	0.069	J
SED-CIC02	10/21/2015	1	2		0.345	0.154	0.1		0.334	0.155	0.132		0.292	0.148	0.144	J
SED-CIC02	10/21/2015	2	3		0.414	0.144	0.06		0.457	0.158	0.119		0.309	0.125	0.092	J
SED-CIC02	10/21/2015	3	4		0.403	0.157	0.039		0.469	0.173	0.109		0.368	0.156	0.129	J
SED-CIC02	10/21/2015	4	5		0.322	0.128	0.032		0.354	0.134	0.073		0.354	0.134	0.073	J
SED-CIC02	10/21/2015	5	6		0.395	0.156	0.04		0.385	0.162	0.134		0.423	0.175	0.161	J
SED-CIC02	10/21/2015	6	7		0.378	0.164	0.047		0.308	0.146	0.075		0.468	0.186	0.118	J
SED-CIC02	10/21/2015	7	8		0.381	0.162	0.172		0.354	0.134	0.088		0.42	0.145	0.071	J
SED-CIC02	10/21/2015	8	9		0.625	0.175	0.096		0.387	0.128	0.063	J	0.645	0.172	0.063	J
SED-CIC02	10/21/2015	9	10		0.329	0.125	0.111		0.328	0.119	0.09		0.356	0.12	0.069	J
SED-CIC03	10/9/2015	0	0.5		0.653	0.168	0.093		0.708	0.171	0.07		0.612	0.155	0.063	
SED-CIC04	10/9/2015	0	0.5		0.488	0.154	0.102		0.641	0.174	0.091		0.415	0.136	0.084	
SED-CIC05	10/9/2015	0	0.5		0.45	0.14	0.11		0.557	0.147	0.066		0.545	0.147	0.077	
SED-CIC06	10/9/2015	0	0.5		0.308	0.105	0.071	J	0.541	0.139	0.053	J	0.396	0.116	0.057	J
SED-CIC06	10/9/2015	0	0.5	SED-CIC06-00-0.5	0.514	0.146	0.079	J	0.427	0.126	0.046		0.456	0.131	0.05	
SED-CIC07	10/9/2015	0	0.5		0.498	0.151	0.109		0.389	0.123	0.06		0.411	0.127	0.063	
SED-CIC08	10/21/2015	0	0.5		0.273	0.117	0.114		0.266	0.103	0.061		0.356	0.122	0.07	J

Notes:
pCi/g - picoCuries per gram
CSU (+/- s) - combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
J - estimated value
U - not detected
* Parent sample ID listed for duplicate samples.

Table 4-8
Background Sediment Sampling Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Uranium-234				Uranium-235				Uranium-238			
					Result (pCi/g)	CSU (+/-2 s)	MDA	Q	Result (pCi/g)	CSU (+/-2 s)	MDA	Q	Result (pCi/g)	CSU (+/-2 s)	MDA	Q
Sediment Coney Island Creek (Background)																
SED-CIC01	10/9/2015	0	0.5		0.749	0.162	0.074		0.027	0.035	0.057	U	0.672	0.15	0.068	
SED-CIC01	10/9/2015	0.5	1		0.799	0.196	0.134		0.042	0.062	0.105	UJ	0.705	0.184	0.137	
SED-CIC01	10/9/2015	1	2		0.922	0.243	0.145	J	0.062	0.071	0.105	UJ	1.039	0.272	0.208	J
SED-CIC01	10/9/2015	1	2	SED-CIC01-01-02	0.683	0.17	0.111	J	0.013	0.048	0.095	UJ	0.485	0.153	0.153	J
SED-CIC01	10/9/2015	2	3		0.961	0.292	0.188	J	0.081	0.106	0.17	UJ	0.68	0.313	0.406	J
SED-CIC01	10/9/2015	3	4		0.555	0.194	0.201	J	0.087	0.106	0.174	UJ	0.495	0.175	0.168	J
SED-CIC01	10/9/2015	4	5		0.71	0.203	0.147	J	0	0.059	0.133	UJ	0.511	0.188	0.201	J
SED-CIC01	10/9/2015	5	6		0.795	0.233	0.199	J	0.033	0.073	0.137	UJ	0.564	0.201	0.205	J
SED-CIC01	10/9/2015	6	7		0.605	0.185	0.125	J	0.037	0.053	0.087	UJ	0.371	0.167	0.2	J
SED-CIC01	10/9/2015	7	8		0.399	0.108	0.075		-0.015	0.02	0.062	U	0.198	0.077	0.077	
SED-CIC01	10/9/2015	8	9		0.977	0.289	0.222	J	0.139	0.127	0.181	UJ	0.591	0.227	0.222	J
SED-CIC01	10/9/2015	9	10		0.529	0.172	0.146	J	0.07	0.069	0.098	UJ	0.779	0.215	0.171	J
SED-CIC02	10/21/2015	0	0.5		0.411	0.192	0.217	J	0.11	0.108	0.154	UJ	0.315	0.186	0.248	J
SED-CIC02	10/21/2015	0.5	1		0.842	0.315	0.284	J	0.165	0.135	0.141	J	0.895	0.321	0.274	J
SED-CIC02	10/21/2015	1	2		0.312	0.152	0.159	J	0.008	0.051	0.12	UJ	0.163	0.114	0.146	J
SED-CIC02	10/21/2015	2	3		0.405	0.161	0.136	J	0.11	0.097	0.133	UJ	0.297	0.188	0.27	J
SED-CIC02	10/21/2015	3	4		0.68	0.261	0.258	J	0.151	0.151	0.227	UJ	0.313	0.204	0.28	J
SED-CIC02	10/21/2015	4	5		0.349	0.155	0.191	J	-0.049	0.076	0.177	UJ	0.353	0.171	0.23	J
SED-CIC02	10/21/2015	5	6		0.523	0.207	0.202	J	0.06	0.09	0.155	UJ	0.345	0.164	0.165	J
SED-CIC02	10/21/2015	6	7		0.35	0.209	0.272	J	-0.021	0.029	0.14	UJ	0.251	0.166	0.21	J
SED-CIC02	10/21/2015	7	8		0.316	0.133	0.144	J	-0.022	0.034	0.104	UJ	0.116	0.107	0.168	U
SED-CIC02	10/21/2015	8	9		3.497	0.67	0.282	J	0.054	0.106	0.196	UJ	1.061	0.323	0.234	J
SED-CIC02	10/21/2015	9	10		0.374	0.156	0.149	J	0.071	0.072	0.096	UJ	0.361	0.156	0.159	J
SED-CIC03	10/9/2015	0	0.5		0.955	0.261	0.175	J	-0.015	0.042	0.127	UJ	0.672	0.231	0.229	J
SED-CIC04	10/9/2015	0	0.5		1.299	0.281	0.122	J	0.029	0.062	0.117	UJ	1.008	0.25	0.179	
SED-CIC05	10/9/2015	0	0.5		1.122	0.249	0.137	J	0.117	0.075	0.073	J	0.857	0.221	0.177	J
SED-CIC06	10/9/2015	0	0.5		0.2	0.076	0.053		0.018	0.026	0.04	U	0.228	0.085	0.07	
SED-CIC06	10/9/2015	0	0.5	SED-CIC06-00-0.5	0.21	0.082	0.061		0.02	0.024	0.021	U	0.16	0.074	0.072	
SED-CIC07	10/9/2015	0	0.5		0.764	0.255	0.196	J	0.153	0.125	0.16	UJ	0.451	0.226	0.278	J
SED-CIC08	10/21/2015	0	0.5		0.56	0.195	0.121	J	0.067	0.077	0.112	UJ	0.359	0.162	0.154	J

Notes:
pCi/g - picoCuries per gram
CSU (+/- s) - combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
J - estimated value
U - not detected
* Parent sample ID listed for duplicate samples.

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

		SB-01		SB-01		SB-02		SB-02		SB-03		SB-03		SB-04		SB-04		SB-04		SB-05		SB-05		SB-05		SB-05	
	Sample ID	SB-01-00-02		SB-01-16-18		SB-02-00-02		SB-02-18-20		SB-03-00-02		SB-03-24-26		SB-04-00-02		SB-04-18-20		SB-904-18-20		SB-05-00-02		SB-05-20-22		SB-905-20-22		SB-05-54-55	
	Parent Sample ID																	SB-04-18-20						SB-05-20-22			
	Sample Date	10/29/2015		10/29/2015		11/6/2015		11/6/2015		10/21/2015		10/21/2015		10/21/2015		10/21/2015		10/21/2015		10/26/2015		10/26/2015		10/26/2015		10/26/2015	
	Type	0-2 feet		16-18 feet		0-2 feet		18-20 feet		0-2 feet		24-26 feet		0-2 feet		18-20 feet		18-20 feet		0-2 feet		20-22 feet		20-22 feet		54-55 feet	
Chemical	RI Screening Criteria	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds (µg/kg)																											
1,1,1-Trichloroethane	100000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,1,2,2-Tetrachloroethane	600	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,1,2-Trichloro-1,2,2-trifluoroethane	100000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,1,2-Trichloroethane	1100	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,1-Dichloroethane	3600	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,1-Dichloroethene	100000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,2,3-Trichlorobenzene	63000	4.4	UJ	4.7	U	5.3	UJ	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,2,4-Trichlorobenzene	24000	4.4	UJ	4.7	U	5.3	UJ	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,2-Dibromo-3-chloropropane	5.3	4.4	UJ	4.7	U	5.3	UJ	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,2-Dibromoethane	36	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,2-Dichlorobenzene	100000	4.4	UJ	4.7	U	5.3	UJ	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,2-Dichloroethane	460	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,2-Dichloropropane	1000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,3-Dichlorobenzene	17000	4.4	UJ	4.7	U	5.3	UJ	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,4-Dichlorobenzene	2600	4.4	UJ	4.7	U	5.3	UJ	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
1,4-Dioxane	5300	44	UJ	47	U	53	R	40	R	64	R	42	R	52	R	51	R	47	R	66	R	55	R	49	R	57	R
2-Butanone	100000	8.7	UJ	9.4	U	8.3	J	7.9	U	13	UJ	8.4	U	10	U	10	U	9.3	U	13	U	11	U	9.7	U	11	U
2-Hexanone	200000	8.7	UJ	9.4	U	11	U	7.9	U	13	R	8.4	U	10	UJ	10	U	9.3	U	13	U	11	U	9.7	U	11	U
4-Methyl-2-pentanone	33000000	8.7	UJ	9.4	U	11	U	7.9	U	13	R	8.4	U	10	UJ	10	U	9.3	U	13	U	11	U	9.7	U	11	U
Acetone	100000	39		19	UJ	80		12	J	25	UJ	17	U	21	U	110		19	U	26	UJ	26		17	J	23	U
Benzene	1200	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Bromochloromethane	150000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Bromodichloromethane	290	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Bromoform	19000	4.4	UJ	4.7	U	5.3	UJ	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Bromomethane	6800	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Carbon Disulfide	100000	4.4	UJ	4.7	UJ	5.3	U	4	UJ	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Carbon Tetrachloride	650	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Chlorobenzene	100000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Chloroethane	14000000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Chloroform	320	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Chloromethane	110000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
cis-1,2-Dichloroethene	59000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
cis-1,3-Dichloropropene	NL	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Cyclohexane	6500000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Dibromochloromethane	8300	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Dichlorodifluoromethane	87000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	UJ	5.2	UJ	5.1	UJ	4.7	UJ	6.6	UJ	5.5	UJ	4.9	UJ	5.7	UJ
Ethylbenzene	5800	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Isopropylbenzene	100000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
m,p-Xylene	100000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Methyl acetate	78000000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Methyl tert-Butyl Ether	47000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Methylcyclohexane	NL	4.4	UJ	4.7	U	5.3	U	4	U	6.4	U	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Methylene Chloride	51000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	UJ	4.9	UJ	27	

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

		SB-01		SB-01		SB-02		SB-02		SB-03		SB-03		SB-04		SB-04		SB-04		SB-05		SB-05		SB-05		SB-05	
	Sample ID	SB-01-00-02		SB-01-16-18		SB-02-00-02		SB-02-18-20		SB-03-00-02		SB-03-24-26		SB-04-00-02		SB-04-18-20		SB-904-18-20		SB-05-00-02		SB-05-20-22		SB-905-20-22		SB-05-54-55	
	Parent Sample ID																	SB-04-18-20						SB-05-20-22			
	Sample Date	10/29/2015		10/29/2015		11/6/2015		11/6/2015		10/21/2015		10/21/2015		10/21/2015		10/21/2015		10/21/2015		10/26/2015		10/26/2015		10/26/2015		10/26/2015	
	Type	0-2 feet		16-18 feet		0-2 feet		18-20 feet		0-2 feet		24-26 feet		0-2 feet		18-20 feet		18-20 feet		0-2 feet		20-22 feet		20-22 feet		54-55 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Volatile Organic Compounds (µg/kg) (continued)																											
o-Xylene	100000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Styrene	6000000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Tetrachloroethene	5500	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Toluene	100000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	UJ	5.5	UJ	4.9	UJ	5.7	UJ
trans-1,2-Dichloroethene	100000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
trans-1,3-Dichloropropene	NL	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Trichloroethene	940	4.4	UJ	4.7	U	5.3	U	4	U	6.4	R	4.2	U	5.2	UJ	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Trichlorofluoromethane	23000000	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Vinyl Chloride	59	4.4	UJ	4.7	U	5.3	U	4	U	6.4	UJ	4.2	U	5.2	U	5.1	U	4.7	U	6.6	U	5.5	U	4.9	U	5.7	U
Semivolatile Organic Compounds (µg/kg)																											
1,1'-Biphenyl	47000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
1,2,4,5-Tetrachlorobenzene	23000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
2,2'-Oxybis(1-chloropropane)	3100000	35	U	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
2,3,4,6-Tetrachlorophenol	1900000	72	UJ	72	UJ	760	U	73	U	810	U	75	U	770	U	74	U	73	U	780	UJ	73	UJ	72	UJ	70	UJ
2,4,5-Trichlorophenol	100000	35	U	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
2,4,6-Trichlorophenol	49000	35	UJ	35	UJ	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	UJ	36	UJ	36	UJ	34	UJ
2,4-Dichlorophenol	100000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
2,4-Dimethylphenol	1300000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
2,4-Dinitrophenol	100000	180	UJ	180	U	1900	U	190	U	2000	R	190	U	1900	R	190	U	180	U	2000	U	180	U	180	U	180	U
2,4-Dinitrotoluene	1700	72	U	72	U	760	U	73	U	810	U	75	U	770	U	74	U	73	U	780	U	73	U	72	U	70	U
2,6-Dinitrotoluene	360	72	UJ	72	U	760	U	73	U	810	U	75	U	770	U	74	U	73	U	780	U	73	U	72	U	70	U
2-Chloronaphthalene	4800000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
2-Chlorophenol	100000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
2-Methylnaphthalene	410	7.2	UJ	7.2	U	76	U	7.3	U	81	U	7.5	U	77	U	7.4	U	7.3	U	270		10		4.9	J	7	U
2-Methylphenol	100000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
2-Nitroaniline	630000	72	UJ	72	U	760	U	73	U	810	U	75	U	770	U	74	U	73	U	780	U	73	U	72	UJ	70	U
2-Nitrophenol	NL	72	UJ	72	U	760	U	73	U	810	U	75	U	770	U	74	U	73	U	780	U	73	U	72	U	70	U
3,3'-Dichlorobenzidine	1200	180	U	180	U	1900	U	190	U	2000	U	190	U	1900	U	190	U	180	U	2000	U	180	U	180	U	180	U
3-Nitroaniline	NL	72	UJ	72	U	760	U	73	U	810	U	75	U	770	U	74	U	73	U	780	U	73	U	72	UJ	70	U
4,6-Dinitro-2-methylphenol	5100	180	UJ	180	U	1900	U	190	U	2000	R	190	U	1900	R	190	U	180	U	2000	U	180	U	180	U	180	U
4-Bromophenyl-phenylether	NL	35	U	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
4-Chloro-3-methylphenol	6300000	35	UJ	35	UJ	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	UJ	36	UJ	36	UJ	34	UJ
4-Chloroaniline	2700	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
4-Chlorophenyl-phenylether	NL	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
4-Methylphenol	34000	72	UJ	72	U	760	U	73	U	810	U	75	U	770	U	74	U	73	U	780	U	73	U	72	U	70	U
4-Nitroaniline	27000	72	UJ	72	U	760	U	73	U	810	U	75	U	770	U	74	U	73	U	780	U	73	U	72	UJ	70	U
4-Nitrophenol	NL	180	U	180	U	1900	U	190	U	2000	U	190	U	1900	U	190	U	180	U	2000	U	180	U	180	UJ	180	U
Acenaphthene	100000	5.4	J	7.2	U	76	U	7.3	U	81	U	7.5	U	77	U	7.4	U	7.3	U	430		11		5.4	J	7	U
Acenaphthylene	100000	6.6	J	7.2	U	76	U	7.3	U	81	U	7.5	U	77	U	7.4	U	7.3	U	110		10		5.1	J	7	U
Acetophenone	7800000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Anthracene	100000	16		7.2	U	76	U	7.3	U	52	J	7.5	U	130		7.4	U	7.3	U	1200		27		13		7	U
Atrazine	2400	35	U	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Benzaldehyde	7800000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

		SB-01		SB-01		SB-02		SB-02		SB-03		SB-03		SB-04		SB-04		SB-04		SB-05		SB-05		SB-05		SB-05	
	Sample ID	SB-01-00-02		SB-01-16-18		SB-02-00-02		SB-02-18-20		SB-03-00-02		SB-03-24-26		SB-04-00-02		SB-04-18-20		SB-904-18-20		SB-05-00-02		SB-05-20-22		SB-905-20-22		SB-05-54-55	
	Parent Sample ID																	SB-04-18-20						SB-05-20-22			
	Sample Date	10/29/2015		10/29/2015		11/6/2015		11/6/2015		10/21/2015		10/21/2015		10/21/2015		10/21/2015		10/21/2015		10/26/2015		10/26/2015		10/26/2015		10/26/2015	
	Type	0-2 feet		16-18 feet		0-2 feet		18-20 feet		0-2 feet		24-26 feet		0-2 feet		18-20 feet		18-20 feet		0-2 feet		20-22 feet		20-22 feet		54-55 feet	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Semivolatile Organic Compounds (µg/kg) (continued)																											
Benzo(a)anthracene	160	120		7.2	U	150		7.3	U	**280**		7.5	U	**670**		7.4	U	7.3	U	**2600**		96	J	51	J	7	U
Benzo(a)pyrene	16	**150**	J	7.2	UJ	**160**		7.3	U	**290**	J	7.5	U	**620**	J	7.4	U	7.3	U	**2500**	J	**89**	J	**47**	J	7	UJ
Benzo(b)fluoranthene	160	**200**		7.2	U	**190**		7.3	U	**460**		7.5	U	**890**		7.4	U	7.3	U	**4400**	J	120	J	64	J	7	U
Benzo(g,h,i)perylene	100000	52	J	7.2	U	100	J	7.3	U	110		7.5	U	140		7.4	U	7.3	U	660	J	26	J	18	J	7	U
Benzo(k)fluoranthene	1000	76	J	7.2	UJ	86		7.3	U	150	J	7.5	U	320	J	7.4	U	7.3	U	**1300**	J	44	J	20	J	7	UJ
Bis(2-chloroethoxy)methane	190000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Bis(2-chloroethyl)ether	230	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Bis(2-ethylhexyl)phthalate	39000	120	J	17	J	370	U	45		400	U	37	U	380	U	36	U	36	U	360	J	33	J	15	J	13	J
Butylbenzylphthalate	100000	72	UJ	72	UJ	760	U	73	U	810	U	75	U	770	U	74	U	73	U	780	UJ	73	UJ	37	J	70	UJ
Caprolactam	31000000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	UJ	36	U	36	U	34	U
Carbazole	NL	35	U	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	400		36	U	36	U	34	U
Chrysene	1000	120		7.2	U	160		7.3	U	340		7.5	U	770		7.4	U	7.3	U	**2700**		130	J	69	J	7	U
Dibenzo(a,h)anthracene	16	7.2	UJ	7.2	U	76	UJ	7.3	U	81	U	7.5	U	77	U	7.4	U	7.3	U	78	UJ	7.3	U	7.2	U	7	U
Dibenzofuran	14000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	300	J	36	U	36	U	34	U
Diethylphthalate	100000	35	U	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Dimethylphthalate	100000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Di-n-butylphthalate	100000	21	J	25	J	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Di-n-octylphthalate	100000	44	J	72	U	760	U	45	J	810	U	75	U	770	U	74	U	73	U	780	UJ	73	U	72	U	70	U
Fluoranthene	100000	210		7.2	U	270	J	7.3	U	460		7.5	U	1000		7.4	U	7.3	U	6000		180	J	89	J	7	U
Fluorene	100000	4.1	J	7.2	U	76	U	7.3	U	81	U	7.5	U	43	J	7.4	U	7.3	U	450		13		7.1	J	7	U
Hexachlorobenzene	210	35	U	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Hexachlorobutadiene	1200	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Hexachlorocyclopentadiene	1800	180	UJ	180	U	1900	U	190	U	2000	R	190	U	1900	R	190	U	180	U	2000	U	180	U	180	UJ	180	U
Hexachloroethane	1800	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Indeno(1,2,3-cd)pyrene	160	48	J	7.2	U	77	J	7.3	U	120		7.5	U	120		7.4	U	7.3	U	**630**	J	25	J	15	J	7	U
Isophorone	100000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	UJ	36	UJ	36	UJ	34	UJ
Naphthalene	3800	7.2	UJ	7.2	U	76	U	7.3	U	81	U	7.5	U	77	U	7.4	U	7.3	U	190		7.5		3.6	J	7	U
Nitrobenzene	3700	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
N-Nitroso-di-n-propylamine	78	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
N-Nitrosodiphenylamine	110000	35	U	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	UJ	36	UJ	36	UJ	34	UJ
Pentachlorophenol	1000	180	U	180	U	1900	U	190	U	2000	U	190	U	1900	U	190	U	180	U	2000	U	180	U	180	U	180	U
Phenanthrene	100000	82	J	7.2	U	130	J	7.3	U	250		7.5	U	650		7.4	U	7.3	U	6100		200	J	94	J	7	U
Phenol	100000	35	UJ	35	U	370	U	36	U	400	U	37	U	380	U	36	U	36	U	380	U	36	U	36	U	34	U
Pyrene	100000	210	J	7.2	U	280	J	7.3	U	450		7.5	U	1400		7.4	U	7.3	U	6100		240	J	110	J	7	U
Polychlorinated Biphenyls (µg/kg)																											
Aroclor 1016	1000	10	U	10	U	11	U	11	U	12	U	11	U	11	U	11	U	10	U	12	U	11	U	11	U	10	U
Aroclor 1221	200	10	U	10	U	11	U	11	U	12	U	11	U	11	U	11	U	10	U	12	U	11	U	11	U	10	U
Aroclor 1232	170	10	U	10	U	11	U	11	U	12	U	11	U	11	U	11	U	10	U	12	U	11	U	11	U	10	U
Aroclor 1242	230	10	U	10	U	11	U	11	U	12	U	11	U	11	U	11	U	10	U	12	U	11	U	11	U	10	U
Aroclor 1248	230	10	U	10	U	11	U	11	U	12	U	11	U	11	U	11	U	10	U	12	U	11	U	11	U	10	U
Aroclor 1254	240	10	U	10	U	11	U	11	U	12	U	11	U	11	U	11	U	10	U	12	U	11	U	11	U	10	U
Aroclor 1260	240	6.3	J	10	U	3.6	J	11	U	7.8	J	11	U	8	J	11	UJ	10	U	190		4.1	J	3.7	J	10	U
Aroclor 1262	1000	10	U	10	U	11	U	11	U	12	U	11	U	11	U	11	U	10	U	12	U	11	U	11	U	10	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

		SB-01		SB-01		SB-02		SB-02		SB-03		SB-03		SB-04		SB-04		SB-04		SB-05		SB-05		SB-05		SB-05	
	Sample ID	SB-01-00-02		SB-01-16-18		SB-02-00-02		SB-02-18-20		SB-03-00-02		SB-03-24-26		SB-04-00-02		SB-04-18-20		SB-904-18-20		SB-05-00-02		SB-05-20-22		SB-905-20-22		SB-05-54-55	
	Parent Sample ID																	SB-04-18-20						SB-05-20-22			
	Sample Date	10/29/2015		10/29/2015		11/6/2015		11/6/2015		10/21/2015		10/21/2015		10/21/2015		10/21/2015		10/21/2015		10/26/2015		10/26/2015		10/26/2015		10/26/2015	
	Type	0-2 feet		16-18 feet		0-2 feet		18-20 feet		0-2 feet		24-26 feet		0-2 feet		18-20 feet		18-20 feet		0-2 feet		20-22 feet		20-22 feet		54-55 feet	
Chemical	RI Screening Criteria	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Polychlorinated Biphenyls (µg/kg) (continued)																											
Aroclor 1268	1000	10	U	10	U	11	U	11	U	12	U	11	U	11	U	11	U	10	U	12	U	11	U	11	U	10	U
Pesticides (µg/kg)																											
4,4'-DDD	2300	1	UJ	1	U	23	U	1.1	U	12	UJ	1.1	U	22	UJ	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
4,4'-DDE	1800	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
4,4'-DDT	1700	0.39	J	1	U	7.8	J	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	UJ	1.1	U	1.1	U	1	U
Aldrin	19	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
alpha-BHC	86	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
alpha-Chlordane	910	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
beta-BHC	72	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
delta-BHC	86	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
Dieldrin	34	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
Endosulfan I	4800	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
Endosulfan II	4800	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	UJ	1.1	U	1.1	U	1	U
Endosulfan Sulfate	4800	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	18	J	1.1	UJ	1.1	U	1	U
Endrin	2200	0.79	J	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	16	J	1.1	UJ	1.1	UJ	1	U
Endrin aldehyde	2200	1	UJ	1	U	23	U	1.1	U	6.1	J	1.1	U	5.1	J	1.1	U	1	U	23	UJ	1.1	U	1.1	U	1	U
Endrin Ketone	2200	1	UJ	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	18	J	1.1	UJ	1.1	UJ	1	U
gamma-BHC (Lindane)	280	1	U	1	U	23	U	1.1	U	12	UJ	1.1	U	22	U	1.1	U	1	U	23	UJ	1.1	U	1.1	U	1	U
gamma-Chlordane	540	1	UJ	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
Heptachlor	130	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
Heptachlor Epoxide	70	1	U	1	U	23	U	1.1	U	12	U	1.1	U	22	U	1.1	U	1	U	23	U	1.1	U	1.1	U	1	U
Methoxychlor	100000	7.4		4.2	U	12	J	4.3	U	26	J	4.2	U	33	J	4.2	U	4.1	U	91	J	7.6		5.1		4.2	U
Toxaphene	490	10	U	10	U	230	U	11	U	120	U	11	U	220	U	11	U	10	U	230	U	11	U	11	U	10	U
Inorganics (µg/kg)																											
Aluminum	77000	8500		7000		6500		5900		7800	J	6300	J	9500	J	4300	J	5400	J	8800	J	9200	J	8000	J	3000	J
Antimony	31	1	UJ	1.1	UJ	1.1	U	1.1	U	6	R	2.2	R	5.3	R	1	R	1.1	R	5.6	UJ	1	UJ	1	UJ	0.99	UJ
Arsenic	0.68	**14**	J	**1.9**	J	**2.9**		**1.4**		**13**	J	**1.4**	J	**15**	J	**1.3**	J	**1.6**	J	**14**		**2.3**		**1.9**		**0.85**	
Barium	350	43	J-	44	J-	52		39		120		40		66		30		39		130	J	47	J	38	J	21	J
Beryllium	14	0.1	J	0.21	J	0.2	J	0.15	J	1.5	U	0.27	U	0.23	J	0.09	J	0.1	J	1.4	U	0.26	U	0.034	J	0.12	J
Cadmium	2.5	0.091	J	0.26	U	0.11	J	0.053	J	0.54	J	0.043	J	0.45	J	0.042	J	0.038	J	0.89	J	0.056	J	0.05	J	0.044	J
Calcium	NL	950		1300		3800		1100		9900	J+	1300	J+	2100	J+	1000	J+	1100	J+	7300	J-	3200	J-	2000	J-	1000	J-
Chromium	NL	13	J-	17	J-	13		15		13		15		15		11		12		20	J-	25	J-	20	J-	8.3	J-
Cobalt	23	3.3	J-	4.8	J-	3.6		5.3		6.3	J	5.3	J	6.2	J	3.3	J	3.8	J	7.1	J	5.4		5		3.3	
Copper	270	15	J-	13	J-	27		9		82		11		66		7.9		9.7		120		25		22		8.4	
Iron	2000	**9600**		**13000**		**9400**		**11000**		**17000**		**13000**		**16000**		**20000**		**11000**		**26000**	J	**15000**	J	**13000**	J	**8100**	J
Lead	400	69		3.6		110		3.3		250	J	2.8	J	150	J	2.6	J	3.1	J	350	J-	13	J-	7.3	J-	2.6	J-
Magnesium	NL	1300		2000		1800		2200		4600	J+	2600	J+	1500	J+	1200	J+	1700	J+	3100		2500		2100		3900	
Manganese	2000	260		310		390		250		160	J+	290	J+	290	J+	250	J+	210	J+	270	J+	280	J+	270	J+	210	J+
Mercury	0.81	0.14		0.081	U	0.56		0.078	U	0.24		0.09	U	0.71		0.086	U	0.082	U	**1.3**	J+	0.054	J+	0.086	UJ	0.076	UJ
Nickel	140	7.6	J-	9.8	J-	6.9		11		14		8.2		13		6.5		7.8		16		11		9.8		33	
Potassium	NL	570		1300		440		930		850	J+	2000	J+	710	J+	800	J+	1000	J+	2500	J+	1400	J+	1200	J+	530	J+
Selenium	36	1	UJ	1.1	UJ	0.76	J	0.44	J	16	J	1.1	UJ	6.3	J	1	UJ	1.1	UJ	5.6	U	1	U	1	U	0.99	U
Silver	36	0.51	U	0.53	U	0.54	U	0.53	U	3	U	0.54	U	2.7	U	0.52	U	0.55	U	2.8	U	0.51	U	0.5	U	0.49	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

		SB-01		SB-01		SB-02		SB-02		SB-03		SB-03		SB-04		SB-04		SB-04		SB-05		SB-05		SB-05		SB-05	
	Sample ID	**SB-01-00-02**		**SB-01-16-18**		**SB-02-00-02**		**SB-02-18-20**		**SB-03-00-02**		**SB-03-24-26**		**SB-04-00-02**		**SB-04-18-20**		**SB-904-18-20**		**SB-05-00-02**		**SB-05-20-22**		**SB-905-20-22**		**SB-05-54-55**	
	Parent Sample ID																	**SB-04-18-20**						**SB-05-20-22**			
	Sample Date	**10/29/2015**		**10/29/2015**		**11/6/2015**		**11/6/2015**		**10/21/2015**		**10/21/2015**		**10/21/2015**		**10/21/2015**		**10/21/2015**		**10/26/2015**		**10/26/2015**		**10/26/2015**		**10/26/2015**	
	Type	**0-2 feet**		**16-18 feet**		**0-2 feet**		**18-20 feet**		**0-2 feet**		**24-26 feet**		**0-2 feet**		**18-20 feet**		**18-20 feet**		**0-2 feet**		**20-22 feet**		**20-22 feet**		**54-55 feet**	
Chemical	**RI Screening Criteria**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Inorganics (µg/kg) (continued)																											
Sodium	NL	200	J	150	J	440		240	J	390	J	78	J	1300	UJ	64	J	55	J	160	J	270		200	J	110	J
Thallium	0.78	2.5	UJ	2.6	UJ	2.7	U	2.6	U	15	U	2.7	U	13	U	2.6	U	2.7	U	14	UJ	2.6	UJ	2.5	UJ	2.5	UJ
Vanadium	100	17	J-	23	J-	21		19		28		20		21		14		18		27		27		22		8.6	
Zinc	2200	63		23		48		23		210		22		210		28		32		280	J+	28	J+	24	J+	13	J+
Miscellaneous																											
Solids, Percent	NL	93.1		92.3		88.1		91.7		80.9		89.7		87.3		89.9		90.6		86		92.4		92.3		95.9	

Notes:
ID - identification
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
Q - qualifier
J - estimated value
J- - estimated value, biased low
J+ - estimated value, biased high
U - not detected
R - rejected value
Highlighted cell and bold format indicates that concentration exceeded screening criteria.

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	SB-06		SB-06		SB-07		SB-07		SB-08		SB-08		SB-11		SB-11		SB-13		SB-13		SB-19		SB-19		SB-21		SB-21		SB-26	
	SB-06-00-02		SB-06-28-30		SB-07-00-02		SB-07-17-19		SB-08-01-02		SB-08-28-30		SB-11-00-02		SB-11-08-09		SB-13-00-02		SB-13-08-10		SB-19-00-02		SB-19-08-10		SB-21-00-02		SB-21-08-10		SB-26-00-02	
	10/29/2015		10/29/2015		10/26/2015		10/26/2015		10/23/2015		10/23/2015		10/20/2015		10/20/2015		10/20/2015		10/20/2015		10/22/2015		10/22/2015		10/22/2015		10/22/2015		10/21/2015	
	0-2 feet		28-30 feet		0-2 feet		17-19 feet		1-2 feet		28-30 feet		0-2 feet		8-9 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		0-2 feet	
Chemical	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Volatile Organic Compounds (µg/kg)																														
1,1,1-Trichloroethane	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
1,1,2,2-Tetrachloroethane	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
1,1,2-Trichloro-1,2,2-trifluoroethane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
1,1,2-Trichloroethane	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
1,1-Dichloroethane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
1,1-Dichloroethene	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
1,2,3-Trichlorobenzene	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
1,2,4-Trichlorobenzene	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
1,2-Dibromo-3-chloropropane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
1,2-Dibromoethane	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
1,2-Dichlorobenzene	4.2	U	5.5	U	4.5	U	3.9	J	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
1,2-Dichloroethane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
1,2-Dichloropropane	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
1,3-Dichlorobenzene	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
1,4-Dichlorobenzene	4.2	U	5.5	U	4.5	U	4	J	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
1,4-Dioxane	42	U	55	U	45	R	44	R	60	R	56	R	45	R	40	R	51	R	47	R	47	R	52	R	48	R	45	R	52	R
2-Butanone	8.4	U	11	U	9.1	U	5.2	J	12	U	11	U	9	U	8	U	10	U	9.4	U	9.4	U	10	U	9.6	U	9	U	10	U
2-Hexanone	8.4	U	11	U	9.1	U	8.7	U	12	UJ	11	U	9	U	8	U	10	U	9.4	U	9.4	U	10	U	9.6	U	9	U	10	U
4-Methyl-2-pentanone	8.4	U	11	U	9.1	U	8.7	U	12	UJ	11	U	9	U	8	U	10	U	9.4	U	9.4	U	10	U	9.6	U	9	U	10	U
Acetone	17	U	22	UJ	18	UJ	29		63		22	U	18	U	71		93		19	U	48		21	U	93		63	J	21	U
Benzene	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Bromochloromethane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Bromodichloromethane	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Bromoform	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Bromomethane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Carbon Disulfide	4.2	U	5.5	U	4.5	U	1.9	J	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Carbon Tetrachloride	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Chlorobenzene	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Chloroethane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Chloroform	4.2	U	5.5	U	13		4.4	U	35		5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Chloromethane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
cis-1,2-Dichloroethene	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
cis-1,3-Dichloropropene	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Cyclohexane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Dibromochloromethane	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Dichlorodifluoromethane	4.2	U	5.5	U	4.5	UJ	4.4	UJ	6	UJ	5.6	UJ	4.5	UJ	4	UJ	5.1	UJ	4.7	UJ	4.7	UJ	5.2	UJ	4.8	UJ	4.5	UJ	5.2	UJ
Ethylbenzene	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Isopropylbenzene	4.2	U	5.5	U	4.5	U	4	J	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
m,p-Xylene	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Methyl acetate	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Methyl tert-Butyl Ether	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Methylcyclohexane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Methylene Chloride	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	SB-06		SB-06		SB-07		SB-07		SB-08		SB-08		SB-11		SB-11		SB-13		SB-13		SB-19		SB-19		SB-21		SB-21		SB-26	
	SB-06-00-02		SB-06-28-30		SB-07-00-02		SB-07-17-19		SB-08-01-02		SB-08-28-30		SB-11-00-02		SB-11-08-09		SB-13-00-02		SB-13-08-10		SB-19-00-02		SB-19-08-10		SB-21-00-02		SB-21-08-10		SB-26-00-02	
	10/29/2015		10/29/2015		10/26/2015		10/26/2015		10/23/2015		10/23/2015		10/20/2015		10/20/2015		10/20/2015		10/20/2015		10/22/2015		10/22/2015		10/22/2015		10/22/2015		10/21/2015	
	0-2 feet		28-30 feet		0-2 feet		17-19 feet		1-2 feet		28-30 feet		0-2 feet		8-9 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		0-2 feet	
Chemical	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Volatile Organic Compounds (µg/kg) (continu																														
o-Xylene	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Styrene	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
Tetrachloroethene	20	J	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Toluene	4.2	U	5.5	U	4.5	UJ	1.7	J	6	UJ	5.6	U	4.5	U	4	U	1.8	J	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
trans-1,2-Dichloroethene	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	UJ	5.2	U
trans-1,3-Dichloropropene	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Trichloroethene	4.2	U	5.5	U	4.5	U	4.4	U	6	UJ	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Trichlorofluoromethane	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Vinyl Chloride	4.2	U	5.5	U	4.5	U	4.4	U	6	U	5.6	U	4.5	U	4	U	5.1	U	4.7	U	4.7	U	5.2	U	4.8	U	4.5	U	5.2	U
Semivolatile Organic Compounds (µg/kg)																														
1,1'-Biphenyl	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
1,2,4,5-Tetrachlorobenzene	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
2,2'-Oxybis(1-chloropropane)	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
2,3,4,6-Tetrachlorophenol	75	UJ	74	UJ	760	UJ	750	UJ	830	U	74	U	74	U	76	U	79	U	73	U	77	U	73	U	75	U	79	U	770	U
2,4,5-Trichlorophenol	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	UJ	39	U	380	U
2,4,6-Trichlorophenol	37	UJ	36	UJ	370	UJ	370	UJ	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	UJ	39	U	380	U
2,4-Dichlorophenol	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
2,4-Dimethylphenol	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	UJ	380	U
2,4-Dinitrophenol	190	UJ	190	U	1900	U	1900	U	2100	U	190	U	190	UJ	190	U	200	UJ	180	U	190	UJ	190	U	190	UJ	200	U	2000	R
2,4-Dinitrotoluene	75	U	74	U	760	U	750	U	830	U	74	U	74	U	76	U	79	U	73	U	77	U	73	U	75	U	79	U	770	U
2,6-Dinitrotoluene	75	U	74	U	760	U	750	U	830	U	74	U	74	U	76	U	79	U	73	U	77	U	73	U	75	U	79	U	770	U
2-Chloronaphthalene	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
2-Chlorophenol	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	UJ	380	U
2-Methylnaphthalene	12		7.4	U	76	U	75	U	83	U	7.4	U	7.4	U	7.6	U	7.9	U	7.3	U	7.7	U	7.3	U	7.5	U	7.9	U	77	U
2-Methylphenol	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	UJ	37	U	39	UJ	380	U
2-Nitroaniline	75	U	74	U	760	U	750	UJ	830	U	74	U	74	U	76	U	79	U	73	U	77	U	73	U	75	U	79	U	770	U
2-Nitrophenol	75	U	74	U	760	U	750	U	830	U	74	U	74	U	76	U	79	U	73	U	77	U	73	U	75	U	79	U	770	U
3,3'-Dichlorobenzidine	190	U	190	U	1900	U	1900	U	2100	U	190	U	190	U	190	U	200	U	180	U	190	U	190	U	190	U	200	U	2000	U
3-Nitroaniline	75	U	74	U	760	U	750	UJ	830	U	74	U	74	U	76	U	79	U	73	U	77	U	73	U	75	U	79	U	770	U
4,6-Dinitro-2-methylphenol	190	UJ	190	U	1900	U	1900	U	2100	U	190	U	190	UJ	190	U	200	UJ	180	U	190	UJ	190	U	190	UJ	200	U	2000	R
4-Bromophenyl-phenylether	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
4-Chloro-3-methylphenol	37	UJ	36	UJ	370	UJ	370	UJ	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
4-Chloroaniline	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	UJ	380	U
4-Chlorophenyl-phenylether	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
4-Methylphenol	75	U	74	U	760	U	750	U	830	U	74	U	74	U	76	U	79	U	73	U	77	U	73	UJ	75	U	79	UJ	770	U
4-Nitroaniline	75	U	74	U	760	U	750	UJ	830	U	74	U	74	U	76	U	79	U	73	U	77	U	73	U	75	U	79	U	770	U
4-Nitrophenol	190	U	190	U	1900	U	1900	UJ	2100	U	190	U	190	U	190	U	200	U	180	U	190	U	190	U	190	U	200	U	2000	U
Acenaphthene	45		7.4	U	76	UJ	75	UJ	83	U	7.4	U	7.4	U	7.6	U	14		7.3	U	3.4	J	7.3	U	7.5	U	7.9	U	45	J
Acenaphthylene	7.5	U	7.4	U	76	UJ	75	UJ	65	J	7.4	U	7.4	U	7.6	U	7.1	J	7.3	U	5.4	J	7.3	U	7.5	U	7.9	U	95	
Acetophenone	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Anthracene	79		7.4	U	38	J	75	U	73	J	7.4	U	7.4	U	7.6	U	47		7.3	U	15		7.3	U	7.5	U	7.9	U	160	
Atrazine	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Benzaldehyde	37	U	36	U	370	U	370	U	1300		37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	UJ	380	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Chemical	SB-06 SB-06-00-02 10/29/2015 0-2 feet		SB-06 SB-06-28-30 10/29/2015 28-30 feet		SB-07 SB-07-00-02 10/26/2015 0-2 feet		SB-07 SB-07-17-19 10/26/2015 17-19 feet		SB-08 SB-08-01-02 10/23/2015 1-2 feet		SB-08 SB-08-28-30 10/23/2015 28-30 feet		SB-11 SB-11-00-02 10/20/2015 0-2 feet		SB-11 SB-11-08-09 10/20/2015 8-9 feet		SB-13 SB-13-00-02 10/20/2015 0-2 feet		SB-13 SB-13-08-10 10/20/2015 8-10 feet		SB-19 SB-19-00-02 10/22/2015 0-2 feet		SB-19 SB-19-08-10 10/22/2015 8-10 feet		SB-21 SB-21-00-02 10/22/2015 0-2 feet		SB-21 SB-21-08-10 10/22/2015 8-10 feet		SB-26 SB-26-00-02 10/21/2015 0-2 feet	
	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Semivolatile Organic Compounds (µg/kg) (co																												
Benzo(a)anthracene	**210**		7.4	U	**200**		75	U	**450**		7.4	U	7.4		7.6	U	**180**		7.3	U	89		7.3	U	13		7.9	U	**940**	
Benzo(a)pyrene	**200**	J	7.4	UJ	**190**	J	75	UJ	**320**	J	7.4	U	9	J	7.6	U	**180**	J	7.3	U	**100**	J	7.3	U	**18**	J	7.9	U	**1100**	J
Benzo(b)fluoranthene	**270**		7.4	U	**370**		75	U	**1900**		7.4	U	11		7.6	U	**240**		7.3	U	140		7.3	U	26		7.9	U	**2000**	
Benzo(g,h,i)perylene	66	J	7.4	U	57	J	75	U	330		7.4	U	7	J	7.6	U	78	J	7.3	U	40	J	7.3	U	8.1	J	7.9	U	330	
Benzo(k)fluoranthene	110	J	7.4	UJ	110	J	75	UJ	670		7.4	U	7.4	U	7.6	U	82	J	7.3	U	53	J	7.3	U	7.1	J	7.9	U	720	J
Bis(2-chloroethoxy)methane	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Bis(2-chloroethyl)ether	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	UJ	380	U
Bis(2-ethylhexyl)phthalate	99	J	32	J	370	U	370	U	410	U	37	U	14	J	37	U	20	J	36	U	120	J	36	U	49	J	39	U	760	J
Butylbenzylphthalate	75	UJ	31	J	760	UJ	750	UJ	830	U	74	U	74	U	76	U	79	U	73	U	56	J	73	U	75	U	79	U	770	U
Caprolactam	37	U	36	U	370	U	370	UJ	410	UJ	37	UJ	37	U	37	U	39	U	36	U	38	U	36	UJ	37	U	39	UJ	380	U
Carbazole	50		36	U	370	U	370	U	410	U	37	U	37	U	37	U	17	J	36	U	38	U	36	U	37	U	39	U	380	U
Chrysene	210		7.4	U	220		75	U	730		7.4	U	11		7.6	U	200		7.3	U	95		7.3	U	17		7.9	U	**1100**	
Dibenzo(a,h)anthracene	7.5	U	7.4	U	76	U	75	U	83	U	7.4	U	7.4	U	7.6	U	7.9	U	7.3	U	7.7	U	7.3	U	7.5	U	7.9	U	77	U
Dibenzofuran	33	J	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Diethylphthalate	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Dimethylphthalate	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Di-n-butylphthalate	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Di-n-octylphthalate	75	UJ	41	J	760	U	750	U	830	U	74	U	74	U	76	U	79	U	73	U	77	U	73	U	75	U	79	U	770	U
Fluoranthene	490		7.4	U	350		75	U	530		7.4	U	20		7.6	U	390		7.3	U	160		7.3	U	53		7.9	U	1600	
Fluorene	33		7.4	U	76	UJ	75	UJ	83	U	7.4	U	7.4	U	7.6	U	13		7.3	U	7.7	U	7.3	U	7.5	U	7.9	U	77	U
Hexachlorobenzene	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Hexachlorobutadiene	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	UJ	380	U
Hexachlorocyclopentadiene	190	UJ	190	U	1900	U	1900	UJ	2100	U	190	U	190	R	190	U	200	R	180	U	190	R	190	U	190	R	200	U	2000	R
Hexachloroethane	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	UJ	37	U	39	UJ	380	U
Indeno(1,2,3-cd)pyrene	64		7.4	U	65	J	75	U	**390**		7.4	U	5.4	J	7.6	U	71		7.3	U	37		7.3	U	7.6		7.9	U	**350**	
Isophorone	37	U	36	U	370	UJ	370	UJ	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Naphthalene	18		7.4	U	76	U	75	U	83	U	7.4	U	7.4	U	7.6	U	7.9	U	7.3	U	7.7	U	7.3	U	7.5	U	7.9	U	32	J
Nitrobenzene	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
N-Nitroso-di-n-propylamine	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	UJ	37	U	39	UJ	380	U
N-Nitrosodiphenylamine	37	U	36	U	370	UJ	370	UJ	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	U	37	U	39	U	380	U
Pentachlorophenol	190	U	190	U	1900	U	1900	U	2100	U	190	U	190	U	190	U	200	U	180	U	190	U	190	U	190	U	200	U	2000	U
Phenanthrene	460		7.4	U	200		75	U	250		7.4	U	29		7.6	U	250		7.3	U	77		7.3	U	48		7.9	U	620	
Phenol	37	U	36	U	370	U	370	U	410	U	37	U	37	U	37	U	39	U	36	U	38	U	36	UJ	37	U	39	UJ	380	U
Pyrene	390		7.4	U	290		75	U	460		7.4	U	26		7.6	U	350		7.3	U	150		7.3	U	40		7.9	U	1500	
Polychlorinated Biphenyls (µg/kg)																												
Aroclor 1016	11	U	11	U	11	U	11	U	12	U	11	U	11	U	11	U	12	U	10	U	11	U	11	U	10	U	11	U	110	U
Aroclor 1221	11	U	11	U	11	U	11	U	12	U	11	U	11	U	11	U	12	U	10	U	11	U	11	U	10	U	11	U	110	U
Aroclor 1232	11	U	11	U	11	U	11	U	12	U	11	U	11	U	11	U	12	U	10	U	11	U	11	U	10	U	11	U	110	U
Aroclor 1242	11	U	11	U	11	U	11	U	12	U	11	U	11	U	11	U	12	U	10	U	11	U	11	U	10	U	11	U	110	U
Aroclor 1248	11	U	11	U	11	U	11	U	12	U	11	U	11	U	11	U	12	U	10	U	11	U	11	U	10	U	11	U	110	U
Aroclor 1254	11	U	11	U	11	U	11	U	12	U	11	U	11	U	11	U	12	U	10	U	11	U	11	U	10	U	11	U	110	U
Aroclor 1260	4.8	J	11	U	6.6	J	11	U	12	U	11	U	3.7	J	11	U	38		10	U	11	U	11	U	10	U	11	U	**1200**	
Aroclor 1262	11	U	11	U	11	U	11	U	12	U	11	U	11	U	11	U	12	U	10	U	11	U	11	U	10	U	11	U	110	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Chemical	SB-06 SB-06-00-02 10/29/2015 0-2 feet		SB-06 SB-06-28-30 10/29/2015 28-30 feet		SB-07 SB-07-00-02 10/26/2015 0-2 feet		SB-07 SB-07-17-19 10/26/2015 17-19 feet		SB-08 SB-08-01-02 10/23/2015 1-2 feet		SB-08 SB-08-28-30 10/23/2015 28-30 feet		SB-11 SB-11-00-02 10/20/2015 0-2 feet		SB-11 SB-11-08-09 10/20/2015 8-9 feet		SB-13 SB-13-00-02 10/20/2015 0-2 feet		SB-13 SB-13-08-10 10/20/2015 8-10 feet		SB-19 SB-19-00-02 10/22/2015 0-2 feet		SB-19 SB-19-08-10 10/22/2015 8-10 feet		SB-21 SB-21-00-02 10/22/2015 0-2 feet		SB-21 SB-21-08-10 10/22/2015 8-10 feet		SB-26 SB-26-00-02 10/21/2015 0-2 feet	
	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Polychlorinated Biphenyls (µg/kg) (continued																												
Aroclor 1268	11	U	11	U	11	U	11	U	12	U	11	U	11	U	11	U	12	U	10	U	11	U	11	U	10	U	11	U	110	U
Pesticides (µg/kg)																												
4,4'-DDD	11	U	1.1	U	23	U	1.1	U	13	U	1.1	U	1.1	UJ	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
4,4'-DDE	11	U	1.1	U	23	U	1.1	U	12	UJ	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
4,4'-DDT	11	U	1.1	U	23	UJ	1.1	U	32	J	1.1	U	0.46	J	1.1	U	5.2	J	1	U	11	U	1.1	U	1	U	0.17	J	110	J+
Aldrin	11	U	1.1	U	23	U	1.1	U	12	UJ	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
alpha-BHC	11	U	1.1	U	23	U	1.1	U	12	U	1.1	U	1.1	U	0.36	J	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
alpha-Chlordane	11	U	1.1	U	23	U	1.1	U	12	U	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	UJ
beta-BHC	11	U	1.1	U	23	U	1.1	U	12	UJ	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
delta-BHC	11	U	1.1	U	23	U	1.1	U	4.2	J	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
Dieldrin	11	U	1.1	U	23	U	1.1	U	12	U	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
Endosulfan I	11	U	1.1	U	23	U	1.1	U	12	U	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
Endosulfan II	11	U	1.1	U	23	U	1.1	U	12	U	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
Endosulfan Sulfate	11	U	1.1	U	23	U	1.1	U	6.1	J	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	UJ	23	U
Endrin	11	U	1.1	U	23	U	1.1	U	12	U	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	34	J+
Endrin aldehyde	11	U	1.1	U	23	U	1.1	U	12	UJ	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
Endrin Ketone	11	U	1.1	U	23	U	1.1	U	12	UJ	1.1	U	1.1	U	1.1	U	8.1	J	1	U	11	U	1.1	U	1	U	1.1	U	51	J
gamma-BHC (Lindane)	11	U	1.1	U	23	U	1.1	UJ	12	U	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
gamma-Chlordane	11	U	1.1	U	23	U	1.1	U	12	U	1.1	U	0.27	J	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
Heptachlor	11	U	1.1	U	23	U	1.1	U	18	U	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	UJ	1.1	U	23	U
Heptachlor Epoxide	11	U	1.1	U	23	U	1.1	U	12	U	1.1	U	1.1	U	1.1	U	12	U	1	U	11	U	1.1	U	1	U	1.1	U	23	U
Methoxychlor	45	UJ	4.3	U	33	J	4.5	U	49	UJ	4.4	U	4.4	U	4.3	U	47	UJ	4.2	U	2.8	J	4.2	U	0.74	J	4.5	U	63	J
Toxaphene	110	U	11	U	230	U	11	U	120	U	11	U	11	U	11	U	120	U	10	U	110	U	11	U	10	U	11	U	230	U
Inorganics (µg/kg)																												
Aluminum	5000		2800		4000	J	9300	J	1300	J	8500	J	9900	J	11000	J	9200	J	7600	J	9000	J	9700	J	10000	J	17000	J	9100	J
Antimony	1.1	UJ	1	UJ	1.1	UJ	1	UJ	11	UJ	1.1	UJ	1	R	1.1	R	1.2	R	1	R	1.1	R	1.1	UJ	1.1	R	5.7	UJ	5.7	R
Arsenic	**8.5**	J	**4.8**	J	**31**		**45**		**8.9**	J	**11**	J	**2.4**	J	**1**	J	**5.5**	J	**1.6**	J	**4.8**	J	**2.5**	J	**4.5**	J	4.3	UJ	**14**	J
Barium	40	J-	57	J-	**760**	J	32	J	200		35		45		46		56		40		48		21		44		34		150	
Beryllium	0.13	J	0.064	J	0.28	U	0.26	U	2.8	U	0.27	U	0.2	J	0.21	J	0.28	J	0.15	J	0.41		0.27	U	0.2	J	1.4	U	0.11	J
Cadmium	0.21	J	0.25	U	0.28	U	0.34		0.34	J	0.27	U	0.076	J	0.027	J	0.22	J	0.042	J	0.13	J	0.048	J	0.049	J	1.4	U	1.2	J
Calcium	14000		1200		1300	J-	560	J-	31000		1600		1600	J+	780	J+	14000	J+	1000	J+	3300	J+	1300		8200	J+	640	J	3800	J+
Chromium	13	J-	7	J-	14	J-	21	J-	8.9		16		21		17		13		15		19		16		19		24		22	
Cobalt	4.3	J-	3.3	J-	6.5		9.5		1.4	J	3.1		5.5	J	4.1	J	3.4	J	5.5	J	4.6	J	4.8		5.8	J	2.3	J	6.5	J
Copper	23	J-	6.2	J-	56		19		260		14		15		17		25		17		25		11		16		9.9		200	
Iron	**11000**		**20000**		**15000**	J	**8900**	J	1300		**13000**		**15000**		**11000**		**10000**		**14000**		**14000**		**10000**		**20000**		**12000**		**22000**	
Lead	58		2.2		190	J-	13	J-	**510**	J	6.4	J	33	J	5.6	J	88	J	4.2	J	90	J	4.2	J	14	J	6.9	J	290	J
Magnesium	5600		1100		610		1700		250	J	1800		2000	J+	2400	J+	1600	J+	1900	J+	2100	J+	1500		2000	J+	1600		2300	J+
Manganese	150		690		52	J+	66	J+	17	J	77	J	230	J+	250	J+	230	J+	310	J+	180	J+	200	J	390	J+	57	J	280	J+
Mercury	0.052	J	0.08	U	0.59	J+	0.08	UJ	**1.7**		0.081	U	0.014	J	0.09	U	0.46		0.082	U	0.21		0.088	U	0.026	J	0.094	U	**1.1**	
Nickel	11	J-	6.7	J-	4.4		12		23	U	9.4		11		9		8.9		10		14		8.1		12		6.9	J	21	
Potassium	900		540		640	J+	1100	J+	580	J	1100		950	J+	1500	J+	680	J+	1100	J+	830	J+	780		880	J+	900	J	1000	J+
Selenium	1.1	UJ	0.51	J-	**50**		0.43	J	**1100**		1.1	U	1	UJ	1.1	UJ	1.3	J	1	UJ	0.52	J	1.1	U	0.5	J	5.7	U	2.3	J
Silver	0.53	U	0.51	U	0.56	U	0.52	U	5.7	U	0.54	U	0.5	U	0.54	U	0.58	U	0.52	U	0.54	U	0.53	U	0.55	U	2.8	U	2.9	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	SB-06		SB-06		SB-07		SB-07		SB-08		SB-08		SB-11		SB-11		SB-13		SB-13		SB-19		SB-19		SB-21		SB-21		SB-26	
	SB-06-00-02		SB-06-28-30		SB-07-00-02		SB-07-17-19		SB-08-01-02		SB-08-28-30		SB-11-00-02		SB-11-08-09		SB-13-00-02		SB-13-08-10		SB-19-00-02		SB-19-08-10		SB-21-00-02		SB-21-08-10		SB-26-00-02	
	10/29/2015		10/29/2015		10/26/2015		10/26/2015		10/23/2015		10/23/2015		10/20/2015		10/20/2015		10/20/2015		10/20/2015		10/22/2015		10/22/2015		10/22/2015		10/22/2015		10/21/2015	
	0-2 feet		28-30 feet		0-2 feet		17-19 feet		1-2 feet		28-30 feet		0-2 feet		8-9 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		0-2 feet	
Chemical	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Inorganics (µg/kg) (continued)																														
Sodium	200	J	180	J	190	J	130	J	410	J	220	J	85	J	82	J	87	J	100	J	140	J	49	J	150	J	160	J	110	J
Thallium	2.7	UJ	2.5	UJ	2.8	UJ	2.6	UJ	28	U	2.7	U	2.5	U	2.7	U	2.9	U	2.6	U	2.7	U	2.7	U	2.7	U	14	U	14	U
Vanadium	18	J-	10	J-	21		32		5.2	J	21		27		27		19		23		24		23		28		32		47	
Zinc	65		12		31	J+	110	J+	35		23		50		23		73		20		78		23		35		24		390	
Miscellaneous																														
Solids, Percent	88.1		90.4		88.5		89.1		80.4		89.6		90.1		88.7		84.3		91.9		87.4		90.8		89.3		85.2		87.1	

Notes:
ID - identification
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
Q - qualifier
J - estimated value
J- - estimated value, biased low
J+ - estimated value, biased high
U - not detected
R - rejected value
Highlighted cell and bold format indicates that conc

