BCP Site No. C224264

FORMER NY CLEANING AND DYEING SITE
376-378 FLUSHING AVENUE
BROOKLYN NEW YORK
Block 1884 Lots 40 and 48

REMEDIAL ACTION WORK PLAN

MAY 2018

Prepared for:
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CERTIFICATIONS

I, Ariel Czemerinski, certify that I am currently a NYS registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

076508	05/09/2018	
NYS Professional Engineer #	Date	Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

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LIST OF ACRONYMS

Acronym	Definition
AMC	AMC Engineering
AWQS	Ambient Water Quality Standards
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CQMP	Construction Quality Management Plan
DUSR	Data Usability Statement Report
EBC	Environmental Business Consultants
FER	Final Engineering Report
HDPE	High Density Polyethylene
IRM	Interim Remedial Measure
NYC	New York City
NYCDEP	New York City Department of Environmental Protection
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PS	Public School
PVC	Polyvinyl Chloride
RAO	Remedial Action Objectives
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
RSCOs	Recommended Site Cleanup Objectives
SCG	Standards, Criteria, and Guidelines
SMMP	Soil/Materials Management Plan
SMP	Site Management Plan
SSDS	Sub-slab Depressurization System
SWPPP	Stormwater Pollution Prevention Plan
SVOCs	Semi-Volatile Organic Compounds
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

EXECUTIVE SUMMARY

Site Description/Physical Setting/Site History

This Remedial Action Work Plan (RAWP) was prepared on behalf of Rose Castle Redevelopment II LLC for the Former NY Cleaning and Dyeing property located at 376-378 Flushing Avenue in the Bedford Stuyvesant section of Brooklyn, New York (hereafter referred to as "Site") (**Figure 1**). The Site was formally accepted into the New York State Brownfield Cleanup Program (BCP) on February 2, 2018. The Brownfield Cleanup Agreement was executed by the NYSDEC on February 23, 2018 and assigned Site No. C224264. Rose Castle Redevelopment II LLC was accepted into the program as a Volunteer.

The Site is located at 376-378 Flushing Avenue in the Bedford Stuyvesant section of Brooklyn, New York, and is currently identified as Block 1884, Lots 40 and 48 on the New York City Tax Map (**see Figure** 2). Lot 40 is a rectangular-shaped lot extending from Flushing Avenue to Little Nassau Street, approximately 13,250 square feet (ft^2) in size. Lot 48 consists of an irregular shaped lot approximately 26,057 ft^2 in size. The total area of both lots is approximately 39,307 ft^2. The Site is located on the southwest side of the intersection of Flushing Avenue and Franklin Avenue and is bordered by Flushing Avenue to the north; Franklin Avenue and a three-story commercial building to the east; Little Nassau Street to the south; and residential apartment building to the west. The Site contains approximately 269 linear feet of street frontage along Flushing Avenue, 103 linear feet of street frontage along Franklin Avenue and 75 linear feet of street frontage along Little Nassau Street.

The entire footprint of the Site is currently developed with four adjacent buildings. Lot 40 is developed with a one-story commercial building approximately 13,250 ft^2 in size, currently occupied by a door and molding company. Lot 48 is developed with three, two-story commercial buildings occupied by an approximate 11,932 ft^2 catering hall, an approximate 11,400 ft^2 warehouse for the door and molding company (on Lot 40), and an approximate 1,595 ft^2 office space.

The property has an elevation of approximately 16 feet above the National Geodetic Vertical Datum (NGVD) feet. The depth to groundwater beneath the site, as determined from field

measurements, ranges from approximately 9 to 13 feet below grade. Based on groundwater contour maps, groundwater flow is east/southeast.

Information regarding ownership of the property was obtained from online property records maintained by the NYC Department of Finance Office of the City Register under its Automated City Register Information System (ACRIS). Information regarding past operators was obtained from historic Sanborn Fire Insurance maps, city phone directories, certificates of occupancy and from an internet search of the property address. The Requestor is in contract with the indirect owner to acquire property that includes the Site. Lotus Residences LLC is the current owner of the property and has owned Lots 40 and 48 since 2014. The current buildings on the Site are in use as a wood door and molding manufacturer and warehouse (Lot 40, p/o Lot 48) and a catering hall (p/o Lot 48). Lot 40 appears to have been redeveloped by 1928 with the existing one-story building identified as "Priemo Garage". By 1945 the building as used by Metropolitan Distributers for the storage of ice cream and delivery trucks. From 1928 to 1934 380 Flushing Avenue (Lot 48) is listed as an auto body fabricator while two 1-story buildings, identified as an auto body repair and a paper company, were located n the western portion of the Lot. A sheet metal works was identified on a portion of Lot 48 from 1928-1940.

By 1940, a commercial dry cleaning plant (NY Cleaners and Dyeing) occupied all of Lot 48. Based on the 1966 Certificate of occupancy, describing Lot 40 as being used for commercial vehicle storage and trucking terminal, the lack of city directory listings for this lot between 1949 and 1992 and the history of common ownership with Lot 48 by Uniform Rentals Inc., it is probable that both lots were part of the NY Cleaners-Uniform Rental operation with lot 40 being used to store and service the company's vehicle fleet from 1949 through 1986-1987. Although not reflected in the Sanborn Maps, the City Directory listings identify 376 Flushing Ave. (lot 40) as Alexander Supply (door and molding warehouse) in 1997 and 378 Flushing Ave (portion of lot 48) as Exclusive millwork in 1992. Exclusive Door and molding currently occupies both 376 and 378 Flushing Avenue.

Summary of the Remedial Investigation

A Phase II Environmental Site Assessment was initially conducted by EBC in December 2016. Based on the results of the initial investigation the project was referred to the NYSDEC and accepted into the BCP. A supplemental RI was completed from January 12th, 13th and 17th of 2017 in accordance with the protocols and methods as established in the NYC Mayor's Office of Remediation (OER) approved Remedial Investigation Workplan (EBC, January 2017). The goals of the Remedial Investigation were to define the nature and extent of contamination in soil, groundwater and any other impacted media; to identify the source(s) of the contamination; to assess the impact of the contamination on public health and/or the environment; and to provide information to support the development and evaluation of remedial alternatives to address the contamination.

Activities completed under the RI were:

- Soil sampling and analysis for volatile and semi-volatile organic compounds (VOCs, SVOCs) in soil samples from 10 soil boring locations;
- The installation of four temporary groundwater monitoring wells;
- The collection and analysis of four groundwater samples for volatile and semi-volatile organic compounds;
- Sampling for non-petroleum contaminants such as pesticides, PCBs and metals in soil and groundwater including the analysis of soil and groundwater samples; and,
- The collection of analysis of soil vapor samples for VOCs.

The field work portion of the RI was conducted by Environmental Business Consultants (EBC) on January 12th, 13th and 17th of 2017 during the Phase II investigation, in accordance with the protocols and methods as established in the approved Remedial Investigation Workplan.

Subsurface soils at the site include a silty non-native fill, fine to coarse sand and sandy silt to a depth of approximately 12 feet below grade followed by brown-gray sandy clay to a depth of at least 22 feet below grade.

Groundwater at the Site is present at a depth of approximately 9 to 13 feet below surface grade within the historic fill material and flows in an east/southeasterly direction.

The results of the RI identified petroleum contamination present across the Site to depths of at least 22 feet below grade. The release scenario is unknown but appears to be related to two former gasoline underground storage tanks (USTs) in the northern portion of Lot 40; and one gasoline UST in the northern portion of Lot 48. Petroleum VOCs appear to have been transferred to the groundwater through direct contact with impacted soil in the vicinity of the USTs.

Petroleum VOCs which transferred to the dissolved phase have been migrating with groundwater flow to the southeast. Free-phase petroleum product was identified in a groundwater sample collected closest to the approximate location of the former UST in Lot 48. Off-gassing of VOCs is significant in the southern portion of Lot 48, where BTEX concentrations were detected at high concentrations. Chlorinated VOCs were also present at elevated concentrations in soil vapor samples. The highest concentrations of CVOCs were found to be in the area of the former dry cleaning operation on Lot 48. No CVOC were detected in any of the soil or groundwater samples.

Off-gassing of petroleum-related compounds is occurring in the mid-to-southern portions of the Site, as is evidenced by concentrations detected in soil gas samples SV4, SV5 and SV9.

Qualitative Human Health Exposure Assessment

The qualitative exposure assessment identified potential completed routes of exposure to VOCs, SVOCs and heavy metals to construction workers and remediation workers through inhalation, ingestion and dermal contact during excavation activities.

Based on the elevated levels of petroleum VOCs and chlorinated VOCs in soil vapor, there is potential for exposure to residents, commercial workers and visitors within the proposed buildings under a future development scenario.

With the elevated levels of VOCs reported in soil, groundwater and soil gas at the Site, there is potential for off-site exposure via vapor intrusion as a result of on-site contamination.

Based upon the concentrations of contaminants currently in groundwater beneath the Site and the distance and position of the Site relative to the nearest body of water, there are no expected impacts to surface water environments from contaminants migrating beneath the Site.

Summary of the Remedy

The remedy recommended for the site is a Track 1 alternative (Alternative 1) which consists of the removal of the soils to Unrestricted Use SCOs and/or the applicable protection of groundwater SCOs, to a depth of 25 feet below grade. Additional excavation for VOCs exceeding UUSCOs will be completed to the extent practical with *in-situ* treatment with chemical oxidants applied if necessary. The Track 1 alternative also includes remediation of groundwater through dewatering during excavation activities. Over-excavated areas will be backfilled with either virgin mined materials, recycled materials or certified fill which meets the requirements of 6 NYCRR Part 375 -6.7(d)(1)(ii)(b). The remedy will include the following items:

1. Removal of underground storage tanks;
2. Excavation of soil/fill exceeding Track 1 Unrestricted Use and/or the applicable protection of groundwater SCOs as listed in Table 1 to a depth of 25 feet below grade;
3. Treatment of residual soil contamination via application of chemical oxidants, if needed as a contingency;
4. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
5. Collection and analysis of end-point soil samples to evaluate the performance of the remedy with respect to attainment of unrestricted SCOs and groundwater standards;
6. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
7. Import of materials to be used for backfill and cover in compliance with 6NYCRR Part 375-6.7(d)(1): (1) chemical limits and other specifications included in **Table 1**, (2) all Federal, State and local rules and regulations for handling and transport of material.
8. All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations;
9. If Track 1 cleanup is not achieved, implementation of a Site Management Plan (SMP) for long term maintenance of the Engineering Controls.
10. If Track 1 cleanup is not achieved, an Environmental Easement will be filed against the Site to ensure implementation of the SMP.

All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP. All deviations from the RAWP will be promptly reported to NYSDEC for approval and fully explained in the FER.

REMEDIAL ACTION WORK PLAN

1.0 INTRODUCTION

In July 2017, Rose Castle Redevelopment II LLC submitted an application to the New York State Department of Environmental Conservation (NYSDEC) to investigate and remediate a 0.902-acre property identified as the Former NY Cleaning and Dyeing Site ("Site") located at 376-378 Flushing Avenue in Brooklyn, New York. The Site was formally accepted into the New York State Brownfield Cleanup Program (BCP) on February 2, 2018. The Brownfield Cleanup Agreement was executed by the NYSDEC on February 23, 2018 and assigned Site No. C224264. Rose Castle Redevelopment II LLC was accepted into the program as a Volunteer.

This Remedial Action Work Plan (RAWP) summarizes the nature and extent of contamination as determined from data gathered during the Remedial Investigation (RI), performed in January 2017. It provides an evaluation of a Track 1 cleanup and other applicable Remedial Action alternatives, their associated costs, and the recommended and preferred remedy. The remedy described in this document is consistent with the procedures defined in DER-10 and complies with all applicable standards, criteria and guidance. The remedy described in this document also complies with all applicable Federal, State and local laws, regulations and requirements. The NYSDEC and New York State Department of Health (NYSDOH) has determined that this Site does poses a significant threat to human health and the environment. The RI for this Site did not identify fish and wildlife resources.

A formal Remedial Design document will not be prepared.

1.1 SITE LOCATION AND DESCRIPTION

The Site is located at 376-378 Flushing Avenue in the Bedford Stuyvesant section of Brooklyn, New York, and is currently identified as Block 1884, Lots 40 and 48 on the New York City Tax Map. Lot 40 is a rectangular-shaped lot extending from Flushing Avenue to Little Nassau Street, approximately 13,250 square feet (ft^2) in size (**see Figure 2**). Lot 48 consists of an irregular shaped lot with approximately 194 linear feet of street frontage along Flushing Avenue and 103 linear feet of street frontage along Franklin Avenue and is approximately 26,057 ft^2 in size. The

total area of both lots is approximately 39,307 ft^2. The Site is located on the southwest side of the intersection of Flushing Avenue and Franklin Avenue and is bordered by Flushing Avenue to the north; Franklin Avenue and a three-story commercial building to the east; Little Nassau Street to the south; and residential apartment building to the west.

A boundary map is provided as **Figure 2** and the 0.902-acre property is fully described in **Attachment A – Metes and Bounds.**

1.2 CONTEMPLATED REDEVELOPMENT PLAN

The Remedial Action to be performed under the RAWP is intended to make the Site protective of human health and the environment consistent with the contemplated end use. The proposed redevelopment plan and end use is described here to provide the basis for this assessment. The Remedial Action contemplated under this RAWP may be implemented independent of the proposed redevelopment plan.

The Site will be redeveloped through the construction of a new 8-story mixed-use building. The building will have an approximate 39,307 ft^2 cellar which will be utilized for storage, mechanical rooms, and a ventilated parking garage. The cellar will have both stair and elevator access, and will require excavation of the entire property to a depth of approximately 25 feet below grade. The first floor will contain retail/commercial space as well as the residential lobby. Floors 2 through 8 will contain residential apartments (see **Attachment G**)

1.3 DESCRIPTION OF SURROUNDING PROPERTY

The area surrounding the property is highly urbanized and predominantly consists of multi-family residential buildings with mixed-use buildings (residential w/ first floor retail) along main artery corridors such as Flushing Avenue. Commercial / industrial properties, equipment yards and warehouses are interspersed throughout the surrounding area to the south and west; and public institutions such as parks, schools, churches and playgrounds are inter-dispersed throughout the area within a quarter mile of the Site in all directions (see **Figure 3**).

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The field work portion of the RI was conducted by EBC in January 2017. The field investigation consisted of environmental sampling, field observations and measurements to determine the following:

- Local geologic/hydrogeologic conditions
- Definition of source areas
- Potential migration of contaminants from the site to surrounding areas
- Overall characterization of site-related contamination in all media

The field effort included the collection and analysis of soil, groundwater and soil gas samples. Drilling services were provided by C-Squared Environmental Corp. (Astoria, NY). Laboratory services were provided by Phoenix Environmental Laboratories of Manchester, CT (NYSDOH No. 11301). A sample matrix showing the number, type and analysis of samples collected during the Remedial Investigation is provided as **Table 2**. Results of the various phases of investigation are documented in the Remedial Investigation Report dated May 2017, prepared by EBC.

2.1 SUMMARY OF REMEDIAL INVESTIGATIONS PERFORMED

2.1.1 Borings

A total of 10 borings were advanced during the initial site mobilization on January 12 and 13, 2017.

At each soil boring location, soil samples were collected continuously in 5-foot intervals using a Geoprobe™ model 6620DT probe drilling machine, using a direct push hydraulic percussion system to drive and retrieve core samplers. Each soil sample recovered from the soil borings was characterized by an experienced Environmental Scientist and field screened for the presence of VOCs using a photo-ionization detector (PID). Field observations and PID readings were recorded for each boring in a soil boring log.

At each boring location, soil cores were collected continuously from grade to depths ranging from 15 feet to 22 feet below grade. The groundwater interface was encountered at

approximately 9-13 feet below grade. Soil samples were retrieved using a 1.5-inch diameter, 5-foot long dual tube sampling system with disposable acetate liners.

Soil recovered from the borings was field screened for the presence of VOCs with a photo-ionization detector (PID) and visually inspected for evidence of contamination. PID readings ranged from less than 1 part per million (ppm) in soil borings SB3 (0-5'), SB2 (20-25'), SB7 (0-5') to 900 ppm in SB1 (20-25'). Highest PID readings above 500 ppm were generally recorded from soil within the 15-25 ft below grade intervals. The locations of soil borings are shown on **Figure 4**.

2.1.2 Monitoring Wells

Four groundwater monitoring wells (GW1 and GW3 through GW5) were installed January 12 and 13, 2017 to establish general groundwater quality at the site. GW2 was not installed due to rejection. All monitoring wells were installed to a depth of approximately 20-25 feet below grade with 10 feet of 0.010 PVC well screen and 15 feet of PVC riser.

At each well, a No. 00 morie filter sand was placed in the borehole to within 2 feet above the top of the screen. A 1-foot hydrated bentonite seal was then placed on top of the filter sand and the remainder of the borehole was backfilled to grade. Monitoring well locations are shown on **Figure 5**.

2.1.3 Samples Collected

A summary of the sampling performed during the RI is provided in **Table 2**.

2.1.3.1 Soil Samples

Soil samples were collected continuously in 5-foot intervals from grade to depths ranging from 15 feet to 22 feet below existing grade using a Geoprobe™ 6620DT, probe drilling machine. The Geoprobe™ system uses a direct push hydraulic percussion system to drive and retrieve core samplers. Soil samples were retrieved using a 1.5-inch diameter, 5-foot long dual-tube sampler with disposable acetate liners.

Two soil samples were retained from each boring location during the Remedial investigation. Retained samples were collected from the 0 to 5 foot interval and from the 20-22 foot interval (except SB8, which was sampled at the intervals 12-14' and 20-22', and SB4, which was sampled at the intervals 0-2', and 14-15'). A third soil sample was retained from borings SB2 (12-14'), SB3 (13-15') and SB7 (14-15'). All samples were submitted for laboratory analysis of one or more of the following analyses: volatile organic compounds (VOCs) by EPA Method 8260, semi-volatile organic compounds (SVOCs) by EPA Method 8270, TAL Metals, pesticides and PCBs by EPA Method 8081/8082.

2.1.3.2 Groundwater Samples

Four groundwater samples were collected from and the four temporary monitoring wells (GW1 and GW3 through GW5) on January 17, 2017.

Samples were collected in accordance with the procedures outlined in Section 2.3 of the approved RIWP. Polyethylene sampling tubing fitted with a stainless steel check valve was used to purge and collect samples from each well location. Sample tubing and the silicone pump tubing were replaced between each sample location. Samples were collected directly into pre-cleaned laboratory supplied glassware, stored in a cooler with ice and submitted to Phoenix Environmental Laboratories of Manchester, CT, a New York State ELAP certified environmental laboratory (ELAP Certification No. 11301).

All groundwater samples were analyzed for VOCs / SVOCs by EPA method 8260/ 8270, target analyte list (TAL) metals (total and dissolved) by Method 6010C and pesticides/PCBs by Method 8081B/8082A.

2.1.3.3 Soil Gas Samples

To assess the presence of VOCs in soil vapor beneath the site, ten soil vapor samples (SV1-SV10) were collected on January 17, 2017. The soil vapor implants were installed during the RI, using Geoprobe™ equipment. All of the implants were installed utilizing the same technique to minimize possible discrepancies. The vapor implants (Geoprobe™ Model AT86 series), were constructed of a 6-inch length of double woven stainless steel wire. The vapor implants were

installed to a depth of 8 feet below grade, above the groundwater interface. Soil vapor sampling locations are shown on **Figure 6**. All soil vapor samples were collected over a 2 hour sampling period.

Soil vapor samples were collected in accordance with the procedures as described in the *Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 10/06)*.

2.1.4 Chemical Analytical Work Performed

Each soil and groundwater sample was placed in pre-cleaned laboratory supplied glassware, and placed in a cooler packed with ice for transport to the laboratory. Sample analysis was provided by Phoenix Environmental Laboratories of Manchester, CT, a New York State ELAP certified environmental laboratory (ELAP Certification No. 11301).

Soil samples were analyzed for one or more of the following depending on location and depth: VOCs / SVOCs by EPA method 8260 / 8270, target analyte list (TAL) metals and pesticides/PCBs by Method 8081/8082. All groundwater samples from the temporary monitoring wells were analyzed for VOCs / SVOCs by EPA method 8260C / 8270, target analyte list (TAL) metals (total, dissolved) and pesticides/PCBs by Method 8081/8082. Soil gas samples were analyzed for VOCs by EPA method TO-15.

2.1.5 Documentation

Maps showing the locations of the soil borings, monitoring wells and soil gas sample collection points are provided in **Figures 4**, **5** and **6**. The results of soil, groundwater and soil gas samples collected during the RI are summarized in **Tables 3** through **14**. Below is a summary of RI findings.

The source areas on-site include the vicinity of two former gasoline USTs in the northern portion of Lot 40, and the former gasoline UST in the northern portion of Lot 48. Petroleum-impacted soil in the vicinity of the USTs, as determined from nearby soil borings, was reported beginning at a depth of approximately 10 feet below the surface and to a depth of approximately 22 ft below grade. No other source areas were identified during the RI.

Petroleum related VOCs were detected in all four groundwater samples collected on-site. Petroleum related VOC concentrations ranged from 262 µg/L (GW4) to 3,280 µg/L (GW5). Benzene was detected in three of the groundwater samples. A 1.4-inch thick layer of free-phase product was detected in the water column sample in GW5. The highest concentrations of petroleum related VOCs were detected in GW5, which is located in the area of the former UST on Lot 48. No chlorinated VOCs were detected in any of the groundwater samples.

Multiple VOCs were detected above the laboratory method detection limit in each of the ten soil gas samples. The total concentration of petroleum-related VOCs (BTEX) ranged from 4.26 µg/m^3 (SV1) to 16,939 µg/m^3 (SV4). Trichloroethylene (TCE) was detected in four of the ten soil gas samples, with the highest concentration reported at 145 µg/m^3. Tetrachloroethene (PCE) was detected in all soil gas samples ranging in concentrations from 1 µg/m^3 to 485 µg/m^3. 1,1,1-Trichloroethane was detected in two soil gas samples, with the highest concentration reported at 27.7 µg/m^3.

2.2 SIGNIFICANT THREAT

The NYSDEC and NYSDOH have determined that this Site does pose as a significant threat to human health and the environment. Notice of this determination will be provided during the 45 day public comment period and in the Proposed Decision Document. A copy of the notice is included in Appendix I.

2.3 SITE HISTORY

2.3.1 Past Uses and Ownership

Previous owners and operators of the property are shown below. Information regarding ownership of the property was obtained from online property records maintained by the NYC Department of Finance Office of the City Register under its Automated City Register Information System (ACRIS). Information regarding past operators was obtained from historic Sanborn Fire Insurance maps, city phone directories, certificates of occupancy and from an internet search of the property address. The Requestor is in contract with the indirect owner to

acquire property that includes the Site. Lotus Residences LLC is the current owner of the property and has owned Lots 40 and 48 since 2014. The current buildings on the Site are in use as a wood door and molding manufacturer and warehouse (Lot 40, p/o Lot 48) and a catering hall (p/o Lot 48). Lot 40 appears to have been redeveloped by 1928 with the existing one-story building identified as "Priemo Garage". By 1945 the building as used by Metropolitan Distributers for the storage of ice cream and delivery trucks. From 1928 to 1934 380 Flushing Avenue (Lot 48) is listed as an auto body fabricator while two 1-story buildings, identified as an auto body repair and a paper company, were located n the western portion of the Lot. A sheet metal works was identified on a portion of Lot 48 from 1928-1940.

By 1940, a commercial dry cleaning plant (NY Cleaners and Dyeing) occupied all of Lot 48. Based on the 1966 Certificate of occupancy, describing Lot 40 as being used for commercial vehicle storage and trucking terminal, the lack of city directory listings for this lot between 1949 and 1992 and the history of common ownership with Lot 48 by Uniform Rentals Inc., it is probable that both lots were part of the NY Cleaners-Uniform Rental operation with lot 40 being used to store and service the company's vehicle fleet from 1949 through 1986-1987. Although not reflected in the Sanborn Maps, the City Directory listings identify 376 Flushing Ave. (lot 40) as Alexander Supply (door and molding warehouse) in 1997 and 378 Flushing Ave (portion of lot 48) as Exclusive millwork in 1992. Exclusive Door and molding currently occupies both 376 and 378 Flushing Avenue. Therefore the laundry operations and fleet maintenance garage vacated prior to these dates, most likely in 1986-1987 when Uniform Rentals sold the lots.

Previous Owners – Lot 40

Dates	Name	Comments	Contact Info
Prior to 11/14/1977	Methodist Hospital of Brooklyn	Deed	506 6th Street, Brooklyn
11/14/1977 to 2/3/1982	Beatrice Foods Co.(louis Sherry Ice Cream)	Deed	2 North LaSalle St, Chicago, IL 60602
2/3/1982 to 4/27/1982	Paz-Franklin Co.	Deed	12 Heyward Street, Brooklyn
4/27/1982 to 5/19/1986	Uniform Rental Corp.	Deed	380 Flushing Avenue, Brooklyn
5/19/1986 to 12/19/19867	Irving Sirotkin	Deed	389 Flushing Avenue, Brooklyn
12/19/1986 to 6/1/2013	Franklin Realty Corp.	Deed	40 Penn Street, Brooklyn
6/1/2013 to 3/6/2014	Franklin Realty Owners LLC	Deed	470 Kent Avenue, Suite 2, Brooklyn
3/6/2014 - present	Lotus Residences	Deed	56 Franklin Avenue, Brooklyn

Previous Owners – Lot 48

Dates	Name	Comments	Contact Info
9/28/1982	NYC Commissioner of Finance Property seized for taxes	Deed	Room 500, Municipal Building, Manhattan, New York
9/28/1982? to 2/13/1986	Uniform Rental Corp. - unclear when ownership began	Deed	380 Flushing Avenue, Brooklyn
2/13/1986 to 6/1/2013	Franklin Realty Corp.	Deed	470 Kent Avenue, Suite 2, Brooklyn
6/1/2013 to 3/6/2014	Franklin Realty Owners LLC	Deed	470 Kent Avenue, Suite 2, Brooklyn
3/6/2014 to present	Lotus Residences	Deed	56 Franklin Avenue, Brooklyn

Previous Operators – Lot 40

Dates	Name	Comments	Contact Info
1918	Residences (372) and storefronts	Sanborn Maps	372-376 Flushing Ave, Brooklyn
1928 -1949	372 Flushing - Preimo Garage (1928), Metropolitan Distributors (1945, 1949)	City Directory	372 Flushing Ave, Brooklyn
1935-199?	Private Garage	Sanborn Maps	372-376 Flushing Ave, Brooklyn
1966	Commercial Vehicle Storage and Trucking Terminal	Certificate of Occupancy	376 Flushing Ave, Brooklyn
1997, 2000	Alexander Supply	City Directories	376 Flushing Ave, Brooklyn
2005, 2010, 2014	Exclusive Door Co.	City Directories	376 Flushing Ave, Brooklyn

Previous Operators – Lot 48

Dates	Name	Comments	Contact Info
1928, 1934, 1940	Expert Sheet metal Works (30 Franklin)	City Directories	30 Franklin Ave, Brooklyn
1928, 1934, 1940	Cafeteria / Restaurant (392 Flushing)	City Directories	392 Flushing Ave, Brooklyn
1928, 1934	Scholl Auto Bodies	City Directories	376-392 Flushing Ave, Brooklyn
1928	Horn Button Works (28 Franklin) Meyer & Co. Boilers (30 Franklin)	Certificate of Occupancy	328-30 Franklin Ave, Brooklyn
1940 - 1985	NY Cleaning and Dyeing Co. (1940, 1945, 1949) NY Cleaners Industries (1960. 1965, 1970, 1976, 1985) Triple A Maintenance (1973, 1976, 1985) Uniform Rental Division (1976, 1985) S&M Trucking (1980)	City Directories (1940, 1945, 1949, 1960,1965, 1970, 1973, 1976, 1980, 1985) Certificates of Occupancy (1940, 1942, 1943, 1946, 1956, 1958)	380 Flushing Ave, Brooklyn
1976, 1985, 1992	Christian & Sons Cleaners and Uniforms	City Directories	24 Franklin Ave, Brooklyn
1992-2014	Rose Castle (1992, 1997, 2000, 2005) Rose Party Functions Corp (2010, 2014)	City Directories Certificates of Occupancy (1992, 1993, 1994)	380 Flushing Ave, Brooklyn

2.3.2 Summary of Previous Reports

EBC is not aware of any previous investigations performed at the Site.

2.4 GEOLOGICAL CONDITIONS

The geologic setting of Long Island is well documented and consists of crystalline bedrock overlain by layers of unconsolidated deposits. According to geologic maps of the area created by the United States Geologic Survey (USGS), the bedrock in this area of Brooklyn is an igneous intrusive classified as the Ravenswood grano-diorite of middle Ordovician to middle Cambrian age. The depth to bedrock is greater than 100 feet below the surface. Unconsolidated sediments overlie the bedrock and consist of Pleistocene aged sand, gravel and silty clays, deposited by glacial-fluvial activity. Non-native fill materials consisting of dredge spoils, rubble and / or other materials have been historically used to reinforce and extend shoreline areas and to raise and improve the drainage of low lying areas.

Subsurface soils at the site include a silty non-native fill to approximately 12 feet below grade underlain by native brown-gray sandy clay to a depth of approximately 22 feet below grade.

Groundwater at the Site ranges from approximately 9 to 13 feet below the surface and generally flows in a southeasterly direction (**Figure 7**). According to the USGS topographic map for the area (Brooklyn Quadrangle), the elevation of the property 16 feet above the National Geodetic Vertical Datum (NGVD).

2.5 CONTAMINATION CONDITIONS

2.5.1 Conceptual Model of Site Contamination

Petroleum contamination is present across the Site to depths of at least 22 feet below grade. The release scenario is unknown but appears to be related to two former gasoline underground storage tanks (USTs) in the northern portion of Lot 40; and one gasoline UST in the northern portion of Lot 48. However, based on historical use and information contained in the April 27, 1943 Certificate of Occupancy, which specifies the storage of clothes cleaning solvent with a flashpoint in excess of 100 degrees F, Stoddard solvent or similar petroleum based solvent was in use at the Site and may be the origin of the petroleum contamination.

The release dates and scenarios are unknown; however, the contamination would have been related to the former laundry operations and fleet maintenance garage which occupied the Site from 1940 through 1986 and released during this time. The release would have been related to a free-phase product (gasoline, Stoddard solvent or both) of sufficient volume to migrate vertically to the water table below. Due to the presence of residual soil contamination at 22 feet below grade, the water table at the time of the release must have been much lower then the current 9 to 13 feet below surface depth. This indicates an older release date during a time when water levels in the area were significantly lower due to local pumping of the aquifer. The older release date is also supported by the constituents present in soil which are higher enriched in trimethylbenzenes.

Upon reaching the water table, the free phase product spread out forming a lens of residually impacted soil. This zone of impacted soil acted as a source of contamination to the groundwater passing through it, forming a plume of contaminated water which migrated in the direction of groundwater flow.

Petroleum VOCs which transferred to the dissolved phase have been migrating with groundwater flow to the southeast. Off-gassing of VOCs from impacted soil would have begun upon release and continued over time. Chlorinated VOCs (CVOCs), which are present at slightly elevated concentrations in soil vapor samples, do not appear to be Site related based on the concentration and distribution. However, given the historic use of the Site as a commercial laundry operation it is possible that the CVOCs are associated with this use.

2.5.2 Description of Areas of Concern

Source areas include the vicinity of the USTs as well as shallow and deep petroleum impacted soil throughout the Site. No other source areas were identified during the RI.

2.5.3 Soil/Fill Contamination

Petroleum-impacted soil is present throughout both lots at depths 15 to 22 feet below surface grade and in shallow soil (0-10 ft) in the vicinity of the two former USTs on Lot 40 and the former UST area on Lot 48 as well as the southern portion of Lot 48.

Fill materials are present throughout the site to depths to approximately 12-14 ft below grade. SVOCs including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthrancene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene and pyrene as well as the metals arsenic, barium, lead and mercury were reported above Restricted Residential use soil cleanup objectives (SCOs) in several of the shallow soil samples collected.

2.5.3.1 Summary of Soil/Fill Data

Soil sample results from the RI are summarized in **Tables 3-7**. Further information on soil sample collection, handling and analysis can be found in the RI Report (EBC May 2017).

2.5.3.2 Comparison of Soil/Fill with SCGs

Table 7 shows soil sample results above Track 1 Unrestricted SCOs for all overburden soil at the Site. Sample results above Track 1 Unrestricted SCOs for all overburden soil are posted on **Figure 8**.

2.5.4 On-Site Groundwater Contamination

Petroleum related VOCs were detected in all four groundwater samples collected on-site. Petroleum related VOC concentrations ranged from 262 µg/L (GW4) to 3,280 µg/L (GW5). Benzene was detected in three of the groundwater samples. A 1.4-inch thick layer of free-phase product was detected in the water column sample in GW5. The highest concentrations of petroleum related VOCs were detected in GW5, which is located in the area of the former UST on Lot 48. No chlorinated VOCs were detected in any of the groundwater samples.

SVOC and metal parameters were detected throughout the Site, with the highest concentrations located along the northern portion of Lot 48.

2.5.4.1 Summary of Groundwater Data

The results of groundwater samples collected during the RI are summarized in **Tables 8-13**. Further information on groundwater sample collection, handling and analysis can be found in the RI Report (EBC, May 2017).

2.5.4.2 Comparison of Groundwater with SCGs

Sample results above GA groundwater standards in monitor wells prior to the remedy are shown in **Table 13**. A spider map which shows groundwater sampling locations and summarizes results above GA groundwater standards prior to the remedy are shown in **Figure 9**.

2.5.5 On-Site Soil Vapor Contamination

Multiple VOCs were detected above the laboratory method detection limit in each of the soil gas samples. Total petroleum related volatile organic compounds were generally moderate to high throughout the Site, with the highest concentrations detected in the southern portion of Lot 48. The total concentration of petroleum-related VOCs (BTEX) ranged from 4.26 µg/m^3 (SV1) to 16,939 µg/m^3 (SV4).

Chlorinated VOCs (CVOCs) were reported in all ten soil gas samples. Trichloroethylene (TCE) (max. 145 µg/m^3) was detected in four of the ten soil gas samples. Tetrachloroethene (PCE) was detected in all ten soil gas samples ranging in concentration from 1 µg/m^3 to 485 µg/m^3. 1,1,1-Trichloroethane (max. 27.7 µg/m^3) was detected in two soil gas samples. The chlorinated VOC, carbon tetrachloride was not detected in any of the soil gas samples. The NYSDOH Final Guidance on Soil Vapor Intrusion (October 2006) notes monitoring is the recommended action for a PCE concentration above 100 µg/m^3 in soil gas. The TCE and TCA concentrations are above the monitoring level ranges established within the NYSDOH Final Guidance on Soil Vapor Intrusion. **Figure 10** shows posted soil gas results from the RI.

2.5.5.1 Summary of Soil Vapor Data

A table of soil vapor data collected prior to the remedy is shown in **Table 14**. Further information on soil gas sample collection, handling and analysis can be found in the RI Report (EBC, May 2017).

2.6 ENVIRONMENTAL AND PUBLIC HEALTH ASSESSMENTS

2.6.1 Qualitative Human Health Exposure Assessment

The objective of the qualitative exposure assessment under the BCP is to identify potential receptors to the contaminants of concern (COC) that are present at, or migrating from, the site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur. An exposure pathway has five elements; a contaminant source, release and transport mechanisms, point of exposure, route of exposure and a receptor population.

The potential exposure pathways identified below, represent both current and future exposure scenarios.

Contaminant Source

The source of petroleum related VOCs include the vicinity of the USTs as well as shallow and deep petroleum impacted soil throughout the Site. Elevated levels of SVOCs and metals are also present in fill materials throughout the Site to depths of up to 12 feet below grade.

Contaminant Release and Transport Mechanism

Petroleum contamination is present in soil below across the Site as well as at the groundwater interface. Impacted groundwater is present and migrating southeast of the source areas at moderate concentrations.

There appears to be migration of petroleum and chlorinated VOCs in soil gas on the property. Off-gassing of petroleum VOCs is occurring predominately in the southern portion of Lot 48.

Point of Exposure, Route of Exposure and Potentially Exposed Populations

Potential On-Site Exposures: Remediation workers and construction workers engaged in the excavation of impacted and non-impacted soil at the site may be exposed to SVOCs, VOCs, pesticides and heavy metals through several routes. Workers excavating impacted soil may be exposed to SVOCs, VOCs, pesticides and heavy metals through inhalation, ingestion and dermal

contact. Workers excavating non-impacted soil may be exposed to low levels of VOCs in soil gas through inhalation. A site specific Health and Safety Plan has been developed to identify and minimize the potential hazards to on-site workers.

Based on the moderate to high levels of petroleum VOCs in soil vapor as well as the CVOCs reported, there is potential for exposure to residents, commercial workers and visitors within the proposed building under a future development scenario.

Potential Off-Site Exposures: The entire area is serviced by the New York City Water System which distributes water from the Croton Reservoir system. Since there are no public or private potable supply wells in the area, exposure from contact with tap water is not a concern. Off-site exposure is therefore limited to vapor intrusion from off-gassing from impacted soil on site or from impacted groundwater migrating beneath the Site. The potentially exposed population in this case would include residents and commercial workers in adjacent buildings.

2.6.2 Fish & Wildlife Remedial Impact Analysis

Since impacted groundwater may be migrating beneath the Site at low concentrations in a southwesterly direction, the groundwater to surface water discharge pathway was evaluated. Note that there are no potential surface water discharge areas in the direction of groundwater flow. The nearest surface water feature is Wallabout Channel is located approximately 0.5 miles west-northwest of the Site. Based upon the concentrations of contaminants currently in groundwater beneath the Site and the distance and position of the Site relative to Wallabout Channel, there are no expected impacts to surface water environments from contaminants migrating beneath the Site. In addition, as the Site is located in a densely populated urban area there are no expected impacts to terrestrial wildlife.

2.7 REMEDIAL ACTION OBJECTIVES

Based on the results of the Remedial Investigation, the following Remedial Action Objectives (RAOs) have been identified for this Site.

2.7.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

2.7.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure to, contaminants volatilizing from contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

2.7.3 Soil Vapor

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site.

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

3.1 EVALUATION OF REMEDIAL ALTERNATIVES

The goal of the remedy selection process under the BCP is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing remedial action objectives (RAOs) for media in which chemical constituents were found in exceedance of NYSDEC standards, criteria and guidance values (SCGs). A remedy is then developed based on the following nine criteria:

- Protection of human health and the environment;
- Compliance with standards, criteria, and guidelines (SCGs);
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance; and
- Land use.

The first two criteria are threshold criteria and must be satisfied in order for an alternative to be considered for selection. The remaining seven criteria are balancing criteria which are used to compare the positive and negative aspects of each of the remedial alternatives, provided the alternative satisfies the threshold criteria.

3.2 STANDARDS, CRITERIA AND GUIDANCE (SCG)

A criterion for remedy selection is evaluation for conformance with SCGs that are applicable, relevant and appropriate. Principal SCGs that are applicable, relevant and appropriate for evaluating the alternatives for remediation of this BCP site include the following:

- 29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response
- 10 NYCRR Part 67 – Lead
- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes (November 1998)
- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (November 1998)
- 6 NYCRR Subpart 374-1 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (November 1998)
- 6 NYCRR Part 375 - 6 NYCRR Part 375 Environmental Remediation Programs Subparts 375-1, 375-3 and 375-6 (December 2006)
- 6 NYCRR Part 376 - Land Disposal Restrictions
- 6 NYCRR Part 608 - Use and Protection of Waters
- 6 NYCRR Parts 700-706 - Water Quality Standards (June 1998)
- 6 NYCRR Part 750 through 758 - Implementation of NPDES Program in NYS ("SPDES Regulations")
- 6 NYCRR Part 375-6 Soil Cleanup Objectives
- New York State Groundwater Quality Standards – 6 NYCRR Part 703;
- NYSDEC Ambient Water Quality Standards and Guidance Values – TOGS 1.1.1;
- NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation - May 2010;
- NYSDEC Draft Brownfield Cleanup Program Guide – May 2004;
- New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan
- NYS Waste Transporter Permits – 6 NYCRR Part 364;
- NYS Solid Waste Management Requirements – 6 NYCRR Part 360 and Part 364.
- TAGM 4059 - Making Changes To Selected Remedies (May 1998)
- STARS #1 - Petroleum-Contaminated Soil Guidance Policy
- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- DER-10, Technical Guidance for Site Investigation and Remediation, May 2010
- DER-23 / Citizen Participation Handbook for Remedial Programs, January 2010

- OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (November 1997)

Additional regulations and guidance are applicable, relevant, and appropriate to the remedial alternatives and will be complied with in connection with implementation of the remedial program; however, the list above is intended to represent the principal SCGs which should be considered in evaluating the remedial alternatives for the BCP site.

Conformance with the appropriate standards for remediation of contaminated soil is an important criterion in evaluating the remedial alternatives for the BCP site. In New York State 6 NYCRR Part 375 establishes the primary SCGs associated with remediation of contaminated soil at sites which are in the BCP. If proposing remediation pursuant to a Track other than Track 1 (Unrestricted Use), 6 NYCRR Part 375 requires evaluation of at least one remedial alternative pursuant to Track 1 (Unrestricted Use) and one other alternative developed by the applicant for the proposed use of the BCP site. The remedial alternatives presented in the following sections have been prepared in conformance with this requirement.

3.3 ALTERNATIVES ANALYSIS

The goal of the remedy selection process under the BCP is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of NYSDEC standards, criteria and guidance values (SCGs). A remedy is then developed based on the following nine criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;

- Cost effectiveness;
- Community Acceptance; and
- Land use.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. This analysis was prepared in accordance with 6 NYCRR Part 375-1.8(f) and Part 375-3.8(f) and Section 4.3(c) of NYSDEC DER-10. As required, a minimum of two remedial alternatives (including a Track 1 scenario) are evaluated, as follows:

- Alternative 1 - Track 1 requires remediation of all soils above bedrock to Unrestricted Use criteria. This alternative would require removal of any existing USTs and excavation of any/all contaminated soil present across the site extending to and beyond the water table at a depth of at least 25 feet below grade. Over-excavation would be required where UUSCO exceedances are detected beyond 25 ft bg. Contamination in groundwater would be removed from the Site through dewatering activities during excavation. This alternative does not allow for the use of long-term institutional/engineering controls to address residual impacted media or prevent exposures for future site occupants.

- Alternative 2 - Track 2 requires remediation of all soils to Restricted Residential criteria to a depth of 15 feet below grade with removal of soils below 15 feet which are a source of contamination to the groundwater. This alternative would require many of the same elements as the Track 1 alternative including removal of the former USTs and excavation of petroleum contaminated soil to 25 feet. This alternative does not allow the use of long-term institutional/engineering controls to meet soil cleanup objectives. Long-term institutional/engineering controls are allowed to address or prevent exposures from other impacted media however, such as soil gas. This alternative is provided as a contingency in the event that Track 1 SCOs cannot be met. Since both Alternative 1 and Alternative2 require excavation to 25 feet to remove petroleum impacted soil, Alterative 2 has been added as a contingency in the event that Alternative 1 cannot be achieved for other parameters.

- Alternative 3 - Track 4, remediation of all soils to site specific SCOs. This alternative would require many of the same elements as Alternatives 1 and 2 including removal of the USTs and excavation of petroleum contaminated soil. Alternative 3 allows for long term remediation of deep source material impacting groundwater. Since this alternative allows the use of long-term institutional/engineering controls (>5yrs) to meet soil cleanup objectives and to address or prevent exposures from other impacted media such as soil gas, it is presented as a contingency to Alternative 2 in the event that on-going engineering controls are required to meet soil SCOs. This alternative will also require an environmental easement and a Site Management Plan.

3.4 REMEDIAL ALTERNATIVE 1

The following sections provide an evaluation of Alternative 1 based on the nine evaluation criteria as previously discussed.

3.4.1 Overall Protection of Human Health and the Environment

Alternative 1 will be protective of human health and the environment by eliminating petroleum concentrations present in all subsurface affected soils at the site and by eliminating constituents in soil related to petroleum and historic fill and by remediating groundwater. The potential for human and environmental exposure to these constituents on-site will be eliminated by excavation of all petroleum contaminated and historic fill soils with parameters in excess of unrestricted criteria, disposing of excavated materials off-site, full dewatering and treatment of groundwater beneath the Site and backfilling as needed with certified clean fill, virgin mined materials or recycled concrete materials from a NYSDEC permitted recycling facility.

Potential post-remediation exposures to on-site residents from soil vapors are not expected to require the operation of SSD systems, though groundwater use will be restricted at the Site until groundwater quality recovers.

During remedial and construction activity workers and area residents may be exposed to impacted soil and vapors. Worker exposure to soil and vapors will be minimized through implementation of a Health and Safety Plan. Exposures to area residents from dust and/or vapors

will be minimized through the use of engineering controls and through implementation of a Community Air Monitoring Plan (CAMP).

3.4.2 Compliance with Remedial Goals, SCGs and RAOs

Alternative 1 will achieve compliance with the remedial goals, SCGs and RAOs for soil through removal to Track 1 Unrestricted Use cleanup levels. SCGs for groundwater will also be achieved as impacted groundwater will be fully extracted and treated prior to discharge into the NYC sewer system (see Section 5.5.10). Compliance with SCGs for soil vapor is expected following completion of the remedial action.

3.4.3 Long-Term Effectiveness and Permanence

Alternative 1 achieves long term effectiveness and permanence by permanently removing and/or remediating all soils affected by Site contaminants or historic fill materials. Under this Alternative, risk from soil impacts is eliminated and risk from groundwater impacts significantly reduced. Alternative 1 will continue to meet RAOs for soil and groundwater in the future, providing a permanent long-term solution for the Site.

3.4.4 Reduction in Toxicity, Mobility or Volume

Alternative 1 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-site soil by removing the source area of contamination and meeting unrestricted objectives. The removal/remediation of on-site soil and groundwater will also reduce the toxicity, mobility, and volume of contaminants in soil vapor.

3.4.5 Short-Term Effectiveness

There is the potential for short-term adverse impacts and risks to workers, the community, and the environment during the implementation of Alternative 1. Short-term exposure to on-site workers during excavation and loading activities will be addressed with a HASP and mitigated through the use of personal protective equipment, monitoring and engineering controls. Potential short-term exposure to the surrounding community will be addressed through the use of odor and dust-suppression techniques and through the implementation of a CAMP which will require air monitoring activities during all excavation and soil disturbance activities.

Other potential impacts to the community such as construction-related noise, vibrations and traffic, will be controlled and regulated under the terms of the NYS Department of Buildings permit which can place a Stop Work Order on the property for unsafe conditions, community impacts or violation of the terms and conditions of the permit. Decontamination procedures of equipment, including trucks transporting soil to off-site disposal facilities, will minimize the potential for impacted soil to be dispersed beyond the Site boundary. A truck traffic plan has also been prepared to minimize disturbance to the local roads and community.

3.4.6 Implementability

The techniques, materials and equipment to implement Alternative 1 are readily available and have been proven effective in remediating the contaminants associated with the Site. Excavation for the remediation of soils is both a "low tech" and reliable method which has a long and proven track record on the remediation of hazardous waste and petroleum spill sites. However, excavation significantly beyond 25 feet below grade would be impractical requiring specialized equipment and extensive shoring.

3.4.7 Cost

Costs associated with Alternative 1 are estimated at approximately $5,917,767. This cost estimate includes the following elements and assumptions:

- Removal of three potential underground storage tanks;
- Excavate to a depth of approximately 25 feet across the site to remove petroleum impacted soil;
- Shoring to accommodate excavation to a depth of 25 ft;
- Disposal of approximately 18,925 cy of petroleum contaminated soil;
- Disposal of approximately 17,470 cy of historic fill;
- Dewatering, treatment and discharge of groundwater to the NYC sewer system;
- Waste characterization and endpoint verification sampling and analysis;
- HASP and CAMP monitoring for the duration of the remedial activities; and
- Preparation of a Final Engineering Report and BCP program fees.

3.4.8 Compatibility with Land Use

The proposed redevelopment of the Site is compatible with its current zoning. Following remediation, the Site will meet unrestricted use objectives which will exceed the objectives for its planned mixed residential and commerical use.

3.4.9 Community Acceptance

This RAWP will be subject to a 45-day public comment period to determine if the community has comments on the presented remedial alternatives and selected remedy. If no comments are received regarding Alternative 1, it will be considered to be acceptable to the community.

3.5 REMEDIAL ALTERNATIVE 2

The following sections provide an evaluation of Alternative 2 based on the nine evaluation criteria as previously discussed.

3.5.1 Overall Protection of Human Health and the Environment

Alternative 2 will be protective of human health and the environment by eliminating petroleum concentrations and constituents in soil to a depth of 25 ft. The potential for human and environmental exposure to these constituents on-site will be eliminated by excavation of all soils with parameters in excess of restricted residential criteria to a minimum depth of 15 feet, petroleum impacted soils to a depth of 25 ft, off-site disposal of excavated materials, dewatering, treatment and discharge of impacted groundwater and backfilling as needed with certified clean fill, virgin mined materials or recycled concrete materials from a NYSDEC permitted recycling facility.

Potential post-remediation exposures to on-site residents from soil vapors are not expected to require the operation of SSD systems, though groundwater use will be restricted at the Site until groundwater quality recovers.

During remedial and construction activity, workers and area residents may be exposed to impacted soil and vapors. Worker exposure to soil and vapors will be minimized through

implementation of a HASP. Exposures to area residents from dust and or vapors will be minimized through the use of engineering controls and through implementation of a CAMP.

3.5.2 Compliance with Remedial Goals, SCGs and RAOs

Alternative 2 will achieve compliance with the remedial goals, SCGs and RAOs for soil through source removal to restricted residential cleanup SCOs. Groundwater quality will continue to improve over time with respect to SCGs. Compliance with SCGs for soil vapor is expected following completion of the remedial action.

3.5.3 Long-term Effectiveness and Permanence

Alternative 2 achieves long term effectiveness and permanence by permanently removing and/or remediating all soils affected by Site contaminants above restricted residential objectives to a depth of 15 feet and petroleum impacted soils to a depth of 25 ft. Under this Alternative risk from soil impacts is eliminated for on-site residents. Alternative 2 will continue to meet RAOs for soil in the future, providing a permanent long-term solution for the Site.

3.5.4 Reduction in Toxicity, Mobility or Volume through Treatment

Alternative 2 will reduce the toxicity, mobility, and volume of contaminants from on-site soil by meeting restricted residential objectives for the upper 15 feet and by removing petroleum impacted soils to a depth of 25 ft. The removal/remediation of on-site soil will also reduce the toxicity, mobility, and volume of contaminants within on-site groundwater and soil vapor.

3.5.5 Short-term Effectiveness

The potential for short-term adverse impacts and risks to the workers, the community, and the environment during the implementation of Alternative 2 is minimal. Short-term exposure to on-site workers during excavation and loading activities will be addressed with a HASP and mitigated through the use of personal protective equipment, monitoring and engineering controls. Potential short-term exposure to the surrounding community will be addressed through the use of odor and dust-suppression techniques and through the implementation of a CAMP which will require air monitoring activities during all excavation and soil disturbance activities.

Other potential impacts to the community such as construction-related noise, vibrations and traffic will be controlled and regulated under the terms of the NYS Department of Buildings permit which can place a Stop Work Order on the property for unsafe conditions, community impacts or violation of the terms and conditions of the permit. Decontamination procedures of equipment, including trucks transporting soil to off-site disposal facilities will minimize the potential for impacted soil to be dispersed beyond the Site boundary. A truck traffic plan will also be prepared to minimize disturbance to the local roads and community.

3.5.6 Implementability

The techniques, materials and equipment to implement Alternative 2 are readily available and have been proven effective in remediating the contaminants associated with the Site. Excavation for the remediation of soils is both a "low tech" and reliable method which has a long and proven track record on the remediation of hazardous waste and petroleum spill sites. Excavation to 15 feet will not require any additional shoring / dewatering beyond that needed for construction purposes.

3.5.7 Cost

Costs associated with Alternative 2 are estimated at approximately $5,943,355. This cost estimate includes the following elements and assumptions:

- Removal of three potential underground storage tanks;
- Excavate to approximately a minimum depth of 15 feet, petroleum impacted soils to a depth of 25 feet across the site to remove petroleum impacted soil;
- Shoring to accommodate excavation to a depth of 25 ft;
- Disposal of approximately 18,925 cy of petroleum contaminated soil;
- Disposal of approximately 17,470 cy of historic fill;
- Dewatering, treatment and discharge of groundwater to the NYC sewer system;
- Waste characterization and endpoint verification sampling and analysis;
- HASP and CAMP monitoring for the duration of the remedial activities; and
- Preparation of a Final Engineering Report and BCP program fees; and
- Recording of an Environmental Easement.

3.5.8 Compatibility with Land Use

The proposed redevelopment of the Site is compatible with its current zoning. Following remediation the Site will meet restricted residential use objectives which is appropriate for its planned mixed residential and commercial use. A groundwater use restriction will be required to prevent future exposure to affected groundwater.

3.5.9 Community Acceptance

This RAWP will be subject to a 45-day public comment period to determine if the community has any comments on the presented remedial alternatives and selected remedy. If no comments are received, it will be considered to be acceptable to the community.

3.6 REMEDIAL ALTERNATIVE 3

The following sections provide an evaluation of Alternative 3 based on the nine evaluation criteria as previously discussed.

3.6.1 Overall Protection of Human Health and the Environment

Alternative 3 will be protective of human health and the environment by eliminating petroleum concentrations and constituents in soil to a depth of 15 ft and by capping the Site with the building foundation. The potential for human and environmental exposure to these constituents on-site will be eliminated by the excavation and / or capping of all soils with parameters above restricted residential criteria. Residual fill with parameters above restricted residential criteria which remain following construction excavation, will be effectively capped with the concrete foundation slab of the new building. The treatment of any residuals with chemical injections will improve groundwater quality further and reduce potential post-remediation exposures to on-site and off-site residents from vapors. Groundwater use will be restricted at the Site until groundwater quality recovers.

During remedial and construction activity, workers and area residents may be exposed to impacted soil and vapors. Worker exposure to soil and vapors will be minimized through implementation of a HASP. Exposures to area residents from dust and or vapors will be minimized through the use of engineering controls and through implementation of a CAMP.

3.6.2 Compliance with Remedial Goals, SCGs and RAOs

Alternative 3 will achieve compliance with the remedial goals, SCGs and RAOs for soil through source removal to restricted residential cleanup SCOs to a depth for the upper 2 feet. Groundwater quality will continue to improve over time with respect to SCGs. Compliance with SCGs for soil vapor is expected following completion of the remedial action.

3.6.3 Long-term Effectiveness and Permanence

Alternative 3 achieves long term effectiveness and permanence by permanently removing and/or remediating all soils affected by Site contaminants above restricted residential objectives in the upper 15 ft. Under this Alternative risk from soil impacts is eliminated for on-site residents. Alternative 2 will continue to meet RAOs for soil in the future, providing a permanent long-term solution for the Site.

3.6.4 Reduction in Toxicity, Mobility or Volume through Treatment

Alternative 3 will reduce the toxicity, mobility, and volume of contaminants from on-site soil by meeting restricted residential objectives for the upper 15 feet. The removal/remediation of on-site soil will also reduce the toxicity, mobility, and volume of contaminants within on-site groundwater and soil vapor.

3.6.5 Short-term Effectiveness

The potential for short-term adverse impacts and risks to the workers, the community, and the environment during the implementation of Alternative 3 is minimal. Short-term exposure to on-site workers during excavation and loading activities will be addressed with a HASP and mitigated through the use of personal protective equipment, monitoring and engineering controls. Potential short-term exposure to the surrounding community will be addressed through the use of odor and dust-suppression techniques and through the implementation of a CAMP which will require air monitoring activities during all excavation and soil disturbance activities.

Other potential impacts to the community such as construction-related noise, vibrations and traffic will be controlled and regulated under the terms of the NYS Department of Buildings permit which can place a Stop Work Order on the property for unsafe conditions, community

impacts or violation of the terms and conditions of the permit. Decontamination procedures of equipment, including trucks transporting soil to off-site disposal facilities will minimize the potential for impacted soil to be dispersed beyond the Site boundary. A truck traffic plan will also be prepared to minimize disturbance to the local roads and community.

3.6.6 Implementability

The techniques, materials and equipment to implement Alternative 3 are readily available and have been proven effective in remediating the contaminants associated with the Site. Excavation for the remediation of soils is both a "low tech" and reliable method which has a long and proven track record on the remediation of hazardous waste and petroleum spill sites. Excavation to 15 feet will not require any additional shoring / dewatering beyond that needed for construction purposes.

3.6.7 Cost

Costs associated with Alternative 3 are estimated at approximately $3,920,979. This cost estimate includes the following elements and assumptions:

- Removal of former underground storage tanks;
- Excavate to 15 ft bg for the entire Site;
- Chemical Oxidant application as needed to remediate residual source materials below 15 ft;
- Disposal of approximately 7,280 cy of petroleum contaminated soil
- Disposal of approximately 14,560 cy of historic fill;
- Waste characterization and endpoint verification sampling and analysis;
- Capping of the Site with the concrete building slab;
- Dewatering, treatment and discharge of groundwater to the NYC sewer system;
- HASP and CAMP monitoring for the duration of the remedial activities; and
- Preparation of a Final Engineering Report and BCP program fees.
- Preparation of a Site Management Plan;
- Recording of an Environmental Easement; and,
- Long term groundwater monitoring and reporting.

3.6.8 Compatibility with Land Use

The proposed redevelopment of the Site is compatible with its current zoning. Following remediation the Site will meet restricted residential use objectives which is appropriate for its planned mixed residential and commercial use. A groundwater use restriction will be required to prevent future exposure to affected groundwater.

3.6.9 Community Acceptance

This RAWP will be subject to a 45-day public comment period to determine if the community has any comments on the presented remedial alternatives and selected remedy. If no comments are received, it will be considered to be acceptable to the community.

3.7 SELECTION OF THE PREFERRED REMEDY

The remedy recommended for the site is a Track 1 alternative (Alternative 1) which consists of the removal of soils to UUSCOs to a depth of 25 feet below grade. This will be achieved through removal of the any existing USTs and excavation of petroleum contaminated soil present to a depth of 25 feet below grade. The Track 1 alternative also includes the removal of contaminated groundwater through dewatering activities during excavation. Over-excavation (>25 ft) may be required in areas exceeding unrestricted SCOs. Over-excavated areas will be backfilled with either virgin mined materials, recycled materials or certified fill which meets unrestricted SCOs. Chemical oxidants may also be used as a contingency to treat residual soil contamination if present below practical excavation limits. If chemical oxidants are to be used, a Remedial Design Document detailing the application procedures will be prepared and submitted to DEC for approval.

3.7.1 Preferred Remedy Land Use Factor Evaluation

As required by Article 27, Title 14 of the Environmental Conservation Law 27-1415, the following land use factor evaluation examines whether the preferred alternative is acceptable based on the 14 criteria presented in the following subsections.

Zoning

The proposed redevelopment project, which includes the construction of a new mixed use, is in compliance with current C4-4L zoning. Therefore, the project will be constructed as-of-right regardless of the remedy implemented. The preferred remedy will comply with current zoning.

Applicable Comprehensive Community Master Plans or Land Use Plans

The proposed redevelopment project and selected remedy are consistent with comprehensive master and land use plans, specifically the Flushing - Bedford rezoning action (CEQR No. 00DCP015K). This area-wide comprehensive re-zoning was completed by the New York City Department of City Planning and adopted by the City Council in May 2001. The preferred remedy will be in full compliance with this applicable land use plan.

Surrounding Property Uses

The surrounding land use includes underutilized commercial properties to the north, multi-family residential buildings to the northeast, mixed-use residential buildings to the northwest and south and a gas station to the west.

Citizen Participation

Citizen participation for implementation of the preferred alternative will be performed in accordance with DER 23 and NYCRR Part 375-1.10 and Part 375-3.10. A Citizen Participation Plan has been prepared and is available for public review at the identified document repositories (NYSDEC Region 2 Office, Brooklyn Public Library, Walt Whitman Branch). This Remedial Action Work Plan was made available for review by the public as required by the BCP.

Environmental Justice Concerns

The Site is located within a potential environmental justice area. The NYSDEC defines a potential environmental justice area as a "minority or low-income community that may bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies".

Environmental justice means the fair treatment and meaningful involvement of all people regardless of race, color, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

Since the goal of the remedy will achieve the highest level of cleanup (unrestricted use) and will remove contaminated materials from the community, the remedy poses no environmental justice concerns.

Land use designations

The proposed remedy is consistent with land-use designations.

Population growth patterns

Population growth patterns support the proposed use for the Site. The preferred remedy will not negatively affect population growth patterns.

Accessibility to existing infrastructure

The Site is accessible to existing infrastructure. The close proximity of the Site to Bedford Avenue and the Brooklyn - Queens Expressway (I-287) will assist soil transportation and contractor access to the Site. The Site is also accessible to mass transit and is within walking distance to bus and subway stops on Flushing Avenue. The preferred remedy will not alter accessibility to existing infrastructure.

Proximity to cultural resources

The proposed remedy will not negatively impact cultural resources

Proximity to natural resources

The proposed remedy will improve the local environment and will not negatively impact natural resources.

Off-Site groundwater impacts

The proposed remedy will improve off-site groundwater impacts by removing petroleum impacted soil and contaminated groundwater from the Site. The proposed remedy will not affect natural resources other than to potentially improve the quality of groundwater on a local basis.

Proximity to floodplains

No portion of the Site is located within a designated flood zone area. The nearest moderate risk and high risk flood zone areas are located 0.5 miles to the west and the nearest high risk flood zone is located approximately 700 feet to the northwest.

Geography and geology of the Site

The selected remedy will excavate soil from the Site to a maximum depth of 25 feet below existing grade. The selected alternative and development of the site have considered the geography and geology of the Site.

Current Institutional Controls

The Site was assigned an E-designation for hazardous materials, noise and air as part of the rezoning action completed by the City. The compliance with the E-designation for hazardous materials will require the approval of the NYC Office of Environmental Remediation (NYCOER) of this RAWP. NYCOER must approve this RAWP in the form of a Notice to Proceed (NTP) letter before building permits will be issued by the NYC Department of Buildings (DOB). Documentation in the form of a Final Engineering Report (FER) for site remediation must be approved by NYCOER in the form of a Notice of Satisfaction (NOS) before the NYCDOB will issue permanent Certificates of Occupancy for the new buildings.

3.8 SUMMARY OF SELECTED REMEDIAL ACTIONS

The remedy recommended for the site is a Track 1 alternative (Alternative 1) which consists of the removal of the soils to Unrestricted Use SCOs and/or the applicable protection of groundwater SCOs, to a depth of 25 feet below grade. Over-excavation for VOCs exceeding UUSCOs will be completed to the extent practical with *in-situ* treatment using chemical oxidants if necessary. The Track 1 alternative also includes remediation of groundwater through

dewatering during excavation activities. Over-excavated areas will be backfilled with either virgin mined materials, recycled materials or certified fill which meets the requirements of 6 NYCRR Part 375 -6.7(d)(1)(ii)(b). The remedy will include the following items:

1. Removal of underground storage tanks;
2. Excavation of soil/fill exceeding Track 1 Unrestricted Use and/or the applicable protection of groundwater SCOs as listed in Table 1 to a depth of 25 feet below grade;
3. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
4. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
5. Collection and analysis of end-point soil samples and post-remedial groundwater samples to evaluate the performance of the remedy with respect to attainment of unrestricted SCOs and groundwater standards;
6. Import of materials to be used for backfill and cover in compliance with 6NYCRR Part 375-6.7(d)(1): (1) chemical limits and other specifications included in **Table 1**, (2) all Federal, State and local rules and regulations for handling and transport of material.
7. All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations;
8. If Track 1 cleanup is not achieved, an Environmental Easement will be filed against the Site to ensure implementation of the SMP.
9. If a Track 1 cleanup or an Alternative Track 2 is not achieved, implementation of a Site Management Plan (SMP) for long term maintenance of the Engineering Controls.

All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP. All deviations from the RAWP will be promptly reported to NYSDEC for approval and fully explained in the FER.

4.0 REMEDIAL ACTION PROGRAM

The objective of this section of the Remedial Action Work Plan, is to present a scope of work which will be approved by NYSDEC and when completely implemented will ready the BCP site for development under the Contemplated Use consistent with the requirements of the Brownfield Cleanup Program.

