# SITE MANAGEMENT PLAN

## for

## 1487 1st Avenue Redevelopment Site
## New York County
## New York, New York

**NYSDEC Site Number: C231152**

***Prepared for:***

**CP VII 78th Street Owner, LLC**
**510 Madison Avenue, 8th Floor**
**New York, New York 10022**

***Prepared by:***

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**DECEMBER 2023**
**100963701**

**Revisions to Final Approved Site Management Plan:**

| Revision No. | Date Submitted | Summary of Revision | NYSDEC Approval Date |
|---|---|---|---|
| 1 | 8/15/2025 | Revised post-remediation groundwater monitoring and sampling plan | |
| | | | |
| | | | |

## CERTIFICATION STATEMENT

I, Jessica Friscia, P.E., certify that I am currently a NYS registered professional engineer as in defined in 6 NYCRR Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).




Jessica Friscia P.E.

8/15/2025 DATE

## Table of Contents


| Section | Description | Page |
|---|---|---|
| CERTIFICATION STATEMENT | | 2 |
| LIST OF ACRONYMS | | 7 |
| ES | EXECUTIVE SUMMARY | 9 |
| 1.0 | INTRODUCTION | 11 |
| 1.1 | General | 11 |
| 1.2 | Revisions and Alterations | 12 |
| 1.3 | Notifications | 13 |
| 2.0 | SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS | 14 |
| 2.1 | Site Location and Description | 14 |
| 2.2 | Physical Setting | 15 |
| 2.2.1 | Land Use | 15 |
| 2.2.2 | Geology | 15 |
| 2.2.3 | Hydrogeology | 16 |
| 2.3 | Investigation and Remedial History | 16 |
| | February 2016 Phase II Environmental Site Assessment, prepared by Cider | 17 |
| | January 2022 Phase I Environmental Site Assessment, prepared by Langan | 18 |
| | March 2022 Phase II Environmental Site Investigation Report, prepared by Langan | 19 |
| | March 2022 60-Day Advance Notice of Site Change of Use, prepared by Langan | 22 |
| | May 2022 Aboveground Storage Tank Closure Letter Report, prepared by Langan | 22 |
| | July 2022 Remedial Investigation Work Plan, prepared by Langan | 23 |
| | January 2023 Interim Remedial Measures Work Plan, prepared by Langan | 24 |
| | October 2022 60-Day Advance Notice of Site Change of Use (Langan) | 24 |

March 2023 Remedial Investigation Report (Langan) ..... 25
March 2023 Emulsified Zero-Valent Iron Remedial Design, prepared by Langan ..... 27
April 2022 Remedial Action Work Plan (Langan) ..... 28
October 2023 Bedrock Well Re-Installation and Performance Monitoring Groundwater Sampling Plan ..... 28
April 2024 Groundwater Performance Monitoring Report and Injection Design ..... 29
October 2024 EZVI Remedial Injection and Groundwater Performance Monitoring Report ..... 30
March 2025 Groundwater Performance Monitoring Report ..... 31
March 2025 Soil Vapor Intrusion Evaluation Memorandum ..... 32
May 2025 Groundwater Performance Monitoring Report ..... 32
2.4 Remedial Action Objectives ..... 33
Groundwater ..... 33
Soil ..... 33
Soil Vapor ..... 34
2.5 Remaining Contamination ..... 34
2.5.1 Soil ..... 34
2.5.2 Groundwater ..... 34
2.5.3 Soil Vapor ..... 35
3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN ..... 36
3.1 General ..... 36
3.2 Institutional Controls ..... 36
3.3 Engineering Controls ..... 38
3.3.1 Monitoring Wells Associated with EZVI Injections ..... 38
4.0 MONITORING AND SAMPLING PLAN ..... 39
4.1 General ..... 39
4.2 Site-wide Inspection ..... 40
4.3 Post-Remediation Groundwater Monitoring and Sampling ..... 41
4.4 Monitoring and Sampling Protocol ..... 46
5.0 OPERATION AND MAINTENANCE PLAN ..... 46
5.1 General ..... 46
6.0 PERIODIC ASSESSMENTS/EVALUATIONS ..... 46
6.1 Climate Change Vulnerability Assessment ..... 46

6.2 Green Remediation Evaluation ..... 47
6.2.1 Timing of Green Remediation Evaluations ..... 47
6.2.2 Groundwater Treatment ..... 47
6.2.3 Frequency of System Checks, Sampling and Other Periodic Activities ..... 48
6.3 Soil Vapor Intrusion Evaluation ..... 48
6.4 Remedial System Optimization ..... 50
7.0. REPORTING REQUIREMENTS ..... 51
7.1 Site Management Reports ..... 51
7.2.1 Certification of Institutional and Engineering Controls ..... 55
7.3 Corrective Measures Work Plan ..... 57
7.4 Remedial System Optimization Report ..... 57
8.0 REFERENCES ..... 57

## TABLE OF CONTENTS (Continued)

### TABLES


Table 1 Soil Cleanup Objectives
Table 2A Passive Diffusion Bag (PDB) Groundwater Sample Analytical Results
Table 2B Baseline Bedrock Groundwater Sample Analytical Results
Table 3 Post-Remediation Groundwater Monitoring Analytical Results
Table 4 Soil Vapor Sample Analytical Results


### FIGURES


Figure 1 Site Location Map
Figure 2 Site Plan
Figure 3A Subsurface Profile A-A'
Figure 3B Subsurface Profile B-B'
Figure 4A Passive Diffusion Bag (PDB) Groundwater Analytical Results
Figure 4B Baseline Bedrock Groundwater Analytical Results
Figure 5A Injection Location Plan
Figure 5B Post-Remediation CVOC Groundwater Analytical Results on Subsurface Profile B-B' (East)
Figure 5C Post-Remediation CVOC Groundwater Analytical Results on Subsurface Profile B-B' (West)
Figure 6 Soil Vapor Sample Analytical Results
Figure 7 Bedrock Well Location Plan
Figure 8 Vapor Intrusion Evaluation Map


### APPENDICES


Appendix A Environmental Easement
Appendix B List of Site Contacts
Appendix C Boring Logs
Appendix D Health and Safety Plan
Appendix E Generic NYSDEC Community Air Monitoring Plan
Appendix F Quality Assurance Project Plans
Appendix G Site Management Forms
Appendix H RSO Report
Appendix I Well Construction Logs and Westbay System Installation Documentation
Appendix J Soil Vapor Intrusion Evaluation Photolog

## LIST OF ACRONYMS

| | |
|---|---|
| AS | Air Sparging |
| ASP | Analytical Services Protocol |
| BCA | Brownfield Cleanup Agreement |
| BCP | Brownfield Cleanup Program |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CAMP | Community Air Monitoring Plan |
| C/D | Construction and Demolition |
| CFR | Code of Federal Regulation |
| CLP | Contract Laboratory Program |
| COC | Certificate of Completion |
| CO2 | Carbon Dioxide |
| CP | Commissioner Policy |
| DER | Division of Environmental Remediation |
| DUSR | Data Usability Summary Report |
| EC | Engineering Control |
| ECL | Environmental Conservation Law |
| ELAP | Environmental Laboratory Approval Program |
| ERP | Environmental Restoration Program |
| GHG | Greenhouse Gas |
| GWE&T | Groundwater Extraction and Treatment |
| HASP | Health and Safety Plan |
| IC | Institutional Control |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| NYCRR | New York Codes, Rules and Regulations |
| O&M | Operation and Maintenance |
| OM&M | Operation, Maintenance and Monitoring |
| OSHA | Occupational Safety and Health Administration |
| OU | Operable Unit |
| P.E. or PE | Professional Engineer |
| PFAS | Per- and Polyfluoroalkyl Substances |
| PID | Photoionization Detector |
| PRP | Potentially Responsible Party |
| PRR | Periodic Review Report |
| QA/QC | Quality Assurance/Quality Control |
| QAPP | Quality Assurance Project Plan |

| | |
|---|---|
| QEP | Qualified Environmental Professional |
| RAO | Remedial Action Objective |
| RAWP | Remedial Action Work Plan |
| RCRA | Resource Conservation and Recovery Act |
| RI/FS | Remedial Investigation/Feasibility Study |
| ROD | Record of Decision |
| RP | Remedial Party |
| RSO | Remedial System Optimization |
| SAC | State Assistance Contract |
| SCG | Standards, Criteria and Guidelines |
| SCO | Soil Cleanup Objective |
| SMP | Site Management Plan |
| SOP | Standard Operating Procedures |
| SOW | Statement of Work |
| SPDES | State Pollutant Discharge Elimination System |
| SSD | Sub-slab Depressurization |
| SVE | Soil Vapor Extraction |
| SVI | Soil Vapor Intrusion |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| TCLP | Toxicity Characteristic Leachate Procedure |
| USEPA | United States Environmental Protection Agency |
| UST | Underground Storage Tank |
| VCA | Voluntary Cleanup Agreement |
| VCP | Voluntary Cleanup Program |

## ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Identification: 1487 1st Avenue Redevelopment Site (Site No. C231152)

| | |
|---|---|
| Institutional Controls: | 1. The Site may be used for: Restricted-Residential use as defined in 6 New York Codes, Rules and Regulations (NYCRR) Part 375-1.8(g)(2)(ii), Commercial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iii), and Industrial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iv), although land use is subject to local zoning laws;<br>2. All ECs must be operated and maintained as specified in this SMP;<br>3. All ECs must be inspected at a frequency and in a manner defined in the SMP;<br>4. The use of groundwater underlying the Site is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene (NYCDOHMH) to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;<br>5. Groundwater monitoring must be performed as defined in this SMP;<br>6. A desktop soil vapor intrusion evaluation must be performed, which is included in this SMP;<br>7. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;<br>8. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;<br>9. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;<br>10. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;<br>11. Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the |

| | |
|---|---|
| | property owner to assure compliance with the restrictions identified by the Environmental Easement;<br>12. The potential for vapor intrusion must be evaluated for any buildings developed within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated;<br>13. Vegetable gardens and farming on the Site are prohibited unless in raised containers; and,<br>14. An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible. |
| Engineering Controls: | 1. Monitoring Wells Associated with EZVI Injections |

| Inspections: | Frequency |
|---|---|
| 1. Site-Wide | Annually |
| Monitoring: | |
| 1. Post-Remediation Groundwater Monitoring | Semi-Annually |
| | |
| Reporting: | |
| 1. Site-Wide Inspection | Annually |
| 2. Post-Remediation Groundwater Monitoring | Semi-Annually |
| | |
| 3. Periodic Review Report | 16 months after COC, annually thereafter |

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

# 1.0 INTRODUCTION

## 1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the 1487 1st Avenue Redevelopment Site located in New York, New York (hereinafter referred to as the "Site"). The Site location is presented on Figure 1. The Site was remediated under the New York State (NYS) Brownfield Cleanup Program (BCP), Site No. C231152, administered by New York State Department of Environmental Conservation (NYSDEC or Department).