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	SB-26		SB-29		SB-29		SB-29		SB-31		SB-31		SB-32		SB-33		SB-33		SB-35		SB-35		SB-44		SB-44		SB-45		SB-45	
	SB-26-05-07		SB-29-00-02		SB-929-00-02 SB-29-00-02		SB-29-08-10		SB-31-00-02		SB-31-08-10		SB-32-05-07		SB-33-00-02		SB-33-08-10		SB-35-00-02		SB-35-20-22		SB-44-00-02		SB-44-08-10		SB-45-00-02		SB-45-08-10	
	10/21/2015		10/20/2015		10/20/2015		10/20/2015		10/19/2015		10/19/2015		2/15/2016		10/20/2015		10/20/2015		10/27/2015		10/27/2015		10/28/2015		10/28/2015		10/28/2015		10/28/2015	
	5-7 feet		0-2 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		5-7 feet		0-2 feet		8-10 feet		0-2 feet		20-22 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet	
Chemical	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Volatile Organic Compounds (µg/kg)																														
1,1,1-Trichloroethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
1,1,2,2-Tetrachloroethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
1,1,2-Trichloroethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
1,1-Dichloroethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
1,1-Dichloroethene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
1,2,3-Trichlorobenzene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	U	4.3	U	5.2	U	5.4	U
1,2,4-Trichlorobenzene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	U	4.3	U	5.2	U	5.4	U
1,2-Dibromo-3-chloropropane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	U	4.3	U	5.2	U	5.4	U
1,2-Dibromoethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
1,2-Dichlorobenzene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	U	4.3	U	5.2	U	5.4	U
1,2-Dichloroethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
1,2-Dichloropropane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
1,3-Dichlorobenzene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	U	4.3	U	5.2	U	5.4	U
1,4-Dichlorobenzene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	U	4.3	U	5.2	U	5.4	U
1,4-Dioxane	50	R	61	R	79	R	55	R	47	R	47	R	22000	R	40	R	49	R	48	R	61	R	75	R	43	R	52	R	54	R
2-Butanone	10	U	12	U	16	U	11	U	9.4	U	9.5	U	4400	U	8	U	9.9	U	9.7	U	12	U	15	U	8.6	U	10	U	11	U
2-Hexanone	10	U	12	U	16	U	11	U	9.4	U	9.5	U	4400	U	8	U	9.9	U	9.7	U	12	U	15	U	8.6	U	10	U	11	U
4-Methyl-2-pentanone	10	U	12	U	16	U	11	U	9.4	U	9.5	U	4400	U	8	U	9.9	U	9.7	U	12	U	15	U	8.6	U	10	U	11	U
Acetone	20	U	24	U	32	U	22	U	19	U	19	U	8800	U	16	U	20	U	19	UJ	26		21	J	17	UJ	21	UJ	21	UJ
Benzene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Bromochloromethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Bromodichloromethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Bromoform	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	U	4.3	U	5.2	U	5.4	U
Bromomethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Carbon Disulfide	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	UJ	4.3	UJ	5.2	UJ	5.4	UJ
Carbon Tetrachloride	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Chlorobenzene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Chloroethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Chloroform	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Chloromethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	U	4.3	U	5.2	U	5.4	U
cis-1,2-Dichloroethene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
cis-1,3-Dichloropropene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Cyclohexane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2500		4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	U	4.3	U	5.2	U	5.4	U
Dibromochloromethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Dichlorodifluoromethane	5	UJ	6.1	UJ	7.9	UJ	5.5	UJ	4.7	UJ	4.7	UJ	2200	U	4	UJ	4.9	UJ	4.8	UJ	6.1	UJ	7.5	UJ	4.3	UJ	5.2	UJ	5.4	UJ
Ethylbenzene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	5300		4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Isopropylbenzene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	1600	J	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
m,p-Xylene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	8000		4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Methyl acetate	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Methyl tert-Butyl Ether	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Methylcyclohexane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	7400	J	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Methylene Chloride	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	SB-26		SB-29		SB-29		SB-29		SB-31		SB-31		SB-32		SB-33		SB-33		SB-35		SB-35		SB-44		SB-44		SB-45		SB-45	
	SB-26-05-07		SB-29-00-02		SB-929-00-02 SB-29-00-02		SB-29-08-10		SB-31-00-02		SB-31-08-10		SB-32-05-07		SB-33-00-02		SB-33-08-10		SB-35-00-02		SB-35-20-22		SB-44-00-02		SB-44-08-10		SB-45-00-02		SB-45-08-10	
	10/21/2015		10/20/2015		10/20/2015		10/20/2015		10/19/2015		10/19/2015		2/15/2016		10/20/2015		10/20/2015		10/27/2015		10/27/2015		10/28/2015		10/28/2015		10/28/2015		10/28/2015	
	5-7 feet		0-2 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		5-7 feet		0-2 feet		8-10 feet		0-2 feet		20-22 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet	
Chemical	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Volatile Organic Compounds (µg/kg) (continu																														
o-Xylene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	4600		4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Styrene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Tetrachloroethene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Toluene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	UJ	6.1	UJ	7.5	UJ	4.3	UJ	5.2	UJ	5.4	UJ
trans-1,2-Dichloroethene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
trans-1,3-Dichloropropene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Trichloroethene	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Trichlorofluoromethane	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Vinyl Chloride	5	U	6.1	U	7.9	U	5.5	U	4.7	U	4.7	U	2200	U	4	U	4.9	U	4.8	U	6.1	U	7.5	U	4.3	U	5.2	U	5.4	U
Semivolatile Organic Compounds (µg/kg)																														
1,1'-Biphenyl	35	U	35	U	360	U	34	U	470		38	U	13000		350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
1,2,4,5-Tetrachlorobenzene	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
2,2'-Oxybis(1-chloropropane)	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
2,3,4,6-Tetrachlorophenol	72	U	71	U	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	UJ	88	UJ	770	UJ	73	UJ	73	UJ	71	UJ
2,4,5-Trichlorophenol	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
2,4,6-Trichlorophenol	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	UJ	43	UJ	380	UJ	36	UJ	36	UJ	35	UJ
2,4-Dichlorophenol	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
2,4-Dimethylphenol	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
2,4-Dinitrophenol	180	U	180	UJ	1900	R	180	U	1900	R	200	U	47000	U	1800	R	190	U	1900	U	220	U	2000	U	190	U	180	U	180	U
2,4-Dinitrotoluene	72	U	71	U	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	U	88	U	770	U	73	U	73	U	71	U
2,6-Dinitrotoluene	72	U	71	U	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	U	88	U	770	U	73	U	73	U	71	U
2-Chloronaphthalene	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
2-Chlorophenol	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
2-Methylnaphthalene	7.2	U	7.1	U	73	U	6.9	U	**1600**		7.7	U	**190000**		72	U	7.6	U	73	U	8.8	U	77	U	7.3	U	7.3	U	7.1	U
2-Methylphenol	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
2-Nitroaniline	72	U	71	U	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	U	88	U	770	U	73	U	73	U	71	U
2-Nitrophenol	72	U	71	U	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	U	88	U	770	U	73	U	73	U	71	U
3,3'-Dichlorobenzidine	180	U	180	U	1900	U	180	U	1900	U	200	U	47000	U	1800	U	190	U	1900	U	220	U	2000	U	190	U	180	U	180	U
3-Nitroaniline	72	U	71	U	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	U	88	U	770	U	73	U	73	U	71	U
4,6-Dinitro-2-methylphenol	180	U	180	UJ	1900	R	180	U	1900	R	200	U	47000	U	1800	R	190	U	1900	U	220	U	2000	U	190	U	180	U	180	U
4-Bromophenyl-phenylether	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
4-Chloro-3-methylphenol	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	UJ	43	UJ	380	UJ	36	UJ	36	UJ	35	UJ
4-Chloroaniline	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
4-Chlorophenyl-phenylether	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
4-Methylphenol	72	U	71	U	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	U	88	U	770	U	73	U	73	U	71	U
4-Nitroaniline	72	U	71	U	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	U	88	U	770	U	73	U	73	U	71	U
4-Nitrophenol	180	U	180	U	1900	U	180	U	1900	U	200	U	47000	U	1800	U	190	U	1900	U	220	U	2000	U	190	U	180	U	180	U
Acenaphthene	7.2	U	5.7	J	73	U	6.9	U	3300		7.7	U	10000		72	U	7.6	U	40	J	8.8	U	96		7.3	U	7.3	U	7.1	U
Acenaphthylene	7.2	U	13		73	U	6.9	U	760		7.7	U	1900	U	72	U	7.6	U	73	U	8.8	U	51	J	7.3	U	4.6	J	7.1	U
Acetophenone	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Anthracene	7.2	U	20		51	J	6.9	U	8600		7.7	U	11000		28	J	7.6	U	140		8.8	U	400		7.3	U	15		7.1	U
Atrazine	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Benzaldehyde	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	SB-26		SB-29		SB-29		SB-29		SB-31		SB-31		SB-32		SB-33		SB-33		SB-35		SB-35		SB-44		SB-44		SB-45		SB-45	
	SB-26-05-07		SB-29-00-02		SB-929-00-02 SB-29-00-02		SB-29-08-10		SB-31-00-02		SB-31-08-10		SB-32-05-07		SB-33-00-02		SB-33-08-10		SB-35-00-02		SB-35-20-22		SB-44-00-02		SB-44-08-10		SB-45-00-02		SB-45-08-10	
	10/21/2015		10/20/2015		10/20/2015		10/20/2015		10/19/2015		10/19/2015		2/15/2016		10/20/2015		10/20/2015		10/27/2015		10/27/2015		10/28/2015		10/28/2015		10/28/2015		10/28/2015	
	5-7 feet		0-2 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		5-7 feet		0-2 feet		8-10 feet		0-2 feet		20-22 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet	
Chemical	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Semivolatile Organic Compounds (µg/kg) (cor																														
Benzo(a)anthracene	7.2	U	87		**200**		6.9	U	**13000**		7.7	U	**5700**		**160**		7.6	U	**370**		18		**2100**		7.3	U	130		7.1	U
Benzo(a)pyrene	7.2	U	**100**	J	**220**	J	6.9	U	**10000**	J	7.7	U	**3200**		**180**	J	7.6	U	**360**	J	**23**	J	**2000**	J	7.3	UJ	**130**	J	7.1	UJ
Benzo(b)fluoranthene	7.2	U	**170**		**340**		6.9	U	**12000**		7.7	U	**1500**	J	**240**		7.6	U	**530**		31		**2900**		7.3	U	**220**		7.1	U
Benzo(g,h,i)perylene	7.2	U	49	J	120		6.9	U	2900		7.7	U	1400	J	60	J	7.6	U	100		11		490		7.3	U	61		7.1	U
Benzo(k)fluoranthene	7.2	U	61	J	130	J	6.9	U	**6500**	J	7.7	U	1900	U	85	J	7.6	U	260	J	13	J	**1200**	J	7.3	UJ	68	J	7.1	UJ
Bis(2-chloroethoxy)methane	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Bis(2-chloroethyl)ether	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Bis(2-ethylhexyl)phthalate	14	J	460	J	790		56	J	910	J	16	J	**41000**		350	U	38	U	360	U	140	U	380	U	36	U	36	U	35	U
Butylbenzylphthalate	72	U	49	J	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	UJ	88	UJ	770	UJ	73	UJ	73	UJ	71	UJ
Caprolactam	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	UJ	43	UJ	380	UJ	36	UJ	36	UJ	35	UJ
Carbazole	35	U	35	U	360	U	34	U	1900		38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Chrysene	7.2	U	77		220		6.9	U	**14000**		7.7	U	**7300**		160		7.6	U	340		20		**2400**		7.3	U	150		7.1	U
Dibenzo(a,h)anthracene	7.2	U	7.1	U	73	U	6.9	U	76	U	7.7	U	**700**	J	72	U	7.6	U	73	U	8.8	U	77	U	7.3	U	7.3	U	7.1	U
Dibenzofuran	35	U	35	U	360	U	34	U	2000		38	U	4900	J	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Diethylphthalate	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Dimethylphthalate	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Di-n-butylphthalate	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Di-n-octylphthalate	72	U	71	U	730	U	69	U	760	U	77	U	19000	U	720	U	76	U	730	U	43	J	770	U	73	U	73	U	71	U
Fluoranthene	7.2	U	130		330		6.9	U	27000		7.7	U	2800		270		7.6	U	730		27		3300		7.3	U	200		7.1	U
Fluorene	7.2	U	6.3	J	73	U	6.9	U	5600		7.7	U	14000		72	U	7.6	U	48	J	8.8	U	100		7.3	U	7.3	U	7.1	U
Hexachlorobenzene	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Hexachlorobutadiene	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Hexachlorocyclopentadiene	180	U	180	R	1900	R	180	U	19000	R	200	U	47000	U	1800	R	190	U	1900	U	220	U	2000	U	190	U	180	U	180	U
Hexachloroethane	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Indeno(1,2,3-cd)pyrene	7.2	U	42		100		6.9	U	**2900**		7.7	U	**530**	J	65	J	7.6	U	95		10		**430**		7.3	U	53		7.1	U
Isophorone	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	UJ	43	UJ	380	UJ	36	UJ	36	UJ	35	UJ
Naphthalene	7.2	U	3.2	J	73	U	6.9	U	1300		7.7	U	**63000**		72	U	7.6	U	73	U	8.8	U	27	J	7.3	U	7.3	U	7.1	U
Nitrobenzene	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
N-Nitroso-di-n-propylamine	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
N-Nitrosodiphenylamine	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	UJ	43	UJ	380	UJ	36	UJ	36	UJ	35	UJ
Pentachlorophenol	180	U	180	U	1900	U	180	U	1900	U	200	U	47000	U	1800	U	190	U	1900	U	220	U	2000	U	190	U	180	U	180	U
Phenanthrene	7.2	U	67		190		6.9	U	37000		7.7	U	46000		100		7.6	U	560		13		2200		7.3	U	73		7.1	U
Phenol	35	U	35	U	360	U	34	U	370	U	38	U	9200	U	350	U	38	U	360	U	43	U	380	U	36	U	36	U	35	U
Pyrene	7.2	U	130		320		6.9	U	27000		7.7	U	14000		250		7.6	U	690		25		4700		7.3	U	230		7.1	U
Polychlorinated Biphenyls (µg/kg)																														
Aroclor 1016	11	U	10	U	11	U	9.7	U	220	U	11	U	54	UJ	10	U	11	U	11	U	13	U	12	U	11	U	5500	U	11	U
Aroclor 1221	11	U	10	U	11	U	9.7	U	220	U	11	U	54	U	10	U	11	U	11	U	13	U	12	U	11	U	5500	U	11	U
Aroclor 1232	11	U	10	U	11	U	9.7	U	220	U	11	U	54	U	10	U	11	U	11	U	13	U	12	U	11	U	5500	U	11	U
Aroclor 1242	11	U	10	U	11	U	9.7	U	220	U	11	U	54	U	10	U	11	U	11	U	13	U	12	U	11	U	5500	U	11	U
Aroclor 1248	11	U	10	U	11	U	9.7	U	220	U	11	U	54	U	10	U	11	U	11	U	13	U	12	U	11	U	5500	U	11	U
Aroclor 1254	11	U	10	U	11	U	9.7	U	220	U	11	U	54	U	10	U	11	U	11	U	13	U	12	U	11	U	5500	U	11	U
Aroclor 1260	11	UJ	62		70		9.7	U	**3000**	J+	11	U	31	J	140		11	UJ	38		13	U	15		11	U	**100000**	J+	4.3	J
Aroclor 1262	11	U	10	U	11	U	9.7	U	220	U	11	U	54	U	10	U	11	U	11	U	13	U	12	U	11	U	5500	U	11	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	SB-26		SB-29		SB-29		SB-29		SB-31		SB-31		SB-32		SB-33		SB-33		SB-35		SB-35		SB-44		SB-44		SB-45		SB-45	
	SB-26-05-07		SB-29-00-02		SB-929-00-02 SB-29-00-02		SB-29-08-10		SB-31-00-02		SB-31-08-10		SB-32-05-07		SB-33-00-02		SB-33-08-10		SB-35-00-02		SB-35-20-22		SB-44-00-02		SB-44-08-10		SB-45-00-02		SB-45-08-10	
	10/21/2015		10/20/2015		10/20/2015		10/20/2015		10/19/2015		10/19/2015		2/15/2016		10/20/2015		10/20/2015		10/27/2015		10/27/2015		10/28/2015		10/28/2015		10/28/2015		10/28/2015	
	5-7 feet		0-2 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		5-7 feet		0-2 feet		8-10 feet		0-2 feet		20-22 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet	
Chemical	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Polychlorinated Biphenyls (µg/kg) (continued																														
Aroclor 1268	11	U	10	U	11	U	9.7	U	220	U	11	U	54	U	10	U	11	U	11	U	13	U	12	U	11	U	5500	U	11	U
Pesticides (µg/kg)																														
4,4'-DDD	1.1	U	21	U	20	U	0.97	U	30	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
4,4'-DDE	1.1	U	21	U	20	U	0.97	U	22	UJ	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
4,4'-DDT	1.1	UJ	21	UJ	7.7	J	0.97	U	340	J+	1.1	U	54	UJ	16		1.1	U	22	UJ	1.3	U	23	U	1.1	U	**6800**	J+	1	U
Aldrin	1.1	U	21	U	20	U	0.97	U	22	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
alpha-BHC	1.1	U	21	U	20	U	0.97	U	22	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
alpha-Chlordane	1.1	U	21	U	20	U	0.97	U	27	J+	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
beta-BHC	1.1	U	21	U	20	U	0.97	U	22	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
delta-BHC	1.1	U	21	U	20	U	0.97	U	22	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
Dieldrin	1.1	U	21	U	20	U	0.97	U	22	UJ	1.1	U	54	U	10	UJ	1.1	U	**40**		1.3	U	23	U	1.1	U	**800**	J	1	U
Endosulfan I	1.1	U	21	U	20	U	0.97	U	22	UJ	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
Endosulfan II	1.1	U	21	U	20	U	0.97	U	28	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
Endosulfan Sulfate	1.1	U	21	U	20	U	0.97	U	22	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1600	J	1	U
Endrin	1.1	U	21	U	20	U	0.97	U	130	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	UJ	1.1	U	1100	U	1	U
Endrin aldehyde	1.1	U	21	U	20	U	0.97	UJ	25	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	8.8	J	1.1	U	1100	UJ	1	U
Endrin Ketone	1.1	U	21	UJ	20	UJ	0.97	U	220	U	1.1	U	54	U	10	UJ	1.1	U	22	UJ	1.3	U	23	U	1.1	U	1100	UJ	1	U
gamma-BHC (Lindane)	1.1	U	21	U	20	U	0.97	U	22	U	1.1	U	54	U	10	U	1.1	U	22	U	0.39	J	23	U	1.1	U	1100	U	1	U
gamma-Chlordane	1.1	U	21	U	20	U	0.97	U	22	UJ	1.1	U	54	U	10	U	1.1	U	4.1	J	1.3	U	23	U	1.1	U	1100	U	1	U
Heptachlor	1.1	U	21	U	20	U	0.97	U	9.2	J+	1.1	U	54	U	10	U	1.1	U	22	U	1.3	UJ	23	U	1.1	U	1100	U	1	U
Heptachlor Epoxide	1.1	U	21	U	20	U	0.97	U	22	U	1.1	U	54	U	10	U	1.1	U	22	U	1.3	U	23	U	1.1	U	1100	U	1	U
Methoxychlor	4.2	U	7.9	J	7.9	J	3.9	U	490	J+	4.6	U	210	U	41	UJ	4.4	U	19	J	5.3	UJ	120		4.2	U	4400	U	4.1	U
Toxaphene	11	U	210	U	200	U	9.7	U	220	U	11	U	540	R	100	U	11	U	220	U	13	U	230	UJ	11	UJ	11000	UJ	10	UJ
Inorganics (µg/kg)																														
Aluminum	8800	J	6300	J	6500	J	4000	J	6100	J	13000	J	9000		7400	J	16000	J	8500	J	17000	J	12000	J	8400	J	7700	J	7600	J
Antimony	1.1	R	2	R	2.2	R	1	R	1.1	R	1.1	R	1.1	UJ	1	R	1.1	R	1	UJ	1.2	UJ	1.1	UJ	1.1	UJ	1	UJ	0.99	UJ
Arsenic	**1.6**	J	**2.2**	J	**2.9**	J	**1.6**	J	**14**	J	**3.1**	J	**1.7**	J	**3.3**	J	**1**	J	**3.1**		**3.3**		**24**		**1.9**		**5**		**2**	
Barium	46		94		110		23		240		30		43		140		76		37	J	54	J	150	J	43	J	42	J	33	J
Beryllium	0.16	J	0.25	U	0.27	U	0.062	J	0.28	U	0.13	J	0.27	J	0.16	J	0.3		0.16	J	0.31		0.28	U	0.16	J	0.3		0.11	J
Cadmium	0.048	J	0.13	J	0.31		0.051	J	0.93		0.26	U	0.079	J	0.08	J	0.28	U	0.11	J	0.066	J	0.77		0.27	U	0.066	J	0.025	J
Calcium	970	J+	6500	J+	8200	J+	1200	J+	17000	J+	900	J+	1400		1800	J+	830	J+	1600		2500		63000		950		9200		810	
Chromium	16		15		16		14		17		20		24	J	14		24		16	J	22	J	15	J	14	J	14	J	15	J
Cobalt	5.6	J	7	J	6.9	J	3.3	J	4.6	J	5.1	J	5.6		5.3	J	5.7	J	4.5		4.3		4.2		5.2		3.7		5.5	
Copper	15		22		28		8.5		80		13		14		27		17		17		26		49		13		24		14	
Iron	**14000**		**13000**		**15000**		**9600**		**14000**		**18000**		**15000**		**14000**		**15000**		**13000**	J	**9400**	J	**16000**	J	**12000**	J	**13000**	J	**12000**	J
Lead	4	J	21	J	41	J	2.2	J	230	J	5.4	J	5.2	J	26	J	6.8	J	33		120		**480**		4.9		140		3.8	
Magnesium	1800	J+	3600	J+	3500	J+	1500	J+	2700	J+	2200	J+	2500	J	2000	J+	2700	J+	1900		1700		2700		2000		1500		1900	
Manganese	340	J+	120	J+	130	J+	230	J+	160	J+	250	J+	400	J-	260	J+	230	J+	210	J-	100	J-	240	J-	360	J-	130	J-	300	J-
Mercury	0.083	U	0.22		0.47		0.084	U	**3.3**		0.09	U	0.0088	J	0.061	J	0.0093	J	0.064	J+	0.26	J+	**2.7**	J+	0.081	UJ	**110**	J+	0.085	UJ
Nickel	12		11		12		8.4		13		11		12	J	11		13		12		15		10		9.7		8.4		11	
Potassium	1200	J+	4000	J+	3900	J+	500	J+	1900	J+	920	J+	860		830	J+	1300	J+	690		890		1300		1100		810		1300	
Selenium	1.1	UJ	0.6	J	1.1	J	1	UJ	1.9	J	0.67	J	1.1	UJ	0.54	J	1.1	UJ	1	U	0.77	J	1.4		1.1	U	1	U	0.99	U
Silver	0.53	U	0.51	U	0.55	U	0.51	U	0.56	U	0.53	U	0.56	UJ	0.5	U	0.56	U	0.52	U	0.6	U	0.56	U	0.54	U	0.51	U	0.49	U

Table 4-9
Soil Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	SB-26		SB-29		SB-29		SB-29		SB-31		SB-31		SB-32		SB-33		SB-33		SB-35		SB-35		SB-44		SB-44		SB-45		SB-45	
	SB-26-05-07		SB-29-00-02		SB-929-00-02 SB-29-00-02		SB-29-08-10		SB-31-00-02		SB-31-08-10		SB-32-05-07		SB-33-00-02		SB-33-08-10		SB-35-00-02		SB-35-20-22		SB-44-00-02		SB-44-08-10		SB-45-00-02		SB-45-08-10	
	10/21/2015		10/20/2015		10/20/2015		10/20/2015		10/19/2015		10/19/2015		2/15/2016		10/20/2015		10/20/2015		10/27/2015		10/27/2015		10/28/2015		10/28/2015		10/28/2015		10/28/2015	
	5-7 feet		0-2 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet		5-7 feet		0-2 feet		8-10 feet		0-2 feet		20-22 feet		0-2 feet		8-10 feet		0-2 feet		8-10 feet	
Chemical	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Inorganics (µg/kg) (continued)																														
Sodium	96	J	100	J	110	J	160	J	130	J	81	J	87	J	110	J	94	J	180	J	430		1200		110	J	890		140	J
Thallium	2.7	U	2.5	U	2.7	U	2.5	U	2.8	U	2.6	U	2.8	UJ	2.5	U	2.8	U	2.6	U	3	U	2.8	U	2.7	U	2.6	U	2.5	U
Vanadium	30		21		22		15		32		32		28	J	22		34		32		29		22		22		18		22	
Zinc	23		60		83		15		330		23		22	J	40		33		150	J-	120	J-	550	J-	24	J-	48	J-	22	J-
Miscellaneous																														
Solids, Percent	92.6		94.6		91.4		95.9		88.1		86.5		88.8		93.4		87.8		91.8		75.7		86.6		91.4		91.3		93.1	

Notes:
ID - identification
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
Q - qualifier
J - estimated value
J- - estimated value, biased low
J+ - estimated value, biased high
U - not detected
R - rejected value
Highlighted cell and bold format indicates that conc

Table 4-10
Groundwater Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Sample ID		MW-01		MW-01		MW-01		MW-02		MW-02		MW-02		MW-02		MW-03		MW-03		MW-03		MW-03		MW-04		MW-04		MW-04		MW-04		MW-05		MW-05		MW-05		MW-06	
Sample ID		MW-01-R1		MW-01-R2		MW-01-R4		MW-02-R1		MW-02-R2		MW-02-R4		MW-902-R4		MW-03-R1		MW-903-R1		MW-03-R2		MW-03-R4		MW-04-R1		MW-04-R2		MW-904-R2		MW-04-R4		MW-05-R1		MW-05-R2		MW-05-R4		MW-06-R4	
Parent Sample ID														MW-02-R4				MW-03-R1										MW-04-R2											
Sample Date		12/10/2015		4/21/2016		4/13/2017		12/9/2015		4/21/2016		4/12/2017		4/12/2017		12/9/2015		12/9/2015		4/20/2016		4/12/2017		12/9/2015		4/21/2016		4/21/2016		4/13/2017		12/9/2015		4/20/2016		4/13/2017		4/13/2017	
Type		60-70		60-70		65-75 feet		60-70		60-70		65-75 feet		65-75 feet		64-74		64-74		64-74		65-75 feet		67-77		67-77		67-77		65-75 feet		63-73		63-73		65-75 feet		65-75 feet	
Chemical	RI Screening Criteria	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds (µg/L)																																					
1,1,1-Trichloroethane	5	5	U	10	U	5	U	5	U	5	U	0.88	J	0.72	J	5	U	5	U	5	U	0.56	J	5	U	10	U	10	U	1	U	0.5	J	5	U	1	U	1	U
1,1,2,2-Tetrachloroethane	0.076	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,1,2-Trichloroethane	0.28	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,1-Dichloroethane	2.8	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,1-Dichloroethene	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,2,3-Trichlorobenzene	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	UJ	1	U	1	U
1,2,4-Trichlorobenzene	1.2	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,2-Dibromo-3-chloropropane	0.00033	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,2-Dibromoethane	0.0006	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,2-Dichlorobenzene	3	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,2-Dichloroethane	0.17	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,2-Dichloropropane	0.44	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,3-Dichlorobenzene	3	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,4-Dichlorobenzene	0.48	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
1,4-Dioxane	0.46	100	UJ	200	UJ	100	U	100	UJ	100	UJ	20	U	20	U	100	UJ	100	UJ	100	UJ	20	U	100	UJ	200	UJ	200	UJ	20	U	20	UJ	100	UJ	20	U	20	U
2-Butanone	50	50	U	100	U	50	U	50	U	50	U	10	U	10	U	50	U	50	U	50	U	10	U	50	U	100	U	100	U	10	U	10	U	50	U	10	U	10	U
2-Hexanone	38	50	U	100	U	50	U	50	U	50	U	10	U	10	U	50	U	50	U	50	U	10	U	50	U	100	U	100	U	10	U	10	U	50	U	10	U	10	U
4-Methyl-2-pentanone	6300	50	U	100	U	50	U	50	U	50	U	10	U	10	U	50	U	50	U	50	U	10	U	50	U	100	U	100	U	10	U	10	U	50	U	10	U	10	U
Acetone	50	100	U	200	U	100	U	100	U	100	U	20	U	20	U	100	U	100	UJ	100	U	20	U	100	U	200	U	200	U	20	U	20	UJ	100	U	20	U	20	U
Benzene	0.46	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Bromochloromethane	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Bromodichloromethane	0.13	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Bromoform	3.3	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Bromomethane	5	10	U	20	U	10	U	10	U	10	U	2	U	2	U	10	U	10	U	10	U	2	U	10	U	20	U	20	U	2	U	2	U	10	U	2	U	2	U
Carbon Disulfide	60	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	UJ	1	U	1	U
Carbon Tetrachloride	0.46	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Chlorobenzene	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Chloroethane	5	10	U	20	U	10	U	10	U	10	U	2	U	2	U	10	U	10	U	10	U	2	U	10	U	20	U	20	U	2	U	2	U	10	U	2	U	2	U
Chloroform	0.22	**3.5**	J	10	U	5	U	**3**	J	**1.5**	J	**0.96**	J	**1**		**2.2**	J	**2.2**	J	5	U	**0.82**	J	**2.7**	J	10	U	10	U	**0.99**	J	**2.3**		**1.6**	J	**4.8**		**5**	
Chloromethane	5	5	UJ	10	U	5	U	5	UJ	5	U	1	U	1	U	5	UJ	5	UJ	5	U	1	U	5	UJ	10	U	10	U	1	U	1	UJ	5	U	1	U	1	U
cis-1,2-Dichloroethene	5	**18**		**16**		**6**		**25**		**22**		**19**		**19**		2.2	J	2	J	1.7	J	0.65	J	2.7	J	3.4	J	3.5	J	2.9		0.74	J	1.4	J	2.9		0.41	J
cis-1,3-Dichloropropene	0.4	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	UJ	1	U	1	U
Cyclohexane	13000	5	U	10	UJ	5	U	5	U	5	UJ	1	U	1	U	5	U	5	U	5	UJ	1	U	5	U	10	UJ	10	UJ	1	U	1	U	5	UJ	1	U	1	U
Dibromochloromethane	0.87	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Dichlorodifluoromethane	5	10	UJ	20	U	10	UJ	10	UJ	10	U	2	UJ	2	UJ	10	UJ	10	UJ	10	U	2	UJ	10	UJ	20	U	20	U	2	UJ	2	UJ	10	U	2	UJ	2	UJ
Volatile Organic Compounds (µg/L) (continued)																																					
Ethylbenzene	1.5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Isopropylbenzene	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
m,p-Xylene	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Methyl acetate	20000	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Methyl tert-Butyl Ether	10	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Methylcyclohexane	NL	25	U	50	U	25	U	25	U	25	U	5	U	5	U	25	U	25	U	25	U	5	U	25	U	50	U	50	U	5	U	5	U	25	UJ	5	U	5	U
Methylene Chloride	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	UJ	1	U	1	U
o-Xylene	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Styrene	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
Tetrachloroethene	5	**480**		**620**		**230**		**190**		**200**		**180**		**180**		**270**		**260**		**360**		**95**		**560**		**930**		**960**		**190**		**150**		**310**		**94**		**72**	
Toluene	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	U	1	U	1	U
trans-1,2-Dichloroethene	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	0.45	J	1	U	5	U	1	U	1	U
trans-1,3-Dichloropropene	0.4	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1	U	1	U	5	UJ	1	U	1	U
Trichloroethene	0.49	**5**		**6.6**	J	**5.1**		**2.8**	J	**2.6**	J	**2.8**		**3.1**		**3.6**	J	**3.4**	J	**4.4**	J	**1.9**		**5.9**		**7.7**	J	**9**	J	**3.4**		**1.9**		**3.3**	J	**2.4**		**0.95**	J
Trichlorofluoromethane	5	5	U	10	U	5	U	5	U	5	U	1	U	1	U	5	U	5	U	5	U	1	U	5	U	10	U	10	U	1.1		1	U	5	U	1	U	1	U
Vinyl Chloride	0.019	5	UJ	10	U	5	U	5	UJ	5	U	1	U	1	U	5	UJ	5	UJ	5	U	1	U	5	UJ	10	U	10	U	1	U	1	UJ	5	U	1	U	1	U
Semivolatile Organic Compounds (µg/L)																																					
1,1'-Biphenyl	0.83	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
1,2,4,5-Tetrachlorobenzene	1.7	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
2,2'-Oxybis(1-chloropropane)	5	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
2,3,4,6-Tetrachlorophenol	240	2	U	2	U			2	U	2	U					2	U	2	U	2	U			2	U	2	U	2	U			2	U	2	U				
2,4,5-Trichlorophenol	1200	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
2,4,6-Trichlorophenol	4.1	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
2,4-Dichlorophenol	5	1	U	1	UJ			1	U	1	UJ					1	U	1	U	1	UJ			1	U	1	UJ	1	UJ			1	U	1	UJ				
2,4-Dimethylphenol	50	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
2,4-Dinitrophenol	10	5	U	5	U			5	U	5	U					5	U	5	U	5	U			5	U	5	U	5	U			5	U	5	U				
2,4-Dinitrotoluene	0.24	2	U	2	U			2	U	2	U					2	U	2	U	2	U			2	U	2	U	2	U			2	U	2	U				
2,6-Dinitrotoluene	0.049	2	U	2	U			2	U	2	U					2	U	2	U	2	U			2	U	2	U	2	U			2	U	2	U				
2-Chloronaphthalene	750	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
2-Chlorophenol	91	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
2-Methylnaphthalene	36	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	U				
2-Methylphenol	930	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			0.51	J	1	U				
2-Nitroaniline	5	2	U	2	U			2	U	2	U					2	U	2	U	2	U			2	U	2	U	2	U			2	U	2	UJ				

Table 4-10
Groundwater Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample ID	MW-01		MW-01		MW-01		MW-02		MW-02		MW-02		MW-02		MW-03		MW-03		MW-03		MW-03		MW-04		MW-04		MW-04		MW-04		MW-05		MW-05		MW-05		MW-06	
	Sample ID	MW-01-R1		MW-01-R2		MW-01-R4		MW-02-R1		MW-02-R2		MW-02-R4		MW-902-R4		MW-03-R1		MW-903-R1		MW-03-R2		MW-03-R4		MW-04-R1		MW-04-R2		MW-904-R2		MW-04-R4		MW-05-R1		MW-05-R2		MW-05-R4		MW-06-R4	
	Parent Sample ID													MW-02-R4				MW-03-R1										MW-04-R2											
	Sample Date	12/10/2015		4/21/2016		4/13/2017		12/9/2015		4/21/2016		4/12/2017		4/12/2017		12/9/2015		12/9/2015		4/20/2016		4/12/2017		12/9/2015		4/21/2016		4/21/2016		4/13/2017		12/9/2015		4/20/2016		4/13/2017		4/13/2017	
	Type	60-70		60-70		65-75 feet		60-70		60-70		65-75 feet		65-75 feet		64-74		64-74		64-74		65-75 feet		67-77		67-77		67-77		65-75 feet		63-73		63-73		65-75 feet		65-75 feet	
Chemical	RI Screening Criteria	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
2-Nitrophenol	NL	2	U	2	U			2	U	2	U					2	U	2	U	2	U			2	U	2	U	2	U			2	U	2	U				
3,3'-Dichlorobenzidine	0.13	5	U	5	U			5	U	5	U					5	U	5	U	5	U			5	U	5	U	5	U			5	U	5	UJ				
3-Nitroaniline	5	2	U	2	U			2	U	2	U					2	U	2	U	2	U			2	U	2	U	2	U			2	U	2	U				
Semivolatile Organic Compounds (µg/L) (continued)																																							
4,6-Dinitro-2-methylphenol	1.5	5	U	5	U			5	U	5	U					5	U	5	U	5	U			5	U	5	U	5	U			5	U	5	U				
4-Bromophenyl-phenylether	NL	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
4-Chloro-3-methylphenol	1400	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
4-Chloroaniline	0.37	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
4-Chlorophenyl-phenylether	NL	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
4-Methylphenol	1900	2	U	2	U			2	U	2	U					2	U	2	U	2	U			2	U	2	U	2	U			2	U	2	U				
4-Nitroaniline	3.8	2	U	2	U			2	U	2	U					2	U	2	U	2	U			2	U	2	U	2	U			2	U	2	UJ				
4-Nitrophenol	NL	5	U	5	UJ			5	U	5	UJ					5	U	5	U	5	UJ			5	U	5	UJ	5	UJ			5	U	5	UJ				
Acenaphthene	530	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	U				
Acenaphthylene	NL	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	U				
Acetophenone	1900	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
Anthracene	50	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.1	J	0.2	U	0.2	U			0.2	U	0.2	U				
Atrazine	0.3	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
Benzaldehyde	1900	5	UJ	5	U			5	U	5	U					5	U	5	U	5	U			5	U	5	U	5	U			5	U	5	U				
Benzo(a)anthracene	0.002	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	U				
Benzo(a)pyrene	0.0034	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	U				
Benzo(b)fluoranthene	0.002	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	UJ				
Benzo(g,h,i)perylene	NL	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	U				
Benzo(k)fluoranthene	0.002	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	U				
Bis(2-chloroethoxy)methane	5	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
Bis(2-chloroethyl)ether	0.014	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
Bis(2-ethylhexyl)phthalate	5	5	U	5	U			5	U	5	U					5	U	5	U	5	U			0.49	J	5	U	5	U			5	U	5	U				
Butylbenzylphthalate	16	5	U	5	U			5	U	5	U					5	U	5	U	5	U			5	U	5	U	5	U			5	U	5	U				
Caprolactam	9900	5	U	5	U			5	U	5	U					5.6		5.3		5	U			5	U	5	U	5	U			5	U	5	U				
Carbazole	NL	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
Chrysene	0.002	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	U				
Dibenzo(a,h)anthracene	0.0034	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	UJ				
Dibenzofuran	7.9	1	UJ	1	U			1	UJ	1	U					1	UJ	1	UJ	1	U			1	UJ	1	U	1	U			1	UJ	1	U				
Diethylphthalate	50	5	U	5	U			5	U	5	U					5	U	5	U	5	U			5	U	5	U	5	U			5	U	5	U				
Dimethylphthalate	50	5	U	5	U			5	U	5	U					5	U	5	U	5	U			5	U	5	U	5	U			5	U	5	U				
Di-n-butylphthalate	50	5	U	5	U			5	U	5	U					5	U	5	U	5	U			5	U	5	U	5	U			5	U	5	U				
Di-n-octylphthalate	50	5	U	5	U			5	U	5	U					5	U	5	U	5	U			5	U	5	U	5	U			5	U	5	U				
Fluoranthene	50	0.2	U	0.2	U			0.15	J	0.2	U					0.2	U	0.2	U	0.2	U			0.24		0.2	U	0.2	U			0.16	J	0.2	U				
Fluorene	50	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	U				
Hexachlorobenzene	0.0098	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
Hexachlorobutadiene	0.14	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
Semivolatile Organic Compounds (µg/L) (continued)																																							
Hexachlorocyclopentadiene	0.41	5	U	5	UJ			5	U	5	UJ					5	U	5	U	5	UJ			5	U	5	UJ	5	UJ			5	U	5	UJ				
Hexachloroethane	0.33	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
Indeno(1,2,3-cd)pyrene	0.002	0.2	U	0.2	U			0.2	U	0.2	U					0.2	U	0.2	U	0.2	U			0.2	U	0.2	U	0.2	U			0.2	U	0.2	UJ				
Isophorone	50	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
Naphthalene	0.17	0.2	U	0.2	UJ			0.2	U	0.2	UJ					0.2	U	0.2	U	0.2	UJ			0.2	U	0.2	UJ	0.2	UJ			0.2	U	0.2	UJ				
Nitrobenzene	0.14	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
N-Nitroso-di-n-propylamine	0.011	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	U				
N-Nitrosodiphenylamine	12	1	UJ	1	UJ			1	UJ	1	UJ					1	UJ	1	UJ	1	UJ			1	UJ	1	UJ	1	UJ			1	UJ	1	UJ				
Pentachlorophenol	0.041	2	U	2	UJ			2	U	2	UJ					2	U	2	U	2	UJ			2	U	2	UJ	2	UJ			2	U	2	UJ				
Phenanthrene	50	0.2	U	0.2	U			0.26		0.2	U					0.2	U	0.2	U	0.2	U			0.6		0.2	U	0.2	U			0.35		0.2	U				
Phenol	2	1	U	1	U			1	U	1	U					1	U	1	U	1	U			1	U	1	U	1	U			1	U	1	UJ				
Pyrene	50	0.2	U	0.2	U			0.19	J	0.2	U					0.2	U	0.2	U	0.2	U			0.3		0.2	U	0.2	U			0.2		0.2	U				
Polychlorinated Biphenyls (µg/L)																																							
Aroclor 1016	0.09	0.4	UJ	0.4	UJ			0.4	U	0.4	UJ					0.4	U	0.4	U	0.4	UJ			0.4	U	0.4	UJ	0.4	UJ			0.4	U	0.4	UJ				
Aroclor 1221	0.0047	0.6	U	0.6	U			0.6	U	0.6	U					0.6	U	0.6	U	0.6	U			0.6	U	0.6	U	0.6	U			0.6	U	0.6	U				
Aroclor 1232	0.0047	0.4	U	0.4	U			0.4	U	0.4	U					0.4	U	0.4	U	0.4	U			0.4	U	0.4	U	0.4	U			0.4	U	0.4	U				
Aroclor 1242	0.0078	0.4	U	0.4	U			0.4	U	0.4	U					0.4	U	0.4	U	0.4	U			0.4	U	0.4	U	0.4	U			0.4	U	0.4	U				
Aroclor 1248	0.0078	0.4	U	0.4	U			0.4	U	0.4	U					0.4	U	0.4	U	0.4	U			0.4	U	0.4	U	0.4	U			0.4	U	0.4	U				
Aroclor 1254	0.0078	0.4	U	0.4	U			0.4	U	0.4	U					0.4	U	0.4	U	0.4	U			0.4	U	0.4	U	0.4	U			0.4	U	0.4	U				
Aroclor 1260	0.0078	0.4	U	0.4	U			0.4	U	0.4	U					0.4	U	0.4	U	0.4	U			0.4	U	0.4	U	0.4	U			0.4	U	0.4	U				
Aroclor 1262	0.09	0.4	U	0.4	U			0.4	U	0.4	U					0.4	U	0.4	U	0.4	U			0.4	U	0.4	U	0.4	U			0.4	U	0.4	U				
Aroclor 1268	0.09	0.4	U	0.4	UJ			0.4	U	0.4	UJ					0.4	U	0.4	U	0.4	UJ			0.4	U	0.4	UJ	0.4	UJ			0.4	U	0.4	UJ				
Pesticides (µg/L)																																							
4,4'-DDD	0.032	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
4,4'-DDE	0.046	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
4,4'-DDT	0.2	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Aldrin	0.00092	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
alpha-BHC	0.0072	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
alpha-Chlordane	0.05	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.015	J	0.04	U			0.04	U	0.04	U				
beta-BHC	0.025	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				

Table 4-10
Groundwater Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

	Sample ID	MW-01		MW-01		MW-01		MW-02		MW-02		MW-02		MW-02		MW-03		MW-03		MW-03		MW-03		MW-04		MW-04		MW-04		MW-04		MW-05		MW-05		MW-05		MW-06	
	Parent Sample ID	MW-01-R1		MW-01-R2		MW-01-R4		MW-02-R1		MW-02-R2		MW-02-R4		MW-902-R4		MW-03-R1		MW-903-R1		MW-03-R2		MW-03-R4		MW-04-R1		MW-04-R2		MW-904-R2		MW-04-R4		MW-05-R1		MW-05-R2		MW-05-R4		MW-06-R4	
														MW-02-R4				MW-03-R1										MW-04-R2											
	Sample Date	12/10/2015		4/21/2016		4/13/2017		12/9/2015		4/21/2016		4/12/2017		4/12/2017		12/9/2015		12/9/2015		4/20/2016		4/12/2017		12/9/2015		4/21/2016		4/21/2016		4/13/2017		12/9/2015		4/20/2016		4/13/2017		4/13/2017	
	Type	60-70		60-70		65-75 feet		60-70		60-70		65-75 feet		65-75 feet		64-74		64-74		64-74		65-75 feet		67-77		67-77		67-77		65-75 feet		63-73		63-73		65-75 feet		65-75 feet	
Chemical	RI Screening Criteria	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
delta-BHC	0.04	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Dieldrin	0.0018	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Endosulfan I	NL	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Endosulfan II	NL	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Endosulfan Sulfate	NL	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Endrin	2	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Pesticides (µg/L) (continued)																																							
Endrin aldehyde	5	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Endrin Ketone	5	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
gamma-BHC (Lindane)	0.042	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
gamma-Chlordane	0.05	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Heptachlor	0.0014	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Heptachlor Epoxide	0.0014	0.04	U	0.04	U			0.04	U	0.04	U					0.04	U	0.04	U	0.04	U			0.04	U	0.04	U	0.04	U			0.04	U	0.04	U				
Methoxychlor	35	0.16	U	0.16	U			0.16	U	0.16	U					0.16	U	0.16	U	0.16	U			0.16	U	0.16	U	0.16	U			0.16	U	0.16	U				
Toxaphene	0.06	0.4	R	0.4	UJ			0.4	R	0.4	UJ					0.4	R	0.4	R	0.4	UJ			0.4	R	0.4	UJ	0.4	UJ			0.4	R	0.4	UJ				
Inorganics (mg/L)																																							
Aluminum	20000	0.4	UJ	0.22	J			0.4	U	0.4	U					0.4	U	0.4	U	0.45				0.4	UJ	0.4	U	0.4	U			0.4	UJ	0.13	J				
Antimony	3	0.02	U	0.02	U			0.02	U	0.02	U					0.02	U	0.02	U	0.02	U			0.02	U	0.02	U	0.02	U			0.02	U	0.02	U				
Arsenic	0.052	0.015	U	0.0025	J			0.015	U	0.015	U					0.015	U	0.015	U	0.015	U			0.0024	J	0.0022	J	0.015	U			0.015	U	0.015	U				
Barium	1000	0.08		0.079				0.084		0.079						0.06		0.058		0.058				0.1		0.092		0.094				0.11		0.1					
Beryllium	3	0.005	U	0.005	U			0.005	U	0.005	U					0.005	U	0.005	U	0.005	U			0.005	U	0.005	U	0.005	U			0.005	U	0.005	U				
Cadmium	5	0.005	U	0.005	U			0.005	U	0.005	U					0.005	U	0.005	U	0.005	U			0.005	U	0.005	U	0.005	U			0.005	U	0.005	U				
Calcium	NL	91		95				70		73						67		67		67				80		86		88				85		83					
Chromium	50	0.011		0.027				0.14		0.007	J					0.019		0.017		0.016				0.011		0.0038	J	0.004	J			0.019		0.0062	J				
Cobalt	6	0.025	U	0.025	U			0.025	U	0.025	U					0.025	U	0.025	U	0.025	U			0.025	U	0.025	U	0.025	U			0.0027	J	0.025	U				
Copper	200	0.01	U	0.0038	J			0.01	UJ	0.01	U					0.01	UJ	0.01	UJ	0.0031	J			0.01	UJ	0.01	U	0.01	U			0.01	U	0.01	U				
Iron	300	0.67		0.52				0.98		0.65						0.49		0.51		1.2				1.2		0.13		0.15				2.4		0.28					
Lead	15	0.01	U	0.01	U			0.01	U	0.01	U					0.01	U	0.01	U	0.01	U			0.01	U	0.01	U	0.01	U			0.01	U	0.01	U				
Magnesium	35000	35		37				37		40						32		32		33				33		36		37				29		31					
Manganese	300	0.55		0.35				2		0.47						0.31		0.31		0.062				1.1		1		1				1.5		0.24					
Mercury	0.63	0.0002	U	0.0002	UJ			0.0002	U	0.0002	UJ					0.0002	U	0.0002	U	0.0002	UJ			0.0002	U	7.50E-05	J-	7.90E-05	J-			0.0002	U	7.40E-05	J-				
Nickel	100	0.04	UJ	0.018	J			0.04	UJ	0.0073	J					0.04	UJ	0.04	UJ	0.014	J			0.04	UJ	0.0045	J	0.0042	J			0.04	UJ	0.0074	J				
Potassium	NL	5	UJ	5.6				5	UJ	3.1	J					5	UJ	5	UJ	2.7	J			7.2		4.3	J	4.5	J			6.7		2.9	J				
Selenium	10	0.02	U	0.02	U			0.02	U	0.02	U					0.02	U	0.02	U	0.026				0.02	U	0.02	U	0.02	U			0.032		0.017	J				
Silver	50	0.01	U	0.01	U			0.01	U	0.01	U					0.01	U	0.01	U	0.01	U			0.01	U	0.01	U	0.01	U			0.01	U	0.01	U				
Sodium	20000	73		72				73		84						73		73		73				72		72		73				120		88					
Thallium	0.2	0.05	U	0.05	U			0.05	U	0.05	U					0.05	U	0.05	U	0.05	U			0.05	U	0.05	U	0.05	U			0.05	U	0.05	U				
Vanadium	86	0.05	U	0.05	U			0.05	U	0.05	U					0.05	U	0.05	U	0.05	U			0.05	U	0.05	U	0.05	U			0.05	U	0.05	U				
Zinc	2000	0.02	UJ	0.07				0.02	UJ	0.0083	J					0.022		0.022		0.011	J			0.02	UJ	0.0075	J	0.0073	J			0.02	UJ	0.0091	J				
Inorganics-Dissolved (mg/L)																																							
Aluminum	20000	0.4	UJ	0.4	U			0.4	U	0.4	U					0.4	U	0.4	U	0.4	U			0.4	U	0.4	U	0.4	U			0.4	U	0.4	U				
Antimony	3	0.02	U	0.02	U			0.02	U	0.02	U					0.02	U	0.02	U	0.02	U			0.02	U	0.02	U	0.02	U			0.02	U	0.02	U				
Arsenic	0.052	0.015	U	0.015	U			0.015	U	0.015	U					0.015	U	0.015	U	0.015	U			0.015	U	0.015	U	0.0022	J			0.015	U	0.015	U				
Inorganics-Dissolved (mg/L) (continued)																																							
Barium	1000	0.038		0.09				0.085		0.077						0.059		0.06		0.053				0.1		0.093		0.093				0.098		0.11					
Beryllium	3	0.005	U	0.005	U			0.005	U	0.005	U					0.005	U	0.005	U	0.005	U			0.005	U	0.005	U	0.005	U			0.005	U	0.005	U				
Cadmium	5	0.005	U	0.005	U			0.005	U	0.005	U					0.005	U	0.005	U	0.005	U			0.005	U	0.005	U	0.005	U			0.005	U	0.005	U				
Calcium	NL	19	J+	95				71	J+	70						67	J+	68	J+	66				80	J+	87		88				79	J+	86					
Chromium	50	0.01	U	0.0017	J			0.01	UJ	0.0026	J					0.01	UJ	0.01	UJ	0.0035	J			0.01	UJ	0.0016	J	0.0016	J			0.01	UJ	0.0018	J				
Cobalt	6	0.025	U	0.025	U			0.025	U	0.025	U					0.025	U	0.025	U	0.025	U			0.025	U	0.025	U	0.025	U			0.0027	J	0.025	U				
Copper	200	0.01	UJ	0.01	U			0.01	U	0.01	U					0.01	U	0.01	U	0.01	U			0.01	UJ	0.01	U	0.01	U			0.01	U	0.01	U				
Iron	300	0.1	UJ	0.11				0.83		0.47						0.29		0.31		0.17				0.9		0.057	J	0.074	J			1.9		0.16					
Lead	15	0.01	U	0.01	U			0.01	U	0.01	U					0.01	U	0.01	U	0.01	U			0.01	U	0.01	U	0.01	U			0.01	U	0.01	U				
Magnesium	35000	5	UJ	37				38	J+	38						32	J+	33	J+	33				32	J+	37		37				27	J+	32					
Manganese	300	0.025	J+	0.29				2	J+	0.41						0.31	J+	0.32	J+	0.047				1.1	J+	1		1				1.4	J+	0.25					
Mercury	0.63	0.0002	U	0.0002	U			0.0002	U	7.60E-05	J					0.0002	U	0.0002	U	3.60E-05	J			0.0002	U	8.00E-05	J	7.80E-05	J			0.0002	U	0.0002	U				
Nickel	100	0.04	U	0.012	J			0.04	UJ	0.0067	J					0.04	UJ	0.04	UJ	0.014	J			0.04	UJ	0.0038	J	0.0045	J			0.04	UJ	0.0072	J				
Potassium	NL	5	UJ	5.1				5	UJ	3	J					5	UJ	5	UJ	2.6	J			7		4.3	J	4.4	J			6.6		3.1	J				
Selenium	10	0.02	U	0.02	U			0.02	U	0.02	U					0.02	UJ	0.02	U	0.021				0.02	U	0.02	U	0.02	U			0.031		0.02					
Silver	50	0.01	U	0.01	U			0.01	U	0.01	U					0.01	U	0.01	U	0.01	U			0.01	U	0.01	U	0.01	U			0.01	U	0.01	U				
Sodium	20000	5	UJ	72				74	J+	81						73	J+	73	J+	72				72	J+	73		73				120	J+	91					

Table 4-10
Groundwater Chemical Analytical Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

		MW-01		MW-01		MW-01		MW-02		MW-02		MW-02		MW-02		MW-03		MW-03		MW-03		MW-03		MW-04		MW-04		MW-04		MW-04		MW-05		MW-05		MW-05		MW-06	
	Sample ID	MW-01-R1		MW-01-R2		MW-01-R4		MW-02-R1		MW-02-R2		MW-02-R4		MW-902-R4		MW-03-R1		MW-903-R1		MW-03-R2		MW-03-R4		MW-04-R1		MW-04-R2		MW-904-R2		MW-04-R4		MW-05-R1		MW-05-R2		MW-05-R4		MW-06-R4	
	Parent Sample ID													MW-02-R4				MW-03-R1										MW-04-R2											
	Sample Date	12/10/2015		4/21/2016		4/13/2017		12/9/2015		4/21/2016		4/12/2017		4/12/2017		12/9/2015		12/9/2015		4/20/2016		4/12/2017		12/9/2015		4/21/2016		4/21/2016		4/13/2017		12/9/2015		4/20/2016		4/13/2017		4/13/2017	
	Type	60-70		60-70		65-75 feet		60-70		60-70		65-75 feet		65-75 feet		64-74		64-74		64-74		65-75 feet		67-77		67-77		67-77		65-75 feet		63-73		63-73		65-75 feet		65-75 feet	
Chemical	RI Screening Criteria	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Thallium	0.2	0.05	U	0.05	U			0.05	U	0.05	U					0.05	U	0.05	U	0.05	U			0.05	U	0.05	U	0.05	U			0.05	U	0.05	U				
Vanadium	86	0.05	U	0.05	U			0.05	U	0.05	U					0.05	U	0.05	U	0.05	U			0.05	U	0.05	U	0.05	U			0.05	U	0.05	U				
Zinc	2000	0.02	UJ	0.032				0.02	UJ	0.0085	J					0.022		0.025		0.01	J			0.02	UJ	0.0066	J	0.0074	J			0.02		0.0092	J				

Notes:
ID - identification
R1 - round 1
R2 - round 2
µg/L - microgram per liter
mg/L - milligram per liter
Q - qualifier
J - estimated value
J- - estimated value, biased low
J+ - estimated value, biased high
U - not detected
R - rejected value
Highlighted cell and bold format indicates that concentration exceeded screening criteria.

Table 4-11
ISOCS Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**				**1.061**			
Soil Borings																				
SB-01	10/30/2015	0	2		14.038	1.370	3.160		0.784	0.067	0.235		**2.578**	0.275	0.135	J	1.360		1.360	U
SB-01	10/30/2015	2	4		11.385	1.244	3.040		0.494	0.057	0.231		1.031	0.197	0.162	J	0.969		0.969	U
SB-01	10/30/2015	4	6		14.659	1.377	3.110		0.451	0.060	0.261		0.806	0.186	0.159	J	1.040		1.040	U
SB-01	10/30/2015	6	8		13.251	1.440	3.550		0.573	0.066	0.283		0.838	0.838	0.187	J	1.170		1.170	U
SB-01	10/30/2015	8	9		16.264	1.425	3.040		0.650	0.063	0.264		1.040	0.198	0.114	J	1.000		1.000	U
SB-01	10/30/2015	10	12		11.748	1.353	3.390		**1.152**	0.087	0.313		**5.008**	0.384	0.168		1.480		1.480	U
SB-01	10/30/2015	12	14		15.523	1.388	3.040		0.679	0.062	0.204		0.977	0.213	0.190		1.070		1.070	U
SB-01	10/30/2015	14	16		13.679	1.378	3.300		0.657	0.063	0.234		0.759	0.184	0.121		0.992		0.992	U
SB-01	10/30/2015	16	18		15.052	1.381	3.080		0.593	0.058	0.212		0.694	0.170	0.159		1.010		1.010	U
SB-01	10/30/2015	20	22		13.284	1.277	2.950		0.662	0.057	0.211		0.888	0.174	0.121		0.863		0.863	U
SB-01	10/30/2015	22	24		13.558	1.329	3.110		0.510	0.051	0.185		0.778	0.198	0.192		0.984		0.984	U
SB-01	10/30/2015	25	27		14.577	1.366	3.110		0.622	0.060	0.219		0.860	0.198	0.167		0.993		0.993	U
SB-01	10/30/2015	27	29		12.805	1.296	3.100		0.640	0.059	0.199		0.891	0.182	0.097		1.030		1.030	U
SB-02	11/6/2015	0	2		11.164	1.351	3.420		0.907	0.076	0.294		**3.151**	0.316	0.255		1.430		1.430	U
SB-02	11/6/2015	2	4		9.694	1.330	3.570		0.489	0.067	0.264		1.092	0.199	0.204		1.010		1.010	U
SB-02	11/6/2015	4	6		10.303	1.304	3.400		0.365	0.058	0.240		1.070	0.206	0.171		1.090		1.090	U
SB-02	11/6/2015	6	8		11.810	1.225	2.930		0.306	0.048	0.199		0.355	0.185	0.153		0.839		0.839	U
SB-02	11/6/2015	8	10		15.257	1.433	3.260		0.675	0.064	0.209		0.720	0.202	0.167		1.140		1.140	U
SB-02	11/6/2015	10	12		14.782	1.415	3.260		0.703	0.066	0.213		**1.960**	0.257	0.223		1.230		1.230	U
SB-02	11/6/2015	12	14		12.737	1.261	2.930		0.580	0.059	0.235		1.003	0.195	0.105		0.992		0.992	U
SB-02	11/6/2015	14	16		11.580	1.206	2.900		0.717	0.059	0.194		0.578	0.170	0.154		1.080		1.080	U
SB-02	11/6/2015	16	18		15.076	1.317	2.850		0.623	0.057	0.222		0.597	0.172	0.161		0.994		0.994	U
SB-02	11/6/2015	18	20		13.014	1.344	3.230		0.549	0.058	0.229		0.837	0.193	0.176		1.080		1.080	U
SB-02	11/6/2015	20	25		12.122	1.295	3.140		0.671	0.063	0.239		0.304	0.169	0.189		0.991		0.991	U
SB-02	11/6/2015	26	28		13.453	1.329	3.120		0.518	0.056	0.211		0.501	0.182	0.151		1.040		1.040	U
SB-02	11/6/2015	28	30		12.840	1.319	3.160		0.494	0.057	0.212		0.510	0.187	0.163		1.090		1.090	U
SB-03	10/21/2015	0	2		7.487	1.503	4.390		**2.152**	0.130	0.381		**7.522**	0.565	0.201		2.050		2.050	U
SB-03	10/21/2015	2	4		10.764	1.193	2.930		0.704	0.061	0.203		0.832	0.176	0.181		0.994		0.994	U
SB-03	10/21/2015	4	6		11.777	1.297	3.190		0.520	0.057	0.204		0.693	0.203	0.182		1.140		1.140	U
SB-03	10/21/2015	6	8		12.088	1.274	3.080		0.558	0.060	0.207		0.972	0.182	0.148		1.070		1.070	U
SB-03	10/21/2015	8	10		12.302	1.245	2.940		0.581	0.061	0.220		0.835	0.174	0.169		0.988		0.988	U
SB-03	10/21/2015	10	12		13.142	1.272	2.960		0.459	0.053	0.214		0.893	0.191	0.160		0.975		0.975	U
SB-03	10/21/2015	12	14		15.163	1.322	2.850		0.624	0.057	0.227		0.846	0.193	0.118		1.510		1.510	U
SB-03	10/21/2015	12	14	SB-03-12-14	14.143	1.366	3.150		0.455	0.059	0.232		1.079	0.203	0.185		0.990		0.990	U
SB-03	10/21/2015	14	16		13.418	1.336	3.150		0.475	0.055	0.230		0.674	0.180	0.175		1.010		1.010	U
SB-03	10/21/2015	16	18		14.455	1.369	3.140		0.522	0.061	0.238		0.571	0.198	0.162		1.070		1.070	U
SB-03	10/21/2015	18	20		14.200	1.319	2.980		0.506	0.055	0.218		0.660	0.170	0.118		0.957		0.957	U
SB-03	10/21/2015	20	22		12.626	1.274	3.020		0.443	0.052	0.207		0.404	0.176	0.150		0.974		0.974	U
SB-03	10/21/2015	22	24		13.474	1.309	3.070		0.511	0.511	0.206		0.769	0.183	0.159		1.040		1.040	U
SB-03	10/21/2015	24	26		14.355	1.362	3.130		0.459	0.057	0.216		0.578	0.187	0.164		1.010		1.010	U
SB-03	10/21/2015	26	28		13.570	1.356	3.190		0.603	0.060	0.229		0.681	0.168	0.193		1.090		1.090	U
SB-03	10/21/2015	28	30		14.143	1.347	3.070		0.507	0.060	0.245		0.766	0.177	0.178		1.080		1.080	U
SB-04	10/21/2015	0	2		8.180	1.707	4.810		**5.624**	0.248	0.674		**43.792**	2.176	0.396		3.780		3.780	U
SB-04	10/21/2015	2	4		13.303	1.351	3.200		0.563	0.062	0.251		1.018	0.216	0.175		1.020		1.020	U
SB-04	10/21/2015	4	6		12.223	1.298	3.160		0.541	0.057	0.214		0.911	0.199	0.172		1.050		1.050	U
SB-04	10/21/2015	6	8		13.144	1.410	3.460		0.620	0.063	0.240		0.951	0.205	0.159		1.060		1.060	U
SB-04	10/21/2015	8	10		15.562	1.434	3.230		0.669	0.065	0.222		**1.257**	0.217	0.177		1.070		1.070	U
SB-04	10/21/2015	10	12		14.253	1.375	3.200		0.579	0.061	0.221		0.959	0.189	0.171		1.020		1.020	U
SB-04	10/21/2015	12	14		14.612	1.397	3.230		0.508	0.058	0.230		0.887	0.197	0.149		1.030		1.030	U
SB-04	10/21/2015	14	16		16.878	1.491	3.290		0.496	0.058	0.238		0.647	0.181	0.167	J	1.040		1.040	U
SB-04	10/21/2015	16	18		14.331	1.368	3.140		0.570	0.062	0.218		0.546	0.187	0.153	J	1.090		1.090	U
SB-04	10/21/2015	16	18	SB-04-16-18	13.898	1.345	3.120		0.501	0.059	0.239		0.608	0.176	0.165		1.000		1.000	U
SB-04	10/21/2015	18	20		13.031	1.465	3.660		0.462	0.062	0.269		**1.391**	0.226	0.190		1.160		1.160	U
SB-04	10/21/2015	20	22		14.338	1.378	3.160		0.624	0.064	0.244		0.973	0.196	0.187		0.917	0.609	1.820	
SB-04	10/21/2015	22	24		15.238	1.434	3.240		0.506	0.058	0.226		0.799	0.180	0.191		1.040		1.040	U
SB-04	10/21/2015	24	26		14.569	1.344	3.010		0.466	0.055	0.221		0.559	0.172	0.121		1.060		1.060	U
SB-04	10/21/2015	26	28		14.414	1.407	3.290		0.597	0.060	0.241		1.164	0.212	0.190		0.977		0.977	U
SB-04	10/21/2015	28	30		12.607	1.326	3.170		0.548	0.058	0.202		0.666	0.212	0.177		0.177		0.177	U
SB-05	10/26/2015	0	2		17.198	1.658	3.760		**2.001**	0.125	0.397		**11.321**	0.704	0.213		2.250		2.250	U
SB-05	10/26/2015	2	4		13.988	1.382	3.250		0.536	0.063	0.252		1.190	0.218	0.179		1.040		1.040	U
SB-05	10/26/2015	4	6		14.290	1.317	2.940		0.667	0.061	0.191		1.181	0.191	0.160		1.030		1.030	U
SB-05	10/26/2015	6	8		13.333	1.273	2.900		0.533	0.057	0.223		1.048	0.194	0.174		1.020		1.020	U
SB-05	10/26/2015	8	10		11.885	1.292	3.170		0.536	0.060	0.225		0.997	0.199	0.187		1.120		1.120	U
SB-05	10/26/2015	10	12		11.011	1.292	3.300		0.545	0.058	0.198		0.858	0.213	0.181		1.030		1.030	U
SB-05	10/26/2015	12	14		15.841	1.436	3.190		0.624	0.061	0.234		**1.380**	0.216	0.123		1.190		1.190	U
SB-05	10/26/2015	14	16		13.663	1.401	3.360		0.487	0.058	0.224		0.958	0.198	0.162		1.080		1.080	U
SB-05	10/26/2015	16	18		11.719	1.254	3.050		0.451	0.059	0.244		0.609	0.175	0.154		1.000		1.000	U
SB-05	10/26/2015	18	20		11.118	1.241	3.100		0.515	0.054	0.217		0.593	0.158	0.190		1.020		1.020	U
SB-05	10/26/2015	20	22		16.459	1.498	3.340		0.422	0.063	0.269		0.947	0.203	0.203		1.050		1.050	U

Table 4-11
ISOCS Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**				**1.061**			
Soil Borings (continued)																				
SB-05	10/26/2015	20	22	SB-05-20-22	14.380	1.355	3.100		0.558	0.057	0.208		0.471	0.180	0.172		1.110		1.110	U
SB-05	10/26/2015	22	24		11.643	1.391	3.540		0.598	0.066	0.235		0.608	0.188	0.210		1.080		1.080	U
SB-05	10/26/2015	24	26		13.745	1.306	2.980		0.548	0.059	0.207		0.504	0.193	0.109		1.080		1.080	U
SB-05	10/26/2015	26	28		15.121	1.418	3.210		0.480	0.060	0.247		0.992	0.212	0.178		0.987		0.987	U
SB-05	10/26/2015	28	30		15.275	1.443	3.290		0.457	0.062	0.247		0.787	0.200	0.182		1.120		1.120	U
SB-05	10/26/2015	54	55		13.324	1.268	2.890		0.274	0.057	0.223		0.284	0.153	0.152		0.823		0.823	U
SB-06	10/29/2015	0	2		13.077	1.365	3.300		**1.111**	0.076	0.248		**1.482**	0.221	0.192		1.340		1.340	U
SB-06	10/29/2015	5	6		14.926	1.478	3.460		**1.046**	0.079	0.281		0.947	0.201	0.197		1.280		1.280	U
SB-06	10/29/2015	6	8		11.537	1.230	2.960		0.604	0.060	0.234		0.846	0.196	0.168		0.982		0.982	U
SB-06	10/29/2015	8	10		13.641	1.332	3.110		0.594	0.058	0.204		0.824	0.174	0.155		1.070		1.070	U
SB-06	10/29/2015	10	12		15.662	1.364	2.910		0.645	0.062	0.230		**1.265**	0.202	0.181		1.300		1.300	U
SB-06	10/29/2015	12	14		11.293	1.187	2.870		0.502	0.054	0.190		0.838	0.174	0.144		3.721	1.136	1.380	
SB-06	10/29/2015	14	16		12.991	1.253	2.870		0.631	0.063	0.224		0.581	0.159	0.162		1.140		1.140	U
SB-06	10/29/2015	16	18		12.966	1.302	3.080		0.576	0.060	0.239		0.730	0.155	0.172		1.120		1.120	U
SB-06	10/29/2015	18	20		14.335	1.371	3.160		0.544	0.059	0.208		0.744	0.189	0.128		1.090		1.090	U
SB-06	10/29/2015	20	22		14.277	1.339	3.040		0.486	0.054	0.220		**1.326**	0.189	0.165		0.956		0.956	U
SB-06	10/29/2015	22	24		11.053	1.253	3.130		0.481	0.055	0.215		0.717	0.186	0.174		1.010		1.010	U
SB-06	10/29/2015	24	26		12.491	1.311	3.170		0.526	0.059	0.212		0.861	0.199	0.172		1.100		1.100	U
SB-06	10/29/2015	26	28		13.992	1.374	3.230		0.539	0.057	0.216		0.687	0.193	0.157		0.959		0.959	U
SB-06	10/29/2015	28	30		13.588	1.363	3.190		0.467	0.061	0.265		0.892	0.204	0.164		1.070		1.070	U
SB-07	10/26/2015	0	2		13.155	2.686	5.900		**6.787**	0.321	1.310		**261.196**	12.132	1.550		6.930		6.930	U
SB-07	10/26/2015	2	4		17.689	1.728	4.250		**1.154**	0.160	0.702		**65.386**	3.550	0.886		4.150		4.150	U
SB-07	10/26/2015	4	6		14.366	1.696	4.540		0.916	0.121	0.595		**66.203**	3.595	0.933		4.180		4.180	U
SB-07	10/26/2015	6	8		15.076	1.541	3.810		0.406		0.406	U	**50.031**	2.452	1.010		8.022	4.235	3.560	
SB-07	10/26/2015	8	10		11.336	1.779	4.290		0.517		0.517	U	**94.155**	4.462	1.020		4.800		4.800	U
SB-07	10/26/2015	10	12		13.315	1.443	3.370		0.644	0.115	0.500		**27.019**	1.398	0.778		6.429	2.613	3.020	
SB-07	10/26/2015	12	14		17.877	1.563	3.390		0.652	0.068	0.284		1.208	0.224	0.535		6.422	1.916	1.400	
SB-07	10/26/2015	14	16		12.875	1.405	3.340		0.577	0.086	0.396		**15.894**	0.890	0.744		8.777	2.759	2.310	
SB-07	10/26/2015	17	19		15.590	1.323	2.770		0.533	0.057	0.205		0.818	0.201	0.401		1.010		1.010	U
SB-07	10/26/2015	18	20		12.613	1.314	3.160		0.847	0.069	0.215		0.624	0.194	0.415		0.979		0.979	U
SB-07	10/26/2015	20	22		14.057	1.391	3.220		0.653	0.066	0.261		**1.965**	0.252	0.547		1.070		1.070	U
SB-07	10/26/2015	22	24		16.308	1.450	3.220		0.521	0.056	0.212		0.559	0.171	0.415	J	0.646		0.646	U
SB-07	10/26/2015	22	24	SB-07-22-24	14.975	1.310	2.840		0.055	0.055	0.192		1.123	0.180	0.531	J	0.597		0.597	U
SB-07	10/26/2015	24	26		13.933	1.334	3.070		0.512	0.060	0.233		0.678	0.177	0.366		0.615		0.615	U
SB-07	10/26/2015	26	28		16.080	1.479	3.300		0.582	0.066	0.279		**4.253**	0.356	0.452		1.398	0.700	1.640	J
SB-07	10/26/2015	28	30		13.490	1.278	2.900		0.512	0.055	0.195		0.834	0.180	0.342		0.605		0.605	U
SB-08	10/23/2015	1	2		10.207	1.824	5.060		**28.858**	0.772	0.845		**37.819**	1.915	1.090		4.390		4.390	U
SB-08	10/23/2015	2	4		14.987	1.502	3.540		**2.245**	0.119	0.313		**3.423**	0.336	0.492		1.580		1.580	U
SB-08	10/23/2015	4	6		11.651	1.457	3.720		**0.932**	0.095	0.422		**14.106**	0.813	0.730		2.230		2.230	U
SB-08	10/23/2015	6	8		10.306	3.900	7.690		**2.359**	0.422	1.880		**533.804**	24.658	2.190		20.866	8.895	12.300	J
SB-08	10/23/2015	8	10		10.224	1.236	3.120		0.311	0.067	0.262		**4.290**	0.359	0.456		1.470		1.470	U
SB-08	10/23/2015	10	12		9.000		9.000	U	1.460		1.460	UJ	**759.990**	40.008	2.930		39.210	13.862	15.500	J
SB-08	10/23/2015	12	14		22.987	2.014	4.020		0.496		0.496	U	**70.420**	3.365	0.844		17.384	5.454	4.580	J
SB-08	10/23/2015	14	16		15.537	2.051	4.660		**2.245**	0.222	0.865		**114.421**	5.398	1.110		10.839	4.463	5.790	J
SB-08	10/23/2015	16	18		11.506	1.335	3.370		0.684	0.069	0.260		**2.323**	0.285	0.414		14.221	4.037	1.470	J
SB-08	10/23/2015	18	20		13.536	1.208	2.630		0.696	0.056	0.192		**1.593**	0.205	0.323		8.510	2.446	1.290	J
SB-08	10/23/2015	18	20	SB-08-18-20	13.397	1.228	2.750		0.734	0.061	0.217		**1.568**	0.211	0.419		7.279	2.121	1.120	J
SB-08	10/23/2015	20	22		17.339	2.124	4.710		**1.579**	0.202	0.922		**120.442**	5.690	1.330		5.840		5.840	U
SB-08	10/23/2015	22	24		11.872	1.187	2.820		0.304	0.046	0.191		0.358	0.153	0.333		0.898		0.898	U
SB-08	10/23/2015	24	26		14.954	1.317	0.258		0.608	0.058	0.224		**2.633**	0.258	0.396		0.975		0.975	U
SB-08	10/23/2015	26	28		13.313	1.278	2.960		0.522	0.056	0.219		0.931	0.183	0.302		0.784		0.784	U
SB-08	10/23/2015	28	30		18.191	1.450	2.910		0.660	0.060	0.230		0.612	0.173	0.358		0.728		0.728	U
SB-11	10/20/2015	0	2		10.970	1.288	3.260		0.530	0.059	0.230		0.949	0.195	0.156		1.100		1.100	U
SB-11	10/20/2015	2	4		14.202	1.412	3.300		0.586	0.061	0.253		1.022	0.215	0.163		1.080		1.080	U
SB-11	10/20/2015	4	6		10.692	1.277	3.270		0.478	0.056	0.204		0.843	0.186	0.207		1.030		1.030	U
SB-11	10/20/2015	6	8		15.418	1.421	3.220		0.651	0.061	0.227		0.940	0.186	0.134		1.000		1.000	U
SB-11	10/20/2015	8	9		12.805	1.329	3.190		0.518	0.060	0.231		0.727	0.198	0.220		1.190		1.190	U
SB-12	10/20/2015	0	2		14.161	1.390	3.220		0.804	0.070	0.239		**1.243**	0.242	0.205		1.200		1.200	U
SB-12	10/20/2015	2	4		11.900	1.254	3.040		0.581	0.058	0.177		0.813	0.168	0.170		1.000		1.000	U
SB-12	10/20/2015	4	6		12.984	1.244	2.860		0.539	0.053	0.176		0.626	0.187	0.162		1.020		1.020	U
SB-12	10/20/2015	4	6	SB-12-04-06	16.909	1.457	3.110		0.645	0.063	0.250		0.897	0.205	0.203	J	1.160		1.160	U
SB-12	10/20/2015	6	8		13.460	1.410	3.400		0.619	0.067	0.254		0.656	0.206	0.187	J	1.160		1.160	U
SB-12	10/20/2015	8	10		15.525	1.480	3.430		0.612	0.065	0.263		0.837	0.202	0.190	J	1.200		1.200	U
SB-12	10/20/2015	8	10	SB-12-08-10	15.013	1.439	3.320		0.709	0.062	0.198		0.787	0.203	0.179	J	1.000		1.000	U
SB-13	10/20/2015	0	2		13.039	1.466	3.650		**1.189**	0.085	0.242		**2.402**	0.276	0.244		1.510		1.510	U
SB-13	10/20/2015	2	4		11.318	1.338	3.410		0.412	0.054	0.234		0.570	0.051	0.162		0.899		0.899	U
SB-13	10/20/2015	4	6		13.855	1.362	3.200		0.526	0.061	0.250		0.642	0.188	0.176		1.090		1.090	U
SB-13	10/20/2015	6	8		16.668	1.426	3.040		0.560	0.058	0.240		0.935	0.213	0.213		1.040		1.040	U
SB-13	10/20/2015	8	10		14.191	1.323	3.020		0.487	0.057	0.222		1.065	0.189	0.200		1.020		1.020	U

