SOIL VAPOR INTRUSION EVALUATION & REBOUND STUDY WORK PLAN

702 Nostrand Avenue
Brooklyn, New York
NYSDEC BCP Site No. C224270

Prepared for:
702 Nostrand Ave, LLC &
MC Properties Management Company, LLC
11 Park Place, Suite 1200
New York, New York 10007

Prepared by:
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
368 Ninth Avenue, 8th Floor
New York, New York 10001

LANGAN

19 June 2026
Langan Project No. 170527801

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

CERTIFICATION

I, Gerald F. Nicholls, certify that I am currently a Qualified Environmental Professional as defined in 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 and that this Soil Vapor Intrusion Evaluation & Rebound Study Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation.

_____

Gerald F. Nicholls, PE, CHMM

1.0 INTRODUCTION

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) prepared this Soil Vapor Intrusion Evaluation & Rebound Study Work Plan on behalf of 702 Nostrand Ave, LLC and MC Properties Management Company, LLC (collectively, the Volunteer) to evaluate potential discontinuation of the soil vapor extraction (SVE) system operating at 702 Nostrand Avenue, Brooklyn, New York (the site) in accordance with the New York State Department of Environmental Conservation (NYSDEC)-approved 12 May 2026 SVE System Evaluation Technical Memorandum prepared by Langan and associated NYSDEC correspondence. The SVE System Evaluation Technical Memo is included as Appendix A.

The site is located in Kings County and is identified as Block 1226, Lot 45 on the Brooklyn Borough Tax Map. The site is about 1,650 square feet (0.038 acre) in area with about 16.5 feet of frontage along Nostrand Avenue. A site location map is included as Figure 1.

The Volunteer entered a Brownfield Cleanup Agreement (BCA) with NYSDEC on 9 May 2018 to investigate and remediate the site. The site was remediated to restricted residential use with a Track 4 cleanup and will continue to be used for commercial and residential uses, as documented in the 17 July 2020 Final Engineering Report (FER) prepared by Langan and submitted to the NYSDEC for review. Site remediation included the installation of two engineering controls (ECs): an SVE system and a composite cover system. Operation, maintenance, and monitoring requirements of the ECs are outlined in the NYSDEC-approved 11 June 2020 Site Management Plan (SMP).

Per the SMP, in the event that monitoring data indicates that the SVE system may no longer be required, a proposal to discontinue the system will be submitted by the remedial party. Conditions that may warrant discontinuing the SVE system include:

- Soil vapor contaminant concentrations reach levels that are consistently below the site Standards, Criteria, and Guidance (SCGs), as appropriate.
- Soil vapor contaminant concentration have become asymptotic to a low level over an extended period of time, as accepted by the NYSDEC.
- The SVE system has reached the limit of its effectiveness, as determined by the NYSDEC based on a proposal by the remedial party.

The SVE system has operated since June 2019 to remediate chlorinated volatile organic compound- (CVOC) impacted soil vapor, which is attributed to historic drycleaning operations at the site and surrounding properties. In accordance with the SMP, sub slab vapor samples are collected annually. As documented in Periodic Review Reports (PRR) and summarized in the SVE System Evaluation Technical Memo, concentrations of the primary contaminant of concern, tetrachloroethene (PCE), have been reduced by 99% when compared to the baseline sampling event. During that time, total VOCs have been decreased by over 90%. This work plan aims to

provide a basis to determine whether or not the above conditions for SVE system discontinuation have been met.

2.0 SCOPE OF WORK

The objective of this work plan is to evaluate potential discontinuation of the SVE system operating at the site via soil vapor intrusion evaluation and rebound study. The components of the evaluation are discussed in more detail in the following sections.

Suspension of SVE System Operation

- During the 2026 heating season, the blower associated with the SVE system will be remotely turned off.

Soil Vapor Intrusion Evaluation

Approximately one week after suspension of SVE system operation, a soil vapor intrusion evaluation will be performed, including:

- Confirmation that institutional controls remain in place
- Inspection to document the integrity of the cellar and rear yard composite cover
- Collection of:
    - four soil vapor samples (one from each monitoring point) in the building cellar
    - one indoor air sample in the main cellar space
    - one ambient air sample in the rear outdoor courtyard
    - a chemical inventory to identify potential sources of sample interference
- Completion of a New York State Department of Health (NYSDOH) Indoor Air Questionnaire

The proposed sample location plan is included as Figure 2. A proposed sample summary is provided as Table 1. Samples will be collected over a 24-hour period and in accordance with the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, October 2006). Samples will be collected in appropriately sized and prepared canisters (SUMMA, SilioniteTM, or equivalent) that have been batch-certified clean by the laboratory.

Soil vapor samples will be analyzed for volatile organic compounds (VOC) by using Environmental Protection Agency (EPA) Method TO-15 and will be compared to the NYSDOH October 2006 Final Guidance for Evaluating Soil Vapor Intrusion for soil vapor and indoor air. Samples will be submitted to a NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratory. Field work will be conducted in accordance with the procedures defined in the site-specific Health and Safety Plan (HASP), included as Appendix B.

Data Management and Validation

Data collected during the evaluation will be reduced and reviewed by the laboratory quality assurance (QA) personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the analytical methodology appropriate for the analyses to be performed, and be reported in standard format.

The completed copies of the Chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

The Analytical Services Protocol (ASP) Category B data packages and an EDD will be provided by the laboratory after receipt of a complete sample delivery group. The Project Manager will immediately arrange for archiving the results and preparation of result tables. These tables will form the database for assessment of the site contamination condition.

Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQuIS™. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system (LIMS). If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a quality control (QC) check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

Data validation will be performed in accordance with the EPA Region 2 SOPs for data validation and EPA's National Functional Guidelines for Organic and Inorganic Data Review. Tier 1 data validation (the equivalent of USEPA's Stage 2A validation) will be performed to evaluate data quality. Tier 1 data validation is based on completeness and compliance checks of sample-related QC results, including:

- Holding times;
- Sample preservation;
- Blank results (method, trip, and field blanks);
- Surrogate recovery compounds and extracted internal standards (as applicable);
- laboratory control samples (LCS) and Laboratory Control Sample Duplicate (LCSD) recoveries and relative percent difference (RPDs);
- Laboratory duplicate RPDs; and

A Data Usability Summary Report (DUSR) will be prepared by the data validator and reviewed by the Quality Assurance Officer (QAO) before issuance. The DUSR will present the results of data

validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.

Based on the results of data validation, the validated analytical results reported by the laboratory will be assigned one of the following usability flags:

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;
- "UJ" - Not detected. Quantitation limit may be inaccurate or imprecise;
- "J" - Analyte is present. Reported value may be associated with a higher level of uncertainty than is normally expected with the analytical method
- "R" – Unreliable result; data is rejected or unusable. Analyte may or may not be present in the sample; and
- No Flag - Result accepted without qualification.

Additional details on the DUSRs are provided in the Quality Assurance Project Plan in Appendix C.

3.0 REPORTING

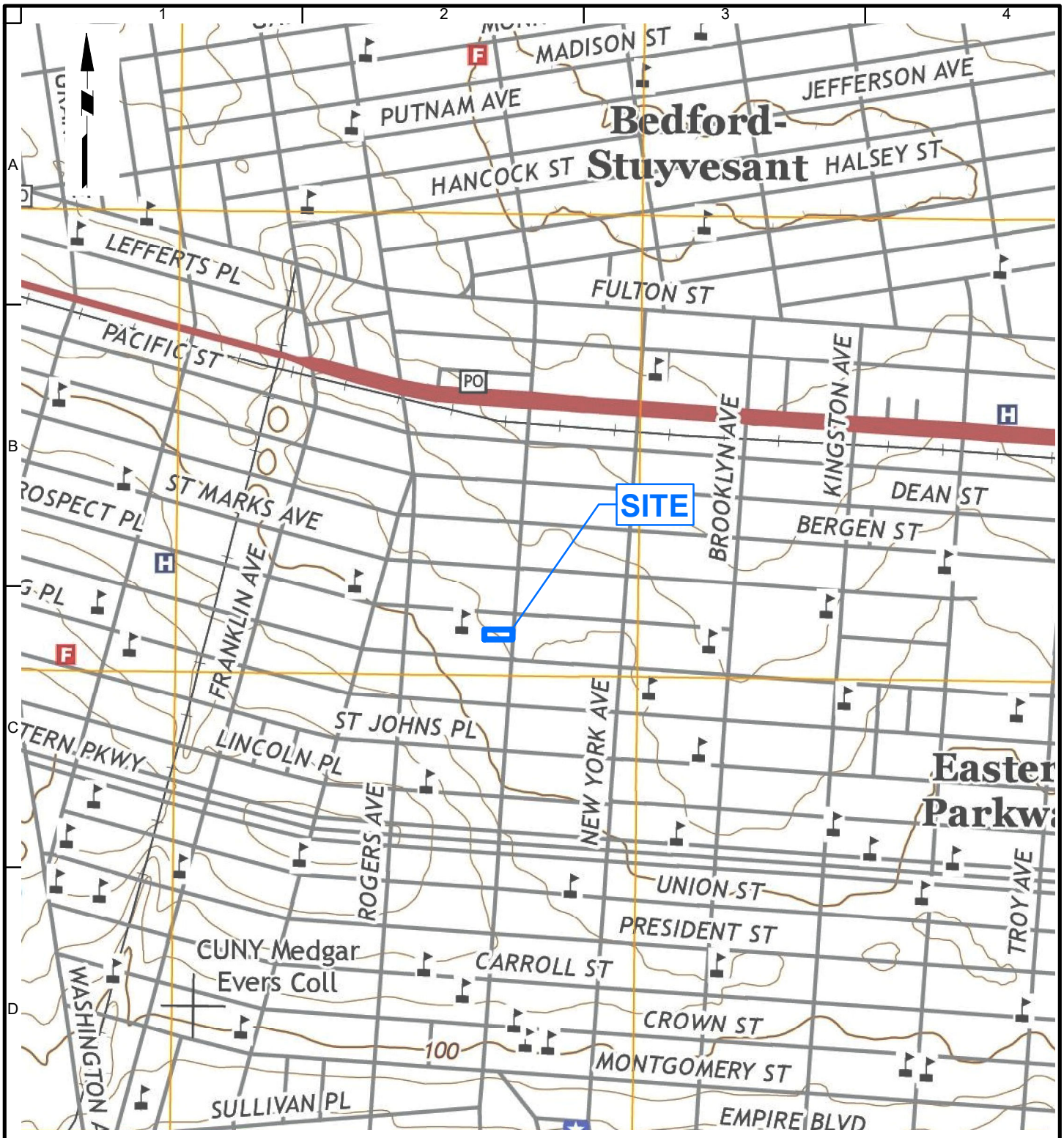
Following completion of the evaluation and receipt of analytical data, an SVI Evaluation and Rebound Study Report will be prepared. The report will include:

- Sampling methodology and field observations
- An evaluation of the results and findings
- Conclusions and recommendations regarding operation of the SVE system and associated adjustments to the SMP

The report will include sampling logs, tabulated analytical results, figures, and laboratory data packages. The tabulated analytical results will include sample location, media sampled, sample height/depth, field/laboratory identification numbers, analytical results and the applicable Standards, Criteria, and Guidance (SCGs) pertaining to the site and contaminants of concern for comparison.

Indoor air and soil vapor sample results for contaminants of concern will be measured against the NYSDOH SVI Decision Matrices to determine if SVI mitigation is required. If results indicate SVI mitigation is not recommended, a request to discontinue SVE system operation and reduce reporting frequency would be included in the following PRR.

FIGURES



LEGEND:

APPROXIMATE SITE BOUNDARY

NOTES:

1. BASE MAP ADAPTED FROM THE 2016 UNITED STATES GEOLOGICAL SURVEY (USGS) 7.5-MINUTE SERIES TOPORGRAPHIC MAPS, BROOKLYN QUADRANGLE, NEW YORK.

LANGAN

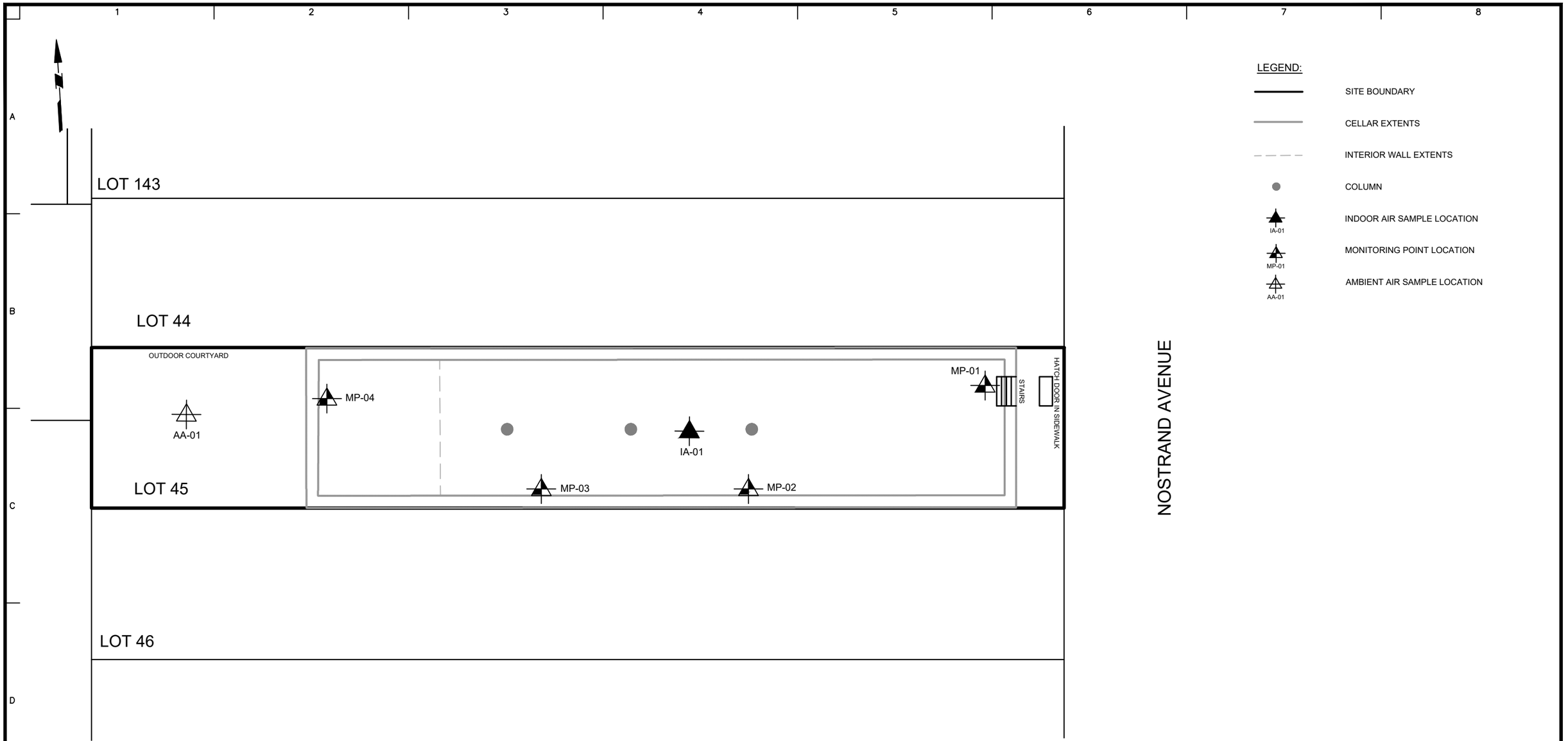
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001-2727
T: 212.479.5400 F: 212.479.5444 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC

Collectively known as Langan

Project	702 NOSTRAND AVENUE BLOCK No. 1226, LOT No. 45 BROOKLYN KINGS NEW YORK
Figure Title	SITE LOCATION MAP
Project No.	170527801
Figure No.	1
Date	11/5/2019
Scale	1"=1,000'
Drawn By	VDP
Submission Date	
Sheet	1 of 9

Path: \\langan.com\data\NYC\data8\170527801\Project Data\ArcGIS\ArcMap_Documents\SMP\Figure 1 - Site Location Map.mxd Date: 11/5/2019 User: vdepaula Time: 9:51:07 AM



NOTES:

1. BASE MAP IS SOURCED FROM NEW YORK CITY DEPARTMENT OF CITY PLANNING PLUTO DATABASE.
2. PROPOSED SAMPLE LOCATIONS ARE APPROXIMATE.

WARNING: It is a violation of the NYS Education Law Article 145 for any person, unless he is acting under the direction of a licensed professional engineer, to alter this item in any way.

10 0 10
SCALE IN FEET

LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC

Collectively known as Langan

Project	Figure Title	Project No.	Figure No.
702 NOSTRAND AVENUE BLOCK No. 1226, LOT No. 45 BROOKLYN KINGS NEW YORK	*PROPOSED SAMPLE LOCATION PLAN*	170527801 Date 6/17/2026 Scale 1"=10' Drawn By BK Submission Date	2

Filename: \\langan.com\data\NYC\data8\170527801\Project Data\CAD\Environmental\SMP\Figure 2 - Proposed Sample Location Plan.dwg Date: 6/17/2026 Time: 15:02 User: bkoontz Style Table: Langan.stb Layout: Figure 2 - SVE Layout

TABLES

Table 1
Proposed Sample Summary
SVI Evaluation and Rebound Study
702 Nostrand Avenue
Brooklyn, New York
NYSDEC BCP Site No. C224270
Langan Project No. 170527801

Sample Location	Sample ID	Sample Height/Depth	Analyses
Sub-Slab Vapor and Air Samples			
MP-01	MP-01_DATE	Two inches bellow cellar slab	VOCs by USEPA TO-15
MP-02	MP-02_DATE		
MP-03	MP-03_DATE		
MP-04	MP-04_DATE		
CELLAR	IA-01_DATE	3 - 5 feet above cellar grade	
COURTYARD	AA-01_DATE	3 - 5 feet above grade surface	

Notes:
1. USEPA = United States Environmental Protection Agency
2. VOC = Volatile organic compound

APPENDIX A
SVE SYSTEM EVALUATION TECHNICAL MEMO

LANGAN

Technical Memorandum

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
368 Ninth Avenue, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444

To: Marlen Salazar (NYSDEC)

From: Gerald Nicholls

Info: Jane O'Connell, Cris-Sandra Maycock (NYSDEC)
Scarlett McLaughlin, Christopher Budd (NYSDOH)
Mimi Raygorodetsky, Brad Koontz (Langan)

Date: 12 May 2026

Re: SVE System Evaluation
702 Nostrand Avenue
Brooklyn, NY
NYSDEC BCP Site No.: C224270
Langan Project No.: 170527801

This technical memorandum was prepared on behalf of 702 Nostrand Ave, LLC and MC Properties Management Company, LLC (collectively, the Volunteer) to evaluate potential discontinuation of the soil vapor extraction (SVE) system operation via a rebound study at 702 Nostrand Avenue, Brooklyn, New York (the site). The site is located in Kings County and is identified as Block 1226, Lot 45 on the Brooklyn Borough Tax Map. The site is about 1,650 square feet (0.038 acre) in area with about 16.5 feet of frontage along Nostrand Avenue. A site location map is included as Figure 1.

The Volunteer entered a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) on 9 May 2018 to investigate and remediate the site. The site was remediated to restricted residential use with a Track 4 cleanup and will continue to be used for commercial and residential uses, as documented in the 17 July 2020 Final Engineering Report (FER) prepared by Langan and submitted to the NYSDEC for review. Site remediation included the installation of two engineering controls (ECs): an SVE system and a composite cover system. Operation, maintenance, and monitoring requirements of the ECs are outlined in the NYSDEC-approved 11 June 2020 Site Management Plan (SMP). Record drawings of the site's ECs are included as Attachment 1.

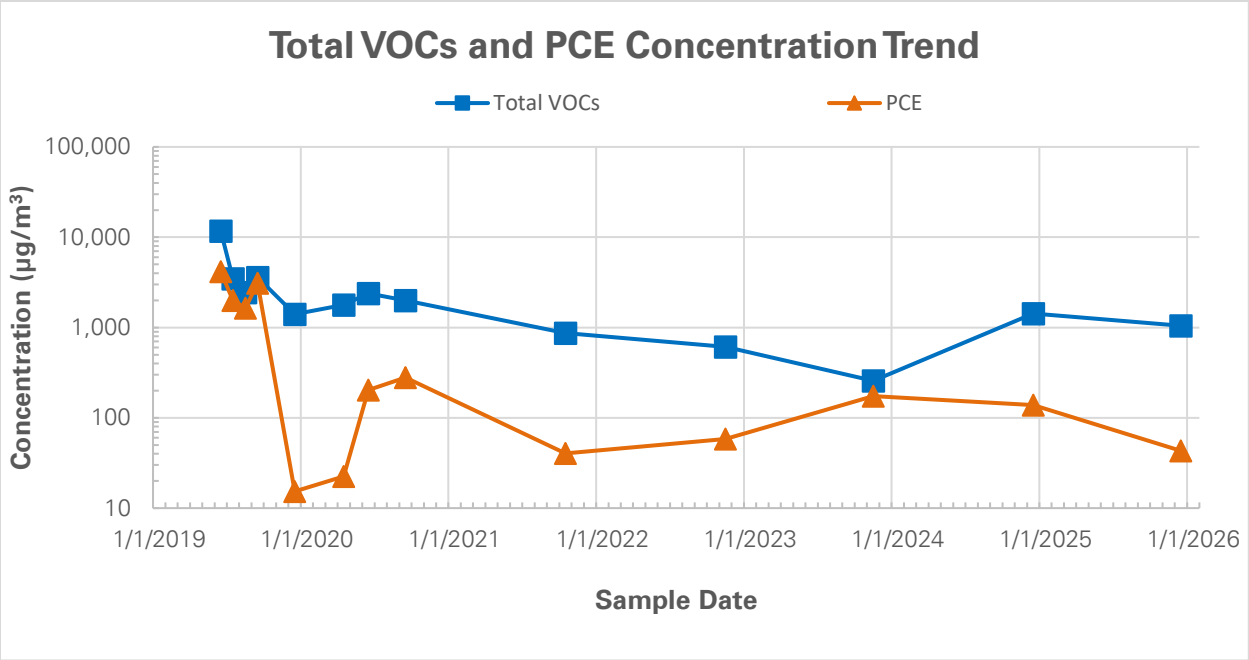
This memorandum provides the technical basis and supporting data for a proposed SVE rebound study to inform future consideration of SVE system discontinuation.

SVE System Operation and Performance

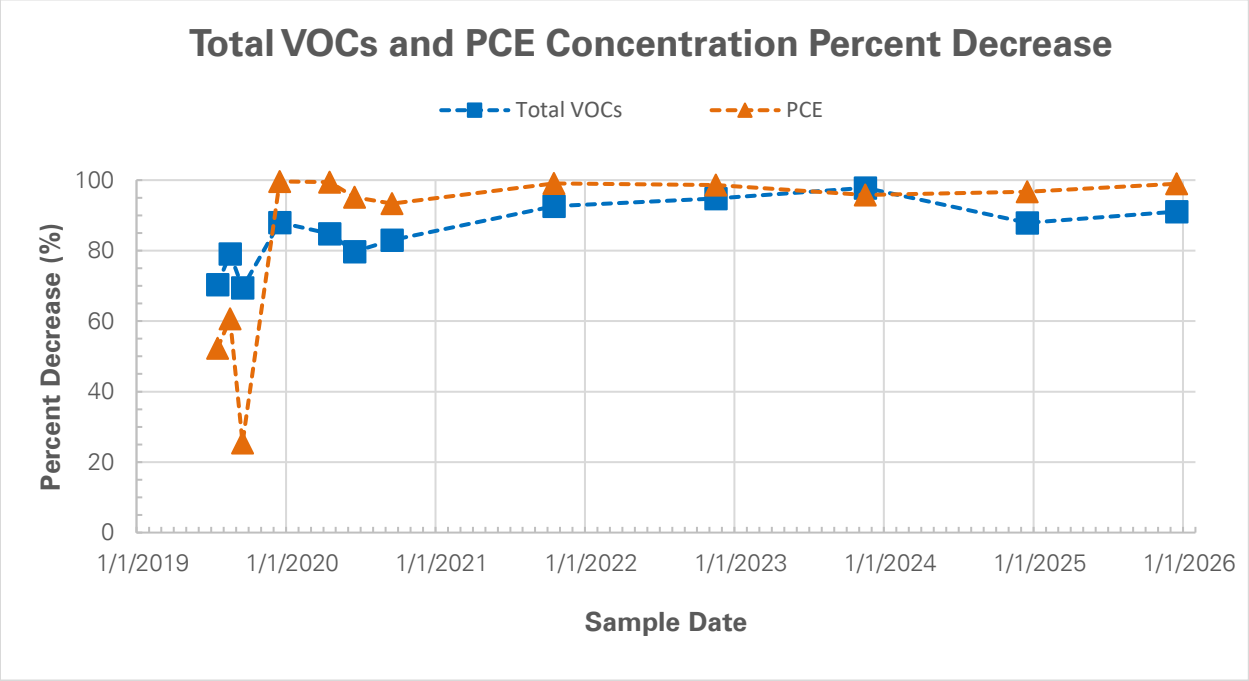
Effluent Air Trends

Analytical results document a reduction in effluent air concentrations for total VOCs and tetrachloroethene (PCE) compared to June 2019 baseline sampling event. Total VOC concentrations decreased from 11,748 micrograms per cubic meter (µg/m³) in June 2019 to 1,049 µg/m³ in December 2025. PCE concentrations decreased from 4,170 µg/m³ in June 2019 to

43.2 µg/m³ in December 2025. Total VOC and PCE effluent air concentrations are plotted on the following graph on a logarithmic scale:



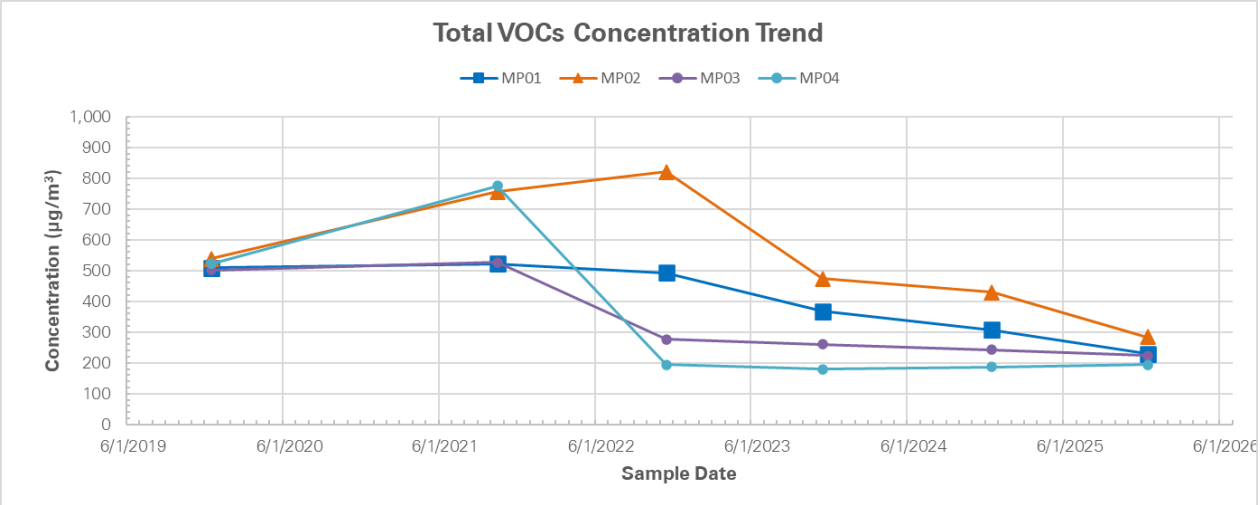
Total VOC and PCE effluent air concentrations detected in December 2025 decreased by 91.1% and 99.0%, respectively, when compared to the June 2019 baseline event. Percent decreases of total VOC and PCE effluent air concentrations are plotted on the following graph:



Comprehensive effluent air results are provided in Table 1.

Soil Vapor Trends

The maximum total VOC concentration detected in soil vapor during the 2017 Remedial Investigation (RI) was 40,120 µg/m^3. As part of the remedial action, four soil vapor monitoring points, MP01 through MP04, were installed. The monitoring points were sampled six months after system start-up in December 2019, and annually thereafter in accordance with the SMP. The following graph show total VOC trends in soil vapor samples collected from the monitoring points:



Total VOC concentrations in the soil vapor samples collected during the December 2025 inspection are 99.3% and 47.2% less than the RI and baseline samples, respectively. Maximum PCE concentrations in the soil vapor samples collected during the December 2025 inspection are 99.8% and 62% less than the RI and post-remediation maximum, respectively. Comprehensive soil vapor results are provided in Table 2, and are shown on Figure 1.

SVE Rebound Study Proposal

Based on the asymptotic trends of effluent air and soil vapor sample results, we request NYSDEC and New York State Department of Health (NYSDOH) approval to perform a Soil Vapor Intrusion (SVI) Evaluation/Rebound Study. If NYSDEC and NYSDOH concur with this approach, we will provide a work plan for review.

If results of the SVI Evaluation/Rebound Study indicate SVI mitigation is not required, we would request permission to discontinue SVE system operation and reduce reporting frequency.

Enclosure(s): Figure 1 – Soil Vapor Sample Analytical Results Map
Table 1 – Effluent Air Sample Analytical Results
Table 2 – Soil Vapor Sample Analytical Results
Attachment 1 – Record Drawings

TABLES

Table 1
Effluent Air Sample Analytical Results

702 Nostrand Avenue
Brooklyn, New York
NYSDEC BCP Site No.: C224270
Langan Project No.: 170527801

Analyte	CAS Number	Location	EA01	EA01	EA01	EA01	EA01	EA01	EA01	EA01	EA01	EA01	EA01	EA01	EA01
		Sample Name	EAO1_062819	EA01_072219	EA01_082219	EA01_092019	EA01_121819	EA01_040220	EA01_062520	EA01_090320	EA01_100621	EA01_110422	EA01_112923	EA01_121224	EA01_121225
		Sample Date	06/28/2019	07/22/2019	08/22/2019	09/20/2019	12/18/2019	04/03/2020	06/25/2020	09/03/2020	10/06/2021	11/04/2022	11/29/2023	12/12/2024	12/12/2025
		Sample Type	AE	AE	AE	AE	AE	AE	AE	AE	AE	AE	AE	AE	AE
		Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds															
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	ug/m3	<40.5 U	<5.47 U	<6.38 U	<12.8 U	<1.53 U	<1.53 U	<6.38 U	<4.79 U	<1.92 U	<1.53 U	<1.36 U	<1.53 U	0.429 J
1,1,2-Trichloroethane	79-00-5	ug/m3	<28.9 U	<3.9 U	<4.54 U	<9.11 U	<1.09 U	<1.09 U	<4.54 U	<3.41 U	<1.36 U	<1.09 U	<0.972 U	<1.09 U	<1.09 U
1,2,4-Trichlorobenzene	120-82-1	ug/m3	<39.3 U	<5.3 U	<6.18 U	<12.4 U	<1.48 U	<1.48 U	<6.18 U	<4.64 U	<1.86 U	<1.48 U	1.98 D	<1.48 U	<1.48 U
1,2,4-Trimethylbenzene	95-63-6	ug/m3	79.6	41.4	21.8	<8.21 U	11.1	1.28	4.88	3.87	2.26	1.53	<0.875 U	<0.983 U	1.07
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	ug/m3	<26 U	<3.51 U	<4.1 U	<8.21 U	2.2	<0.983 U	<4.1 U	<3.07 U	<1.23 U	<0.983 U	<0.876 U	<0.983 U	<0.983 U
1,4-Dichlorobenzene	106-46-7	ug/m3	<31.8 U	<4.29 U	<5.01 U	<10 U	<1.2 U	<1.2 U	<5.01 U	<3.76 U	<1.5 U	1.55	<1.07 U	<1.2 U	<1.2 U
2,2,4-Trimethylpentane	540-84-1	ug/m3	<24.7 U	<3.33 U	<3.89 U	<7.8 U	8.92	<0.934 U	<3.89 U	<2.92 U	<1.17 U	1.52	NA	1.07	<0.934 U
2-Hexanone (MBK)	591-78-6	ug/m3	<21.7 U	9.1	<3.41 U	<6.84 U	<0.82 U	<0.82 U	<3.41 U	<2.56 U	1.14	5.12	<1.46 U	<0.82 U	<0.82 U
4-Ethyltoluene	622-96-8	ug/m3	47.4	17.5	8.06	<8.21 U	3.25	<0.983 U	<4.1 U	<3.07 U	<1.23 U	<0.983 U	<0.876 U	<0.983 U	<0.983 U
Acetone	67-64-1	ug/m3	98.8	164	21.7	24.2	30.2	45.8	71.5	114	80.8	252	12.3 D	75.5	48.2
Benzene	71-43-2	ug/m3	<16.9 U	<2.28 U	<2.66 U	<5.34 U	1.94	<0.639 U	<2.66 U	<2 U	<0.799 U	2.13	1.65 D	0.674	0.594 J
Carbon Disulfide	75-15-0	ug/m3	16.5	10	3.02	<5.2 U	<0.623 U	<0.623 U	<2.59 U	<1.95 U	<0.779 U	<0.623 U	<0.555 U	<0.623 U	<0.623 U
Carbon Tetrachloride	56-23-5	ug/m3	<33.3 U	<4.49 U	<5.24 U	<10.5 U	<1.26 U	0.434	<5.24 U	<3.93 U	<1.57 U	<1.26 U	0.448 J	<1.26 U	0.541 J
Chloroform	67-66-3	ug/m3	<25.8 U	12.3	12.7	<8.16 U	2.3	2.69	8.4	4.81	9.52	6.59	<0.87 U	3.47	2.97
Chloromethane	74-87-3	ug/m3	<10.9 U	<1.47 U	<1.72 U	<3.45 U	0.615	0.814	<1.72 U	<1.29 U	<0.516 U	0.609	1.21 D	0.694	0.617
Cis-1,2-Dichloroethene	156-59-2	ug/m3	59.9	72.6	27.3	28.4	48	1.4	23.9	90	8.37	14.1	0.494 D	104	50.4
Cyclohexane	110-82-7	ug/m3	<18.2 U	4.99	4.13	<5.75 U	4.3	<0.688 U	<2.87 U	<2.15 U	1.31	0.764	<0.613 U	<0.688 U	0.334 J
Dichlorodifluoromethane	75-71-8	ug/m3	<26.2 U	<3.53 U	<4.12 U	<8.26 U	2.28	2.22	<4.12 U	<3.09 U	1.94	2.95	21.3 D	2.72	2.13
Ethanol	64-17-5	ug/m3	<249 U	<33.5 U	<39.2 U	90.8	1,060	277	627	462	203	399	NA	778	678
Ethyl Acetate	141-78-6	ug/m3	<47.6 U	<6.41 U	<7.5 U	<15 U	2.45	<1.8 U	<7.5 U	<5.62 U	<2.25 U	<1.8 U	<1.28 U	<1.8 U	<1.8 U
Ethylbenzene	100-41-4	ug/m3	<23 U	<3.1 U	<3.62 U	<7.25 U	4.15	<0.869 U	<3.62 U	<2.71 U	7.99	1.19	<0.773 U	<0.869 U	0.604 J
Isopropanol	67-63-0	ug/m3	6,930	880	568	273	93.9	1,420	1,420	1,000	413	113	32.9 D	285	182
M,P-Xylene	179601-23-1	ug/m3	<46 U	<6.21 U	7.99	<14.5 U	13.9	<1.74 U	<7.25 U	<5.43 U	26.4	3.7	1.7 D	<1.74 U	2.44
Methyl Ethyl Ketone (2-Butanone)	78-93-3	ug/m3	<38.9 U	67.2	<6.13 U	<12.3 U	2.85	3.66	<6.13 U	7.37	12	69.6	0.63 D	1.81	4.54
Methylene Chloride	75-09-2	ug/m3	<45.9 U	<6.18 U	33.5	<14.5 U	<1.74 U	<1.74 U	<7.23 U	<5.42 U	<2.17 U	1.8	<1.24 U	<1.74 U	<1.74 U
n-Heptane	142-82-5	ug/m3	<21.7 U	3.76	<3.41 U	<6.84 U	3.98	<0.82 U	<3.41 U	<2.56 U	<1.02 U	1.12	<0.73 U	<0.82 U	<0.82 U
n-Hexane	110-54-3	ug/m3	<18.6 U	2.96	3.25	<5.89 U	3.28	<0.705 U	<2.94 U	<2.2 U	1.23	1.73	1.88 D	<0.705 U	0.437 J
o-Xylene (1,2-Dimethylbenzene)	95-47-6	ug/m3	67.3	22.5	6.95	<7.25 U	4.34	<0.869 U	<3.62 U	<2.71 U	7.99	1.33	<0.773 U	<0.869 U	0.999
Propylene	115-07-1	ug/m3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.38 D	NA	NA
Tert-Butyl Alcohol	75-65-0	ug/m3	<40 U	<5.4 U	<6.31 U	<12.6 U	7.67	<1.52 U	<6.31 U	<4.73 U	5.46	3.02	NA	1.89	2.46 J
Tetrachloroethene (PCE)	127-18-4	ug/m3	4,170	1,990	1,640	3,110	15.3	22.4	203	279	40.3	58.1	174 D	138	43.2
Tetrahydrofuran	109-99-9	ug/m3	<38.9 U	6.93	<6.13 U	<12.3 U	1.64	<1.47 U	<6.13 U	<4.6 U	<1.84 U	<1.47 U	<1.05 U	<1.47 U	<1.47 U
Toluene	108-88-3	ug/m3	<19.9 U	<2.69 U	<3.14 U	<6.29 U	8.25	3.44	5.05	7.54	4.37	5.84	2.48 D	1.54	0.931
Total 1,2-Dichloroethene (Cis and Trans)	540-59-0	ug/m3	59.9	72.6	27.3	28.4	48	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	ug/m3	67.3	22.5	15	<7.25 U	18.2	<0.869 U	<3.62 U	<2.71 U	NA	5.04	NA	NA	NA
Trichloroethene (TCE)	79-01-6	ug/m3	151	66.1	35.4	31.4	4.68	0.505	6.4	11.4	4.78	5.2	0.479 D	9.94	7.52
Trichlorofluoromethane	75-69-4	ug/m3	<29.7 U	12.6	17.5	<9.38 U	2.52	2.41	9.22	12.3	3.25	10.7	1.7 J	20.5	17.8
Vinyl Chloride	75-01-4	ug/m3	<13.5 U	<1.83 U	<2.13 U	<4.27 U	<0.511 U	<0.051 U	<2.13 U	2.46	<0.639 U	<0.511 U	<0.228 U	0.726	0.744

Table 1
Effluent Air Sample Analytical Results

702 Nostrand Avenue
Brooklyn, New York
NYSDEC BCP Site No.: C224270
Langan Project No.: 170527801

Notes:

AE - Vapor Extraction Well Effluent
CAS - Chemical Abstract Service
NS - No standard
ug/m3 - microgram per cubic meter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected

Qualifiers:

D - The concentration reported is a result of a diluted sample.
J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
U - The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Table 2
Soil Vapor Sample Analytical Results