CP VII 78th Street Owner, LLC (the Volunteer) entered into a Brownfield Cleanup Agreement (BCA), Index No. C231152-06-22, on 27 July 2022 with the NYSDEC to remediate the Site. A figure showing the boundaries of this Site is provided in Figure 2. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A.

After completion of the remedial work, some contamination was left at this Site, which is hereafter referred to as "remaining contamination." Institutional Controls (ICs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement (EE) granted to the NYSDEC and recorded with the Office of the City Register of the City of New York, requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC); and,

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 NYCRR Part 375 and the BCA (Index No. C231152-06-22; BCP Site No. C231152) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix B of this SMP.

This SMP was prepared by Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan), on behalf of the Volunteer, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated 3 May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the Site.

## 1.2 Revisions and Alterations

Revisions and alterations to this plan will be proposed in writing to the NYSDEC's project manager. The NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. All approved alterations must conform with Article 145 Section 7209 of the Education Law regarding the application of professional seals and alterations. For example, any changes to as-built drawings must be stamped by a New York State Professional Engineer. In accordance with the Environmental Easement for the Site, the NYSDEC project manager will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

## 1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER-10 for the following reasons:

1. 60-day advance notice of any proposed changes in Site use that are required under the terms of the BCA, 6 NYCRR Part 375 and/or Environmental Conservation Law.

2. 7-day advance notice of any field activity associated with the remedial program.

3. Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.

4. Notice within 48 hours of any non-routine maintenance activities.

5. Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

6. Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

7. At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Brownfield Cleanup Agreement (BCA), and all approved work plans and reports, including this SMP.

8. Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

The table below includes contact information for the above notifications. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

| **Name** | **Contact Information** | **Required Notification**** |
|---|---|---|
| Daniel Nierenberg<br>NYSDEC Project Manager | Telephone: (518) 402-9554<br>E-mail: daniel.nierenberg@dec.ny.gov | All Notifications |
| Sarah Quandt<br>NYSDEC Section Chief | Telephone: (518) 402-9116<br>E-mail: sarah.quandt@dec.ny.gov | All Notifications |
| Kelly Lewandowski<br>NYSDEC Site Control | Telephone: (518) 402-0193<br>E-mail: kelly.lewandowski@dec.ny.gov | Notifications 1 and 8 |
| Johnathan Robinson<br>NYSDOH Project Manager | Telephone: 518-402-7881<br>Email: beei@health.ny.gov | Notifications 4, 6, and 7 |

* Note: Notifications are subject to change and will be updated as necessary.

** Note: Numbers in this column reference the numbered bullets in the notification list in this section.

## 2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

### 2.1 Site Location and Description

The Site is located in the Upper East Side neighborhood of Manhattan, New York and is identified as Block 1452, Lot 27. A Site Location Plan is provided as Figure 1. The Site is an approximately 10,050-square foot parcel bordered by the four-story 354 East 78th Street building to the west, East 78th Street to the north, First Avenue to the east, and the nine-story 1485 First Avenue building to the south. The boundaries of the Site are more fully described in Appendix A – Environmental Easement. The owner and operator of the Site parcel at the time of issuance of this SMP is/are:

CP VII 78th Street Owner, LLC
510 Madison Avenue, 8th Floor
New York, NY 10022

## 2.2 Physical Setting

### 2.2.1 Land Use

After remediation and upon completion of construction, the development will consist of a new 35-story mixed-use residential and commercial building that will occupy the entirety of the Site footprint. The current zoning designation is commercial (C2-8). The proposed use is consistent with existing zoning for the property.

The following is a summary of adjacent property usage:

| Direction | Adjacent Properties | | |
|---|---|---|---|
| | Block No. | Lot No. | Description |
| North | 1453 | 23 | East 78th Street followed by a 5-story mixed-use commercial/ residential building |
| East | 1472 | 47, 48, 49, and 50 | First Avenue followed by three 4-story and one 5-story mixed-use commercial/residential buildings |
| South | 1452 | 26 | A 9-story mixed-use commercial/residential building |
| West | 1452 | 31 | A 4-story mixed-use commercial/residential building |

### 2.2.2 Geology

According to a survey prepared by True North Surveyors, Inc. dated 29 April 2022, the sidewalk elevation slopes from the northwest corner (elevation [el] 38.28) to the southeast corner (el 36.58). All elevations are in feet relative to the North American Vertical Datum of 1988 (NAVD 88).

Based on borings completed during the November 2021 and January/February 2022 Phase II Environmental Site Investigations (ESI) and the August 2022 RI, stratigraphy throughout the Site consisted of remnant demolition debris followed by a 1- to 4-foot-thick layer of fill. The fill layer extended from surface grade (or immediately below remnant demolition debris) to between approximately 5 and 12 feet below sidewalk level (bsl) across the Site footprint and consisted of grayish brown to brown, fine- to coarse-grained sand with varying amounts of gravel, silt, brick, clay, organics, miscellaneous debris, and concrete. The fill was underlain by 3 to 14 feet of native sand and clayey sand. Drilling refusal on presumed bedrock was encountered between approximately 17 and 22 feet bsl. A geotechnical investigation completed by Langan in November 2021 and March 2022 documented an approximately 6-foot-thick layer of fill beneath the sidewalks adjacent to the Site, followed by approximately 14 feet of sand and clay underlain by weathered mica schist rock. The top of competent rock was encountered at approximately 22 and 27 feet bsl.

The fill and sand layer were removed during the Site redevelopment excavation, which extended into bedrock.

#### 2.2.3 Hydrogeology

Monitoring wells installed and surveyed as part of the August 2022 RI revealed perched groundwater between 11.8 and 14.2 feet bsl, corresponding to elevations between el 22.79 and el 25.21 NAVD88. Shallow bedrock monitoring wells revealed groundwater ranging from approximately 11.7 and 13.2 feet bsl (corresponding to elevations between el 23.80 and el 25.33 NAVD88); deep bedrock monitoring wells revealed groundwater ranging from approximately 12.3 and 13.2 feet bsl (corresponding to elevations between el 23.76 and el 24.69 NAVD88) in the deep bedrock monitoring wells. Based on the groundwater elevations recorded during the August 2022 RI, perched groundwater in the overburden flows to the northwest and bedrock groundwater flows to the southeast.

## 2.3 Investigation and Remedial History

The following environmental assessment and investigation reports have been prepared for the Site.

- Phase II Environmental Site Assessment (ESA) prepared by Cider Environmental (Cider), dated 23 February 2016.
- Phase I ESA prepared by Langan, dated 5 January 2021.

- Phase II Environmental Site Investigation (ESI) Report prepared by Langan, dated 3 March 2022.
- 60-Day Advance Notice of Site Change of Use prepared by Langan, dated 25 March 2022.
- Aboveground Storage Tank Closure Letter Report prepared by Langan, dated 18 May 2022.
- Remedial Investigation Work Plan prepared by Langan, dated 16 March 2022 and last revised 26 July 2022.
- Interim Remedial Measures Work Plan prepared by Langan, dated 16 March 2022 and last revised 4 January 2023.
- 60-Day Advance Notice of Site Change of Use prepared by Langan, dated 21 October 2022.
- Emulsified Zero-Valent Iron Remedial Design prepared by Langan, dated 6 March 2023.
- Remedial Investigation Report prepared by Langan, dated 30 March 2023.
- Remedial Action Work Plan prepared by Langan, dated 5 April 2023.
- Bedrock Well Re-Installation and Performance Monitoring Groundwater Sampling Plan prepared by Langan, dated 16 October 2023
- Groundwater Performance Monitoring Report and Injection Design prepared by Langan, dated 24 April 2024.
- Emulsified Zero-Valent Iron Remedial Injection and Groundwater Performance Monitoring Report prepared by Langan, dated 15 October 2024.
- Groundwater Performance Monitoring Report prepared by Langan, dated March 2025.
- Soil Vapor Intrusion Evaluation Memorandum, prepared by Langan, dated March 2025.
- Groundwater Performance Monitoring Report prepared by Langan, dated May 2025.

Summaries of environmental findings of these reports are provided below.

<u>February 2016 Phase II Environmental Site Assessment, prepared by Cider</u>

The 23 February 2016 Phase II ESA completed by Cider documented the findings of a 21 January 2016 Phase I ESA also prepared by Cider. The Phase I ESA identified the following recognized environmental conditions (RECs):

- REC-1: Historic dyeing and cleaning operations documented between 1920 and 2005 on former Lot 28 and former Lot 30, and a solvent tank identified on former Lot 30 on the Sanborn Fire Insurance Maps from 1951 to 2005; and,
- REC-2: Potential presence of abandoned fuel oil underground storage tanks (USTs) due to historical fuel oil burner application records.

The Phase I ESA also identified the observation of urban fill material at the Site.

The Cider Phase II ESI was completed to investigate the RECs and included the completion of a geophysical survey in accessible portions of the Site, installation of soil borings and collection soil samples, and installation of soil vapor points and collection of soil vapor samples. Soil borings were advanced with a hand auger to approximately five feet below the former basement slabs (corresponding to approximately 15 feet bsl). Soil borings and soil vapor points were advanced in the vicinity of former dry-cleaning operations. The geophysical survey identified the presence of one suspected 275-gallon UST of unknown contents in former Lot 29, and one of the soil borings and one of the soil vapor points were also installed in the vicinity of the suspected UST. Discrete soil samples were collected for analysis of volatile organic compounds (VOCs) and petroleum-related semi-volatile organic compounds (SVOCs), and soil vapor points were sampled from either 2 or 4 feet below the former basement slabs for VOC analysis. One five-point composite soil sample was also collected to characterize impacts in fill at the site for analysis of metals, polychlorinated biphenyls (PCBs), VOCs, SVOCs, and herbicides. Groundwater was not encountered in any of the soil borings.

The Phase II ESA soil analytical results revealed no detections of VOCs or petroleum-related SVOCs. The composite soil sample analytical results revealed the presence of lead marginally above the NYSDEC Unrestricted Use Soil Cleanup Objective (SCO). Soil vapor analytical results revealed the presence of tetrachloroethylene (PCE) at concentrations below New York State Department of Health (NYSDOH) minimum matrix guidance values requiring monitoring or mitigation; an indoor air quality assessment was not completed.

<u>January 2022 Phase I Environmental Site Assessment, prepared by Langan</u>

The January 2022 Phase I ESA identified the following RECs, historical RECs (HRECs), and business environmental risks (BERs):

- REC-1: Historical Site Operations. Dyeing and cleaning operations are documented between 1920 and 2005, and a solvent tank was identified on the Sanborn Fire Insurance Maps from 1951 to 2005. Subsequent testing of on-Site

soil, groundwater, and soil vapor as documented in the Langan Phase II ESI Report (discussed below) revealed impacts to soil, groundwater, and soil vapor from historical site use at concentrations exceeding NYSDEC and NYSDOH standards. The concentrations of PCE and associated breakdown compounds detected in soil, groundwater, and soil vapor are indicative of a release from the former solvent tank.