4.1 GOVERNING DOCUMENTS

Governing documents and procedures included in the Remedial Work Plan include a Site-specific Health and Safety Plan (HASP), a Community Air Monitoring Plan (CAMP), a Citizen Participation Plan, a Soil Management Plan (SoMP), a Quality Assurance Project Plan (QAPP), fluid management procedures, and contractors' site operations and quality control procedures. Highlights of these documents and procedures are provided in the following sections.

4.1.1 Health & Safety Plan (HASP)

Contractors and subcontractors will have the option of adopting this HASP or developing their own site-specific document. If a contractor or subcontractor chooses to prepare their own HASP, the Remedial Engineer will insure that it meets the minimum requirements as detailed in the site-specific HASP prepared by EBC.

Activities performed under the HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926. Modifications to the HASP may be made with the approval of the Remedial Engineer (RE), Site Safety Manager (SSM) and/or Project Manager (PM).

All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal OSHA.

The Volunteer and associated parties preparing the remedial documents submitted to the State and those performing the construction work, are completely responsible for the preparation of an

appropriate Health and Safety Plan and for the appropriate performance of work according to that plan and applicable laws.

The Health and Safety Plan (HASP) and requirements defined in this Remedial Action Work Plan pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion.

The Site Safety Coordinator will be Kevin Waters. Mr. Waters' resume is provided in **Attachment F**. Confined space entry will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gasses. A copy of the Site Specific Health and Safety Plan is provided in **Attachment B.**

4.1.2 Quality Assurance Project Plan (QAPP)

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or a cold-pak(s) to maintain a temperature of 4^{o}C.

Dedicated disposable sampling materials will be used for both soil and groundwater samples, eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, (stainless steel scoop, etc.) field rinsate blanks will be prepared at the rate of 1 for every eight samples collected.

Decontamination of non-dedicated sampling equipment will consist of the following:

- Gently tap or scrape to remove adhered soil
- Rinse with tap water
- Wash with Alconox® detergent solution and scrub
- Rinse with tap water
- Rinse with distilled or deionized water

Prepare field blanks by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers. Trip blanks will accompany samples each time they are transported to the laboratory. Matrix spike and matrix spike duplicates (MS/MSD) will be collected at the rate of one per 20 samples submitted to the laboratory. Laboratory reports will be upgradeable to ASP category B deliverables for use in the preparation of a data usability report (DUSR). The QAPP for the Site is provided in **Attachment C**.

4.1.3 Construction Quality Assurance Plan (CQAP)

All construction work related to the remedy (i.e., soil excavation) will be monitored by EBC field personnel under the direct supervision of the Remedial Engineer. Monitoring during soil excavation will be performed to protect the health of site workers and the surrounding community. A Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) have been specifically developed for this project. These plans specify the monitoring procedures, action levels, and contingency measures that are required to protect public health.

All intrusive and soil disturbance activities will be monitored by a qualified environmental professional (QEP) under the direct supervision of the Remedial Engineer who will record observations in the site field book and complete a photographic log of the daily activities. The QEP will provide daily updates to the Project Manager and Remedial Engineer who will both make periodic visits to the site as needed to assure construction quality.

4.1.4 Soil/Materials Management Plan (SoMP)

A SoMP has been prepared for excavation, handling, storage, transport and disposal of all soils/materials that are disturbed/excavated at the Site. The SoMP includes all of the controls that

will be applied to these efforts to assure effective, nuisance-free performance in compliance with all applicable Federal, State and local laws and regulations. The SoMP is presented in **Section 5.4**.

4.1.5 Erosion and Sediment Control Plan (ESCP)

Erosion and sediment controls will be performed in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control. Typical measures that will be utilized at various stages of the project to limit the potential for erosion and migration of soil include the use of hay bales, temporary stabilized construction entrances/exits, placement of silt fencing and/or hay bales around soil stockpiles, and dust control measures.

4.1.6 Community Air Monitoring Plan (CAMP)

The CAMP provides measures for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities.

The action levels specified require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the remedial work did not spread contamination off-site through the air.

The primary concerns for this site are vapors, nuisance odors and dust particulates. A CAMP was previously prepared for implementation of the RAWP and is provided in **Attachment D**.

4.1.7 Contractors Site Operations Plan (SOP)

The Remedial Engineer has reviewed all plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and confirms that they are in compliance with this RAWP. The Remedial Engineer is responsible to ensure that all later document submittals for this remedial project, including contractor and sub-contractor document submittals, are in compliance with this RAWP. All remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

4.1.8 Citizen Participation Plan (CPP)

A certification of mailing will be sent by the Volunteer to the NYSDEC project manager following the distribution of all Fact Sheets and notices that includes: (1) certification that the Fact Sheets were mailed, (2) the date they were mailed; (3) a copy of the Fact Sheet, (4) a list of recipients (contact list); and (5) a statement that the repository was inspected on (specific date) and that it contained all of applicable project documents.

No changes will be made to approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing. The approved Citizen Participation Plan for this project is provided in **Attachment E**.

Document repositories have been established at the following locations and contain all applicable project documents:

Williamsburgh Library
240 Division Street
Brooklyn, NY 11205
(718) 302-3485

Hours:

Mon 10:00 AM - 6:00 PM
Tue 10:00 AM - 6:00 PM
Wed 1:00 PM - 8:00 PM
Thu 10:00 AM - 6:00 PM
Fri 10:00 AM - 6:00 PM
Sat 10:00AM - 5:00PM
Sun closed

Brooklyn 3 Community District Information

1360 Fulton Street Rm. 202

Brooklyn, NY, 11216

718-622-6601

4.2 GENERAL REMEDIAL ACTION INFORMATION

4.2.1 Project Organization

The Project Manager for the remedial activity will be Mr. Keith Butler. Overall responsibility for the BCP project will be Mr. Charles B. Sosik, P.G., P.HG. The Remedial Engineer for this project is Mr. Ariel Czemerinski, P.E. Mr. Kevin Brussee will serve as the Quality Assurance Officer. Resumes of key personnel involved in the Remedial Action are included in **Attachment F**.

4.2.2 Remedial Engineer

The Remedial Engineer for this project will be Mr. Ariel Czemerinski, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the Site (NYSDEC BCA Index Site No. C224264). The Remedial Engineer will certify in the Final Engineering Report that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

The Remedial Engineer will review all pre-remedial plans submitted by contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of back fill material, and management of waste transport and disposal, and will certify compliance in the Final Remediation Report. The Remedial Engineer will provide the certifications listed in Section 10.1 in the Final Engineering Report. The Remedial Engineer will be responsible for all appropriate communication with NYSDEC and NYSDOH.

4.2.3 Remedial Action Schedule

The remedial action will begin with mobilization of equipment and material to the Site, which will begin following RAWP approval and issuance of the building permit, and within 10 days of

the distribution of the remedial construction Fact Sheet. A pre-construction meeting will be held among NYSDEC, the Remedial Engineer, and the selected remedial contractor prior to site mobilization. Mobilization will be followed by installation of shoring, dewatering system installation, soil removal and disposal and confirmation sampling. The work is expected to take up to 12 months as part of the construction excavation and foundation installation.

4.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Volunteer of any variances issued by the Department of Buildings. NYSDEC reserves the right to deny alternate remedial construction hours.

4.2.5 Site Security

A construction fence will be erected along the front of the property as required by the NYC Department of Buildings. The fence will be maintained as required and secured at the end of each work day.

4.2.6 Traffic Control

The Volunteer's construction management personnel will direct the arrival or departure of construction vehicles, and provide flag services as needed to maintain safe travel exiting and entering the Site from Flushing Avenue. Traffic related to on-going remedial activity will require the staging of 10-wheel dump trucks along Flushing Avenue on a daily basis during soil excavation activity. The soil disposal transport route will be as follows:

- ENTERING SITE - from the Brooklyn Queens Expressway, take the Flushing Avenue exit (Exit 30) and head east on Flushing Avenue to Site entrance on the right.
- EXITING SITE – Turn left onto Flushing Avenue and make a left onto Brooklyn Queens Expressway West.

A map showing the truck routes is included as **Figure 11**.

4.2.7 Worker Training and Monitoring

An excavation contractor will remove historic fill, and uncontaminated soil. The excavation contractor's on-site personnel will have a minimum of 24 hour Hazardous Waste Operations and Emergency Response Operations (HAZWOPER) training. The excavation and loading of contaminated soil and the application of chemical oxidants will be performed by personnel with a minimum of 40 hour HAZWOPER.

All field personnel involved in remedial activities will participate in training, if required, under 29 CFR 1910.120, including 24 and 40-hour hazardous waste operator training and annual 8-hour refresher training. The Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign a HASP acknowledgment.

All on-site personnel engaged in remedial or sampling activities must receive adequate site-specific training in the form of an on-site Health and Safety briefing prior to participating in field work with emphasis on the following:

- Protection of the adjacent community from hazardous vapors and / or dust which may be released during intrusive activities.
- Identification of chemicals known or suspected to be present on-site and the health effects and hazards of those substances.
- The need for vigilance in personnel protection, and the importance of attention to proper use, fit and care of personnel protective equipment.
- Decontamination procedures.
- Site control including work zones, access and security.
- Hazards and protection against heat or cold.
- The proper observance of daily health and safety practices, such as entry and exit of work zones and site. Proper hygiene during lunch, break, etc.

- Emergency procedures to be followed in case of fire, explosion and sudden release of hazardous gases.

4.2.8 Agency Approvals

The Volunteer has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, obtained prior to the start of remedial construction.

The planned end use for the Site is in conformance with the current zoning for the property as determined by New York City Department of Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

A complete list of all local, regional and national governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work is attached in **Table 15**. This list includes a citation of the law, statute or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the Final Engineering Report.

4.2.9 Pre-Construction Meeting with NYSDEC

A pre-construction meeting with the Project Manager, Remedial Engineer, Construction Manager, Owner's Representative and the NYSDEC will take place prior to site mobilization.

4.2.10 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in **Table 16**. That document defines the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

4.2.11 Remedial Action Costs

The total estimated cost of the Remedial Action is $5,917,767. An itemized and detailed summary of estimated costs for all remedial activity is attached as **Attachment H**. This will be revised based on actual costs and submitted as an Appendix to the Final Engineering Report.

4.3 SITE PREPARATION

4.3.1 Mobilization

Mobilization will include the delivery of construction equipment and materials to the site. All construction personnel will receive site orientation and training in accordance with the site specific HASP, CAMP and established policies and procedures to be followed during the implementation of the RAWP. The remediation contractor, construction manager and all associated subcontractors will each receive a copy of the RAWP and the site specific HASP and will be briefed on their contents.

4.3.2 Erosion and Sedimentation Controls

Soil erosion and sediment control measures for management of storm water will be installed in accordance with the New York Guidelines for Urban Erosion and Sediment Control. Haybales and/or silt fence will be placed by the remedial contractor at locations surrounding excavation areas and within the perimeter fencing as needed, to control stormwater runoff and surface water from exiting the excavation. These control measures will be installed prior to initiating the soil excavation.

4.3.3 Stabilized Construction Entrance(s)

Stabilized construction entrances will be installed at all points of vehicle ingress and egress to the Site. The stabilized entrances will be constructed of a 4 to 6-inch bed of crushed stone or recycled concrete aggregate (RCA) from a NYSDEC-registered facility, which will be sloped back toward the interior of the Site. The stabilized entrances will be inspected by the Remedial Engineer or his designee on a daily basis during soil loading activities and reinforced as needed with additional stone/RCA to prevent the accumulation of ruts, mud or soil.

4.3.4 Utility Marker and Easements Layout

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other

work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this Remedial Action Work Plan is posed by utilities or easements on the Site.

4.3.5 Sheeting and Shoring

Appropriate management of structural stability of on-Site or off-Site structures during on-Site activities including excavation is the sole responsibility of the Volunteer and its contractors. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals that may be required to perform work under this Plan. Further, the Volunteer and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved Plan.

4.3.6 Equipment and Material Staging

All equipment and work materials will be staged on-Site in areas as designated by the General Contractor, and / or Construction Site Superintendent.

4.3.7 Decontamination Area

A temporary truck decontamination pad will be constructed to decontaminate trucks and other vehicles/equipment leaving the Site. The pad will be constructed by placing a stone aggregate such as crushed rock or RCA. The pad will be bermed at the sides and sloped back to the interior of the Site. The truck pad will be sized to accommodate the largest construction vehicle used and located in line with the stabilized construction entrance.

4.3.8 Site Fencing

An 8-foot high temporary construction fence will be installed along Flushing Avenue, Franklin Avenue and Little Nassau Street with entrance/egress gates located on each. This fence will be properly secured at the end of the day and supplemented, as needed, by installing orange safety fencing around open excavations to ensure on-site worker safety.

4.3.9 Demobilization

Demobilization will consist of the restoration of material staging areas and the disposal of materials and/or general refuse in accordance with acceptable rules and regulations. Materials used in remedial activities will be removed and disposed properly. All equipment will be decontaminated prior to leaving the Site.

4.4 REPORTING

All daily and monthly reports will be included in the Final Engineering Report.

4.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by the end of each day in which remedial activity takes place. Daily reports will include:

- An update of progress made during the reporting day;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP finding, including excursions;
- An explanation of notable Site conditions;
- Identification of planned activities for the following day.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information. However, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the 10th of the month following the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e. tons of material exported and imported, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and,
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

4.4.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital (JPEG) format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the Final Engineering Report.

Job-site record keeping for all remedial work will be appropriately documented. These records will be maintained on-Site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

4.4.4 Complaint Management Plan

Complaints from the public regarding nuisance or other Site conditions including noise, odor, truck traffic etc., will be recorded in the Site field book and reported to the NYSDEC via email on the same day as the complaint is received.

4.4.5 Deviations from the Remedial Action Work Plan

Minor deviations from the RAWP will be identified in the daily update report and will be noted in the Final Engineering Report. When deviations are reported a brief discussion will be provided which will state the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy.

Major changes to the scope of work must be discussed with the NYSDEC and the NYSDOH prior to implementation. If the changes are considered to be significant enough, an addendum to the RAWP Work Plan will be prepared and submitted to NYSDEC / NYSDOH for review.

5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

Excavation work includes the removal of the three former USTs and excavation of petroleum contaminated soil and all soil exceeding Unrestricted Use SCOs to a depth of 25 feet below grade. Additional excavation for VOCs will be completed beyond 25 ft where soils exceed UUSCOs. Soil excavation will be performed using conventional equipment such as track-mounted excavators, backhoes and loaders.

All excavation work will be performed in accordance with the Site-specific HASP and CAMP. Removal of the underground tanks will be performed by a licensed tank removal contractor with appropriately trained personnel (40HR OSHA HAZWOPER). Excavation of the petroleum impacted soil and historic fill material will be performed by the excavation contractor for the construction project using appropriately trained personnel (24 to 40HR OSHA HAZWOPER). If any additional underground storage tanks (UST) are discovered during excavation the NYSDEC Project Manager will be immediately notified and the UST removed and closed in accordance with DER-10, NYSDEC PBS regulations and NYC Fire Department regulations.

The selected remedial action includes removal of any current underground storage tanks and excavation of all soil exceeding unrestricted use criteria to a depth of 25 feet below grade across the entire site. **Figure 12** shows the planned excavation depths to accommodate the new building's foundation. The building excavation depth was increased to 25 ft to achieve Track 1. An excavation plan showing the excavation depths to achieve the Track 1 remedy is provided as **Figure 13**.

Due to the presence of groundwater at approximately 9-13 feet below grade dewatering will be necessary to complete excavation to 25 ft. The water will be treated and discharged into the New York City combined sanitary/storm sewer system. A permit to discharge will be obtained from the New York City Department of Environmental Protection (NYCDEP). The need for pretreatment will be determined by DEP's requirements for the discharge permit. If pretreatment is required by the DEP, it will be performed in accordance with that detailed in the approved permit.

5.1 UST REMOVAL METHODS

Three underground storage tanks (USTs) may be present at the Site (**Figure 2**). Any USTs will be removed in accordance with the procedures described under the NYSDEC Memorandum for the Permanent Abandonment of Petroleum Storage Tanks and Section 5.5 of Draft DER-10 as follows:

- Remove all product to its lowest draw-off point
- Drain and flush piping into the tank
- Vacuum out the tank bottom consisting of water product and sludge
- Dig down to the top of the tank and expose the upper half of the tank
- Remove the fill tube and disconnect the fill, gauge, product and vent lines and pumps. Cap and plug open ends of lines
- Temporarily plug all tank openings, complete the excavation, remove the tank and place it in a secure location
- Render the tank safe and check the tank atmosphere to ensure that petroleum vapors have been satisfactorily purged from the tank
- Clean tank or remove to a storage yard for cleaning
- If the tank is to be moved it must be transported by licensed waste transported. Plug and cap all holes prior to transport leaving a 1/8 inch vent hole located at the top of the tank during transport
- After cleaning the tank must be made acceptable for disposal at a scrap yard cleaning the tank interior with a high pressure rinse and cutting the tank in several pieces.

During the tank and pipe line removal the following field observations should be made and recorded:

- A description and photographic documentation of the tank and pipe line condition (pitting, holes, staining, leak points, evidence of repairs, etc.)
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.)

- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation with a calibrated photoionization detector (PID).

5.2 SOIL CLEANUP OBJECTIVES

The Soil Cleanup Objectives for this Site are listed in **Table 1**. **Table 7** summarizes all soil samples that exceed the SCOs proposed for this Remedial Action. A spider map that shows all soil samples that exceed the SCOs proposed for this Remedial Action are shown in **Figure 8**.

5.3 REMEDIAL PERFORMANCE EVALUATION (POST EXCAVATION END-POINT AND GROUNDWATER SAMPLING

Post excavation soil samples, soil vapor, and groundwater samples will be collected from the site to verify that remedial goals have been achieved. These samples will be collected from the Site as follows:

(1) Site-wide bottom of excavation endpoint soil samples will be collected following removal of all soil needed for construction of the buildings cellar level to verify that remedial goals have been achieved (**Figure 14**). The Site-wide endpoint soil samples will be analyzed for VOCs, SVOCs, pesticides, PCBs and metals.

(2) Groundwater samples will be collected from two off-site monitoring wells located near the property line (**Figure 14**) to verify that a bulk reduction in groundwater contamination has occurred. Groundwater samples will be analyzed for VOCs. Prior to initiating dewatering operations baseline samples will be collected from these wells and analyzed for VOCs, 1,4-dioxane and PFAS.

5.3.1 End-Point Sampling Frequency

Endpoint sampling frequency will be in accordance with DER-10 section 5.4, which recommends the collection of one bottom sample per 900 sf of bottom area and one sidewall sample per 30 linear feet. Sidewall samples will not be collected where sheeting or shoring is present. Sheeting will be located outside the bounds of the property line, therefore soil up to and just beyond the property line will be removed.

5.3.2 Methodology

Collected samples will be placed in glass jars supplied by the analytical laboratory and stored in a cooler with ice to maintain a temperature of 4ºC. Samples will either be picked up at the Site by a laboratory-dispatched courier at the end of the day, or transported back to the EBC office where they will be picked up the following day by the laboratory courier. All samples will be analyzed by a NYSDOH ELAP certified environmental laboratory certified in the appropriate categories.

All site-wide post-excavation (endpoint) soil samples will be analyzed for VOCs and SVOCs according to EPA method 8260C/8270D, pesticides/PCBs by EPA method 8081B/8082A and TAL metals Method 6010C. Post-excavation groundwater samples will be analyzed for VOCs by EPA Method 8260B. Note that baseline samples will be collected from the two downgradient wells before dewatering begins. Baseline samples from the monitoring wells will be analyzed for VOCs by EPA Method 8260B, 1,4-dioxane by EPA Method 8260(SIM) and PFAS by EPA Method 537 or ISO 25101.

5.3.3 Reporting of Results

Sample analysis will be provided by a New York State certified environmental laboratory, certified in appropriate categories. Laboratory reports will include NYSDEC Analytical Services Protocol (ASP) category B data deliverables for use in the preparation of a data usability summary report (DUSR). All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format.

5.3.4 QA/QC

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or cold-pak(s) to maintain a temperature of 4^{o}C, +/- 2 ^{o}C.

Dedicated disposable sampling materials will be used for both soil samples, eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, (stainless steel scoop, etc.) field rinsate blanks will be prepared at the rate of 1 for every eight samples collected. Field blanks will be prepared by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers.

Trip blanks, as prepared and provided by the NYS certified laboratory, will accompany samples each time they are transported to the laboratory. Matrix spike and matrix spike duplicates (MS/MSD) will be collected at the rate of one per 20 samples submitted to the laboratory.

5.3.5 DUSR

The DUSR provides a thorough evaluation of analytical data with full third party data validation. The primary objective of a DUSR is to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and data use. Verification and/or performance monitoring samples collected under this RAWP will be reviewed and evaluated in accordance with the Guidance for the Development of Data Usability Summary Reports as presented in Appendix 2B of DER-10. The completed DUSR for verification/performance samples collected during implementation of this RAWP will be included in the final Engineering Report.

5.3.6 Reporting of End-Point Data in FER

All endpoint data collected as part of this remedial action will be summarized in tables and maps and presented in the Final Engineering Report. The summary tables and maps will include comparison of results to Unrestricted Use SCOs to verify attainment of Track 1. Laboratory reports and the DUSR will be included as an appendix in the FER.

5.4 ESTIMATED MATERIAL REMOVAL QUANTITIES

Historic fill materials were documented throughout the site to depths as great as 12 feet below grade. Petroleum contaminated soil is present across the site to depths of 25 ft. It is expected that approximately 36,395 cubic yards (69,878 tons) of non-hazardous historic fill and petroleum contaminated soil will be excavated from the site for off-site disposal.

Clean native soils may be encountered in the northern and eastern portions of Lot 48 from 12 to 25 below grade. If present, this material will be segregated from contaminated soil and disposed of separately. Reuse of clean native soil from on-site is not anticipated; however, if needed, requests to reuse material on-site will be submitted to NYSDEC with accompanying analytical data.

5.5 SOIL/MATERIALS MANAGEMENT PLAN

5.5.1 Excavation of Historic Fill Materials

Historic fill has been identified throughout the property to depths as great at 12 ft below grade. Historic fill will be segregated from non-contaminated native soils and disposed of off-site at a permitted disposal facility. Excavated historic fill materials will be secured and temporarily stored on-site until arrangements can be made for off-site disposal. As an alternative, pre-characterization samples may be collected to allow the soil to be loaded directly on to trucks for transport to the disposal facility. It is anticipated that historic fill materials will be classified as a non-hazardous material. It is anticipated that the excavation of historic fill materials will be performed by the excavation contractor for the construction project.

5.5.2 Excavation of Petroleum Contaminated Soil

Petroleum-impacted soil has been documented throughout most of the site to 25 feet below grade. Pre-characterization samples will be collected to allow the soil to be loaded directly on to trucks for transport to the disposal facility. The final determination on classification will be based on the results of waste characterization analysis and the NYSDEC. Soil excavation will be performed in accordance with the procedures described under Section 5 of DER-10 as follows:

- A description and photographic documentation of the excavation.
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.).
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation with a calibrated photoionization detector (PID).

Final excavation depth, length, and width will be determined by the Remedial Engineer or his designee, and will depend on the horizontal and vertical extent of contaminated soils as identified through physical examination (PID response, odor, staining, etc.). Expansion of the excavation beyond the planned hotspot area, if necessary, can easily be accommodated.

The following procedure will be used for the excavation of impacted soil (as necessary and appropriate):

- Wear appropriate health and safety equipment as outlined in the HASP;

- Prior to excavation, ensure that the area is clear of utility lines or other obstructions. Lay plastic sheeting on the ground next to the area to be excavated;

- Using a rubber-tired backhoe or track mounted excavator, remove overburden soils and stockpile or dispose of separate from the impacted soil;

- If USTs are discovered, the NYSDEC will be notified and the best course of action to remove the structure should be determined in the field. This may involve the continued removal of overburden to access the top of the structure or continued trenching around the perimeter to minimize its disturbance;

- If physically contaminated soil is present (e.g., staining, odors, sheen, PID response, etc), an attempt will be made to remove it to the extent not limited by the site boundaries. If possible, physically impacted soil will be removed using the backhoe or excavator, segregated from clean soils and overburden, and staged on separate dedicated plastic

sheeting or live loaded into trucks from the disposal facility. Removal of the impacted soils will continue until visibly clean material is encountered and monitoring instruments indicate that no contaminants are present;

- Excavated soils which are temporarily stockpiled on-site will be covered with 6-mil polyethylene sheeting while disposal options are determined. Sheeting will be checked on a daily basis and replaced, repaired or adjusted as needed to provide full coverage. The sheeting will be shaped and secured in such a manner as to drain runoff and direct it toward the interior of the property;

- Once the Remedial Engineer is satisfied with the removal effort, verification or confirmatory samples will be collected from the excavation as described in **Section 6.3** of this document.

The excavation of VOC contaminated areas will be performed by an excavation contractor and appropriately trained personnel (24 - 40HR OSHA HAZWOPER).

5.5.3 Excavation of Native Soils

Native soils are present directly below the fill materials. Based on the results of the RI, it is expected that native soils will be contaminated with petroleum. However, if uncontaminated native soils are encountered in some areas of the Site they will be segregated from contaminated soils and disposed of off-site as a beneficial re-use material upon approval by the NYSDEC. Clean native soils re-used on-site for backfill will be subject to a testing program to verify that they meet unrestricted SCOs prior to use.

It is anticipated that the excavation of native soil materials will be performed by the excavation contractor for the project. If contamination is identified in native soil, excavation of this material will be performed by appropriately trained personnel (24 - 40HR OSHA HAZWOPER).

5.5.4 Soil Screening Methods

Visual, olfactory and PID (10.6eV) soil screening and assessment will be performed by an experienced environmental professional under the direction of the Remedial Engineer during all remedial and development excavations into known or potentially contaminated material. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development phase, such as excavations for foundations and utility work, prior to issuance of the COC.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the Final Engineering Report.

Screening will be performed by qualified environmental professionals or other experienced field personnel under the direction of the Remedial Engineer. Resumes are provided in **Attachment F** for all personnel responsible for field screening (i.e. those representing the Remedial Engineer) of invasive work for unknown contaminant sources during remediation and development work.

5.5.5 Stockpile Methods

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced. Hay bales will be used as needed near catch basins, surface waters and other discharge points. Water will be available on-site at suitable supply and pressure for use in dust control.

5.5.6 Materials Excavation and Load Out

The Remedial Engineer or a qualified environmental professional under his supervision will oversee all invasive work and the excavation and load-out of all excavated material. The

Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

Where effective, the equipment will be "dry" decontaminated using a broom and/or brushes. If significant amounts of soil or other contaminants remain after the dry decontamination, the equipment will also be pressure washed before leaving the Site. The Remedial Engineer or his designee will be responsible for ensuring that all outbound trucks are dry-brushed or washed on the truck wash/equipment pad before leaving the Site until the remedial construction is complete. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site sediment tracking. The Remedial Engineer will be responsible for ensuring that all egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during Site remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site derived materials.

The Volunteer and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

The Remedial Engineer will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this Remedial Action Work Plan.

Each hotspot and structure to be remediated will be removed and end-point remedial performance sampling completed before excavations related to Site development commence proximal to the hotspot or structure.

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation required by this plan.

Mechanical processing of historical fill and contaminated soil on-Site is prohibited. All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be located and shown on maps to be reported in the Final Engineering Report.

5.5.7 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded All haulers will be in full compliance with all applicable local, State and Federal regulations. The soil disposal transport route will be as follows:

- ENTERING SITE - from the Brooklyn Queens Expressway, take the Flushing Avenue exit (Exit 30) and head east on Flushing Avenue to Site entrance on the right.

- EXITING SITE – Turn left onto Flushing Avenue and make a left onto Brooklyn Queens Expressway West.

A map showing the truck routes is included as **Figure 11**. These are the most appropriate routes to and from the Site and take into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off- Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

When possible, queuing of trucks will be performed on-Site in order to minimize off-Site disturbance.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. If loads contain wet material capable of producing free liquid, truck liners will be used. All trucks will be inspected, dry-brushed and/or washed, as needed, before leaving the site. Truck wash waters will be collected and disposed of off-Site in an appropriate manner.

5.5.8 Materials Disposal Off-Site

Multiple disposal facility designations will be employed for the materials removed from the Site. Once final arrangements have been made the disposal location(s) will be reported to the NYSDEC Project Manager. The total quantity of material expected to be disposed off-Site is 36,395 cubic yards including petroleum impacted soil (18,925 cy) and historic fill (17,470 cy).

All petroleum contaminated and historic fill material excavated and removed from the Site will be treated as contaminated and regulated material and will be disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.

It is anticipated that petroleum contaminated soils and historic fill will be disposed of as a non-hazardous material. Final classification of excavated materials will be dependent upon the results of waste characterization sampling. Waste characterization will be performed for off-Site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

Non-hazardous historic fill and contaminated soils taken off-Site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet UUSCOs is prohibited from being taken to a New York State soil recycling facility (6NYCRR Part 360-16 Registration Facility).

If encountered, hazardous wastes derived from on-Site will be stored, transported, and disposed of in full compliance with applicable local, State, and Federal regulations. Appropriately licensed haulers will be used for material removed from this Site and will be in full compliance with all applicable local, State and Federal regulations.

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the Division of Materials Management (DMM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without permit modifications only upon prior notification of NYSDEC Region 2 DMM. This material is prohibited from being sent or redirected to a Part 360-16 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.

Clean native soil removed from the site for development purposes (i.e. basement levels) will be handled as unregulated or beneficial use disposal. This soil will undergo a testing program to confirm that it meets restricted residential SCOs prior to unregulated disposal or reuse on-site. Confirmation testing of clean soils will be in accordance with DER-10 as follows:

Contaminant	**VOCs**	**SVOCs, Inorganics & PCBs/Pesticides**	
Soil Quantity (cubic yards)	**Discrete Samples**	**Composite**	**Discrete Samples/Composite**
0-50	1	1	Each composite sample for analysis is created from 3-5 discrete samples
50-100	2	1	
100-200	3	1	

200-300	4	1	from representative locations in the fill.
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

Uncontaminated native soil confirmed by the above testing program and removed from the site will be disposed of as unregulated C&D material or sent to a beneficial re-use facility. The final destination of soils, whether classified as contaminated or uncontaminated, must be approved by the NYSDEC.

Concrete demolition material generated on the Site from building slabs, parking areas and other structures will be segregated, sized and shipped to a concrete recycling facility upon approval by NYSDEC. Concrete crushing or processing on-Site is prohibited. Asphalt removed from the Site will be sent to a separate recycling facility.

Additionally, it is common to encounter scrap metals and large boulders (greater than one foot in diameter) during excavation which may not be accepted by either the licensed disposal facility or the C&D facility. These materials will be segregated and subsequently recycled at local facilities. Uncontaminated metal objects will be taken to a local scrap metal facility.

Bricks and other C&D material are also not accepted by most soil disposal facilities if present at greater than 5% by volume. This material, if encountered, will be sent to a C&D landfill or other C&D processing facility if approved by NYSDEC. C&D material of this type is most often encountered on sites in which former basement structures have been filled in with material from demolishing a former building. There was no evidence of former basement areas identified during previous investigations performed at the Site.

The following documentation will be obtained and reported by the Remedial Engineer for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a letter from the Remedial Engineer or BCP Volunteer to the receiving facility describing the material to be disposed and

requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported (including Site Characterization data); and (2) a letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material. These documents will be included in the FER.

Bill of Lading system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the Final Engineering Report. Documentation for materials disposed of at recycling facilities (such as metal, concrete, asphalt) and as non-regulated C&D will include transport tickets for each load stating the origin of the material, the destination of the material and the quantity transported.

The Final Engineering Report will include an accounting of the destination of all material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will also be presented in a tabular form in the FER.

5.5.9 Materials Reuse On-Site

Reuse of materials on-site is not anticipated; however, if needed only clean native soil can be approved by NYSDEC if the material is found to meet restricted residential SCOs through the verification testing program detailed in Section 5.5.8 above. The Remedial Engineer will ensure that procedures defined for materials reuse in this RAWP are followed and that unacceptable material will not remain on-Site.

Chemical criteria for on-Site reuse of material is the Track 1 unrestricted SCOs as presented in **Table 1**. The Remedial Engineer will ensure that procedures defined for materials reuse in this RAWP are followed and that unacceptable material will not remain on-Site. Contaminated on-Site material will not be reused on-Site.

5.5.10 Fluids Management

As the depth to groundwater at the Site is approximately 9-13 feet below grade, dewatering operations will need to be employed during construction. All liquids to be removed from the Site, including dewatering fluids will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP and issuance of a NYCDEP sewer discharge permit. The pumping and treatment system design will be detailed in the NYCDEP discharge permit submittal. This submittal as well as the approved permit will be provided to the DEC prior to initiating dewatering operations.

Based on conditions observed during dewatering operations on projects in the immediate area of the Site, it is expected that flow rates will not approach that required for a Long Island well permit. However, a permit package will be submitted to the NYSDEC Division of Water to obtain a LI well permit equivalency under the BCP, as a contingency should conditions vary considerably from expected.

Dewatered fluids will not be recharged back to the land surface or subsurface of the Site. Dewatering fluids will be managed off-Site. Discharge of water generated during remedial construction to surface waters (i.e. a local pond, stream or river) is prohibited without a SPDES permit.

5.5.11 Backfill from Off-Site Sources

Off-site fill material may be needed to construct the stabilized construction entrance - exit areas, for temporary driveways for loading trucks and as an underlayment to structural components of the new buildings including slabs and footings. Recycled Concrete Aggregate (RCA) derived from recognizable and uncontaminated concrete and supplied by facilities permitted by, and in full compliance with Part 360-16 and DSNY regulations, is an acceptable form of backfill material beneath building foundations. The Remedial Engineer is responsible for ensuring that the facility is compliant with the registration and permitting requirements of 6 NYCRR Part 360 and DSNY regulations at the time the RCA is acquired. RCA imported from compliant facilities

does not require additional testing unless required by NYSDEC and DSNY under its terms of operations for the facility. Documentation of Part 360-16 and DSNY compliance must be provided to the Remedial Engineer before the RCA is transported to the Site. This information will be reported in the FER.

Fill material may also consist of virgin mined sand, gravel or stone products. Materials from a virgin mined source may be imported to the Site without testing provided that that the material meets the specifications of the geotechnical engineer, Remedial Engineer, and Redevelopment Construction Documents and that the source of the material is approved by the Remediation Engineer and the NYSDEC Project Manager.

The source approval process will require a review of the following information:

- The origin of the material;
- The address of the facility which mines/processes the material;
- A letter from the facility stating that the material to be delivered to the site is a virgin mined material and that it has not been co-mingled with other materials during processing or stockpiling.

All materials proposed for import onto the Site will be approved by the Remedial Engineer and will be in compliance with provisions in this RAWP prior to receipt at the Site. Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The Final Engineering Report will include the following certification by the Remedial Engineer: "I certify that all import of soils from off-Site, including source evaluation, approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan".

All imported soils will meet NYSDEC approved backfill or cover soil quality objectives for this Site. Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC. These NYSDEC approved backfill or cover soil quality objectives are the lower of the protection

of groundwater or the protection of public health soil cleanup objectives for [site specific use] as set forth in Table 375-6.8(b) of 6 NYCRR Part 375 and listed in **Tables 1.** If sufficient documentation is not obtained, fill materials will be tested at a frequency consistent with that as specified in Table 5.4 of DER 10 and must meet unrestricted SCOs. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC.

Nothing in this Remedial Action Work Plan should be construed as an approval for this purpose. Solid waste will not be imported onto the Site. Trucks entering the Site with imported soils will be securely covered with tight fitting covers.

5.5.12 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering. Erosion and sediment control measures identified in the RAWP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Silt fencing or hay bales will be installed around the entire perimeter of the remedial construction area.

5.5.13 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation or development related construction, sampling will be performed on product, sediment and surrounding soils, etc. Chemical analytical work will be for full scan parameters (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs). These analyses will be limited to CP-51 parameters where tanks are identified without prior approval by NYSDEC. Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will be also included in daily and periodic electronic media reports.

UST Removal Methods

Any USTs encountered during excavation activities at the Site will be removed in accordance with the procedures described under 6NYCRR Part 613.9 and Section 5.5 of DER-10 as follows:

- Remove all product to its lowest draw-off point
- Drain and flush piping into the tank
- Vacuum out the tank bottom consisting of water product and sludge
- Dig down to the top of the tank and expose the upper half of the tank
- Remove the fill tube and disconnect the fill, gauge, product and vent lines and pumps. Cap and plug open ends of lines
- Temporarily plug all tank openings, complete the excavation, remove the tank and place it in a secure location
- Render the tank safe and check the tank atmosphere to ensure that petroleum vapors have been satisfactorily purged from the tank
- Clean tank or remove to a storage yard for cleaning
- If the tank is to be moved it must be transported by licensed waste transporter. Plug and cap all holes prior to transport leaving a 1/8 inch vent hole located at the top of the tank during transport
- After cleaning the tank must be made acceptable for disposal at a scrap yard cleaning the tank interior with a high pressure rinse and cutting the tank in several pieces.

During the tank and pipe line removal the following field observations should be made and recorded:

- A description and photographic documentation of the tank and pipe line condition (pitting, holes, staining, leak points, evidence of repairs, etc.)

- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.)
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation with a calibrated photoionization detector (PID).
- Post-excavation soil sampling will be completed in conformance with DER-10 Section 5.5(c)(3)(iv).

5.5.14 Community Air Monitoring Plan

The Community Air Monitoring Plan (CAMP) provides measures for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities at the Site.

The action levels specified in the CAMP require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the remedial work did not spread contamination off-site through the air. The primary concerns for this site are odors and respirable dust associated with soil excavation and loading.

Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report. The complete CAMP developed for this site is included in **Attachment D** or this Work Plan.

5.5.15 Odor, Dust and Nuisance Control Plan

The Final Engineering Report will include the following certification by the Remedial Engineer: "I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan."

5.5.15.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site and on-Site. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and

NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Volunteer's Remediation Engineer, who is responsible for certifying the Final Engineering Report.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

5.5.15.2 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-Site work, will include, at a minimum, the items listed below:

- Dust suppression will be achieved though spraying water directly onto off-road areas including excavations and stockpiles.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water application.

5.5.15.3 Nuisance Control Plan

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work. A plan will be developed and utilized

by the contractor for all remedial work and conforms, at a minimum, to NYCDEP noise control standards.

6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

If a Track 1 cleanup is achieved, all on-Site soil remaining after completion of remediation will meet Track 1 Unrestricted Use SCOs and an Institutional Control (IC) will not be required to protect human health and the environment.

However, if a Track 1 cleanup is not achieved, the Track 2 alternative will be implemented as a contingency and an IC will be required. The Track 2 alternative will allow restricted residential use of the property. Long-term management of the IC will be executed under an environmental easement recorded with the NYC Department of Finance, Office of the City Register.

If Track 1 is not achieved, long-term management of ICs and of residual contamination will be executed under a site-specific Site Management Plan (SMP) that will be developed and submitted to DEC, if needed. The FER will report residual contamination on the Site in tabular and map form.

7.0 ENGINEERING CONTROLS

The intent of this project is to achieve Track 1 Cleanup criteria, however, if a Track 1 Cleanup is not achieved, a Track 2 Cleanup will result and Engineering Controls (ECs) may be required for the remedy.

If Track 1 is not achieved, the Site will be limited to a Tack 2 with restricted use based on the intended use of the property-residential, restricted residential (single family houses not allowed), commercial, or industrial.

8.0 INSTITUTIONAL CONTROLS

Since the intent of this project is to achieve Track 1 cleanup criteria, institutional controls are not expected to be part of the final remedy for the Site.

If Track 1 cleanup is not achieved, Institutional Controls (ICs) will be incorporated into the remedy to render the overall Site remedy protective of public health and the environmental. Two elements have been designed to ensure continual and proper management of residual contamination in perpetuity: an Environmental Easement and a Site Management Plan (SMP).

If required, a Site-Specific Environmental Easement will be recorded with the City of New York to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all Engineering and Institutional Controls (ECs/ICs) placed on the Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs.

The SMP describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

8.1 ENVIRONMENTAL EASEMENT

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination is left on-Site after the Remedial Action is complete. If the Site will have residual contamination after completion of all Remedial Actions than an Environmental Easement is required. If an Environmental Easement is needed following completion of the remedy an Environmental Easement approved by NYSDEC will be filed and recorded with the City of New York. The Environmental Easement (if needed) will be submitted as part of the Final Remediation Report.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement must be recorded with the City of New York before the Certificate of Completion can be issued by NYSDEC. These Institutional Controls are requirements or restrictions placed on the Site that are listed in, and required by, the Environmental Easement. Institutional Controls can, generally, be subdivided between controls that support Engineering Controls, and those that place general restrictions on Site usage or other requirements. Institutional Controls in both of these groups are closely integrated with the Site Management Plan (SMP), which provides all of the methods and procedures to be followed to comply with this remedy. The Institutional Controls which will be needed to support Engineering Controls are:

The Institutional Controls which will be needed to support Engineering Controls are:

- Compliance with the Environmental Easement by the Grantee and the Grantee's successors and adherence of all elements of the SMP is required;

- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;

- Compliance with the Environmental Easement by the Grantee and the Grantee's successor's is required;

- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the Controls;

- NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This annual statement must be certified by an expert that the NYSDEC finds acceptable;

8.2 SITE MANAGEMENT PLAN

Site Management is the last phase of remediation and begins with the approval of the Final Engineering Report and issuance of the Certificate of Completion (COC) for the Remedial Action. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the Site Management Plan are performed.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual); (4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (5) defining criteria for termination of treatment system operation.

To address these needs, this SMP will include four plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems; and (4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated [month, year], and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annually. The Site Management Plan will be based on a calendar year and will be due for submission to NYSDEC by March 1 of the year following the reporting period.

No exclusions for handling of residual contaminated soils will be provided in the Site Management Plan (SMP). All handling of residual contaminated material will be subject to provisions contained in the SMP.

9.0 FINAL ENGINEERING REPORT

A Final Engineering Report (FER) will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides the documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The Final Engineering Report will include as-built drawings for all constructed elements, certifications, manifests, bills of lading as well as the complete Site Management Plan (formerly the Operation and Maintenance Plan). The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP and associated design documents. The FER will provide a tabular summary of all performance evaluation sampling results and all material characterization results and other sampling and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The FER will be prepared in conformance with DER-10.

Where determined to be necessary by NYSDEC, a Financial Assurance Plan will be required to ensure the sufficiency of revenue to perform long-term operations, maintenance and monitoring tasks defined in the Site Management Plan and Environmental Easement. This determination will be made by NYSDEC in the context of the Final Engineering Report review.

The Final Engineering Report will include written and photographic documentation of all remedial work performed under this remedy. The FER will include an itemized tabular description of actual costs incurred during all aspects of the Remedial Action.

The FER will provide a thorough summary of all residual contamination left on the Site after the remedy is complete. Residual contamination includes all contamination that exceeds the Track 1 Unrestricted Use SCO in 6NYCRR Part 375-6. A table that shows exceedances from Track 1 Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action and a map that

shows the location and summarizes exceedances from Track 1 Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

The FER will provide a thorough summary of all residual contamination that exceeds the SCOs defined for the Site in the RAWP and must provide an explanation for why the material was not removed as part of the Remedial Action. A table that shows residual contamination in excess of Site SCOs and a map that shows residual contamination in excess of Site SCOs will be included in the FER.

The Final Engineering Report will include an accounting of the destination of all material removed from the Site, including excavated contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the Site.

Before approval of a FER and issuance of a Certificate of Completion, all project reports must be submitted in digital form on electronic media (PDF).

9.1 CERTIFICATIONS

The following certification will appear in front of the Executive Summary of the Final Engineering Report. The certification will be signed by the Remedial Engineer Ariel Czemerinski who is a Professional Engineer registered in New York State. This certification will be appropriately signed and stamped. The certification will include the following statements:

I, _____, am currently a registered professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the Former NY Cleaning and Dyeing Site (NYSDEC BCA Site No. C224264).

I certify that the Site description presented in this FER is identical to the Site descriptions presented in the Environmental Easement, the Site Management Plan, and the Brownfield Cleanup Agreement for the Former NY Cleaning and Dyeing Site and related amendments.

I certify that the Remedial Action Work Plan dated [month day year] and Stipulations [if any] in a letter dated [month day year] and approved by the NYSDEC were implemented and that all requirements in those documents have been substantively complied with.

I certify that the remedial activities were observed by qualified environmental professionals under my supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved.

I certify that all use restrictions, Institutional Controls, Engineering Controls, and all operation and maintenance requirements applicable to the Site are contained in an Environmental Easement created and recorded pursuant ECL 71-3605 and that all affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded. A Site Management Plan has been submitted by the Volunteer for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by the NYSDEC.

I certify that the export of all contaminated soil, fill, water or other material from the property was performed in accordance with the Remedial Action Work Plan, and were taken to facilities licensed to accept this material in full compliance with all Federal, State and local laws.

I certify that all import of soils from off-Site, including source approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan.

I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology and soil screening methodology defined in the Remedial Action Work Plan.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education Law.

10.0 SCHEDULE

The remedial action will begin with mobilization of equipment and material to the Site which will begin approximately 3 weeks following the issuance of permits by the NYC Department of Buildings for construction of the new building and within 10 days of the distribution of the Construction Fact Sheet. Mobilization will be followed by the installation of shoring structures, installation and operation of dewatering equipment, removal and disposal of the USTs (if present), excavation and disposal of petroleum impacted soil, historic fill materials and native soil and by confirmation soil and groundwater sampling. Excavation work may proceed in several stages as needed to accommodate pile or sheet driving equipment, underpinning and other components related to the support of excavation (SOE). The work is expected to take approximately 12 months as part of the construction excavation and foundation installation. The schedule of tasks completed under this RAWP is as follows:

Conduct pre-construction meeting with NYSDEC	Within 3 weeks of RAWP approval
Mobilize equipment to the site and construct truck pad and other designated areas	Within 3 weeks following building demolition and, NYCDOB close-out and issuance of the new building permit
Mobilize Excavation Contractor and equipment to the Site	Within 1 week following Site prep and truck pad construction
Begin UST removal	Immediately following mobilization
Mobilize shoring Contractor and equipment to the Site	Immediately following UST removal and excavation of the top 2-3 ft across the Site
Mobilize Dewatering Contractor and equipment to the Site	Within 3 weeks following shoring or as shoring proceeds
Complete excavation and disposal of historic fill soils, petroleum impacted soil and native soil.	Within 12 months of mobilization
Perform endpoint verification of entire site	Performed in sequence as final depth of each excavated area is complete.
Prepare and submit draft Environmental Easement package (as a contingency if Track 1 Cleanup is not achieved)	By June 15th of the year in which the COC is sought or as required by DEC.
Submit SMP (as a contingency if Track 1 Cleanup is not achieved)	By August 15th of the year in which the COC is sought or as required by DEC.
Submit FER	By September 15th of the year in which the COC is sought or as required by DEC.
Obtain Certificate of Completion	December 2019

TABLES

TABLE 1
Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water	Unrestricted Use
		Residential	Restricted-Residential	Commercial	Industrial			
METALS								
Arsenic	7440-38 -2	16f	16f	16f	16f	13f	16f	13 [c]
Barium	7440-39 -3	350f	400	400	10,000 d	433	820	350 [c]
Beryllium	7440-41 -7	14	72	590	2,700	10	47	7.2
Cadmium	7440-43 -9	2.5f	4.3	9.3	60	4	7.5	2.5 [c]
Chromium, hexavalent [h]	18540-29-9	22	110	400	800	1e	19	1 [b]
Chromium, trivalent[h]	16065-83-1	36	180	1,500	6,800	41	NS	30 [c]
Copper	7440-50 -8	270	270	270	10,000 d	50	1,720	50
Total Cyanide [h]		27	27	27	10,000 d	NS	40	27
Lead	7439-92 -1	400	400	1,000	3,900	63f	450	63 [c]
Manganese	7439-96 -5	2,000f	2,000f	10,000 d	10,000 d	1600f	2,000f	1600 [c]
Total Mercury		0.81j	0.81j	2.8j	5.7j	0.18f	0.73	0.18 [c]
Nickel	7440-02 -0	140	310	310	10,000 d	30	130	30
Selenium	7782-49 -2	36	180	1,500	6,800	3.9f	4f	3.9[c]
Silver	7440-22 -4	36	180	1,500	6,800	2	8.3	2
Zinc	7440-66 -6	2200	10,000 d	10,000 d	10,000 d	109f	2,480	109 [c]
PESTICIDES / PCBs								
2,4,5-TP Acid (Silvex)	93-72-1	58	100a	500b	1,000c	NS	3.8	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033 e	17	0.0033 [b]
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033 e	136	0.0033 [b]
4,4'-DDD	72-54-8	2.6	13	92	180	0.0033 e	14	0.0033 [b]
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19	0.005 [c]
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04g	0.02	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09	0.036
Chlordane (alpha)	5103-71 -9	0.91	4.2	24	47	1.3	2.9	0.094
delta-BHC	319-86-8	100a	100a	500b	1,000c	0.04g	0.25	0.04
Dibenzofuran	132-64-9	14	59	350	1,000c	NS	210	7
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1	0.005[c]
Endosulfan I	959-98-8	4.8i	24i	200i	920i	NS	102	2.4
Endosulfan II	33213-65-9	4.8i	24i	200i	920i	NS	102	2.4
Endosulfan sulfate	1031-07 -8	4.8i	24i	200i	920i	NS	1,000c	2.4
Endrin	72-20-8	2.2	11	89	410	0.014	0.06	0.014
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38	0.042
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1	0.1
Polychlorinated biphenyls	1336-36 -3	1	1	1	25	1	3.2	0.1
SEMI-VOLATILES								
Acenaphthene	83-32-9	100a	100a	500b	1,000c	20	98	20
Acenapthylene	208-96-8	100a	100a	500b	1,000c	NS	107	100 [a]
Anthracene	120-12-7	100a	100a	500b	1,000c	NS	1,000c	100 [a]
Benz(a)anthracene	56-55-3	1f	1f	5.6	11	NS	1f	1[c]
Benzo(a)pyrene	50-32-8	1f	1f	1f	1.1	2.6	22	1[c]
Benzo(b) fluoranthene	205-99-2	1f	1f	5.6	11	NS	1.7	1[c]
Benzo(g,h,i) perylene	191-24-2	100a	100a	500b	1,000c	NS	1,000c	100
Benzo(k) fluoranthene	207-08-9	1	3.9	56	110	NS	1.7	0.8 [c]
Chrysene	218-01-9	1f	3.9	56	110	NS	1f	1[c]
Dibenz(a,h) anthracene	53-70-3	0.33e	0.33e	0.56	1.1	NS	1,000c	0.33 [b]
Fluoranthene	206-44-0	100a	100a	500b	1,000c	NS	1,000c	100 [a]
Fluorene	86-73-7	100a	100a	500b	1,000c	30	386	30
Indeno(1,2,3-cd) pyrene	193-39-5	0.5f	0.5f	5.6	11	NS	8.2	0.5 [c]
m-Cresol	108-39-4	100a	100a	500b	1,000c	NS	0.33e	0.33 [b]
Naphthalene	91-20-3	100a	100a	500b	1,000c	NS	12	12
o-Cresol	95-48-7	100a	100a	500b	1,000c	NS	0.33e	0.33 [b]
p-Cresol	106-44-5	34	100a	500b	1,000c	NS	0.33e	0.33 [b]
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8e	0.8e	0.8[b]
Phenanthrene	85-01-8	100a	100a	500b	1,000c	NS	1,000c	100
Phenol	108-95-2	100a	100a	500b	1,000c	30	0.33e	0.33[b]
Pyrene	129-00-0	100a	100a	500b	1,000c	NS	1,000c	100

TABLE 2
SUMMARY OF REMEDIAL INVESTIGATION
SAMPLING PROGRAM RATIONALE AND ANALYSIS

Matrix	Location	Approximate Number of Samples	Rationale for Sampling	Laboratory Analysis
Subsurface soil - January 2017 (0 to 22 feet bgs)	10 borings throughout the Site	23	To evaluate soil quality of VOCs, CVOCs, urban fill materials and native soil across the site.	VOCs EPA Method 8260B, SVOCs EPA Method 8270 BN, pesticide / PCBs EPA Method 8081/8082, TAL metals.
Total (Soils)		23		
Groundwater - January 2017 (water table)	From 5 temporary monitoring wells	5	To evaluate soil quality of VOCs in groundwater.	VOCs EPA Method 8260B, SVOCs EPA Method 8270 BN, pesticide / PCBs EPA Method 8081/8082, TAL metals.
Groundwater - January 2017 (water table)	From 1 temporary monitoring well	1	Fingerprint analysis of free-phase petroleum product detected on top of water table in GW5	TPH By 8015DRO
Total (Groundwater)		11		
Soil Gas	10 soil gas implants installed across the Site	10	Evaluate soil gas at perimeter and beneath the cellar slab of the Site.	VOCs EPA Method TO15
Total (Soil Gas)		10		
Duplicates	Soil and groundwater duplicate at a rate of 1 duplicate per 20 samples.	2	To meet requirements of QA / QC program	VOCs EPA Method 8260B, SVOCs EPA Method 8270 BN, pesticide / PCBs EPA Method 8081/8082, TAL metals.
Trip Blanks	One laboratory prepared trip blank to accompany samples each time they are delivered to the laboratory.	4	To meet requirements of QA / QC program	VOCs EPA Method 8260B
Total (QA / QC Samples)		6		

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 3
Soil Analytical Results
Volatile Organic Compounds

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	SB1				SB2						SB3						SB4				SB5			
			(5-10') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(12-14') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-5') 1/13/2017 µg/Kg		(13-15') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(14-15') 1/13/2017 µg/Kg		(0-2') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg	
			Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,1,1,2-Tetrachlorothane			< 28000	28,000	< 20000	20,000	< 16	16	< 1100	1,100	< 14	14	< 20	20	< 24000	24,000	< 4.2	4.2	< 17000	17,000	< 20000	20,000	< 5800	5,800	< 20000	20,000
1,1,1-Trichloroethane	680	100,000	< 700	700	< 680	680	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 680	680	< 4.2	4.2	< 680	680	< 680	680	< 680	680	< 680	680
1,1,2,2-Tetrachloroethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,1,2-Trichloroethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,1-Dichloroethane	270	26,000	< 1400	1,400	< 980	980	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 1200	1,200	< 4.2	4.2	< 850	850	< 1000	1,000	< 290	290	< 820	820
1,1-Dichloroethene	330	100,000	< 700	700	< 490	490	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 610	610	< 4.2	4.2	< 430	430	< 510	510	< 330	330	< 410	410
1,1-Dichloropropene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,2,3-Trichlorobenzene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,2,3-Trichloropropane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,2,4-Trichlorobenzene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,2,4-Trimethylbenzene	3,600	52,000	**25,000**	3,600	**160,000**	3,600	**7.8**	4.1	< 270	270	**0.53**	3.5	< 320	320	**470,000**	3,600	**12**	4.2	**67,000**	3,600	**73,000**	3,600	**160,000**	3,600	**120,000**	3,600
1,2-Dibromo-3-chloropropane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,2-Dibromomethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,2-Dichlorobenzene	1,100	100,000	< 1100	1,100	< 1100	1,100	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 1100	1,100	< 4.2	4.2	< 1100	1,100	< 1100	1,100	< 1100	1,100	< 1100	1,100
1,2-Dichloroethane	20	3,100	< 700	700	< 490	490	< 4.1	4.1	< 27	27	**2.6**	3.5	< 5.0	5.0	< 610	610	< 4.2	4.2	< 430	430	< 510	510	< 140	140	< 410	410
1,2-Dichloropropane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,3,5-Trimethylbenzene	8,400	52,000	**4,200**	7,000	**60,000**	4,900	**6**	4.1	< 270	270	< 3.5	3.5	< 320	320	**160,000**	8,400	**3.7**	4.2	**33,000**	4,300	**34,000**	5,100	**86,000**	5,800	**73,000**	8,400
1,3-Dichlorobenzene	2,400	4,900	< 2400	2,400	< 2400	2,400	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 2400	2,400	< 4.2	4.2	< 2400	2,400	< 2400	2,400	< 1400	1,400	< 2400	2,400
1,3-Dichloropropane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
1,4-Dichlorobenzene	1,800	13,000	< 1800	1,800	< 1800	1,800	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 1800	1,800	< 4.2	4.2	< 1800	1,800	< 1800	1,800	< 1400	1,400	< 1800	1,800
2,2-Dichloropropane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
2-Chlorotoluene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
2-Hexanone (Methyl Butyl Ketone)			< 35000	35,000	< 25000	25,000	< 20	20	< 1300	1,300	< 18	18	< 25	25	< 30000	30,000	< 21	21	< 21000	21,000	< 25000	25,000	< 7200	7,200	< 25000	25,000
2-Isopropyltoluene			**1,400**	7,000	**980**	4,900	**0.77**	4.1	**2,500**	270	< 3.5	3.5	< 320	320	**20,000**	6,100	**0.45**	4.2	**3,100**	4,300	**3,000**	5,100	**820**	1,400	**5,400**	5,100
4-Chlorotoluene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
4-Methyl-2-Pentanone			< 35000	35,000	< 25000	25,000	< 20	20	< 1300	1,300	< 18	18	< 25	25	< 30000	30,000	< 21	21	< 21000	21,000	< 25000	25,000	< 7200	7,200	< 25000	25,000
Acetone	50	100,000	**11,000**	7,000	< 4900	4,900	**8.3**	20	**320**	270	**7.2**	18	**14**	25	< 6100	6,100	**4.6**	21	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 4100	4,100
Acrolein			< 28000	28,000	< 20000	20,000	< 16	16	< 1100	1,100	< 14	14	< 20	20	< 24000	24,000	< 17	17	< 17000	17,000	< 20000	20,000	< 5800	5,800	< 20000	20,000
Acrylonitrile			< 28000	28,000	< 20000	20,000	< 16	16	< 1100	1,100	< 14	14	< 20	20	< 24000	24,000	< 8.3	8.3	< 17000	17,000	< 20000	20,000	< 5800	5,800	< 20000	20,000
Benzene	60	4,800	< 700	700	**52,000**	490	**37**	60	< 60	60	**0.87**	3.5	**23**	5.0	**710**	610	**0.44**	4.2	< 430	430	< 510	510	< 140	140	< 410	410
Bromobenzene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Bromochloromethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Bromodichloromethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Bromoform			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Bromomethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Carbon Disulfide			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Carbon tetrachloride	760	2,400	< 1400	1,400	< 980	980	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 1200	1,200	< 4.2	4.2	< 850	850	< 1000	1,000	< 760	760	< 820	820
Chlorobenzene	1,100	100,000	< 1100	1,100	< 1100	1,100	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 1100	1,100	< 4.2	4.2	< 1100	1,100	< 1100	1,100	< 1100	1,100	< 1100	1,100
Chloroethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Chloroform	370	49,000	< 700	700	< 490	490	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 610	610	< 4.2	4.2	< 430	430	< 510	510	< 370	370	< 410	410
Chloromethane			< 7000	7,000	**4,400**	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	**2.3**	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
cis-1,2-Dichloroethene	250	100,000	< 700	700	< 490	490	< 4.1	4.1	< 250	250	< 3.5	3.5	< 5.0	5.0	< 610	610	< 4.2	4.2	< 430	430	< 510	510	< 250	250	< 410	410
cis-1,3-Dichloropropene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Dibromochloromethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Dibromomethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Dichlorodifluoromethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Ethylbenzene	1,000	41,000	< 1000	1,000	**120,000**	1,000	< 4.1	4.1	< 270	270	< 3.5	3.5	**1.7**	5.0	**45,000**	1,000	**1.4**	4.2	**7,000**	1,000	**7,600**	1,000	**3,000**	1,000	**2,900**	1,000
Hexachlorobutadiene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 320	320	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Isopropylbenzene			**5,300**	7,000	**9,300**	4,900	**0.47**	4.1	**1,200**	270	< 3.5	3.5	< 320	320	**35,000**	6,100	**1**	4.2	**5,700**	4,300	**5,600**	5,100	**9,000**	5,800	**12,000**	5,100
m&p-Xylenes	260	100,000	< 7000	7,000	**390,000**	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	**3.9**	5.0	**68,000**	6,100	**2.1**	4.2	**23,000**	4,300	**24,000**	5,100	**24,000**	5,800	**3,500**	5,100
Methyl Ethyl Ketone (2-Butanone)	120	100,000	< 7000	7,000	< 4900	4,900	< 24	24	< 270	270	< 21	21	< 30	30	< 6100	6,100	< 25	25	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 4100	4,100
Methyl t-butyl ether (MTBE)	930	100,000	< 1400	1,400	< 980	980	< 8.2	8.2	< 530	530	< 7.1	7.1	< 10	10	< 1200	1,200	< 8.3	8.3	< 930	930	< 1000	1,000	< 930	930	< 930	930
Methylene chloride	50	100,000	< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Naphthalene	12,000	100,000	**1,900**	7,000	**25,000**	4,900	**170**	290	< 270	270	**0.84**	3.5	< 320	320	**48,000**	30,000	**1.3**	4.2	**6,600**	4,300	**7,200**	5,100	**17,000**	5,800	**8,500**	5,100
n-Butylbenzene	12,000	100,000	**11,000**	7,000	**12,000**	4,900	**0.87**	4.1	**7,400**	2,700	< 3.5	3.5	< 320	320	**93,000**	12,000	**1.4**	4.2	**16,000**	4,300	**14,000**	5,100	**3,100**	1,400	**16,000**	12,000
n-Propylbenzene	3,900	100,000	**19,000**	3,900	**35,000**	3,900	< 4.1	4.1	**2,000**	270	< 3.5	3.5	< 320	320	**72,000**	6,100	**1.7**	4.2	**11,000**	3,900	**11,000**	3,900	**24,000**	3,900	**25,000**	3,900
o-Xylene	260	100,000	< 7000	7,000	**130,000**	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	**1.4**	5.0	**14,000**	6,100	< 4.2	4.2	**6,300**	4,300	**7,900**	5,100	**8,900**	5,800	**11,000**	5,100
p-Isopropyltoluene			**2,100**	7,000	**3,300**	4,900	**1.7**	4.1	< 270	270	< 3.5	3.5	< 320	320	**63,000**	30,000	**1.1**	4.2	**10,000**	4,300	**11,000**	5,100	**2,800**	1,400	**13,000**	13,000
sec-Butylbenzene	11,000	100,000	**5,600**	7,000	**4,400**	4,900	**1.6**	4.1	**7,400**	270	**0.68**	3.5	< 320	320	**71,000**	11,000	**1.4**	4.2	**11,000**	4,300	**11,000**	5,100	**2,800**	1,400	**17,000**	5,100
Styrene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Tert-butyl alcohol			< 140000	######	< 98000	98,000	< 82	82	< 5300	5,300	< 71	71	< 100	100	< 120000	######	< 83	83	< 85000	85,000	< 100000	######	< 29000	29,000	< 100000	######
tert-Butylbenzene	5,900	100,000	< 5900	5,900	< 4900	4,900	< 4.1	4.1	**660**	270	< 3.5	3.5	< 320	320	**6,500**	5,900	< 4.2	4.2	**1,000**	4,300	**1,100**	5,100	**160**	1,400	**2,700**	5,100
Tetrachloroethene	1,300	19,000	< 1400	1,400	< 1300	1,300	< 4.1	4.1	< 270	270	< 3.5	3.5	**2.6**	5.0	< 1300	1,300	< 4.2	4.2	< 1300	1,300	< 1300	1,300	< 1300	1,300	< 1300	1,300
Tetrahydrofuran (THF)			< 14000	14,000	**13,000**	9,800	< 8.2	8.2	**150**	530	< 7.1	7.1	< 10	10	< 12000	12,000	< 8.3	8.3	< 8500	8,500	< 10000	10,000	< 2900	2,900	< 10000	10,000
Toluene	700	100,000	< 700	700	**130,000**	700	< 4.1	4.1	< 270	270	< 3.5	3.5	**8.7**	5.0	**820**	700	< 4.2	4.2	< 700	700	**530**	700	**450**	700	< 700	700
trans-1,2-Dichloroethene	190	100,000	< 700	700	< 490	490	< 4.1	4.1	< 190	190	< 3.5	3.5	< 5.0	5.0	< 610	610	< 4.2	4.2	< 430	430	< 510	510	< 190	190	< 410	410
trans-1,3-Dichloropropene			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
trabs-1,4-dichloro-2-butene			< 14000	14,000	< 9800	9,800	< 8.2	8.2	< 530	530	< 7.1	7.1	< 630	630	< 12000	12,000	< 8.3	8.3	< 8500	8,500	< 10000	10,000	< 2900	2,900	< 10000	10,000
Trichloroethene	470	21,000	< 700	700	< 490	490	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 610	610	< 4.2	4.2	< 470	470	< 510	510	< 470	470	< 470	470
Trichlorofluoromethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Trichlorotrifluoroethane			< 7000	7,000	< 4900	4,900	< 4.1	4.1	< 270	270	< 3.5	3.5	< 5.0	5.0	< 6100	6,100	< 4.2	4.2	< 4300	4,300	< 5100	5,100	< 1400	1,400	< 5100	5,100
Vinyl Chloride	20	900	< 700	700	< 490	490	< 4.1	4.1	< 27	27	< 3.5	3.5	< 5.0	5.0	< 610	610	< 4.2	4.2	< 430	430	< 510	510	< 140	140	< 410	410
1,4-dioxane			< 56000	56,000	< 39000	39,000	< 61	61	< 2100	2,100	< 53	53	< 75	75	< 49000	49,000	< 62	62	< 34000	34,000	< 41000	41,000	< 12000	12,000	< 41000	41,000
Total BTEX Concentration			**0**		**822,000**		**37**		**0**		**0.87**		**38.7**		**128,530**		**3.94**		**36,300**		**40,030**		**36,350**		**17,400**	
Total VOCs Concentration			**86,500**		**1,149,380**		**234.51**		**21,630**		**12.72**		**57.6**		**1,167,030**		**32.59**		**200,700**		**210,930**		**342,030**		**310,000**	