702 Nostrand Avenue
Brooklyn, New York
NYSDEC BCP Site No.: C224270
Langan Project No.: 170527801

Analyte	CAS Number	NYSDOH Decision Matrices Minimum Concentrations	Location	MP01	MP01	MP01	MP01	MP01	MP01	MP02	MP02	MP02	MP02	MP02	MP02
			Sample Name	SV-MP-1_121819	MP01_100621	MP01_110422	MP01_112923	MP01_121224	MP01_121225	SV-MP-2_121819	MP02_100621	MP02_110422	MP02_112923	MP02_121224	MP02_121225
			Sample Date	12/18/2019	10/06/2021	11/04/2022	11/29/2023	12/12/2024	12/12/2025	12/18/2019	10/06/2021	11/04/2022	11/29/2023	12/12/2024	12/12/2025
			Sample Type	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds															
1,1,1,2-Tetrachloroethane	630-20-6	NS	ug/m3	NA	NA	NA	<1.12 U	NA	NA	NA	NA	NA	<2.26 U	NA	NA
1,1,1-Trichloroethane	71-55-6	100	ug/m3	<1.09 U	<1.09 U	<1.09 U	<0.888 U	<1.09 U	<1.09 U	<1.09 U	<2.18 U	<2.6 U	<1.79 U	<1.09 U	<1.09 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	ug/m3	<1.37 U	<1.37 U	<1.37 U	<1.12 U	<1.37 U	<1.37 U	<1.37 U	<2.75 U	<3.27 U	<2.26 U	<1.37 U	<1.37 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	ug/m3	<1.53 U	<1.53 U	<1.53 U	<1.25 U	<1.53 U	0.491 J	<1.53 U	<3.07 U	<3.65 U	<2.52 U	<1.53 U	0.483 J
1,1,2-Trichloroethane	79-00-5	NS	ug/m3	<1.09 U	<1.09 U	<1.09 U	<0.888 U	<1.09 U	<1.09 U	<1.09 U	<2.18 U	<2.6 U	<1.79 U	<1.09 U	<1.09 U
1,1-Dichloroethane	75-34-3	NS	ug/m3	<0.809 U	<0.809 U	<0.809 U	<0.659 U	<0.809 U	<0.809 U	<0.809 U	<1.62 U	<1.93 U	<1.33 U	<0.809 U	<0.809 U
1,1-Dichloroethene	75-35-4	6	ug/m3	<0.793 U	<0.793 U	<0.793 U	<0.323 U	<0.793 U	<0.793 U	<0.793 U	<1.59 U	<1.89 U	<0.651 U	<0.793 U	<0.793 U
1,2,4-Trichlorobenzene	120-82-1	NS	ug/m3	<1.48 U	<1.48 U	<1.48 U	<1.21 U	<1.48 U	<1.48 U	<1.48 U	<2.97 U	<3.53 U	<2.44 U	<1.48 U	<1.48 U
1,2,4-Trimethylbenzene	95-63-6	60	ug/m3	2.08	1.92	1.27	3.92 D	3.54	4.48	5.6	<1.97 U	<2.34 U	<1.62 U	<0.983 U	<0.983 U
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	ug/m3	<1.54 U	<1.54 U	<1.54 U	<1.25 U	<1.54 U	<1.54 U	<1.54 U	<3.07 U	<3.66 U	<2.52 U	<1.54 U	<1.54 U
1,2-Dichlorobenzene	95-50-1	NS	ug/m3	<1.2 U	<1.2 U	<1.2 U	<0.978 U	<1.2 U	<1.2 U	<1.2 U	<2.4 U	<2.86 U	<1.98 U	<1.2 U	<1.2 U
1,2-Dichloroethane	107-06-2	NS	ug/m3	<0.809 U	<0.809 U	<0.809 U	<0.658 U	<0.809 U	<0.809 U	<0.809 U	<1.62 U	<1.93 U	<1.33 U	<0.809 U	<0.809 U
1,2-Dichloropropane	78-87-5	NS	ug/m3	<0.924 U	<0.924 U	<0.924 U	<0.752 U	<0.924 U	<0.924 U	<0.924 U	<1.85 U	<2.2 U	<1.52 U	<0.924 U	<0.924 U
1,2-Dichlorotetrafluoroethane	76-14-2	NS	ug/m3	<1.4 U	<1.4 U	<1.4 U	<1.14 U	<1.4 U	<1.4 U	<1.4 U	<2.8 U	<3.33 U	<2.3 U	<1.4 U	<1.4 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	60	ug/m3	<0.983 U	<0.983 U	<0.983 U	0.88 D	<0.983 U	1.09	1.5	<1.97 U	<2.34 U	<1.62 U	<0.983 U	<0.983 U
1,3-Butadiene	106-99-0	NS	ug/m3	<0.442 U	<0.442 U	<0.442 U	<1.08 U	<0.442 U	<0.442 U	<0.442 U	<0.885 U	<1.05 U	<2.18 U	<0.442 U	<0.442 U
1,3-Dichlorobenzene	541-73-1	NS	ug/m3	<1.2 U	<1.2 U	<1.2 U	<0.978 U	<1.2 U	<1.2 U	<1.2 U	<2.4 U	<2.86 U	<1.98 U	<1.2 U	<1.2 U
1,3-Dichloropropane	142-28-9	NS	ug/m3	NA	NA	NA	<0.752 U	NA	NA	NA	NA	NA	<1.52 U	NA	NA
1,4-Dichlorobenzene	106-46-7	NS	ug/m3	<1.2 U	<1.2 U	<1.2 U	<0.978 U	<1.2 U	<1.2 U	<1.2 U	<2.4 U	<2.86 U	<1.98 U	<1.2 U	<1.2 U
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/m3	<0.721 U	<0.721 U	<0.721 U	<1.17 U	<0.721 U	<0.721 U	<0.721 U	<1.44 U	<1.72 U	<2.37 U	<0.721 U	<0.721 U
2,2,4-Trimethylpentane	540-84-1	60	ug/m3	2.81	<0.934 U	<0.934 U	NA	<0.934 U	<0.934 U	5.89	<1.87 U	<2.22 U	NA	<0.934 U	<0.934 U
2-Hexanone (MBK)	591-78-6	NS	ug/m3	<0.82 U	<0.82 U	<0.82 U	<1.33 U	<0.82 U	<0.82 U	<0.82 U	<1.64 U	<1.95 U	<2.69 U	<0.82 U	<0.82 U
4-Ethyltoluene	622-96-8	NS	ug/m3	<0.983 U	<0.983 U	<0.983 U	2.88 D	<0.983 U	0.728 J	1.32	<1.97 U	<2.34 U	<1.62 U	<0.983 U	<0.983 U
Acetone	67-64-1	NS	ug/m3	122	127	59.9	61.4 D	49.4	24.5	80.8	141	76.3	22.4 D	18	25.4
Acrylonitrile	107-13-1	NS	ug/m3	NA	NA	NA	0.565 D	NA	NA	NA	NA	NA	<0.713 U	NA	NA
Allyl Chloride (3-Chloropropene)	107-05-1	NS	ug/m3	<0.626 U	<0.626 U	<0.626 U	<2.55 U	<0.626 U	<0.626 U	<0.626 U	<1.25 U	<1.49 U	<5.14 U	<0.626 U	<0.626 U
Benzene	71-43-2	60	ug/m3	1.96	<0.639 U	1.2	0.832 D	1.67	0.371 J	2.44	<1.28 U	<1.52 U	<1.05 U	<0.639 U	<0.639 U
Benzyl Chloride	100-44-7	NS	ug/m3	<1.04 U	<1.04 U	<1.04 U	<0.842 U	<1.04 U	<1.04 U	<1.04 U	<2.07 U	<2.46 U	<1.7 U	<1.04 U	<1.04 U
Bromodichloromethane	75-27-4	NS	ug/m3	<1.34 U	<1.34 U	<1.34 U	<1.09 U	<1.34 U	<1.34 U	<1.34 U	<2.68 U	<3.19 U	<2.2 U	<1.34 U	<1.34 U
Bromoethene	593-60-2	NS	ug/m3	<0.874 U	<0.874 U	<0.874 U	<0.712 U	<0.874 U	<0.874 U	<0.874 U	<1.75 U	<2.08 U	<1.44 U	<0.874 U	<0.874 U
Bromoform	75-25-2	NS	ug/m3	<2.07 U	<2.07 U	<2.07 U	<1.68 UJ	<2.07 U	<2.07 U	<2.07 U	<4.14 U	<4.92 U	<3.4 UJ	<2.07 U	<2.07 U
Bromomethane	74-83-9	NS	ug/m3	<0.777 U	<0.777 U	<0.777 U	<0.632 U	<0.777 U	<0.777 U	<0.777 U	<1.55 U	<1.85 U	<1.28 U	<0.777 U	<0.777 U
Carbon Disulfide	75-15-0	NS	ug/m3	1.51	2.15	0.993	1.72 D	2.47	1.78	4.45	16.7	<1.48 U	<1.02 U	<0.623 U	0.206 J
Carbon Tetrachloride	56-23-5	6	ug/m3	<1.26 U	<1.26 U	<1.26 U	0.512 J	<1.26 U	0.453 J	<1.26 U	<2.52 U	<2.99 U	0.62 J	<1.26 U	0.497 J
Chlorobenzene	108-90-7	NS	ug/m3	<0.921 U	<0.921 U	<0.921 U	<0.749 U	<0.921 U	<0.921 U	<0.921 U	<1.84 U	<2.19 U	<1.51 U	<0.921 U	<0.921 U
Chloroethane	75-00-3	NS	ug/m3	<0.528 U	<0.528 U	<0.528 U	<0.429 U	<0.528 U	<0.528 U	<0.528 U	<1.06 U	<1.26 U	<0.867 U	<0.528 U	<0.528 U
Chloroform	67-66-3	NS	ug/m3	1.13	2.31	1.68	6.12 D	<0.977 U	1.13	1.32	4.24	<2.32 U	<1.6 U	<0.977 U	<0.977 U
Chloromethane	74-87-3	NS	ug/m3	0.698	0.907	0.874	0.504 D	0.766	0.768	1.51	1.73	<0.983 U	<0.679 U	<0.413 U	0.186 J
Cis-1,2-Dichloroethene	156-59-2	6	ug/m3	1.13	<0.793 U	<0.793 U	2.77 D	2.21	0.813	2.66	<1.59 U	<1.89 U	0.782 D	1.58	0.381 J
Cis-1,3-Dichloropropene	10061-01-5	NS	ug/m3	<0.908 U	<0.908 U	<0.908 U	<0.738 U	<0.908 U	<0.908 U	<0.908 U	<1.82 U	<2.16 U	<1.49 U	<0.908 U	<0.908 U
Cyclohexane	110-82-7	60	ug/m3	5.3	<0.688 U	<0.688 U	<0.56 U	<0.688 U	<0.688 U	10.1	<1.38 U	<1.64 U	<1.13 U	<0.688 U	<0.688 U
Dibromochloromethane	124-48-1	NS	ug/m3	<1.7 U	<1.7 U	<1.7 U	<1.39 U	<1.7 U	<1.7 U	<1.7 U	<3.41 U	<4.06 U	<2.8 U	<1.7 U	<1.7 U
Dichlorodifluoromethane	75-71-8	NS	ug/m3	2.24	1.95	2.85	3.46 D	2.64	2.26	2.29	<1.98 U	2.9	3.9 D	2.62	2.24
Ethanol	64-17-5	NS	ug/m3	101	89.7	113	NA	48	81.4	122	91	<22.4 U	NA	<9.42 U	6.18 J
Ethyl Acetate	141-78-6	NS	ug/m3	2.19	<1.8 U	<1.8 U	3.05 D	<1.8 U	<1.8 U	2.6	<3.6 U	<4.29 U	<2.37 U	4.5	<1.8 U
Ethylbenzene	100-41-4	60	ug/m3	2.68	9.25	3.83	2.47 D	2.99	0.647 J	4.78	7.43	<2.07 U	<1.43 U	<0.869 U	<0.869 U
Hexachlorobutadiene	87-68-3	NS	ug/m3	<2.13 U	<2.13 U	<2.13 U	<1.74 U	<2.13 U	<2.13 U	<2.13 U	<4.27 U	<5.08 U	<3.5 U	<2.13 U	<2.13 U
Isopropanol	67-63-0	NS	ug/m3	113	54.6	32.4	26.4 D	10.3	16.4	35.4	78.9	7.33	6.7 D	2.51	6.27
M,P-Xylene	179601-23-1	200	ug/m3	11.4	28.7	57.3	9.61 D	10.3	2.77	24.5	22.7	<4.14 U	<2.85 U	<1.74 U	<1.74 U
Methyl Ethyl Ketone (2-Butanone)	78-93-3	NS	ug/m3	32.4	56.6	38.9	44.8 D	36	16.8	5.52	80.5	88.2	21.9 D	29.8	31.3
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/m3	<2.05 U	<2.05 U	<2.05 U	<0.667 U	15.2	<2.05 U	<2.05 U	<4.1 U	<4.88 U	<1.35 U	<2.05 U	<2.05 U
Methyl Methacrylate	80-62-6	NS	ug/m3	NA	NA	NA	<0.666 U	NA	NA	NA	NA	NA	<1.35 U	NA	NA
Methylene Chloride	75-09-2	100	ug/m3	<1.74 U	<1.74 U	2.45	<1.13 U	<1.74 U	<1.74 U	<1.74 U	<3.47 U	<4.13 U	<2.28 U	<1.74 U	<1.74 U
Naphthalene	91-20-3	60	ug/m3	NA	NA	NA	NA	<1.05 U	0.451 J	NA	NA	NA	NA	<1.05 U	<0.996 U
n-Heptane	142-82-5	200	ug/m3	5.57	<0.82 U	0.832	<0.667 U	2.51	<0.82 U	7.29	<1.64 U	<1.95 U	<1.35 U	4.18	<0.82 U
n-Hexane	110-54-3	200	ug/m3	3.5	1.37	0.874	<0.573 U	1.06	<0.705 U	5.25	1.61	<1.68 U	<1.16 U	1.32	<0.705 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	60	ug/m3	4.6	8.77	19.2	3.53 D	3.68	1.54	8.82	6.95	<2.07 U	<1.43 U	<0.869 U	<0.869 U
Propylene	115-07-1	NS	ug/m3	NA	NA	NA	<0.28 U	NA	NA	NA	NA	NA	<0.566 U	NA	NA
Styrene	100-42-5	NS	ug/m3	<0.852 U	<0.852 U	<0.852 U	<0.693 U	<0.852 U	<0.852 U	<0.852 U	<1.7 U	<2.03 U	<1.4 U	<0.852 U	<0.852 U
Tert-Butyl Alcohol	75-65-0	NS	ug/m3	9.22	22.3	1.6	NA	<1.52 U	<1.52 U	12.5	21	<3.61 U	NA	<1.52 U	<1.52 U
Tert-Butyl Methyl Ether (MTBE)	1634-04-4	NS	ug/m3	<0.721 U	<0.721 U	<0.721 U	<0.587 U	<0.721 U	<0.721 U	<0.721 U	<1.44 U	<1.72 U	<1.18 U	<0.721 U	<0.721 U
Tetrachloroethene (PCE)	127-18-4	**100**	ug/m3	10.1	2.77	7.26	60.7 D	21	20.1	34.7	4.83	88.8	**201 D**	**114**	45.2
Tetrahydrofuran	109-99-9	NS	ug/m3	39.8	106	61.1	118 D	85.2	46.9	100	272	554	213 D	244	163
Toluene	108-88-3	300	ug/m3	8.59	4.6	6.59	7.73 D	4.56	0.871	10.9	5.16	<1.79 U	<1.24 U	1.68	<0.754 U
Total 1,2-Dichloroethene (Cis and Trans)	540-59-0	NS	ug/m3	2.54	NA	NA	NA	NA	NA	4.28	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	NS	ug/m3	16	NA	76.4	NA	NA	NA	33.3	NA	<2.07 U	NA	NA	NA
Trans-1,2-Dichloroethene	156-60-5	NS	ug/m3	1.41	<0.793 U	<0.793 U	<0.645 U	<0.793 U	<0.793 U	1.61	<1.59 U	<1.89 U	<1.3 U	<0.793 U	<0.793 U
Trans-1,3-Dichloropropene	10061-02-6	NS	ug/m3	<0.908 U	<0.908 U	<0.908 U	<0.738 U	<0.908 U	<0.908 U	<0.908 U	<1.82 U	<2.16 U	<1.49 U	<0.908 U	<0.908 U
Trichloroethene (TCE)	79-01-6	6	ug/m3	1.81	<1.07 U	<1.07 U	3.15 D	1.34	0.924 J	2.75	<2.15 U	2.57	1.41 D	1.19	0.64 J
Trichlorofluoromethane	75-69-4	NS	ug/m3	1.75	1.21	2.12	3.66 J	2.67	1.59	2.23	<2.25 U	<2.67 U	2.77 J	3.71	2.07
Vinyl Acetate	108-05-4	NS	ug/m3	NA	NA	NA	<0.573 U	NA	NA	NA	NA	NA	<1.16 U	NA	NA
Vinyl Chloride	75-01-4	6	ug/m3	<0.511 U	<0.511 U	<0.511 U	<0.208 U	<0.511 U	<0.511 U	<0.511 U	<1.02 U	<1.22 U	<0.42 U	<0.511 U	<0.511 U
Total CVOCs	TOTALCVOCS	NS	ug/m3	14.45	2.77	7.26	66.62	24.55	21.837	41.72	4.83	91.37	203.192	116.77	46.221
Total VOCs	TOTALVOCS	NS	ug/m3	508.418	522.107	492.623	368.663	307.506	229.257	538.31	755.75	820.1	474.482	429.09	284.053

Table 2
Soil Vapor Sample Analytical Results

702 Nostrand Avenue
Brooklyn, New York
NYSDEC BCP Site No.: C224270
Langan Project No.: 170527801

Analyte	CAS Number	NYSDOH Decision Matrices Minimum Concentrations	Location	MP03	MP03	MP03	MP03	MP03	MP03	MP04	MP04	MP04	MP04	MP04	MP04
			Sample Name	SV-MP-3_121819	MP03_100621	MP03_110422	MP03_112923	MP03_121224	MP03_121225	SV-MP-4_121819	MP04_100621	MP04_110422	MP04_112923	MP04_121224	MP04_121225
			Sample Date	12/18/2019	10/06/2021	11/04/2022	11/29/2023	12/12/2024	12/12/2025	12/18/2019	10/06/2021	11/04/2022	11/29/2023	12/12/2024	12/12/2025
			Sample Type	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV
			Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds															
1,1,1,2-Tetrachloroethane	630-20-6	NS	ug/m3	NA	NA	NA	<1.28 U	NA	NA	NA	NA	NA	<1.06 U	NA	NA
1,1,1-Trichloroethane	71-55-6	100	ug/m3	<1.09 U	<1.09 U	<1.09 U	<1.02 U	<1.09 U	<1.09 U	<1.09 U	<1.56 U	<1.09 U	<0.841 U	<1.09 U	<1.09 U
1,1,2,2-Tetrachloroethane	79-34-5	NS	ug/m3	<1.37 U	<1.37 U	<1.37 U	<1.28 U	<1.37 U	<1.37 U	<1.37 U	<1.96 U	<1.37 U	<1.06 U	<1.37 U	<1.37 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	NS	ug/m3	<1.53 U	<1.53 U	<1.53 U	<1.43 U	<1.53 U	0.483 J	<1.53 U	<2.19 U	<1.53 U	<1.18 U	<1.53 U	0.46 J
1,1,2-Trichloroethane	79-00-5	NS	ug/m3	<1.09 U	<1.09 U	<1.09 U	<1.02 U	<1.09 U	<1.09 U	<1.09 U	<1.56 U	<1.09 U	<0.841 U	<1.09 U	<1.09 U
1,1-Dichloroethane	75-34-3	NS	ug/m3	<0.809 U	<0.809 U	<0.809 U	<0.756 U	<0.809 U	<0.809 U	<0.809 U	<1.16 U	<0.809 U	<0.624 U	<0.809 U	<0.809 U
1,1-Dichloroethene	75-35-4	6	ug/m3	<0.793 U	<0.793 U	<0.793 U	<0.371 U	<0.793 U	<0.793 U	<0.793 U	<1.13 U	<0.793 U	<0.305 U	<0.793 U	<0.793 U
1,2,4-Trichlorobenzene	120-82-1	NS	ug/m3	<1.48 U	<1.48 U	<1.48 U	<1.39 U	<1.48 U	<1.48 U	<1.48 U	<2.12 U	<1.48 U	<1.14 U	<1.48 U	<1.48 U
1,2,4-Trimethylbenzene	95-63-6	60	ug/m3	3.44	1.71	1.48	4.41 D	3.75	4.37	3.41	<1.41 U	8.06	4.17 D	4.2	5.26
1,2-Dibromoethane (Ethylene Dibromide)	106-93-4	NS	ug/m3	<1.54 U	<1.54 U	<1.54 U	<1.44 U	<1.54 U	<1.54 U	<1.54 U	<2.2 U	<1.54 U	<1.18 U	<1.54 U	<1.54 U
1,2-Dichlorobenzene	95-50-1	NS	ug/m3	<1.2 U	<1.2 U	<1.2 U	<1.12 U	<1.2 U	<1.2 U	<1.2 U	<1.72 U	<1.2 U	<0.926 U	<1.2 U	<1.2 U
1,2-Dichloroethane	107-06-2	NS	ug/m3	<0.809 U	<0.809 U	<0.809 U	<0.756 U	<0.809 U	<0.809 U	<0.809 U	<1.16 U	<0.809 U	<0.624 U	<0.809 U	<0.809 U
1,2-Dichloropropane	78-87-5	NS	ug/m3	<0.924 U	<0.924 U	<0.924 U	<0.864 U	<0.924 U	<0.924 U	<0.924 U	<1.32 U	<0.924 U	<0.712 U	<0.924 U	<0.924 U
1,2-Dichlorotetrafluoroethane	76-14-2	NS	ug/m3	<1.4 U	<1.4 U	<1.4 U	<1.31 U	<1.4 U	<1.4 U	<1.4 U	<2 U	<1.4 U	<1.08 U	<1.4 U	<1.4 U
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	60	ug/m3	<0.983 U	<0.983 U	<0.983 U	1.1 D	<0.983 U	1	<0.983 U	<1.41 U	5.56	0.985 D	0.983	1.23
1,3-Butadiene	106-99-0	NS	ug/m3	<0.442 U	<0.442 U	<0.442 U	<1.24 U	<0.442 U	<0.442 U	<0.442 U	<0.633 U	<0.442 U	<1.02 U	<0.442 U	<0.442 U
1,3-Dichlorobenzene	541-73-1	NS	ug/m3	<1.2 U	<1.2 U	<1.2 U	<1.12 U	<1.2 U	<1.2 U	<1.2 U	<1.72 U	<1.2 U	<0.926 U	<1.2 U	<1.2 U
1,3-Dichloropropane	142-28-9	NS	ug/m3	NA	NA	NA	<0.864 U	NA	NA	NA	NA	NA	<0.712 U	NA	NA
1,4-Dichlorobenzene	106-46-7	NS	ug/m3	<1.2 U	<1.2 U	1.36	<1.12 U	<1.2 U	<1.2 U	<1.2 U	<1.72 U	1.35	<0.926 U	<1.2 U	<1.2 U
1,4-Dioxane (P-Dioxane)	123-91-1	NS	ug/m3	<0.721 U	<0.721 U	<0.721 U	<1.35 U	<0.721 U	<0.721 U	<0.721 U	<1.03 U	<0.721 U	<1.11 U	<0.721 U	<0.721 U
2,2,4-Trimethylpentane	540-84-1	60	ug/m3	8.36	<0.934 U	0.939	NA	<0.934 U	<0.934 U	5.51	<1.34 U	2	NA	<0.934 U	<0.934 U
2-Hexanone (MBK)	591-78-6	NS	ug/m3	<0.82 U	<0.82 U	<0.82 U	<1.53 U	<0.82 U	<0.82 U	<0.82 U	<1.17 U	<0.82 U	<1.26 U	<0.82 U	<0.82 U
4-Ethyltoluene	622-96-8	NS	ug/m3	<0.983 U	<0.983 U	<0.983 U	4.59 D	<0.983 U	0.615 J	<0.983 U	<1.41 U	1.96	4.09 D	<0.983 U	0.654 J
Acetone	67-64-1	NS	ug/m3	94.1	49.9	56.5	29.2 D	21.9	15.1	120	50.1	18.1	15.1 D	6.49	6.75
Acrylonitrile	107-13-1	NS	ug/m3	NA	NA	NA	1.99 D	NA	NA	NA	NA	NA	<0.334 U	NA	NA
Allyl Chloride (3-Chloropropene)	107-05-1	NS	ug/m3	<0.626 U	<0.626 U	<0.626 U	<2.93 U	<0.626 U	<0.626 U	<0.626 U	<0.895 U	<0.626 U	<2.41 U	<0.626 U	<0.626 U
Benzene	71-43-2	60	ug/m3	2.37	<0.639 U	1.59	1.07 D	2.6	0.486 J	3.87	<0.914 U	1.51	0.935 D	1.23	0.578 J
Benzyl Chloride	100-44-7	NS	ug/m3	<1.04 U	<1.04 U	<1.04 U	<0.968 U	<1.04 U	<1.04 U	<1.04 U	<1.48 U	<1.04 U	<0.798 U	<1.04 U	<1.04 U
Bromodichloromethane	75-27-4	NS	ug/m3	<1.34 U	<1.34 U	<1.34 U	<1.25 U	<1.34 U	<1.34 U	<1.34 U	<1.92 U	<1.34 U	<1.03 U	<1.34 U	<1.34 U
Bromoethene	593-60-2	NS	ug/m3	<0.874 U	<0.874 U	<0.874 U	<0.818 U	<0.874 U	<0.874 U	<0.874 U	<1.25 U	<0.874 U	<0.674 U	<0.874 U	<0.874 U
Bromoform	75-25-2	NS	ug/m3	<2.07 U	<2.07 U	<2.07 U	<1.93 UJ	<2.07 U	<2.07 U	<2.07 U	<2.96 U	<2.07 U	<1.59 UJ	<2.07 U	<2.07 U
Bromomethane	74-83-9	NS	ug/m3	<0.777 U	<0.777 U	<0.777 U	<0.726 U	<0.777 U	<0.777 U	<0.777 U	<1.11 U	<0.777 U	<0.598 U	<0.777 U	<0.777 U
Carbon Disulfide	75-15-0	NS	ug/m3	2.37	6.76	1.06	2.79 D	2.65	2.25	0.694	9.75	10.1	4.65 D	4.24	2.99
Carbon Tetrachloride	56-23-5	6	ug/m3	<1.26 U	<1.26 U	<1.26 U	0.588 J	<1.26 U	0.459 J	<1.26 U	<1.8 U	<1.26 U	0.582 J	<1.26 U	0.491 J
Chlorobenzene	108-90-7	NS	ug/m3	<0.921 U	<0.921 U	<0.921 U	<0.86 U	<0.921 U	<0.921 U	<0.921 U	<1.32 U	<0.921 U	<0.709 U	<0.921 U	<0.921 U
Chloroethane	75-00-3	NS	ug/m3	<0.528 U	<0.528 U	<0.528 U	<0.493 U	<0.528 U	<0.528 U	<0.528 U	<0.755 U	<0.528 U	<0.407 U	<0.528 U	<0.528 U
Chloroform	67-66-3	NS	ug/m3	1.23	3	1.86	1.46 D	<0.977 U	0.278 J	<0.977 U	<1.4 U	<0.977 U	<0.752 U	<0.977 U	<0.977 U
Chloromethane	74-87-3	NS	ug/m3	2.35	2.71	0.84	0.502 D	0.878	1.42	0.63	3.92	3.2	1.72 D	1.38	1.81
Cis-1,2-Dichloroethene	156-59-2	6	ug/m3	1.11	<0.793 U	<0.793 U	1.93 D	1.76	0.642 J	<0.793 U	<1.13 U	<0.793 U	<0.305 U	<0.793 U	<0.793 U
Cis-1,3-Dichloropropene	10061-01-5	NS	ug/m3	<0.908 U	<0.908 U	<0.908 U	<0.848 U	<0.908 U	<0.908 U	<0.908 U	<1.3 U	<0.908 U	<0.699 U	<0.908 U	<0.908 U
Cyclohexane	110-82-7	60	ug/m3	9.4	<0.688 U	<0.688 U	<0.643 U	<0.688 U	<0.688 U	12.9	1.54	<0.688 U	<0.53 U	<0.688 U	<0.688 U
Dibromochloromethane	124-48-1	NS	ug/m3	<1.7 U	<1.7 U	<1.7 U	<1.59 U	<1.7 U	<1.7 U	<1.7 U	<2.44 U	<1.7 U	<1.31 U	<1.7 U	<1.7 U
Dichlorodifluoromethane	75-71-8	NS	ug/m3	2.23	1.96	2.9	3.05 D	2.53	2.16	2.14	1.92	3.04	3.89 D	2.57	2.19
Ethanol	64-17-5	NS	ug/m3	123	104	60.1	NA	58.4	88.6	155	106	27.3	NA	41.6	117
Ethyl Acetate	141-78-6	NS	ug/m3	3.43	1.96	<1.8 U	4.18 D	<1.8 U	<1.8 U	4.36	<2.57 U	<1.8 U	3 D	<1.8 U	<1.8 U
Ethylbenzene	100-41-4	60	ug/m3	5.69	9.95	1.36	3.25 D	3.74	0.513 J	4.47	<1.24 U	1.4	2.68 D	3.31	0.652 J
Hexachlorobutadiene	87-68-3	NS	ug/m3	<2.13 U	<2.13 U	<2.13 U	<1.99 U	<2.13 U	<2.13 U	<2.13 U	<3.05 U	<2.13 U	<1.64 U	<2.13 U	<2.13 U
Isopropanol	67-63-0	NS	ug/m3	14.9	60.5	17.2	28.3 D	12.4	16.1	20.8	489	9.54	27.2 D	4.97	14.8
M,P-Xylene	179601-23-1	200	ug/m3	27.3	29.8	4.29	12.2 D	12.6	2.09	18.6	<2.48 U	4.73	10.3 D	11.8	2.69
Methyl Ethyl Ketone (2-Butanone)	78-93-3	NS	ug/m3	16.9	34.8	27.3	16.7 D	16	12.4	36.6	2.95	3.19	2.32 D	1.9	1.01 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	108-10-1	NS	ug/m3	<2.05 U	<2.05 U	<2.05 U	<0.766 U	18.1	<2.05 U	<2.05 U	<2.93 U	<2.05 U	<0.631 U	15.9	<2.05 U
Methyl Methacrylate	80-62-6	NS	ug/m3	NA	NA	NA	<0.765 U	NA	NA	NA	NA	NA	<0.631 U	NA	NA
Methylene Chloride	75-09-2	100	ug/m3	<1.74 U	<1.74 U	<1.74 U	<1.3 U	<1.74 U	<1.74 U	<1.74 U	<2.48 U	1.82	<1.07 U	<1.74 U	<1.74 U
Naphthalene	91-20-3	60	ug/m3	NA	NA	NA	NA	<1.05 U	1.28	NA	NA	NA	NA	<1.05 U	1.21
n-Heptane	142-82-5	200	ug/m3	7.58	<0.82 U	<0.82 U	<0.766 U	2.56	0.357 J	10.6	<1.17 U	0.852	<0.632 U	4.47	0.361 J
n-Hexane	110-54-3	200	ug/m3	4.55	1.17	<0.705 U	0.988 D	1.51	<0.705 U	7.93	1.33	0.888	0.815 D	1.49	<0.705 U
o-Xylene (1,2-Dimethylbenzene)	95-47-6	60	ug/m3	12.5	8.82	1.53	4.46 D	4.39	1.12	7.04	<1.24 U	1.52	3.88 D	4.31	1.43
Propylene	115-07-1	NS	ug/m3	NA	NA	NA	<0.322 U	NA	NA	NA	NA	NA	<0.265 U	NA	NA
Styrene	100-42-5	NS	ug/m3	<0.852 U	<0.852 U	<0.852 U	<0.796 U	<0.852 U	<0.852 U	<0.852 U	<1.22 U	<0.852 U	<0.656 U	<0.852 U	<0.852 U
Tert-Butyl Alcohol	75-65-0	NS	ug/m3	13.9	20.8	<1.52 U	NA	<1.52 U	<1.52 U	19.1	<2.16 U	<1.52 U	NA	<1.52 U	<1.52 U
Tert-Butyl Methyl Ether (MTBE)	1634-04-4	NS	ug/m3	<0.721 U	<0.721 U	<0.721 U	<0.674 U	<0.721 U	<0.721 U	<0.721 U	<1.03 U	<0.721 U	<0.556 U	<0.721 U	<0.721 U
Tetrachloroethene (PCE)	127-18-4	**100**	ug/m3	20.9	2.85	7.05	50.6 D	15.8	16.6	<1.36 U	6.58	5.85	38.3 D	20.9	7.87
Tetrahydrofuran	109-99-9	NS	ug/m3	63.7	179	74.3	70.8 D	52.2	52.5	35.7	96.1	67.8	44.3 D	47.2	22.1
Toluene	108-88-3	300	ug/m3	12	5.31	6.41	11.1 D	6.93	1.06	16.4	5.65	6.33	8.01 D	4.71	1.21
Total 1,2-Dichloroethene (Cis and Trans)	540-59-0	NS	ug/m3	2.66	NA	NA	NA	NA	NA	4.12	NA	NA	NA	NA	NA
Total Xylenes	1330-20-7	NS	ug/m3	39.8	NA	5.82	NA	NA	NA	25.7	NA	6.25	NA	NA	NA
Trans-1,2-Dichloroethene	156-60-5	NS	ug/m3	1.55	<0.793 U	<0.793 U	<0.741 U	<0.793 U	<0.793 U	4.12	<1.13 U	<0.793 U	<0.611 U	<0.793 U	<0.793 U
Trans-1,3-Dichloropropene	10061-02-6	NS	ug/m3	<0.908 U	<0.908 U	<0.908 U	<0.848 U	<0.908 U	<0.908 U	<0.908 U	<1.3 U	<0.908 U	<0.699 U	<0.908 U	<0.908 U
Trichloroethene (TCE)	79-01-6	6	ug/m3	2.16	<1.07 U	<1.07 U	2.41 D	<1.07 U	0.833 J	<1.07 U	<1.54 U	<1.07 U	0.497 D	<1.07 U	<1.07 U
Trichlorofluoromethane	75-69-4	NS	ug/m3	1.63	1.17	2.34	2.31 J	2.56	1.77	2.74	<1.61 U	2.35	1.99 J	2.93	1.42
Vinyl Acetate	108-05-4	NS	ug/m3	NA	NA	NA	<0.658 U	NA	NA	NA	NA	NA	<0.543 U	NA	NA
Vinyl Chloride	75-01-4	6	ug/m3	<0.511 U	<0.511 U	<0.511 U	<0.239 U	<0.511 U	<0.511 U	<0.511 U	<0.731 U	<0.511 U	<0.197 U	<0.511 U	<0.511 U
Total CVOCs	TOTALCVOCS	NS	ug/m3	25.72	2.85	7.05	54.94	17.56	18.075	4.12	6.58	5.85	38.797	20.9	7.87
Total VOCs	TOTALVOCS	NS	ug/m3	501.11	526.17	276.229	259.978	243.258	224.486	522.434	774.84	194.7	179.414	186.583	194.166

Table 2
Soil Vapor Sample Analytical Results

702 Nostrand Avenue
Brooklyn, New York
NYSDEC BCP Site No.: C224270
Langan Project No.: 170527801

Notes:

SV - Soil Vapor
CAS - Chemical Abstract Service
NS - No standard
ug/m3 - microgram per cubic meter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Soil vapor sample analytical results are compared to the minimum soil vapor concentrations at which mitigation is recommended as set forth in the New York State Department of Health (NYSDOH) October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York Decision Matrices for Sub-Slab Vapor and Indoor Air and subsequent updates (2017).

Qualifiers:

D - The concentration reported is a result of a diluted sample.
J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ - The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
U - The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Exceedance Summary:

10 - Result exceeds minimum soil vapor concentrations recommending mitigation

FIGURES

Location	MP04	MP04	MP04	MP04	MP04	MP04
Sample Name	SV-MP-4_121819	MP04_100621	MP04_110422	MP04_112923	MP04_121224	MP04_121225
Sample Date	12/18/2019	10/06/2021	11/04/2022	11/29/2023	12/12/2024	12/12/2025
Sample Type	SV	SV	SV	SV	SV	SV
VOCs						
1,1,2-Trichloro-1,2,2-Trifluoroethane	<1.53 U	<2.19 U	<1.53 U	<1.18 U	<1.53 U	0.46 J
1,2,4-Trimethylbenzene	3.41	<1.41 U	8.06	4.17 D	4.2	5.26
1,3,5-Trimethylbenzene (Mesitylene)	<0.983 U	<1.41 U	5.56	0.885 D	0.983	1.23
1,4-Dichlorobenzene	<1.2 U	<1.72 U	1.35	<0.926 U	<1.2 U	<1.2 U
2,2,4-Trimethylpentane	5.51	<1.34 U	2	NA	<0.934 U	<0.934 U
4-Ethyltoluene	<0.983 U	<1.41 U	1.96	4.09 D	<0.983 U	0.654 J
Acetone	120	50.1	18.1	15.1 D	6.49	6.75
Acrylonitrile	NA	NA	NA	<0.334 U	NA	NA
Benzene	3.87	<0.914 U	1.51	0.935 D	1.23	0.578 J
Carbon Disulfide	0.694	9.75	10.1	4.65 D	4.24	2.99
Carbon Tetrachloride	<1.26 U	<1.8 U	<1.26 U	0.582 J	<1.26 U	0.491 J
Chloromethane	0.63	3.92	3.2	1.72 D	1.38	1.81
Cyclohexane	12.9	1.54	<0.688 U	<0.53 U	<0.688 U	<0.688 U
Dichlorodifluoromethane	2.14	1.92	3.04	3.89 D	2.57	2.19
Ethanol	155	106	27.3	NA	41.6	117
Ethyl Acetate	4.36	<2.57 U	<1.8 U	3 D	<1.8 U	<1.8 U
Ethylbenzene	4.47	<1.24 U	1.4	2.68 D	3.31	0.652 J
Isopropanol	20.8	489	9.54	27.2 D	4.97	14.8
M,P-Xylene	18.6	<2.48 U	4.73	10.3 D	11.8	2.69
Methyl Ethyl Ketone (2-Butanone)	36.6	2.95	3.19	2.32 D	1.9	1.01 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	<2.05 U	<2.93 U	<2.05 U	<0.631 U	15.9	<2.05 U
Methylene Chloride	<1.74 U	<2.48 U	1.82	<1.07 U	<1.74 U	<1.74 U
Naphthalene	NA	NA	NA	NA	<1.05 U	1.21
n-Heptane	10.6	<1.17 U	0.852	<0.632 U	4.47	0.361 J
n-Hexane	7.93	1.33	0.898	0.815 D	1.49	<0.705 U
o-Xylene (1,2-Dimethylbenzene)	7.04	<1.24 U	1.52	3.88 D	4.31	1.43
Tert-Butyl Alcohol	19.1	<2.16 U	<1.52 U	NA	<1.52 U	<1.52 U
Tetrachloroethene (PCE)	<1.36 U	6.58	5.85	38.3 D	20.9	7.87
Tetrahydrofuran	35.7	96.1	67.8	44.3 D	47.2	22.1
Toluene	16.4	5.65	6.33	8.01 D	4.71	1.21
Total 1,2-Dichloroethene (Cis and Trans)	4.12	NA	NA	NA	NA	NA
Total Xylenes	25.7	NA	6.25	NA	NA	NA
Trans-1,2-Dichloroethene	4.12	<1.13 U	<0.793 U	<0.611 U	<0.793 U	<0.793 U
Trichloroethene (TCE)	<1.07 U	<1.54 U	<1.07 U	0.497 D	<1.07 U	<1.07 U
Trichlorofluoromethane	2.74	<1.61 U	2.35	1.99 J	2.93	1.42
Total VOCs	522.434	774.84	194.7	179.414	186.583	194.166

Location	MP01	MP01	MP01	MP01	MP01	MP01
Sample Name	SV-MP-1_121819	MP01_100621	MP01_110422	MP01_112923	MP01_121224	MP01_121225
Sample Date	12/18/2019	10/06/2021	11/04/2022	11/29/2023	12/12/2024	12/12/2025
Sample Type	SV	SV	SV	SV	SV	SV
VOCs						
1,1,2-Trichloro-1,2,2-Trifluoroethane	<1.53 U	<1.53 U	<1.53 U	<1.25 U	<1.53 U	0.491 J
1,2,4-Trimethylbenzene	2.08	1.92	1.27	3.92 D	3.54	4.48
1,3,5-Trimethylbenzene (Mesitylene)	<0.983 U	<0.983 U	<0.983 U	0.88 D	<0.983 U	1.09
2,2,4-Trimethylpentane	2.81	<0.934 U	<0.934 U	NA	<0.934 U	<0.934 U
4-Ethyltoluene	<0.983 U	<0.983 U	<0.983 U	2.88 D	<0.983 U	0.728 J
Acetone	122	127	59.9	61.4 D	49.4	24.5
Acrylonitrile	NA	NA	NA	0.565 D	NA	NA
Benzene	1.96	<0.639 U	1.2	0.832 D	1.67	0.371 J
Carbon Disulfide	1.51	2.15	0.993	1.72 D	2.47	1.78
Carbon Tetrachloride	<1.26 U	<1.26 U	<1.26 U	0.512 J	<1.26 U	0.453 J
Chloroform	1.13	2.31	1.68	6.12 D	<0.977 U	1.13
Chloromethane	0.698	0.907	0.874	0.504 D	0.766	0.768
Cis-1,2-Dichloroethene	1.13	<0.793 U	<0.793 U	2.77 D	2.21	0.813
Cyclohexane	5.3	<0.688 U	<0.688 U	<0.56 U	<0.688 U	<0.688 U
Dichlorodifluoromethane	2.24	1.95	2.85	3.46 D	2.64	2.26
Ethanol	101	89.7	113	NA	48	81.4
Ethyl Acetate	2.19	<1.8 U	<1.8 U	3.05 D	<1.8 U	<1.8 U
Ethylbenzene	2.68	9.25	3.83	2.47 D	2.99	0.647 J
Isopropanol	113	54.6	32.4	26.4 D	10.3	16.4
M,P-Xylene	11.4	28.7	57.3	9.61 D	10.3	2.77
Methyl Ethyl Ketone (2-Butanone)	32.4	56.6	38.9	44.8 D	36	16.8
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	<2.05 U	<2.05 U	<2.05 U	<0.667 U	15.2	<2.05 U
Methylene Chloride	<1.74 U	<1.74 U	2.45	<1.13 U	<1.74 U	<1.74 U
Naphthalene	NA	NA	NA	NA	<1.05 U	0.451 J
n-Heptane	5.57	<0.82 U	0.832	<0.667 U	2.51	<0.82 U
n-Hexane	3.5	1.37	0.874	<0.573 U	1.06	<0.705 U
o-Xylene (1,2-Dimethylbenzene)	4.6	8.77	19.2	3.53 D	3.68	1.54
Tert-Butyl Alcohol	9.22	22.3	1.6	NA	<1.52 U	<1.52 U
Tetrachloroethene (PCE)	10.1	2.77	7.26	60.7 D	21	29.1
Tetrahydrofuran	39.8	106	61.1	118 D	85.2	46.9
Toluene	8.59	4.6	6.59	7.73 D	4.56	0.871
Total 1,2-Dichloroethene (Cis and Trans)	2.54	NA	NA	NA	NA	NA
Total Xylenes	16	NA	76.4	NA	NA	NA
Trans-1,2-Dichloroethene	1.41	<0.793 U	<0.793 U	<0.645 U	<0.793 U	<0.793 U
Trichloroethene (TCE)	1.81	<1.07 U	<1.07 U	3.15 D	1.34	0.924 J
Trichlorofluoromethane	1.75	1.21	2.12	3.66 J	2.67	1.59
Total VOCs	508.418	522.107	492.623	368.663	307.506	229.257

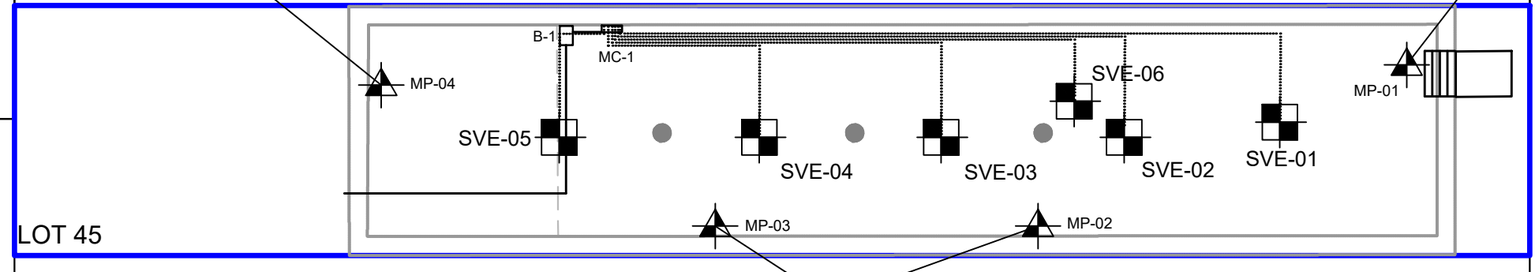
Location	MP03	MP03	MP03	MP03	MP03	MP03
Sample Name	SV-MP-3_121819	MP03_100621	MP03_110422	MP03_112923	MP03_121224	MP03_121225
Sample Date	12/18/2019	10/06/2021	11/04/2022	11/29/2023	12/12/2024	12/12/2025
Sample Type	SV	SV	SV	SV	SV	SV
VOCs						
1,1,2-Trichloro-1,2,2-Trifluoroethane	<1.53 U	<1.53 U	<1.53 U	<1.43 U	<1.53 U	0.483 J
1,2,4-Trimethylbenzene	3.44	1.71	1.48	4.41 D	3.75	4.37
1,3,5-Trimethylbenzene (Mesitylene)	<0.983 U	<0.983 U	<0.983 U	1.1 D	<0.983 U	1
1,4-Dichlorobenzene	<1.2 U	<1.2 U	1.36	<1.12 U	<1.2 U	<1.2 U
2,2,4-Trimethylpentane	8.36	<0.934 U	0.939	NA	<0.934 U	<0.934 U
4-Ethyltoluene	<0.983 U	<0.983 U	<0.983 U	4.59 D	<0.983 U	0.615 J
Acetone	94.1	49.9	56.5	29.2 D	21.9	15.1
Acrylonitrile	NA	NA	NA	1.99 D	NA	NA
Benzene	2.37	<0.639 U	1.59	1.07 D	2.6	0.486 J
Carbon Disulfide	2.37	6.76	1.06	2.79 D	2.65	2.25
Carbon Tetrachloride	<1.26 U	<1.26 U	<1.26 U	0.588 J	<1.26 U	0.459 J
Chloroform	1.23	3	1.86	1.46 D	<0.977 U	0.278 J
Chloromethane	2.35	2.71	0.94	0.502 D	0.878	1.42
Cis-1,2-Dichloroethene	1.11	<0.793 U	<0.793 U	1.93 D	1.76	0.642 J
Cyclohexane	9.4	<0.688 U	<0.688 U	<0.643 U	<0.688 U	<0.688 U
Dichlorodifluoromethane	2.23	1.96	2.9	3.05 D	2.53	2.16
Ethanol	123	104	60.1	NA	58.4	88.6
Ethyl Acetate	3.43	1.96	<1.8 U	4.18 D	<1.8 U	<1.8 U
Ethylbenzene	5.69	9.95	1.36	3.25 D	3.74	0.513 J
Isopropanol	14.9	60.5	17.2	28.3 D	12.4	16.1
M,P-Xylene	27.3	29.8	4.29	12.2 D	12.6	2.09
Methyl Ethyl Ketone (2-Butanone)	16.9	34.8	27.3	16.7 D	16	12.4
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	<2.05 U	<2.05 U	<2.05 U	<0.766 U	18.1	<2.05 U
Naphthalene	NA	NA	NA	NA	<1.05 U	1.28
n-Heptane	7.58	<0.82 U	<0.82 U	<0.766 U	2.56	0.357 J
n-Hexane	4.55	1.17	<0.705 U	0.988 D	1.51	<0.705 U
o-Xylene (1,2-Dimethylbenzene)	12.5	8.82	1.53	4.46 D	4.39	1.12
Tert-Butyl Alcohol	13.9	20.8	<1.52 U	NA	<1.52 U	<1.52 U
Tetrachloroethene (PCE)	20.9	2.85	7.05	50.6 D	15.8	16.6
Tetrahydrofuran	63.7	179	74.3	70.8 D	52.2	52.5
Toluene	12	5.31	6.41	11.1 D	6.93	1.06
Total 1,2-Dichloroethene (Cis and Trans)	2.66	NA	NA	NA	NA	NA
Total Xylenes	39.8	NA	5.82	NA	NA	NA
Trans-1,2-Dichloroethene	1.55	<0.793 U	<0.793 U	<0.741 U	<0.793 U	<0.793 U
Trichloroethene (TCE)	2.16	<1.07 U	<1.07 U	2.41 D	<1.07 U	0.833 J
Trichlorofluoromethane	1.63	1.17	2.34	2.31 J	2.56	1.77
Total VOCs	501.11	526.17	276.229	259.978	243.258	224.486

Sample Name	SV-MP-2_121819	MP02_100621	MP02_110422	MP02_112923	MP02_121224	MP02_121225
Sample Date	12/18/2019	10/06/2021	11/04/2022	11/29/2023	12/12/2024	12/12/2025
Sample Type	SV	SV	SV	SV	SV	SV
VOCs						
1,1,2-Trichloro-1,2,2-Trifluoroethane	<1.53 U	<3.07 U	<3.65 U	<2.52 U	<1.53 U	0.483 J
1,2,4-Trimethylbenzene	5.6	<1.97 U	<2.34 U	<1.62 U	<0.983 U	<0.983 U
1,3,5-Trimethylbenzene (Mesitylene)	1.5	<1.97 U	<2.34 U	<1.62 U	<0.983 U	<0.983 U
2,2,4-Trimethylpentane	5.89	<1.87 U	<2.22 U	NA	<0.934 U	<0.934 U
4-Ethyltoluene	1.32	<1.97 U	<2.34 U	<1.62 U	<0.983 U	<0.983 U
Acetone	80.8	141	76.3	22.4 D	18	25.4
Acrylonitrile	NA	NA	NA	<0.713 U	NA	NA
Benzene	2.44	<1.28 U	<1.52 U	<1.05 U	<0.639 U	<0.639 U
Carbon Disulfide	4.45	16.7	<1.48 U	<1.02 U	<0.623 U	0.206 J
Carbon Tetrachloride	<1.26 U	<2.52 U	<2.99 U	0.62 J	<1.26 U	0.497 J
Chloroform	1.32	4.24	<2.32 U	<1.6 U	<0.977 U	<0.977 U
Chloromethane	1.51	1.73	<0.983 U	<0.679 U	<0.413 U	0.186 J
Cis-1,2-Dichloroethene	2.66	<1.59 U	<1.89 U	0.782 D	1.58	0.381 J
Cyclohexane	10.1	<1.38 U	<1.64 U	<1.13 U	<0.688 U	<0.688 U
Dichlorodifluoromethane	2.29	<1.98 U	2.9	3.9 D	2.62	2.24
Ethanol	122	91	<22.4 U	NA	<9.42 U	6.18 J
Ethyl Acetate	2.6	<3.6 U	<4.29 U	<2.37 U	4.5	<1.8 U
Ethylbenzene	4.78	7.43	<2.07 U	<1.43 U	<0.869 U	<0.869 U
Isopropanol	35.4	78.9	7.33	6.7 D	2.51	6.27
M,P-Xylene	24.5	22.7	<4.14 U	<2.85 U	<1.74 U	<1.74 U
Methyl Ethyl Ketone (2-Butanone)	5.62	80.5	88.2	21.9 D	29.8	31.3
Naphthalene	NA	NA	NA	NA	<1.05 U	<0.996 U
n-Heptane	7.29	<1.64 U	<1.95 U	<1.35 U	4.18	<0.82 U
n-Hexane	5.25	1.61	<1.68 U	<1.16 U	1.32	<0.705 U
o-Xylene (1,2-Dimethylbenzene)	8.82	6.95	<2.07 U	<1.43 U	<0.869 U	<0.869 U
Tert-Butyl Alcohol	12.5	21	<3.61 U	NA	<1.52 U	<1.52 U
Tetrachloroethene (PCE)	34.7	4.83	88.8	**201 D**	**114**	45.2
Tetrahydrofuran	100	272	554	213 D	244	163
Toluene	10.9	5.16	<1.79 U	<1.24 U	1.68	<0.754 U
Total 1,2-Dichloroethene (Cis and Trans)	4.28	NA	NA	NA	NA	NA
Total Xylenes	33.3	NA	<2.07 U	NA	NA	NA
Trans-1,2-Dichloroethene	1.61	<1.59 U	<1.89 U	<1.3 U	<0.793 U	<0.793 U
Trichloroethene (TCE)	2.75	<2.15 U	2.57	1.41 D	1.19	0.64 J
Trichlorofluoromethane	2.23	<2.25 U	<2.67 U	2.77 J	3.71	2.07
Total VOCs	538.31	755.75	820.1	474.482	429.09	284.053

Analyte	NYSDOH Decision Matrices Minimum Concentrations
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	NS
1,2,4-Trimethylbenzene	60
1,3,5-Trimethylbenzene (Mesitylene)	60
1,4-Dichlorobenzene	NS
2,2,4-Trimethylpentane	60
4-Ethyltoluene	NS
Acetone	NS
Acrylonitrile	NS
Benzene	60
Carbon Disulfide	NS
Carbon Tetrachloride	6
Chloroform	NS
Chloromethane	NS
Cis-1,2-Dichloroethene	6
Cyclohexane	60
Dichlorodifluoromethane	NS
Ethanol	NS
Ethyl Acetate	NS
Ethylbenzene	60
Isopropanol	NS
M,P-Xylene	200
Methyl Ethyl Ketone (2-Butanone)	NS
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	NS
Methylene Chloride	100
Naphthalene	60
n-Heptane	200
n-Hexane	200
o-Xylene (1,2-Dimethylbenzene)	60
Tert-Butyl Alcohol	NS
Tetrachloroethene (PCE)	100
Tetrahydrofuran	NS
Toluene	300
Total 1,2-Dichloroethene (Cis and Trans)	NS
Total Xylenes	NS
Trans-1,2-Dichloroethene	NS
Trichloroethene (TCE)	6
Trichlorofluoromethane	NS

Exceedance Summary:

10 - Result exceeds minimum soil vapor concentrations recommending mitigation



LEGEND:

- APPROXIMATE SITE BOUNDARY
- CELLAR EXTENTS
- INTERIOR WALL EXTENTS
- COLUMN
- SVE-01 — SOIL VAPOR EXTRACTION WELL LOCATION
- MP-01 — MONITORING POINT LOCATION
- BELOW GRADE PVC PIPING
- ABOVE GRADE METAL PIPING
- MC-1 — MANIFOLD CLOSET
- B-1 — BLOWER AND CONTROL PANEL

NOTES:

1. BASE MAP IS SOURCED FROM NEW YORK CITY DEPARTMENT OF CITY PLANNING PLUTO DATABASE.
2. ONLY COMPOUNDS WITH DETECTIONS ARE SHOWN.
3. SOIL VAPOR SAMPLE ANALYTICAL RESULTS ARE COMPARED TO THE MINIMUM SOIL VAPOR CONCENTRATIONS AT WHICH MITIGATION IS RECOMMENDED AS SET FORTH IN THE NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) OCTOBER 2006 GUIDANCE FOR EVALUATING SOIL VAPOR INTRUSION IN THE STATE OF NEW YORK DECISION MATRICES FOR SUB-SLAB VAPOR AND INDOOR AIR AND SUBSEQUENT UPDATES (2017).
4. PVC = POLYVINYL CHLORIDE
5. SVE = SOIL VAPOR EXTRACTION
6. SV = SOIL VAPOR
7. CAS = CHEMICAL ABSTRACT SERVICE
8. NS = NO STANDARD
9. UG/M3 = MICROGRAM PER CUBIC METER
10. NA = NOT ANALYZED
11. RL = REPORTING LIMIT
12. <RL = NOT DETECTED
13. D =THE CONCENTRATION REPORTED IS A RESULT OF A DILUTED SAMPLE.
14. J = THE ANALYTE WAS POSITIVELY IDENTIFIED AND THE ASSOCIATED NUMERICAL VALUE IS THE APPROXIMATE CONCENTRATION OF THE ANALYTE IN THE SAMPLE.
15. UJ = THE ANALYTE WAS NOT DETECTED AT A LEVEL GREATER THAN OR EQUAL TO THE RL; HOWEVER, THE REPORTED RL IS APPROXIMATE AND MAY BE INACCURATE OR IMPRECISE.
16. U = THE ANALYTE WAS ANALYZED FOR, BUT WAS NOT DETECTED AT A LEVEL GREATER THAN OR EQUAL TO THE LEVEL OF THE RL OR THE SAMPLE CONCENTRATION FOR RESULTS IMPACTED BY BLANK CONTAMINATION.