- REC-2: Presence of Contaminated Fill Material. The Langan Phase II ESI (discussed below) revealed the presence of fill impacted with elevated concentrations of metals above the NYSDEC SCOs beneath the former basement slabs.
- HREC-1: Closed Spill No. 0908776. The spill was reported to NYSDEC on 4 November 2009 when supply line for two 275-gallon fuel oil ASTs was suspected to have leaked. The initial spill report identified that the supply line was located underground, but additional narrative by NYSDEC documented that the supply line was aboveground. The supply line was replaced, and the spill was administratively closed on 2 December 2009.
- BER-1: Potential Presence of Undocumented USTs. No evidence of USTs was observed during the Site inspection; however, the buildings at the Site were historically operated for commercial and residential purposes and have historically received approvals for fuel oil use. In addition, a UST was suspected to be present based on historical geophysical survey results during the Cider Phase II ESI.
- BER-2: Potential Impacts from Current and Historical Operations at Adjacent and Nearby Properties. Potential impacts from current and historical operations conducted at adjacent and nearby properties involving drycleaners and spills and the generation and disposal of hazardous waste have potential for off-site migration of contaminants to impact sub-slab soil, soil vapor, and/or groundwater below the Site.

<u>March 2022 Phase II Environmental Site Investigation Report, prepared by Langan</u>

The Langan Phase II ESI was completed in November 2021 and January/February 2022 and consisted of the following:

- Excavation of three test pits in the northern portion of the Site to assess the potential presence of the former solvent tank;
- Installation of thirteen soil borings (LB-01 through LB-08, LSB-9 through LSB-11, LSB-14, and LSB-15) to between 18 to 23 feet bsl, completion of two soil borings/rock cores (LSB-12 and LSB-13) to 50 feet bsl, and collection of 28 soil samples;

- Installation of five groundwater monitoring wells and collection of seven groundwater samples;
- Installation of two bedrock monitoring wells and collection of five groundwater samples; and
- Installation of seven soil vapor sampling points and collection of nine soil vapor samples.

Two test pits (TP-1 and TP-2) were excavated to a depth of approximately 3.5 feet below the former basement slab (corresponding to approximately 12 feet bsl) and one test pit (TP-3) was excavated to the top of bedrock at approximately 9 feet below the former basement slab (corresponding to approximately 17.5 feet bsl). No evidence of a former solvent tank or odors were observed in TP-1 and TP-2. Odors and elevated PID readings between 14 and 23 parts-per-million (ppm) were observed in soil immediately above bedrock in TP-3. The test pits were backfilled with the excavated material from the same depth at which the material was excavated.

Six soil boings were advanced in the vicinity of the historical solvent tank, in the vicinity of former historical drycleaning operations, and in the vicinity of the suspected 275-gallon AST reported in the Cider Phase II ESI to assess for subsurface impacts from historical Site operations. Seven soil borings were completed to assess general subsurface conditions throughout the Site footprint.

Elevated PID readings up to 21.6 ppm were detected in two soil borings between approximately 15 and 17 feet bsl. Odors and globules potentially associated with the AST that had previously been discovered nearby (discussed below) were also observed at one soil boring location.

Twenty-eight soil samples were collected for chemical analysis during the Langan Phase II ESI. Five soil borings were completed as groundwater monitoring wells to between 18 and 23.5 feet bsl in perched water immediately above bedrock. One well was installed in the vicinity of the former solvent tank, two wells were installed in the vicinity of historical dyeing and dry-cleaning operations, and two wells were installed to assess general site conditions and for potential impacts from historical dyeing and dry=cleaning operations. No evidence of sheen, odors, or free product were observed during purging or sampling activities in any of the wells.

Two soil borings were advanced into bedrock to 50 feet bsl and completed as open-hole groundwater monitoring wells to assess for impacts within bedrock from historical dyeing and dry-cleaning operations. Two groundwater samples were collected from each bedrock monitoring well from between 20 and 45 feet bsl for VOC analysis.

Seven soil vapor points were installed and sampled to assess general site conditions, for potential impacts from historical dyeing and dry-cleaning operations, and in the vicinity of the former solvent tank. All soil vapor points were installed to approximately 2-feet above the observed perched groundwater interface as measured in the installed monitoring wells and were sampled for VOC analysis.

Laboratory analytical results for soil samples were compared to the 6 NYCRR Subpart 375-6.8(a-b) Remedial Program Soil Cleanup Objectives for Unrestricted Use, Restricted Residential Use, and Protection of Groundwater. Groundwater analytical results were compared to NYSDEC Ambient Water Quality Standards and Guidance Value (SGVs). Soil vapor was compared to the minimum values of the NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion Matrices A through C dated October 2006 and revised in May 2017 (NYSDOH Soil Vapor Guidance); an indoor air quality assessment was not completed.

Laboratory analytical results identified subsurface chlorinated VOC impacts in the vicinity of the solvent tank formerly located in the northern portion of the Site. PCE was detected in soil from between approximately 14.5 and 16.5 feet bsl at this location in exceedance of the Unrestricted Use SCOs and Protection of Groundwater SCOs. Perched groundwater analytical results at this location revealed cis-1,2-dichloroethene (cis-1,2-DCE), PCE, and trichloroethylene (TCE) in exceedance of the NYSDEC SGVs. Chlorinated VOCs detected in soil vapor at this location that are included in the NYSDOH Soil Vapor/Indoor Air Decision Matrices A through C include cis-1,2-DCE, TCE, and PCE, all of which were detected at concentrations above the minimum matrix guidance values that require mitigation according to the NYSDOH Soil Vapor Guidance.

Laboratory analytical results also identified subsurface chlorinated VOC impacts in perched groundwater and bedrock wells in exceedance of the NYSDEC SGVs within the eastern portion of the Site to the south of the former solvent tank. Chlorinated VOCs were detected in soil vapors throughout the remainder of the Site footprint, but at concentrations below requiring further action according to the NYSDOH Soil Vapor Guidance.

Metals including barium, copper, trivalent chromium, lead, nickel, silver, and zinc were detected at concentrations exceeding the Unrestricted Use SCOs in the fill and native soil in all but two soil borings. Lead and barium were also detected at concentrations above the Protection of Groundwater and/or Restricted Residential RUSCOs. Metals including total chromium, iron, lead, magnesium, manganese, nickel, selenium, and/or sodium were detected in exceedance of the NYSDEC SGVs at all perched monitoring well locations. Detections of total metals in groundwater are likely attributable to sediment entrainment in the samples or naturally occurring background conditions.

Based on the results of the Langan Phase II ESI, the presence of contaminated fill and subsurface impacts to soil, groundwater, and soil vapor from historical site use were identified.

March 2022 60-Day Advance Notice of Site Change of Use, prepared by Langan

A NYSDEC 60-Day Advanced Notification of Site Change of Use Form was prepared for the initial foundation element installation and submitted with the BCP Application on 28 March 2022. The Site Change of Use submission included the foundation drawings as well as a Soil Management Plan/Excavation Work Plan which included a Community Air Monitoring Plan (CAMP). The caisson installation work commenced in April 2022, prior to the execution of the Site's Brownfield Cleanup Agreement.

May 2022 Aboveground Storage Tank Closure Letter Report, prepared by Langan

An Aboveground Storage Tank (AST) Closure Letter Report dated 18 May 2022 was prepared by Langan for the Volunteer and submitted to the NYSDEC. The AST Closure Letter Report was prepared to document the AST discovery and the removal and cleanup activities implemented to address the NYSDEC Spill No. 2109276 on 14, 15, and 17 March 2022 by Brookside Environmental (Brookside). On 21 January 2022, an approximately 275-gallon AST was discovered buried in the demolition debris left in place by the previous property owner in the northeastern corner of the Site during preparation for the geotechnical and environmental investigations. The AST was removed and staged on tarpaulins, and all surrounding demolition debris with visual impacts of product from the AST was excavated and staged on tarpaulins. While excavating and stockpiling the impacted demolition debris, it was determined that the AST was located above the former basement slab.

AST cleaning and closure activities commenced on 14 March 2022 and included: removal of liquid sludge material, solid sludge, cleaning pads, and associate tank debris; cleaning and inspection of the AST; and the removal of all stockpiled petroleum-impacted

demolition debris that had been removed from the area immediately surrounding the AST. All demolition debris and concrete with evidence of petroleum impacts was containerized within USDOT-approved 55-gallon drums for off-site transportation to Clean Water of New York in Staten Island, NY. In total, 36 55-gallon drums containing tank sludge, cleaning pads, plastic sheeting, and impacted demolition debris and concrete were transported off-site for disposal at Clean Water of New York. The empty AST was taken to Gershaw Recycling of Lindenhurst, NY and recycled as scrap metal.

July 2022 Remedial Investigation Work Plan, prepared by Langan

A Remedial Investigation Work Plan (RIWP) dated 16 March 2022 and last revised 26 July 2022 for final submission was prepared by Langan for the Volunteer and submitted to the NYSDEC. The RIWP was prepared to investigate and characterize "the nature and extent of the contamination at and/or emanating from the brownfield site," per ECL Article 27, Title 14 (Brownfield Cleanup Program). The scope of work provided supplemented the investigation activities and results documented in the January 2022 Phase II ESI Report.

The scope of work for the remedial investigation presented in the RIWP consisted of:

- Advancement of fifteen soil borings (LSB-16 through LSB-30) and collection of up to 31 soil samples for laboratory analysis.
- Installation of groundwater monitoring wells across the central and eastern side of the Site to evaluate the extents of impacts and potential remedial options based on subsurface conditions.
- Installation of five permanent groundwater monitoring wells (LMW-6 through LMW-10) in the perched groundwater layer above bedrock and collection of five groundwater samples for laboratory analysis.
- Installation of six permanent bedrock monitoring wells (LMW-8R-S through LMW-13R-S) to 50 feet bsl. Two existing wells (LMW-6R-S [formerly referred to as MW-6] and LMW-7R-S [formerly referred to MW-7]) would also be reinstalled because the wells were damaged prior to mobilization for the RI.
- Installation of eight permanent bedrock monitoring wells (LMW-6R-D through LMW-13R-D) to 85 feet bsl.
- Downhole geophysical evaluation of the bedrock wells, hydraulic conductivity testing of specific fracture zones by packer testing, and additional groundwater sample collection and analysis for the completion of a treatability study.
- Collection of up to two samples from each of the 16 bedrock wells. The number of samples collected would depend on the results of the geophysical evaluation and hydraulic conductivity testing.

- Installation of six soil vapor sampling points (LSV-8 through LSV-13) and collection of six soil vapor samples.