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 3
Soil Analytical Results
Volatile Organic Compounds

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	SB6				SB7						SB8				SB9				SB10				SOIL DUPLICATE SB5	
			(0-2') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(0-2') 1/12/2017 µg/Kg		(11-13') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(12-14') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg	
			Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,1,1,2-Tetrachlorothane			< 17	17	< 1000	1,000	< 22	22	< 1100	1,100	< 1100	1,100	< 4900	4,900	< 19	19	< 1300	1,300	< 6100	6,100	< 17	17	< 20000	20,000	< 290	290
1,1,1-Trichloroethane	680	100,000	< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 680	680	< 4.8	4.8	< 330	330	< 680	680	< 4.3	4.3	< 680	680	< 290	290
1,1,2,2-Tetrachloroethane			< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,1,2-Trichloroethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,1-Dichloroethane	270	26,000	< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 270	270	< 780	780	< 4.8	4.8	< 270	270	< 1200	1,200	< 4.3	4.3	< 1000	1,000	< 270	270
1,1-Dichloroethene	330	100,000	< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 390	390	< 4.8	4.8	< 330	330	< 610	610	< 4.3	4.3	< 510	510	< 290	290
1,1-Dichloropropene			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,2,3-Trichlorobenzene			< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,2,3-Trichloropropane			< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,2,4-Trichlorobenzene			< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,2,4-Trimethylbenzene	3,600	52,000	220	260	< 250	250	82	360	< 270	270	< 280	280	130,000	3,600	72	4.8	930	330	1,400	3,600	1.1	4.3	100,000	3,600	100,000	2,900
1,2-Dibromo-3-chloropropane			< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,2-Dibromomethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,2-Dichlorobenzene	1,100	100,000	< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 1100	1,100	< 4.8	4.8	< 330	330	< 1100	1,100	< 4.3	4.3	< 1100	1,100	< 290	290
1,2-Dichloroethane	20	3,100	< 4.2	4.2	< 25	25	< 5.5	5.5	< 21	21	< 22	22	< 390	390	< 4.8	4.8	< 33	33	< 610	610	< 4.3	4.3	< 510	510	< 24	24
1,2-Dichloropropane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,3,5-Trimethylbenzene	8,400	52,000	170	260	< 250	250	37	360	< 270	270	< 280	280	54,000	8,400	30	4.8	610	330	< 6100	6,100	< 4.3	4.3	43,000	5,100	58,000	2,900
1,3-Dichlorobenzene	2,400	4,900	< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 2400	2,400	< 4.8	4.8	< 330	330	< 2400	2,400	< 4.3	4.3	< 2400	2,400	< 290	290
1,3-Dichloropropane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
1,4-Dichlorobenzene	1,800	13,000	< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 1800	1,800	< 4.8	4.8	< 330	330	< 1800	1,800	< 4.3	4.3	< 1800	1,800	< 290	290
2,2-Dichloropropane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
2-Chlorotoluene			< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
2-Hexanone (Methyl Butyl Ketone)			< 21	21	< 1300	1,300	< 27	27	< 1400	1,400	< 1400	1,400	< 24000	24,000	< 24	24	< 1600	1,600	< 30000	30,000	< 22	22	< 25000	25,000	< 1500	1,500
2-Isopropyltoluene			< 260	260	910	250	< 360	360	1,100	270	< 280	280	5,100	4,900	13	4.8	450	330	15,000	6,100	< 4.3	4.3	2,100	5,100	540	290
4-Chlorotoluene			< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
4-Methyl-2-Pentanone			< 21	21	< 1300	1,300	< 27	27	< 1400	1,400	< 1400	1,400	< 24000	24,000	< 24	24	< 1600	1,600	< 30000	30,000	< 22	22	< 25000	25,000	< 1500	1,500
Acetone	50	100,000	8.2	21	< 250	250	7	27	< 210	210	< 220	220	6,700	3,900	17	24	< 330	330	7,200	6,100	5.8	22	< 5100	5,100	900	240
Acrolein			< 17	17	< 1000	1,000	< 22	22	< 1100	1,100	< 1100	1,100	< 20000	20,000	< 19	19	< 1300	1,300	< 24000	24,000	< 17	17	< 20000	20,000	< 1200	1,200
Acrylonitrile			< 17	17	< 1000	1,000	< 22	22	< 1100	1,100	< 1100	1,100	< 9800	9,800	< 19	19	< 1300	1,300	< 12000	12,000	< 17	17	< 20000	20,000	< 590	590
Benzene	60	4,800	< 4.2	4.2	< 60	60	< 5.5	5.5	< 60	60	< 60	60	< 390	390	< 4.8	4.8	< 60	60	< 610	610	9.6	4.3	5,000	510	< 60	60
Bromobenzene			< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Bromochloromethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Bromodichloromethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Bromoform			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Bromomethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Carbon Disulfide			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Carbon tetrachloride	760	2,400	< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 780	780	< 4.8	4.8	< 330	330	< 1200	1,200	< 4.3	4.3	< 1000	1,000	< 290	290
Chlorobenzene	1,100	100,000	< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 1100	1,100	< 4.8	4.8	< 330	330	< 1100	1,100	< 4.3	4.3	< 1100	1,100	< 290	290
Chloroethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Chloroform	370	49,000	< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 390	390	< 4.8	4.8	< 330	330	< 610	610	< 4.3	4.3	< 510	510	< 290	290
Chloromethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	14	4.3	1,100	5,100	< 290	290
cis-1,2-Dichloroethene	250	100,000	< 4.2	4.2	< 250	250	< 5.5	5.5	< 250	250	< 250	250	< 390	390	< 4.8	4.8	< 250	250	< 610	610	< 4.3	4.3	< 510	510	< 250	250
cis-1,3-Dichloropropene			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Dibromochloromethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Dibromomethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Dichlorodifluoromethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Ethylbenzene	1,000	41,000	7.9	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	14,000	1,000	5.4	4.8	84	330	< 1000	1,000	0.46	4.3	28,000	1,000	2,100	290
Hexachlorobutadiene			< 260	260	< 250	250	< 360	360	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Isopropylbenzene			< 260	260	1,100	250	< 360	360	1,800	270	< 280	280	9,700	4,900	17	4.8	800	330	15,000	6,100	< 4.3	4.3	6,200	5,100	5,800	2,900
m&p-Xylenes	260	100,000	73	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	35,000	4,900	13	4.8	69	330	< 6100	6,100	1.3	4.3	150,000	5,100	16,000	2,900
Methyl Ethyl Ketone (2-Butanone)	120	100,000	< 25	25	< 250	250	< 33	33	< 210	210	< 220	220	< 3900	3,900	< 29	29	< 330	330	< 6100	6,100	< 26	26	< 5100	5,100	< 240	240
Methyl t-butyl ether (MTBE)	930	100,000	< 8.3	8.3	< 510	510	< 11	11	< 540	540	< 560	560	< 930	930	< 9.6	9.6	< 660	660	< 1200	1,200	< 8.6	8.6	< 1000	1,000	< 590	590
Methylene chloride	50	100,000	< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Naphthalene	12,000	100,000	< 260	260	< 250	250	< 360	360	82	270	< 280	280	15,000	4,900	11	4.8	330	330	< 6100	6,100	210	280	13,000	5,100	9,900	2,900
n-Butylbenzene	12,000	100,000	< 260	260	2,300	250	< 360	360	4,700	2,700	49	280	23,000	12,000	46	4.8	530	330	59,000	6,100	< 4.3	4.3	9,100	5,100	1,500	290
n-Propylbenzene	3,900	100,000	< 260	260	3,100	250	< 360	360	5,100	2,700	< 280	280	20,000	3,900	34	4.8	1,600	330	31,000	3,900	< 4.3	4.3	15,000	3,900	15,000	2,900
o-Xylene	260	100,000	30	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	5,700	4,900	2.2	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	50,000	5,100	4,700	2,900
p-Isopropyltoluene			< 260	260	34	250	< 360	360	< 270	270	< 280	280	18,000	12,000	12	4.8	39	330	< 6100	6,100	< 4.3	4.3	8,400	5,100	1,500	290
sec-Butylbenzene	11,000	100,000	< 260	260	2,700	250	< 360	360	4,900	2,700	78	280	20,000	11,000	44	4.8	1,100	330	56,000	6,100	< 4.3	4.3	6,600	5,100	1,500	290
Styrene			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Tert-butyl alcohol			< 83	83	< 5100	5,100	< 110	110	< 5400	5,400	< 5600	5,600	< 98000	98,000	< 96	96	< 6600	6,600	< 120000	######	< 86	86	< 100000	######	< 5900	5,900
tert-Butylbenzene	5,900	100,000	< 260	260	360	250	< 360	360	310	270	< 280	280	1,600	4,900	4.3	4.8	180	330	3,800	5,900	< 4.3	4.3	880	5,100	110	290
Tetrachloroethene	1,300	19,000	18	4.2	< 250	250	27	5.5	< 270	270	< 280	280	< 1300	1,300	< 4.8	4.8	< 330	330	< 1300	1,300	60	280	< 1300	1,300	180	290
Tetrahydrofuran (THF)			< 8.3	8.3	< 510	510	< 11	11	< 540	540	< 560	560	< 9800	9,800	< 9.6	9.6	< 660	660	< 12000	12,000	< 8.6	8.6	< 10000	10,000	< 590	590
Toluene	700	100,000	46	260	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 700	700	< 4.8	4.8	< 330	330	< 700	700	2.5	4.3	2,300	700	520	290
trans-1,2-Dichloroethene	190	100,000	< 4.2	4.2	< 190	190	< 5.5	5.5	< 190	190	< 190	190	< 390	390	< 4.8	4.8	41	190	< 610	610	< 4.3	4.3	< 510	510	< 190	190
trans-1,3-Dichloropropene			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
trabs-1,4-dichloro-2-butene			< 520	520	< 510	510	< 730	730	< 540	540	< 560	560	< 9800	9,800	< 9.6	9.6	< 660	660	< 12000	12,000	< 8.6	8.6	< 10000	10,000	< 590	590
Trichloroethene	470	21,000	< 4.2	4.2	< 250	250	0.91	5.5	< 270	270	< 280	280	< 470	470	< 4.8	4.8	< 330	330	< 610	610	< 4.3	4.3	< 510	510	< 290	290
Trichlorofluoromethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Trichlorotrifluoroethane			< 4.2	4.2	< 250	250	< 5.5	5.5	< 270	270	< 280	280	< 4900	4,900	< 4.8	4.8	< 330	330	< 6100	6,100	< 4.3	4.3	< 5100	5,100	< 290	290
Vinyl Chloride	20	900	< 4.2	4.2	< 25	25	< 5.5	5.5	< 21	21	< 22	22	< 390	390	< 4.8	4.8	< 33	33	< 610	610	< 4.3	4.3	< 510	510	< 24	24
1,4-dioxane			< 62	62	< 2000	2,000	< 82	82	< 2200	2,200	< 2200	2,200	< 39000	39,000	< 72	72	< 2600	2,600	< 49000	49,000	< 65	65	< 41000	41,000	< 2300	2,300
Total BTEX Concentration			156.9		0		0		0		0		54,700		20.6		153		0		13.86		235,300		23,320	
Total VOCs Concentration			573.1		10,504		153.91		17,992		127		357,800		320.9		6,763		188,400		304.76		440,680		218,250	

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL - Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

TABLE 4
Soil Analytical Results
Semi-Volatile Organic Compounds

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	SB1				SB2						SB3						SB4				SB5			
			(5-10') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(12-14') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-5') 1/13/2017 µg/Kg		(13-15') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(14-15') 1/13/2017 µg/Kg		(0-2') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg	
			Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,2,4,5-Tetrachlorobenzene			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
1,2,4-Trichlorobenzene			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
1,2-Dichlorobenzene			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
1,2-Diphenylhydrazine			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
1,3-Dichlorobenzene			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
1,4-Dichlorobenzene			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
2,4,5-Trichlorophenol			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
2,4,6-Trichlorophenol			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
2,4-Dichlorophenol			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
2,4-Dimethylphenol			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
2,4-Dinitrophenol			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
2,4-Dinitrotoluene			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
2,6-Dinitrotoluene			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
2-Chloronaphthalene			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
2-Chlorophenol			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
2-Methylnaphthalene			**12,000**	2,700	**4,800**	260	**19,000**	5,300	< 250	250	< 260	260	**260**	260	**890**	260	< 280	280	< 2500	2,500	**930**	250	**1,200**	250	< 13000	13,000
2-Methylphenol (o-cresol)	330	100,000	< 1800	1,800	< 260	260	< 3600	3,600	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 1700	1,700	< 250	250	< 250	250	< 8600	8,600
2-Nitroaniline			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
2-Nitrophenol			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
3&4-Methylphenol (m&p-cresol)	330	100,000	< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
3,3'-Dichlorobenzidine			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
3-Nitroaniline			< 3900	3,900	< 370	370	< 7600	7,600	< 360	360	< 370	370	< 370	370	< 380	380	< 400	400	< 3500	3,500	< 360	360	< 360	360	< 18000	18,000
4,6-Dinitro-2-methylphenol			< 2300	2,300	< 220	220	< 4600	4,600	< 220	220	< 220	220	< 220	220	< 230	230	< 240	240	< 2100	2,100	< 220	220	< 210	210	< 11000	11,000
4-Bromophenyl phenyl ether			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
4-Chloro-3-methylphenol			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
4-Chloroaniline			< 3100	3,100	< 290	290	< 6100	6,100	< 290	290	< 290	290	< 300	300	< 300	300	< 320	320	< 2800	2,800	< 290	290	< 290	290	< 15000	15,000
4-Chlorophenyl phenyl ether			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
4-Nitroaniline			< 3900	3,900	< 370	370	< 7600	7,600	< 360	360	< 370	370	< 370	370	< 380	380	< 400	400	< 3500	3,500	< 360	360	< 360	360	< 18000	18,000
4-Nitrophenol			< 3900	3,900	< 370	370	< 7600	7,600	< 360	360	< 370	370	< 370	370	< 380	380	< 400	400	< 3500	3,500	< 360	360	< 360	360	< 18000	18,000
Acenaphthene	20,000	100,000	< 2700	2,700	< 260	260	**14,000**	5,300	< 250	250	< 260	260	**830**	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Acenaphthylene	100,000	100,000	< 2700	2,700	< 260	260	**12,000**	5,300	**370**	250	**120**	260	**160**	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Acetophenone			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Aniline			< 3100	3,100	< 290	290	< 6100	6,100	< 290	290	< 290	290	< 300	300	< 300	300	< 320	320	< 2800	2,800	< 290	290	< 290	290	< 15000	15,000
Anthracene	100,000	100,000	< 2700	2,700	< 260	260	**33,000**	5,300	**150**	250	< 260	260	**1,500**	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Benz(a)anthracene	1,000	1,000	< 1300	1,300	< 260	260	**86,000**	2,600	< 250	250	< 260	260	**3,800**	260	< 260	260	< 280	280	< 1200	1,200	< 250	250	< 250	250	< 6200	6,200
Benzidine			< 3900	3,900	< 370	370	< 7600	7,600	< 360	360	< 370	370	< 370	370	< 380	380	< 400	400	< 3500	3,500	< 360	360	< 360	360	< 18000	18,000
Benzo(a)pyrene	1,000	1,000	< 1300	1,300	< 180	180	**65,000**	2,500	**4,200**	180	**350**	180	**2,900**	190	< 190	190	< 200	200	< 1200	1,200	< 180	180	< 180	180	< 6000	6,000
Benzo(b)fluoranthene	1,000	1,000	< 1300	1,300	< 260	260	**53,000**	2,600	**2,000**	250	< 260	260	**2,600**	260	< 260	260	< 280	280	< 1200	1,200	< 250	250	< 250	250	< 6300	6,300
Benzo(ghi)perylene	100,000	100,000	< 2700	2,700	< 260	260	**33,000**	5,300	**3,600**	250	**1,600**	260	**2,200**	260	**590**	260	**370**	280	< 2500	2,500	**220**	250	< 250	250	< 13000	13,000
Benzo(k)fluoranthene	800	3,900	< 1300	1,300	< 260	260	**54,000**	2,500	**1,700**	250	< 260	260	**2,400**	260	< 260	260	< 280	280	< 1200	1,200	< 250	250	< 250	250	< 6100	6,100
Benzoic acid			< 20000	20,000	< 1800	1,800	< 38000	38,000	< 1800	1,800	< 1800	1,800	< 1900	1,900	< 1900	1,900	< 2000	2,000	< 18000	18,000	< 1800	1,800	< 1800	1,800	< 92000	92,000
Benzyl butyl phthalate			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Bis(2-chloroethoxy)methane			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Bis(2-chloroethyl)ether			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
Bis(2-chloroisopropyl)ether			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Bis(2-ethylhexyl)phthalate			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	**220**	260	< 280	280	< 2500	2,500	**200**	250	**6,800**	1,300	< 13000	13,000
Carbazole			< 2000	2,000	< 180	180	**13,000**	3,800	< 180	180	< 180	180	**720**	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
Chrysene	1,000	3,900	< 1300	1,300	< 260	260	**99,000**	2,600	< 250	250	< 260	260	**4,200**	260	< 260	260	< 280	280	< 1200	1,200	< 250	250	< 250	250	< 6200	6,200
Dibenz(a,h)anthracene	330	330	< 1300	1,300	< 180	180	**8,100**	2,500	**640**	180	**270**	180	**390**	190	< 190	190	< 200	200	< 1100	1,100	< 180	180	< 180	180	< 5900	5,900
Dibenzofuran	7,000	59,000	< 2700	2,700	< 260	260	**17,000**	5,300	< 250	250	< 260	260	**420**	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 7000	7,000
Diethyl phthalate			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Dimethylphthalate			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Di-n-butylphthalate			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Di-n-octylphthalate			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Fluoranthene	100,000	100,000	< 2700	2,700	< 260	260	**190,000**	53,000	< 250	250	< 260	260	**6,500**	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Fluorene	30,000	100,000	< 2700	2,700	< 260	260	**38,000**	5,300	< 250	250	< 260	260	**690**	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Hexachlorobenzene			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
Hexachlorobutadiene			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Hexachlorocyclopentadiene			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Hexachloroethane			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
Indeno(1,2,3-cd)pyrene	500	500	< 1300	1,300	< 260	260	**42,000**	2,500	**4,400**	250	**1,800**	260	**2,500**	260	**520**	260	**270**	280	< 1200	1,200	**160**	250	< 250	250	< 6100	6,100
Isophorone			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
Naphthalene	12,000	100,000	< 2700	2,700	**7,100**	260	**23,000**	5,300	< 250	250	< 260	260	**390**	260	**4,000**	260	< 280	280	**3,000**	2,500	**4,300**	250	**2,200**	250	**5,700**	12,000
Nitrobenzene			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
N-Nitrosodimethylamine			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
N-Nitrosodi-n-propylamine			< 2000	2,000	< 180	180	< 3800	3,800	< 180	180	< 180	180	< 190	190	< 190	190	< 200	200	< 1800	1,800	< 180	180	< 180	180	< 9200	9,200
N-Nitrosodiphenylamine			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Pentachloronitrobenzene			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Pentachlorophenol	800	6,700	< 1500	1,500	< 220	220	< 2900	2,900	< 220	220	< 220	220	< 220	220	< 230	230	< 240	240	< 1300	1,300	< 220	220	< 210	210	< 6900	6,900
Phenanthrene	100,000	100,000	**2,400**	2,700	< 260	260	**260,000**	53,000	**110**	250	< 260	260	**6,800**	260	< 260	260	< 280	280	< 2500	2,500	**150**	250	**200**	250	< 13000	13,000
Phenol	330	100,000	< 1200	1,200	< 260	260	< 2400	2,400	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 1100	1,100	< 250	250	< 250	250	< 5900	5,900
Pyrene	100,000	100,000	< 2700	2,700	< 260	260	**210,000**	53,000	< 250	250	< 260	260	**6,600**	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000
Pyridine			< 2700	2,700	< 260	260	< 5300	5,300	< 250	250	< 260	260	< 260	260	< 260	260	< 280	280	< 2500	2,500	< 250	250	< 250	250	< 13000	13,000

Notes:
* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives
RL - Reporting Limit
Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value
Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

TABLE 4
Soil Analytical Results
Semi-Volatile Organic Compounds

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	SB6				SB7						SB8				SB9				SB10				SOIL DUPLICATE SB5	
			(0-2') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(0-2') 1/12/2017 µg/Kg		(11-13') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(12-14') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg	
			Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,2,4,5-Tetrachlorobenzene			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
1,2,4-Trichlorobenzene			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
1,2-Dichlorobenzene			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
1,2-Diphenylhydrazine			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
1,3-Dichlorobenzene			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
1,4-Dichlorobenzene			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
2,4,5-Trichlorophenol			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
2,4,6-Trichlorophenol			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
2,4-Dichlorophenol			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
2,4-Dimethylphenol			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	**94**	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
2,4-Dinitrophenol			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
2,4-Dinitrotoluene			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
2,6-Dinitrotoluene			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
2-Chloronaphthalene			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
2-Chlorophenol			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
2-Methylnaphthalene			< 260	260	**490**	**260**	< 1400	1,400	**350**	260	< 260	260	< 13000	13,000	**270**	260	**520**	270	< 280	280	< 2600	2,600	**2,700**	260	**1,200**	260
2-Methylphenol (o-cresol)	330	100,000	< 260	260	< 260	260	< 920	920	< 260	260	< 260	260	< 8500	8,500	< 260	260	< 270	270	< 280	280	< 1700	1,700	< 260	260	< 260	260
2-Nitroaniline			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
2-Nitrophenol			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
3&4-Methylphenol (m&p-cresol)	330	100,000	< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
3,3'-Dichlorobenzidine			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
3-Nitroaniline			< 370	370	< 380	380	< 2000	2,000	< 370	370	< 370	370	< 18000	18,000	< 370	370	< 380	380	< 390	390	< 3700	3,700	< 370	370	< 370	370
4,6-Dinitro-2-methylphenol			< 220	220	< 230	230	< 1200	1,200	< 220	220	< 220	220	< 11000	11,000	< 220	220	< 230	230	< 240	240	< 2200	2,200	< 220	220	< 220	220
4-Bromophenyl phenyl ether			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
4-Chloro-3-methylphenol			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
4-Chloroaniline			< 300	300	< 300	300	< 1600	1,600	< 300	300	< 300	300	< 14000	14,000	< 300	300	< 310	310	< 310	310	< 3000	3,000	< 290	290	< 290	290
4-Chlorophenyl phenyl ether			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
4-Nitroaniline			< 370	370	< 380	380	< 2000	2,000	< 370	370	< 370	370	< 18000	18,000	< 370	370	< 380	380	< 390	390	< 3700	3,700	< 370	370	< 370	370
4-Nitrophenol			< 370	370	< 380	380	< 2000	2,000	< 370	370	< 370	370	< 18000	18,000	< 370	370	< 380	380	< 390	390	< 3700	3,700	< 370	370	< 370	370
Acenaphthene	20,000	100,000	< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	**1,000**	270	< 280	280	**1,600**	2,600	< 260	260	< 260	260
Acenaphthylene	100,000	100,000	< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	**200**	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Acetophenone			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Aniline			< 300	300	< 300	300	< 1600	1,600	< 300	300	< 300	300	< 14000	14,000	< 300	300	< 310	310	< 310	310	< 3000	3,000	< 290	290	< 290	290
Anthracene	100,000	100,000	**130**	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	**1,900**	270	< 280	280	**5,700**	2,600	< 260	260	< 260	260
Benz(a)anthracene	1,000	1,000	**550**	260	< 260	260	< 1000	1,000	< 260	260	< 260	260	< 6100	6,100	< 260	260	**6,200**	270	< 280	280	**14,000**	1,200	< 260	260	< 260	260
Benzidine			< 370	370	< 380	380	< 2000	2,000	< 370	370	< 370	370	< 18000	18,000	< 370	370	< 380	380	< 390	390	< 3700	3,700	< 370	370	< 370	370
Benzo(a)pyrene	1,000	1,000	**720**	190	< 190	190	< 980	980	< 190	190	< 180	180	< 5900	5,900	< 190	190	**6,000**	190	< 200	200	**12,000**	1,200	**230**	180	< 180	180
Benzo(b)fluoranthene	1,000	1,000	**880**	260	< 260	260	< 1000	1,000	< 260	260	< 260	260	< 6200	6,200	< 260	260	**5,800**	270	< 280	280	**12,000**	1,300	**130**	260	< 260	260
Benzo(ghi)perylene	100,000	100,000	**1,300**	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	**9,000**	13,000	< 260	260	**4,100**	270	< 280	280	**7,300**	2,600	**780**	260	< 260	260
Benzo(k)fluoranthene	800	3,900	**530**	260	< 260	260	< 800	800	< 260	260	< 260	260	< 6000	6,000	< 260	260	**4,500**	270	< 280	280	**11,000**	1,200	< 260	260	< 260	260
Benzoic acid			< 1900	1,900	< 1900	1,900	< 9800	9,800	< 1900	1,900	< 1800	1,800	< 90000	90,000	< 1900	1,900	< 1900	1,900	< 2000	2,000	< 19000	19,000	< 1800	1,800	< 1800	1,800
Benzyl butyl phthalate			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Bis(2-chloroethoxy)methane			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Bis(2-chloroethyl)ether			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
Bis(2-chloroisopropyl)ether			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Bis(2-ethylhexyl)phthalate			**810**	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	**1,600**	270	< 280	280	< 2600	2,600	< 260	260	**6,700**	260
Carbazole			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	**930**	190	< 200	200	**2,000**	1,900	< 180	180	< 180	180
Chrysene	1,000	3,900	**800**	260	< 260	260	< 1000	1,000	**190**	260	< 260	260	< 6100	6,100	< 260	260	**6,500**	270	< 280	280	**14,000**	1,200	< 260	260	< 260	260
Dibenz(a,h)anthracene	330	330	**150**	190	< 190	190	< 630	630	< 190	190	< 180	180	**7,100**	5,800	< 190	190	**1,400**	190	< 200	200	**1,500**	1,200	< 180	180	< 180	180
Dibenzofuran	7,000	59,000	< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 7000	7,000	< 260	260	**650**	270	< 280	280	**1,700**	2,600	< 260	260	< 260	260
Diethyl phthalate			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Dimethylphthalate			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Di-n-butylphthalate			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Di-n-octylphthalate			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Fluoranthene	100,000	100,000	**990**	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	**9,200**	1,300	< 280	280	**32,000**	2,600	< 260	260	< 260	260
Fluorene	30,000	100,000	< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	**880**	270	< 280	280	**2,600**	2,600	< 260	260	< 260	260
Hexachlorobenzene			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
Hexachlorobutadiene			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Hexachlorocyclopentadiene			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Hexachloroethane			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
Indeno(1,2,3-cd)pyrene	500	500	**1,000**	260	< 260	260	< 650	650	< 260	260	< 260	260	**6,300**	6,000	< 260	260	**4,800**	270	< 280	280	**9,400**	1,200	**810**	260	< 260	260
Isophorone			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
Naphthalene	12,000	100,000	< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	**13,000**	12,000	**190**	260	**730**	270	< 280	280	< 2600	2,600	**5,600**	260	**2,100**	260
Nitrobenzene			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
N-Nitrosodimethylamine			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
N-Nitrosodi-n-propylamine			< 190	190	< 190	190	< 980	980	< 190	190	< 180	180	< 9000	9,000	< 190	190	< 190	190	< 200	200	< 1900	1,900	< 180	180	< 180	180
N-Nitrosodiphenylamine			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Pentachloronitrobenzene			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260
Pentachlorophenol	800	6,700	< 220	220	< 230	230	< 800	800	< 220	220	< 220	220	< 6800	6,800	< 220	220	< 230	230	< 240	240	< 1400	1,400	< 220	220	< 220	220
Phenanthrene	100,000	100,000	**680**	260	< 260	260	< 1400	1,400	**470**	260	< 260	260	< 13000	13,000	< 260	260	**7,800**	1,300	**290**	280	**28,000**	2,600	< 260	260	**170**	260
Phenol	330	100,000	< 260	260	< 260	260	< 630	630	< 260	260	< 260	260	< 5800	5,800	< 260	260	< 270	270	< 280	280	< 1200	1,200	< 260	260	< 260	260
Pyrene	100,000	100,000	**1,000**	260	< 260	260	< 1400	1,400	**390**	260	< 260	260	< 13000	13,000	< 260	260	**8,100**	1,300	< 280	280	**25,000**	2,600	< 260	260	< 260	260
Pyridine			< 260	260	< 260	260	< 1400	1,400	< 260	260	< 260	260	< 13000	13,000	< 260	260	< 270	270	< 280	280	< 2600	2,600	< 260	260	< 260	260

Notes:
* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives
RL - Reporting Limit
Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value
Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 5
Soil Analytical Results
Pesticides PCBs

	COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	SB1				SB2						SB3						SB4				SB5			
				(5-10') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(12-14') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-5') 1/13/2017 µg/Kg		(13-15') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(14-15') 1/13/2017 µg/Kg		(0-2') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg	
				Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Pesticides	4,4' -DDD	3.3	13,000	< 2.4	2.4	< 2.2	2.2	< 23	23	**5.2**	3.7	< 2.2	2.2	< 2.2	2.2	**6.8**	2.3	< 2.4	2.4	< 2.2	2.2	< 2.2	2.2	< 2.1	2.1	**63**	2.2
	4,4' -DDE	3.3	8,900	< 2.4	2.4	< 2.2	2.2	< 19	19	< 2.2	2.2	< 2.2	2.2	< 2.2	2.2	< 2.3	2.3	< 2.4	2.4	< 2.2	2.2	< 2.2	2.2	< 2.1	2.1	< 2.2	2.2
	4,4' -DDT	3.3	7,900	< 2.4	2.4	< 2.2	2.2	< 23	23	< 2.2	2.2	< 2.2	2.2	< 2.2	2.2	< 2.3	2.3	< 2.4	2.4	< 2.2	2.2	< 2.2	2.2	< 2.1	2.1	< 2.2	2.2
	a-BHC	20	480	< 7.9	7.9	< 7.5	7.5	< 19	19	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	a-Chlordane	94	4,200	< 4.0	4.0	< 3.7	3.7	< 38	38	< 3.7	3.7	< 3.6	3.6	< 3.7	3.7	< 3.8	3.8	< 4.0	4.0	< 3.6	3.6	< 3.6	3.6	< 3.5	3.5	< 3.6	3.6
	Aldrin	5	97	< 4.0	4.0	< 3.7	3.7	< 19	19	< 3.7	3.7	< 3.6	3.6	< 3.7	3.7	< 3.8	3.8	< 4.0	4.0	< 3.6	3.6	< 3.6	3.6	< 3.5	3.5	< 3.6	3.6
	b-BHC	36	360	< 7.9	7.9	< 7.5	7.5	< 19	19	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	Chlordane	94	4,200	< 40	40	< 37	37	< 380	380	< 37	37	< 36	36	< 37	37	< 38	38	< 40	40	< 36	36	< 36	36	< 35	35	< 36	36
	d-BHC	40	100,000	< 7.9	7.9	< 7.5	7.5	< 38	38	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	Dieldrin	5	200	< 4.0	4.0	< 3.7	3.7	< 60	60	< 3.7	3.7	< 3.6	3.6	< 3.7	3.7	< 3.8	3.8	< 4.0	4.0	< 3.6	3.6	< 3.6	3.6	< 3.5	3.5	< 3.6	3.6
	Endosulfan I	2,400	24,000	< 7.9	7.9	< 7.5	7.5	< 75	75	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	Endosulfan II	2,400	24,000	< 7.9	7.9	< 7.5	7.5	< 75	75	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	Endosulfan sulfate	2,400	24,000	< 7.9	7.9	< 7.5	7.5	< 75	75	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	Endrin	14	11,000	< 7.9	7.9	< 7.5	7.5	< 38	38	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	Endrin aldehyde			< 7.9	7.9	< 7.5	7.5	< 75	75	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	Endrin ketone			< 7.9	7.9	< 7.5	7.5	< 75	75	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	g-BHC			< 1.6	1.6	< 1.5	1.5	< 30	30	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.6	1.6	< 1.4	1.4	< 1.4	1.4	< 1.4	1.4	< 1.5	1.5
	g-Chlordane			< 4.0	4.0	< 3.7	3.7	< 70	70	< 3.7	3.7	< 3.6	3.6	< 3.7	3.7	< 3.8	3.8	< 4.0	4.0	< 3.6	3.6	< 3.6	3.6	< 3.5	3.5	< 3.6	3.6
	Heptachlor	42	2,100	< 7.9	7.9	< 7.5	7.5	< 38	38	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	Heptachlor epoxide			< 7.9	7.9	< 7.5	7.5	< 75	75	< 7.3	7.3	< 7.3	7.3	< 7.4	7.4	< 7.5	7.5	< 7.9	7.9	< 7.2	7.2	< 7.2	7.2	< 7.0	7.0	< 7.3	7.3
	Methoxychlor			< 40	40	< 37	37	< 380	380	< 37	37	< 36	36	< 37	37	< 38	38	< 40	40	< 36	36	< 36	36	< 35	35	< 36	36
	Toxaphene			< 160	160	< 150	150	< 1500	1,500	< 150	150	< 150	150	< 150	150	< 150	150	< 160	160	< 140	140	< 140	140	< 140	140	< 150	150
PCBs	PCB-1016	100	1,000	< 79	79	< 75	75	< 75	75	< 73	73	< 73	73	< 74	74	< 75	75	< 79	79	< 72	72	< 72	72	< 70	70	< 73	73
	PCB-1221	100	1,000	< 79	79	< 75	75	< 75	75	< 73	73	< 73	73	< 74	74	< 75	75	< 79	79	< 72	72	< 72	72	< 70	70	< 73	73
	PCB-1232	100	1,000	< 79	79	< 75	75	< 75	75	< 73	73	< 73	73	< 74	74	< 75	75	< 79	79	< 72	72	< 72	72	< 70	70	< 73	73
	PCB-1242	100	1,000	< 79	79	< 75	75	< 75	75	< 73	73	< 73	73	< 74	74	< 75	75	< 79	79	< 72	72	< 72	72	< 70	70	< 73	73
	PCB-1248	100	1,000	< 79	79	< 75	75	< 75	75	< 73	73	< 73	73	< 74	74	< 75	75	< 79	79	< 72	72	< 72	72	< 70	70	< 73	73
	PCB-1254	100	1,000	< 79	79	< 75	75	< 75	75	< 73	73	< 73	73	< 74	74	< 75	75	< 79	79	< 72	72	< 72	72	< 70	70	< 73	73
	PCB-1260	100	1,000	< 79	79	< 75	75	< 75	75	< 73	73	< 73	73	< 74	74	< 75	75	< 79	79	< 72	72	< 72	72	< 70	70	< 73	73
	PCB-1262	100	1,000	< 79	79	< 75	75	< 75	75	< 73	73	< 73	73	< 74	74	< 75	75	< 79	79	< 72	72	< 72	72	< 70	70	< 73	73
	PCB-1268	100	1,000	< 79	79	< 75	75	< 75	75	< 73	73	< 73	73	< 74	74	< 75	75	< 79	79	< 72	72	< 72	72	< 70	70	< 73	73

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL- Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 5
Soil Analytical Results
Pesticides PCBs

	COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	SB6				SB7						SB8				SB9				SB10				SOIL DUPLICATE SB5	
				(0-2') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(0-2') 1/12/2017 µg/Kg		(11-13') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(12-14') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg	
				Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Pesticides	4,4' -DDD	3.3	13,000	< 2.2	2.2	**12**	2.2	< 2.3	2.3	< 2.2	2.2	< 2.2	2.2	< 2.2	2.2	< 2.2	2.2	< 2.3	2.3	< 2.3	2.3	< 11	11	< 3.0	3.0	< 2.1	2.1
	4,4' -DDE	3.3	8,900	< 2.2	2.2	< 2.2	2.2	< 2.3	2.3	< 2.2	2.2	< 2.2	2.2	< 2.2	2.2	< 2.2	2.2	< 2.3	2.3	< 2.3	2.3	< 11	11	< 2.3	2.3	< 2.1	2.1
	4,4' -DDT	3.3	7,900	**4.4**	2.2	< 2.2	2.2	< 2.3	2.3	< 2.2	2.2	< 2.2	2.2	< 2.2	2.2	< 2.2	2.2	< 2.3	2.3	< 2.3	2.3	< 11	11	< 2.3	2.3	< 2.1	2.1
	a-BHC	20	480	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 9.4	9.4	< 7.5	7.5	< 7.2	7.2
	a-Chlordane	94	4,200	< 3.6	3.6	< 3.7	3.7	< 3.9	3.9	< 3.7	3.7	< 3.7	3.7	< 3.6	3.6	< 3.7	3.7	< 3.8	3.8	< 3.9	3.9	< 19	19	< 3.8	3.8	< 3.6	3.6
	Aldrin	5	97	< 3.6	3.6	< 3.7	3.7	< 3.9	3.9	< 3.7	3.7	< 3.7	3.7	< 3.6	3.6	< 3.7	3.7	< 3.8	3.8	< 3.9	3.9	< 9.4	9.4	< 3.8	3.8	< 3.6	3.6
	b-BHC	36	360	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 9.4	9.4	< 7.5	7.5	< 7.2	7.2
	Chlordane	94	4,200	< 36	36	< 37	37	< 39	39	< 37	37	< 37	37	< 36	36	< 37	37	< 38	38	< 39	39	< 190	190	< 38	38	< 36	36
	d-BHC	40	100,000	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 38	38	< 7.5	7.5	< 7.2	7.2
	Dieldrin	5	200	**5.9**	3.6	< 3.7	3.7	< 3.9	3.9	< 3.7	3.7	< 3.7	3.7	< 3.6	3.6	< 3.7	3.7	< 3.8	3.8	< 3.9	3.9	< 9.4	9.4	< 3.8	3.8	< 3.6	3.6
	Endosulfan I	2,400	24,000	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 38	38	< 7.5	7.5	< 7.2	7.2
	Endosulfan II	2,400	24,000	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 38	38	< 7.5	7.5	< 7.2	7.2
	Endosulfan sulfate	2,400	24,000	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 38	38	< 7.5	7.5	< 7.2	7.2
	Endrin	14	11,000	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 19	19	< 7.5	7.5	< 7.2	7.2
	Endrin aldehyde			< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 38	38	< 7.5	7.5	< 7.2	7.2
	Endrin ketone			< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 38	38	< 7.5	7.5	< 7.2	7.2
	g-BHC			< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 1.5	1.5	< 19	19	< 1.5	1.5	< 1.4	1.4
	g-Chlordane			< 3.6	3.6	< 3.7	3.7	< 3.9	3.9	< 3.7	3.7	< 3.7	3.7	< 3.6	3.6	< 3.7	3.7	< 3.8	3.8	< 3.9	3.9	< 19	19	< 3.8	3.8	< 3.6	3.6
	Heptachlor	42	2,100	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 38	38	< 7.5	7.5	< 7.2	7.2
	Heptachlor epoxide			< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.5	7.5	< 7.4	7.4	< 7.3	7.3	< 7.4	7.4	< 7.7	7.7	< 7.7	7.7	< 38	38	< 7.5	7.5	< 7.2	7.2
	Methoxychlor			< 36	36	< 37	37	< 39	39	< 37	37	< 37	37	< 36	36	< 37	37	< 38	38	< 39	39	< 190	190	< 38	38	< 36	36
	Toxaphene			< 150	150	< 150	150	< 150	150	< 150	150	< 150	150	< 150	150	< 150	150	< 150	150	< 150	150	< 750	750	< 150	150	< 140	140
PCBs	PCB-1016	100	1,000	< 73	73	< 74	74	< 77	77	< 75	75	< 74	74	< 73	73	< 74	74	< 77	77	< 77	77	< 75	75	< 75	75	< 72	72
	PCB-1221	100	1,000	< 73	73	< 74	74	< 77	77	< 75	75	< 74	74	< 73	73	< 74	74	< 77	77	< 77	77	< 75	75	< 75	75	< 72	72
	PCB-1232	100	1,000	< 73	73	< 74	74	< 77	77	< 75	75	< 74	74	< 73	73	< 74	74	< 77	77	< 77	77	< 75	75	< 75	75	< 72	72
	PCB-1242	100	1,000	< 73	73	< 74	74	< 77	77	< 75	75	< 74	74	< 73	73	< 74	74	< 77	77	< 77	77	< 75	75	< 75	75	< 72	72
	PCB-1248	100	1,000	< 73	73	< 74	74	< 77	77	< 75	75	< 74	74	< 73	73	< 74	74	< 77	77	< 77	77	< 75	75	< 75	75	< 72	72
	PCB-1254	100	1,000	< 73	73	< 74	74	< 77	77	< 75	75	< 74	74	< 73	73	< 74	74	< 77	77	< 77	77	< 75	75	< 75	75	< 72	72
	PCB-1260	100	1,000	< 73	73	< 74	74	< 77	77	< 75	75	< 74	74	< 73	73	< 74	74	< 77	77	< 77	77	< 75	75	< 75	75	< 72	72
	PCB-1262	100	1,000	< 73	73	< 74	74	< 77	77	< 75	75	< 74	74	< 73	73	< 74	74	< 77	77	< 77	77	< 75	75	< 75	75	< 72	72
	PCB-1268	100	1,000	< 73	73	< 74	74	< 77	77	< 75	75	< 74	74	< 73	73	< 74	74	< 77	77	< 77	77	< 75	75	< 75	75	< 72	72

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL- Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 6
Soil Analytical Results
Metals

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	SB1				SB2						SB3						SB4				SB5			
			(5-10') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(12-14') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-5') 1/13/2017 µg/Kg		(13-15') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(14-15') 1/13/2017 µg/Kg		(0-2') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg	
			Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum			10,600	35	7,360	40	7,400	39	7,370	36	7,630	34	10,000	38	11,400	40	5,600	40	10,200	34	8,400	38	7,800	34	6,370	33
Antimony			< 1.8	1.8	< 2.0	2.0	< 1.9	1.9	< 1.8	1.8	< 1.7	1.7	< 1.9	1.9	< 2.0	2.0	< 2.0	2.0	< 1.7	1.7	< 1.9	1.9	< 1.7	1.7	< 1.7	1.7
Arsenic	13	16	7.62	0.71	2.03	0.79	13.9	0.78	3.89	0.71	2.26	0.68	4.82	0.77	2.91	0.81	2.41	0.79	2.84	0.68	1.56	0.76	5.89	0.68	2.16	0.67
Barium	350	350	78.2	0.7	41.3	0.8	386	0.8	27.1	0.7	64.6	0.7	70	0.8	71.2	0.8	35.6	0.8	45.5	0.7	43.1	0.8	38	0.7	38.4	0.7
Beryllium	7.2	14	0.4	0.28	0.38	0.32	0.37	0.31	0.35	0.28	0.49	0.27	0.5	0.31	0.49	0.32	0.36	0.32	0.59	0.27	0.43	0.31	0.35	0.27	0.46	0.27
Cadmium	2.5	2.5	0.35	0.35	< 0.40	0.40	0.99	0.39	< 0.36	0.36	< 0.34	0.34	< 0.38	0.38	< 0.40	0.40	< 0.40	0.40	< 0.34	0.34	< 0.38	0.38	< 0.34	0.34	< 0.33	0.33
Calcium			24,600	35	926	4.0	21,200	39	535	3.6	1,540	3.4	12,500	38	1,200	4.0	890	4.0	973	3.4	584	3.8	3,060	3.4	1,020	3.3
Chromium	30	180	17	0.35	14.8	0.40	24.9	0.39	12.8	0.36	19.5	0.34	19.1	0.38	28.4	0.40	16	0.40	27.3	0.34	16.4	0.38	13	0.34	16.6	0.33
Cobalt			6.6	0.35	7.16	0.40	6.35	0.39	5.41	0.36	8.81	0.34	8.9	0.38	11.8	0.40	8.08	0.40	9.64	0.34	7.28	0.38	5.53	0.34	6.37	0.33
Copper	50	270	38.6	0.35	15	0.40	148	3.9	9.13	0.36	21.7	0.34	21.8	0.38	18.5	0.40	14.8	0.40	18	0.34	16.4	0.38	15.9	0.34	17.8	0.33
Iron			19,800	35	21,100	40	16,700	39	14,700	36	22,000	34	22,200	38	24,400	40	16,500	40	25,100	34	19,400	38	14,500	34	22,400	33
Lead	63	400	132	0.7	18	0.8	1,120	7.8	3.6	0.7	6	0.7	24	0.8	5.7	0.8	4.4	0.8	5.4	0.7	4.4	0.8	43	0.7	4.6	0.7
Magnesium			3,130	3.5	1,800	4.0	2,390	3.9	1,850	3.6	2,440	3.4	3,020	3.8	3,640	4.0	1,800	4.0	2,970	3.4	1,930	3.8	1,760	3.4	1,740	3.3
Manganese	1,600	2,000	304	3.5	455	4.0	275	3.9	170	3.6	396	3.4	338	3.8	550	4.0	348	4.0	568	3.4	424	3.8	181	3.4	332	3.3
Mercury	0.18	0.81	0.95	0.03	< 0.03	0.03	5.73	0.15	< 0.03	0.03	< 0.03	0.03	0.9	0.03	< 0.03	0.03	< 0.03	0.03	0.13	0.03	< 0.03	0.03	0.15	0.03	< 0.03	0.03
Nickel	30	140	12.1	0.35	13.1	0.40	17.5	0.39	10.2	0.36	14.3	0.34	19.6	0.38	17	0.40	12.7	0.40	15.4	0.34	12.3	0.38	11.1	0.34	12	0.33
Potassium			1,200	7	1,190	8	1,130	8	971	7	1,870	7	1,770	8	2,530	8	1,230	8	2,180	7	1,860	8	1,110	7	1,200	7
Selenium	3.9	36	< 1.4	1.4	< 1.6	1.6	< 1.6	1.6	< 1.4	1.4	< 1.4	1.4	< 1.5	1.5	< 1.6	1.6	< 1.6	1.6	< 1.4	1.4	< 1.5	1.5	< 1.4	1.4	< 1.3	1.3
Silver	2	36	< 0.35	0.35	< 0.40	0.40	< 0.39	0.39	< 0.36	0.36	< 0.34	0.34	< 0.38	0.38	< 0.40	0.40	< 0.40	0.40	< 0.34	0.34	< 0.38	0.38	< 0.34	0.34	< 0.33	0.33
Sodium			354	7	200	8	758	8	121	7	173	7	819	8	623	8	116	8	4,180	68	4,400	8	278	7	160	7
Thallium			< 1.4	1.4	< 1.6	1.6	< 1.6	1.6	< 1.4	1.4	< 1.4	1.4	< 1.5	1.5	< 1.6	1.6	< 1.6	1.6	< 1.4	1.4	< 1.5	1.5	< 1.4	1.4	< 1.3	1.3
Vanadium			22	0.35	32.3	0.40	21.8	0.39	18.1	0.36	33.5	0.34	28.3	0.38	35.6	0.40	27.7	0.40	39.4	0.34	24.5	0.38	20.6	0.34	35.4	0.33
Zinc	109	2,200	112	0.7	30.4	0.8	485	7.8	21.8	0.7	34.5	0.7	41.3	0.8	46.3	0.8	27	0.8	41.9	0.7	30.6	0.8	32.4	0.7	32	0.7

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL- Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 6
Soil Analytical Results
Metals

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives*	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	SB6				SB7						SB8				SB9				SB10				SOIL DUPLICATE SB5	
			(0-2') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(0-2') 1/12/2017 µg/Kg		(11-13') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(12-14') 1/12/2017 µg/Kg		(20-22') 1/12/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg		(20-22') 1/13/2017 µg/Kg		(0-2') 1/13/2017 µg/Kg	
			Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
Aluminum			8,050	37	9,200	35	6,770	39	8,870	36	6,690	36	9,230	36	8,360	39	6,770	41	3,770	35	11,400	36	7,410	34	8,870	33
Antimony			< 1.9	1.9	< 1.8	1.8	< 1.9	1.9	< 1.8	1.8	< 1.8	1.8	< 1.8	1.8	< 2.0	2.0	8.6	2.1	< 1.8	1.8	< 1.8	1.8	< 1.7	1.7	< 1.6	1.6
Arsenic	13	16	13.4	0.75	2.22	0.71	17.3	0.77	1.74	0.71	2.06	0.72	2.76	0.72	2.42	0.78	9.63	0.83	0.99	0.71	4.73	0.71	2.07	0.68	7.77	0.65
Barium	350	350	372	0.7	53.8	0.7	323	0.8	56.5	0.7	45.4	0.7	54.6	0.7	47.7	0.8	1,040	0.8	24.8	0.7	94.9	0.7	54.1	0.7	53	0.7
Beryllium	7.2	14	0.47	0.30	0.62	0.28	0.4	0.31	0.57	0.28	0.47	0.29	0.64	0.29	0.5	0.31	0.35	0.33	0.22	0.28	0.62	0.28	0.48	0.27	0.32	0.26
Cadmium	2.5	2.5	0.53	0.37	< 0.35	0.35	1.56	0.39	< 0.36	0.36	0.38	0.36	0.41	0.36	< 0.39	0.39	1.43	0.41	< 0.35	0.35	< 0.36	0.36	< 0.34	0.34	< 0.33	0.33
Calcium			5,920	3.7	750	3.5	41,200	39	885	3.6	1,500	3.6	1,030	3.6	2,060	3.9	19,100	41	478	3.5	8,750	3.6	334	3.4	2,220	3.3
Chromium	30	180	19.8	0.37	22.2	0.35	18.8	0.39	20	0.36	17.6	0.36	23.2	0.36	22.7	0.39	26.9	0.41	9.64	0.35	16.2	0.36	21.3	0.34	13.4	0.33
Cobalt			8.3	0.37	9.94	0.35	10.5	0.39	9.39	0.36	7.68	0.36	10.3	0.36	8.64	0.39	6.94	0.41	5.86	0.35	5.81	0.36	8.41	0.34	5.15	0.33
Copper	50	270	61.5	0.37	23.6	0.35	101	0.39	26.3	0.36	19.3	0.36	24.1	0.36	28.1	0.39	89.5	0.41	10	0.35	18.8	0.36	16.9	0.34	15	0.33
Iron			24,600	37	23,500	35	18,300	39	20,900	36	22,000	36	24,700	36	19,700	39	25,100	41	7,830	35	14,800	36	20,200	34	16,200	33
Lead	63	400	1,380	7.5	6	0.7	991	7.7	8.9	0.7	3.8	0.7	5.4	0.7	4.8	0.8	2,190	83	2.6	0.7	130	0.7	12.7	0.7	21	0.7
Magnesium			1,940	3.7	1,980	3.5	4,580	3.9	1,940	3.6	1,930	3.6	2,680	3.6	3,410	3.9	2,980	4.1	1,380	3.5	2,140	3.6	2,020	3.4	1,830	3.3
Manganese	1,600	2,000	394	3.7	382	3.5	365	3.9	438	3.6	644	3.6	661	3.6	358	3.9	320	4.1	161	3.5	165	3.6	548	3.4	168	3.3
Mercury	0.18	0.81	8.61	1.4	< 0.03	0.03	14.5	1.5	0.04	0.03	< 0.03	0.03	0.02	0.03	< 0.03	0.03	3.09	0.15	< 0.03	0.03	0.48	0.03	< 0.03	0.03	0.18	0.03
Nickel	30	140	15.9	0.37	14.9	0.35	16.6	0.39	14.2	0.36	14.5	0.36	14.8	0.36	17.7	0.39	18.5	0.41	9.69	0.35	11.9	0.36	13.3	0.34	9.86	0.33
Potassium			1,100	7	2,050	7	1,000	8	1,440	7	1,320	7	1,650	7	1,570	8	1,210	8	653	7	1,130	7	1,420	7	1,180	7
Selenium	3.9	36	< 1.5	1.5	< 1.4	1.4	< 1.5	1.5	< 1.4	1.4	< 1.4	1.4	< 1.4	1.4	< 1.6	1.6	< 1.7	1.7	< 1.4	1.4	< 1.4	1.4	< 1.4	1.4	< 1.3	1.3
Silver	2	36	< 0.37	0.37	< 0.35	0.35	< 0.39	0.39	< 0.36	0.36	< 0.36	0.36	< 0.36	0.36	< 0.39	0.39	< 0.41	0.41	< 0.35	0.35	< 0.36	0.36	< 0.34	0.34	< 0.33	0.33
Sodium			1,040	7	213	7	841	8	194	7	213	7	147	7	414	8	744	8	97	7	3,220	7	385	7	292	7
Thallium			< 1.5	1.5	< 1.4	1.4	< 1.5	1.5	< 1.4	1.4	< 1.4	1.4	< 1.4	1.4	< 1.6	1.6	< 1.7	1.7	< 1.4	1.4	< 1.4	1.4	< 1.4	1.4	< 1.3	1.3
Vanadium			24	0.37	40.5	0.35	74.9	0.39	40.1	0.36	29.5	0.36	40.6	0.36	35.6	0.39	27	0.41	13.8	0.35	20.5	0.36	35.2	0.34	21.4	0.33
Zinc	109	2,200	181	7.5	36.7	0.7	919	7.7	44	0.7	38.4	0.7	44.9	0.7	31.5	0.8	940	8.3	15.5	0.7	98.4	0.7	40.7	0.7	29.2	0.7

Notes:

* - 6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives

RL- Reporting Limit

Bold/highlighted- Indicated exceedance of the NYSDEC UUSCO Guidance Value

Bold/highlighted- Indicated exceedance of the NYSDEC RRSCO Guidance Value

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 7
Parameters Detected Above Track 1 Soil Cleanup Objectives

COMPOUND	Range in Exceedances	Frequency of Detection	SB1		SB2			SB3		SB4		SB5		SB6		SB7		SB8	SB9		SB10		SOIL DUPLICATE SB5
			(5-10')	(20-22')	(0-2')	(12-14')	(20-22')	(0-5')	(13-15')	(0-2')	(14-15')	(0-2')	(20-22')	(0-2')	(20-22')	(0-2')	(11-13')	(12-14')	(0-2')	(20-22')	(0-2')	(20-22')	(0-2')
Sample Results in µg/kg																							
1,2,4-Trimethylbenzene	**25,000-470,000**	**10**	25,000	160,000					470,000	67,000	73,000	160,000	120,000					130,000				100,000	100,000
1,3,5-Trimethylbenzene	**33,000-160,000**	**9**		60,000					160,000	33,000	34,000	86,000	73,000					54,000				43,000	58,000
Acetone	**320-11,000**	**5**	11,000			320												6,700		7,200			900
Benzene	**710-52,000**	**3**		52,000					710													5,000	
Ethylbenzene	**2,100-45,000**	**9**		120,000					45,000	7,000	7,600	3,000	2,900					14,000				28,000	2,100
m&p-Xylenes	**3,500-390,000**	**9**		390,000					68,000	23,000	24,000	24,000	3,500					35,000				150,000	16,000
Naphthalene	**13,000-48,000**	**5**		25,000					48,000			17,000						15,000				13,000	
n-Butylbenzene	**14,000-93,000**	**6**							93,000	16,000	14,000		16,000					23,000		59,000			
n-Propylbenzene	**11,000-72,000**	**12**	19,000	35,000					72,000	11,000	11,000	24,000	25,000				5,100	20,000		31,000		15,000	15,000
o-Xylene	**4,700-130,000**	**10**		130,000					14,000	6,300	7,900	8,900	11,000					5,700				50,000	4,700
p-Isopropyltoluene	**63,000**	**1**							63,000														
sec-Butylbenzene	**17,000-71,000**	**4**							71,000				17,000					20,000		56,000			
tert-Butylbenzene	**6,500**	**1**							6,500														
Toluene	**820-130,000**	**3**		130,000					820													2,300	
Benz(a)anthracene	**3,800-86,000**	**4**			86,000			3,800											6,200		14,000		
Benzo(a)pyrene	**2,900-65,000**	**5**			65,000	4,200		2,900											6,000		12,000		
Benzo(b)fluoranthene	**2,000-53,000**	**5**			53,000	2,000		2,600											5,800		12,000		
Benzo(k)fluoranthene	**1,700-54,000**	**5**			54,000	1,700		2,400											4,500		11,000		
Chrysene	**4,200-99,000**	**4**			99,000			4,200											6,500		14,000		
Dibenz(a,h)anthracene	**390-8,100**	**6**			8,100	640		390										7,100	1,400		1,500		
Dibenzofuran	**17,000**	**1**			17,000																		
Fluoranthene	**190,000**	**1**			190,000																		
Fluorene	**38,000**	**1**			38,000																		
Indeno(1,2,3-cd)pyrene	**520-42,000**	**10**			42,000	4,400	1,800	2,500	520					1,000				6,300	4,800		9,400	810	
Naphthalene	**23,000**	**1**			23,000													13,000					
Phenanthrene	**260,000**	**1**			260,000																		
Pyrene	**210,000**	**1**			210,000																		
4,4' -DDD	**5.2-12**	**4**				5.2			6.8				63		12								
4,4' -DDT	**4**	**1**												4.4									
Dieldrin	**5.9**	**1**												5.9									
Sample Results in mg/kg																							
Arsenic	**13.4-17.3**	**3**			13.9									13.4		17.3							
Barium	**372-1,040**	**3**			386									372					1,040				
Copper	**89.5-148**	**4**			148									61.5		101			89.5				
Lead	**130-2,190**	**6**	132		1,120									1,380		991			2,190		130		
Mercury	**0.48-14.5**	**7**	0.95		5.73			0.9						8.61		14.5			3.09		0.48		
Zinc	**112-940**	**5**	112		485									181		919			940				

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

Table 8
Ground Water Analytical Results
Volatile Organic Compounds

Compound	NYSDEC Groundwater Quality Standards	GW1 1/17/2017 µg/L		GW3 1/17/2017 µg/L		GW4 1/17/2017 µg/L		GW5 1/17/2017 µg/L		DUPLICATE GW1 1/17/2017 µg/L	
	µg/L	Results	RL	Results	RL	Results	RL	Results	RL	Results	RL
1,1,1,2-Tetrachlorothane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
1,1,1-Trichloroethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
1,1,2,2-Tetrachloroethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
1,1,2-Trichloroethane	1	< 2.5	2.5	< 2.5	2.5	< 5.0	5.0	< 25	25	< 2.5	2.5
1,1-Dichloroethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
1,1-Dichloroethene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
1,1-Dichloropropene		< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
1,2,3-Trichlorobenzene		< 10	10	< 10	10	< 20	20	< 100	100	< 10	10
1,2,3-Trichloropropane	0.04	< 2.5	2.5	< 2.5	2.5	< 5.0	5.0	< 25	25	< 2.5	2.5
1,2,4-Trichlorobenzene		< 10	10	< 10	10	< 20	20	< 100	100	< 10	10
1,2,4-Trimethylbenzene	5	**440**	10	**1,100**	10	**1,700**	100	**7,900**	25	**460**	100
1,2-Dibromo-3-chloropropane	0.04	< 5.0	5.0	< 5.0	5.0	< 10	10	< 50	50	< 5.0	5.0
1,2-Dibromoethane		< 2.5	2.5	< 2.5	2.5	< 5.0	5.0	< 25	25	< 2.5	2.5
1,2-Dichlorobenzene	5	< 4.7	4.7	< 4.7	4.7	< 5.0	5.0	< 25	25	< 4.7	4.7
1,2-Dichloroethane	0.6	< 5.0	5.0	< 5.0	5.0	< 10	10	< 50	50	< 5.0	5.0
1,2-Dichloropropane	0.94	< 2.5	2.5	< 2.5	2.5	< 5.0	5.0	< 25	25	< 2.5	2.5
1,3,5-Trimethylbenzene	5	**97**	5.0	**280**	5.0	**470**	5.0	**2,600**	25	**110**	5.0
1,3-Dichlorobenzene		< 3.0	3.0	< 3.0	3.0	< 5.0	5.0	< 25	25	< 3.0	3.0
1,3-Dichloropropane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
1,4-Dichlorobenzene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
2,2-Dichloropropane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
2-Chlorotoluene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
2-Hexanone (Methyl Butyl Ketone)		< 25	25	< 25	25	< 50	50	< 250	250	< 25	25
2-Isopropyltoluene	5	**6.9**	5.0	**32**	5.0	**32**	5.0	**690**	25	**9.1**	5.0
4-Chlorotoluene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
4-Methyl-2-Pentanone		< 25	25	< 25	25	< 50	50	< 250	250	< 25	25
Acetone	50	< 50	50	**570**	100	< 50	50	< 250	250	< 50	50
Acrolein		< 25	25	< 25	25	< 50	50	< 250	250	< 25	25
Acrylonitrile	5	< 25	25	< 25	25	< 50	50	< 250	250	< 25	25
Benzene	1	**3.7**	2.5	**56**	2.5	**53**	5.0	< 25	25	**3.8**	2.5
Bromobenzene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Bromochloromethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Bromodichloromethane		< 10	10	< 10	10	< 20	20	< 50	50	< 10	10
Bromoform		< 50	50	< 50	50	< 50	50	< 50	50	< 50	50
Bromomethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	**120**	25	< 5.0	5.0
Carbon Disulfide	60	< 10	10	< 10	10	< 20	20	< 50	50	< 10	10
Carbon tetrachloride	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Chlorobenzene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Chloroethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Chloroform	7	< 7.0	7.0	< 7.0	7.0	< 7.0	7.0	< 25	25	< 7.0	7.0
Chloromethane	60	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
cis-1,2-Dichloroethene	5	< 5.0	5.0	**2.5**	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
cis-1,3-Dichloropropene		< 2.5	2.5	< 2.5	2.5	< 5.0	5.0	< 25	25	< 2.5	2.5
Dibromochloromethane		< 10	10	< 10	10	< 20	20	< 50	50	< 10	10
Dibromomethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Dichlorodifluoromethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Ethylbenzene	5	**88**	5.0	**130**	5.0	**30**	5.0	**890**	25	**97**	5.0
Hexachlorobutadiene	0.5	< 2.0	2.0	< 2.0	2.0	< 4.0	4.0	< 20	20	< 2.0	2.0
Isopropylbenzene	5	**33**	5.0	**120**	5.0	**130**	5.0	**1,200**	25	**37**	5.0
m&p-Xylenes	5	**190**	10	**180**	10	**49**	20	**2,000**	100	**210**	10
Methyl Ethyl Ketone (2-Butanone)	50	< 25	25	**190**	25	< 50	50	< 250	250	< 25	25
Methyl t-butyl ether (MTBE)	10	< 10	10	< 10	10	< 20	20	< 100	100	< 10	10
Methylene chloride	5	< 10	10	< 10	10	< 20	20	< 100	100	< 10	10
Naphthalene	10	**62**	10	**290**	10	**150**	20	**1,100**	100	**77**	10
n-Butylbenzene	5	**38**	5.0	**86**	5.0	**70**	5.0	**3,400**	25	**65**	5.0
n-Propylbenzene	5	**86**	5.0	**200**	5.0	**240**	5.0	**2,600**	25	**100**	5.0
o-Xylene	5	**62**	5.0	**92**	5.0	**130**	5.0	**390**	25	**66**	5.0
p-Isopropyltoluene		**16**	5.0	**93**	5.0	**53**	5.0	**860**	25	**26**	5.0
sec-Butylbenzene	5	**22**	5.0	**87**	5.0	**79**	5.0	**2,600**	25	**33**	5.0
Styrene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
tert-Butylbenzene	5	< 5.0	5.0	**14**	5.0	**16**	5.0	**220**	25	**3.2**	5.0
Tetrachloroethene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Tetrahydrofuran (THF)		< 50	50	**160**	50	< 50	50	< 250	250	< 50	50
Toluene	5	**33**	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	**36**	5.0
trans-1,2-Dichloroethene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
trans-1,3-Dichloropropene	0.4	< 2.5	2.5	< 2.5	2.5	< 5.0	5.0	< 25	25	< 2.5	2.5
trans-1,4-dichloro-2-butene	5	< 25	25	< 25	25	< 50	50	< 250	250	< 25	25
Trichloroethene	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Trichlorofluoromethane	5	< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Trichlorotrifluoroethane		< 5.0	5.0	< 5.0	5.0	< 5.0	5.0	< 25	25	< 5.0	5.0
Vinyl Chloride	2	< 2.5	2.5	< 2.5	2.5	< 5.0	5.0	< 25	25	< 2.5	2.5