WARNING: It is a violation of the NYS Education Law Article 145 for any person, unless he is acting under the direction of a licensed professional engineer, to alter this item in any way.

10 0 10

SCALE IN FEET

LANGAN

21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC

Collectively known as Langan

Project

702 NOSTRAND AVENUE
BLOCK No. 1226, LOT No. 45
BROOKLYN

KINGS NEW YORK

Figure Title

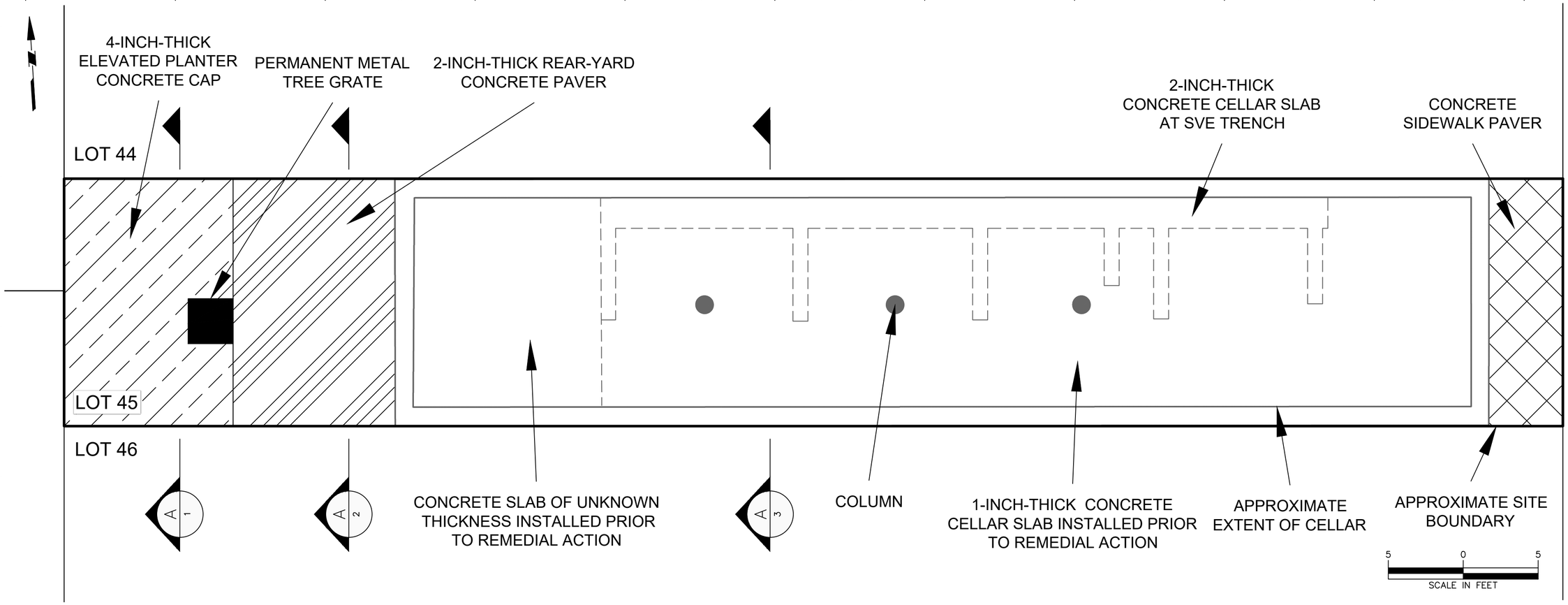
SOIL VAPOR SAMPLE ANALYTICAL RESULTS MAP

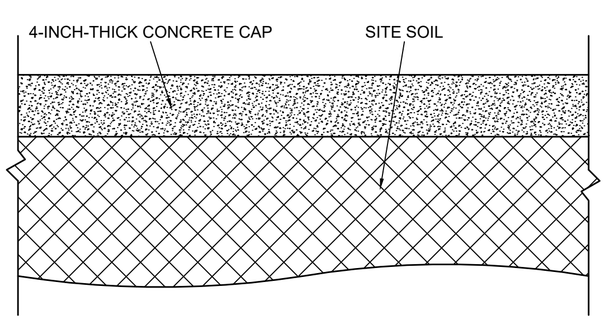
Project No.	Figure No.
170527801	1
Date: 5/12/2026	
Scale: 1"=10'	
Drawn By: BK	
Submission Date	

Filename: \\langan.com\data\NYC\data8\170527801\Project Data\CAD\Environmental\FER\Figure 1 - Soil Vapor Sample Analytical Results Map.dwg Date: 5/12/2026 Time: 12:41 User: bkoontz Style Table: Langan.stb Layout: Figure 2 - SVE Layout

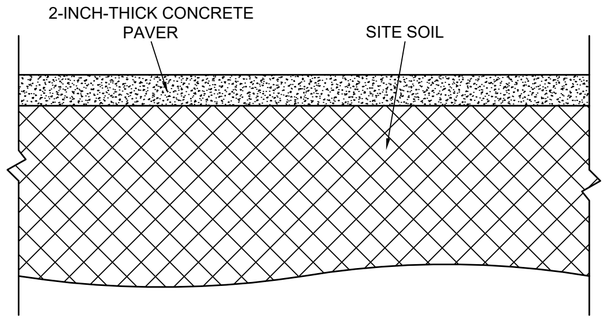
ATTACHMENT 1

RECORD DRAWINGS

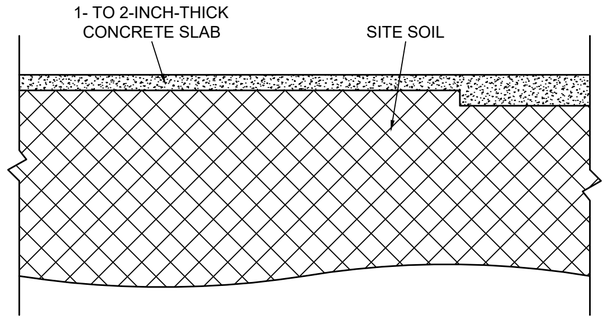




A 1 TYPICAL ELEVATED PLANTER CAP CROSS-SECTION
N.T.S.



A 2 TYPICAL REAR-YARD PAVER CROSS-SECTION
N.T.S.



A 3 TYPICAL CELLAR SLAB CROSS-SECTION
N.T.S.

GENERAL NOTES:

1. BASE MAP IS SOURCED FROM NEW YORK CITY DEPARTMENT OF CITY PLANNING PLUTO DATABASE.
2. CELLAR FLOOR PLAN SOURCED FROM DRAWING NUMBERED A2, PREPARED BY JNS ENGINEERS, DATED 6 JUNE 2005.
3. THE COMPOSITE COVER SYSTEM DETAILS ARE SHOWN FOR THE PURPOSE OF DOCUMENTING AND MAINTAINING THE COMPOSITE COVER SYSTEM AS AN ENGINEERING CONTROL ONLY.

Date	Description	No.
REVISIONS		

WARNING:
IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

STATE OF NEW YORK · DOUGLAS J. HAMES · 089491 · LICENSED PROFESSIONAL ENGINEER
6/8/2020

SIGNATURE DATE SIGNED

PROFESSIONAL ENGINEER
STATE LIC. No. 089491

LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Project
702 NOSTRAND AVENUE
BLOCK No. 1296, LOT No. 45
BROOKLYN
KINGS COUNTY **NEW YORK**

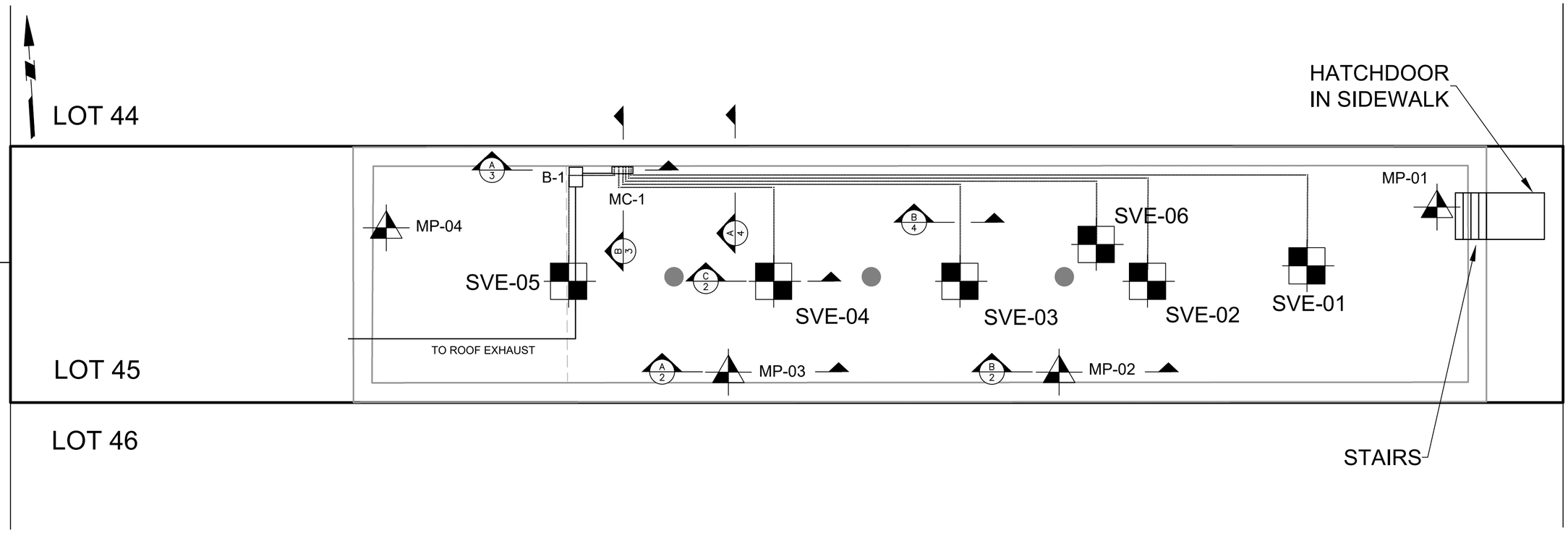
Drawing Title
COMPOSITE COVER SYSTEM PLAN AND DETAILS

Project No. **170527801**
Date **6/8/2020**
Drawn By **VDP**
Checked By **GN**

Drawing No. **1**
Sheet 1 of 6

LANGAN
PROJECT NO. 170527801

Filename: \\langan.com\data\NYC\data8\170527801\Project Data\CAD\Environmental\Record Drawings\Drawing 1 - Composite Cover System.dwg Date: 6/9/2020 Time: 15:25 User: vdepaula Style Table: Langan.stb Layout: D1 - Composite Cover System



LANGAN

PROJECT NO. 170527801

LEGEND:

———	SITE BOUNDARY
———	CELLAR EXTENTS
- - - - -	INTERIOR WALL EXTENTS
●	COLUMN
SVE-01	SOIL VAPOR EXTRACTION WELL LOCATION
MP-01	MONITORING POINT LOCATION
·····	BELOW GRADE PVC PIPING
———	ABOVE GRADE METAL PIPING
MC-1	MANIFOLD CLOSET
B-1	BLOWER AND CONTROL PANEL

NOTES:

1. BASE MAP IS SOURCED FROM NEW YORK CITY DEPARTMENT OF CITY PLANNING PLUTO DATABASE.
2. PIPE AND CONDUIT PENETRATIONS THROUGH THE SLAB (INCLUDING MECHANICAL, ELECTRICAL, PLUMBING, OR OTHER), AND CRACKS/VOIDS ARE SEALED WITH A POLYURETHANE SEALANT (SIKAFLEX® SELF LEVELING SEALANT), SOIL VAPOR EXTRACTION WELLS AND MONITORING POINTS ARE SEALED WITH HYDRAULIC CEMENT.
3. ABOVE GRADE PIPING IS CONSTRUCTED OF METAL PIPING IN ACCORDANCE WITH NEW YORK CITY BUILDING CODE.
4. TRENCHES ARE SEALED ON ALL SIDES WITH 6 MIL POLYETHYLENE SHEETING AND BACKFILLED WITH PEA GRAVEL FOLLOWED BY PREVIOUSLY EXCAVATED SOIL.
5. CELLAR FLOOR SLAB IS REPAIRED WITH 2-INCH-THICK CONCRETE OF 3,000 PSI COMPRESSIVE STRENGTH.
6. PVC = POLYVINYL CHLORIDE
7. SVE = SOIL VAPOR EXTRACTION

5 0 5
SCALE IN FEET

Date	Description	No.
REVISIONS		

WARNING:
IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

STATE OF NEW YORK · DAVID PAUL MARKEE · 089491 · PROFESSIONAL ENGINEER

6/8/2020

SIGNATURE DATE SIGNED

PROFESSIONAL ENGINEER
STATE LIC. No. 089491

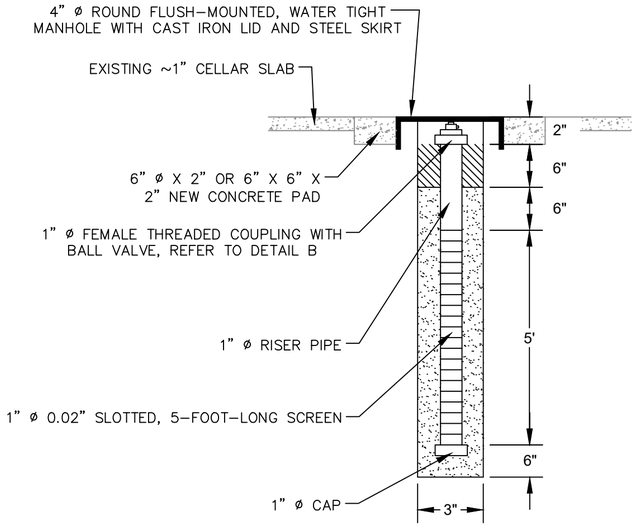
LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Project
702 NOSTRAND AVENUE
BLOCK No. 1296, LOT No. 45
BROOKLYN
KINGS COUNTY **NEW YORK**

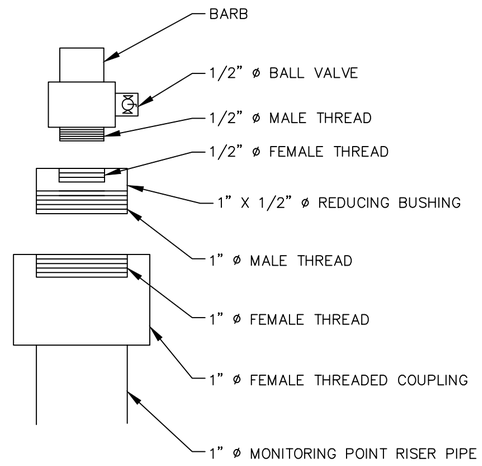
Drawing Title
SVE SYSTEM EXTENT

Project No.	170527801
Date	6/8/2020
Drawn By	VDP
Checked By	GN
Drawing No.	2
Sheet	2 of 6

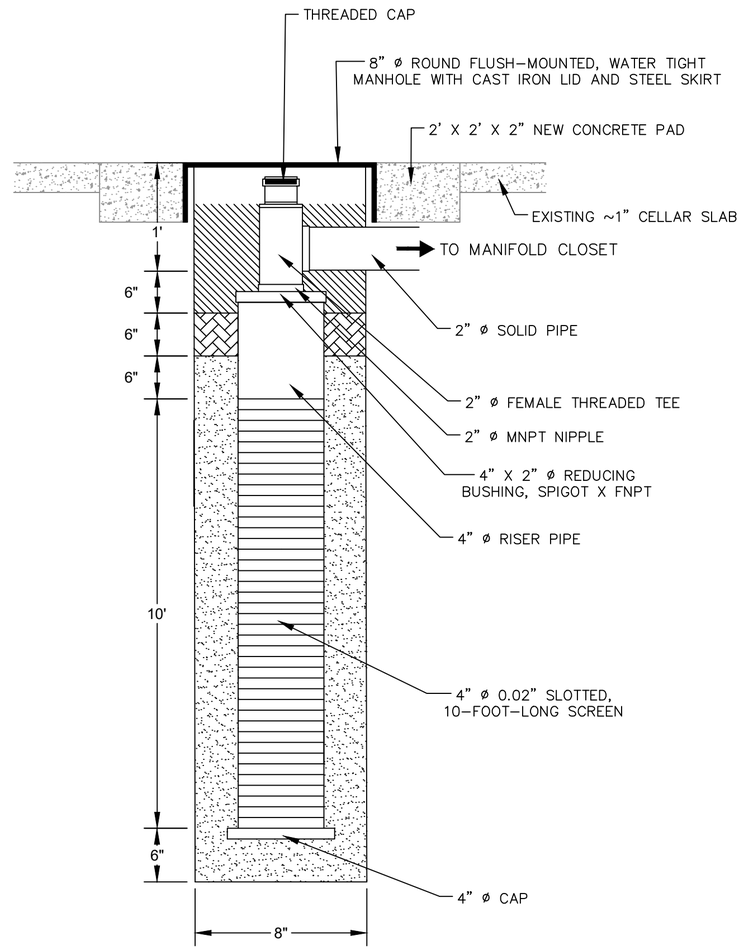
Filename: \\langan.com\data\NYC\data8\170527801\Project Data\CAD\Environmental\Record Drawings\Drawing 2 - SVE System Extent.dwg Date: 6/9/2020 Time: 14:56 User: vdepaula Style Table: Langan.stb Layout: D1 - SVE System Layout



A/2 TYPICAL MONITORING POINT
N.T.S.



B/2 TYPICAL WELL COUPLING AND BALL VALVE CONNECTION
N.T.S.



C/2 TYPICAL SVE WELL
N.T.S.

LEGEND:

- GROUT / BENTONITE SEAL MIXTURE
- HYDRATED BENTONITE SEAL
- NO. 2 SAND FILTER PACK
- CONCRETE
- 0.02" SLOTTED SCREEN

GENERAL NOTES:

1. PIPE AND CONDUIT PENETRATIONS THROUGH THE SLAB (INCLUDING MECHANICAL, ELECTRICAL, PLUMBING, OR OTHER), AND CRACKS/VOIDS ARE SEALED WITH A POLYURETHANE SEALANT (SIKAFLEX® SELF LEVELING SEALANT).
2. SVE WELLS AND ASSOCIATED BELOW GRADE PIPING ARE CONSTRUCTED OF POLYVINYL CHLORIDE (PVC) SCHEDULE (SCH) 80 PIPE (OR APPROVED ALTERNATIVE). MONITORING POINTS ARE CONSTRUCTED OF PVC SCH 40 PIPE (OR APPROVED ALTERNATIVE). ABOVE GRADE PIPING IS CONSTRUCTED OF METAL PIPING IN ACCORDANCE WITH NEW YORK CITY BUILDING CODE.

Date	Description	No.
REVISIONS		

WARNING:
IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

STATE OF NEW YORK — DANIEL JAMES LA VIA — 089491 — PROFESSIONAL ENGINEER — 6/8/2020

SIGNATURE DATE SIGNED
PROFESSIONAL ENGINEER
STATE LIC. No. 089491

LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

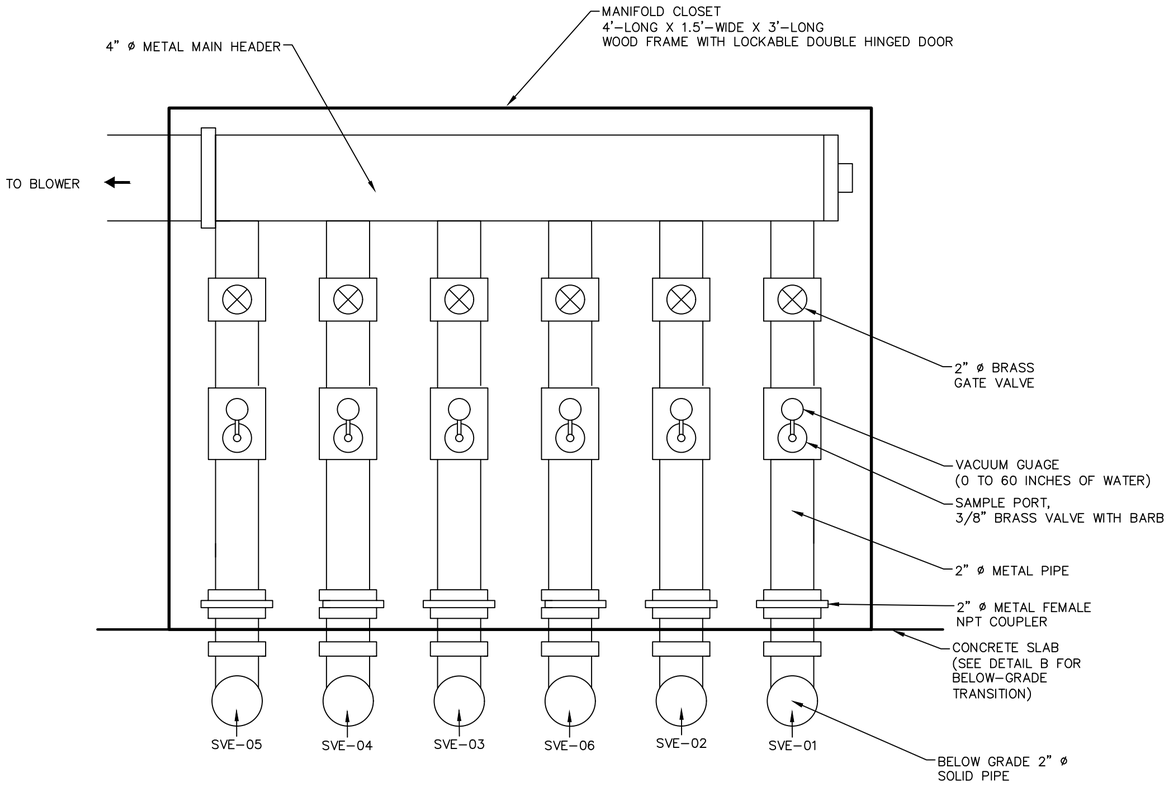
Project
702 NOSTRAND AVENUE
BLOCK No. 1296, LOT No. 45
BROOKLYN
KINGS COUNTY **NEW YORK**

Drawing Title
SVE WELL AND MONITORING POINT CONSTRUCTION DETAILS

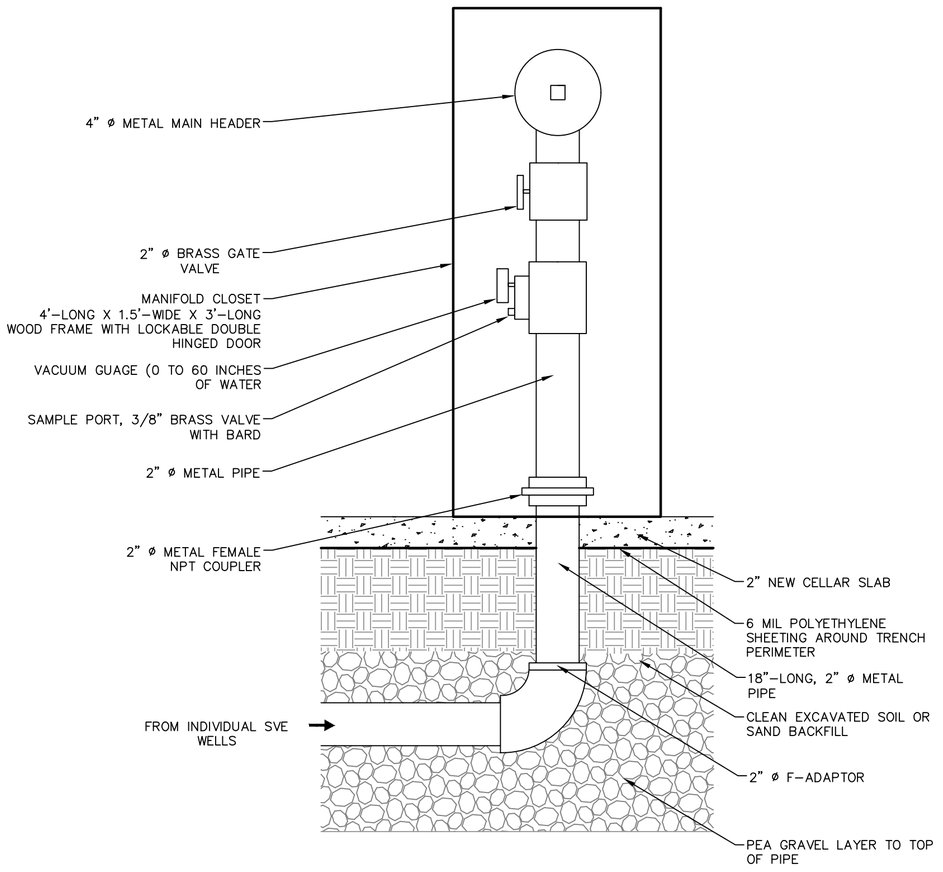
Project No. 170527801	Drawing No. 3
Date 6/8/2020	
Drawn By VDP	
Checked By GN	Sheet 3 of 6

Filename: \\langan.com\data\NYC\data8\170527801\Project Data\CAD\Environmental\Record Drawings\Drawing 3 - SVE Well and Soil Vapor Monitoring Point Construction Details.dwg Date: 6/9/2020 Time: 14:57 User: vdepaula Style Table: Langan.stb Layout: D2 - Construction Details

LANGAN
PROJECT NO. 170527801



A/3 MANIFOLD CLOSET
N.T.S.



B/3 BELOW GRADE TRANSITION AT MANIFOLD CLOSET
N.T.S.

GENERAL NOTES:

1. SEAL PIPE AND CONDUIT PENETRATIONS THROUGH THE SLAB (INCLUDING MECHANICAL, ELECTRICAL, PLUMBING, OR OTHER), AND CRACKS/VOIDS ARE SEALED WITH A POLYURETHANE SEALANT (SIKAFLEX® SELF LEVELING SEALANT).

2. SVE WELL AND ASSOCIATED BELOW GRADE PIPING ARE CONSTRUCTED OF POLYVINYL CHLORIDE (PVC) SCHEDULE (SCH) 80 PIPE (OR APPROVED ALTERNATIVE). ABOVE GRADE PIPING ARE CONSTRUCTED OF METAL PIPING IN ACCORDANCE WITH NEW YORK CITY BUILDING CODE.

Date	Description	No.
REVISIONS		

WARNING:
IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

STATE OF NEW YORK · JOHN HAMES · 089491 · LICENSED PROFESSIONAL ENGINEER
6/8/2020
SIGNATURE DATE SIGNED
PROFESSIONAL ENGINEER
STATE LIC. No. 089491

LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

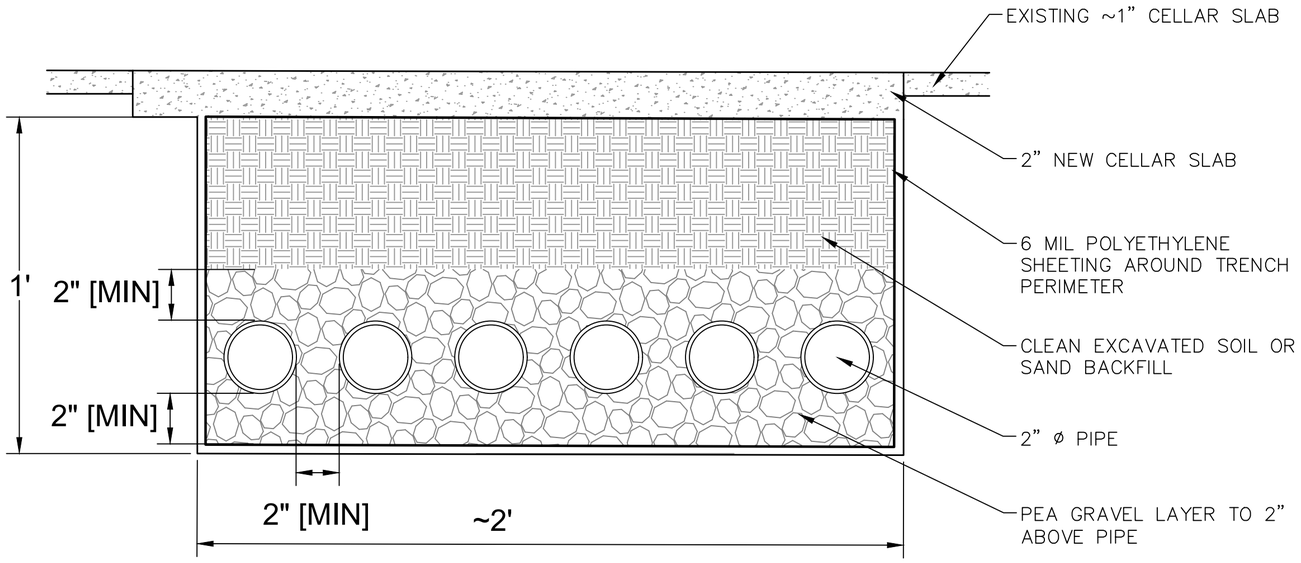
Project
702 NOSTRAND AVENUE
BLOCK No. 1296, LOT No. 45
BROOKLYN
KINGS COUNTY **NEW YORK**

Drawing Title
MANIFOLD CLOSET DETAILS

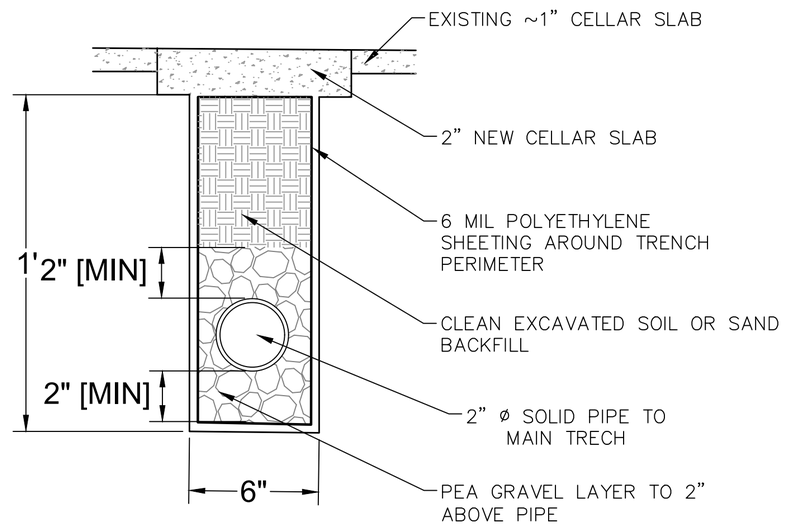
Project No.	170527801
Date	6/8/2020
Drawn By	VDP
Checked By	GN
Drawing No.	4
Sheet	4 of 6

LANGAN
PROJECT NO. 170527801

Filename: \\langan.com\data\NYC\data8\170527801\Project Data\CAD\Environmental\Record Drawings\Drawing 4 and 5 - SVE Trench and Manifold Closet Cross-Section Details.dwg Date: 6/9/2020 Time: 14:54 User: vdepaula Style Table: Langan.stb Layout: D3 - Manifold Closet



A/4 MAIN TRENCH CROSS-SECTION
N.T.S.



B/4 BRANCH TRENCH CROSS-SECTION
N.T.S.

GENERAL NOTES:

1. SEAL PIPE AND CONDUIT PENETRATIONS THROUGH THE SLAB (INCLUDING MECHANICAL, ELECTRICAL, PLUMBING, OR OTHER), AND CRACKS/VOIDS ARE SEALED WITH A POLYURETHANE SEALANT (SIKAFLEX® SELF LEVELING SEALANT).
2. SVE WELLS AND ASSOCIATED BELOW GRADE PIPING ARE CONSTRUCTED OF POLYVINYL CHLORIDE (PVC) SCHEDULE (SCH) 80 PIPE (OR APPROVED ALTERNATIVE).
3. PEA GRAVEL IS VIRGIN STONE FROM A QUARRY WITH LESS THAN 10% PASSING THROUGH NO. 80 SIEVE BY WEIGHT.

WARNING:
IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

STATE OF NEW YORK · JOHN HAMES · 089491 · LICENSED PROFESSIONAL ENGINEER
6/8/2020
SIGNATURE DATE SIGNED
PROFESSIONAL ENGINEER
STATE LIC. No. 089491

LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Project
702 NOSTRAND AVENUE
BLOCK No. 1296, LOT No. 45
BROOKLYN
KINGS COUNTY NEW YORK

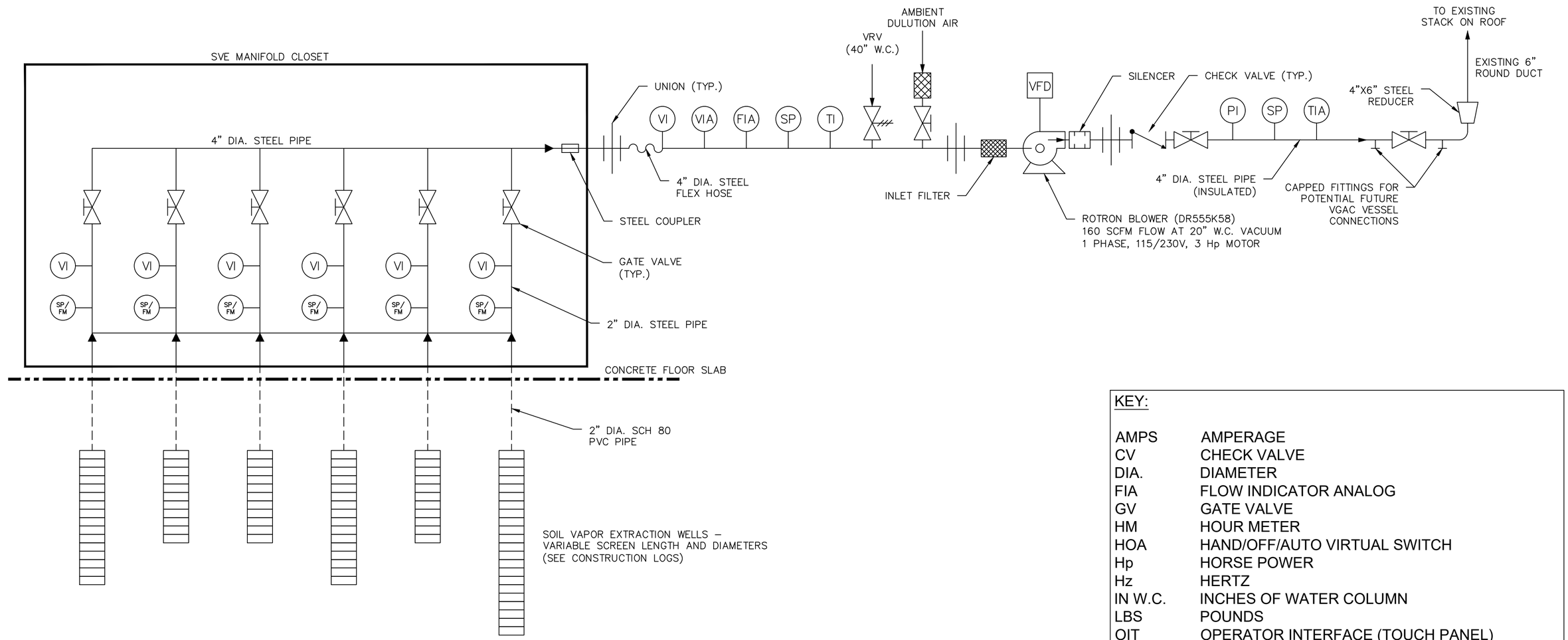
Drawing Title
SVE TRENCH CROSS-SECTIONS

Date	Description	No.
REVISIONS		

Project No. 170527801
Date 6/8/2020
Drawn By VDP
Checked By GN
Drawing No. 5
Sheet 5 of 6

LANGAN
PROJECT NO. 170527801

Filename: \\langan.com\data\NYC\data8\170527801\Project Data\CAD\Environmental\Record Drawings\Drawing 4 and 5 - SVE Trench and Manifold Closet Cross-Section Details.dwg Date: 6/9/2020 Time: 14:55 User: vdepaula Style Table: Langan.stb Layout: D4 - Trench Cross-Sections



KEY:

AMPS	AMPERAGE
CV	CHECK VALVE
DIA.	DIAMETER
FIA	FLOW INDICATOR ANALOG
GV	GATE VALVE
HM	HOUR METER
HOA	HAND/OFF/AUTO VIRTUAL SWITCH
Hp	HORSE POWER
Hz	HERTZ
IN W.C.	INCHES OF WATER COLUMN
LBS	POUNDS
OIT	OPERATOR INTERFACE (TOUCH PANEL)
PH	PHASE
PI	PRESSURE INDICATOR
PLC	PROGRAMMABLE LOGIC CONTROLLER
SCFM	STANDARD CUBIC FEET PER MINUTE
SVE	SOIL VAPOR EXTRACTION
SP	SAMPLE PORT (BALL VALVE WITH BARB FITTING)
SP/FM	SAMPLE PORT (BALL VALVE WITH BARB FITTING) ALSO USED FOR FLOW MEASUREMENT
TI	TEMPERATURE INDICATOR
TIA	TEMPERATURE INDICATOR ANALOG
UPS	UNINTERRUPTED POWER SUPPLY
VFD	VARIABLE FREQUENCY DRIVE
VGAC	VAPOR-PHASE GRANULAR ACTIVATED CARBON
VI	VACUUM INDICATOR
VIA	VACUUM INDICATOR ANALOG
VRV	VACUUM RELIEF VALVE
230V	230 VOLTS

WARNING:
IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

STATE OF NEW YORK · JASON JAMES YATES · 089491 · LICENSED PROFESSIONAL ENGINEER

6/8/2020

SIGNATURE DATE SIGNED

PROFESSIONAL ENGINEER
STATE LIC. No. 089491

LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Project
702 NOSTRAND AVENUE
BLOCK No. 1296, LOT No. 45
BROOKLYN
KINGS COUNTY **NEW YORK**

Drawing Title
SVE SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

Date	Description	No.
REVISIONS		

Project No. 170527801	Drawing No. 6
Date 6/8/2020	
Drawn By VDP	
Checked By GN	Sheet 6 of 6

LANGAN
PROJECT NO. 170527801

Filename: \\langan.com\data\NYC\data8\170527801\Project Data\CAD\Environmental\Record Drawings\Drawing 6 - SVE System PID.dwg Date: 6/9/2020 Time: 14:58 User: vdepaula Style Table: Langan.stb Layout: D5 - PID

APPENDIX B
HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

702 NOSTRAND AVENUE
Brooklyn, New York
NYSDEC BCP Site No. C224270

Prepared For:

702 Nostrand Ave, LLC
c/o MC Properties Management Company, LLC
11 Park Place, Suite 1200
New York, New York 10007

Prepared By:

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001

LANGAN

November 2019
Langan Project No. 170527801

TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

***** Items to be posted prominently on site, or made readily available to personnel.

1.0 INTRODUCTION

1.1 General

This Health and Safety Plan (HASP) was developed to address disturbance of known and reasonably anticipated subsurface contaminants and comply with Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.120(b) (4), *Hazardous Waste Operations and Emergency Response* during anticipated site work at 702 Nostrand Avenue, Brooklyn, New York. This HASP provides the minimum requirements for implementing the activities described in the Site Management Plan (SMP). All contractors performing work on this Site shall implement their own Health and Safety Plans that, at a minimum, adhere to this HASP. The contractor is solely responsible for their own health and safety and that of their subcontractors. Langan personnel will implement this HASP while on site.

The Site was assigned Site No. C224270 in the Brownfield Cleanup Program (BCP), pursuant to a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) executed on 9 May 2018.

The management of the day-to-day site activities and implementation of this HASP in the field is the responsibility of the site Langan Field Team Leader (FTL). Assistance in the implementation of this HASP can also be obtained from the site Langan Health and Safety Officer (HSO) and the Langan Health and Safety Manager (HSM). Contractors operating on the Site shall designate their own FTL, HSO and HSM. The content of this HASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the work plan.

1.2 Site Location and Background

The site is located in the Crown Heights neighborhood of Brooklyn, New York, and is located at New York City Brooklyn Borough Tax Block 1226, Lot 45. Block 1226 is bound by St. Marks Avenue to the north, Nostrand Avenue to the east, Prospect Place to the south and Rogers Avenue to the west. The site encompasses an area of about 1,650 square feet (±0.038 acres) with about 16.5 feet of frontage along Nostand Avenue, and is bound by a two-story mixed-use residential and commercial building (Lot 44) to the north, Nostrand Avenue followed by retail and office buildings to the east, a two-story mixed-use residential and commercial building (Lot 46) to the south, and two- and four-story residential buildings (Lots 35 and 51) to the west. A site location map is provided as Figure 1.

The site is improved with a two-story mixed-use residential and commercial building with a full cellar level and a backyard. Site occupants include a medical office on the ground floor and a residential tenant on the second floor. The cellar is not occupied and is used for storage. The site was previously occupied by a dry cleaning facility from at least 1960 to as late as 2005.