January 2023 Interim Remedial Measures Work Plan, prepared by Langan

An Interim Remedial Measures (IRM) Work Plan was prepared by Langan for the Volunteer and submitted to NYSDEC with the BCP Application on 28 March 2022 and was revised for final submission on 4 January 2023 in response to NYSDEC comments. The IRM Work Plan included excavation for the removal of chlorinated VOC-impacted source material in saturated soil within the perched groundwater. PCE was detected in soil between approximately 14.5 and 16.5 feet bsl and in the vicinity of the former solvent tank area at concentrations exceeding the Unrestricted Use SCOs and Protection of Groundwater SCOs during the previous investigations. Soil borings were advanced as part of the August 2022 RI to delineate to the north, east, and west of PCE impacts detected in LB-02 and MW-02 during the previous investigations. An approximately 30-foot by 20-foot hotspot area was proposed for excavation from the then-current ground surface (approximately 9 feet bsl) to the top of bedrock (approximately 18.5 feet bsl) for the removal of chlorinated VOCs in saturated soil within the perched groundwater in this contamination source area and in the location of the former solvent tank.

The IRM Work Plan also included implementation of an in-situ groundwater treatment technology to reduce chlorinated VOCs in groundwater. A bench-scale treatability study to demonstrate the effectiveness of various remedial treatments to address chlorinated VOCs in Site groundwater, as well as confirm dosages of the potential additives was completed. The results of the bench-scale treatability study, in conjunction with the additional data on bedrock fracture conditions determined during the August 2022 RI, was used to finalize the full-scale design (e.g., injection requirements in specific fractures such as selected reagent, dosages, monitoring requirements, injection spacing interval, pressure, and radius of influence), which was submitted for NYSDEC review under separate cover (discussed below).

October 2022 60-Day Advance Notice of Site Change of Use (Langan)

A NYSDEC 60-Day Advanced Notification of Site Change of Use Form was prepared for the demolition of the on-Site buildings and submitted on 21 October 2022. The demolition of the on-Site buildings began in October 2022 and accommodated the implementation of the RAWP in conjunction with Site redevelopment.

March 2023 Remedial Investigation Report (Langan)

A Remedial Investigation Report dated 30 March 2023 was prepared by Langan for the Volunteer to document the Remedial Investigation completed in accordance with the RIWP. Visual observations made during the 2022 RI revealed that the Site is underlain by a layer of contaminated fill up to 12 feet bsl throughout the Site footprint. The fill layer is underlain by a layer of silty sand. Drilling refusal on presumed bedrock was encountered between approximately 17 and 22 feet bsl during the August 2022 RI. The top of competent rock was encountered at approximately 22 and 27 feet bsl during an initial geotechnical investigation completed at the Site. Depth to perched groundwater ranged from approximately 11.8 and 14.2 feet bsl and groundwater was encountered at depths ranging from approximately 11.7 to 13.2 feet bsl corresponding to elevations between el 23.76 and el 25.33 NAVD88 in the shallow and deep bedrock monitoring wells. Based on the groundwater elevations recorded during the August 2022 RI, perched groundwater flows to the northeast and bedrock groundwater flows to the southeast.

Soil samples were collected between 8 and 21 feet bsl and analytical results were indicative of contaminated fill present to depths of 12 feet bsl in some parts of the Site and impacts in the native sand layer were present to depths of 19 feet bsl. Exceedances of the Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs) for pesticides and metals were detected within contaminated fill and sand layers. The source of pesticides in the sand layer was attributed to the quality of the overlying fill material or an unknown on- or off-Site source. Additionally, the VOC acetone, a common laboratory artifact, was detected above the Unrestricted Use SCO and Protection of Groundwater SCO in one sample collected from between 10 and 12 feet bsl in the sand layer. SVOCs, PCBs, and herbicides were not detected above the Unrestricted Use SCOs, Restricted Residential RUSCOs, and/or Protection of Groundwater SCOs in any of the samples collected during the 2022 RI.

Perched groundwater analytical results exceeding the SGVs for VOCs and metals were detected throughout the Site and SVOC exceedances were detected at select well locations. As SVOCs were not detected in exceedance of the Protection of Groundwater SCOs throughout the Site footprint, detections in groundwater were attributed to an off-Site source. Detections of total metals were generally attributed to sediment entrainment in the samples; in particular, total beryllium, copper, and lead were detected in the groundwater samples, but were not detected in the dissolved phase. Detections of dissolved metals are likely attributable to naturally occurring background concentrations or an unknown off-Site source.

Borehole geophysical logging was completed in the 16 bedrock wells installed across an approximately 40-foot by 70-foot area on the eastern portion of the Site during the RI. The geophysical logging was completed to determine the depth, orientation, and groundwater flow characteristics of potential water bearing zones such as bedrock fractures. The geophysical logging program included collection of fluid temperature, fluid conductivity, natural gamma ray, single point resistance, caliper, optical televiewer, acoustic televiewer, and heat pulse flow meter readings under ambient and pumping conditions. A total of 1,625 bedrock fractures were identified during the geophysical investigation by Hagar-Richter. The fractures ranged from minor (944) with no apparent aperture and variably continuous around the bore hole, to intermediate (605) with little or no apparent aperture but distinct and continuous around the borehole, to major fractures (76) having apparent aperture and continuity around the borehole. The results of the borehole geophysics analysis revealed that bedrock at the Site contains few major fractures and is characterized by generally low transmissivity.

Initial bedrock groundwater sampling was completed at 53 sampling intervals via passive diffusion bags (PDBs) as a screening tool to evaluate vertical and horizontal contaminant distribution and refine the forthcoming packer testing intervals. Analytical results from the PDB sampling revealed the presence of PCE and TCE above the SGVs in six of the eight shallow bedrock wells and in one of the eight deep bedrock wells. The highest concentrations of PCE and TCE were detected in the northern portion of the Site in the vicinity of the former solvent tank.

Soil vapor samples collected during the August 2022 RI and previous investigations revealed the chlorinated VOCs cis-1,2-DCE, TCE, 1,1-Dichloroethene (1,1-DCE), and PCE at concentrations above the respective minimum matrix guidance values requiring monitoring and/or mitigation threshold in four samples in the northeastern portion of the Site. Soil vapor sample analytical results also identified elevated concentrations of petroleum-related VOCs including benzene, toluene, ethylbenzene, and xylenes (collectively referred to as BTEX), 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene throughout the Site footprint. As the presence of petroleum-related VOCs were not detected at elevated concentrations in soil or groundwater at the Site and no historical source of these impacts has been identified, the presence of these compounds in soil vapor is likely attributed to an off-Site source.

March 2023 Emulsified Zero-Valent Iron Remedial Design, prepared by Langan

An Emulsified Zero-Valent Iron (EZVI) Remedial Design dated 6 March 2023 was prepared by Langan for the Volunteer and submitted to the NYSDEC. The EZVI Remedial Design documented the results of the baseline groundwater sampling completed in September and December 2022, a discussion of the treatability study completed, the results of the treatability study, and the final proposed groundwater remedy.

Initial bedrock groundwater sampling was completed via PDBs as a screening tool to evaluate vertical and horizontal contaminant distribution and refine the packer testing intervals. Analytical results revealed exceedances of the NYSDEC SGVs for VOCs in 49 of the 53 groundwater samples collected during the investigation. The highest concentrations of PCE and TCE were detected in the northern portion of the Site in the vicinity of the former solvent tank.

Packer testing and groundwater sampling was completed at the Site between 19 and 28 December 2022. The investigation included hydraulic conductivity tests (pump tests) at 13 fracture intervals between 13 and 81 feet bsl within six bedrock monitoring wells (LMW-7R-S, LMW-7R-D, LMW-8R-S, LMW-8R-D, LMW-10R-S, and LMW-10R-D). Prior to the in-situ aquifer conductivity test (pump test), one groundwater sample was collected from each fracture interval via USEPA low-flow sampling methods. Groundwater samples were also collected from four additional fracture intervals between 20.5 and 52.75 feet bsl within four bedrock monitoring wells (LMW-6R-S, LMW-6R-D, LMW-13R-S, and LMW-13R-D). Monitoring wells LMW-11R-S, LMW-11R-D, LMW-12R-S, and LMW-12R-D were not accessible for hydraulic conductivity testing or groundwater sampling due to the building demolition being completed at the time. Analytical results revealed exceedances of the NYSDEC SGVs for VOCs, metals, and general chemistry parameters in all of the groundwater samples collected during the investigation.

A bench-scale treatability study was conducted by Langan between August 2022 and November 2022 at the Langan Treatability Facility at the New Jersey Institute of Technology (NJIT) (Newark, New Jersey), to analyze the performance of three iron-based remedial options (two doses of SRS®-ZVI, a product of Terra Systems Inc. [Claymont, DE], and one dose of Provect-ERD-CH4™, product of Provectus Environmental Products, Inc. [Freeport, IL]) for the reduction of Site CVOCs using Site-derived groundwater and rock. The treatability results showed a decrease in groundwater PCE mass in the test jars treated with SRS®-ZVI and Provect-ERD-CH4™. In test jars treated with low and high dose of SRS®-ZVI, the PCE mass decreased by 100% compared to the control (untreated) jars. Overall, the data showed that SRS®-ZVI was

more effective than Provect-ERD-CH4™ in degradation of chlorinated VOCs. Therefore, SRS®-ZVI treatment was recommended for field implementation of the remedy. The dosages and injection volumes at each injection location were determined based on the treatability.

An EZVI injection at the Site was performed for both abiotic and biological degradation of chlorinated VOCs. The EZVI injections were designed to promote natural attenuation and mitigate potential for off-Site migration of on-Site chlorinated VOC-impacted groundwater. The chemically and biologically reducing conditions induced by EZVI enhance conditions for long-term natural attenuation. The EZVI reagents were delivered into the subsurface through the bedrock wells installed during the Remedial Investigation. The lateral and vertical treatment zones for the application of EZVI were determined based on the shallow and deep bedrock groundwater concentrations of the chlorinated VOCs detected at the Site. The shallow EZVI Treatment Zone was determined to be approximately 6,125 square feet wide and up to 30 feet thick (up to 50 feet bsl), and the deep EZVI Treatment Zone was determined to be approximately 6,125 square feet wide and up to 35 feet thick (up to 80 feet bsl). The final remedial design included an injection solution consisting of EVO, ZVI (along with ferrous sulfide to generate sulfidated ZVI), nutrients (yeast extract, and diammonium phosphate [DAP]), buffering agent (calcium carbonate and alkaline buffer), sodium ascorbate (reducing agent for dilution water) and bioaugmentation culture SDC-9™ that was injected into both the shallow and deep Treatment Zones. EZVI injections were completed in all bedrock wells installed during the Remedial Investigation between 14 March and 7 April 2023.

April 2022 Remedial Action Work Plan (Langan)

A Remedial Action Work Plan (RAWP), dated 5 April 2023, was prepared by Langan on behalf of the Volunteer. The RAWP summarized the nature and extent of contamination as determined from data gathered during the RI and to select a remedy that is consistent with the procedures defined in DER-10 and complies with applicable standards, criteria, and guidance, as well as with applicable federal, state and local laws, regulations and requirements. A Track 1 Unrestricted Use Remedy was selected for the remediation of the Site. The Remedial Action Work Plan was approved by NYSDEC in a letter dated 6 April 2023.