Table 4-11
ISOCS Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**				**1.061**			
Soil Borings (continued)																				
SB-14	10/21/2015	0	2		11.777	1.365	3.470		**0.964**	0.071	0.239		0.625	0.173	0.201		1.240		1.240	U
SB-14	10/21/2015	2	4		11.674	1.283	3.180		0.593	0.060	0.213		0.520	0.177	0.170		0.943		0.943	U
SB-14	10/21/2015	4	6		11.072	1.240	3.080		0.467	0.053	0.161		0.758	0.188	0.187		1.040		1.040	U
SB-14	10/21/2015	6	8		12.973	1.238	2.860		0.535	0.054	0.194		0.905	0.164	0.109		1.020		1.020	U
SB-14	10/21/2015	8	10		14.078	1.294	2.880		0.633	0.057	0.198		1.200	0.190	0.161		1.040		1.040	U
SB-15	10/28/2015	0	2		12.150	1.349	3.330		0.633	0.066	0.236		0.970	0.194	0.414		0.657		0.657	U
SB-15	10/28/2015	2	4		9.931	1.265	3.303		0.440	0.056	0.219		0.661	0.185	0.549		0.525		0.525	U
SB-15	10/28/2015	4	6		13.459	1.367	3.230		0.633	0.064	0.263		0.826	0.181	0.420		0.693		0.693	U
SB-15	10/28/2015	6	8		12.203	1.247	2.970		0.650	0.057	0.211		0.882	0.187	0.523		0.631		0.631	U
SB-15	10/28/2015	8	10		14.208	1.375	3.170		0.510	0.066	0.244		0.889	0.188	0.522		0.584		0.584	U
SB-15	10/28/2015	8	10	SB-15-08-10	13.096	1.338	3.210		0.533	0.051	0.201		1.005	0.177	0.450		0.591		0.591	U
SB-16	10/21/2015	0	2		13.285	1.399	3.370		0.686	0.068	0.250		1.101	0.211	0.127		1.310		1.310	U
SB-16	10/21/2015	2	4		14.844	1.488	3.510		0.592	0.063	0.244		0.571	0.189	0.178		1.160		1.160	U
SB-16	10/21/2015	4	6		10.104	1.225	3.120		0.682	0.062	0.209		0.883	0.200	0.180		1.200		1.200	U
SB-16	10/21/2015	6	8		13.838	1.403	3.320		0.550	0.062	0.239		**1.303**	0.211	0.183		1.140		1.140	U
SB-16	10/21/2015	8	10		15.967	1.424	3.130		0.658	0.067	0.255		1.011	0.203	0.180	J	1.260		1.260	U
SB-17	10/27/2015	0	2		12.273	1.300	3.160		0.672	0.060	0.227		0.914	0.185	0.504		0.639		0.639	U
SB-17	10/27/2015	2	4		11.660	1.324	3.320		0.614	0.059	0.187		0.852	0.213	0.624		0.626		0.626	U
SB-17	10/27/2015	4	6		12.329	1.404	3.530		0.712	0.064	0.226		0.982	0.220	0.629		0.677		0.677	U
SB-17	10/27/2015	6	8		11.183	1.210	2.980		0.744	0.058	0.160		0.911	0.194	0.549		0.619		0.619	U
SB-17	10/27/2015	8	10		14.571	1.309	2.890		0.657	0.059	0.201		0.693	0.186	0.553		0.587		0.587	U
SB-18	10/27/2015	0	2		9.868	1.222	3.180		0.449	0.053	0.209		**1.434**	0.209	0.499		1.080		1.080	U
SB-18	10/27/2015	2	4		10.882	1.265	3.210		0.639	0.061	0.212		0.698	0.175	0.504		0.577		0.577	U
SB-18	10/27/2015	4	6		10.628	1.350	3.530		0.289	0.052	0.235		0.411	0.177	0.402		0.759		0.759	U
SB-18	10/27/2015	6	8		18.247	1.525	3.210		0.657	0.059	0.187		1.151	0.205	0.541		0.584		0.584	U
SB-18	10/27/2015	6	8	SB-18-06-08	16.148	1.372	2.930		0.713	0.061	0.218		1.166	0.186	0.156		1.050		1.050	U
SB-18	10/27/2015	8	10		13.678	1.320	3.080		0.654	0.060	0.195		0.998	0.187	0.502		0.545		0.545	U
SB-19	10/22/2015	0	2		10.681	1.408	3.730		**1.012**	0.081	0.290		**1.339**	0.241	0.212		1.450		1.450	U
SB-19	10/22/2015	2	4		12.574	1.315	3.160		0.534	0.058	0.222		0.518	0.208	0.206		1.090		1.090	U
SB-19	10/22/2015	4	6		10.370	1.288	3.350		0.540	0.060	0.217		0.848	0.177	0.173		1.100		1.100	U
SB-19	10/22/2015	6	8		13.542	1.324	3.110		0.584	0.056	0.163		0.775	0.163	0.163		0.923		0.923	U
SB-19	10/22/2015	8	10		14.129	1.339	3.080		0.725	0.062	0.223		0.750	0.192	0.114		1.600		1.600	U
SB-20	11/9/2015	0	2		8.820	1.341	3.700		**0.955**	0.081	0.295		**2.045**	0.266	0.135		1.470		1.470	U
SB-20	11/9/2015	2	4		11.667	1.258	3.090		0.652	0.061	0.222		1.205	0.221	0.180		1.130		1.130	U
SB-21	10/22/2015	0	2		13.833	1.343	3.120		0.657	0.062	0.236		0.602	0.203	0.176		1.180		1.180	U
SB-21	10/22/2015	2	4		10.475	1.195	2.990		0.553	0.057	0.245		1.014	0.193	0.163		0.997		0.997	U
SB-21	10/22/2015	4	6		11.395	1.256	3.110		0.555	0.059	0.219		0.784	0.180	0.169		0.955		0.955	U
SB-21	10/22/2015	4	6	SB-21-04-06	12.700	1.293	3.070		0.532	0.057	0.238		0.950	0.186	0.158		0.973		0.973	U
SB-21	10/22/2015	6	8		14.897	1.548	3.720		0.883	0.076	0.254		0.914	0.218	0.200		1.210		1.210	U
SB-21	10/22/2015	8	10		13.617	1.390	3.290		0.755	0.067	0.229		0.258		0.258	U	1.140		1.140	U
SB-22	10/22/2015	0	2		10.812	1.271	3.230		0.597	0.066	0.292		**2.048**	0.253	0.142		1.180		1.180	U
SB-22	10/22/2015	2	4		11.953	1.181	2.750		0.560	0.055	0.183		0.779	0.172	0.099		1.010		1.010	U
SB-22	10/22/2015	4	6		15.233	1.393	3.150		0.517	0.059	0.225		0.517	0.189	0.200		1.050		1.050	U
SB-22	10/22/2015	6	8		11.196	1.251	3.120		0.721	0.062	0.193		1.119	0.192	0.172		1.080		1.080	U
SB-22	10/22/2015	8	10		14.574	1.386	3.200		0.619	0.060	0.217		**1.249**	0.209	0.184		1.070		1.070	U
SB-26	10/21/2015	0	2		11.499	1.484	3.890		**2.117**	0.123	0.363		**8.660**	0.577	0.184		2.030		2.030	U
SB-26	10/21/2015	2	4		9.155	1.347	3.680		**1.195**	0.084	0.299		**2.601**	0.305	0.221	J	1.520		1.520	U
SB-26	10/21/2015	2	4	SB-26-02-04	11.513	1.442	3.760		**1.150**	0.086	0.278		1.210	0.223	0.219	J	1.520		1.520	U
SB-26	10/21/2015	4	6		13.610	1.377	3.280		0.606	0.062	0.243		0.908	0.209	0.129		1.110		1.110	U
SB-26	10/21/2015	5	7		15.819	1.433	3.170		0.602	0.061	0.244		0.950	0.196	0.174		1.010		1.010	U
SB-29	10/20/2015	0	2		13.177	1.462	3.630		**1.920**	0.110	0.305		**6.958**	0.493	0.187		1.770		1.770	U
SB-29	10/20/2015	2	4		15.233	1.613	3.900		**0.943**	0.080	0.280		**1.394**	0.255	0.218		1.490		1.490	U
SB-29	10/20/2015	4	6		14.581	1.572	3.850		0.634	0.071	0.286		0.531	0.186	0.196		1.010		1.010	U
SB-29	10/20/2015	6	8		14.535	1.398	3.240		0.611	0.065	0.208		0.969	0.203	0.172		1.120		1.120	U
SB-29	10/20/2015	8	10		12.489	1.257	2.960		0.395	0.052	0.216		0.612	0.165	0.152	J	0.860		0.860	U
SB-31	10/19/2015	0	2		15.230	1.342	2.910		0.894	0.067	0.238		**2.454**	0.256	0.150		1.240		1.240	U
SB-31	10/19/2015	2	4		14.671	1.700	4.200		**2.705**	0.148	0.481		**16.999**	0.970	0.268		2.600		2.600	U
SB-31	10/19/2015	4	6		14.224	1.336	3.010		0.537	0.060	0.227		0.968	0.213	0.155		1.110		1.110	U
SB-31	10/19/2015	6	8		12.938	1.342	3.210		0.571	0.062	0.224		0.741	0.208	0.168		1.050		1.050	U
SB-31	10/19/2015	8	10		13.543	1.396	3.360		0.637	0.060	0.210		1.019	0.206	0.195		1.110		1.110	U
SB-33	10/20/2015	0	2		11.832	1.393	3.530		0.846	0.077	0.285		0.932	0.229	0.201		1.170		1.170	U
SB-33	10/20/2015	2	4		12.327	1.400	3.500		**0.929**	0.074	0.268		0.911	0.192	0.230		1.170		1.170	U
SB-33	10/20/2015	4	6		8.431	1.545	4.450		**2.329**	0.132	0.359		**2.105**	0.308	0.174		2.663	1.173	2.940	
SB-33	10/20/2015	6	8		10.805	1.599	4.370		**1.172**	0.095	0.328		1.117	0.269	0.244		1.540		1.540	U
SB-33	10/20/2015	8	10		17.775	1.525	3.270		0.788	0.068	0.272		**1.269**	0.228	0.117		1.180		1.180	U
SB-34	10/20/2015	0	2		13.338	1.305	3.050		0.631	0.059	0.246		0.723	0.191	0.171		1.030		1.030	U
SB-34	10/20/2015	2	4		13.174	1.436	3.540		**1.298**	0.083	0.227		**1.512**	0.250	0.150		1.520		1.520	U
SB-34	10/20/2015	4	6		8.519	1.692	4.940		**2.734**	0.148	0.376		**2.775**	0.376	0.201		3.039	1.318	3.260	
SB-34	10/20/2015	6	8		13.893	1.669	4.250		0.794	0.081	0.301		0.905	0.264	0.149		1.430		1.430	U

Table 4-11
ISOCS Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**				**1.061**			
Soil Borings (continued)																				
SB-34	10/20/2015	8	10		11.960	1.291	3.160		0.608	0.061	0.217		0.629	0.197	0.177		1.220		1.220	U
SB-35	10/27/2015	0	2		12.700	1.348	3.260		0.799	0.069	0.259		0.952	0.211	0.203		1.190		1.190	U
SB-35	10/27/2015	2	4		9.191	1.266	3.350		**2.336**	0.125	0.363		**10.058**	0.615	0.215		4.394	1.611	3.400	J
SB-35	10/27/2015	4	6		5.956	1.302	3.860		**2.318**	0.124	0.327		**3.523**	0.372	0.185		1.950		1.950	U
SB-35	10/27/2015	6	8		8.863	1.516	4.280		**3.112**	0.157	0.384		**2.526**	0.344	0.178		5.024	1.696	3.030	J
SB-35	10/27/2015	8	10		14.318	1.456	3.440		0.765	0.071	0.266		1.177	0.203	0.215		1.240		1.240	U
SB-35	10/27/2015	10	12		14.955	1.311	2.840		0.572	0.060	0.230		0.932	0.184	0.163		1.080		1.080	U
SB-35	10/27/2015	12	14		13.189	1.198	2.640		0.450	0.052	0.195		0.667	0.162	0.148		0.959		0.959	U
SB-35	10/27/2015	14	16		13.667	1.321	3.080		0.689	0.060	0.218		0.893	0.193	0.210		1.040		1.040	U
SB-35	10/27/2015	16	18		14.557	1.356	3.100		0.444	0.056	0.223		0.864	0.191	0.163		0.934		0.934	U
SB-35	10/27/2015	18	20		9.829	1.184	3.050		0.384	0.052	0.195		0.537	0.162	0.152		0.947		0.947	U
SB-35	10/27/2015	20	22		7.987	1.414	4.070		**0.948**	0.079	0.275		1.124	0.228	0.224	J	1.390		1.390	U
SB-35	10/27/2015	22	24		12.918	1.283	3.010		0.518	0.059	0.238		0.647	0.170	0.178	J	1.685	0.662	1.480	J
SB-35	10/27/2015	24	26		16.154	1.429	3.130		0.817	0.062	0.199		0.790	0.178	0.107	J	1.140		1.140	U
SB-35	10/27/2015	26	28		14.044	1.347	3.110		0.457	0.054	0.224		0.839	0.177	0.168	J	0.941		0.941	U
SB-35	10/27/2015	28	30		13.730	1.300	2.930		0.555	0.057	0.214		**1.221**	0.186	0.166	J	1.020		1.020	U
SB-36	10/22/2015	0	2		9.414	1.324	3.440		**5.546**	0.224	0.499		**28.549**	1.435	0.741		4.749	2.551	3.040	J
SB-36	10/22/2015	0	2	SB-36-00-02	8.575	1.450	3.950		**6.345**	0.253	0.653		**32.665**	1.666	0.314		3.510		3.510	U
SB-36	10/22/2015	2	4		10.616	1.237	3.130		0.719	0.064	0.231		1.140	0.190	0.398		0.717		0.717	U
SB-36	10/22/2015	4	6		12.812	1.313	3.110		0.502	0.059	0.232		0.435		0.435	U	0.631		0.631	U
SB-36	10/22/2015	6	7		13.527	1.362	3.200		0.568	0.058	0.206		0.968	0.187	0.180		1.010		1.010	U
SB-37	10/22/2015	0	2		14.021	1.566	3.910		**3.686**	0.171	0.436		**10.146**	0.652	0.774		3.137	0.919	2.420	
SB-37	10/22/2015	2	4		14.106	1.334	3.020		0.627	0.059	0.222		0.959	0.261	0.336		0.545		0.545	U
SB-37	10/22/2015	4	6		13.188	1.336	3.180		0.564	0.063	0.238		0.895	0.201	0.424		0.613		0.613	U
SB-37	10/22/2015	6	8		14.758	1.329	2.920		0.668	0.059	0.194		0.815	0.198	0.400		0.632		0.632	U
SB-37	10/22/2015	8	10		14.631	1.297	2.810		0.615	0.057	0.202		0.835	0.173	0.335		0.603		0.603	U
SB-38	10/27/2015	0	2		11.159	1.276	3.210		**1.873**	0.103	0.242	J	**4.211**	0.371	0.654		1.670		1.670	U
SB-38	10/27/2015	2	4		12.612	1.313	3.170		0.753	0.065	0.220	J	**1.250**	0.208	0.538		0.612		0.612	U
SB-38	10/27/2015	4	6		11.367	1.279	3.190		0.793	0.062	0.210		0.803	0.182	0.515		0.604		0.604	U
SB-38	10/27/2015	6	8		9.778	1.198	3.080		0.559	0.060	0.238		0.625	0.178	0.529		0.591		0.591	U
SB-38	10/27/2015	8	10		13.060	1.303	3.080		0.579	0.054	0.171		0.680	0.176	0.516		0.727		0.727	U
SB-39	10/27/2015	0	2		12.086	1.403	3.550		**1.204**	0.079	0.222	J	1.133	0.225	0.621		0.785		0.785	U
SB-39	10/27/2015	2	4		9.186	1.283	3.500		0.766	0.065	0.224	J	0.477	0.174	0.541		0.777		0.777	U
SB-39	10/27/2015	2	4	SB-39-02-04	12.253	1.300	3.160		0.753	0.062	0.228	J	0.967	0.194	0.532		0.572		0.572	U
SB-39	10/27/2015	4	6		10.001	1.252	3.280		0.834	0.066	0.209	J	0.709	0.206	0.576		0.606		0.606	U
SB-39	10/27/2015	6	8		9.744	1.216	3.180		0.708	0.064	0.218	J	0.972	0.180	0.470		0.652		0.652	U
SB-39	10/27/2015	8	10		12.710	1.324	3.170		0.834	0.063	0.191	J	0.488	0.189	0.593		0.662		0.662	U
SB-40	10/27/2015	0	2		12.015	1.263	3.060		0.653	0.058	0.193		1.045	0.188	0.495		0.581		0.581	U
SB-40	10/27/2015	2	4		11.851	1.280	3.130		0.567	0.058	0.204		0.888	0.188	0.521		0.535		0.535	U
SB-40	10/27/2015	4	6		10.597	1.220	3.080		0.682	0.058	0.204		0.867	0.186	0.520		0.569		0.569	U
SB-40	10/27/2015	6	7		12.004	1.220	2.900		0.753	0.060	0.223		1.027	0.191	0.515		0.629		0.629	U
SB-41	10/26/2015	0	2		10.510	1.435	3.860		**1.840**	0.109	0.340		**4.371**	0.387	0.727		3.342	0.818	1.410	
SB-41	10/26/2015	2	4		11.299	1.384	3.570		0.702	0.063	0.241		0.888	0.198	0.552		0.629		0.629	U
SB-41	10/26/2015	4	6		11.898	1.333	3.330		0.773	0.067	0.226		0.699		0.699	U	0.691		0.691	U
SB-41	10/26/2015	6	8		9.506	1.208	3.170		0.567	0.061	0.202		0.696	0.199	0.598		0.569		0.569	U
SB-41	10/26/2015	8	10		12.687	1.255	2.950		0.793	0.061	0.203		0.756	0.165	0.458		0.566		0.566	U
SB-42	10/26/2015	0	2		10.321	1.279	3.320		**1.119**	0.075	0.212		**1.491**	0.221	0.537		0.719		0.719	U
SB-42	10/26/2015	2	4		14.052	1.350	3.090		0.814	0.066	0.215		0.865	0.194	0.550		0.613		0.613	U
SB-42	10/26/2015	2	4	SB-42-02-04	12.050	1.293	3.150		0.718	0.063	0.212		1.219	0.207	0.536		0.606		0.606	U
SB-42	10/26/2015	4	6		13.974	1.344	3.080		0.725	0.062	0.223		0.898	0.176	0.469		0.732		0.732	U
SB-42	10/26/2015	6	8		11.495	1.231	3.030		0.593	0.053	0.173		0.954	0.183	0.496		0.597		0.597	U
SB-42	10/26/2015	8	10		12.284	1.258	1.258		0.448	0.045	0.188		0.774	0.159	0.428		0.634		0.634	U
SB-43	10/29/2015	0	2		11.600	1.340	3.390		0.550	0.059	0.208	J	0.859	0.180	0.488		0.560		0.560	U
SB-43	10/29/2015	2	4		12.723	1.277	3.030		0.643	0.059	0.210	J	0.626	0.166	0.486		0.602		0.602	U
SB-43	10/29/2015	4	6		11.003	1.224	3.040		0.682	0.060	0.161	J	0.640	0.188	0.568		0.689		0.689	U
SB-44	10/28/2015	0	2		9.178	1.951	5.620		**62.834**	1.356	0.978		**54.227**	2.694	1.010		4.970		4.970	U
SB-44	10/28/2015	2	4		12.595	1.370	3.260		0.878	0.075	0.265		0.885	0.212	0.422		0.700		0.700	U
SB-44	10/28/2015	4	6		10.862	1.142	2.740		0.320	0.046	0.197		0.418	0.166	0.394		0.527		0.527	U
SB-44	10/28/2015	6	8		15.872	1.410	3.090		0.504	0.054	0.208		1.145	0.182	0.386		0.600		0.600	U
SB-44	10/28/2015	8	10		13.502	1.410	3.420		0.607	0.060	0.223		0.754	0.173	0.433		0.641		0.641	U
SB-45	10/28/2015	0	2		18.448	1.538	3.240		0.867	0.072	0.290		**2.619**	0.299	0.509		1.050	0.508	1.200	J
SB-45	10/28/2015	2	4		11.812	1.341	3.340		0.390	0.057	0.218		0.450		0.450	U	0.627		0.627	U
SB-45	10/28/2015	4	6		11.739	1.279	3.130		0.453	0.054	0.201		0.389		0.389	U	0.607		0.607	U
SB-45	10/28/2015	6	8		15.502	1.368	2.980		0.573	0.060	0.222		0.933	0.181	0.391		0.649		0.649	U
SB-45	10/28/2015	8	10		15.028	1.391	3.140		0.696	0.063	0.196		0.680	0.183	0.377		0.632		0.632	U
SB-50	12/1/2015	0	1		9.025	2.532	6.440		**38.648**	1.019	1.280		**209.934**	9.785	0.756		13.100		13.100	UJ
SB-50	12/1/2015	1	2		10.877	1.293	3.290		0.801	0.072	0.262		**2.235**	0.267	0.158		1.310		1.310	U
SB-50	12/1/2015	2	4		10.648	1.196	2.970		0.498	0.057	0.207		0.959	0.184	0.158		1.010		1.010	U
SB-50	12/1/2015	4	6		9.773	1.670	4.740		**2.308**	0.137	0.384		**3.161**	0.350	0.189		5.249	1.689	2.610	J

Table 4-11
ISOCS Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**				**1.061**			
Soil Borings (continued)																				
SB-50	12/1/2015	6	8		9.990	1.286	3.390		0.685	0.061	0.225		0.834	0.197	0.183		1.170		1.170	U
SB-50	12/1/2015	6	8	SB-50-06-08	12.540	1.370	3.370		0.671	0.066	0.234		0.677	0.180	0.166		1.170		1.170	U
SB-50	12/1/2015	8	10		14.772	1.379	3.120		0.559	0.059	0.218		1.129	0.206	0.196		1.120		1.120	U
SB-50	12/1/2015	10	12		15.461	1.326	2.820		0.537	0.057	0.204		0.670	0.179	0.173		1.010		1.010	U
SB-50	12/1/2015	12	14		13.585	1.342	3.160		0.619	0.062	0.209		1.002	0.184	0.167		1.090		1.090	U
SB-50	12/1/2015	14	16		18.528	1.498	3.060		0.634	0.060	0.194		1.216	0.214	0.186		1.070		1.070	U
SB-50	12/1/2015	16	18		11.071	1.253	3.140		0.611	0.059	0.213		1.202	0.187	0.172		1.120		1.120	U
SB-50	12/1/2015	18	20		13.304	1.300	3.000		0.681	0.066	0.249		1.015	0.210	0.165		1.120		1.120	U
SB-50	12/1/2015	20	22		13.506	1.297	2.990		0.568	0.059	0.230		**1.324**	0.217	0.171		1.100		1.100	U
SB-50	12/1/2015	22	24		13.776	1.329	3.080		0.381	0.060	0.269		1.008	0.179	0.145		0.975		0.975	U
SB-50	12/1/2015	24	26		13.004	1.322	3.160		0.568	0.057	0.195		0.789	0.200	0.167		0.918		0.918	U
SB-50	12/1/2015	26	27		15.610	1.420	3.170		0.529	0.057	0.218		1.135	0.200	0.169		1.090		1.090	U
SB-51	12/3/2015	0	1		10.811	1.745	4.560		**11.128**	0.386	0.749		**59.350**	2.904	0.413	J	9.008	3.528	8.160	J
SB-51	12/3/2015	1	2		16.896	1.558	3.500		**1.285**	0.088	0.294		**2.365**	0.304	0.150	J	2.320		2.320	U
SB-51	12/3/2015	2	4		13.419	1.334	3.140		0.525	0.059	0.227		**1.278**	0.220	0.172	J	1.070		1.070	U
SB-51	12/3/2015	4	6		7.756	1.798	5.390		**3.158**	0.165	0.438		**3.408**	0.440	0.232	J	2.630		2.630	U
SB-51	12/3/2015	6	8		10.791	1.334	3.440		0.881	0.071	0.196		**1.353**	0.222	0.202	J	1.290		1.290	U
SB-51	12/3/2015	8	10		16.334	1.426	3.070		0.469	0.469	0.191		0.931	0.199	0.114	J	1.040		1.040	U
SB-52	12/1/2015	0	1		9.911	1.401	3.710		**4.200**	0.183	0.413		**16.072**	0.912	0.236		5.768	2.136	4.590	
SB-52	12/1/2015	1	2		11.874	1.339	3.330		**1.142**	0.080	0.218		**1.662**	0.222	0.203		1.320		1.320	U
SB-52	12/1/2015	2	4		13.395	1.371	3.270		0.567	0.061	0.244		0.829	0.200	0.159		1.070		1.070	U
SB-52	12/1/2015	4	6		10.520	1.282	3.280		0.372	0.054	0.188		0.453	0.188	0.168		1.030		1.030	U
SB-52	12/1/2015	6	8		11.132	1.262	3.140		0.440	0.058	0.232		0.518	0.188	0.164		0.968		0.968	U
SB-52	12/1/2015	8	10		10.286	1.197	3.000		0.323	0.060	0.205		0.172		0.172	U	0.843		0.843	U
SB-53	12/1/2015	0	1		11.505	11.505	4.300		**5.185**	0.216	0.471		**19.352**	1.081	0.273	J	8.070	2.715	4.950	J
SB-53	12/1/2015	1	2		11.919	1.398	3.550		0.791	0.070	0.225		**1.368**	0.234	0.207	J	1.240		1.240	U
SB-53	12/1/2015	2	4		13.130	1.316	3.080		0.558	0.058	0.210		0.655	0.190	0.183	J	1.070		1.070	U
SB-53	12/1/2015	4	6		15.601	1.428	3.200		0.516	0.057	0.195		0.994	0.185	0.174		1.000		1.000	U
SB-53	12/1/2015	6	8		10.672	1.286	3.290		0.621	0.065	0.257		**1.314**	0.218	0.189		1.060		1.060	U
SB-53	12/1/2015	8	10		13.546	1.372	3.290		0.545	0.063	0.231		0.819	0.182	0.186		1.100		1.100	U
SB-54	12/3/2015	0	1		12.466	1.651	4.160		**6.875**	0.262	0.608		**39.304**	1.986	0.368		3.610		3.610	U
SB-54	12/3/2015	1	2		12.071	1.253	3.030		0.524	0.057	0.219		0.624	0.181	0.148		1.010		1.010	U
SB-54	12/3/2015	2	4		14.044	1.270	2.810		0.598	0.058	0.201		0.806	0.180	0.174		1.080		1.080	U
SB-54	12/3/2015	2	4	SB-54-02-04	15.552	1.365	2.990		0.756	0.063	0.213		0.927	0.189	0.116		1.190		1.190	U
SB-54	12/3/2015	4	6		14.697	1.329	2.950		0.578	0.057	0.198		0.671	0.170	0.157		1.070		1.070	U
SB-54	12/3/2015	6	8		12.296	1.183	2.730		0.476	0.051	0.215		0.727	0.174	0.143		0.843		0.843	U
SB-54	12/3/2015	8	10		10.452	0.938	2.080		0.362	0.039	0.142		0.681	0.123	0.108		0.693		0.693	U
SB-55	12/2/2015	0	2		14.538	1.435	3.370		0.647	0.066	0.267		0.803	0.175	0.132		1.240		1.240	U
SB-55	12/2/2015	2	4		13.483	1.339	3.180		0.634	0.059	0.235		0.796	0.188	0.111		1.090		1.090	U
SB-55	12/2/2015	4	6		14.978	1.382	3.120		0.686	0.064	0.220		1.059	0.181	0.192		1.040		1.040	U
SB-55	12/2/2015	6	8		14.434	1.337	3.010		0.516	0.056	0.205		0.816	0.182	0.159		1.060		1.060	U
SB-55	12/2/2015	8	10		16.293	1.440	3.160		0.582	0.059	0.231		0.706	0.175	0.176		0.968		0.968	U
SB-56	11/30/2015	0	2		14.560	1.731	4.400		**1.669**	0.117	0.405		**6.445**	0.494	0.218		1.970		1.970	U
SB-56	11/30/2015	2	4		12.931	1.400	3.400		0.421	0.056	0.216		0.746	0.194	0.153		1.090		1.090	U
SB-56	11/30/2015	4	6		13.509	1.377	3.280		0.243	0.054	0.235		0.468	0.192	0.158		0.975		0.975	U
SB-56	11/30/2015	6	8		14.853	1.374	3.080		0.520	0.067	0.225		0.748	0.194	0.227		0.996		0.996	U
SB-56	11/30/2015	8	10		12.823	1.262	2.940		0.412	0.055	0.242		1.033	0.173	0.102		1.097	0.580	1.610	
SB-56	11/30/2015	10	12		15.136	1.359	2.980		0.632	0.060	0.230		0.638	0.187	0.181		1.100		1.100	U
SB-56	11/30/2015	12	14		13.222	1.317	3.100		0.484	0.058	0.208		1.023	0.199	0.169		1.120		1.120	U
SB-56	11/30/2015	14	16		16.533	1.456	3.200		0.589	0.058	0.190		0.819	0.181	0.200		1.100		1.100	U
SB-56	11/30/2015	16	18		14.522	1.323	2.930		0.557	0.055	0.214		0.756	0.182	0.164		0.935		0.935	U
SB-56	11/30/2015	18	20		13.777	1.388	3.280		0.626	0.062	0.213		0.714	0.182	0.187		1.170		1.170	U
SB-56	11/30/2015	20	22		14.707	1.395	3.180		0.497	0.066	0.245		1.001	0.205	0.174		1.010		1.010	U
SB-56	11/30/2015	22	24		13.699	1.382	3.260		0.566	0.058	0.224		0.701	0.202	0.178		1.080		1.080	U
SB-57	12/1/2015	0	2		9.850	1.415	3.850		**0.959**	0.079	0.251		**1.486**	0.253	0.139		1.420		1.420	U
SB-57	12/1/2015	0	2	SB-57-00-02	11.239	1.400	3.620		**1.015**	0.081	0.256		**1.484**	0.241	0.150		1.330		1.330	U
SB-57	12/1/2015	2	4		13.583	1.246	2.820		0.384	0.050	0.222		0.746	0.164	0.105		0.884		0.884	U
SB-57	12/1/2015	4	6		12.406	1.328	3.240		0.323	0.050	0.215		0.473	0.182	0.157		0.945		0.945	U
SB-57	12/1/2015	6	8		13.831	1.364	3.230		0.623	0.063	0.242		**1.392**	0.211	0.115		1.050		1.050	U
SB-57	12/1/2015	8	10		15.017	1.337	2.920		0.499	0.058	0.217		0.934	0.179	0.180		1.050		1.050	U
SB-58	11/30/2015	0	2		14.228	1.412	3.340		0.853	0.068	0.242		**1.299**	0.241	0.193		1.150		1.150	U
SB-58	11/30/2015	2	3		12.075	1.294	3.170		0.825	0.067	0.244		0.901	0.197	0.189		1.110		1.110	U
SB-58	11/30/2015	5	6		13.154	1.367	3.280		**0.966**	0.966	0.255		0.792	0.182	0.166		1.200		1.200	U
SB-58	11/30/2015	6	8		9.961	1.445	3.920		0.662	0.071	0.234		0.960	0.222	0.205		1.260		1.260	U
SB-58	11/30/2015	8	10		12.323	1.312	3.200		0.648	0.063	0.247		1.183	0.202	0.163		0.990		0.990	U
SB-59	11/30/2015	0	2		12.799	1.470	3.690		0.650	0.073	0.270		**1.255**	0.228	0.217		1.320		1.320	U
SB-59	11/30/2015	2	4		13.079	1.372	3.300		0.681	0.061	0.210		1.111	0.208	0.160		1.210		1.210	U
SB-59	11/30/2015	4	6		12.136	1.372	3.410		0.644	0.063	0.255		0.603	0.202	0.191	J	1.200		1.200	U
SB-59	11/30/2015	8	10		12.493	1.295	3.120		0.612	0.060	0.233		0.711	0.157	0.103	J	1.120		1.120	U

Table 4-11
ISOCS Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**				**1.061**			
Soil Borings (continued)																				
SB-59	11/30/2015	8	10	SB-59-08-10	12.292	1.299	3.150		0.537	0.055	0.197		0.785	0.192	0.162		1.060		1.060	U
SB-60	11/30/2015	0	2		13.757	1.341	3.090		0.815	0.069	0.236		1.083	0.206	0.196		1.030		1.030	U
SB-60	11/30/2015	2	2.6		13.209	1.359	3.220		0.843	0.072	0.258		**1.883**	0.259	0.163		1.150		1.150	U
SB-60	11/30/2015	6	8		9.768	1.315	3.510		0.852	0.071	0.264		0.884	0.239	0.223		1.140		1.140	U
SB-60	11/30/2015	8	10		16.281	1.368	2.920		0.498	0.056	0.210		0.948	0.164	0.177		1.030		1.030	U
SB-61	12/1/2015	0	2		11.176	1.337	3.430		0.777	0.069	0.260		1.072	0.211	0.125		1.220		1.220	U
SB-61	12/1/2015	2	3		11.569	1.452	3.770		0.706	0.067	0.271		0.731	0.236	0.136		1.330		1.330	U
SB-61	12/1/2015	5	6		9.803	1.428	3.890		0.767	0.076	0.270		0.741	0.215	0.195		1.360		1.360	U
SB-61	12/1/2015	6	8		13.365	1.325	3.090		0.613	0.058	0.207		1.069	0.209	0.178		1.060		1.060	U
SB-61	12/1/2015	8	10		13.381	1.319	3.110		0.588	0.057	0.186		**1.320**	0.191	0.121		1.060		1.060	U
SB-61	12/1/2015	15	16		15.728	1.407	3.100		0.592	0.061	0.245		0.988	0.195	0.190		1.080		1.080	U
SB-61	12/1/2015	16	18		12.702	1.394	3.470		0.498	0.060	0.250		1.164	0.211	0.174		1.070		1.070	U
SB-61	12/1/2015	18	20		15.193	1.427	3.240		0.532	0.057	0.231		0.664	0.185	0.175		1.100		1.100	U
SB-61	12/1/2015	20	22		14.119	1.447	3.480		0.672	0.067	0.229		0.649	0.196	0.172		1.130		1.130	U
SB-61	12/1/2015	22	24		13.170	1.389	3.380		0.521	0.058	0.219		0.844	0.186	0.218		1.120		1.120	U
SB-61	12/1/2015	24	26		13.330	1.470	3.640		0.570	0.065	0.230		**1.317**	0.228	0.202		1.130		1.130	U
SB-61	12/1/2015	26	28		13.211	1.395	3.370		0.623	0.064	0.258		1.036	0.210	0.188		1.050		1.050	U
SB-61	12/1/2015	28	30		14.165	1.282	2.820		0.628	0.057	0.207		0.670	0.182	0.181		1.140		1.140	U
SB-62	11/30/2015	0	2		14.245	1.527	3.720		0.815	0.079	0.272		0.834	0.194	0.183		1.230		1.230	U
SB-62	11/30/2015	2	4		15.047	1.464	3.380		0.705	0.067	0.228		0.880	0.218	0.180		1.160		1.160	U
SB-62	11/30/2015	6	8		13.228	1.398	3.380		0.689	0.067	0.246		0.969	0.202	0.205		1.080		1.080	U
SB-62	11/30/2015	8	10		12.494	1.367	3.370		0.576	0.062	0.220		0.842	0.189	0.164		1.060		1.060	U
SB-63	11/30/2015	0	2		13.136	1.402	3.410		0.857	0.071	0.243		1.026	0.206	0.170		1.150		1.150	U
SB-63	11/30/2015	2	4		14.656	1.522	3.660		0.781	0.074	0.274		**1.246**	0.222	0.206		1.270		1.270	U
SB-63	11/30/2015	4	6		10.921	1.427	3.760		0.482	0.067	0.276		0.618	0.214	0.159		1.230		1.230	U
SB-63	11/30/2015	6	8		13.239	1.396	3.350		0.492	0.061	0.242		1.201	0.191	0.198	J	1.200		1.200	U
SB-63	11/30/2015	8	10		12.908	1.346	3.220		0.443	0.059	0.243		0.587	0.179	0.177		1.010		1.010	U
Sewer Borings																				
SWSB-01	12/4/2015	0	2		13.093	1.276	2.950		0.388	0.054	0.234		0.855	0.191	0.177		1.010		1.010	U
SWSB-01	12/4/2015	2	4		10.029	1.363	3.650		0.499	0.064	0.269		0.802	0.188	0.167		1.100		1.100	U
SWSB-01	12/4/2015	4	6		14.034	1.465	3.540		0.509	0.065	0.244		0.851	0.202	0.162		1.060		1.060	U
SWSB-01	12/4/2015	4	6	SWSB-01-04-06	12.586	1.272	2.990		0.436	0.056	0.234		0.650	0.180	0.168		0.978		0.978	U
SWSB-02	12/4/2015	0	2		12.913	1.401	3.430		0.778	0.066	0.203		**1.761**	0.247	0.151		1.320		1.320	U
SWSB-02	12/4/2015	5	6		15.353	1.400	3.140		0.703	0.063	0.228		0.882	0.180	0.184		1.030		1.030	U
SWSB-02	12/4/2015	6	8		13.693	1.309	3.020		0.563	0.057	0.223		1.043	0.198	0.167		1.110		1.110	U
SWSB-02	12/4/2015	8	10		11.851	1.292	3.170		0.554	0.058	0.209		0.931	0.207	0.113		1.060		1.060	U
SWSB-02	12/4/2015	10	12		13.387	1.299	3.020		0.571	0.056	0.220		0.903	0.203	0.188		1.140		1.140	U
SWSB-02	12/4/2015	12	14		14.451	1.428	3.360		0.549	0.059	0.233		0.848	0.184	0.174		1.040		1.040	U
SWSB-03	12/4/2015	0	1		8.016	1.547	4.150		**7.774**	0.297	0.642		**58.008**	2.804	0.401		4.290		4.290	U
SWSB-03	12/4/2015	1	2		12.054	1.446	3.710		0.547	0.069	0.259		1.020	0.234	0.183		1.100		1.100	U
SWSB-03	12/4/2015	2	4		12.857	1.511	3.870		0.593	0.066	0.260		0.778	0.226	0.190		1.190		1.190	U
SWSB-03	12/4/2015	2	4	SWSB-03-02-04	13.674	1.382	3.260		0.742	0.065	0.222		0.729	0.196	0.190		1.140		1.140	U
SWSB-03	12/4/2015	4	6		11.994	1.317	3.270		0.409	0.055	0.224		0.382	0.164	0.163		1.040		1.040	U
SWSB-03	12/4/2015	6	8		12.472	1.501	3.840		0.618	0.072	0.271		0.885	0.203	0.199		1.240		1.240	U
SWSB-03	12/4/2015	8	10		14.202	1.569	3.880		0.698	0.076	0.263		1.197	0.238	0.206		1.210		1.210	U
SWSB-03	12/4/2015	10	12		16.473	1.517	3.410		0.579	0.066	0.246		0.908	0.203	0.199		1.140		1.140	U
SWSB-03	12/4/2015	12	14		14.530	1.306	2.880		0.581	0.058	0.215		0.836	0.182	0.146		1.020		1.020	U
SWSB-03	12/4/2015	14	16		14.756	1.328	2.930		0.606	0.060	0.188		0.812	0.185	0.173		0.966		0.966	U
SWSB-03	12/4/2015	16	18		13.807	1.350	3.160		0.564	0.060	0.218		0.576	0.168	0.117		1.040		1.040	U
SWSB-03	12/4/2015	18	20		11.596	1.197	2.870		0.507	0.054	0.196		0.899	0.168	0.143		1.020		1.020	U
SWSB-04	12/3/2015	0	2		11.834	1.369	3.440		0.626	0.064	0.239		0.723	0.190	0.192		1.110		1.110	U
SWSB-04	12/3/2015	2	4		12.559	1.277	3.030		0.674	0.059	0.228		1.056	0.216	0.112		1.100		1.100	U
SWSB-04	12/3/2015	4	6		15.678	1.454	3.280		0.638	0.064	0.245		0.727	0.186	0.185	J	1.160		1.160	U
SWSB-04	12/3/2015	4	6	SWSB-04-04-06	12.693	1.387	3.400		0.713	0.069	0.280		**1.509**	0.225	0.192	J	1.220		1.220	U
SWSB-04	12/3/2015	6	8		15.270	1.521	3.560		0.604	0.065	0.251		0.883	0.213	0.186		1.110		1.110	U
SWSB-04	12/3/2015	8	10		10.456	1.243	3.180		0.411	0.057	0.217		0.893	0.183	0.111		1.520		1.520	U
SWSB-04	12/3/2015	10	12		12.140	1.282	3.130		0.595	0.059	0.199		0.442	0.163	0.167		1.000		1.000	U
SWSB-04	12/3/2015	12	14		13.546	1.387	3.300		0.794	0.070	0.251		1.198	0.214	0.152		1.140		1.140	U
SWSB-04	12/3/2015	14	16		13.586	1.322	3.060		0.531	0.057	0.196		0.907	0.184	0.215		1.610		1.610	U
SWSB-04	12/3/2015	16	18		13.020	1.377	3.340		0.523	0.058	0.227		1.219	0.208	0.177		1.160		1.160	U
SWSB-04	12/3/2015	18	20		14.126	1.329	3.010		0.433	0.055	0.237		1.174	0.188	0.171		0.921		0.921	U
SWSB-06	12/3/2015	1.5	5		13.307	1.279	2.930		0.695	0.062	0.231		1.185	0.194	0.177		1.030		1.030	U
SWSB-06	12/3/2015	5	6		14.359	1.361	3.100		0.731	0.064	0.235		0.759	0.176	0.182		1.040		1.040	U
SWSB-06	12/3/2015	6	8		14.527	1.349	3.050		0.504	0.056	0.238		**1.249**	0.207	0.153		1.090		1.090	U
SWSB-06	12/3/2015	8	10		13.730	1.303	3.010		0.623	0.057	0.216		0.734	0.179	0.156		1.030		1.030	U
SWSB-06	12/3/2015	8	10	SWSB-06-08-10	13.781	1.323	3.020		0.509	0.060	0.254		0.737	0.187	0.175		1.070		1.070	U
SWSB-06	12/3/2015	10	12		10.430	1.217	3.100		0.714	0.060	0.205		0.774	0.202	0.122		0.973		0.973	U
SWSB-06	12/3/2015	12	14		13.969	1.333	3.050		0.543	0.058	0.232		0.482	0.169	0.222		1.080		1.080	U
SWSB-06	12/3/2015	14	16		14.752	1.381	3.140		0.621	0.063	0.249		0.870	0.203	0.221		1.090		1.090	U

Table 4-11
ISOCS Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**				**1.061**			
Sewer Borings (continued)																				
SWSB-06	12/3/2015	16	18		16.235	1.401	3.020		0.508	0.054	0.203		0.727	0.174	0.184		1.050		1.050	U
SWSB-06	12/3/2015	18	20		13.900	1.281	2.880		0.514	0.054	0.180		0.923	0.194	0.991		0.991		0.991	U
SWSB-07	12/3/2015	0	2		10.329	1.319	3.450		0.571	0.060	0.222		0.698	0.201	0.126		1.120		1.120	U
SWSB-07	12/3/2015	2	4		14.871	1.432	3.300		0.635	0.065	0.227		1.010	0.214	0.187		1.130		1.130	U
SWSB-07	12/3/2015	4	6		15.114	1.389	3.130		0.472	0.057	0.198		0.600	0.199	0.171		1.090		1.090	U
SWSB-07	12/3/2015	6	8		16.183	1.386	2.960		0.592	0.055	0.186		0.880	0.172	0.176		1.050		1.050	U
SWSB-07	12/3/2015	8	10		13.377	1.313	3.070		0.535	0.055	0.208		0.917	0.192	0.169		0.982		0.982	U
SWSB-07	12/3/2015	10	12		15.511	1.388	3.030		0.703	0.062	0.218		0.828	0.184	0.194		1.160		1.160	U
SWSB-07	12/3/2015	12	14		13.729	1.334	3.120		0.822	0.066	0.222		0.897	0.202	0.168		1.160		1.160	U
SWSB-07	12/3/2015	14	16		12.372	1.223	2.870		0.534	0.054	0.208		0.698	0.166	0.177		0.896		0.896	U
SWSB-07	12/3/2015	16	18		11.629	1.207	2.910		0.421	0.053	0.199		0.621	0.152	0.151		0.936		0.936	U
SWSB-07	12/3/2015	18	20		13.442	1.345	3.170		0.421	0.054	0.223		0.670	0.179	0.162		1.010		1.010	U
SWSB-08	12/2/2015	0	2		11.971	1.321	3.270		0.497	0.061	0.238		0.549	0.177	0.125		1.720		1.720	U
SWSB-08	12/2/2015	2	4		11.675	1.349	3.410		0.719	0.069	0.254		1.002	0.220	0.187		1.110		1.110	U
SWSB-08	12/2/2015	4	6		12.787	1.287	3.030		0.747	0.068	0.245		**2.367**	0.266	0.205		1.130		1.130	U
SWSB-08	12/2/2015	6	8		14.520	1.330	2.950		0.503	0.066	0.255		0.716	0.181	0.172		1.070		1.070	U
SWSB-08	12/2/2015	8	10		14.833	1.390	3.150		0.537	0.062	0.225		1.067	0.181	0.175		1.070		1.070	U
SWSB-08	12/2/2015	10	12		11.743	1.291	3.190		0.548	0.058	0.229		1.178	0.192	0.185		0.995		0.995	U
SWSB-08	12/2/2015	12	14		16.678	1.431	3.080		0.710	0.059	0.199		0.871	0.189	0.170		0.973		0.973	U
SWSB-08	12/2/2015	14	16		14.925	1.364	3.050		0.627	0.060	0.210		0.943	0.192	0.170		1.090		1.090	U
SWSB-08	12/2/2015	16	18		14.651	1.288	2.800		0.519	0.054	0.211		0.761	0.177	0.150		0.973		0.973	U
SWSB-08	12/2/2015	18	20		13.004	1.238	2.870		0.487	0.050	0.193		0.428	0.155	0.092		0.995		0.995	U
SWSB-09	12/2/2015	0	2		13.926	1.415	3.370		0.650	0.065	0.225		**1.249**	0.215	0.178		1.240		1.240	U
SWSB-09	12/2/2015	2	4		15.186	1.526	3.580		0.590	0.068	0.265		0.268		0.268	U	1.130		1.130	U
SWSB-09	12/2/2015	2	4	SWSB-09-02-04	15.614	1.502	3.460		0.514	0.063	0.241		**1.369**	0.239	0.186		1.150		1.150	U
SWSB-09	12/2/2015	4	6		13.860	1.358	3.170		0.709	0.061	0.205		0.926	0.207	0.160		1.080		1.080	U
SWSB-09	12/2/2015	6	8		15.228	1.408	3.180		0.672	0.063	0.253		1.101	0.211	0.130		1.120		1.120	U
SWSB-09	12/2/2015	8	10		13.691	1.346	3.160		**0.943**	0.069	0.221		1.000	0.207	0.178		1.020		1.020	U
SWSB-09	12/2/2015	10	12		15.220	1.381	3.070		0.706	0.062	0.218		1.085	0.208	0.162		1.100		1.100	U
SWSB-09	12/2/2015	12	14		14.122	1.422	3.380		0.660	0.061	0.210		0.913	0.206	0.220		1.070		1.070	U
SWSB-09	12/2/2015	15	16		11.992	1.290	3.140		0.496	0.057	0.219		0.190		0.190	U	0.952		0.952	U
SWSB-09	12/2/2015	16	18		11.615	1.291	3.210		0.240	0.046	0.173		0.180		0.180	U	0.871		0.871	U
SWSB-09	12/2/2015	18	20		11.598	1.228	2.980		0.619	0.060	2.980		0.930	0.189	0.189		1.020		1.020	U
SWSB-11	12/2/2015	0	2		10.718	1.241	3.130		0.561	0.066	0.209		0.659	0.165	0.166		0.894		0.894	U
SWSB-11	12/2/2015	2	4		10.355	1.175	2.930		0.639	0.057	0.195		0.760	0.188	0.124		1.080		1.080	U
SWSB-11	12/2/2015	4	6		13.825	1.297	2.920		0.770	0.066	0.219		**1.518**	0.216	0.219		1.180		1.180	U
SWSB-11	12/2/2015	6	8		14.601	1.412	3.290		0.708	0.064	0.223		1.117	0.212	0.152		1.120		1.120	U
SWSB-11	12/2/2015	8	10		12.018	1.273	3.060		0.619	0.063	0.232		0.832	0.196	0.210		1.100		1.100	U
SWSB-11	12/2/2015	10	11		13.145	1.261	2.900		0.539	0.055	0.203		0.684	0.172	0.160		0.987		0.987	U
SWSB-11	12/2/2015	15	16		13.794	1.308	3.020		0.387	0.052	0.218		1.020	0.194	0.159		0.979		0.979	U
School Borings																				
SCSB-01	10/31/2015	0	2		9.455	1.331	3.600		0.452	0.061	0.265		0.586	0.173	0.176		1.210		1.210	U
SCSB-01	10/31/2015	2	4		15.233	1.580	3.780		0.664	0.073	0.287		0.971	0.204	0.220		1.310		1.310	U
SCSB-01	10/31/2015	4	6		14.901	1.356	2.990		0.541	0.053	0.192		**1.291**	0.211	0.176	J	1.050		1.050	U
SCSB-01	10/31/2015	4	6	SCSB-01-04-06	13.010	1.283	2.980		0.436	0.055	0.211		0.682	0.166	0.174	J	0.975		0.975	U
SCSB-01	10/31/2015	6	8		13.140	1.308	3.100		0.588	0.058	0.192		0.918	0.182	0.174		1.040		1.040	U
SCSB-01	10/31/2015	8	10		13.234	1.304	3.020		0.505	0.055	0.185		0.761	0.185	0.179		1.010		1.010	U
SCSB-02	10/31/2015	0	2		11.359	1.234	3.020		0.501	0.052	0.193		0.840	0.180	0.142		1.020		1.020	U
SCSB-02	10/31/2015	2	4		13.714	1.571	3.920		0.796	0.076	0.285		**1.363**	0.232	0.220		1.240		1.240	U
SCSB-02	10/31/2015	4	6		10.631	1.248	3.160		0.473	0.054	0.193		1.051	0.217	0.204		1.050		1.050	U
SCSB-02	10/31/2015	6	8		16.103	1.432	3.160		0.769	0.065	0.223		**1.353**	0.205	0.191		1.180		1.180	U
SCSB-02	10/31/2015	8	10		12.262	1.321	3.250		0.366	0.051	0.199		0.874	0.177	0.186	J	0.958		0.958	U
SCSB-03	10/31/2015	0	2		9.851	1.205	3.100		0.369	0.053	0.215		0.604	0.181	0.200	J	1.030		1.030	U
SCSB-03	10/31/2015	2	4		10.874	1.205	2.970		0.381	0.050	0.203		0.712	0.179	0.162		0.920		0.920	U
SCSB-03	10/31/2015	4	6		9.139	1.243	3.320		0.530	0.064	0.214		0.227		0.227	U	1.020		1.020	U
SCSB-03	10/31/2015	6	8		17.539	1.461	3.060		0.777	0.066	0.224		**1.548**	0.236	0.122		1.200		1.200	U
SCSB-03	10/31/2015	8	10		9.532	1.156	2.970		0.276	0.055	0.198		0.616	0.154	0.163		0.875		0.875	U
SCSB-04	10/31/2015	0	2		12.514	1.351	3.310		0.564	0.060	0.235		0.923	0.187	0.164		1.030		1.030	U
SCSB-04	10/31/2015	2	4		6.515	1.086	3.060		0.286	0.051	0.184		0.554	0.152	0.164		0.867		0.867	U
SCSB-04	10/31/2015	4	6		18.531	1.556	3.290		0.580	0.059	0.247		1.129	0.211	0.179		1.180		1.180	U
SCSB-04	10/31/2015	6	8		11.212	1.253	3.100		0.464	0.057	0.217		1.019	0.197	0.195		0.953		0.953	U
SCSB-04	10/31/2015	8	10		10.026	1.218	3.150		0.311	0.054	0.238		0.343	0.178	0.164		0.818		0.818	U
SCSB-05	10/31/2015	0	2		8.747	1.221	3.280		0.755	0.065	0.225		1.165	0.197	0.184		1.180		1.180	U
SCSB-05	10/31/2015	2	4		12.012	1.377	3.460		0.647	0.068	0.233		0.924	0.192	0.194		1.200		1.200	U
SCSB-05	10/31/2015	4	6		12.500	1.356	3.310		0.526	0.063	0.244		0.652	0.202	0.207		1.050		1.050	U
SCSB-05	10/31/2015	6	8		14.685	1.405	3.240		0.549	0.060	0.231		0.839	0.194	0.195		1.180		1.180	U
SCSB-05	10/31/2015	8	10		16.858	1.490	3.230		0.459	0.060	0.259		0.887	0.204	0.129		1.010		1.010	U
SCSB-06	10/31/2015	0	2		10.571	1.265	3.230		0.413	0.055	0.216		0.865	0.187	0.163		1.030		1.030	U
SCSB-06	10/31/2015	0	2	SCSB-06-00-02	10.633	1.272	3.260		0.499	0.056	0.202		0.906	0.204	0.189		1.050		1.050	U

Table 4-11
ISOCS Radiological Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**				**1.061**			
School Borings (continued)																				
SCSB-06	10/31/2015	2	4		14.811	1.400	3.180		0.525	0.059	0.240		0.755	0.188	0.177		1.080		1.080	U
SCSB-06	10/31/2015	4	6		14.382	1.411	3.280		0.548	0.059	0.228		0.586	0.169	0.170		1.110		1.110	U
SCSB-06	10/31/2015	6	8		10.460	1.233	3.120		0.538	0.059	0.225		0.815	0.200	0.173		1.020		1.020	U
SCSB-06	10/31/2015	8	10		10.289	1.216	3.100		0.532	0.062	0.247		1.041	0.199	0.174		1.000		1.000	U
Sewer Sediments																				
I-2	11/18/2015				8.170		8.170	U	**51.957**	1.414	2.550		**1022.759**	53.755	1.940		53.458	16.301	22.600	J
I-2	11/18/2015				14.800		14.800	U	**13.960**	0.904	4.070		**1405.109**	73.973	2.760		110.860	33.363	43.300	J
I-7	11/18/2015				5.967	2.025	5.360		**10.025**	0.402	1.010		**148.831**	6.975	0.632		6.190		6.190	U
Background																				
BKSB-01	12/16/2015	0	2		11.012	1.239	3.070		0.342	0.053	0.224		0.523	0.170	0.137		1.050		1.050	U
BKSB-02	12/16/2015	0	2		14.920	1.558	3.740		0.667	0.074	0.276		0.683	0.232	0.207		1.230		1.230	U
BKSB-02	12/16/2015	0	2	BKSB-02-00-02	11.238	1.388	3.570		0.558	0.067	0.274		0.645	0.202	0.205		1.300		1.300	U
BKSB-03	12/16/2015	0	1		11.125	1.442	3.780		0.449	0.066	0.291		0.595	0.202	0.198		1.210		1.210	U
BKSB-04	12/22/2015	0	2		13.009	1.405	3.470		0.508	0.062	0.221		0.745	0.181	0.186		1.110		1.110	U
BKSB-04	12/22/2015	0	2	BKSB-04-00-02	11.059	1.309	3.330		0.478	0.059	0.246		0.972	0.196	0.231		1.050		1.050	U
BKSB-04	12/22/2015	4	6		12.212	1.380	3.460		0.176	0.057	0.224		0.184		0.184	U	0.860		0.860	U
BKSB-04	12/22/2015	8	10		14.806	1.371	3.090		0.429	0.056	0.227		0.779	0.187	0.173		1.020		1.020	U
BKSB-04	12/22/2015	18	20		14.518	1.354	3.070		0.512	0.058	0.214		1.030	0.191	0.188		0.986		0.986	U
BKSB-04	12/22/2015	23	25		14.562	1.381	3.140		0.713	0.065	0.222		0.687	0.167	0.165		1.060		1.060	U
BKSB-05	12/16/2015	0	1		10.841	1.381	3.610		0.669	0.066	0.210		0.846	0.204	0.125		1.040		1.040	U
BKSB-06	10/30/2015	0	2		11.569	1.343	3.390		0.814	0.073	0.235		1.007	0.224	0.178		1.120		1.120	U
BKSB-06	10/30/2015	4	6		13.102	1.387	3.360		0.530	0.061	0.246		0.911	0.198	0.198		1.150		1.150	U
BKSB-06	10/30/2015	8	10		10.777	1.607	4.410		0.919	0.088	0.344		0.690	0.241	0.256		1.390		1.390	U
BKSB-06	10/30/2015	18	20		12.850	1.371	3.340		0.513	0.060	0.233		0.869	0.197	0.168		1.110		1.110	U
BKSB-06	10/30/2015	28	30		12.589	1.341	3.290		0.474	0.058	0.234		1.132	0.212	0.181		1.520		1.520	U
BKSB-07	10/30/2015	0	2		14.256	1.365	3.110		0.464	0.055	0.210		0.487	0.172	0.178		0.998		0.998	U
BKSB-07	10/30/2015	4	6		11.702	1.415	3.630		0.406	0.058	0.233		0.588	0.202	0.210		1.210		1.210	U
BKSB-07	10/30/2015	8	10		14.354	1.526	3.720		0.475	0.066	0.257		0.694	0.217	0.216		1.170		1.170	U
BKSB-07	10/30/2015	18	20		11.988	1.329	3.310		0.536	0.062	0.245		0.617	0.188	0.159		1.160		1.160	U
BKSB-07	10/30/2015	28	30		14.057	1.372	3.180		0.441	0.054	0.201		0.878	0.190	0.183		0.930		0.930	U
BKSB-08	10/30/2015	0	2		10.967	1.460	3.900		0.513	0.064	0.229		0.741	0.229	0.131		1.200		1.200	U
BKSB-08	10/30/2015	0	2	BKSB-08-00-02	14.169	1.545	3.770		0.627	0.069	0.261		0.766	0.241	0.213		1.320		1.320	U
BKSB-08	10/30/2015	4	6		11.285	1.212	2.930		0.518	0.056	0.216		0.687	0.181	0.155		1.030		1.030	U
BKSB-08	10/30/2015	8	10		15.806	1.469	3.340		0.484	0.059	0.248		0.649	0.197	0.170		1.040		1.040	U
BKSB-08	10/30/2015	18	20		14.436	1.382	3.190		0.383	0.056	0.241		1.027	0.196	0.168		1.050		1.050	U
BKSB-08	10/30/2015	28	30		12.552	1.240	2.880		0.499	0.056	0.222		0.821	0.163	0.119		1.000		1.000	U

Notes:
All units in picoCurie per gram (pCi/g).
CSU (+/- s) = combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
U - not detected
J - estimated value
* Parent sample ID listed for duplicate samples.
Highlighted cell and bold format indicates that concentration exceeded screening criteria.
Note: Combined standard uncertainty is not reported when chemical is not detected.