The proposed activities will include the following:

- Geophysical survey;
- Soil boring advancement and sampling;
- Sub-slab vapor point installation and sampling; and
- Drum sampling (if necessary).

1.3 Summary of Work Tasks

The general categories of work tasks being performed during implementation of the work plan include:

1.3.1 Geophysical Surveying

Prior to the commencement of intrusive field activities (i.e., soil borings), a geophysical consultant will conduct a geophysical survey using ground penetrating radar (GPR) and electromagnetic detection equipment. The objective of the survey will be to identify any underground storage tank (UST) structures and/or associated piping and subsurface utilities that may be encountered during the investigation.

1.3.2 Soil Investigation and Sampling

Langan will retain a drilling contractor to advance soil borings to a depth below grade surface (bgs) specified in the RIWP, using appropriate drilling technology. Borings locations will be based on the results of the geophysical survey and the site inspection and document review. The drilling contractor will contact the appropriate utility mark-out authority and make available to their drilling staff the verification number and effective dates.

Langan personnel will screen soil for visual, olfactory, and instrumental indicators suggestive of a potential chemical or petroleum release. Instrument screening for the presence of volatile organic compounds (VOCs) may be performed with a calibrated photoionization detector (PID).

1.3.3 Groundwater Investigation and Sampling

One or more soil borings may be converted into groundwater monitoring wells, as a contingency, and sampled to evaluate groundwater quality. The wells will be developed in accordance with the Langan Well Development Standard Operating Procedure (SOP #07) by surging and pumping the well until the purged water is visibly clear. Groundwater samples will then be collected from one or more of the monitoring wells in accordance with the Langan Low Flow Groundwater Sampling SOP (SOP #12). Groundwater samples will be submitted to an NYSDOH ELAP-certified laboratory and analyzed for constituents as specified in the work plan. Langan personnel may survey the location and elevations of the newly completed wells.

1.3.4 Soil Vapor Point Investigation and Sampling

The drilling contractor will install sub-slab vapor points as specified in the work plan. Sub-slab vapor samples will be collected in accordance with the October 2006 NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York and Langan's Soil Vapor Sampling SOP (SOP #13). The sub-slab vapor samples will be collected with polyethylene tubing. The annulus around the tubing will be filled with sand in accordance with the work plan. Bentonite slurry will be applied to the top of the sand up to the surface to seal the sampling points.

Sub-slab vapor samples will be collected for laboratory analysis in accordance with the Langan Soil Vapor Sampling Standard Operating Procedure (SOP #13) following specifications outlined in the work plan. The sub-slab vapor and ambient air samples (if applicable) will be collected into laboratory-supplied, certified-clean Summa® canisters (or equivalent) that are calibrated for a sampling rate specified in the work plan.

1.3.5 Excavation and Soil Screening

Langan personnel will screen excavated material for visual, olfactory, and instrumental indicators suggestive of a potential chemical or petroleum release. Instrument screening for the presence of volatile organic compounds (VOCs) may be performed with a calibrated photoionization detector (PID). Contractors will excavate for utilities, foundation components and potential grading using heavy equipment and hand tools. Contractors will notify Langan personnel if they identify indications suggestive of a potential chemical or petroleum release. Contaminated material shall be handled and property disposed in accordance with federal, state and city regulations, criteria and guidelines.

1.3.6 Soil Screening

As part of future excavation activities, the Langan personnel will report when they have observed visual and olfactory indications of possible soil impact. Langan personnel will also report concentrations of volatile organic vapors (VOCs) above background when using a properly calibrated hand held photoionization detector (PID, or equivalent).

1.3.7 Soil Sampling

Soil samples for excavation endpoint or delineation sampling (along with QA/QC samples) may be collected into laboratory-supplied batch-certified clean glassware and submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP).

1.3.8 Stockpiling

Potentially impacted soil may be stockpiled pending laboratory analysis and determining proper off-site disposal. Langan personnel will coordinate with the contractor in stockpiling soils (in accordance with the SMP, where applicable).

1.3.9 Characterization of Excavated Material

When required by the SMP, Langan personnel will characterize excavated soil or clean backfill in accordance with Langan standards.

1.3.10 Excavation Backfill

Areas of the site that were over-excavated may be backfilled to development grade (i.e., the grade required to complete construction of the foundation and sidewalk extension). Imported material will consist of clean fill that meets the 6 New York Codes, Rules and Regulations (NYCRR) Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (UU SCOs) or other acceptable fill material such as virgin stone from a permitted mine or quarry or recycled concrete aggregate (RCA), from a New York State Department of Environmental Conservation (NYSDEC)-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of RCA acquisition. Imported RCA must be derived from recognizable and uncontaminated concrete. RCA is not acceptable for, and will not be used as, site cover or drainage material.

1.3.11 Removal of Underground Storage Tank

If encountered, the contractor shall furnish all labor and materials, equipment and incidentals required for the proper decontamination, removal and closure of any UST in accordance with federal, state and local regulations. Langan personnel will monitor VOCs with a calibrated PID downwind from the UST excavation and record the PID readings.

1.3.12 Soil Vapor Extraction System Install and Operations, Maintenance and Monitoring and Observations

Langan will observe installation and subsequently operate, maintain, and monitor the soil vapor extraction system (SVE) system installed in the cellar. SVE system operations, maintenance & monitoring (OM&M) activities include system operation, site checks/inspections, routine (scheduled) or unscheduled maintenance, and system monitoring, optimization, and troubleshooting. During OM&M of the SVE system soil vapor samples will be collected periodically to monitor the performance of the SVE system. The SVE system consists of SVE

wells connected to a main SVE header pipe that extends to a manifold closet. The header pipe connects to a vacuum blower and a moisture separator. A network of soil vapor monitoring points is located throughout the cellar to monitor the vacuum influence.

1.3.13 Drum Sampling

Drummed excess or impacted soil and water must be labeled in accordance with the Langan Drum Labeling Standard Operating Procedure (SOP-#9). Langan personnel will collect drum samples, as required, prior to off-site drum disposal.

1.3.14 Site-Wide Inspection

Site-wide inspections will be performed annually. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

1.3.15 Cover System Monitoring

A composite cover system, comprised of the concrete building slab, the rear yard concrete pavement, and the rear yard planter concrete cap that span the site footprint serve as a protective barrier mitigating the risk of exposure to the remaining contamination. Inspection of the composite cover system by a professional engineer, or a qualified environmental professional under the direction of a professional engineer, is required on a regular schedule at a minimum of once per year and following any severe weather or other conditions that could affect the cover. During these inspections, a site inspection form will be completed. The inspection requires sufficient information to certify the integrity of all elements of the cover system described above and should document any cover system disturbances. Any damage to the composite cover system identified during the inspection will be repaired in kind and in compliance with this SMP.

2.0 IDENTIFICATION OF KEY PERSONNEL/HEALTH AND SAFETY PERSONEL

The following briefly describes the health and safety (H&S) designations and general

responsibilities that may be employed for this site. The titles have been established to accommodate the project needs and requirements and ensure the safe conduct of site activities. The H&S personnel requirements for a given work location are based upon the proposed site activities.

2.1 Langan Project Manager

The Langan Project Manager (PM) is Gerald Nicholls. His responsibilities include:

- Ensuring that this HASP is developed and approved prior to on-site activities.
- Ensuring that all the tasks in the project are performed in a manner consistent with Langan's comprehensive *Health and Safety Program for Hazardous Waste Operations* and this HASP.

2.2 Langan Corporate Health and Safety Manager

The Langan Corporate Health and Safety Manager (HSM) is Tony Moffa. His responsibilities include:

- Updating the *Health and Safety Program for Hazardous Waste Operations*.
- Assisting the site Health and Safety Officer (HSO) with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc. and approving changes to this HASP.
- Assisting the HSO in the implementation of this HASP and conducting Jobsite Safety Inspections and assisting with communication of results and correction of shortcomings found.
- Maintaining records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

2.3 Langan Site Health & Safety Officer

The Langan site HSO is William Bohrer. His responsibilities include:

- Participating in the development and implementation of this HASP.
- When on-site, assisting the Langan Field Team Leader in conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.
- Ensuring that proper PPE is available, worn by employees and properly stored and maintained.
- Controlling entry into and exit from the site contaminated areas or zones.
- Monitoring employees for signs of stress, such as heat stress, fatigue, and cold exposure.
- Monitoring site hazards and conditions.

- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department.
- Resolving conflicts that may arise concerning safety requirements and working conditions.
- Reporting all incidents, injuries and near misses to the Langan Incident/Injury Hotline immediately and the client representative.

2.4 Langan Field Team Leader Responsibilities

The Langan Field Team Leader (FTL) is to be determined prior to the start of investigation activities. The Field Team Leader's responsibilities include:

- The management of the day-to-day site activities and implementation of this HASP in the field.
- Participating in and/or conducting Tailgate Safety Meetings and Jobsite Safety Inspections and correcting any shortcomings in a timely manner.
- When a Community Air Monitoring Operating Program (CAMP) is part of the scope, the FTL will set up and maintaining community air monitoring activities and instructing the responsible contractor to implement organic vapor or dust mitigation when necessary.
- Overseeing the implementation of activities specified in the work plan.

2.5 Contractor Responsibilities

The contractor shall develop and implement their own HASP for their employees, lower-tier subcontractors, and consultants. The contractor is solely responsible for their own health and safety and that of their subcontractors. Contractors operating on the Site shall designate their own FTL, HSO and HSM. The contractor's HASP will be at least as stringent as this Langan HASP. The contractor must be familiar with and abide by the requirements outlined in their own HASP. A contractor may elect to adopt Langan's HASP as its own provided that it has given written notification to Langan, but where Langan's HASP excludes provisions pertinent to the contractor's work (i.e., confined space entry); the contractor must provide written addendums to this HASP. Additionally, the contractor must:

- Ensure their employees are trained in the use of all appropriate PPE for the tasks involved;
- Notify Langan of any hazardous material brought onto the job site or site related area, the hazards associated with the material, and must provide a material safety data sheet (MSDS) or safety data sheet (SDS) for the material;
- Have knowledge of, understand, and abide by all current federal, state, and local health and safety regulations pertinent to the work;
- Ensure their employees handling hazardous materials, if identified at the Site, have

received current training in the appropriate levels of 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER) if hazardous waste is identified at the Site;

- Ensure their employees handling hazardous materials, if identified at the Site, have been fit-tested within the year on the type respirator they will wear;
- Ensure all air monitoring is in place pertaining to the health and safety of their employees as required by OSHA 1910.120; and
- All contractors must adherer to all federal, state, and local regulatory requirements.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSES

A Task-Hazard Analysis (Table 1) was completed for general construction hazards that may be encountered at the Site. Known and suspected chemical contaminant hazards that could be encountered during site operations are included in Table 2. A complete inventory of MSDS/SDS for chemical products used on site is included as Attachment A.

3.1 Specific Task Safety Analysis

3.1.1 Geophysical Survey

Langan personnel are not permitted to operate or otherwise handle the geophysical equipment including any downhole geophysical equipment subsequently used to survey boreholes. When soil, groundwater or soil vapor points are surveyed with surface geophysical equipment, the locations of the point as well as possible utilities and other artifacts that may interfere with the subsurface investigation are to be marked with indelible paint, flags, or color tape (when marking indoor locations that the client has specifically requested not be marked with indelible paint). When applying paint, proper PPE including at a minimum hand protections should be used.

3.1.2 Soil Investigation and Sampling

Sampling the soil requires the donning of chemical resistant gloves in addition to the standard PPE. Langan personnel are not to operate drilling equipment nor open sampling devices (acetate liners, sonic sample bags, etc.). These tasks are to be completed by the driller contractor.

3.1.3 Groundwater Investigation and Sampling

Sampling groundwater requires the donning of chemical resistant gloves in addition to the standard PPE and cut resistant gloves when cutting sampling-tubing to length. Langan personnel are not to operate drilling equipment nor assemble or install monitoring well equipment. These tasks are to be completed by the driller contractor.

3.1.4 Soil Vapor Investigation and Sampling

Sampling soil vapor requires the donning of work gloves in addition to the standard PPE when assembling the Summa™ canister with the regulator and cut resistant gloves when cutting sampling or silicone tubing to length. Langan personnel are not to operate drilling equipment nor assemble or install soil vapor point equipment. These tasks are to be completed by the driller contractor.

3.1.5 Soil Screening and Sampling

When conducting soil screening and collecting soil samples, Langan personnel will don chemical resistant gloves in addition to the standard personal protection equipment (PPE).

3.1.6 Stockpile Sampling

The Langan personnel are not to scale or otherwise climb stockpiles. If the soil sampling plan requires sampling from the stockpile above ground level, samples are to be obtained using suitable excavation equipment operated by the contractor (i.e. front end loader).

3.1.7 Removal of Underground Storage Tank

If UST excavation and removal activity is initiated, Langan personnel will conduct air monitoring for lower explosion limit (LEL) conditions within the UST excavation itself. This task is to be performed using calibrated air monitoring equipment designed to sound an audio alarm when atmospheric concentrations of VOC are within 10% of the LEL. In normal atmospheric oxygen concentrations, the LEL monitoring may be done with a Wheatstone bridge/catalytic bead type sensor (i.e. MultiRAE). However in oxygen depleted atmospheres (confined space), only an LEL designed to work in low oxygen environments may be used. Best practices require that the LEL monitoring unit be equipped with a long sniffer tube to allow the LEL unit to remain outside the UST excavation. Langan personnel are not to enter the UST excavation nor enter an excavated UST.

In addition to monitoring LEL, Langan personnel will monitor atmospheric VOC concentrations directly downwind of the UST excavation in accordance with standard CAMP procedures using calibrated air monitoring equipment.

1.3.8 Soil Vapor Extraction System Install plus Operations, Maintenance and Monitoring and Observations

SVE installation, operations, maintenance and monitoring require donning proper work gloves and hearing protection in addition to standard Langan PPE. When necessary to access the SVE motor, Langan will incorporate lock-out/tag out procedures.

3.1.9 Indoor Work Using Combustion Engine

In the event that one or more boreholes and soil vapor points are to be install indoors, these boreholes and vapor points should be advanced using electrical or hydraulic powered machinery (provide the hydraulic generator is either electric or operating outside the building). If the advancement of the boreholes or soil vapor points must be done using drilling equipment

powered by an internal combustion engine, the drilling contractor and Langan must do the following:

- The drilling contractor must bring heat protected tubing having sufficient length, diameter and fixtures to vent all combustion exhaust from the drill rig directly outdoors;
- The drilling contractor must bring fans to provide adequate circulation of fresh air into the work area;
- All work area windows and doors to the outside must be opened to provide continuous fresh air;
- Langan personnel must monitor indoor air for carbon monoxide using a MultiRAE or equivalent detector:
    - The 8 hour PEL for Carbon Monoxide is 50 ppm, if the detector indicates carbon monoxide concentrations above 50 ppm, work is to stop and steps are to be taken to mitigate the carbon dioxide concentrations.
    - If the detector indicates carbon monoxide concentrations above 100 ppm, all work is to stop and the work area is to be evacuated. Langan personnel will contact the PM to determine the best course of action.

3.1.10 Drum Sampling

Drilling fluid, rinse water, grossly-contaminated soil samples and cuttings will be containerized in 55-gallon drums for disposed off-site. Each drum must be labeled in accordance with the Langan Drum Labeling Standard Operating Procedure (SOP-#9). Langan personnel may collect drum samples, as required, prior to off-site drum disposal. Samples will be placed into laboratory-supplied batch-certified clean glassware and submitted to a NYSDOH ELAP-certified laboratory.

Langan personnel and contractors are not to move or opened any orphaned (unlabeled) drum found on the site without approval of the project manager.

3.2 Radiation Hazards

No radiation hazards are known or expected at the site.

3.3 Physical Hazards

Physical hazards, which may be encountered during site operations for this project, are detailed in Table 1.

3.3.1 Explosion

No explosion hazards are expected for the scope of work at this site.

3.3.2 Heat Stress

The use of Level C protective equipment, or greater, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 72°F or above. Table 6 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates are observed. Refer to the Table 7 to assist in assessing when the risk for heat related illness is likely. To use this table, the ambient temperature and relative humidity must be obtained (a regional weather report should suffice). Heat stress monitoring should be performed by the HSO or the FTL, who shall be able to recognize symptoms related to heat stress.

To monitor the workers, be familiar with the following heat-related disorders and their symptoms:

- **Heat Cramps:** Painful spasm of arm, leg or abdominal muscles, during or after work
- **Heat Exhaustion:** Headache, nausea, dizziness; cool, clammy, moist skin; heavy sweating; weak, fast pulse; shallow respiration, normal temperature
- **Heat Stroke**: Headache, nausea, weakness, hot dry skin, fever, rapid strong pulse, rapid deep respirations, loss of consciousness, convulsions, coma. *This is a life threatening condition***.**

Do not permit a worker to wear a semi-permeable or impermeable garment when they are showing signs or symptoms of heat-related illness.

To monitor the worker, measure:

- **Heart rate:** Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third. A worker cannot return to work after a rest period until their heart rate is below 100 beats per minute.
- **Oral temperature:** Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. A worker cannot return to work after a rest period until their oral temperature is below 99.6°F. If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

Prevention of Heat Stress - Proper training and preventative measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress the following steps should be taken:

- Adjust work schedules.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, id., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
    - Maintain water temperature 50^{O} to 60^{O}F (10^{O} to 16.6^{O}C).
    - Provide small disposal cups that hold about four ounces (0.1 liter).
    - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
    - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
    - Train workers to recognize the symptoms of heat related illness.

3.3.3 Cold-Related Illness

If work on this project begins in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally called frostbite.

- **Hypothermia -** Hypothermia is defined as a decrease in the patient core temperature below 96^{O}F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interference with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered a "cold" ambient temperature. Symptoms of hypothermia include: shivering, apathy, listlessness, sleepiness, and unconsciousness.

- **Frostbite -** Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20^{O}F. Symptoms of frostbite are: a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid.

Prevention of Cold-Related Illness - To prevent cold-related illness:

- Educate workers to recognize the symptoms of frostbite and hypothermia
- Identify and limit known risk factors:
- Assure the availability of enclosed, heated environment on or adjacent to the site.
- Assure the availability of dry changes of clothing.
- Assure the availability of warm drinks.
- Start (oral) temperature recording at the job site:
- At the FSO or Field Team Leader's discretion when suspicion is based on changes in a worker's performance or mental status.
- At a worker's request.
- As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20^{O}F, or wind-chill less than 30^{O}F with precipitation).
- As a screening measure whenever anyone worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 92^{O}F) cannot return to work for 48 hours.

3.3.4 Noise

Work activities during the proposed activities may be conducted at locations with high noise levels from the operation of equipment. Hearing protection will be used as necessary.

3.3.5 Hand and Power Tools

The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. All hand and power tools should be inspected for health and safety hazards prior to use. If deemed unserviceable/un-operable, notify supervisor and tag equipment out of service. Ground Fault Circuit Interrupters (GFCIs) are required for all power tools requiring direct electrical service.

3.3.6 Slips, Trips and Fall Hazards

Care should be exercised when walking at the site, especially when carrying equipment. The presence of surface debris, uneven surfaces, pits, facility equipment, and soil piles contribute to tripping hazards and fall hazards. To the extent possible, all hazards should be identified and marked on the Site, with hazards communicated to all workers in the area.

3.3.7 Utilities (Electrocution and Fire Hazards)

The possibility of encountering underground utilities poses fire, explosion, and electrocution hazards. All excavation work will be preceded by review of available utility drawings and by notification of the subsurface work to the N.Y. One–Call Center. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death.

3.4 Biological Hazards

3.4.1 Animals

No animals are expected to be encountered during site operations.

3.4.2 Insects

Insects are not expected to be encountered during site operations.

3.5 Additional Safety Analysis

3.5.1 Presence of Non-Aqueous Phase Liquids (NAPL)

There is potential for exposure to NAPL at this site. Special care and PPE should be considered when NAPL is observed as NAPL is a typically flammable fluid and releases VOCs known to be toxic and/or carcinogenic. If NAPL is present in a monitoring well, vapors from the well casing may contaminate the work area breathing zone with concentrations of VOCs potentially exceeding health and safety action levels. In addition, all equipment used to monitor or sample NAPL (or groundwater from wells containing NAPL) must be intrinsically safe. Equipment that directly contacts NAPL must also be resistant to organic solvents.

At a minimum, a PID should be used to monitor for VOCs when NAPL is observed. If NAPL is expected to be observed in an excavation or enclosed area, air monitoring must be started using calibrated air monitoring equipment designed to sound an audio alarm when atmospheric concentrations of VOC are within 10% of the LEL. In normal atmospheric oxygen concentrations, the LEL monitoring may be done with a Wheatstone bridge/catalytic bead type sensor (i.e. MultiRAE). However in oxygen depleted atmospheres (confined space), only an LEL designed to work in low oxygen environments may be used. Best practices require that the LEL monitoring unit be equipped with a long sniffer tube to allow the LEL unit to remain outside the UST excavation.

When NAPL is present, Langan personnel are required to use disposable nitrile gloves at all times to prevent skin contact with contaminated materials. They should also consider having available a respirator and protective clothing (Tyvek® overalls), especially if NAPL is in abundance and there are high concentrations of VOCs.

All contaminated disposables including PPE and sampling equipment must be properly

disposed of in labeled 55-gallon drums.

3.6 Job Safety Analysis

A Job Safety Analysis (JSA) is a process to identify existing and potential hazards associated with each job or task so these hazards can be eliminated, controlled or minimized. A JSA will be performed at the beginning of each work day, and additionally whenever an employee begins a new task or moves to a new location. All JSAs must be developed and reviewed by all parties involved. A blank JSA form and documentation of completed JSAs are in Attachment B.

4.0 PERSONNEL TRAINING

4.1 Basic Training

Completion of an initial 40-hour HAZWOPER training program as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees working on a site engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances, health hazards, or safety hazards as defined by 29 CFR 1910.120(a). Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment. In addition to these training requirements, all employees must complete the OSHA 10-hour Construction Safety and Health training and supervisory personnel must also receive eight additional hours of specialized management training. Training records are maintained by the HSM.

4.2 Initial Site-Specific Training

Training will be provided to specifically address the activities, procedures, monitoring, and equipment for site operations at the beginning of each field mobilization and the beginning of each discrete phase of work. The training will include the site and facility layout, hazards, and emergency services at the site, and will detail all the provisions contained within this HASP. For a HAZWOPER operation, training on the site must be for a minimum of 3 days. Specific issues that will be addressed include the hazards described in Section 3.0.

4.3 Tailgate Safety Briefings

Before starting work each day or as needed, the Langan HSO will conduct a brief tailgate safety meeting to assist site personnel in conducting their activities safely. Tailgate meetings will be documented in Attachment C. Briefings will include the following:

- Work plan for the day;
- Review of safety information relevant to planned tasks and environmental conditions;
- New activities/task being conducted;
- Results of Jobsite Safety Inspection Checklist;
- Changes in work practices;
- Safe work practices; and
- Discussion and remedies for noted or observed deficiencies.

5.0 MEDICAL SURVEILLANCE

All personnel who will be performing field work involving potential exposure to toxic and hazardous substances (defined by 29 CFR 1910.120(a)) will be required to have passed an initial baseline medical examination, with follow-up medical exams thereafter, consistent with 29 CFR 1910.120(f). Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine.

Additionally, personnel who may be required to perform work while wearing a respirator must receive medical clearance as required under CFR 1910.134(e), *Respiratory Protection*. Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine. Results of medical evaluations are maintained by the HSM.

6.0 COMMUNITY AIR MONITORING PROGRAM

Community air monitoring may be conducted in compliance with the NYSDOH Generic CAMP outlined below:

Monitoring for dust and odors will be conducted during all ground intrusive activities by the FTL. Continuous monitoring on the perimeter of the work zones for odor, VOCs, and dust may be required for all ground intrusive activities such as soil excavation and handling activities. The work zone is defined as the general area in which machinery is operating in support of remediation activities. A portable PID will be used to monitor the work zone and for periodic monitoring for VOCs during activities such as soil and groundwater sampling and .soil excavation. The site perimeter will be monitored for fugitive dust emissions by visual observations as well as instrumentation measurements (if required). When required, particulate or dust will be monitored continuously with real-time field instrumentation that will meet, at a minimum, the performance standards from DER-10 Appendix 1B. Real-time field instruments will be calibrated before each day of use. Calibration results will be recorded in Attachment D.

If VOC monitoring is required, the following actions will be taken based on VOC levels measured:

- If total VOC levels exceed 5 ppm above background for the 15-minute average at the perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total VOC levels at the downwind perimeter of the hot zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps work activities will resume provided that the total organic vapor level 200 feet downwind of the hot 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 above background for the 15-minute average.
- If the total VOC level is above 25 ppm at the perimeter of the hot zone, activities will be shutdown.

If dust monitoring with field instrumentation is required, the following actions will be taken based on instrumentation measurements:

- If the downwind particulate level is 100 micrograms per cubic meter (µg/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 must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 µg/m^3 above the background level and provided that no visible dust is

migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 µg/m³ above the background level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM10 concentration to within 150 µg/m³ of the upwind level and in preventing visible dust migration.

6.1 Vapor Emission Response Plan

This section applies if VOC monitoring is required. If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the hot zone, boring and well installation, and excavation activities will be halted or odor controls will be employed, and monitoring continued. When work shut-down occurs, downwind air monitoring as directed by the HSO or FTL will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

If the organic vapor level decreases below 5 ppm above background, sampling and boring and well installation can resume, provided:

- The organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest residential or commercial structure, whichever is less, is below 1 ppm over background, and
- More frequent intervals of monitoring, as directed by the HSO or FTL, are conducted.

6.2 Major Vapor Emission

This section applies if VOC monitoring is required. If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or odor controls must be implemented.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the hot zone, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If either of the following criteria is exceeded in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be implemented.

- Sustained organic vapor levels approaching 5 ppm above background for a period of more than 30 minutes, or

- Organic vapor levels greater than 5 ppm above background for any time period.

6.3 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

- The local police authorities will immediately be contacted by the HSO or FTL and advised of the situation;
- Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the HSO or FTL; and
- All Emergency contacts will go into effect as appropriate.

6.4 Dust Suppression Techniques

Preventative measures for dust generation may include wetting site fill and soil, construction of an engineered construction entrance with gravel pad, a truck wash area, covering soils with tarps, and limiting vehicle speeds to five miles per hour.

Work practices to minimize odors and vapors include limiting the time that the excavations remain open, minimizing stockpiling of contaminated-source soil, and minimizing the handling of contaminated material. Offending odor and organic vapor controls may include the application of foam suppressants or tarps over the odor or VOC source areas. Foam suppressants may include biodegradable foams applied over the source material for short-term control of the odor and VOCs.

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: direct load-out of soils to trucks for off-Site disposal; use of chemical odorants in spray or misting systems; and, use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed 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.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 Levels of Protection

Langan will provide PPE to Langan employees to protect them from the specific hazards they are likely to encounter on-site. Direct hired contractors will provide their employees with equivalent PPE to protect them from the specific hazards likely to be encountered on-site. Selection of the appropriate PPE must take into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and, (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards.

Based on anticipated site conditions and the proposed work activities to be performed at the site, Level D protection will be used. The upgrading/downgrading of the level of protection will be based on continuous air monitoring results as described in Section 6.0 (when applicable). The decision to modify standard PPE will be made by the site HSO or FTL after conferring with the PM. The levels of protection are described below.

Level D Protection (as needed)

- Safety glasses with side shields or chemical splash goggles
- Safety boots/shoes
- Coveralls (Tyvek® or equivalent)
- Hard hat
- Long sleeve work shirt and work pants
- Nitrile gloves
- Hearing protection
- Reflective safety vest

Level C Protection (as needed)

- Full or Half face, air-purifying respirator, with NIOSH approved HEPA filter
- Inner (latex) and outer (nitrile) chemical-resistant gloves
- Safety glasses with side shields or chemical splash goggles
- Chemical-resistant safety boots/shoes
- Hard hat
- Long sleeve work shirt and work pants
- Coveralls (Tyvek® or equivalent)
- Hearing protection (as needed)
- Reflective safety vest

The action levels used in determining the necessary levels of respiratory protection and upgrading to Level C are summarized in Table 4. The written Respiratory Protection Program is maintained by the HSM and is available if needed. The monitoring procedures and equipment are outlined in Section 6.0 (when applicable).

7.2 Respirator Fit-Test

All Langan employees who may be exposed to hazardous substances at the work site are in possession of a full or half face-piece, air-purifying respirator and have been successfully fit-tested within the past year. Fit-test records are maintained by the HSM.

8.0 SITE CONTROL

8.1 Site Communications Plan

Verbal communications will be the primary method of communication used at the site. Cell phones shall be used to the extent practical. In the instances where verbal communication cannot be used, such as when working in respiratory protective equipment, hand signals will be used. Hand signals will be covered during site-specific training. Hand signals and their messages:

Hand Signal	Meaning
Hand gripping throat	Out of air; cannot breathe
Grip partners wrists or place both hands around waist	Leave immediately without debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm alright; I understand
Thumbs down	No; negative
Simulated "stick" break with fists	Take a break; stop work

8.2 Work Zones

The need to formally establish specific work zones (Support, Contamination Reduction, and Exclusion Zones) during site activities will be determined by the HSO or FTL. It is important for the safety of all concerned that appropriate barriers (cones, wooden horses, plastic fencing etc.) are in place to keep vehicles and pedestrians away from the Work Zone.

8.2.1 Exclusion Zone

Exclusion zones or hot zones will be established within a 25 foot radius around drilling and sampling activities involving hazardous materials, where applicable and feasible. All personnel within the hot zone must don the appropriate levels of personal protection as set forth by the HSO. It is not anticipated that Level C or higher will be required for this site.

All personnel within the hot zone will be required to use the specified level of protection. No food, drink, or smoking will be allowed in the hot or warm zones.

8.2.2 Contamination Reduction Zone

If PID VOC concentration action levels are exceeded or obvious indications of contamination (by sight or odor) are encountered, a contamination reduction zone or warm zone will be established and utilized during the field activities. This zone will be established between the hot zone and the cold zone (discussed below), and will include the personnel and equipment necessary for decontamination of equipment and personnel exiting the hot zone. Personnel and equipment in the hot zone must pass through this zone before entering the cold zone. This zone should always be located upwind of the hot zone.

8.2.3 Support Zone

The support zone or cold zone will include the remaining areas of the job site. Break areas and support facilities (include equipment storage and maintenance areas) will be located in this zone. No equipment or personnel will be permitted to enter the cold zone from the hot zone without passing through the decontamination station in the warm zone (if necessitated). Eating, smoking, and drinking will be allowed only in this area.

8.3 The Buddy System

When working in teams of two or more, workers will use the "buddy system" for all work activities to ensure that rapid assistance can be provided in the event of an emergency. This requires work groups to be organized such that workers can remain close together and maintain visual contact with one another. Workers using the "buddy system" have the following responsibilities:

- Provide his/her partner with assistance.
- Observe his/her partner for signs of chemical or heat exposure.
- Periodically check the integrity of his/her partner's PPE.
- Notify the HSO or other site personnel if emergency service is needed.

9.0 NEAREST MEDICAL ASSISTANCE

The address and telephone number of the nearest hospital:

Interfaith Medical Center
1545 Atlantic Avenue
Brooklyn, NY 11213
(718) 613-4000

Map with directions to the hospital are shown in Figure 2. This information will either be posted prominently at the site or will be available to all personnel all of the time. Further, all field personnel, including the HSO & FTL, will know the directions to the hospital.

10.0 STANDING ORDERS/SAFE WORK PRACTICES

The standing orders, which consist of a description of safe work practices that must always be followed while on-site by Langan employees and contractors, are shown in Attachment E. The site HSO and FTL each have the responsibility for enforcing these practices. The standing orders will be posted prominently at the site, or are made available to all personnel at all times. Those who do not abide by these safe work practices will be removed from the site.

11.0 SITE SECURITY

No unauthorized personnel shall be permitted access to the work areas.

12.0 UNDERGROUND UTILITIES

As provided in Langan's Underground Utility Clearance Guidelines, the following safe work practices should be followed by Langan personnel and the contractor before and during subsurface work in accordance with federal, state and local regulations:

- Obtain available utility drawings from the property owner/client or operator.
- Provide utility drawings to the project team.
- In the field, mark the proposed area of subsurface disturbance (when possible).
- Ensure that the utility clearance system has been notified.
- Ensure that utilities are marked before beginning subsurface work.
- Discuss subsurface work locations with the owner/client and contractors.
- Obtain approval from the owner/client and operators for proposed subsurface work locations.
- Use safe digging procedures when applicable.
- Stay at least 10 feet from all equipment performing subsurface work.

13.0 SITE SAFETY INSPECTION

The Langan HSO or alternate will check the work area daily, at the beginning and end of each work shift or more frequently to ensure safe work conditions. The HSO or alternate must complete the Jobsite Safety Inspection Checklist, found in Attachment F. Any deficiencies shall be shared with the FTL, HSM and PM and will be discussed at the daily tailgate meeting.

14.0 HAND AND POWER TOOLS

All hand- and electric-power tools and similar equipment shall be maintained in a safe operating condition. All electric-power tools must be inspected before initial use. Damaged tools shall be removed immediately from service or repaired. Tools shall be used only for the purpose for which they were designed. All users must be properly trained in their safe operation.

15.0 DECONTAMINATION PLAN

15.1 General

All personnel, equipment, and samples leaving the contaminated area of the site must be decontaminated. Decontamination for this operation is achieved through physical removal and chemical detoxification/disinfection/sterilization. The first step in decontamination, however, is prevention and standard operating procedures have been established meant to minimize contact with wastes:

- Work habits that minimize contact with wastes are stressed.
- Disposable equipment, where appropriate, will be used.

15.2 Decontamination Procedures

Standard decontamination procedures will be used as described in Attachment G.

15.3 Disposal of Decontamination Wastes

Waste solutions generated during decontamination procedures shall be contained, collected, and stored in drums or other appropriate containers and labeled for proper off-site disposal.

16.0 EMERGENCY RESPONSE

16.1 General

Due to hazards that may be present at the site and the conditions under which operations are conducted, it is possible that an emergency situation may develop. Emergency situations can be characterized as injury or acute chemical exposure to personnel, fire or explosion, environmental release, or hazardous weather conditions.

16.2 Responsibilities

Site Emergency Coordinator - The HSO, or his/her alternate, will serve as the Site Emergency Coordinator and shall implement emergency procedures whenever conditions warrant such action. The Site Emergency Coordinator will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel, and notification of emergency units and the appropriate management staff. Emergency response instructions will be provided by the HSO as part of every employee's training prior to the start of work.

Employees - All employees at the site will be familiar with emergency response procedures for this work location.

16.3 Evacuation

In the event of an emergency situation, an air horn or vehicle horn will be sounded three times indicating the initiation of evacuation procedures. Loud voice command, if appropriate, can be used. All personnel will evacuate and assemble at the site entrance. No one, except the emergency responders, will be allowed to proceed into the area once the emergency signal has been given. The Site Emergency Coordinator will ensure that access for emergency equipment is provided and that all sources of combustion (e.g., operating machinery, etc.) have been shut down once the alarm has been sounded. Wind direction will be taken into consideration for evacuation plans. Evacuation plans will be discussed at the initial Site-Specific Training and as needed at the regular safety briefings.

In all situations, when an on-site emergency results in an evacuation, personnel shall not re-enter until:

- The conditions resulting in the emergency have been corrected.
- The hazards have been reassessed.
- This HASP has been reviewed.
- Site personnel have been briefed on any changes to this HASP.

16.4 Emergency Contacts/Notification System

The fire department and other emergency response groups will be notified by telephone of the emergency as soon as possible. An emergency telephone numbers list is presented as Table 5

in this HASP. This list will either be posted prominently at the site or will be made readily available to all personnel all of the time.

16.5 Emergency Medical Treatment

Personnel Injury - In case of injury to personnel, the HSO or his/her alternate will immediately administer emergency first aid. The ambulance/rescue squad will also be contacted as necessary. Some situations may require transport of the injured parties by automobile. Therefore, maps/directions to the nearest hospital are provided as Figure 2. Figure 2 will either be posted at the site, or will be made readily available to all personnel all of the time.

Personnel Exposure – Emergency first aid procedures to be followed are:

- **Skin Contact:** Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, and then provide appropriate medical attention. Rinse eyes with water for at least 15 minutes.
- **Inhalation:** Move to fresh air and/or, if necessary decontaminate and transport to emergency medical facility.
- **Ingestion:** Decontaminate and transport to emergency medical facility.
- **Puncture/Laceration**: Decontaminate, if possible, and transport to emergency medical facility.

16.6 Fire or Explosion

Appropriate fire extinguishers will be made available at the site for trained personnel to use on insipient stage fires without endangering the safety and health of those nearby. If the use of fire extinguishers will not extinguish the fire, immediately notify the fire department, sound the evacuation signal, and then evacuate the area, assembling at the site entrance to be accounted for and to receive further instruction.

16.7 Spills/Leaks

Control or stop the spread of minor chemical spills or contamination by utilizing the appropriate materials (absorbents, etc.), if possible. If the release is significant, or highly hazardous, immediately notify the appropriate response groups, sound the evacuation signal, evacuate the area, and assemble at the site entrance to be accounted for and to receive further instruction.

16.8 Adverse Weather Conditions

In the event of severe weather (rain, snow, sleet, heat, etc.), conditions will be assessed on site to determine if the work can proceed safely. If it is determined that the weather poses a significant hazard, site operations will be stopped and rescheduled. Some of the items to be considered prior to determining if work should continue include:

- Potential for heat stress and heat-related injuries.

- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions including thunder storms. When thunderstorms do occur, work is to cease immediately while personnel seek shelter. Work cannot resume until 30 minutes after the last thunder clap.
- Limited visibility.

16.9 Underground Utilities

In the event a utility is encountered or disturbed during subsurface work, follow these procedures:

- Immediately stop work;
- Leave the work area and retreat to a safe area;
- Call 911, if necessary;
- Contact the client representative and owner and operator of the property; and
- Immediately notify the Langan PM, HSC and Langan Incident/Injury Hotline.

16.10 Documentation

Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan Incident/Injury Hotline at 1-(800)-9-LANGAN (ext. #4699) and the client representative to report the incident or near miss. For emergencies involving personnel injury and/or exposure, the HSO and affected employee will complete and submit an Employee Exposure/Injury Incident Report (Attachment H) to the Langan Corporate Health and Safety Manager as soon as possible following the incident.

17.0 CONFINED SPACE ENTRY

Confined spaces are not anticipated at the Site during planned construction activities. If confined spaces are identified, the contractor must implement their own confined space program that all applicable federal, state and local regulations. Confined spaces **will not** be entered by Langan personnel.

18.0 HASP ACKNOWLEDGEMENT FORM

All Langan personnel and contractors will sign this HASP Compliance Agreement indicating that they have become familiar with this HASP and that they understand it and agree to abide by it.

Printed Name	Signature	Company	Date

TABLES

TABLE 1
TASK HAZARD ANALYSES

Task	Hazard	Description	Control Measures	First Aid
1.3.1 – 1.3.13	Contaminated Soil or Groundwater-Dermal Contact	Contaminated water spills on skin, splashes in eyes; contact with contaminated soil/fill during construction activities or sampling.	Wear proper PPE; follow safe practices, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 – 1.3.13	Lacerations, abrasions, punctures	Cutting bailer twine, pump tubing, acetate liners, etc. with knife; cuts from sharp site objects or previously cut piles, tanks, etc.; Using tools in tight spaces	Wear proper PPE; follow safe practices	Clean wound, apply pressure and/or bandages; seek medical attention as required.
1.3.1 – 1.3.13	Contaminated Media Inhalation	Opening drums, tanks, wells; vapors for non-aqueous phase liquids or other contaminated site media; dust inhalation during excavation; vapor accumulation in excavation	Follow air monitoring plan; have quick access to respirator, do not move or open unlabeled drums found at the site, maintain safe distance from construction activities	See Table 2, seek medical attention as required
1.3.1 – 1.3.13	Lifting	Improper lifting/carrying of equipment and materials causing strains	Follow safe lifting techniques; Langan employees are not to carry contractor equipment or materials	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 – 1.3.13	Slips, trips, and falls	Slips, trips and falls due to uneven surfaces, cords, steep slopes, debris and equipment in work areas	Good housekeeping at site; constant awareness and focus on the task; avoid climbing on stockpiles; maintain safe distance from construction activities and excavations; avoid elevated areas over six feet unless fully accredited in fall protection and wearing an approved fall protection safety apparatus	Rest, ice, compression, elevation; seek medical attention as required
1.3.1 – 1.3.13	Noise	Excavation equipment, hand tools, drilling equipment.	Wear hearing protection; maintain safe distance from construction activities	Seek medical attention as required
1.3.1 – 1.3.13	Falling objects	Soil material, tools, etc. dropping from drill rigs, front-end loaders, etc.	Hard hats to be worn at all times while in work zones; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 – 1.3.13	Underground/ overhead utilities	Excavation equipment, drill rig auger makes contact with underground object; boom touches overhead utility	"One Call" before dig; follow safe practices; confirm utility locations with contractor; wear proper PPE; maintain safe distance from construction activities and excavations	Seek medical attention as required
1.3.1 – 1.3.13	Insects (bees, wasps, hornet, mosquitoes, and spider)	Sings, bites	Insect Repellent; wear proper protective clothing (work boots, socks and light colored pants);field personnel who may have insect allergies (e.g., bee sting) should provide this information to the HSO or FSO prior to commencing work, and will have allergy medication on Site.	Seek medical attention as required
1.3.1 – 1.3.13	Vehicle traffic / Heavy Equipment Operation	Vehicles unable to see workers on site, operation of heavy equipment in tight spaces, equipment failure, malfunctioning alarms	Wear proper PPE, especially visibility vest; use a buddy system to look for traffic; rope off area of work with cones and caution tape or devices at points of hazard, maintain safe distance from construction activities and equipment	Seek medical attention as required