October 2023 Bedrock Well Re-Installation and Performance Monitoring Groundwater Sampling Plan

A Bedrock Well Re-Installation and Performance Monitoring Groundwater Sampling Plan (GSP), dated 16 October 2023, was prepared by Langan on behalf of the Volunteer. The report summarized the proposed bedrock monitoring well re-installation procedures and

construction as well as the sampling methodology and analysis. All 16 previously installed bedrock monitoring wells were removed during foundation construction for the new development. As such, ten wells are to be re-installed and the locations were selected based on proximity to the former chlorinated solvent tank and the highest concentrations of PCE and TCE detected during the previous groundwater sampling events. The bedrock monitoring wells will be re-installed as 4-inch open hole wells to between 52 feet (shallow wells) and 87 feet (deep wells). Following bedrock monitoring well installation, down-hole geophysical logging is proposed for all five pairs of bedrock monitoring wells to characterize the water-bearing fractures. All ten bedrock monitoring wells will be fitted with custom-designed Westbay System fixed multi-level monitoring equipment. The Westbay Systems allows for the vertical isolation of discrete water-bearing zones in a continuous assemble that can be deployed in a single borehole. A total of seventeen groundwater samples will be collected from sampling zones that overlap with a well interval previously samples as part of the previous groundwater sampling events. The well installation and construction details and the performance monitoring groundwater analytical results will be reported in a Groundwater Monitoring Report.

The Bedrock Well Re-Installation and Performance Monitoring Groundwater Sampling Plan was approved by NYSDEC in an email dated 18 October 2023 with the assumption that CAMP for VOCs will be conducted during the drilling activities.

April 2024 Groundwater Performance Monitoring Report and Injection Design

A Groundwater Performance Monitoring Report and Injection Design, dated 24 April 2024, was prepared by Langan on behalf of the Volunteer. The report summarized the bedrock monitoring well re-installation completed November 2023 through February 2024 and the first post-injection groundwater sampling event analytical results collected in February 2024. The report also included a design for a second, focused injection event to address residual CVOC concentrations.

As proposed in the October 2023 GSP, rock cores for the reinstallation of the ten bedrock monitoring wells were advanced at the Site between 15 and 28 November 2023. Well locations are shown on Figure 2. Re-installed wells were placed as close to the original well locations as practicable based on the design and location of deep foundation elements and interior architectural structures, and no greater than approximately 10 feet from the original installation locations. Following rock coring, borehole geophysical logging was completed between 22 December 2023 and 8 January 2024 in all ten bedrock monitoring wells to characterize the bedrock water-bearing fractures, verify the previously targeted sampling intervals, and finalize the well sampling system design. The

geophysical observations were generally consistent with those reported in the RIR. Using the geophysical data, 10 of the sampling intervals identified in the October 2023 GSP were confirmed, six of the proposed sampling intervals were modified to better align with water bearing fractures either by moving them vertically up or down approximately 5 feet or horizontally shifting the interval to the other well in its pair, and the deepest sampling interval proposed to be installed at LMW-7R-D instead was installed at LMW-9R-D due to the location of the detected water-bearing fracture.

All ten bedrock monitoring wells were fitted with custom-designed Westbay System fixed multi-level monitoring equipment between 31 January and 5 February 2024. Each well construction consists of a vertically separated series of hydraulically inflated packers connected with central access casing to provide engineered seals between discrete groundwater monitoring zones. Seventeen sampling zones ranging in length from five to seven feet were isolated between packers across the ten wells. Each sampling zone overlapped with a well interval or was within 5 feet of a well interval previously sampled as part of the initial September 2022 sampling event or December 2022 baseline sampling event. Following installation and sampling, it was determined that one of these zones did not produce water.

Groundwater samples were collected in accordance with the NYSDEC-approved October 2023 GSP on 13 and 16 February 2024. Performance monitoring groundwater analytical results revealed concentrations of PCE, TCE, and cis-1,2-DCE above the SGVs by an order of magnitude at only three wells: LMW-7R-S, LMW-7R-D, and LMW-8R-S. Vinyl chloride exceedances of the SGVs were present at LMW-6R-S, LMW-7R-S, LMW-7R-D, LMW-8R-S, LMW-8R-D, and LMW-9R-S; the concentration of vinyl chloride exceeded the SGV by over one order of magnitude at LMW-7R-S and LMW-7R-D. A concentration of chloroform was detected above the SGV at LMW-10R-S.

Based on the performance monitoring analytical results, a round of focused EZVI injections was proposed at three monitoring well locations to address remaining concentrations of PCE and TCE and one elevated detection of cis-1,2-DCE. Emulsified vegetable oil (EVO) only was proposed to be injected at four monitoring well locations to promote further bioremediation of the residual degradation compound concentrations.

<u>October 2024 EZVI Remedial Injection and Groundwater Performance Monitoring Report</u>
An EZVI Remedial Injection and Groundwater Performance Monitoring Report, dated 15 October 2024, was prepared by Langan on behalf of the Volunteer. The report

summarized the second, focused injection event performed in May and September 2024 and the second post-injection groundwater sampling event collected in August 2024.

All remediation activities were completed between 1 May and 17 May 2024, and on 25 September 2024. The additional injection was conducted in accordance with the April 2024 design at the four specific well intervals where COC concentrations greater than one order of magnitude above the SGV were detected during the February 2024 event. These locations included:

- LMW-7R-S at el 8 to 3 NAVD88 and el -2 to -7 NAVD88 intervals,
- LMW-7R-D at el -9 to 14 NAVD88 interval, and
- LMW-8R-S at el 8 to 3 NAVD88 interval.

EZVI was also injected into LMW-9R-S at el 1 to -5 NAVD88 to treat impacts in LMW-7R-S, as communication was observed between these two wells during the 2023 injection event. In addition to EZVI injections, additional emulsified vegetable oil (EVO) was added at these five intervals (prior to and/or following the EZVI injection) and also at the following well intervals where only cis-1,2-DCE and/or VC remained above the SGVs:

- LMW-6R-S at el -4 to -9 NAVD88, and
- LMW-8R-D at el -43 to -50 NAVD88.

Performance monitoring groundwater samples were collected on 12 to 16 August 2024. The analytical results revealed the elimination of PCE and TCE concentrations above the SGVs across the treatment area. Concentrations of cis-1,2-DCE and VC remained present at concentrations above the SGVs at only LMW-7R-S, confirming the continued degradation of PCE and TCE. Based on observations of reagent in some wells during the performance monitoring event, a small volume of reagent and groundwater was purged from LMW-7R-S at el 8 to 3 NAVD88 and additional anaerobic chase water was injected into LMW-7R-S at el 8 to 3 NAVD88 and el -2 to -7 NAVD88 on 25 September 2024 in accordance with the April 2024 design.

March 2025 Groundwater Performance Monitoring Report

A Groundwater Performance Monitoring Report, dated March 2025, was prepared by Langan on behalf of the Volunteer. The report summarized the third post-injection groundwater sampling event analytical results collected in November 2024.

Analytical results revealed no CVOCs above the SGVs in any of the wells sampled. CVOCs were either not detected or were detected below the SGVs at the following seven intervals/locations in four of the monitoring wells: all three intervals at LMW-6R-D, the only interval at LMW-9R-D, the only interval at LMW-10R-S, and both at LMW 10R-D. Elevated reporting limits above the SGVs for cis-1,2-DCE, PCE, TCE, and VC, were reported by the laboratory at nine well intervals in six of the wells sampled: the only interval at LMW-6R-S, the two intervals at LMW-7R-S, the only interval at LMW-7R-D, both intervals at LMW-8R-S, both intervals at LMW-8R-D, and the only interval at LMW-9R-S. Based on these results, which were submitted to NYSDEC on 14 December 2024 and discussed during a meeting with NYSDEC on 10 January 2025, the elimination of LMW-9R-D, LMW-10R-D, and two of the intervals at LMW-6R-D (el -18 to -23 and el -28 to -33) from the sampling program has been approved by NYSDEC for all future sampling events. Continued monitoring was proposed for the remaining eleven sampling intervals. The sampling program and these approved revisions are discussed in further detail in Section 4.3.

March 2025 Soil Vapor Intrusion Evaluation Memorandum

PVC sleeve penetrations were installed during foundation construction that were intended for the installation of vapor monitoring points in accordance with the decision document. However, based on observations made during site visits in January and February 2025, groundwater is present immediately below the subcellar slab elevation. As such, vapor monitoring points could not be installed, and sub-slab vapor sampling could not be completed as part of the soil vapor intrusion evaluation. Therefore, a desktop soil vapor intrusion evaluation was completed, which is also included in Section 6.3, below.

May 2025 Groundwater Performance Monitoring Report

A Groundwater Performance Monitoring Report, dated May 2025, was prepared by Langan on behalf of the Volunteer. The report summarized the fourth post-injection groundwater sampling event analytical results collected in March 2025.

The analytical results revealed that CVOCs were not detected at concentrations above the SGVs across the treatment area. CVOCs were either not detected or were detected below the SGVs at the following four intervals in four of the monitoring wells: the only interval at LMW-6R-S, one interval at LMW-8R-S, one interval at LMW-8R-D, and the only interval at LMW-10R-S. Elevated reporting limits were reported by the laboratory for PCE and/or breakdown products at four well intervals in four of the monitoring wells: the only interval at LMW-7R-D, one interval at LMW-8R-S, one interval at LMW 8R-D, and the only interval at LMW-9R-S. These data were also transmitted to NYSDEC via email on

1 April 2025, along with recommendations that will be discussed in further detail in Section 4.3.

## 2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated April 2023 are as follows:

**Groundwater**

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

**Soil**

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

**Soil Vapor**

RAOs for Public Health Protection

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

## 2.5 Remaining Contamination

### 2.5.1 Soil

No soil contamination remains as the entire Site footprint was excavated into bedrock. A Track 1 Unrestricted Use remedy was achieved for the Site.

### 2.5.2 Groundwater

Following the excavation for foundation construction, which advanced into bedrock at the Site, no overburden containing perched water remains at the Site.

Prior to the implementation of an in-situ groundwater treatment technology to reduce chlorinated VOCs in groundwater in March and April 2023, analytical results from the PDB sampling in September 2022 revealed exceedances of the NYSDEC SGVs for VOCs in 49 of the 53 groundwater samples collected, including the presence of PCE (9.4 µg/L – 640 µg/L) and TCE (5.4 µg/L – 390 µg/L) above the SGVs in six of the eight shallow bedrock wells and in one of the eight deep bedrock wells. The highest concentrations of PCE and TCE were detected in the northern portion of the Site in the vicinity of the former solvent tank.

Bedrock groundwater sampling was completed in December 2022. Analytical results revealed exceedances of the NYSDEC SGVs for VOCs in all of the groundwater samples collected during the investigation. PCE (7.2 µg/L – 900 µg/L), TCE (6.3 µg/L – 360 µg/L), and/or VC (4.4 µg/L – 6.4 µg/L) were detected in 8 of the 10 wells sampled. The highest concentrations of PCE and TCE were detected in the northern portion of the Site in the vicinity of the former solvent tank.