Table 4-12
Soil Radiological Gamma Spectroscopy Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**			
Soil Borings																
SB-01	10/30/2015	10	12		14.409	1.713	0.708		**1.416**	0.235	0.173		**3.22**	0.499	0.529	
SB-02	11/6/2015	0	2		13.436	1.89	0.519		**1.239**	0.209	0.191		**3.183**	0.459	0.208	
SB-03	10/21/2015	0	2		8.006	1.967	1.39	J	**2.681**	0.38	0.238	J	**6.248**	0.656	0.244	J
SB-03	10/21/2015	20	22		14.497	1.981	0.524		0.584	0.138	0.139		1.094	0.205	0.222	
SB-04	10/21/2015	0	2		14.037	2.856	2.15	J	**7.558**	0.819	0.548		**40.024**	2.825	0.698	
SB-07	10/26/2015	0	2		19.724	3.758	4.94	J	**7.455**	1.302	1.334		**221.83**	13.743	1.58	
SB-07	10/26/2015	2	4		19.982	3.131	1.86	J	**1.12**	0.445	0.636		**54.571**	3.831	0.846	
SB-07	10/26/2015	10	12		17.196	2.005	0.663		0.897	0.28	0.328		**23.58**	1.73	0.487	
SB-07	10/26/2015	14	16		13.755	1.727	0.781		**0.983**	0.246	0.32		**13.396**	1.061	0.329	
SB-08	10/23/2015	6	8		9.161	5.563	8.97	J	**2.934**	1.316	2.109		**505.17**	30.986	2.26	
SB-08	10/23/2015	14	16		24.865	4.148	3.02	J	**2.914**	0.73	0.857		**118.88**	7.492	1.1	
SB-13	10/20/2015	0	2		11.909	1.845	0.787		**1.308**	0.253	0.189		**2.451**	0.39	0.284	
SB-14	10/21/2015	2	4		12.433	1.799	0.518		0.731	0.164	0.136		0.463	0.181	0.267	J
SB-15	10/28/2015	0	2		12.084	1.62	0.885		**0.935**	0.17	0.111		**1.425**	0.245	0.067	
SB-16	10/21/2015	6	8		13.659	1.733	0.523		0.775	0.15	0.097		1.068	0.209	0.067	J
SB-17	10/27/2015	4	6		12.583	1.919	0.596		0.819	0.201	0.177		1.017	0.237	0.147	
SB-18	10/27/2015	4	6		11.247	1.502	0.275		0.397	0.117	0.09		0.553	0.147	0.07	
SB-19	10/22/2015	0	2		12.119	1.606	0.289		**1.033**	0.196	0.131		**1.472**	0.287	0.123	
SB-20	11/9/2015	0	2		10.84	1.723	0.563		**1.472**	0.261	0.178		**2.075**	0.374	0.159	
SB-21	10/22/2015	8	10		13.772	1.911	0.514		0.774	0.166	0.17		0.889	0.218	0.364	
SB-22	10/22/2015	0	2		10.553	1.538	1.2		0.776	0.163	0.111		**1.476**	0.25	0.114	
SB-23	2/15/2016	0	2		9.554	1.533	0.511		0.689	0.145	0.144		1.034	0.209	0.126	J
SB-23	2/15/2016	2	4		12.577	1.706	0.443		0.752	0.154	0.132		0.957	0.174	0.166	J
SB-23	2/15/2016	2	4	SB-23-02-04	14.979	1.761	0.713		0.748	0.134	0.104		0.826	0.173	0.217	J
SB-23	2/15/2016	4	6		14.018	1.871	0.674		0.728	0.155	0.128		**1.282**	0.244	0.114	J
SB-23	2/15/2016	6	8		13.747	1.734	0.626		0.774	0.147	0.098		0.986	0.215	0.113	J
SB-23	2/15/2016	8	10		14.318	1.764	0.823		0.604	0.13	0.117		1.108	0.239	0.13	J
SB-24	2/15/2016	0	2		12.341	2.027	0.697		**2.349**	0.334	0.2		**1.896**	0.342	0.326	J
SB-24	2/15/2016	2	4		9.374	1.494	0.841		0.206	0.096	0.147		0.098	0.153	0.268	UJ
SB-24	2/15/2016	4	6		13.07	1.622	0.475		0.548	0.115	0.078		0.706	0.137	0.107	J
SB-24	2/15/2016	6	8		13.754	1.813	0.722		0.705	0.161	0.122		0.929	0.216	0.144	J
SB-24	2/15/2016	8	10		13.832	1.96	1		**0.999**	0.174	0.099		1.093	0.22	0.107	J
SB-25	2/15/2016	0	2		11.275	1.538	0.791		0.89	0.176	0.128		**1.282**	0.245	0.088	J
SB-25	2/15/2016	2	4		11.29	1.787	0.726		0.697	0.177	0.176		0.979	0.203	0.211	J
SB-25	2/15/2016	4	6		10.205	1.523	0.456		0.53	0.146	0.161		0.292	0.163	0.23	J
SB-25	2/15/2016	6	8		14.287	1.858	0.637		0.665	0.135	0.116		0.649	0.156	0.292	J
SB-25	2/15/2016	8	10		13.37	1.679	0.512		0.732	0.152	0.098		1.195	0.215	0.062	J
SB-26	10/21/2015	0	2		14.652	1.841	0.304		**2.724**	0.376	0.254		**8.329**	0.8	0.306	
SB-26	10/21/2015	2	4		10.5	1.622	1.01		**1.634**	0.266	0.168		**2.464**	0.357	0.162	
SB-27	2/15/2016	0	2		9.53	1.892	1.27	J	**1.643**	0.286	0.21	J	**1.786**	0.336	0.254	J
SB-27	2/15/2016	2	4		8.532	1.474	1		0.755	0.161	0.127		1.033	0.232	0.125	
SB-27	2/15/2016	4	6		12.576	1.88	1.04		0.88	0.18	0.128		0.623	0.223	0.253	
SB-27	2/15/2016	6	8		13.858	1.848	0.665		0.833	0.166	0.132		1.097	0.229	0.204	
SB-27	2/15/2016	8	10		12.934	1.71	0.427		0.722	0.152	0.153		**1.244**	0.219	0.173	
SB-28	2/15/2016	0	2		11.235	1.633	0.341		**1.715**	0.253	0.144		**2.927**	0.365	0.149	J
SB-28	2/15/2016	0	2	SB-28-00-02	11.891	1.627	0.84		**1.514**	0.252	0.181		**3.52**	0.417	0.219	J
SB-28	2/15/2016	2	4		8.827	1.533	0.885		0.55	0.15	0.149		0.485	0.177	0.232	
SB-28	2/15/2016	4	6		12.026	1.687	0.461		0.45	0.117	0.135		0.359	0.153	0.288	
SB-28	2/15/2016	6	8		11.7	1.884	1.25		0.672	0.152	0.141		0.779	0.213	0.275	
SB-28	2/15/2016	8	10		12.822	1.759	0.912		0.656	0.158	0.146		0.689	0.185	0.258	
SB-29	10/20/2015	0	2		12.89	1.869	1.17		**2.022**	0.307	0.213		**5.253**	0.573	0.272	
SB-30	2/18/2016	0	2		10.63	1.677	1.06	J	**0.952**	0.202	0.183		1.03	0.261	0.211	
SB-30	2/18/2016	2	4		15.324	1.837	0.523	J	0.754	0.141	0.105		1.102	0.166	0.125	
SB-30	2/18/2016	4	6		12.035	1.631	0.83	J	0.399	0.106	0.098		0.445	0.118	0.166	
SB-30	2/18/2016	6	8		12.817	1.835	0.749	J	0.778	0.16	0.126		0.831	0.198	0.17	
SB-30	2/18/2016	8	10		7.863	1.364	0.504	J	0.49	0.131	0.135		0.844	0.186	0.18	
SB-31	10/19/2015	2	4		16.27	2.237	1.18		**3.239**	0.46	0.326		**12.217**	1.068	0.457	
SB-32	2/15/2016	0	2		11.896	1.789	1.14		**3.793**	0.557	0.343		**11.949**	1.028	0.36	
SB-32	2/15/2016	5	7		13.203	1.919	0.762		0.786	0.161	0.157		**1.403**	0.226	0.125	
SB-33	10/20/2015	4	6		11.804	2.077	0.781	J	**2.717**	0.419	0.253	J	**2.485**	0.398	0.192	J
SB-34	10/20/2015	4	6		11.448	1.901	0.8	J	**2.965**	0.387	0.188	J	**3.042**	0.478	0.186	J
SB-35	10/27/2015	2	4		12.464	1.725	0.462		**2.663**	0.379	0.254		**7.737**	0.749	0.321	

Table 4-12
Soil Radiological Gamma Spectroscopy Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**			
Soil Borings (continued)																
SB-35	10/27/2015	4	6		8.667	1.641	0.676		**2.104**	0.342	0.239		**3.74**	0.585	0.277	
SB-35	10/27/2015	6	8		9.963	1.564	0.365	J	**2.878**	0.365	0.193	J	**2.977**	0.509	0.274	J
SB-36	10/22/2015	0	2		16.631	2.588	1.43	J	**7.182**	0.825	0.551	J	**32.047**	2.429	0.711	J
SB-36	10/22/2015	0	2	SB-36-00-02	12.748	2.024	1.1	J	**5.944**	0.66	0.483	J	**28.055**	2.113	0.638	J
SB-37	10/22/2015	0	2		14.282	1.991	0.832		**4.228**	0.462	0.252		**9.629**	0.922	0.426	
SB-41	10/26/2015	0	2		7.447	1.303	1.12		**1.62**	0.254	0.201		**3.917**	0.461	0.24	
SB-42	10/26/2015	0	2		11.553	1.738	0.53		**0.982**	0.185	0.162		**1.355**	0.247	0.191	
SB-44	10/28/2015	0	2		15.836	3.603	2.85	J	**57.113**	4.36	0.786		**49.243**	3.296	1.09	
SB-45	10/28/2015	0	2		17.56	1.999	0.511		**1.113**	0.213	0.157		**2.894**	0.388	0.164	
SB-50	12/1/2015	0	1		29.618	5.429	3.37	J	**43.349**	3.432	1.154		**156.15**	9.968	1.46	
SB-50	12/1/2015	0	1	SB-50-00-01	16.234	3.495	4.71	J	**41.135**	3.264	1.135		**147.65**	9.496	1.68	
SB-50	12/1/2015	1	2		10.705	1.477	0.772		**1.174**	0.201	0.143		**2.206**	0.329	0.132	
SB-51	12/3/2015	0	1		16.04	2.724	1.94	J	**11.004**	1.129	0.604		**43.93**	3.047	0.789	
SB-52	12/1/2015	0	1		13.209	2.054	0.906		**4.273**	0.567	0.382		**12.05**	1.136	0.468	
SB-52	12/1/2015	0	1	SB-52-00-01	13.382	1.882	1.05		**4.35**	0.51	0.296		**12.502**	1.137	0.386	
SB-52	12/1/2015	1	2		12.116	1.585	0.765		**1.317**	0.203	0.135		**1.579**	0.285	0.143	J
SB-54	12/3/2015	0	1		15.746	2.554	1.48		**5.852**	0.714	0.484		**25.405**	1.823	0.598	
SB-56	11/30/2015	0	2		12.657	1.815	0.667		**2.277**	0.312	0.205		**6.178**	0.568	0.193	
SB-57	12/1/2015	6	8		15.007	1.908	0.446		0.874	0.184	0.141		0.947	0.211	0.126	J
SB-64	2/17/2016	1	2		12.229	1.819	0.542		**0.939**	0.19	0.172		1.085	0.264	0.362	
SB-64	2/17/2016	2	4		11.186	1.763	1.22		0.673	0.152	0.122		0.584	0.175	0.216	
SB-64	2/17/2016	4	6		15.432	1.833	0.756		0.747	0.151	0.11		1.149	0.203	0.137	
SB-64	2/17/2016	6	8		18.291	2.129	0.912		**1.111**	0.173	0.136		**1.522**	0.282	0.185	
SB-64	2/17/2016	8	10		12.216	1.782	0.52		0.74	0.155	0.137		0.851	0.212	0.128	
SB-65	2/17/2016	0	2		12.973	2.054	0.672	J	**3.212**	0.517	0.427		**4.909**	1.142	1.6	J
SB-65	2/17/2016	0	2	SB-65-00-02	17.5	2.373	0.881	J	**3.522**	0.482	0.376		**13.146**	1.178	0.537	J
SB-65	2/17/2016	2	4		13.761	1.924	0.523		**1.108**	0.226	0.175		1.202	0.267	0.148	J
SB-65	2/17/2016	4	6		11.64	1.75	0.683		**1.509**	0.241	0.137		**1.533**	0.278	0.081	J
SB-65	2/17/2016	6	8		13.01	1.649	0.758		0.753	0.16	0.129		1.174	0.178	0.084	J
SB-65	2/17/2016	8	10		13.535	1.969	0.966		0.621	0.129	0.097		0.677	0.2	0.168	J
SB-66	2/17/2016	0	2		13.463	1.829	0.935		**1.733**	0.276	0.186		**2.353**	0.384	0.16	
SB-66	2/17/2016	2	4		12.678	1.822	0.749		**1.018**	0.187	0.123		0.854	0.2	0.294	
SB-66	2/17/2016	4	6		11.151	1.823	0.623		**1.699**	0.316	0.228		**1.793**	0.288	0.234	
SB-66	2/17/2016	6	8		12.115	2.024	0.707	J	**0.94**	0.215	0.205	J	**1.375**	0.32	0.395	J
SB-66	2/17/2016	8	10		17.365	2.037	0.543		**1.386**	0.198	0.107		**1.414**	0.221	0.179	
SB-67	2/17/2016	0	2		13.079	1.756	0.881		**1.246**	0.215	0.174		**1.996**	0.335	0.16	
SB-67	2/17/2016	2	4		13.894	2.157	1.38		**1.484**	0.248	0.211		**2.028**	0.376	0.22	
SB-67	2/17/2016	4	6		11.834	1.794	0.741		0.64	0.145	0.137		0.677	0.173	0.247	
SB-67	2/17/2016	6	8		11.741	1.875	0.448	J	**2.387**	0.341	0.179	J	**2.19**	0.439	0.356	J
SB-67	2/17/2016	8	10		11.247	1.993	1.45	J	0.831	0.194	0.211	J	0.92	0.259	0.403	J
SB-68	2/18/2016	0	2		10.127	1.751	0.639	J	**1.852**	0.288	0.192	J	**2.072**	0.349	0.308	J
SB-68	2/18/2016	2	4		12.755	1.633	0.277	J	0.758	0.154	0.099		1.066	0.191	0.07	
SB-68	2/18/2016	4	6		6.463	1.41	1.23	J	**2.137**	0.343	0.22	J	**2.004**	0.3	0.24	J
SB-68	2/18/2016	6	8		13.643	1.895	0.734	J	0.69	0.164	0.141		0.644	0.179	0.322	J
SB-68	2/18/2016	6	8	SB-68-06-08	10.252	1.64	1.11	J	0.703	0.166	0.151		1.03	0.206	0.12	J
SB-68	2/18/2016	8	10		13.295	1.901	0.538	J	0.486	0.128	0.143		0.442	0.189	0.269	
SB-69	2/16/2016	0	2		8.248	1.66	1.2	J	**1.436**	0.262	0.205	J	1.159	0.3	0.367	J
SB-69	2/16/2016	2	4		8.026	1.649	1.55		**1.453**	0.247	0.165		**1.748**	0.296	0.283	
SB-69	2/16/2016	4	5		9.591	1.739	1.01	J	**1.831**	0.293	0.187	J	**2.235**	0.408	0.242	J
SB-69	2/16/2016	6	8		12.046	1.646	0.311		**1.071**	0.196	0.12		**1.222**	0.234	0.138	
SB-69	2/16/2016	8	10		14.327	1.717	0.719		0.771	0.157	0.122		0.792	0.176	0.248	
SB-70	2/18/2016	0	2		11.969	1.984	0.686	J	**1.328**	0.245	0.218	J	**1.772**	0.366	0.193	J
SB-70	2/18/2016	2	4		10.582	1.533	0.318	J	**0.933**	0.185	0.13		1.06	0.219	0.133	
SB-70	2/18/2016	4	6		12.391	1.945	0.629		**1.322**	0.251	0.183		**1.834**	0.314	0.234	
SB-70	2/18/2016	6	8		13.07	1.673	0.396		0.556	0.125	0.128		0.77	0.192	0.184	
SB-70	2/18/2016	8	10		16.061	1.825	0.248		0.774	0.153	0.105		0.918	0.178	0.146	
SB-71	2/19/2016	0	1		9.117	1.456	0.348		**1.392**	0.237	0.157		**1.502**	0.278	0.088	
SB-72	2/19/2016	0	2		12.162	1.619	0.803		0.87	0.16	0.118		1.156	0.234	0.089	
SB-73	2/19/2016	0	2		11.602	1.705	0.727		**0.946**	0.18	0.131		**1.261**	0.282	0.176	
SB-74	2/17/2016	0.5	3		11.36	1.654	0.932		**1.487**	0.221	0.138		**1.651**	0.268	0.172	
SB-74	2/17/2016	3	5		11.51	1.846	0.902		**0.991**	0.208	0.159		**1.336**	0.288	0.226	
SB-74	2/17/2016	5	7		12.369	1.969	1.08		0.609	0.168	0.173		1.09	0.245	0.232	

Table 4-12
Soil Radiological Gamma Spectroscopy Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**			
Soil Borings (continued)																
SB-74	2/17/2016	7	9		13.719	1.977	0.563		0.699	0.182	0.181		1.14	0.225	0.22	
SB-75	2/17/2016	0.5	3		13.248	2.048	0.947	J	**1.813**	0.275	0.161	J	**2.32**	0.393	0.357	J
SB-75	2/17/2016	3	4		16.709	2.366	0.661		**1.693**	0.292	0.208		**2.393**	0.35	0.163	
SB-75	2/17/2016	6	8		15.511	2.197	0.613		**1.457**	0.246	0.203		**2.237**	0.327	0.151	
SB-75	2/17/2016	8	10		16.22	2.214	0.832		**1.375**	0.239	0.159		**1.551**	0.325	0.35	
SB-76	2/16/2016	1	6		12.262	1.976	0.663		**1.887**	0.33	0.222		**2.042**	0.333	0.276	
SB-76	2/16/2016	6	8		9.798	1.632	0.744		0.86	0.185	0.17		0.85	0.222	0.332	
SB-76	2/16/2016	8	10		14.217	1.857	0.946		**1.132**	0.207	0.149		1.215	0.238	0.212	J
SB-77	2/16/2016	1	3		9.716	1.587	0.754		0.548	0.137	0.161		0.637	0.189	0.259	J
SB-77	2/16/2016	3	5		10.75	1.616	0.755		0.445	0.128	0.161		0.609	0.187	0.272	J
SB-77	2/16/2016	6	7.5		12.421	1.67	0.61		0.687	0.146	0.108		0.946	0.222	0.16	J
SB-78	2/19/2016	0	2		10.914	1.759	0.59		0.741	0.182	0.167		1.022	0.228	0.25	J
SB-78	2/19/2016	2	4		11.603	1.62	0.44		0.382	0.112	0.144		0.668	0.204	0.172	J
SB-78	2/19/2016	4	6		13.802	1.662	0.702	J	0.466	0.102	0.09		0.339	0.127	0.22	
SB-79	2/18/2016	0	2		12.761	2.408	1.48	J	**3.587**	0.524	0.32	J	**5.37**	0.773	0.369	J
SB-79	2/18/2016	2	4		11.731	1.727	0.51	J	0.667	0.165	0.153		0.776	0.205	0.242	
SB-79	2/18/2016	4	6		13.313	1.837	0.489	J	0.366	0.126	0.165		0.637	0.199	0.232	
SB-79	2/18/2016	6	8		13.485	1.658	0.262	J	0.888	0.158	0.093	J	0.944	0.212	0.108	
SB-79	2/18/2016	6	8	SB-79-06-08	11.666	1.745	0.528	J	0.634	0.15	0.138	J	1.086	0.225	0.188	
SB-79	2/18/2016	8	10		13.25	1.695	0.79	J	0.548	0.121	0.135		0.613	0.169	0.259	
SB-80	2/18/2016	0	1		12.244	1.935	1.75		**3.834**	0.495	0.348		**20.176**	1.54	0.53	J
SB-80	2/18/2016	1	2		13.41	1.75	0.842		**0.936**	0.166	0.116		**1.331**	0.283	0.175	J
SB-80	2/18/2016	2	4		9.748	1.524	0.639		0.592	0.146	0.158		0.579	0.162	0.233	J
SB-80	2/18/2016	4	6		11.108	1.583	0.443		0.377	0.118	0.153		0.438	0.199	0.269	J
SB-80	2/18/2016	6	8		11.141	1.584	0.64		0.359	0.105	0.1		0.21	0.124	0.259	UJ
SB-80	2/18/2016	8	9		12.013	1.486	0.237		0.468	0.114	0.095		0.626	0.198	0.189	J
SB-81	2/18/2016	0	1		15.177	2.296	1.45		**8.26**	0.876	0.451		**24.945**	1.849	0.605	J
SB-81	2/18/2016	1	2		10.535	1.653	0.535		0.585	0.153	0.149		0.659	0.226	0.309	J
SB-81	2/18/2016	2	4		11.474	1.588	0.425		0.341	0.106	0.126		0.51	0.163	0.192	J
SB-81	2/18/2016	4	6		9.97	1.49	0.653		0.374	0.108	0.099		0.432	0.132	0.217	J
SB-81	2/18/2016	6	8		9.624	1.405	0.524		0.336	0.081	0.053		0.338	0.216	0.203	J
SB-81	2/18/2016	8	9		9.798	1.388	0.752		0.311	0.099	0.122		0.201	0.117	0.219	UJ
SB-82	2/19/2016	0	2		14.252	2.55	1.43	J	**5.702**	0.749	0.478	J	**17.893**	1.646	0.478	J
SB-82	2/19/2016	0	2	SB-82-00-02	11.921	2.254	1.7	J	**5.484**	0.642	0.39	J	**17.7**	1.413	0.509	J
SB-83	2/19/2016	0	2		13.786	2.339	1.13	J	**5.795**	0.716	0.469	J	**19.341**	1.699	0.608	J
SB-83	2/19/2016	2	4		9.081	1.881	1.92	J	**5.261**	0.645	0.391	J	**15.6**	1.385	0.518	J
Sewer Borings																
SWSB-01	12/4/2015	2	4		9.919	1.553	0.501		0.631	0.137	0.121		0.707	0.173	0.123	J
SWSB-03	12/4/2015	0	1		9.479	1.795	2.17		**8.738**	0.892	0.546		**57.796**	3.96	0.79	
SWSB-03	12/4/2015	18	20		12.971	1.611	0.466		0.536	0.117	0.096		0.868	0.157	0.105	J
SWSB-04	12/3/2015	6	8		12.403	1.665	0.835		0.837	0.148	0.115		0.848	0.231	0.197	
SWSB-06	12/3/2015	12	14		16.048	1.895	0.773		0.703	0.144	0.124		0.538	0.19	0.226	J
SWSB-07	12/3/2015	2	4		14.28	1.903	0.481		0.617	0.148	0.166		0.996	0.199	0.177	J
SWSB-07	12/3/2015	8	10		13.797	1.827	0.457		0.673	0.143	0.14		1.042	0.222	0.207	
SWSB-08	12/2/2015	4	6		14.339	1.912	0.486		0.797	0.186	0.15		1.193	0.231	0.12	
School Borings																
SCSB-04	10/31/2015	4	6		16.237	2.135	0.531		**0.967**	0.203	0.151		1.217	0.241	0.183	J
SCSB-04	10/31/2015	8	10		13.032	1.702	0.416		0.486	0.123	0.123		0.605	0.15	0.191	
SCSB-06	10/31/2015	6	8		10.882	1.413	0.246		0.753	0.135	0.101		0.873	0.205	0.116	J
SCSB-11	3/27/2017	0	2		12.261	1.773	0.531		0.709	0.158	0.127		0.976	0.198	0.253	
SCSB-11	3/27/2017	2	3.5		12.084	1.692	0.662		0.731	0.149	0.109		0.819	0.181	0.241	
SCSB-12	3/27/2017	0	2		11.475	1.665	0.792		0.678	0.142	0.113		1.015	0.224	0.159	
SCSB-12	3/27/2017	2	4		14.248	2.007	0.579		0.748	0.167	0.134		1.076	0.206	0.19	
SCSB-13	3/27/2017	0	2		11.329	1.662	0.945		0.75	0.147	0.104		0.725	0.179	0.268	
SCSB-13	3/27/2017	2	4		13.596	1.769	0.636		0.731	0.148	0.117		1.085	0.185	0.104	
SCSB-14	3/28/2017	0	2		13.807	1.865	0.504		0.711	0.141	0.128		0.905	0.186	0.181	
SCSB-14	3/28/2017	2	4		13.131	1.711	0.544		0.691	0.154	0.145		1.044	0.207	0.224	
SCSB-14	3/28/2017	4	5		14.43	1.805	0.537		0.784	0.17	0.13		0.832	0.193	0.217	
SCSB-15	3/28/2017	0	2		12.794	1.74	0.592		0.8	0.171	0.134		0.866	0.226	0.201	
SCSB-15	3/28/2017	2	4		13.39	1.623	0.622		0.75	0.138	0.107		0.934	0.173	0.135	
SCSB-15	3/28/2017	4	5		13.813	1.854	0.701		0.848	0.176	0.13		1.009	0.221	0.114	

Table 4-12
Soil Radiological Gamma Spectroscopy Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria									**0.919**				**1.220**			
Daycare Borings																
SCSB-16	3/29/2017	0	2		10.233	1.407	0.658		0.542	0.116	0.113		0.708	0.153	0.091	
SCSB-16	3/29/2017	2	4		13.617	1.791	0.655		0.735	0.146	0.139		0.67	0.177	0.237	
SCSB-17	3/29/2017	0	2		11.766	1.645	0.469		0.574	0.142	0.139		0.662	0.163	0.246	
SCSB-17	3/29/2017	2	3		14.551	1.944	0.793		0.729	0.146	0.109		0.578	0.167	0.233	
SCSB-18	3/31/2017	0	2		8.741	1.364	0.933	J	**1.004**	0.201	0.134	J	0.954	0.191	0.137	
SCSB-18	3/31/2017	0	2	SCSB-18-2	12.313	1.704	0.675	J	0.747	0.153	0.155	J	0.882	0.204	0.11	
SCSB-18	3/31/2017	2	4		11.129	1.667	0.526		0.606	0.14	0.138		0.741	0.154	0.185	
SCSB-18	3/31/2017	4	6		15.299	2.103	0.898		0.907	0.176	0.127		0.922	0.268	0.317	
SCSB-18	3/31/2017	6	8		16.024	2.013	0.603		**0.976**	0.215	0.17		1.165	0.202	0.199	J
SCSB-19	3/31/2017	0	2		9.648	1.359	0.657		0.621	0.131	0.115		0.978	0.182	0.091	J
SCSB-19	3/31/2017	2	4		14.544	2.009	0.562		0.822	0.189	0.16		0.996	0.244	0.298	J
SCSB-19	3/31/2017	4	6		13.721	1.862	0.689		0.79	0.165	0.119		0.918	0.187	0.195	J
SCSB-19	3/31/2017	6	8		13.366	2.103	1.18	J	**1.181**	0.244	0.178	J	**1.298**	0.281	0.374	J
SCSB-20	3/31/2017	0	2		10.924	1.634	0.639		0.771	0.175	0.157		0.804	0.206	0.227	J
SCSB-20	3/31/2017	2	4		10.222	1.55	0.7		0.816	0.169	0.139		1.008	0.2	0.166	J
SCSB-20	3/31/2017	4	6		11.25	1.667	0.517		0.623	0.151	0.134		0.81	0.196	0.185	J
SCSB-20	3/31/2017	4	6	SCSB-20-6	13.478	1.835	0.683		0.794	0.154	0.105		0.725	0.189	0.23	J
SCSB-20	3/31/2017	6	8		15.17	1.864	0.848		0.916	0.176	0.133		1.212	0.236	0.093	J
Background																
BKSB-04	12/22/2015	0	2		12.925	1.836	0.511		0.593	0.164	0.176		0.571	0.235	0.324	J
BKSB-04	12/22/2015	0	2	BKSB-04-00-02	12.279	1.779	0.51		0.677	0.184	0.195		0.661	0.199	0.325	J
BKSB-06	10/30/2015	18	20		12.616	1.869	0.983		0.575	0.154	0.181		1.036	0.203	0.2	J
BKSB-08	10/30/2015	28	30		13.355	1.593	0.662		0.558	0.139	0.149		0.79	0.167	0.117	J

Notes:

All units in picoCurie per gram (pCi/g).
CSU (+/- s) = combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
U - not detected
J - estimated value
* Parent sample ID listed for duplicate samples.
Highlighted cell and bold format indicates that concentration exceeded screening criteria.

Table 4-13
Sediment Radiological Gamma Spectroscopy Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Sediment Screening Criteria										**0.797**				**0.637**		
Sediment East Branch																
SED-EB01	9/28/2015	0	0.5		3.443	1.696	2.2	R	0.289	0.208	0.367	R	0.275	0.328	0.566	R
SED-EB01	9/28/2015	0.5	1		8.947	1.462	0.496		0.308	0.107	0.147		**0.857**	0.215	0.192	
SED-EB01	9/28/2015	1	2		6.885	1.279	1.03		0.375	0.168	0.152		**1.272**	0.208	0.289	
SED-EB01	9/28/2015	2	3		6.617	1.433	0.763		0.607	0.17	0.182		**1.782**	0.29	0.267	
SED-EB01	9/28/2015	3	4		6.598	1.528	1.5		**1.387**	0.305	0.393		**14.725**	1.293	0.412	
SED-EB01	9/28/2015	4	5		14.463	3.023	2.1	J	**3.645**	0.598	0.569	J	**45.317**	3.147	0.9	J
SED-EB01	9/28/2015	5	6		19.436	3.159	2.11	J	**2.293**	0.664	0.798	J	**70.211**	4.781	0.967	J
SED-EB01	9/28/2015	6	7		11.962	2.125	1.11		**1.837**	0.489	0.426		**22.945**	1.711	0.606	
SED-EB01	9/28/2015	7	8		14.044	1.838	0.628		0.748	0.164	0.133		**1.416**	0.254	0.197	
SED-EB01	9/28/2015	8	9		14.848	1.693	0.24		0.57	0.138	0.111		**1.33**	0.212	0.135	
SED-EB01	9/28/2015	8	9	SED-EB01-08-09	12.849	1.788	0.539		0.51	0.133	0.13		**0.814**	0.193	0.15	
SED-EB01	9/28/2015	9	10		11.095	1.457	0.882		0.443	0.107	0.127		**0.738**	0.187	0.124	
SED-EB02	9/28/2015	0	0.5		8.85	1.274	0.706		0.359	0.107	0.126		0.506	0.162	0.227	
SED-EB02	9/28/2015	0.5	1		9.959	1.308	0.238		0.458	0.116	0.091		**1.65**	0.286	0.148	
SED-EB02	9/28/2015	1	2		9.633	1.615	0.791		**0.828**	0.247	0.288		**9.157**	0.82	0.333	
SED-EB02	9/28/2015	2	3		5.486	1.474	1.54	J	**0.952**	0.243	0.3	J	**9.17**	0.875	0.303	J
SED-EB02	9/28/2015	3	4		12.365	1.556	0.264		**0.874**	0.209	0.181	J	**5.037**	0.534	0.119	J
SED-EB02	9/28/2015	3	4	SED-EB02-03-04	11.498	1.694	0.556		0.581	0.149	0.159	J	**2.55**	0.34	0.199	J
SED-EB02	9/28/2015	4	5		13.241	1.69	0.785		0.667	0.149	0.134		**0.983**	0.218	0.207	
SED-EB03	9/29/2015	0	0.5		9.362	1.383	0.794		0.225	0.094	0.137		**0.721**	0.16	0.147	
SED-EB03	9/29/2015	0.5	1		12.111	1.488	0.243		0.466	0.114	0.076		**0.856**	0.153	0.107	
SED-EB03	9/29/2015	1	2		7.575	1.538	1.17		0.346	0.142	0.199		**2.254**	0.345	0.283	
SED-EB03	9/29/2015	2	3		10.157	1.548	0.478		0.793	0.218	0.248		**8.868**	0.746	0.253	
SED-EB03	9/29/2015	3	4		6.943	1.238	0.348		**0.862**	0.275	0.277		**7.877**	0.798	0.261	
SED-EB03	9/29/2015	4	5		11.022	1.776	1.15		**1.858**	0.433	0.336		**16.022**	1.296	0.403	
SED-EB03	9/29/2015	5	6		10.328	1.682	0.634		0.761	0.197	0.234		**5.013**	0.563	0.225	
SED-EB03	9/29/2015	6	7		11.665	1.754	0.756		0.787	0.163	0.144		**1.165**	0.218	0.214	
SED-EB03	9/29/2015	7	8		14.014	1.867	0.527		0.619	0.147	0.167		**1.184**	0.222	0.146	
SED-EB03	9/29/2015	8	9		19.044	2.195	0.859		0.787	0.159	0.133		**1.292**	0.199	0.147	
SED-EB03	9/29/2015	9	10		15.228	1.962	0.524		0.596	0.142	0.154		**0.817**	0.169	0.18	
SED-EB04	9/29/2015	0	0.5		2.789	1.461	2.31	R	0.296	0.164	0.255	R	0.526	0.257	0.458	R
SED-EB04	9/29/2015	0.5	1		10.555	1.484	0.3		0.536	0.135	0.101		**0.793**	0.178	0.076	
SED-EB04	9/29/2015	1	2		9.758	1.543	0.559		0.437	0.122	0.148		**0.689**	0.151	0.207	
SED-EB04	9/29/2015	2	3		11.945	1.596	0.405		0.625	0.145	0.121		**0.669**	0.172	0.235	
SED-EB04	9/29/2015	2	3	SED-EB04-02-03	11.314	1.698	0.686		0.555	0.135	0.139		0.544	0.16	0.308	
SED-EB04	9/29/2015	3	4		13.4	1.778	0.329		0.744	0.163	0.114		**1.052**	0.221	0.191	
SED-EB04	9/29/2015	4	5		13.853	1.793	0.851		0.486	0.128	0.165		**0.9**	0.207	0.094	
SED-EB04	9/29/2015	5	6		11.552	1.815	0.651		0.582	0.155	0.14		**0.862**	0.229	0.243	
SED-EB04	9/29/2015	6	7		13.762	1.899	0.506		0.768	0.155	0.137		**0.685**	0.188	0.329	
SED-EB04	9/29/2015	7	8		14.574	2.103	0.841		0.779	0.176	0.152		**0.932**	0.185	0.223	
Sediment East Branch (continued)																
SED-EB05	9/28/2015	0	0.5		2.133	2.803	2.67	R	0.194	0.182	0.403	R	0.143	0.39	0.443	R
SED-EB05	9/28/2015	0.5	1		5.914	1.45	0.588	R	0.534	0.204	0.202	R	**0.75**	0.261	0.468	R
SED-EB05	9/28/2015	1	2		8.727	1.602	0.466	J	0.486	0.15	0.123	J	**1.333**	0.302	0.118	J
SED-EB05	9/28/2015	2	3		8.519	1.662	1.32	J	0.339	0.145	0.197	J	**0.901**	0.262	0.37	J
SED-EB05	9/28/2015	3	4		8.309	1.388	0.485		0.457	0.141	0.146		**1.05**	0.271	0.265	
SED-EB05	9/28/2015	4	5		9.202	1.468	0.941		0.751	0.173	0.142		**3.586**	0.443	0.15	
SED-EB05	9/28/2015	5	6		9.159	1.636	0.847		0.541	0.154	0.183		**1.87**	0.273	0.175	
SED-EB05	9/28/2015	6	7		10.328	1.52	0.329		**0.9**	0.165	0.09		**1.005**	0.191	0.146	
SED-EB05	9/28/2015	7	8		8.995	1.505	1.01		0.688	0.153	0.13		**0.646**	0.179	0.279	
SED-EB05	9/28/2015	8	9		7.439	1.613	0.869	J	0.721	0.179	0.177	J	**1.076**	0.221	0.238	J
SED-EB05	9/28/2015	9	10		6.031	1.317	0.875		0.653	0.17	0.189		**0.982**	0.211	0.217	
SED-EB06	9/29/2015	0	0.5		5.468	1.262	0.479	J	0.463	0.151	0.109	J	**0.692**	0.219	0.283	J
SED-EB06	9/29/2015	0.5	1		7.144	1.438	1		0.379	0.135	0.191		**0.805**	0.198	0.204	
SED-EB06	9/29/2015	1	2		8.644	1.261	0.712		0.338	0.102	0.127		**0.833**	0.203	0.141	
SED-EB06	9/29/2015	2	3		7.618	1.331	0.549		0.371	0.116	0.148		**0.696**	0.169	0.152	
SED-EB06	9/29/2015	3	4		6.218	1.297	0.866		0.443	0.141	0.181		**0.897**	0.2	0.214	
SED-EB06	9/29/2015	4	5		9.418	1.326	0.269		0.469	0.125	0.114		**1.129**	0.204	0.068	
SED-EB06	9/29/2015	5	6		9.244	1.903	0.957	J	0.447	0.174	0.263	J	**1.143**	0.26	0.265	J
SED-EB06	9/29/2015	6	7		8.171	1.554	1.21	J	0.474	0.156	0.176	J	**0.743**	0.214	0.334	J
SED-EB06	9/29/2015	6	7	SED-EB06-06-07	7.661	1.608	1.06	J	0.445	0.151	0.172	J	**0.838**	0.251	0.36	J
SED-EB06	9/29/2015	7	8		9.28	1.762	0.534	R	0.482	0.222	0.218	R	**1.163**	0.406	0.374	R
SED-EB06	9/29/2015	8	9		6.186	1.46	1.5	J	0.532	0.168	0.204	J	**1.439**	0.301	0.229	J
SED-EB06	9/29/2015	9	10		6.072	1.334	0.936		0.456	0.157	0.183		**1.252**	0.251	0.185	

Table 4-13
Sediment Radiological Gamma Spectroscopy Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Potassium-40				Radium-226				Thorium-232			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Sediment Screening Criteria									**0.797**				**0.637**			
SED-EB07	9/29/2015	0	0.5		8.536	1.404	0.924		0.385	0.119	0.148		**1.295**	0.236	0.102	
SED-EB07	9/29/2015	0.5	1		8.559	1.194	0.239		0.324	0.116	0.118		**1.505**	0.249	0.162	
SED-EB07	9/29/2015	1	2		8.718	1.463	0.573		0.215	0.101	0.158		**1.025**	0.257	0.219	
SED-EB07	9/29/2015	2	3		8.361	1.363	0.461		0.386	0.122	0.132		**1.094**	0.212	0.203	
SED-EB07	9/29/2015	3	4		11.351	1.444	0.25		0.495	0.133	0.132		**1.589**	0.21	0.063	
SED-EB07	9/29/2015	4	5		8.988	1.448	0.928		0.446	0.128	0.14		**1.251**	0.203	0.103	
SED-EB07	9/29/2015	5	6		7.079	1.556	0.842	J	0.47	0.164	0.207	J	**0.835**	0.225	0.362	J
SED-EB07	9/29/2015	6	7		5.568	1.363	1.07	J	0.583	0.17	0.188	J	**1.185**	0.237	0.3	J
SED-EB07	9/29/2015	7	8		5.397	1.529	1.42	J	0.398	0.17	0.245	J	**1.614**	0.346	0.255	J
SED-EB07	9/29/2015	8	9		5.216	1.346	0.882	J	0.403	0.182	0.262	J	**1.906**	0.386	0.342	J
SED-EB07	9/29/2015	9	10		7.982	1.724	1.52	R	0.65	0.198	0.233	R	**2.341**	0.457	0.168	R
SED-EB08	9/29/2015	0	0.5		8.231	1.556	0.707		0.324	0.132	0.174		0.62	0.19	0.327	
SED-EB08	9/29/2015	0.5	1		7.472	1.223	0.927		0.298	0.092	0.114		**0.638**	0.178	0.246	
SED-EB08	9/29/2015	1	2		9.728	1.486	0.46		0.359	0.126	0.143		**0.971**	0.196	0.176	
SED-EB08	9/29/2015	2	3		8.558	1.237	0.262		0.451	0.117	0.09		**1.049**	0.192	0.11	
SED-EB08	9/29/2015	3	4		6.208	1.116	0.89		0.315	0.097	0.128		**1.042**	0.188	0.085	
SED-EB08	9/29/2015	4	5		9.136	1.478	0.551		0.381	0.117	0.138		**1.281**	0.194	0.191	
Sediment East Branch (continued)																
SED-EB08	9/29/2015	5	6		8.411	1.388	0.477		0.394	0.12	0.156		**1.038**	0.199	0.134	
SED-EB08	9/29/2015	6	7		7.319	1.189	0.296		0.468	0.127	0.097		**1.071**	0.191	0.13	
SED-EB08	9/29/2015	7	8		5.022	1.304	1.46	J	0.372	0.138	0.176	J	**1.01**	0.263	0.13	J
SED-EB08	9/29/2015	8	9		7.302	1.385	0.633		0.332	0.118	0.179		**1.132**	0.221	0.175	
SED-EB08	9/29/2015	9	10		7.412	1.327	0.507		0.472	0.134	0.133		**0.875**	0.21	0.192	

Notes:

All units in picoCurie per gram (pCi/g).
CSU (+/- s) = combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
U - not detected
J - estimated value
R - rejected
* Parent sample ID listed for duplicate samples.
Highlighted cell and bold format indicates that concentration exceeded screening criteria.

Table 4-14
Building and Sewer Materials Radiological Gamma Spectroscopy Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Parent Sample*	Potassium-40				Radium-226				Thorium-232			
			Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Solids Screening Criteria							**0.919**				**1.220**			
Building Materials														
LOT33	12/17/2015		23.743	3.068	0.976		**3.86**	1.593	1.67	J	**1.754**	0.384	0.183	
LOT33	12/17/2015	BRICK-02-LOT33	22.182	3.137	0.874		**3.85**	2.149	2.46	J	**1.76**	0.35	0.352	
LOT33	12/17/2015		2.18	1.14	1.79	J	**2.726**	1.59	1.86	J	0.579	0.215	0.372	J
LOT42	12/18/2015		33.469	6.481	4.41	J	**21.09**	10.986	13.5	J	**152.66**	9.698	1.6	
LOT42	12/17/2015		12.978	2.782	2.18	J	**8.217**	6.701	8.15	J	**57.643**	4.018	0.758	
LOT42	12/18/2015		3.917	0.608	0.191		0.349	0.602	0.705	UJ	0.45	0.115	0.077	
LOT44	12/17/2015		32.95	6.769	9.2	J	**44.219**	16.906	21.1	J	**415.17**	25.721	2.73	
LOT46	12/17/2015		9.781	1.986	1.93	J	**6.619**	2.855	3.73	J	**7.784**	0.813	0.332	J
LOT46	12/17/2015		0.479	0.302	0.469		0.413	0.498	0.723	UJ	0.099	0.075	0.125	U
LOT46	12/17/2015		2.85	0.975	0.613	R	0.147	0.987	1.15	R	0.505	0.178	0.216	R
Sewer Materials														
I-2	11/18/2015		184.87	20.203	22.6	R	**76.423**	38.146	44.9	J	**2206.4**	136.66	8.11	
I-4	11/18/2015		215.93	24.123	26.9	R	**163.12**	51.598	57.8	J	**2536.2**	155.41	10.2	
I-4	11/18/2015		6.553	1.662	1.58		2.106	1.877	3.11	UJ	**4.423**	0.624	0.185	
I-5	11/18/2015		6.876	1.31	0.396		1.117	2.253	2.63	UJ	**4.67**	0.494	0.208	
I-6	11/18/2015		16.45	2.735	0.956		**2.686**	2.131	2.59	J	1.044	0.289	0.314	
I-6	11/18/2015		6	1.397	1.09		0.347	1.113	2.02	UJ	0.698	0.213	0.366	
I-6	11/18/2015	CONC-I6	8.959	1.766	0.764		0.803	1.05	1.88	UJ	0.785	0.245	0.378	
I-7	11/18/2015		7.137	1.363	1.06		1.003	1.317	2.23	UJ	**2.275**	0.345	0.197	
I-8	11/18/2015		8.33	1.493	0.417		1.31	1.305	1.5	UJ	0.922	0.252	0.397	
Sewer Sediments														
I-2	11/18/2015		72.749	15.332	20.7	J	**69.801**	6.939	4.254	J	**1079.9**	73.029	7.8	J
I-2	11/18/2015		90.381	11.434	13.6	J	**45.938**	4.762	3.809	J	**1218.1**	76.238	4.69	J
I-7	11/18/2015		21.624	4.044	2.99	J	**6.153**	0.837	0.892		**116.72**	7.319	1.25	J

Notes:

All units in picoCurie per gram (pCi/g).
CSU (+/- s) = combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
U - not detected
J - estimated value
R - rejected
* Parent sample ID listed for duplicate samples.
Highlighted cell and bold format indicates that concentration exceeded screening criteria.

Table 4-15
Soil Radiological Isotopic Results
Wolff-Alport Chemical Company Site
Ridgewood,NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Thorium-228				Thorium-230				Thorium-232			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria													**1.220**			
Soil Borings																
SB-07	10/26/2015	10	12		35.034	4.894	0.217		4.442	0.998	0.278		**30.44**	4.28	0.262	
SB-08	10/23/2015	14	16		119.299	21.351	2.407	J	11.705	5.251	4.436	J	**126.653**	21.823	4.047	J
SB-23	2/15/2016	0	2		1.06	0.222	0.037	J	0.667	0.164	0.053		0.803	0.184	0.056	
SB-24	2/15/2016	0	2		2.072	0.359	0.044	J	1.749	0.316	0.081		**1.967**	0.345	0.091	
SB-30	2/18/2016	0	2		0.94	0.21	0.046		0.582	0.16	0.092	J	0.804	0.194	0.102	
SB-32	2/15/2016	0	2		12.966	1.793	0.081		2.358	0.476	0.232		**12.485**	1.729	0.237	
SB-34	10/20/2015	4	6		3.454	0.788	0.132		2.087	0.565	0.255		**2.719**	0.661	0.259	
SB-35	10/27/2015	6	8		7.129	1.029	0.061		3.09	0.514	0.089		**7.275**	1.032	0.085	
SB-50	12/1/2015	0	1		88.53	11.738	0.332		10.12	2.01	0.416		**83.561**	11.082	0.441	
SB-50	12/1/2015	0	1	SB-50-00-01	102.017	17.265	1.469	J	9.357	3.774	1.828	J	**98.85**	16.638	1.825	J
SB-52	12/1/2015	0	1		15.813	2.655	0.296	J	2.98	0.884	0.562	J	**16.025**	2.644	0.62	J
SB-52	12/1/2015	0	1	SB-52-00-01	14.098	1.954	0.09	J	2.887	0.545	0.133	J	**13.462**	1.858	0.128	J
SB-54	12/3/2015	0	1		41.519	5.524	0.152	J	5.692	1.079	0.237	J	**38.218**	5.091	0.236	J
SB-68	2/18/2016	0	2		1.631	0.335	0.069		1.025	0.258	0.165	J	**1.317**	0.301	0.179	
SB-70	2/18/2016	0	2		1.498	0.285	0.045		0.969	0.213	0.07	J	**1.306**	0.259	0.068	
SB-74	2/17/2016	0.5	3		1.378	0.256	0.038		1.042	0.21	0.045	J	**1.306**	0.245	0.041	
SB-79	2/18/2016	0	2		5.444	0.771	0.035		2.15	0.362	0.06	J	**4.606**	0.669	0.123	
SB-80	2/18/2016	0	1		29.767	5.494	0.685	J	4.536	1.734	1.1	J	**32.669**	5.824	1.045	J
SB-81	2/18/2016	0	1		20.332	2.926	0.172		2.998	0.702	0.184		**18.029**	2.627	0.084	
SB-82	2/19/2016	0	2		22.271	2.88	0.056	J	3.847	0.629	0.092	J	**22.162**	2.864	0.091	J
SB-82	2/19/2016	0	2	SB-82-00-02	17.615	2.246	0.048	J	2.826	0.445	0.066	J	**17.904**	2.279	0.073	J
Sewer Borings																
SWSB-03	12/4/2015	0	1		75.488	9.568	0.13	J	8.076	1.334	0.2	J	**65.565**	8.334	0.2	J
School Borings																
SCSB-04	10/31/2015	4	6		1.296	0.266	0.042		0.805	0.19	0.066		1.11	0.241	0.136	
Background																
BKSB-04	12/22/2015	0	2		0.793	0.193	0.049		0.484	0.152	0.123		0.727	0.183	0.084	
BKSB-04	12/22/2015	0	2	BKSB-04-00-02	0.99	0.228	0.045		0.369	0.127	0.075		0.889	0.21	0.056	
BKSB-06	10/30/2015	18	20		0.928	0.196	0.049		0.534	0.134	0.052		0.801	0.173	0.057	

Notes:

All units in picoCurie per gram (pCi/g).

CSU (+/- s) = combined standard uncertainty (2 sigma)

MDA - minimum detectable activity

Q - qualifier

U - not detected

J - estimated value

* Parent sample ID listed for duplicate samples.

Highlighted cell and bold format indicates that concentration exceeded screening criteria.

Table 4-15
Soil Radiological Isotopic Results
Wolff-Alport Chemical Company Site
Ridgewood,NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Uranium-234				Uranium-235				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Soil Screening Criteria																
Soil Borings																
SB-07	10/26/2015	10	12		7.297	0.935	0.04		0.338	0.084	0.033		7.175	0.92	0.047	
SB-08	10/23/2015	14	16		9.797	1.242	0.04		0.406	0.096	0.012		9.457	1.201	0.04	
SB-23	2/15/2016	0	2		0.247	0.083	0.065		0.015	0.022	0.034	U	0.244	0.083	0.067	
SB-24	2/15/2016	0	2		0.333	0.118	0.113		0.008	0.033	0.07	U	0.296	0.109	0.103	
SB-30	2/18/2016	0	2		0.217	0.079	0.087		0.007	0.043	0.083	UJ	0.215	0.085	0.104	
SB-32	2/15/2016	0	2		0.239	0.113	0.133		0.014	0.036	0.073	U	0.247	0.105	0.104	
SB-34	10/20/2015	4	6		0.365	0.101	0.058		0.019	0.026	0.042	U	0.292	0.107	0.123	
SB-35	10/27/2015	6	8		0.351	0.446	0.736	UJ	-0.034	0.067	0.377	UJ	0	0.343	0.734	U
SB-50	12/1/2015	0	1		2.954	0.414	0.048		0.142	0.055	0.043		2.959	0.415	0.064	
SB-50	12/1/2015	0	1	SB-50-00-01	2.674	0.387	0.09		0.193	0.072	0.068		2.65	0.385	0.104	
SB-52	12/1/2015	0	1		2.107	0.733	0.484	J	0	0.148	0.417	UJ	1.49	0.595	0.359	J
SB-52	12/1/2015	0	1	SB-52-00-01	0.643	0.22	0.205	J	-0.015	0.042	0.127	UJ	0.784	0.237	0.187	J
SB-54	12/3/2015	0	1		0.857	0.265	0.191	J	0.027	0.054	0.101	UJ	0.612	0.226	0.198	
SB-68	2/18/2016	0	2		0.132	0.089	0.121		-0.005	0.033	0.084	UJ	0.316	0.112	0.082	
SB-70	2/18/2016	0	2		0.311	0.106	0.068		0	0.021	0.059	U	0.269	0.096	0.05	
SB-74	2/17/2016	0.5	3		0.339	0.089	0.041		0.018	0.021	0.029	U	0.243	0.074	0.047	
SB-79	2/18/2016	0	2		0.181	0.099	0.126		0.018	0.033	0.06	U	0.127	0.089	0.126	
SB-80	2/18/2016	0	1		0.693	0.152	0.064		0.076	0.049	0.051		0.552	0.131	0.055	
SB-81	2/18/2016	0	1		0.712	0.146	0.065		0.068	0.048	0.061		0.567	0.129	0.081	
SB-82	2/19/2016	0	2		0.376	0.114	0.095	J	0.014	0.031	0.059	U	0.393	0.114	0.087	
SB-82	2/19/2016	0	2	SB-82-00-02	0.56	0.133	0.085	J	0.046	0.038	0.047	U	0.516	0.124	0.066	
Sewer Borings																
SWSB-03	12/4/2015	0	1		3.454	0.545	0.084	J	0.117	0.071	0.029		3.855	0.597	0.115	
School Borings																
SCSB-04	10/31/2015	4	6		0.47	0.148	0.099	J	0.005	0.05	0.11	UJ	0.207	0.139	0.205	
Background																
BKSB-04	12/22/2015	0	2		0.148	0.122	0.185	UJ	0.059	0.072	0.115	UJ	0.112	0.106	0.164	U
BKSB-04	12/22/2015	0	2	BKSB-04-00-02	0.385	0.127	0.083	J	0.015	0.029	0.055	U	0.179	0.09	0.092	
BKSB-06	10/30/2015	18	20		0.267	0.111	0.092	J	-0.006	0.039	0.1	UJ	0.386	0.138	0.116	

Notes:

All units in picoCurie per gram (pCi/g).
CSU (+/- s) = combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
U - not detected
J - estimated value
* Parent sample ID listed for duplicate samples.
Highlighted cell and bold format indicates that concentration exceeded screening crit

Table 4-16
Sediment Radiological Isotopic Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Thorium-228				Thorium-230				Thorium-232				Uranium-234				Uranium-235				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Sediment Screening Criteria					**0.759**				**0.697**				**0.637**				**1.279**				**0.117**				**1.061**			
Sediment East Branch																												
SED-EB01	9/28/2015	0	0.5		**0.896**	0.25	0.04		0.439	0.186	0.186		**1.079**	0.287	0.174		0.537	0.105	0.043	J	0.005	0.02	0.04	U	0.461	0.097	0.057	
SED-EB01	9/28/2015	0.5	1		0.401	0.126	0.046		0.212	0.091	0.071		0.297	0.107	0.068		0.952	0.172	0.052		0.017	0.031	0.056	U	0.961	0.175	0.071	
SED-EB01	9/28/2015	1	2		**1.173**	0.317	0.112		0.477	0.195	0.149		**1.252**	0.33	0.166		0.321	0.088	0.057		0.026	0.034	0.056	U	0.334	0.092	0.067	
SED-EB01	9/28/2015	2	3		**17.139**	2.245	0.078		**2.29**	0.418	0.088		**15.06**	1.988	0.097		0.764	0.174	0.076	J	0.041	0.036	0.022		0.854	0.187	0.082	
SED-EB01	9/28/2015	3	4		**21.311**	2.921	0.123	J	**1.885**	0.461	0.277	J	**15.923**	2.217	0.189	J	**1.51**	0.252	0.069	J	0.105	0.059	0.068		**1.414**	0.243	0.095	
SED-EB01	9/28/2015	4	5		**57.968**	7.897	0.406	J	**6.089**	1.324	0.401	J	**42.704**	5.914	0.446	J	**2.281**	0.337	0.049		0.088	0.047	0.047		**2.314**	0.342	0.068	
SED-EB01	9/28/2015	5	6		**77.485**	12.212	0.938	J	**7.207**	2.433	1.391	J	**56.355**	9.191	1.034	J	**3.867**	0.526	0.035	J	**0.215**	0.067	0.03		**6.729**	0.873	0.042	
SED-EB01	9/28/2015	6	7		**27.437**	3.642	0.098	J	**3.538**	0.68	0.131	J	**24.693**	3.293	0.139	J	**1.558**	0.231	0.025	J	0.064	0.032	0.026		**1.431**	0.216	0.041	
SED-EB01	9/28/2015	7	8		**1.721**	0.32	0.047		0.526	0.148	0.065		**1.465**	0.283	0.068		0.483	0.097	0.031	J	0.033	0.027	0.035	U	0.389	0.086	0.048	
SED-EB01	9/28/2015	8	9		**1.033**	0.242	0.049	J	0.458	0.148	0.067		**0.86**	0.214	0.071	J	0.353	0.078	0.033	J	0.018	0.016	0.01		0.351	0.078	0.028	
SED-EB01	9/28/2015	8	9	SED-EB01-08-09	**0.765**	0.206	0.031		0.542	0.169	0.081		**0.7**	0.196	0.092	J	0.377	0.085	0.037	J	0.012	0.013	0.011		0.393	0.088	0.043	
SED-EB01	9/28/2015	9	10		0.553	0.172	0.032		0.278	0.129	0.129		0.499	0.167	0.114		0.264	0.068	0.038	J	0.035	0.027	0.034		0.241	0.066	0.048	J
SED-EB02	9/28/2015	0	0.5		0.561	0.154	0.122	J	0.368	0.111	0.064		**0.816**	0.18	0.077		0.323	0.105	0.098	J	0.029	0.033	0.05	U	0.286	0.094	0.079	
SED-EB02	9/28/2015	0.5	1		**1.27**	0.277	0.145	J	0.418	0.138	0.087		**1.15**	0.253	0.127		0.169	0.058	0.053		-0.002	0.02	0.047	U	0.136	0.054	0.058	
SED-EB02	9/28/2015	1	2		**11.922**	1.582	0.107	J	**1.574**	0.301	0.082		**9.595**	1.292	0.082		0.506	0.122	0.092		0.008	0.044	0.085	UJ	0.391	0.112	0.111	
SED-EB02	9/28/2015	2	3		**10.258**	1.374	0.093	J	**1.126**	0.237	0.085		**7.452**	1.026	0.08		0.583	0.151	0.095	J	0.078	0.06	0.075		0.678	0.166	0.103	
SED-EB02	9/28/2015	3	4		**3.119**	0.484	0.105	J	0.454	0.127	0.061		**1.857**	0.32	0.075	J	0.209	0.071	0.06	J	0.043	0.035	0.046	U	0.195	0.066	0.049	J
SED-EB02	9/28/2015	3	4	SED-EB02-03-04	**1.891**	0.334	0.079	J	0.55	0.144	0.045		**1.298**	0.251	0.052	J	0.637	0.15	0.09	J	0.024	0.04	0.071	U	0.588	0.152	0.13	J
SED-EB02	9/28/2015	4	5		**0.888**	0.206	0.096	J	0.483	0.138	0.067		**0.878**	0.199	0.083		0.61	0.124	0.051	J	0.028	0.03	0.045	U	0.621	0.127	0.059	
SED-EB03	9/29/2015	0	0.5		0.372	0.127	0.111	J	0.343	0.111	0.063		0.393	0.123	0.08	J	0.423	0.093	0.035		0.025	0.02	0.011		0.359	0.084	0.032	
SED-EB03	9/29/2015	0.5	1		0.447	0.128	0.075	J	0.197	0.077	0.041		0.288	0.096	0.05	J	0.22	0.079	0.072		0.036	0.029	0.016		0.166	0.068	0.066	
SED-EB03	9/29/2015	1	2		**2.039**	0.435	0.152	J	0.423	0.166	0.069		**1.457**	0.343	0.104	J	0.423	0.101	0.064		0.021	0.024	0.036	U	0.427	0.102	0.066	
SED-EB03	9/29/2015	2	3		**8.3**	1.336	0.3	J	**0.972**	0.321	0.165	J	**7.076**	1.165	0.181	J	0.384	0.092	0.063		0.035	0.027	0.032		0.449	0.098	0.05	
SED-EB03	9/29/2015	3	4		**9.053**	1.234	0.06	J	**1.306**	0.268	0.08		**9.392**	1.272	0.089	J	0.633	0.12	0.029		-0.002	0.01	0.03	U	0.615	0.118	0.043	
SED-EB03	9/29/2015	4	5		**18.713**	2.458	0.076	J	**1.501**	0.33	0.14		**11.691**	1.6	0.095	J	1.222	0.198	0.048		0.052	0.033	0.038		**1.1**	0.183	0.052	
SED-EB03	9/29/2015	5	6		**3.229**	0.53	0.055	J	**0.777**	0.199	0.076		**2.942**	0.491	0.079	J	0.671	0.134	0.051		0.044	0.031	0.033		0.634	0.128	0.045	
SED-EB03	9/29/2015	6	7		**1.136**	0.212	0.058	J	0.345	0.099	0.057		**1.022**	0.194	0.043	J	0.577	0.112	0.029		0.032	0.024	0.027		0.506	0.104	0.047	
SED-EB03	9/29/2015	7	8		**1.433**	0.294	0.1	J	**0.834**	0.203	0.056		**1.441**	0.289	0.061	J	0.613	0.118	0.04		0.018	0.022	0.036	U	0.66	0.126	0.061	
SED-EB03	9/29/2015	8	9		**1.095**	0.283	0.078		0.667	0.218	0.155		**1.013**	0.276	0.171		1.002	0.213	0.071	J	0.036	0.042	0.061	U	0.821	0.194	0.118	
SED-EB03	9/29/2015	9	10		**0.889**	0.233	0.073		0.615	0.201	0.172		**0.789**	0.231	0.186		0.325	0.116	0.09		0.019	0.027	0.026	U	0.52	0.152	0.108	
SED-EB04	9/29/2015	0	0.5		0.611	0.198	0.065		0.304	0.139	0.109		0.406	0.19	0.223		0.48	0.092	0.021	J	0.013	0.015	0.021	U	0.477	0.092	0.029	
SED-EB04	9/29/2015	0.5	1		0.611	0.184	0.081		0.342	0.134	0.09		0.492	0.164	0.1		0.482	0.099	0.042	J	0.017	0.021	0.034	U	0.451	0.096	0.05	
SED-EB04	9/29/2015	1	2		0.384	0.134	0.056		0.325	0.129	0.111		0.198	0.107	0.122		0.349	0.079	0.022	J	0.019	0.019	0.026	U	0.36	0.083	0.045	
SED-EB04	9/29/2015	2	3		0.625	0.205	0.087		0.254	0.158	0.207		0.521	0.211	0.224		0.406	0.119	0.06		0.066	0.051	0.056		0.463	0.13	0.077	
SED-EB04	9/29/2015	2	3	SED-EB04-02-03	0.6	0.158	0.05		0.67	0.176	0.119	J	0.552	0.161	0.129	J	0.586	0.147	0.084		0.035	0.051	0.087	UJ	0.475	0.135	0.109	
SED-EB04	9/29/2015	3	4		**1.457**	0.286	0.048	J	**0.75**	0.183	0.065		**1.237**	0.252	0.065		0.728	0.129	0.033	J	0.05	0.028	0.024		0.624	0.116	0.033	
SED-EB04	9/29/2015	4	5		**0.934**	0.242	0.067		**0.828**	0.226	0.105		**0.769**	0.215	0.101		0.559	0.114	0.047	J	0.045	0.032	0.039		0.545	0.113	0.056	
SED-EB04	9/29/2015	5	6		0.627	0.214	0.103		0.661	0.222	0.138		**0.832**	0.254	0.154	J	0.546	0.127	0.06		0.028	0.043	0.075	U	0.521	0.125	0.067	
SED-EB04	9/29/2015	6	7		0.618	0.181	0.06		0.623	0.183	0.094		0.636	0.185	0.091	J	0.519	0.109	0.046		0.004	0.017	0.037	U	0.492	0.106	0.052	
SED-EB04	9/29/2015	7	8		**0.77**	0.196	0.046		0.381	0.132	0.077		0.599	0.184	0.158	J	0.622	0.121	0.041		0.019	0.019	0.024	U	0.561	0.114	0.046	
SED-EB05	9/28/2015	0	0.5		0.337	0.135	0.073		0.237	0.124	0.134	J	0.278	0.123	0.091	J	0.335	0.096	0.058		0.006	0.025	0.053	U	0.221	0.098	0.125	
SED-EB05	9/28/2015	0.5	1		**0.899**	0.259	0.093		0.193	0.133	0.169		0.624	0.209	0.115		0.352	0.09	0.052		0.014	0.023	0.04	U	0.352	0.089	0.048	
SED-EB05	9/28/2015	1	2		0.521	0.151	0.05		0.549	0.156	0.069		0.382	0.128	0.072	J	0.365	0.101	0.078		0.025	0.031	0.05	U	0.422	0.11	0.083	
SED-EB05	9/28/2015	2	3		**1.604**	0.362	0.069		0.457	0.173	0.094		**1.32**	0.318	0.1	J	0.379	0.102	0.084		0.016	0.039	0.073	U	0.421	0.105	0.07	
SED-EB05	9/28/2015	3	4		**0.894**	0.228	0.032		0.325	0.139	0.129		**0.741**	0.207	0.115	J	0.33	0.093	0.067		0.027	0.024	0.015		0.346	0.094	0.061	
SED-EB05	9/28/2015	4	5		**3.363**	0.543	0.064	J	0.51	0.153	0.078		**2.727**	0.457	0.078		0.549	0.133	0.073	J	-0.013	0.013	0.056	U	0.398	0.11	0.068	
SED-EB05	9/28/2015	5	6		**1.203**	0.262	0.028	J	0.558	0.171	0.128		**0.92**	0.224	0.12		0.406	0.118	0.054	J	0.016	0.03	0.055	U	0.359	0.11	0.059	
SED-EB05	9/28/2015	6	7		0.742	0.202	0.077	J	0.591	0.175	0.085		0.56	0.171	0.094		0.23	0.121	0.148	J	0.052	0.065	0.105	UJ	0.115	0.108	0.169	UJ
SED-EB05	9/28/2015	7	8		0.716	0.185	0.044	J	0.462	0.143	0.073		0.629	0.168	0.054		0.174	0.123	0.167	J	0.067	0.067	0.083	UJ	0.27	0.142	0.162	J
SED-EB05	9/28/2015	8	9		**0.799**	0.215	0.054	J	0.501	0.164	0.09		0.506	0.185	0.184		0.494	0.173	0.138	J	0.061	0.07	0.104	UJ	0.164	0.105	0.126	J
SED-EB05	9/28/2015	9	10		0.604	0.157	0.044	J	0.426	0.127	0.067		0.513	0.141	0.064		0.796	0.369	0.335	J	0.08	0.112	0.109	UJ	0.605	0.321	0.314	J
SED-EB06	9/29/2015	0	0.5		0.644	0.178	0.093	J	0.371	0.129	0.091		0.462	0.142	0.07		0.718	0.347	0.38	J	-0.034	0.094	0.285	UJ	0.789	0.426	0.565	J
SED-EB06	9/29/2015	0.5	1		0.664	0.185	0.122	J	0.462	0.142	0.075		0.475	0.143	0.069		0.552	0.127	0.069	J	0.02	0.033	0.059	U	0.371	0.104	0.085	
SED-EB06	9/29/2015	1	2		0.421	0.128	0.067	J	0.264	0.096	0.05		0.308	0.103	0.035		0.61	0.198	0.175	J	**0.144**	0.103	0.127	J	0.513	0.192	0.204	J
SED-EB06	9/29/2015	2	3		**0.777**	0.201	0.12	J	0.362	0.125	0.082		0.562	0.159	0.08		0.251	0.088	0.046	J	0.012	0.03	0.06	U	0.271	0.104	0.105	
SED-EB06	9/29/2015	3	4		0.407	0.164	0.042		0.279	0.158	0.192		0.121	0.118	0.18	UJ	0.285	0.086	0.066	J	-0.002	0.024	0.057	U	0.248	0.078	0.056	
SED-EB06	9/29/2015	4	5		0.747	0.179	0.099		0.222	0.089	0.076	J	0.292	0.1	0.07	J	0.504	0.199	0.203	J	0.086	0.093	0.141	UJ	0.482	0.186	0.169	J
SED-EB06	9/29/2015	5	6		**1.043**	0.364	0.152	J	0.201	0.232	0.376	UJ	0.388	0.232	0.256	J	0.69	0.167	0.064		0.027	0.043	0.075	U	0.624	0.162	0.099	
SED-EB06	9/29/2015	6	7		0.706	0.375	0.306	J	0.168	0.211	0.333	UJ	**0.64**	0.364	0.37	J	0.597	0.147	0.063		0.024	0.027	0.022		0.489	0.132	0.074	
SED-EB06	9/29/2015	6	7	SED-EB06-06-07	0.673	0.21	0.084		0.29	0.158	0.193		0.353	0.175	0.209	J	0.614	0.116	0.036		0.028	0.026	0.038	U	0.625	0.118	0.044	
SED-EB06	9/29/2015	7	8		0.743	0.267	0.1	J	0.206	0.145	0.163	J	0.211	0.137	0.121	J	0.534	0.144	0.053		0.05	0.05	0.07	U	0.568	0.148	0.044	
SED-EB06	9/29/2015	8	9		**1.381**	0.534	0.219	J	0.405	0.303	0.356	J	**0.921**	0.55	0.729	J	0.656	0.119	0.023		0.042	0.025	0.01		0.57	0.108	0.031	
SED-EB06	9/29/2015	9	10		**0.944**	0.246	0.069		0.293	0.136	0.133		**0.713**	0.213	0.147	J	0.527	0.107	0.04		0.02	0.022	0.034	U	0.548	0.109	0.031	

Table 4-16
Sediment Radiological Isotopic Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample Date	Start Depth (feet)	End Depth (feet)	Parent Sample*	Thorium-228				Thorium-230				Thorium-232				Uranium-234				Uranium-235				Uranium-238			
					Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Sediment Screening Criteria					**0.759**				**0.697**				**0.637**				**1.279**				**0.117**				**1.061**			
Sediment East Branch (continued)																												
SED-EB07	9/29/2015	0	0.5		**0.925**	0.208	0.059		0.551	0.151	0.066		**0.761**	0.184	0.073	J	0.243	0.077	0.056		0.006	0.029	0.059	U	0.257	0.083	0.07	
SED-EB07	9/29/2015	0.5	1		**1.028**	0.243	0.07		0.256	0.113	0.093		**0.688**	0.192	0.104		0.24	0.073	0.039		0.005	0.017	0.036	U	0.202	0.068	0.05	
SED-EB07	9/29/2015	1	2		0.736	0.2	0.031		0.243	0.126	0.145	J	0.223	0.119	0.135	J	0.274	0.082	0.039		0.024	0.027	0.04	U	0.304	0.088	0.046	
SED-EB07	9/29/2015	2	3		**1.028**	0.239	0.029		0.335	0.125	0.074		0.409	0.141	0.085	J	1.002	0.171	0.025		0.059	0.035	0.033		0.934	0.163	0.049	
SED-EB07	9/29/2015	3	4		**1.132**	0.222	0.019		0.297	0.097	0.049		0.612	0.148	0.056	J	0.279	0.104	0.086		0	0.042	0.095	UJ	0.377	0.121	0.086	
SED-EB07	9/29/2015	4	5		**1.174**	0.271	0.032		0.3	0.14	0.151	J	**0.831**	0.226	0.141	J	0.427	0.12	0.061		0.031	0.031	0.021		0.443	0.124	0.072	
SED-EB07	9/29/2015	5	6		**0.928**	0.262	0.104		0.446	0.175	0.118		**0.701**	0.224	0.131	J	0.332	0.085	0.029		-0.003	0.013	0.039	U	0.368	0.091	0.024	
SED-EB07	9/29/2015	6	7		0.716	0.182	0.042		0.327	0.117	0.072		0.467	0.157	0.147	J	0.388	0.085	0.035		0.013	0.022	0.039	U	0.257	0.071	0.058	
SED-EB07	9/29/2015	7	8		**1.504**	0.337	0.074		0.377	0.161	0.147		**1.029**	0.273	0.163	J	0.608	0.121	0.03		0.036	0.025	0.012		0.498	0.107	0.04	
SED-EB07	9/29/2015	8	9		**1.428**	0.308	0.069		0.295	0.144	0.166	J	**0.806**	0.23	0.18	J	0.913	0.209	0.088	J	0.03	0.041	0.067	UJ	0.852	0.199	0.078	J
SED-EB07	9/29/2015	9	10		**1.871**	0.357	0.056		0.508	0.158	0.087		**1.276**	0.274	0.084	J	**2.213**	0.374	0.108		0.076	0.062	0.081	UJ	**1.768**	0.318	0.121	
SED-EB08	9/29/2015	0	0.5		**0.809**	0.192	0.04	J	0.449	0.135	0.067		**0.748**	0.193	0.137	J	0.447	0.119	0.08		0.033	0.037	0.055	U	0.232	0.086	0.084	
SED-EB08	9/29/2015	0.5	1		0.311	0.107	0.055	J	0.324	0.108	0.061		0.248	0.095	0.068	J	0.317	0.082	0.044		0.009	0.025	0.049	U	0.243	0.071	0.049	
SED-EB08	9/29/2015	1	2		0.704	0.19	0.056	J	0.427	0.148	0.111		0.472	0.158	0.123	J	0.204	0.071	0.058		0.005	0.024	0.051	U	0.232	0.084	0.087	
SED-EB08	9/29/2015	2	3		0.52	0.136	0.042	J	0.303	0.108	0.1		0.128	0.081	0.109	J	0.429	0.107	0.061		0.036	0.032	0.039	U	0.394	0.104	0.074	
SED-EB08	9/29/2015	3	4		0.662	0.165	0.043	J	0.293	0.104	0.067		0.396	0.122	0.064	J	0.401	0.112	0.069		0.007	0.027	0.057	U	0.303	0.102	0.093	
SED-EB08	9/29/2015	4	5		**0.879**	0.2	0.054	J	0.449	0.133	0.072		0.569	0.154	0.08	J	0.266	0.071	0.032		0.022	0.022	0.03	U	0.292	0.076	0.037	
SED-EB08	9/29/2015	5	6		**0.873**	0.201	0.051	J	0.333	0.119	0.093		0.386	0.123	0.063	J	0.185	0.089	0.066	J	0.006	0.037	0.086	UJ	0.286	0.124	0.126	J
SED-EB08	9/29/2015	6	7		**0.764**	0.2	0.149	J	0.285	0.107	0.073		**0.722**	0.181	0.093	J	0.34	0.086	0.059		0.015	0.027	0.049	U	0.325	0.082	0.048	
SED-EB08	9/29/2015	7	8		**0.785**	0.19	0.095	J	0.339	0.115	0.073		0.465	0.135	0.066	J	0.38	0.208	0.2	J	-0.028	0.038	0.185	UJ	0.296	0.173	0.132	J
SED-EB08	9/29/2015	8	9		0.616	0.152	0.057	J	0.301	0.099	0.057		**0.67**	0.157	0.05	J	0.409	0.085	0.039		0.021	0.022	0.033	U	0.365	0.081	0.054	
SED-EB08	9/29/2015	9	10		**0.929**	0.201	0.077	J	0.377	0.116	0.071		**0.761**	0.174	0.067	J	0.371	0.093	0.06		0.039	0.033	0.044	U	0.334	0.089	0.065	

Notes:

All units in picoCurie per gram (pCi/g).
CSU (+/- s) = combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
U - not detected
J - estimated value
* Parent sample ID listed for duplicate samples.
Highlighted cell and bold format indicates that concentration exceeded screening criteria.

Table 4-17
Sewer Sediments Radiological Isotopic Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample ID	Sample Date	Thorium-228				Thorium-230				Thorium-232			
			Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Solids Screening Criteria											**1.220**			
Sewer Sediments														
I-2	SED-I2-BOTTOM	11/18/2015	1020.6	126.138	0.79	R	99.108	14.218	0.746	R	918.058	113.373	0.416	R
I-2	SED-I2-COATING	11/18/2015	546.4	69.723	0.94	R	59.025	9.895	1.131	R	548.093	69.447	1.183	R
I-7	SED-I7	11/18/2015	119.973	15.963	0.44	J	11.078	2.368	0.696	J	**105.597**	14.106	1.424	J

Notes:

All units in picoCurie per gram (pCi/g).
CSU (+/- s) = combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
J - estimated value
R - rejected
Highlighted cell and bold format indicates that concentration exceeded screening criteria.