TABLE 2
CONTAMINANT HAZARDS OF CONCERN

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	1,2,4-Trimethylbenzene	95-63-6	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	1,3,5-Trimethylbenzene Mesitylene sym-Trimethylbenzene	108-67-8	PID	None None	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	1,2-Dichlorobenzene	95-50-1	PID	50 ppm 200 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eye, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	p-Dichlorobenzene p-DCB 1,4-Dichlorobenzene para-Dichlorobenzene Dichlorocide	106-46-7	PID	75 ppm 150 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	1,3-Dichlorobenzene 1,3-Dichlorobenzene; m-Dichlorobenzol; m-Phenylene dichloride	541-73-1	PID	None None	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately4
1.3.1 – 1.3.13	Acenaphthene 1,2-Dihydroacenaphthylene 1,8-Ethylenenaphthalene peri-Ethylenenaphthalene Naphthyleneethylene Tricyclododecapentaene	83-32-9	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact,	irritation to the skin, eyes, mucous membranes and upper respiratory tract; If ingested, it can cause vomiting	Eye: Irrigate immediately Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Acenaphthylene Cycopental(de)naphthalene, Acenaphthalene	208-96-8	PID	NA NA	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the skin, eyes, mucous membranes and upper respiratory tract	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, if redness or irritation develop, seek medical attention immediately Breathing: Move to fresh air Swallow: do not induce vomiting, seek medical attention immediately
1.3.1 – 1.3.13	Acetone Dimethyl ketone Ketone propane 2-Propanone	67-64-1	PID	1000 ppm 2500 ppm	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Aldrin 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-endo-1,4-exo-5,8-dimethanonaphthalene HHDN Octalene	309-00-2	PID	0.25 ppm 5 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort); myoclonic jerks of limbs; clonic, tonic convulsions; coma; hematuria (blood in the urine), azotemia; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Anthracene	120-12-7	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to the skin, eyes, mucous membranes and upper respiratory tract, abdominal pain if ingested.	Eye: Irrigate immediately, seek medical attention immediately, Skin: Soap wash immediately, Breathing: Move to fresh air, refer to medical attention; Swallow: refer to medical attention
1.3.1 – 1.3.13	Benzene Benzol Phenyl hydride	71-43-2	PID	3.19 mg/m^3 1,595 mg/mg^3	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; lassitude (weakness, exhaustion) [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Benzo(a)anthracene Benzanthracene Benzanthrene 1,2-Benzanthracene Benzo[b]phenanthrene Tetraphene	56-55-3	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Benzo(a)pyrene	50-32-8	PID	0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	dermatitis, bronchitis, [potential occupational carcinogen]	Eye: Irrigate immediately, seek medical attention Skin: Soap wash immediately; Breathing: move to fresh air; Swallow: Induce vomiting if conscious, seek medical attention immediately
1.3.1 – 1.3.13	Benzo(k)fluoranthene	207-08-9	PID	0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation (dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.13	Chrysene Benzo[a]phenanthrene 1,2-Benzphenanthrene	218-01-9	PID	0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eye, skin, and respiratory, gastrointestinal irritation nausea, vomit, diarrhea [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	1,2-Dichloroethylene 1,2-DCE cis-1,2-Dichloroethylene mixture of cis and trans Acetylene dichloride cis-Acetylene dichloride trans-Acetylene dichloride sym-Dichloroethylene cis- 1,2-Dichloroethene Trans-1,2-Dichloroethylene, tDCE cDCE cis-1,2-Dichloroethene	540-59-0	PID	200 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, respiratory system; central nervous system depression	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	m-Cresol 3-methylphenol meta-Cresol 3-Cresol m-Cresylic acid 1-Hydroxy-3-methylbenzene 3-Hydroxytoluene 3-Methylphenol	108-39-4	PID	5 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irreg rapid resp, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	p-Cresol para-Cresol 4-Cresol p-Cresylic acid 1-Hydroxy-4-methylbenzene 4-Hydroxytoluene 4-Methylphenol	106-44-5	PID	5 ppm 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; central nervous system effects: confusion, depression, resp failure; dyspnea (breathing difficulty), irreg rapid resp, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Dibenzo(a,h)anthracene	53-70-3	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, absorption, ingestion, consumption	irritation to eyes, skin, respiratory, and digestion [potential occupational carcinogen]	Eyes: Irrigate immediately Skin: Soap wash promptly. Breath: Respiratory support PID Swallow: Medical attention immediately
1.3.1 – 1.3.13	Bis(2-ethylhexyl)phthalate Di-sec octyl phthalate DEHP Di(2-ethylhexyl)phthalate Octyl phthalate	117-81-7	None	5 mg/m^3 5000 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen	Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	DDT 4,4-DDT p,p'-DDT Dichlorodiphenyltrichloroethane 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane	50-29-3	None	1 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	DDE 4,4-DDE 1,1-bis-(4-chlorophenyl)-2,2-dichloroethene Dichlorodiphenyldichloroethylene	72-55-9	None	NA NA	Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	Oral ingestion of food is the primary source of exposure for the general population. Acute and chronic ingestion may cause nausea, vomiting, diarrhea, stomach pain, headache, dizziness, disorientation, tingling sensation, kidney damage, liver damage, convulsions, coma, and death. 4,4' DDE may cross the placenta and can be excreted in breast milk	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Ethyl benzene Ethylbenzene Ethylbenzol Phenylethane	100-40-4	PID	435 mg/m^3 3,472 mg/m^3	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Fluoranthene Benzo(j, k)fluorene	206-44-0	PID	0.2 mg/m^3 80 mg/m^3 (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Fluorene	86-73-7	PID	0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar)	Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.13	Hexachloroethane Carbon hexachloride Ethane hexachloride Perchloroethane	67-72-1	PID	1 ppm\ 300 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; In Animals: kidney damage; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Methyl *tert*-butyl ether MTBE Methyl tertiary-butyl ether Methyl t-butyl ether tert-Butyl methyl ether tBME tert-BuOMe	1634-04-4	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Methylene Chloride Dichloromethane Methylene dichloride	75-09-2	PID	25 ppm 2300 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Naphthalene Naphthalin Tar camphor White tar	91-20-3	PID	50 mg/m^3 250 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; hematuria (blood in the urine); dermatitis, optical neuritis	Eye: Irrigate immediately Skin: Molten flush immediately/solid-liquid soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	n-Butylbenzene	104-51-8	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	n-Propylbenzene Isocumene Propylbenzene 1-Phenylpropane 1-Propylbenzene Phenylpropane	103-65-1	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormal cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury	Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Phenanthrene	85-01-8	PID	0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately
1.3.1 – 1.3.13	Pyrene benzo[def]phenanthrene	129-00-0	PID	0.2 mg/m³ 80 mg/m³ (Coal Pitch Tar)	Groundwater Soil	inhalation, skin or eye contact, ingestion	irritation to eyes and skin, respiratory irritation(dizziness, weakness, fatigue, nausea, headache)	Eye: Irrigate immediately, refer to medical attention Skin: Soap wash immediately Breathing: move to fresh air Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	1,1′-Biphenyl, Biphenyl, Phenyl benzene Diphenyl	92-52-4	None	1 mg/m^3 100 mg/m^3	Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, throat; headache, nausea, lassitude (weakness, exhaustion), numb limbs; liver damage	Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	sec-Butylbenzene	135-98-8	PID	10 ppm 100 ppm	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose, throat; inhalation: nausea or vomiting	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Toluene Methyl benzene Methyl benzol Phenyl methane Toluol	108-88-3	PID	200 ppm 500 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, paresthesia; dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Trichloroethylene Ethylene trichloride TCE Trichloroethene Trilene	79-01-6	PID	100 ppm 1000 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Vinyl Chloride Chloroethene Chloroethylen Ethylene monochloride Monochloroethene Monochloroethylene VC Vinyl chloride monomer (VCM)	75-01-4	PID	1 ppm NA	Groundwater Soil Vapor	inhalation, skin and/or eye contact (liquid)	lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Eye: Frostbite Skin: Frostbite Breathing: Respiratory support
1.3.1 – 1.3.13	Total PCBs Chlorodiphenyl (42% chlorine) Aroclor® 1242 PCB Polychlorinated biphenyl	53469-21-9	None	0.5 mg/m³ 5 mg/m³	Groundwater Soil	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, chloracne	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Total Xylenes Dimethylbenzene Xylol	1330-20-7	PID	100 ppm 900 ppm	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Gasoline	8006-61-9	PID	NA NA	Groundwater Soil Vapor	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Fuel Oil No. 2	68476-30-2	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Diesel Fuel automotive diesel fuel oil No. 2 distillate diesoline diesel oil diesel oil light diesel oil No. 1-D summer diesel	68334-30-5	PID	NA NA	Groundwater Soil Vapor	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Arsenic	NA	None	0.5 mg/m³ NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation skin, possible dermatitis; resp distress; diarrhea; muscle tremor, convulsions; possible gastrointestinal tract	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Chromium Hexavalent- Trivalent-	7440-47-3	None	1.0 mg/m³ 250 mg/m³	Groundwater Soil	inhalation absorption ingestion	irritation to eye, skin, and respiratory	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Copper	7440-50-8	None	1.0 mg/m³ 100 mg/m³	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, nose, metallic taste; dermatitis; anemia	Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Iron	7439-89-6	None	10 mg/m³ NA	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting	Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Lead	7439-92-1	None	0.050 mg/m^3 100 mg/m^3	Groundwater Soil	inhalation, ingestion, skin and/or eye contact	lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation to the eyes; hypertension	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Manganese	7439-96-5	None	5 mg/m^3 500 mg/m^3	Groundwater Soil	inhalation, ingestion	aerosol is irritating to the respiratory tract	Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Magnesium	7439-95-4	None	15 mg/m^3 NA	Soil	inhalation, skin and/or eye contact	irritation to the eyes, skin, respiratory system; cough	Eye: Irrigate immediately Breathing: Fresh air
1.3.1 – 1.3.13	Nickel	7440-02-0	None	NA 10 mg/m^3	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Selenium	7782-49-2	None	1 mg/m³ 0.2 mg/m³	Soil	inhalation, ingestion, skin and/or eye contact	irritation to the eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Sodium	7440-23-5	None	NA NA	Groundwater Soil	ion, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately
1.3.1 – 1.3.13	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Methane Hydrogen Sulfide Carbon Monoxide Nitrogen	 7782-44-7 74-82-8 7783-08-4 830-08-0 7727-37-9	Multi-Gas PID	 NA/NA NA/NA 10/100 ppm 50/1200 ppm NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.13	Helium	7440-59-7	Helium Detector	NA NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support
1.3.1 – 1.3.13	Potassium hydrogen phthalate	877-24-7	NA	NA NA	NA	skin absorption, ingestion, skin and/or eye contact	nausea, diarrhea, abdominal pain, vomiting;	Skin: Water flush promptly Swallow: Medical attention immediately

Task	Contaminant	CAS Number	Monitoring Device	PEL/ IDLH	Source of Concentration on Site	Route of Exposure	Symptoms	First Aid
1.3.1 – 1.3.13	Non-Flammable Gas Mixture CALGAS (Equipment Calibration Gas : Oxygen Isobutylene Nitrogen	 7782-44-7 115-11-7 7727-37-9	PID	 NA/NA NA/NA NA/NA	NA	inhalation	dizziness, headache, and nausea	Breathing: Respiratory support

EXPLANATION OF ABBREVIATIONS

PID = Photoionization Detector
PEL = Permissible Exposure Limit (8-hour Time Weighted Average
IDLH = Immediately Dangerous to Life and Health
ppm = part per million
mg/m^3 = milligrams per cubic meter
500 mg/m3

TABLE 3
Summary of Monitoring Equipment

Instrument	Operation Parameters
Photoionization Detector (PID)	**Hazard Monitored:** Many organic and some inorganic gases and vapors. **Application:** Detects total concentration of many organic and some inorganic gases and vapors. Some identification of compounds is possible if more than one probe is measured. **Detection Method:** Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions. **General Care/Maintenance:** Recharge or replace battery. Regularly clean lamp window. Regularly clean and maintain the instrument and accessories. **Typical Operating Time:** 10 hours. 5 hours with strip chart recorder.
Oxygen Meter	**Hazard Monitored:** Oxygen (O_2). **Application:** Measures the percentage of O_2 in the air. **Detection Method:** Uses an electrochemical sensor to measure the partial pressure of O_2 in the air, and converts the reading to O_2 concentration. **General Care/Maintenance:** Replace detector cell according to manufacturer's recommendations. Recharge or replace batteries prior to explanation of the specified interval. If the ambient air is less than 0.5% CO_2, replace the detector cell frequently. **Typical Operating Time:** 8 – 12 hours.
Additional equipment (if needed, based on site conditions)	
Combustible Gas Indicator (CGI)	**Hazard Monitored:** Combustible gases and vapors. **Application:** Measures the concentration of combustible gas or vapor. **Detection Method:** A filament, usually made of platinum, is heated by burning the combustible gas or vapor. The increase in heat is measured. Gases and vapors are ionized in a flame. A current is produced in proportion to the number of carbon atoms present. **General Care/Maintenance:** Recharge or replace battery. Calibrate immediately before use. **Typical Operating Time:** Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.
Flame Ionization Detector (FID) with Gas Chromatography Option *(i.e., Foxboro Organic Vapor Analyzer (OVA))*	**Hazard Monitored:** Many organic gases and vapors (approved areas only). **Application:** In survey mode, detects the concentration of many organic gases and vapors. In gas chromatography (GC) mode, identifies and measures specific compounds. In survey mode, all the organic compounds are ionized and detected at the same time. In GC mode, volatile species are separated. **General Care/Maintenance:** Recharge or replace battery. Monitor fuel and/or combustion air supply gauges. Perform routine maintenance as described in the manual. Check for leaks. **Typical Operating Time:** 8 hours; 3 hours with strip chart recorder.

Instrument	Operation Parameters
Potable Infrared (IR) Spectrophotometer	**Hazard Monitored:** Many gases and vapors. **Application:** Measures concentration of many gases and vapors in air. Designed to quantify one or two component mixtures. **Detection Method:** Passes different frequencies of IR through the sample. The frequencies absorbed are specific for each compound. **General Care/Maintenance:** As specified by the manufacturer.
Direct Reading Colorimetric Indicator Tube	**Hazard Monitored:** Specific gas and vapors. **Application:** Measures concentration of specific gases and vapors. **Detection Method:** The compound reacts with the indicator chemical in the tube, producing a stain whose length or color change is proportional to the compound's concentration. **General Care/Maintenance:** Do not use a previously opened tube even if the indicator chemical is not stained. Check pump for leaks before and after use. Refrigerate before use to maintain a shelf life of about 2 years. Check expiration dates of tubes. Calibrate pump volume at least quarterly. Avoid rough handling which may cause channeling.
Aerosol Monitor	**Hazard Monitored:** Airborne particulate (dust, mist, fume) concentrations **Application:** Measures total concentration of semi-volatile organic compounds, PCBs, and metals. **Detection Method:** Based on light-scattering properties of particulate matter. Using an internal pump, air sample is drawn into the sensing volume where near infrared light scattering is used to detect particles. **General Care/Maintenance:** As specified by the mfr. Also, the instrument must be calibrated with particulates of a size and refractive index similar to those to be measured in the ambient air.
Monitox	**Hazard Monitored:** Gases and vapors. **Application:** Measures specific gases and vapors. **Detection Method:** Electrochemical sensor relatively specific for the chemical species in question. **General Care/Maintenance:** Moisten sponge before use; check the function switch; change the battery when needed.
Gamma Radiation Survey Instrument	**Hazard Monitored:** Gamma Radiation. **Application:** Environmental radiation monitor. **Detection Method:** Scintillation detector. **General Care/Maintenance:** Must be calibrated annually at a specialized facility. **Typical Operating Time:** Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

TABLE 4
INSTRUMENTATION ACTION LEVELS

Photoionization Detector Action Levels	**Action Required**
Background to 5 ppm	No respirator; no further action required
> 1 ppm but < 5 ppm for > 5 minutes	1. Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., by slowing drilling or excavation activities), contact HSO to review conditions and determine source and appropriate response action. 2. If PID readings remain above 1 ppm, temporarily discontinue work and upgrade to Level C protection. 3. If sustained PID readings fall below 1 ppm, downgrading to Level D protection may be permitted.
> 5 ppm but < 150 ppm for > 5 minutes	1. Discontinue all work; all workers shall move to an area upwind of the jobsite. 2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm. 3. Level C protection will continue to be used until PID readings fall below 1 ppm.
> 150 ppm	Evacuate the work area

Notes:
1. 1 ppm level based on OSHA Permissible Exposure Limit (PEL) for benzene.
2. 5 ppm level based on OSHA Short Term Exposure Limit (STEL) maximum exposure for benzene for any 15 minute period.
3. 150 ppm level based on NIOSH Immediately Dangerous to Life and Health (IDLH) for tetrachloroethylene.

TABLE 5
EMERGENCY NOTIFICATION LIST

ORGANIZATION	CONTACT	TELEPHONE
Local Police Department	NYPD	911
Local Fire Department	NYFD	911
Ambulance/Rescue Squad	NYFD	911
Hospital	Brooklyn Hospital Center	911 or 718-250-8000
Langan Incident / Injury Hotline		800-952-6426 ex 4699
Langan Project Manager	Gerald Nicholls	609-933-5330 (cell)
Langan Health and Safety Manager (HSM)	Tony Moffa	215-756-2523 (cell)
Langan Health & Safety Officer (HSO)	William Bohrer	410-984-3068 (cell)
Langan Field Team Leader (FTL)	To Be Determined	
Client's Representative	Chris Hunter	201-414-0717 (cell)
National Response Center (NRC)		800-424-8802
Chemical Transportation Emergency Center (Chemtrec)		800-424-9300
Center for Disease Control (CDC)		404-639-3534
EPA (RCRA Superfund Hotline)		800-424-9346
TSCA Hotline		202-554-1404
Poison Control Center		800-222-1222

Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan Incident/Injury Hotline at 1-(800)-9-LANGAN (ext. #4699).

TABLE 6
SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING
FOR FIT AND ACCLIMATED WORKERS[A]

Adjusted Temperature[b]	Normal Work Ensemble[c]	Impermeable Ensemble
90°F or above (32.2°C) or above	After each 45 min. of work	After each 15 min. of work
87.5°F (30.8°-32.2°C)	After each 60 min. of work	After each 30 min. of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 min. of work	After each 60 min. of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 min. of work	After each 90 min. of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 min. of work	After each 120 min. of work

a. For work levels of 250 kilocalories/hour.
b. Calculate the adjusted air temperature (ta adj) by using this equation: ta adj oF = ta oF + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)
c. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

TABLE 7

HEAT INDEX

	ENVIRONMENTAL TEMPERATURE (Fahrenheit)										
	70	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**	**120**
RELATIVE HUMIDITY	**APPARENT TEMPERATURE***										
0%	64	69	73	78	83	87	91	95	99	103	107
10%	65	70	75	80	85	90	95	100	105	111	116
20%	66	72	77	82	87	93	99	105	112	120	**130**
30%	67	73	78	84	90	96	104	113	123	**135**	**148**
40%	68	74	79	86	93	101	110	123	**137**	**151**	
50%	69	75	81	88	96	107	120	**135**	**150**		
60%	70	76	82	90	100	114	**132**	**149**			
70%	70	77	85	93	106	124	**144**				
80%	71	78	86	97	113	**136**					
90%	71	79	88	102	122						
100%	72	80	91	108							

*Combined Index of Heat and Humidity...what it "feels like" to the body
Source: National Oceanic and Atmospheric Administration

How to use Heat Index:
1. Across top locate Environmental Temperature
2. Down left side locate Relative Humidity
3. Follow across and down to find Apparent Temperature
4. Determine Heat Stress Risk on chart at right

Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

Apparent Temperature	**Heat Stress Risk with Physical Activity and/or Prolonged Exposure**
90-105	Heat Cramps or Heat Exhaustion Possible
105-130	Heat Cramps or Heat Exhaustion Likely, Heat Stroke Possible
>130	Heatstroke Highly Likely

FIGURES

FIGURE 1

Site Location Map

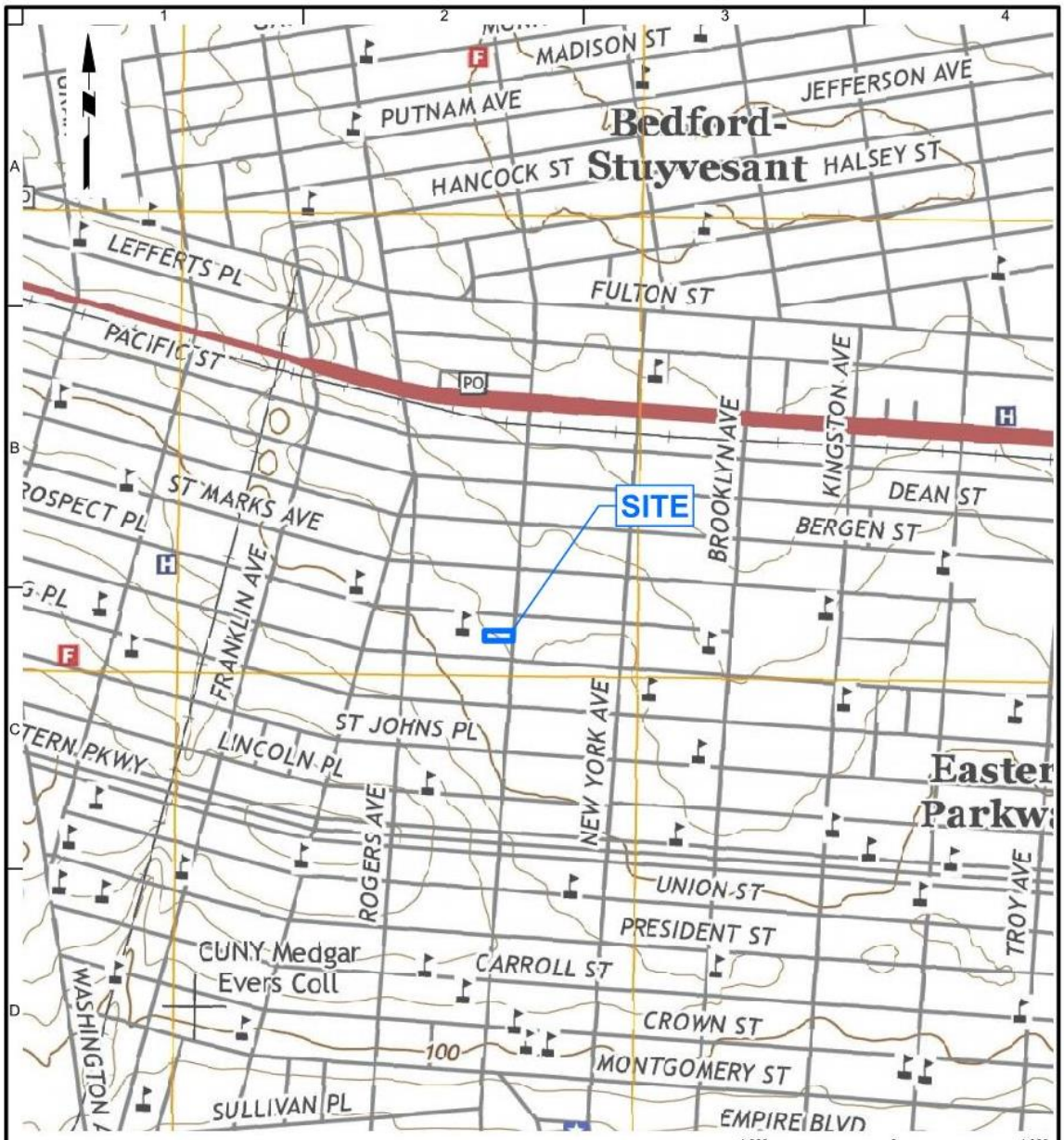


FIGURE 2

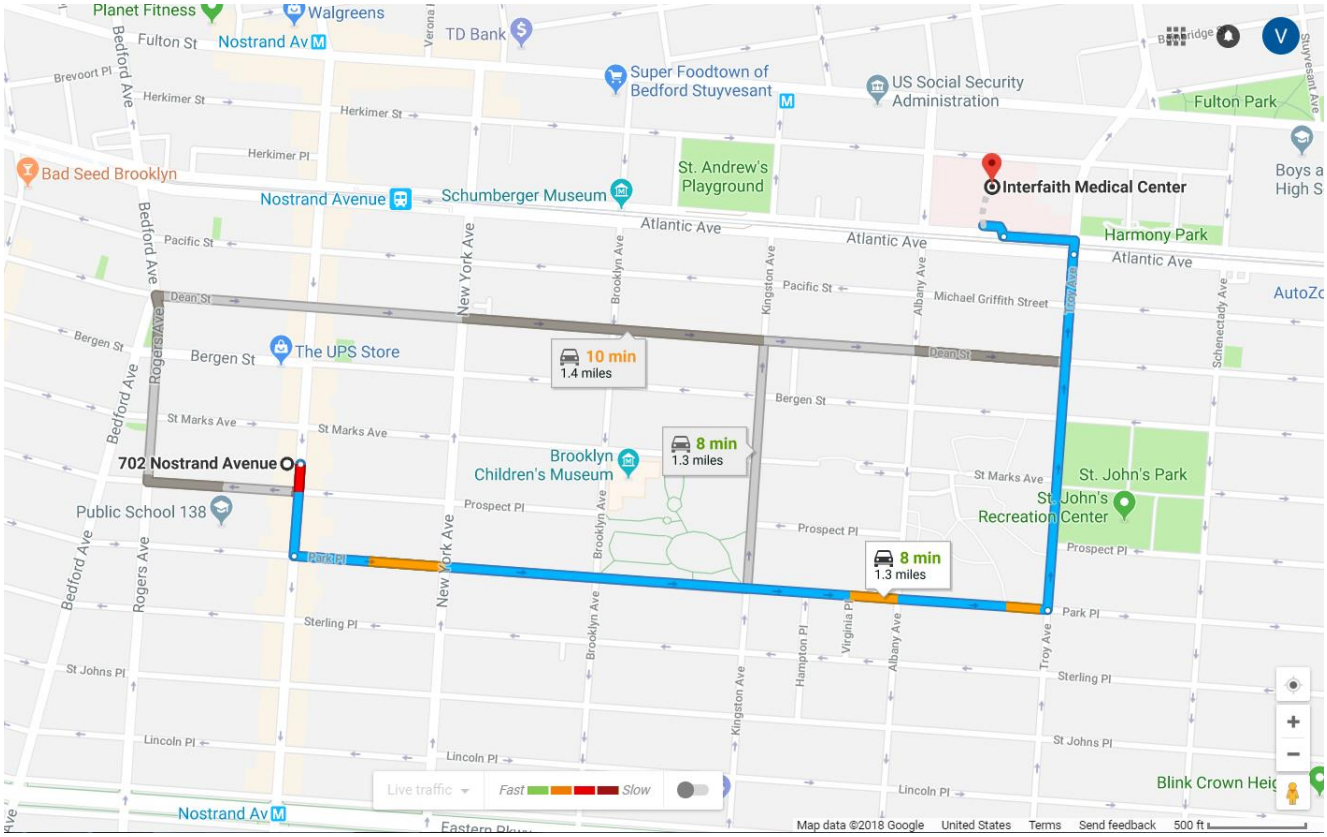
HOSPITAL ROUTE PLAN

Hospital Location: **Brooklyn Hospital Center**
121 DeKalb Avenue
New York, NY
718-250-8000

START: 702 Nostrand Avenue, Brooklyn, New York

1. Head south on Nostrand Avenue towards Prospect Place
2. Turn left at the 2nd cross street onto Park Place
3. Turn left onto Troy Avenue
4. Turn left onto Atlantic Avenue, destination will be on the right

END: Interfaith Medical Center, 1545 Atlantic Avenue, Brooklyn, NY



ATTACHMENT A

MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEETS

All Langan Field Personnel Completing This Work Plan Are To Have Real Time Accessibility To Material Safety Data Sheet (MSDs) or Safety Data Sheet (SDSs) Through Their Smart Phone.

The link is http://www.msds.com/
The login name is "drapehead"
The password is "2angan987"

If You Are Unable To Use the Smart Phone App, You Are To Bring Printed Copies of the MSDs/SDSs to the Site

ATTACHMENT B

JOB SAFETY ANALYSIS FORM

LANGAN	Job Safety Analysis (JSA) Health and Safety
JSA TITLE: **JSA NUMBER:**	**DATE CREATED:** **CREATED BY**: **REVISION DATE:** **REVISED BY:**
Langan employees must review and revise the Job Safety Analysis (JSA) as needed to address the any site specific hazards not identified. Employees must provide their signatures on the last page of the JSA indicating they have review the JSA and are aware the potential hazards associated with this work and will follow the provided preventive or corrective measures.	

PERSONAL PROTECTIVE EQUIPMENT REQUIRED: (PPE): ■ Required ☒ As Needed		
☐ Steel-toed boots	☐ Nitrile gloves	☐ Dermal Protection (Specify)
☐ Long-sleeved shirt	☐ Leather/ Cut-resistant gloves	☐ High visibility vest/clothing
☐ Safety glasses	☐Face Shield	☐ Hard hat
ADDITIONAL PERSONAL PROTECTIVE EQUIPMENT NEEDED (Provide specific type(s) or descriptions)		
☐ Air Monitoring:	☐ Respirators:	☐ Other:

JOB STEPS	POTENTIAL HAZARDS	PREVENTATIVE OR CORRECTIVE ACTION
1.	1. 2.	1a. 1b. 2a. 2b.
2.	1.	1
Additional items identified in the field.		
Additional Items.		

If additional items are identified during daily work activities, please notify all relevant personnel about the change and document on this JSA.

ATTACHMENT C

TAILGATE SAFETY BRIEFING FORM

LANGAN TAILGATE SAFETY BRIEFING

Date:_____ Time: _____

Leader:_____ Location:_____

Work Task: _____

SAFETY TOPICS (*provide detail on discussion points*)

Chemical Exposure Hazards and Control:_____

_____

Physical Hazards and Control: _____

Air Monitoring: _____

PPE: _____

Communications:_____

Safe Work Practices: _____

_____

Emergency Response: _____

Hospital/Medical Center Location: _____

Phone Nos.: _____

Other: _____

FOR FOLLOW-UP (the issues, responsibilities, due dates, etc.**)**

_____

_____

_____

ATTENDEES

PRINT NAME	COMPANY	SIGNATURE

ATTACHMENT D

CALIBRATION LOG

DATE:________________ PROJECT:____________________

CALIBRATION LOG

Date & Time	Inst Type	Inst #	Media	Initial Reading	Span #	Calibrat. Reading	Performed By:

ATTACHMENT E

STANDING ORDERS

STANDING ORDERS

GENERAL

- No smoking, eating, or drinking in this work zone.
- Upon leaving the work zone, personnel will thoroughly wash their hands and face.
- Minimize contact with contaminated materials through proper planning of work areas and decontamination areas, and by following proper procedures. Do not place equipment on the ground. Do not sit on contaminated materials.
- No open flames in the work zone.
- Only properly trained and equipped personnel are permitted to work in potentially contaminated areas.
- Always use the appropriate level of personal protective equipment (PPE).
- Maintain close contact with your buddy in the work zone
- Contaminated material will be contained in the Exclusion Zone (EZ).
- Report any unusual conditions.
- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible.
- The number of personnel and equipment in the work zone will be kept to an essential minimum.
- Be alert to the symptoms of fatigue and heat/cold stress, and their effects on the normal caution and judgment of personnel.
- Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved quickly by the site HSO.

TOOLS AND HEAVY EQUIPMENT

- Do not, under any circumstances, enter or ride in or on any backhoe bucket, materials hoist, or any other device not specifically designed to carrying passengers.
- Loose-fitting clothing or loose long hair is prohibited around moving machinery.
- Ensure that heavy equipment operators and all other personnel in the work zone are using the same hand signals to communicate.
- Drilling/excavating within 10 feet in any direction of overhead power lines is prohibited.
- The locations of all underground utilities must be identified and marked out prior to initiating any subsurface activities.
- Check to insure that the equipment operator has lowered all blades and buckets to the ground before shutting off the vehicle.
- If the equipment has an emergency stop device, have the operator show all personnel its location and how to activate it.
- Help the operator ensure adequate clearances when the equipment must negotiate in tight quarters; serve as a signalman to direct backing as necessary.
- Ensure that all heavy equipment that is used in the Exclusion Zone is kept in that zone until the job is done, and that such equipment is completely decontaminated before moving it into the clean area of the work zone.
- Samplers must not reach into or get near rotating equipment such as the drill rig. If personnel must work near any tools that could rotate, the equipment operator must completely shut down the rig prior to initiating such work. It may be necessary to use a remote sampling device.

ATTACHMENT F

JOBSITE SAFETY INSPECTION CHECKLIST

Jobsite Safety Inspection Checklist

Date: _____ **Inspected By:** _____

Location: _____ **Project #:** _____

Check one of the following: **A:** Acceptable **NA**: Not Applicable **D**: Deficiency

	A	NA	D	Remark
1. HASP available onsite for inspection?				
2. Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and contractors?				
3. Hospital route map with directions posted on site?				
4. Emergency Notification List posted on site?				
5. First Aid kit available and properly stocked?				
6. Personnel trained in CPR/First Aid on site?				
7. MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed?				
8 Appropriate PPE being worn by Langan employees and contractors?				
9. Project site safe practices ("Standing Orders") posted?				
10. Project staff have 40-hr./8-hr./Supervisor HAZWOPER training?				
11. Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed?				
12. Respiratory protection readily available?				
13. Health & Safety Incident Report forms available?				
14. Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet?				
15. Air monitoring readings recorded on the air monitoring data sheet/field log book?				
16. Subcontract workers have received 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate?				
17. Subcontract workers medically cleared to work on site, and fit-tested for respirator wear?				
18. Subcontract workers have respirators readily available?				
19. Mark outs of underground utilities done prior to initiating any subsurface activities?				
20. Decontamination procedures being followed as outlined in HASP?				
21. Are tools in good condition and properly used?				
22. Drilling performed in areas free from underground objects including utilities?				

	A	NA	D	Remark
23. Adequate size/type fire extinguisher supplied?				
24. Equipment at least 20 feet from overhead power lines?				
25. Evidence that drilling operator is responsible for the safety of his rig.				
26. Trench sides shored, layer back, or boxed?				
27. Underground utilities located and authorities contacted before digging?				
28. Ladders in trench (25-foot spacing)?				
29. Excavated material placed more than 2 feet away from excavation edge?				
30. Public protected from exposure to open excavation?				
31. People entering the excavation regarding it as a permit-required confined space and following appropriate procedures?				
32. Confined space entry permit is completed and posted?				
33. All persons knowledgeable about the conditions and characteristics of the confined space?				
34. All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)?				
35. Full body harnesses, lifelines, and hoisting apparatus available for rescue needs?				
36. Attendant and/or supervisor certified in basic first aid and CPR?				
37. Confined space atmosphere checked before entry and continuously while the work is going on?				
38. Results of confined space atmosphere testing recorded?				
39. Evidence of coordination with off-site rescue services to perform entry rescue, if needed?				
40. Are extension cords rated for this work being used and are they properly maintained?				
41. Are GFCIs provided and being used?				

Unsafe Acts:

Notes:

ATTACHMENT G

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION

LEVEL C DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask Change	4. If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	Face piece Removal	6. Face piece is removed (avoid touching face with fingers). Face piece deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL D DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Boot, Gloves and Outer Garment Removal	4. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 5:	Field Wash	5. Hands and face are thoroughly washed. Shower as soon as possible.

EQUIPMENT DECONTAMINATION

GENERAL:

Equipment to be decontaminated during the project may include tools, monitoring equipment, respirators, sampling containers, laboratory equipment and drilling equipment.

All decontamination will be done by personnel in protective gear, appropriate for the level of decontamination, as determined by the site HSO. The decontamination work tasks will be split or rotated among support and work crews.

Depending on site conditions, backhoe and pumps may be decontaminated over a portable decontamination pad to contain wash water; or, wash water may be allowed to run off into a storm sewer system. Equipment needed may include a steam generator with high-pressure water, empty drums, screens, screen support structures, and shovels. Drums will be used to hold contaminated wash water pumped from the lined pit. These drums will be labeled as such.

Miscellaneous tools and equipment will be dropped into a plastic pail, tub, or other container. They will be brushed off and rinsed with a detergent solution, and finally rinsed with clean water.

MONITORING EQUIPMENT:

Monitoring equipment will be protected as much as possible from contamination by draping, masking, or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The PID, HNu or OVA meter, for example, can be placed in a clear plastic bag, which allows reading of the scale and operation of knobs. The probes can be partially wrapped keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe.

RESPIRATORS:

Respirators will be cleaned and disinfected after every use. Taken from the drop area, the masks (with the cartridges removed and disposed of with other used disposable gear) will be immersed in a cleaning solution and scrubbed gently with a soft brush, followed by a rinse in plain warm water, and then allowed to air dry. In the morning, new cartridges will be installed. Personnel will inspect their own masks for serviceability prior to donning them. And, once the mask is on, the wearer will check the respirator for leakage using the negative and positive pressure fit check techniques.

ATTACHMENT H

EMPLOYEE EXPOSURE/
INJURY INCIDENT REPORT

EMPLOYEE INCIDENT/INJURY REPORT
LANGAN ENGINEERING & ENVIRONMENTAL SERVICES

(Complete and return to Tony Moffa in the Doylestown Office)

Affected Employee Name: _____ Date: _____

Incident type: ☐ Injury ☐ Report Only/No Injury
☐ Near Miss ☐ Other: _____

EMPLOYEE INFORMATION (Person completing Form)

Employee Name: _____ Employee No: _____

Title: _____ Office Location: _____

Length of time employed or date of hire: _____

Mailing address: _____

_____

Sex: M ☐ F ☐ Birth date: _____

Business phone & extension: _____ Residence/cell phone: _____

ACCIDENT INFORMATION

Project: _____ Project #: _____

Date & time of incident: _____ Time work started & ended: _____

Site location: _____

Incident Type: Possible Exposure ☐ Exposure ☐ Physical Injury ☐

Names of person(s) who witnessed the incident: _____

_____

Exact location incident occurred: _____

_____

Describe work being done: _____

_____

Describe what affected employee was doing prior to the incident occurring: _____

Describe in detail how the incident occurred: _____

Nature of the incident (List the parts of the body affected): _____

Person(s) to whom incident was reported (Time and Date): _____

List the names of other persons affected during this incident: _____

Possible causes of the incident (equipment, unsafe work practices, lack of PPE, etc.): _____

Weather conditions during incident: _____

MEDICAL CARE INFORMATION

Did affected employee receive medical care? Yes ☐ No ☐

If Yes, when and where was medical care received: _____

Provide name of facility (hospital, clinic, etc.): _____

Length of stay at the facility? _____

Did the employee miss any work time? Yes ☐ No ☐ Undetermined ☐

Date employee last worked: _____ Date employee returned to work: _____

Has the employee returned to work? Yes ☐ No ☐

Does the employee have any work limitations or restrictions from the injury? : Yes ☐ No ☐

If Yes, please describe: _____

_____

Did the exposure/injury result in permanent disability? Yes ☐ No ☐ Unknown ☐

If Yes, please describe: _____

HEALTH & SAFETY INFORMATION

Was the operation being conducted under an established site specific CONSTRUCTION HEALTH AND SAFETY PLAN?
Yes ☐ No ☐ Not Applicable: ☐

Describe protective equipment and clothing used by the employee:

_____

_____

_____

Did any limitations in safety equipment or protective clothing contribute to or affect exposure / injury? If so, explain:

_____

_____

_____

_____ _____

Employee Signature Date

_____ _____

Langan Representative Date

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

702 NOSTRAND AVENUE
Brooklyn, New York
NYSDEC BCP Site No. C224270

Prepared For:

702 Nostrand Ave, LLC
MC Properties Management Company, LLC
11 Park Place Suite 1200
New York, New York 10003

Prepared By:

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001

November 2019
Langan Project No. 170527801

TABLE OF CONTENTS

FIGURES

ATTACHMENTS

1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is for 702 Nostrand Avenue, Brooklyn, New York. The Site is located in the Crown Heights neighborhood of Brooklyn, New York, and is located at New York City Brooklyn Borough Tax Block 1226, Lot 45. The Site encompasses an area of about 1,650 square feet (±0.038 acres) with about 16.5 feet of frontage along Nostrand Avenue. The Site was assigned Site No. C224270 in the Brownfield Cleanup Program (BCP), pursuant to a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) executed on 9 May 2018.

This QAPP specifies analytical methods to be used to ensure that data collected during site management are precise, accurate, representative, comparable, complete, and meet the sensitivity requirements of the project.

1.2 PROJECT OBJECTIVES

Soil vapor and effluent air (from the soil vapor extraction [SVE] system) samples will be collected following on a regular basis as described in the Site Management Plan (SMP). Future building renovations and improvements or new construction requiring the disturbance, excavation, and/or off-site removal of soil or groundwater may warrant the collection and analysis of soil or groundwater samples in accordance with the Excavation Work Plan (EWP) included in Appendix D of the SMP, and NYSDEC Division of Environmental Remediation (DER)-10: Technical Guidance for Site Investigation and Remediation. In addition, soil vapor and/or air sampling may be required as a condition for discontinuation of the SVE system. Accordingly, this QAPP addresses sampling and analytical methods that may be necessary in support of future Site improvements or proposed modifications to the SMP. These objectives have been established in order to meet standards that will protect public health and the environment for the Site.

1.3 SCOPE OF WORK

The specific scope of work covered in this QAPP includes any future intrusive work at the Site that may be conducted beneath the Site cap and any Site activities covered under the SMP. The SMP only requires collection of soil vapor and effluent air samples to evaluate the SVE system; however, the SMP governs future activities relative to the Site which may include soil or groundwater sampling.

2.0 DATA QUALITY OBJECTIVES AND PROCESS

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall objective is to evaluate the performance of the SVE system through the collection of soil vapor and effluent air samples. The sampling program will also provide for collection of soil or groundwater samples as part of a future need for sampling.

The DQO process is an iterative process where various options for implementing a project are explored, dissected, and recombined. The feasibility and costs of various options are estimated, and then the most advantageous option is selected and developed into project work plans that will be implemented.

DQOs for sampling activities are determined by evaluating five factors:

- Data needs and uses: The types of data required and how the data will be used after it is obtained.
- Parameters of Interest: The types of chemical or physical parameters required for the intended use.
- Level of Concern: Levels of constituents, which may require remedial actions or further investigations, based on comparison to Title 6 of the Official Compilation of New York Codes, Rules and Regulations Part 375 NYSDEC Unrestricted Use Soil Cleanup Objectives for soil samples and to the October 2006 (updated in May 2017) New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York Air Guideline Values and Decision Matrices for soil vapor samples.
- Required Analytical Level: The level of data quality, data precision, and QA/QC documentation required for chemical analysis.
- Required Detection Limits: The detection limits necessary based on the above information.

The investigation will be evaluated using the DQO process on an individual, task-specific basis. DQOs and the required level of review will be determined during this process.

3.0 PROJECT ORGANIZATION

Any future remedial activities and investigations will be documented by an environmental consultant of 702 Nostrand Ave, LLC and MC Properties Management Company, LLC. The environmental consultant will also arrange data analysis and reporting tasks. The analytical services will be performed by an Environmental Laboratory Approval Program (ELAP)-certified laboratory. Data validation services will be performed by approved data validation contractor(s).

For the required sampling as stated in the SMP, sampling will be conducted by Langan; the analytical services will be performed by Alpha Analytical, Inc. of Westborough, Massachusetts (NYSDOH ELAP certification number 11148). Data validation services will be performed by Emily Strake of Langan.

Résumés for Langan personnel can be found in Attachment B; key contacts for this project are as follows:

702 Nostrand Ave, LLC:	Leslie Pennypacker Telephone: (718) 709-6352
Langan Project Manager:	Gerald Nicholls, PE, CHMM Telephone: (212) 479-5559
Langan Health & Safety Officer:	Tony Moffa, CHMM Telephone: (215) 491-6500
Langan Quality Assurance Manager:	Mimi Raygorodetsky Telephone: (212) 479-5441
Langan Data Validator:	Emily Strake, CEP Telephone: (215) 491-6526
Laboratory Representative:	Alpha Analytical, Inc. Ben Rao Telephone: (201) 812-2633

4.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION OF DATA

The overall quality assurance objective is to develop and implement procedures for sampling, laboratory analysis, field measurements, and reporting that will provide data of sufficient quality to evaluate the engineering controls on the Site. The sample set, chemical analysis results, and interpretations must be based on data that meet or exceed quality assurance objectives established for the Site. Quality assurance objectives are usually expressed in terms of precision, accuracy or bias, representativeness, completeness, comparability, and sensitivity of analysis. Variances from the quality assurance objectives at any stage of the investigation will result in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data.

4.1 PRECISION

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates. Laboratory precision and sample heterogeneity also contribute to the uncertainty of field duplicate measurements. This uncertainty is taken into account during the data assessment process. The following field duplicate precision criteria will be applied:

Aqueous and Canister Air Samples

- Results greater than 5 times the laboratory reporting limit (RL) must have a relative percent difference (RPD) $\leq 30\%$.
- Results less than 5 times the RL must have an absolute difference $\leq \pm$RL.

Soil Samples

- Results greater than 5 times the laboratory RL must have a RPD $\leq 50\%$.
- Results less than 5 times the RL must have an absolute difference $\leq 2\times \pm$RL.

RLs and method detection limits (MDL) are provided in Attachment A

Laboratory precision is assessed through the analysis of matrix spike/matrix spike duplicates (MS/MSD), laboratory control sample/laboratory control sample duplicates (LCS/LCSD) and subsequent calculation of RPD. For outliers, if additional sample volume is present, the MS/MSD should be reanalyzed and the RPD recomputed. If additional volume is not present, an evaluation will be performed to determine the extent of potential matrix interference.

4.2 ACCURACY

Accuracy is the measurement of the reproducibility of the sampling and analytical methodology. It should be noted that precise data may not be accurate data. For the purpose of this QAPP, bias is defined as the constant or systematic distortion of a measurement process, which manifests itself as a persistent positive or negative deviation from the known or true value. This may be due to (but not limited to) improper sample collection, sample matrix, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.

Accuracy in the field is assessed through the use of field and trip blanks and through compliance to all sample handling, preservation, and holding time requirements. All field and trip blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated field blank will be evaluated against laboratory blanks (preparation or method) and evaluated against field samples collected on the same day to determine potential for bias.

Laboratory accuracy is assessed by evaluating the percent recoveries of MS/MSD samples, LCS/LCSD, surrogate compound recoveries, internal standard area counts, initial and continuing calibrations, and the results of method, initial and continuing calibration blanks. MS/MSD, LCS/LCSD, and surrogate percent recoveries will be compared to either method-specific control limits or laboratory-derived control limits. Sample volume permitting, samples displaying outliers should be reanalyzed. All associated method blanks should be non-detect when analyzed by the laboratory.

4.3 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. This is performed by following applicable standard operating procedures (SOPs) and this QAPP. All field technicians will be given copies of appropriate documents prior to sampling events and are required to read, understand, and follow each document as it pertains to the tasks at hand.

Representativeness in the laboratory is ensured by compliance with nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is performed by following all applicable analytical methods, laboratory-issued SOPs, the laboratory’s Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

4.4 COMPLETENESS

Laboratory completeness is the ratio of total number of samples analyzed and verified as acceptable compared to the number of samples submitted to the fixed-base laboratory for analysis, expressed as a percent. Three measures of completeness are defined:

- Sampling completeness, defined as the number of valid samples collected relative to the number of samples planned for collection;
- Analytical completeness, defined as the number of valid sample measurements relative to the number of valid samples collected; and
- Overall completeness, defined as the number of valid sample measurements relative to the number of samples planned for collection.

Soil, groundwater (contingency) and sub-slab vapor data will meet a 90% completeness criterion. If the criterion is not met, sample results will be evaluated for trends in rejected and unusable data. The effect of unusable data required for a determination of compliance will also be evaluated.

4.5 COMPARABILITY

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the sampling plan is followed and that sampling is performed according to the SOPs or other project-specific procedures. Analytical data will be comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability will be controlled by requiring the use of specific nationally-recognized analytical methods and requiring consistent method performance criteria. Comparability is also dependent on similar quality assurance objectives. Previously collected data will be evaluated to determine whether they may be combined with contemporary data sets.

4.6 SENSITIVITY

Sensitivity is the ability of the instrument or method to detect target analytes at the levels of interest. The project manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection and QC acceptance limits that meet established performance criteria. Concurrently, the project manager will select the level of data assessment to ensure that only data meeting the project DQOs are used in decision-making.

Field equipment will be used that can achieve the required levels of detection for analytical measurements in the field. In addition, the field sampling staff will collect and submit full volumes of samples as required by the laboratory for analysis, whenever possible. Full volume aliquots will help ensure achievement of the required limits of detection and allow for reanalysis if necessary.

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment C. The frequency of associated field blanks, trip blanks and duplicate samples will be based on the recommendations listed in DER-10, and as described in Section 5.3.

Site-specific MS and MSD samples will be prepared and analyzed by the analytical laboratory by spiking an aliquot of submitted sample volume with analytes of interest. An MS/MSD analysis will be analyzed at a rate of 1 out of every 20 samples, or one per analytical batch. MS/MSD samples are only required for soil and groundwater (contingency) samples.

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

Soil and groundwater (contingency) sampling will be conducted in accordance with the established NYSDEC protocols contained in DER-10/Technical Guidance for Site Investigation and Remediation (May 2010). Soil vapor sampling will be conducted in accordance with NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006). The following sections describe procedures to be followed for specific tasks.