Following the first injection event completed in February and March 2023 and the second, focused injection event completed in May and September 2024, performance groundwater monitoring events have been completed in February, August, and November 2024 and March 2025. As of November 2024, the analytical results revealed the elimination of PCE, daughter product, and chloroform concentrations above the SGVs across the treatment area.

Tables 2A, 2B, and 4 and Figures 4A, 4B, 5B, and 5C summarize the results of all groundwater samples that exceed the SGVs.

The results of the performance monitoring groundwater sampling have been and will continue to be documented in Groundwater Monitoring Reports following future sampling activities.

### 2.5.3 Soil Vapor

Soil vapor samples collected during the August 2022 RI and previous investigations revealed the chlorinated VOCs cis-1,2-DCE, TCE, 1,1-DCE, and PCE at concentrations above the respective minimum NYSDOH Soil Vapor Guidance matrix threshold values requiring monitoring and/or mitigation in four samples in the northeastern portion of the Site. The presence of elevated concentrations of CVOCs in the northern portion of the Site is attributed to releases associated with the former solvent tank. Soil vapor sample analytical results also identified elevated concentrations of petroleum-related VOCs including BTEX, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene throughout the Site footprint. As the presence of petroleum-related VOCs were not detected at elevated concentrations in soil or groundwater at the Site and no historical source of these impacts has been identified, the presence of these compounds in soil vapor is likely attributed to an off-Site source. No soil vapor remains at the Site as all soil across the Site footprint was excavated into bedrock. Table 4 and Figure 6 summarize the results of all samples of soil vapor that exceed the minimum matrix guidance values.

The results of a soil vapor intrusion evaluation into the new building are included in Section 6.3.

## 3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

### 3.1 General

Since remaining contamination exists at the Site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs; and,
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC project manager.

### 3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and (3) limit the use and development of the site to Restricted-Residential uses only. Adherence to these ICs on the site is required by the Environmental Easement (Appendix A) and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figure 2. These ICs are:

- The Site may be used for: Restricted-Residential use as defined in 6 New York Codes, Rules and Regulations (NYCRR) Part 375-1.8(g)(2)(ii), Commercial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iii), and Industrial use as defined in 6 NYCRR Part 375-1.8(g)(2)(iv), although land use is subject to local zoning laws;

- All ECs must be operated and maintained as specified in this SMP;

- All ECs must be inspected at a frequency and in a manner defined in the SMP;

- The use of groundwater underlying the Site is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene (NYCDOHMH) to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

- Groundwater monitoring and a soil vapor intrusion evaluation consisting of collated soil vapor and indoor air sample collection must be performed as defined in this SMP;

- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;

- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;

- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;

- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;

- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement;

- The potential for vapor intrusion must be evaluated for any buildings developed within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated;

- Vegetable gardens and farming on the Site are prohibited unless in raised containers; and,
- An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.

## 3.3 Engineering Controls

### 3.3.1 Monitoring Wells Associated with EZVI Injections

Groundwater monitoring activities to assess the effectiveness of the EZVI injections will continue, as determined by the NYSDEC project manager and in consultation with NYSDOH project manager as follows:

- until residual groundwater concentrations of CVOCs are found to be consistently below ambient water quality standards or the site SGVs for two consecutive rounds of sampling or until residual groundwater concentrations of CVOCs have become asymptotic at an acceptable level over a minimum of four rounds of sampling, and
- until groundwater concentrations of fermentation byproducts (acetone and methyl ethyl ketone) display a declining trend over a minimum of three rounds of sampling.

If monitoring data indicates that monitoring may no longer be required, a proposal to discontinue the remedy will be submitted by the remedial party. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC project manager. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, a remedial design will be submitted to NYSDEC for approval which will provide the details and schedule for completing additional remediation and/or treatment. The additional treatment will be determined based on the performance monitoring results and may consist of injecting EZVI into the subsurface via the bedrock monitoring wells.

## 4.0 MONITORING AND SAMPLING PLAN

### 4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC project manager. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the Quality Assurance Project Plan provided in Appendix F.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater SGVs and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and,
- Annual inspection and periodic certification.

A soil vapor intrusion evaluation is included in Section 6.3 and reporting requirements are provided in Section 7.0 of this SMP.

### 4.2 Site-wide Inspection

Site-wide inspections will be performed annually or at a minimum of once per year. Site-wide inspections will be performed by a qualified environmental professional (QEP) as defined in 6 NYCRR Part 375, a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a QEP or PE who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the NYSDEC project manager. 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 as provided in Appendix G – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- Whether stormwater management systems, such as basins and outfalls, are working as designed;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the Site will be conducted. A comprehensive Site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. 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.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC project manager must be given by noon of the following day. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a QEP as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a QEP or PE who is licensed and registered in New York State. Written confirmation must be provided to the NYSDEC project manager within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public. The remedial party will submit follow-up status reports to the NYSDEC within 45 days of the event on actions taken to respond to any emergency event requiring ongoing responsive action, describing and documenting actions taken to restore the effectiveness of the ECs.

### 4.3 Post-Remediation Groundwater Monitoring and Sampling

Post-remediation groundwater monitoring events were performed in February 2024 (approximately 10 months after the completion of the initial injections) and in August and November 2024 and March 2025 (approximately three, six, and nine months after the completion of the second, focused injections). Groundwater sampling will continue and modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

As documented in the Final Engineering Report (FER), the previously installed bedrock monitoring wells were removed during foundation construction for the new development. Remedial excavation of soil was completed to between 12 and 20 feet bsl; however, general excavation was completed across the majority of the Site footprint to approximately 23 feet bsl for construction of the cellar and sub-cellar, with excavation for

deeper foundation elements advancing to between 31 and 42 feet bsl. The top of bedrock was encountered between 14 and 20 feet bsl across the Site footprint.

To implement performance monitoring at the Site, five shallow wells (LMW-6R-S through LMW-10R-S) and five deep wells (LMW-6R-D through LMW-10R-D) were re-installed throughout the Site footprint, as discussed in Section 2.3. These wells were selected based on proximity to the former chlorinated solvent tank and the highest concentrations of PCE and TCE detected during the initial bedrock groundwater sampling event competed via PDBs in September 2022 and the baseline bedrock groundwater sampling event collected via low-flow sampling from within a straddle pack assembly in December 2022 as reported in the March 2023 EZVI Injection Remedial Design.

LMW-6R-S through LMW-10R-S were constructed by installing five and a half-inch steel casing installed to a depth of 3.75 feet below top of slab (btos), corresponding to elevation (el) 11 feet North American Vertical Datum 1988 (NAVD88). The casing and open annulus was sealed with bentonite pellets and allowed to expand prior to initiating coring the four-inch open hole, which was completed to between 29.75 feet btos and 35.78 feet btos, corresponding to between el -15 feet and el -21 feet. LMW-6R-D through LMW-10R-D were constructed by installing five and a half-inch steel casing installed to a depth between 23 feet btos and 23.77 feet btos, corresponding to el -9 feet. The casing and open annulus was sealed with bentonite pellets and allowed to expand prior to initiating coring, which was completed to between 59.79 feet btos and 64.77 feet btos, corresponding to between el -45 feet and el -50 feet. All bedrock wells were constructed as four-inch open-hole wells below the steel casing. All ten bedrock monitoring wells were fitted with custom-designed Westbay System fixed multi-level monitoring equipment. Each well construction consists of a vertically separated series of hydraulically inflated packers connected with central access casing to provide engineered seals between discrete groundwater monitoring zones.

Based on the performance groundwater monitoring analytical results from February, August, and November 2024 and March 2025, concentrations of PCE and daughter products in groundwater at the Site have been successfully reduced to either below the applicable SGVs or not detected above the laboratory reporting limit. Based on the 2024 results, which were submitted to NYSDEC on 14 December 2024 and discussed during a meeting with NYSDEC on 10 January 2025, the elimination of LMW-9R-D, LMW-10R-D, and two of the intervals at LMW-6R-D (el -18 to -23 and el -28 to -33) from the sampling program has been approved for all future sampling events. Additionally, based on the March 2025 results discussed in Section 2.3, which were submitted to NYSDEC on

1 April 2025, the elimination of the following three additional sampling intervals from the sampling program are proposed for all future sampling events:

- LMW-6R-S (el -4 to -9), due to CVOCs, methyl ethyl ketone, and acetone either not being detected or being detected below the SGVs for two consecutive sampling events (November 2024 and March 2025); and,
- LMW-8R-D (el -13 to -20), due to CVOCs, methyl ethyl ketone, and acetone either not being detected or being detected below the SGVs for three consecutive sampling events (August and November 2024 and March 2025, with elevated reporting limits for three CVOCs in November).

LMW 6R-S is proposed to be removed from the monitoring plan as PCE, breakdown products, chloroform, and fermentation byproducts were not detected above the SGVs in the November 2024 or March 2025 performance monitoring events. Similarly, these compounds were not detected above the SGVs in August or November 2024 or March 2025 at the el -13 to -20 interval at LMW-8R-D. In an email dated 8 July 2025, NYSDEC approved this modification to the sampling program provided that a sentinel well remained in the program.

Downgradient monitoring well LMW-10R-S was initially proposed to NYSDEC to be removed from the program due to the observed reduction of PCE and breakdown products within the source area, the limited lateral extents of impacts at the Site, the limited impacts at this well during the baseline event, and the lack of CVOC or fermentation byproduct impacts detected above the SGVs during the November 2024 and March 2025 events. However, during a call with NYSDEC on 11 August 2025, it was determined that LMW-10R-S would remain in the program as the sentinel well.

As of March 2025, elevated reporting limits were reported by the laboratory for CVOCs at four well locations; based on correspondence with the laboratory, elevated reporting limits are attributed to sample matrix interference and/or interferences from the elevated concentrations of methyl ethyl ketone and acetone. Decreased concentrations of these fermentation byproducts were detected in March 2025 at LMW-6R-S, one of the intervals at LMW-8R-S, LMW-8R-D, LMW-9R-S, and LMW-10R-S compared to previously detected peak concentrations. Based on these results and the feedback from NYSDEC on 8 July and 11 August 2025, continued monitoring is proposed for the following nine intervals at the monitoring wells in the table below:

| Monitoring Well | Monitoring Interval (NAVD88) | Monitoring Parameter | Monitoring Schedule |
|---|---|---|---|
| LMW-6R-D | el -38 to -45 | VOCs | Semi-Annually |
| LMW-7R-S | el 8 to 3 | | |
| | el -2 to -7 | | |
| LMW-7R-D | el -9 to -14 | | |
| LMW-8R-S | el 8 to 3 | | |
| | el -2 to -9 | | |
| LMW-8R-D | el -43 to -50 | | |
| LMW-9R-S | el 1 to -5 | | |
| LMW-10R-S | el -9 to -15 | | |

Groundwater performance monitoring will be implemented semi-annually to assess performance of the in-situ groundwater remedy. The potential for these bedrock fractures to produce the necessary groundwater sample volume will continue to be evaluated during future sampling events.