Table 4-17
Sewer Sediments Radiological Isotopic Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample ID	Sample Date	Uranium-234				Uranium-235				Uranium-238			
			Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Solids Screening Criteria														
Sewer Sediments														
I-2	SED-I2-BOTTOM	11/18/2015	14.666	2.463	0.791	J	0.599	0.406	0.436		14.096	2.376	0.618	
I-2	SED-I2-COATING	11/18/2015	24.074	3.456	0.6	J	1.275	0.492	0.286		22.452	3.257	0.599	
I-7	SED-I7	11/18/2015	4.514	1.136	0.912		-0.129	0.408	0.874	UJ	2.397	0.913	1.1	

Notes:

All units in picoCurie per gram (pCi/g).
CSU (+/- s) = combined standard uncertainty (2 sigma)
MDA - minimum detectable activity
Q - qualifier
J - estimated value
R - rejected
Highlighted cell and bold format indicates that concentration excee

Table 4-18
Groundwater Radiological Gamma Spectroscopy Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Sample ID	Sample Date	Start Depth (feet)	End Depth (feet)	Depth Unit	Matrix	Sample Type	Parent Sample*	Potassium-40				Radium-226				Thorium-232			
									Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q	Result	CSU (+/-2 s)	MDA	Q
Groundwater Screening Criteria														**5.0**				**5.0**		
Groundwater Round 1																				
MW-01	MW-01-R1	12/10/2015	65	75	ft	WG	N		-37.608	1504.3	32.4	UJ	-12.207	46.562	55.9	UJ	1.342	5.562	10.1	UJ
MW-02	MW-02-R1	12/9/2015	65	75	ft	WG	N		-5.308	20.632	31.6	UJ	-11.472	34.599	57	UJ	1.761	5.963	10.7	UJ
MW-03	MW-03-R1	12/9/2015	65	75	ft	WG	N		10.342	21.476	29.2	UJ	-5.928	35.328	51.1	UJ	4.4	5.468	9.73	UJ
MW-03	MW-903-R1	12/9/2015	65	75	ft	WG	FD	MW-03-R1	35.406	22.922	28.9	J	-5.511	42.71	56.1	UJ	-0.195	5.768	10.2	UJ
MW-04	MW-04-R1	12/9/2015	65	75	ft	WG	N		33.66	21.462	27.1	J	17.369	44.788	57.2	UJ	-5.18	16.37	10.7	UJ
MW-05	MW-05-R1	12/9/2015	65	75	ft	WG	N		-28.385	36.131	41.3	UJ	-9.085	28.978	44.9	UJ	-0.518	5.582	7.95	UJ
Groundwater Round 2																				
MW-01	MW-01-R2	4/21/2016	65	75	ft	WG	N		28.61	19.215	25.8	J	0.652	33.436	51.1	UJ	-3.835	12.053	10.6	UJ
MW-02	MW-02-R2	4/21/2016	65	75	ft	WG	N		-13.788	37.2	34.8	UJ	1.405	41.491	56.6	UJ	5.947	4.48	10.7	UJ
MW-03	MW-03-R2	4/20/2016	65	75	ft	WG	N		-33.658	35.2	40.9	UJ	16.514	34.309	45.2	UJ	0.636	4.301	7.64	UJ
MW-04	MW-04-R2	4/21/2016	65	75	ft	WG	N		9.194	27.734	38.4	UJ	-17.007	43.694	43.8	UJ	3.554	7.63	8.71	UJ
MW-04	MW-904-R2	4/21/2016	65	75	ft	WG	FD	MW-04-R2	-58.72	46.367	41.2	UJ	3.266	24.9	45.3	UJ	0.739	4.639	8.17	UJ
MW-05	MW-05-R2	4/20/2016	65	75	ft	WG	N		10.705	19.5	28.4	UJ	-31.416	49.318	52.8	UJ	**10.988**	5.263	8.09	J
Groundwater Round 3																				
MW-01	MW-01-R3	11/17/2016	65	75	ft		N						0.053	0.148	0.283	U	2.544	0.989	1.12	
MW-02	MW-02-R3	11/17/2016	65	75	ft		N						0.269	0.191	0.244	J	-0.336	0.29	0.841	UJ
MW-02	MW-902-R3	11/17/2016	65	75	ft		FD	MW-02-R3					0.371	0.256	0.337	J	0.281	0.32	0.478	U
MW-03	MW-03-R3	11/17/2016	65	75	ft		N						0.297	0.204	0.248	J	-0.158	0.623	1.267	UJ
MW-05	MW-05-R3	11/17/2016	65	75	ft		N						0.115	0.194	0.338	U	-0.119	0.275	0.7	U
Groundwater Round 4																				
MW-01	MW-01-R4	4/13/2017	65	75	ft		N						0.313	0.156	0.154		-0.359	0.445	1.025	UJ
MW-02	MW-02-R4	4/12/2017	65	75	ft		N						0.235	0.136	0.15		-0.457	0.499	1.163	UJ
MW-02	MW-902-R4	4/12/2017	65	75	ft		FD	MW-02-R4					0.26	0.147	0.163		-0.392	0.363	0.951	UJ
MW-03	MW-03-R4	4/12/2017	65	75	ft		N						0.198	0.127	0.151		-0.192	0.219	0.689	U
MW-04	MW-04-R4	4/13/2017	65	75	ft		N						0.16	0.124	0.175	U	-0.035	0.068	0.384	U
MW-05	MW-05-R4	4/13/2017	65	75	ft		N						0.248	0.16	0.206		0.301	0.419	0.706	U
MW-06	MW-06-R4	4/13/2017	65	75	ft		N						0.274	0.152	0.18		0	0.197	0.488	U

Notes:

All units in picoCurie per gram (pCi/g).

CSU (+/- s) = combined standard uncertainty (2 sigma)

MDA - minimum detectable activity

Q - qualifier

U - not detected

J - estimated value

* Parent sample ID listed for duplicate samples.

Highlighted cell and bold format indicates that concentration exceeded screening criteria.

Table 4-19
Building Material Scan Data
Wolff-Alport Chemical Company Site
Ridgewood, NY

Sample ID	Comments/Location Description	Pre-Sampling Total	Removable (Wipe Samples)
		Alpha (dpm/100cm^2)	
CIND-01-LOT33	Cinder block from Lot 33	63	0
BRICK-02-LOT33	Brick from Lot 33	131	0
CONC-07-LOT42	In Primo Auto Body main shop (Lot 42)	575	2
CONC-08-LOT42	Concrete collected in Primo Auto main shop (Lot 42)	724	2
BRICK-09-LOT42	Brick collected in Primo Auto main shop (Lot 42) but underneath the overlying concrete	2,363	0
BRICK-06-LOT44	In Primo Auto Body auxillary shop (Lot 44). Brick from short brick wall in front of one of the arches	27,365	0
BRICK-03-LOT46	Brick In basement of deli (Lot 46)	10,376	0
WOOD-04-LOT46	Wood from basement of deli (Lot 46)	63	0
IBEAM-05-LOT46	Rusted steel from I-beam in basement of Jarabacoa Deli	59	0

Notes:

ID - identification

Table 4-20
Sewer Line Gamma Data Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Sewer Run (Manhole to Manhole Downstream)	Dates	Pipe Size (inch) and Material	Total Length between Manholes (feet)	Maximum Gamma Reading[1] (cpm)	Maximum Gamma Location[2]	Minimum Gamma Reading[1] (cpm)	Minimum Gamma Location[2]	Comments
C-1 to I-3	11/13/15	15" Clay	189	103,496	C1_DS_177	7,400	C1_DS_77	
C-2 to C-1	11/13/15	15" Clay	35	10,930	C1_US_2	3,300	C1_US_11	
C-3 to C-2	11/13/15	15" Clay	127	11,563	C2_US_87	4,700	C3_DS_7	
C-4 to C-3	11/13/15	15" Clay	136	6,262	C4_DS_97	3,700	C4_DS_136	
CO-2 to CO-1	11/23/15	15" di	178	1,800	CO2_DS_178	1,100	CO3_DS_130	
CO-3 to I-10	11/23/15	12" clay	37	4,700	CO3_DS_25	4,300	CO3_DS_10	
CO-4 to CO-3	11/23/15	12" clay	110	4,600	CO3_US_10	4,200	CO3_US_30	Run ended at 50 feet due to debris
D-1 to I-6	11/24/15	N/A	120	N/A	N/A	N/A	N/A	Sewer line full of water, likely due to a blockage. Could not perform survey.
H-1 to H-2	11/10/15	36" Concrete	156	28,000	H1_DS_97	5,000	H1_DS_107	
H-2 to H-3	11/17/15	36" concrete	429	8,000	H2_DS_168	1,500	H2_DS_157	Due to overall distance between H-2 and H-3 being over two times greater than the length of the 1x1 cable, there is a 67 feet length of sewer between the two manholes that could not be surveyed.
H-3 to W-1	11/17/15	36" concrete	68	69,000	H3_DS_17	28,000	H3_DS_37	
I-1 to I-2	11/16/15	12" Clay	N/A	386,598	I2_US_8	200,000	I2_US_5	Impassable debris in pipeline at 15 feet upstream from I-2 toward I-1. Manhole I-1 could not be located. May be paved over.
I-2 to I-3	11/16/15	12" Clay	20	N/A	N/A	N/A	N/A	There are two 12" clay pipelines between I-2 and I-3. Both are clogged with a greasy blockage.
I-3 to I-4	11/16/15	12" Clay	50	N/A	N/A	N/A	N/A	Could not perform downstream run from I-3 to I-4 due to hazardous location of I-3 in middle of busy intersection. Could not perform upstream run from I-4 to I-3 due to pipelines being full of water.
I-4 to I-5	11/16/15	24" Concrete	75	307,453	I5_US_12	120,000	I5_US_17	Unable to perform a downstream run from I-4 to I-5 due to pipeline at I-4 being full of water. Performed upstream run from I-5 to I-4, but encountered impassable debris at 21 feet.
I-5 to I-6	11/16/15	24" Concrete	130	184,733	I6_US_33	40,000	I6_US_52	Unable to perform a downstream run from I-5 to I-6 due to sediment build-up in sewer line. Performed upstream run from I-6 to I-5, but encountered impassable debris at 55 feet.
I-6 to I-7	11/16/15, 11/17/15	24" Concrete	129	125,908	I6_DS_67	10,000	I6_DS_75	Encountered impassable debris at 78 feet on downstream run from I-6 to I-7. Upstream run performed toward I-6 up to point of same debris.
I-7 to I-8	11/17/15	24" Concrete	130	190,390	I7_DS_50	38,000	I7_DS_17	
I-8 to I-9	11/9/15	24" Concrete	131	83,412	I9_US_39	28,000	I8_DS_7	Encountered impassable debris at 60 feet on downstream run from I-8 to I-9. Upstream run performed from I-9 to I-8 up to point of same debris.
I-9 to I-10	11/9/15	24" Concrete	130	121,000	I9_DS_47	13,000	I10_US_7	
I-10 to I-11	11/12/15	24" Concrete	130	77,000	I10_DS_45	12,000	I10_DS_57	
I-11 to I-12	11/17/15	24" Concrete	131	14,322	I12_US_94	3,000	I12_US_7	Due to difficulty accessing manhole I-11 for an extended period, data was collected by an upstream run from I-12 to I-11.
I-12 to I-13	11/10/15	36" Concrete	145	74,426	I12_DS_67	3,700	I13_US_19	
I-13 to H-1	11/10/15	36" Concrete	157	12,000	H1_US_0	2,000	I13_DS_77	
K-1 to K-2	11/5/15, 11/6/15	12" Clay	100	3,600	K2_US_2	1,600	K1_DS_77	
K-2 to K-3	11/6/15	12" Clay	100	4,600	K2_DS_39	3,700	K2_DS_77	
M-2 to M-3	11/5/15	10" Clay	132	6,013	M3_US_70	3,500	M2_DS_5	M2 is capped upstream at the invert. M-1 could not be located and is most likely paved over.
M-3 to M-4	11/5/15	12" Clay	151	5,500	M4_US_22	4,200	M3_DS_70	
M-4 to K-1	11/5/15	12" Clay	45	3,000	M4_DS_10	2,100	M4_DS_40	
S-1 to I-8	11/23/15	12" clay	125	4,500	I8_US_10	4,200	I8_US_20	Run ended at 37 feet due to debris
W-1 to W-2	11/17/15	48" concrete top and brick bottom	103	13,000	W1_DS_0	5,700	W1_DS_97	

Notes:

[1] Gamma readings taken with Ludlum 2221 Meter and Ludlum 44-2 Probe .

[2] Manhole ID_direction upstream (US) or downstream (DS)_distance (feet)

Acronyms:

bgs - below ground surface
cpm - counts per minute
DS - downstream
di - ductile iron
ID - identification
N/A - not applicable
US - upstream

Table 4-21
Sewer Manhole Data Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Manhole ID	Date	Depth (feet bgs)	Vault Material	Surface Exposure Rate[1] (µR/hr)	3 feet from Bottom Exposure Rate[1] (µR/hr)	Surface Gamma Reading[2] (cpm)	3 feet from Bottom Gamma Reading[2] (cpm)	Maximum Reading[2] (cpm)	Depth of Maximum (feet bgs)	Comments
C-1	11/13/15	9.7	Brick	8.8	N/A	2,696	7,574	7,574	6.7	
C-2	11/13/15	9.75	Brick	10	N/A	2,777	5,178	5,897	6	
C-3	11/13/15	9.75	Brick	11	N/A	2,296	4,985	4,985	8	
C-4	11/13/15	10.6	Brick	11.5	N/A	2,202	4,817	5,617	5.5	
CO-1	11/11/15	14.5	Concrete	8	N/A	1,898	2,330	2,330	11.5	
CO-2	11/23/15	10.8	Concrete	5.4	N/A	1,500	1,966	2,145	1.5	
CO-3	11/11/15	11.5	Brick	9.3	N/A	2,254	4,969	4,969	8.5	
H-1	11/10/15	16.7	Brick	10.5	N/A	2,100*	4,864	5,266	8	
H-2	11/17/15	18.3	Brick	18.5	N/A	1,360	6,429	25,296	18.3	Concrete invert
H-3	11/17/15	18	Brick	10	N/A	1,600	9,901	45,676	18	Brick invert
I-2	11/11/15	10	Brick	33	270	13,314	113,646	113,646	7	
I-3	11/11/15	10	Brick	40	N/A	13,567	160,977	164,987	7.5	
I-4	11/16/15	13.8	Brick	10	38	3,965	20,964	20,964	10.8	~ 2.5 feet of standing water in bottom. Two 10-inch incoming pipes are cast iron and eroded away on the bottom of each pipe.
I-5	11/16/15	13.1	Brick	39	310	9,578	193,333	482,397	13.1	Collected bag of fully saturated sediment. 342,585 cpm and 275 µR/hr on bag at street level. Not sampled, returned to manhole.
I-6	11/16/15	14.5	Brick	21	130	4,159	52,626	101,137	14.5	12-inch line flowing in from north Decatur St. ~600,000 cpm 3-inches above water in invert.
I-7	11/16/15	15.5	Brick	16	85	1,656	17,731	42,843	15.5	Counts are roughly double on the upstream side compared to downstream side. Counts highest on the inside floor of the upstream pipe.
I-8	11/9/15	17.5	Brick	22	50	1,700	14,878	14,878	14.5	Count rate gradually increases with depth. Counts are roughly double on the upstream side compared to downstream side. Counts highest on the inside floor of the upstream pipe.
I-9	11/9/15	16.7	Brick	15	N/A	1,400	7,964	7,964	13.7	Count rate gradually increases with depth
I-10	11/9/15	16.3	Brick	11	N/A	1,100	4,394	4,394	13.3	Count rate gradually increases with depth
I-11	11/19/15	16	Brick	8.1	N/A	2,777	16,540	69,884	16	Maximum reading taken on small sediment pile in invert
I-12	11/10/15	16	Brick	7.5	N/A	1,700	3,234	3,415	8	
I-13	11/10/15	17	Brick	5.7	N/A	2,500	4,420	5,491	6	
K-1	11/5/15	10.8	Brick	N/A	N/A	1,500	3,500	3,600	4	
K-2	11/5/15	11	Brick	5	N/A	1,700	4,300	4,300	8	
M-2	11/5/15	9	Brick	N/A	N/A	1,607	3,775	4,184	5.5	Upstream line capped at invert
M-3	11/5/15	9.5	Brick	N/A	N/A	2,057	4,686	4,590	4.5	
M-4	11/5/15	8.6	Brick	N/A	N/A	2,250	3,900	4,150	6	
W-1	11/19/15	18	Brick	7.6	N/A	2,007	9,196	11,714	18	Water covering invert
W-2	11/19/15	17.7	Brick	7.4	N/A	2,111	5,199	8,125	17.6	Brick invert

Notes:
[1]Dose rates taken with Ludlum Model 9DP. Dose rates were only taken 3 feet from the botton in manholes accessed for sewer material sampling.
[2]Gamma readings taken with Ludlum 2221 Meter and Ludlum 44-2 Probe. Readings are one minute counts unless otherwise noted.

Acronyms:
ID - identification
bgs - below ground surface
µR/hr - microrem per hour
cpm - counts per minute
N/A - not available

Table 4-22
Gamma Exposure Rate Locations and Results Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Northing	Easting	3 Feet Above Ground Reading (µR/hr)					Ground Reading (µR/hr)					Comments
			1	2	3	4	Average	1	2	3	4	Average	
1	191133.4	1011206.5	7.9	9.3	8.9	9.4	**8.9**	12.4	10.9	11.2	7.5	**10.5**	Confirmatory
2	190856.8	1010985.4	7.1	6.7	9.4	9.7	**8.2**	9.5	12.1	13.2	10.8	**11.4**	Confirmatory
3	190618.2	1010808.4	9.4	8.2	6.3	7.0	**7.7**	7.1	8.6	8.4	9.5	**8.4**	Confirmatory
4	190323.6	1010574.3	14.0	18.7	17.0	14.7	**16.1**	20.0	18.7	19.0	22.1	**20.0**	Confirmatory
5	191903.6	1011823.3	6.2	7.2	6.6	5.2	**6.3**	8.1	6.9	4.9	6.4	**6.6**	Confirmatory
6	190454.7	1010405.7	12.6	13.7	13.5	13.2	**13.3**	17.4	19.8	20.5	18.5	**19.1**	Confirmatory
7	190696.9	1010577.9	8.5	6.8	7.8	7.0	**7.5**	7.4	8.9	8.5	9.7	**8.6**	Confirmatory
8	190955.8	1010780.8	6.7	7.7	10.7	8.5	**8.4**	11.1	10.8	11.1	12.5	**11.4**	Confirmatory
9	191688.9	1011076.2	47.2	50.1	53.1	45.8	**49.1**	213.0	205.0	193.0	210.0	**205.3**	Confirmatory
10	190399.4	1009336.9	12.1	11.1	7.4	7.2	**9.5**	8.9	6.0	6.8	11.8	**8.4**	Confirmatory
11	191299.9	1010390.7	11.3	9.7	10.0	10.8	**10.5**	7.5	8.5	10.1	11.8	**9.5**	Confirmatory
12	192582.1	1011005.8	11.5	9.1	9.3	7.4	**9.3**	9.5	12.6	9.3	7.9	**9.8**	Confirmatory
13	192324.6	1010823.3	8.3	7.9	7.9	5.7	**7.5**	6.2	5.6	6.5	7.8	**6.5**	Confirmatory
14	192321.6	1010167.8	10.4	12.5	10.3	11.3	**11.1**	9.8	7.6	13.0	10.5	**10.2**	Confirmatory
15	190356.7	1010612.5	23.4	12.9	14.5	15.2	**16.5**	23.3	23.9	23.2	24.7	**23.8**	On sidewalk by SCSB-03 location
18	191398.1	1011468.2	10.1	10.6	9.4	12.0	**10.5**	11.1	9.4	7.2	7.1	**8.7**	Confirmatory
19	191414.2	1011370.9	33.0	34.3	35.0	34.1	**34.1**	73.5	84.6	75.4	71.7	**76.3**	Confirmatory
20	191458.2	1011293.6	30.6	36.6	36.2	34.2	**34.4**	148.0	143.0	128.0	156.0	**143.8**	Confirmatory
21	191567.4	1011237.9	8.7	9.1	7.9	7.3	**8.3**	11.2	11.5	11.2	13.3	**11.8**	Confirmatory
22	191591.9	1011203.3	8.7	9.8	14.5	12.9	**11.5**	9.9	12.0	10.7	7.2	**10.0**	Confirmatory
23	191680.0	1011406.9	18.3	19.9	21.1	23.3	**20.7**	28.2	36.8	30.9	27.5	**30.9**	Confirmatory
24	191504.2	1011476.6	7.4	6.6	8.4	8.8	**7.8**	8.5	8.5	9.6	6.8	**8.4**	Confirmatory
25	Deli First Floor	Front	12.3	11.2	10.6	10.4	**11.1**	11.4	11.8	10.5	9.5	**10.8**	Store front entrance
26	Deli First Floor	Back	8.1	6.7	8.5	8.4	**7.9**	7.4	6.8	13.6	10.6	**9.6**	Back of store
27	Deli Basement	Front	53.1	50.8	50.6	51.1	**51.4**	23.5	23.8	20.9	22.5	**22.7**	At SB-43 location
28	Deli Basement	Back	20.8	18.5	19.4	31.5	**22.6**	68.9	71.5	66.2	74.3	**70.2**	Middle of basement floor at wooden cover
29	191435.3	1011430.1	40.1	45.7	42.7	47.9	**44.1**	171.0	180.0	163.0	174.0	**172.0**	Against bulding where garage door meets brick wall
30	191464.6	1011367.0	125.0	117.0	116.0	112.0	**117.5**	397.0	385.0	383.0	376.0	**385.3**	Edge of sidewalk/street
31	191488.9	1011327.5	325.0	351.0	343.0	331.0	**337.5**	580.0	620.0	580.0	610.0	**597.5**	Asphalt street
32	191498.5	1011295.3	229.0	206.0	227.0	219.0	**220.3**	398.0	387.0	382.0	399.0	**391.5**	Middle of street (Irving Ave.)
33	191522.1	1011285.1	129.0	133.0	140.0	115.0	**129.3**	208.0	177.0	215.0	173.0	**193.3**	Asphalt street in front of Lot 44
34	191541.8	1011283.3	16.2	17.6	19.6	15.8	**17.3**	14.2	11.2	9.5	13.1	**12.0**	Sidewalk just past where lead shielding ends
35	191503.0	1011330.4	19.4	22.7	23.8	20.1	**21.5**	18.0	16.1	18.6	15.0	**16.9**	Sidewalk on lead shielding
36	191481.1	1011367.0	61.0	71.8	66.5	63.1	**65.6**	124.0	125.0	130.0	118.0	**124.3**	Sidewalk just past where lead shielding ends
SB-50	191399.5	1011416.9	64.4	70.5	69.4	60.7	**66.3**	--	--	--	--	--	
SB-51	191271.5	1011344.6	48.8	46.1	46.5	46.6	**47.0**	--	--	--	--	--	
SB-52	191222.4	1011270.2	21.3	23.2	21.4	24	**22.5**	--	--	--	--	--	

Table 4-22
Gamma Exposure Rate Locations and Results Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Northing	Easting	3 Feet Above Ground Reading (µR/hr)					Ground Reading (µR/hr)					Comments
			1	2	3	4	Average	1	2	3	4	Average	
SB-53	191051.9	1011140.9	15.5	16	16.1	13.6	**15.3**	--	--	--	--	--	
SB-54	190945.6	1011094.2	16.3	12.9	13.2	14.6	**14.3**	--	--	--	--	--	
SB-55	190933.8	1011039.2	11.2	8.4	10.3	9.4	**9.8**	--	--	--	--	--	
37	Lot 42	TerraNova	35.6	36.4	37.5	41.4	**37.7**	--	--	--	--	--	At sink/laundry station
38	Lot 42	TerraNova	18.1	16.7	14.2	13.7	**15.7**	--	--	--	--	--	
39	Lot 42	TerraNova	22.6	28.5	23.5	27.4	**25.5**	--	--	--	--	--	
40	Lot 42	TerraNova	16.3	22.1	24	20.8	**20.8**	--	--	--	--	--	
41	Lot 42	TerraNova	34	39.1	29.4	27.2	**32.4**	--	--	--	--	--	In office space
42	Lot 33	Room 33-4	28	29.8	27.6	26.7	**28.0**	--	--	--	--	--	
43	Lot 33	Room 33-4	28.5	29.6	30.6	22	**27.7**	--	--	--	--	--	
44	Lot 33	Room 33-4	17.2	17.9	19	16.7	**17.7**	--	--	--	--	--	
45	Lot 33	Room 33-4	14.3	14.6	11.6	12.5	**13.3**	--	--	--	--	--	
46	Lot 33	Room 33-4	15.3	22.4	21.1	19.2	**19.5**	--	--	--	--	--	
47	Lot 33	Room 33-3	22	21.4	20.8	20.6	**21.2**	--	--	--	--	--	
48	Lot 33	Room 33-3	9.9	10	12.8	16.3	**12.3**	--	--	--	--	--	
49	Lot 33	Room 33-3	18.1	19.3	19.7	19.3	**19.1**	--	--	--	--	--	
50	Lot 33	Room 33-3	16.8	16	11.8	15.1	**14.9**	--	--	--	--	--	
51	Lot 33	Room 33-3	12.7	14.5	17.2	16.9	**15.3**	--	--	--	--	--	
52	Lot 33	Room 33-2	13.3	8.7	10	10.4	**10.6**	--	--	--	--	--	
53	Lot 33	Room 33-2	20.7	19.9	21	23.4	**21.3**	--	--	--	--	--	
54	Lot 33	Room 33-1	50	45.3	45	58.2	**49.6**	--	--	--	--	--	SB-44 boring location
55	Lot 33	Room 33-1	22.4	23.7	28.1	25.5	**24.9**	--	--	--	--	--	
56	Lot 33	Room 33-1	19.9	16.5	17.8	15.5	**17.4**	--	--	--	--	--	
57	Lot 33	Room 33-1	15.6	12.7	14.3	16.6	**14.8**	--	--	--	--	--	
58	Lot 33	Room 33-1	9	8.4	10	9.7	**9.3**	--	--	--	--	--	
59	Lot 33	Room 33-1	13.7	13.7	16.1	21.2	**16.2**	--	--	--	--	--	
60	Lot 33	Room 33-1	20.4	13	18.9	16.3	**17.2**	--	--	--	--	--	
61	Lot 33	Room 33-1	15.2	14.5	11.5	10.8	**13.0**	--	--	--	--	--	
62	Lot 33	Room 33-1	12.3	10.2	14.8	9.6	**11.7**	--	--	--	--	--	
63	Lot 33	Room 33-1	37.3	41.1	35.8	35.5	**37.4**	--	--	--	--	--	
64	Lot 44	Primo Autobody	17.7	16.9	20	19.4	**18.5**	--	--	--	--	--	
65	Lot 44	Primo Autobody	45.9	33.9	45.7	43.9	**42.4**	--	--	--	--	--	
66	Lot 44	Primo Autobody	37	45.1	43.4	38.5	**41.0**	--	--	--	--	--	Car lift station
67	Lot 44	Primo Autobody	26.7	29.4	28.5	25.9	**27.6**	--	--	--	--	--	
68	Lot 44	Primo Autobody	16.1	16.8	16.7	20.7	**17.6**	--	--	--	--	--	
69	Lot 42	Primo Autobody	29.9	30.5	27.6	29.3	**29.3**	38.3	36	34.3	41.6	**37.6**	Break area bench
70	Lot 42	Primo Autobody	26.3	26.6	24.6	28.4	**26.5**	24	23.2	23.6	21.7	**23.1**	Car lift station

Table 4-22
Gamma Exposure Rate Locations and Results Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Northing	Easting	3 Feet Above Ground Reading (µR/hr)					Ground Reading (µR/hr)					Comments
			1	2	3	4	Average	1	2	3	4	Average	
71	Lot 42	Primo Autobody	22.3	18.2	19.3	19.6	**19.9**	18.6	20.1	18.6	23	**20.1**	Car lift station
72	Lot 42	Primo Autobody	44.4	41.1	42.4	39	**41.7**	71	68	69.8	64.7	**68.4**	Hot spot just beyond where lead ends
73	Lot 42	Primo Autobody	20.4	27.4	20.3	22.4	**22.6**	29.7	34.6	39.9	29.7	**33.5**	Paint shop station
74	Lot 42	Primo Autobody	10.3	9.1	13.8	12.4	**11.4**	16.9	15.7	14.3	11.4	**14.6**	Storage area
75	Lot 46	Primo Flat Fix	7.9	9.7	7	7.7	**8.1**	--	--	--	--	--	Shop doorway
76	Lot 46	Primo Flat Fix	7.9	8.8	7.2	12	**9.0**	--	--	--	--	--	Tire changing station
77	Lot 46	Primo Flat Fix	11.4	13	12.9	12.6	**12.5**	18.1	17.1	16.4	18.4	**17.5**	Office doorway
78	Lot 48	K&M Auto	20.4	18.3	18.8	19.5	**19.3**	--	--	--	--	--	Car lift station
79	Lot 48	K&M Auto	24.7	21	22.3	22.4	**22.6**	51.4	49.7	47.7	52.1	**50.2**	Hotspot
80	Lot 48	K&M Auto	14.1	12.2	10.7	10.3	**11.8**	--	--	--	--	--	Office
81	School	Basement	6.3	6.2	6.0	--	**6.2**	--	--	--	--	--	Location B1
82	School	Basement	6.5	5.7	7.0	--	**6.4**	--	--	--	--	--	Location B3
83	School	Basement	7.3	6.4	6.1	--	**6.6**	--	--	--	--	--	Location B5
84	School	Basement	5.3	5.3	5.2	--	**5.3**	--	--	--	--	--	Location B7/B9
85	School	Basement	11.5	6.6	4.2	--	**7.4**	--	--	--	--	--	Location B11
86	School	Basement	7.2	8.2	7.0	--	**7.5**	--	--	--	--	--	Location B13
87	School	Basement	6.0	8.8	5.7	--	**6.8**	--	--	--	--	--	Location B15
88	School	Basement	6.7	8.3	7.7	--	**7.6**	--	--	--	--	--	Location B17
89	School	Basement	7.4	6.2	7.7	--	**7.1**	--	--	--	--	--	Location B19
90	School	Basement	5.3	6.0	5.4	--	**5.6**	--	--	--	--	--	End room
91	School	Basement	8.5	7.4	7.2	--	**7.7**	--	--	--	--	--	Hallway
92	School	Basement	7.4	5.8	6.4	--	**6.5**	--	--	--	--	--	Hallway
93	School	Basement	6.5	6.0	5.2	--	**5.9**	--	--	--	--	--	Hallway
94	School	Basement	6.1	7.1	7.0	--	**6.7**	--	--	--	--	--	Location B4
95	School	Basement	6.5	7.6	5.4	--	**6.5**	--	--	--	--	--	Boiler Room
96	School	Basement	4.6	4.8	5.3	--	**4.9**	--	--	--	--	--	Boiler Room
97	School	Basement	7.3	10.8	6.1	--	**8.1**	--	--	--	--	--	Boiler Room
98	School	Basement	6.3	7.5	6.4	--	**6.7**	--	--	--	--	--	Oil Tank Room
106	190628.1	1010698.5	6.2	6.7	5.9	--	**6.3**	--	--	--	--	--	School Courtyard - North
107	190644.8	1010675.7	5.8	9.8	7.8	--	**7.8**	--	--	--	--	--	School Courtyard - North
108	190661.2	1010652.4	9.2	6.4	8.2	--	**7.9**	--	--	--	--	--	School Courtyard - North
109	190636.9	1010633.4	7.3	5.1	8.8	--	**7.1**	--	--	--	--	--	School Courtyard - North
110	190617.9	1010654.5	8.5	8.3	6.0	--	**7.6**	--	--	--	--	--	School Courtyard - North
111	190598.1	1010684.5	6.6	7.3	7.1	--	**7.0**	--	--	--	--	--	School Courtyard - North
112	190594.6	1010664.7	8.1	9.1	7.4	--	**8.2**	--	--	--	--	--	School Courtyard - North
113	190603.8	1010649.1	8.5	8.2	8.3	--	**8.3**	--	--	--	--	--	School Courtyard - North
114	190617.7	1010623.2	7.0	7.1	8.1	--	**7.4**	--	--	--	--	--	School Courtyard - North

Table 4-22
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Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Northing	Easting	3 Feet Above Ground Reading (µR/hr)					Ground Reading (µR/hr)					Comments
			1	2	3	4	Average	1	2	3	4	Average	
115	190525.6	1010552.1	5.8	5.7	8.1	--	**6.5**	--	--	--	--	--	School Courtyard - South
116	190500.6	1010582.7	7.5	6.2	7.1	--	**6.9**	--	--	--	--	--	School Courtyard - South
117	190471.9	1010570.8	7.2	5.9	9.0	--	**7.4**	--	--	--	--	--	School Courtyard - South
118	190487.7	1010550.3	9.0	9.3	9.9	--	**9.4**	--	--	--	--	--	School Courtyard - South
119	190505.3	1010523.9	5.7	8.3	10.1	--	**8.0**	--	--	--	--	--	School Courtyard - South
120	190474.6	1010519.1	7.5	8.3	5.9	--	**7.2**	--	--	--	--	--	School Courtyard - South
121	190453.0	1010549.2	8.6	7.7	8.4	--	**8.2**	--	--	--	--	--	School Courtyard - South
122	190439.9	1010630.6	8.3	9.5	11.6	--	**9.8**	--	--	--	--	--	School Kindergarten Play Area
123	190424.7	1010637.1	6.4	6.4	7.0	--	**6.6**	--	--	--	--	--	School Kindergarten Play Area
124	190416.6	1010594.5	10.3	7.8	9.9	--	**9.3**	--	--	--	--	--	School Kindergarten Play Area
125	190390.7	1010613.1	9.4	7.7	11.1	--	**9.4**	--	--	--	--	--	School Kindergarten Play Area
126	190498.4	1010460.9	6.6	7.0	9.3	--	**7.6**	--	--	--	--	--	School South Garden Area
127	190460.4	1010437.8	9.1	9.2	10.5	--	**9.6**	--	--	--	--	--	School South Garden Area
128	190436.0	1010456.5	10.3	8.8	9.0	--	**9.4**	--	--	--	--	--	School South Garden Area
129	190409.5	1010477.6	10.6	10.0	12.9	--	**11.2**	--	--	--	--	--	School South Garden Area
130	190401.9	1010506.9	10.6	9.1	10.3	--	**10.0**	--	--	--	--	--	School South Garden Area
131	190388.5	1010532.4	11.2	8.9	11.5	--	**10.5**	--	--	--	--	--	School South Garden Area
132	190370.2	1010557.6	9.2	8.1	8.8	--	**8.7**	--	--	--	--	--	School South Garden Area
133	190350.5	1010577.7	8.5	6.8	8.3	--	**7.9**	--	--	--	--	--	School South Garden Area
134	190376.4	1010594.4	8.4	10.5	10.2	--	**9.7**	--	--	--	--	--	School South Garden Area
135	190400.6	1010568.1	10.0	9.2	8.2	--	**9.1**	--	--	--	--	--	School South Garden Area
136	190793.5	1010691.0	6.2	7.9	6.6	--	**6.9**	--	--	--	--	--	School North Play Area
137	190776.6	1010713.6	7.5	7.7	12.1	--	**9.1**	--	--	--	--	--	School North Play Area
138	190756.8	1010738.0	6.7	8.5	6.9	--	**7.4**	--	--	--	--	--	School North Play Area
139	190737.4	1010761.9	7.1	7.6	8.0	--	**7.6**	--	--	--	--	--	School North Play Area
140	190712.6	1010790.9	7.6	5.9	5.1	--	**6.2**	--	--	--	--	--	School North Play Area
141	190695.8	1010817.3	10.1	9.6	6.4	--	**8.7**	--	--	--	--	--	School North Play Area
142	190723.8	1010830.4	6.1	8.7	6.5	--	**7.1**	--	--	--	--	--	School North Play Area
143	190741.9	1010808.1	7.2	6.5	6.6	--	**6.8**	--	--	--	--	--	School North Play Area
144	190760.4	1010785.0	6.8	5.8	6.5	--	**6.4**	--	--	--	--	--	School North Play Area
145	190778.6	1010760.4	8.0	6.7	7.7	--	**7.5**	--	--	--	--	--	School North Play Area
146	190798.4	1010733.7	9.4	5.9	7.4	--	**7.6**	--	--	--	--	--	School North Play Area
147	190815.9	1010711.0	7.6	7.5	8.4	--	**7.8**	--	--	--	--	--	School North Play Area
148	190843.8	1010734.4	7.3	9.6	8.6	--	**8.5**	--	--	--	--	--	School North Play Area
149	190822.8	1010758.7	7.9	11.5	6.5	--	**8.6**	--	--	--	--	--	School North Play Area
150	190805.6	1010784.8	6.4	7.3	7.9	--	**7.2**	--	--	--	--	--	School North Play Area
151	190786.3	1010808.9	7.1	9.7	8.7	--	**8.5**	--	--	--	--	--	School North Play Area

Table 4-22
Gamma Exposure Rate Locations and Results Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Northing	Easting	3 Feet Above Ground Reading (µR/hr)					Ground Reading (µR/hr)					Comments
			1	2	3	4	Average	1	2	3	4	Average	
152	190767.2	1010833.0	8.8	9.2	6.5	--	**8.2**	--	--	--	--	--	School North Play Area
153	190749.6	1010861.9	8.5	9.1	7.3	--	**8.3**	--	--	--	--	--	School North Play Area
154	190765.8	1010871.8	8.1	6.2	7.6	--	**7.3**	--	--	--	--	--	School North Play Area
155	190791.8	1010849.6	7.6	7.6	7.9	--	**7.7**	--	--	--	--	--	School North Play Area
156	190811.6	1010824.9	8.3	6.4	9.1	--	**7.9**	--	--	--	--	--	School North Play Area
157	190833.1	1010798.0	7.6	6.3	6.9	--	**6.9**	--	--	--	--	--	School North Play Area
158	190852.9	1010773.3	8.1	7.1	8.5	--	**7.9**	--	--	--	--	--	School North Play Area
159	190870.5	1010753.7	6.6	8.1	8.5	--	**7.7**	--	--	--	--	--	School North Play Area
160	190898.6	1010777.6	8.6	6.0	7.2	--	**7.3**	--	--	--	--	--	School North Play Area
161	190879.6	1010796.2	8.4	9.3	7.5	--	**8.4**	--	--	--	--	--	School North Play Area
162	190859.5	1010821.1	7.3	7.6	7.9	--	**7.6**	--	--	--	--	--	School North Play Area
163	190839.3	1010848.3	7.5	7.3	7.0	--	**7.3**	--	--	--	--	--	School North Play Area
164	190818.6	1010873.8	9.0	6.5	7.3	--	**7.6**	--	--	--	--	--	School North Play Area
165	190798.6	1010893.4	7.8	7.9	7.7	--	**7.8**	--	--	--	--	--	School North Play Area
166	190845.1	1010887.5	6.6	11.4	7.8	--	**8.6**	--	--	--	--	--	School North Play Area
167	190867.8	1010863.8	6.9	11.6	9.9	--	**9.5**	--	--	--	--	--	School North Play Area
168	190886.7	1010836.8	9.4	6.6	7.4	--	**7.8**	--	--	--	--	--	School North Play Area
169	190903.9	1010810.0	7.0	6.8	6.3	--	**6.7**	--	--	--	--	--	School North Play Area
170	190921.7	1010789.9	9.6	9.8	7.2	--	**8.9**	--	--	--	--	--	School North Play Area
171	190836.6	1010921.5	12.2	11.3	9.6		**11.0**	--	--	--	--	--	School North Play Area
99	Daycare	Basement	13.6	13.1	13.8	12.1	**13.2**	--	--	--	--	--	Storage Room
100	Daycare	Basement	13.5	14.5	10.4	14.9	**13.3**	--	--	--	--	--	Storage Room
101	Daycare	Basement	11.7	11.9	10.5	14.7	**12.2**	--	--	--	--	--	Men's Restroom
102	Daycare	Basement	10.9	11.7	12.6	10.4	**11.4**	--	--	--	--	--	Women's Restroom
103	Daycare	Basement	10.2	12.8	8.7	8.9	**10.2**	--	--	--	--	--	Boiler Room
104	Daycare	Basement	12.1	11.7	12.2	12.5	**12.1**	--	--	--	--	--	Storage Room
105	Daycare	Basement	11.6	16.4	11.2	12.3	**12.9**	--	--	--	--	--	Storage Room
106	Daycare	Basement	9.4	10.9	14.2	11.6	**11.5**	--	--	--	--	--	Hallway
172	190447.4	1010763.9	8.1	8.6	11.3	8.5	**9.1**	--	--	--	--	--	Daycare Exterior Play Area
173	190422.3	1010743.6	7.7	11.8	9.5	8.7	**9.4**	--	--	--	--	--	Daycare Exterior Play Area
174	190396.0	1010723.3	12.3	12.3	9.8	12.6	**11.8**	--	--	--	--	--	Daycare Exterior Play Area
175	190377.4	1010736.8	10.1	10.3	11.3	9.2	**10.2**	--	--	--	--	--	Daycare Exterior Play Area
176	190397.2	1010752.1	9.5	10.0	10.2	9.1	**9.7**	--	--	--	--	--	Daycare Exterior Play Area
177	190418.0	1010767.6	13.2	11.1	11.1	10.8	**11.6**	--	--	--	--	--	Daycare Exterior Play Area
178	190440.3	1010782.9	9.1	9.8	14.6	12.9	**11.6**	--	--	--	--	--	Daycare Exterior Play Area
179	190428.0	1010799.4	6.1	8.1	10.2	7.8	**8.1**	--	--	--	--	--	Daycare Exterior Play Area
180	190407.2	1010784.6	8.9	8.6	8.3	9.9	**8.9**	--	--	--	--	--	Daycare Exterior Play Area

Table 4-22
Gamma Exposure Rate Locations and Results Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Northing	Easting	3 Feet Above Ground Reading (µR/hr)					Ground Reading (µR/hr)					Comments
			1	2	3	4	Average	1	2	3	4	Average	
181	190390.8	1010774.6	11.5	7.4	10.5	13.0	**10.6**	--	--	--	--	--	Daycare Exterior Play Area
182	190370.4	1010760.8	10.2	11.2	10.2	9.0	**10.2**	--	--	--	--	--	Daycare Exterior Play Area
183	190354.8	1010778.4	10.4	9.5	10.0	7.6	**9.4**	--	--	--	--	--	Daycare Exterior Play Area
184	190380.3	1010799.6	9.6	10.0	10.3	12.7	**10.7**	--	--	--	--	--	Daycare Exterior Play Area
185	190405.2	1010820.5	9.6	8.6	10.9	11.2	**10.1**	--	--	--	--	--	Daycare Exterior Play Area

Notes:
µR/hr - microRem per hour
-- - data was not collected

Table 4-23
Short-term Radon Sample Location and Results Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Canister Number	First Floor Room No.	Start Date	Start Time	End Date	End Time	Radon Results (pCi/L)	Error (pCi/L)	Comments
Audrey Johnson Daycare Center								
2425085	6	10/9/2015	15:35	10/13/2015	6:46	0.4	± 0.2	
2425088	7	10/9/2015	15:36	10/13/2015	6:45	0.4	± 0.2	
2425093	5	10/9/2015	15:40	10/13/2015	6:48	0.3	± 0.2	
2425126	Teachers Ed.	10/9/2015	15:40	10/13/2015	6:52	0.4	± 0.2	
2425141	Mult. Purp. Room	10/9/2015	15:39	10/13/2015	6:47	0.2	± 0.2	
2425147	Mult. Purp. Room	10/9/2015	15:39	10/13/2015	6:47	0.3	± 0.2	Field Duplicate
2425153	8	10/9/2015	15:42	10/13/2015	6:49	0.4	± 0.2	
2425172	Asst. Dir. Office	10/9/2015	15:53	10/13/2015	6:50	0.2	± 0.2	
2425178	3	10/9/2015	15:45	10/13/2015	6:59	0.5	± 0.2	
2425180	3	10/9/2015	15:45	10/13/2015	6:59	0.3	± 0.2	Field Duplicate
2425182	4	10/9/2015	15:50	10/13/2015	6:58	0.7	± 0.2	
2425990	Play Room #2	10/9/2015	15:47	10/13/2015	6:57	0.5	± 0.2	
2426000	9	10/9/2015	15:49	10/13/2015	6:57	0.6	± 0.2	
2426018	2	10/9/2015	15:44	10/13/2015	6:56	0.4	± 0.2	
2426020	Board of Dir.	10/9/2015	15:45	10/13/2015	6:54	0.4	± 0.2	
2426022	1	10/9/2015	15:46	10/13/2015	6:55	0.5	± 0.2	
2426028	Comp. Library	10/9/2015	15:51	10/13/2015	7:00	0.4	± 0.2	
PS/IS 384 - Frances E. Carter School								
2425079	126	10/9/2015	19:29	10/12/2015	18:56	0.1	± 0.3	
2425080	101B	10/9/2015	19:38	10/12/2015	18:17	0.1	± 0.8	
2425086	165	10/9/2015	19:13	10/12/2015	18:31	0.2	± 0.2	
2425091	116B	10/9/2015	19:30	10/12/2015	18:35	0.1	± 0.2	
2425092	161	10/9/2015	19:10	10/12/2015	18:29	0.2	± 0.2	
2425103	121	10/9/2015	19:18	10/12/2015	18:41	0.2	± 0.2	
2425121	102	10/9/2015	19:09	10/12/2015	18:26	0.2	± 0.3	

Table 4-23
Short-term Radon Sample Location and Results Summary
Wolff-Alport Chemical Company Site
Ridgewood, NY

Canister Number	First Floor Room No.	Start Date	Start Time	End Date	End Time	Radon Results (pCi/L)	Error (pCi/L)	Comments
2425122	130	10/9/2015	19:12	10/12/2015	18:52	0.1	± 0.2	Location A
2425155	130	10/9/2015	19:12	10/12/2015	18:52	0.1	± 0.2	Field Duplicate of 2425122
2425127	169	10/9/2015	19:16	10/12/2015	18:32	0.3	± 0.3	
2425139	101C	10/9/2015	19:38	10/12/2015	18:18	0.3	± 0.3	
2425145	112A	10/9/2015	19:25	10/12/2015	18:46	0.2	0.3	
2425148	167	10/9/2015	19:15	10/12/2015	18:31	0.1	± 0.6	
2426023	167	10/9/2015	19:15	10/12/2015	18:31	0.2	± 0.3	Field Duplicate of 2425148
2425150	115	10/9/2015	19:17	10/12/2015	18:33	0.1	± 0.2	
2425151	114	10/9/2015	19:31	10/12/2015	18:45	0.1	± 0.5	
2425152	157	10/9/2015	19:07	10/12/2015	18:25	0.3	± 0.2	
2425154	149	10/9/2015	19:40	10/12/2015	18:14	0.1	± 0.2	
2425156	130	10/9/2015	19:30	10/12/2015	18:53	0.1	± 0.5	Location B
2425160	122	10/9/2015	19:21	10/12/2015	18:40	0.1	± 0.2	
2425165	123	10/9/2015	19:20	10/12/2015	18:43	0.1	± 0.4	
2425176	119	10/9/2015	19:30	10/12/2015	18:37	0.3	± 0.3	
2425177	101A	10/9/2015	19:38	10/12/2015	18:16	0.1	± 0.6	
2425986	150	10/9/2015	19:13	10/12/2015	18:23	0.4	± 0.3	
2425992	103	10/9/2015	19:37	10/12/2015	18:19	0.1	± 0.4	
2425995	112B	10/9/2015	19:35	10/12/2015	18:46	0.1	± 0.5	
2425998	111	10/9/2015	19:32	10/12/2015	18:50	0.1	± 0.5	
2426003	130	10/9/2015	19:35	10/12/2015	18:54	0.1	± 0.6	Blank
2426010	105	10/9/2015	19:37	10/12/2015	18:20	0.2	± 0.2	
2426012	163	10/9/2015	19:11	10/12/2015	18:30	0.3	± 0.3	
2426025	101	10/9/2015	19:06	10/12/2015	18:24	0.3	± 0.3	
2426029	104	10/9/2015	19:36	10/12/2015	18:21	0.1	± 0.6	

Acronyms:

pCi/L - picocuries per liter

Table 4-24
Six-Month Radon and Thoron Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Detector Number	Detector Type	Room Number	Description of Sample Location	Sample Type	Lab Reported Radon Concentration (pCi/L)		Calculated Thoron Concentration (pCi/L)	
					Results	Uncertainty (±1S)	Results	Uncertainty (±1S)
5510784	DRNT	B-Hallway	School basement hallway	N	**1.3**	0.07	-0.2	0.10
5506549	DRN				1.1	0.07		
5510783	DRNT	B-Hallway	School basement hallway	FD	1.2	0.07	0.2	0.10
5506526	DRN				**1.4**	0.07		
5508077	DRNT	B-7	School basement room B-7	N	**1.3**	0.07	-0.1	0.10
5510264	DRN				1.2	0.07		
5508096	DRNT	105	School first floor room 105	N	0.2	0.02	0	0.03
5506582	DRN				0.2	0.02		
5508090	DRNT	101A	School first floor room 101A	N	0.2	0.02	0	0.03
5510266	DRN				0.2	0.02		
5510780	DRNT	169	School first floor room 169	N	0.2	0.02	0.1	0.04
5510265	DRN				0.3	0.03		

Notes:

DRN - standard radon detector

DRNT - radon detector fitted with thoron filter

N - normal sample

FD - field duplicate

pCi/L - picoCuries per liter

1S - one standard deviation

Thoron Results = DRN - DRNT

Thoron Uncertainty = Square Root ((DRN)^2 + (DRNT)^2)

Highlighted cell and bold format indicates concentration exceeds the screening criteria.

Table 4-25
One Year Radon and Thoron Results
Wolff-Alport Chemical Company Site
Ridgewood, NY

Detector Number	Detector Type	Room Number	Description of Sample Location	Sample Type	Lab Reported Radon Concentration (pCi/L)		Calculated Thoron Concentration (pCi/L)	
					Results	Uncertainty (±1S)	Results	Uncertainty (±1S)
5508081	DRNT	B-Hallway	School basement hallway	N	1	0.05	0	0.07
5506548	DRN				1	0.05		
5508079	DRNT	B-Hallway	School basement hallway	FD	1	0.04	-0.2	0.06
5506556	DRN				0.8	0.04		
5508083	DRNT	B-7	School basement room B-7	N	1.2	0.05	-0.1	0.07
5510268	DRN				1.1	0.05		
5508084	DRNT	105	School first floor room 105	N	0.1	0.01	0	0.01
5506564	DRN				0.1	0.01		
5508069	DRNT	101A	School first floor room 101A	N	0.1	0.01	0	0.01
5506571	DRN				0.1	0.01		
5510782	DRNT	169	School first floor room 169	N	0.1	0.01	0.1	0.01
5510267	DRN				0.2	0.01		

Notes:

DRN - standard radon detector

DRNT - radon detector fitted with thoron filter

N - normal sample

FD - field duplicate

pCi/L - picoCuries per liter

1S - one standard deviation

Thoron Results = DRN - DRNT

Thoron Uncertainty = Square Root ((DRN)^2 + (DRNT)^2)

Table 4-26
Radon and Thoron Measurements - 2017
Wolff-Alport Chemical Company Site
Ridgewood, NY

Location	Radon (pCi/L)	Thoron (pCi/L)	Test Duration (minutes)
School Basement/Crawlspace			
Crawlspace Ambient Air	0.659 ± 0.09	0.659 ± 0.1.3	16
SCSB-11	3.41 ± 1.8	0.00 ± 0.0	33
SCSB-12	1.30 ± 0.6	0.157 ± 0.31	93
SCSB-13	2.99 ± 1.8	0.282 ± 1.6	33
SCSB-14	10.9 ± 3.0	3.19 ± 2.8	35
SCSB-15	1.30 ± 1.3	1.62 ± 2.2	33
Daycare Basement			
SCSB-16	0.394 ± 1	3.56 ± 2.9	34
SCSB-17	0.646 ± 1.0	3.22 ± 2.8	32
Daycare - Thoron Test Mode		0.236 ± 0.036	5 days, 3 hours, 49 minutes
Daycare - Radon Test Mode	0.265 ± 0.023		6 days, 15 hours, 54 minutes

Notes:

The radon test mode is not optimized for thoron which requires a Drystik lab drying unit to keep the humidity from the larger amount of air pulled into the detector during thoron test mode from overwhelming the limited capacity of the dessicant in the Durridge RAD-7. As such, the thoron results are not presented for equipment in radon test mode and the radon results are not presented equipment in thoron test mode.

Table 5-1
Thorium, Uranium, and Radium – Physical and Chemical Properties
Wolff-Alport Chemical Company Site
Ridgewood, NY

Property	Thorium (Th)	Radium (Ra)	Uranium (U)	Source
Molecular weight	232.04	226.03	238.0289	a
Color	Gray	Silver-white	Silvery-white	a
Physical state	Solid	Solid	Solid	a
Solubility in water	Insoluble	Decays	Insoluble	a
Solubility in other	Soluble in HCl, H_2SO_4, slightly soluble in HNO_3	Decays in acids	Soluble in concentrated acids	a
Site-specific Partition coefficient (K_d) – assuming neutral pH (5-8 pH) at the site	1,700 – 300,000	18 – 1,742 *	0.4 – 1,000,000	b/c/d
Site-specific Partition coefficient (K_d) – assuming acidic pH (<3 pH) at the site in areas of process liquor disposal	62 – 6,200	Not available	<1 - 32	b

Source –

a) ATSDR Toxicological profiles

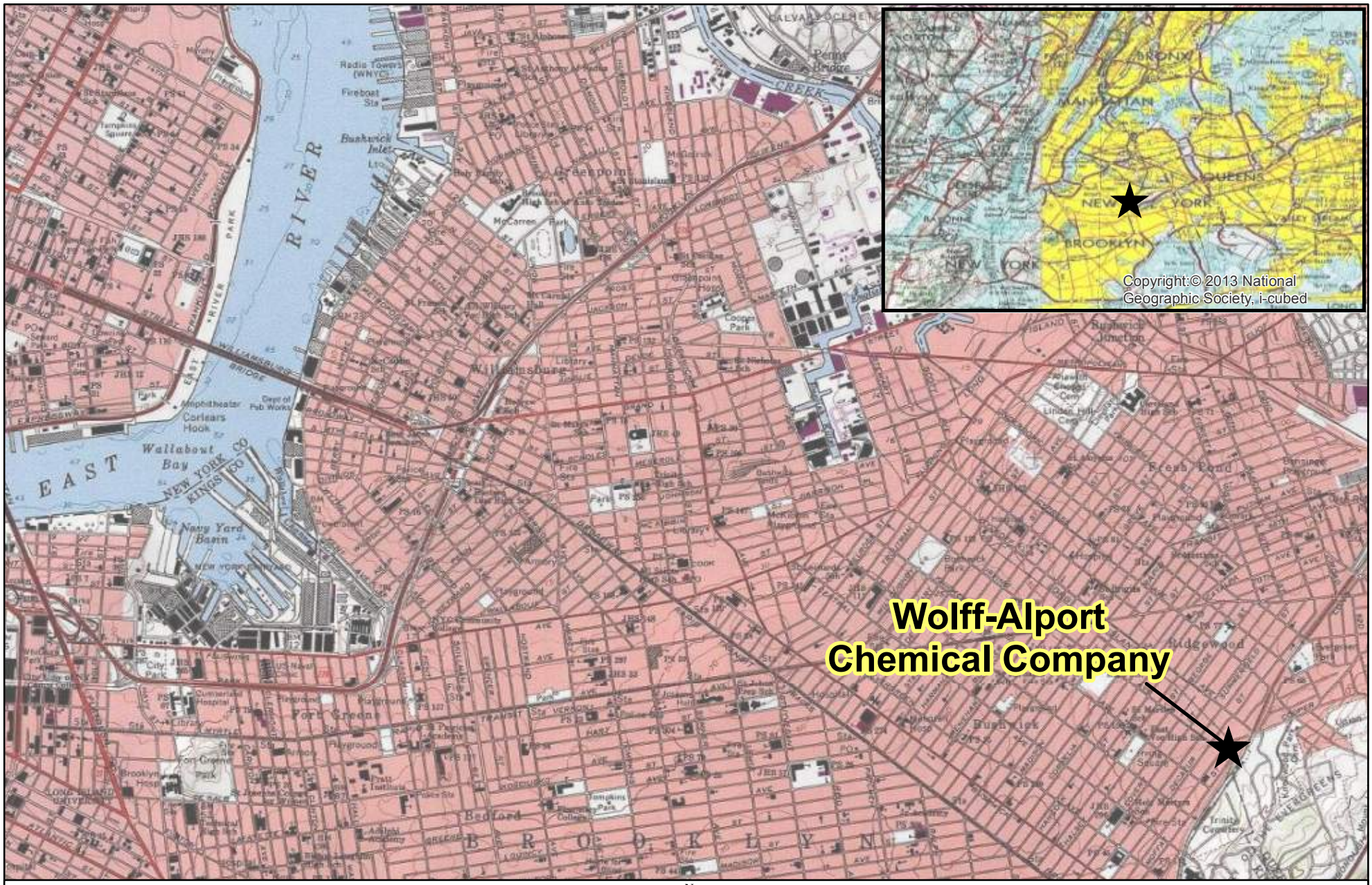
b) EPA. 1999.

c) EPA. 2004.

c) Benes et al. 1984; Valentine et al. 1987.

* Range based on K_d values for sand.

Figures



N
W E
S

0 0.25 0.5 1 Miles

Figure 1-1
Site Location Map
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

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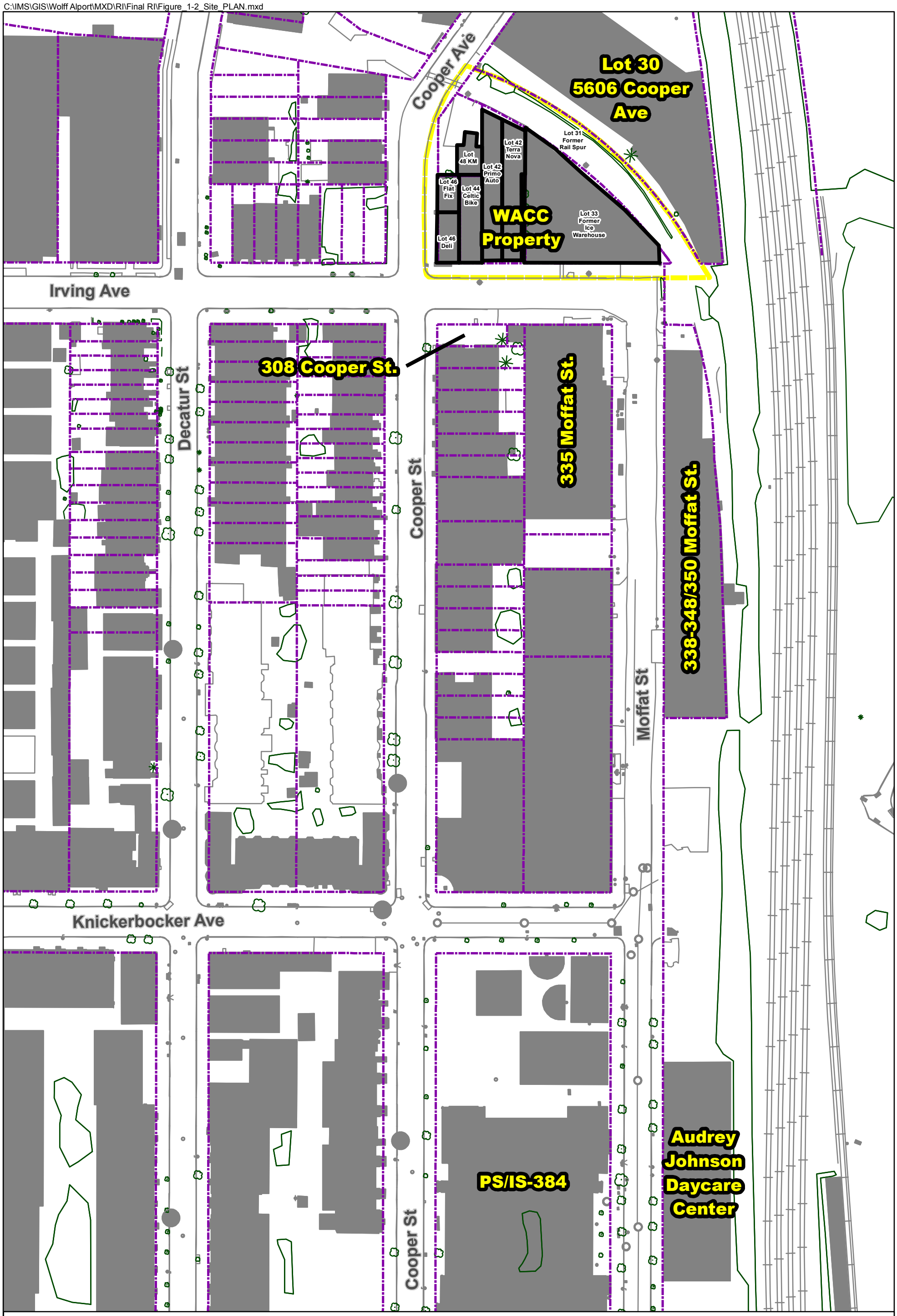
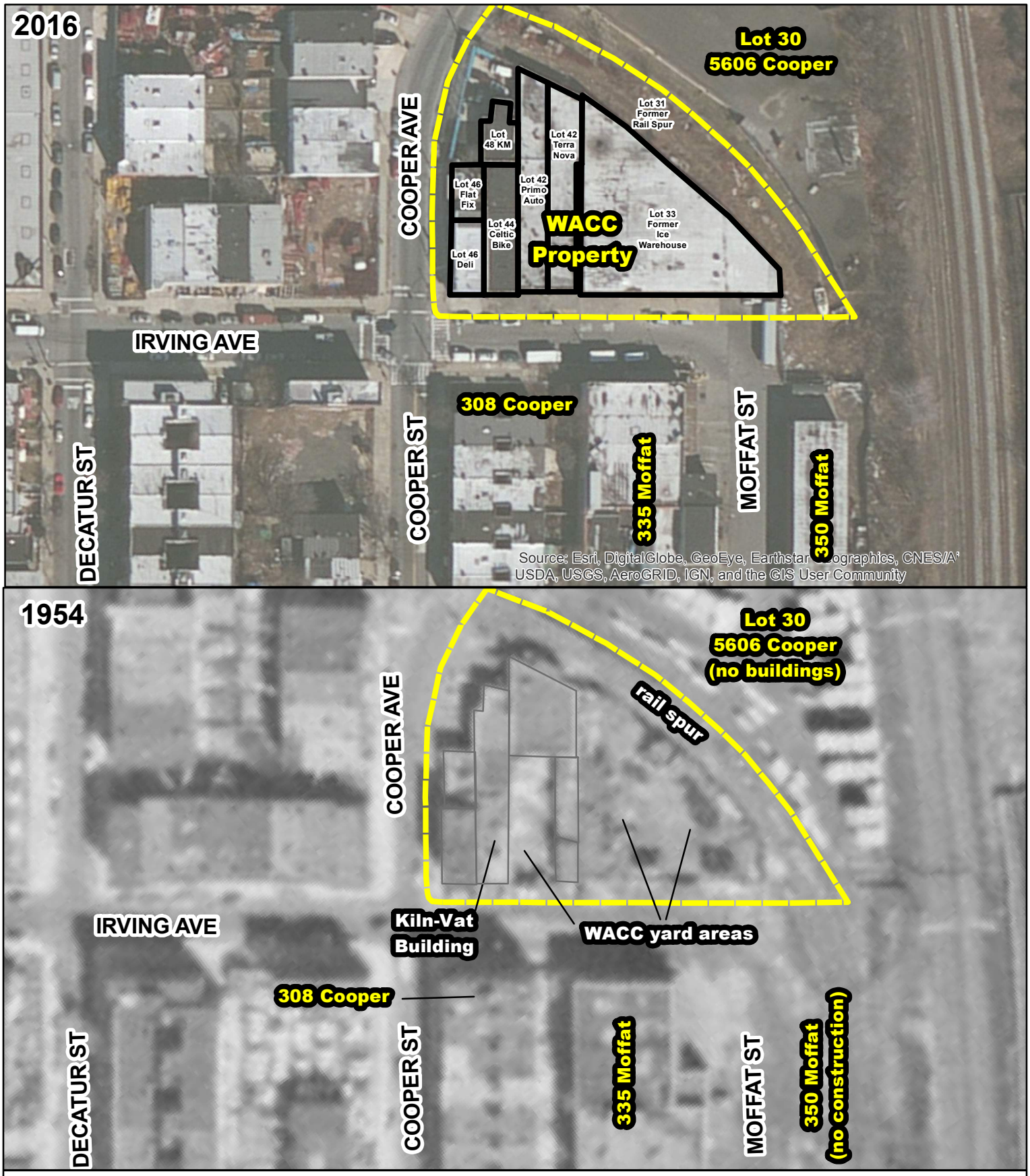