5.1 FIELD DOCUMENTATION PROCEDURES

Field documentation procedures will include summarizing field data in field books, filling out applicable Site inspection forms and checklists contained in Appendix H of the SMP, and proper sample labeling. These procedures are described in the following sections.

5.1.1 Field Data and Notes

Field notebooks contain the documentary evidence regarding procedures conducted by field personnel. Hard cover, bound field notebooks will be used because of their compact size, durability, and secure page binding. The pages of the notebook will not be removed.

Entries will be made in waterproof, permanent blue or black ink. No erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark and the change initialed and dated by the team member making the change. Each entry will be dated. Entries will be legible and contain accurate and complete documentation of the individual or sampling team's activities or observations made. The level of detail will be sufficient to explain and reconstruct the activity conducted. Each entry will be signed by the person(s) making the entry.

The following types of information will be provided for each sampling task, as appropriate:

- Project name and number
- Reasons for being on-site or taking the sample(s)
- Date and time of activity
- Sample identification number(s)
- Geographical location of sampling points with references to the Site, other facilities or a map coordinate system; sketches will be made in the field logbook when appropriate
- Physical location of sampling locations such as depth below ground surface

- Description of the method of sampling including procedures followed, equipment used and any departure from the specified procedures
- Description of the sample including physical characteristics, odor, etc.
- Readings obtained from health and safety equipment
- Weather conditions at the time of sampling and previous meteorological events that may affect the representative nature of a sample
- Photographic information including a brief description of what was photographed, the date and time, the compass direction of the picture and the number of the picture on the camera
- Other pertinent observations such as the presence of other persons on the Site, actions by others that may affect performance of site tasks, etc.
- Names of sampling personnel and signature of persons making entries

Field records will also be collected on field data sheets including boring logs, which will be used for geologic and drilling data during soil boring activities. Field data sheets will include the project-specific number and stored in the field project files when not in use. At the completion of the field activities, the field data sheets will be maintained in the central project file.

5.1.2 Sample Labeling

Each sample collected will be assigned a unique identification number and abbreviation in accordance with the sample nomenclature guidance provided in the following table and the Standard Operating Procedure provided in Attachment D.

Sample Nomenclature Summary	
AA	Ambient Air
DUP	Field Duplicate
EA	Effluent Air
FB	Field Blank
IA	Indoor Air
MW	Monitoring Well
SB	Soil Boring
SSV	Sub-slab Vapor
TB	Trip Blank
(#-#)	Depth Interval
MMDDYY	Date of Sampling

Each sample container will have a sample label affixed to the outside with the date and time of sample collection and project name. In addition, the label will contain the sample identification number, analysis required and chemical preservatives added, if any. All documentation will be completed in waterproof ink.

5.1.3 Site Inspection Forms

Periodic Site inspections are a requirement of the SMP and are discussed in Section 5 of the SMP. It is required that all engineering controls be periodically inspected to ensure that (1) the ECs are in place and effective; (2) the SMP is being implemented; (3) the operation and maintenance of the SVE system is being implemented; and (4) the Site remedy continues to be protective of public health and the environment and is performing as designed. If sampling conducted at the Site includes intrusive activates that affect an engineering control, the relevant Site inspection form(s) should be completed.

5.2 EQUIPMENT CALIBRATION AND PREVENTATIVE MAINTENANCE

A PID will be used during the sampling activities to evaluate work zone action levels, screen soil samples, and collect monitoring well headspace readings. Field calibration and/or field checking of the PID will be the responsibility of the field team leader and the Site Health & Safety Officer, and will be accomplished by following the procedures outlined in the operating manual for the instrument. At a minimum, field calibration and/or field equipment checking will be performed once daily, prior to use. Field calibration will be documented in the field notebook. Entries made into the logbook regarding the status of field equipment will include the following information:

- Date and time of calibration
- Type of equipment serviced and identification number (such as serial number)
- Reference standard used for calibration
- Calibration and/or maintenance procedure used
- Other pertinent information

A water quality meter (YSI 6820 or similar) will be used during purging of groundwater (contingency) to measure pH, specific conductance, temperature, dissolved oxygen, turbidity and oxidation-reduction-potential (ORP), every five minutes, or, depending on pump flow rate, after at least one full volume of the water quality meter flow through cell has passed through. A portable turbidity meter (LaMotte or similar) may also be used to measure turbidity. Water-

quality meters should be calibrated and the results documented before use each day using standardized field calibration procedures and calibration checks.

Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent utilization. The equipment will be properly tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated to the manufacturer's specifications by qualified personnel. Equipment that cannot be repaired will be replaced.

Off-site calibration and maintenance of field instruments will be conducted as appropriate throughout the duration of project activities. All field instrumentation, sampling equipment and accessories will be maintained in accordance with the manufacturer's recommendations and specifications and established field equipment practice. Off-site calibration and maintenance will be performed by qualified personnel. A logbook will be kept to document that established calibration and maintenance procedures have been followed. Documentation will include both scheduled and unscheduled maintenance.

5.3 SAMPLE COLLECTION

Soil Samples

Soil samples will be visually classified and field screened using a PID to assess potential impacts from volatile organic compounds (VOCs) and for health and safety monitoring. Soil samples collected for analysis of VOCs will be collected using either En Core® or Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. Samples will be collected with unused sterile sampling scoops or spoons and homogenized in unused sterile polyethylene zipper bags. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Sections 5.4 and 5.6. Analysis and/or extraction and digestion of collected soil samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected soil samples will meet all quality assurance criteria set forth by this QAPP and DER-10.

Groundwater Samples (Contingency)

Groundwater sampling will be conducted using low-flow sampling procedures following USEPA guidance ("Low Stress [low flow] Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells", EQASOP-GW4, dated September 19, 2017).

During purging, field parameters should be measured, including: water level drawdown, purge rate, pH, specific conductance, temperature, dissolved oxygen, turbidity and oxidation-reduction-potential (ORP), every five minutes using a water quality meter (YSI 6820 or similar) and a depth-to-water interface probe that should be decontaminated between wells. Samples should generally not be collected until the field parameters have stabilized. Field parameters will be considered stable once three sets of measurements are within ±0.1 standard units for pH, ±3% for conductivity and temperature, ±10 millivolts for ORP, and ±10% for turbidity and dissolved oxygen. Purge rates should be adjusted to keep the drawdown in the well to less than 0.3 feet, as practical. Additionally, an attempt should be made to achieve a stable turbidity reading of less than 10 Nephelometric Turbidity Units (NTU) prior to sampling. If the turbidity reading does not stabilize at reading of less than 10 NTU for a given well, then both filtered and unfiltered samples should be collected from that well. If necessary, field filtration should be performed using a 0.45 micron disposable in-line filter. Groundwater samples should be collected after parameters have stabilized as noted above or the readings are within the precision of the meter. Deviations from the stabilization and drawdown criteria, if any, should be noted on the sampling logs.

Samples should be collected directly into laboratory-supplied jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Sections 5.4 and 5.6. Analysis and/or extraction and digestion of collected groundwater samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected groundwater samples will meet all quality assurance criteria set forth by this QAPP and DER-10.

Sub-slab Vapor and Ambient Air Samples

Prior to sub-slab vapor and ambient air sample collection, a pre-sampling inspection will be conducted to document chemicals and potential subsurface pathways at the Site. The pre-sampling inspection will assess the potential for impacts from any chemical or petroleum storage within the on-site buildings. Air samples will be collected into laboratory-supplied, batch certified-clean Summa® canisters calibrated for a sampling rate of eight hours. The pressure gauges on each calibrated flow controller should be monitored throughout sample collection. Sample collection should be stopped when the pressure reading reaches -4 mmHg.

Sample Field Blanks, Trip Blanks and Duplicates

Field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative samples per matrix (soil and groundwater only). Field blanks will be obtained by pouring laboratory-demonstrated analyte-free water on or through a decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected

off of the sampling device into a laboratory-provided sample container for analysis. Field blank samples will be analyzed for the complete list of analytes on the day of sampling. To assess contamination resulting from sample transport, trip blanks will be collected at a rate of one per day if soil or groundwater (contingency) samples are analyzed for VOCs during that day.

Duplicate soil and groundwater (contingency) samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative samples per matrix and will be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

5.4 SAMPLE CONTAINERS AND HANDLING

Certified, commercially clean sample containers will be obtained from the analytical laboratory. If soil samples or groundwater (contingency) are being collected, the laboratory will also prepare and supply the required trip blanks and field blank sample containers and reagent preservatives. Sample bottle containers, including the field blank containers, will be placed into plastic coolers by the laboratory. These coolers will be received by the field sampling team within 24 hours of their preparation in the laboratory. Prior to the commencement of field work, Langan field personnel will fill the plastic coolers with ice in Ziploc® bags (or equivalent) to maintain a temperature of 4° ±2° C.

Soil and/or groundwater (contingency) samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. Samples will then be placed and stored on-ice in laboratory provided coolers until shipment to the laboratory. The temperature in the coolers containing samples and associated field blanks will be maintained at a temperature of 4°±2°C while on-site and during sample shipment to the analytical laboratory.

Groundwater sampling (contingency) for per- and polyfluoroalkyl substances (PFAS) will be collected in accordance with EPA Method 537 Field Sampling Guidelines. PFAS samples will be collected first in High Density Polyethylene (HDPE)/polypropylene containers using sampling equipment either made with stainless steel, HDPE, or polypropylene. Food and beverages will be prohibited near the sampling equipment. Additionally, no cosmetics, moisturizers, hand cream, sun screen or clothing materials containing Gore-Tex™ or Tyvek® will be worn during sampling.

Possession of samples collected in the field will be traceable from the time of collection until they are analyzed by the analytical laboratory or are properly disposed. Chain-of-custody procedures, described in Section 5.9, will be followed to maintain and document sample possession. Samples will be packaged and shipped as described in Section 5.6.

5.5 SAMPLE PRESERVATION

Sample preservation measures will be used in an attempt to prevent sample decomposition by contamination, degradation, biological transformation, chemical interactions and other factors during the time between sample collection and analysis. Preservation will commence at the time of sample collection and will continue until analyses are performed. Should chemical preservation be required, the analytical laboratory will add the preservatives to the appropriate sample containers before shipment to the office or field. Samples will be preserved according to the requirements of the specific analytical method selected, as shown in Attachment C.

5.6 SAMPLE SHIPMENT

5.6.1 Packaging

Soil and groundwater (contingency) sample containers will be placed in plastic coolers. Ice in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around the sample containers if necessary. Chains-of-custody and other paperwork will be placed in a Ziploc® bag (or equivalent) and placed inside the cooler. The cooler will be taped closed and custody seals will be affixed to one side of the cooler at a minimum. If the samples are being shipped by an express delivery company (e.g. FedEx) then laboratory address labels will be placed on top of the cooler.

5.6.2 Shipping

Standard procedures to be followed for shipping environmental samples to the analytical laboratory are outlined below.

- All environmental samples will be transported to the laboratory by a laboratory-provided courier under the chain-of-custody protocols described in Section 5.9.

- Prior notice will be provided to the laboratory regarding when to expect shipped samples. If the number, type or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

5.7 DECONTAMINATION PROCEDURES

Decontamination procedures will be used for non-dedicated sampling equipment. Decontamination of field personnel is discussed in the site-specific sample Health and Safety Plan (HASP) included in Appendix E of the SMP. Field sampling equipment that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and tap water scrub to remove visual contamination
2. Generous tap water rinse
3. Distilled/de-ionized water rinse

5.8 RESIDUALS MANAGEMENT

Debris (e.g., paper, plastic and disposable personal protective equipment) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Soil cuttings with no apparent staining, odors, or elevated PID readings will be used to backfill boring holes. Soil to be disposed off-site will be placed in 55-gallon, UN/Department of Transportation (DOT) approved drums. Decontamination and well development/purging fluids will be placed in DOT-approved fluid drums with closed tops. All drums will be properly labeled, sealed, and characterized as necessary.

If existing analytical data is insufficient to gain disposal facility acceptance, waste characterization samples will be analyzed for parameters that are typically required by disposal facilities, such as target compounds list (TCL) VOCs, semivolatile organic compounds (SVOCs), Resource Conservation and Recovery Act (RCRA) metals, polychlorinated biphenyls (PCBs), pesticides, herbicides, Toxicity Characteristic Leaching Procedure (TCLP) VOCs, TCLP SVOCs, TCLP metals, ignitability, corrosivity, reactivity, and paint filter. Additional sampling and analyses may be required based on the selected disposal facility.

Samples will be collected in accordance with the selected disposal facility's requirements and will be collected to be representative of the material requiring disposal at a frequency consistent with disposal facility requirements. It is anticipated that all drummed material will be transported off-site and disposed of at a permitted facility.

5.9 CHAIN OF CUSTODY PROCEDURES

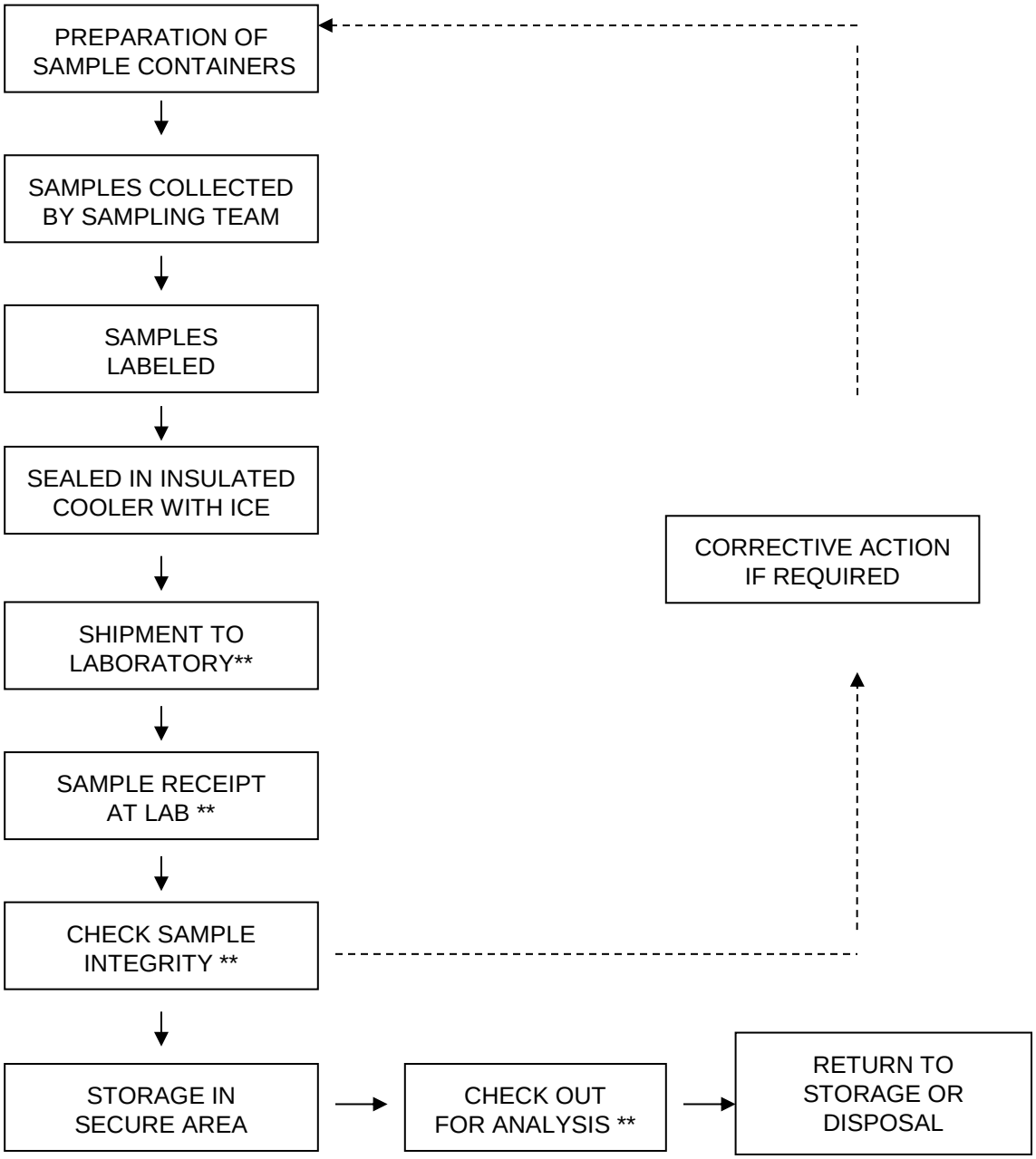
A chain-of-custody protocol has been established for collected samples that will be followed during sample handling activities in both field and laboratory operations. The primary purpose of the chain-of-custody procedures is to document the possession of the samples from collection through shipping, storage and analysis to data reporting and disposal. Chain-of-custody refers to actual possession of the samples. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except the shipping courier, is responsible for sample integrity and safe keeping. Chain-of-custody procedures are provided below:

- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers.
- Following sample collection, the chain-of-custody form will be completed for the sample collected. The sample identification number, date and time of sample collection, analysis requested and other pertinent information (e.g., preservatives) will be recorded on the form. All entries will be made in waterproof, permanent blue or black ink.
- Langan field personnel will be responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory, or disposed. The sampling team leader will be responsible for enforcing chain-of-custody procedures during field work.
- When the form is full or when all samples have been collected that will fit in a single cooler, the sampling team leader will check the form for possible errors and sign the chain-of-custody form. Any necessary corrections will be made to the record with a single strike mark, dated, and initialed.

When soil and groundwater (contingency) samples are collected, sample coolers will be accompanied by the chain-of-custody form, sealed in a Ziploc® bag (or equivalent) and placed on top of the samples or taped to the inside of the cooler lid. If applicable, a shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form.

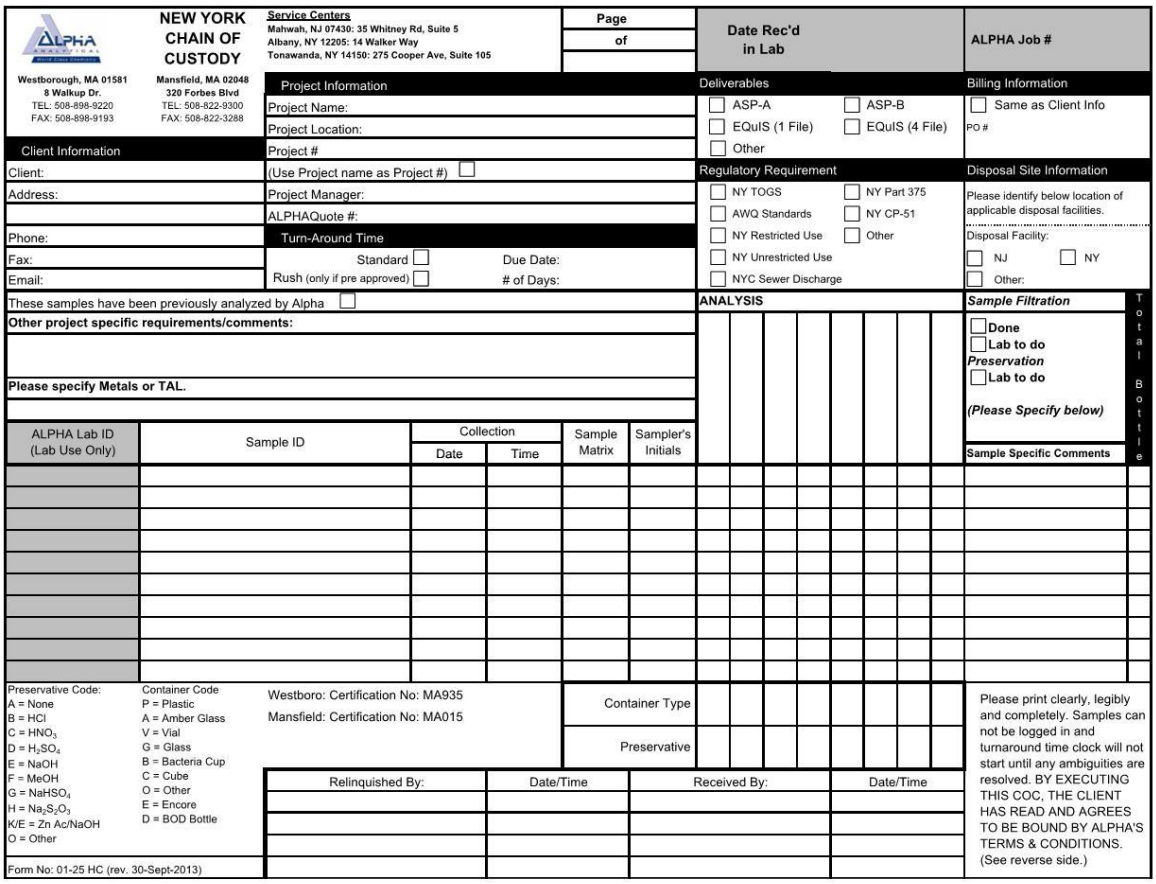
Samples will be packaged for shipment to the laboratory with the appropriate chain-of-custody form. A copy of the form will be retained by the sampling team for the project file and the original will be sent to the laboratory with the samples. Bills of lading will also be retained as part of the documentation for the chain-of-custody records, if applicable. When transferring custody of the samples, the individuals relinquishing and receiving custody of the samples will verify sample numbers and condition and will document the sample acquisition and transfer by signing and dating the chain-of-custody form. This process documents sample custody transfer from the sampler to the analytical laboratory. A flow chart showing a sample custody process is included as Figure 5.1, and an example chain-of-custody form for soil and groundwater (contingency) samples is included as Figure 5.2.

Figure 5.1 Sample Custody



** REQUIRES SIGN-OFF ON CHAIN-OF-CUSTODY FORM

Figure 5.2 Sample Chain-of-Custody Form – Soil and Groundwater Samples



NEW YORK CHAIN OF CUSTODY

ALPHA ANALYTICAL

Westborough, MA 01581 — 8 Walkup Dr. — TEL: 508-898-9220 — FAX: 508-898-9193

Mansfield, MA 02048 — 320 Forbes Blvd — TEL: 508-822-9300 — FAX: 508-822-3288

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page of

Date Rec'd in Lab

ALPHA Job #

Client Information
Client:
Address:
Phone:
Fax:
Email:

Project Information
Project Name:
Project Location:
Project #
(Use Project name as Project #) ☐
Project Manager:
ALPHAQuote #:

Turn-Around Time
Standard ☐ Due Date:
Rush (only if pre approved) ☐ # of Days:

These samples have been previously analyzed by Alpha ☐

Other project specific requirements/comments:

Please specify Metals or TAL.

Deliverables
☐ ASP-A ☐ ASP-B
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

Regulatory Requirement
☐ NY TOGS ☐ NY Part 375
☐ AWQ Standards ☐ NY CP-51
☐ NY Restricted Use ☐ Other
☐ NY Unrestricted Use
☐ NYC Sewer Discharge

Billing Information
☐ Same as Client Info
PO #

Disposal Site Information
Please identify below location of applicable disposal facilities.
Disposal Facility:
☐ NJ ☐ NY
☐ Other:

ANALYSIS

Sample Filtration
☐ Done
☐ Lab to do
Preservation
☐ Lab to do
(Please Specify below)

Total Bottle

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Sample Specific Comments

Preservative Code:
A = None
B = HCl
C = HNO_3
D = H_2SO_4
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

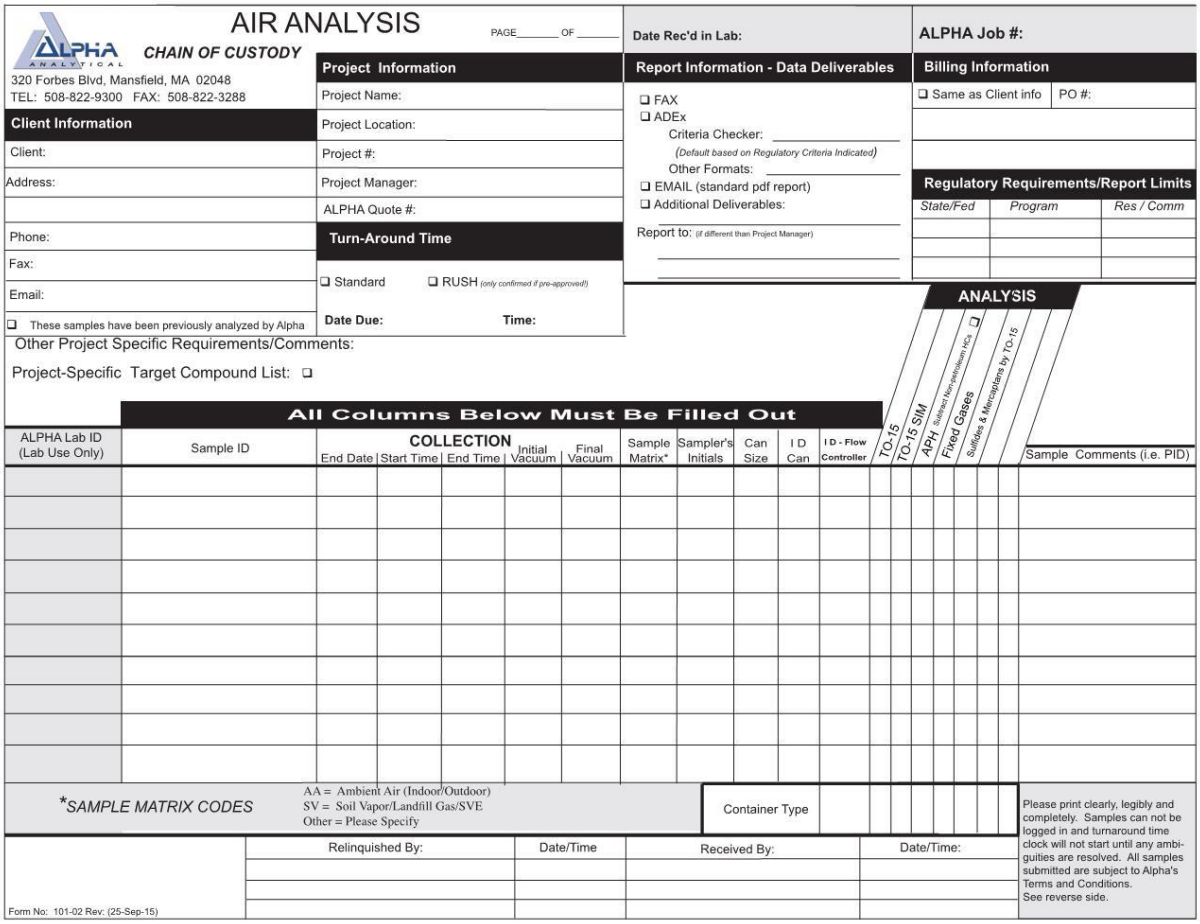
Container Type
Preservative

Relinquished By:	Date/Time	Received By:	Date/Time

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-25 HC (rev. 30-Sept-2013)

Figure 5.3 Sample Chain-of-Custody Form – Sub-slab Vapor and Ambient Air Samples



AIR ANALYSIS
CHAIN OF CUSTODY
PAGE_____ OF _____

ALPHA ANALYTICAL
320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab:

ALPHA Job #:

Client Information
Client:
Address:
Phone:
Fax:
Email:
❑ These samples have been previously analyzed by Alpha

Project Information
Project Name:
Project Location:
Project #:
Project Manager:
ALPHA Quote #:

Turn-Around Time
❑ Standard ❑ RUSH (only confirmed if pre-approved!)
Date Due: Time:

Report Information - Data Deliverables
❑ FAX
❑ ADEx
Criteria Checker: _____
(Default based on Regulatory Criteria Indicated)
Other Formats: _____
❑ EMAIL (standard pdf report)
❑ Additional Deliverables: _____
Report to: (if different than Project Manager)

Billing Information
❑ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Res / Comm

Other Project Specific Requirements/Comments:

Project-Specific Target Compound List: ❑

ANALYSIS

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	COLLECTION End Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	TO-15	TO-15 SIM	APH Sulfate/Nonchlorinated HCs	Fixed Gases	Sulfides & Mercaptans by TO-15	❑	Sample Comments (i.e. PID)

*SAMPLE MATRIX CODES
AA = Ambient Air (Indoor/Outdoor)
SV = Soil Vapor/Landfill Gas/SVE
Other = Please Specify

Container Type

Relinquished By:	Date/Time	Received By:	Date/Time:

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

Form No: 101-02 Rev: (25-Sep-15)

Laboratory chain-of-custody will be maintained throughout the analytical processes as described in the laboratory's Quality Assurance Manual. The analytical laboratory will provide a copy of the chain-of-custody in the analytical data deliverable package. The chain-of-custody becomes the permanent record of sample handling and shipment.

5.10 LABORATORY SAMPLE STORAGE PROCEDURES

The subcontracted laboratory will use a laboratory information management system to track and schedule samples upon receipt by the analytical laboratories. Any sample anomalies identified during sample log-in must be evaluated on individual merit for the impact upon the results and the data quality objectives of the project. When irregularities do exist, the environmental consultant must be notified to discuss recommended courses of action and documentation of the issue must be included in the project file.

For samples requiring thermal preservation, the temperature of each cooler will be immediately recorded. Each sample and container will be will be assigned a unique laboratory identification number and secured within the custody room walk-in coolers designated for new samples. Samples will be, as soon as practical, disbursed in a manner that is functional for the operational team. The temperature of all coolers and freezers will be monitored and recorded using a certified temperature sensor. Any temperature excursions outside of acceptance criteria (i.e., below 2°C or above 6°C) will initiate an investigation to determine whether any samples may have been affected. Samples for VOCs will be maintained in satellite storage areas within the VOC laboratory. Following analysis, the laboratory's specific procedures for retention and disposal will be followed as specified in the laboratory's SOPs and/or QA manual.

5.11 SPECIAL CONSIDERATIONS FOR PFAS SAMPLE COLLECTION

Groundwater samples (contingency) collected for analysis of PFAS will be collected in accordance with the specialized protocol outlined in this section. Groundwater samples collected from select wells will be analyzed for 1,4-dioxane with a detection limit no higher than 0.35 micrograms per liter, and for PFAS with a detection limit no higher than 2 nanograms per liter in accordance with the procedure outlined in Attachment E.

The following special considerations apply to the collection of groundwater samples for PFAS analysis to prevent cross-contamination:

- Field equipment will not contain Teflon®
- All sampling material will be made from stainless steel, HDPE, acetate, silicon, or polypropylene
- No waterproof field books will be used
- No plastic clipboards, binders, or spiral hard cover notebooks will be used

- No adhesives will be used
- No sharpies or permanent markers will be used; ball point pens are acceptable
- Aluminum foil will not be used
- PFAS samples will be kept in a separate cooler from other sampling containers
- Coolers will be filled only with regular ice

PFAS compound sampling protocol is provided in Attachment E.

5.12 PFAS TARGET ANALYTE LIST

DER has developed a PFAS target analyte list. At minimum, the laboratory will report the following PFAS target compounds:

Group	Analyte Name	Abbreviation	CAS #
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 INTRODUCTION

Data collected during the field investigation will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the USEPA SW-846 methodology appropriate for the analyses to be performed, and be reported in standard format.

The completed copies of the chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

6.2 DATA REDUCTION

The Analytical Services Protocol (ASP) Category B data packages and an electronic data deliverable (EDD) will be provided by the laboratory after receipt of a complete sample delivery group. The Project Manager will immediately arrange for archiving the results and preparation of result tables. These tables will form the database for assessment of the site contamination condition.

Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQuIS. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system. If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA review has been completed, the Project Manager may direct the Team Leaders or others to initiate and finalize the analytical data assessment.

6.3 DATA VALIDATION

Data validation will be performed in accordance with the USEPA Region 2 validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of the QC sample results;
- Verification of the identification of sample results (both positive hits and non-detects);
- Recalculation of 10% of all investigative sample results; and
- Preparation of Data Usability Summary Reports (DUSR).

A DUSR will be prepared by the data validator and reviewed by the QAM before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each sample delivery group will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard area counts (if applicable);
- MS and MSD recoveries and RPDs
- LCS and LCSD recoveries and RPDs
- Endrin/DDT Breakdown (if applicable);
- Dual Column Analysis (if applicable);
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;
- Overall system performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory control samples;
- Laboratory Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- Contract Required Detection Limit standards;
- ICP serial dilutions; and
- Results verification and reported detection limits.

Based on the results of data validation, the validated analytical results reported by the laboratory will be assigned one of the following usability flags:

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;
- "UJ" - Not detected. Quantitation limit may be inaccurate or imprecise;
- "J" - Analyte is present. Reported value may be associated with a higher level of uncertainty than is normally expected with the analytical method
- "R" – Unreliable result; data is rejected or unusable. Analyte may or may not be present in the sample; and
- No Flag - Result accepted without qualification.

7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

7.1 INTRODUCTION

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the Quality Assurance Manager (QAM). These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAM may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAM may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

7.2 SYSTEM AUDITS

System audits may be performed by the QAM or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be system audited. These audits may be performed once during the performance of the project. Additional audits may occur if conditions adverse to quality are detected or at the request of the Project Manager.

7.3 PERFORMANCE AUDITS

The laboratory may be required to conduct an analysis of Performance Evaluation samples or provide proof that Performance Evaluation samples submitted by USEPA or a state agency have been analyzed within the past twelve months.

7.4 FORMAL AUDITS

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management.

Non-compliances will be logged, and documented through audit findings, which are attached to and are a part of the integral audit report. These audit-finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAM prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAM will close out the audit report and findings.

8.0 CORRECTIVE ACTION

8.1 INTRODUCTION

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

8.2 PROCEDURE DESCRIPTION

When a significant condition adverse to quality is noted at a site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAM, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management personnel, field investigation teams, remedial response planning personnel, and laboratory groups monitor ongoing work performance during the normal course of daily responsibilities. Work may be audited at project sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding

sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 8.1 or similar by email). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

Figure 8.1

CORRECTIVE ACTION REQUEST

Number: _____ Date: _____

TO: _____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

_____ _____ _____ _____ _____ _____

Originator Date Approval Date Approval Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOWUP:

CORRECTIVE ACTION VERIFIED BY: _____ DATE:_____

9.0 REFERENCES

NYSDEC. Division of Environmental Remediation. DER-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.

USEPA, 2014. "Test Method for Evaluating Solid Waste," Update V dated July 2014 U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 2016. Low/Medium Volatile Data Validation. SOP No. HW-33A, Revision 1, dated September 2016. USEPA Region II.

USEPA, 2015. PCB Aroclor Data Validation. SOP No. HW-37A, Revision 0, dated July 2015. USEPA Region II.

USEPA, 2016. ICP-AES Data Validation. SOP No. HW-3a, Revision 1, dated September 2016. USEPA Region II.

USEPA, 2016. Mercury and Cyanide Data Validation. SOP No. HW-3c, Revision 1, dated September 2016. USEPA Region II.

USEPA, 2016. Pesticide Data Validation. SOP No. HW-36A, Revision 1, dated October 2016. USEPA Region II.

USEPA, 2016. Semivolatile Data Validation. SOP No. HW-35A, Revision 1, dated September 2016. USEPA Region II.

USEPA, 2016. Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15, Revision 6, dated September 2016. USEPA Region II.

ATTACHMENT A

LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 1

Langan Engineering & Environmental

TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Methylene chloride	75-09-2	5	2.29	ug/kg	70-130	30	70-130	30	30			
1,1-Dichloroethane	75-34-3	1	0.145	ug/kg	70-130	30	70-130	30	30			
Chloroform	67-66-3	1.5	0.14	ug/kg	70-130	30	70-130	30	30			
Carbon tetrachloride	56-23-5	1	0.23	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloropropane	78-87-5	1	0.125	ug/kg	70-130	30	70-130	30	30			
Dibromochloromethane	124-48-1	1	0.14	ug/kg	70-130	30	70-130	30	30			
1,1,2-Trichloroethane	79-00-5	1	0.267	ug/kg	70-130	30	70-130	30	30			
Tetrachloroethene	127-18-4	0.5	0.196	ug/kg	70-130	30	70-130	30	30			
Chlorobenzene	108-90-7	0.5	0.127	ug/kg	70-130	30	70-130	30	30			
Trichlorofluoromethane	75-69-4	4	0.695	ug/kg	70-139	30	70-139	30	30			
1,2-Dichloroethane	107-06-2	1	0.257	ug/kg	70-130	30	70-130	30	30			
1,1,1-Trichloroethane	71-55-6	0.5	0.167	ug/kg	70-130	30	70-130	30	30			
Bromodichloromethane	75-27-4	0.5	0.109	ug/kg	70-130	30	70-130	30	30			
trans-1,3-Dichloropropene	10061-02-6	1	0.273	ug/kg	70-130	30	70-130	30	30			
cis-1,3-Dichloropropene	10061-01-5	0.5	0.158	ug/kg	70-130	30	70-130	30	30			
1,3-Dichloropropene, Total	542-75-6	0.5	0.158	ug/kg				30	30			
1,3-Dichloropropene, Total	542-75-6	0.5	0.158	ug/kg				30	30			
1,1-Dichloropropene	563-58-6	0.5	0.159	ug/kg	70-130	30	70-130	30	30			
Bromoform	75-25-2	4	0.246	ug/kg	70-130	30	70-130	30	30			
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.166	ug/kg	70-130	30	70-130	30	30			
Benzene	71-43-2	0.5	0.166	ug/kg	70-130	30	70-130	30	30			
Toluene	108-88-3	1	0.543	ug/kg	70-130	30	70-130	30	30			
Ethylbenzene	100-41-4	1	0.141	ug/kg	70-130	30	70-130	30	30			
Chloromethane	74-87-3	4	0.932	ug/kg	52-130	30	52-130	30	30			
Bromomethane	74-83-9	2	0.581	ug/kg	57-147	30	57-147	30	30			
Vinyl chloride	75-01-4	1	0.335	ug/kg	67-130	30	67-130	30	30			
Chloroethane	75-00-3	2	0.452	ug/kg	50-151	30	50-151	30	30			
1,1-Dichloroethene	75-35-4	1	0.238	ug/kg	65-135	30	65-135	30	30			
trans-1,2-Dichloroethene	156-60-5	1.5	0.137	ug/kg	70-130	30	70-130	30	30			
Trichloroethene	79-01-6	0.5	0.137	ug/kg	70-130	30	70-130	30	30			
1,2-Dichlorobenzene	95-50-1	2	0.144	ug/kg	70-130	30	70-130	30	30			
1,3-Dichlorobenzene	541-73-1	2	0.148	ug/kg	70-130	30	70-130	30	30			
1,4-Dichlorobenzene	106-46-7	2	0.171	ug/kg	70-130	30	70-130	30	30			
Methyl tert butyl ether	1634-04-4	2	0.201	ug/kg	66-130	30	66-130	30	30			
p/m-Xylene	179601-23-1	2	0.56	ug/kg	70-130	30	70-130	30	30			
o-Xylene	95-47-6	1	0.291	ug/kg	70-130	30	70-130	30	30			
Xylene (Total)	1330-20-7	1	0.291	ug/kg				30	30			
Xylene (Total)	1330-20-7	1	0.291	ug/kg				30	30			
cis-1,2-Dichloroethene	156-59-2	1	0.175	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloroethene (total)	540-59-0	1	0.137	ug/kg				30	30			
1,2-Dichloroethene (total)	540-59-0	1	0.137	ug/kg				30	30			
Dibromomethane	74-95-3	2	0.238	ug/kg	70-130	30	70-130	30	30			

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Langan Engineering & Environmental

TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Styrene	100-42-5	1	0.196	ug/kg	70-130	30	70-130	30	30			
Dichlorodifluoromethane	75-71-8	10	0.915	ug/kg	30-146	30	30-146	30	30			
Acetone	67-64-1	10	4.811	ug/kg	54-140	30	54-140	30	30			
Carbon disulfide	75-15-0	10	4.55	ug/kg	59-130	30	59-130	30	30			
2-Butanone	78-93-3	10	2.22	ug/kg	70-130	30	70-130	30	30			
Vinyl acetate	108-05-4	10	2.15	ug/kg	70-130	30	70-130	30	30			
4-Methyl-2-pentanone	108-10-1	10	1.28	ug/kg	70-130	30	70-130	30	30			
1,2,3-Trichloropropane	96-18-4	2	0.127	ug/kg	68-130	30	68-130	30	30			
2-Hexanone	591-78-6	10	1.18	ug/kg	70-130	30	70-130	30	30			
Bromochloromethane	74-97-5	2	0.205	ug/kg	70-130	30	70-130	30	30			
2,2-Dichloropropane	594-20-7	2	0.202	ug/kg	70-130	30	70-130	30	30			
1,2-Dibromoethane	106-93-4	1	0.279	ug/kg	70-130	30	70-130	30	30			
1,3-Dichloropropane	142-28-9	2	0.167	ug/kg	69-130	30	69-130	30	30			
1,1,1,2-Tetrachloroethane	630-20-6	0.5	0.132	ug/kg	70-130	30	70-130	30	30			
Bromobenzene	108-86-1	2	0.145	ug/kg	70-130	30	70-130	30	30			
n-Butylbenzene	104-51-8	1	0.167	ug/kg	70-130	30	70-130	30	30			
sec-Butylbenzene	135-98-8	1	0.146	ug/kg	70-130	30	70-130	30	30			
tert-Butylbenzene	98-06-6	2	0.118	ug/kg	70-130	30	70-130	30	30			
o-Chlorotoluene	95-49-8	2	0.191	ug/kg	70-130	30	70-130	30	30			
p-Chlorotoluene	106-43-4	2	0.108	ug/kg	70-130	30	70-130	30	30			
1,2-Dibromo-3-chloropropane	96-12-8	3	0.998	ug/kg	68-130	30	68-130	30	30			
Hexachlorobutadiene	87-68-3	4	0.169	ug/kg	67-130	30	67-130	30	30			
Isopropylbenzene	98-82-8	1	0.109	ug/kg	70-130	30	70-130	30	30			
p-Isopropyltoluene	99-87-6	1	0.109	ug/kg	70-130	30	70-130	30	30			
Naphthalene	91-20-3	4	0.65	ug/kg	70-130	30	70-130	30	30			
Acrylonitrile	107-13-1	4	1.15	ug/kg	70-130	30	70-130	30	30			
n-Propylbenzene	103-65-1	1	0.171	ug/kg	70-130	30	70-130	30	30			
1,2,3-Trichlorobenzene	87-61-6	2	0.322	ug/kg	70-130	30	70-130	30	30			
1,2,4-Trichlorobenzene	120-82-1	2	0.272	ug/kg	70-130	30	70-130	30	30			
1,3,5-Trimethylbenzene	108-67-8	2	0.193	ug/kg	70-130	30	70-130	30	30			
1,2,4-Trimethylbenzene	95-63-6	2	0.334	ug/kg	70-130	30	70-130	30	30			
1,4-Dioxane	123-91-1	100	35.1	ug/kg	65-136	30	65-136	30	30			
1,4-Diethylbenzene	105-05-5	2	0.177	ug/kg	70-130	30	70-130	30	30			
4-Ethyltoluene	622-96-8	2	0.384	ug/kg	70-130	30	70-130	30	30			
1,2,4,5-Tetramethylbenzene	95-93-2	2	0.191	ug/kg	70-130	30	70-130	30	30			
Ethyl ether	60-29-7	2	0.341	ug/kg	67-130	30	67-130	30	30			
trans-1,4-Dichloro-2-butene	110-57-6	5	1.42	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloroethane-d4	*17060-07-0*									*70-130*		
2-Chloroethoxyethane												
Toluene-d8	*2037-26-5*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		
Dibromofluoromethane	*1868-53-7*									*70-130*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 1

Langan Engineering & Environmental

NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	133.6	17.3012	ug/kg	31-137	50	31-137	50	50			
1,2,4-Trichlorobenzene	120-82-1	167	19.1048	ug/kg	38-107	50	38-107	50	50			
Hexachlorobenzene	118-74-1	100.2	18.704	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroethyl)ether	111-44-4	150.3	22.6452	ug/kg	40-140	50	40-140	50	50			
2-Chloronaphthalene	91-58-7	167	16.5664	ug/kg	40-140	50	40-140	50	50			
1,2-Dichlorobenzene	95-50-1	167	29.9932	ug/kg	40-140	50	40-140	50	50			
1,3-Dichlorobenzene	541-73-1	167	28.724	ug/kg	40-140	50	40-140	50	50			
1,4-Dichlorobenzene	106-46-7	167	29.1582	ug/kg	28-104	50	28-104	50	50			
3,3'-Dichlorobenzidine	91-94-1	167	44.422	ug/kg	40-140	50	40-140	50	50			
2,4-Dinitrotoluene	121-14-2	167	33.4	ug/kg	40-132	50	40-132	50	50			
2,6-Dinitrotoluene	606-20-2	167	28.6572	ug/kg	40-140	50	40-140	50	50			
Fluoranthene	206-44-0	100.2	19.1716	ug/kg	40-140	50	40-140	50	50			
4-Chlorophenyl phenyl ether	7005-72-3	167	17.869	ug/kg	40-140	50	40-140	50	50			
4-Bromophenyl phenyl ether	101-55-3	167	25.4842	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroisopropyl)ether	108-60-1	200.4	28.5236	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroethoxy)methane	111-91-1	180.36	16.7334	ug/kg	40-117	50	40-117	50	50			
Hexachlorobutadiene	87-68-3	167	24.4488	ug/kg	40-140	50	40-140	50	50			
Hexachlorocyclopentadiene	77-47-4	477.62	151.302	ug/kg	40-140	50	40-140	50	50			
Hexachloroethane	67-72-1	133.6	27.0206	ug/kg	40-140	50	40-140	50	50			
Isophorone	78-59-1	150.3	21.6766	ug/kg	40-140	50	40-140	50	50			
Naphthalene	91-20-3	167	20.3406	ug/kg	40-140	50	40-140	50	50			
Nitrobenzene	98-95-3	150.3	24.716	ug/kg	40-140	50	40-140	50	50			
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	133.6	19.0046	ug/kg	36-157	50	36-157	50	50			
n-Nitrosodi-n-propylamine	621-64-7	167	25.7848	ug/kg	32-121	50	32-121	50	50			
Bis(2-Ethylhexyl)phthalate	117-81-7	167	57.782	ug/kg	40-140	50	40-140	50	50			
Butyl benzyl phthalate	85-68-7	167	42.084	ug/kg	40-140	50	40-140	50	50			
Di-n-butylphthalate	84-74-2	167	31.6632	ug/kg	40-140	50	40-140	50	50			
Di-n-octylphthalate	117-84-0	167	56.78	ug/kg	40-140	50	40-140	50	50			
Diethyl phthalate	84-66-2	167	15.4642	ug/kg	40-140	50	40-140	50	50			
Dimethyl phthalate	131-11-3	167	35.07	ug/kg	40-140	50	40-140	50	50			
Benzo(a)anthracene	56-55-3	100.2	18.8042	ug/kg	40-140	50	40-140	50	50			
Benzo(a)pyrene	50-32-8	133.6	40.748	ug/kg	40-140	50	40-140	50	50			
Benzo(b)fluoranthene	205-99-2	100.2	28.1228	ug/kg	40-140	50	40-140	50	50			
Benzo(k)fluoranthene	207-08-9	100.2	26.72	ug/kg	40-140	50	40-140	50	50			
Chrysene	218-01-9	100.2	17.368	ug/kg	40-140	50	40-140	50	50			
Acenaphthylene	208-96-8	133.6	25.7848	ug/kg	40-140	50	40-140	50	50			
Anthracene	120-12-7	100.2	32.565	ug/kg	40-140	50	40-140	50	50			
Benzo(ghi)perylene	191-24-2	133.6	19.6392	ug/kg	40-140	50	40-140	50	50			
Fluorene	86-73-7	167	16.2324	ug/kg	40-140	50	40-140	50	50			
Phenanthrene	85-01-8	100.2	20.3072	ug/kg	40-140	50	40-140	50	50			
Dibenzo(a,h)anthracene	53-70-3	100.2	19.3052	ug/kg	40-140	50	40-140	50	50			
Indeno(1,2,3-cd)Pyrene	193-39-5	133.6	23.2798	ug/kg	40-140	50	40-140	50	50			