Notes:
RL- Reporting Limit
Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 9
Groundwater Analytical Results
Semi-Volatile Organic Compounds

Compound	NYSDEC Groundwater Quality Standards µg/L	GW1 1/17/2017 µg/L		GW3 1/17/2017 µg/L		GW4 1/17/2017 µg/L		GW5 1/17/2017 µg/L		DUPLICATE GW1 1/17/2017 µg/L	
		Results	RL	Results	RL	Results	RL	Results	RL	Results	RL
1,2,4-Trichlorobenzene		< 5.6	5.6	< 25	25	< 10	10	< 110	110	< 5.3	5.3
1,2-Dichlorobenzene		< 1.1	1.1	< 7.1	7.1	< 4.7	4.7	< 30	30	< 1.1	1.1
1,2-Diphenylhydrazine		< 5.6	5.6	< 25	25	< 10	10	< 110	110	< 5.3	5.3
1,3-Dichlorobenzene	3	< 1.1	1.1	< 7.4	7.4	< 3.0	3.0	< 31	31	< 1.1	1.1
1,4-Dichlorobenzene		< 1.1	1.1	< 7.4	7.4	< 5.0	5.0	< 31	31	< 1.1	1.1
2,4,5-Trichlorophenol	1	< 1.1	1.1	< 14	14	< 5.6	5.6	< 58	58	< 1.1	1.1
2,4,6-Trichlorophenol	1	< 1.1	1.1	< 8.0	8.0	< 3.3	3.3	< 34	34	< 1.1	1.1
2,4-Dichlorophenol		< 1.1	1.1	< 8.8	8.8	< 3.6	3.6	< 37	37	< 1.1	1.1
2,4-Dimethylphenol		< 1.1	1.1	< 6.2	6.2	< 2.5	2.5	< 26	26	< 1.1	1.1
2,4-Dinitrophenol	5	< 1.1	1.1	< 18	18	< 7.2	7.2	< 74	74	< 1.1	1.1
2,4-Dinitrotoluene	5	< 5.0	5.0	< 9.9	9.9	< 5.0	5.0	< 41	41	< 5.0	5.0
2,6-Dinitrotoluene	5	< 5.0	5.0	< 7.9	7.9	< 5.0	5.0	< 33	33	< 5.0	5.0
2-Chloronaphthalene	10	< 5.6	5.6	< 10	10	< 10	10	< 30	30	< 5.3	5.3
2-Chlorophenol	1	< 1.1	1.1	< 7.1	7.1	< 2.9	2.9	< 30	30	< 1.1	1.1
2-Methylnaphthalene		**46**	5.6	**8.4**	25	**12**	10	**55**	50	**29**	5.3
2-Methylphenol (o-cresol)	1	< 1.1	1.1	< 12	12	< 4.8	4.8	< 49	49	< 1.1	1.1
2-Nitroaniline	5	< 5.0	5.0	< 25	25	< 10	10	< 110	110	< 5.0	5.0
2-Nitrophenol	1	< 1.1	1.1	< 16	16	< 6.5	6.5	< 67	67	< 1.1	1.1
3&4-Methylphenol (m&p-cresol)		< 1.1	1.1	< 25	25	< 10	10	< 110	110	< 1.1	1.1
3,3'-Dichlorobenzidine	5	< 5.0	5.0	< 12	12	< 5.0	5.0	< 50	50	< 5.0	5.0
3-Nitroaniline	5	< 5.0	5.0	< 54	54	< 22	22	< 230	230	< 5.0	5.0
4,6-Dinitro-2-methylphenol	1	< 1.1	1.1	< 27	27	< 11	11	< 110	110	< 1.1	1.1
4-Bromophenyl phenyl ether		< 5.6	5.6	< 25	25	< 10	10	< 110	110	< 5.3	5.3
4-Chloro-3-methylphenol	1	< 1.1	1.1	< 8.8	8.8	< 3.6	3.6	< 37	37	< 1.1	1.1
4-Chloroaniline	5	< 3.9	3.9	< 12	12	< 5.0	5.0	< 49	49	< 3.7	3.7
4-Chlorophenyl phenyl ether		< 5.6	5.6	< 25	25	< 10	10	< 110	110	< 5.3	5.3
4-Nitroaniline	5	< 5.0	5.0	< 8.4	8.4	< 5.0	5.0	< 35	35	< 5.0	5.0
4-Nitrophenol		< 1.1	1.1	< 11	11	< 4.6	4.6	< 48	48	< 1.1	1.1
Acenaphthene		< 5.6	5.6	< 20	20	< 10	10	< 32	32	< 5.3	5.3
Acetophenone		< 5.6	5.6	< 25	25	< 10	10	< 110	110	< 5.3	5.3
Aniline	5	< 3.9	3.9	< 75	75	< 31	31	< 320	320	< 3.7	3.7
Anthracene	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Benzidine	5	< 5.0	5.0	< 15	15	< 6.0	6.0	< 62	62	< 4.7	4.7
Benzoic acid		< 28	28	**590**	250	< 50	50	< 210	210	< 26	26
Benzyl butyl phthalate	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Bis(2-chloroethoxy)methane	5	< 5.0	5.0	< 6.9	6.9	< 5.0	5.0	< 29	29	< 5.0	5.0
Bis(2-chloroethyl)ether	1	< 1.1	1.1	< 6.8	6.8	< 2.8	2.8	< 28	28	< 1.1	1.1
Bis(2-chloroisopropyl)ether		< 5.6	5.6	< 25	25	< 10	10	< 110	110	< 5.3	5.3
Carbazole		< 5.6	5.6	< 130	130	< 51	51	< 530	530	< 5.3	5.3
Dibenzofuran		< 5.0	5.0	< 7.3	7.3	< 5.0	5.0	< 31	31	< 5.0	5.0
Diethyl phthalate	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Dimethylphthalate	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Di-n-butylphthalate	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Di-n-octylphthalate	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Fluoranthene	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Fluorene	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Hexachlorocyclopentadiene	5	< 5.0	5.0	< 7.7	7.7	< 5.0	5.0	< 32	32	< 5.0	5.0
Isophorone	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Naphthalene	10	**51**	5.0	**98**	7.2	**91**	5.0	**210**	30	**39**	5.0
N-Nitrosodi-n-propylamine		< 5.6	5.6	< 25	25	< 10	10	< 110	110	< 5.3	5.3
N-Nitrosodiphenylamine	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Phenol	50	< 1.1	1.1	< 8.0	8.0	< 3.3	3.3	< 34	34	< 1.1	1.1
Pyrene	50	< 5.6	5.6	< 25	25	< 10	10	< 50	50	< 5.3	5.3
Pyridine		< 11	11	< 25	25	< 10	10	< 50	50	< 11	11
1,2,4,5-Tetrachlorobenzene		< 0.56	0.56	< 25	25	< 10	10	< 110	110	< 0.53	0.53
Acenaphthene	20	**0.16**	0.11	< 20	20	< 10	10	< 29	29	**0.13**	0.11
Benz(a)anthracene	0.002	**0.12**	0.02	< 8.4	8.4	< 3.4	3.4	< 35	35	**0.1**	0.02
Benzo(a)pyrene		**0.07**	0.02	< 8.2	8.2	< 3.3	3.3	< 34	34	**0.07**	0.02
Benzo(b)fluoranthene	0.002	**0.07**	0.02	< 8.6	8.6	< 3.5	3.5	< 36	36	**0.06**	0.02
Benzo(ghi)perylene		**0.06**	0.02	< 8.1	8.1	< 5.0	5.0	< 34	34	**0.06**	0.02
Benzo(k)fluoranthene	0.002	**0.06**	0.02	< 8.3	8.3	< 3.4	3.4	< 35	35	**0.06**	0.02
Bis(2-ethylhexyl)phthalate	5	< 1.1	1.1	< 7.2	7.2	< 5.0	5.0	< 30	30	< 1.1	1.1
Chrysene	0.002	**0.11**	0.02	< 8.4	8.4	< 3.4	3.4	< 35	35	**0.11**	0.02
Dibenz(a,h)anthracene		< 0.02	0.02	< 25	25	< 10	10	< 50	50	< 0.02	0.02
Hexachlorobenzene	0.04	< 0.02	0.02	< 7.3	7.3	< 3.0	3.0	< 31	31	< 0.02	0.02
Hexachlorobutadiene	0.5	< 0.44	0.44	< 9.1	9.1	< 3.7	3.7	< 38	38	< 0.42	0.42
Hexachloroethane	5	< 0.56	0.56	< 7.5	7.5	< 5.0	5.0	< 32	32	< 0.53	0.53
Indeno(1,2,3-cd)pyrene		**0.05**	0.02	< 8.3	8.3	< 3.4	3.4	< 35	35	**0.06**	0.02
Nitrobenzene	0.4	< 0.11	0.11	< 8.8	8.8	< 3.6	3.6	< 37	37	< 0.11	0.11
N-Nitrosodimethylamine		< 0.11	0.11	< 25	25	< 10	10	< 110	110	< 0.11	0.11
Pentachloronitrobenzene		< 0.11	0.11	< 25	25	< 10	10	< 110	110	< 0.11	0.11
Pentachlorophenol		< 0.89	0.89	< 9.5	9.5	< 3.9	3.9	< 40	40	< 0.84	0.84
Phenanthrene		**1.7**	0.11	< 25	25	< 10	10	< 50	50	**1**	0.11

Notes:
RL- Reporting Limit
Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 10
Groundwater Analytical Results
Pesticides/PCBs

	Compound	NYSDEC Groundwater Quality Standards µg/L	GW1 1/17/2017 µg/L		GW3 1/17/2017 µg/L		GW4 1/17/2017 µg/L		GW5 1/17/2017 µg/L		DUPLICATE GW1 1/17/2017 µg/L	
			Results	RL	Results	RL	Results	RL	Results	RL	Results	RL
PCBs	PCB-1016	0.09	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.056	0.056
	PCB-1221	0.09	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.056	0.056
	PCB-1232	0.09	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.056	0.056
	PCB-1242	0.09	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.056	0.056
	PCB-1248	0.09	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.056	0.056
	PCB-1254	0.09	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.056	0.056
	PCB-1260	0.09	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.056	0.056
	PCB-1262	0.09	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.056	0.056
	PCB-1268	0.09	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.056	0.056
Pesticides	4,4-DDD	0.3	**0.3**	0.057	**0.11**	0.053	< 0.026	0.026	< 0.034	0.034	**0.044**	0.006
	4,4-DDE	0.2	< 0.028	0.028	< 0.026	0.026	< 0.026	0.026	< 0.069	0.069	< 0.006	0.006
	4,4-DDT	0.11	< 0.028	0.028	< 0.026	0.026	< 0.026	0.026	< 0.034	0.034	< 0.006	0.006
	a-BHC	0.94	< 0.028	0.028	< 0.026	0.026	< 0.026	0.026	< 0.034	0.034	< 0.006	0.006
	a-Chlordane		< 0.11	0.11	< 0.11	0.11	< 0.10	0.10	< 0.034	0.034	< 0.011	0.011
	Alachlor		< 0.85	0.85	< 0.053	0.053	< 0.78	0.78	< 0.068	0.068	< 0.083	0.083
	Aldrin		< 0.017	0.017	< 0.016	0.016	< 0.020	0.020	< 0.021	0.021	< 0.002	0.002
	b-BHC	0.04	< 0.028	0.028	< 0.026	0.026	< 0.026	0.026	< 0.034	0.034	< 0.006	0.006
	Chlordane	0.05	< 0.57	0.57	< 0.53	0.53	< 0.52	0.52	< 0.68	0.68	< 0.056	0.056
	d-BHC	0.04	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.069	0.069	< 0.006	0.006
	Dieldrin	0.004	< 0.017	0.017	< 0.016	0.016	< 0.016	0.016	< 0.021	0.021	< 0.002	0.002
	Endosulfan I		< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.068	0.068	< 0.011	0.011
	Endosulfan II		< 0.11	0.11	< 0.053	0.053	< 0.052	0.052	< 0.068	0.068	< 0.011	0.011
	Endosulfan Sulfate		< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.068	0.068	< 0.011	0.011
	Endrin		< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.068	0.068	< 0.006	0.006
	Endrin aldehyde	5	< 0.057	0.057	< 0.11	0.11	< 0.052	0.052	< 0.14	0.14	< 0.011	0.011
	Endrin ketone		< 0.11	0.11	< 0.11	0.11	< 0.10	0.10	< 0.14	0.14	< 0.011	0.011
	gamma-BHC	0.05	< 0.028	0.028	< 0.026	0.026	< 0.026	0.026	< 0.034	0.034	< 0.006	0.006
	g-Chlordane		< 0.057	0.057	< 0.026	0.026	< 0.052	0.052	< 0.034	0.034	< 0.011	0.011
	Heptachlor	0.04	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.068	0.068	< 0.006	0.006
	Heptachlor epoxide	0.03	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 0.068	0.068	< 0.006	0.006
	Methoxychlor	35	< 0.057	0.057	< 0.053	0.053	< 0.052	0.052	< 1.4	1.4	< 0.11	0.11
	Toxaphene		< 2.3	2.3	< 2.1	2.1	< 2.1	2.1	< 2.7	2.7	< 0.22	0.22

Notes:
RL- Reporting limit
ND - Non-detect
ND* - Due to matrix interference from non target compounds in the sample an elevated RL was reported.
Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

Table 11
Groundwater Analytical Results
Total Metals

Compound	NYSDEC Groundwater Quality Standards mg/L	GW1 1/17/2017 mg/L		GW3 1/17/2017 mg/L		GW4 1/17/2017 mg/L		GW5 1/17/2017 mg/L		DUPLICATE GW1 1/17/2017 mg/L	
		Results	RL	Results	RL	Results	RL	Results	RL	Results	RL
Aluminum	NS	75.8	0.10	5.87	0.010	63	0.10	35.2	0.10	4.49	0.010
Antimony	0.003	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002
Arsenic	0.025	0.098	0.004	< 0.004	0.004	0.025	0.004	0.013	0.004	0.032	0.004
Barium	1	0.618	0.010	0.066	0.010	0.4	0.010	0.531	0.010	0.155	0.010
Beryllium	0.003	0.003	0.001	< 0.001	0.001	0.003	0.001	0.002	0.001	< 0.001	0.001
Cadmium	0.005	0.002	0.004	< 0.004	0.004	0.001	0.004	0.001	0.004	< 0.004	0.004
Calcium	NS	76.7	0.010	115	0.010	31.3	0.010	76	0.010	62.8	0.010
Chromium	0.05	0.185	0.001	0.009	0.001	0.095	0.001	0.075	0.001	0.014	0.001
Cobalt	NS	0.051	0.005	0.003	0.005	0.039	0.005	0.026	0.005	0.003	0.005
Copper	0.2	0.226	0.005	0.02	0.005	0.161	0.005	0.203	0.005	0.03	0.005
Iron	0.5	118	0.10	4.23	0.01	96.8	0.01	60.9	0.01	6.86	0.01
Lead	0.025	0.519	0.002	0.004	0.002	0.155	0.002	0.065	0.002	0.059	0.002
Magnesium	35	17.6	0.010	1.62	0.010	13.8	0.010	36.9	0.010	2.69	0.010
Manganese	0.3	2.27	0.050	0.053	0.005	0.773	0.005	0.887	0.005	0.272	0.005
Mercury	0.0007	< 0.0002	0.0002	< 0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	< 0.0002	0.0002
Nickel	0.1	0.114	0.004	0.011	0.004	0.082	0.004	0.066	0.004	0.007	0.004
Potassium	NS	13.1	0.1	29.7	0.1	28.8	0.1	40.3	0.1	3	0.1
Selenium	0.01	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002
Silver	0.05	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
Sodium	2	9.51	0.10	128	1.0	168	1.0	151	1.0	7.49	0.10
Thallium	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005
Vanadium	NS	0.165	0.010	0.013	0.010	0.15	0.010	0.089	0.010	0.009	0.010
Zinc	2	0.669	0.010	0.016	0.010	0.207	0.010	0.155	0.010	0.147	0.010

Notes:
RL- Reporting limit
NS - No Standard
Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

Table 12
Groundwater Analytical Results
TAL Filtered Metals

Compound	NYSDEC Groundwater Quality Standards mg/L	GW1 1/17/2017 mg/L		GW3 1/17/2017 mg/L		GW4 1/17/2017 mg/L		GW5 1/17/2017 mg/L		DUPLICATE GW1 1/17/2017 mg/L	
		Results	RL	Results	RL	Results	RL	Results	RL	Results	RL
Aluminum	NS	< 0.011	0.011	**2.15**	0.011	**0.039**	0.011	**0.011**	0.011	< 0.011	0.011
Antimony	0.003	< 0.003	0.003	< 0.003	0.003	< 0.003	0.003	< 0.003	0.003	< 0.003	0.003
Arsenic	0.025	**0.005**	0.003	**0.005**	0.003	**0.012**	0.003	**0.004**	0.003	**0.004**	0.003
Barium	1	**0.112**	0.011	**0.033**	0.011	**0.032**	0.011	**0.261**	0.011	**0.111**	0.011
Beryllium	0.003	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001
Cadmium	0.005	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004
Calcium	NS	**58.6**	0.01	**75.6**	0.01	**20.5**	0.01	**68.1**	0.01	**59.8**	0.01
Chromium	0.05	**0.003**	0.001	**0.003**	0.001	< 0.001	0.001	< 0.001	0.001	**0.002**	0.001
Cobalt	NS	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	**0.001**	0.005	< 0.005	0.005
Copper	0.2	**0.005**	0.005	**0.013**	0.005	**0.005**	0.005	**0.003**	0.005	**0.005**	0.005
Iron	0.5	**0.05**	0.01	**0.01**	0.01	**0.04**	0.01	**0.03**	0.01	**0.03**	0.01
Lead	0.025	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002	< 0.002	0.002
Magnesium	35	**1.87**	0.01	**0.14**	0.01	**2.55**	0.01	**26.5**	0.01	**1.94**	0.01
Manganese	0.3	**0.173**	0.005	< 0.005	0.005	**0.003**	0.005	**0.225**	0.005	**0.179**	0.005
Mercury	0.0007	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002	< 0.0002	0.0002
Nickel	0.1	**0.001**	0.004	**0.007**	0.004	**0.005**	0.004	**0.007**	0.004	**0.001**	0.004
Potassium	NS	**2.2**	0.1	**27.9**	0.1	**21**	0.1	**32.4**	0.1	**2.2**	0.1
Selenium	0.01	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004	< 0.004	0.004
Silver	0.05	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005	< 0.005	0.005
Sodium	2	**7.08**	0.11	**128**	1.1	**159**	1.1	**144**	1.1	**7.08**	0.11
Thallium	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005	< 0.0005	0.0005
Vanadium	NS	< 0.011	0.011	**0.005**	0.011	**0.014**	0.011	< 0.011	0.011	< 0.011	0.011
Zinc	2	**0.043**	0.011	**0.001**	0.011	< 0.011	0.011	**0.001**	0.011	**0.035**	0.011

Notes:
RL- Reporting limit
NS - No Standard
Bold/highlighted- Indicated exceedance of the NYSDEC Groundwater Standard

Former NY Cleaning and Dyeing Site Table 13
376-378 Flushing Avenue, Brooklyn, NY Parameters Detected Above Ambient Groundwater Standards

COMPOUND	Range in Exceedances	GW1	GW3	GW4	GW5	DUPLICATE GW1
Sample Results in µg/L						
1,2,4-Trimethylbenzene	**440-7,900**	440	1,100	1,700	7,900	460
1,3,5-Trimethylbenzene	**97-2,600**	97	280	470	2,600	110
2-Isopropyltoluene	**6.9-690**	6.9	32	32	690	9.1
Acetone	**570**		570			
Benzene	**3.7-56**	3.7	56	53		3.8
Bromomethane	**120**				120	
Ethylbenzene	**30-890**	88	130	30	890	97
Isopropylbenzene	**33-1,200**	33	120	130	1,200	37
m&p-Xylenes	**49-2,000**	190	180	49	2,000	210
Methyl Ethyl Ketone (2-Butanone)	**190**		190			
Naphthalene	**62-1,100**	62	290	150	1,100	77
n-Butylbenzene	**38-3,400**	38	86	70	3,400	65
n-Propylbenzene	**84-2,600**	86	200	240	2,600	100
o-Xylene	**62-390**	62	92	130	390	66
sec-Butylbenzene	**22-2,600**	22	87	79	2,600	33
tert-Butylbenzene	**14-220**		14	16	220	
Toluene	**33-36**	33				36
Naphthalene	**39-210**	51	98	91	210	39
Benz(a)anthracene	**0.1-0.12**	0.12				0.1
Benzo(b)fluoranthene	**0.06-0.07**	0.07				0.06
Benzo(k)fluoranthene	**0.06**	0.06				0.06
Chrysene	**0.11**	0.11				0.11
Sample Results in mg/L						
Arsenic	**0.032-0.098**	0.098				0.032
Chromium	**0.095-0.185**	0.185		0.095	0.075	
Copper	**0.203-0.226**	0.226			0.203	
Iron	**6.86-118**	118	4.23	96.8	60.9	6.86
Lead	**0.059-0.519**	0.519		0.155	0.065	0.059
Magnesium	**36.9**				36.9	
Manganese	**0.773-2.27**	2.27		0.773	0.887	
Nickel	**0.114**	0.114				
Sodium	**7.49-168**	9.51	128	168	151	7.49
Sodium (dissolved)	**7.08-159**	7.08	128	159	144	7.08

Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

TABLE 14
Soil Gas - Volatile Organic Compounds

COMPOUNDS	NYSDOH Maximum Sub-Slab Value ($\mu g/m^3$) [a]	NYSDOH Soil Outdoor Background Levels ($\mu g/m^3$) [b]	SV1 1/17/2017 ($\mu g/m3$)		SV2 1/17/2017 ($\mu g/m3$)		SV3 1/17/2017 ($\mu g/m3$)		SV4 1/17/2017 ($\mu g/m3$)		SV5 1/17/2017 ($\mu g/m3$)		SV6 1/17/2017 ($\mu g/m3$)	
			Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL
1,1,1,2-Tetrachloroethane			< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
1,1,1-Trichloroethane	100	<2.0 - 2.8	< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	**27.7**	9.98	< 150	150	**22.7**	9.98
1,1,2,2-Tetrachloroethane		<1.5	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
1,1,2-Trichloroethane		<1.0	< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
1,1-Dichloroethane		<1.0	< 1.00	1.00	< 30.0	30.0	< 9.99	9.99	**566**	9.99	< 150	150	< 9.99	9.99
1,1-Dichloroethene		<1.0	< 1.00	1.00	< 30.0	30.0	< 9.99	9.99	< 9.99	9.99	< 150	150	< 9.99	9.99
1,2,4-Trichlorobenzene		NA	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
1,2,4-Trimethylbenzene		<1.0	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	**191**	10.0	**963**	150	< 10.0	10.0
1,2-Dibromoethane		<1.5	< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
1,2-Dichlorobenzene		<2.0	< 1.00	1.00	< 30.0	30.0	< 9.97	9.97	< 9.97	9.97	< 150	150	< 9.97	9.97
1,2-Dichloroethane		<1.0	< 1.00	1.00	< 30.0	30.0	**46.9**	9.99	< 9.99	9.99	< 150	150	< 9.99	9.99
1,2-Dichloropropane			< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
1,2-Dichlorotetrafluoroethane			< 1.00	1.00	< 30.0	30.0	< 9.99	9.99	< 9.99	9.99	< 150	150	< 9.99	9.99
1,3,5-Trimethylbenzene		<1.0	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	**270**	10.0	**1,270**	150	< 10.0	10.0
1,3-Butadiene		NA	< 1.00	1.00	< 30.1	30.1	< 9.99	9.99	< 9.99	9.99	< 150	150	< 9.99	9.99
1,3-Dichlorobenzene		<2.0	**1**	1.00	< 30.0	30.0	**10.3**	9.97	< 9.97	9.97	< 150	150	< 9.97	9.97
1,4-Dichlorobenzene		NA	< 1.00	1.00	< 30.0	30.0	< 9.97	9.97	< 9.97	9.97	< 150	150	< 9.97	9.97
1,4-Dioxane			< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
2-Hexanone			< 1.00	1.00	< 30.0	30.0	< 9.99	9.99	< 9.99	9.99	< 150	150	< 9.99	9.99
4-Ethyltoluene		NA	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	**303**	10.0	**742**	150	< 10.0	10.0
4-Isopropyltoluene			< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
4-Methyl-2-pentanone			< 1.00	1.00	< 30.0	30.0	< 9.99	9.99	< 9.99	9.99	< 150	150	< 9.99	9.99
Acetone		NA	**2.31**	1.00	< 29.9	29.9	< 9.99	9.99	< 9.99	9.99	< 150	150	< 9.99	9.99
Acrylonitrile			< 1.00	1.00	< 29.9	29.9	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Benzene		<1.6 - 4.7	< 1.00	1.00	< 30.0	30.0	**74.7**	9.99	**149**	9.99	< 150	150	**15.8**	9.99
Benzyl Chloride		NA	< 1.00	1.00	< 30.0	30.0	< 9.99	9.99	< 9.99	9.99	< 150	150	< 9.99	9.99
Bromodichloromethane		<5.0	< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
Bromoform		<1.0	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Bromomethane		<1.0	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Carbon Disulfide		NA	< 1.00	1.00	< 30.0	30.0	**67.5**	9.99	**11.5**	9.99	< 150	150	**71.9**	9.99
Carbon Tetrachloride	5	<3.1	< 0.25	0.25	< 7.48	7.48	< 2.50	2.50	< 2.50	2.50	< 37.4	37.4	< 2.50	2.50
Chlorobenzene		<2.0	< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
Chloroethane		NA	< 1.00	1.00	< 30.1	30.1	< 10.0	10.0	**197**	10.0	< 150	150	< 10.0	10.0
Chloroform		<2.4	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Chloromethane		<1.0 - 1.4	< 1.00	1.00	< 29.9	29.9	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
cis-1,2-Dichloroethene		<1.0	< 1.00	1.00	< 30.0	30.0	**56.7**	9.99	**95.5**	9.99	**395**	150	< 9.99	9.99
cis-1,3-Dichloropropene		NA	< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
Cyclohexane		NA	< 1.00	1.00	**2,240**	30.0	**7,740**	150	**1,350**	10.0	**1,000**	150	**347**	10.0
Dibromochloromethane		<5.0	< 1.00	1.00	< 30.0	30.0	< 9.96	9.96	< 9.96	9.96	< 150	150	< 9.96	9.96
Dichlorodifluromethane		NA	< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
Ethanol			< 1.00	1.00	< 29.9	29.9	**21.3**	10.0	**22.6**	10.0	< 150	150	< 10.0	10.0
Ethyl Acetate		NA	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Ethylbenzene		<4.3	< 1.00	1.00	< 30.0	30.0	**24.6**	9.98	**10,800**	89.8	**512**	150	**20.9**	9.98
Heptane		NA	< 1.00	1.00	**811**	30.0	**1,430**	9.99	**3,380**	59.8	**359**	150	**18.1**	9.99
Hexachlorobutadiene		NA	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Hexane		<1.5	< 1.00	1.00	< 30.0	30.0	**10,700**	150	**793**	10.0	< 150	150	**52.5**	10.0
Isopropylalcohol		NA	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Isopropylbenzene			< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	**5,700**	59.9	< 150	150	< 10.0	10.0
Xylene (m&p)		<4.3	**2.98**	1.00	< 30.0	30.0	**41.9**	9.98	**2,730**	9.98	**1,920**	150	**29.4**	9.98
Methyl Ethyl Ketone			**1.51**	1.00	< 30.1	30.1	< 9.99	9.99	**74.3**	9.99	< 150	150	**53.6**	9.99
MTBE		NA	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Methylene Chloride		<3.4	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
n-Butylbenzene			< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
Xylene (o)		<4.3	< 1.00	1.00	< 30.0	30.0	**15**	9.98	**1,170**	9.98	**833**	150	**18**	9.98
Propylene		NA	< 1.00	1.00	< 29.9	29.9	**65.4**	9.99	**308**	9.99	**251**	150	**103**	9.99
sec-Butylbenzene			< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
Styrene		<1.0	< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Tetrachloroethene	30		**1**	0.25	**16.5**	7.52	**47**	2.50	**43.3**	2.50	**252**	37.5	**485**	2.50
Tetrahydrofuran		NA	< 1.00	1.00	< 30.1	30.1	**23.8**	9.99	**136**	9.99	< 150	150	**71.6**	9.99
Toluene		1.0 - 6.1	**1.28**	1.00	< 30.0	30.0	**166**	10.0	**2,090**	59.9	**152**	150	**12.7**	10.0
trans-1,2-Dichloroethene		NA	< 1.00	1.00	< 30.0	30.0	< 9.99	9.99	**72.9**	9.99	< 150	150	< 9.99	9.99
trans-1,3-Dichloropropene		NA	< 1.00	1.00	< 30.0	30.0	< 9.98	9.98	< 9.98	9.98	< 150	150	< 9.98	9.98
Trichloroethene	2	<1.7	< 0.25	0.25	< 7.52	7.52	< 2.50	2.50	**37.2**	2.50	**145**	37.5	< 2.50	2.50
Trichlorofluoromethane		NA	< 1.00	1.00	< 30.0	30.0	< 9.99	9.99	< 9.99	9.99	< 150	150	< 9.99	9.99
Trichlorotrifluoroethane			< 1.00	1.00	< 30.0	30.0	< 10.0	10.0	< 10.0	10.0	< 150	150	< 10.0	10.0
Vinyl Chloride		<1.0	< 0.25	0.25	< 7.51	7.51	**56.2**	2.50	**136**	2.50	**358**	37.6	**8.07**	2.50
BTEX			**4.26**		**0**		**322.2**		**16,939**		**3,417**		**96.8**	
Total VOCs			**10.08**		**3,067.5**		**20,587.3**		**30,654**		**9,152**		**1,330.27**	

Notes:
NA No guidance value or standard available
(a) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006. New York State Department of Health.
(b) NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, February 2005, Summary of Background Levels for Selected Compounds (NYSDOH Database, Outdoor

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TABLE 14
Soil Gas - Volatile Organic Compounds

COMPOUNDS	NYSDOH Maximum Sub-Slab Value ($\mu g/m^3$) [a]	NYSDOH Soil Outdoor Background Levels ($\mu g/m^3$) [b]	SV7 1/17/2017 ($\mu g/m3$)		SV8 1/17/2017 ($\mu g/m3$)		SV9 1/17/2017 ($\mu g/m3$)		SV10 1/17/2017 ($\mu g/m3$)	
			Result	RL	Result	RL	Result	RL	Result	RL
1,1,1,2-Tetrachloroethane			< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
1,1,1-Trichloroethane	100	<2.0 - 2.8	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
1,1,2,2-Tetrachloroethane		<1.5	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
1,1,2-Trichloroethane		<1.0	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
1,1-Dichloroethane		<1.0	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
1,1-Dichloroethene		<1.0	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
1,2,4-Trichlorobenzene		NA	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
1,2,4-Trimethylbenzene		<1.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	**10.9**	10.0
1,2-Dibromoethane		<1.5	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
1,2-Dichlorobenzene		<2.0	< 9.97	9.97	< 9.97	9.97	< 9.97	9.97	< 9.97	9.97
1,2-Dichloroethane		<1.0	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
1,2-Dichloropropane			< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
1,2-Dichlorotetrafluoroethane			< 9.99	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
1,3,5-Trimethylbenzene		<1.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
1,3-Butadiene		NA	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
1,3-Dichlorobenzene		<2.0	< 9.97	9.97	< 9.97	9.97	< 9.97	9.97	**12**	9.97
1,4-Dichlorobenzene		NA	< 9.97	9.97	< 9.97	9.97	< 9.97	9.97	< 9.97	9.97
1,4-Dioxane			< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
2-Hexanone			< 9.99	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
4-Ethyltoluene		NA	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
4-Isopropyltoluene			< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
4-Methyl-2-pentanone			< 9.99	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
Acetone		NA	**256**	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
Acrylonitrile			< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Benzene		<1.6 - 4.7	**58.7**	9.99	**200**	9.99	**178**	9.99	**140**	9.99
Benzyl Chloride		NA	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
Bromodichloromethane		<5.0	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
Bromoform		<1.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Bromomethane		<1.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Carbon Disulfide		NA	**153**	9.99	**613**	9.99	**299**	9.99	< 9.99	9.99
Carbon Tetrachloride	5	<3.1	< 2.50	2.50	< 2.50	2.50	< 2.50	2.50	< 2.50	2.50
Chlorobenzene		<2.0	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
Chloroethane		NA	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Chloroform		<2.4	**11.5**	10.0	**24.6**	10.0	< 10.0	10.0	< 10.0	10.0
Chloromethane		<1.0 - 1.4	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
cis-1,2-Dichloroethene		<1.0	< 9.99	9.99	< 9.99	9.99	**30.9**	9.99	< 9.99	9.99
cis-1,3-Dichloropropene		NA	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
Cyclohexane		NA	< 10.0	10.0	**1,180**	20.0	**592**	10.0	< 150	150
Dibromochloromethane		<5.0	< 9.96	9.96	< 9.96	9.96	< 9.96	9.96	< 9.96	9.96
Dichlorodifluromethane		NA	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
Ethanol			**15.8**	10.0	< 10.0	10.0	**15.4**	10.0	**14.3**	10.0
Ethyl Acetate		NA	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Ethylbenzene		<4.3	**41.4**	9.98	**21.4**	9.98	**621**	9.98	**62.9**	9.98
Heptane		NA	**43.8**	9.99	**696**	9.99	**782**	9.99	**1,440**	150
Hexachlorobutadiene		NA	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Hexane		<1.5	**23.8**	10.0	**796**	10.0	**359**	10.0	< 10.0	10.0
Isopropylalcohol		NA	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Isopropylbenzene			< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Xylene (m&p)		<4.3	**97.6**	9.98	**49.5**	9.98	**768**	9.98	**219**	9.98
Methyl Ethyl Ketone			**105**	9.99	**92.5**	9.99	**54.5**	9.99	< 9.99	9.99
MTBE		NA	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Methylene Chloride		<3.4	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
n-Butylbenzene			< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
Xylene (o)		<4.3	**25.7**	9.98	**14**	9.98	**48.6**	9.98	**117**	9.98
Propylene		NA	**17.1**	9.99	**249**	9.99	**404**	9.99	**43**	9.99
sec-Butylbenzene			< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
Styrene		<1.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Tetrachloroethene	30		**138**	2.50	**33.3**	2.50	**12.2**	2.50	**52.1**	2.50
Tetrahydrofuran		NA	**23.4**	9.99	**103**	9.99	**10.6**	9.99	< 9.99	9.99
Toluene		1.0 - 6.1	**572**	10.0	**51.2**	10.0	**279**	10.0	**45.6**	10.0
trans-1,2-Dichloroethene		NA	< 9.99	9.99	< 9.99	9.99	**29.3**	9.99	< 9.99	9.99
trans-1,3-Dichloropropene		NA	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98	< 9.98	9.98
Trichloroethene	2	<1.7	**19.7**	2.50	< 2.50	2.50	**171**	2.50	< 2.50	2.50
Trichlorofluoromethane		NA	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99	< 9.99	9.99
Trichlorotrifluoroethane			< 10.0	10.0	< 10.0	10.0	< 10.0	10.0	< 10.0	10.0
Vinyl Chloride		<1.0	< 2.50	2.50	< 2.50	2.50	**129**	2.50	< 2.50	2.50
BTEX			**795.4**		**336.1**		**1,894.6**		**584.5**	
Total VOCs			**1,602.5**		**4,123.5**		**4,783.5**		**2,156.8**	

Notes:
NA No guidance value or standard available
(a) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006. New York State Department of Health.
(b) NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, February 2005, Summary of Background Levels for Selected Compounds (NYSDOH Database, Outdoor

FIGURES

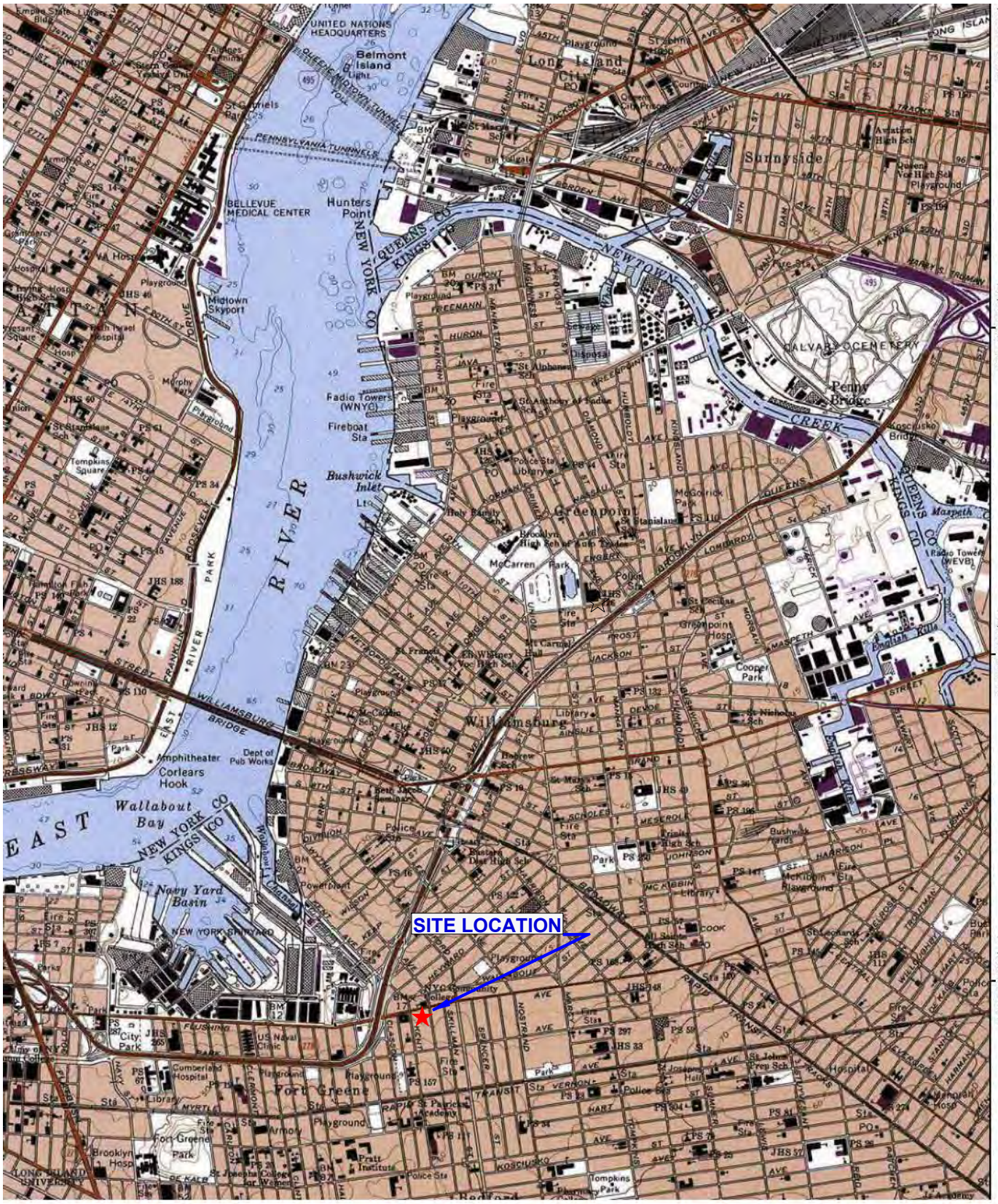

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Figure No. 1

Site Name: Former NY Cleaning and Dyeing Site

Site Address: 376-378 Flushing Avenue, Brooklyn, NY

Drawing Title: Site Location Map

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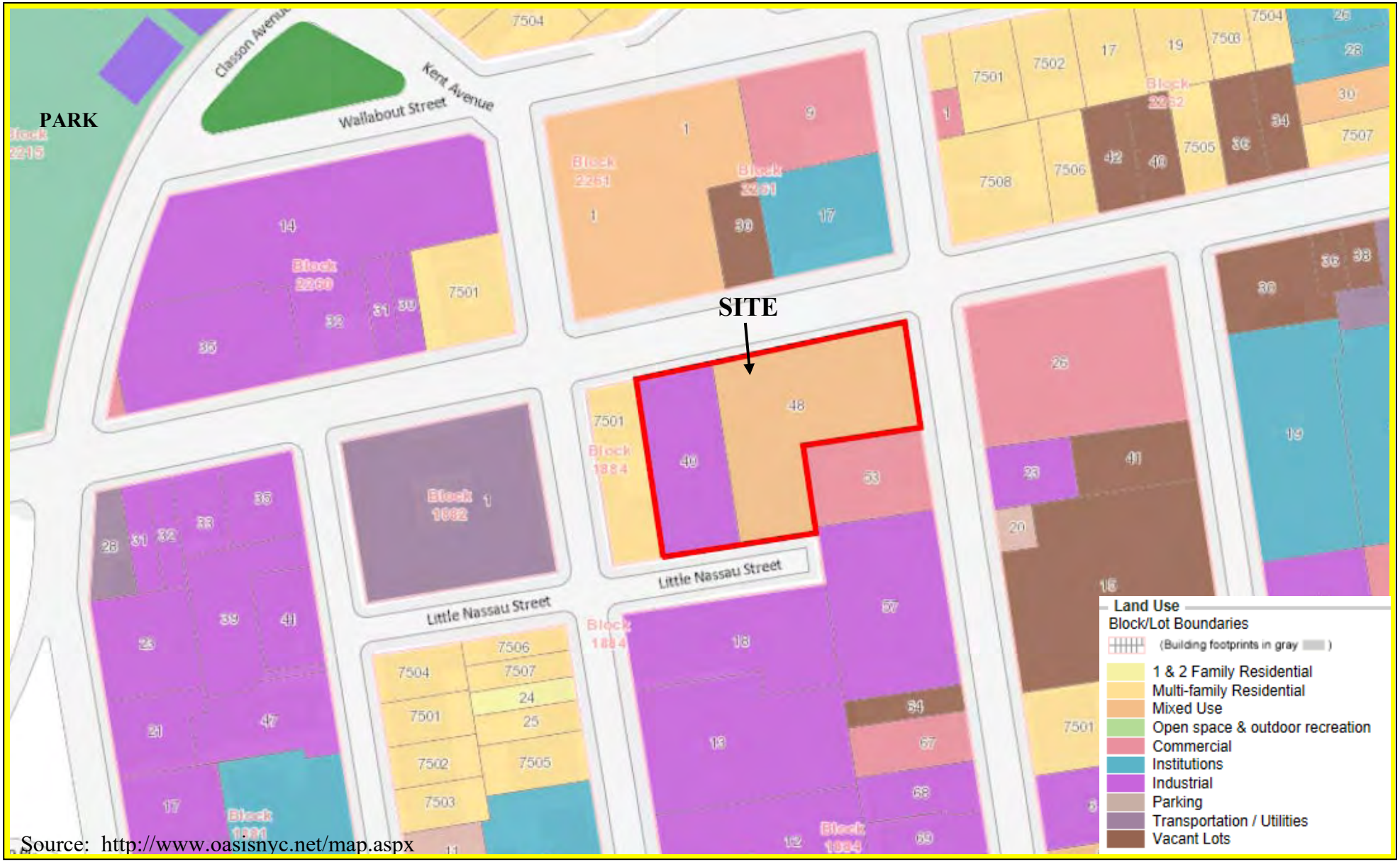
Figure No. 2

Site Name: 376-378 Flushing Avenue
Site Address: 376-378 Flushing Avenue, Brooklyn, NY
Drawing Title: Site Plan



Source: http://www.oasisnyc.net/map.aspx

FIGURE 3
SURROUNDING LAND USE MAP

FORMER NY CLEANING AND DYEING SITE
376-378 FLUSHING AVENUE, BROOKLYN, NY
HAZARDOUS MATERIALS REMEDIAL ACTION WORK PLAN

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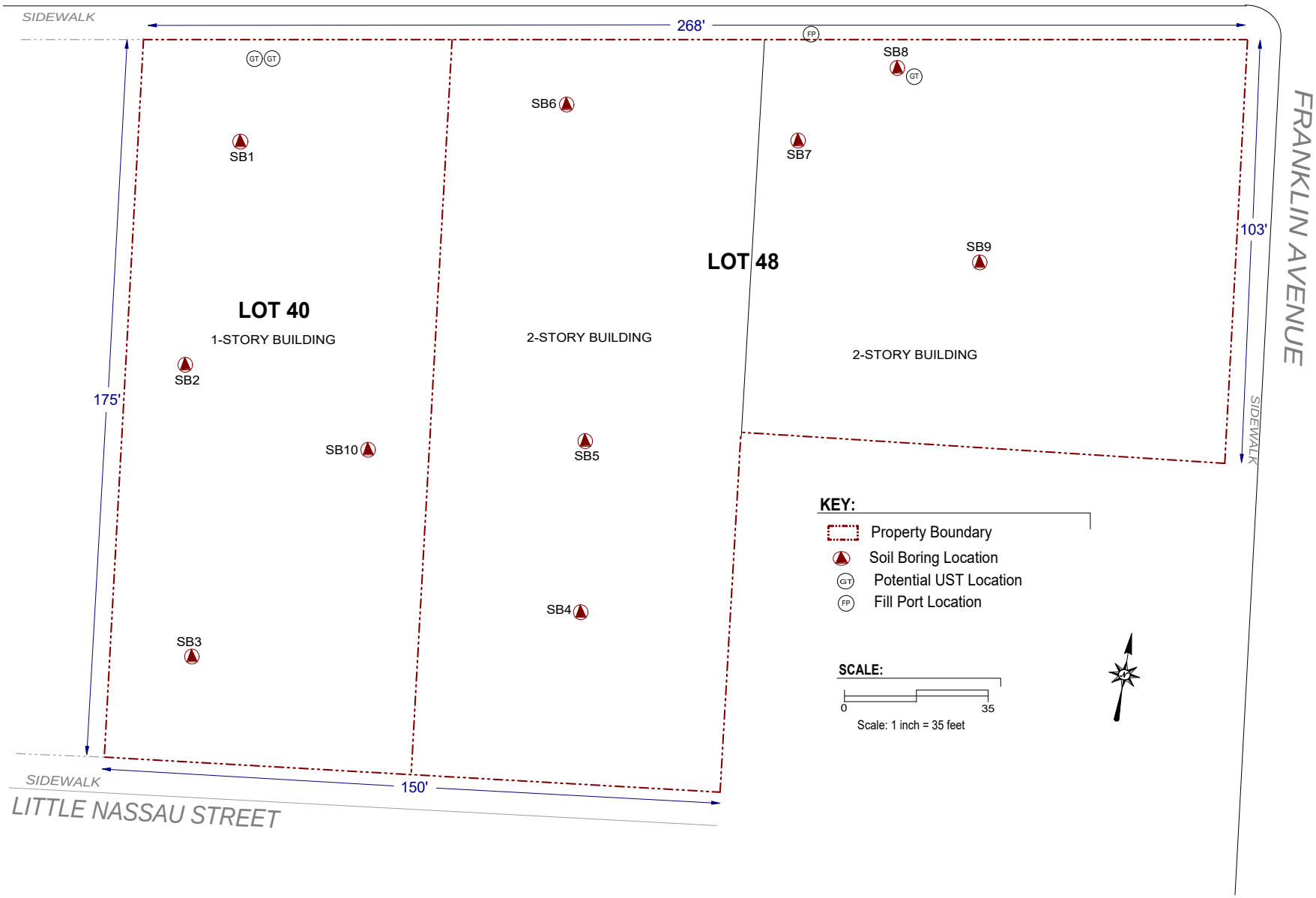

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Figure No. 4

Site Name: FORMER NY CLEANING AND DYEING SITE
Site Address: 376-378 FLUSHING AVENUE, BROOKLYN, NY
Drawing Title: SOIL BORING LOCATIONS

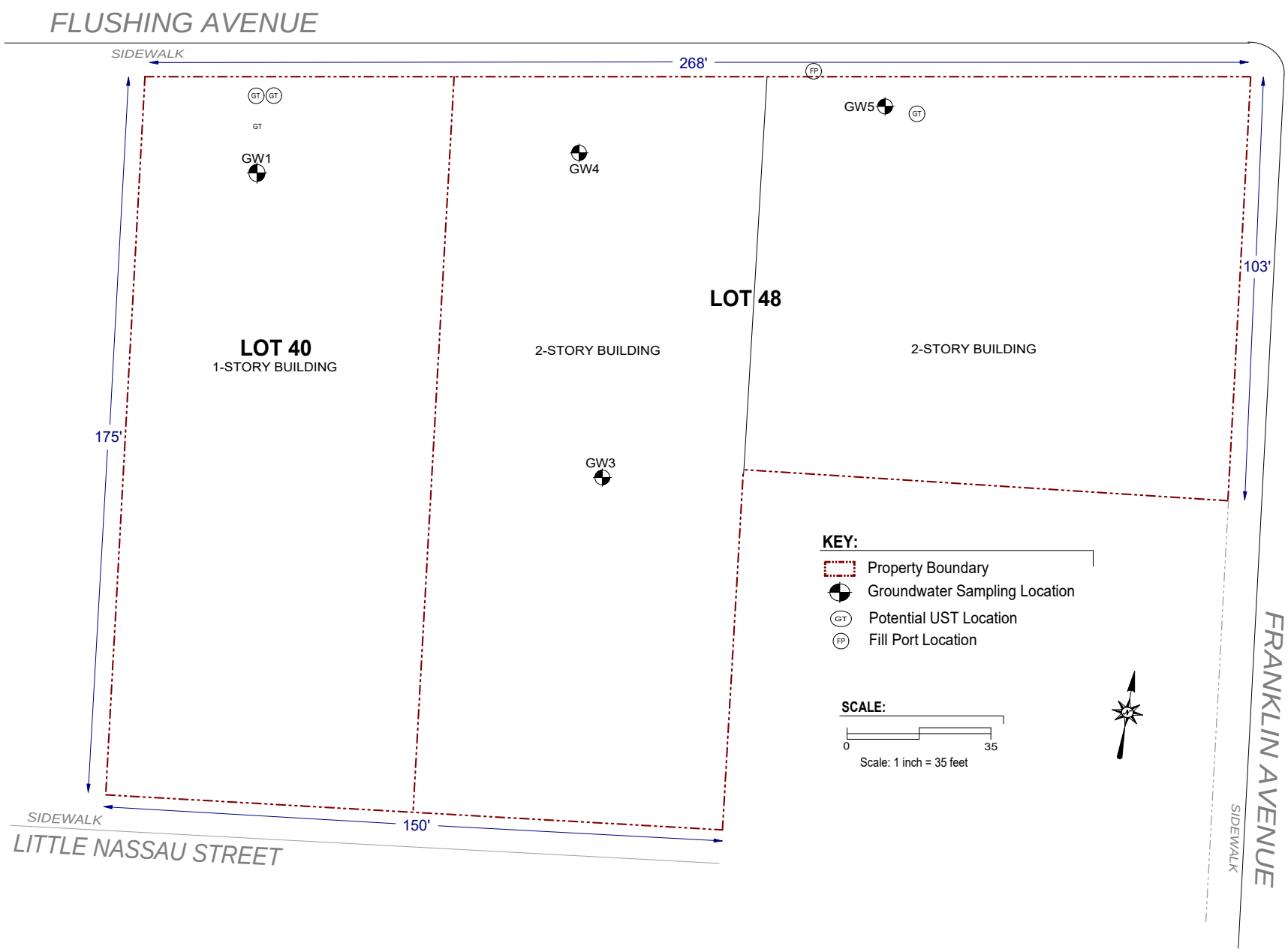

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Figure No. 5

Site Name: FORMER NY CLEANING AND DYEING SITE
Site Address: 376-378 FLUSHING AVENUE, BROOKLYN, NY
Drawing Title: MONITORING WELL LOCATIONS

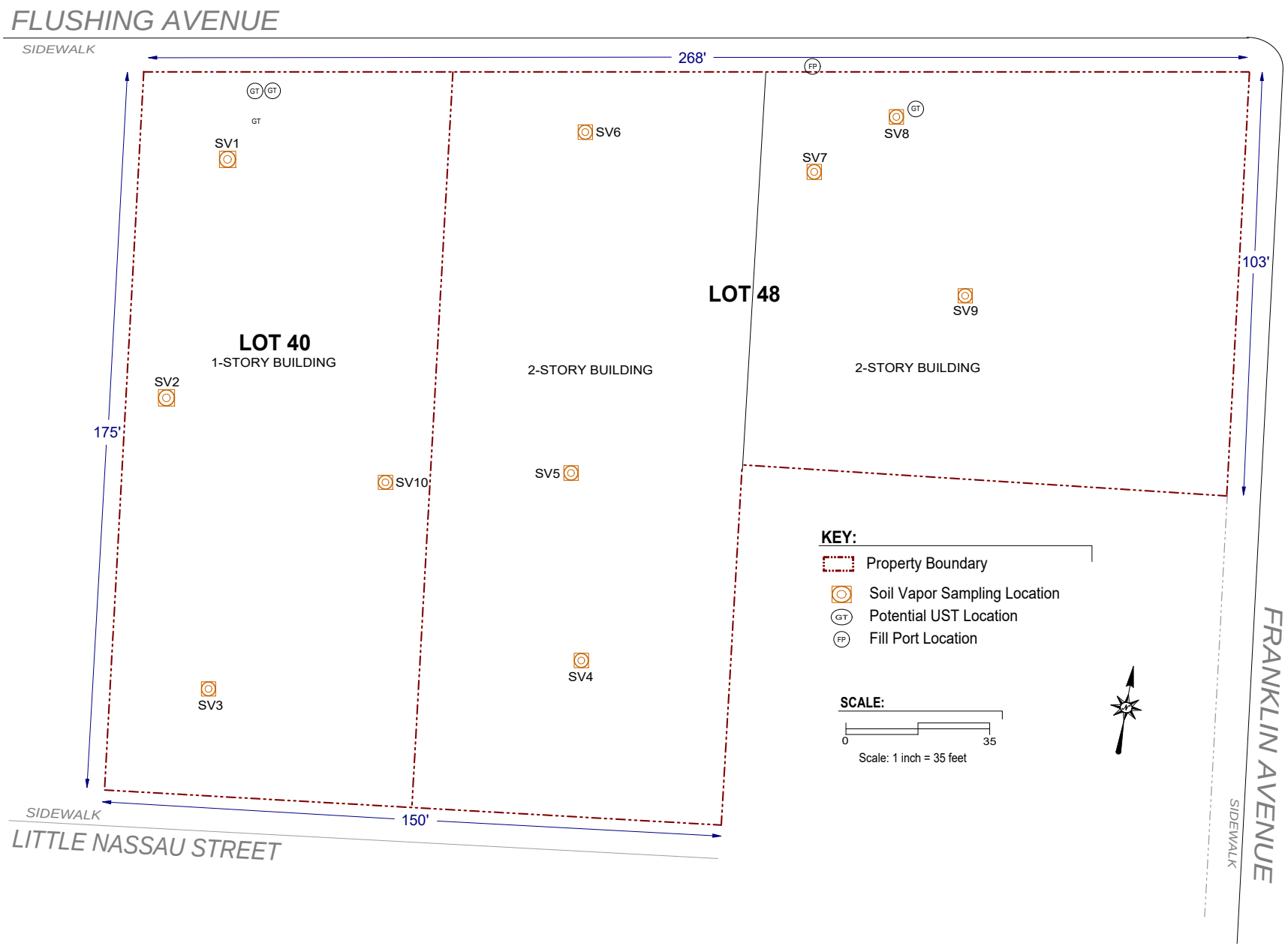

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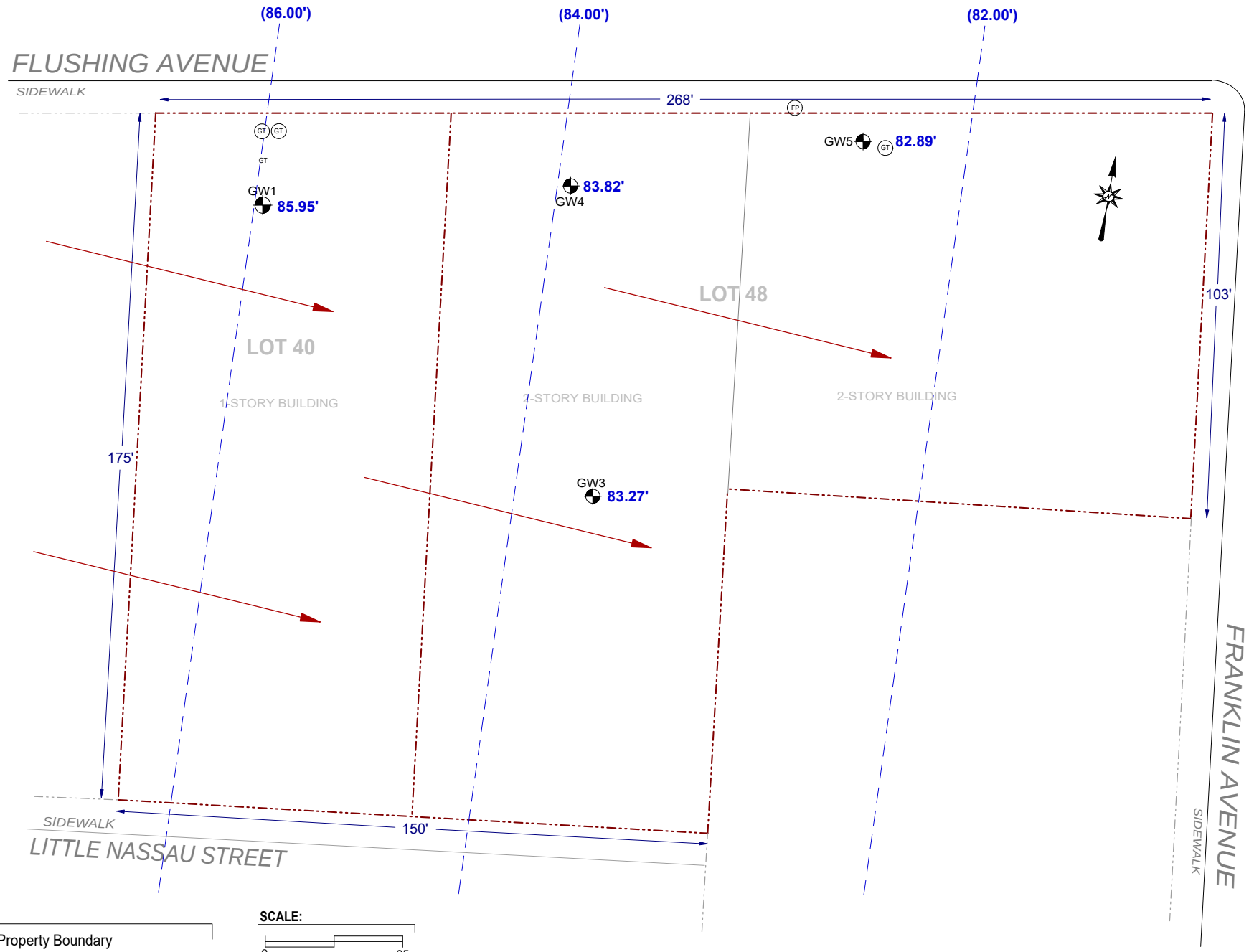
Figure No. 6

Site Name: FORMER NY CLEANING AND DYEING SITE
Site Address: 376-378 FLUSHING AVENUE, BROOKLYN, NY
Drawing Title: SOIL GAS SAMPLING LOCATIONS



KEY:

- Property Boundary
- Groundwater Sampling Location
- Soil Boring Location
- Soil Vapor Sampling Location
- Potential UST Location
- Fill Port Location

SCALE:

0 — 35

Scale: 1 inch = 35 feet

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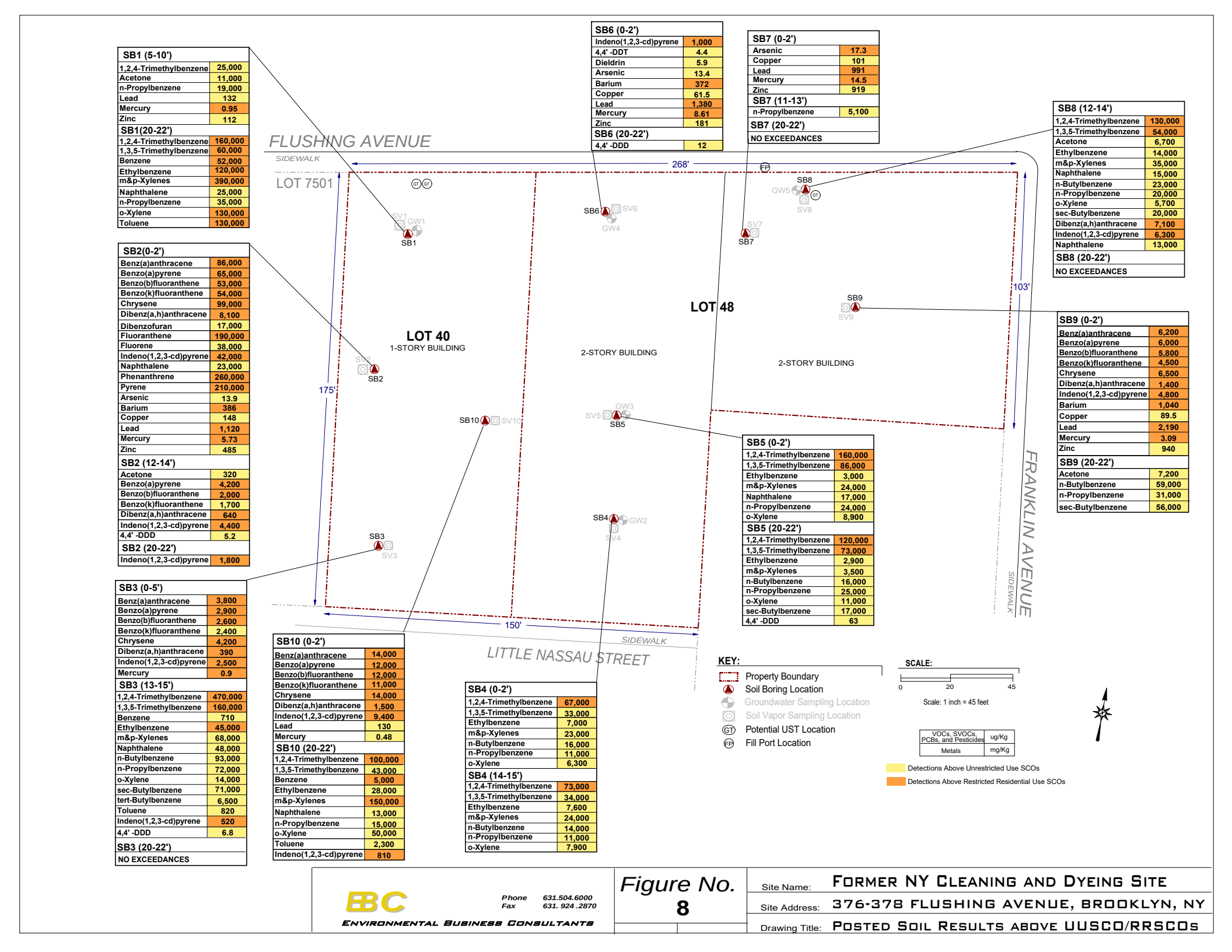
Figure No. 7