Figure 1-2
Site Plan
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York



WACC Property

WACC Lot Boundaries

Property Lines

Acronyms

WACC - Wolff-Alport Chemical Company

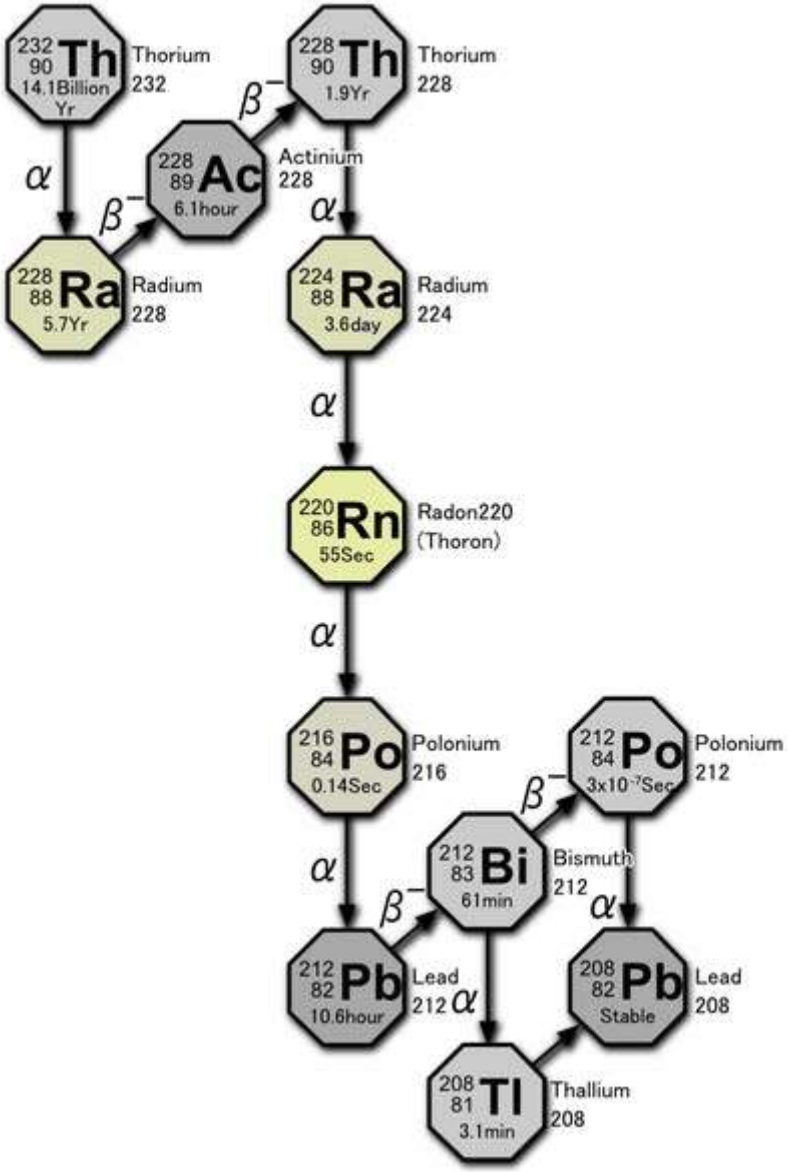
N E S W

0 50 100 200 Feet

Figure 1-3
1954 Aerial
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

Thorium-232 Decay Chain



Uranium-238 Decay Chain

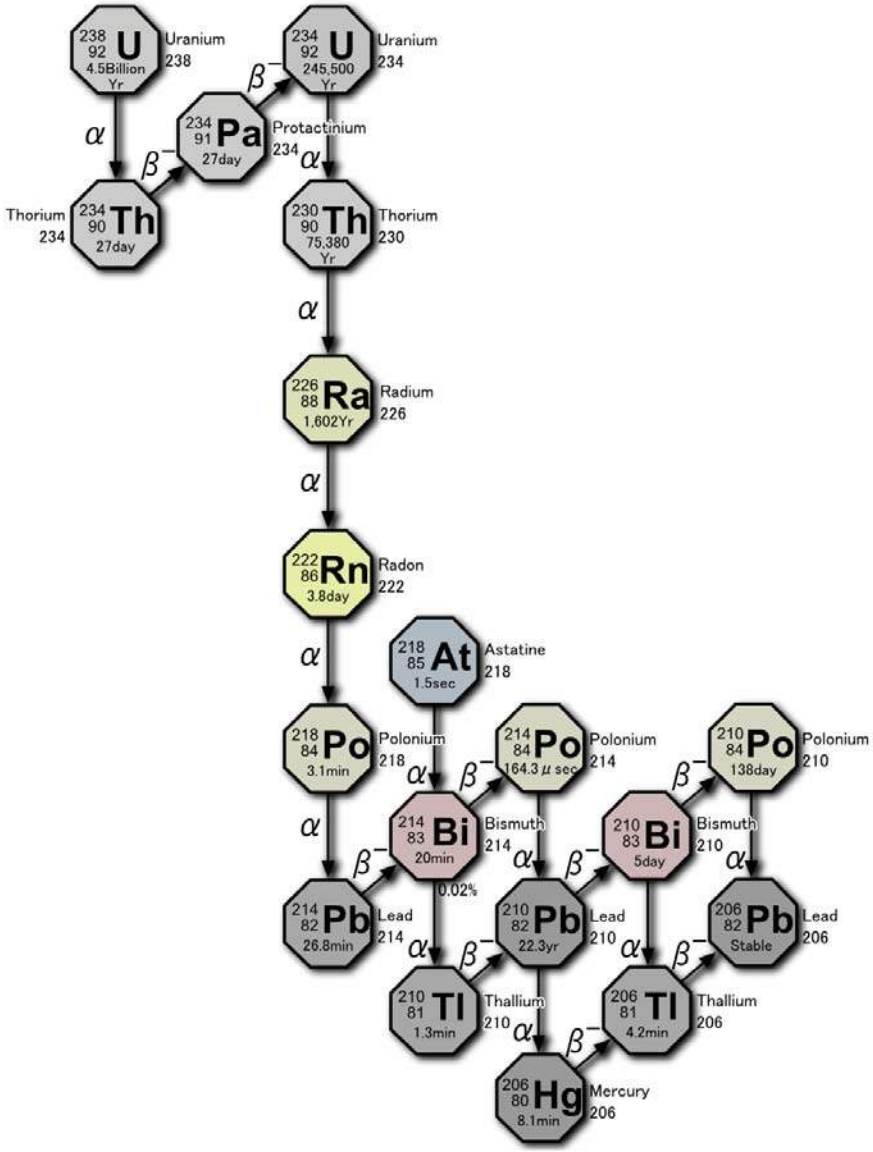


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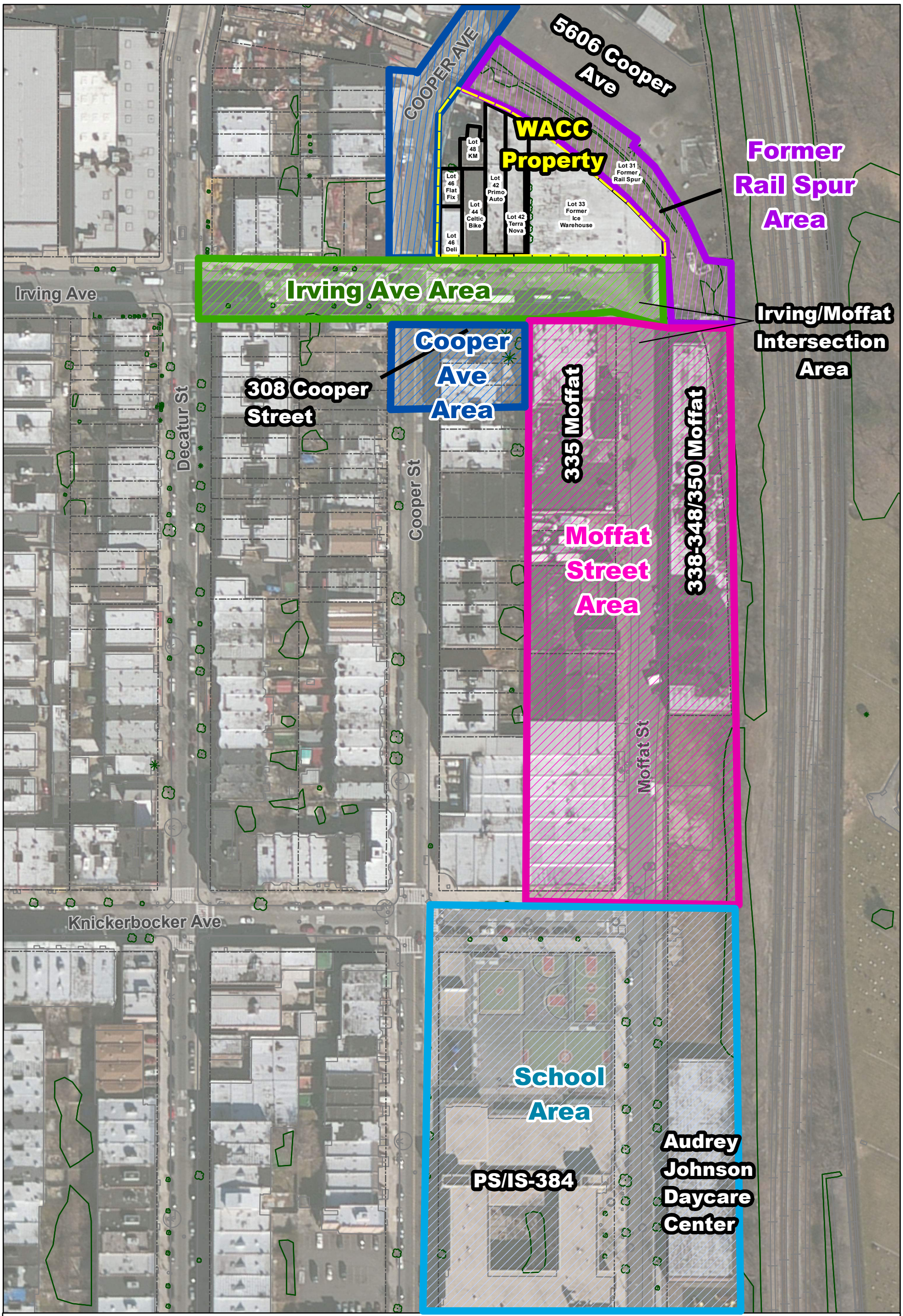
Figure 1-4
Decay Chains for Thorium-232 and Uranium-238
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York



WACC Property
WACC Lot Boundaries
Vegetation
Property Lines

Acronyms
PS/IS - Public School/ Intermediate School
WACC - Wolff-Alport Chemical Company

N E S W

0 50 100 200 Feet

Figure 2-1
Site Areas
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

Background Soil Boring Location

Wolff-Alport Chemical Company Property

N E S W

0 300 600 1,200 Feet

Figure 2-2
Background Soil Boring Locations
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

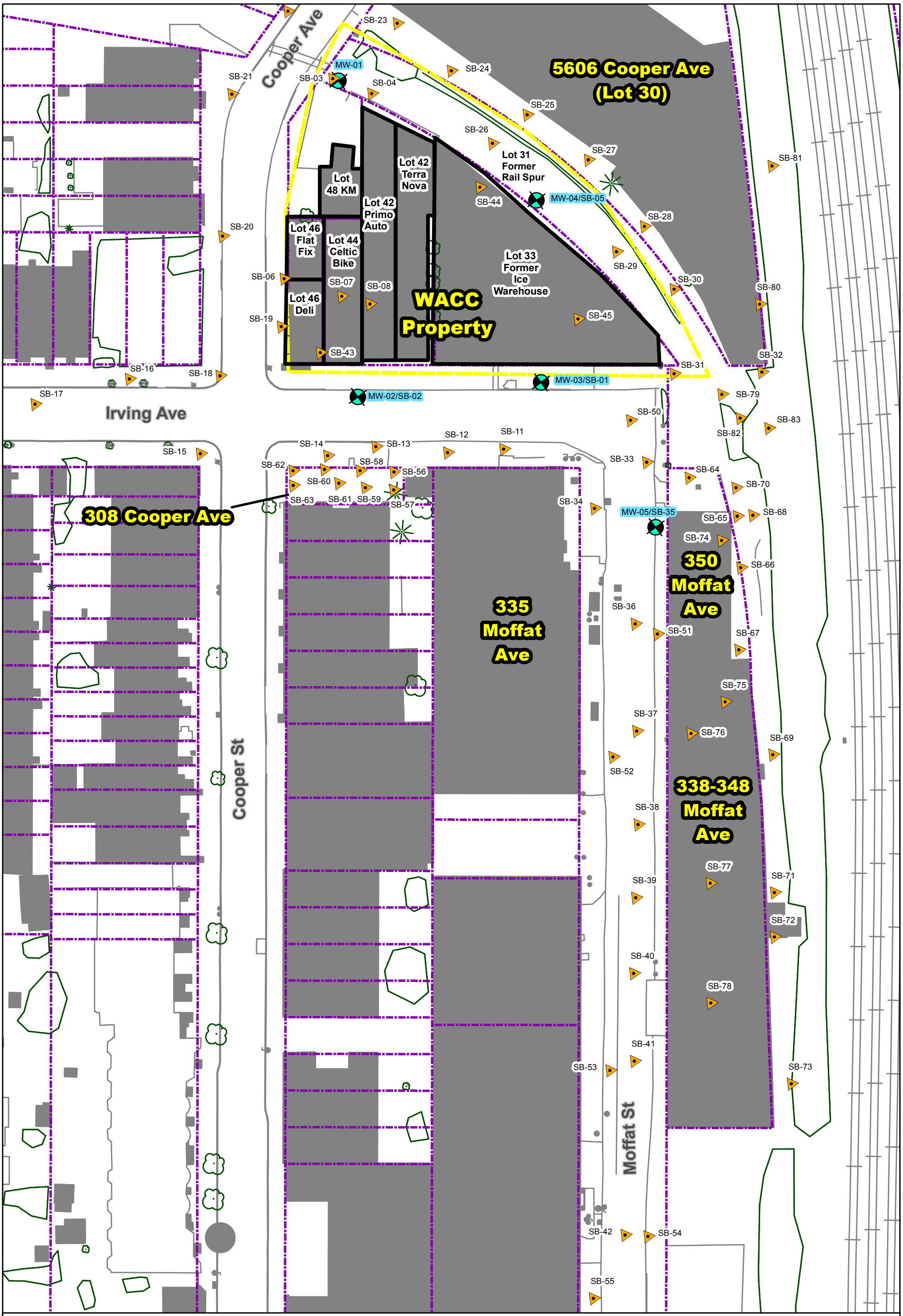
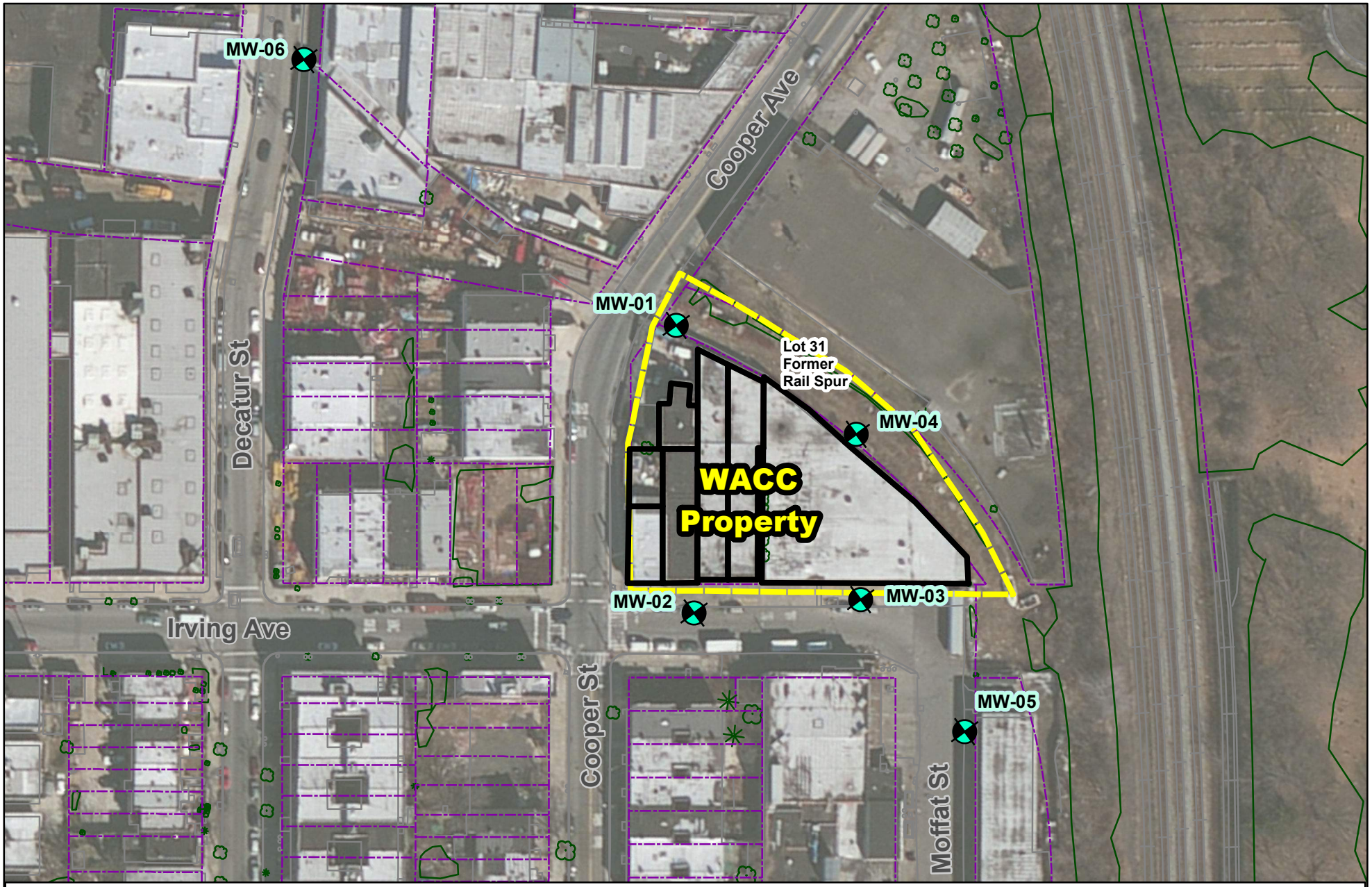


Figure 2-3
Soil Boring Locations
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York



RI Sampling Locations

Monitoring Wells

WACC Property

WACC Lot Boundaries

Vegetation

Property Lines

Acronyms

WACC - Wolff-Alport Chemical Corporaion

N E S W

0 50 100 200 Feet

Figure 2-4
Monitoring Well Locations
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

RI Sewer Investigation

- Sewer Soil Boring Location
- Primary Survey Area
- Upstream Sewer Lines
- Background Sewer Lines
- Combined Storm Sewer (approx.)
- Unknown Sewer (approx.)
- Primary Manholes (fibrescope)
- Secondary Upstream Manholes
- Background Manholes
- Manhole not Found (buried)
- WACC Lot Boundaries
- Buildings
- Vegetation
- Property Lines

Notes

1. During times of sewer overflow the combined sewer system discharges to Newtown Creek about 2 miles northwest of the WACC property.

Acronyms

PS/IS - Public School/ Intermediate School
WACC - Wolff-Alport Chemical Company

N E S W

0 125 250 500 Feet

Figure 2-5
Sewer Investigation Locations
Wolf-Allport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

Document Path: C:\IMS\GIS\Wolff Alport\MXD\RI\Final RI\Figure_2-5_SewerInvest_Final.mxd

C:\IMS\GIS\Wolff Alport\MXD\RI\Final RI\Figure_2-6_Sediment Sample Locations.mxd

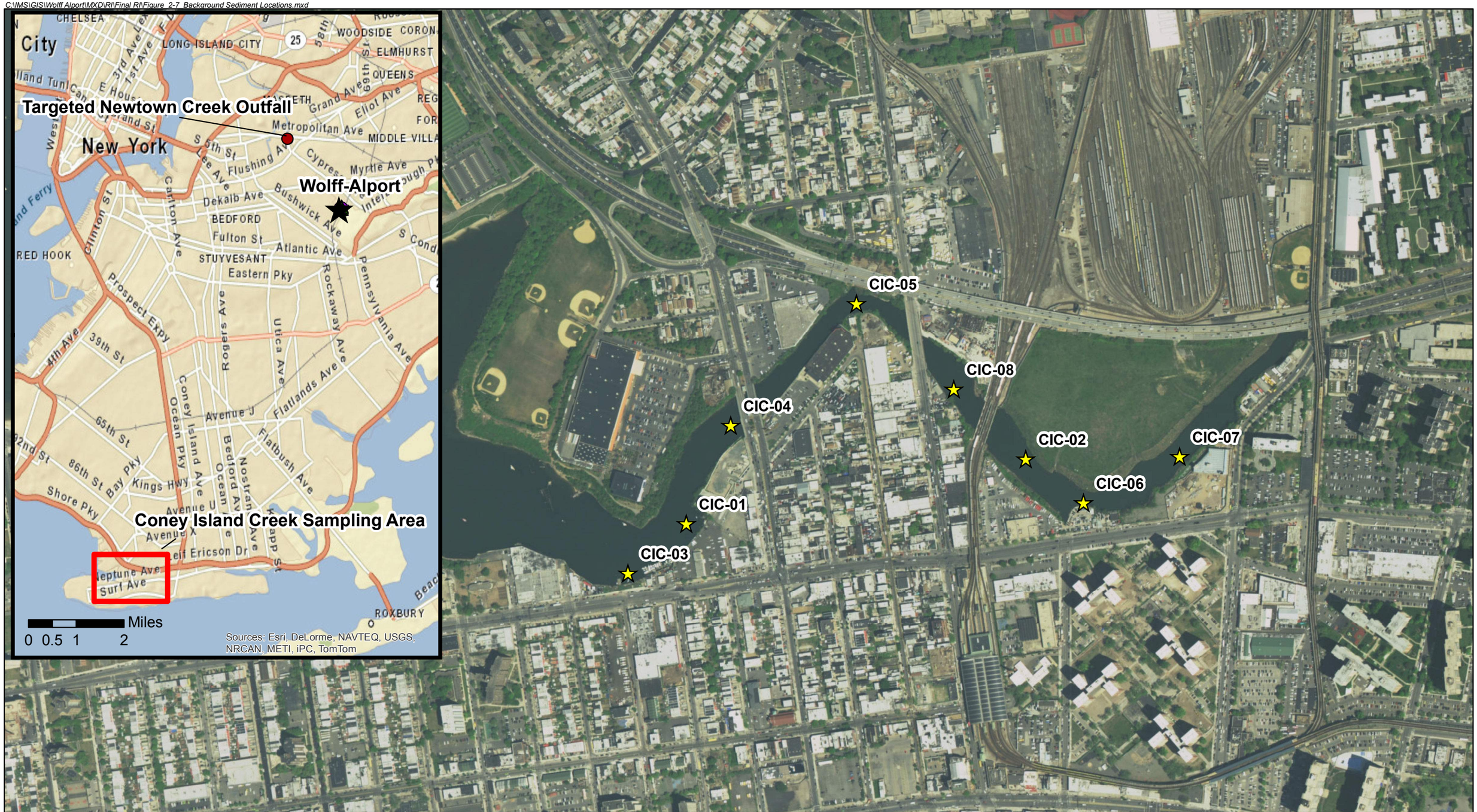
Sediment Core Location

Approximate Combined Sewer Overflow Discharge Location (Morgan Avenue Interceptor East)

Figure 2-6
Sediment Sampling Locations
Newtown Creek - East Branch
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

C:\IMS\GIS\Wolff Alport\MXD\RI\Final RI\Figure 2-7 Background Sediment Locations.mxd

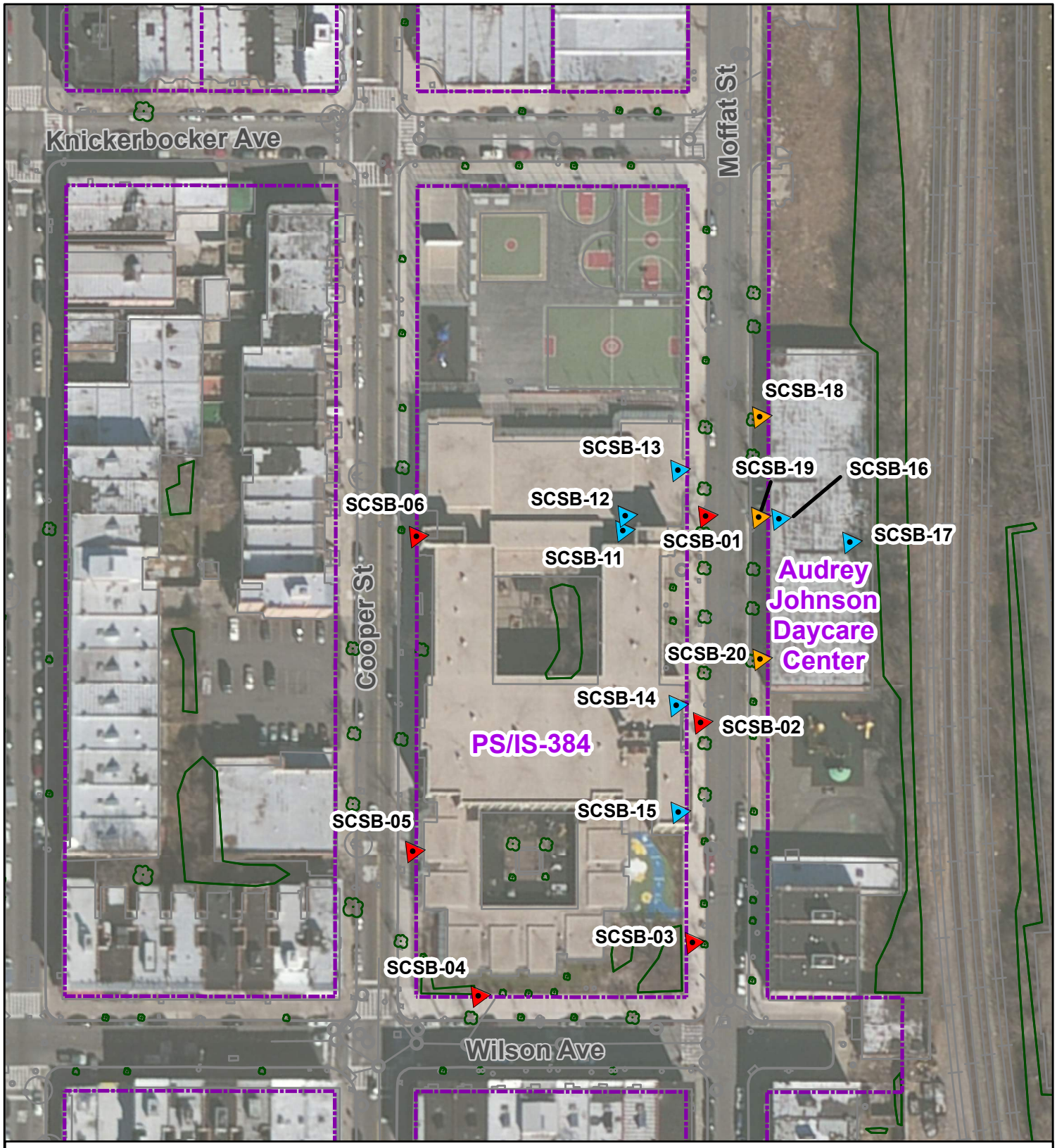


Legend

Background Sediment Core Location

Figure 2-7
Background Sediment Sampling Locations
Coney Island Creek
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Exterior Soil Boring Location (2016)

Exterior Soil Boring Location (2017)

Basement Soil Boring Location (2017)

Vegetation

Property Lines

Acronyms

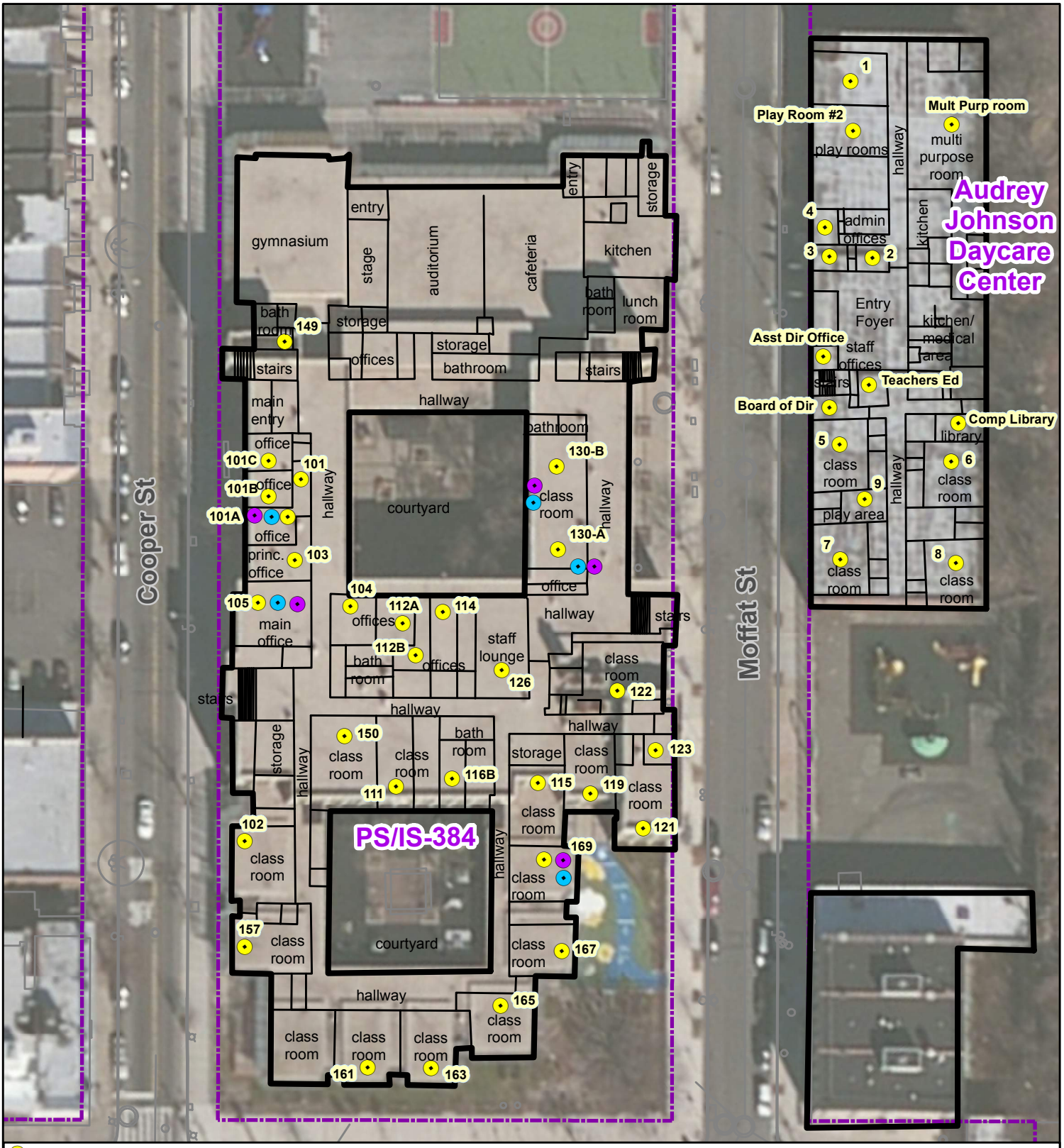
PS/IS - Public School/ Intermediate School

N E S W

0 50 100 200 Feet

Figure 2-8
School and Daycare Investigation
Soil Boring Locations
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Short-Term Radon Sampling Location

6-Month Radon and Thoron Sampling Location

12-Month Radon and Thoron Sampling Location

Property Lines

Notes

1. Short-term samples were collected using charcoal canisters.
2. Long-term radon samples were collected with alpha track detectors (ATDs). Radon results reported here are those from a ATD fitted with a thoron filter. Thoron results reported are calculated based on the radon concentrations from detectors with and without the thoron filter.

Acronyms

PS/IS - Public School/ Intermediate School

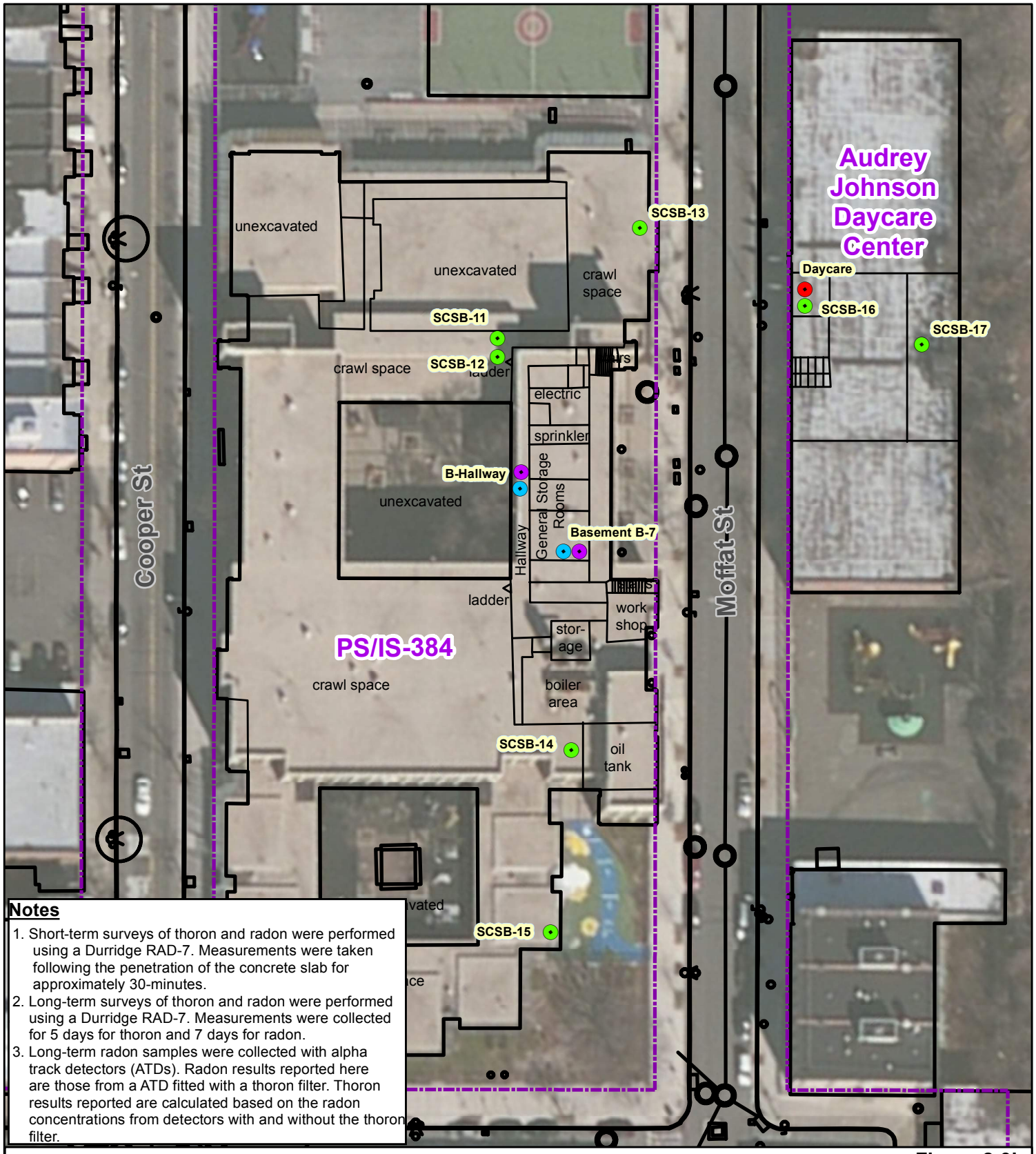
N E S W

Feet

0 30 60 120

Figure 2-9a
School and Daycare Investigation
1st Floor Air Sampling Locations
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Notes

1. Short-term surveys of thoron and radon were performed using a Durridge RAD-7. Measurements were taken following the penetration of the concrete slab for approximately 30-minutes.
2. Long-term surveys of thoron and radon were performed using a Durridge RAD-7. Measurements were collected for 5 days for thoron and 7 days for radon.
3. Long-term radon samples were collected with alpha track detectors (ATDs). Radon results reported here are those from a ATD fitted with a thoron filter. Thoron results reported are calculated based on the radon concentrations from detectors with and without the thoron filter.

- RAD-7 Survey Location (Short-Term)
- RAD-7 Survey Location (Long-Term)
- 6-Month Radon and Thoron Sampling Location
- 12-Month Radon and Thoron Sampling Location
- Property Lines

Acronyms

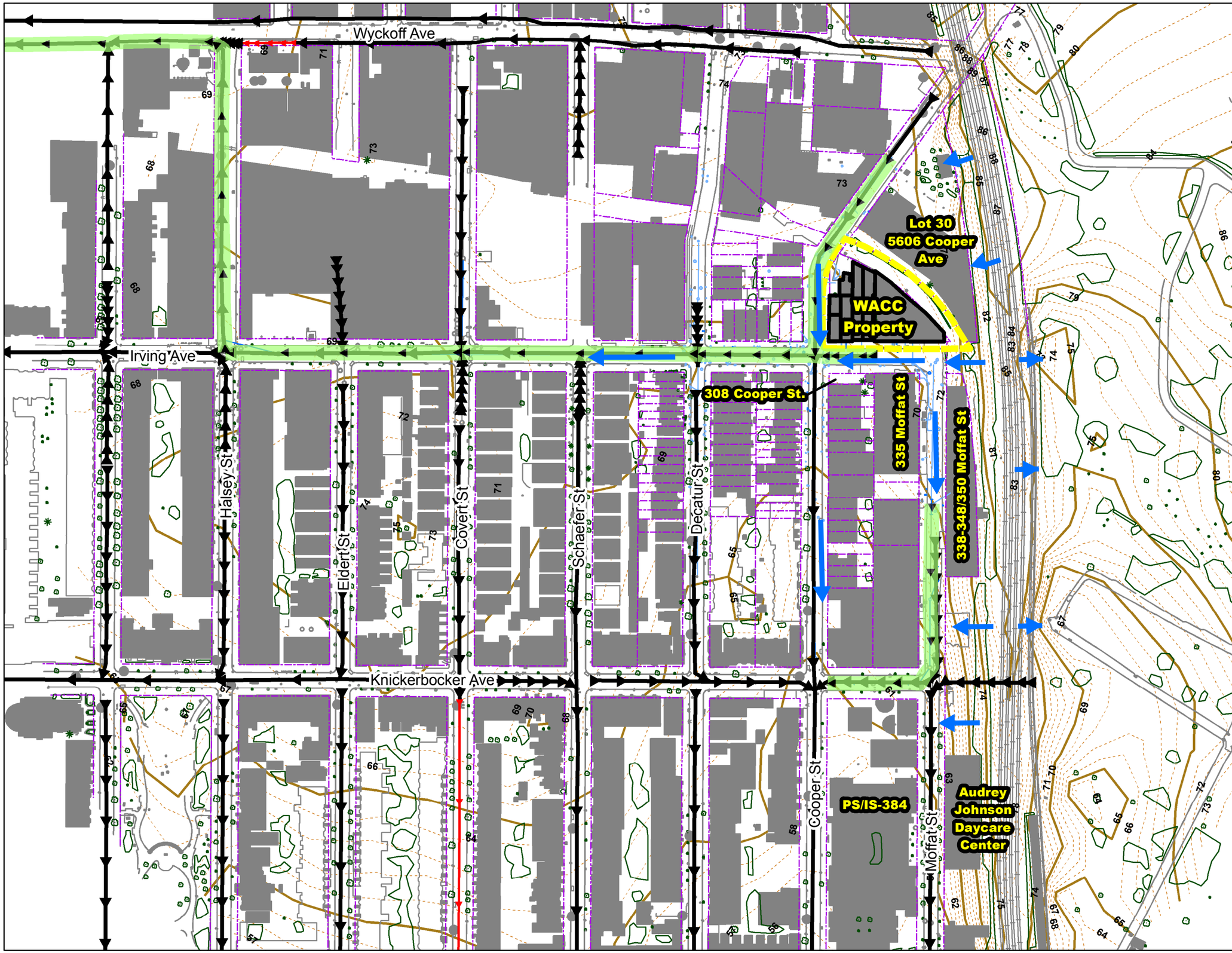
PS/IS - Public School/ Intermediate School

N E S W

0 30 60 120 Feet

Figure 2-9b
School and Daycare Investigation
Basement Air Sampling Locations
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



WACC Property

Combined Storm Sewer (approx.)
Shaded green in sewers flowing away from the WACC property.

Unknown Sewer (approx.)

WACC Lot Boundaries

Buildings

Vegetation

Property Lines

Topography Index Contour (5-ft)

Topography Contour (1-ft)

Surface Water Flow

Acronyms

PS/IS - Public School/ Intermediate School
WACC - Wolff-Alport Chemical Company

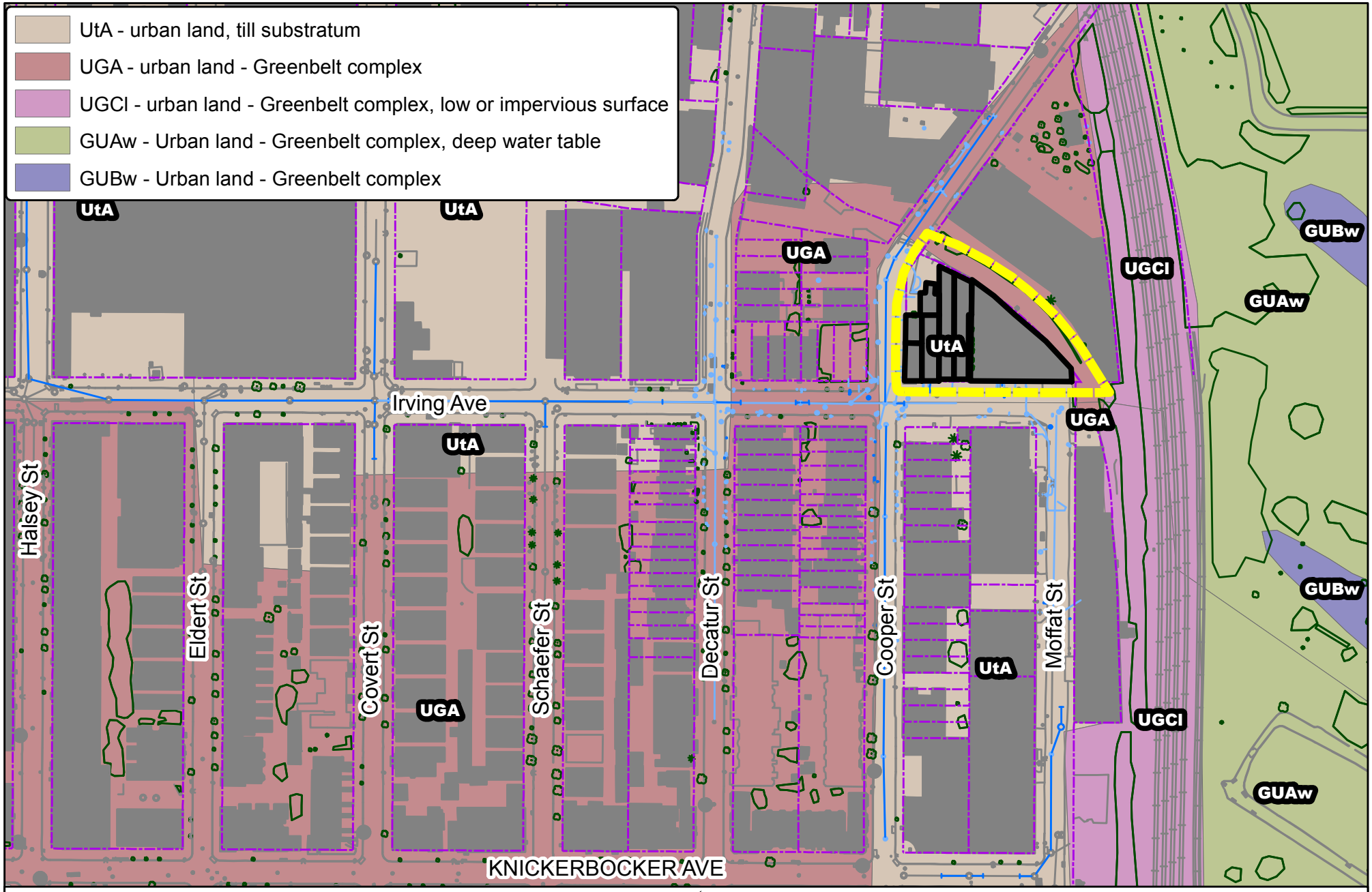
N E S W

0 100 200 400 Feet

Figure 3-1
Site Topography and Drainage
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

Document Path: C:\IMS\GIS\Wolff Alport\MXD\RI\Final RI\Figure_3-1_Drainage.mxd



WACC Property
WACC Lot Boundaries
Buildings
Property Lines

Acronyms
PS/IS - Public School/ Intermediate School
WACC - Wolff-Alport Chemical Corporation

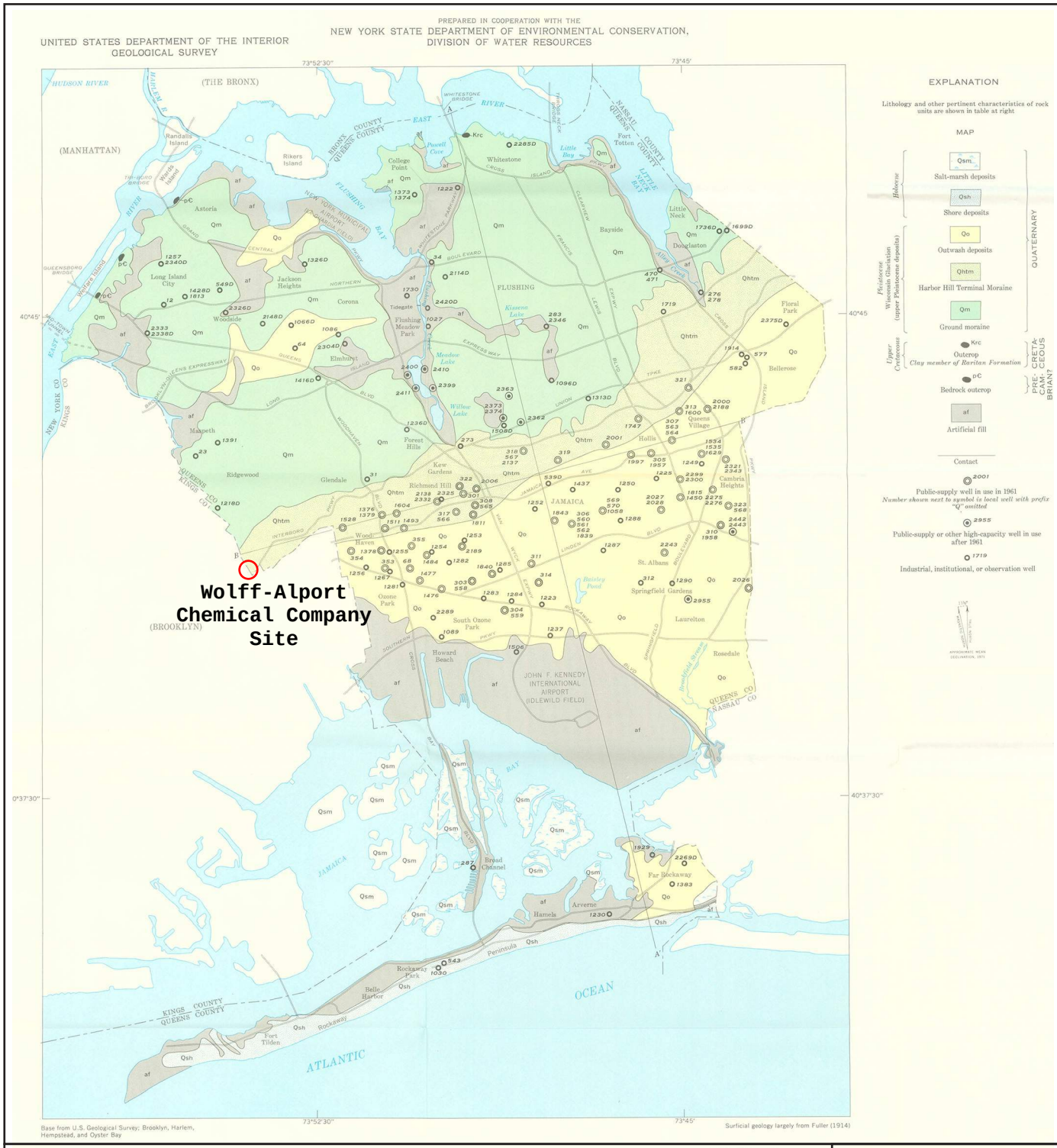
N E S W

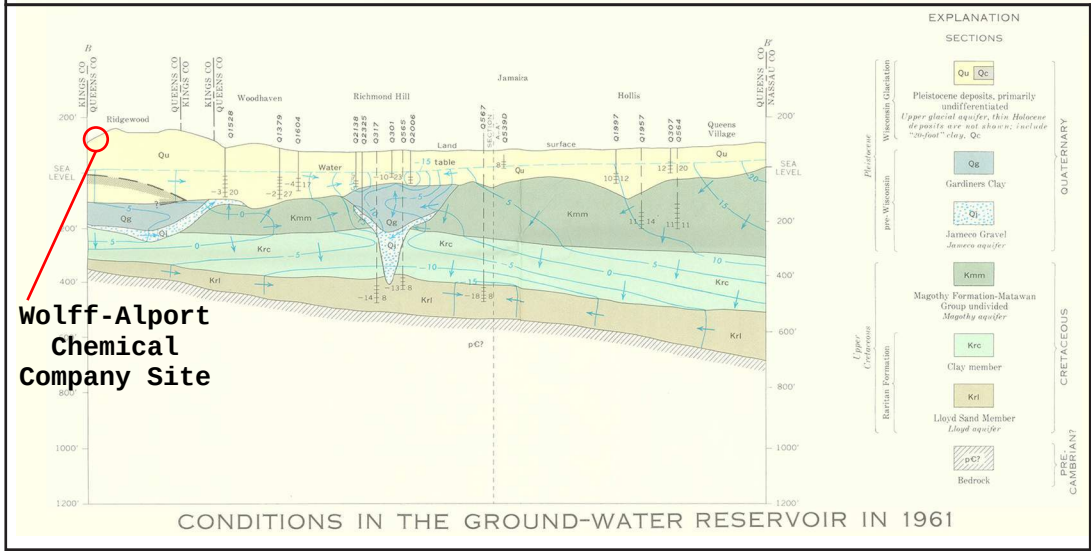
Feet
0 100 200 400

Figure 3-2
USDA Soil Classifications
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

Document Path: C:\IMS\GIS\Wolff Alport\MXD\RI\Final RI\Figure_3-2_SiteSoils.mxd

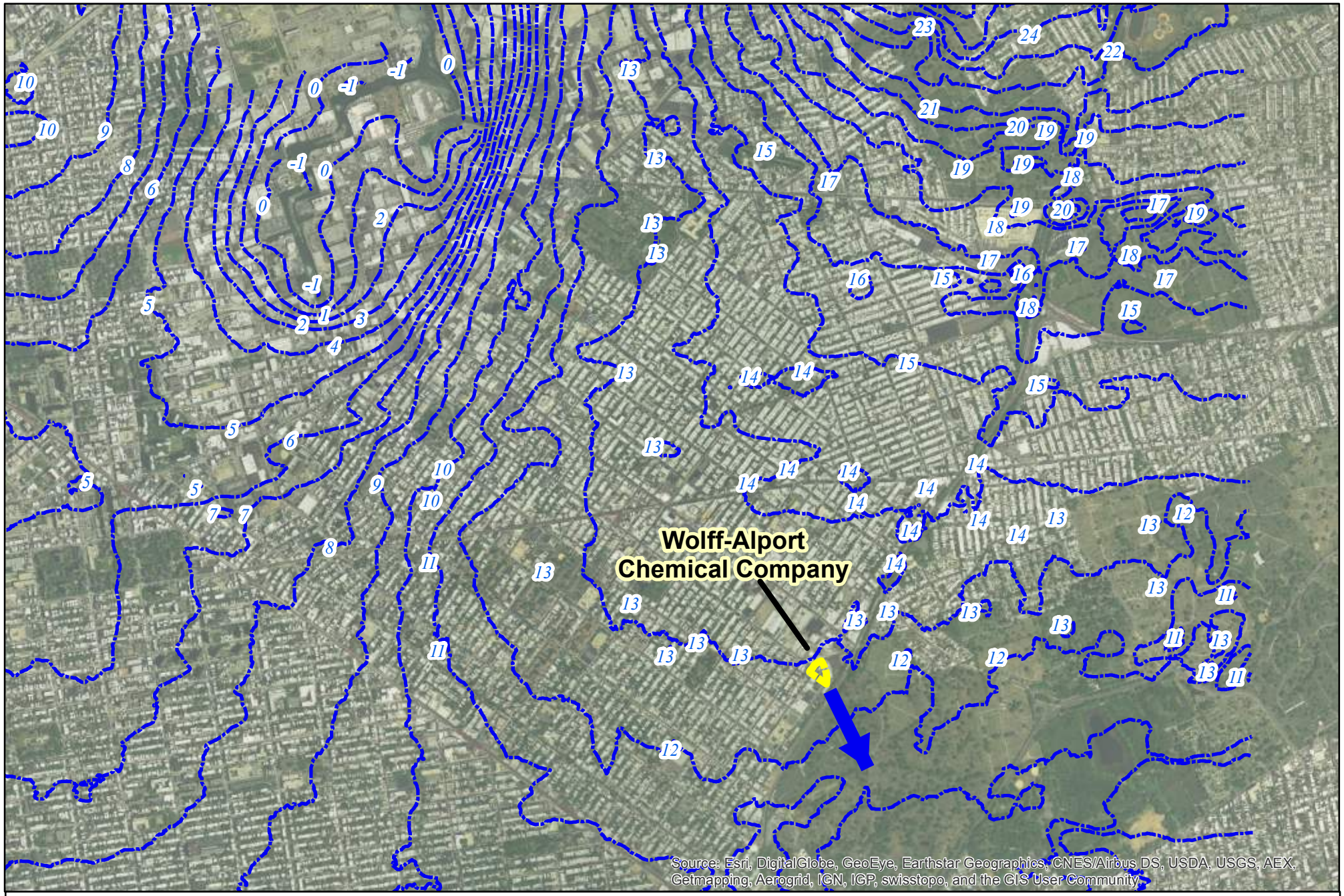




Modified from Source: Soren. 1971. Ground-water and geohydrologic conditions in Queens County, Long Island, New York.

Figure 3-3
Regional Geology
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Wolff-Alport Property

2010 USGS Upper Glacial Groundwater Contours

Notes:
Groundwater elevations presented in feet above mean sea level.

N
W E
S

0 1,000 2,000 4,000 Feet

Figure 3-4
Regional Groundwater Flow
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

New York State Surficial Geology - Lower Hudson Sheet

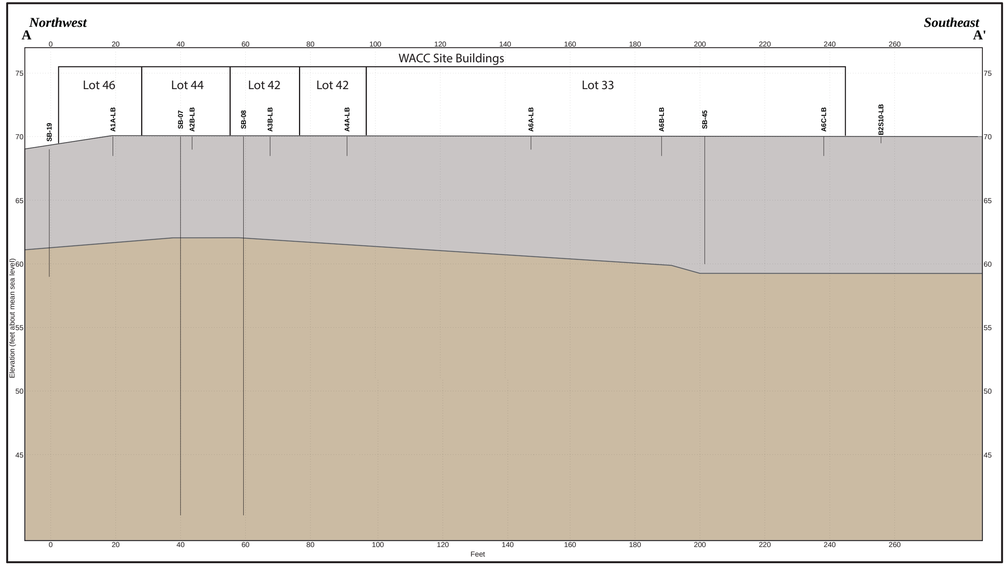
- og - outwash sand and gravels (up to 60 ft thick)
- t - till (variable texture - up to 150 ft thick)
- tm - till moraine (30-100 ft thick)

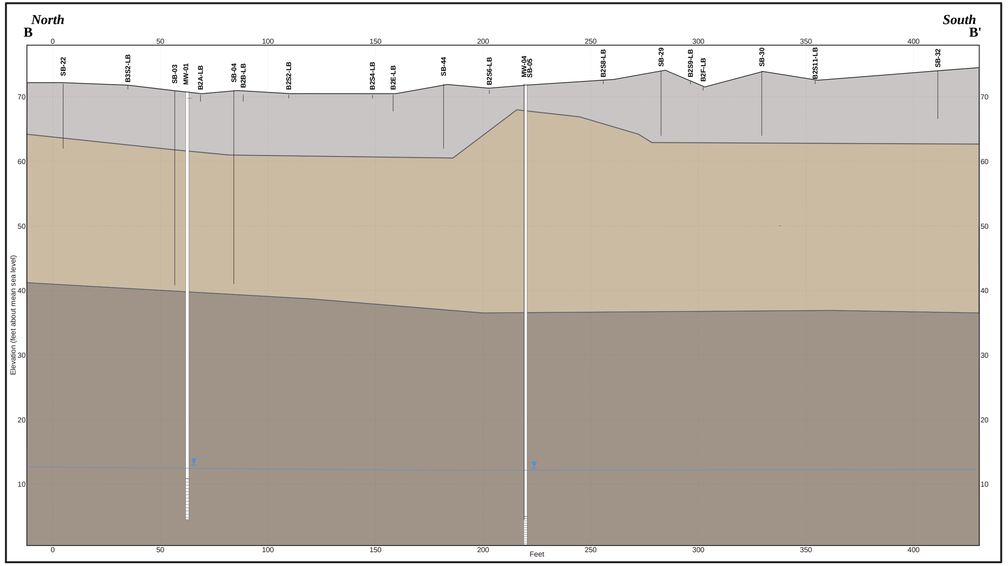
N
W E
S

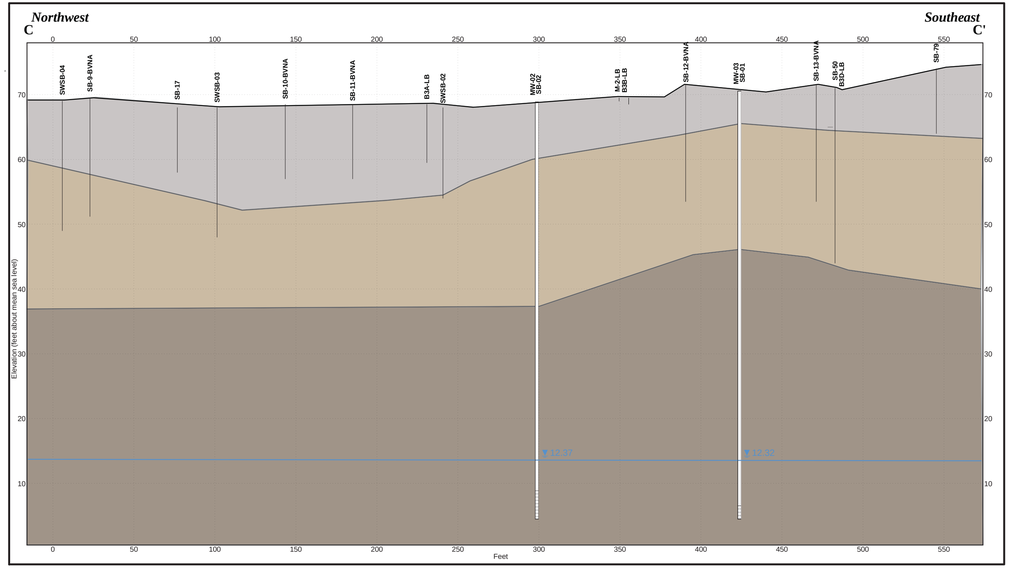
0 500 1,000 Feet

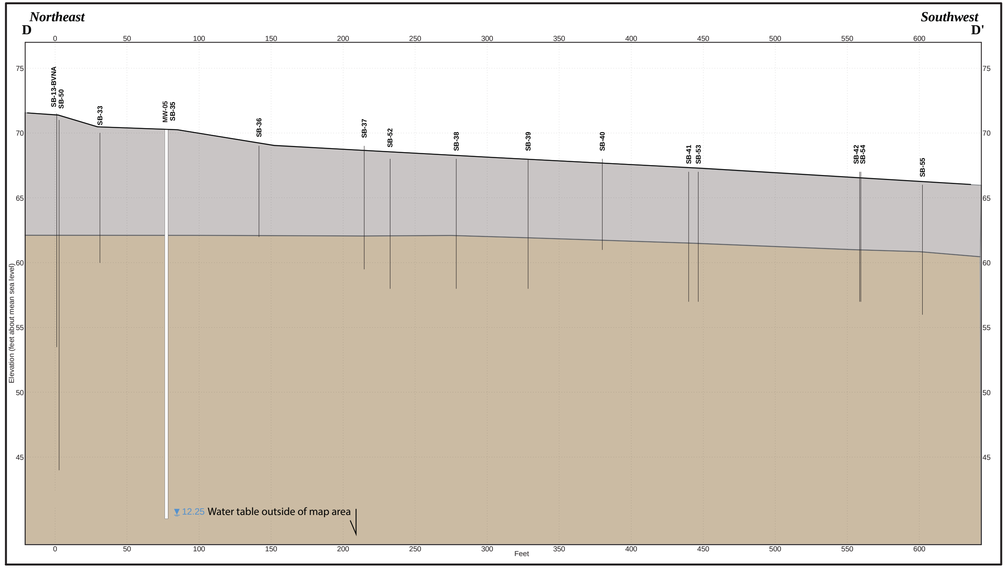
Figure 3-5
USGS Surficial Geology
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

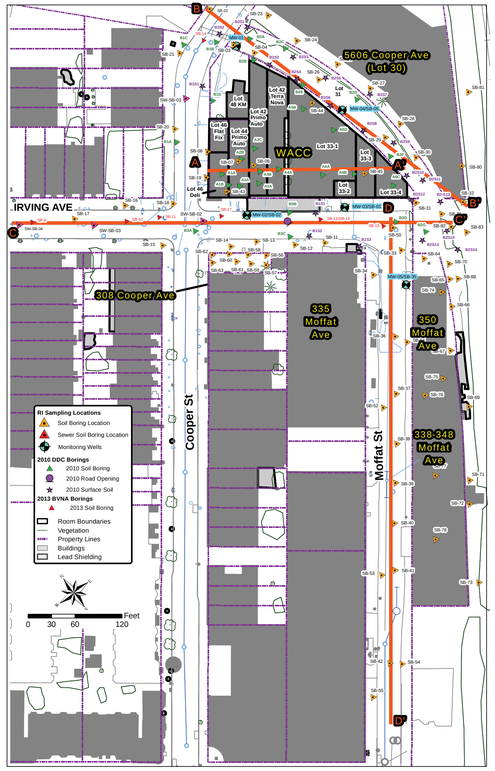
CDM Smith











Cross Section Locations

Lithologic Legend:

General fill - brick material, stone, cinder, often with surficial layers of grey ashy tailings (1-3 ft thick)

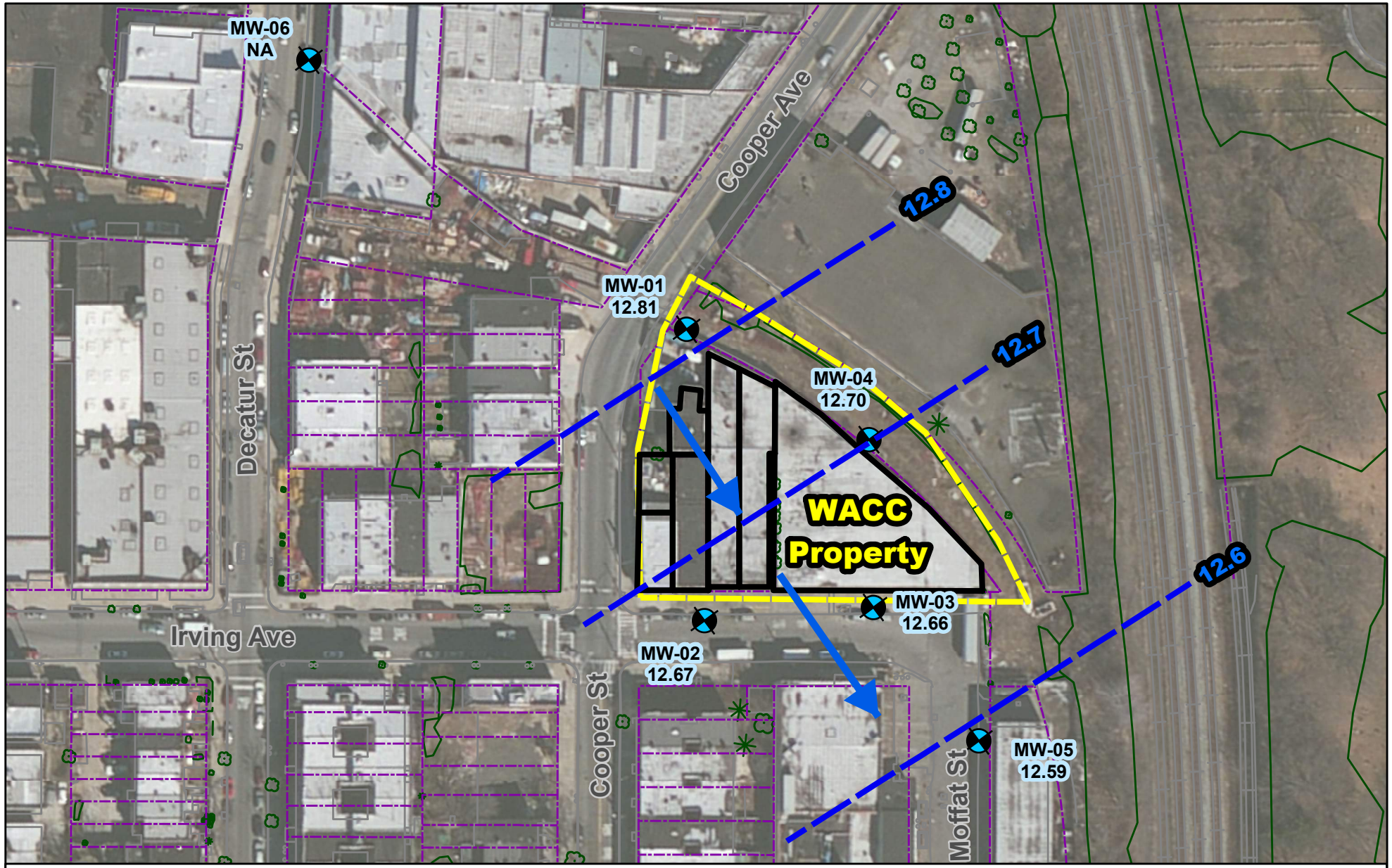
Upper Glacial Aquifer Deposits

Till - dense silty sands and gravel

Outwash - coarser sands and gravels

CDM Smith

Figure 3-6
Geologic Cross Sections
Wolff-Alport Chemical Company Site
Ridgewood, Queens, NY



RI Sampling Locations

- Monitoring Wells
- WACC Property
- WACC Lot Boundaries
- Vegetation
- Property Lines

12.6 Potentiometric Contour (elevation in feet amsl)

Groundwater Flow Direction

Notes

Groundwater elevations collected on 12/8/2015.
Groundwater elevations presented in feet above mean sea level.

Acronyms

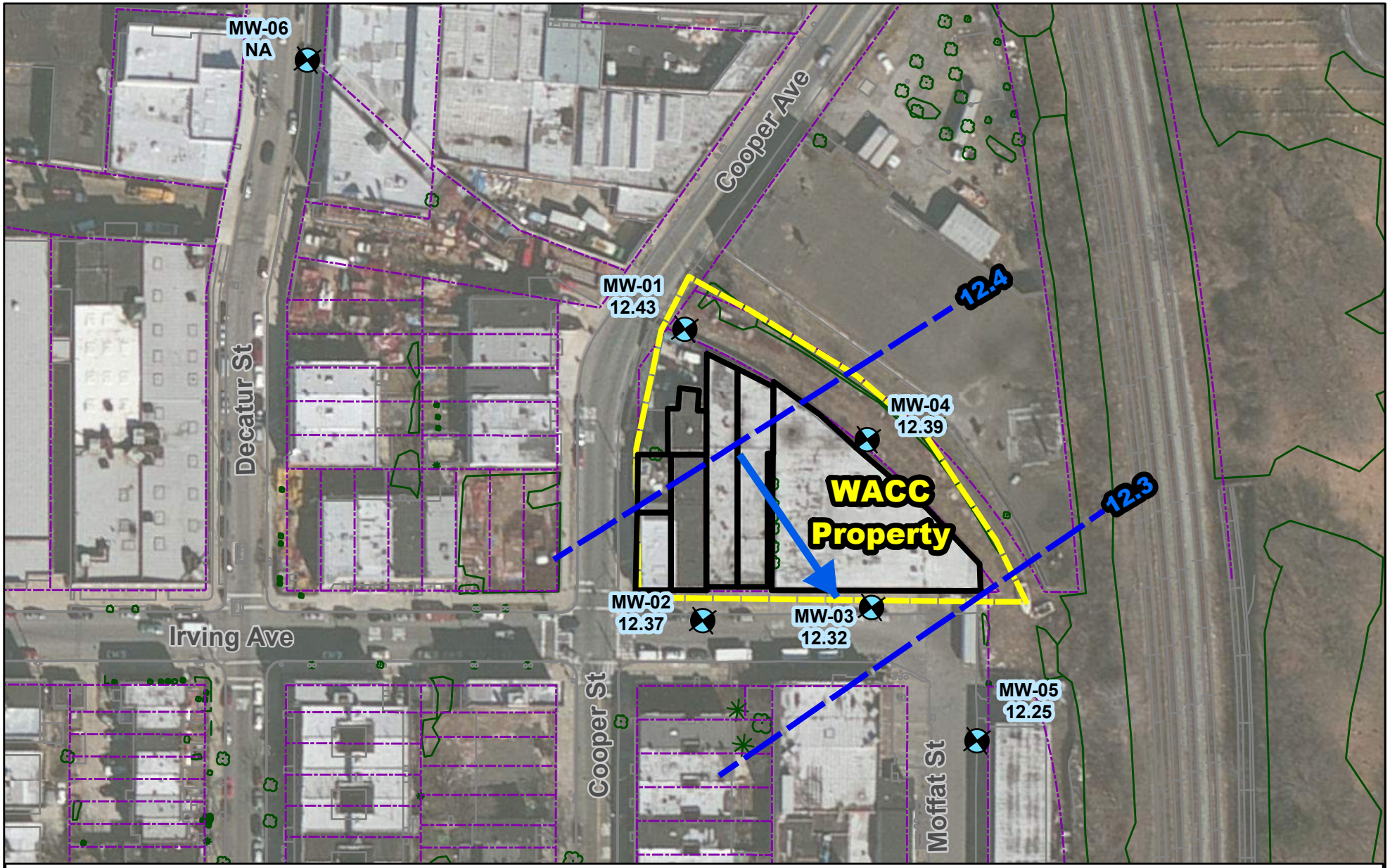
amsl - above mean sea level
WACC - Wolff-Alport Chemical Company

N E S W

0 50 100 200 Feet

Figure 3-7a
December 2015
Potentiometric Surface Map
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



RI Sampling Locations

- Monitoring Wells
- WACC Property
- WACC Lot Boundaries
- Vegetation
- Property Lines

12.6 Potentiometric Contour (elevation in feet amsl)

Groundwater Flow Direction

Notes

Groundwater elevations collected on 4/20/2016.
Groundwater elevations presented in feet above mean sea level.