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1

Langan Engineering & Environmental

NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Pyrene	129-00-0	100.2	16.5998	ug/kg	35-142	50	35-142	50	50			
Biphenyl	92-52-4	380.76	38.744	ug/kg	54-104	50	54-104	50	50			
4-Chloroaniline	106-47-8	167	30.394	ug/kg	40-140	50	40-140	50	50			
2-Nitroaniline	88-74-4	167	32.1976	ug/kg	47-134	50	47-134	50	50			
3-Nitroaniline	99-09-2	167	31.4962	ug/kg	26-129	50	26-129	50	50			
4-Nitroaniline	100-01-6	167	69.138	ug/kg	41-125	50	41-125	50	50			
Dibenzofuran	132-64-9	167	15.7982	ug/kg	40-140	50	40-140	50	50			
2-Methylnaphthalene	91-57-6	200.4	20.1736	ug/kg	40-140	50	40-140	50	50			
Acetophenone	98-86-2	167	20.6746	ug/kg	14-144	50	14-144	50	50			
2,4,6-Trichlorophenol	88-06-2	100.2	31.6632	ug/kg	30-130	50	30-130	50	50			
P-Chloro-M-Cresol	59-50-7	167	24.883	ug/kg	26-103	50	26-103	50	50			
2-Chlorophenol	95-57-8	167	19.7394	ug/kg	25-102	50	25-102	50	50			
2,4-Dichlorophenol	120-83-2	150.3	26.8536	ug/kg	30-130	50	30-130	50	50			
2,4-Dimethylphenol	105-67-9	167	55.11	ug/kg	30-130	50	30-130	50	50			
2-Nitrophenol	88-75-5	360.72	62.792	ug/kg	30-130	50	30-130	50	50			
4-Nitrophenol	100-02-7	233.8	68.136	ug/kg	11-114	50	11-114	50	50			
2,4-Dinitrophenol	51-28-5	801.6	77.822	ug/kg	4-130	50	4-130	50	50			
4,6-Dinitro-o-cresol	534-52-1	434.2	80.16	ug/kg	10-130	50	10-130	50	50			
Pentachlorophenol	87-86-5	133.6	36.74	ug/kg	17-109	50	17-109	50	50			
Phenol	108-95-2	167	25.217	ug/kg	26-90	50	26-90	50	50			
2-Methylphenol	95-48-7	167	25.885	ug/kg	30-130.	50	30-130.	50	50			
3-Methylphenol/4-Methylphenol	106-44-5	240.48	26.1522	ug/kg	30-130	50	30-130	50	50			
2,4,5-Trichlorophenol	95-95-4	167	31.9972	ug/kg	30-130	50	30-130	50	50			
Benzoic Acid	65-85-0	541.08	169.004	ug/kg	10-110	50	10-110	50	50			
Benzyl Alcohol	100-51-6	167	51.102	ug/kg	40-140	50	40-140	50	50			
Carbazole	86-74-8	167	16.2324	ug/kg	54-128	50	54-128	50	50			
2-Fluorophenol	*367-12-4*									*25-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*30-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-136*		
4-Terphenyl-d14	*1718-51-0*									*18-120*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1

Langan Engineering & Environmental

TCL Pesticides - EPA 8081B (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Delta-BHC	319-86-8	7.992	1.5651	ug/kg	30-150	30	30-150	50	50			
Lindane	58-89-9	3.33	1.48851	ug/kg	30-150	30	30-150	50	50			
Alpha-BHC	319-84-6	3.33	0.94572	ug/kg	30-150	30	30-150	50	50			
Beta-BHC	319-85-7	7.992	3.0303	ug/kg	30-150	30	30-150	50	50			
Heptachlor	76-44-8	3.996	1.79154	ug/kg	30-150	30	30-150	50	50			
Aldrin	309-00-2	7.992	2.81385	ug/kg	30-150	30	30-150	50	50			
Heptachlor epoxide	1024-57-3	14.985	4.4955	ug/kg	30-150	30	30-150	50	50			
Endrin	72-20-8	3.33	1.3653	ug/kg	30-150	30	30-150	50	50			
Endrin aldehyde	7421-93-4	9.99	3.4965	ug/kg	30-150	30	30-150	50	50			
Endrin ketone	53494-70-5	7.992	2.05794	ug/kg	30-150	30	30-150	50	50			
Dieldrin	60-57-1	4.995	2.4975	ug/kg	30-150	30	30-150	50	50			
4,4'-DDE	72-55-9	7.992	1.84815	ug/kg	30-150	30	30-150	50	50			
4,4'-DDD	72-54-8	7.992	2.85048	ug/kg	30-150	30	30-150	50	50			
4,4'-DDT	50-29-3	14.985	6.4269	ug/kg	30-150	30	30-150	50	50			
Endosulfan I	959-98-8	7.992	1.88811	ug/kg	30-150	30	30-150	50	50			
Endosulfan II	33213-65-9	7.992	2.67066	ug/kg	30-150	30	30-150	50	50			
Endosulfan sulfate	1031-07-8	3.33	1.58508	ug/kg	30-150	30	30-150	50	50			
Methoxychlor	72-43-5	14.985	4.662	ug/kg	30-150	30	30-150	50	50			
Toxaphene	8001-35-2	149.85	41.958	ug/kg	30-150	30	30-150	50	50			
cis-Chlordane	5103-71-9	9.99	2.78388	ug/kg	30-150	30	30-150	50	50			
trans-Chlordane	5103-74-2	9.99	2.63736	ug/kg	30-150	30	30-150	50	50			
Chlordane	57-74-9	64.935	26.4735	ug/kg	30-150	30	30-150	50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 1

Langan Engineering & Environmental

Herbicides -EPA 8151A (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
2,4-D	94-75-7	0.1665	0.0104895	mg/kg	30-150	30	30-150	30	30			
2,4,5-T	93-76-5	0.1665	0.0051615	mg/kg	30-150	30	30-150	30	30			
2,4,5-TP (Silvex)	93-72-1	0.1665	0.0044289	mg/kg	30-150	30	30-150	30	30			
DCAA	*19719-28-9*									*30-150*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 1

Langan Engineering & Environmental

TCL PCBs - EPA 8082A (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Aroclor 1016	12674-11-2	33.5	3.7989	ug/kg	40-140	50	40-140	50	50			
Aroclor 1221	11104-28-2	33.5	5.0987	ug/kg	40-140	50	40-140	50	50			
Aroclor 1232	11141-16-5	33.5	3.2964	ug/kg	40-140	50	40-140	50	50			
Aroclor 1242	53469-21-9	33.5	4.1004	ug/kg	40-140	50	40-140	50	50			
Aroclor 1248	12672-29-6	33.5	3.7587	ug/kg	40-140	50	40-140	50	50			
Aroclor 1254	11097-69-1	33.5	2.7336	ug/kg	40-140	50	40-140	50	50			
Aroclor 1260	11096-82-5	33.5	3.4974	ug/kg	40-140	50	40-140	50	50			
Aroclor 1262	37324-23-5	33.5	2.7537	ug/kg	40-140	50	40-140	50	50			
Aroclor 1268	11100-14-4	33.5	2.3718	ug/kg	40-140	50	40-140	50	50			
PCBs, Total	1336-36-3	33.5	1.541	ug/kg				50	50			
PCBs, Total	1336-36-3	33.5	1.541	ug/kg				50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 1

Langan Engineering & Environmental

METALS by 6010D (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Aluminum, Total	7429-90-5	4	1.08	mg/kg	48-151		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Antimony, Total	7440-36-0	2	0.152	mg/kg	1-208		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Arsenic, Total	7440-38-2	0.4	0.0832	mg/kg	79-121		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Barium, Total	7440-39-3	0.4	0.0696	mg/kg	83-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Beryllium, Total	7440-41-7	0.2	0.0132	mg/kg	83-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Cadmium, Total	7440-43-9	0.4	0.0392	mg/kg	83-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Calcium, Total	7440-70-2	4	1.4	mg/kg	81-119		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Chromium, Total	7440-47-3	0.4	0.0384	mg/kg	80-120		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Cobalt, Total	7440-48-4	0.8	0.0664	mg/kg	84-115		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Copper, Total	7440-50-8	0.4	0.1032	mg/kg	81-118		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Iron, Total	7439-89-6	2	0.3612	mg/kg	45-155		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Lead, Total	7439-92-1	2	0.1072	mg/kg	81-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Magnesium, Total	7439-95-4	4	0.616	mg/kg	76-124		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Manganese, Total	7439-96-5	0.4	0.0636	mg/kg	81-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Nickel, Total	7440-02-0	1	0.0968	mg/kg	83-117		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Potassium, Total	7440-09-7	100	5.76	mg/kg	71-129		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Selenium, Total	7782-49-2	0.8	0.1032	mg/kg	78-122		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Silver, Total	7440-22-4	0.4	0.1132	mg/kg	75-124		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Sodium, Total	7440-23-5	80	1.26	mg/kg	72-127		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Thallium, Total	7440-28-0	0.8	0.126	mg/kg	80-120		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Vanadium, Total	7440-62-2	0.4	0.0812	mg/kg	78-122		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved
Zinc, Total	7440-66-6	2	0.1172	mg/kg	82-118		75-125	20	20		180 days	Metals Only-Glass 60mL/2oz unpreserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 1

Langan Engineering & Environmental

METALS by 7471B (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Mercury, Total	7439-97-6	0.08	0.016896	mg/kg	72-128		80-120	20	20		28 days	Metals Only-Glass 60mL/2oz unpreserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 1

Langan Engineering & Environmental

WETCHEM (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Cyanide, Reactive	57-12-5	10	10	mg/kg	30-125	40		40	40	7.3	14 days	1 - Glass 250ml/8oz unpreserved
Sulfide, Reactive	NONE	10	10	mg/kg	60-125	40		40	40	7.3	14 days	1 - Glass 250ml/8oz unpreserved
Chromium, Hexavalent	18540-29-9	0.8	0.16	mg/kg	80-120	20	75-125	20	20	7196A	30 days	1 - Glass 120ml/4oz unpreserved
Cyanide, Total	57-12-5	1	0.212	mg/kg	80-120	35	75-125	35	35	9010C/9012B	14 days	1 - Glass 250ml/8oz unpreserved
pH	12408-02-5	0		SU	99-101			5	5	9045D	24 hours	1 - Glass 250ml/8oz unpreserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1

Langan Engineering & Environmental

TPH by GC-FID Quantitation Only (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
TPH	NONE	33350	3835.25	ug/kg	40-140	40	40-140	40	40			
Total Petroleum Hydrocarbons (C9-C44)	NONE	33350	3341.67	ug/kg	40-140	40	40-140	40	40			
o-Terphenyl	*84-15-1*									*40-140*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5251-1
Page: 1

Langan Engineering & Environmental

TPH - Gasoline Range Organics (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Vial MeOH preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Gasoline Range Organics	NONE	2500	48.15	ug/kg	80-120	20	80-120	20	20			
1,1,1-Trifluorotoluene	*98-08-8*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1

Langan Engineering & Environmental

TCL Volatiles - EPA 8260C (WATER)

Holding Time: 14 days
Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Methylene chloride	75-09-2	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,1-Dichloroethane	75-34-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Chloroform	67-66-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Carbon tetrachloride	56-23-5	0.5	0.134	ug/l	63-132	20	63-132	20	20			
1,2-Dichloropropane	78-87-5	1	0.137	ug/l	70-130	20	70-130	20	20			
Dibromochloromethane	124-48-1	0.5	0.149	ug/l	63-130	20	63-130	20	20			
1,1,2-Trichloroethane	79-00-5	1.5	0.5	ug/l	70-130	20	70-130	20	20			
Tetrachloroethene	127-18-4	0.5	0.181	ug/l	70-130	20	70-130	20	20			
Chlorobenzene	108-90-7	2.5	0.7	ug/l	75-130	20	75-130	20	20			
Trichlorofluoromethane	75-69-4	2.5	0.7	ug/l	62-150	20	62-150	20	20			
1,2-Dichloroethane	107-06-2	0.5	0.132	ug/l	70-130	20	70-130	20	20			
1,1,1-Trichloroethane	71-55-6	2.5	0.7	ug/l	67-130	20	67-130	20	20			
Bromodichloromethane	75-27-4	0.5	0.192	ug/l	67-130	20	67-130	20	20			
trans-1,3-Dichloropropene	10061-02-6	0.5	0.164	ug/l	70-130	20	70-130	20	20			
cis-1,3-Dichloropropene	10061-01-5	0.5	0.144	ug/l	70-130	20	70-130	20	20			
1,3-Dichloropropene, Total	542-75-6	0.5	0.144	ug/l				20	20			
1,3-Dichloropropene, Total	542-75-6	0.5	0.144	ug/l				20	20			
1,1-Dichloropropene	563-58-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Bromoform	75-25-2	2	0.65	ug/l	54-136	20	54-136	20	20			
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.167	ug/l	67-130	20	67-130	20	20			
Benzene	71-43-2	0.5	0.159	ug/l	70-130	20	70-130	20	20			
Toluene	108-88-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Ethylbenzene	100-41-4	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Chloromethane	74-87-3	2.5	0.7	ug/l	64-130	20	64-130	20	20			
Bromomethane	74-83-9	2.5	0.7	ug/l	39-139	20	39-139	20	20			
Vinyl chloride	75-01-4	1	0.0714	ug/l	55-140	20	55-140	20	20			
Chloroethane	75-00-3	2.5	0.7	ug/l	55-138	20	55-138	20	20			
1,1-Dichloroethene	75-35-4	0.5	0.169	ug/l	61-145	20	61-145	20	20			
trans-1,2-Dichloroethene	156-60-5	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Trichloroethene	79-01-6	0.5	0.175	ug/l	70-130	20	70-130	20	20			
1,2-Dichlorobenzene	95-50-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,3-Dichlorobenzene	541-73-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,4-Dichlorobenzene	106-46-7	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Methyl tert butyl ether	1634-04-4	2.5	0.7	ug/l	63-130	20	63-130	20	20			
p/m-Xylene	179601-23-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
o-Xylene	95-47-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Xylene (Total)	1330-20-7	2.5	0.7	ug/l				20	20			
Xylene (Total)	1330-20-7	2.5	0.7	ug/l				20	20			
cis-1,2-Dichloroethene	156-59-2	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2-Dichloroethene (total)	540-59-0	2.5	0.7	ug/l				20	20			
1,2-Dichloroethene (total)	540-59-0	2.5	0.7	ug/l				20	20			
Dibromomethane	74-95-3	5	1	ug/l	70-130	20	70-130	20	20			

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1

Langan Engineering & Environmental

TCL Volatiles - EPA 8260C (WATER)

Holding Time: 14 days
Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,2,3-Trichloropropane	96-18-4	2.5	0.7	ug/l	64-130	20	64-130	20	20			
Acrylonitrile	107-13-1	5	1.5	ug/l	70-130	20	70-130	20	20			
Styrene	100-42-5	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Dichlorodifluoromethane	75-71-8	5	1	ug/l	36-147	20	36-147	20	20			
Acetone	67-64-1	5	1.46	ug/l	58-148	20	58-148	20	20			
Carbon disulfide	75-15-0	5	1	ug/l	51-130	20	51-130	20	20			
2-Butanone	78-93-3	5	1.94	ug/l	63-138	20	63-138	20	20			
Vinyl acetate	108-05-4	5	1	ug/l	70-130	20	70-130	20	20			
4-Methyl-2-pentanone	108-10-1	5	1	ug/l	59-130	20	59-130	20	20			
2-Hexanone	591-78-6	5	1	ug/l	57-130	20	57-130	20	20			
Bromochloromethane	74-97-5	2.5	0.7	ug/l	70-130	20	70-130	20	20			
2,2-Dichloropropane	594-20-7	2.5	0.7	ug/l	63-133	20	63-133	20	20			
1,2-Dibromoethane	106-93-4	2	0.65	ug/l	70-130	20	70-130	20	20			
1,3-Dichloropropane	142-28-9	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,1,1,2-Tetrachloroethane	630-20-6	2.5	0.7	ug/l	64-130	20	64-130	20	20			
Bromobenzene	108-86-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
n-Butylbenzene	104-51-8	2.5	0.7	ug/l	53-136	20	53-136	20	20			
sec-Butylbenzene	135-98-8	2.5	0.7	ug/l	70-130	20	70-130	20	20			
tert-Butylbenzene	98-06-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
o-Chlorotoluene	95-49-8	2.5	0.7	ug/l	70-130	20	70-130	20	20			
p-Chlorotoluene	106-43-4	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2-Dibromo-3-chloropropane	96-12-8	2.5	0.7	ug/l	41-144	20	41-144	20	20			
Hexachlorobutadiene	87-68-3	2.5	0.7	ug/l	63-130	20	63-130	20	20			
Isopropylbenzene	98-82-8	2.5	0.7	ug/l	70-130	20	70-130	20	20			
p-Isopropyltoluene	99-87-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
Naphthalene	91-20-3	2.5	0.7	ug/l	70-130	20	70-130	20	20			
n-Propylbenzene	103-65-1	2.5	0.7	ug/l	69-130	20	69-130	20	20			
1,2,3-Trichlorobenzene	87-61-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2,4-Trichlorobenzene	120-82-1	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,3,5-Trimethylbenzene	108-67-8	2.5	0.7	ug/l	64-130	20	64-130	20	20			
1,2,4-Trimethylbenzene	95-63-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,4-Dioxane	123-91-1	250	60.8	ug/l	56-162	20	56-162	20	20			
1,4-Diethylbenzene	105-05-5	2	0.7	ug/l	70-130	20	70-130	20	20			
4-Ethyltoluene	622-96-8	2	0.7	ug/l	70-130	20	70-130	20	20			
1,2,4,5-Tetramethylbenzene	95-93-2	2	0.542	ug/l	70-130	20	70-130	20	20			
Ethyl ether	60-29-7	2.5	0.7	ug/l	59-134	20	59-134	20	20			
trans-1,4-Dichloro-2-butene	110-57-6	2.5	0.7	ug/l	70-130	20	70-130	20	20			
1,2-Dichloroethane-d4	*17060-07-0*									*70-130*		
Toluene-d8	*2037-26-5*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		
Dibromofluoromethane	*1868-53-7*									*70-130*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1
Page: 1

Langan Engineering & Environmental

NYTCL Semivolatiles - EPA 8270D (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	2	0.591	ug/l	37-111	30	37-111	30	30			
1,2,4-Trichlorobenzene	120-82-1	5	0.661	ug/l	39-98	30	39-98	30	30			
Hexachlorobenzene	118-74-1	2	0.579	ug/l	40-140	30	40-140	30	30			
Bis(2-chloroethyl)ether	111-44-4	2	0.669	ug/l	40-140	30	40-140	30	30			
2-Chloronaphthalene	91-58-7	2	0.64	ug/l	40-140	30	40-140	30	30			
1,2-Dichlorobenzene	95-50-1	2	0.732	ug/l	40-140	30	40-140	30	30			
1,3-Dichlorobenzene	541-73-1	2	0.688	ug/l	40-140	30	40-140	30	30			
1,4-Dichlorobenzene	106-46-7	2	0.708	ug/l	36-97	30	36-97	30	30			
3,3'-Dichlorobenzidine	91-94-1	5	1.39	ug/l	40-140	30	40-140	30	30			
2,4-Dinitrotoluene	121-14-2	5	0.845	ug/l	48-143	30	48-143	30	30			
2,6-Dinitrotoluene	606-20-2	5	1.12	ug/l	40-140	30	40-140	30	30			
Fluoranthene	206-44-0	2	0.568	ug/l	40-140	30	40-140	30	30			
4-Chlorophenyl phenyl ether	7005-72-3	2	0.625	ug/l	40-140	30	40-140	30	30			
4-Bromophenyl phenyl ether	101-55-3	2	0.731	ug/l	40-140	30	40-140	30	30			
Bis(2-chloroisopropyl)ether	108-60-1	2	0.696	ug/l	40-140	30	40-140	30	30			
Bis(2-chloroethoxy)methane	111-91-1	5	0.626	ug/l	40-140	30	40-140	30	30			
Hexachlorobutadiene	87-68-3	2	0.717	ug/l	40-140	30	40-140	30	30			
Hexachlorocyclopentadiene	77-47-4	20	7.84	ug/l	40-140	30	40-140	30	30			
Hexachloroethane	67-72-1	2	0.682	ug/l	40-140	30	40-140	30	30			
Isophorone	78-59-1	5	0.601	ug/l	40-140	30	40-140	30	30			
Naphthalene	91-20-3	2	0.68	ug/l	40-140	30	40-140	30	30			
Nitrobenzene	98-95-3	2	0.753	ug/l	40-140	30	40-140	30	30			
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	2	0.644	ug/l	40-140	30	40-140	30	30			
n-Nitrosodi-n-propylamine	621-64-7	5	0.7	ug/l	29-132	30	29-132	30	30			
Bis(2-Ethylhexyl)phthalate	117-81-7	3	0.91	ug/l	40-140	30	40-140	30	30			
Butyl benzyl phthalate	85-68-7	5	1.26	ug/l	40-140	30	40-140	30	30			
Di-n-butylphthalate	84-74-2	5	0.689	ug/l	40-140	30	40-140	30	30			
Di-n-octylphthalate	117-84-0	5	1.14	ug/l	40-140	30	40-140	30	30			
Diethyl phthalate	84-66-2	5	0.628	ug/l	40-140	30	40-140	30	30			
Dimethyl phthalate	131-11-3	5	0.65	ug/l	40-140	30	40-140	30	30			
Benzo(a)anthracene	56-55-3	2	0.61	ug/l	40-140	30	40-140	30	30			
Benzo(a)pyrene	50-32-8	2	0.539	ug/l	40-140	30	40-140	30	30			
Benzo(b)fluoranthene	205-99-2	2	0.635	ug/l	40-140	30	40-140	30	30			
Benzo(k)fluoranthene	207-08-9	2	0.597	ug/l	40-140	30	40-140	30	30			
Chrysene	218-01-9	2	0.543	ug/l	40-140	30	40-140	30	30			
Acenaphthylene	208-96-8	2	0.658	ug/l	45-123	30	45-123	30	30			
Anthracene	120-12-7	2	0.645	ug/l	40-140	30	40-140	30	30			
Benzo(ghi)perylene	191-24-2	2	0.611	ug/l	40-140	30	40-140	30	30			
Fluorene	86-73-7	2	0.619	ug/l	40-140	30	40-140	30	30			
Phenanthrene	85-01-8	2	0.613	ug/l	40-140	30	40-140	30	30			
Dibenzo(a,h)anthracene	53-70-3	2	0.548	ug/l	40-140	30	40-140	30	30			
Indeno(1,2,3-cd)Pyrene	193-39-5	2	0.707	ug/l	40-140	30	40-140	30	30			

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Langan Engineering & Environmental

NYTCL Semivolatiles - EPA 8270D (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Pyrene	129-00-0	2	0.569	ug/l	26-127	30	26-127	30	30			
Biphenyl	92-52-4	2	0.757	ug/l	40-140	30	40-140	30	30			
4-Chloroaniline	106-47-8	5	0.632	ug/l	40-140	30	40-140	30	30			
2-Nitroaniline	88-74-4	5	1.14	ug/l	52-143	30	52-143	30	30			
3-Nitroaniline	99-09-2	5	1.22	ug/l	25-145	30	25-145	30	30			
4-Nitroaniline	100-01-6	5	1.3	ug/l	51-143	30	51-143	30	30			
Dibenzofuran	132-64-9	2	0.656	ug/l	40-140	30	40-140	30	30			
2-Methylnaphthalene	91-57-6	2	0.72	ug/l	40-140	30	40-140	30	30			
Acetophenone	98-86-2	5	0.847	ug/l	39-129	30	39-129	30	30			
2,4,6-Trichlorophenol	88-06-2	5	0.681	ug/l	30-130	30	30-130	30	30			
P-Chloro-M-Cresol	59-50-7	2	0.617	ug/l	23-97	30	23-97	30	30			
2-Chlorophenol	95-57-8	2	0.631	ug/l	27-123	30	27-123	30	30			
2,4-Dichlorophenol	120-83-2	5	0.769	ug/l	30-130	30	30-130	30	30			
2,4-Dimethylphenol	105-67-9	5	1.64	ug/l	30-130	30	30-130	30	30			
2-Nitrophenol	88-75-5	10	1.52	ug/l	30-130	30	30-130	30	30			
4-Nitrophenol	100-02-7	10	1.77	ug/l	10-80	30	10-80	30	30			
2,4-Dinitrophenol	51-28-5	20	5.47	ug/l	20-130	30	20-130	30	30			
4,6-Dinitro-o-cresol	534-52-1	10	2.1	ug/l	20-164	30	20-164	30	30			
Pentachlorophenol	87-86-5	10	3.43	ug/l	9-103	30	9-103	30	30			
Phenol	108-95-2	5	1.89	ug/l	12-110	30	12-110	30	30			
2-Methylphenol	95-48-7	5	1.02	ug/l	30-130	30	30-130	30	30			
3-Methylphenol/4-Methylphenol	106-44-5	5	1.11	ug/l	30-130	30	30-130	30	30			
2,4,5-Trichlorophenol	95-95-4	5	0.715	ug/l	30-130	30	30-130	30	30			
Benzoic Acid	65-85-0	50	12.9	ug/l	10-164	30	10-164	30	30			
Benzyl Alcohol	100-51-6	2	0.725	ug/l	26-116	30	26-116	30	30			
Carbazole	86-74-8	2	0.627	ug/l	55-144	30	55-144	30	30			
2-Fluorophenol	*367-12-4*									*21-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*15-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-120*		
4-Terphenyl-d14	*1718-51-0*									*41-149*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1
Page: 1

Langan Engineering & Environmental

NYTCL Semivolatiles -EPA 8270D-SIM (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	0.1	0.035	ug/l	40-140	40	40-140	40	40			
2-Chloronaphthalene	91-58-7	0.2	0.035	ug/l	40-140	40	40-140	40	40			
Fluoranthene	206-44-0	0.1	0.038	ug/l	40-140	40	40-140	40	40			
Hexachlorobutadiene	87-68-3	0.5	0.036	ug/l	40-140	40	40-140	40	40			
Naphthalene	91-20-3	0.1	0.043	ug/l	40-140	40	40-140	40	40			
Benzo(a)anthracene	56-55-3	0.1	0.018	ug/l	40-140	40	40-140	40	40			
Benzo(a)pyrene	50-32-8	0.1	0.039	ug/l	40-140	40	40-140	40	40			
Benzo(b)fluoranthene	205-99-2	0.1	0.016	ug/l	40-140	40	40-140	40	40			
Benzo(k)fluoranthene	207-08-9	0.1	0.042	ug/l	40-140	40	40-140	40	40			
Chrysene	218-01-9	0.1	0.038	ug/l	40-140	40	40-140	40	40			
Acenaphthylene	208-96-8	0.1	0.035	ug/l	40-140	40	40-140	40	40			
Anthracene	120-12-7	0.1	0.035	ug/l	40-140	40	40-140	40	40			
Benzo(ghi)perylene	191-24-2	0.1	0.042	ug/l	40-140	40	40-140	40	40			
Fluorene	86-73-7	0.1	0.037	ug/l	40-140	40	40-140	40	40			
Phenanthrene	85-01-8	0.1	0.015	ug/l	40-140	40	40-140	40	40			
Dibenzo(a,h)anthracene	53-70-3	0.1	0.039	ug/l	40-140	40	40-140	40	40			
Indeno(1,2,3-cd)Pyrene	193-39-5	0.1	0.04	ug/l	40-140	40	40-140	40	40			
Pyrene	129-00-0	0.1	0.04	ug/l	40-140	40	40-140	40	40			
2-Methylnaphthalene	91-57-6	0.1	0.045	ug/l	40-140	40	40-140	40	40			
Pentachlorophenol	87-86-5	0.8	0.22	ug/l	40-140	40	40-140	40	40			
Hexachlorobenzene	118-74-1	0.8	0.032	ug/l	40-140	40	40-140	40	40			
Hexachloroethane	67-72-1	0.8	0.03	ug/l	40-140	40	40-140	40	40			
2-Fluorophenol	*367-12-4*									*21-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*15-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-120*		
4-Terphenyl-d14	*1718-51-0*									*41-149*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1

Langan Engineering & Environmental

TCL Pesticides - EPA 8081B (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 120ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Delta-BHC	319-86-8	0.02	0.00467	ug/l	30-150	20	30-150	30	30			
Lindane	58-89-9	0.02	0.00434	ug/l	30-150	20	30-150	30	30			
Alpha-BHC	319-84-6	0.02	0.00439	ug/l	30-150	20	30-150	30	30			
Beta-BHC	319-85-7	0.02	0.0056	ug/l	30-150	20	30-150	30	30			
Heptachlor	76-44-8	0.02	0.0031	ug/l	30-150	20	30-150	30	30			
Aldrin	309-00-2	0.02	0.00216	ug/l	30-150	20	30-150	30	30			
Heptachlor epoxide	1024-57-3	0.02	0.00415	ug/l	30-150	20	30-150	30	30			
Endrin	72-20-8	0.04	0.00429	ug/l	30-150	20	30-150	30	30			
Endrin aldehyde	7421-93-4	0.04	0.0081	ug/l	30-150	20	30-150	30	30			
Endrin ketone	53494-70-5	0.04	0.00477	ug/l	30-150	20	30-150	30	30			
Dieldrin	60-57-1	0.04	0.00429	ug/l	30-150	20	30-150	30	30			
4,4'-DDE	72-55-9	0.04	0.00381	ug/l	30-150	20	30-150	30	30			
4,4'-DDD	72-54-8	0.04	0.00464	ug/l	30-150	20	30-150	30	30			
4,4'-DDT	50-29-3	0.04	0.00432	ug/l	30-150	20	30-150	30	30			
Endosulfan I	959-98-8	0.02	0.00345	ug/l	30-150	20	30-150	30	30			
Endosulfan II	33213-65-9	0.04	0.00519	ug/l	30-150	20	30-150	30	30			
Endosulfan sulfate	1031-07-8	0.04	0.00481	ug/l	30-150	20	30-150	30	30			
Methoxychlor	72-43-5	0.2	0.00684	ug/l	30-150	20	30-150	30	30			
Toxaphene	8001-35-2	0.2	0.0627	ug/l	30-150	20	30-150	30	30			
cis-Chlordane	5103-71-9	0.02	0.00666	ug/l	30-150	20	30-150	30	30			
trans-Chlordane	5103-74-2	0.02	0.00627	ug/l	30-150	20	30-150	30	30			
Chlordane	57-74-9	0.2	0.0463	ug/l	30-150	20	30-150	30	30			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1

Langan Engineering & Environmental

Herbicides -EPA 8151A (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
2,4-D	94-75-7	10	0.498	ug/l	30-150	25	30-150	25	25			
2,4,5-T	93-76-5	2	0.531	ug/l	30-150	25	30-150	25	25			
2,4,5-TP (Silvex)	93-72-1	2	0.539	ug/l	30-150	25	30-150	25	25			
DCAA	*19719-28-9*									*30-150*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1
Page: 1

Langan Engineering & Environmental

TCL PCBs - EPA 8082A (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Aroclor 1016	12674-11-2	0.083	0.019588	ug/l	40-140	50	40-140	50	50			
Aroclor 1221	11104-28-2	0.083	0.031872	ug/l	40-140	50	40-140	50	50			
Aroclor 1232	11141-16-5	0.083	0.027058	ug/l	40-140	50	40-140	50	50			
Aroclor 1242	53469-21-9	0.083	0.029548	ug/l	40-140	50	40-140	50	50			
Aroclor 1248	12672-29-6	0.083	0.022576	ug/l	40-140	50	40-140	50	50			
Aroclor 1254	11097-69-1	0.083	0.034611	ug/l	40-140	50	40-140	50	50			
Aroclor 1260	11096-82-5	0.083	0.01992	ug/l	40-140	50	40-140	50	50			
Aroclor 1262	37324-23-5	0.083	0.017098	ug/l	40-140	50	40-140	50	50			
Aroclor 1268	11100-14-4	0.083	0.027058	ug/l	40-140	50	40-140	50	50			
PCBs, Total	1336-36-3	0.083	0.017098	ug/l				50	50			
PCBs, Total	1336-36-3	0.083	0.017098	ug/l				50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1

Langan Engineering & Environmental

METALS by 6020B (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Aluminum, Total	7429-90-5	0.01	0.00327	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Antimony, Total	7440-36-0	0.004	0.000429	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Arsenic, Total	7440-38-2	0.0005	0.000165	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Barium, Total	7440-39-3	0.0005	0.000173	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Beryllium, Total	7440-41-7	0.0005	0.000107	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Cadmium, Total	7440-43-9	0.0002	0.0000599	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Calcium, Total	7440-70-2	0.1	0.0394	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Chromium, Total	7440-47-3	0.001	0.000178	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Cobalt, Total	7440-48-4	0.0005	0.000163	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Copper, Total	7440-50-8	0.001	0.000384	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Iron, Total	7439-89-6	0.05	0.0191	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Lead, Total	7439-92-1	0.001	0.000343	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Magnesium, Total	7439-95-4	0.07	0.0242	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Manganese, Total	7439-96-5	0.001	0.00044	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Nickel, Total	7440-02-0	0.002	0.000556	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Potassium, Total	7440-09-7	0.1	0.0309	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Selenium, Total	7782-49-2	0.005	0.00173	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Silver, Total	7440-22-4	0.0004	0.000163	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Sodium, Total	7440-23-5	0.1	0.0293	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Thallium, Total	7440-28-0	0.0005	0.000143	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Vanadium, Total	7440-62-2	0.005	0.00157	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved
Zinc, Total	7440-66-6	0.01	0.00341	mg/l	80-120		75-125	20	20		180 days	1 - Plastic 500ml HNO3 preserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1
Page: 1

Langan Engineering & Environmental

METALS by 7470A (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Mercury, Total	7439-97-6	0.0002	0.000066	mg/l	80-120		75-125	20	20		28 days	1 - Plastic 500ml HNO3 preserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1
Page: 1

Langan Engineering & Environmental

WETCHEM (WATER)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Chromium, Hexavalent	18540-29-9	0.01	0.003	mg/l	85-115	20	85-115	20	20	7196A	24 hours	1 - Plastic 500ml unpreserved
Cyanide, Total	57-12-5	0.005	0.0018	mg/l	85-115	20	80-120	20	20	9010C/9012B	14 days	1 - Plastic 250ml NaOH preserved

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1
Page: 1

Langan Engineering & Environmental

TPH by GC-FID Quantitation Only (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 1000ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
TPH	NONE	200	42	ug/l	40-140	40	40-140	40	40			
Total Petroleum Hydrocarbons (C9-C44)	NONE	500	43.1	ug/l	40-140	40	40-140	40	40			
o-Terphenyl	*84-15-1*									*40-140*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5253-1

Langan Engineering & Environmental

TPH - Gasoline Range Organics (WATER)

Holding Time: 14 days
Container/Sample Preservation: 3 - Vial HCl preserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Gasoline Range Organics	NONE	50	3.048	ug/l	80-120	20	80-120	20	20			
1,1,1-Trifluorotoluene	*98-08-8*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5254-1
Page: 1

Langan Engineering & Environmental

1,4 Dioxane via EPA 8270D-SIM (WATER)

Holding Time: 7 days
Container/Sample Preservation: 2 - Amber 500ml unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,4-Dioxane	123-91-1	150	75	ng/l	40-140	30	40-140	30	30			
1,4-Dioxane-d8	*17647-74-4*									*15-110*		
1,4-Dioxane-d8 (IS)	17647-74-4			ng/l								

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 07/27/18
Created By: Ben Rao
File: PM5254-1
Page: 1

Langan Engineering & Environmental

NY PFAAs via EPA 537(M)-Isotope Dilution (WATER)

Holding Time: 14 days
Container/Sample Preservation: 1 - 3 Plastic Trizma/1 Plastic/1 H20+Trizma

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanoic Acid (PFBA)	375-22-4	2	0.1312	ng/l	50-150	30	50-150	30	30			
Perfluoropentanoic Acid (PFPeA)	2706-90-3	2	0.0856	ng/l	50-150	30	50-150	30	30			
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	2	0.11	ng/l	50-150	30	50-150	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	2	0.1264	ng/l	50-150	30	50-150	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	2	0.0924	ng/l	50-150	30	50-150	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	2	0.1076	ng/l	50-150	30	50-150	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	2	0.0504	ng/l	50-150	30	50-150	30	30			
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	2	0.194	ng/l	50-150	30	50-150	30	30			
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	2	0.1552	ng/l	50-150	30	50-150	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	2	0.1008	ng/l	50-150	30	50-150	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	2	0.1116	ng/l	50-150	30	50-150	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	2	0.1904	ng/l	50-150	30	50-150	30	30			
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	2	0.2908	ng/l	50-150	30	50-150	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSA	2355-31-9	2	0.2504	ng/l	50-150	30	50-150	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	2	0.1912	ng/l	50-150	30	50-150	30	30			
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	2	0.2224	ng/l	50-150	30	50-150	30	30			
Perfluorooctanesulfonamide (FOSA)	754-91-6	2	0.2268	ng/l	50-150	30	50-150	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	2	0.3728	ng/l	50-150	30	50-150	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	2	0.0916	ng/l	50-150	30	50-150	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	2	0.0904	ng/l	50-150	30	50-150	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	2	0.072	ng/l	50-150	30	50-150	30	30			
Perfluoro[13C4]Butanoic Acid (MPFBA)	*NONE*									*50-150*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*50-150*		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*50-150*		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	*NONE*									*50-150*		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	*NONE*									*50-150*		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	*NONE*									*50-150*		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	*NONE*									*50-150*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-	*NONE*									*50-150*		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	*NONE*									*50-150*		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	*NONE*									*50-150*		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	*NONE*									*50-150*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-	*NONE*									*50-150*		
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid	*NONE*									*50-150*		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	*NONE*									*50-150*		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	*NONE*									*50-150*		
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (	*NONE*									*50-150*		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	*NONE*									*50-150*		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	*NONE*									*50-150*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, In

Date Created: 01/16/18
Created By: Ben Rao
File: PM4429-1
Page: 1

Langan Engineering & Environmental

Volatile Organics in Air: TO-15 (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,1,1-Trichloroethane	71-55-6	1.09	µg/m³	70-130			25	25			
1,1,2,2-Tetrachloroethane	79-34-5	1.37	µg/m³	70-130			25	25			
1,1,2-Trichloroethane	79-00-5	1.09	µg/m³	70-130			25	25			
1,1-Dichloroethane	75-34-3	0.809	µg/m³	70-130			25	25			
1,1-Dichloroethene	75-35-4	0.793	µg/m³	70-130			25	25			
1,2,3-Trimethylbenzene	526-73-8		µg/m³	70-130			25	25			
1,2,4-Trichlorobenzene	120-82-1	1.48	µg/m³	70-130			25	25			
1,2,4-Trimethylbenzene	95-63-6	0.983	µg/m³	70-130			25	25			
1,2,4,5-Tetramethylbenzene	95-93-2		µg/m³	70-130			25	25			
1,2-Dibromoethane	106-93-4	1.54	µg/m³	70-130			25	25			
1,2-Dichlorobenzene	95-50-1	1.2	µg/m³	70-130			25	25			
1,2-Dichloroethane	107-06-2	0.809	µg/m³	70-130			25	25			
1,2-Dichloropropane	78-87-5	0.924	µg/m³	70-130			25	25			
1,3,5-Trimethylbenzene	108-67-8	0.983	µg/m³	70-130			25	25			
1,3-Butadiene	106-99-0	0.442	µg/m³	70-130			25	25			
1,3-Dichlorobenzene	541-73-1	1.2	µg/m³	70-130			25	25			
1,4-Dichlorobenzene	106-46-7	1.2	µg/m³	70-130			25	25			
1,4-Dioxane	123-91-1	0.721	µg/m³	70-130			25	25			
2,2,4-Trimethylpentane	540-84-1	0.934	µg/m³	70-130			25	25			
2-Butanone	78-93-3	1.47	µg/m³	70-130			25	25			
2-Hexanone	591-78-6	0.82	µg/m³	70-130			25	25			
2-Methylthiophene	554-14-3		µg/m³	70-130			25	25			
3-Methylthiophene	616-44-4		µg/m³	70-130			25	25			
3-Chloropropene	107-05-1	0.626	µg/m³	70-130			25	25			
2-Ethylthiophene	872-55-9		µg/m³	70-130			25	25			
4-Ethyltoluene	622-96-8	0.983	µg/m³	70-130			25	25			
Acetone	67-64-1	2.38	µg/m³	70-130			25	25			
Benzene	71-43-2	0.639	µg/m³	70-130			25	25			
Benzyl chloride	100-44-7	1.04	µg/m³	70-130			25	25			
Benzothiophene	95-15-8		µg/m³	70-130			25	25			
Bromodichloromethane	75-27-4	1.34	µg/m³	70-130			25	25			
Bromoform	75-25-2	2.07	µg/m³	70-130			25	25			
Bromomethane	74-83-9	0.777	µg/m³	70-130			25	25			
Carbon disulfide	75-15-0	0.623	µg/m³	70-130			25	25			
Carbon tetrachloride	56-23-5	1.26	µg/m³	70-130			25	25			
Chlorobenzene	108-90-7	0.921	µg/m³	70-130			25	25			
Chloroethane	75-00-3	0.528	µg/m³	70-130			25	25			
Chloroform	67-66-3	0.977	µg/m³	70-130			25	25			
Chloromethane	74-87-3	0.413	µg/m³	70-130			25	25			
cis-1,2-Dichloroethene	156-59-2	0.793	µg/m³	70-130			25	25			
cis-1,3-Dichloropropene	10061-01-5	0.908	µg/m³	70-130			25	25			
Cyclohexane	110-82-7	0.688	µg/m³	70-130			25	25			

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. ***(Soil/Solids only)***
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.

Date Created: 01/16/18
Created By: Ben Rao
File: PM4429-1
Page: 2

Langan Engineering & Environmental

Volatile Organics in Air: TO-15 (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Dibromochloromethane	124-48-1	1.7	µg/m³	70-130			25	25			
Dichlorodifluoromethane	75-71-8	0.989	µg/m³	70-130			25	25			
Ethyl Alcohol	GCDAI06	9.42	µg/m³	70-130			25	25			
Ethyl Acetate	141-78-6	1.8	µg/m³	70-130			25	25			
Ethylbenzene	100-41-4	0.869	µg/m³	70-130			25	25			
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	1.53	µg/m³	70-130			25	25			
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	1.4	µg/m³	70-130			25	25			
Hexachlorobutadiene	87-68-3	2.13	µg/m³	70-130			25	25			
iso-Propyl Alcohol	67-63-0	1.23	µg/m³	70-130			25	25			
Methylene chloride	75-09-2	1.74	µg/m³	70-130			25	25			
4-Methyl-2-pentanone	108-10-1	2.05	µg/m³	70-130			25	25			
Methyl tert butyl ether	1634-04-4	0.721	µg/m³	70-130			25	25			
Methyl Methacrylate	80-62-6	2.05	µg/m³	70-130			25	25			
p/m-Xylene	179601-23-1	1.74	µg/m³	70-130			25	25			
o-Xylene	95-47-6	0.869	µg/m³	70-130			25	25			
Xylene (Total)	1330-20-7		µg/m³	70-130			25	25			
Heptane	142-82-5	0.82	µg/m³	70-130			25	25			
n-Heptane	142-82-5		µg/m³	70-130			25	25			
n-Hexane	110-54-3	0.705	µg/m³	70-130			25	25			
Propylene	115-07-1	0.861	µg/m³	70-130			25	25			
Styrene	100-42-5	0.852	µg/m³	70-130			25	25			
Tetrachloroethene	127-18-4	1.36	µg/m³	70-130			25	25			
Thiophene	110-02-1		µg/m³	70-130			25	25			
Tetrahydrofuran	109-99-9	1.47	µg/m³	70-130			25	25			
Toluene	108-88-3	0.754	µg/m³	70-130			25	25			
trans-1,2-Dichloroethene	156-60-5	0.793	µg/m³	70-130			25	25			
1,2-Dichloroethene (total)	540-59-0		µg/m³	70-130			25	25			
trans-1,3-Dichloropropene	10061-02-6	0.908	µg/m³	70-130			25	25			
1,3-Dichloropropene, Total	542-75-6		µg/m³	70-130			25	25			
Trichloroethene	79-01-6	1.07	µg/m³	70-130			25	25			
Trichlorofluoromethane	75-69-4	1.12	µg/m³	70-130			25	25			
Vinyl acetate	108-05-4	3.52	µg/m³	70-130			25	25			
Vinyl bromide	593-60-2	0.874	µg/m³	70-130			25	25			
Vinyl chloride	75-01-4	0.511	µg/m³	70-130			25	25			
Naphthalene	91-20-3	1.05	µg/m³	70-130			25	25			
Total HC As Hexane	NONE		µg/m³	70-130			25	25			
Total VOCs As Toluene	NONE		µg/m³	70-130			25	25			
Propane	74-98-6	0.902	µg/m³	70-130			25	25			
Acrylonitrile	107-13-1	1.09	µg/m³	70-130			25	25			
Acrolein	107-02-8	1.15	µg/m³	70-130			25	25			
1,1,1,2-Tetrachloroethane	630-20-6	1.37	µg/m³	70-130			25	25			
Isopropylbenzene	98-82-8	0.983	µg/m³	70-130			25	25			

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. ***(Soil/Solids only)***
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.