Site Name: Former NY Cleaning and Dyeing Site

Site Address: 376-378 Flushing Avenue, Brooklyn, NY

Drawing Title: Groundwater Elevation Map



SB1 (5-10')	
1,2,4-Trimethylbenzene	25,000
Acetone	11,000
n-Propylbenzene	19,000
Lead	132
Mercury	0.95
Zinc	112
SB1(20-22')	
1,2,4-Trimethylbenzene	160,000
1,3,5-Trimethylbenzene	60,000
Benzene	52,000
Ethylbenzene	120,000
m&p-Xylenes	390,000
Naphthalene	25,000
n-Propylbenzene	35,000
o-Xylene	130,000
Toluene	130,000

SB2(0-2')	
Benz(a)anthracene	86,000
Benzo(a)pyrene	65,000
Benzo(b)fluoranthene	53,000
Benzo(k)fluoranthene	54,000
Chrysene	99,000
Dibenz(a,h)anthracene	8,100
Dibenzofuran	17,000
Fluoranthene	190,000
Fluorene	38,000
Indeno(1,2,3-cd)pyrene	42,000
Naphthalene	23,000
Phenanthrene	260,000
Pyrene	210,000
Arsenic	13.9
Barium	386
Copper	148
Lead	1,120
Mercury	5.73
Zinc	485
SB2 (12-14')	
Acetone	320
Benzo(a)pyrene	4,200
Benzo(b)fluoranthene	2,000
Benzo(k)fluoranthene	1,700
Dibenz(a,h)anthracene	640
Indeno(1,2,3-cd)pyrene	4,400
4,4' -DDD	5.2
SB2 (20-22')	
Indeno(1,2,3-cd)pyrene	1,800

SB3 (0-5')	
Benz(a)anthracene	3,800
Benzo(a)pyrene	2,900
Benzo(b)fluoranthene	2,600
Benzo(k)fluoranthene	2,400
Chrysene	4,200
Dibenz(a,h)anthracene	390
Indeno(1,2,3-cd)pyrene	2,500
Mercury	0.9
SB3 (13-15')	
1,2,4-Trimethylbenzene	470,000
1,3,5-Trimethylbenzene	160,000
Benzene	710
Ethylbenzene	45,000
m&p-Xylenes	68,000
Naphthalene	48,000
n-Butylbenzene	93,000
n-Propylbenzene	72,000
o-Xylene	14,000
sec-Butylbenzene	71,000
tert-Butylbenzene	6,500
Toluene	820
Indeno(1,2,3-cd)pyrene	520
4,4' -DDD	6.8
SB3 (20-22')	
NO EXCEEDANCES	

SB10 (0-2')	
Benz(a)anthracene	14,000
Benzo(a)pyrene	12,000
Benzo(b)fluoranthene	12,000
Benzo(k)fluoranthene	11,000
Chrysene	14,000
Dibenz(a,h)anthracene	1,500
Indeno(1,2,3-cd)pyrene	9,400
Lead	130
Mercury	0.48
SB10 (20-22')	
1,2,4-Trimethylbenzene	100,000
1,3,5-Trimethylbenzene	43,000
Benzene	5,000
Ethylbenzene	28,000
m&p-Xylenes	150,000
Naphthalene	13,000
n-Propylbenzene	15,000
o-Xylene	50,000
Toluene	2,300
Indeno(1,2,3-cd)pyrene	810

SB4 (0-2')	
1,2,4-Trimethylbenzene	67,000
1,3,5-Trimethylbenzene	33,000
Ethylbenzene	7,000
m&p-Xylenes	23,000
n-Butylbenzene	16,000
n-Propylbenzene	11,000
o-Xylene	6,300
SB4 (14-15')	
1,2,4-Trimethylbenzene	73,000
1,3,5-Trimethylbenzene	34,000
Ethylbenzene	7,600
m&p-Xylenes	24,000
n-Butylbenzene	14,000
n-Propylbenzene	11,000
o-Xylene	7,900

SB6 (0-2')	
Indeno(1,2,3-cd)pyrene	1,000
4,4' -DDT	4.4
Dieldrin	5.9
Arsenic	13.4
Barium	372
Copper	61.5
Lead	1,380
Mercury	8.61
Zinc	181
SB6 (20-22')	
4,4' -DDD	12

SB7 (0-2')	
Arsenic	17.3
Copper	101
Lead	991
Mercury	14.5
Zinc	919
SB7 (11-13')	
n-Propylbenzene	5,100
SB7 (20-22')	
NO EXCEEDANCES	

SB8 (12-14')	
1,2,4-Trimethylbenzene	130,000
1,3,5-Trimethylbenzene	54,000
Acetone	6,700
Ethylbenzene	14,000
m&p-Xylenes	35,000
Naphthalene	15,000
n-Butylbenzene	23,000
n-Propylbenzene	20,000
o-Xylene	5,700
sec-Butylbenzene	20,000
Dibenz(a,h)anthracene	7,100
Indeno(1,2,3-cd)pyrene	6,300
Naphthalene	13,000
SB8 (20-22')	
NO EXCEEDANCES	

SB9 (0-2')	
Benz(a)anthracene	6,200
Benzo(a)pyrene	6,000
Benzo(b)fluoranthene	5,800
Benzo(k)fluoranthene	4,500
Chrysene	6,500
Dibenz(a,h)anthracene	1,400
Indeno(1,2,3-cd)pyrene	4,800
Barium	1,040
Copper	89.5
Lead	2,190
Mercury	3.09
Zinc	940
SB9 (20-22')	
Acetone	7,200
n-Butylbenzene	59,000
n-Propylbenzene	31,000
sec-Butylbenzene	56,000

SB5 (0-2')	
1,2,4-Trimethylbenzene	160,000
1,3,5-Trimethylbenzene	86,000
Ethylbenzene	3,000
m&p-Xylenes	24,000
Naphthalene	17,000
n-Propylbenzene	24,000
o-Xylene	8,900
SB5 (20-22')	
1,2,4-Trimethylbenzene	120,000
1,3,5-Trimethylbenzene	73,000
Ethylbenzene	2,900
m&p-Xylenes	3,500
n-Butylbenzene	16,000
n-Propylbenzene	25,000
o-Xylene	11,000
sec-Butylbenzene	17,000
4,4' -DDD	63

KEY:

- Property Boundary
- Soil Boring Location
- Groundwater Sampling Location
- Soil Vapor Sampling Location
- (GT) Potential UST Location
- (FP) Fill Port Location

SCALE:

0 20 45

Scale: 1 inch = 45 feet

VOCs, SVOCs, PCBs, and Pesticides	ug/Kg
Metals	mg/Kg

Detections Above Unrestricted Use SCOs

Detections Above Restricted Residential Use SCOs

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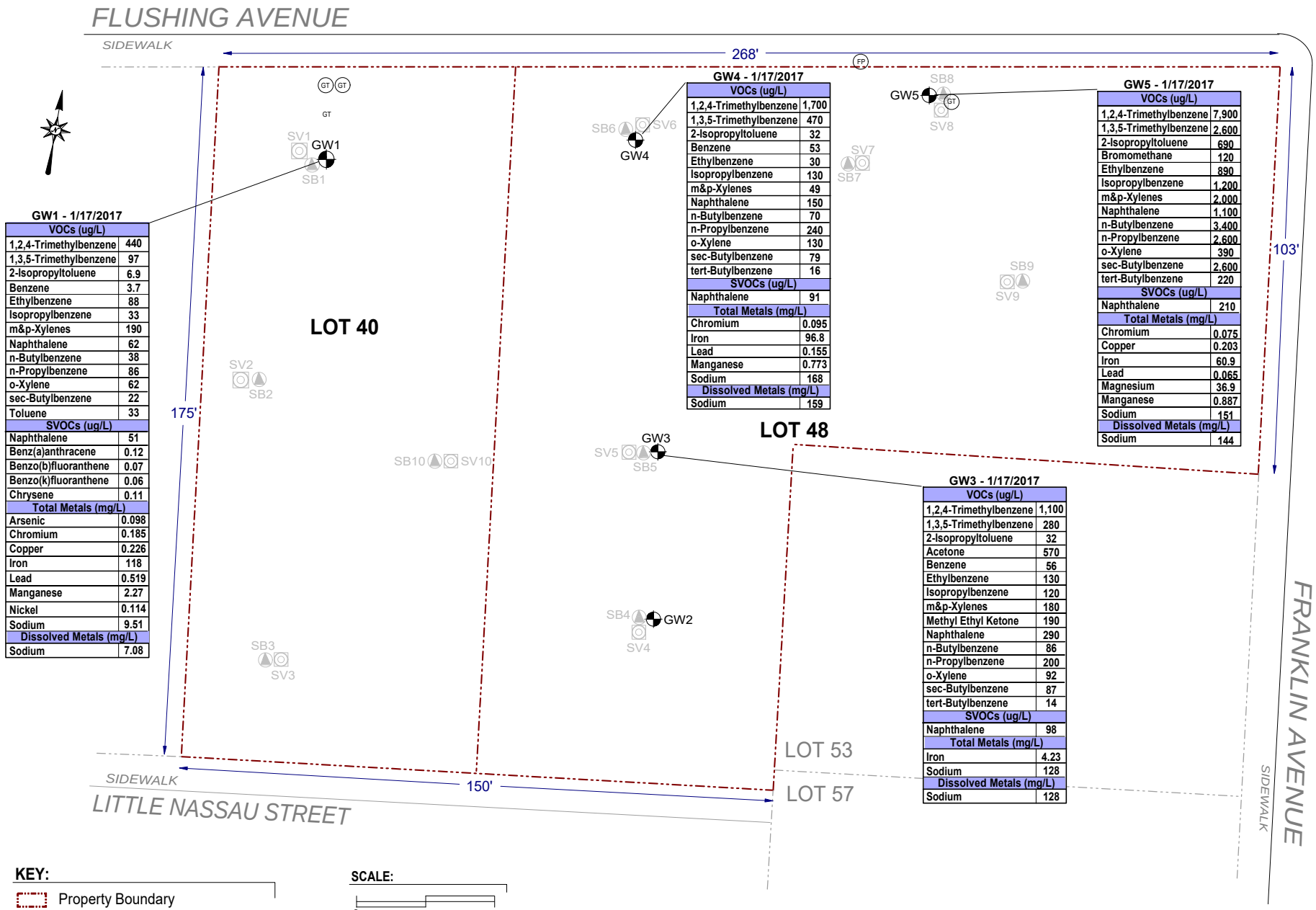
Figure No. 8

Site Name: FORMER NY CLEANING AND DYEING SITE

Site Address: 376-378 FLUSHING AVENUE, BROOKLYN, NY

Drawing Title: POSTED SOIL RESULTS ABOVE UUSCO/RRSCOs



GW1 - 1/17/2017

VOCs (ug/L)	
1,2,4-Trimethylbenzene	440
1,3,5-Trimethylbenzene	97
2-Isopropyltoluene	6.9
Benzene	3.7
Ethylbenzene	88
Isopropylbenzene	33
m&p-Xylenes	190
Naphthalene	62
n-Butylbenzene	38
n-Propylbenzene	86
o-Xylene	62
sec-Butylbenzene	22
Toluene	33
SVOCs (ug/L)	
Naphthalene	51
Benz(a)anthracene	0.12
Benzo(b)fluoranthene	0.07
Benzo(k)fluoranthene	0.06
Chrysene	0.11
Total Metals (mg/L)	
Arsenic	0.098
Chromium	0.185
Copper	0.226
Iron	118
Lead	0.519
Manganese	2.27
Nickel	0.114
Sodium	9.51
Dissolved Metals (mg/L)	
Sodium	7.08

GW4 - 1/17/2017

VOCs (ug/L)	
1,2,4-Trimethylbenzene	1,700
1,3,5-Trimethylbenzene	470
2-Isopropyltoluene	32
Benzene	53
Ethylbenzene	30
Isopropylbenzene	130
m&p-Xylenes	49
Naphthalene	150
n-Butylbenzene	70
n-Propylbenzene	240
o-Xylene	130
sec-Butylbenzene	79
tert-Butylbenzene	16
SVOCs (ug/L)	
Naphthalene	91
Total Metals (mg/L)	
Chromium	0.095
Iron	96.8
Lead	0.155
Manganese	0.773
Sodium	168
Dissolved Metals (mg/L)	
Sodium	159

GW5 - 1/17/2017

VOCs (ug/L)	
1,2,4-Trimethylbenzene	7,900
1,3,5-Trimethylbenzene	2,600
2-Isopropyltoluene	690
Bromomethane	120
Ethylbenzene	890
Isopropylbenzene	1,200
m&p-Xylenes	2,000
Naphthalene	1,100
n-Butylbenzene	3,400
n-Propylbenzene	2,600
o-Xylene	390
sec-Butylbenzene	2,600
tert-Butylbenzene	220
SVOCs (ug/L)	
Naphthalene	210
Total Metals (mg/L)	
Chromium	0.075
Copper	0.203
Iron	60.9
Lead	0.065
Magnesium	36.9
Manganese	0.887
Sodium	151
Dissolved Metals (mg/L)	
Sodium	144

GW3 - 1/17/2017

VOCs (ug/L)	
1,2,4-Trimethylbenzene	1,100
1,3,5-Trimethylbenzene	280
2-Isopropyltoluene	32
Acetone	570
Benzene	56
Ethylbenzene	130
Isopropylbenzene	120
m&p-Xylenes	180
Methyl Ethyl Ketone	190
Naphthalene	290
n-Butylbenzene	86
n-Propylbenzene	200
o-Xylene	92
sec-Butylbenzene	87
tert-Butylbenzene	14
SVOCs (ug/L)	
Naphthalene	98
Total Metals (mg/L)	
Iron	4.23
Sodium	128
Dissolved Metals (mg/L)	
Sodium	128

KEY:

- Property Boundary
- Groundwater Sampling Location
- Soil Boring Location
- Soil Vapor Sampling Location
- Potential UST Location
- Fill Port Location

SCALE:

0 — 35

Scale: 1 inch = 35 feet

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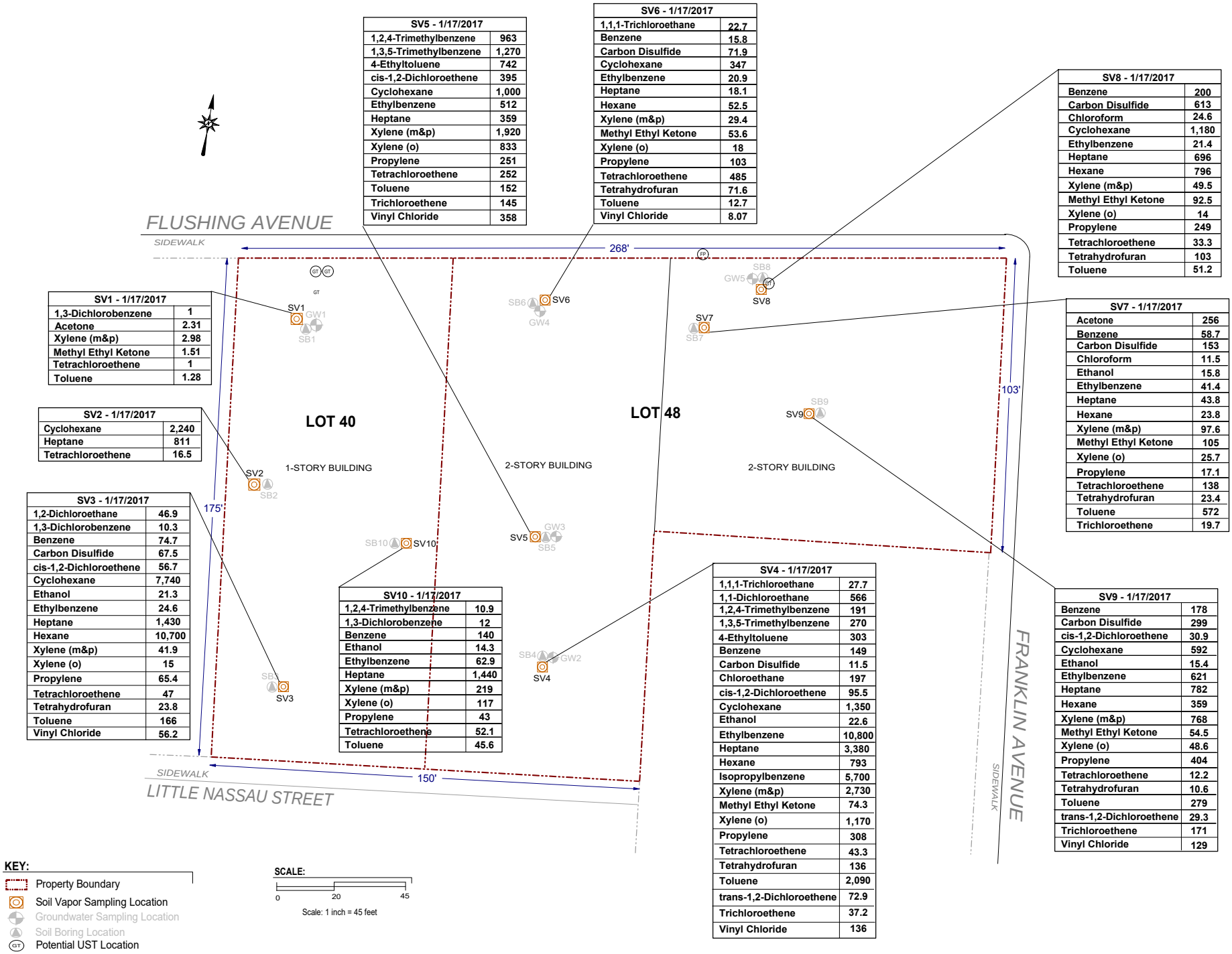
Figure No. 9

Site Name: Former NY Cleaning and Dyeing Site

Site Address: 376-378 Flushing Avenue, Brooklyn, NY

Drawing Title: Posted Groundwater Results above AWQS



SV5 - 1/17/2017	
1,2,4-Trimethylbenzene	963
1,3,5-Trimethylbenzene	1,270
4-Ethyltoluene	742
cis-1,2-Dichloroethene	395
Cyclohexane	1,000
Ethylbenzene	512
Heptane	359
Xylene (m&p)	1,920
Xylene (o)	833
Propylene	251
Tetrachloroethene	252
Toluene	152
Trichloroethene	145
Vinyl Chloride	358

SV6 - 1/17/2017	
1,1,1-Trichloroethane	22.7
Benzene	15.8
Carbon Disulfide	71.9
Cyclohexane	347
Ethylbenzene	20.9
Heptane	18.1
Hexane	52.5
Xylene (m&p)	29.4
Methyl Ethyl Ketone	53.6
Xylene (o)	18
Propylene	103
Tetrachloroethene	485
Tetrahydrofuran	71.6
Toluene	12.7
Vinyl Chloride	8.07

SV8 - 1/17/2017	
Benzene	200
Carbon Disulfide	613
Chloroform	24.6
Cyclohexane	1,180
Ethylbenzene	21.4
Heptane	696
Hexane	796
Xylene (m&p)	49.5
Methyl Ethyl Ketone	92.5
Xylene (o)	14
Propylene	249
Tetrachloroethene	33.3
Tetrahydrofuran	103
Toluene	51.2

SV1 - 1/17/2017	
1,3-Dichlorobenzene	1
Acetone	2.31
Xylene (m&p)	2.98
Methyl Ethyl Ketone	1.51
Tetrachloroethene	1
Toluene	1.28

SV7 - 1/17/2017	
Acetone	256
Benzene	58.7
Carbon Disulfide	153
Chloroform	11.5
Ethanol	15.8
Ethylbenzene	41.4
Heptane	43.8
Hexane	23.8
Xylene (m&p)	97.6
Methyl Ethyl Ketone	105
Xylene (o)	25.7
Propylene	17.1
Tetrachloroethene	138
Tetrahydrofuran	23.4
Toluene	572
Trichloroethene	19.7

SV2 - 1/17/2017	
Cyclohexane	2,240
Heptane	811
Tetrachloroethene	16.5

SV3 - 1/17/2017	
1,2-Dichloroethane	46.9
1,3-Dichlorobenzene	10.3
Benzene	74.7
Carbon Disulfide	67.5
cis-1,2-Dichloroethene	56.7
Cyclohexane	7,740
Ethanol	21.3
Ethylbenzene	24.6
Heptane	1,430
Hexane	10,700
Xylene (m&p)	41.9
Xylene (o)	15
Propylene	65.4
Tetrachloroethene	47
Tetrahydrofuran	23.8
Toluene	166
Vinyl Chloride	56.2

SV10 - 1/17/2017	
1,2,4-Trimethylbenzene	10.9
1,3-Dichlorobenzene	12
Benzene	140
Ethanol	14.3
Ethylbenzene	62.9
Heptane	1,440
Xylene (m&p)	219
Xylene (o)	117
Propylene	43
Tetrachloroethene	52.1
Toluene	45.6

SV4 - 1/17/2017	
1,1,1-Trichloroethane	27.7
1,1-Dichloroethane	566
1,2,4-Trimethylbenzene	191
1,3,5-Trimethylbenzene	270
4-Ethyltoluene	303
Benzene	149
Carbon Disulfide	11.5
Chloroethane	197
cis-1,2-Dichloroethene	95.5
Cyclohexane	1,350
Ethanol	22.6
Ethylbenzene	10,800
Heptane	3,380
Hexane	793
Isopropylbenzene	5,700
Xylene (m&p)	2,730
Methyl Ethyl Ketone	74.3
Xylene (o)	1,170
Propylene	308
Tetrachloroethene	43.3
Tetrahydrofuran	136
Toluene	2,090
trans-1,2-Dichloroethene	72.9
Trichloroethene	37.2
Vinyl Chloride	136

SV9 - 1/17/2017	
Benzene	178
Carbon Disulfide	299
cis-1,2-Dichloroethene	30.9
Cyclohexane	592
Ethanol	15.4
Ethylbenzene	621
Heptane	782
Hexane	359
Xylene (m&p)	768
Methyl Ethyl Ketone	54.5
Xylene (o)	48.6
Propylene	404
Tetrachloroethene	12.2
Tetrahydrofuran	10.6
Toluene	279
trans-1,2-Dichloroethene	29.3
Trichloroethene	171
Vinyl Chloride	129

KEY:

- Property Boundary
- Soil Vapor Sampling Location
- Groundwater Sampling Location
- Soil Boring Location
- Potential UST Location
- Fill Port Location

SCALE:

0 20 45

Scale: 1 inch = 45 feet

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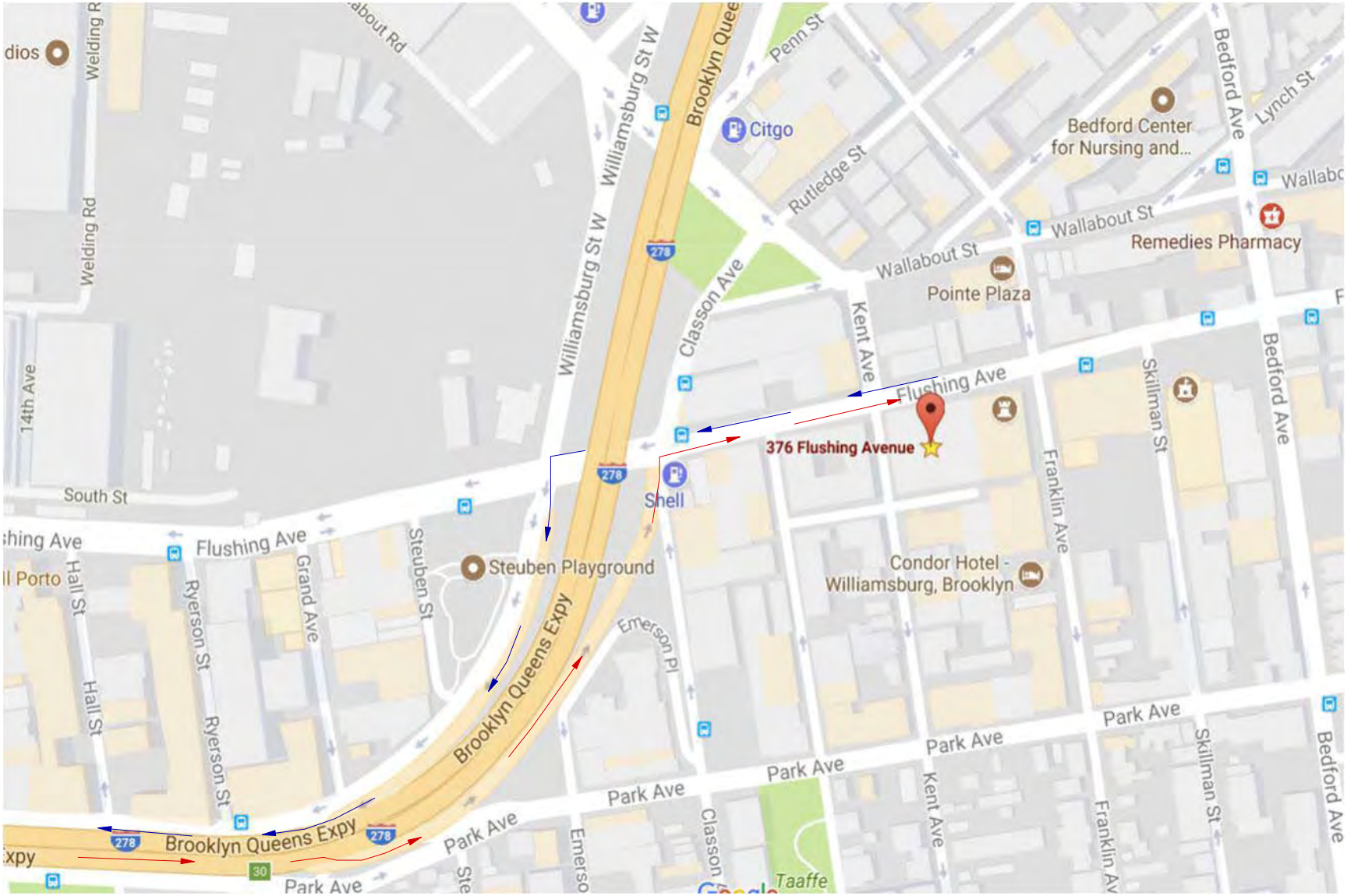
Figure No. 10

Site Name: Former NY Cleaning and Dyeing Site

Site Address: 376-378 Flushing Avenue, Brooklyn, NY

Drawing Title: Posted Soil Vapor Results



Key:

Truck Route From Site

Truck Route To Site

AMC Engineeting, PLLC 18-36 42nd Street Astoria, NY 11105	*Figure No.* **11**	Site Name:	FORMER NY CLEANING AND DYEING SITE
		Site Address:	376-378 FLUSHING AVENUE, BROOKLYN, NY
		Drawing Title:	TRUCK ROUTES

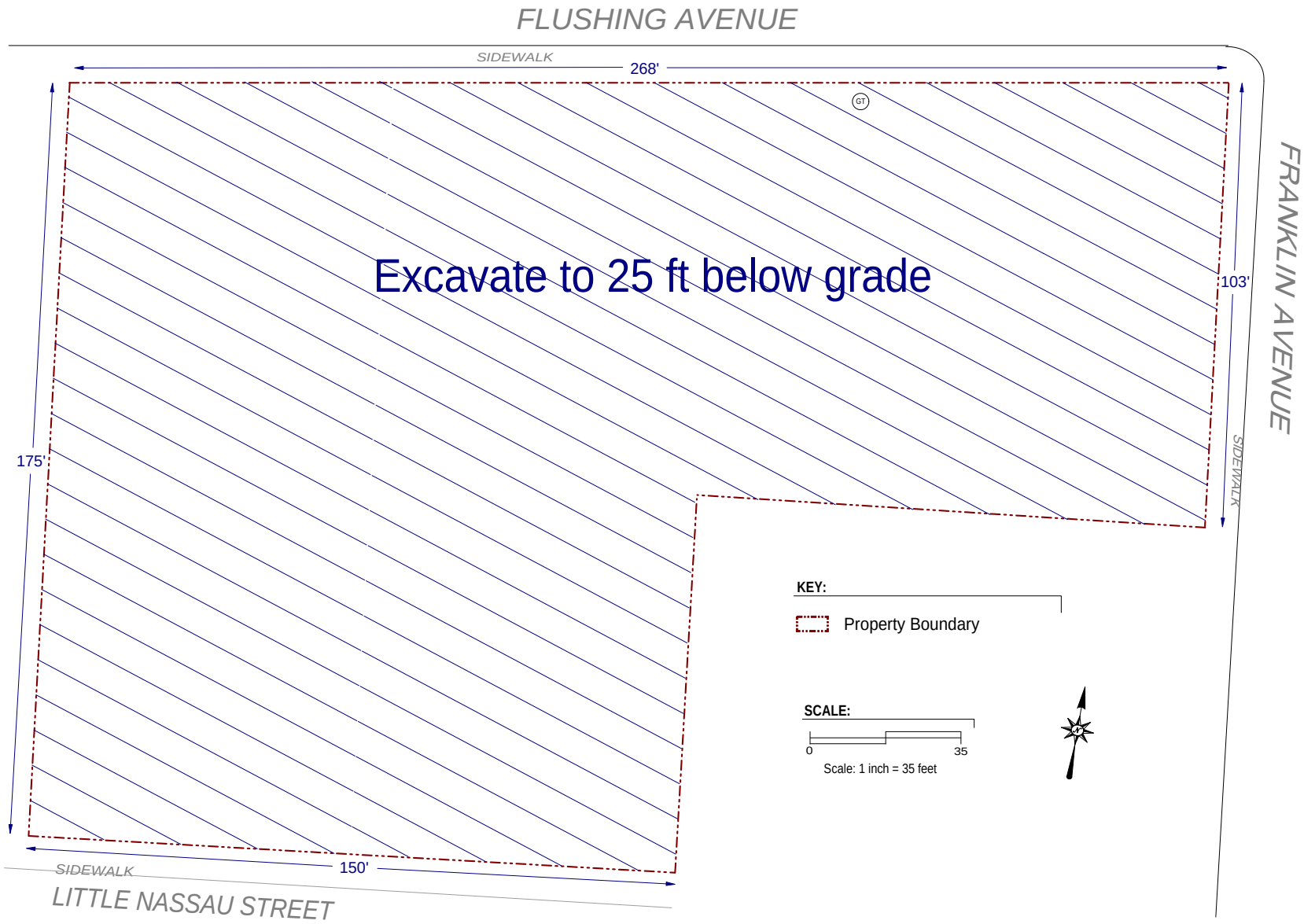


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Figure No.
12

Site Name: FORMER NY CLEANING AND DYEING SITE
Site Address: 376-378 FLUSHING AVENUE, BROOKLYN, NY
Drawing Title: PLANNED CONSTRUCTION EXCAVATION DEPTHS

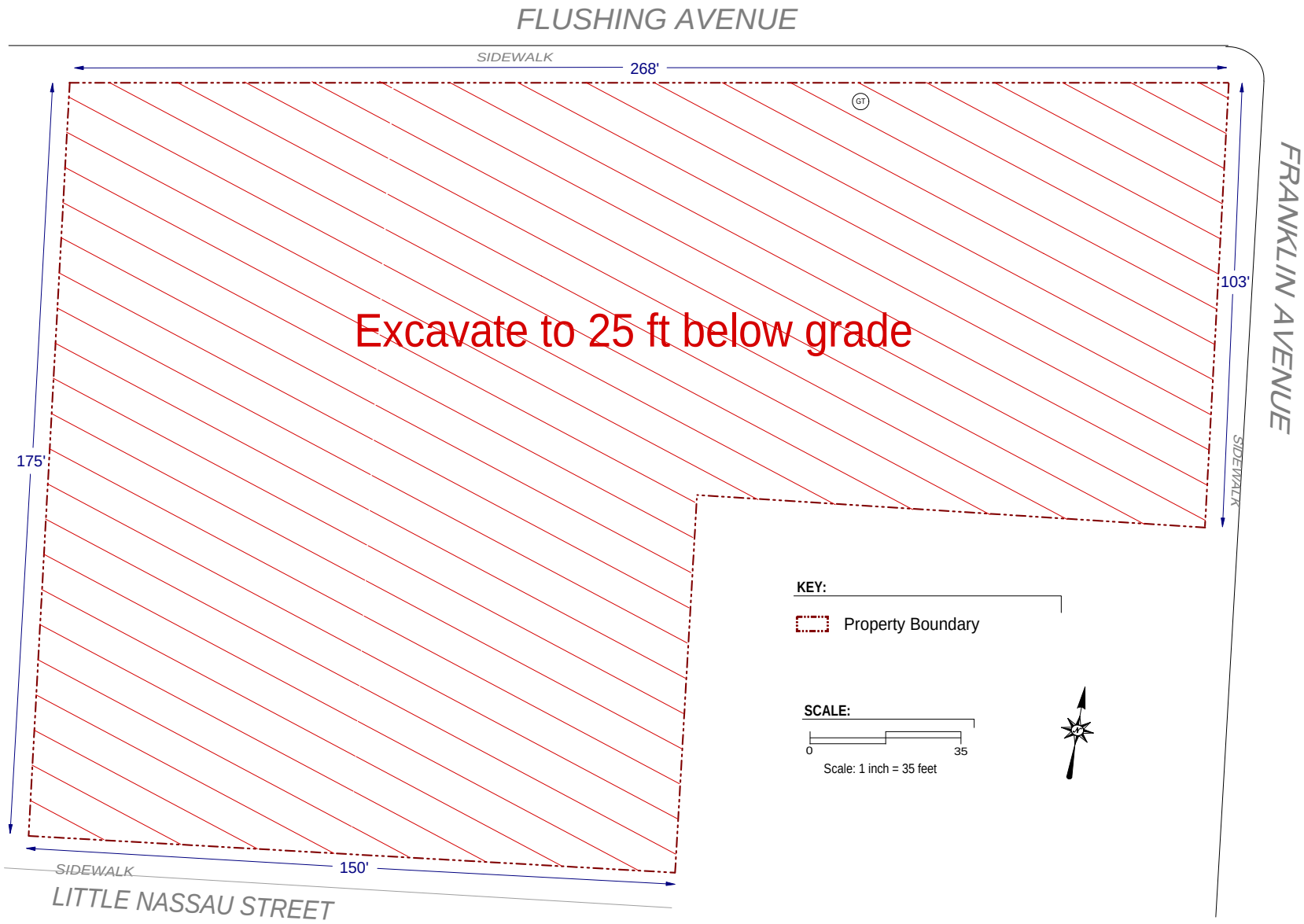

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Figure No.
13

Site Name: FORMER NY CLEANING AND DYEING SITE
Site Address: 376-378 FLUSHING AVENUE, BROOKLYN, NY
Drawing Title: REMEDIAL EXCAVATION PLAN

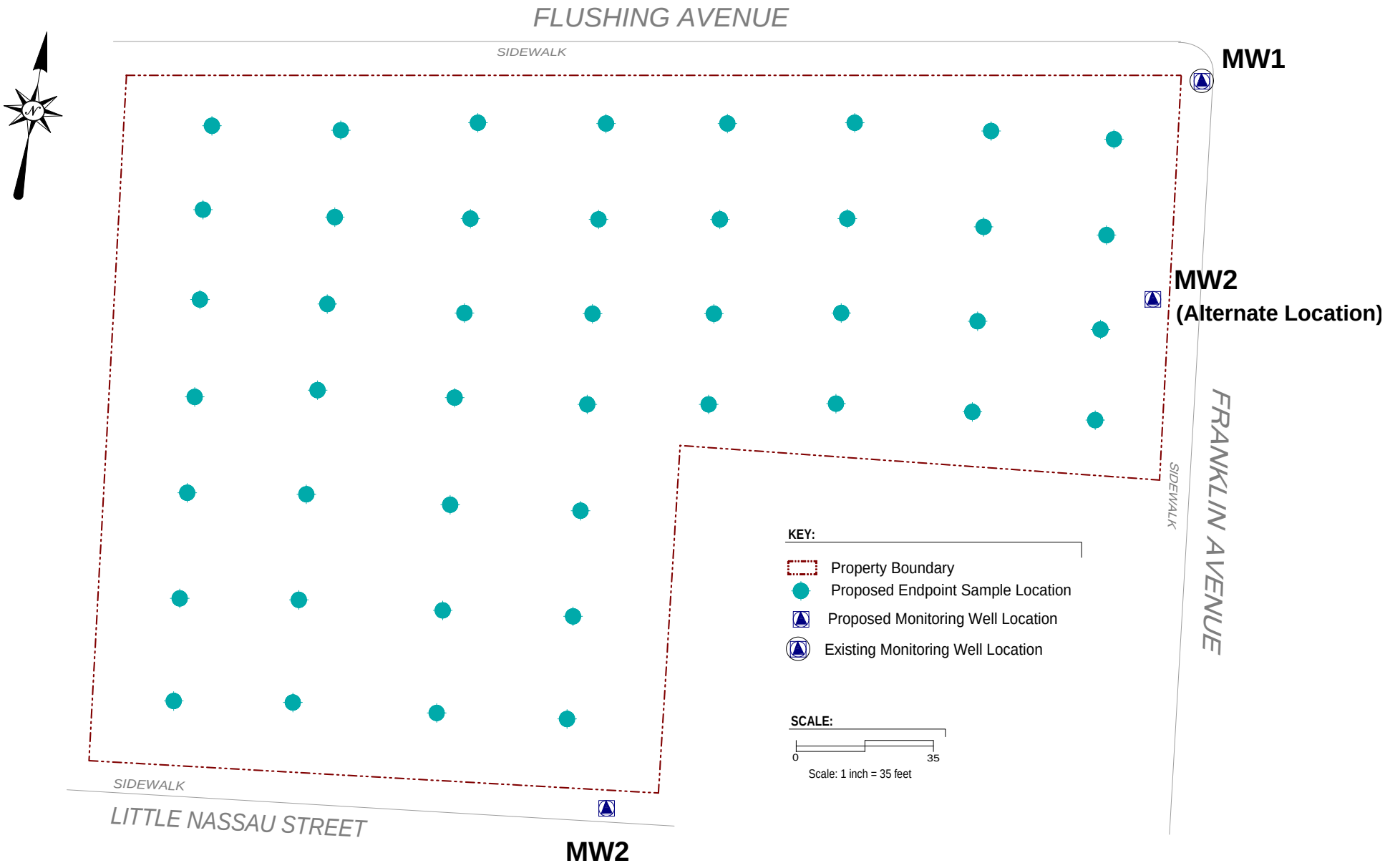

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Figure No.
14

Site Name: FORMER NY CLEANING AND DYEING SITE
Site Address: 376-378 FLUSHING AVENUE, BROOKLYN, NY
Drawing Title: ENDPOINT SAMPLING LOCATIONS

ATTACHMENT A
Metes and Bounds Description of Property

METES AND BOUNDS – 376-378 Flushing Avenue (Block 1884, Lots 40 and 48)

Lot 40

BEGINNING at a point on the southerly side of Flushing Avenue, distant 50 feet 2 inches easterly from the corner formed by the intersection of the southerly side of Flushing Avenue with the easterly side of Kent Avenue;

RUNNING THENCE southerly and parallel with Kent Avenue, 174 feet 6 inches to the northerly side of Little Nassau Street;

THENCE easterly, along the northerly side of Little Nassau Street, 75 feet 3-1/4 inches (75 feet 1-7/8 inches actual) to a point which is 125 feet 3-1/4 inches easterly from the corner formed by the intersection of the northerly side of Little Nassau Street with the easterly side of Kent Avenue;

THENCE northerly, in a straight line to a point on the southerly side of Flushing Avenue, which is 125 feet 2-1/8 inches easterly from the corner formed by the intersection of the southerly side of Flushing Avenue with the easterly side of Kent Avenue;

THENCE westerly, along the southerly side of Flushing Avenue, 75 feet 1/8 of an inch more or less to the point or place of BEGINNING.

Lot 48

BEGINNING at the corner formed by the intersection of the southerly side of Flushing Avenue and the westerly side of Franklin Avenue;

RUNNING THENCE along the southerly side of Flushing Avenue 193 feet 7-1/8 inches west to a point on the dividing line between lot numbers 3 and 4 as laid down on a certain map entitled "Map of Lands of General Jeremiah Johnson filed on 2/2/1839" which map was filed in the Kings County Clerk's Office as Map No. 246;

RUNNING THENCE along said dividing line south 178 feet 3 inches to the northerly side of Little Nassau Street;

RUNNING THENCE along said northerly side of Little Nassau Street east 75 feet ½ inch to a point on the dividing line between the easterly side of lands shown on the aforesaid map and the westerly side of lands shown on the map of lands of John Skillman dated 1/1/1835;

RUNNING THENCE north along the dividing line of the aforesaid lands north 86 feet 1-1/2 inches to the point or place of BEGINNING.

ATTACHMENT B
Health & Safety Plan

FORMER NY CLEANING AND DYEING SITE
376-378 FLUSHING AVENUE
BROOKLYN, NEW YORK
Block 1884, Lots 40 & 48

CONSTRUCTION
HEALTH AND SAFETY PLAN

February 2018

Prepared for:
Riverside Developers USA, Inc.
266 Broadway, Suite 301
Brooklyn, New York 11211

Prepared by:

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS
1808 Middle Country Road
Ridge, NY 11961

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Figure 1 Route to Hospital (Appendix D)

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APPENDIX D HOSPITAL INFORMATION, MAP AND FIELD ACCIDENT REPORT

STATEMENT OF COMMITMENT

This Construction Health and Safety Plan (CHASP) has been prepared to ensure that workers are not exposed to risks from hazardous materials during the Remedial Action at 376-378 Flushing Avenue, Brooklyn, NY

This CHASP, which applies to persons present at the site actually or potentially exposed to hazardous materials, describes emergency response procedures for actual and potential chemical hazards. This CHASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy by signing off on receipt of their individual copy of the document. Contractors and suppliers are retained as independent contractors and are responsible for ensuring the health and safety of their own employees.

1.0 INTRODUCTION AND SITE ENTRY REQUIREMENTS

This document describes the health and safety guidelines developed by Environmental Business Consultants (EBC) for the planned Remedial Action at the 376-378 Flushing Avenue, Brooklyn, New York to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes during remedial activities. In accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response Final rule, this CHASP, including the attachments, addresses safety and health hazards related to excavation, loading and other soil disturbance activities and is based on the best information available. The CHASP may be revised by EBC at the request of Riverside Developers USA, Inc. and/or a regulatory agency upon receipt of new information regarding site conditions. Changes will be documented by written amendments signed by EBC's project manager, site safety officer and/or the EBC health and safety consultant.

Work performed under the remedial action will not involve confined space entry since the excavations will be large and sloped back in accordance with NYCDOB shoring requirements and will not have a limited or restricted means for entry or exit.

1.1 Training Requirements

Personnel entering the exclusion zone or decontamination zone are required to be certified in health and safety practices for hazardous waste site operations as specified in the Federal OSHA Regulations CFR 1910.120e (revised 3/6/90).

Paragraph (e - 3) of the above referenced regulations requires that all on-site management personnel directly responsible for or who supervise employees engaged in hazardous waste operations, must initially receive 8 hours of supervisor training related to managing hazardous waste work. Paragraph (e - 8) of the above referenced regulations requires that workers and supervisors receive 8 hours of refresher training annually on the items specified in Paragraph (e-1) and/or (e-3).

Additionally all on-site personnel must receive adequate site-specific training in the form of an on-site Health and Safety briefing prior to participating in field work with emphasis on the following:

- Protection of the adjacent community from hazardous vapors and / or dust which may be released during intrusive activities.
- Identification of chemicals known or suspected to be present on-site and the health effects and hazards of those substances.
- The need for vigilance in personnel protection, and the importance of attention to proper use, fit and care of personnel protective equipment.
- Decontamination procedures.
- Site control including work zones, access and security.
- Hazards and protection against heat or cold.
- The proper observance of daily health and safety practices, such as entry and exit of work zones and site. Proper hygiene during lunch, break, etc.
- Emergency procedures to be followed in case of fire, explosion and sudden release of hazardous gases.

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Health and Safety meetings will be conducted on a daily basis and will cover protective clothing and other equipment to be used that day, potential and chemical and physical hazards, emergency procedures, and conditions and activities from the previous day.

1.2 Medical Monitoring Requirements

Field personnel and visitors entering the exclusion zone or decontamination zone must have completed appropriate medical monitoring required under OSHA 29 CFR 1910.120(f) if respirators or other breathing related PPE is needed. Medical monitoring enables a physician to monitor each employee's health, physical condition, and his fitness to wear respiratory protective equipment and carry out on-site tasks.

1.3 Site Safety Plan Acceptance, Acknowledgment and Amendments

The project superintendent and the site safety officer are responsible for informing personnel (EBC employees and/or owner or owners representatives) entering the work area of the contents of this plan and ensuring that each person signs the safety plan acknowledging the on-site hazards and procedures required to minimize exposure to adverse effects of these hazards. A copy of the Acknowledgement Form is included in **Appendix A**.

Site conditions may warrant an amendment to the CHASP. Amendments to the CHASP are acknowledged by completing forms included in **Appendix B**.

1.4 Key Personnel - Roles and Responsibilities

Personnel responsible for implementing this Health and Safety Plan are:

Name	Title	Address	Contact Numbers
Keith Butler	EBC- Project Manager	1808 Middle Country Rd Ridge, NY 11961	(631) 504-6000
Kevin Waters	Health and Safety Officer	1808 Middle Country Rd Ridge, NY 11961	(631) 504-6000

The project manager is responsible for overall project administration and, with guidance from the site safety officer, for supervising the implementation of this CHASP. The site safety officer will conduct daily (tail gate or tool box) safety meetings at the project site and oversee daily safety issues. Each subcontractor and supplier (defined as an OSHA employer) is also responsible for the health and safety of its employees. If there is any dispute about health and safety or project activities, on-site personnel will attempt to resolve the issue. If the issue cannot be resolved at the site, then the project manager will be consulted.

The site safety officer is also responsible for coordinating health and safety activities related to hazardous material exposure on-site. The site safety officer is responsible for the following:

1. Educating personnel about information in this CHASP and other safety requirements to be observed during site operations, including, but not limited to, decontamination procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and first aid.

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2. Coordinating site safety decisions with the project manager.

3. Designating exclusion, decontamination and support zones on a daily basis.

4. Monitoring the condition and status of known on-site hazards and maintaining and implementing the air quality monitoring program specified in this CHASP.

5. Maintaining the work zone entry/exit log and site entry/exit log.

6. Maintaining records of safety problems, corrective measures and documentation of chemical exposures or physical injuries (the site safety officer will document these conditions in a bound notebook and maintain a copy of the notebook on-site).

The person who observes safety concerns and potential hazards that have not been addressed in the daily safety meetings should immediately report their observations/concerns to the site safety officer or appropriate key personnel.

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2.0 SITE BACKGROUND AND SCOPE OF WORK

The street address for the Site is 376-378 Flushing Avenue, Brooklyn, NY. The Site is located in the Bedford Stuyvesant section of Kings County and is comprised of a two tax parcels totaling 39,307 square feet (0.902 acre). The Site consists of approximately 269 ft of street frontage along Flushing Avenue and approximately 103 ft of street frontage along Franklin Avenue. Currently the property is developed with four adjacent buildings. Lot 40 is developed with a one-story commercial building approximately 13,250 ft^2 in size, currently occupied by a door and molding company. Lot 48 is developed with three, two-story commercial buildings occupied by an approximate 11,932 ft^2 catering hall, an approximate 11,400 ft^2 warehouse for the door and molding company (on Lot 40), and an approximate 1,595 ft^2 office space.. These buildings are being demolished as part of the redevelopment of the Site.

2.1 Previous Investigations

2.1.1 April 2017 - Remedial Investigation Report (Environmental Business Consultants)
The field work portion of the RI was conducted by Environmental Business Consultants (EBC) on January 12th, 13th and 17th of 2017 during the Phase II investigation, in accordance with the protocols and methods as established in the approved Remedial Investigation Workplan.

Subsurface soils at the site include a silty non-native fill, fine to coarse sand and sandy silt to a depth of approximately 12 feet below grade followed by brown-gray sandy clay to a depth of at least 22 feet below grade.

Groundwater at the Site is present at a depth of approximately 9 to 13 feet below surface grade within the historic fill material and flows in an east/southeasterly direction.
The results of the RI identified petroleum contamination present across the Site to depths of at least 22 feet below grade. The release scenario is unknown but appears to be related to two former gasoline underground storage tanks (USTs) in the northern portion of Lot 40; and one gasoline UST in the northern portion of Lot 48. Petroleum VOCs appear to have been transferred to the groundwater through direct contact with impacted soil in the vicinity of the USTs.

Petroleum VOCs which transferred to the dissolved phase have been migrating with groundwater flow to the southeast. Free-phase petroleum product was identified in a groundwater sample collected closest to the approximate location of the former UST in Lot 48. Off-gassing of VOCs is significant in the southern portion of Lot 48, where BTEX concentrations were detected at high concentrations. Chlorinated VOCs were also present at elevated concentrations in soil vapor samples. The highest concentrations of CVOCs were found to be in the area of the former dry cleaning operation on Lot 48. No CVOC were detected in any of the soil or groundwater samples. Off-gassing of petroleum-related compounds is occurring in the mid-to-southern portions of the Site.

2.2 Redevelopment Plans

The Remedial Action to be performed under the RAWP is intended to make the Site protective of human health and the environment consistent with the contemplated end use. The proposed redevelopment plan and end use is described here to provide the basis for this assessment. The

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Remedial Action contemplated under this RAWP may be implemented independent of the proposed redevelopment plan.

The Site will be redeveloped through the construction of a new 8-story mixed-use building. The building will have an approximate 39,307 ft2 cellar which will be utilized for storage, mechanical rooms, and a ventilated parking garage. The cellar will have both stair and elevator access, and will require excavation of the entire property to a depth of approximately 25 feet below grade. The first floor will contain retail/commercial space as well as the residential lobby. Floors 2 through 8 will contain residential apartments.

2.3 Description of Remedial Action

The remedy recommended for the site is a Track 1 alternative (Alternative 1) which consists of the removal of the soils to Unrestricted Use SCOs and/or the applicable protection of groundwater SCOs, to a depth of 25 feet below grade. Additional excavation for VOCs exceeding UUSCOs will be completed to the extent practical with *in-situ* treatment with chemical oxidants applied if necessary. The Track 1 alternative also includes remediation of groundwater through dewatering during excavation activities. Over-excavated areas will be backfilled with either virgin mined materials, recycled materials or certified fill which meets the requirements of 6 NYCRR Part 375 -6.7(d)(1)(ii)(b). The remedy will include the following items:

1. Removal of underground storage tanks;
2. Excavation of soil/fill exceeding Track 1 Unrestricted Use and/or the applicable protection of groundwater SCOs as listed in Table 1 to a depth of 25 feet below grade;
3. Treatment of residual soil contamination via application of chemical oxidants if needed as a contingency;
4. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
5. Collection and analysis of end-point soil samples and post-remedial groundwater samples to evaluate the performance of the remedy with respect to attainment of unrestricted SCOs and groundwater standards;
6. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
7. Import of materials to be used for backfill and cover in compliance with 6NYCRR Part 375-6.7(d)(1): (1) chemical limits and other specifications included in **Table 1**, (2) all Federal, State and local rules and regulations for handling and transport of material.
8. All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations;
9. If Track 1 cleanup is not achieved, implementation of a Site Management Plan (SMP) for long term maintenance of the Engineering Controls.
10. If Track 1 cleanup is not achieved, an Environmental Easement will be filed against the Site to ensure implementation of the SMP.

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3.0 HAZARD ASSESSMENT

This section identifies the hazards associated with the proposed scope of work, general physical hazards that can be expected at most sites; and presents a summary of documented or potential chemical hazards at the site. Every effort must be made to reduce or eliminate these hazards. Those that cannot be eliminated must be guarded against using engineering controls and/or personal protective equipment.

3.1 Physical Hazards

3.1.1 Tripping Hazards

An area of risk associated with on-site activities are presented by uneven ground, concrete, curbstones or equipment which may be present at the site thereby creating a potential tripping hazard. During intrusive work, care should be taken to mark or remove any obstacles within the exclusion zone.

3.1.2 Climbing Hazards

During site activities, workers may have to work on excavating equipment by climbing. The excavating contractor will conform with any applicable NIOSH and OSHA requirements or climbing activities.

3.1.3 Cuts and Lacerations

Field activities that involve excavating activities usually involve contact with various types of machinery. A first aid kit approved by the American Red Cross will be available during all intrusive activities.

3.1.4 Lifting Hazards

Improper lifting by workers is one of the leading causes of industrial injuries. Field workers in the excavation program may be required to lift heavy objects. Therefore, all members of the field crew should be trained in the proper methods of lifting heavy objects. All workers should be cautioned against lifting objects too heavy for one person.

3.1.5 Utility Hazards

Before conducting any excavation, the excavation contractor will be responsible for locating and verifying all existing utilities at each excavation.

3.1.6 Traffic Hazards

All traffic, vehicular and pedestrian, shall be maintained and protected at all times consistent with local, state and federal agency regulations regarding such traffic and in accordance with NYCDOT guidelines. The excavation contractor shall carry on his operations without undue interference or delays to traffic. The excavation contractor shall furnish all labor, materials, guards, barricades, signs, lights, and anything else necessary to maintain traffic and to protect his work and the public, during operations.

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3.2 Work in Extreme Temperatures

Work under extremely hot or cold weather conditions requires special protocols to minimize the chance that employees will be affected by heat or cold stress.

3.2.1 Heat Stress

The combination of high ambient temperature, high humidity, physical exertion, and personal protective apparel, which limits the dissipation of body heat and moisture, can cause heat stress.

The following prevention, recognition and treatment strategies will be implemented to protect personnel from heat stress. Personnel will be trained to recognize the symptoms of heat stress and to apply the appropriate treatment.

1. Prevention
    a. Provide plenty of fluids. Available in the support zone will be a 50% solution of fruit punch and water or plain water.
    b. Work in Pairs. Individuals should avoid undertaking any activity alone.
    c. Provide cooling devices. A spray hose and a source of water will be provided to reduce body temperature, cool protective clothing and/or act as a quick-drench shower in case of an exposure incident.
    d. Adjustment of the work schedule. As is practical, the most labor-intensive tasks should be carried out during the coolest part of the day.

2. Recognition and Treatment
    a Heat Rash (or prickly heat):
        Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.
        Symptoms: Eruption of red pimples around sweat ducts accompanied by intense itching and tingling.
        Treatment: Remove source or irritation and cool skin with water or wet cloths.

    b. Heat Cramps (or heat prostration)
        Cause: Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.
        Symptoms: Muscular weakness, staggering gait, nausea, dizziness, shallow breathing, pale and clammy skin, approximately normal body temperature.
        Treatment: Perform the following while making arrangement for transport to a medical facility. Remove the worker to a contamination reduction zone. Remove protective clothing. Lie worker down on back in a cool place and raise feet 6 to 12 inches. Keep warm, but loosen all clothing. If conscious, provide sips of salt-water solution, using one teaspoon of salt in 12 ounces of water. Transport to a medical facility.

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c. Heat Stroke

Cause:	Same as heat exhaustion. This is also an extremely serious condition.
Symptoms:	Dry hot skin, dry mouth, dizziness, nausea, headache, rapid pulse.
Treatment:	Cool worker immediately by immersing or spraying with cool water or sponge bare skin after removing protective clothing. Transport to hospital.

3.2.2 Cold Exposure

Exposure to cold weather, wet conditions and extreme wind-chill factors may result in excessive loss of body heat (hypothermia) and /or frostbite. To guard against cold exposure and to prevent cold injuries, appropriate warm clothing should be worn, warm shelter must be readily available, rest periods should be adjusted as needed, and the physical conditions of on-site field personnel should be closely monitored. Personnel and supervisors working on-site will be made aware of the signs and symptoms of frost bite and hypothermia such as:

- Shivering;
- reduced blood pressure;
- reduced coordination;
- drowsiness;
- impaired judgment;
- fatigue;
- pupils dilated but reactive to light; and,
- numbing of the toes and fingers.

3.3 Chemical Hazards

The RI Investigation identified chlorinated and petroleum volatile organic compounds (VOCs) in soil, groundwater, and soil vapor. SVOCs, pesticides and metals were detected within the soil and groundwater at the Site.

Based on the findings of the Remedial Investigation and the inherent properties of impacted soil and free product within one of the wells, the following compounds are considered for the site as potential contaminants: petroleum VOCs, SVOCs, pesticides and heavy metals.

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VOCs expected to be in the soil and groundwater includes the following:

1,2,4-Trimethylbenzene	Acetone	m&p-Xylenes	Bromomethane	n-butylbenzene
1,3,5-Trimethylbenzene	Benzene	Tert-butylbenzene	isopropylbenzene	Sec-butylbenzene
Ethylbezne	Toluene	2-isopropyltoluene	Methyl ethyl ketone	n-propylbenzene
Naphthalene	o-Xylene			

SVOCs expected to be in the soil and groundwater includes the following:

Benz(a)anthracene	Benzo(k)fluoranthene	Fluroanthene	Indeno(1,2,3-cd)pyrene	Naphthalene
Benzo(a)pyrene	Chrysene	Fluorene	pyrene	
Benzo(b)Fluoranthene	Dibenz(a,h)anthracene			

Pesticides expected to be in the soil and groundwater includes the following:

4,4'-DDD	4,4'-DDT	Dieldrin

Metals expected to be present in the soil and groundwater includes the following:

Arsenic	Barium	Chromium	Copper	Iron	Lead
Magnesium	Manganese	Mercury	Nickel	Sodium	Zinc

The primary routes of exposure to these contaminants are inhalation, ingestion and absorption.

Appendix C includes information sheets for suspected chemicals that may be encountered at the site. Also included under the appendix are procedures for handling and storing the chemical oxidant. These procedures will be followed to protect workers and the public.

3.3.1 Respirable Dust

Dust may be generated from vehicular traffic and/or excavation activities. If visible observation detects elevated levels of dust, a program of wetting will be employed by the site safety officer. If elevated dust levels persist, the site safety office will employ dust monitoring using a particulate monitor (Miniram or equivalent). If monitoring detects concentrations greater than 150 µg/m3 over daily background, the site safety officer will take corrective actions as defined herein, including the use of water for dust suppression and if this is not effective, requiring workers to wear APRs with high efficiency particulate air (HEPA) cartridges.

Absorption pathways for dust and direct contact with soils or groundwater will be mitigated with the implementation of latex gloves, hand washing and decontamination exercises when necessary.

3.3.2 Dust Control and Monitoring During Earthwork

Dust generated during excavation activities or other earthwork may contain contaminants identified in soils at the site. Dust will be controlled by wetting the working surface with water. Calcium chloride may be used if the problem cannot be controlled with water. Air monitoring and dust control techniques are specified in a site specific Dust Control Plan (if applicable). Site

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workers will not be required to wear APR's unless dust concentrations are consistently over 150 $\mu g/m^3$ over site-specific background in the breathing zone as measured by a dust monitor unless the site safety officer directs workers to wear APRs. The site safety officer will use visible dust as an indicator to implement the dust control plan.

3.3.3 Organic Vapors

Elevated levels of chlorinated VOCs were detected in soil, soil gas and groundwater samples collected during previous investigations at the site. Therefore, excavation activities may cause the release of organic vapors to the atmosphere. The site safety officer will periodically monitor organic vapors with a Photoionization Detector (PID) during excavation activities to determine whether organic vapor concentrations exceed action levels shown in Section 5 and/or the Community Air Monitoring Plan.

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4.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) shall be selected in accordance with the site air monitoring program, OSHA 29 CFR 1910.120(c), (g), and 1910.132. Protective equipment shall be NIOSH approved and respiratory protection shall conform to OSHA 29 CFR Part 1910.133 and 1910.134 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133; and foot protection shall conform to 1910.136. The only true difference among the levels of protection from D thru B is the addition of the type of respiratory protection. **It is anticipated that work will be performed in Level D PPE.**

4.1 Level D

Level D PPE shall be donned when the atmosphere contains no known hazards and work functions preclude splashes, immersion, or the potential for inhalation of, or contact with, hazardous concentrations of harmful chemicals. Level D PPE consists of:

- standard work uniform, coveralls, or tyvek, as needed;
- steel toe and steel shank work boots;
- hard hat;
- gloves, as needed;
- safety glasses;
- hearing protection;
- equipment replacements are available as needed.

4.2 Level C

Level C PPE shall be donned when the concentrations of measured total organic vapors in the breathing zone exceed background concentrations (using a portable OVA, or equivalent), but are less than 5 ppm. The specifications on the APR filters used must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the identified contaminants have adequate warning properties and criteria for using APR have been met. Level C PPE consists of:

- chemical resistant or coated tyvek coveralls;
- steel-toe and steel-shank workboots;
- chemical resistant overboots or disposable boot covers;
- disposable inner gloves (surgical gloves);
- disposable outer gloves;
- full face APR fitted with organic vapor/dust and mist filters or filters appropriate for the identified or expected contaminants;
- hard hat;
- splash shield, as needed; and,
- ankles/wrists taped with duct tape.

The site safety officer will verify if Level C is appropriate by checking organic vapor concentrations using compound and/or class-specific detector tubes.

EBC
Environmental Business Consultants
1808 Middle Country Road
Ridge, NY 11961
Phone 631.504.6000
Fax 631.924.2870

The exact PPE ensemble is decided on a site-by-site basis by the Site Safety Officer with the intent to provide the most protective and efficient worker PPE.

4.3 Activity-Specific Levels of Personal Protection

The required level of PPE is activity-specific and is based on air monitoring results (Section 4.0) and properties of identified or expected contaminants. **It is expected that site work will be performed in Level D.** If air monitoring results indicate the necessity to upgrade the level of protection engineering controls (i.e. Facing equipment away from the wind and placing site personnel upwind of drilling locations, active venting, etc.) will be implemented before requiring the use of respiratory protection.

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5.0 AIR MONITORING AND ACTION LEVELS

29 CFR 1910.120(h) specifies that monitoring shall be performed where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits, or published exposure levels if there are no permissible exposure limits, for hazardous substances.

5.1 Air Monitoring Requirements

If excavation work is performed, air will be monitored for VOCs with a portable ION Science 3000EX photoionization detector, or the equivalent. If necessary, Lower Explosive Limit (LEL) and oxygen will be monitored with a Combustible Gas Indicator (CGI). If appropriate, fugitive dust will be monitored using a MiniRam Model PDM-3 aerosol monitor. Air will be monitored when any of the following conditions apply:

- initial site entry;
- during any work where a potential IDLH condition or flammable atmosphere could develop;
- excavation work begins on another portion of the site;
- contaminants, other than those previously identified, have been discovered;
- each time a different task or activity is initiated;
- during trenching and/or excavation work.

The designated site safety officer will record air monitoring data and ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. Instruments will be zeroed daily and checked for accuracy. Monitoring results will be recorded in a field notebook and will be transferred to instrument reading logs.

5.2 Work Stoppage Responses

The following responses will be initiated whenever one or more of the action levels necessitating a work stoppage are exceeded:

1 The SSO will be consulted immediately
2 All personnel (except as necessary for continued monitoring and contaminant migration, if applicable) will be cleared from the work area (eg from the exclusion zone).
3 Monitoring will be continued until intrusive work resumes.

5.3 Action Levels During Excavation Activities

Instrument readings will be taken in the breathing zone above the excavation pit unless otherwise noted. Each action level is independent of all other action levels in determining responses.

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Organic Vapors (PID)	LEL %	Responses
0-1 ppm above background	0%	• Continue excavating • Level D protection • Continue monitoring every 10 minutes
1-5 ppm Above Background, Sustained Reading	1-10%	• Continue excavating • Go to Level C protection or employ engineering controls • Continue monitoring every 10 minutes
5-25 ppm Above Background, Sustained Reading	10-20%	• Discontinue excavating, unless PID is only action level exceeded. • Level C protection or employ engineering controls • Continue monitoring for organic vapors 200 ft downwind • Continuous monitoring for LEL at excavation pit
>25 ppm Above Background, Sustained Reading	>20%	• Discontinue excavating • Withdraw from area, shut off all engine ignition sources. • Allow pit to vent • Continuous monitoring for organic vapors 200 ft downwind.