Groundwater quality parameters (pH, temperature, ORP, DO, turbidity, and conductivity) will be collected during each groundwater monitoring event. Performance monitoring samples for VOC analysis will be collected by lowering between one and four proprietary Westbay System 250 milliliter (ml) sample containers through the central access casing to the designated sampling zone. The number of sample containers lowered at one time depends on the length of the specific sampling zone. The sealed sample container(s) are then pulled to the surface and the collected sample placed in laboratory-provided bottleware, sealed, labeled, and placed into a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to a NYSDOH ELAP-certified analytical laboratory.

Purging is not required with the Westbay System due to the isolated nature of each monitoring zone. Valved ports within each monitoring zone provided access to each sampling interval for discrete groundwater sample collection. Discrete groundwater samples were collected at each designated sampling zone in a container that was sealed before being brought to the surface. Purged groundwater collected during the sampling event (if any) will be containerized in 55-gallon drums and properly disposed of off-Site.

Samples will be analyzed for TCL VOCs, and up to five of the samples may also be analyzed for supplemental parameters including iron (total and dissolved), manganese (total and dissolved), sulfate, sulfide, chloride, dissolved gases (methane, ethene, ethane), alkalinity, Dehalococcoides (DHC) and/or total bacteria (EBAC). These supplemental parameters are proposed by the RE for further review of remedial performance; however, collection of these additional parameters may be suspended at the direction of the RE based on groundwater recovery observations during sampling and/or the RE's assessment of VOC concentration trends.

A monitoring well map is provided as Figure 7 and monitoring well construction logs are provided in Appendix I.

If biofouling or silt accumulation occurs in the on-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced if an event renders the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC project manager will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC project manager. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC project manager.

The sampling frequency may only be modified with the approval of the NYSDEC project manager. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC project manager.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

## 4.4 Monitoring and Sampling Protocol

All sampling protocols and activities will be recorded in accordance with the QAPP and recorded on the Site Management Forms provided in Appendix G. Other observations (e.g., groundwater monitoring well integrity) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network.

# 5.0 OPERATION AND MAINTENANCE PLAN

## 5.1 General

The site remedy does not rely on any mechanical systems, such as active groundwater treatment systems, sub-slab depressurization systems or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

# 6.0 PERIODIC ASSESSMENTS/EVALUATIONS

## 6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the Site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the Site during periodic assessments, and briefly summarizes the vulnerability of the Site and/or engineering controls to severe storms/weather events and associated flooding.

As stated in Section 4.1, Site-wide inspections will be performed after severe weather events. According to the National Flood Insurance Rate map for the City of New York published by the FEMA (Community Panel No. 3604970089F, effective date September 5, 2007), the Site is located in Zone X, which is designated for areas

determined to be outside the 0.2% annual chance of flood and in an area of minimal flood hazard.

Site erosion is not expected during severe weather or precipitation events because remaining impacts in soil is covered with a concrete slab. The Site would not be susceptible to a spill or contaminant release because source material has been removed.

## 6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the Periodic Review Report (PRR).

### 6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the NYSDEC project manager requests such an evaluation as reasonably necessary, e.g., during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

### 6.2.2 Groundwater Treatment

Groundwater treatment, if required, will be implemented properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials will be sent for recycling, as appropriate.

### 6.2.3 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site, use of consumables in relation to visiting the Site in order to conduct system checks and/or collect samples, and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

## 6.3 Soil Vapor Intrusion Evaluation

As required in the Decision Document, a soil vapor intrusion (SVI) evaluation is presented below.

As discussed in Section 2.3, a historical solvent tank was identified on the Sanborn Fire Insurance Maps in the northern portion of the site from 1951 to 2005. Subsequent testing of on-Site soil, groundwater, and soil vapor during the 2021/2022 Phase II ESI revealed impacts to soil, groundwater, and soil vapor at concentrations exceeding NYSDEC and NYSDOH standards. The concentrations of PCE and associated breakdown compounds detected in soil, groundwater, and soil vapor in the immediate vicinity of the former solvent tank during the Phase II ESI were indicative of a release from the former solvent tank.

PCE was detected above the applicable Unrestricted Use Soil Cleanup Objective (SCO) and Protection of Groundwater SCO in soil at the Site at one location in the immediate vicinity of the solvent tank during the Phase II ESI, and PCE, TCE, cis-1,2- DCE, and vinyl chloride were detected in groundwater above the NYSDEC SGVs during the Phase II ESI and 2022 RI. Fifteen soil vapor samples were collected during the Phase II ESI and RI, and analytical results revealed concentrations of cis-1,2-DCE, 1,1-DCE, TCE, and/or PCE above the monitoring and/or mitigation sub-slab screening threshold according to NYSDOH Soil Vapor Intrusion Guidance Matrices A and B in four soil vapor samples in the northeastern portion of the Site. BTEX were also detected in all soil vapor samples collected. As the presence of petroleum-related VOCs was not detected at elevated concentrations in soil or groundwater at the Site and no historical source of these impacts has been identified, the presence of these compounds in soil vapor was attributed to an unknown off-Site source.

As part of the site remediation, an approximately 30-foot-long-by-20-foot-wide area was excavated between 6 feet below street level (bsl) to the top of bedrock (approximately 18.5 feet bsl) for the removal of CVOCs in saturated soil in the contamination source area where the historical solvent tank was formerly located. Confirmation samples were collected from the base and the sidewalls of the CVOC source area remedial excavation from the native soil or weathered bedrock immediately above the bedrock interface. Based on the final confirmation sample analytical results, Track 1 Unrestricted Use SCOs were achieved at all excavation base and sidewall samples collected, with the exception of one sample (EPSW01_W_17.5-18). However, excavation for the entire Site was advanced to the bedrock interface. A total of approximately 9,696.28 tons of contaminated soil/fill were removed as part of the remedial action, including all soil with VOCs present at concentrations above Track 1 Unrestricted Use SCOs. As such, all soil related to the CVOC source area was removed from the Site.

An EZVI injection was performed in 2023 and a second, focused EZVI injection was performed in 2024 to support the abiotic and biological degradation of chlorinated VOCs in groundwater. Four quarterly performance monitoring groundwater sampling events have been completed since the 2023 remedial injections (February, August, and November 2024 and March 2025). As documented in Section 2.3, maximum concentrations of PCE and TCE decreased by one order of magnitude following the 2023 EZVI injections and were not detected above laboratory reporting limits during either the August or November 2024 performance monitoring events following the May 2024 EZVI targeted injections.

There are no known potential pathways for soil vapor intrusion into the building through the newly constructed 12-inch building slab and foundation walls, which were constructed with an exterior waterproofing membrane. The new building is constructed immediately above bedrock and no residual contaminated soil remains beneath the building, as all soil across the Site footprint was excavated as part of the completed Track 1 remedial action and cellar construction advanced into bedrock. In addition, based on observations made during site visits in January and February 2025, groundwater is present immediately below the subcellar slab elevation. As shown in the photolog in Appendix J, PVC sleeve penetrations were installed through the subcellar slab during foundation construction which were intended to be completed as sub-slab vapor monitoring points. However, vapor monitoring points could not be installed at the Site as groundwater was observed immediately below the slab at four of the proposed locations. As such, there is limited to no potential for the production or accumulation of soil vapor between the water table and the base of the subcellar slab. Based on the soil and groundwater remedies implemented

at the Site and this soil vapor intrusion evaluation, engineering controls are not necessary because on-site sources of contamination have been removed and the construction of the new building directly on top of rock and within the groundwater table limits the potential for soil vapor production and accumulation.

Soil vapor intrusion is not considered a concern for the new development due to the source removal, groundwater treatment, and construction of the new building directly on top of rock and within the groundwater table. Nevertheless, a soil vapor intrusion evaluation must be performed upon a change in use of the property that will result in occupancy of a previously unoccupied building or initial occupancy of a new building. The breadth of this future evaluation will be determined based upon discussion with the NYSDEC and NYSDOH project managers. Based upon these discussions and agency requirements, a work plan may need to be developed that requires that sampling be performed. Upon completion of the evaluation, if an action is required, any actions taken or to be taken must be reflected in an updated SMP.

### 6.4 Remedial System Optimization

A Remedial System Optimization (RSO) study will be conducted any time that the NYSDEC project manager or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and,

- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focus on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

## 7.0. REPORTING REQUIREMENTS

### 7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix G. These forms are subject to NYSDEC revision. All site management inspection, maintenance, and monitoring events will be conducted by a QEP as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a QEP or PE who is licensed and registered in New York State.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the following Table and summarized in the Periodic Review Report.

| **Task/Report** | **Reporting Frequency*** |
|---|---|
| Performance Monitoring Groundwater Analytical Data | Semi-Annually |
| Soil Vapor Intrusion Evaluation Sampling | Upon a change in use of the property that will result in occupancy of a previously unoccupied building or initial occupancy of a new building |
| Site-wide Inspections | Annually |

| Task/Report | Reporting Frequency* |
|---|---|
| Periodic Review Report | 16 months after COC, annually thereafter, or as otherwise determined by the NYSDEC |

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and,
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;

- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

### 7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the NYSDEC project manager beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the NYSDEC project manager or at another frequency as may be required by the NYSDEC project manager. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix A - Environmental Easement. The report will be prepared

in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections, fire inspections and severe condition inspections, if applicable.
- Description of any change of use or import of materials that occurred during the certifying period.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- Identification of any wastes generated during the reporting period, along with waste characterization data, manifests, and disposal documentation.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These tables and figures will include a presentation of past data as part of an evaluation of contaminant concentration trends, including but not limited to:
  - Trend monitoring graphs that present groundwater contaminant levels from before the start of the remedy implementation to the most current sampling data;
  - Trend monitoring graphs depicting system influent analytical data on a per event and cumulative basis;
  - O&M data summary tables;
  - A current plume map for sites with remaining groundwater contamination; and
  - A groundwater elevation contour map for each gauging event.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:

  - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan (RAWP) and Decision Document;

  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;

  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;

  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;

  - An evaluation of trends in contaminant levels in the affected media to determine if the remedy continues to be effective in achieving remedial goals as specified by the RAWP and Decision Document; and

  - The overall performance and effectiveness of the remedy.

### 7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice and registered in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional or engineering control identified for the site, I certify that all of the following statements are true:*

- *The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*

- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*

- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*

- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*

- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*

- *Use of the site is compliant with the environmental easement;*

- *The engineering control systems are performing as designed and are effective;*

- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*

- *The information presented in this report is accurate and complete.*

*I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Stewart Abrams, of Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., am certifying as Remedial Party's Designated Site Representative for the site."*

*"I certify that the New York State Education Department has granted a Certificate of Authorization to provide Professional Engineering services to the firm that prepared this Periodic Review Report."*

Every five years the following certification will be added to the PRR:

- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager. The Periodic Review Report may also need to be submitted in hard-copy format if requested by the NYSDEC project manager.