Acronyms

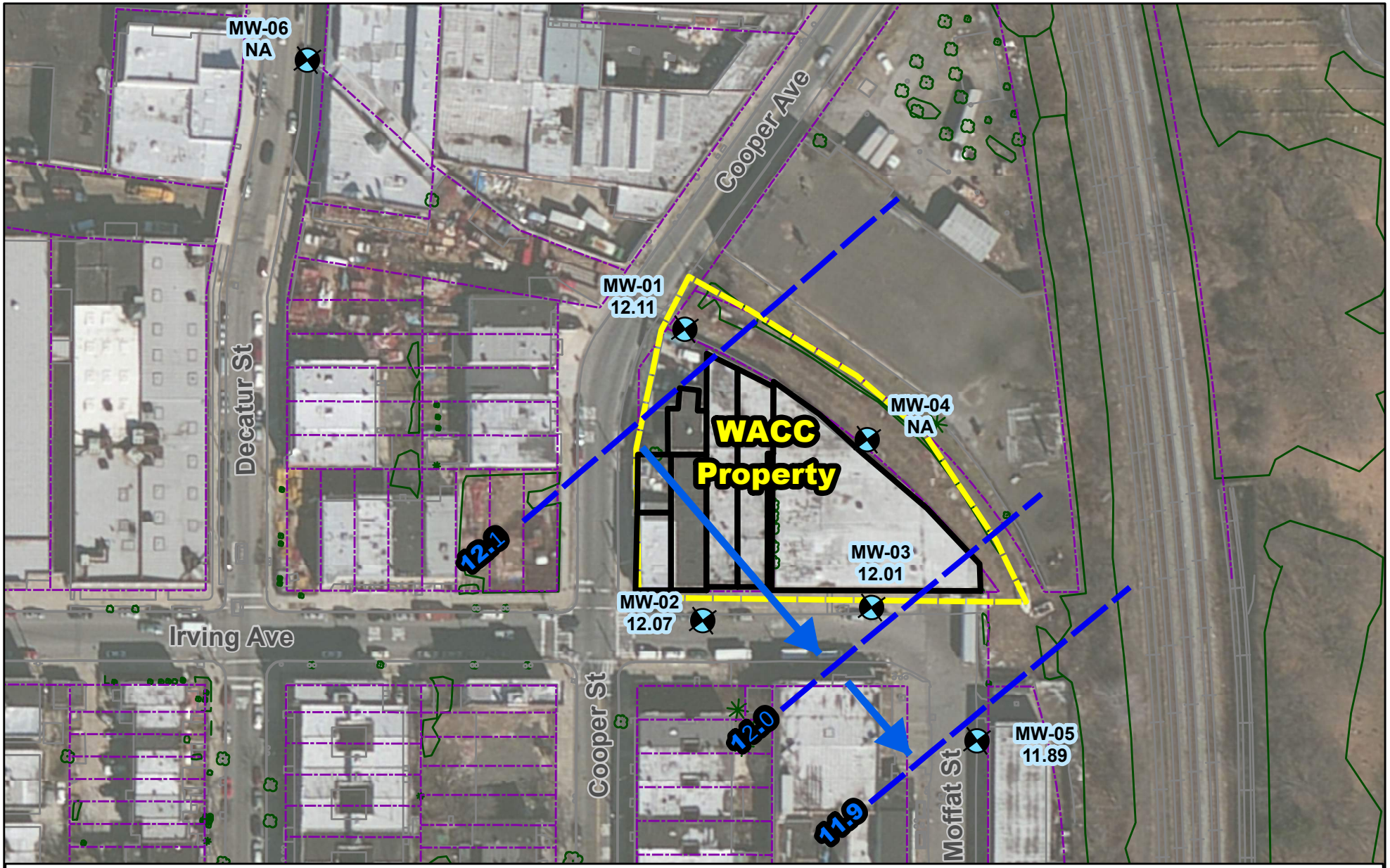
amsl - above mean sea level
WACC - Wolff-Alport Chemical Company

N E S W

0 50 100 200 Feet

Figure 3-7b
April 2016
Potentiometric Surface Map
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



RI Sampling Locations

- Monitoring Wells
- WACC Property
- WACC Lot Boundaries
- Vegetation
- Property Lines

12.0 Potentiometric Contour (elevation in feet amsl)

Groundwater Flow Direction

Notes

Groundwater elevations collected on 11/20/2016.
Groundwater elevations presented in feet above mean sea level.

Acronyms

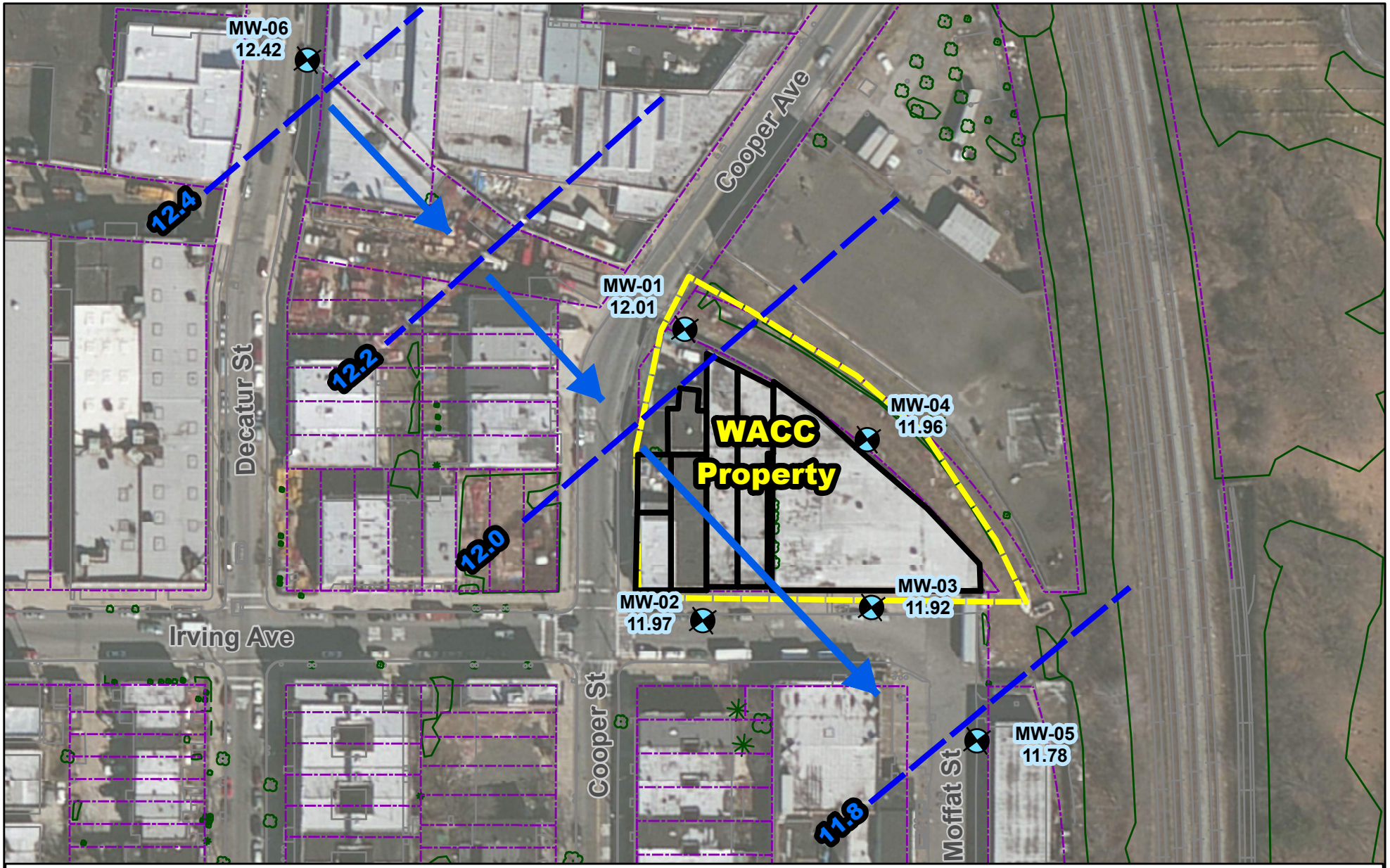
amsl - above mean sea level
WACC - Wolff-Alport Chemical Company

N E S W

0 50 100 200 Feet

Figure 3-7c
November 2016
Potentiometric Surface Map
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



RI Sampling Locations

- Monitoring Wells
- WACC Property
- WACC Lot Boundaries
- Vegetation
- Property Lines

12.2 Potentiometric Contour (elevation in feet amsl)

Groundwater Flow Direction

Notes

Groundwater elevations collected on 4/12/2017.
Groundwater elevations presented in feet above mean sea level.

Acronyms

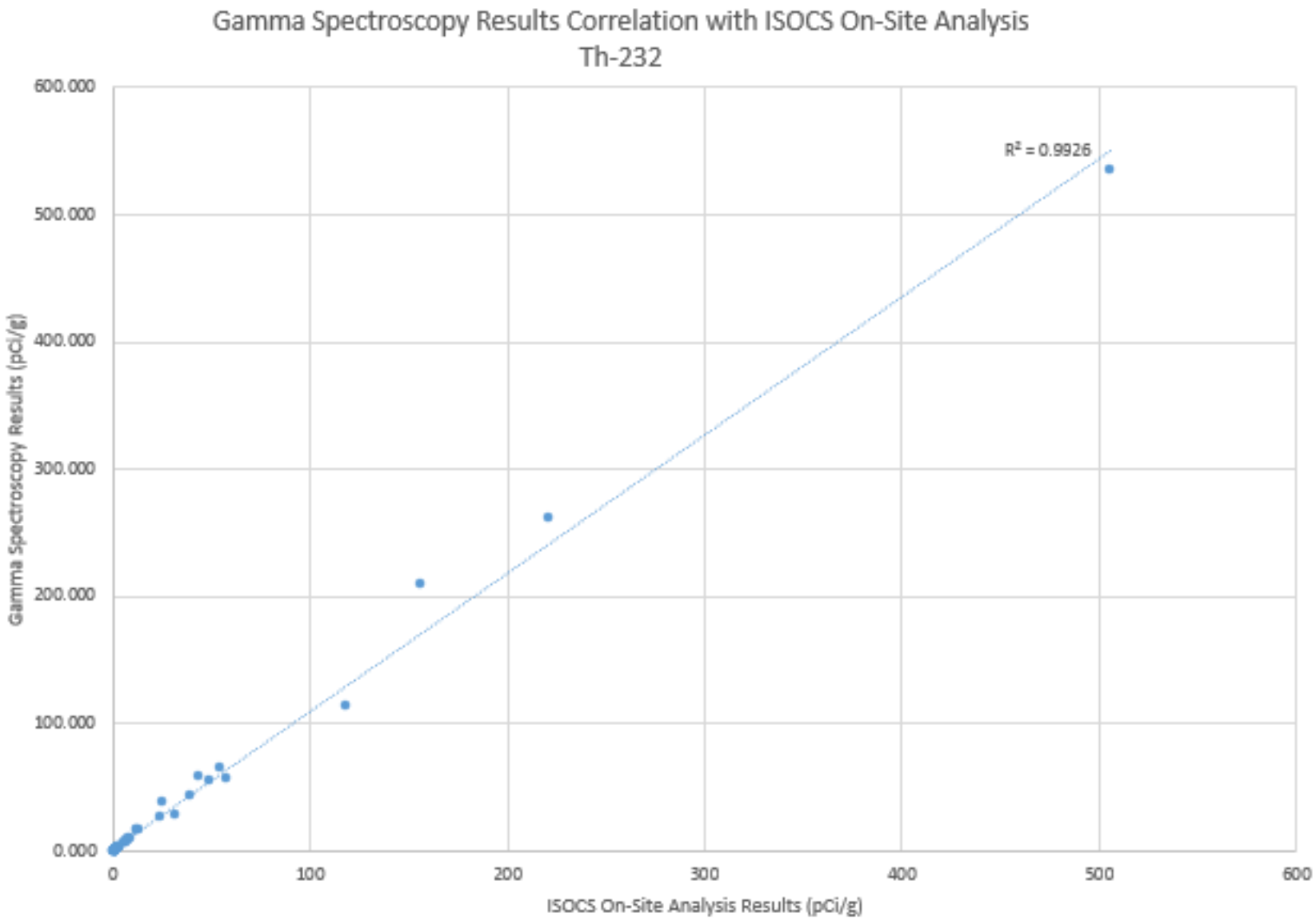
amsl - above mean sea level
WACC - Wolff-Alport Chemical Company

N E S W

0 50 100 200 Feet

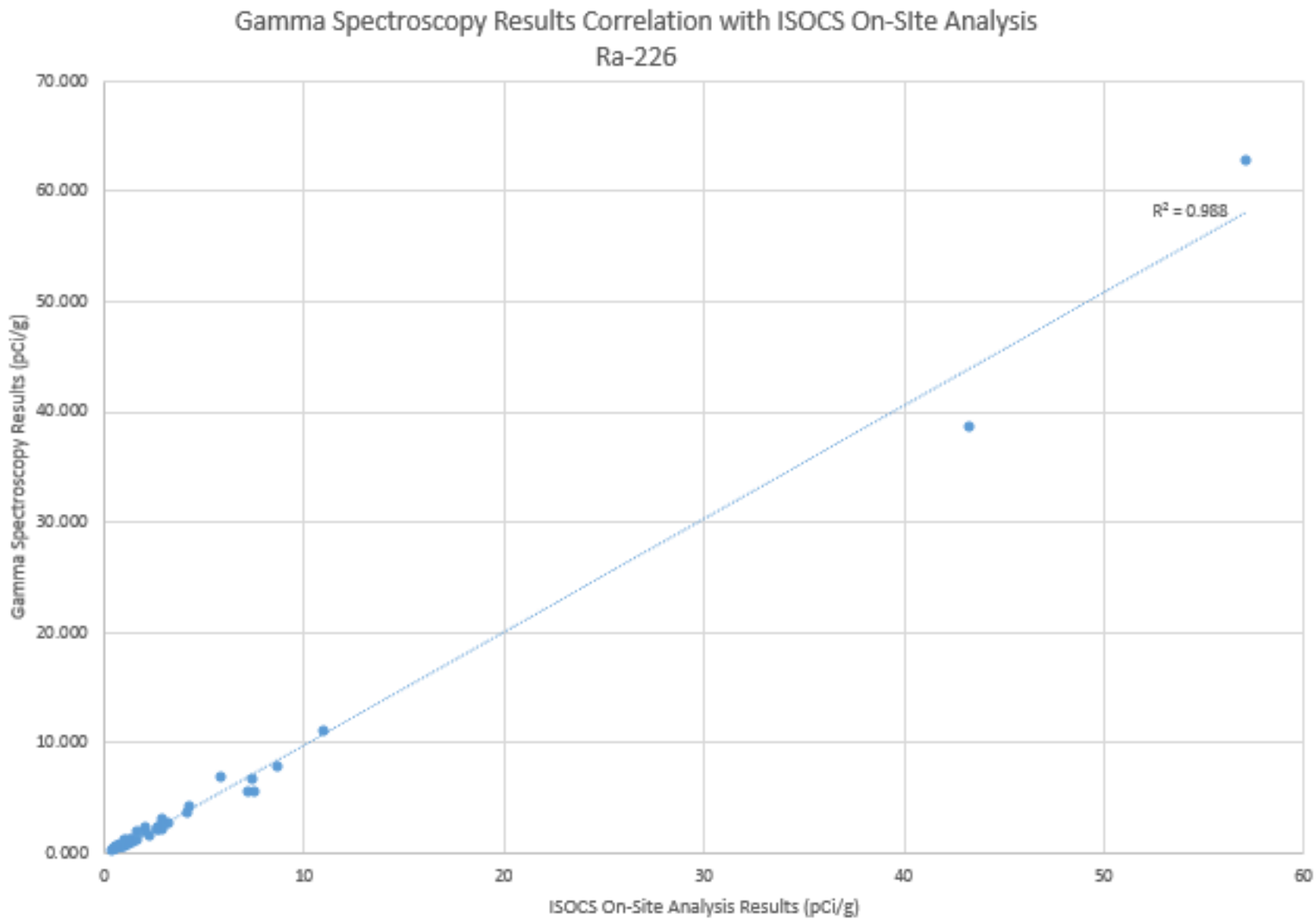
Figure 3-7d
April 2017
Potentiometric Surface Map
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



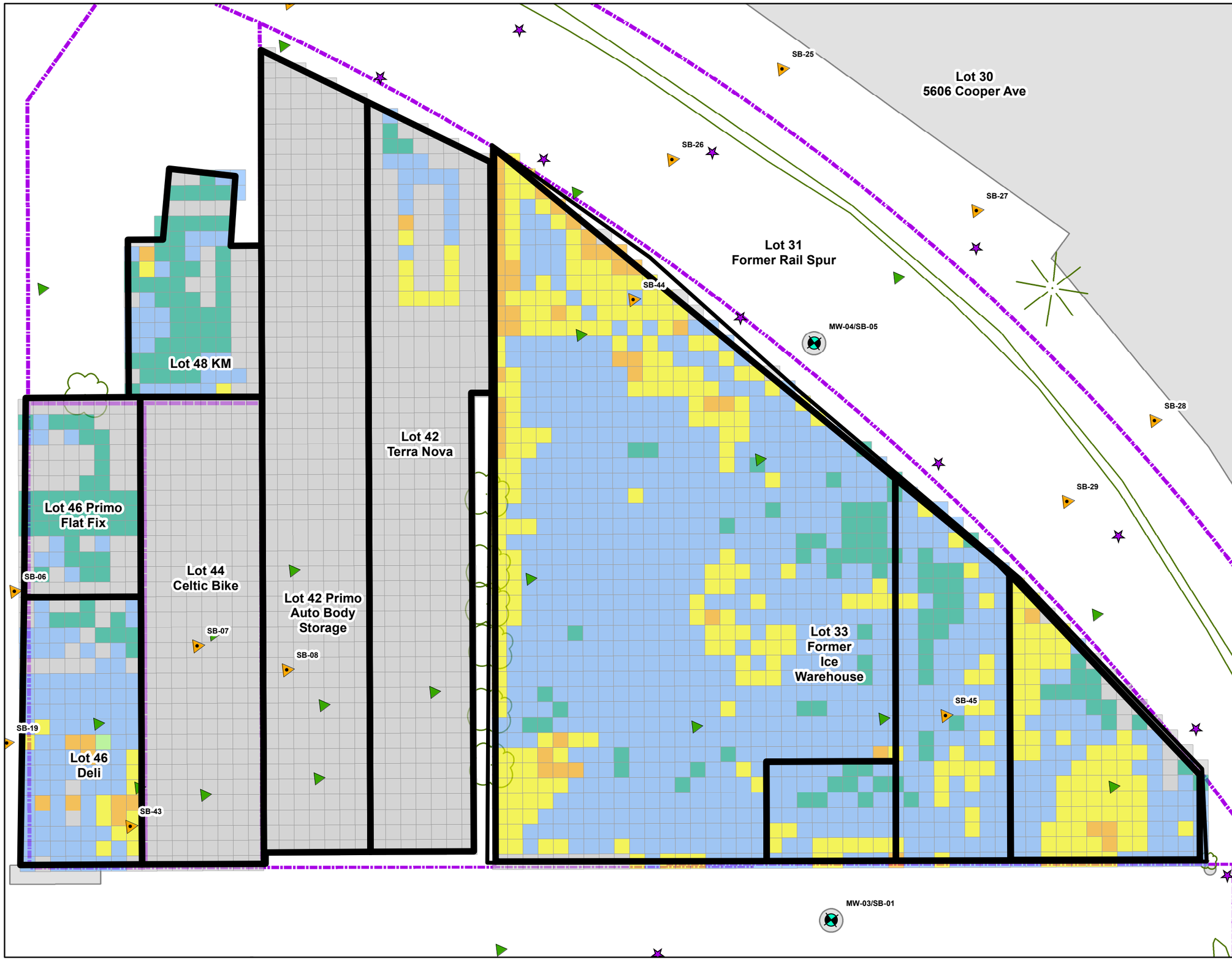
CDM Smith

Figure 4-1
Correlation of ISOCS Results and Gamma Spectroscopy Results - Th-232
Wolff-Alport Chemical Company Site
Ridgewood, Queens, NY



CDM Smith

Figure 4-2
Correlation of ISOCS Results and Gamma Spectroscopy Results - Ra-226
Wolff-Alport Chemical Company Site
Ridgewood, Queens, NY



Floor Gamma Survey (CPM)

- No sample
- <2,500 (background)
- 2,500-5,000 (< 2x background)
- 5,000-12,500 (2-5x background)
- 12,500-25,000 (5-10x background)
- >25,000 (>10x background)
- Walls
- Vegetation
- Property Lines
- Buildings

Final RI Locations

- Background Boring
- Monitoring Well
- Soil Boring

2013 BVNA Sewer Locations

- 2013 Soil Boring
- 2013 Background Soil Boring

2010 NYCDDC Boring Locs

- 2010 Soil Boring
- 2010 Road Opening
- 2010 Surface Soil

Acronyms

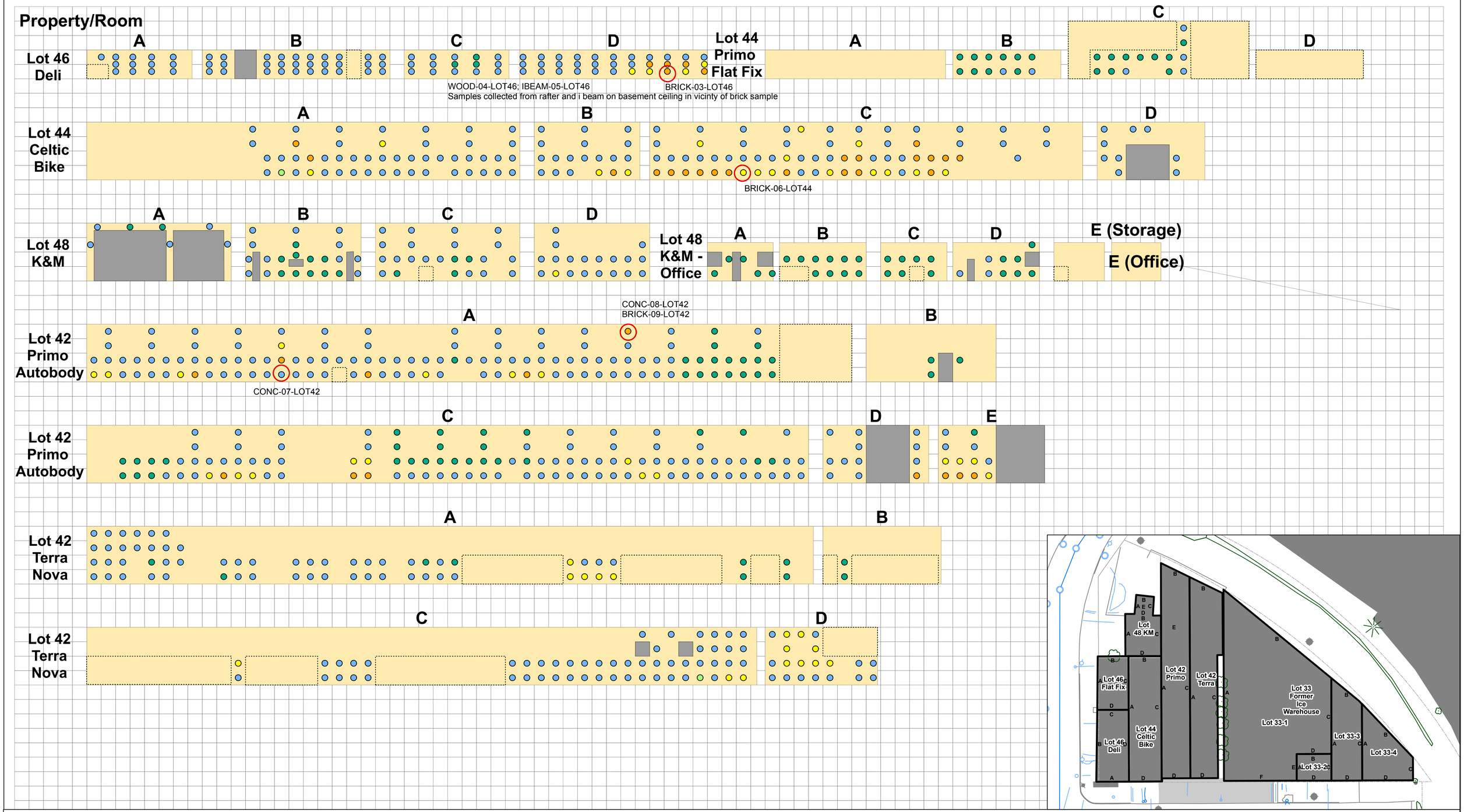
BVNA - Bureau Veritas North America
CPM - counts per minute
NYCDDC - New York City Department of Design and Construction
RI - Remedial Investigation

N E S W

0 10 20 40 Feet

Figure 4-3a
Building Gamma Survey - Floor
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Wall Gamma Survey (CPM)

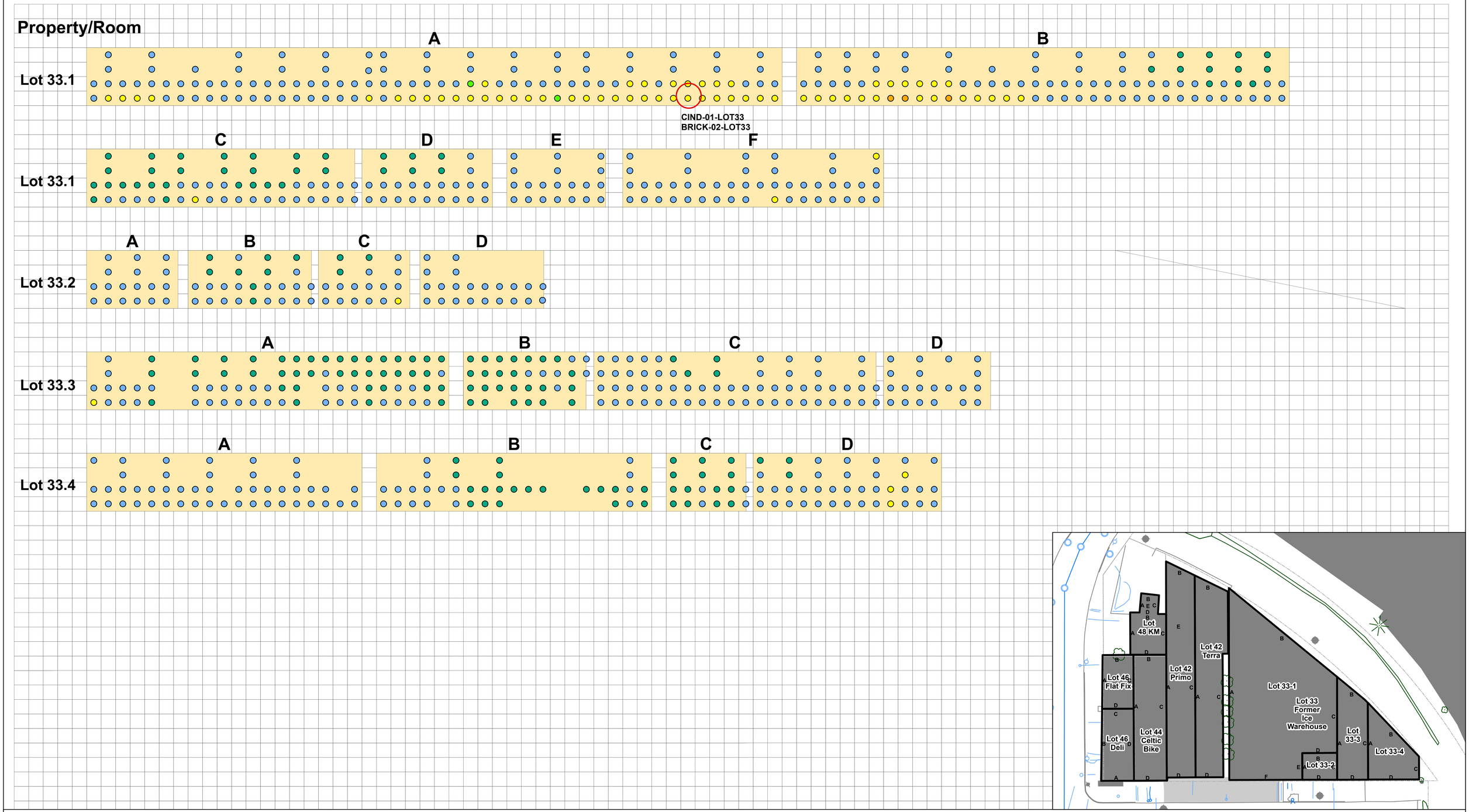
- <2,500 (background)
- 2,500-5,000 (<2x background)
- 5,000-12,500 (2-5x background)
- 12,500-25,000 (5-10x background)
- >25,000 (>10x background)

- Interior Walls
- 1 Meter Wall Grid
- Door
- Obstruction

Notes:
Scale - 1 meter = 1 grid unit
All data in counts per minute (CPM)
Material sampling locations designated on map.

Figure 4-3b
Building Gamma Survey - Interior Wall A
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Wall Gamma Survey (CPM)

- <2,500 (background)
- 2,500-5,000 (<2x background)
- 5,000-12,500 (2-5x background)
- 12,500-25,000 (5-10x background)
- >25,000 (>10x background)

Interior Walls

1 Meter Wall Grid

Notes:
Scale - 1 meter = 1 grid unit
All data in counts per minute (CPM)
Material sampling locations designated on map.

Figure 4-3c
Building Gamma Survey - Interior Wall B
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

Legend

Ceiling Gamma Survey (CPM)

- No Sample
- <2,500 (background)
- 2,500-5,000 (<2x background)
- 5,000-12,500 (2-5x background)
- 12,500-25,000 (5-10x background)
- >25,000 (>10x background)
- Rafters/Ceiling Features
- Walls
- Vegetation
- Property Lines
- Buildings

Acronyms

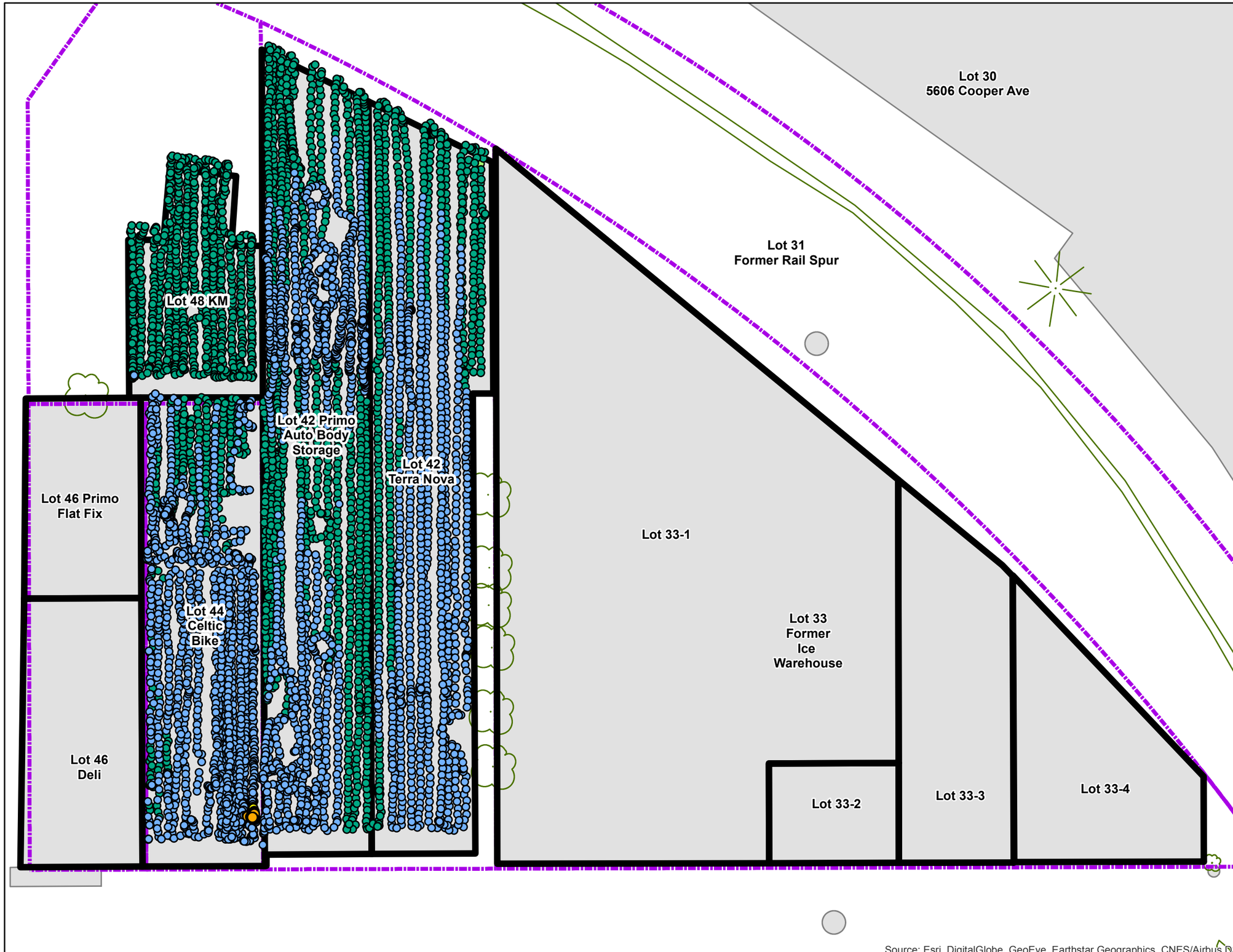
CPM - counts per minute

N E S W

0 10 20 40 Feet

Figure 4-3d
Building Gamma Survey - Ceiling
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Legend

Roof Gamma Survey (CPM)

- <2,500 (background)
- 2,500-5,000 (<2x background)
- 5,000-12,500 (2-5x background)
- 12,500-25,000 (5-10x background)
- >25,000 (>10x background)
- Walls
- Vegetation
- Property Lines
- Buildings

Acronyms

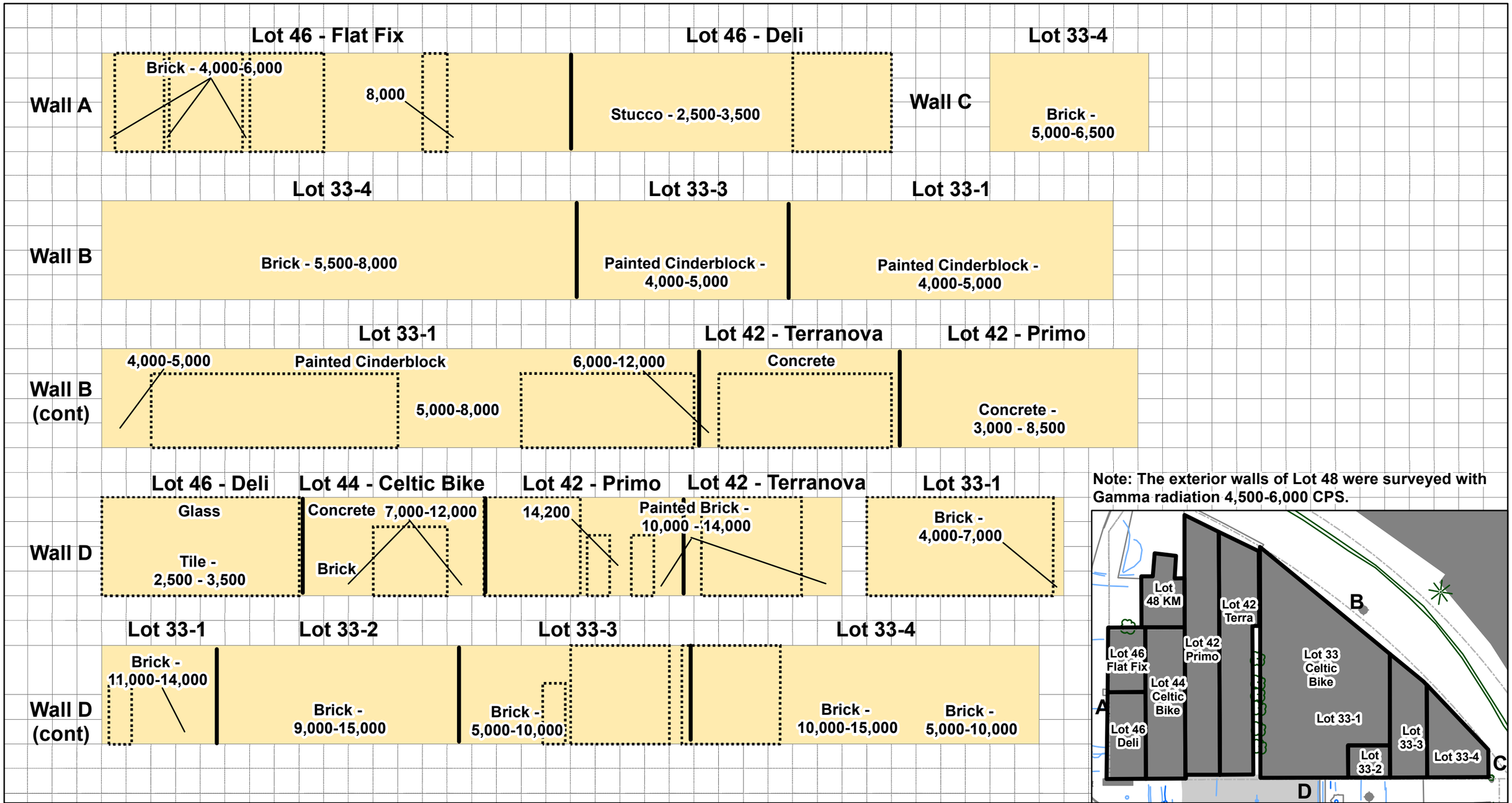
CPM - counts per minute

N E S W

0 10 20 40 Feet

Figure 4-3e
Building Gamma Survey - Roof
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

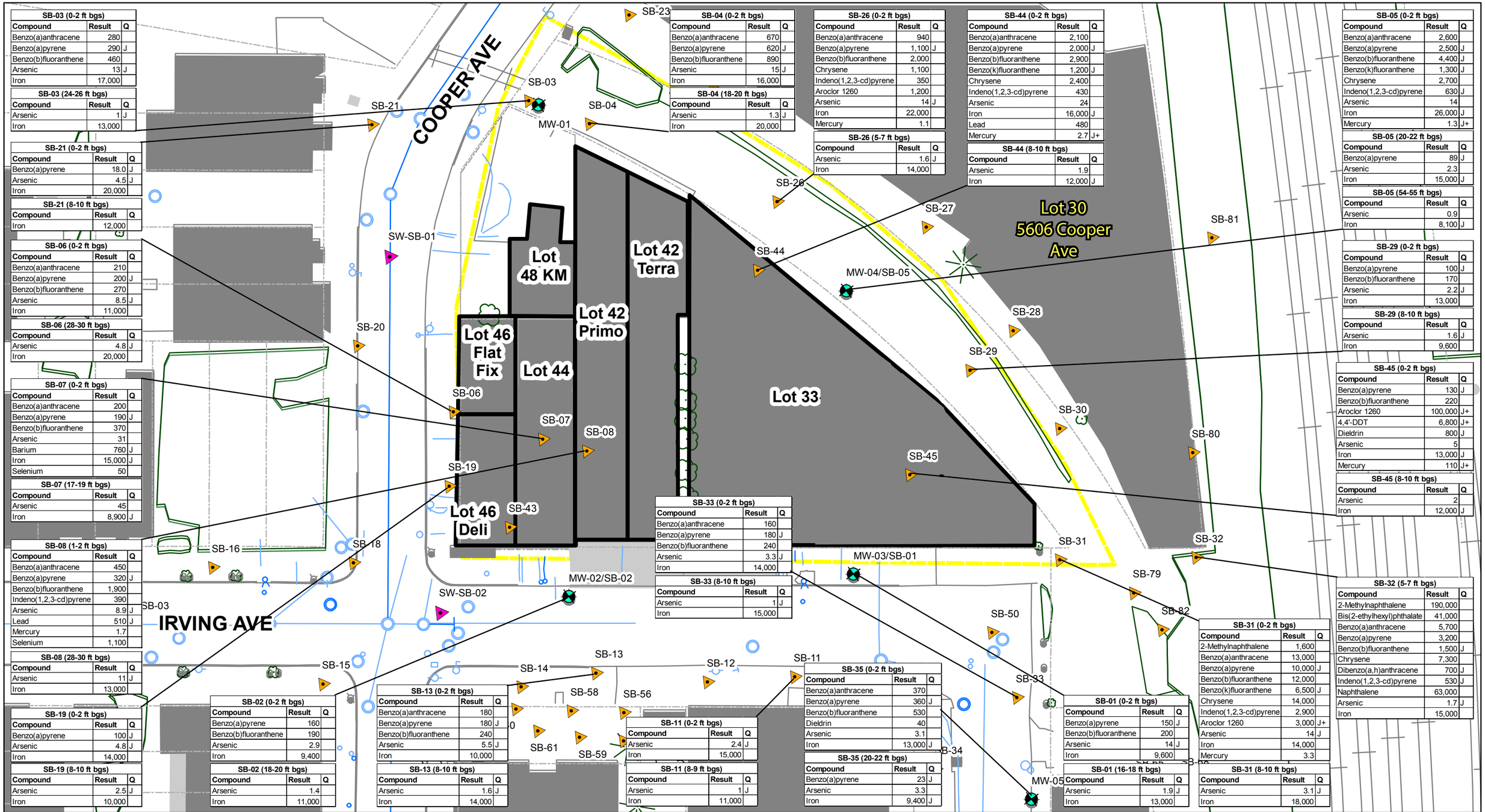


Interior Walls
1 Meter Wall Grid
Door
Obstruction

Scale - 1 meter = 1 grid unit
All data in counts per minute (CPM)
Data collected from bottom two meters of wall only
Ranges represent the majority of data collected per wall area.
The high end of the ranges were measured at the base of the walls.

Figure 4-3f
Building Gamma Survey - Exterior Wall
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



SB-03 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	280	
Benzo(a)pyrene	290	J
Benzo(b)fluoranthene	460	
Arsenic	13	J
Iron	17,000	

SB-03 (24-26 ft bgs)		
Compound	Result	Q
Arsenic	1	J
Iron	13,000	

SB-21 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)pyrene	18.0	J
Arsenic	4.5	J
Iron	20,000	

SB-21 (8-10 ft bgs)		
Compound	Result	Q
Iron	12,000	

SB-06 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	210	
Benzo(a)pyrene	200	J
Benzo(b)fluoranthene	270	
Arsenic	8.5	J
Iron	11,000	

SB-06 (28-30 ft bgs)		
Compound	Result	Q
Arsenic	4.8	J
Iron	20,000	

SB-07 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	200	
Benzo(a)pyrene	190	J
Benzo(b)fluoranthene	370	
Arsenic	31	
Barium	760	J
Iron	15,000	J
Selenium	50	

SB-07 (17-19 ft bgs)		
Compound	Result	Q
Arsenic	45	
Iron	8,900	J

SB-08 (1-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	450	
Benzo(a)pyrene	320	J
Benzo(b)fluoranthene	1,900	
Indeno(1,2,3-cd)pyrene	390	
Arsenic	8.9	J
Lead	510	J
Mercury	1.7	
Selenium	1,100	

SB-08 (28-30 ft bgs)		
Compound	Result	Q
Arsenic	11	J
Iron	13,000	

SB-19 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)pyrene	100	J
Arsenic	4.8	J
Iron	14,000	

SB-19 (8-10 ft bgs)		
Compound	Result	Q
Arsenic	2.5	J
Iron	10,000	

SB-02 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)pyrene	160	
Benzo(b)fluoranthene	190	
Arsenic	2.9	
Iron	9,400	

SB-02 (18-20 ft bgs)		
Compound	Result	Q
Arsenic	1.4	
Iron	11,000	

SB-13 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	180	
Benzo(a)pyrene	180	J
Benzo(b)fluoranthene	240	
Arsenic	5.5	J
Iron	10,000	

SB-13 (8-10 ft bgs)		
Compound	Result	Q
Arsenic	1.6	J
Iron	14,000	

SB-11 (0-2 ft bgs)		
Compound	Result	Q
Arsenic	2.4	J
Iron	15,000	

SB-11 (8-9 ft bgs)		
Compound	Result	Q
Arsenic	1	J
Iron	11,000	

SB-35 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	370	
Benzo(a)pyrene	360	J
Benzo(b)fluoranthene	530	
Dieldrin	40	
Arsenic	3.1	
Iron	13,000	J

SB-35 (20-22 ft bgs)		
Compound	Result	Q
Benzo(a)pyrene	23	J
Arsenic	3.3	
Iron	9,400	J

SB-01 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)pyrene	150	J
Benzo(b)fluoranthene	200	
Arsenic	14	J
Iron	9,600	

SB-01 (16-18 ft bgs)		
Compound	Result	Q
Arsenic	1.9	J
Iron	13,000	

SB-31 (0-2 ft bgs)		
Compound	Result	Q
2-Methylnaphthalene	1,600	
Benzo(a)anthracene	13,000	
Benzo(a)pyrene	10,000	J
Benzo(b)fluoranthene	12,000	
Benzo(k)fluoranthene	6,500	J
Chrysene	14,000	
Indeno(1,2,3-cd)pyrene	2,900	
Aroclor 1260	3,000	J+
Arsenic	14	J
Iron	14,000	
Mercury	3.3	

SB-31 (8-10 ft bgs)		
Compound	Result	Q
Arsenic	3.1	J
Iron	18,000	

SB-32 (5-7 ft bgs)		
Compound	Result	Q
2-Methylnaphthalene	190,000	
Bis(2-ethylhexyl)phthalate	41,000	
Benzo(a)anthracene	5,700	
Benzo(a)pyrene	3,200	
Benzo(b)fluoranthene	1,500	J
Chrysene	7,300	
Dibenzo(a,h)anthracene	700	J
Indeno(1,2,3-cd)pyrene	530	J
Naphthalene	63,000	
Arsenic	1.7	J
Iron	15,000	

SB-04 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	670	
Benzo(a)pyrene	620	J
Benzo(b)fluoranthene	890	
Arsenic	15	J
Iron	16,000	

SB-04 (18-20 ft bgs)		
Compound	Result	Q
Arsenic	1.3	J
Iron	20,000	

SB-26 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	940	
Benzo(a)pyrene	1,100	J
Benzo(b)fluoranthene	2,000	
Chrysene	1,100	
Indeno(1,2,3-cd)pyrene	350	
Aroclor 1260	1,200	
Arsenic	14	J
Iron	22,000	
Mercury	1.1	

SB-26 (5-7 ft bgs)		
Compound	Result	Q
Arsenic	1.6	J
Iron	14,000	

SB-44 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	2,100	
Benzo(a)pyrene	2,000	J
Benzo(b)fluoranthene	2,900	
Benzo(k)fluoranthene	1,200	J
Chrysene	2,400	
Indeno(1,2,3-cd)pyrene	430	
Arsenic	24	
Iron	16,000	J
Lead	480	
Mercury	2.7	J+

SB-44 (8-10 ft bgs)		
Compound	Result	Q
Arsenic	1.9	
Iron	12,000	J

SB-33 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	160	
Benzo(a)pyrene	180	J
Benzo(b)fluoranthene	240	
Arsenic	3.3	J
Iron	14,000	

SB-33 (8-10 ft bgs)		
Compound	Result	Q
Arsenic	1	J
Iron	15,000	

SB-05 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)anthracene	2,600	
Benzo(a)pyrene	2,500	J
Benzo(b)fluoranthene	4,400	J
Benzo(k)fluoranthene	1,300	J
Chrysene	2,700	
Indeno(1,2,3-cd)pyrene	630	J
Arsenic	14	
Iron	26,000	J
Mercury	1.3	J+

SB-05 (20-22 ft bgs)		
Compound	Result	Q
Benzo(a)pyrene	89	J
Arsenic	2.3	
Iron	15,000	J

SB-05 (54-55 ft bgs)		
Compound	Result	Q
Arsenic	0.9	
Iron	8,100	J

SB-29 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)pyrene	100	J
Benzo(b)fluoranthene	170	
Arsenic	2.2	J
Iron	13,000	

SB-29 (8-10 ft bgs)		
Compound	Result	Q
Arsenic	1.6	J
Iron	9,600	

SB-45 (0-2 ft bgs)		
Compound	Result	Q
Benzo(a)pyrene	130	J
Benzo(b)fluoranthene	220	
Aroclor 1260	100,000	J+
4,4'-DDT	6,800	J+
Dieldrin	800	J
Arsenic	5	
Iron	13,000	J
Mercury	110	J+

SB-45 (8-10 ft bgs)		
Compound	Result	Q
Arsenic	2	
Iron	12,000	J

Soil Boring Location

Monitoring Wells

Wolff-Alport Property

2010 NYCDDC Borings

2010 Soil Boring

2010 Road Opening

2010 Surface Soil

Notes:
1. Only results exceeding RI screening criteria are presented on this map.
2. Organic results are presented in ug/kg
3. Inorganic results presented in mg/kg

Acronyms:
bgs - below ground surface
ft - feet
J - estimated value
mg/kg - milligram per kilogram
ug/kg - microgram per kiligram
Q - qualifier

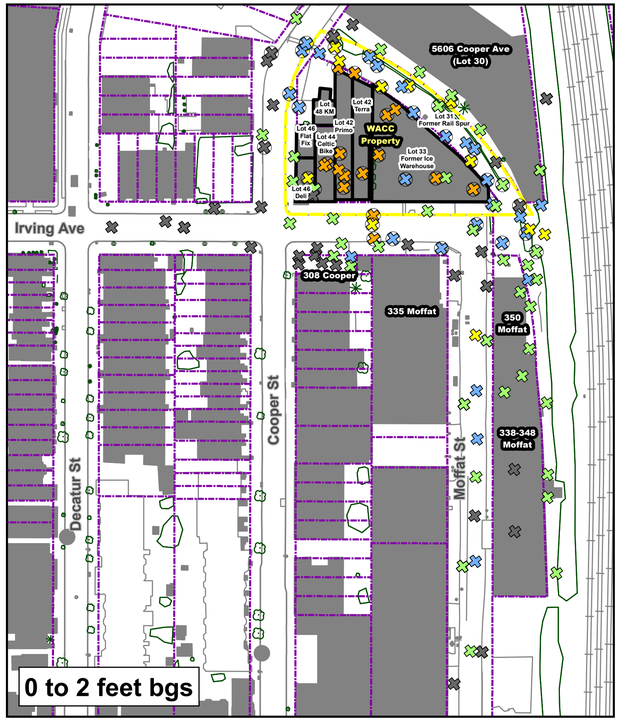
N E S W

0 30 60 120 Feet

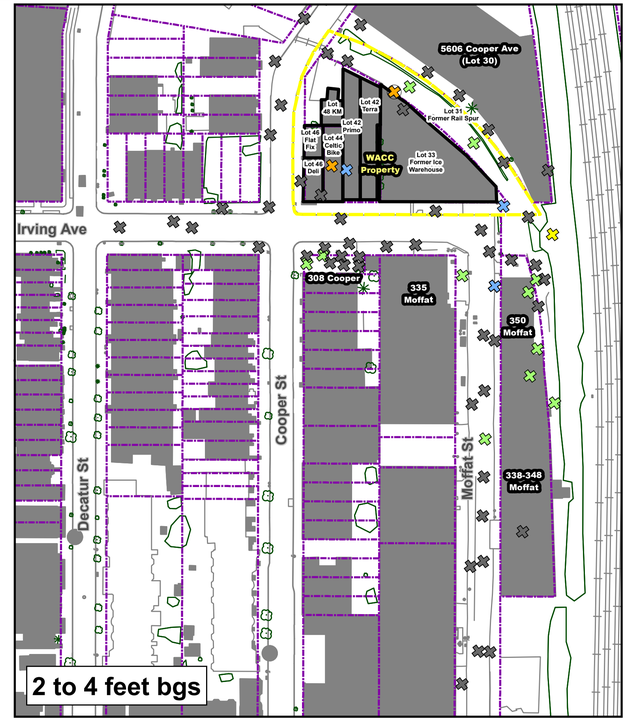
Figure 4-4
Non-Radiological Soil Screening Criteria Exceedances
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

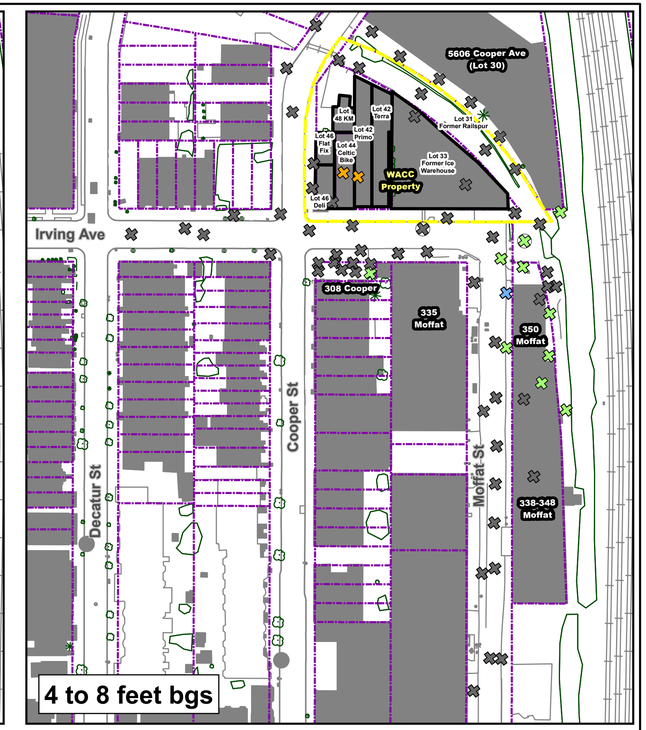
Surficial Gamma Scan



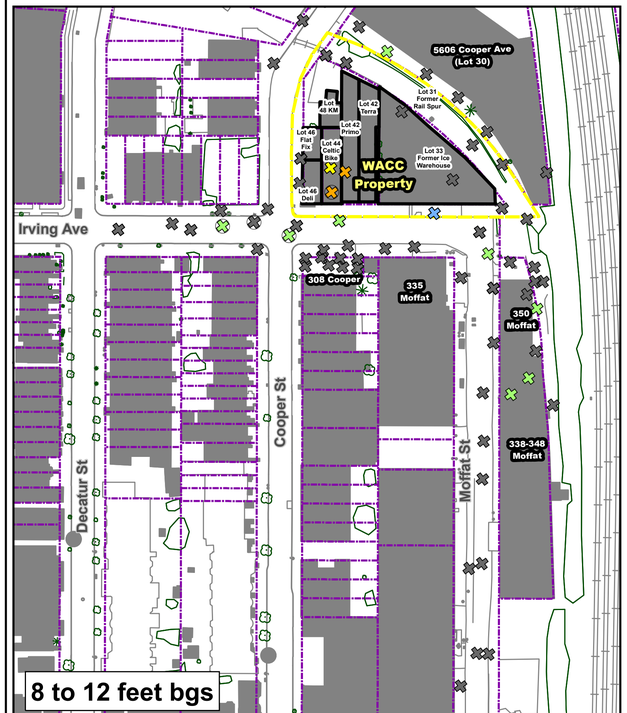
0 to 2 feet bgs



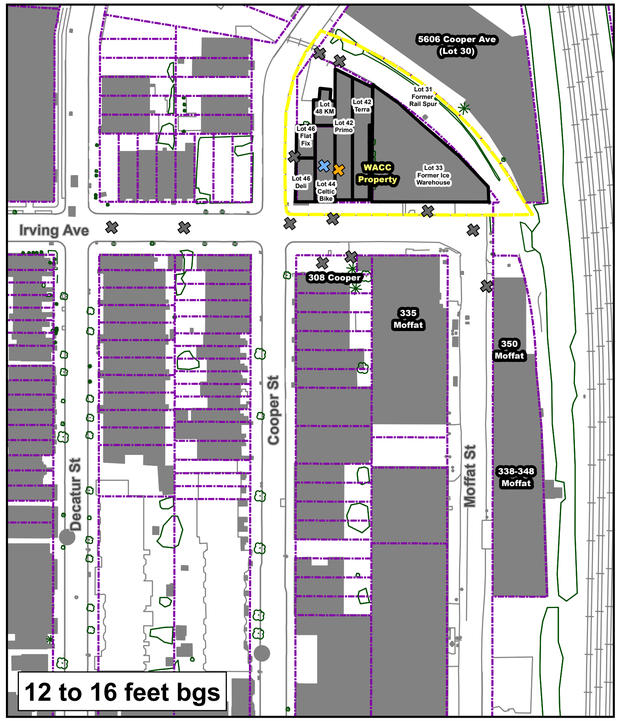
2 to 4 feet bgs



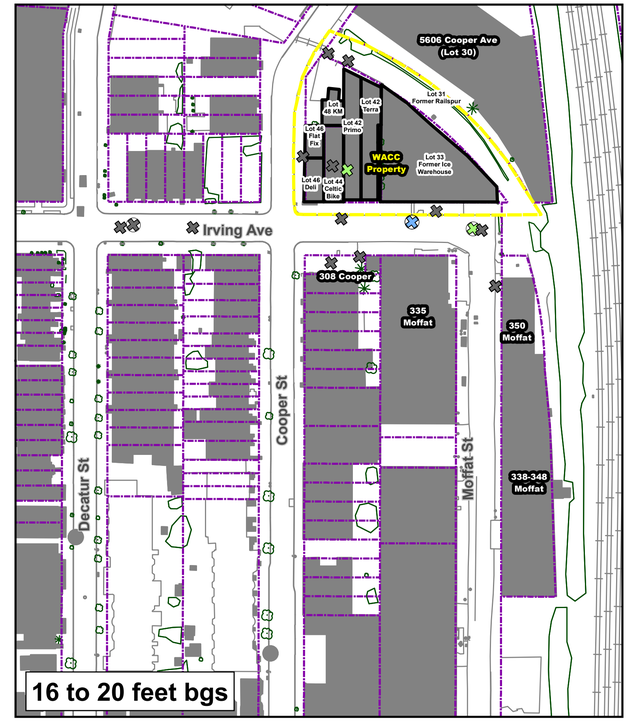
4 to 8 feet bgs



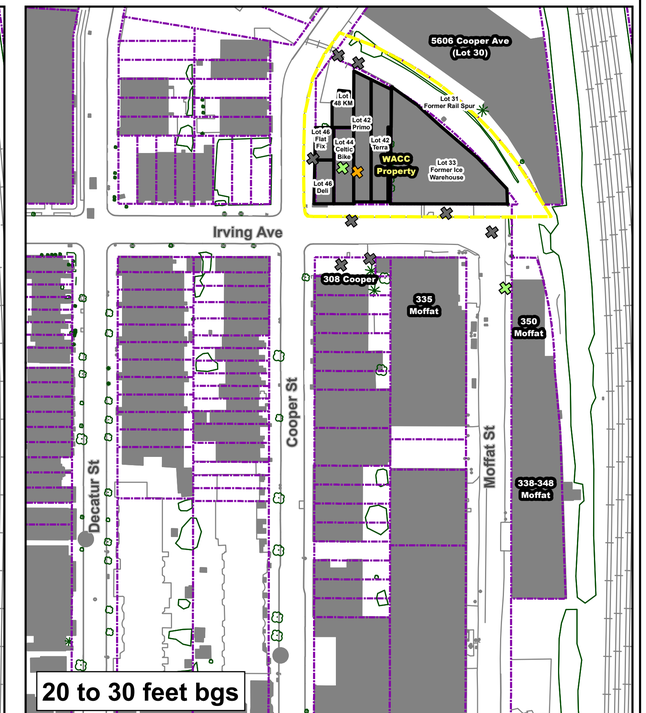
8 to 12 feet bgs



12 to 16 feet bgs



16 to 20 feet bgs



20 to 30 feet bgs

- Soil Boring Location
- School Soil Boring Location
- Sewer Soil Boring Location
- Monitoring Wells

2010 NYCDDC Borings
- 2010 Soil Boring
- 2010 Road Opening
- 2010 Surface Soil

2013 BVNA Borings
- 2013 Soil Boring

- WACC Property
- WACC Lot Boundaries
- Vegetation
- Property Lines
- Buildings

Surface Gamma Scans (CPM)
- <5,000 (background)
- 5,000-10,000 (<2x background)
- 10,000-15,000 (2-3x background)
- 15,000-20,000 (3-4x background)
- >20,000 (>4x Background)

Combined Th-232/Ra-226 Results (pCi/gram)

2015/2016 RI	Historic	
		Th-232<1.2 and Ra-226<0.9 (screening criteria)
		Th-232>1.2 or Ra-226>0.9; but combined <5
		5-20 (~2 to 10x screening criteria)
		20-50 (~10-25x screening criteria)
		> 50 (>25x screening criteria)

Notes

1. RI Screening criteria:
   Th-232 - 1.2 pCi/gram
   Ra-226 - 0.9 pCi/gram
2. Results of samples are plotted from the RI sampling and historic sampling by NYCDEP (BVNA 2013) and NYCDDC (LBA 2010c) (historic reports included in Appendix A)

Acronyms

BVNA - Bureau Veritas North America
CPM - counts per minute
LBA - Louis Berger Associates
NYCDDC - New York City Department of Design and Construction
NYCDEP - New York City Department of Environmental Protection
pCi/gram - pico curies per gram
RI - Remedial Investigation
WACC - Wolff-Alport Chemical Company

N W E S

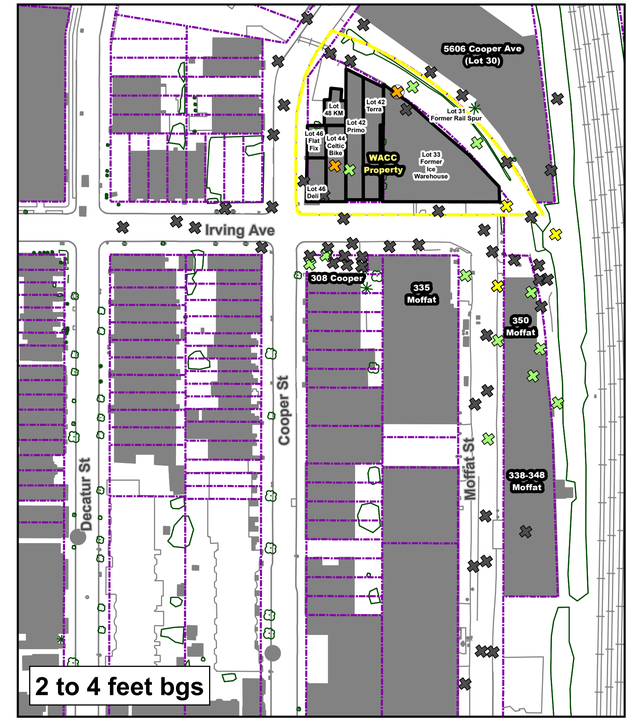
0 50 100 200 Feet

Figure 4-5a
Combined Th-232/ Ra-226 Concentrations in Soil
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

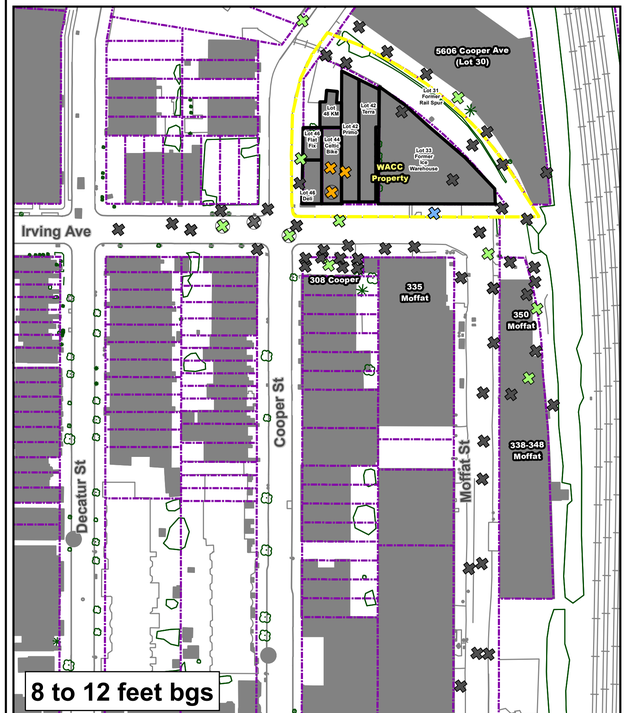
Surficial Gamma Scan

0 to 2 feet bgs



2 to 4 feet bgs

4 to 8 feet bgs



8 to 12 feet bgs

12 to 16 feet bgs

16 to 20 feet bgs

20 to 30 feet bgs

- Soil Boring Location
- School Soil Boring Location
- Sewer Soil Boring Location
- Monitoring Wells

2010 NYCDDC Borings
- 2010 Soil Boring
- 2010 Road Opening
- 2010 Surface Soil

2013 BVNA Borings
- 2013 Soil Boring

- WACC Property
- WACC Lot Boundaries
- Vegetation
- Property Lines
- Buildings

Surface Gamma Scans (CPM)
- <5,000 (background)
- 5,000-10,000 (<2x background)
- 10,000-15,000 (2-3x background)
- 15,000-20,000 (3-4x background)
- >20,000 (>4x Background)

Th-232 Results (pCi/gram)

2015/2016 RI	Historic	
		<1.2 (screening criteria)
		1.2-5 (<5x screening criteria)
		5-10 (5-10x screening criteria)
		10-25 (10-25x screening criteria)
		> 25 (>25x screening criteria)

Notes

1. RI Screening criteria:
   Th-232 - 1.2 pCi/gram
2. Results of samples are plotted from the RI sampling and historic sampling by NYCDEP (BVNA 2013) and NYCDDC (LBA 2010c) (historic reports included in Appendix A)

Acronyms

BVNA - Bureau Veritas North America
CPM - counts per minute
LBA - Louis Berger Associates
NYCDDC - New York City Department of Design and Construction
NYCDEP - New York City Department of Environmental Protection
pCi/gram - pico curies per gram
RI - Remedial Investigation
WACC - Wolff-Alport Chemical Company

N E S W

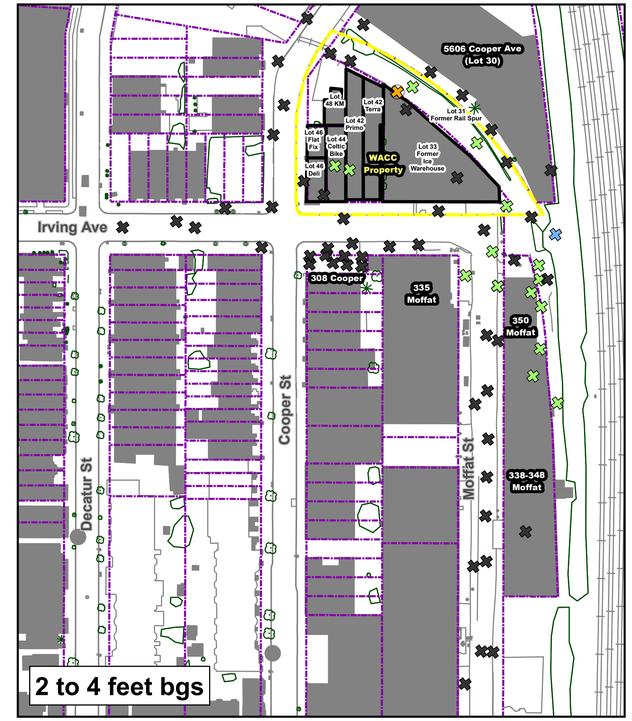
Feet
0 50 100 200

Figure 4-5b
Th-232 Concentrations in Soil
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