Notes: Air monitoring will occur in the breathing zone 30 inches above the excavation pit. Readings may also be taken in the excavation pit but will not be used for action levels.

If action levels for any one of the monitoring parameters are exceeded, the appropriate responses listed in the right hand column should be taken. If instrument readings do not return to acceptable levels after the excavation pit has been vented for a period of greater than one-half hour, a decision will then be made whether or not to seal the pit with suppressant foam.

If, during excavation activities, downwind monitoring PID readings are greater than 5 ppm above background for more than one-half hour, excavation will stop until sustained levels are less then 5 ppm (see Community Air Monitoring Plan).

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Phone 631.504.6000
Fax 631.924.2870

6.0 SITE CONTROL

6.1 Work Zones

The primary purpose of site controls is to establish the perimeter of a hazardous area, to reduce the migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. When operations are to take place involving hazardous materials, the site safety officer will establish an exclusion zone, a decontamination zone, and a support zone. These zones "float" (move around the site) depending on the tasks being performed on any given day. The site safety officer will outline these locations before work begins and when zones change. The site safety officer records this information in the site log book. If contamination is encountered then the Site Safety officer will establish the zones as follows:

Tasks requiring OSHA 40-hour Hazardous Waste Operations and Emergency Response Operations training are carried out in the exclusion zone. The exclusion zone is defined by the site safety officer but will typically be a 50-foot area around work activities. Gross decontamination (as determined by the site Health and Safety Officer) is conducted in the exclusion zone; all other decontamination is performed in the decontamination zone or trailer.

Protective equipment is removed in the decontamination zone. Disposable protective equipment is stored in receptacles staged in the decontamination zone, and non-disposable equipment is decontaminated. All personnel and equipment exit the exclusion zone through the decontamination zone. If a decontamination trailer is provided the first aid equipment, an eye wash unit, and drinking water are kept in the decontamination trailer.

The support zone is used for vehicle parking, daily safety meetings, and supply storage. Eating, drinking, and smoking are permitted only in the support zone. When a decontamination trailer is not provided, the eye wash unit, first aid equipment, and drinking water are kept at a central location designated by the site safety officer.

6.2 General Site Work

A general excavation contractor may complete the site excavation/grading as needed for the footing installation, or as deemed necessary by the Interim Remedial Measure Work Plan and/or Project Manager. All onsite employees must have obtained OSHA 24-hour Hazardous Waste Operations and Emergency Response Operations training prior to performing soil disturbing activities.

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Phone 631.504.6000
Fax 631.924.2870

7.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN

Site personnel must be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather.

Emergency telephone numbers and a map to the hospital will be posted in the command post. Site personnel should be familiar with the emergency procedures, and the locations of site safety, first aid, and communication equipment.

7.1 Emergency Equipment On-site

Private telephones:	Site personnel.
Two-way radios:	Site personnel where necessary.
Emergency Alarms:	On-site vehicle horns*.
First aid kits:	On-site, in vehicles or office.
Fire extinguisher:	On-site, in office or on equipment.

* Horns: Air horns will be supplied to personnel at the discretion of the project superintendent or site safety officer.

7.2 Emergency Telephone Numbers

General Emergencies	911
New York City Police	911
Woodhull Medical Center	1-718-963-8000
NYSDEC Spills Division	1-800-457-7362
NYSDEC Division of Env. Remediation	1-718-482-4900
NYCDEP	1-718-699-9811
NYC Department of Health	1-212-788-4711
NYC Fire Department	911
National Response Center	1-800-424-8802
Poison Control	1-212-340-4494
Site Safety Officer	1-631-504-6000
Alternate Site Safety Officer	1-631-504-6000

7.3 Personnel Responsibilities During an Emergency

The project manager is primarily responsible for responding to and correcting any emergency situations. However, in the absence of the project manager, the site safety officer shall act as the project manager's on-site designee and perform the following tasks:

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, evacuate and secure the site, or upgrade/downgrade the level of protective clothing and respiratory protection;

- Ensure that appropriate federal, state, and local agencies are informed and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. If toxic materials are released to the air, the local authorities should be informed in order to assess the need for evacuation;

- Ensure appropriate decontamination, treatment, or testing for exposed or injured personnel;

- Determine the cause of incidents and make recommendations to prevent recurrence; and,

- Ensure that all required reports have been prepared.

The following key personnel are planned for this project:

- Project Manager — Keith Butler (631) 504-6000
- Site Safety Officer — Kevin Waters (631) 504-6000

7.4 Medical Emergencies

A person who becomes ill or injured in the exclusion zone will be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination will be completed and first aid administered prior to transport. First aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (**Appendix D**) must be filled out for any injury.

A person transporting an injured/exposed person to a clinic or hospital for treatment will take the directions to the hospital (**Appendix D**).and information on the chemical(s) to which they may have been exposed (**Appendix C**).

7.5 Fire or Explosion

In the event of a fire or explosion, the local fire department will be summoned immediately. The site safety officer or his designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on-site. If it is safe to do so, site personnel may:

- use fire fighting equipment available on site; or,
- remove or isolate flammable or other hazardous materials that may contribute to the fire.

7.6 Evacuation Routes

Evacuation routes established by work area locations for each site will be reviewed prior to commencing site operations. As the work areas change, the evacuation routes will be altered accordingly, and the new route will be reviewed.

Under extreme emergency conditions, evacuation is to be immediate without regard for equipment. The evacuation signal will be a continuous blast of a vehicle horn, if possible, and/or by verbal/radio communication. When evacuating the site, personnel will follow these instructions:

- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation through the decontamination corridor is not possible, personnel should remove contaminated clothing once they are in a safe location and leave it near the exclusion zone or in a safe place.
- The site safety officer will conduct a head count to ensure that all personnel have been evacuated safely. The head count will be correlated to the site and/or exclusion zone entry/exit log.
- If emergency site evacuation is necessary, all personnel are to escape the emergency situation and decontaminate to the maximum extent practical.

7.7 Spill Control Procedures

Spills associated with site activities may be attributed to project equipment and include gasoline, diesel and hydraulic oil. In the event of a leak or a release, site personnel will inform their supervisor immediately, locate the source of spillage and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy dry absorbent material will be available to site personnel to facilitate the immediate recovery of the spilled material. Daily inspections of site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment leaks and to ensure equipment soundness. In the event of a spill, site personnel will immediately notify the NYSDEC (1-800-457-7362), and a spill number will be generated.

7.8 Vapor Release Plan

If work zone organic vapor (excluding methane) exceeds 5 ppm, then a downwind reading will be made either 200 feet from the work zone or at the property line, whichever is closer. If readings at this location exceed 5 ppm over background, the work will be stopped.

If 5 ppm of VOCs are recorded over background on a PID at the property line, then an off-site reading will be taken within 20 feet of the nearest residential or commercial property, whichever is closer. If efforts to mitigate the emission source are unsuccessful for 30 minutes, then the designated site safety officer will:

- contact the local police;
- continue to monitor air every 30 minutes, 20 feet from the closest off-site property. If two successive readings are below 5 ppm (non-methane), off-site air monitoring will be halted.

- All property line and off site air monitoring locations and results associated with vapor releases will be recorded in the site safety log book.

APPENDIX A

SITE SAFETY ACKNOWLEDGEMENT FORM

DAILY BREIFING SIGN-IN SHEET

Date:_____ Person Conducting Briefing:_____

Project Name and Location:_____

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc…):

_____

_____

_____

_____

2. OTHER ISSUES (HASP changes, attendee comments, etc…):

_____

_____

_____

3. ATTENDEES (Print Name):

1.	11.
2.	12.
3.	13.
4.	14.
5.	15.
6.	16.
7.	17.
8.	18.
9.	19.
10.	20.

APPENDIX B

SITE SAFETY PLAN AMENDMENTS

SITE SAFETY PLAN AMENDMENT FORM

Site Safety Plan Amendment #: _____

Site Name: _____

Reason for Amendment: _____

_____

_____

_____

Alternative Procedures: _____

_____

_____

_____

Required Changes in PPE: _____

_____

_____

_____

_____ _____

Project Superintendent (signature) **Date**

_____ _____

Health and Safety Consultant (signature) **Date**

_____ _____

Site Safety Officer (signature) **Date**

APPENDIX C

CHEMICAL HAZARDS

CHEMICAL HAZARDS

The attached International Chemical Safety Cards are provided for contaminants of concern that have been identified in soils and/or groundwater at the site.

International Chemical Safety Cards

1,2,4-TRIMETHYLBENZENE

ICSC: 1433

Pseudocumene

C_9H_{12}

Molecular mass: 120,2

ICSC # 1433
CAS # 95-63-6
RTECS # DC3325000
UN # 1993
EC # 601-043-00-3
March 06, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Alcohol-resistant foam, dry powder, carbon dioxide.
EXPLOSION	Above 44°C explosive vapour/air mixtures may be formed.	Above 44°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness. Dry skin.	Protective gloves.	Rinse skin with plenty of water or shower.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	(See Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: filter respirator for organic gases and vapours.	Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	Xn symbol N symbol R: 10-20-36/37/38-51/53 S: 2-26-61 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1433

International Chemical Safety Cards

1,2,4-TRIMETHYLBENZENE

ICSC: 1433

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on burning producing toxic and irritating fumes Reacts violently with strong oxidants causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (as mixed isomers) 25 ppm as TWA (ACGIH 2004). MAK: (as mixed isomers) 20 ppm 100 mg/m³ Peak limitation category: II(2) Pregnancy risk group: C (DFG 2004). OSHA PEL†: none NIOSH REL: TWA 25 ppm (125 mg/m^3) NIOSH IDLH: N.D. See: IDLH INDEX	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes the skin and the respiratory tract If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. Lungs may be affected by repeated or prolonged exposure , resulting in chronic bronchitis The substance may have effects on the central nervous system blood See Notes.
PHYSICAL PROPERTIES	Boiling point: 169°C Melting point: -44°C Relative density (water = 1): 0.88 Solubility in water: very poor Relative vapour density (air = 1): 4.1	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01 Flash point: 44°C c.c. Auto-ignition temperature: 500°C Explosive limits, vol% in air: 0.9-6.4 Octanol/water partition coefficient as log Pow: 3.8
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. 	

N O T E S

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is suggested. See also ICSC 1155 1,3,5-Trimethylbenzene (Mesitylene), ICSC 1362 1,2,3-Trimethylbenzene (Hemimellitene), ICSC 1389 Trimethyl benzene (mixed isomers). 1,3,5-Trimethylbenzene (Mesitylene) is classified as a marine pollutant.

Transport Emergency Card: TEC (R)-30GF1-III
NFPA Code: H0; F2; R0;

ADDITIONAL INFORMATION

International Chemical Safety Cards

1,3,5-TRIMETHYLBENZENE

ICSC: 1155

Mesitylene
C_9H_{12}
Molecular mass: 120.2

ICSC # 1155
CAS # 108-67-8
RTECS # OX6825000
UN # 2325
EC # 601-025-00-5
March 06, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Alcohol-resistant foam, dry powder, carbon dioxide.
EXPLOSION	Above 50°C explosive vapour/air mixtures may be formed.	Above 50°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•**INHALATION**	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Redness. Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•**EYES**	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	(See Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	Marine pollutant. Xi symbol N symbol R: 10-37-51/53 S: 2-61 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

1,3,5-TRIMETHYLBENZENE

ICSC: 1155

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on burning producing toxic and irritating fumes. Reacts violently with strong oxidants causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV (as mixed isomers): 25 ppm; (ACGIH 2001). MAK (all isomers): 20 ppm; 100 mg/m^3; class II 1 © (2001) OSHA PEL†: none NIOSH REL: TWA 25 ppm (125 mg/m^3) NIOSH IDLH: N.D. See: IDLH INDEX **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes the skin and the respiratory tract If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. Lungs may be affected by repeated or prolonged exposure, resulting in chronic bronchitis. The substance may have effects on the central nervous system blood See Notes.
PHYSICAL PROPERTIES	Boiling point: 165°C Melting point: -45°C Relative density (water = 1): 0.86 Solubility in water: very poor Vapour pressure, kPa at 20°C: 0.25 Relative vapour density (air = 1): 4.1 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01 Flash point: 50°C (c.c.) Auto-ignition temperature: 550°C Octanol/water partition coefficient as log Pow: 3.42
ENVIRONMENTAL DATA	The substance is harmful to aquatic organisms. Bioaccumulation of this chemical may occur in fish. 

NOTES

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. See ICSC 1433 1,2,4-Trimethylbenzene (Pseudocumene), ICSC 1362 1,2,3-Trimethylbenzene (Hemimellitene), ICSC 1389 Trimethyl benzene (mixed isomers).

Transport Emergency Card: TEC (R)-30S2325
NFPA Code: H0; F2; R0

ADDITIONAL INFORMATION

International Chemical Safety Cards

BENZENE

ICSC: 0015

Cyclohexatriene
Benzol
C_6H_6
Molecular mass: 78.1

ICSC # 0015
CAS # 71-43-2
RTECS # CY1400000
UN # 1114
EC # 601-020-00-8
May 06, 2003 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive. Risk of fire and explosion: see Chemical Dangers.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	
•**INHALATION**	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	MAY BE ABSORBED! Dry skin. Redness. Pain. (Further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
•**EYES**	Redness. Pain.	Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Abdominal pain. Sore throat. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Fireproof. Separated from food and feedstuffs oxidants halogens	Do not transport with food and feedstuffs. Note: E F symbol T symbol R: 45-46-11-36/38-48/23/24/25-65 S: 53-45 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

BENZENE

ICSC: 0015

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with oxidants, nitric acid, sulfuric acid and halogens causing fire and explosion hazard. Attacks plastic and rubber.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.5 ppm as TWA 2.5 ppm as STEL (skin) A1 BEI (ACGIH 2004).
MAK: H
Carcinogen category: 1 Germ cell mutagen group: 3A (DFG 2004).
OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm See Appendix F
NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A
NIOSH IDLH: Ca 500 ppm See: 71432

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation through the skin and by ingestion

INHALATION RISK:
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system , resulting in lowering of consciousness Exposure far above the occupational exposure limit value may result in unconsciousness death

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the bone marrow immune system , resulting in a decrease of blood cells. This substance is carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 80°C
Melting point: 6°C
Relative density (water = 1): 0.88
Solubility in water, g/100 ml at 25°C: 0.18
Vapour pressure, kPa at 20°C: 10
Relative vapour density (air = 1): 2.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point:
-11°C c.c.
Auto-ignition temperature: 498°C
Explosive limits, vol% in air: 1.2-8.0
Octanol/water partition coefficient as log Pow: 2.13

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms.

NOTES

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-30S1114 / 30GF1-II
NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0015 **BENZENE**

IMPORTANT LEGAL NOTICE:

International Chemical Safety Cards

ACETONE

ICSC: 0087

2-Propanone
Dimethyl ketone
Methyl ketone
C_3H_6O / CH_3COCH_3
Molecular mass: 58.1

ICSC # 0087
CAS # 67-64-1
RTECS # AL3150000
UN # 1090
EC # 606-001-00-8
April 22, 1994 Validated
Fi, review at IHE: 10/09/89

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, alcohol-resistant foam, water in large amounts, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
•INHALATION	Sore throat. Cough. Confusion. Headache. Dizziness. Drowsiness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness. Pain. Blurred vision. Possible corneal damage.	Safety spectacles or face shield . Contact lenses should not be worn.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Nausea. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: self-contained breathing apparatus. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Then wash away with plenty of water.	Fireproof. Separated from strong oxidants. Store in an area without drain or sewer access.	F symbol Xi symbol R: 11-36-66-67 S: 2-9-16-26 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0087

International Chemical Safety Cards

ACETONE

ICSC: 0087

I M P O R T A N T D A T A

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible.

CHEMICAL DANGERS:
The substance can form explosive peroxides on contact with strong oxidants such as acetic acid, nitric acid, hydrogen peroxide. Reacts with chloroform and bromoform under basic conditions, causing fire and explosion hazard. Attacks plastic.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 500 ppm as TWA, 750 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued; (ACGIH 2004).
MAK: 500 ppm 1200 mg/m³
Peak limitation category: I(2); Pregnancy risk group: D; (DFG 2006).
OSHA PEL†: TWA 1000 ppm (2400 mg/m^3)
NIOSH REL: TWA 250 ppm (590 mg/m^3)
NIOSH IDLH: 2500 ppm 10%LEL See: 67641

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and through the skin.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

EFFECTS OF SHORT-TERM EXPOSURE:
The vapour irritates the eyes and the respiratory tract. The substance may cause effects on the central nervous system , liver , kidneys and gastrointestinal tract .

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the blood and bone marrow .

PHYSICAL PROPERTIES

Boiling point: 56°C
Melting point: -95°C
Relative density (water = 1): 0.8
Solubility in water:
miscible
Vapour pressure, kPa at 20°C: 24

Relative vapour density (air = 1): 2.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point: -18°C c.c.
Auto-ignition temperature: 465°C
Explosive limits, vol% in air: 2.2-13
Octanol/water partition coefficient as log Pow: -0.24

ENVIRONMENTAL DATA

N O T E S

Use of alcoholic beverages enhances the harmful effect.

Transport Emergency Card: TEC (R)-30S1090

NFPA Code: H 1; F 3; R 0;
Card has been partially updated in July 2007: see Occupational Exposure Limits.
Card has been partially updated in January 2008: see Storage.

ADDITIONAL INFORMATION

International Chemical Safety Cards

METHYL BROMIDE

ICSC: 0109

Bromomethane
Monobromomethane
CH_3Br
Molecular mass: 94.9
(cylinder)

ICSC # 0109
CAS # 74-83-9
RTECS # PA4900000
UN # 1062
EC # 602-002-00-2
November 25, 2009 Validated
Fi, review at IHE: 10/09/89

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with aluminium, zinc, magnesium or pure oxygen.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with appropriate extinguishing agent .
EXPLOSION	Risk of fire and explosion on contact with aluminium, zinc, magnesium or oxygen.		In case of fire: keep cylinder cool by spraying with water.
EXPOSURE		STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR! FIRST AID: USE PERSONAL PROTECTION
•INHALATION	Cough. Sore throat. Dizziness. Headache. Abdominal pain. Vomiting. Weakness. Shortness of breath. Confusion. Hallucinations. Loss of speech. Incoordination. Convulsions. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
•SKIN	MAY BE ABSORBED! Tingling. Itching. Burning sensation. Redness. Blisters. Pain. ON CONTACT WITH LIQUID: FROSTBITE. (Further see Inhalation).	Cold-insulating gloves. Protective clothing.	Rinse skin with plenty of water or shower. ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer immediately for medical attention.
•EYES	Redness. Pain. Blurred vision. Temporary loss of vision.	Safety goggles , face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
•INGESTION			

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. NEVER direct water	Fireproof if in building. Separated from strong oxidants, aluminium and cylinders containing oxygen. Cool. Ventilation along the floor.	T symbol N symbol R: 23/25-36/37/38-48/20-68-50-59

jet on liquid.		S: 1/2-15-27-36/39-38-45-59-61 UN Hazard Class: 2.3 Signal: Danger Cylinder-Skull-Health haz Contains gas under pressure; may explode if heated Toxic if inhaled (gas) Causes skin irritation Causes eye irritation Causes damage to lungs, kidneys and central nervous system if inhaled Causes damage to liver, kidneys and central nervous system through prolonged or repeated exposure if inhaled Harms public health and the environment by destroying ozone in the upper atmosphere

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0109

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

METHYL BROMIDE

ICSC: 0109

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
ODOURLESS AND COLOURLESS COMPRESSED LIQUEFIED GAS.

PHYSICAL DANGERS:
The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

CHEMICAL DANGERS:
The substance decomposes on heating producing <313353290\toxic and corrosive fumes \including hydrogen bromide, bromine and carbon oxybromide. Reacts with strong oxidants. Attacks many metals in presence of water. Attacks aluminium, zinc and magnesium with formation of pyrophoric compounds, causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 1 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen); (ACGIH 2009).
MAK: skin absorption (H);
Carcinogen category: 3B; BLW issued (DFG 2009).
OSHA PEL†: C 20 ppm (80 mg/m^3) skin
NIOSH REL: Ca See Appendix A
NIOSH IDLH: Ca 250 ppm See: 74839

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and through the skin , also as a vapour!

INHALATION RISK:
On loss of containment, a harmful concentration of this gas in the air will be reached very quickly.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance, as a liquid, is severely irritating to the skin and is irritating to the eyes and the respiratory tract. Inhalation may cause lung oedema (see Notes). Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system , and kidneys. The effects may be delayed up to 48 hours. Exposure at high levels may result in death. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the central nervous system, Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 4°C
Melting point: -94°C
Relative density (water = 1): 1.7 at 0 C
Solubility in water, g/100 ml at 20°C: 1.5
instead of Solubility in water, ml/100 ml at 20°C: 1.5
sister PI suggestion
Vapour pressure, kPa at 20°C: 1893
Relative vapour density (air = 1): 3.3
Flash point: 194°C
Auto-ignition temperature: 537°C
Explosive limits, vol% in air: 10-16
Octanol/water partition coefficient as log Pow: 1.19

The substance is toxic to aquatic organisms. This substance may be hazardous in the environment;

ENVIRONMENTAL DATA	special attention should be given to its impact on the ozone layer. This substance does enter the environment under normal use. Great care, however, should be given to avoid any additional release, e.g. through inappropriate disposal.

N O T E S

Depending on the degree of exposure, periodic medical examination is suggested. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Toxic effects on the nervous system may be delayed for several hours Immediate administration of an appropriate inhalation therapy by a doctor or a person authorized by him/her, should be considered. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state. by IPCS Dec 09 - since inhal symptoms mentions delayed effects and these are not just pulmonary

NFPA Code: H 3; F 1; R 0;

ADDITIONAL INFORMATION

ICSC: 0109 **METHYL BROMIDE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

Ethylbenzol
Phenylethane
EB
C_8H_{10} / $C_6H_5C_2H_5$
Molecular mass: 106.2

ICSC # 0268
CAS # 100-41-4
RTECS # DA0700000
UN # 1175
EC # 601-023-00-4
March 13, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•**INHALATION**	Cough. Dizziness. Drowsiness. Headache.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•**EYES**	Redness. Pain. Blurred vision.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	(Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: A filter respirator for organic gases and vapours.	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-20 S: 2-16-24/25-29 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0268

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH AROMATIC ODOUR. **PHYSICAL DANGERS:** The vapour mixes well with air, explosive mixtures are easily formed. **CHEMICAL DANGERS:** Reacts with strong oxidants. Attacks plastic and rubber. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA 125 ppm as STEL A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2005). MAK: skin absorption (H); Carcinogen category: 3A; (DFG 2004). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 125 ppm (545 mg/m^3) NIOSH IDLH: 800 ppm 10%LEL See: 100414	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system Exposure far above the OEL could cause lowering of consciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis.
PHYSICAL PROPERTIES	Boiling point: 136°C Melting point: -95°C Relative density (water = 1): 0.9 Solubility in water, g/100 ml at 20°C: 0.015 Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 18°C c.c. Auto-ignition temperature: 432°C Explosive limits, vol% in air: 1.0-6.7 Octanol/water partition coefficient as log Pow: 3.2
ENVIRONMENTAL DATA	The substance is harmful to aquatic organisms. 	

N O T E S

The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-30S1175 or 30GF1-I+II
NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CUMENE

ICSC: 0170

(1-Methylethyl)benzene
2-Phenylpropane
Isopropylbenzene
C_9H_{12} / $C_6H_5CH(CH_3)_2$
Molecular mass: 120.2

ICSC # 0170
CAS # 98-82-8
RTECS # GR8575000
UN # 1918
EC # 601-024-00-X
April 13, 2000 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Above 31°C explosive vapour/air mixtures may be formed.	Above 31°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Dizziness. Ataxia. Drowsiness. Headache. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	(See Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. Personal protection: filter respirator for organic gases and vapours.	Fireproof. Separated from strong oxidants, acids. Cool. Keep in the dark. Store only if stabilized.	Marine pollutant. Note: C Xn symbol N symbol R: 10-37-51/53-65 S: 2-24-37-61-62 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0170

International Chemical Safety Cards

CUMENE

ICSC: 0170

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts violently with acids and strong oxidants causing fire and explosion hazard. The substance can form explosive peroxides. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 50 ppm as TWA (ACGIH 2004). MAK: 50 ppm 250 mg/m³ Peak limitation category: II(4); skin absorption (H); Pregnancy risk group: C; (DFG 2004). OSHA PEL: TWA 50 ppm (245 mg/m^3) skin NIOSH REL: TWA 50 ppm (245 mg/m^3) skin NIOSH IDLH: 900 ppm 10%LEL See: 98828 **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation and through the skin. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system Exposure far above the OEL may result in unconsciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis.
PHYSICAL PROPERTIES	Boiling point: 152°C Melting point: -96°C Relative density (water = 1): 0.90 Solubility in water: none Vapour pressure, Pa at 20°C: 427 Relative vapour density (air = 1): 4.2 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01 Flash point: 31°C c.c. Auto-ignition temperature: 420°C Explosive limits, vol% in air: 0.9-6.5 Octanol/water partition coefficient as log Pow: 3.66
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. 

N O T E S

Check for peroxides prior to distillation; eliminate if found.

Transport Emergency Card: TEC (R)-30S1918 or 30GF1-III
NFPA Code: H2; F3; R1

ADDITIONAL INFORMATION

ICSC: 0170 **CUMENE**

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

Naphthene
$C_{10}H_8$
Molecular mass: 128.18

ICSC # 0667
CAS # 91-20-3
RTECS # QJ0525000
UN # 1334 (solid); 2304 (molten)
EC # 601-052-00-2
April 21, 2005 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Headache. Weakness. Nausea. Vomiting. Sweating. Confusion. Jaundice. Dark urine.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! (Further see Inhalation).	Protective gloves.	Rinse skin with plenty of water or shower.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Convulsions. Unconsciousness. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, food and feedstuffs . Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 22-40-50/53 S: 2-36/37-46-60-61 UN Hazard Class: 4.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0667

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
WHITE SOLID IN VARIOUS FORMS , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
On combustion, forms irritating and toxic gases. Reacts with strong oxidants .

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 10 ppm as TWA; 15 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen); (ACGIH 2005).
MAK: skin absorption (H);
Carcinogen category: 2; Germ cell mutagen group: 3B; (DFG 2004).
OSHA PEL†: TWA 10 ppm (50 mg/m^3)
NIOSH REL: TWA 10 ppm (50 mg/m^3) ST 15 ppm (75 mg/m^3)
NIOSH IDLH: 250 ppm See: 91203

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. See Notes.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance may cause effects on the blood , resulting in lesions of blood cells (haemolysis) . See Notes. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the blood , resulting in chronic haemolytic anaemia. The substance may have effects on the eyes , resulting in the development of cataract. This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 218°C

Sublimation slowly at room temperature
Melting point: 80°C
Density: 1.16
g/cm³
Solubility in water, g/100 ml at 25°C:
none

Vapour pressure, Pa at 25°C: 11
Relative vapour density (air = 1): 4.42
Flash point:
80°C c.c.
Auto-ignition temperature: 540°C
Explosive limits, vol% in air: 0.9-5.9
Octanol/water partition coefficient as log Pow: 3.3

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Some individuals may be more sensitive to the effect of naphthalene on blood cells.

Transport Emergency Card: TEC (R)-41S1334 (solid); 41GF1-II+III (solid); 41S2304 (molten)

NFPA Code: H2; F2; R0;

ADDITIONAL INFORMATION

ICSC: 0667 **NAPHTHALENE**

IMPORTANT LEGAL NOTICE:

Material Safety Data Sheet

Normal-Butylbenzene, 99+%

ACC# 55434

Section 1 - Chemical Product and Company Identification

MSDS Name: Normal-Butylbenzene, 99+%
Catalog Numbers: AC107850000, AC107850050, AC107850250, AC107850500, AC107851000, AC107852500 AC107852500
Synonyms: 1-Phenylbutane
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
104-51-8	n-Butylbenzene	>99	203-209-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 59 deg C.
Warning! Flammable liquid and vapor. May cause eye and skin irritation. May cause respiratory and digestive tract irritation. The toxicological properties of this material have not been fully investigated.
Target Organs: Liver, nervous system.

Potential Health Effects

Eye: May cause eye irritation. The toxicological properties of this material have not been fully investigated.
Skin: May cause skin irritation. The toxicological properties of this material have not been fully investigated.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. The toxicological properties of this substance have not been fully investigated.
Inhalation: May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. Vapors may cause dizziness or suffocation.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable liquid and vapor. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Use agent most appropriate to extinguish fire. Do NOT use straight streams of water.
Flash Point: 59 deg C (138.20 deg F)
Autoignition Temperature: 412 deg C (773.60 deg F)
Explosion Limits, Lower:.80 vol %
Upper: 5.80 vol %
NFPA Rating: (estimated) Health: 1; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
n-Butylbenzene	none listed	none listed	none listed

OSHA Vacated PELs: n-Butylbenzene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Wear a NIOSH/MSHA or European Standard EN 149 approved full-facepiece airline respirator in the positive pressure mode with emergency escape provisions. Follow the OSHA respirator regulations found in 29

CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: None reported.
pH: Not available.
Vapor Pressure: 1.33 hPa @ 23 C
Vapor Density: 4.6
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 183 deg C @ 760.00mm Hg
Freezing/Melting Point:-88 deg C
Decomposition Temperature:> 183 deg C
Solubility: insoluble
Specific Gravity/Density:.8600g/cm3
Molecular Formula:C10H14
Molecular Weight:134.22

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat, strong oxidants.
Incompatibilities with Other Materials: Oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 104-51-8: CY9070000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 104-51-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: Rapidly volatilizes into the atmosphere where it is photochemically degraded by hydroxyl radicals.

Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	BUTYL BENZENES	No information available.
Hazard Class:	3	
UN Number:	UN2709	
Packing Group:	III	

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 104-51-8 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 104-51-8: Effective 6/1/87, Sunset 12/19/95
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 104-51-8: immediate, fire.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 104-51-8 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

R 10 Flammable.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 24/25 Avoid contact with skin and eyes.
S 33 Take precautionary measures against static discharges.
S 37 Wear suitable gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 9 Keep container in a well-ventilated place.
S 28A After contact with skin, wash immediately with plenty of water
.

WGK (Water Danger/Protection)

CAS# 104-51-8: 1

Canada - DSL/NDSL

CAS# 104-51-8 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

Section 16 - Additional Information

MSDS Creation Date: 4/15/1998
Revision #4 Date: 3/16/2007

Material Safety Data Sheet

Version 4.0
Revision Date 07/28/2010
Print Date 12/07/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Propylbenzene
Product Number	:	P52407
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid

Target Organs

Lungs, Eyes, Kidney

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P331	Do NOT induce vomiting.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Ingestion Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1-Phenylpropane

Formula : C_9H_{12}
Molecular Weight : 120.19 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Propylbenzene			
103-65-1	203-132-9	601-024-00-X	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
For prolonged or repeated contact use protective gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-99 °C (-146 °F) - lit.
Boiling point	159 °C (318 °F) - lit.
Flash point	42.0 °C (107.6 °F) - closed cup
Ignition temperature	450 °C (842 °F)
Lower explosion limit	0.8 %(V)
Upper explosion limit	6 %(V)
Density	0.862 g/cm3 at 25 °C (77 °F)
Water solubility	slightly soluble

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 6,040 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - rat - 2 h - 65000 ppm

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Damage to the lungs., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: DA8750000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 1.55 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 2 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propyl benzene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2364 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: PROPYLBENZENE
Marine pollutant: No

IATA
UN-Number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propylbenzene

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

ortho-Xylene
1,2-Dimethylbenzene
o-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0084
CAS # 95-47-6
RTECS # ZE2450000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 32°C explosive vapour/air mixtures may be formed.	Above 32°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants and strong acids .	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the

ICSC: 0084

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts with strong acids and strong oxidants . **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001). BEI specified by (ACGIH 2001). EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) NIOSH IDLH: 900 ppm See: 95476 **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin . The substance may cause effects on the central nervous system . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 144°C Melting point: -25°C Relative density (water = 1): 0.88 Solubility in water: none Vapour pressure, kPa at 20°C: 0.7 Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 32°C c.c. Auto-ignition temperature: 463°C Explosive limits, vol% in air: 0.9-6.7 Octanol/water partition coefficient as log Pow: 3.12
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. 

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0086 p-Xylene and 0085 m-Xylene.

Transport Emergency Card: TEC (R)-30S1307-III

NFPA Code: H 2; F 3; R 0;
Card has been partially updated in January 2008: see Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0084 **o-XYLENE**

IMPORTANT LEGAL	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only

NOTICE:	modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

para-Xylene
1,4-Dimethylbenzene
p-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0086
CAS # 106-42-3
RTECS # ZE2625000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants, strong acids	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0086

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts with strong acids strong oxidants **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001). MAK: 100 ppm 440 mg/m³ Peak limitation category: II(2) skin absorption (H); Pregnancy risk group: D (DFG 2005). EU OEL: 50 ppm as TWA 100 ppm as STEL (skin) (EU 2000). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) NIOSH IDLH: 900 ppm See: 95476 **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the central nervous system. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 138°C Melting point: 13°C Relative density (water = 1): 0.86 Solubility in water: none Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 27°C c.c. Auto-ignition temperature: 528°C Explosive limits, vol% in air: 1.1-7.0 Octanol/water partition coefficient as log Pow: 3.15
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. 

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0085 m-Xylene.

Transport Emergency Card: TEC (R)-30S1307-III
NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0086 **p-XYLENE**

International Chemical Safety Cards

m-XYLENE

ICSC: 0085

meta-Xylene
1,3-Dimethylbenzene
m-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0085
CAS # 108-38-3
RTECS # ZE2275000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants strong acids	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0085

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

m-XYLENE

ICSC: 0085

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts with strong acids strong oxidants **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001). MAK: 100 ppm 440 mg/m³ Peak limitation category: II(2) skin absorption (H); Pregnancy risk group: D (DFG 2005). EU OEL: 50 ppm as TWA 100 ppm as STEL (skin) (EU 2000). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) NIOSH IDLH: 900 ppm See: 95476 **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the central nervous system Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 139°C Melting point: -48°C Relative density (water = 1): 0.86 Solubility in water: none Vapour pressure, kPa at 20°C: 0.8 Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 27°C c.c. Auto-ignition temperature: 527°C Explosive limits, vol% in air: 1.1-7.0 Octanol/water partition coefficient as log Pow: 3.20
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. 

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0086 p-Xylene.

NFPA Code: H 2; F 3; R 0;
Transport Emergency Card: TEC (R)-30S1307-III

ADDITIONAL INFORMATION

ICSC: 0085 **m-XYLENE**

Material Safety Data Sheet

Version 4.0
Revision Date 07/24/2010
Print Date 12/07/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	*sec*-Butylbenzene
Product Number	:	B90408
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid, Irritant

GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H226	Flammable liquid and vapour.
H315 + H320	Causes skin and eye irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 2-Phenylbutane

Formula	:	$C_{10}H_{14}$
Molecular Weight	:	134.22 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
sec-Butylbenzene			
135-98-8	205-227-0	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	75.5 °C (167.9 °F) - lit.
Boiling point	173 - 174 °C (343 - 345 °F) - lit.
Flash point	52.0 °C (125.6 °F) - closed cup
Ignition temperature	418 °C (784 °F)
Lower explosion limit	0.8 %(V)
Density	0.863 g/mL at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Dermal - rabbit - > 13,792 mg/kg

Skin corrosion/irritation
Skin - rabbit - irritating - 24 h

Serious eye damage/eye irritation
Eyes - rabbit - Mild eye irritation - 24 h

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: CY9100000

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2709 Class: 3 Packing group: III
Proper shipping name: Butyl benzenes
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2709 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: BUTYLBENZENES
Marine pollutant: No

IATA
UN-Number: 2709 Class: 3 Packing group: III
Proper shipping name: Butylbenzenes

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid, Irritant

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
sec-Butylbenzene	135-98-8

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
sec-Butylbenzene	135-98-8	

New Jersey Right To Know Components

	CAS-No.	Revision Date
sec-Butylbenzene	135-98-8	

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 3.0
Revision Date 08/21/2009
Print Date 12/07/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : *tert*-Butylbenzene

Product Number : B90602
Brand : Aldrich

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 2-Methyl-2-phenylpropane

Formula : $C_{10}H_{14}$
Molecular Weight : 134.22 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
tert-Butylbenzene			
98-06-6	202-632-4	-	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable Liquid, Irritant

HMIS Classification
Health Hazard: 2
Flammability: 3
Physical hazards: 0

NFPA Rating
Health Hazard: 2
Fire: 3
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	34.0 °C (93.2 °F) - closed cup
Ignition temperature	450 °C (842 °F)

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-58 °C (-72 °F) - lit.
Boiling point	169 °C (336 °F) - lit.
Flash point	34.0 °C (93.2 °F) - closed cup
Ignition temperature	450 °C (842 °F)
Lower explosion limit	0.8 %(V)
Density	0.867 g/mL at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 3.80

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Hazardous reactions
Vapours may form explosive mixture with air.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 3,045 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Tremor. Gastrointestinal:Changes in structure or function of salivary glands.

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

Additional Information
RTECS: CY9120000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

no data available

Ecotoxicity effects

Toxicity to fish	LC0 - Leuciscus idus (Golden orfe) - 44 mg/l - 48 h
	LC50 - Leuciscus idus (Golden orfe) - 65 mg/l - 48 h
Toxicity to daphnia and other aquatic	LC50 - Daphnia magna (Water flea) - 41 mg/l - 24 h

invertebrates.

Further information on ecology

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2709 Class: 3 Packing group: III
Proper shipping name: Butyl benzenes
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2709 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: BUTYLBENZENES
Marine pollutant: No

IATA
UN-Number: 2709 Class: 3 Packing group: III
Proper shipping name: Butylbenzenes

15. REGULATORY INFORMATION

OSHA Hazards
Flammable Liquid, Irritant

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
tert-Butylbenzene	98-06-6	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
tert-Butylbenzene	98-06-6	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
tert-Butylbenzene	98-06-6	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects.

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

International Chemical Safety Cards

TOLUENE

ICSC: 0078

Methylbenzene
Toluol
Phenylmethane
$C_6H_5CH_3$ / C_7H_8
Molecular mass: 92.1

ICSC # 0078
CAS # 108-88-3
RTECS # XS5250000
UN # 1294
EC # 601-021-00-3
October 10, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•**INHALATION**	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•**EYES**	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area in large spill! Consult an expert in large spill! Remove all ignition sources. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: self-contained breathing apparatus	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-38-48/20-63-65-67 S: 2-36/37-46-62 UN Hazard Class: 3 UN Packing Group: II

ICSC: 0078

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

TOLUENE

ICSC: 0078

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour mixes well with air, explosive mixtures are formed easily. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 50 ppm as TWA (skin) A4 BEI issued (ACGIH 2004).
MAK: 50 ppm 190 mg/m³ H
Peak limitation category: II(4) Pregnancy risk group: C (DFG 2004).
OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)
NIOSH REL: TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3)
NIOSH IDLH: 500 ppm See: 108883

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the respiratory tract The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels may result in cardiac dysrhythmiaandunconsciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 111°C
Melting point: -95°C
Relative density (water = 1): 0.87
Solubility in water: none
Vapour pressure, kPa at 25°C: 3.8
Relative vapour density (air = 1): 3.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 4°C c.c.
Auto-ignition temperature: 480°C
Explosive limits, vol% in air: 1.1-7.1
Octanol/water partition coefficient as log Pow: 2.69

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Use of alcoholic beverages enhances the harmful effect.

Transport Emergency Card: TEC (R)-30S1294
NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene
$C_{18}H_{12}$
Molecular mass: 228.3

ICSC # 0385
CAS # 56-55-3
RTECS # CV9275000
EC # 601-033-00-9
October 23, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: complete protective clothing including self-contained breathing apparatus.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0385

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ICSC: 0385

BENZ(a)ANTHRACENE

I M P O R T A N T D A T A

PHYSICAL STATE; APPEARANCE:
COLOURLESS TO YELLOW BROWN FLUORESCENT FLAKES OR POWDER.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS:
TLV: A2 (suspected human carcinogen); (ACGIH 2004).
MAK:
Carcinogen category: 2 (as pyrolysis product of organic materials)
(DFG 2005).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Sublimation point: 435°C
Melting point: 162°C
Relative density (water = 1): 1.274
Solubility in water:
none

Vapour pressure, Pa at 20°C: 292
Octanol/water partition coefficient as log Pow: 5.61

ENVIRONMENTAL DATA

Bioaccumulation of this chemical may occur in seafood.

N O T E S

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name. Card has been partly updated in October 2005 and August 2006: see sections Occupational Exposure Limits, EU classification.

ADDITIONAL INFORMATION

ICSC: 0385 **BENZ(a)ANTHRACENE**

International Chemical Safety Cards

BENZO(a)PYRENE

ICSC: 0104

Benz(a)pyrene
3,4-Benzopyrene
Benzo(d,e,f)chrysene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0104
CAS # 50-32-8
RTECS # DJ3675000
EC # 601-032-00-3
October 17, 2005 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, foam, powder, carbon dioxide.
EXPLOSION			
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants.	T symbol N symbol R: 45-46-60-61-43-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0104

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BENZO(a)PYRENE

ICSC: 0104

I M P O R T A N T D A T A

PHYSICAL STATE; APPEARANCE:
PALE-YELLOW CRYSTALS

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Reacts with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: Exposure by all routes should be carefully controlled to levels as low as possible A2 (suspected human carcinogen); (ACGIH 2005).
MAK:
Carcinogen category: 2; Germ cell mutagen group: 2; (DFG 2005).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 496°C
Melting point: 178.1°C
Density: 1.4
g/cm³

Solubility in water: none (<0.1 g/100 ml)
Vapour pressure :
negligible
Octanol/water partition coefficient as log Pow: 6.04

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, in plants and in molluscs. The substance may cause long-term effects in the aquatic environment.

N O T E S

Do NOT take working clothes home. Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ADDITIONAL INFORMATION

International Chemical Safety Cards

BENZO(b)FLUORANTHENE

ICSC: 0720

Benz(e)acephenanthrylene
2,3-Benzofluoroanthene
Benzo(e)fluoranthene
3,4-Benzofluoranthene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0720
CAS # 205-99-2
RTECS # CU1400000
EC # 601-034-00-4
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0720

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BENZO(b)FLUORANTHENE

ICSC: 0720

I	**PHYSICAL STATE; APPEARANCE:** COLOURLESS CRYSTALS	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation

IMPORTANT DATA	**PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: A2 (suspected human carcinogen); (ACGIH 2004). MAK: Carcinogen category: 2; (DFG 2004). of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans. May cause genetic damage in humans.
PHYSICAL PROPERTIES	Boiling point: 481°C Melting point: 168°C Solubility in water: none Octanol/water partition coefficient as log Pow: 6.12
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. 

N O T E S

Benzo(b)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(b)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0720 **BENZO(b)FLUORANTHENE**

International Chemical Safety Cards

BENZO(k)FLUORANTHENE

ICSC: 0721

Dibenzo(b,jk)fluorene
8,9-Benzofluoranthene
11,12-Benzofluoranthene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0721
CAS # 207-08-9
RTECS # DF6350000
EC # 601-036-00-5
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0721

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BENZO(k)FLUORANTHENE

ICSC: 0721

I **M**	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

P O R T A N T D A T A	**PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004). **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 217°C Solubility in water: none Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and in fish. 

N O T E S

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0721 **BENZO(k)FLUORANTHENE**

International Chemical Safety Cards

CHRYSENE

ICSC: 1672

Benzoaphenanthrene
1,2-Benzophenanthrene
1,2,5,6-Dibenzonaphthalene
$C_{18}H_{12}$
Molecular mass: 228.3

ICSC # 1672
CAS # 218-01-9
RTECS # GC0700000
UN # 3077
EC # 601-048-00-0
October 12, 2006 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray. Dry powder. Foam. Carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: P3 filter respirator for toxic particles. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	T symbol N symbol R: 45-68-50/53 S: 53-45-60-61 UN Hazard Class: 9 UN Packing Group: III Signal: Warning Aqua-Cancer Suspected of causing cancer Very toxic to aquatic life with long lasting effects Very toxic to aquatic life

SEE IMPORTANT INFORMATION ON BACK

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European

International Chemical Safety Cards

CHRYSENE

ICSC: 1672

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS TO BEIGE CRYSTALS OR POWDER

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
The substance decomposes on burning producing toxic fumes Reacts violently with strong oxidants

OCCUPATIONAL EXPOSURE LIMITS:
TLV: A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2006).
MAK not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

INHALATION RISK:
A harmful concentration of airborne particles can be reached quickly when dispersed

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 448°C
Melting point: 254 - 256°C
Density: 1.3 g/cm³

Solubility in water:
very poor
Octanol/water partition coefficient as log Pow: 5.9

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in seafood. It is strongly advised that this substance does not enter the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. This substance does not usually occur as a pure substance but as a component of polyaromatic hydrocarbon (PAH) mixtures. Human population studies have associated PAH's exposure with cancer and cardiovascular diseases.

Transport Emergency Card: TEC (R)-90GM7-III

ADDITIONAL INFORMATION

International Chemical Safety Cards

DIBENZO(a,h)ANTHRACENE

ICSC: 0431

1,25,6-Dibenzanthracene
$C_{22}H_{14}$
Molecular mass: 278.4

ICSC # 0431
CAS # 53-70-3
RTECS # HN2625000
EC # 601-041-00-2
October 23, 1995 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN	Redness. Swelling. Itching.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P3 filter respirator for toxic particles.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0431

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

DIBENZO(a,h)ANTHRACENE

ICSC: 0431

I

M

P

O

PHYSICAL STATE; APPEARANCE:
COLOURLESS CRYSTALLINE POWDER.

PHYSICAL DANGERS:

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration

R T A N T D A T A	**CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established.	of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the skin , resulting in photosensitization. This substance is probably carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 524°C Melting point: 267°C Relative density (water = 1): 1.28	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.5
ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in seafood. 	

N O T E S

This is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. DBA is a commonly used name. This substance is one of many polycyclic aromatic hydrocarbons (PAH).

ADDITIONAL INFORMATION

ICSC: 0431 **DIBENZO(a,h)ANTHRACENE**

Material Safety Data Sheet

Version 4.2
Revision Date 05/19/2011
Print Date 12/09/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Fluoranthene
Product Number	:	423947
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Harmful by ingestion., Carcinogen

GHS Classification
Acute toxicity, Oral (Category 4)
Acute toxicity, Dermal (Category 5)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H302	Harmful if swallowed.
H313	May be harmful in contact with skin.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273	Avoid release to the environment.
P501	Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	1
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	1
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Benzo[*j*,*k*]fluorene

Formula : $C_{16}H_{10}$

Molecular Weight : 202.25 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Fluoranthene			
206-44-0	205-912-4	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 105 - 110 °C (221 - 230 °F) - lit.
Boiling point	384 °C (723 °F) - lit.
Flash point	198.0 °C (388.4 °F) - closed cup
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available

Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 2,000 mg/kg

Inhalation LC50
no data available

Dermal LD50
LD50 Dermal - rabbit - 3,180 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Fluoranthene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be human carcinogens. (Fluoranthene)
	Reasonably anticipated to be a human carcinogen (Fluoranthene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: LL4025000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.0077 mg/l - 96 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 560 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - > 0.005 - < 0.01 mg/l - 3 d
	Immobilization EC50 - Daphnia magna (Water flea) - 0.78 mg/l - 20 h
	NOEC - Daphnia magna (Water flea) - 0.085 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Fluoranthene)
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
Harmful by ingestion., Carcinogen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Fluoranthene	206-44-0	1990-01-01

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 3.1
Revision Date 10/15/2010
Print Date 12/09/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Fluorene

Product Number : 46880
Brand : Aldrich
Product Use : For laboratory research purposes.

Supplier : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Manufacturer : Sigma-Aldrich Corporation
3050 Spruce St.
St. Louis, Missouri 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555
Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
No known OSHA hazards

GHS Classification
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P273 Avoid release to the environment.
P501 Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification
Health hazard: 1
Flammability: 1
Physical hazards: 0

NFPA Rating
Health hazard: 1
Fire: 1
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.

Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{13}H_{10}$
Molecular Weight : 166.22 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Fluorene			
86-73-7	201-695-5	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	crystalline
Colour	white

Safety data

pH	no data available
Melting/freezing point	Melting point/range: 113 - 115 °C (235 - 239 °F)
	Melting point/range: 111 - 114 °C (232 - 237 °F) - lit.
Boiling point	298 °C (568 °F) - lit.
Flash point	151.0 °C (303.8 °F) - closed cup
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available

Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
LD50 Intraperitoneal - mouse - > 2.0 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Fluorene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: LL5670000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Fish - 0.82 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	Remarks: no data available
Toxicity to algae	EC50 - Algae - 3.4 mg/l - 96 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 24 h Bioconcentration factor (BCF): 512

Mobility in soil
Adsorbs on soil.

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN-Number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Fluorene)
Marine pollutant: Marine pollutant

IATA
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Fluorene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
No known OSHA hazards

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Fluorene	86-73-7	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Fluorene	86-73-7	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Fluorene	86-73-7	2007-03-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

International Chemical Safety Cards

INDENO(1,2,3-cd)PYRENE

ICSC: 0730

o-Phenylenepyrene
2,3-Phenylenepyrene
$C_{22}H_{12}$
Molecular mass: 276.3

ICSC # 0730
CAS # 193-39-5
RTECS # NK9300000
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0730

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

INDENO(1,2,3-cd)PYRENE

ICSC: 0730

I **M** **P**	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS **PHYSICAL DANGERS:**	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:**

O R T A N T D A T A	**CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004).	Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 536°C Melting point: 164°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.58
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish. 	

N O T E S

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0730 **INDENO(1,2,3-cd)PYRENE**

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

Naphthene
$C_{10}H_8$
Molecular mass: 128.18

ICSC # 0667
CAS # 91-20-3
RTECS # QJ0525000
UN # 1334 (solid); 2304 (molten)
EC # 601-052-00-2
April 21, 2005 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Headache. Weakness. Nausea. Vomiting. Sweating. Confusion. Jaundice. Dark urine.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! (Further see Inhalation).	Protective gloves.	Rinse skin with plenty of water or shower.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Convulsions. Unconsciousness. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, food and feedstuffs Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 22-40-50/53 S: 2-36/37-46-60-61 UN Hazard Class: 4.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0667

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

I M P O R T A N T D A T A

PHYSICAL STATE; APPEARANCE:
WHITE SOLID IN VARIOUS FORMS , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
On combustion, forms irritating and toxic gases. Reacts with strong oxidants

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 10 ppm as TWA 15 ppm as STEL (skin) A4 (not classifiable as a human carcinogen); (ACGIH 2005).
MAK: skin absorption (H);
Carcinogen category: 2; Germ cell mutagen group: 3B; (DFG 2004).
OSHA PEL†: TWA 10 ppm (50 mg/m^3)
NIOSH REL: TWA 10 ppm (50 mg/m^3) ST 15 ppm (75 mg/m^3)
NIOSH IDLH: 250 ppm See: 91203

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. See Notes.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance may cause effects on the blood , resulting in lesions of blood cells (haemolysis) See Notes. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the blood , resulting in chronic haemolytic anaemia. The substance may have effects on the eyes , resulting in the development of cataract. This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 218°C
Sublimation slowly at room temperature
Melting point: 80°C
Density: 1.16
g/cm3
Solubility in water, g/100 ml at 25°C:
none

Vapour pressure, Pa at 25°C: 11
Relative vapour density (air = 1): 4.42
Flash point:
80°C c.c.
Auto-ignition temperature: 540°C
Explosive limits, vol% in air: 0.9-5.9
Octanol/water partition coefficient as log Pow: 3.3

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

N O T E S

Some individuals may be more sensitive to the effect of naphthalene on blood cells.

Transport Emergency Card: TEC (R)-41S1334 (solid); 41GF1-II+III (solid); 41S2304 (molten)
NFPA Code: H2; F2; R0;

ADDITIONAL INFORMATION

Material Safety Data Sheet

Version 4.0
Revision Date 07/24/2010
Print Date 12/09/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Phenanthrene
Product Number	:	695114
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Harmful by ingestion., Irritant

Other hazards which do not result in classification
Photosensitizer.

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.

Eyes	Causes eye irritation.
Ingestion	Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{14}H_{10}$
Molecular Weight : 178.23 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Phenanthrene			
85-01-8	201-581-5	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Handle and store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control	Update	Basis

			parameters		
Phenanthrene	85-01-8	TWA	0.2 mg/m3	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m3	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses with side-shields conforming to EN166

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid

Safety data

pH	no data available
Melting point	98 - 100 °C (208 - 212 °F)
Boiling point	340 °C (644 °F)
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	1.063 g/mL at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 4.57

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - mouse - 700.0 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
Causes photosensitivity. Exposure to light can result in allergic reactions resulting in dermatologic lesions, which can vary from sunburnlike responses to edematous, vesiculated lesions, or bullae

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Phenanthrene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 3.2 mg/l - 96.0 h
	LC100 - other fish - 1.5 mg/l - 1.0 h
Toxicity to daphnia	EC50 - Daphnia magna (Water flea) - 0.86 mg/l - 24 h

and other aquatic invertebrates.

EC50 - Daphnia magna (Water flea) - 0.38 mg/l - 48 h

Toxicity to algae EC50 - Chlorella vulgaris (Fresh water algae) - 1.20 mg/l - 3 h

Persistence and degradability

Biodegradability Result: 55 - 95 % - Partially biodegradable.

Bioaccumulative potential

Bioaccumulation Pimephales promelas (fathead minnow) - 28 d
Bioconcentration factor (BCF): 5,100

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms.

13. DISPOSAL CONSIDERATIONS

Product

Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Phenanthrene)
Reportable Quantity (RQ): 5000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN-Number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Phenanthrene)
Marine pollutant: No

IATA

UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Phenanthrene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards

Harmful by ingestion., Irritant

DSL Status

All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Phenanthrene	85-01-8	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Phenanthrene	85-01-8	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Phenanthrene	85-01-8	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Phenanthrene	85-01-8	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Phenanthrene	85-01-8	1990-01-01

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

International Chemical Safety Cards

PYRENE

ICSC: 1474

Benzo (d,e,f) phenanthrene
beta-Pyrene
$C_{16}H_{10}$
Molecular mass: 202.26

ICSC # 1474
CAS # 129-00-0
RTECS # UR2450000
November 27, 2003 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking.	Water spray, carbon dioxide, dry powder, alcohol-resistant foam, foam.
EXPLOSION			
EXPOSURE			
•INHALATION		Avoid inhalation of dust	Fresh air, rest.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder Do NOT let this chemical enter the environment. (Extra personal protection: P2 filter respirator for harmful particles.)	Separated from strong oxidants. Keep in a well-ventilated room.	Do not transport with food and feedstuffs. R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1474

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

PYRENE

ICSC: 1474

I **M**	**PHYSICAL STATE; APPEARANCE:** YELLOW COLOURLESS SOLID IN VARIOUS FORMS	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation through the skin and by ingestion

P O R T A N T D A T A	**PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on heating producing irritating fumes **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK not established. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Exposure to sun may provoke an irritating effect of pyrene on skin and lead to chronic skin discoloration. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**

PHYSICAL PROPERTIES	Boiling point: 404°C Melting point: 151°C Density: 1.27 g/cm3	Solubility in water: 0.135 mg/l at 25°C Vapour pressure, Pa at °C: 0.08 Octanol/water partition coefficient as log Pow: 4.88
ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in crustacea,in fish,in milk,in algae andin molluscs. It is strongly advised that this substance does not enter the environment. 	

N O T E S

Pyrene is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, pyrene may be encountered as a laboratory chemical in its pure form. Health effects of exposure to the substance have not been investigated adequately. See ICSC 1415 Coal-tar pitch.

ADDITIONAL INFORMATION

ICSC: 1474 **PYRENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

Material Safety Data Sheet

Version 4.0
Revision Date 03/12/2010
Print Date 12/09/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	4,4'-DDD PESTANAL,250 MG (2,2-BIS(4-CHL&
Product Number	:	35486
Brand	:	Fluka
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Toxic by ingestion, Harmful by skin absorption., Possible carcinogen.

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane
4,4′-DDD
TDE

Formula : $C_{14}H_{10}Cl_4$
Molecular Weight : 320.04 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane			
72-54-8	200-783-0	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid

Safety data

pH	no data available
Melting point	94.0 - 96.0 °C (201.2 - 204.8 °F)
Boiling point	193.0 °C (379.4 °F) at 1.3 hPa (1.0 mmHg)
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg) at 25.0 °C (77.0 °F)
Density	1.38 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 6.02

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - Hamster - > 5,000 mg/kg

TDLo Oral - Human - 428.5 mg/kg
Remarks: Endocrine:Adrenal cortex hypoplasia.

TDLo Oral - rat - 6,000 mg/kg
Remarks: Cardiac:Other changes. Gastrointestinal:Other changes. Kidney, Ureter, Bladder:Changes in both tubules and glomeruli.

TDLo Oral - rat - 14 mg/kg
Remarks: Liver:Changes in liver weight. Endocrine:Estrogenic. Musculoskeletal:Other changes.

TDLo Oral - rat - 2,100 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex).

LD50 Dermal - rabbit - 1,200 mg/kg
Remarks: Behavioral:Excitement. Behavioral:Convulsions or effect on seizure threshold. Skin irritation

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (GHS)
no data available

Specific target organ toxicity - repeated exposure (GHS)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.

Eyes May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: KI0700000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - other fish - 1.18 - 9 mg/l - 96.0 h
	LC50 - Lepomis macrochirus (Bluegill) - 0.04 - 0.05 mg/l - 96.0 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.06 - 0.09 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 3.47 - 5.58 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia pulex (Water flea) - 0.01 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
Indication of bioaccumulation.

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Marine pollutant: No

IATA
UN-Number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

15. REGULATORY INFORMATION

OSHA Hazards
Toxic by ingestion, Harmful by skin absorption., Possible carcinogen.

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

International Chemical Safety Cards

DDT

ICSC: 0034

Dichlorodiphenyltrichloroethane
1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane
2,2-bis(p-Chlorophenyl)-1,1,1-trichloroethane
1,1'-(2,2,2-Trichloroethylidene)bis(4-chlorobenzene)
p,p'-DDT
$C_{14}H_9Cl_5$
Molecular mass: 354.5

ICSC # 0034
CAS # 50-29-3
RTECS # KJ3325000
UN # 2761
EC # 602-045-00-7
April 20, 2004 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety goggles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Tremors. Diarrhoea. Dizziness. Headache. Vomiting. Numbness. Paresthesias. Hyperexcitability. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT let this chemical enter the environment. Sweep spilled substance into sealable non-metallic containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P3 filter respirator for toxic particles.	Provision to contain effluent from fire extinguishing. Separated from iron, aluminum and its salts, food and feedstuffs See Chemical Dangers.	Do not transport with food and feedstuffs. Severe marine pollutant. T symbol N symbol R: 25-40-48/25-50/53 S: 1/2-22-36/37-45-60-61 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

DDT

ICSC: 0034

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS CRYSTALS WHITE POWDER. TECHNICAL PRODUCT IS WAXY SOLID. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** On combustion, forms toxic and corrosive fumesincludinghydrogen chloride. Reacts with aluminium and iron. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 1 mg/m³ as TWA A3 (ACGIH 2004). MAK: 1 mg/m³ H Peak limitation category: II(8) (DFG 2003). OSHA PEL: TWA 1 mg/m^3 skin NIOSH REL: Ca TWA 0.5 mg/m^3 See Appendix A NIOSH IDLH: Ca 500 mg/m^3 See: 50293 **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly especially if powdered. **EFFECTS OF SHORT-TERM EXPOSURE:** May cause mechanical irritation. The substance may cause effects on the central nervous system , resulting in convulsions and respiratory depression Exposure at high levels may result in death. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 260°C Melting point: 109°C Density: 1.6 g/cm3 Solubility in water: poor Octanol/water partition coefficient as log Pow: 6.36
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to birds. Bioaccumulation of this chemical may occur along the food chain, for example in milk and aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be given to avoid any additional release, e.g. through inappropriate disposal. 

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home. Consult national legislation. Agritan, Azotox, Anofex, Ixodex, Gesapon, Gesarex, Gesarol, Guesapon, Clofenotane, Zeidane, Dicophane, Neocid are trade names.

Transport Emergency Card: TEC (R)-61GT7-III

ADDITIONAL INFORMATION

ICSC: 0034 **DDT**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

DIELDRIN

ICSC: 0787

1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo-1,4-exo- 5,8-dimethanonaphthalene
3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2ß,2aalpha,3ß,6ß,6aalpha,7ß,7aalpha)-2,73,6-dimethanonaphth(2,3-b)oxirene
HEOD
$C_{12}H_8Cl_6O$
Molecular mass: 380.9

ICSC # 0787
CAS # 60-57-1
RTECS # IO1750000
UN # 2761
EC # 602-049-00-9
March 26, 1998 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	
•INHALATION	(See Ingestion).	Ventilation (not if powder).	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! See Ingestion.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Convulsions. Dizziness. Headache. Nausea. Vomiting. Muscle twitching.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT wash away into sewer. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. (Extra personal protection: chemical protection suit including self-contained breathing apparatus).	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs and incompatible materials: See Chemical Dangers. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Severe marine pollutant. T+ symbol N symbol R: 25-27-40-48/25-50/53 S: 1/2-22-36/37-45-60-61 UN Hazard Class: 6.1 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

DIELDRIN

ICSC: 0787

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS CRYSTALS

PHYSICAL DANGERS:

CHEMICAL DANGERS:
The substance decomposes on heating producing toxic fumes including hydrogen chloride. Reacts with oxidants and acids. Attacks metal due to the slow formation of hydrogen chloride in storage.

OCCUPATIONAL EXPOSURE LIMITS:
TLV (as TWA): 0.25 mg/m³, A4 (skin) (ACGIH 1997).
MAK: (Inhalable fraction) 0.25 mg/m³ :
Peak limitation category: II(8)
skin absorption (H); (DFG 2007).
OSHA PEL: TWA 0.25 mg/m^3 skin
NIOSH REL: Ca TWA 0.25 mg/m^3 skin See Appendix A
NIOSH IDLH: Ca 50 mg/m^3 See: 60571

ROUTES OF EXPOSURE:
The substance can be absorbed into the body through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance may cause effects on the central nervous system , resulting in convulsions. Medical observation is indicated.

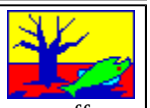
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance accumulates in the human body. Cumulative effects are possible: see Acute Hazards/Symptoms.

PHYSICAL PROPERTIES

Melting point: 175-176°C
Density: 1.7 g/cm³
Solubility in water: none

Vapour pressure, Pa at 20°C: 0.0004
Octanol/water partition coefficient as log Pow: 6.2

ENVIRONMENTAL DATA



The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to honey bees, birds. In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment because it persists in the environment. The substance may cause long-term effects in the aquatic environment. Avoid release to the environment in circumstances different to normal use.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s). Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home. Alvit, Dieldrex, Dieldrite, Illoxol, Octalox, Panoram, and Quintox are trade names. Also consult ICSC #0774, Aldrin.

Transport Emergency Card: TEC (R)-61G41b.
Card has been partially updated in August 2007: see Storage, Occupational Exposure Limits.