Date Created: 01/16/18
Created By: Ben Rao
File: PM4429-1
Page: 3

Langan Engineering & Environmental

Volatile Organics in Air: TO-15 (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,2,3-Trichloropropane	96-18-4	1.21	µg/m³	70-130			25	25			
Acetonitrile	75-05-8	0.336	µg/m³	70-130			25	25			
Bromobenzene	108-86-1	0.793	µg/m³	70-130			25	25			
Chlorodifluoromethane	75-45-6	0.707	µg/m³	70-130			25	25			
Dichlorofluoromethane	75-43-4	0.842	µg/m³	70-130			25	25			
Dibromomethane	74-95-3	1.42	µg/m³	70-130			25	25			
Pentane	109-66-0	0.59	µg/m³	70-130			25	25			
Octane	111-65-9	0.34	µg/m³	70-130			25	25			
Tertiary-Amyl Methyl Ether	994-05-8	0.836	µg/m³	70-130			25	25			
o-Chlorotoluene	95-49-8	1.04	µg/m³	70-130			25	25			
p-Chlorotoluene	106-43-4	1.04	µg/m³	70-130			25	25			
2,2-Dichloropropane	594-20-7	0.924	µg/m³	70-130			25	25			
1,1-Dichloropropene	563-58-6	0.908	µg/m³	70-130			25	25			
Isopropyl Ether	108-20-3	0.836	µg/m³	70-130			25	25			
Ethyl-Tert-Butyl-Ether	637-92-3	0.836	µg/m³	70-130			25	25			
1,2,3-Trichlorobenzene	87-61-6	1.48	µg/m³	70-130			25	25			
Ethyl ether	60-29-7	0.606	µg/m³	70-130			25	25			
n-Butylbenzene	104-51-8	1.1	µg/m³	70-130			25	25			
sec-Butylbenzene	135-98-8	1.1	µg/m³	70-130			25	25			
tert-Butylbenzene	98-06-6	1.1	µg/m³	70-130			25	25			
1,2-Dibromo-3-chloropropane	96-12-8	1.93	µg/m³	70-130			25	25			
p-Isopropyltoluene	99-87-6	1.1	µg/m³	70-130			25	25			
n-Propylbenzene	103-65-1	0.983	µg/m³	70-130			25	25			
1,3-Dichloropropane	142-28-9	0.924	µg/m³	70-130			25	25			
Methanol	67-56-1	6.55	µg/m³	70-130			25	25			
Acetaldehyde	75-07-0		µg/m³	70-130			25	25			
Butane	106-97-8	0.475	µg/m³	70-130			25	25			
Nonane (C9)	111-84-2	1.05	µg/m³	70-130			25	25			
Decane (C10)	124-18-5	1.16	µg/m³	70-130			25	25			
Undecane	1120-21-4	1.28	µg/m³	70-130			25	25			
Indane	496-11-7		µg/m³	70-130			25	25			
Indene	95-13-6		µg/m³	70-130			25	25			
1-Methylnaphthalene	90-12-0		µg/m³	70-130			25	25			
Dodecane (C12)	112-40-3	1.39	µg/m³	70-130			25	25			
Butyl Acetate	123-86-4	2.38	µg/m³	70-130			25	25			
tert-Butyl Alcohol	75-65-0	1.52	µg/m³	70-130			25	25			
2-Methylnaphthalene	91-57-6		µg/m³	70-130			25	25			
1,2-Dichloroethane-d4	*17060-07-0*								*70-130*		
Toluene-d8	*2037-26-5*								*70-130*		
Bromofluorobenzene	*460-00-4*								*70-130*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. ***(Soil/Solids only)***
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.

Date Created: 01/16/18
Created By: Ben Rao
File: PM4429-1
Page: 1

Langan Engineering & Environmental

Volatile Organics in Air by TO-15 SIM (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,1,1-Trichloroethane	71-55-6	0.109	µg/m³	70-130	25		25	25			
1,1,1,2-Tetrachloroethane	630-20-6	0.137	µg/m³	70-130	25		25	25			
1,1,2,2-Tetrachloroethane	79-34-5	0.137	µg/m³	70-130	25		25	25			
1,1,2-Trichloroethane	79-00-5	0.109	µg/m³	70-130	25		25	25			
1,1-Dichloroethane	75-34-3	0.081	µg/m³	70-130	25		25	25			
1,1-Dichloroethene	75-35-4	0.079	µg/m³	70-130	25		25	25			
1,2,4-Trimethylbenzene	95-63-6	0.098	µg/m³	70-130	25		25	25			
1,2-Dibromoethane	106-93-4	0.154	µg/m³	70-130	25		25	25			
1,2-Dichlorobenzene	95-50-1	0.12	µg/m³	70-130	25		25	25			
1,2-Dichloroethane	107-06-2	0.081	µg/m³	70-130	25		25	25			
1,2-Dichloropropane	78-87-5	0.092	µg/m³	70-130	25		25	25			
1,3,5-Trimethylbenzene	108-67-8	0.098	µg/m³	70-130	25		25	25			
1,3-Butadiene	106-99-0	0.044	µg/m³	70-130	25		25	25			
1,3-Dichlorobenzene	541-73-1	0.12	µg/m³	70-130	25		25	25			
1,4-Dichlorobenzene	106-46-7	0.12	µg/m³	70-130	25		25	25			
1,4-Dioxane	123-91-1	0.36	µg/m³	70-130	25		25	25			
2,2,4-Trimethylpentane	540-84-1		µg/m³	70-130	25		25	25			
2-Hexanone	591-78-6		µg/m³	70-130	25		25	25			
3-Chloropropene	107-05-1		µg/m³	70-130	25		25	25			
4-Ethyltoluene	622-96-8	0.098	µg/m³	70-130	25		25	25			
Benzene	71-43-2	0.319	µg/m³	70-130	25		25	25			
Benzyl chloride	100-44-7	1.04	µg/m³	70-130	25		25	25			
Bromodichloromethane	75-27-4	0.134	µg/m³	70-130	25		25	25			
Bromoform	75-25-2	0.207	µg/m³	70-130	25		25	25			
Bromomethane	74-83-9	0.078	µg/m³	70-130	25		25	25			
Carbon disulfide	75-15-0		µg/m³	70-130	25		25	25			
Carbon tetrachloride	56-23-5	0.126	µg/m³	70-130	25		25	25			
Chlorobenzene	108-90-7	0.461	µg/m³	70-130	25		25	25			
Chloroethane	75-00-3	0.264	µg/m³	70-130	25		25	25			
Chloroform	67-66-3	0.098	µg/m³	70-130	25		25	25			
Chloromethane	74-87-3	0.413	µg/m³	70-130	25		25	25			
cis-1,2-Dichloroethene	156-59-2	0.079	µg/m³	70-130	25		25	25			
trans-1,2-Dichloroethene	156-60-5	0.079	µg/m³	70-130	25		25	25			
1,2-Dichloroethene (total)	540-59-0		µg/m³	70-130	25		25	25			
cis-1,3-Dichloropropene	10061-01-5	0.091	µg/m³	70-130	25		25	25			
1,3-Dichloropropene (Total)	542-75-6		µg/m³	70-130	25		25	25			
Cyclohexane	110-82-7		µg/m³	70-130	25		25	25			
Dibromochloromethane	124-48-1	0.17	µg/m³	70-130	25		25	25			
Dichlorodifluoromethane	75-71-8	0.989	µg/m³	70-130	25		25	25			
Ethyl Alcohol	GCDAI06		µg/m³	70-130	25		25	25			
Ethyl Acetate	141-78-6		µg/m³	70-130	25		25	25			
Ethylbenzene	100-41-4	0.087	µg/m³	70-130	25		25	25			

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. ***(Soil/Solids only)***
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.

Date Created: 01/16/18
Created By: Ben Rao
File: PM4429-1
Page: 2

Langan Engineering & Environmental

Volatile Organics in Air by TO-15 SIM (SOIL_VAPOR)

Holding Time: 30 days
Container/Sample Preservation: 1 - Canister - 2.7 Liter

Analyte	CAS #	RL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	0.383	µg/m³	70-130	25		25	25			
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	0.349	µg/m³	70-130	25		25	25			
Methylene chloride	75-09-2	1.74	µg/m³	70-130	25		25	25			
Methyl tert butyl ether	1634-04-4	0.721	µg/m³	70-130	25		25	25			
Naphthalene	91-20-3	0.262	µg/m³	70-130	25		25	25			
p/m-Xylene	179601-23-1	0.174	µg/m³	70-130	25		25	25			
o-Xylene	95-47-6	0.087	µg/m³	70-130	25		25	25			
Xylene (Total)	1330-20-7		µg/m³	70-130	25		25	25			
Heptane	142-82-5		µg/m³	70-130	25		25	25			
n-Hexane	110-54-3		µg/m³	70-130	25		25	25			
Propylene	115-07-1		µg/m³	70-130	25		25	25			
Styrene	100-42-5	0.085	µg/m³	70-130	25		25	25			
Tetrachloroethene	127-18-4	0.136	µg/m³	70-130	25		25	25			
Tetrahydrofuran	109-99-9		µg/m³	70-130	25		25	25			
Toluene	108-88-3	0.188	µg/m³	70-130	25		25	25			
trans-1,3-Dichloropropene	10061-02-6	0.091	µg/m³	70-130	25		25	25			
Trichloroethene	79-01-6	0.107	µg/m³	70-130	25		25	25			
1,2,4-Trichlorobenzene	120-82-1	0.371	µg/m³	70-130	25		25	25			
Trichlorofluoromethane	75-69-4	0.281	µg/m³	70-130	25		25	25			
Vinyl acetate	108-05-4		µg/m³	70-130	25		25	25			
Vinyl bromide	593-60-2		µg/m³	70-130	25		25	25			
Hexachlorobutadiene	87-68-3	0.533	µg/m³	70-130	25		25	25			
iso-Propyl Alcohol	67-63-0		µg/m³	70-130	25		25	25			
Vinyl chloride	75-01-4	0.051	µg/m³	70-130	25		25	25			
Acrylonitrile	107-13-1	1.09	µg/m³	70-130	25		25	25			
n-Butylbenzene	104-51-8	1.1	µg/m³	70-130	25		25	25			
sec-Butylbenzene	135-98-8	1.1	µg/m³	70-130	25		25	25			
Isopropylbenzene	98-82-8	0.983	µg/m³	70-130	25		25	25			
p-Isopropyltoluene	99-87-6	1.1	µg/m³	70-130	25		25	25			
Acetone	67-64-1	2.38	µg/m³	70-130	25		25	25			
2-Butanone	78-93-3	1.47	µg/m³	70-130	25		25	25			
4-Methyl-2-pentanone	108-10-1	2.05	µg/m³	70-130	25		25	25			
Halothane	151-67-7		µg/m³	70-130	25		25	25			
1,2,3-Trichlorobenzene	87-61-6	0.371	µg/m³	70-130	25		25	25			
1,2-Dichloroethane-d4	*17060-07-0*								*70-130*		
Toluene-d8	*2037-26-5*								*70-130*		
Bromofluorobenzene	*460-00-4*								*70-130*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. ***(Soil/Solids only)***
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.

ATTACHMENT B

RÉSUMÉS

Gerald F. Nicholls, PE, CHMM

Senior Project Manager

Environmental Engineering & Hazardous Materials Management

15 years in the industry

Mr. Nicholls' expertise includes management of remediation and site investigations, brownfield cleanups, remedial design, industrial hygiene, air monitoring and environmental health and safety projects including data collection, inspection and reporting for projects throughout New York and New Jersey. He works closely with various private, Department of Defense, state, commercial, industrial, and municipal clients, acting as a liaison between the client and project team.

As a Senior Project Manager, Mr. Nicholls is responsible for supervising project staff; conducting technical review; maintaining quality control; budget forecasting and control; and managing the technical and financial aspects of active projects.

Selected Projects

- New York City School Construction Authority On-Call Contract for Hazmat Consulting Services, Various Locations, Five Boroughs of New York, NY
- G4 Capital third party due diligence reviews and environmental risk evaluations, Various Locations, New York, NY
- 140 6th Avenue, Sub-Membrane Depressurization System Design, Spill Remediation, Subslab Remediation and Monitoring Well Piping Design, Remediation Oversight, and Construction Administration, New York, NY
- 23-01 42nd Road, Phase I, Phase II Remedial Investigation, Remedial Action Work Plan, Sub-Membrane Depressurization System Design, Underground Storage Tank Closure and Remediation, Brownfield Cleanup Program, Remediation Oversight, Construction Administration, Long Island City, NY
- 23-10 Queens Plaza South, Phase I, Phase II Remedial Investigation, Remedial Action Work Plan, Sub-Membrane Depressurization System Design, Underground Storage Tank Closure and Remediation, Brownfield Cleanup Program, Remediation Oversight, Construction Administration, Long Island City, NY
- 170 Amsterdam Avenue, Remedial Action Work Plan, Voluntary Cleanup Program, Remediation Oversight, Construction Administration, New York, NY
- Urban Health Plan, Medical Building, DNAPL Delineation, Remedial Action Work Plan, Hazardous Waste Management and Minimization, Brownfield Cleanup Program, Bronx, NY
- Whitehead Realty, Acme Sites, DNAPL Delineation, Site Characterization, Remedial Investigation and Reporting, Brooklyn, NY
- Second Avenue Subway, Air Monitoring and Ventilated Air Treatment Program, New York, NY
- West 17th Street Development, DNAPL Assessment, DNAPL Recovery, Remedial Design, Closure through Brownfield Cleanup

Education

M.S., Environmental Engineering
New Jersey Institute of Technology

B.S., Chemistry and
Environmental Studies (Double Major)
Ursinus College

Professional Registration

Professional Engineer (PE) in NY

Certified Hazardous Materials Manager (CHMM)

Affiliations

City of Jersey City Environmental Commission, Former Commission, Vice Chair and Chair

Alliance of Hazardous Materials Professionals (AHMP)

Academy of Hazardous Materials Managers (ACHMM), NJ Chapter

American Chemical Society

Association of NJ Environmental Commissions (ANJEC)

Program, Remediation Oversight, Bid Documents, ISS and Containment Wall Design, Construction Administration, New York, NY
- New York University Spill Sites, 4 Washington Square Village, 7-13, Washington Square North, and 251 Mercer Street, Fuel Oil Spill Cleanup and Closure, New York, NY
- Dormitory Authority of New York (DASNY), City College of New York, Fuel Protection and Leak Detection System Repair and Upgrades, New York, NY
- Surfactant Remediation Project, In-Situ Chemical Oxidation Design and Implementation and Site Closure, Margate City, NJ
- NYU Langone Medical Center, New Science Building, Remediation Oversight and Construction Administration, Voluntary Cleanup Program, New York, NY
- 86 Warren Street, Waste Characterization and Construction Documents, New York, NY
- 459 Smith Street, Due Diligence and Cost Estimating, Brooklyn, NY
- 491 Wortman Ave, Air Sparge/Soil Vapor Extraction Design and Implementation, Brownfield Cleanup Program, Bid Documents, Construction Administration, Brooklyn, NY
- Gowanus Canal Northside, Demolition and Decommissioning of MOSF, Remediation Investigation, Brownfield Cleanup Program, Brooklyn, NY
- 163 6th Street, Phase I and Phase II Due Diligence, Spill Response, Remedial Action Work Plan, Brooklyn, NY
- 111 Leroy Street, New York, NY
- 45 Broad Street, Waste Characterization, Construction Documents, New York, NY
- 411 Broadway, Phase I, Remedial Investigation, Air/Noise Coordination for E-Designation, New York, NY
- Modera on the Hudson, Remediation Oversight, Remedial Action Work Plan, Submembrane Depressurization System Design, Yonkers, NY
- Honeywell Quanta, Remedial Design Peer Review, Edgewater, NJ
- New York University Tandon School of Engineering (Spill 1009933), Remediation, Laser-Induced Fluorescence Investigation, Remedial System Optimization, Product Recovery, Spill Cleanup, Brooklyn, NY
- 237-261 North 9th Street, Peer Review and Due Diligence, Brooklyn, NY

Selected Publications, Reports, and Presentations

”Biodegradation Pathways and End Products of Sodium Dioctyl Sulfosuccinate/Sodium Hexadecyl Diphenyl Oxide Disulfonate Surfactant Solution.” Florida Remediation Conference, Orlando, Florida, November 2005.

Anthony Moffa, Jr., ASP, CHMM, COSS

Associate/Corporate Health and Safety Manager

Anthony is Langan's Corporate Health & Safety Manager and is responsible for managing health and safety compliance in all Langan office locations. He has over 15 years experience in the health and safety field. He is responsible for ensuring compliance with all federal and state occupational health and safety laws and development and implementation of corporate health and safety policies. Responsibilities include reviewing and updating Langan's Corporate Health and Safety Program and assisting employees in the development of site specific Health & Safety Plans. He maintains and manages health and safety records for employees in all Langan office locations including medical evaluations, respirator fit testing, and Hazardous Waste Operations and Emergency Response training. He is also responsible for documentation and investigation of work-related injuries and incidents and sharing this information with employees to assist in the prevention of future incidents. He is also the chairman of the Corporate Health & Safety Committee and Health & Safety Leadership Team that meet periodically throughout the year. He is responsible for coordinating and providing health and safe training to Langan employees. He was formerly the Environmental, Health and Safety Coordinator at a chemical manufacturer. His experience included employee hazard communications, development of material safety data sheets for developed products, respirator fit testing and conducting required Occupational Health & Safety Association and Department of Transportation training.

Education

B.S., Physics
West Chester University

Professional Registration

Associate Safety Professional (ASP)

Certified Hazardous Material Manager (CHMM)

Certified Occupational Safety Specialist (COSS)

Affiliations

Pennsylvania Chamber of Business & Industry

Chemical Council of New Jersey

New Jersey Business & Industry Association

Geoprofessional Business Association

Certifications and Training

Hazardous Waste Operations and Emergency Response Training

OSHA Site Supervisor Training

10 & 30-Hour Construction Safety & Health Training

30-Hour Construction Safety & Health Training

10-Hour Industry Safety & Health Training

Confined Space Awareness & Entry

Competent Person in Excavations

Hazard Communications

Defensive Driving Training

LANGAN

Mimi Raygorodetsky

Senior Associate
Environmental Engineering

19 years in the industry

Ms. Raygorodetsky sources and directs large, complex environmental remediation and redevelopment projects from the earliest stages of pre-development diligence, through the remediation/construction phase, to long-term operation and monitoring of remedial systems and engineering controls. She has a comprehensive understanding of federal, state and local regulatory programs and she uses this expertise to guide her clients through a preliminary cost benefit analysis to select the right program(s) given the clients' legal obligations, development desires and risk tolerance. She is particularly strong at integrating the requirements of selected programs and client development needs to develop and design targeted and streamlined diligence programs and remediation strategies. Ms. Raygorodetsky is also highly skilled in integrating remediation with construction on large urban waterfront projects, which tend to more complex than landside projects.

Selected Projects

- 25 Kent Avenue, Due Diligence for Purchase of a Brownfields Location, Brooklyn, NY
- Ferry Point Waterfront Park, Redevelopment of a Former Landfill into a Park, Bronx, NY
- Battery Maritime Building (10 South Street), Phase I ESA, New York, NY
- Residential Development at 351-357 Broadway, Phase 1 ESA, New York, NY
- 450 Union Street, Phase I and Phase II Remediation (NYS DEC Brownfield Cleanup Program), New York, NY
- Echo Bay Center, NYS DEC Brownfield Cleanup Program, New York, NY
- 420 Kent Avenue, NYS DEC Brownfield Cleanup Program, Brooklyn, NY
- 416 Kent Avenue, NYS DEC Brownfield Cleanup Program, Brooklyn, NY
- 264 Fifth Avenue, Phase I ESA, New York, NY
- 262 Fifth Avenue, Phase I ESA, New York, NY
- ABC Blocks 25-27 (Mixed-Use Properties), Brownfield Cleanup Program, Long Island City, NY
- Residences at 100 Barrow Street, Phase I ESA, New York, NY
- Residences at 22-12 Jackson Avenue, Due Diligence for Building Sale, Long Island City, NY
- Residences at 2253-2255 Broadway, Phase I and Phase II Services, New York, NY
- Prince Point, Phase I ESA, Staten Island, NY
- 787 Eleventh Avenue (Office Building Renovation), Phase I UST Closure, New York, NY
- 218 Front Street/98 Gold Street, Planning and Brownfield Consulting, Brooklyn, NY

Education

B.A., Biology and Spanish Literature
Colby College

Affiliations

New York Women Executives in Real Estate (WX), Member

New York Building Congress, Council of Industry Women, Committee Member

New York City Brownfield Partnership, Founding Member and President

NYC Office of Environmental Remediation Technical Task Force, Committee Member

- Mark JCH of Bensonhurst, Phase I and HazMat Renovation, Brooklyn, NY
- 39 West 23rd Street, E-Designation Brownfield, New York, NY
- 250 Water Street, Phase I and Phase II Property Transaction, New York, NY
- 27-19 44th Drive, Residential Redevelopment, Long Island City, NY
- 515 West 42nd Street, E-Designation, New York, NY
- 310 Meserole Street, Due Diligence Property Purchase, Brooklyn, NY
- Former Georgetown Heating Plant, HazMat and Phase I ESA, Washington D.C.
- 80-110 Flatbush Avenue, Brooklyn, NY
- 132 East 23rd Street, New York, NY
- 846 Sixth Avenue, New York, NY
- Greenpoint Landing, Remediation/Redevelopment, Brooklyn, NY
- 711 Eleventh Avenue, Due Diligence/Owner's Representative, New York, NY
- Brooklyn Bridge Park, Pier 1, Waste Characterization and Remediation, Brooklyn, NY
- Post-Hurricane Sandy Mold Remediation, Various Private Homes, Far Rockaway, NY
- Brooklyn Bridge Park, One John Street Development, Pre-Construction Due Diligence and Construction Administration, Brooklyn, NY
- 7 West 21st Street, Brownfields Remediation, New York, NY
- 546 West 44th Street, Brownfields Remediation, New York, NY
- Post-Hurricane Sandy Mold Remediation, Various Private Homes, Nassau and Suffolk Counties, Long Island, NY
- 55 West 17th Street, Brownfield Site Support, New York, NY
- Pratt Institute, 550 Myrtle Avenue Renovations, Environmental Remediation, Brooklyn, NY
- 42-02 Crescent Street Redevelopment, Phase I and II Environmental, Long Island City, NY
- IAC Building (555 West 18th Street), New York, NY
- Retirement Communities on100-acre Parcels in ME, NJ, MA, CT, and NJ
- 363-365 Bond Street/400 Carroll Street, Brooklyn, NY
- 160 East 22nd Street, New York, NY
- 110 Third Avenue, New York, NY
- Lycee Francais (East 76th Street & York Avenue), New York, NY
- Winchester Arms Munitions Factory, New Haven, CT

Emily G. Strake

Project Chemist/ Risk Assessor
Environmental Engineering

17 years in the industry ~ 5 years with Langan

Ms. Strake has 17 years of environmental chemistry, risk assessment, auditing, and quality assurance experience. Most recently, she has focused her efforts on human health risk assessment, and has been the primary author or key contributor of risk assessment reports and screening evaluations for projects governed under RCRA, CERCLA, NJDEP, DNREC, SWRCB, DTSC, PADEP, CTDEEP, ODEQ, NYSDEC and MDE. She has experience in site-specific strategy development, which has enabled her to perform assessments to focus areas of investigation and identify risk-based alternatives for reducing remediation costs. Ms. Strake is a member of the Interstate Technology and Regulatory Council Risk Assessment Team responsible for the development and review of organizational risk assessment guidance documents and serves as a National Trainer in risk assessment for the organization.

Ms. Strake has extensive experience in environmental data validation, focused on ensuring laboratory deliverables follow specific guidelines as described by regulatory agencies and the analytical methods employed. In addition, she has experience in EQuIS chemical database management. She also has a broad range of environmental field experience and maintains current OSHA HAZWOPER certification. Ms. Strake is experienced in auditing laboratory and field-sampling activities for compliance with Quality Assurance Project Plans (QAPPs), the National Environmental Laboratory Accreditation Conference Standards Quality Systems manual, and applicable USEPA Guidance. Ms. Strake has also audited on-site laboratories in support of groundwater treatment operations and implemented corrective actions. Her responsibilities include writing reports on the value of laboratory work, writing/editing QAPPs for clients and project-specific sites, peer reviewing colleague's work, and mentoring staff within the office. She has also served as the Quality Assurance officer for several long-term projects, responsible for the achievement of all forms of Quality Control/Quality Assurance by onsite personnel relating to sampling, analysis, and data evaluation.

Selected Project Experience

Major League Soccer's San Jose Earthquakes Stadium, Santa Clara, CA
DuPont, Waynesboro, VA
PECO/Exelon, Various Locations
Texas Instruments, San Francisco, CA
Regency, Philadelphia, PA
Veteran's Affairs, Palo Alto, CA
DOW Chemical, Various Locations
Avon, Rye, NY
Golden Gate National Parks Conservancy, San Francisco, CA
Sunoco Refineries, Various Locations
Honeywell, Highland Park, NJ
Delaware City Refinery, DE

Education

MBA
The University of Scranton

B.S., Chemistry
Cedar Crest College

Professional Licenses

Board Certified Environmental Professional (CEP)

Training

40 hr. OSHA HAZWOPER Training/Nov 2002

8 hr. HAZWOPER Supervisor/June 2004

8 hr. OSHA HAZWOPER Refresher/2013

Affiliations

The Society for Risk Analysis

Interstate Technology and Regulatory Council

LANGAN

Occidental Chemical, Bakersfield, CA
Floreffe Terminal, Pittsburgh, PA
Ryder, Hartford, CT
Rohm and Haas, Philadelphia, PA

ATTACHMENT C

ANALYTICAL METHODS/
QUALITY ASSURANCE SUMMARY TABLE

ATTACHMENT C

ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

Matrix Type	Field Parameters	Laboratory Parameters	Analytical Methods	Sample Preservation	Sample Container Volume and Type	Sample Hold Time	Field Duplicate Samples	Field Blank Samples	Trip Blank Samples	Ambient Air Samples	MS/MSD Samples
Soil	Total VOCs via PID	Part 375 + TCL VOCs	EPA 8260C	Cool to 4°C	Two 40-ml VOC vials with 5ml H_2O, one with MeOH or 3 En Core Samplers (separate container for % solids)	14 days if froze to -7 C° or extruded into methanol (vials); 48 hours otherwise (En Cores)	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	1 per Shipment of VOC samples	NA	1 per 20 samples
		Part 375 + TCL SVOCs	EPA 8270D	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis			NA		
		Part 375 + TAL Metals + Cyanide	EPA 6010D, EPA 7471B, EPA 7196A, EPA 9010C/9012B	Cool to 4°C	2 oz. amber glass jar	6 months, except mercury 28 days and cyanide 14 days					
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	4 oz. amber glass jar	14 days extract, 40 days after extraction to analysis					
Groundwater	Temperature, Turbidity, pH, ORP, Conductivity	Part 375 + TCL VOCs	EPA 8260C	Cool to 4°C; HCl to pH <2; no headspace	Three 40-mL VOC vials with Teflon® - lined cap	Analyze within 14 days of collection	1 per 20 samples (minimum 1)	1 per 20 samples (minimum 1)	1 per Shipment of VOC samples	NA	1 per 20 samples
		Part 375 + TCL SVOCs	EPA 8270D and 8270D with SIM	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extract; 40 days after extraction to analysis			NA		
		1,4-Dioxane as SVOC	EPA 8270D With SIM	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extract; 40 days after extraction to analysis					
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extract; 40 days after extraction to analysis					
		PCBs	EPA 8082A	Cool to 4°C							
		PFAS	EPA 537M	Cool to 4°C; Trizma	Three 250-mL HDPE or polypropylene container	14 days to extract; 28 days after extraction to analysis					
		Part 375 + TAL Metals	EPA 6020B, 7470A	Cool to 4°C; HNO_3 to pH <2	250 mL plastic	6 months, except Mercury 28 days					
		Hexavalent Chromium	EPA 7196A	Cool to 4°C	250 mL plastic	24 Hours					
		Cyanide	EPA 9010CB/9012B	NaOH plus 0.6g ascorbic acid	250 mL plastic	14 days					
Sub-slab Vapor	Total VOCs, Oxygen, LEL, CO, and H_2S, with MultiGas Meter	TO-15 Listed VOCs	EPA TO-15	Ambient Temperature	2.7-Liter Summa Canister	Analyze within 30 days of collection	NA	NA	NA	1 per 10 samples (minimum 1)	NA
Ambient Air	Total VOCs via PID									NA	

Notes:

1. PID - Photoionization Detector
2. VOC - Volatile organic compound
3. EPA - Environmental Protection Agency
4. TCL - Target compound list
5. TAL - Target analyte list
6. ORP - Oxidation reduction potential
7. DO - Dissolved oxygen
8. LEL - Lower explosive limit
9. CO -Carbon monoxide
10. H_2S - Hydrogen sulfide
11. NA - Not applicable

ATTACHMENT D

SAMPLE NOMENCLATURE STANDARD OPERATING PROCEDURE

SOP #01 – Sample Nomenclature

INTRODUCTION

The Langan Environmental Group conducts an assortment of site investigations where samples (Vapor, Solids, and Aqueous) are collected and submitted to analytical laboratories for analysis. The results of which are then evaluated and entered into a data base allowing quick submittal to the state regulatory authority (New York State Division of Environmental Conservation [NYSDEC]). In addition, Langan is linking their data management system to graphic and analytical software to enable efficient evaluation of the data as well as creating client-ready presentational material.

SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the general framework for labeling vapor, solid (soil) and aqueous (groundwater) samples that will be submitted for laboratory analysis. The nomenclature being introduced is designed to meet the NYSDEC EQuIS standard and has been incorporated into Langan software scripts to assist project personnel in processing the data. While this SOP is applicable to all site investigation; unanticipated conditions may arise which may require considerable flexibility in complying with this SOP. Therefore, guidance provided in this SOP is presented in terms of general steps and strategies that should be applied; but deviation from this SOP must be reported to the Project Manager (PM) immediately.

GENERAL SAMPLE IDENTIFICATION CONSIDERATIONS

Sample Labels

All sample ware must have a label. Recall that when you are using the Encore™ samples (see below); they are delivered in plastic lined foil bags. You are to label the bags[1]:

All other samples containers including Terra Cores™ must be labeled with laboratory provided self-adhesive labels.

Quick Breakdown of Sample Format

The general format for sample nomenclature is:

[1]Both Alpha and York laboratories permit the combining of the three Encore™ into a single bag. This may not be appropriate for all laboratories so please confirm with the labs themselves

LLNN_ID

Where

LL is a grouping of two (2) to four (4) letters signifying the sample media source. In older nomenclature SOPs this portion of the sample identification is commonly referred to as the *Sample Investigation Code*

NN represents a two digit number identifying the specific sample location or sample sequence number

_ ***(underscore)*** is required between the sample lettering and numeric identification and additional modifying data that determines the date of sampling or the depth of the sample interval

ID is a modifier specific to the sample type media (depth of soil sample or date of groundwater sample)

LL – Sample Investigation Code

Langan has devised a list of two to four letters to insure a quick ability to identify the sample investigation.

Code	Investigation
AA	Ambient Air
DS	Drum
EPB	Endpoint Location - Bottom (Excavation)
EPSW	Endpoint Location - Sidewall (Excavation)
FP	Free Product
IA	Indoor Air
IDW	Investigation Derived Waste (Soil Pile)
MW	Monitoring Well (Permanent)
SB	Soil Boring
SG	Staff Gauge (Stream Gauging)
SL	Sludge
SV	Soil Vapor Point
SVE	Soil Vapor Extraction Well
SW	Surface Water
TMW	Temporary Monitoring Well
TP	Test Pit (Excavated Material from Test Pit Not Associated With Sidewall or Bottom Samples)
WC	Waste Characterization Boring
COMP	Composite Sample
TB	Trip Blank (QA/QC Sampling – All Investigations)
FB	Field Blank (QA/QC Sampling – All Investigations)
DUP	Duplicate (QA/QC Sampling – All Investigations)

NN – Numeric Identifier

The two digit number that follows the sample investigation code (LL) identifies the specific sample based on the soil boring, monitoring well, endpoint or other location identification. For a subset of samples

where there is no specific location identifier, the two digit number is the sequence number for the sample submitted. For example, an aqueous sample from a monitoring well identified as MW-1 would have the sample investigation code of MW and the numeric identifier as 01. Note there is no hyphen. The same can be done for soil borings, a soil sample collected from soil boring 9 (SB-9) would be have the LLNN identification of SB09 (again, no hyphen).

Note however that there is a subset of samples related to laboratory analytical quality assurance, among these includes TB, FB, and DUP. On many investigations, the Scope will require multiple collections of these types of samples, therefore the numerical number represents the sequence sample count where the first sample is 01, the second sample is 02, and the third sample is 03 and so on.

_ Underscore
The underscore is required. It separates the investigation code and numeric identifier from the modifier specific to the sample itself. Note that every effort should be made to insure that the underscore is clear on the sample label and chain of custody (COC).

ID – Modifier Specific to Type Media
Each sample investigation code and numeric identifier is further modified by an ID specific to the sample type media. In general, soil samples (soil borings or endpoint samples) use an ID that indicates the depth at which the sample was taken. Aqueous samples (groundwater or surface water samples) are identified by the date the sample was collected. Other types of samples including quality control (TB, FB, and DUP), Vapor samples (AA, IA, SV or SVE), other soil type samples (IDW, sludge, free product, drum, and others) are also identified by a date. The following rules apply to the ID when using sample depth or sample date.

Sample Depth
The sample depth must be whole numbers (no fractions) separated by a hyphen. Thus for a soil sample collected from the soil boring SB-1 from a depth of 6 feet to 8 feet, the sample would be identified as:

SB01_6-8

Unfortunately, the NYSDEC EQuIS system does not accept fractions. Therefore, if your sample interval is a fraction of a foot (6.5-7.5), round up to the larger interval (6-8).

Sample Date
The sample date is always in the format of MMDDYY. Note that the year is two digits. Thus for a groundwater sample collected on July 1, 2015 from the monitoring well MW-1, the sample would be identified as:

MW01_070115

Special Cases
There are a couple of specific sample types that require further explanation.

Endpoint Sampling
End point sidewall samples are sometimes modified by magnetic direction (N, S, E, and W). For example, the first sidewall endpoint sample from the north wall of an excavation at a depth of 5 feet would be written as:

EPSW01_N_5

Again, note that the N in the identification refers to north and is separated from the prefix investigation code/numeric identifier and ID modifier suffix by underscores.

Vapor Extraction Well Sample
As with the sidewall endpoint samples, the sample name is altered by inserting a middle modifier between the prefix and suffix of the sample name. The middle modifier is used to identify the source of the sample (inlet sample port, midpoint sample port or outlet sample port). For example the midpoint port of the vapor extraction well number 1 sampled on July 1, 2015 would be written as;

SVE01_MID_070115

Matrix Spike and Matrix Spike Duplicate
On occasion, a Langan investigation will collect a sample to be used to provide the lab with a site specific medium to spike to determine the quality of the analytical method. This special case of sampling requires additional information to be used in the sample name, specifically, a suffix specifying whether the sample is the matrix spike (MS) or the matrix spike duplicate (MSD). In the following example, the sample is collected from soil boring number 1 at a depth of 2-4 feet. For the matrix spike sample:

SB01_2-4_MS

and for the matrix spike duplicate sample:

SB01_2-4_MSD

Multiple Interval Groundwater Sampling
Although not currently a common practice, low flow sampling facilitates stratigraphic sampling of a monitoring well. If the scope requires stratigraphic sampling then groundwater samples will be labeled with a lower case letter following the well number. For example, placing the pump or sampling tube at 10 feet below surface in MW01 on July 1, 2015 would require the sample to be labeled as:

MW01a_070115

While a second sample where the pump or tubing intake is placed at 20 feet would be labeled as:

MW01b_070115

Note that it is important that you record what depth the intake for each sample represents in your field notes; as this information is going to be critical to interpreting the results.

ATTACHMENT E

PFAS SAMPLING PROTOCOL

EPA 537 Field Sampling Guidelines

Sampling for PFAAs via EPA 537 can be challenging due to the prevalence of these compounds in consumer products. The following guidelines are strongly recommended when conducting sampling.

Reference-NHDES https://www.des.nh.gov/organization/divisions/waste/hwrb/documents/pfc-stakeholder-notification-20161122.pdf

Field Clothing and PPE

- No clothing or boots containing Gore-TexTM
- All safety boots made from polyurethane and PVC
- No materials containing Tyvek®
- Do not use fabric softener on clothing to be worn in field
- Do not used cosmetics, moisturizers, hand cream, or other related products the morning of sampling
- Do not use unauthorized sunscreen or insect repellant (see reference above for acceptable products)

Sample Containers

- All sample containers made of HDPE or polypropylene
- Caps are unlined and made of HDPE or polypropylene

Wet Weather (as applicable)

Wet weather gear made of polyurethane and PVC only

Equipment Decontamination

- "PFC-free" water on-site for decontamination of sample equipment. No other water sources to be used.
- Only Alconox and Liquinox can be used as decontamination materials

Food Considerations

- No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

Other Recommendations

Sample for PFCs first! Other containers for other methods may have PFCs present on their sampling containers

Field Equipment

- Must not contain Teflon® (aka PTFE) or LDPE materials
- All sampling materials must be made from stainless steel, HDPE, acetate, silicon, or polypropylene
- No waterproof field books can be used
- No plastic clipboards, binders, or spiral hard cover notebooks can be used
- No adhesives (i.e.Post-It Notes) can be used
- Sharpies and permanent markers not allowed; regular ball point pens are acceptable
- Aluminum foil must not be used
- Keep PFC samples in separate cooler, away from sampling containers that may contain PFCs
- Coolers filled with regular ice only. Do not use chemical (blue) ice packs.

EPA Method 537 (PFAS) Sampling Instructions

Please read instructions entirely prior to sampling event.

*Sampler must wash hands before wearing nitrile gloves in order to limit contamination during sampling.

Each sample set* requires a set of containers to comply with the method as indicated below.
*sample set is composed of samples collected from the same sample site and at the same time.

Container Count	Container Type	Preservative
3 Sampling Containers - Empty	250 mL container	Pre preserved with 1.25 g Trizma
Reagent Water for Field Blank use	250 mL container	Pre preserved with 1.25 g Trizma
1 Field Blank (FRB) Container - Empty	250 mL container	Unpreserved

**** Sampling container must be filled to the neck. For instructional purposes a black line has been drawn to illustrate the required fill level for each of the 3 Sample containers****

Field blanks are recommended and the containers have been provided, please follow the instructions below.

Field Blank Instructions:

1. Locate the Reagent Water container from the bottle order. The Reagent Water container will be prefilled with PFAS-free water and is preserved with Trizma.
2. Locate the empty container labeled “Field Blank”.
3. Open both containers and proceed to transfer contents of the “Reagent Water” container into the “Field Blank” container.
4. If field blanks are to be analyzed, they need to be noted on COC, and will be billed accordingly as a sample.

Both the empty Reagent Water container and the filled Field Blank container must be returned to the laboratory along with the samples taken.

Sampling Instructions:

1. Each sampling event requires 3 containers to be filled to the neck of the provided containers for each sampling location.
2. Before sampling, remove faucet aerator, run water for 5 min, slow water to flow of pencil to avoid splashing and fill sample containers to neck of container (as previously illustrated) and invert 5 times.
3. Do not overfill or rinse the container.
4. Close containers securely. Place containers in sealed ZipLoc bags, and in a separate cooler (no other container types).
5. Ensure Chain-of-Custody and all labels on containers contain required information.Place sample, Field Blank and empty Reagent Blank containers in ice filled cooler (do not use blue ice) and return to the laboratory. Samples should be kept at 4°C ±2. Samples must not exceed 10°C during first 48 hours after collection. Hold time is 14 days.

Please contact your project manager with additional questions or concerns.

Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.

The procedure used must be consistent with the NYSDEC March 1991 Sampling Guidelines and Protocols http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate and polypropylene. Equipment blanks should be generated at least daily. Additional materials may be acceptable if pre-approved by NYSDEC. Requests to use alternate equipment should include clean equipment blanks. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse will be performed for equipment that does come in contact with PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and “plumbers thread seal tape” contain PFCs.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2º Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

Groundwater Sampling for Emerging Contaminants

April 2018

Issue: NYSDEC has committed to analyzing representative groundwater samples at remediation sites for emerging contaminants (1,4-dioxane and PFAS) as described in the below guidance.

Implementation

NYSDEC project managers will be contacting site owners to schedule sampling for these chemicals. Only groundwater sampling is required. The number of samples required will be similar to the number of samples where "full TAL/TCL sampling" would typically be required in a remedial investigation. If sampling is not feasible (e.g., the site no longer has any monitoring wells in place), sampling may be waived on a site-specific basis after first considering potential sources of these chemicals and whether there are water supplies nearby.

Upon a new site being brought into any program (i.e., SSF, BCP), PFAS and 1,4-dioxane will be incorporated into the investigation of groundwater as part of the standard "full TAL/TCL" sampling. Until an SCO is established for PFAS, soil samples do not need to be analyzed for PFAS unless groundwater contamination is detected. Separate guidance will be developed to address sites where emerging contaminants are found in the groundwater. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane, which already has an established SCO.

Analysis and Reporting

Labs should provide a full category B deliverable, and a DUSR should be prepared by a data validator, and the electronic data submission should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html ,

The work plan should explicitly describe analysis and reporting requirements.

PFAS sample analysis: Currently, ELAP does not offer certification for PFAS compounds in matrices other than finished drinking water. However, laboratories analyzing environmental samples (ex. soil, sediments, and groundwater) are required, by DER, to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537 or ISO 25101.

Modified EPA Method 537 is the preferred method to use for groundwater samples due to the ability to achieve 2 ng/L (ppt) detection limits. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve similar reporting limits, the project manager should discuss this with a DER chemist. Note: Reporting limits for PFOA and PFOS should not exceed 2 ng/L.

PFAS sample reporting: DER has developed a PFAS target analyte list (below) with the intent of achieving reporting consistency between labs for commonly reportable analytes. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. This list may be updated in the future as new information is learned and as labs develop new capabilities. If lab and/or matrix specific issues are encountered for any particular compounds, the NYSDEC project manager will make case-by-case decisions as to whether particular analytes may be temporarily or permanently discontinued from analysis for each site. Any technical lab issues should be brought to the attention of a NYSDEC chemist.

Some sampling using this full PFAS target analyte list is needed to understand the nature of contamination. It may also be critical to differentiate PFAS compounds associated with a site from other

sources of these chemicals. Like routine refinements to parameter lists based on investigative findings, the full PFAS target analyte list may not be needed for all sampling intended to define the extent of contamination. Project managers may approve a shorter analyte list (e.g., just the UCMR3 list) for some reporting on a case by case basis.

1,4-Dioxane Analysis and Reporting: The method detection limit (MDL) for 1,4-dioxane should be no higher than 0.28 µg/l (ppb). ELAP offers certification for both EPA Methods 8260 and 8270. In order to get the appropriate detection limits, the lab would need to run either of these methods in "selective ion monitoring" (SIM) mode. DER is advising the use of method 8270, since this method provides a more robust extraction procedure, uses a larger sample volume, and is less vulnerable to interference from chlorinated solvents (we acknowledge that 8260 has been shown to have a higher recovery in some studies).

Full PFAS Target Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	**Perfluorobutanesulfonic acid**	**PFBS**	**375-73-5**
	Perfluorohexanesulfonic acid	**PFHxS**	**355-46-4**
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	**PFOS**	**1763-23-1**
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	**PFHpA**	**375-85-9**
	Perfluorooctanoic acid	**PFOA**	**335-67-1**
	Perfluorononanoic acid	**PFNA**	**375-95-1**
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

Bold entries depict the 6 original UCMR3 chemicals

Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.

The sampling procedure used must be consistent with the NYSDEC March 1991 SAMPLING GUIDELINES AND PROTOCOLS
http://www.dec.ny.gov/regulations/2636.html with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE) and polypropylene. Additional materials may be acceptable if proven not to contain PFCs. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse should be considered for equipment that does come in contact with PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and "plumbers thread seal tape" contain PFCs.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2º Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.