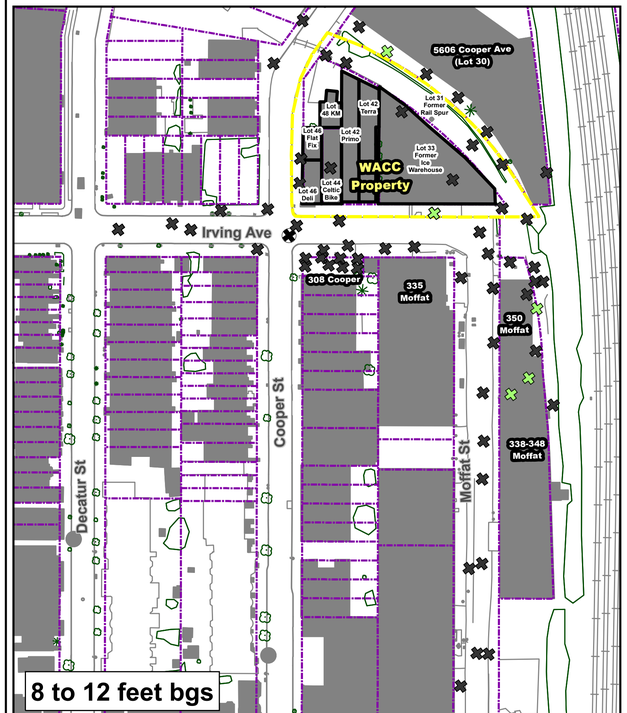
Surficial Gamma Scan

0 to 2 feet bgs



2 to 4 feet bgs

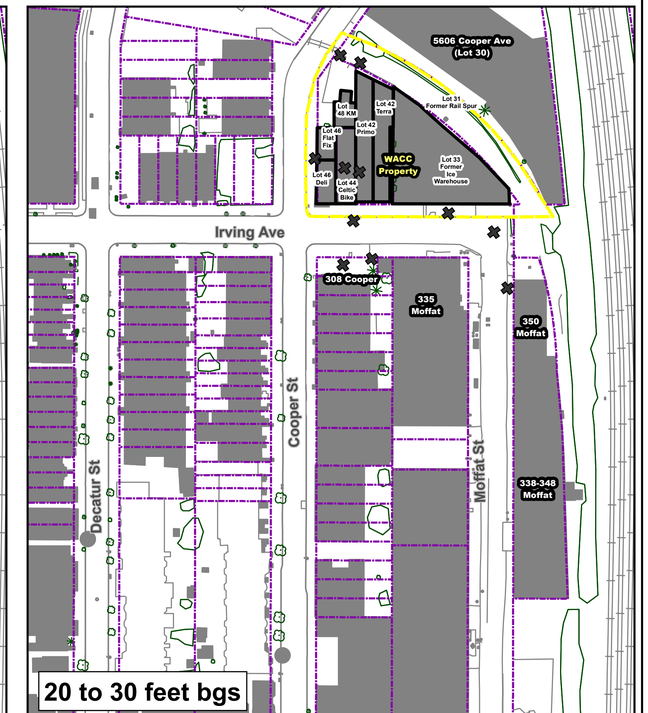
4 to 8 feet bgs



8 to 12 feet bgs

12 to 16 feet bgs

16 to 20 feet bgs



20 to 30 feet bgs

- Soil Boring Location
- School Soil Boring Location
- Sewer Soil Boring Location
- Monitoring Wells

2010 NYCDDC Borings
- 2010 Soil Boring
- 2010 Road Opening
- 2010 Surface Soil

2013 BVNA Borings
- 2013 Soil Boring

- WACC Property
- Room Boundaries
- Vegetation
- Property Lines
- Buildings

Surface Gamma Scans (CPM)
- <5,000 (background)
- 5,000-10,000 (<2x background)
- 10,000-15,000 (2-3x background)
- 15,000-20,000 (3-4x background)
- >20,000 (>4x Background)

Ra-226 Results (pCi/gram)

2015/2016 RI	Historic
	<0.9 (screening criteria)
	0.9-5 (<5x screening criteria)
	5-10 (5-10x screening criteria)
	10-25 (10-25x screening criteria)
	> 25 (>25x screening criteria)

Notes

1. RI Screening criteria:
   Ra-226 - 0.9 pCi/gram
2. Results of samples are plotted from the RI sampling and historic sampling by NYCDEP (BVNA 2013) and NYCDDC (LBA 2010c) (historic reports included in Appendix A)

Acronyms

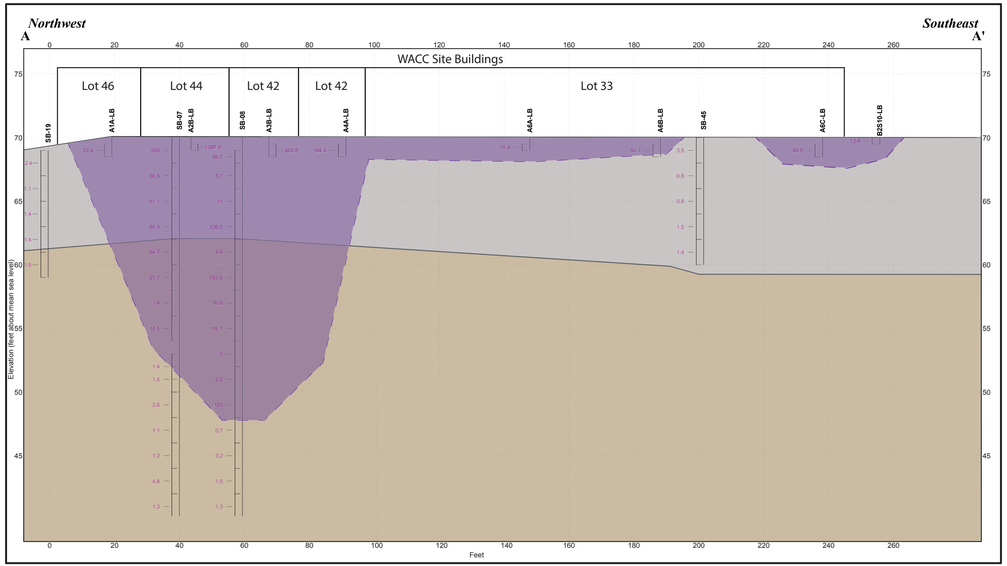
BVNA - Bureau Veritas North America
CPM - counts per minute
LBA - Louis Berger Associates
NYCDDC - New York City Department of Design and Construction
NYCDEP - New York City Department of Environmental Protection
pCi/gram - pico curies per gram
RI - Remedial Investigation
WACC - Wolff-Alport Chemical Company

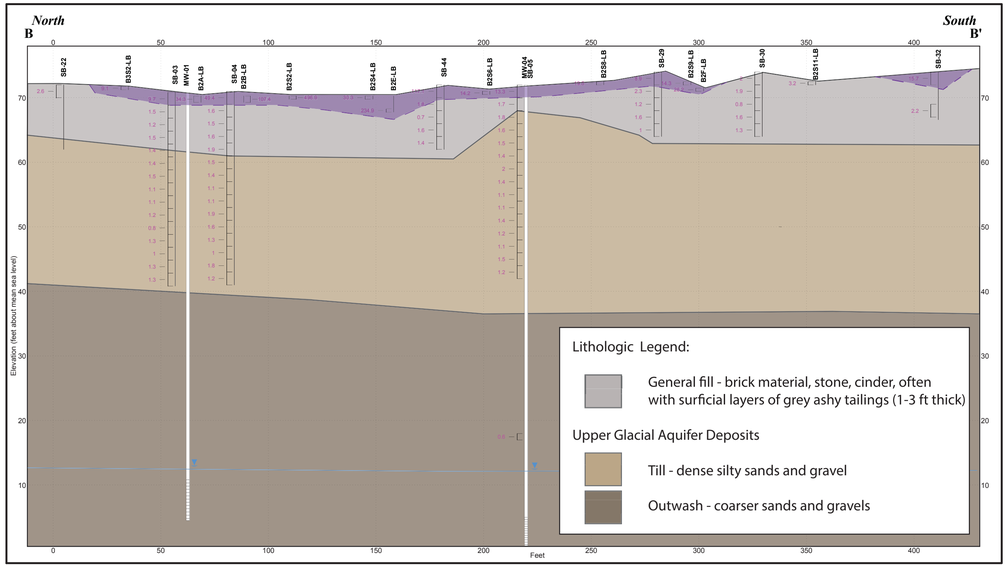
N W E S

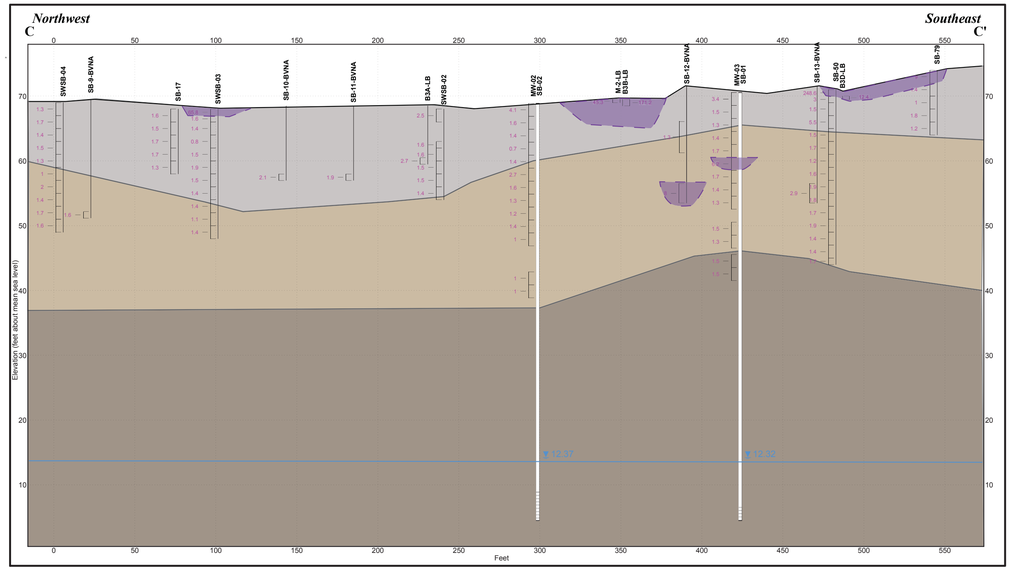
0 50 100 200 Feet

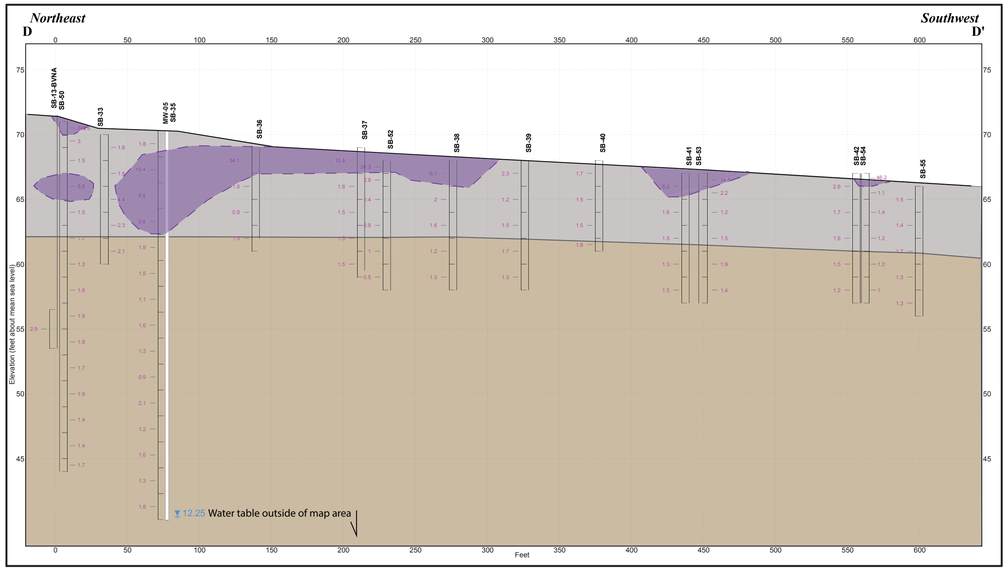
Figure 4-5c
Ra-226 Concentrations in Soil
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

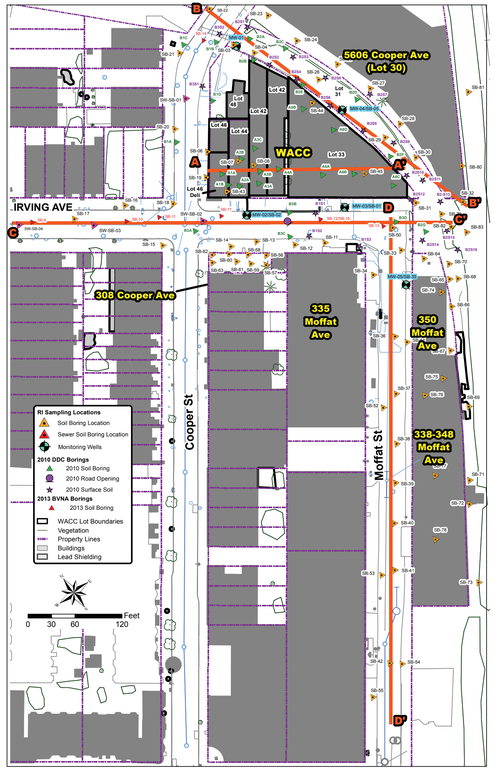
CDM Smith











Cross Section Locations

Legend
Soil Sample Results
Combined Th-232/Ra-226 Results
Results in pCi/gram

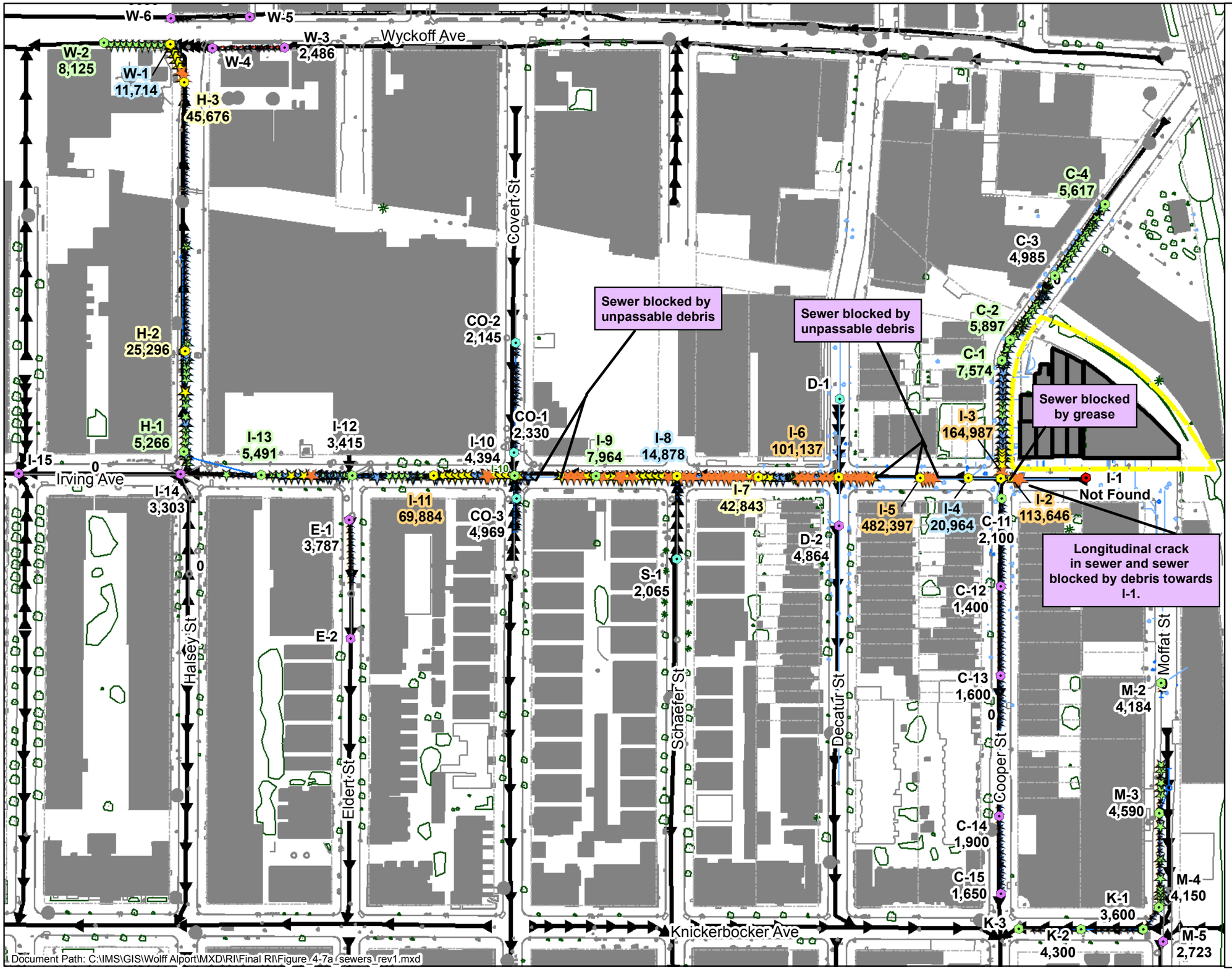
>5 pCi/gram isocontours (>2x background)

Notes:
1. Results of samples are plotted from the RI sampling and historical sampling by NYCDEP (BVNA 2013) and NYCDDC (LBA 2010c) (historical reports included in Appendix A)

Acronyms:
BVNA - Bureau Veritas North America
LBA - Louis Berger Associates
NYCDDC - New York City Department of Design and Construction
NYCDEP - New York City Department of Environmental Protection
pCi/gram - pico curies per gram
RI - Remedial Investigation
WACC - Wolff-Alport Chemical Company

Figure 4-6
Combined Th-232 and Ra-226 in Cross Section
Wolff-Alport Chemical Company Site
Ridgewood, Queens, NY

CDM Smith



Sewer Survey Locations

- Primary Manholes (fiberscope)
- Secondary Upstream Locs
- Background Manholes
- Manhole Inaccessible
- I-2 / 113,646 — Manhole Identifier / Manhole Gamma (cpm)

Manhole ID highlighted to show cmagnitude of gamma counts. (coloring same as in-sewer results)

In-Sewer Gamma Scan (CPM)

- <5,000 (< background)
- 5,000-10,000 (<2x background)
- 10,000-25,000 (2-5x background)
- 25,000-50,000 (5-10x background)
- >50,000 (>10x background)
- WACC Property
- WACC Lot Boundaries
- Vegetation
- Property Lines
- Buildings

Notes

1. Manhole gamma counts measured at the most elevated area within the vault.
2. In-sewer gamma scans are approximate locations.

Acronyms

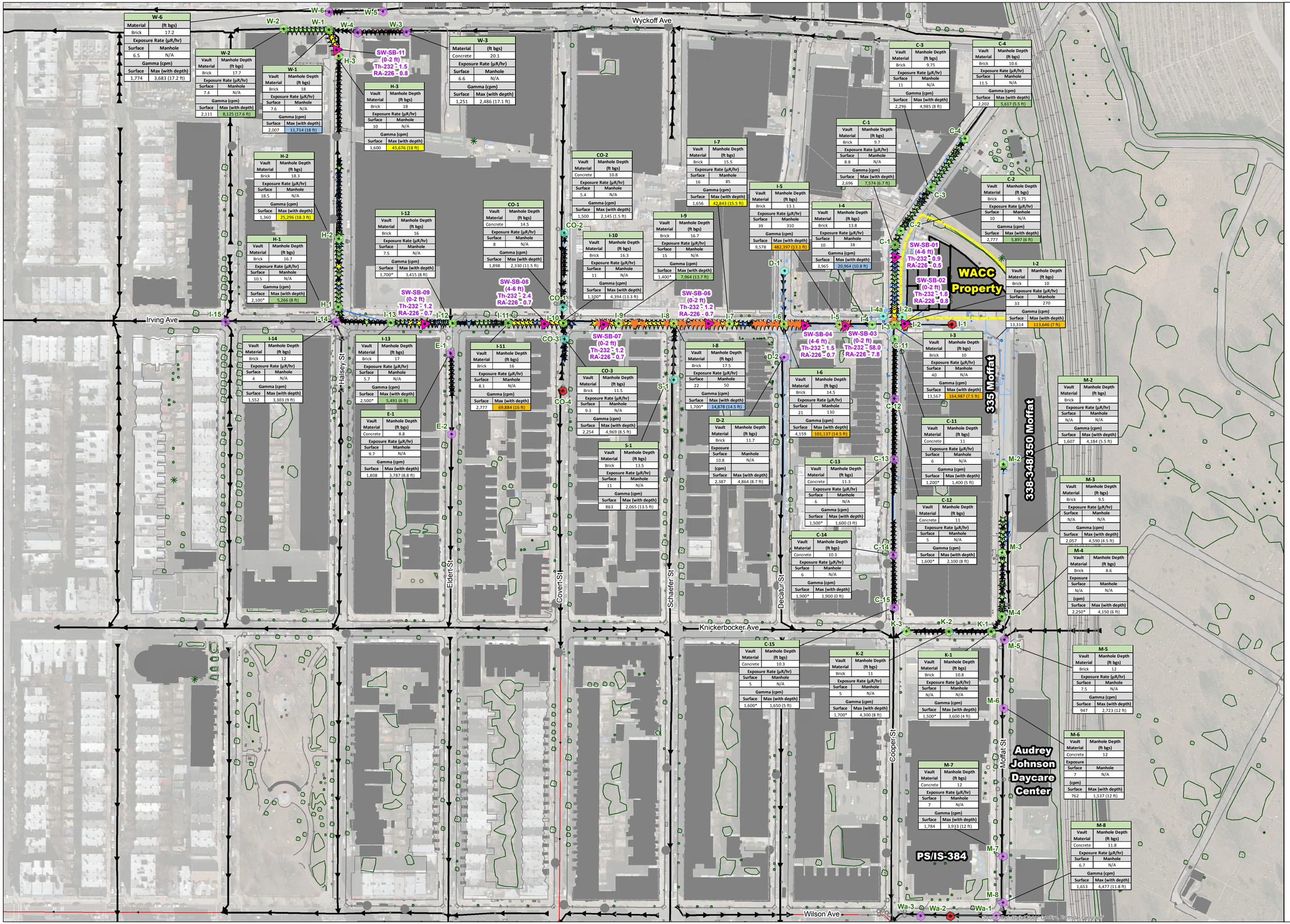
CPM - counts per minute
RI - Remedial Investigation
WACC - Wolff-Alport Chemical Company

N E S W

0 75 150 300 Feet

Figure 4-7a
Sewer Investigation Fiberscope Results
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Sewer Soil Borings

Sewer Survey Locations

- Primary Manholes (fiberscope)
- Secondary Upstream Manhole
- Background Manhole
- Manhole not Found

In-Sewer Gamma Scan

Gamma (CPM)

- <5,000 (< background)
- 5,000-10,000 (<2x background)
- 10,000-25,000 (2-5x background)
- 25,000-50,000 (5-10x background)
- >50,000 (>10x background)

- WACC Property
- WACC Lot Boundaries
- Vegetation
- Property Lines
- Buildings
- Combined Storm Sewer (approx.)
- Unknown Sewer (approx.)

Notes

1. Th-232 and Ra-226 results presented in pCi/gram.
2. Gamma exposure rates measured at the road surface and within the manhole vault.
3. Manhole gamma counts measured at the road surface and at the most elevated area within the vault.
4. In-sewer gamma scans are approximate locations.
5. Sewer soil boring sample results are presented for the 2-ft layer of soil showing the highest concentrations of radionuclides.
6. RI Screening criteria for solids:
   Th-232 - 1.2 pCi/gram
   Ra-226 - 0.9 pCi/gram

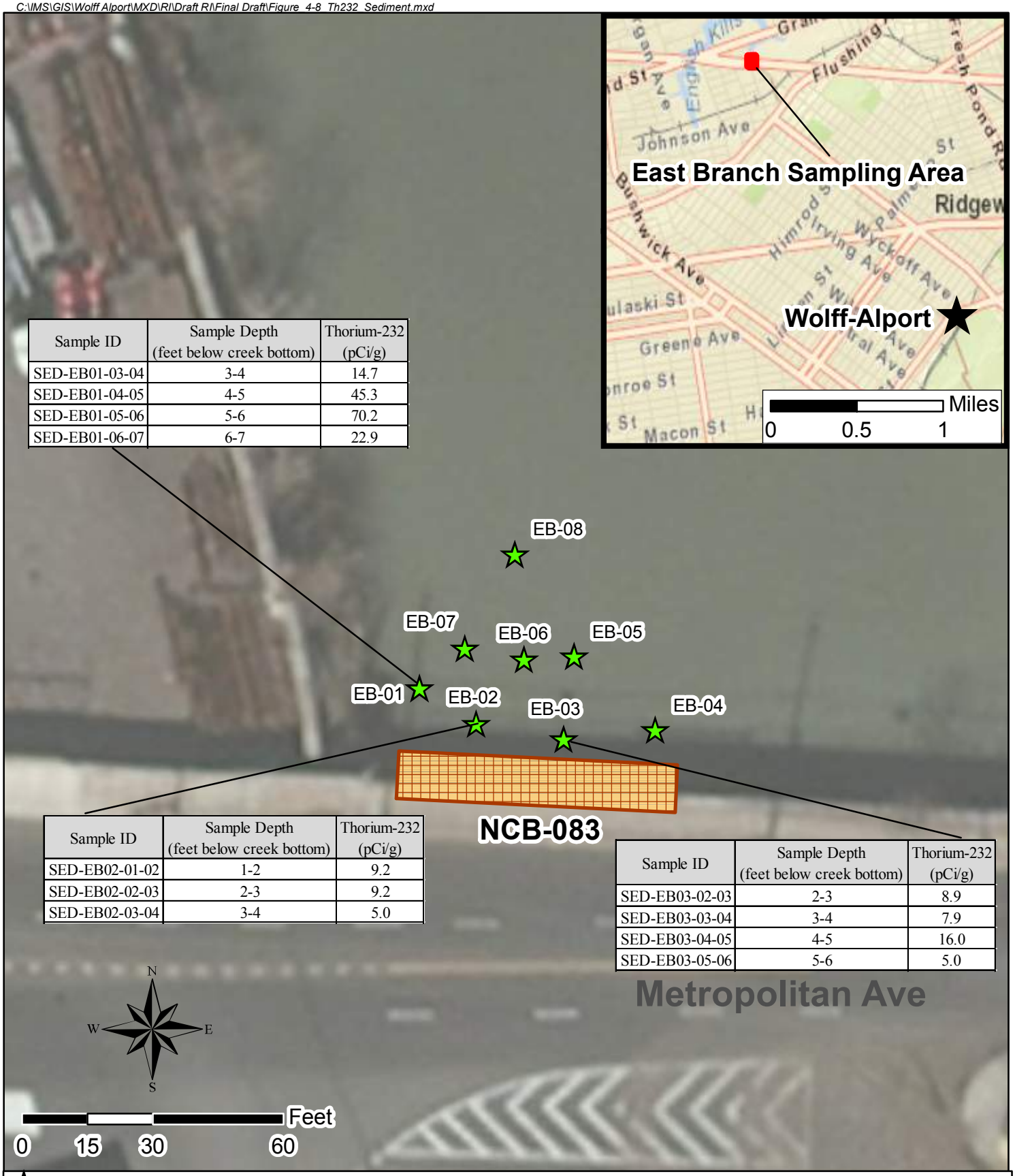
Acronyms

CPM - counts per minute
pCi/gram - pico curies per gram
RI - Remedial Investigation
WACC - Wolff-Alport Chemical Company
µR/hr - microroentgen per hour

Figure 4-7b
Sewer Investigation Soil Boring and Gamma Survey Results
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith

C:\IMS\GIS\Wolff Alport\MXD\RI\Draft RI\Final Draft\Figure 4-8 Th232 Sediment.mxd



Sample ID	Sample Depth (feet below creek bottom)	Thorium-232 (pCi/g)
SED-EB01-03-04	3-4	14.7
SED-EB01-04-05	4-5	45.3
SED-EB01-05-06	5-6	70.2
SED-EB01-06-07	6-7	22.9

Sample ID	Sample Depth (feet below creek bottom)	Thorium-232 (pCi/g)
SED-EB02-01-02	1-2	9.2
SED-EB02-02-03	2-3	9.2
SED-EB02-03-04	3-4	5.0

Sample ID	Sample Depth (feet below creek bottom)	Thorium-232 (pCi/g)
SED-EB03-02-03	2-3	8.9
SED-EB03-03-04	3-4	7.9
SED-EB03-04-05	4-5	16.0
SED-EB03-05-06	5-6	5.0

Sediment Core Location

Approximate Combined Sewer Overflow Discharge Location (Morgan Avenue Interceptor East)

Notes

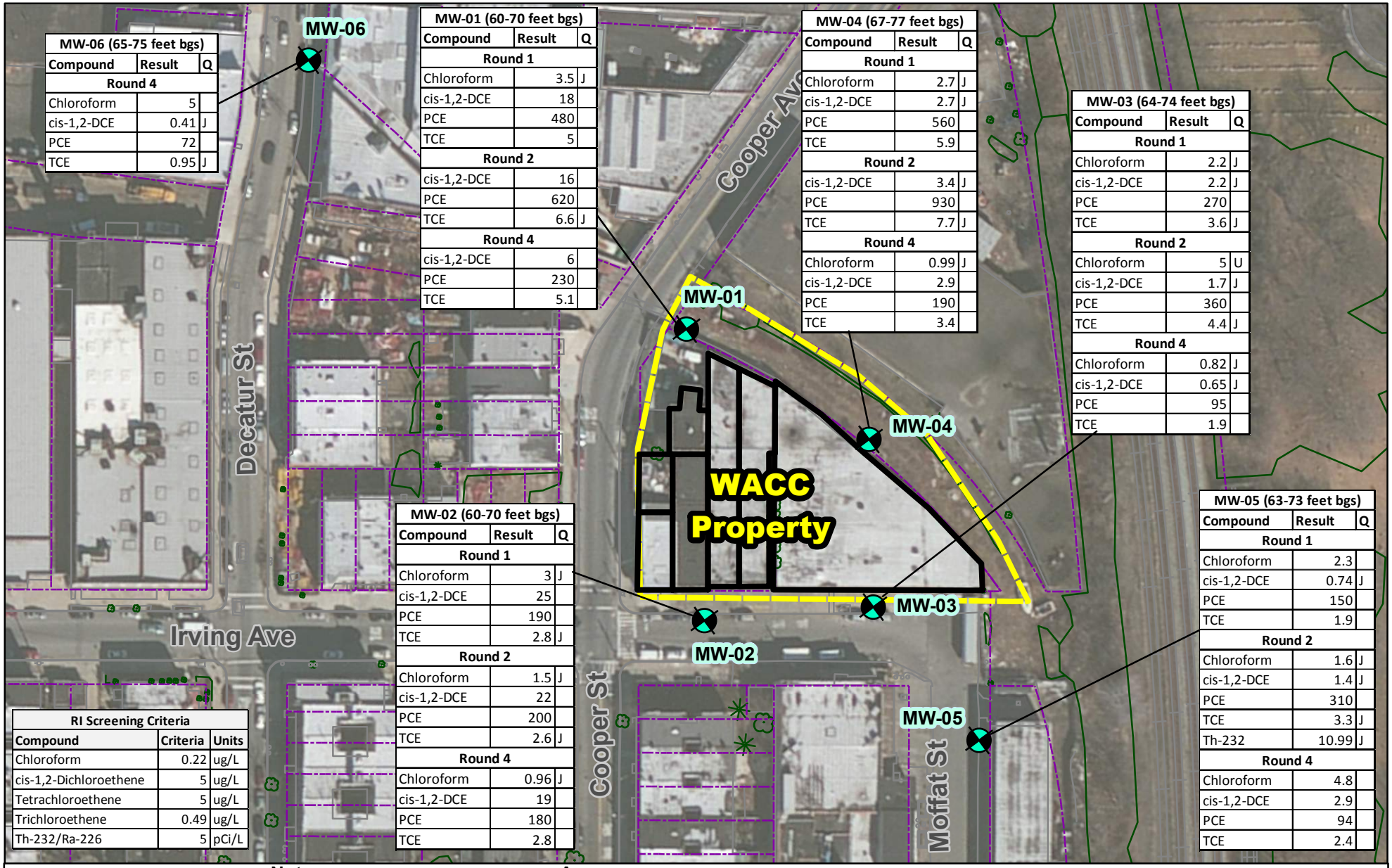
1. Sediment results above 5 pCi/gram are presented.

Acronyms

pCi/gram - pico curies per gram

Figure 4-8
Newtown Creek - East Branch Sediments
Thorium-232 Results
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



MW-06 (65-75 feet bgs)		
Compound	Result	Q
Round 4		
Chloroform	5	
cis-1,2-DCE	0.41	J
PCE	72	
TCE	0.95	J

MW-01 (60-70 feet bgs)		
Compound	Result	Q
Round 1		
Chloroform	3.5	J
cis-1,2-DCE	18	
PCE	480	
TCE	5	
Round 2		
cis-1,2-DCE	16	
PCE	620	
TCE	6.6	J
Round 4		
cis-1,2-DCE	6	
PCE	230	
TCE	5.1	

MW-04 (67-77 feet bgs)		
Compound	Result	Q
Round 1		
Chloroform	2.7	J
cis-1,2-DCE	2.7	J
PCE	560	
TCE	5.9	
Round 2		
cis-1,2-DCE	3.4	J
PCE	930	
TCE	7.7	J
Round 4		
Chloroform	0.99	J
cis-1,2-DCE	2.9	
PCE	190	
TCE	3.4	

MW-03 (64-74 feet bgs)		
Compound	Result	Q
Round 1		
Chloroform	2.2	J
cis-1,2-DCE	2.2	J
PCE	270	
TCE	3.6	J
Round 2		
Chloroform	5	U
cis-1,2-DCE	1.7	J
PCE	360	
TCE	4.4	J
Round 4		
Chloroform	0.82	J
cis-1,2-DCE	0.65	J
PCE	95	
TCE	1.9	

MW-02 (60-70 feet bgs)		
Compound	Result	Q
Round 1		
Chloroform	3	J
cis-1,2-DCE	25	
PCE	190	
TCE	2.8	J
Round 2		
Chloroform	1.5	J
cis-1,2-DCE	22	
PCE	200	
TCE	2.6	J
Round 4		
Chloroform	0.96	J
cis-1,2-DCE	19	
PCE	180	
TCE	2.8	

MW-05 (63-73 feet bgs)		
Compound	Result	Q
Round 1		
Chloroform	2.3	
cis-1,2-DCE	0.74	J
PCE	150	
TCE	1.9	
Round 2		
Chloroform	1.6	J
cis-1,2-DCE	1.4	J
PCE	310	
TCE	3.3	J
Th-232	10.99	J
Round 4		
Chloroform	4.8	
cis-1,2-DCE	2.9	
PCE	94	
TCE	2.4	

RI Screening Criteria		
Compound	Criteria	Units
Chloroform	0.22	ug/L
cis-1,2-Dichloroethene	5	ug/L
Tetrachloroethene	5	ug/L
Trichloroethene	0.49	ug/L
Th-232/Ra-226	5	pCi/L

RI Sampling Locations

- Monitoring Wells
- WACC Property
- WACC Lot Boundaries
- Vegetation
- Property Lines

Notes

1. Only results exceeding RI screening criteria are presented.
2. Organic results are presented in ug/L.
3. Radiological results are presented in pCi/L.
4. Round 3 samples were only collected for radiological parameters. Results did not exceed screening criteria.

Acronyms

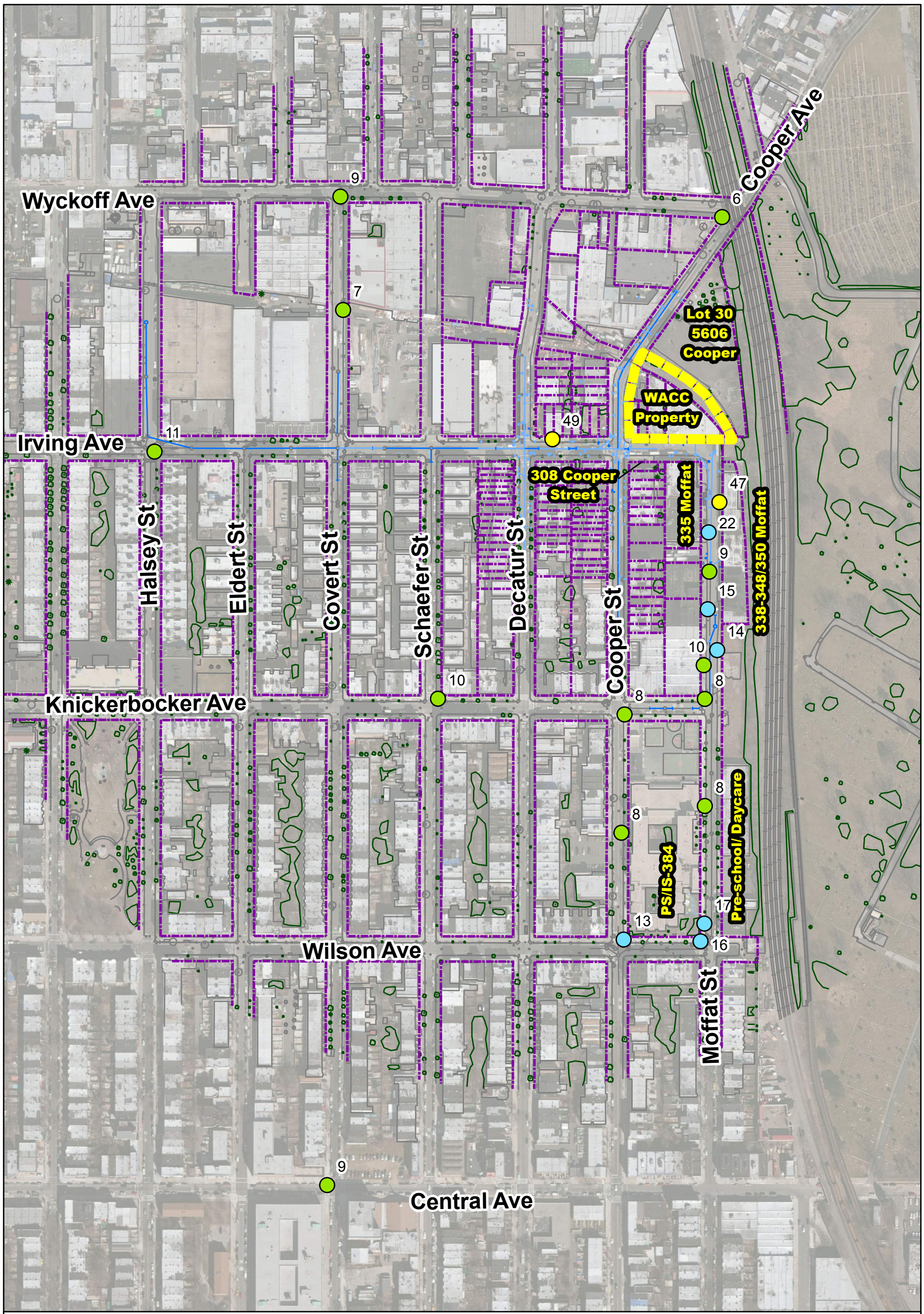
bgs - below ground surface
ft - feet
J - estimated value
pCi/L - picocuries per liter
Q - data qualifier
Th - thorium
WACC - Wolff-Alport Chemical Company
ug/L - micrograms per liter

N E S W

0 50 100 200 Feet

Figure 4-9
Groundwater Sampling Results
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Exposure Rate (µR/hr)

- <12 (< background)
- 12-24 (<2x background)
- 24-60 (2-5x background)
- >60 (>5x background)

- Vegetation
- Sewer
- Property Lines
- Building Outlines
- WACC Property

Acronyms

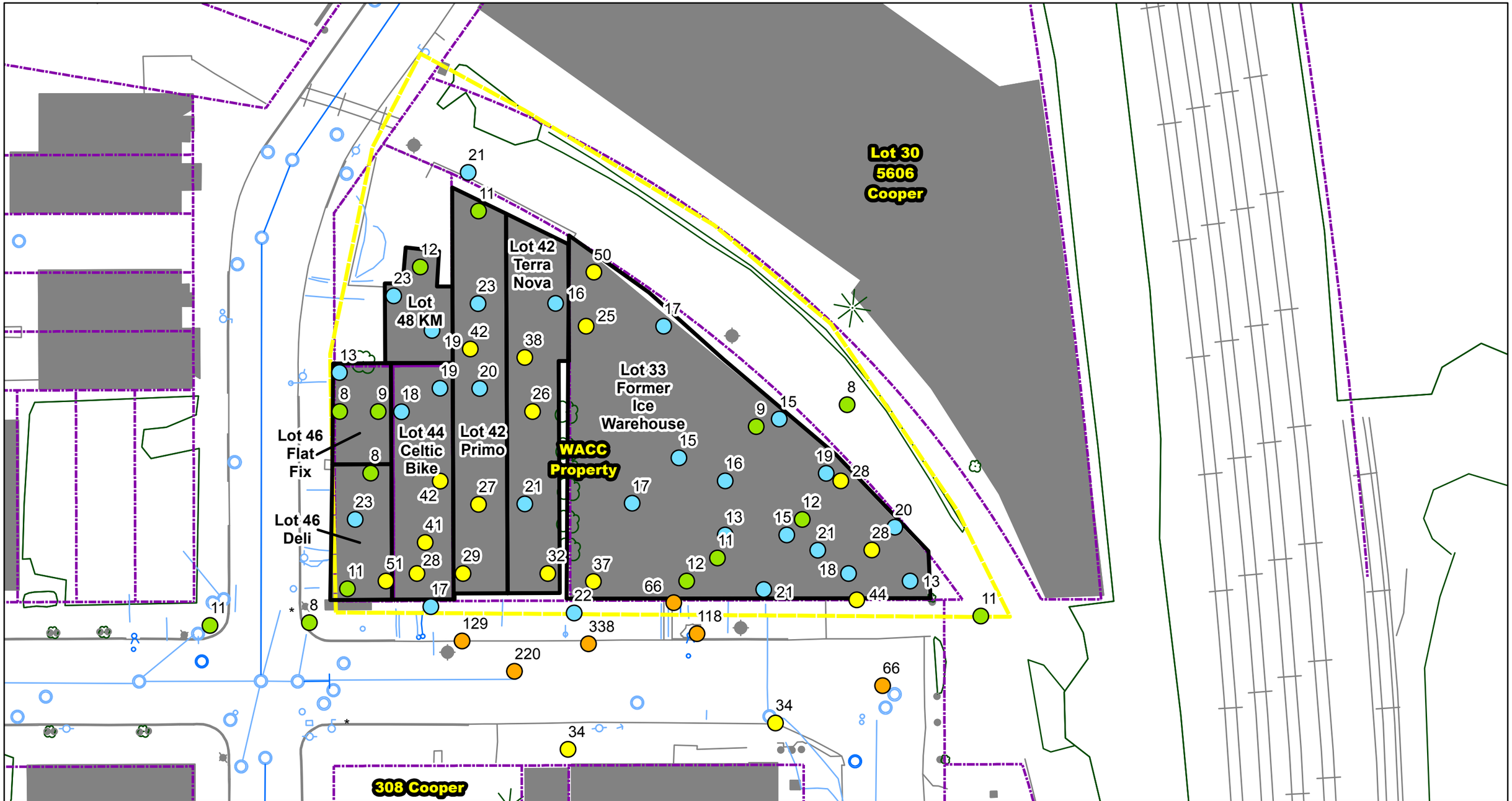
PS/IS - Public School/ Intermediate School
WACC - Wolff-Alport Chemical Company

N E S W

0 125 250 500 Feet

Figure 4-10a
Gamma Exposure Rate Survey
- Neighborhood Locations
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Exposure Rate (µR/hr)

- <12 (< background)
- 12-24 (<2x background)
- 24-60 (2-5x background)
- >60 (>5x background)

- WACC Property
- Vegetation
- Sewer
- Property Lines
- Buildings

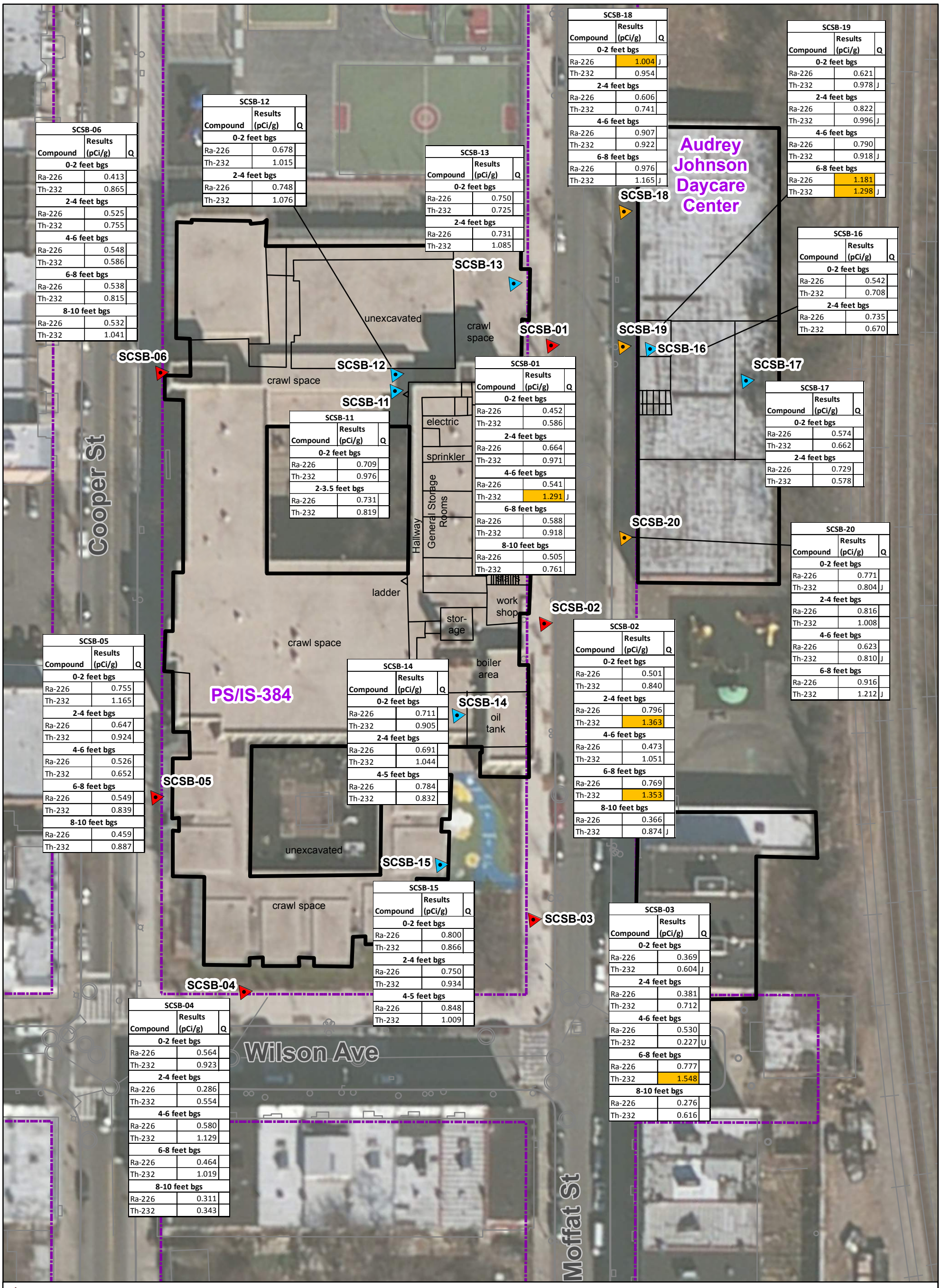
Acronyms

WACC - Wolff-Alport Chemical Company

40 20 0 40 Feet

Figure 4-10b
Gamma Exposure Rate Survey
- Building Interior and Exterior
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



SCSB-06		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.413	
Th-232	0.865	
2-4 feet bgs		
Ra-226	0.525	
Th-232	0.755	
4-6 feet bgs		
Ra-226	0.548	
Th-232	0.586	
6-8 feet bgs		
Ra-226	0.538	
Th-232	0.815	
8-10 feet bgs		
Ra-226	0.532	
Th-232	1.041	

SCSB-12		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.678	
Th-232	1.015	
2-4 feet bgs		
Ra-226	0.748	
Th-232	1.076	

SCSB-13		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.750	
Th-232	0.725	
2-4 feet bgs		
Ra-226	0.731	
Th-232	1.085	

SCSB-18		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	1.004	J
Th-232	0.954	
2-4 feet bgs		
Ra-226	0.606	
Th-232	0.741	
4-6 feet bgs		
Ra-226	0.907	
Th-232	0.922	
6-8 feet bgs		
Ra-226	0.976	
Th-232	1.165	J

SCSB-19		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.621	
Th-232	0.978	J
2-4 feet bgs		
Ra-226	0.822	
Th-232	0.996	J
4-6 feet bgs		
Ra-226	0.790	
Th-232	0.918	J
6-8 feet bgs		
Ra-226	1.181	
Th-232	1.298	J

SCSB-16		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.542	
Th-232	0.708	
2-4 feet bgs		
Ra-226	0.735	
Th-232	0.670	

SCSB-17		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.574	
Th-232	0.662	
2-4 feet bgs		
Ra-226	0.729	
Th-232	0.578	

SCSB-01		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.452	
Th-232	0.586	
2-4 feet bgs		
Ra-226	0.664	
Th-232	0.971	
4-6 feet bgs		
Ra-226	0.541	
Th-232	1.291	J
6-8 feet bgs		
Ra-226	0.588	
Th-232	0.918	
8-10 feet bgs		
Ra-226	0.505	
Th-232	0.761	

SCSB-11		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.709	
Th-232	0.976	
2-3.5 feet bgs		
Ra-226	0.731	
Th-232	0.819	

SCSB-20		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.771	
Th-232	0.804	J
2-4 feet bgs		
Ra-226	0.816	
Th-232	1.008	
4-6 feet bgs		
Ra-226	0.623	
Th-232	0.810	J
6-8 feet bgs		
Ra-226	0.916	
Th-232	1.212	J

SCSB-05		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.755	
Th-232	1.165	
2-4 feet bgs		
Ra-226	0.647	
Th-232	0.924	
4-6 feet bgs		
Ra-226	0.526	
Th-232	0.652	
6-8 feet bgs		
Ra-226	0.549	
Th-232	0.839	
8-10 feet bgs		
Ra-226	0.459	
Th-232	0.887	

SCSB-14		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.711	
Th-232	0.905	
2-4 feet bgs		
Ra-226	0.691	
Th-232	1.044	
4-5 feet bgs		
Ra-226	0.784	
Th-232	0.832	

SCSB-02		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.501	
Th-232	0.840	
2-4 feet bgs		
Ra-226	0.796	
Th-232	1.363	
4-6 feet bgs		
Ra-226	0.473	
Th-232	1.051	
6-8 feet bgs		
Ra-226	0.769	
Th-232	1.353	
8-10 feet bgs		
Ra-226	0.366	
Th-232	0.874	J

SCSB-15		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.800	
Th-232	0.866	
2-4 feet bgs		
Ra-226	0.750	
Th-232	0.934	
4-5 feet bgs		
Ra-226	0.848	
Th-232	1.009	

SCSB-03		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.369	
Th-232	0.604	J
2-4 feet bgs		
Ra-226	0.381	
Th-232	0.712	
4-6 feet bgs		
Ra-226	0.530	
Th-232	0.227	U
6-8 feet bgs		
Ra-226	0.777	
Th-232	1.548	
8-10 feet bgs		
Ra-226	0.276	
Th-232	0.616	

SCSB-04		
Compound	Results (pCi/g)	Q
0-2 feet bgs		
Ra-226	0.564	
Th-232	0.923	
2-4 feet bgs		
Ra-226	0.286	
Th-232	0.554	
4-6 feet bgs		
Ra-226	0.580	
Th-232	1.129	
6-8 feet bgs		
Ra-226	0.464	
Th-232	1.019	
8-10 feet bgs		
Ra-226	0.311	
Th-232	0.343	

Exterior Soil Boring Location (2016)

Exterior Soil Boring Location (2017)

Basement Soil Boring Location (2017)

Soil Screening Criteria (pCi/g)	
Ra-226	**0.919**
Th-232	**1.22**

Notes

1. Results are presented in pCi/gram.
2. Soil sample results exceeding the screening criteria are highlighted orange.

Acronyms

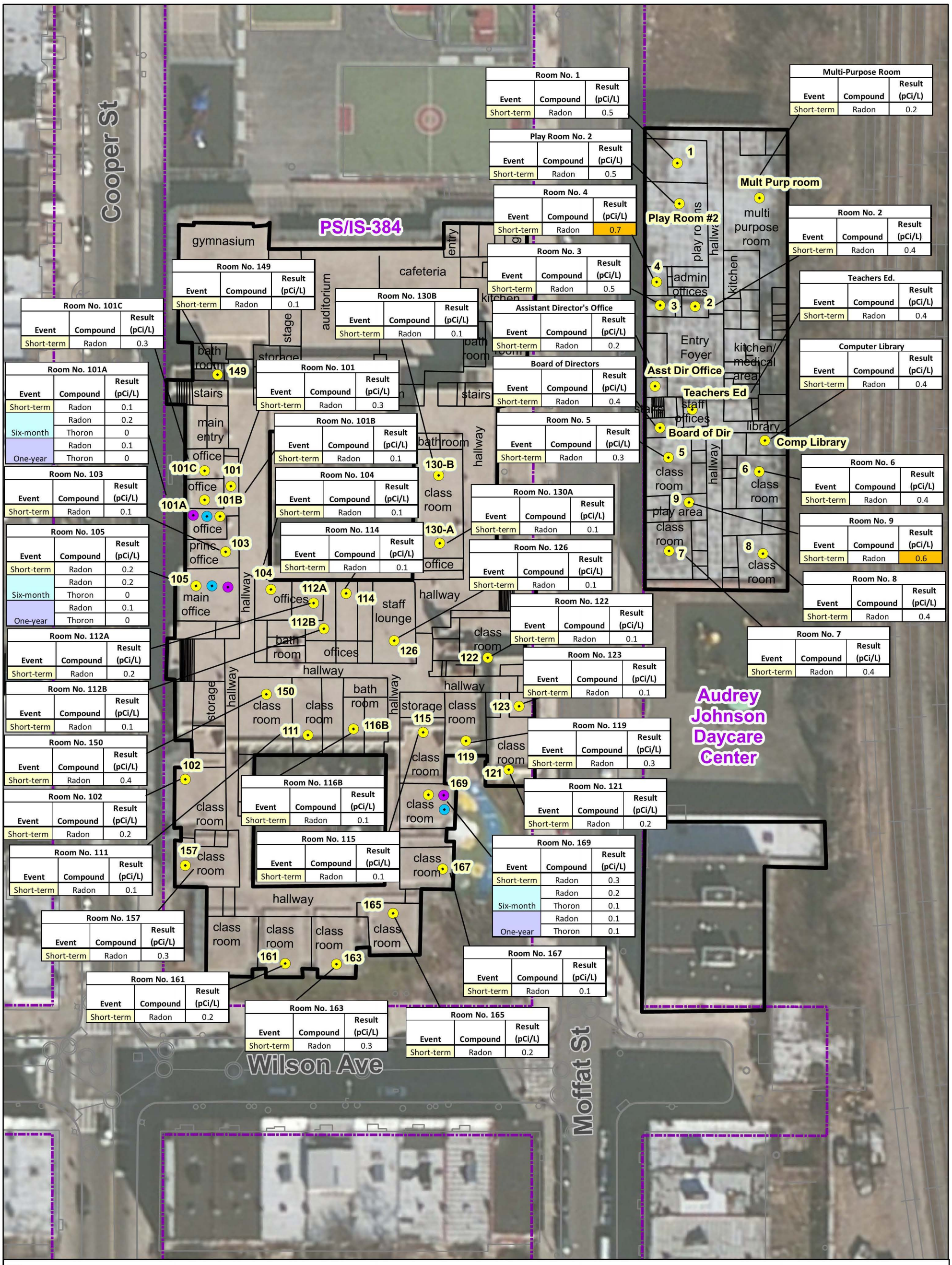
pCi/gram - pico curies per gram
PS/IS - Public School/ Intermediate School

N E S W

0 25 50 100 Feet

Figure 4-11
School and Daycare Investigation
Soil Sampling Results
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Room No. 1		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.5

Play Room No. 2		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.5

Room No. 4		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.7

Room No. 3		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.5

Assistant Director's Office		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.2

Board of Directors		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.4

Room No. 5		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.3

Multi-Purpose Room		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.2

Room No. 2		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.4

Teachers Ed.		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.4

Computer Library		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.4

Room No. 6		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.4

Room No. 9		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.6

Room No. 8		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.4

Room No. 7		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.4

Room No. 149		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 130B		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 101C		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.3

Room No. 101A		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1
Six-month	Radon	0.2
	Thoron	0
One-year	Radon	0.1
	Thoron	0

Room No. 101		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.3

Room No. 101B		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 104		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 103		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 105		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.2
Six-month	Radon	0.2
	Thoron	0
One-year	Radon	0.1
	Thoron	0

Room No. 114		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 130A		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 126		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 122		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 123		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 112A		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.2

Room No. 112B		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 150		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.4

Room No. 102		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.2

Room No. 111		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 116B		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 115		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

Room No. 119		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.3

Room No. 121		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.2

Room No. 169		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.3
Six-month	Radon	0.2
	Thoron	0.1
One-year	Radon	0.1
	Thoron	0.1

Room No. 157		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.3

Room No. 161		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.2

Room No. 163		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.3

Room No. 165		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.2

Room No. 167		
Event	Compound	Result (pCi/L)
Short-term	Radon	0.1

- Short-Term Radon Sampling Location
- 6-Month Radon and Thoron Sampling Location
- 12-Month Radon and Thoron Sampling Location
- Property Lines

Screening Criteria (pCi/L)	
Radon-Indoors - Basement	1.2
Radon-Indoors First Floor	0.5

Figure 4-12
School and Daycare Investigation
1st Floor Air Sampling Results
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

Notes

1. Short-term samples were collected using charcoal canisters.
2. Long-term (6-month and 12-month) radon samples were collected with alpha track detectors (ATDs). Radon results reported here are those from a ATD fitted with a thoron filter. Thoron results reported are calculated based on the radon concentrations from detectors with and without the thoron filter.
3. Results are presented in pCi/L.
4. Results exceeding the screening criteria are highlighted orange.

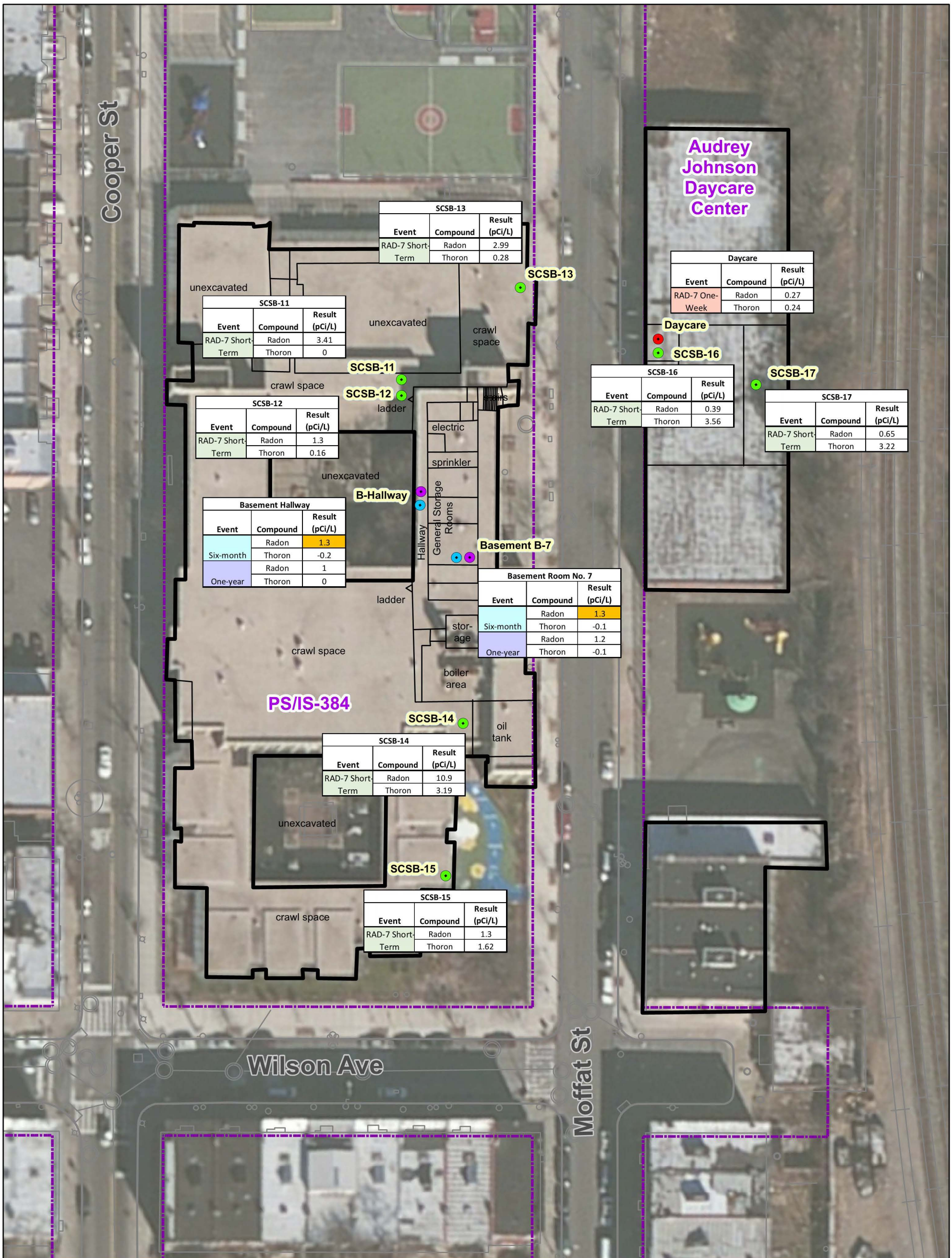
Acronyms

PS/IS - Public School/ Intermediate School

N E S W

0 25 50 100 Feet

CDM Smith



RAD-7 Survey Location (Short-Term)

RAD-7 Survey Location (Long-Term)

6-Month Radon and Thoron Sampling Location

12-Month Radon and Thoron Sampling Location

Property Lines

Screening Criteria (pCi/L)	
Radon-Indoors - Basement	1.2
Radon-Indoors First Floor	0.5

Acronyms

PS/IS - Public School/ Intermediate School

Notes

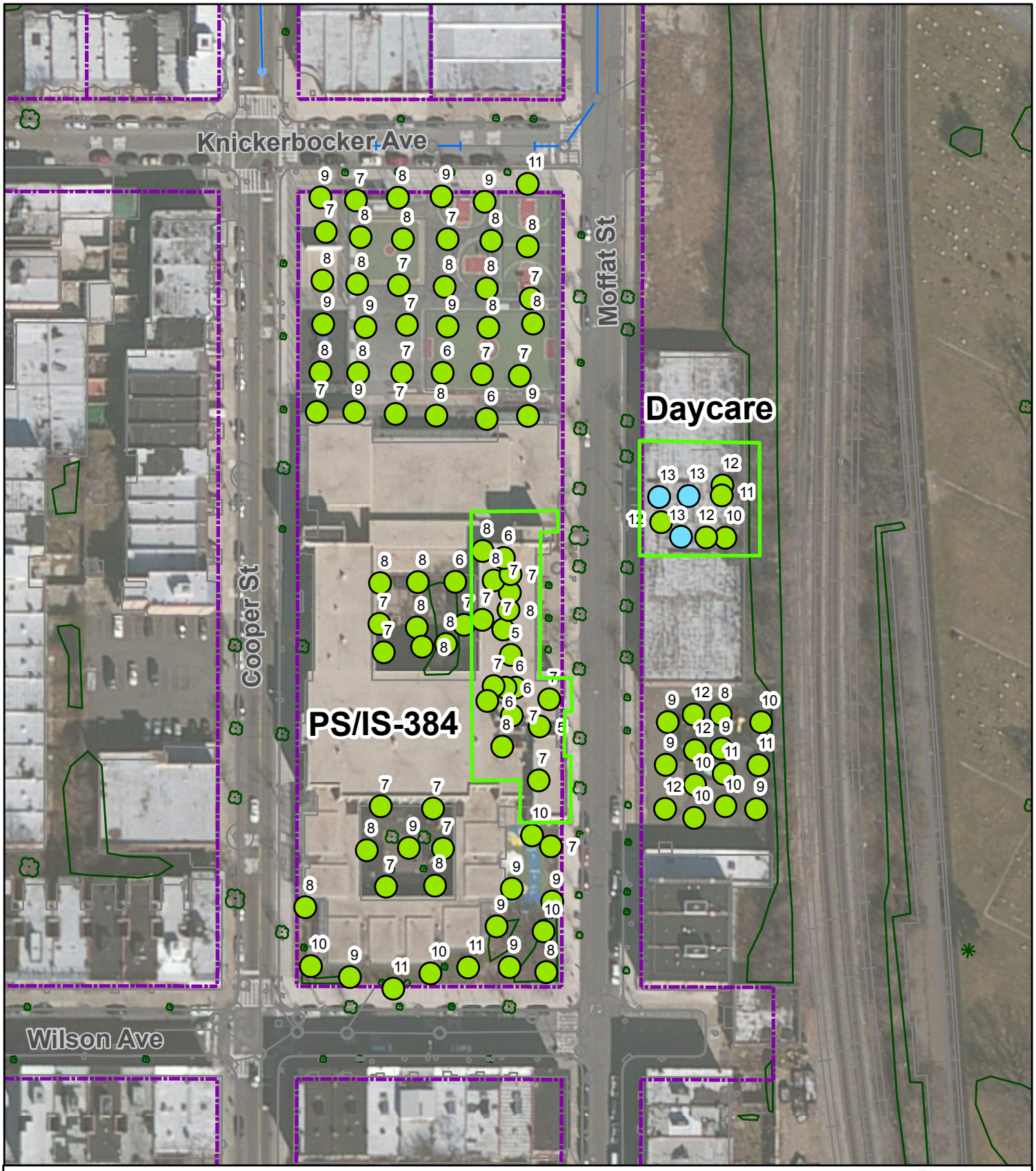
1. Short-term surveys of thoron and radon were performed using a Durridge RAD-7. Measurements were taken following the penetration of the concrete slab for approximately 30-minutes.
2. Long-term surveys of thoron and radon were performed using a Durridge RAD-7. Measurements were collected for 5 days for thoron and 7 days for radon.
3. Long-term radon samples were collected with alpha track detectors (ATDs). Radon results reported here are those from a ATD fitted with a thoron filter. Thoron results reported are calculated based on the radon concentrations from detectors with and without the thoron filter.
4. Results are presented in pCi/L.
5. 6-Month and 12-Month results exceeding the screening criteria are highlighted orange. RAD-7 survey results were not compared to the screening criteria.

N E S W

0 25 50 100 Feet

Figure 4-13
School and Daycare Investigation
Basement Air Sampling Results
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith



Exposure Rate (µR/hr)

- <12 (< background)
- 12-24 (<2x background)
- 24-60 (2-5x background)
- >60 (>5x background)

- Vegetation
- Sewer
- Property Lines
- Building Outlines
- Basement Locations

Acronyms

PS/IS - Public School/ Intermediate School

0 50 100 200 Feet

Figure 4-14
Gamma Exposure Rate Survey
- School and Daycare
Wolff-Alport Chemical Company Site
Ridgewood, Queens, New York

CDM Smith