ADDITIONAL INFORMATION

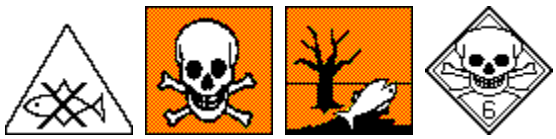
International Chemical Safety Cards

ARSENIC

ICSC: 0013

Grey arsenic
As
Atomic mass: 74.9

ICSC # 0013
CAS # 7440-38-2
RTECS # CG0525000
UN # 1558
EC # 033-001-00-X
October 18, 1999 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with strong oxidizers. NO contact with hot surfaces.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion is slight when exposed to hot surfaces or flames in the form of fine powder or dust.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Cough. Sore throat. Shortness of breath. Weakness. See Ingestion.	Closed system and ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness.	Face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Nausea. Vomiting. Burning sensation in the throat and chest. Shock or collapse. Unconsciousness.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment.	Separated from strong oxidants, acids, halogens, food and feedstuffs. Well closed.	Do not transport with food and feedstuffs. Marine pollutant. T symbol N symbol R: 23/25-50/53 S: 1/2-20/21-28-45-60-61 UN Hazard Class: 6.1 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

ARSENIC

ICSC: 0013

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS, BRITTLE, GREY, METALLIC-LOOKING CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens, causing fire and explosion hazard. Reacts with acids to produce **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.01 mg/m³ as TWA A1 (confirmed human carcinogen); BEI issued (ACGIH 2004). MAK: Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004). OSHA PEL: 1910.1018 TWA 0.010 mg/m^3 NIOSH REL: Ca C 0.002 mg/m^3 15-minute See Appendix A NIOSH IDLH: Ca 5 mg/m^3 (as As) See: 7440382 **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly, when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes the skin and the respiratory tract. The substance may cause effects on the gastrointestinal tract cardiovascular system central nervous system kidneys , resulting in severe gastroenteritis, loss of fluid, and electrolytes, cardiac disorders shock convulsions and kidney impairment Exposure above the OEL may result in death. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the mucous membranes, skin, peripheral nervous system liver bone marrow , resulting in pigmentation disorders, hyperkeratosis, perforation of nasal septum, neuropathy, liver impairment anaemia This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Sublimation point: 613°C Density: 5.7 g/cm³ Solubility in water: none
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. It is strongly advised that this substance does not enter the environment. 

N O T E S

The substance is combustible but no flash point is available in literature. Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. Refer also to cards for specific arsenic compounds, e.g., Arsenic pentoxide (ICSC 0377), Arsenic trichloride (ICSC 0221), Arsenic trioxide (ICSC 0378), Arsine (ICSC 0222).

Transport Emergency Card: TEC (R)-61GT5-II

ADDITIONAL INFORMATION

International Chemical Safety Cards

BARIUM SULFATE

ICSC: 0827

Barium sulphate
Blanc fixe
Artificial barite
$BaSO_4$
Molecular mass: 233.43

ICSC # 0827
CAS # 7727-43-7
RTECS # CR0600000
October 20, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P1 filter respirator for inert particles.		R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0827

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BARIUM SULFATE

ICSC: 0827

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS TASTELESS, WHITE OR YELLOWISH CRYSTALS OR POWDER. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Reacts violently with aluminium powder. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 10 mg/m³ as TWA; (ACGIH 2004). MAK: (Inhalable fraction) 4 mg/m³; (Respirable fraction) 1.5 mg/m³; (DFG 2004). OSHA PEL†: TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp) NIOSH REL: TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp) NIOSH IDLH: N.D. See: IDLH INDEX **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol. **INHALATION RISK:** Evaporation at 20°C is negligible; a nuisance-causing concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Lungs may be affected by repeated or prolonged exposure to dust particles , resulting in baritosis (a form of benign pneumoconiosis).
PHYSICAL PROPERTIES	Melting point (decomposes): 1600°C Density: 4.5 g/cm³ Solubility in water: none
ENVIRONMENTAL DATA	

N O T E S

Occurs in nature as the mineral barite; also as barytes, heavy spar. Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

Chrome
Cr
Atomic mass: 52.0
(powder)

ICSC # 0029
CAS # 7440-47-3
RTECS # GB4200000
October 27, 2004 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions.	No open flames if in powder form.	In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION		Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P2 filter respirator for harmful particles.		R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0029

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

I **M** **P**	**PHYSICAL STATE; APPEARANCE:** GREY POWDER **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air.	**ROUTES OF EXPOSURE:** **INHALATION RISK:** A harmful concentration of airborne particles can be reached quickly when dispersed.

O R T A N T D A T A	**CHEMICAL DANGERS:** Chromium is a catalytic substance and may cause reaction in contact with many organic and inorganic substances , causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (as Cr metal, Cr(III) compounds) 0.5 mg/m³ as TWA A4 (ACGIH 2004). MAK not established. OSHA PEL*: TWA 1 mg/m^3 See Appendix C *Note: The PEL also applies to insoluble chromium salts. NIOSH REL: TWA 0.5 mg/m^3 See Appendix C NIOSH IDLH: 250 mg/m^3 (as Cr) See: 7440473 **EFFECTS OF SHORT-TERM EXPOSURE:** May cause mechanical irritation tothe eyesandthe respiratory tract. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 2642°C Melting point: 1900°C Density: 7.15 g/cm³ Solubility in water: none
ENVIRONMENTAL DATA	

N O T E S

The surface of the chromium particles is oxidized to chromium(III)oxide in air. See ICSC 1531 Chromium(III) oxide.

ADDITIONAL INFORMATION

ICSC: 0029 **CHROMIUM**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

COPPER

ICSC: 0240

Cu
(powder)

ICSC # 0240
CAS # 7440-50-8
RTECS # GL5325000
September 24, 1993 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Special powder, dry sand, NO other agents.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough. Headache. Shortness of breath. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder. Then remove to safe place. (Extra personal protection: P2 filter respirator for harmful particles).	Separated from - See Chemical Dangers.	R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0240

International Chemical Safety Cards

COPPER

ICSC: 0240

I

M

P

PHYSICAL STATE; APPEARANCE:
RED POWDER, TURNS GREEN ON EXPOSURE TO MOIST AIR.

PHYSICAL DANGERS:

CHEMICAL DANGERS:

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

O **R** **T** **A** **N** **T** **D** **A** **T** **A**	Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxides and azides. Reacts with strong oxidants like chlorates, bromates and iodates, causing explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.2 mg/m³ fume (ACGIH 1992-1993). TLV (as Cu, dusts & mists): 1 mg/m³ (ACGIH 1992-1993). Intended change 0.1 mg/m³ Inhal., A4 (not classifiable as a human carcinogen); MAK: 0.1 mg/m³ (Inhalable fraction) Peak limitation category: II(2) Pregnancy risk group: D (DFG 2005). OSHA PEL*: TWA 1 mg/m^3 *Note: The PEL also applies to other copper compounds (as Cu) except copper fume. NIOSH REL*: TWA 1 mg/m^3 *Note: The REL also applies to other copper compounds (as Cu) except Copper fume. NIOSH IDLH: 100 mg/m^3 (as Cu) See: 7440508	**EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of fumes may cause metal fume fever. See Notes. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact may cause skin sensitization.

PHYSICAL PROPERTIES	Boiling point: 2595°C Melting point: 1083°C Relative density (water = 1): 8.9	Solubility in water: none
ENVIRONMENTAL DATA		

N O T E S

The symptoms of metal fume fever do not become manifest until several hours.

ADDITIONAL INFORMATION

ICSC: 0240 **COPPER**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

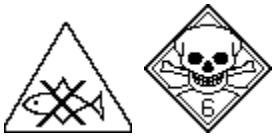
International Chemical Safety Cards

IRON (III)-o-ARSENITE, PENTAHYDRATE

ICSC: 1241

Ferric arsenite
$As_2Fe_2O_6 \cdot Fe_2O_3 \cdot 5H_2O$
Molecular mass: 607.3

ICSC # 1241
CAS # 63989-69-5
RTECS # NO4600000
UN # 1607
EC # 033-002-00-5
October 27, 1994 Validated



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Cough. Shortness of breath. Sore throat. Weakness. See Ingestion.	Avoid inhalation of fine dust and mist. Closed system and ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Redness. Burning sensation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Vacuum spilled material. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. Personal protection: P3 filter respirator for toxic particles.	Separated from food and feedstuffs .	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Marine pollutant. Note: A, 1 T symbol N symbol R: 23/25-50/53 S: 1/2-20/21-28-45-60-61 UN Hazard Class: 6.1 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1241

International Chemical Safety Cards

IRON (III)-o-ARSENITE, PENTAHYDRATE

ICSC: 1241

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** BROWN POWDER. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on heating or on burning producing toxic fumes of arsenic and iron. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (as As) 0.01 mg/m³ as TWA; A1 (confirmed human carcinogen); BEI issued; (ACGIH 2004). MAK: Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes , the skin and the respiratory tract . The substance may cause effects on the nervous system, liver, skin, kidneys and gastrointestinal tract , resulting in kidney impairment, neuropathy, severe gastroenteritis, degenerative liver damage and dermatitis. Exposure may result in death. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis, grey skin and hyperkeratosis. The substance may have effects on the nervous system,liver,cardiovascular system and respiratory tract , resulting in neuropathy, gangrene, degenerative liver damage and perforation of nasal septum. This substance is carcinogenic to humans.
PHYSICAL PROPERTIES	Solubility in water: none	
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to plants, air quality and water quality. It is strongly advised that this substance does not enter the environment. 	

N O T E S

Do NOT take working clothes home. See also ICSC0013 Arsenic. Card has been partly updated in April and October 2005. See sections Occupational Exposure Limits, EU classification, Emergency Response.

Transport Emergency Card: TEC (R)-61GT5-II

ADDITIONAL INFORMATION

ICSC: 1241 **IRON (III)-o-ARSENITE, PENTAHYDRATE**

International Chemical Safety Cards

LEAD

ICSC: 0052

Lead metal
Plumbum
Pb
Atomic mass: 207.2
(powder)

ICSC # 0052
CAS # 7439-92-1
RTECS # OF7525000
October 08, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. Personal protection: P3 filter respirator for toxic particles.	Separated from food and feedstuffs incompatible materials See Chemical Dangers.	R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0052

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

LEAD

ICSC: 0052

I M P O R T A N T D A T A

PHYSICAL STATE; APPEARANCE:
BLUISH-WHITE OR SILVERY-GREY SOLID IN VARIOUS FORMS. TURNS TARNISHED ON EXPOSURE TO AIR.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
On heating, toxic fumes are formed. Reacts with oxidants. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric acid and sulfuric acid. Attacked by pure water and by weak organic acids in the presence of oxygen.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.05 mg/m³ A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2004).
MAK:
Carcinogen category: 3B; Germ cell mutagen group: 3A; (DFG 2004).
EU OEL: as TWA 0.15 mg/m³ (EU 2002).
OSHA PEL*: 1910.1025 TWA 0.050 mg/m^3 See Appendix C *Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.
NIOSH REL*: TWA 0.050 mg/m^3 See Appendix C *Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.
NIOSH IDLH: 100 mg/m^3 (as Pb) See: 7439921

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the blood bone marrow central nervous system peripheral nervous system kidneys , resulting in anaemia, encephalopathy (e.g., convulsions), peripheral nerve disease, abdominal cramps and kidney impairment. Causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES	Boiling point: 1740°C Melting point: 327.5°C	Density: 11.34 g/cm3 Solubility in water: none
ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in plants and in mammals. It is strongly advised that this substance does not enter the environment. 	

N O T E S

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home.

Transport Emergency Card: TEC (R)-51S1872

ADDITIONAL INFORMATION

ICSC: 0052 **LEAD**

International Chemical Safety Cards

MAGNESIUM (POWDER)

ICSC: 0289

Mg
Atomic mass: 24.30

ICSC # 0289
CAS # 7439-95-4
RTECS # OM2100000
UN # 1418
EC # 012-001-00-3 (pyrophoric)
April 12, 2000 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with moisture, acids, halogens and many other substances.	Special powder, dry sand, NO other agents. NO water.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Do NOT expose to friction or shock. Prevent build-up of electrostatic charges (e.g., by grounding).	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough. Laboured breathing. Headache. Dullness. Weakness. Fever or elevated body temperature.		
•SKIN			
•EYES	Redness. Pain.	Safety goggles.	
•INGESTION	Abdominal pain. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT wash away into sewer. Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Personal protection: P2 filter respirator for harmful particles.	Fireproof. Separated from strong oxidants, acids. Dry.	Airtight. F symbol R: 15-17 S: 2-7/8-43 UN Hazard Class: 4.3 UN Subsidiary Risks: 4.2 UN Packing Group: ll

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0289

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

MAGNESIUM (POWDER)

ICSC: 0289

I **M**	**PHYSICAL STATE; APPEARANCE:** GREY POWDER	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation.

P O R T A N T D A T A	**PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc. **CHEMICAL DANGERS:** The substance may spontaneously ignite on contact with air or moisture producing irritating or toxic fumes Reacts violently with strong oxidants. Reacts violently with many substances causing fire and explosion hazard. Reacts with acids and water forming flammable/explosive gas (hydrogen - see ICSC0001) causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK not established. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of fumes may cause metal fume fever. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 1100°C Melting point: 651°C Density: 1.7 g/cm³ Solubility in water: none Auto-ignition temperature: 473°C Explosive limits, vol% in air: see Notes
ENVIRONMENTAL DATA	

N O T E S

Burns with an intense flame. In order to prevent eye injury do not look directly at magnesium fires. Reacts violently with fire extinguishing agents such as water, carbon dioxide and powder. Explosive limits, vol% in air: (LEL) 0.03 kg/m^3.

Transport Emergency Card: TEC (R)-43GWS-II+III
NFPA Code: H0; F1; R2;

ADDITIONAL INFORMATION

ICSC: 0289 **MAGNESIUM (POWDER)**

International Chemical Safety Cards

MANGANESE

ICSC: 0174

Mn
Atomic mass: 54.9
(powder)

ICSC # 0174
CAS # 7439-96-5
RTECS # OO9275000
November 27, 2003 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Dry sand, special powder.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN		Protective gloves.	Rinse and then wash skin with water and soap.
•EYES		Safety goggles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. (Extra personal protection: P2 filter respirator for harmful particles.)	Separated from acids. Dry.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0174

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

MANGANESE

ICSC: 0174

I	**PHYSICAL STATE; APPEARANCE:** GREY - WHITE POWDER **PHYSICAL DANGERS:**	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

IMPORTANT DATA	Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts slowly with water more rapidly with steam and acids forming flammable/explosive gas (hydrogen - see ICSC0001) causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.2 mg/m³ (as TWA); (ACGIH 2003). MAK: (Inhalable fraction) 0.5 mg/m³; Pregnancy risk group: C; (DFG 2007). OSHA PEL*: C 5 mg/m^3 *Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl and Methyl cyclopentadienyl manganese tricarbonyl. NIOSH REL*: TWA 1 mg/m^3 ST 3 mg/m^3 *Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl, Methyl cyclopentadienyl manganese tricarbonyl, and Manganese tetroxide. NIOSH IDLH: 500 mg/m^3 (as Mn) See: 7439965	**INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** The aerosol is irritating to the respiratory tract . **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the lungs and central nervous system , resulting in increased susceptibility to bronchitis, pneumonitis and neurologic, neuropsychiatric disorders (manganism). Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 1962°C Melting point: 1244°C Density: 7.47 g/cm³	Solubility in water: none
ENVIRONMENTAL DATA	This substance may be hazardous in the environment; special attention should be given to aquatic organisms. 	

N O T E S

Depending on the degree of exposure, periodic medical examination is suggested. The recommendations on this Card also apply to ferro manganese.

ADDITIONAL INFORMATION

ICSC: 0174 **MANGANESE**

International Chemical Safety Cards

MERCURY

ICSC: 0056

Quicksilver
Liquid silver
Hg
Atomic mass: 200.6

ICSC # 0056
CAS # 7439-97-6
RTECS # OV4550000
UN # 2809
EC # 080-001-00-0
April 22, 2004 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Risk of fire and explosion.		In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Abdominal pain. Cough. Diarrhoea. Shortness of breath. Vomiting. Fever or elevated body temperature.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area in case of a large spill! Consult an expert! Ventilation. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Chemical protection suit including self-contained breathing apparatus.	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs Well closed.	Special material. Do not transport with food and feedstuffs. T symbol N symbol R: 23-33-50/53 S: 1/2-7-45-60-61 UN Hazard Class: 8 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

MERCURY

ICSC: 0056

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts violently with ammonia and halogens causing fire and explosion hazard. Attacks aluminium and many other metals forming amalgams. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.025 mg/m³ as TWA (skin) A4 BEI issued (ACGIH 2004). MAK: 0.1 mg/m³ Sh Peak limitation category: II(8) Carcinogen category: 3B (DFG 2003). OSHA PEL†: C 0.1 mg/m^3 NIOSH REL: Hg Vapor: TWA 0.05 mg/m^3 skin Other: C 0.1 mg/m^3 skin NIOSH IDLH: 10 mg/m^3 (as Hg) See: 7439976 **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour and through the skin , also as a vapour! **INHALATION RISK:** A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the skin. Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the central nervous systemandkidneys. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the central nervous system kidneys , resulting in irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction.
PHYSICAL PROPERTIES	Boiling point: 357°C Melting point: -39°C Relative density (water = 1): 13.5 Solubility in water: none Vapour pressure, Pa at 20°C: 0.26 Relative vapour density (air = 1): 6.93 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish. 

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. No odour warning if toxic concentrations are present. Do NOT take working clothes home.

Transport Emergency Card: TEC (R)-80GC9-II+III

ADDITIONAL INFORMATION

ICSC: 0056 **MERCURY**

International Chemical Safety Cards

NICKEL

ICSC: 0062

Ni
Atomic mass: 58.7
(powder)

ICSC # 0062
CAS # 7440-02-0
RTECS # QR5950000
EC # 028-002-00-7
October 17, 2001 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable as dust. Toxic fumes may be released in a fire.		Dry sand. NO carbon dioxide. NO water.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!	
•INHALATION	Cough. Shortness of breath.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Vacuum spilled material. Carefully collect remainder, then remove to safe place. Personal protection: P2 filter respirator for harmful particles.	Separated from strong acids.	Xn symbol R: 40-43 S: 2-22-36

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0062

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

NICKEL

ICSC: 0062

I

PHYSICAL STATE; APPEARANCE:
SILVERY METALLIC SOLID IN VARIOUS FORMS.

PHYSICAL DANGERS:

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of the dust.

IMPORTANT DATA	Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts violently, in powder form, with titanium powder and potassium perchlorate, and oxidants such as ammonium nitrate, causing fire and explosion hazard. Reacts slowly with non-oxidizing acids and more rapidly with oxidizing acids. Toxic gases and vapours (such as nickel carbonyl) may be released in a fire involving nickel. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (Inhalable fraction) 1.5 mg/m³ as TWA A5 (not suspected as a human carcinogen); (ACGIH 2004). MAK: (Inhalable fraction) sensitization of respiratory tract and skin (Sah); Carcinogen category: 1; (DFG 2004). OSHA PEL*†: TWA 1 mg/m^3 *Note: The PEL does not apply to Nickel carbonyl. NIOSH REL*: Ca TWA 0.015 mg/m^3 See Appendix A *Note: The REL does not apply to Nickel carbonyl. NIOSH IDLH: Ca 10 mg/m^3 (as Ni) See: 7440020 **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** May cause mechanical irritation. Inhalation of fumes may cause pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation exposure may cause asthma. Lungs may be affected by repeated or prolonged exposure. This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 2730°C Melting point: 1455°C Density: 8.9 g/cm3 Solubility in water: none
ENVIRONMENTAL DATA	

N O T E S

At high temperatures, nickel oxide fumes will be formed. Depending on the degree of exposure, periodic medical examination is suggested. The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Anyone who has shown symptoms of asthma due to this substance should avoid all further contact with this substance.

ADDITIONAL INFORMATION

ICSC: 0062 **NICKEL**

International Chemical Safety Cards

SODIUM

ICSC: 0717

Natrium
Na
Atomic mass: 23.0

ICSC # 0717
CAS # 7440-23-5
RTECS # VY0686000
UN # 1428
EC # 011-001-00-0
April 06, 2006 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire.	NO contact with water, acid(s) or halogens . NO open flames, NO sparks, and NO smoking.	Special powder, dry sand, NO other agents.
EXPLOSION	Risk of fire and explosion. on contact with acid(s) , halogens , water .		Combat fire from a sheltered position.
EXPOSURE			
•INHALATION	Cough. Sore throat. Burning sensation.	Closed system and ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Pain. Blisters. Serious skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
•EYES	Severe deep burns. loss of vision.	Face shield .	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Chemical protection suit including self-contained breathing apparatus. Cover the spilled material with dry powder.	Fireproof. Keep under mineral oil. Dry. Well closed.	Airtight. Unbreakable packaging; put breakable packaging into closed unbreakable container. F symbol C symbol R: 14/15-34 S: (1/2)-5 -8-43-45 UN Hazard Class: 4.3 UN Packing Group: I Signal: Danger Flame-Corr In contact with water releases flammable gases which may ignite spontaneously Causes severe skin burns and eye damage

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0717

International Chemical Safety Cards

SODIUM

ICSC: 0717

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
SILVERY SOLID IN VARIOUS FORMS

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Reacts violently with water , causing fire and explosion hazard . The substance decomposes rapidly under the influence of air and moisture , forming flammable/explosive gas (Hydrogen - see ICSC0001) .

OCCUPATIONAL EXPOSURE LIMITS:
TLV not established.
MAK not established.

ROUTES OF EXPOSURE:
Serious local effects by all routes of exposure.

INHALATION RISK:

EFFECTS OF SHORT-TERM EXPOSURE:
See ICSC 0360 (Sodium hydroxide)

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:

PHYSICAL PROPERTIES

Boiling point: 880°C
Melting point: 97.4°C
Density: 0.97 g/cm³
Solubility in water: reaction
Vapour pressure, Pa at 20°C: negligible
Auto-ignition temperature: 120-125°C

ENVIRONMENTAL DATA

NOTES

Sodium is always kept under mineral oil. Reacts violently with fire extinguishing agents such as water and carbon dioxide .

Transport Emergency Card: TEC (R)-43S1428a
NFPA Code: H3; F3; R2;

ADDITIONAL INFORMATION

ICSC: 0717 **SODIUM**

IMPORTANT LEGAL NOTICE:

International Chemical Safety Cards

ZINC POWDER

ICSC: 1205

Blue powder
Merrillite
Zn
Atomic mass: 65.4
(powder)



ICSC # 1205
CAS # 7440-66-6
RTECS # ZG8600000
UN # 1436 (zinc powder or dust)
EC # 030-001-00-1
October 24, 1994 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with acid(s), base (s) and incompatible substances (see Chemical Dangers).	Special powder, dry sand, NO other agents. NO water.
EXPLOSION	Risk of fire and explosion on contact with acid(s), base(s), water and incompatible substances.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Prevent deposition of dust.	In case of fire: cool drums, etc., by spraying with water but avoid contact of the substance with water.
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
•**INHALATION**	Metallic taste and metal fume fever. Symptoms may be delayed (see Notes).	Local exhaust.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Dry skin.	Protective gloves.	Rinse and then wash skin with water and soap.
•**EYES**		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Extinguish or remove all ignition sources. Do NOT wash away into sewer. Sweep spilled substance into containers. then remove to safe place. Personal protection: self-contained breathing apparatus.	Fireproof. Separated from acids, bases oxidants Dry.	Airtight. F symbol N symbol R: 15-17-50/53 S: 2-7/8-43-46-60-61 UN Hazard Class: 4.3 UN Subsidiary Risks: 4.2

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

ZINC POWDER

ICSC: 1205

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** ODOURLESS GREY TO BLUE POWDER. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc. **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. The substance is a strong reducing agent and reacts violently with oxidants. Reacts with water and reacts violently with acids and bases forming flammable/explosive gas (hydrogen - see ICSC0001) Reacts violently with sulfur, halogenated hydrocarbons and many other substances causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of fumes may cause metal fume fever. The effects may be delayed. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis.
PHYSICAL PROPERTIES	Boiling point: 907°C Melting point: 419°C Relative density (water = 1): 7.14 Solubility in water: reaction Vapour pressure, kPa at 487°C: 0.1 Auto-ignition temperature: 460°C
ENVIRONMENTAL DATA	

N O T E S

Zinc may contain trace amounts of arsenic, when forming hydrogen, may also form toxic gas arsine (see ICSC 0001 and ICSC 0222). Reacts violently with fire extinguishing agents such as water, halons, foam and carbon dioxide. The symptoms of metal fume fever do not become manifest until several hours later. Rinse contaminated clothes (fire hazard) with plenty of water.

Transport Emergency Card: TEC (R)-43GWS-II+III
NFPA Code: H0; F1; R1;

ADDITIONAL INFORMATION

ICSC: 1205 **ZINC POWDER**

APPENDIX D

HOSPITAL INFORMATION AND MAP

FIELD ACCIDENT REPORT

FIELD ACCIDENT REPORT

This report is to be filled out by the designated Site Safety Officer after EVERY accident.

PROJECT NAME _____ PROJECT. NO._____

Date of Accident _____ Time _____ Report By _____

Type of Accident (Check One):

( ) Vehicular ( ) Personal ( ) Property

Name of Injured _____ DOB or Age _____

How Long Employed _____

Names of Witnesses _____

_____

Description of Accident _____

_____

_____

Action Taken _____

_____

_____

Did the Injured Lose Any Time? _____ How Much (Days/Hrs.)? _____

Was Safety Equipment in Use at the Time of the Accident (Hard Hat, Safety Glasses, Gloves, Safety Shoes, etc.)? _____

_____

(If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW

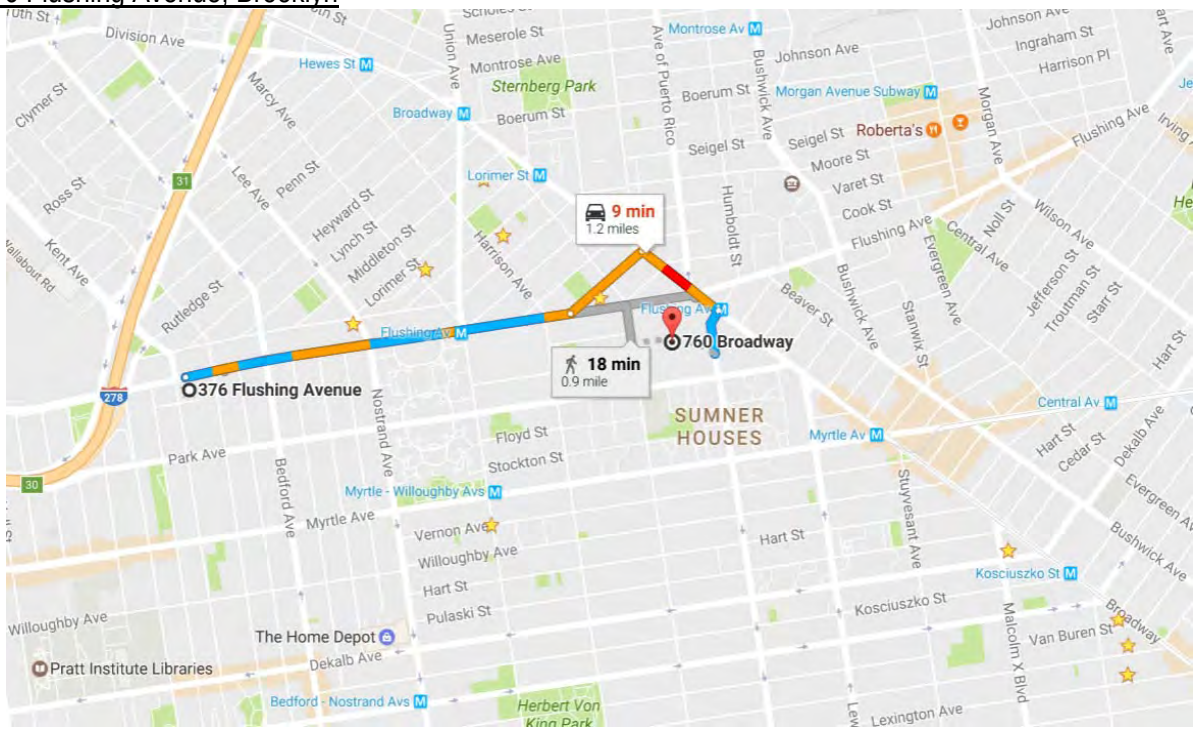
HOSPITAL INFORMATION AND MAP

The hospital nearest the site is:

NYC Health + Hospitals Woodhull
760 Broadway, Brooklyn, New York 11206
718-963-8000

1.2 Miles – About 9 Minutes

376 Flushing Avenue, Brooklyn



376 Flushing Avenue
Brooklyn, NY 11205

- Head east on Flushing Ave toward Franklin Ave
  0.7 mi
- Slight left onto Whipple St
  0.2 mi
- Turn right onto Broadway
  0.2 mi
- Turn right onto Marcus Garvey Blvd/Sumner Ave
  440 ft

760 Broadway
Brooklyn, NY 11206

ATTACHMENT C
Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN
FORMER NY CLEANING AND DYEING SITE
376-378 FLUSHING AVENUE
BROOKLYN, NEW YORK 11205

Prepared on behalf of:

Rose Castle Redevelopment II LLC
266 Broadway, Suite 301
Brooklyn, NY 11211

Prepared by:

EBC
Environmental Business Consultants
1808 Middle Country Road
Ridge, NY 11961

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Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared in accordance with DER-10 to detail procedures to be followed during the course of the sampling and analytical portion of the project, as required by the approved work plan.

To ensure the successful completion of the project each individual responsible for a given component of the project must be aware of the quality assurance objectives of his / her particular work and of the overall project. The EBC Project Director, Charles Sosik will be directly responsible to the client for the overall project conduct and quality assurance/quality control (QA/QC) for the project. The Project Director will be responsible for overseeing all technical and administrative aspects of the project and for directing QA/QC activities. Mr. Kevin Brussee (EBC) will serve as the Quality Assurance Officer (QAO) and in this role may conduct:

- conduct periodic field and sampling audits;
- interface with the analytical laboratory to resolve problems; and
- interface with the data validator and/or the preparer of the DUSR to resolve problems.

Keith Butler will serve as the Project Manager and will be responsible for implementation of the Remedial Action Workplan and coordination with field sampling crews and subcontractors. Reporting directly to the Project Manager will be the Field Operations Officer, Kevin Waters; who will serve as the on-Site qualified environmental professional who will record observations, direct the drilling crew and be responsible for the collection and handling of all samples.

1.1 Organization

Project QA will be maintained under the direction of the Project Manager, in accordance with this QAPP. QC for specific tasks will be the responsibility of the individuals and organizations listed below, under the direction and coordination of the Project Manager.

GENERAL RESPONSIBILITY	SCOPE OF WORK	RESPONSIBILITY OF QUALITY CONTROL
Field Operations	Supervision of Field Crew, sample collection and handling	K. Waters, EBC
Project Manager	Implementation of the RAWP.	K. Butler, EBC
Laboratory Analysis	Analysis of soil samples by NYSDEC ASP methods Laboratory	NYSDOH-Certified Laboratory
Data review	Review for completeness and compliance	3rd party validation

2.0 QUALITY ASSURANCE PROJECT PLAN OBJECTIVES

2.1 Overview

Overall project goals are defined through the development of Data Quality Objectives (DQOs), which are qualitative and quantitative Statements that specify the quality of the data required to support decisions; DQOs, as described in this section, are based on the end uses of the data as described in the work plan.

In this plan, Quality Assurance and Quality Control are defined as follows:

- Quality Assurance - The overall integrated program for assuring reliability of monitoring and measurement data.

- Quality Control - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

2.2 QA / QC Requirements for Analytical Laboratory

Samples will be analyzed by a New York State Department of Health (NYSDOH) certified laboratory, certified in the appropriate categories. Data generated from the laboratory will be used to evaluate contaminants such as metals and semi-volatile organic compounds (SVOCs) in historic fills, chlorinated volatile organic compounds (CVOCs) in soil, soil gas and groundwater and SVOCs in groundwater. The QA requirements for all subcontracted analytical laboratory work performed on this project are described below. QA elements to be evaluated include accuracy, precision, sensitivity, representativeness, and completeness. The data generated by the analytical laboratory for this project are required to be sensitive enough to achieve detection levels low enough to meet required quantification limits as specified in NYSDEC Analytical Services Protocol (NYSDEC ASP, 07/2005). The analytical results meeting the required quantification limits will provide data sensitive enough to meet the data quality objectives of this remedial program as described in the work plan. Reporting of the data must be clear, concise, and comprehensive. The QC elements that are important to this project are completeness of field data, sample custody, sample holding times, sample preservation, sample storage, instrument calibration and blank contamination.

2.2.1 Instrument Calibration

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in NYSDEC ASP 07/2005.

2.2.2 Continuing Instrument Calibration

The initial calibration curve will be verified every 12 hrs by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

2.2.3 Method Blanks

Method blank or preparation blank is prepared from an analyte-free matrix which includes the same reagents, internal standards and surrogate standards as me related samples. II is carried through the entire sample preparation and analytical procedure. A method blank analysis will be performed once for each 12 hr period during the analysis of samples for volatiles. An acceptable method blank will contain less than two (2) times the CRQL of methylene chloride, acetone and 2-butanone. For all other target compounds, the method blank must contain less than or equal to the CRQL of any single target compound. For non-target peaks in the method blank, the peak area must be less than 10 percent of the nearest internal standard. The method blank will be used to demonstrate the level of laboratory background and reagent contamination that might result from the analytical process itself.

2.2.4 Field Blanks / Trip Blanks.

Field blanks / rinsate blanks are samples which are obtained by running analyte free deionized water through or over decontaminated sampling equipment including pump tubing, scoops, augers etc. (bailer, pump, auger, etc.). These samples are used to determine if decontamination procedures have are adequate. Field / rinsate blanks will not be collected if dedicated or disposable sampling materials are used and changed between samples.

Trip blanks consist of a single set of sample containers filled at the laboratory with deionized. laboratory-grade water. The water used will be from the same source as that used for the laboratory method blank. The containers will be carried into the field and handled and transported in the same way as the samples collected that day. Analysis of the trip blank for VOCs is used to identify contamination from the air, shipping containers, or from other items coming in contact with the sample bottles. (The bottles holding the trip blanks will be not opened during this procedure.) A complete set of trip blanks will be provided with each shipment of samples to the certified laboratory.

2.2.5 Surrogate Spike Analysis

For organic analyses, all samples and blanks will be spiked with surrogate compounds before purging or extraction in order to monitor preparation and analyses of samples. Surrogate spike recoveries shall fall within the advisory limits in accordance with the NYSDEC ASP protocols for samples falling within the quantification limits without dilution.

2.2.6 Matrix Spike / Matrix Spike Duplicate / Matrix Spike Blank (MS/MSDIMSB) Analysis

MS, MSD and MSB analyses will be performed to evaluate the matrix effect of the sample upon the analytical methodology along with the precision of the instrument by measuring recoveries. The MS / MSD / MSB samples will be analyzed for each group of samples of a similar matrix at a rate of one for every 20 field samples. The RPD will be calculated from the difference between the MS and MSD. Matrix spike blank analysis will be performed to indicate the appropriateness of the spiking solution(s) used for the MS/MSD.

2.3 Accuracy

Accuracy is defined as the nearness of a real or the mean (x) of a set of results to the true value. Accuracy is assessed by means of reference samples and percent recoveries. Accuracy includes both precision and recovery and is expressed as percent recovery (% REC). The MS sample is used to determine the percent recovery. The matrix spike percent recovery (% REC) is calculated by the following equation:

$$\%REC = \frac{SSR - SR}{SA} \times 100$$

Where:
SSR = spike sample results
SR = sample results
SA = spike added from spiking mix

2.4 Precision

Precision is defined as the measurement of agreement of a set of replicate results among themselves without a Precision is defined as the measurement of agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analyses.

Analytical precision is expressed in terms of RPD. The RPD is calculated using the following formula:

$$RPD = \frac{D^1 - D^2}{(D^1 + D^2)/2} \times 100$$

Where:
RPD = relative percent difference
D^1 = first sample value
D^2 = second sample value (duplicate)

2.5 Sensitivity

The sensitivity objectives for this plan require that data generated by the analytical laboratory achieve quantification levels low enough to meet the required detection limits specified by NYSDEC ASP and to meet all site-specific standards, criteria and guidance values (SGCs) established for this project.

2.6 Representativeness

Representativeness is a measure of the relationship of an individual sample taken from a particular site to the remainder of that site and the relationship of a small aliquot of the sample (i.e., the one used in the actual analysis) to the sample remaining on site. The representativeness of samples is assured by adherence to sampling procedures described in the Remedial Investigation Work Plan.

2.7 Completeness

Completeness is a measure of the quantity of data obtained from a measurement system as compared to the amount of data expected from the measurement system. Completeness is defined as the percentage of all results that are not affected by failing QC qualifiers, and should be between 70 and 100% of all analyses performed. The objective of completeness in laboratory reporting is to provide a thorough data support package. The laboratory data package provides documentation of sample analysis and results in the form of summaries, QC data, and raw analytical data. The laboratory will be required to submit data packages that follow NYSDEC ASP reporting format which, at a minimum, will include the following components:

1. All sample chain-of-custody forms.
2. The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.

3. Documentation demonstrating the laboratory's ability to attain the contract specified detection limits for all target analytes in all required matrices.
4. Tabulated target compound results and tentatively identified compounds.
5. Surrogate spike analysis results (organics).
6. Matrix spike/matrix spike duplicate/matrix spike blank results.
7. QC check sample and standard recovery results
8. Blank results (field, trip, and method).
9. Internal standard area and RT summary.

2.8 Laboratory Custody Procedures

The following elements are important for maintaining the field custody of samples:

- Sample identification
- Sample labels
- Custody records
- Shipping records
- Packaging procedures

Sample labels will be attached to all sampling bottles before field activities begin; each label will contain an identifying number. Each number will have a suffix that identifies the site and where the sample was taken. Approximate sampling locations will be marked on a map with a description of the sample location. The number, type of sample, and sample identification will be entered into the field logbook. A chain-of-custody form, initiated at the analytical laboratory will accompany the sample bottles from the laboratory into the field. Upon receipt of the bottles and cooler, the sampler will sign and date the first received blank space. After each sample is collected and appropriately identified, entries will be made on the chain-of-custody form that will include:

- Site name and address
- Samplers' names and signatures

3.0 ANALYTICAL PROCEDURES

3.1 Laboratory Analysis

Samples will be analyzed by the NYSDEC ASP laboratory for one or more of the following parameters: VOCs in soil / groundwater by USEPA Method 8260C, SVOCs in soil by USEPA Method 8270D, Target Analyte Metals 6010C in soil, pesticides and PCBs by USEPA Method 8081B/8082A, 1,4-dioxane by VOC 8260 SIM mode, PFAS by EPA Method 537 and VOCs in air by USEPA Method TO15. If any modifications or additions to the standard procedures are anticipated. and if any nonstandard sample preparation or analytical protocol is to be used, the modifications and the nonstandard protocol will be explicitly defined and documented. Prior approval by EBC's PM will be necessary for any nonstandard analytical or sample preparation protocol used by the laboratory, i.e., dilution of samples or extracts by greater than a factor of five (5).

4.0 DATA REDUCTION, REVIEW, AND REPORTING

4.1 Overview

The process of data reduction, review, and reporting ensures the assessments or a conclusion based on the final data accurately reflects actual site conditions. This plan presents the specific procedures, methods, and format that will be employed for data reduction, review and reporting of each measurement parameter determined in the laboratory and field. Also described in this section is the process by which all data, reports, and work plans are proofed and checked for technical and numerical errors prior to final submission.

4.2 Data Reduction

Standard methods and references will be used as guidelines for data handling, reduction, validation, and reporting. All data for the project will be compiled and summarized with an independent verification at each step in the process to prevent transcription/typographical errors. Any computerized entry of data will also undergo verification review.

Sample analysis will be provided by a New York State certified environmental laboratory. Laboratory reports will include ASP category B deliverables for use in the preparation of a data usability summary report (DUSR). All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format. Analytical results shall be presented on standard NYSDEC ASP-B forms or equivalents, and include the dates the samples were received and analyzed, and the actual methodology used. Note that waste characterization samples (if collected) will be in results only format and will not be evaluated in the DUSR.

Laboratory QA/QC information required by the method protocols will be compiled, including the application of data QA/QC qualifiers as appropriate. In addition, laboratory worksheets, laboratory notebooks, chains-of-custody, instrument logs, standards records, calibration records, and maintenance records, as applicable, will be provided in the laboratory data packages to determine the validity of data. Specifics on internal laboratory data reduction protocols are identified in the laboratory's SOPs.

Following receipt of the laboratory analytical results by EBC, the data results will be compiled and presented in an appropriate tabular form. Where appropriate, the impacts of QA/QC qualifiers resulting from laboratory or external validation reviews will be assessed in terms of data usability.

4.3 Laboratory Data Reporting

All sample data packages submitted by the analytical laboratory will be required to be reported in conformance to the NYSDEC ASP (7/2005), Category B data deliverable requirements as applicable to the method utilized. All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format. Note that waste characterization samples will be in results only format and will not be evaluated in the DUSR.

TABLE 1
SUMMARY OF
SAMPLING PROGRAM RATIONALE AND ANALYSIS

Matrix	Location	Approximate Number of Samples	Frequency	Rationale for Sampling	Laboratory Analysis	Duplicates	Matrix Spikes	Spike Duplicates	Trip Blanks
Soil	Excavation Bottom	44	1 per 900 square feet	Endpoint verification	VOCs / SVOCs by 8260C / 8270, pesticides / PCBs by EPA 8081/8082, TAL Metals	1 per day	1 per 20 samples	1 per 20 samples	1 per trip
Soil	Excavated VOC Contaminated Soil	14	1 per 800 cy	Waste Characterization	VOCs EPA Method 8260C, pesticides and PCBs by EPA 8081B/8082A, other as per	0	0	0	0
Soil	Excavated Historic Fill Material	26	1 per 800 cy	Waste Characterization	VOCs EPA Method 8260C, pesticides and PCBs by EPA 8081B/8082A, other as per	0	0	0	0
Soil	Excavated Native Material	4	1 per 800 cy or as per approved facility	Waste Characterization	VOCs EPA Method 8260C, pesticides and PCBs by EPA 8081B/8082A, other as per disposal facility	0	0	0	0
Water	Off-site / Property Line Monitoring Wells (2)	2	2	To determine off-site groundwater conditions	VOCs including 1,4-dioxane by 8260 SIM mode PFAS by EPA Method 537	1 per day	1 per 20 samples	1 per 20 samples	1 per trip
Soil Gas	Property Line Implants (2)	2	2	To determine off-site vapor conditions	VOCs EPA Method TO15	0	0	0	0

TABLE 2
SAMPLE COLLECTION AND ANALYSIS PROTOCOLS

Sample Type	Matrix	Sampling Device	Parameter	Sample Container	Sample Preservation	Analytical Method#	CRQL / MDLH	Holding Time
Grab	Soil	Scoop Direct into Jar	VOCs	(1) 2 oz Jar	Cool to 4^{o} C	EPA Method 8260C	Compound specific (1-5 ug/kg)	14 days
Composite	Soil	Scoop Direct into Jar	SVOCs	(1) 8 oz jar	Cool to 4^{o} C	EPA Method 8260D	Compound specific (1-5 ug/kg)	14 day ext/40 days
Composite	Soil	Scoop Direct into Jar	Pesticides / PCBs	from 8oz jar above	Cool to 4^{o} C	EPA Method 8081B/8082A	Compound specific (1-5 ug/kg)	14 day ext/40 days
Composite	Soil	Scoop Direct into Jar	Metals	from 8oz jar above	Cool to 4^{o} C	TAL Metals 6010	Compound specific (01-1 mg/kg)	6 months
Grab	Water	Pump tubing	VOCs And 1,4-Dioxane	(3) 40 ml vials	Cool to 4^{o} C 1:1 HCL	EPA Method 8260C SIM mode	Compound specific (1-5 ug/L)	14 days
Grab	Water	Pump tubing	PFAS	250-mL polypropylene bottle	Cool to 6^{o} C	EPA Method 537	Compound specific (2-100 ng/L)	14 days
2 hr Avg	Soil Vapor	6-Liter Summa Canister	VOCs	6-Liter Summa Canister	None	EPA Method TO15	<0.5 ppbv	30 days if pressure Difference between sampling and analysis if <5psi

Notes:
All holding times listed are from Verified Time of Sample Receipt (VTSR) unless noted otherwise. * Holding time listed is from time of sample collection.
The number in parentheses in the "Sample Container" column denotes the number of containers needed.
Triple volume required when collected MS/MSD samples
The number of trip blanks are estimated.
CRQL / MDL = Contract Required Quantitation Limit / Method Detection Limit.
MCAWW = Methods for Chemical Analysis of Water and Wastes.
NA = Not available or not applicable.

ATTACHMENT D
Community Air Monitoring Plan

COMMUNITY AIR MONITORING PLAN

FORMER NY CLEANING AND DYEING SITE
376-378 FLUSHING AVENUE
Brooklyn, NY

JANUARY - 2018

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Former NY Cleaning and Dyeing Site
376-378 Flushing Avenue, Brooklyn, NY

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APPENDICES

Appendix A Action Limit Report

1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) has been prepared for the excavation and building activities to be performed under Remedial Action Work Plan (RAWP) at 376-378 Flushing Avenue, in Brooklyn, NY. The CAMP provides measures for protection for the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the investigation activities) from potential airborne contaminant releases resulting from remedial activities at the site.

Compliance with this CAMP is required during all activities associated with soil disturbance activities that have the potential to generate airborne particulate matter and volatile organic compounds (VOCs). These activities include excavation and loading of affected soil. This CAMP has been prepared to ensure that remedial activities do not adversely affect passersby, residents, or workers in the area immediately surrounding the Site and to preclude or minimize airborne migration of site-related contaminants to off-site areas.

1.1 Regulatory Requirements

This CAMP was established in accordance with the following requirements:

- New York State Department of Health's (NYSDOH) Generic Community Air Monitoring Plan as presented in DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC May 3, 2010). This guidance specifies that a community air-monitoring program shall be implemented to protect the surrounding community and to confirm that the work does not spread contamination off-site through the air;

2.0 AIR MONITORING

Petroleum volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals and pesticides are the constituents of concern at the Site. The appropriate method to monitor air for these constituents during remediation activities is through real-time VOC and air particulate (dust) monitoring.

2.1 Meteorological Data

At a minimum, wind direction will be evaluated at the start of each workday, noon of each workday, and the end of each workday. These readings will be utilized to position the monitoring equipment in appropriate upwind and downwind locations.

2.2 Community Air Monitoring Requirements

To establish ambient air background concentrations, air will be monitored at several locations around the site perimeter before activities begin. These points will be monitored periodically in series during the site work. When the excavation area is within 20 feet of potentially exposed populations or occupied structures, the perimeter monitoring points will be located to represent the nearest potentially exposed individuals at the downwind location and will take into account the locations of ventilation system intakes of nearby structures.

Fugitive respirable dust will be monitored using a MiniRam Model PDM-3 aerosol monitor (or equivalent). Air will be monitored for VOCs with a portable Ionscience 3000 photoionization detector (PID), or equivalent. All air monitoring data will be documented in a site log book by the designated site safety officer. The site safety officer or delegate must ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. All instruments will be zeroed daily and checked for accuracy. A daily log will be kept. If additional monitoring is required, the protocols will be developed and appended to this plan

- Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work. If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are

successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.

Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

3.0 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

Volatile organic compounds (VOCs) will be monitored at the two building entrance locations and active ventilation discharge point on an hourly basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present.

The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

All readings will be recorded and made available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report, as shown in Appendix A, will be completed.

3.1 Potential Corrective Measures and VOC Suppression Techniques

If the 15-minute integrated VOC level at the downwind location persists at a concentration that exceeds the upwind level by more than 5 ppm but less than 25 ppm during remediation activities, then vapor suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive organic vapors:

- limiting the excavation size;
- limiting the drop-height when loading soil into trucks;
- spraying chemical odorants onto the soil;
- covering soil stockpiles with 6-mil plastic sheeting or tarps;
- hauling waste materials in properly tarped containers; and/or
- applying vapor suppressant foam.

4.0 PARTICULATE MONITORING

Air monitoring for particulates (i.e., dust) will be performed continuously during excavation and loading activities using both air monitoring equipment and visual observation at upwind and downwind locations. Monitoring equipment capable of measuring particulate matter smaller than 10 microns (PM_{10}) and capable of integrating (averaging) over periods of 15 minutes or less will be set up at upwind (i.e., background) and downwind locations, at heights approximately four to five feet above land surface (i.e., the breathing zone). Monitoring equipment will be MIE Data Ram monitors, or equivalent. The audible alarm on the particulate monitoring device will be set at 90 micrograms per cubic meter ($\mu g/m_3$). This setting will allow proactive evaluation of worksite conditions prior to reaching the action level of 100 $\mu g/m^3$ above background. The monitors will be calibrated at least once per day prior to work activities and recalibrated as needed thereafter. In addition, fugitive dust migration will be visually assessed during all intrusive work activities.

The following summarizes particulate action levels and the appropriate responses:

- If the downwind PM-10 particulate level is 100 $\mu g/m^3$ greater than background (upwind perimeter) for the 15-minute period, or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$ above the upwind level, work must be stopped and an evaluation of activities initiated. Work can resume provided that dust suppression measures (as described in Section 2.3.1 below) and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report as shown in **Appendix A** will be completed.

4.1 Potential Particulate Suppression Techniques

If the integrated particulate level at the downwind location exceeds the upwind level by more than 100 $\mu g/m^3$ at any time during remediation activities, then dust suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive dusts:

- limiting the excavation size;
- backfilling the excavation;
- spraying water onto the excavation faces and equipment;
- covering soil stockpiles with 8-mil plastic sheeting;
- hauling waste materials in properly tarped containers; and/or
- limiting vehicle speeds onsite.

Work may continue with dust suppression techniques provided that downwind PM_{10} levels are not more than 150 $\mu g/m^3$ greater than the upwind levels.

There may also be situations where the dust is generated by remediation activities and migrates to downwind locations, but is not detected by the monitoring equipment at or above the action level. Therefore, if dust is observed leaving the working area, dust suppression techniques such as those listed above will be employed.

If dust suppression techniques do not lower particulates to below 150 $\mu g/m^3$, or visible dust persists, work will be suspended until appropriate corrective measures are identified and implemented to remedy the situation.

All air monitoring readings will be recorded in the field logbook and will be available for the NYSDEC and NYSDOH personnel to review.

5.0 DATA QUALITY ASSURANCE

5.1 Calibration

Instrument calibration shall be documented on instrument calibration and maintenance sheets or in the designated field logbook. All instruments shall be calibrated as required by the manufacturer. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

5.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on-site by the SSO for reference.

5.3 Data Review

The SSO will interpret all monitoring data based the established criteria and his/her professional judgment. The SSO shall review the data with the PM to evaluate the potential for worker exposure, upgrades/downgrades in level of protection, comparison to direct reading instrumentation and changes in the integrated monitoring strategy.

Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the PM.

6.0 RECORDS AND REPORTING

All air readings must be recorded on daily air monitoring log sheets and made available for review by personnel from NYSDEC and NYSDOH.

APPENDIX A
ACTION LIMIT REPORT

CAMP
ACTION LIMIT REPORT

Project Location: _____

Date: _____ Time: _____

Name: _____

Contaminant: _____ PM-10: _____ VOC: _____

Wind Speed: _____ Wind Direction: _____

Temperature: _____ Barometric Pressure: _____

DOWNWIND DATA

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

UPWIND DATA

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

BACKGROUND CORRECTED LEVELS

Monitor ID #: Location: _____ Level Reported: Level Reported: _____

ACTIONS TAKEN

_____
_____
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_____

ATTACHMENT E
Citizen Participation Plan

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

Brownfield Cleanup Program

Citizen Participation Plan
for
Former NY Cleaning and Dyeing Site

February 2018

Site # C224264
376-378 Flushing Avenue
Kings County, New York

Contents

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* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **Rose Castle Redevelopment II ("Applicant")**
Site Name: **Former NY Cleaning and Dyeing ("Site")**
Site Address: **376-378 Flushing Avenue**
Site County: Kings
Site Number: C224264

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at:
http://www.dec.ny.gov/chemical/8450.html .

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment

- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process

- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community

- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup

process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.
The site contact list includes, at a minimum:

- Chief executive officer and planning board chairperson of each county, city, town and village in which the Site is located;
- Residents, owners, and occupants of the Site and properties adjacent to the Site;
- The public water supplier which services the area in which the Site is located;
- Any person who has requested to be placed on the site contact list;
- The administrator of any school or day care facility located on or near the Site for purposes of posting and/or dissemination of information at the facility;
- Location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site. See http://www.dec.ny.gov/chemical/61092.html .

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in Appendix A if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The flowchart in Appendix D shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.

- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the Site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager,

the significant threat determination for the site had not yet been made.

To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at
http://www.dec.ny.gov/regulations/2590.html

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Activities	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repository(ies)	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation **Note:** Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC)	At the time the cleanup action has been completed. **Note:** The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the site. Additional major issues of public concern may be identified during the course of the site's investigation and cleanup process.

The major issues of concern to the public will be potential impacts of nuisance odors and dust during the removal of affected soil at the Site. Another example of a major issue of public concern would be the impact of increased truck traffic on the surrounding neighborhood. Construction safety issues will also be addressed.

This work will be performed in accordance with procedures which will be specified under a detailed Remedial Program which considers and takes preventive measures for exposures to future residents of the property and those on adjacent properties during construction. Detailed plans to monitor the potential for exposure including a Health and Safety Plan (HASP) and a Community Air Monitoring Plan (CAMP) are required components of the remedial program. Implementation of these plans will be under the direct oversight of the NYSDEC and the New York State Department of Health (NYSDOH).

These plans will specify the following worker and community health and safety activities during remedial activity at the Site:

- On-Site air monitoring for worker protection;
- Perimeter air monitoring for community protection;
- The use of odor, vapor, and dust controls, such as water or foam sprays, as needed;
- Monitoring and control of soil, sediments, and water generated during remediation; and
- Truck routes which avoid residential streets.

The HASP and the CAMP will be prepared as part of the Remedial Action Work Plan (RAWP) and will be available for public review at the document repository as identified in Appendix A.

Experience from similar projects, 311 complaints and other construction projects in the area will help in identifying such issues.

The Site is located in an Environmental Justice Area, but there is no need to translate future fact sheets into another language. In addition, the Applicant needs to be aware of impacts related to odor, noise and truck traffic.

Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

4. Site Information

Appendix C contains a map identifying the location of the site.

Site Description

The Site is located at 376-378 Flushing Avenue in the Bedford Stuyvesant section of Brooklyn, NY, and is currently identified as Block 1884, Lots 40 and 48 on the New York City Tax Map. Lot 40 is a rectangular-shaped lot extending from Flushing Avenue to Little Nassau Street, approximately 13,250 square feet (ft^2) in size. Lot 48 consists of an irregular shaped lot approximately 26,057 ft^2 in size. The total area of both lots is approximately 39,307 ft^2. The Site is located on the southwest side of the intersection of Flushing Avenue and Franklin Avenue and is bordered by Flushing Avenue to the north; Franklin Avenue and a three-story commercial building to the east; Little Nassau Street to the south; and residential apartment building to the west. The Site contains approximately 269 linear feet of street frontage along Flushing Avenue, 103 linear feet of street frontage along Franklin Avenue and 75 linear feet of street frontage along Little Nassau Street.

The entire footprint of the Site is currently with four adjacent buildings. Lot 40 is developed with a one-story commercial building approximately 13,250 ft^2 in size, currently occupied by a door and molding company. Lot 48 is developed with three, two-story commercial buildings occupied by an approximate 11,932 ft^2 catering hall, an approximate 11,400 ft^2 warehouse for the door and molding company (on Lot 40), and an approximate 1,595 ft^2 office space.

The property has an elevation of approximately 16 feet above the National Geodetic Vertical Datum (NGVD) feet. The depth to groundwater beneath the Site, as determined from field measurements, ranges from approximately 9 to 13 feet below grade. Based on groundwater contour maps, groundwater flow is east/southeast.

History of Site Use, Investigation, and Cleanup

The current buildings on the Site are in use as a wood door and molding manufacturer and warehouse (Lot 40, p/o Lot 48) and a catering hall (p/o Lot 48). Lot 40 appears to have been redeveloped by 1928 with the existing one-story building identified as

"Priemo Garage". By 1945 the building as used by Metropolitan Distributers for the storage of ice cream and delivery trucks. From 1928 to 1934, 378 Flushing Avenue (Lot 48) is listed as an auto body fabricator while two 1-story buildings, identified as an auto body repair and a paper company, were located in the western portion of the Lot. A sheet metal works was identified on a portion of Lot 48 from 1928-1940.

By 1940, a commercial dry cleaning plant (NY Cleaners and Dyeing) occupied all of Lot 48. Based on the 1966 Certificate of occupancy, describing Lot 40 as being used for commercial vehicle storage and trucking terminal. The lack of city directory listings for this lot between 1949 and 1992 and the history of common ownership with Lot 48 by Uniform Rentals Inc., it is probable that both lots were part of the NY Cleaners-Uniform Rental operation with Lot 40 being used to store and service the company's vehicle fleet from 1949 through 1986-1987. Although not reflected in the Sanborn Maps, the City Directory listings identify 376 Flushing Ave. (Lot 40) as Alexander Supply (door and molding warehouse) in 1997 and 378 Flushing Ave (portion of Lot 48) as Exclusive millwork in 1992. Exclusive Door and molding currently occupies both 376 and 378 Flushing Avenue. Therefore, the laundry operations and fleet maintenance garage vacated prior to these dates, most likely in 1986-1987 when Uniform Rentals sold the lots.

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a **Volunteer**. This means **that the Applicant was the owner and that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination onsite, and must conduct a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the Site and to contamination that has migrated from the site.**

The Applicant in its Application proposes that the site will be used for **unrestricted** purposes.

To achieve this goal, the Applicant will conduct **cleanup** activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

Investigation

The Applicant has completed a **"full"** site investigation before it entered into the BCP. **The Applicant has submitted an investigation report for the full site investigation. NYSDEC will determine if the investigation goals and requirements of the BCP have been met or if additional work is needed before a remedy can be selected."**

NYSDEC will use the information in the investigation report to determine if the Site poses a significant threat to public health or the environment. If the Site is a "significant threat," it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the Site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. If an IRM is likely to represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

When the investigation of the Site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the Site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a "Remedial Work Plan". The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a Final Engineering Report (FER) that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the Site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the FER. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved, and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An *engineering control* is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A -
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Wendi Zheng
Project Manager
NYSDEC Region 2
Division of Environmental Remediation
1 Hunter's Point Plaza
47-40 21st Street
Long Island City, NY 11101
Phone: (718) 482-7541
Email: wendi.zheng@dec.ny.gov

Thomas V. Panzone
Public Participation Specialist
NYSDEC Region 2
Office of Communications Services
1 Hunter's Point Plaza
47-40 21st Street
Long Island City, NY 11101
Phone: (718) 482-4953
Email: Thomas.panzone@dec.ny.gov

New York State Department of Health (NYSDOH):
Kristin Kulow
Project Manager
NYSDOH
Empire State Plaza
Corning Tower Room 1782
Albany, NY 12237
Phone Phone: (518) 402-7860
Email: BEEI@health.ny.gov

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Brooklyn Public Library – Williamsburgh Library
240 Division Avenue (at Marcy Avenue)
Brooklyn, NY 11211
Phone: (718) 302-3485

Brooklyn 3 Community Board
1360 Fulton Street Rm. 202
Brooklyn, NY, 11216
Phone: (718) 622-6601

	A	B	C	D	E	F
2	Site Contact List					
3	Site #: C224264					
4	Site Name: Former NY & Cleaning Die Site					
5	Name, Title	Address 1	Street Address	City	State	Zip
6	Hon. Bill de Blasio	NYC Mayor	City Hall	New York	NY	10007
7	Hon. Scott Stringer	NYC Comptroller	1 Centre Street	New York	NY	10007
8	Hon. Letitia James	Public Advocate	1 Centre Street	New York	NY	10007
9	Marisa Lago	Commissioner, NYC DCP	120 Broadway, 31st Floor	New York	NY	10271
10	Vincent Sapienza	Commissioner, NYC DEP	59-17 Junction Boulevard	Flushing	NY	11373
11	Dan Walsh, Director	NYC OOER	100 Gold Street - 2nd Floor	New York	NY	10038
12	Julie Stein	NYCDEP - OEAS	96-05 Horace Harding Exp.	Flushing	NY	11373
13	Hon. Eric Adams	Brooklyn Borough President	209 Joralemon Street	Brooklyn	NY	11201
14	Wendi Zheng	NYSDEC Project Manager	625 Broadway	Albany	NY	12233
15	Thomas V. Panzone	NYSDEC Citizen Participation	47-40 21st Street	Long Is.City	NY	11101
16	Larry Ennist	NYSDEC	625 Broadway	Albany	NY	12233
17	Kristin Kulowa	NYSDOH Public Health Specialist	Corning Tower, Room 1787	Albany	NY	12237
18	Hon Charles Schumer	U.S. Senator	780 Third Avenue, Suite 2301	New York	NY	10017
19	Hon. Kirsten Gillibrand	U.S. Senator	780 Third Avenue, Suite 2601	New York	NY	10017
20	Hon. Nydia M. Velazquez	U.S. House of Representatives	266 Broadway, Suite 201	Brooklyn	NY	11211
21	Hon. Stephen Levin	NYC Councilmember 33rd District	410 Atlantic Avenue	Brooklyn	NY	11217
22	Hon. Brian Kavanagh	NYS Senator	250 Broadway, Room 2011	New York	NY	10007
23	Hon. Joseph Lentol	NYS Assemblymember	619 Lorimer Street	Brooklyn	NY	11211
24	Mr. Henry Butler, District Mgr	Brooklyn Community Board 3	1360 Fulton Street	Brooklyn	NY	11216
25	Richard Flateau, Chairman	Brooklyn Community Board 3	1360 Fulton Street	Brooklyn	NY	11216
26	Environmental Committee Chair	Brooklyn CB3 Environmental Committ	1360 Fulton Street	Brooklyn	NY	11216
27	Nancy T. Sunshine	Kings County Clerk	360 Adams Street, Room 189	Brooklyn	NY	11201
28	Antonia Yuille, Director	Consolidated Edison Public Affairs	30 Flatbush Avenue	Brooklyn	NY	11217
29	Kim Best, President	79th NYPD Police Precinct Council	263 Tompkins Avenue	Brooklyn	NY	11216
30	Ladder 103	FDNY	850 Bedford Avenue	Brooklyn	NY	11205
31	Dalila Hall	NYCDOT Brooklyn Borough Com.	55 Water Street, 9th Floor	New York	NY	10041
32	Child Development Support Corporation		802 Kent Ave # 804	Brooklyn	NY	11205
33	Mosdos Krula		799 Kent Ave	Brooklyn	NY	11205
34	Hychel Hatorah of Williamsburg		70 Franklin Ave	Brooklyn	NY	11205
35	Yeled Vyalda Head Start and Yeshivas Ahavas Israel		12 Franklin Ave	Brooklyn	NY	11249
36	P.S. 157 Benjamin Franklin	Attn: Kourtney Boyd, Principal	850 Kent Avenue	Brooklyn	NY	11205
37	Central Uta Inc		76 Rutledge St	Brooklyn	NY	11249
38	Beth Chana School		712 Bedford Avenue	Brooklyn	NY	11206
39	Talmud Torah Tashbar		128 Franklin Ave	Brooklyn	NY	11205
40	Brooklyn Community Arts & Media High School		300 Willoughby Ave	Brooklyn	NY	11205
41	Ohel Elozer		263 Classon Ave	Brooklyn	NY	11205
42	Santander Bank	North Hall	200 Willoughby Ave	Brooklyn	NY	11205
43	Talmud Torah Dnitra		1005 Bedford Avenue	Brooklyn	NY	11249
44	Yeled V Yalda Headstart		563 Bedford Ave	Brooklyn	NY	11211
45	Yeshiva Beth Josef Zvi		135 Ross St # A	Brooklyn	NY	11211
46	United Talmudic Seminary		191 Rodney St # B	Brooklyn	NY	11211
47	United Talmudic Seminary		212 Williamsburg St E	Brooklyn	NY	11211
48	Beth Chana School For Girls		118 Wallabout St	Brooklyn	NY	11249
49	Rabbinical College Of Ohr Shimon Yisroel		215 Hewes St # 217	Brooklyn	NY	11211
50	Mosdos Chasidei Square		105 Heyward St	Brooklyn	NY	11206
51	Keren Hatorah		322 Rutledge St	Brooklyn	NY	11211
52	P 141 K-PS 380 School	Attn: Principal	370 Marcy Ave	Brooklyn	NY	11206
53	Eis Laasois		22 Middleton St	Brooklyn	NY	11206
54	Cong Ahavas Shulem		237 Lee Ave	Brooklyn	NY	11206
55	Bnei Shimon Yisroel of Sopron		18 Warsoff Pl	Brooklyn	NY	11205
56	Our Children Leaders Tomorrow		756 Myrtle Ave	Brooklyn	NY	11206
57	Bnos Square of Williamsburg		382 Willoughby Ave	Brooklyn	NY	11205
58	BA Above 32		799 Kent Avenue	Brooklyn	NY	11205
59	Child Development Support Corporation		802 Kent Avenue	Brooklyn	NY	11205
60	BA Above 34		8 Skillman Street	Brooklyn	NY	11205

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61	Spectrum NY 1 News		75 Ninth Avenue	New York	NY	10011
62	New York Daily News		4 New York Plaza	New York	NY	10004
63	New York Post		1211 Avenue of the Americas	New York	NY	10036
64	Courier-Life Publications		1 Metro-Tech Center N.10th Fl	Brooklyn	NY	11201
65	Brooklyn Daily Eagle		16 Court Street, Suite 1208	Brooklyn	NY	11241
66	The Brooklyn Papers		1 Metrotech Center, Suite 1001	Brooklyn	NY	11201
67	Flushing Avenue Condos	Attn: Management Development Off.	461 Flushing Avenue	Brooklyn	NY	11205
68	Resident/Business Owner	135	CLASSON AVENUE	Brooklyn	NY	11205
69	Resident/Business Owner	133	CLASSON AVENUE	Brooklyn	NY	11205
70	Resident/Business Owner	131	CLASSON AVENUE	Brooklyn	NY	11205
71	Resident/Business Owner	129	CLASSON AVENUE	Brooklyn	NY	11205
72	Resident/Business Owner	123	CLASSON AVENUE	Brooklyn	NY	11205
73	Resident/Business Owner	111	CLASSON AVENUE	Brooklyn	NY	11205
74	Resident/Business Owner	101	CLASSON AVENUE	Brooklyn	NY	11205
75	Resident/Business Owner	95	CLASSON AVENUE	Brooklyn	NY	11205
76	Resident/Business Owner	85	CLASSON AVENUE	Brooklyn	NY	11205
77	Resident/Business Owner	75	CLASSON AVENUE	Brooklyn	NY	11205
78	Resident/Business Owner	334	FLUSHING AVENUE	Brooklyn	NY	11205
79	Resident/Business Owner	336	FLUSHING AVENUE	Brooklyn	NY	11205
80	Resident/Business Owner	338	FLUSHING AVENUE	Brooklyn	NY	11205
81	Resident/Business Owner	342	FLUSHING AVENUE	Brooklyn	NY	11205
82	Resident/Business Owner	32	TAAFFE PLACE	Brooklyn	NY	11205
83	Resident/Business Owner	36	TAAFFE PLACE	Brooklyn	NY	11205
84	Resident/Business Owner	50	TAAFFE PLACE	Brooklyn	NY	11205
85	Resident/Business Owner	401	PARK AVENUE	Brooklyn	NY	11205
86	Resident/Business Owner	350	TAAFFE PLACE	Brooklyn	NY	00000
87	Resident/Business Owner	413	PARK AVENUE	Brooklyn	NY	11205
88	Resident/Business Owner	75	TAAFFE PLACE	Brooklyn	NY	11205
89	Resident/Business Owner	67	TAAFFE PLACE	Brooklyn	NY	11205
90	Resident/Business Owner	65	TAAFFE PLACE	Brooklyn	NY	11205
91	Resident/Business Owner	61	TAAFFE PLACE	Brooklyn	NY	11205
92	Resident/Business Owner	8	LITTLE NASSAU STREET	Brooklyn	NY	11205
93	Resident/Business Owner	788	KENT AVENUE	Brooklyn	NY	11205
94	Resident/Business Owner	790	KENT AVENUE	Brooklyn	NY	11205
95	Resident/Business Owner	792	KENT AVENUE	Brooklyn	NY	11205
96	Resident/Business Owner	802	KENT AVENUE	Brooklyn	NY	11205
97	Resident/Business Owner	810	KENT AVENUE	Brooklyn	NY	11205
98	Resident/Business Owner	812	KENT AVENUE	Brooklyn	NY	11205
99	Resident/Business Owner	433	PARK AVENUE	Brooklyn	NY	11205
100	Resident/Business Owner	799	KENT AVENUE	Brooklyn	NY	11205
101	Resident/Business Owner	791	KENT AVENUE	Brooklyn	NY	11205
102	Resident/Business Owner	781	KENT AVENUE	Brooklyn	NY	11205
103	Resident/Business Owner	777	KENT AVENUE	Brooklyn	NY	11205
104	Resident/Business Owner	366	FLUSHING AVENUE	Brooklyn	NY	11205
105	Resident/Business Owner	376	FLUSHING AVENUE	Brooklyn	NY	11205
106	Resident/Business Owner	378	FLUSHING AVENUE	Brooklyn	NY	11205
107	Resident/Business Owner	34	FRANKLIN AVENUE	Brooklyn	NY	11205
108	Resident/Business Owner	40	FRANKLIN AVENUE	Brooklyn	NY	11205
109	Resident/Business Owner	54	FRANKLIN AVENUE	Brooklyn	NY	11205
110	Resident/Business Owner	56	FRANKLIN AVENUE	Brooklyn	NY	11205
111	Resident/Business Owner	60	FRANKLIN AVENUE	Brooklyn	NY	11205
112	Resident/Business Owner	64	FRANKLIN AVENUE	Brooklyn	NY	11205
113	Resident/Business Owner	72	FRANKLIN AVENUE	Brooklyn	NY	11205
114	Resident/Business Owner	439	PARK AVENUE	Brooklyn	NY	11205
115	Resident/Business Owner	75	FRANKLIN AVENUE	Brooklyn	NY	11205
116	Resident/Business Owner	71	FRANKLIN AVENUE	Brooklyn	NY	11205
117	Resident/Business Owner	67	FRANKLIN AVENUE	Brooklyn	NY	11205
118	Resident/Business Owner	61	FRANKLIN AVENUE	Brooklyn	NY	11205
119	Resident/Business Owner	55	FRANKLIN AVENUE	Brooklyn	NY	11205
120	Resident/Business Owner	37	FRANKLIN AVENUE	Brooklyn	NY	11205

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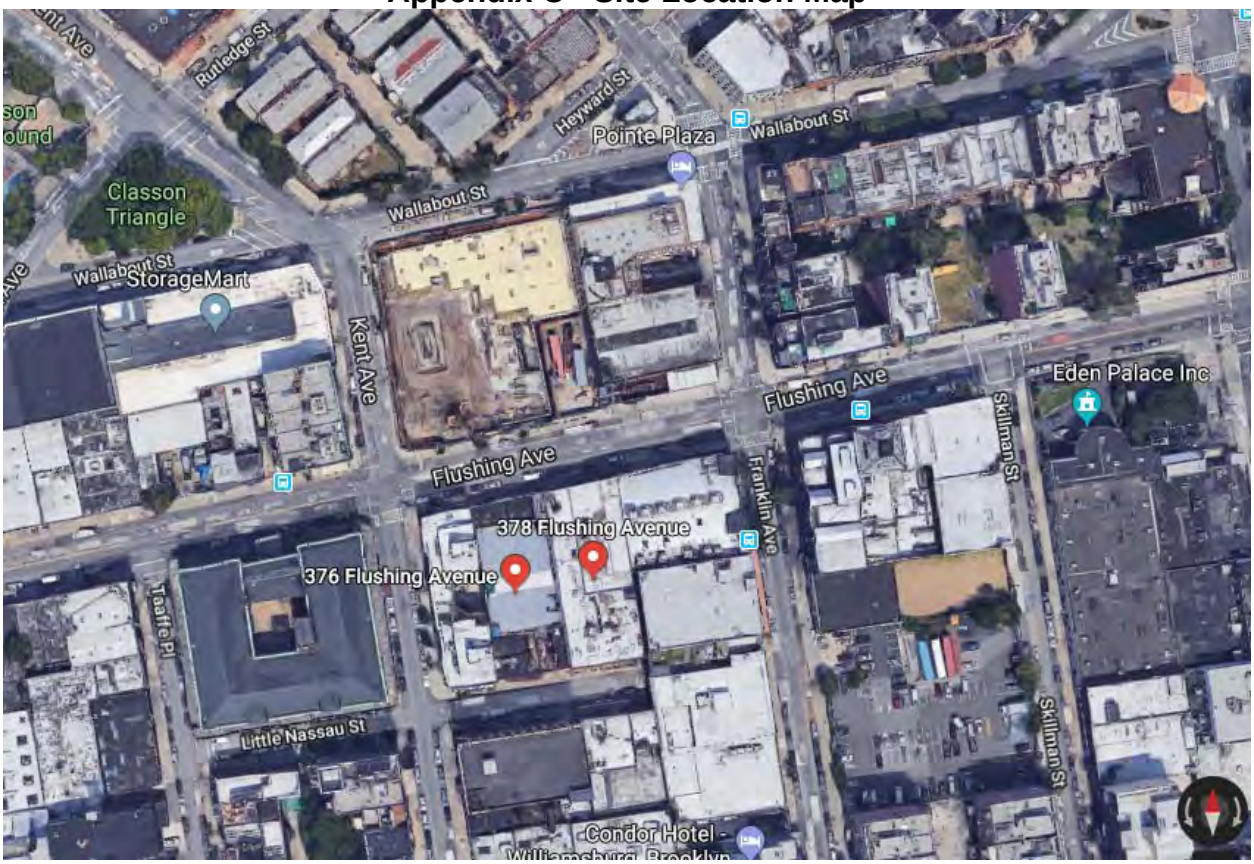
121	Resident/Business Owner	33	FRANKLIN AVENUE	Brooklyn	NY	11205
122	Resident/Business Owner	2	SKILLMAN STREET	Brooklyn	NY	11205
123	Resident/Business Owner	16	SKILLMAN STREET	Brooklyn	NY	11205
124	Resident/Business Owner	48	SKILLMAN STREET	Brooklyn	NY	11205
125	Resident/Business Owner	52	SKILLMAN STREET	Brooklyn	NY	11205
126	Resident/Business Owner	54	SKILLMAN STREET	Brooklyn	NY	11205
127	Resident/Business Owner	483	PARK AVENUE	Brooklyn	NY	11205
128	Resident/Business Owner	481	PARK AVENUE	Brooklyn	NY	11205
129	Resident/Business Owner	479	PARK AVENUE	Brooklyn	NY	11205
130	Resident/Business Owner	477	PARK AVENUE	Brooklyn	NY	11205
131	Resident/Business Owner	475	PARK AVENUE	Brooklyn	NY	11205
132	Resident/Business Owner	473	PARK AVENUE	Brooklyn	NY	11205
133	Resident/Business Owner	471	PARK AVENUE	Brooklyn	NY	11205
134	Resident/Business Owner	469	PARK AVENUE	Brooklyn	NY	11205
135	Resident/Business Owner	467	PARK AVENUE	Brooklyn	NY	11205
136	Resident/Business Owner	465	PARK AVENUE	Brooklyn	NY	11205
137	Resident/Business Owner	59	SKILLMAN STREET	Brooklyn	NY	11205
138	Resident/Business Owner	57	SKILLMAN STREET	Brooklyn	NY	11205
139	Resident/Business Owner	55	SKILLMAN STREET	Brooklyn	NY	11205
140	Resident/Business Owner	39	SKILLMAN STREET	Brooklyn	NY	11205
141	Resident/Business Owner	37	SKILLMAN STREET	Brooklyn	NY	11205
142	Resident/Business Owner	7	SKILLMAN STREET	Brooklyn	NY	11205
143	Resident/Business Owner	5	SKILLMAN STREET	Brooklyn	NY	11205
144	Resident/Business Owner	430	FLUSHING AVENUE	Brooklyn	NY	11205
145	Resident/Business Owner	434	FLUSHING AVENUE	Brooklyn	NY	11205
146	Resident/Business Owner	742	BEDFORD AVENUE	Brooklyn	NY	11205
147	Resident/Business Owner	760	BEDFORD AVENUE	Brooklyn	NY	11205
148	Resident/Business Owner	762	BEDFORD AVENUE	Brooklyn	NY	11205
149	Resident/Business Owner	774	BEDFORD AVENUE	Brooklyn	NY	11205
150	Resident/Business Owner	790	BEDFORD AVENUE	Brooklyn	NY	11205
151	Resident/Business Owner	794	BEDFORD AVENUE	Brooklyn	NY	11205
152	Resident/Business Owner	796	BEDFORD AVENUE	Brooklyn	NY	11205
153	Resident/Business Owner	798	BEDFORD AVENUE	Brooklyn	NY	11205
154	Resident/Business Owner	802	BEDFORD AVENUE	Brooklyn	NY	11205
155	Resident/Business Owner	804	BEDFORD AVENUE	Brooklyn	NY	11205
156	Resident/Business Owner	806	BEDFORD AVENUE	Brooklyn	NY	11205
157	Resident/Business Owner	808	BEDFORD AVENUE	Brooklyn	NY	11205
158	Resident/Business Owner	495	PARK AVENUE	Brooklyn	NY	11205
159	Resident/Business Owner	493	PARK AVENUE	Brooklyn	NY	11205
160	Resident/Business Owner	53	SKILLMAN STREET	Brooklyn	NY	11205
161	Resident/Business Owner	744	BEDFORD AVENUE	Brooklyn	NY	11205
162	Resident/Business Owner	44	WALLABOUT STREET	Brooklyn	NY	11211
163	Resident/Business Owner	760	KENT AVENUE	Brooklyn	NY	11211
164	Resident/Business Owner	367	FLUSHING AVENUE	Brooklyn	NY	11205
165	Resident/Business Owner	365	FLUSHING AVENUE	Brooklyn	NY	11205
166	Resident/Business Owner	347	FLUSHING AVENUE	Brooklyn	NY	11205
167	Resident/Business Owner	74	WALLABOUT STREET	Brooklyn	NY	11211
168	Resident/Business Owner	2	FRANKLIN AVENUE	Brooklyn	NY	11211
169	Resident/Business Owner	12	FRANKLIN AVENUE	Brooklyn	NY	11211
170	Resident/Business Owner	405	FLUSHING AVENUE	Brooklyn	NY	11205
171	Resident/Business Owner	7	FRANKLIN AVENUE	Brooklyn	NY	11211
172	Resident/Business Owner	1	FRANKLIN AVENUE	Brooklyn	NY	11211
173	Resident/Business Owner	118	WALLABOUT STREET	Brooklyn	NY	11211
174	Resident/Business Owner	124	WALLABOUT STREET	Brooklyn	NY	11211
175	Resident/Business Owner	132	WALLABOUT STREET	Brooklyn	NY	11211
176	Resident/Business Owner	136	WALLABOUT STREET	Brooklyn	NY	11211
177	Resident/Business Owner	712	BEDFORD AVENUE	Brooklyn	NY	11206
178	Resident/Business Owner	716	BEDFORD AVENUE	Brooklyn	NY	11206
179	Resident/Business Owner	720	BEDFORD AVENUE	Brooklyn	NY	11206

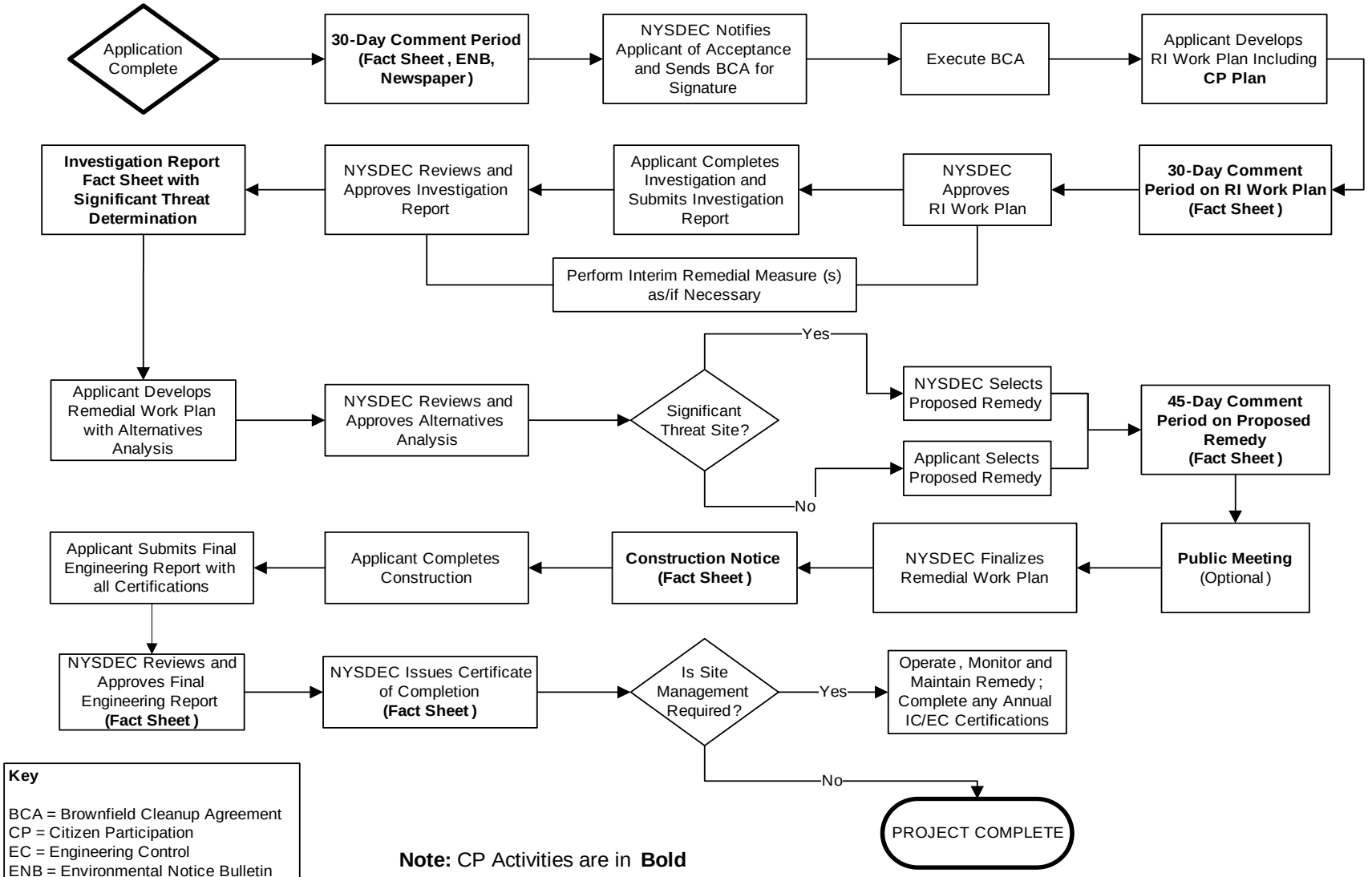
APPENDIX B - CONTACT LIST

	A	B	C	D	E	F
180	Resident/Business Owner	724	BEDFORD AVENUE	Brooklyn	NY	11206
181	Resident/Business Owner	728	BEDFORD AVENUE	Brooklyn	NY	11206
182	Resident/Business Owner	437	FLUSHING AVENUE	Brooklyn	NY	11205
183	Resident/Business Owner	433	FLUSHING AVENUE	Brooklyn	NY	11205
184	Resident/Business Owner	429	FLUSHING AVENUE	Brooklyn	NY	11205
185	Resident/Business Owner	427	FLUSHING AVENUE	Brooklyn	NY	11205
186	Resident/Business Owner	419	FLUSHING AVENUE	Brooklyn	NY	11205
187	Resident/Business Owner	417	FLUSHING AVENUE	Brooklyn	NY	11205
188	Resident/Business Owner	413	FLUSHING AVENUE	Brooklyn	NY	11205
189	Resident/Business Owner	108	WALLABOUT STREET	Brooklyn	NY	11211
190	Resident/Business Owner	112	WALLABOUT STREET	Brooklyn	NY	11211

Appendix C - Site Location Map



Appendix D– Brownfield Cleanup Program Process



Key

BCA = Brownfield Cleanup Agreement
CP = Citizen Participation
EC = Engineering Control
ENB = Environmental Notice Bulletin
IC = Institutional Control
RI = Remedial Investigation

Note: CP Activities are in **Bold**

Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern (see instructions)

Site Name: Former NY Cleaning and Dyeing

Site Number: C224264

Site Address and County: 376-378 Flushing Avenue, Brooklyn

Remedial Party(ies): Rose Castle Development

Note: For Parts 1. – 3. the individuals, groups, organizations, businesses and units of government identified should be added to the site contact list as appropriate.

Part 1. List major issues of public concern and information the community wants. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and information needs. **Use this information as an aid to prepare or update the Major Issues of Public Concern section of the site Citizen Participation Plan.**
Odors, dust, truck traffic, and noise.

How were these issues and/or information needs identified?
Experience on similar projects in the area

Part 2. List important information needed **from** the community, if applicable. Identify individuals, groups, organizations, businesses and/or units of government related to the information needed.
N/A

How were these information needs identified?
Click here to enter text.

Part 3. List major issues and information that need to be communicated **to** the community. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and/or information.
See BCP CPP milestones and Site Contact list

How were these issues and/or information needs identified?
Applicable guidance

Part 4. Identify the following characteristics of the affected/interested community. This knowledge will help to identify and understand issues and information important to the community, and ways to effectively develop and implement the site citizen participation plan (mark all that apply):

a. Land use/zoning at and around site:
X **Residential** ☐ **Agricultural** ☐ **Recreational** X **Commercial** ☐ **Industrial**

b. Residential type around site:
X **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:
X **High** ☐ **Medium** ☐ **Low**

d. Water supply of nearby residences:
X **Public** ☐ **Private Wells** ☐ **Mixed**

e. Is part or all of the water supply of the affected/interested community currently impacted by the site?
☐ **Yes** X **No**

Provide details if appropriate:
Click here to enter text.

f. Other environmental issues significantly impacted/impacting the affected community?
☐ **Yes** X **No**

Provide details if appropriate:
Click here to enter text.

g. Is the site and/or the affected/interested community wholly or partly in an Environmental Justice Area?
X **Yes** ☐ **No**

h. Special considerations:
☐ **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**
None
Explain any marked categories in **h:**
Click here to enter text.

Part 5. The site contact list must include, at a minimum, the individuals, groups, and organizations identified in Part 2. of the Citizen Participation Plan under 'Site Contact List'. Are *other* individuals, groups, organizations, and units of government affected by, or interested in, the site, or its remedial program? (Mark and identify all that apply, then adjust the site contact list as appropriate.)

X **Non-Adjacent Residents/Property Owners:** Click here to enter text.

X **Local Officials:** Click here to enter text.

X **Media:** Click here to enter text.

☐ **Business/Commercial Interests:** Click here to enter text.

☐ **Labor Group(s)/Employees:** Click here to enter text.

☐ **Indian Nation:** Click here to enter text.

X **Citizens/Community Group(s):** Click here to enter text.

☐ **Environmental Justice Group(s):** Click here to enter text.

☐ **Environmental Group(s):** Click here to enter text.

X☐ **Civic Group(s):** Click here to enter text.

☐ **Recreational Group(s):** Click here to enter text.

☐ **Other(s):** Click here to enter text.

Prepared/Updated By: Charles Sosik **Date:** 1-31-18

ReviewedApproved By: Thomas V. Panzone **Date:** 2-14-18

ATTACHMENT F
Resumes

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

Charles B. Sosik, PG, PHG, Principal

Professional Experience

28 years

Education

MS, Hydrogeology, Adelphi University, NY
BS, Geology, Northern Arizona University, AZ

Areas of Expertise

- Brownfields Redevelopment
- Hazardous Waste Site Investigations
- Pre-purchase Site Evaluations and Support
- Regulatory Negotiations
- Remedial Planning and "Cost to Cure" Analysis
- Strategic Planning
- Real Estate Transactions
- NYC "E" Designations

Professional Certification

- Professional Geologist, NH
- Professional Geologist, Hydrogeologist, WA
- OSHA 40-hr HAZMAT
- OSHA 8-hr. Supervisor
- NYC OER Qualified Environmental Professional

Professional Affiliation / Committees

- NYS Council of Professional Geologists (NYSCPG)
- Association of Groundwater Scientists & Engineers (AGSE)
- NYS RBCA Advisory Committee
- Massachusetts LSP Association
- New Hampshire Association of Professional Geologists
- Interstate Technology Regulatory Council/MTBE Team
- Environmental Business Association, Brownfields Task Force
- Part 375 Working Group

PROFILE

Mr. Sosik has 28 years of experience in environmental consulting. He specializes in advising clients on managing environmental compliance with federal, state, and municipal agencies and has successfully directed numerous investigation and remediation projects involving petroleum, pesticides, chlorinated solvents, heavy metals and radiologically activated media. His work included extensive three-dimensional investigations on MTBE, which have been used effectively to help shape public policy. He also has experience in applying models to groundwater related problems and has completed several large-scale projects to determine fate and transport of contaminants, establish spill scenarios, and closure criteria. His experience and expertise in the area of contaminant hydrogeology has resulted in requests from environmental attorneys, property owners and New York State to serve as an expert witness and technical advisor on a variety of legal disputes.

For the past 15 years Mr. Sosik has been primarily engaged in providing environmental consulting to developers responding to the extensive re-zoning of former industrial and commercial properties, which is currently taking place throughout New York City. These services include everything from pre-purchase evaluations and contract negotiations to gaining acceptance in and moving projects through the NYS Brownfields Program. Mr. Sosik has taken a pro-active role in the continued development of the NYS Brownfields Program and related policy, by attending numerous working seminars, active participation in work groups and task forces and by providing commentary to draft versions of new guidance documents. Throughout his professional career, Mr. Sosik has remained committed to developing innovative cost- efficient solutions to environmental issues, specifically tailored to the needs of his clients.

SELECTED PROJECTS

Scavenger Waste Treatment Facility (SWTF), Suffolk County, NY

Water Treatment Plant EIS - Focused EIS - In response to requests from the Suffolk County Council on Environmental Quality and the Brookhaven Conservation Advisory Council, Mr. Sosik prepared a focused EIS to evaluate the potential impacts to an important surface water resource from the proposed facility including cumulative and synergistic effects with established contaminant plumes in the area.

Advanced Residential Communities, Rockville Centre, NY

Brownfield Project – As the senior project manager on this large scale, high profile redevelopment project, Mr. Sosik was asked to develop a plan to accelerate the regulatory process in the face of general community opposition. Through numerous discussions with the BCP management team, He was able to condense the schedule and review period, through the submission of supporting documents (Investigation Report, Remedial Work Plan) with the BCP application package. Community opposition, which focused on the environmental condition of the site as a means to block the project, was used to advantage in expediting approval of the aggressive interim remedial plan. This will allow the developer to begin remedial work approximately 5 months ahead of schedule.

Former Temco Uniform site, West Haverstraw, NY

Brownfield Project – Mr. Sosik took over management of this project from another consultant following transition of this VCP site to the BCP. Mr. Sosik used the opportunity to renegotiate and revise the scope of work to allow a more cost effective and focused investigation plan without re-writing or resubmitting the RIWP. During the NYSDEC's review of the transition package, he met with and coordinated changes with the NYSDEC Project Manager to gain approval. The result saved the client a significant amount of money, but perhaps more importantly in this case, did so without loss of time.

Grovick Properties, Jackson Heights, NY

Brownfield Project – This Brownfield property is somewhat unique in that it had been investigated and partially remediated by the NYSDEC through the petroleum spill fund. The client was interested in

purchasing the property and redeveloping it as office and retail space. Mr. Sosik reviewed the NYSDEC investigation and developed a supplemental plan to meet the requirements of an RI under the BCP program. By performing this limited amount of field work "up-front" he was able to complete an RI Report and Remedial Plan and submit both with the BCP application package. The NYSDEC and NYSDOH approved the RI Report and the Remedial Plan with minor changes. This cut 120 days from the review process and allowed the client to arrange financing and move his project forward knowing what the clean-up costs would be at the outset.

Metro Management, Bronx, NY

Brownfield Project – The site of a former gas station, the developer had planned to construct a 12-story affordable housing apartment complex with first floor retail space. Since the site was located in an Environmental zone, potential tax credits of 22% for site development, remediation and tangible property could be realized under the BCP. In a pre-application meeting with the NYSDEC, Mr. Sosik realized that the department did not believe the site was eligible for the BCP, since it had been previously investigated and closed under the spills program.

Mr. Sosik assisted the developer in securing financing, and due to the demands of an aggressive construction schedule developed an Interim Remedial Measure (IRM), based on chemical oxidation treatment. Working closely with the clients environmental counsel, Mr. Sosik was able to get the IRM approved without a public comment period. Implementation of the IRM is currently underway.

The project was awarded the 2009 NYC Brownfield Award for Innovation.

Brandt Airflex, NY

Technical Consulting Services - Mr. Sosik provided senior level technical advice and strategic planning in developing an off-site RI/FS for the site, in negotiating a tax reduction for the property due to the environmental condition and in preparing a cost to cure estimate for settlement between business partners. After achieving a favorable tax consideration and settlement agreement for his client

Allied Aviation Services, Dallas, Fort Worth, Airport, Dallas, TX

Jet Fuel Investigation - Mr. Sosik developed and managed an investigative plan to quickly identify the extent and source of jet fuel which was discharging from the Airport's storm drain system to a creek a mile away. Through the use of a refined conceptual model, accelerated investigative techniques and a flexible work plan, he was able to identify the source of the fuel and the migration route within a single week. He then identifled remedial options and successfully negotiated a risk based plan with the Texas regulatory agency that had issued a notice of enforcement action against the facility.

KeySpan – Former LILCO Facilities, Various NY Locations

Pesticide Impact Evaluation - Mr. Sosik developed, negotiated and implemented a site screening procedure to evaluate impact to public health and the environment as the result of past herbicide use at 211 utility sites. Using an unsaturated zone leaching model (PRZM) on a small subset of the sites, he was able to establish mass loading schedules for the remaining sites. This was combined with public well data in a GIS environment to perform queries with respect to mass loading, time transport and proximity to vunerable public supply wells. Using this approach Mr. Sosik was able to show that there were no concerns for future impact. This effort satisfied the public health and resource concerns of the state environmental agency and county health department in a reasonable amount of time and at a fraction of the cost of a full scale investigation.

Former Computer Circuits (Superfund) Site, Hauppauge, NY

CERCLA RI/FS - As Senior Project Manager for the site, he played a major role in regaining control of the investigation activites for the PRP. This action prevented the USEPA from initiating an extensive investigation at the site using a RAC II contractor allowing the client to perform a more efficient investigation. He was involved in all negotiations with EPA and was the project lead in developing a revised site characterization plan (work plan, field sampling plan, quality assurance plan, etc.). By carefully managing all phases of the investigation and continued interaction with each of the three regulatory agencies involved, Mr. Sosik was able to keep the project focused and incrementally reinforce the clients position. The estimated cost of the revised investigation is expected to save the client 1.5 to 2 million dollars.

Sun Oil, Seaford, NY

Remediation Consuliting Services & Project Management - Under an atmosphere of regulatory distrust, political pressure and mounting public hostility toward the client, Mr. Sosik conducted an off-site 3-D investigation to define the extent of contamination and the potential impact on public health. By designing and implementing an aggressive source area remediation program and personal interaction with the public and regulatory agencies, he was able to successfully negotiate a limited off-site remediation favorable to the client. Source area remediation was completed within 6 months and the project successfully closed without damage to the client's public image or working relationship with the regulatory agencies.

Con Edison, Various Locations, NY

Hydrogeologic Consulting Services - Under a general consulting contract, Mr. Sosik conducted detailed subsurface hydrogeologic investigations at five locations to assist in the development of groundwater contingency planning. He also developed and implemented work plans to investigate and remediate existing petroleum, cable fluid, and PCB releases at many of the generating facilities and substations. An important aspect of his role was in assisting the client in strategic planning and negotiations with the regulatory agency.

Keyspan - Tuthill Substation, Aqueboque, NY

Accelerated Site Characterization - Using accelerated site characterization techniques, Mr. Sosik presented the project as a case study in establishing the transport of an herbacide and its metobolites aplied at utility sites in the 1980's The results were then used to establish a screening method for evaluating 211 similar sites controlled by the client in a reasonable and eficient manner.

NYSDEC Spill, East Moriches, NY

Spill Release Analysis - With recognized expertise in the area of gasoline plume development on Long Island, Mr. Sosik was asked by

Charles B. Sosik, PG, PHG, Principal

the State to establish the release date (and principal responsible party) of an extensive petroleum spill, which impacted a residential neighborhood. He used multiple lines of evidence, and a new EPA model (HSSM), which he has helped to refine, to reconstruct the release scenario and spill date, in support of the State Attorney General's cost recovery effort from the PRP.

Minmilt Realty, Farmingdale, NY

Fate & Transport Modeling - He completed an RI/FS at this location for a PCE plume that had been in transit for over 30 years. Mr. Sosik applied a conservative model to evaluate time/concentration impacts under a variety of transport scenarios to a municipal wellfield located 13,000 feet away. Through the use of the model and careful interpretation of an extensive data set compiled from several sources, Mr. Sosik was able to propose a plan which was both acceptable to the regulator and favorable to the client.

Sebonack Golf Course Project, Town of Southampton, NY

IPM Pesticide Study - Provided professional hydrogeologic services in support of the EIS prepared for the development of the site. The proposed development included an 18-hole golf course, clubhouse, dormitory facility, cottages, associated structures, and a 6,000 square foot research station for Southampton College. Mr. Sosik performed an extensive evaluation (using a pesticide-leaching model) on the effects of pesticide and nitrogen loading to groundwater as part of the projects commitment to an Integrated Pest Management (IPM) approach.

NYSDEC, Spills Division, Regions 1 – 4

Petroleum Spills Investigation & Remediation - As a prime contractor/consultant for the NYSDEC in Regions 1-4, Mr. Sosik has managed the investigation and remediation of numerous petroleum spills throughout the State. Many of these projects required the development of innovative investigation and remediation techniques to achieve project goals. He was also involved in many pilot projects and research studies to evaluate innovative investigation techniques such as accelerated site characterization, and alternative approaches to remediation such as monitored natural attenuation and risk based corrective action.

Sun Oil, E. Meadow, NY

Exposure Assessment - Performed to seek closure of the spill file, despite the presence of contaminants above standards, Mr. Sosik determined after the extended assessment that the level of remaining contamination would not pose a future threat to human health or the environment. He used multiple lines of evidence, and a fate and transport model to show that degradation processes would achieve standards within a reasonable time.

Sand & Gravel Mine, NY

Property Development - As part of the development of a sand and gravel mine, Mr. Sosik provided environmental consulting services to assist in obtaining a mining permit, which would result in the construction of a 150-acre lake. Specifically, Mr. Sosik investigated if the proposed lake would reduce groundwater quantity to domestic and public well fields, and/or accelerate the migration of potential surface contaminants to the lower part of the aquifer. After assuming the lead role in negotiations with the regulatory agency, Mr. Sosik was able to obtain a permit for the client by adequately addressing water quality and quantity issues, and by preparing a monitoring plan and spill response plan, acceptable to all parties.

NYSDEC, Mamaroneck, NY

Site Characterization / Source Identification - In a complex hydrogeologic setting consisting of contaminant transport through fractured metomorphic bedrock and variable overburden materials, Mr. Sosik was able to develop and implement a sub-surface investigation to differentiate and separate the impact associated with each of two sources. The results of this investigation were successful in encouraging the spiller to accept responsibility for the release.

Riverhead Municipal Water District, NY

Site Characterization / Remedial Planning - Using accelerated characterization techniques, he implemented a 3-D site investigation to identify two service stations 4,000 ft. away as the source of contamination impacting a municipal wellfield. In accordance with the strict time table imposed by the need to return the wellfield to production by early spring, he designed and implemented a multi-point (9 RW, 6 IW) recovery and injection well system using a 3-d numerical flow model, and completed the project on time. Using a contaminant transport model, Mr. Sosik developed clean-up goals which were achieved in 9 months of operation, well below the projected 3 to 5 year project duration.

Montauk Fire Department, NY

Site Assessment - Mr. Sosik performed a limited investigation and used a 2-D flow model to demonstrate that the property could not have been the source of contamination which had impacted an adjacent wellfield as per the results of a previous investigation. This small focused effort successfully reversed a $500,000, and rising, claim against the department by the water district and the NYSDEC.

PREVIOUS EXPERIENCE

P.W. Grosser Consulting, Bohemia, NY
Senior Project Manager, 1999-2006

Environmental Assessment & Remediation, Patchogue, NY
Senior Project Manager, 1994-1999

Miller Environmental Group, Calverton, NY
Project Manager, 1989-1994

DuPont Biosystems, Aston, PA
Hydrogeologist, 1988-1989

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

Charles B. Sosik, PG, PHG, Principal

EXPERT WITNESS TESTIMONY AND DEPOSITIONS

Fact Witness -Testimony on relative age of petroleum spill based on nature and extent of residual and dissolved components at the Delta Service Station in Uniondale, NY Fall/1999

Expert Witness / Expert Report for defendant in cost recovery case by NYS Attorney General regarding a Class II Inactive Hazardous Waste (State Superfund) project by the NYSDEC (October 2004 – present, Report: March 2005, Deposition: April 2005, 2nd Report: Aug. 2013, 2nd Deposition Nov. 2013, Bench Trial: December 2013 - qualified as expert in Federal Court),

Expert Witness / Fact Witness for plaintiff seeking compensation for partial expenses incurred during the investigation and remediation of a USEPA CERCLA site due to the release and migration of contaminants from an "upgradient" industrial property. (Deposition May 2005, case settled April 2007).

Expert Witness / Fact Witness for NYS Attorney General with respect to cost recovery for a NYSDEC petroleum spill site in Holtzville, NY (Deposition April 2005 - case settled).

Expert Witness – Statement of opinion and expert testimony at trial for plaintiff seeking damages from a major oil corporation for contamination under a prior leasing agreement in Rego Park, NY. Case decided in favor of plaintiff. Trial July 2007, in favor of Plaintiff. Qualified as Expert.

Expert Witness / Fact Witness for NYS Attorney General with respect to cost recovery for a NYSDEC petroleum spill site in Lindenhurst, NY (Trial date Dec. 2009, in favor of plaintiff. Qualified as Expert State Supreme Court.

Expert Witness - for NYS Attorney General regarding NYSDEC cost recovery for a petroleum spill site at Riverhead, NY. Case settled July 2008.

Expert Witness for plaintiffs in class action case with respect to damages from chlorinated plume impact to residences in Dayton, OH. (Draft Report – May 2013).

Expert Witness / Fact Witness for defendant with respect to cost recovery and third party responsibility for a NYSDEC petroleum spill site in Lindenhurst, NY (Expert Statement of Fact – October 2005).

Expert Witness for plaintiff seeking damages related to a petroleum spill from the previous owner/operator of a gas station in College Point, NY. Case settled 2009.

Expert Witness for plaintiff (municipal water supply purveyor) seeking damages from major oil companies and manufacturer of MTBE at various locations in Suffolk County, NY. Expert reports July 2007, August 2007 and October 2007, Case settled August, 2008.

Expert Witness - Deposition for NYS Attorney General regarding NYSDEC cost recovery for a petroleum spill site at Sag Harbor, NY. August 2002

Expert Witness for defendant responding to a claim from adjacent commercial property owner on the origin of chlorinated solvents on plaintiff's property located in Cedarhurst, NY. Expert opinion submitted to lead counsel on March 6, 2009, case settled April 2009.

Expert Report - for Attorney General on modeling performed to determine the spill release scenario at a NYSDEC petroleum spill site in East Moriches, NY. June 2000.

Expert Witness - for plaintiff in case regarding impact to private wells from a spill at adjacent Town and County properties with open gasoline spill files in Goshen, NY. Expert report submitted August 2013.

Expert Witness for defendant with respect to cost recovery from Sunoco for a NYSDEC petroleum spill site. (Declaration – January 2013).

Expert Witness - for plaintiff (municipal water supply purveyor) seeking damages from Dow Chemical for PCE impact at various locations in Suffolk County, NY. Affidavit submitted 2011.

MODELING EXPERIENCE (PARTIAL LISTING)

PROJECT	MODEL	APPLICATION
Riverhead Water District, Riverhead, NY	MODFLOW, MODPATH	Remediation system design to intercept MTBE plume and prevent continued impact to municipal well field.
NYSDEC - Region 1, Holbrook, NY	MODFLOW, MODPATH	Simulate transport of MTBE plume to predict future impact.
NYSDEC - Region 1, East Moriches, NY	HSSM	Evaluate release scenario and start date of petroleum spill in support of cost recovery by NYS AG office.
AMOCO, Deer Park, NY	HSSM	Estimate release amount, start date and spill scenario to evaluate the potential for mass unaccounted for
Keyspan Energy, Nassau/Suffolk Counties Substations	PRZM	Estimate mass load of simazine used at 211 electric substations and screen sites according to potential for human health and ecological impacts.
Saboneck Golf Club, Southampton NY	PRZM	Estimate mass load of proposed pesticides on new golf course to evaluate acceptability under an IPM program.
Suffolk County Department of Public Works (SCDPW) Scavenger Waste Treatment Plant, Yaphank, NY	DYNFLOW, DYNTRAC	Evaluate time-transport and nitrogen impact on local river system.
SCDPW SUNY Waste Water Treatment Plant, Stony Brook, NY	DYNFLOW, DYNTRAC	Determine outfall location and time-transport of nitrogen from proposed upgrades to an existing wastewater treatment plant
Water Authority of Great Neck North Great Neck, NY	MODFLOW, MODPATH, MT3D	Review of modeling study performed by EPA to evaluate potential future impact to Well field from PCE plume. Identified serious flaws in model construction and implementation, which invalidated conclusions

PUBLICATIONS / PROFESSIONAL PAPERS

Smart Pump & Treat Strategy for MTBE Impacting a Public Water Supply (14th Annual Conference on Contaminated Soils Proceedings, 1998)

Transport & Transformation of BTEX & MTBE in a Sand Aquifer (Groundwater Monitoring & Remediation 05/1998)

Characteristics of Gasoline Releases in the Water Table Aquifer of Long Island (Petroleum Hydrocarbons Conference Proceedings, 1999)

Field Applications of the Hydrocarbon Spill Screening Model (HSSM) (USEPA Interactive Modeling Web Course www.epa.gov/athens/software/training/webcourse Authored module on model application and applied use of calculators, 02/2000)

Comparative Evaluation of MTBE Sites on Long Island, US EPA Workshop on MTBE Bioremediation (Cincinnati, 02/2000)

Comparison of Four MTBE Plumes in the Upper Glacial Aquifer of Long Island (American Geophysical Union, San Francisco, 12/1996)

Analysis and Simulation of the Gasoline Spill at East Patchogue, New York (American Geophysical Union, San Francisco, 12/1998)

AMC Engineering PLLC
18-36 42nd Street
Astoria, NY 11105
Phone: (516) 417-8588

ARIEL CZEMERINSKI, P.E.
Email: Ariel@AMC-Engineering.com

SUMMARY:

New York State Professional Engineer. Chemical and Environmental Engineer, with 29 years of experience in the chemical and environmental areas. Areas of expertise include inspections and sign off on Large Scale Vapor Barrier Installations at Various NYC schools, Design and inspections of Sub Slab Depressurization Systems, wastewater treatment systems, process control and automation, process optimization, productivity improvement, quality systems, environmental compliance, Phase I Environmental Site Assessments, Phase II Environmental Investigations, Phase III: Remedial Activities, process and plant safety, and management of a production facility. Special Inspector with New York City Department of Buildings. Registered PE in NY.

Professional Experience:

AMC: 18 Years
Prior: 6 years

Education

Master of Science in Chemical Engineering, Columbia University, New York, NY, Feb. 1990.
Bachelor of Science in Chemical Engineering, University Of Buenos Aires, Buenos Aires, Argentina, May 1987

Areas of Expertise

- Vapor Intrusion - Barrier and Sub Slab Venting System Design
- Environmental Assessment Statements and Environmental Impact Assessments under
- CEQR, ULURP
- Remedial Program Design and Management
- Environmental Compliance, Clean Water Act, Clean Air Act, Hazardous Materials
- Dewatering & Treatment System Design
- NYCDEP Sewer Discharge Permitting
- Transfer Station Permitting and Compliance
- Chemical Process Design and Optimization
- Wastewater Treatment Systems and Permitting, SPEDES, Air
- Zoning Regulations and Permitting
- Safety and Environmental Training
- Waste Management Plans
- Professional Certifications
- OSHA 40-hr HAZWOPER
- OSHA 10-hr Construction Safety and Health

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Project Experience

Project: Domsey Fiber Corp. - 431 Kent Avenue, Brooklyn NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with chlorinated solvents, petroleum and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: Express Builders
Regulatory Authority: NYSDEC, NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Springfield Gardens Residential Area BMP - Springfield Gardens, Queens, NY
Project Description: NYC Residential infrastructure (sewer, gas, water) upgrade, drainage channel installation and pond restoration. Soil contaminated with, petroleum and heavy metals requiring excavation, soil management and disposal under a Materials Handling Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: EIC Associates - NYCEDC
Regulatory Authority: NYSDEC, NYCParks
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Former Domino Sugar Site - Kent Avenue, Brooklyn NY
Project Description: NYC E-Designation. Soil contaminated with semi-volatile organic compounds and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: Two Trees Management
Regulatory Authority: NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Former Uniforms For Industry Site - Jamaica Avenue, Queens NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with chlorinated solvents, petroleum, mop oil and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: The Arker Companies
Regulatory Authority: NYSDEC, NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project

AMC Engineering PLLC
18-36 42nd Street
Astoria, NY 11105
Phone: (516) 417-8588

Project Experience

Project: Former Charles Pfizer & Co. Site - 407 Marcy Avenue, Brooklyn, NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with chlorinated solvents, petroleum, and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: The Rabsky Group
Regulatory Authority: NYSDEC, NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Former East Coast Industrial Uniforms Site - 39 Skillman Street, Brooklyn, NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with chlorinated solvents, petroleum, and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: Riverside Builders
Regulatory Authority: NYSDEC, NYCOER
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

Project: Former BP Amoco Service Station Site - 1800 Southern Boulevard, Bronx, NY
Project Description: NYS Brownfield cleanup project / NYC E-Designation. Soil contaminated with petroleum, and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: SoBro, Joy Construction
Regulatory Authority: NYSDEC, NYCOER

Role: Mr. Czemerinski served as the Remedial Engineer for the project.
Project: Former Dico G Auto & Truck Repair Site - 3035 White Plains Road, Bronx, NY
Project Description: NYS Brownfield cleanup project. Soil contaminated with petroleum, and heavy metals requiring excavation, soil management and disposal under a Remedial Action Work Plan, Soil / Materials Management Plan, Construction Health and Safety Plan and Community Air Monitoring Plan
Client: The Arker Companies
Regulatory Authority: NYSDEC
Role: Mr. Czemerinski served as the Remedial Engineer for the project.

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

Keith W. Butler, Senior Project Manager

PROFILE

Mr. Butler has extensive project management experience with respect to environmental due diligence and subsurface investigations. He is responsible for the preparation of project proposals, Phase I and II Environmental Site Assessments, Work Plans, Health and Safety Plans, Quality Assurance Project Plans, and investigation reports. Additionally, Mr. Butler has conducted and managed numerous Phase I and II ESAs. In these roles, Mr. Butler is responsible for applying the various state and local regulations, which govern environmental compliance and determine the need for additional investigation and/or remediation.

SELECTED PROJECTS

Madison National Bank, Various Sites, New York

Mr. Butler served as the Project Manager and principal contact for Madison National Bank. He was responsible for the preparation of Transaction Screen and Phase I/II Environmental Site Assessments (ESAs) at various sites throughout the New York metropolitan area, as required by the bank to satisfy client mortgage or construction loan requests.

Jewish Home & Hospital, Manhattan, NY

Most recently, Mr. Butler completed a Phase I ESA at their Bronx campus to obtain US. Housing and Urban Development (HUD) funding for a future construction project. Mr. Butler was also responsible for implementing a Remedial Action Work (RAW) Plan at the Bronx facility as required by the NYSDEC under a Voluntary Cleanup Agreement. The RAW included the preparation of contract documents, excavation of over 2,000 tons petroleum contaminated soils, installation of a Soil Vapor Extraction (SVE) system remedial oversight, and sampling.

Pulte Homes of New York, Patchogue, NY

Mr. Butler served as the Project Manager for the re-development of this six-acre site and was responsible for field oversight and coordination between remediation contractors and various regulatory agencies. Initial phases of the project included the completion of Phase I and II ESAs. Subsequent remediation consisted of UST removal, excavation of petroleum-impacted soils, closure of three NYSDEC spill numbers, removal of contaminated UIC sediment/sludge, the closure of commercial and residential UIC structures and the excavation of arsenic and metals contaminated soil. The project was conducted under approved Remedial Work and Soil Management Plans with oversight from the State, County and Village agencies.

Town of Islip, Blydenburgh Road Landfill, Hauppauge, NY

Mr. Butler served as the Project Manager for the groundwater and leachate monitoring program at the Blydenburgh Road Landfill - Cleanfills 1 and 2 and Leachate Impoundment Area. Mr. Butler was the principal contact for the Town's Resource Recovery Agency. He prepared the quarterly and annual monitoring reports, oversaw sampling efforts, and coordinated with the Town's analytical laboratory and data validation contractors. Mr. Butler was also responsible for preparing quarterly well condition reports and leachate quality reports for compliance with the Town's Suffolk County Discharge Certification Permit.

Ogden Aviation, Various Sites, JFK International Airport, Jamaica, New York

Mr. Butler served as the project manager for the rehabilitation of the satellite fuel farm recovery well system. Recovery wells at the fuel farm had become clogged with iron deposits and bacteria limiting product recovery efforts. Mr. Butler developed and supervised chemical cleaning and redevelopment of recovery wells under the approval of the NYSDEC. The chemical treatment has resulted in significant increases in product recovery volumes.

Brookhaven National Laboratory, Upton, NY

Mr. Butler has worked on a number of remediation system and monitoring well installation projects at BNL. His duties included oversight of installations, system pump tests, performance evaluations, and well development. He also provided oversight of soil borings, temporary well construction, soil and water sampling, and air monitoring for groundwater screening survey of two operable units in hazardous and radioactive waste storage areas. Mr. Butler also provided oversight for groundwater monitoring, well construction, well abandonment, and methane-monitoring wells for landfill closure.

metroPCS, Various Sites, New York

Mr. Butler served as the Project Manager for metroPCS' Long Island region telecommunications site acquisition and expansion program. Mr. Butler was responsible for the preparation of Phase I ESAs, the conduct of Phase II ESAs, including asbestos, lead paint and soil sampling, and coordination of National Environmental Policy Act (NEPA) reports and planning studies at various locations proposed for construction of new cellular telephone facilities. Reports and associated communications were transmitted electronically through metroPCS' data management system.

Dormitory Authority - State of New York, Harlem Hospital Center Modernization Project - Hazardous and Universal Waste Survey, Harlem Hospital, New York, NY

Mr. Butler served as the field team leader for conducting hazardous and universal waste surveys in multiple buildings affiliated with Harlem Hospital Center. The survey included the identification of hazardous and universal waste materials including chemicals, paints, fluorescent bulbs, high intensity discharge bulbs/fixtures, battery operated equipment, above and underground petroleum storage tank identification, PCB containing light ballasts and electrical equipment.

Keith W. Butler, Senior Project Manager

The hospital is comprised of a number of buildings, many that were abandoned and slated for demolition.

SVE Monitoring at Newark International Airport, Elizabeth, NJ
A routine leak detection test indicated that two 10,000-gallon underground storage tanks, which were used to store unleaded gasoline, had failed tightness tests. Follow-up investigation revealed that the product had impacted the subsurface environment. In response to this, a soil vapor extraction system was installed to reduce the residual concentrations of petroleum constituents in soil and groundwater and to minimize vapor migration into subsurface utility vaults. Mr. Butler was responsible for implementing the Remedial Action Work Plan, developed for the site by Ogden and the State of New Jersey. Activities conducted under the RAW include quarterly groundwater monitoring, air sampling, vacuum pressure monitoring, system maintenance and reporting.

Federal Express Site, Newark International Airport, Elizabeth, NJ
Mr. Butler worked with Ogden Aviation and the State of New Jersey to address outstanding environmental issues at the site related to a spill of jet fuel, which occurred during a construction accident. Mr. Butler performed a site assessment, which included groundwater monitoring, product gauging, and groundwater flow modeling. After reviewing these data, Mr. Butler determined that fill material at the site was contributing to soil and groundwater contamination and has petitioned the State for partial site closure. Mr. Butler is continuing to address the remaining area of concern through product recovery and continued monitoring.

Northrop Grumman, Various Sites
Mr. Butler conducted three Phase I ESAs and a Phase II investigation for the presence of PCBs in soil. He also inspected and supervised the removal of underground storage tanks, asbestos abatement projects, and sanitary system closures related to the facility decommissioning. Mr. Butler also conducted groundwater investigations and provided oversight during soil sampling, drilling and soil remediation activities.

New York City Department of Environmental Protection, Various Sites
Mr. Butler served as an Environmental Scientist for hazard investigation at seven sewage pump stations. Mr. Butler addressed a wide range of environmental concerns including asbestos, lead based paints, PCB oil, light ballasts, and other hazardous building materials. He conducted field investigations, sampling, and prepared Hazardous Materials Survey Reports for use during preparation of plans and specifications for proposed pump station construction projects.

Fresh Kills Landfill, Staten Island, New York
Mr. Butler participated in the field operations during pump and yield tests conducted on Cells 1 and 9. The tests were performed to determine the hydraulic properties of the landfill's refuse. He collected groundwater and leachate measurements in recovery wells and in adjacent observation wells under pumping and non-pumping conditions.

PREVIOUS EXPERIENCE

DECA Real Estate Advisors
Director of Environmental Services, 2011-2017

VHB Engineering, Surveying and Landscape Architecture PC, Hauppague NY
Senior Project Manager, 2005-2011

Parsons Brinkerhoff, Inc. New York NY
Senior Project Manager, 2004-2005

P.W. Grosser Consulting, Bohemia, NY
Senior Project Manager, 1998-2004

Eder Associates, Locust Valley, NY
Field Hydrogeologist, 1992-1998

EDUCATION

BS, Geology, Slippery Rock University of Pennsylvania, 1990

PROFESSIONAL REGISTRATIONS/CERTIFICATIONS

OSHA Certification, 40-hour Health & Safety Training at Hazardous Waste Sites

OSHA Certification, 8-hour Refresher Health & Safety Training at Hazardous Waste Sites

OSHA Confined Space Entry Training

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

Kevin Waters, Field Manager

Professional Experience
EBC: October 2010
Prior: 5 years

Education
Bachelor of Science, Geology, State University of New York, Stony Brook

Areas of Expertise
- Field Operations
- Phase II and RI Implementation, Site Characterization Studies
- Health & Safety Monitoring and Oversight
- Waste Characterization / Soil Management
- Site Logistics

Professional Certification
- OSHA 40-hr HAZWOPER
- OSHA 8-hr HAZWOPER Supervisor

PROFILE

Mr. Waters has 12 years experience as an environmental consultant and has worked on a wide range of environmental projects. Mr. Waters is EBC's manager of field operations and has extensive experience on remedial construction projects including site characterization, waste classification, soil management and disposal, dewatering operations, community air monitoring and health & safety and performance sampling.

Mr. Waters' field experience includes soil, air and groundwater sampling, operation and maintenance of groundwater remediation systems, tank removals, spill management and closure, and oversight of monitoring well installations. In addition, Mr. Waters has prepared reports for both regulatory and client use.

PREVIOUS EXPERIENCE

P.W. Grosser Consulting, Bohemia, NY
Field Hydrogeologist, 2003-2008

SELECT PROJECT EXPERIENCE

Project:	Former Gas Station / car wash to mixed use affordable housing / commercial
Location:	Bronx, NY, Southern Boulevard
Type:	NYS BCP, NYC E-Site Hazmat, Former gas station / gar wash
Contamination:	Petroleum - Gasoline
Role:	Field Operations Manager, Health and Safety Officer

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

Kevin Waters, Field Manager

SELECT PROJECT EXPERIENCE

Project:	Former Uniforms for Industry Site – Richmond Hill Senior Living Residences / Richmond Place
Location:	Jamaica Ave, Richmond Hill Queens, NY
Type:	NYS BCP, NYC E-Site Hazmat, Noise, Former industrial Laundry
Contamination:	Chlorinated Solvents, Historic Fill, Petroleum - Fuel oil/Mop oil
Role:	Field Operations Manager, Health and Safety Monitoring and Field Oversight

Project:	Rikers Island – West Intake Facility
Location:	NYC Department of Corrections, Rikers Island, NY
Type:	Municipal Construction Project
Contamination:	Hazardous levels of lead, heavy metals in Historic fill
Role:	Field Operations Manager, Health and Safety Monitoring and Field Oversight

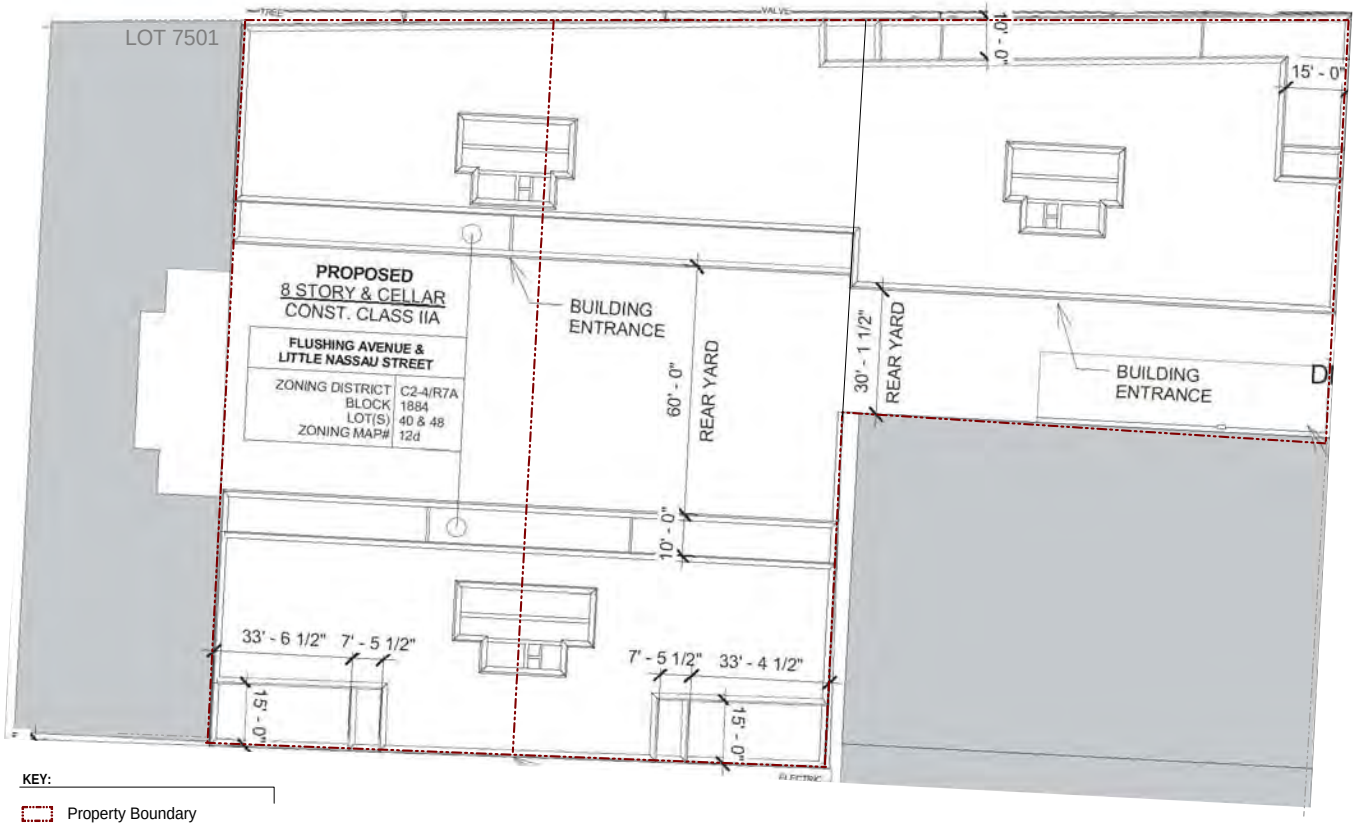
Project:	Residential Redevelopment Project
Location:	Williamsburg Section of Brooklyn, Wallabout Street
Type:	NYC E-Designation Site
Contamination:	Hazardous levels of lead, heavy metals, SVOCs in Historic fill
Role:	Implement RI Work Plan, Supervise sample collection in all media

Project Name:	Former Domsey Fiber Corp.
Location:	Brooklyn NY, S. 9th Street, Wythe and Kent Avenues Williamsburg
Program Type:	NYS BCP, NYC E-Site Hazmat / Noise
Role:	Field Operations Manager - managing and supervising field crews in sample collection, Health and Safety Monitoring and Field Oversight

Project Name:	Former 110th Street Station
Location:	Manhattan, NY, 2040 Frederick Douglas Boulevard, Harlem
Program Type:	NYS BCP, NYC E-designation Hazmat
Role:	Field Operations Manager - managing and supervising field crews in sample collection, Health and Safety Monitoring and Field Oversight

Project Name:	Former East Coast Industrial Uniforms
Redevelopment:	Industrial to residential (market rate condos)
Location:	Brooklyn, NY, 39 Skillman Street, Williamsburg
Program Type:	NYS BCP
Role:	Field Operations Manager - managing and supervising field crews in sample collection, Health and Safety Monitoring and Field Oversight

ATTACHMENT G
Redevelopment Plan



EBC Environmental Business Consultants	Phone 631.504.6000 Fax 631. 924 .2870	*Figure No.* **G-1**	Site Name: 376-378 Flushing Avenue
			Site Address: 376-378 flushing avenue, brooklyn, ny
			Drawing Title: Redevelopment Plans

ATTACHMENT H
Estimated Remedial Costs

FORMER NY CLEANING AND DYEING SITE
Brooklyn, NY

Summary of Project Costs

NYS Brownfields Cleanup Program
Costs by Task

TASK - ENVIRONMENTAL REMEDIATION	Alternative 1 - Track 1	Alternative 2 - Track 2	Alternative 3 - Track 4
BCP Entry Documents	Completed	Completed	Completed
Remedial Investigation and RI Report	Completed	Completed	Completed
Remedial Work Plan, Remedy Scoping & Coordination	Completed	Completed	Completed
Remedial Program Implementation	$ 5,127,685.00	$ 5,127,685.00	$ 3,344,917.00
Final Engineering Report, Site Management Plan & IC/ECs	$ 18,200.00	$ 40,450.00	$ 40,450.00
Post Remedial Monitoring	-	-	$ 24,180.00
Subtotal	$ 5,145,885.00	$ 5,168,135.00	$ 3,409,547.00
15% Contigency	$ 771,882.75	$ 775,220.25	$ 511,432.05
Total	**$ 5,917,767.75**	**$ 5,943,355.25**	**$ 3,920,979.05**

ATTACHMENT I
Significant Threat Determination

NEW YORK STATE OF OPPORTUNITY. Department of Health

ANDREW M. CUOMO
Governor

HOWARD A. ZUCKER, M.D., J.D.
Commissioner

SALLY DRESLIN, M.S., R.N.
Executive Deputy Commissioner

March 9, 2018

Gerard Burke, Director
Remedial Bureau B
Division of Environmental Remediation
NYS Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233

RE: **Significant Threat Determination**
Site #C224264
Former NY Cleaning and Dyeing Site
Brooklyn, Kings County

Dear Mr. Burke:

At your Department's request, we have reviewed the May 2017 *Remedial Investigation Report* and the January 2018 *Remedial Action Work Plan* for the referenced site. Based on that review, I understand that on-site soil and groundwater are contaminated with volatile organic compounds, semi-volatile organic compounds and metals. Soils also contain pesticides. On-site soil vapor is contaminated with volatile organic compounds, primarily trichloroethene, tetrachloroethene, and vinyl chloride, and site-related contamination is likely migrating from the site.

The site is currently entirely covered by buildings. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. People are not expected to come into direct contact with site-related contamination in soil or groundwater unless they dig below the surface. Environmental sampling indicates that soil vapor intrusion represents a concern on-site and additional evaluation is needed to determine whether actions are needed to address exposure to site-related contaminants off-site.

Based on the information provided to date, and the potential for exposure to site-related contamination, I believe that this site represents a significant threat to public health. If you have any questions, or would like to discuss this site further, please contact me at (518) 402-7860.

Sincerely,

Justin H. Deming
Chief - Regions 2, 4, & 8
Bureau of Environmental Exposure Investigation

ec: K. Anders / K. Kulow / e-File
C. Westerman – NYSDOH MARO
C. D'Andrea – NYC DOHMH
J. O'Connell / W. Zheng – NYSDEC Region 2