### 7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control or failure to conduct site management activities, a Corrective Measures Work Plan will be submitted to the NYSDEC project manager for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

### 7.4 Remedial System Optimization Report

If an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the NYSDEC project manager for approval. A general outline for the RSO report is provided in Appendix H. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager.

## 8.0 REFERENCES

6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

Phase II Environmental Site Assessment (ESA) prepared by Cider Environmental (Cider), dated 23 February 2016.

Phase I ESA prepared by Langan, dated 5 January 2021.

Phase II Environmental Site Investigation (ESI) Report prepared by Langan, dated 3 March 2022.

60-Day Advance Notice of Site Change of Use prepared by Langan, dated 25 March 2022.

Aboveground Storage Tank Closure Letter Report prepared by Langan, dated 18 May 2022

Remedial Investigation Work Plan prepared by Langan, dated 16 March 2022 and last revised 26 July 2022.

Interim Remedial Measures Work Plan prepared by Langan, dated 16 March 2022 and last revised 4 January 2023.

60-Day Advance Notice of Site Change of Use prepared by Langan, dated 21 October 2022.

Emulsified Zero-Valent Iron Remedial Design prepared by Langan, dated 6 March 2023

Remedial Investigation Report prepared by Langan, dated 30 March 2023.

Remedial Action Work Plan prepared by Langan, dated 5 April 2023.

Bedrock Well Re-Installation and Performance Monitoring Groundwater Sampling Plan prepared by Langan, dated 16 October 2023.

Groundwater Performance Monitoring Report and Injection Design prepared by Langan, dated 24 April 2024.

Emulsified Zero-Valent Iron Remedial Injection and Groundwater Performance Monitoring Report prepared by Langan, dated 15 October 2024.

Groundwater Performance Monitoring Report prepared by Langan, dated March 2025.

Soil Vapor Intrusion Evaluation Memorandum prepared by Langan, dated March 2025.

Groundwater Performance Monitoring Report prepared by Langan, dated May 2025.

# TABLES

**Table 1**
**Site Management Plan**
**Soil Cleanup Objectives**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | Track 1 NYSDEC Part 375 Unrestricted Use SCOs | Track 2 NYSDEC Part 375 Restricted Use Restricted-Residential SCOs |
|---|---|---|---|
| **Volatile Organic Compounds (mg/kg)** | | | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.68 | 100 |
| 1,1-Dichloroethane | 75-34-3 | 0.27 | 26 |
| 1,1-Dichloroethene | 75-35-4 | 0.33 | 100 |
| 1,2,4-Trimethylbenzene | 95-63-6 | 3.6 | 52 |
| 1,2-Dichlorobenzene | 95-50-1 | 1.1 | 100 |
| 1,2-Dichloroethane | 107-06-2 | 0.02 | 3.1 |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 8.4 | 52 |
| 1,3-Dichlorobenzene | 541-73-1 | 2.4 | 49 |
| 1,4-Dichlorobenzene | 106-46-7 | 1.8 | 13 |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | 0.1 | 13 |
| Acetone | 67-64-1 | 0.05 | 100 |
| Benzene | 71-43-2 | 0.06 | 4.8 |
| Carbon Tetrachloride | 56-23-5 | 0.76 | 2.4 |
| Chlorobenzene | 108-90-7 | 1.1 | 100 |
| Chloroform | 67-66-3 | 0.37 | 49 |
| Cis-1,2-Dichloroethene | 156-59-2 | 0.25 | 100 |
| Ethylbenzene | 100-41-4 | 1 | 41 |
| Hexachlorobenzene | 118-74-1 | 0.33 | 1.2 |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 0.12 | 100 |
| Methylene Chloride | 75-09-2 | 0.05 | 100 |
| Naphthalene | 91-20-3 | 12 | 100 |
| n-Butylbenzene | 104-51-8 | 12 | 100 |
| n-Propylbenzene | 103-65-1 | 3.9 | 100 |
| Sec-Butylbenzene | 135-98-8 | 11 | 100 |
| T-Butylbenzene | 98-06-6 | 5.9 | 100 |
| Tert-Butyl Methyl Ether | 1634-04-4 | 0.93 | 100 |
| Tetrachloroethene (PCE) | 127-18-4 | 1.3 | 19 |
| Toluene | 108-88-3 | 0.7 | 100 |
| Total Xylenes | 1330-20-7 | 0.26 | 100 |
| Trans-1,2-Dichloroethene | 156-60-5 | 0.19 | 100 |
| Trichloroethene (TCE) | 79-01-6 | 0.47 | 21 |
| Vinyl Chloride | 75-01-4 | 0.02 | 0.9 |
| **Semivolatile Organic Compounds (mg/kg)** | | | |
| 1,2-Dichlorobenzene | 95-50-1 | 1.1 | 100 |
| 1,3-Dichlorobenzene | 541-73-1 | 2.4 | 49 |
| 1,4-Dichlorobenzene | 106-46-7 | 1.8 | 13 |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | 0.1 | 13 |
| 2-Methylphenol (o-Cresol) | 95-48-7 | 0.33 | 100 |
| 3 & 4 Methylphenol (m&p Cresol) | 65794-96-9 | 0.33 | 100 |
| Acenaphthene | 83-32-9 | 20 | 100 |
| Acenaphthylene | 208-96-8 | 100 | 100 |
| Anthracene | 120-12-7 | 100 | 100 |
| Benzo(a)anthracene | 56-55-3 | 1 | 1 |
| Benzo(a)pyrene | 50-32-8 | 1 | 1 |
| Benzo(b)fluoranthene | 205-99-2 | 1 | 1 |
| Benzo(g,h,i)Perylene | 191-24-2 | 100 | 100 |
| Benzo(k)fluoranthene | 207-08-9 | 0.8 | 3.9 |
| Chrysene | 218-01-9 | 1 | 3.9 |
| Dibenz(a,h)anthracene | 53-70-3 | 0.33 | 0.33 |
| Dibenzofuran | 132-64-9 | 7 | 59 |
| Fluoranthene | 206-44-0 | 100 | 100 |
| Fluorene | 86-73-7 | 30 | 100 |
| Hexachlorobenzene | 118-74-1 | 0.33 | 1.2 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 0.5 | 0.5 |
| Naphthalene | 91-20-3 | 12 | 100 |
| Pentachlorophenol | 87-86-5 | 0.8 | 6.7 |
| Phenanthrene | 85-01-8 | 100 | 100 |
| Phenol | 108-95-2 | 0.33 | 100 |
| Pyrene | 129-00-0 | 100 | 100 |

**Table 1**
**Site Management Plan**
**Soil Cleanup Objectives**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | Track 1 NYSDEC Part 375 Unrestricted Use SCOs | Track 2 NYSDEC Part 375 Restricted Use Restricted-Residential SCOs |
|---|---|---|---|
| **Pesticides (mg/kg)** | | | |
| 4,4'-DDD | 72-54-8 | 0.0033 | 13 |
| 4,4'-DDE | 72-55-9 | 0.0033 | 8.9 |
| 4,4'-DDT | 50-29-3 | 0.0033 | 7.9 |
| Aldrin | 309-00-2 | 0.005 | 0.097 |
| Alpha BHC (Alpha Hexachlorocyclohexane | 319-84-6 | 0.02 | 0.48 |
| Alpha Chlordane | 5103-71-9 | 0.094 | 4.2 |
| Alpha Endosulfan | 959-98-8 | 2.4 | 24 |
| Beta Bhc (Beta Hexachlorocyclohexane) | 319-85-7 | 0.036 | 0.36 |
| Beta Endosulfan | 33213-65-9 | 2.4 | 24 |
| Delta Bhc (Delta Hexachlorocyclohexane) | 319-86-8 | 0.04 | 100 |
| Dibenzofuran | 132-64-9 | 7 | 59 |
| Dieldrin | 60-57-1 | 0.005 | 0.2 |
| Endosulfan Sulfate | 1031-07-8 | 2.4 | 24 |
| Endrin | 72-20-8 | 0.014 | 11 |
| Gamma Bhc (Lindane) | 58-89-9 | 0.1 | 1.3 |
| Heptachlor | 76-44-8 | 0.042 | 2.1 |
| **Herbicides (mg/kg)** | | | |
| Silvex (2,4,5-Tp) | 93-72-1 | 3.8 | 100 |
| **Polychlorinated Biphenyls (mg/kg)** | | | |
| Total PCBs | 1336-36-3 | 0.1 | 1 |
| **Inorganics (mg/kg)** | | | |
| Arsenic | 7440-38-2 | 13 | 16 |
| Barium | 7440-39-3 | 350 | 400 |
| Beryllium | 7440-41-7 | 7.2 | 72 |
| Cadmium | 7440-43-9 | 2.5 | 4.3 |
| Chromium, Hexavalent | 18540-29-9 | 1 | 110 |
| Chromium, Trivalent | 16065-83-1 | 30 | 180 |
| Copper | 7440-50-8 | 50 | 270 |
| Total Cyanide | ~ | 27 | 27 |
| Lead | 7439-92-1 | 63 | 400 |
| Manganese | 7439-96-5 | 1,600 | 2,000 |
| Mercury | 7439-97-6 | 0.18 | 0.81 |
| Nickel | 7440-02-0 | 30 | 310 |
| Selenium | 7782-49-2 | 3.9 | 180 |
| Silver | 7440-22-4 | 2 | 180 |
| Zinc | 7440-66-6 | 109 | 10,000 |

**Notes:**
1. Soil cleanup objectives taken from New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use and Restricted Use Restricted-Residential Soil Cleanup Objectives (SCOs).
2. Criterion comparisons for 3- & 4-methylphenol (m&p cresol) are provided for reference. Promulgated SCOs are for 3-methylphenol (m-cresol) and
3. ~ = Regulatory limit for this analyte does not exist
4. mg/kg = milligrams per kilogram

**Table 2A**
**Site Management Plan**
**Passive Diffusion Bag (PDB) Groundwater Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-6R-D | LMW-6R-D | LMW-6R-D | LMW-6R-S | LMW-6R-S | LMW-7R-D | LMW-7R-D | LMW-7R-D | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-6R-D_46 | LMW-6R-D_70 | LMW-6R-D_75 | LMW-6R-S_21.5 | LMW-6R-S_31 | LMW-7R-D_48 | LMW-7R-D_68.5 | LMW-7R-D_75 | LMW-7R-S_21.5 | LMW-7R-S_27 | LMW-7R-S_39 | LMW-7R-S_42.5 |
| | | | Sample Date | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 |
| | | | Pump Intake Depth | 46 | 70 | 75 | 21.5 | 31 | 48 | 68.5 | 75 | 21.5 | 27 | 39 | 42.5 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <2.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <3 U | <3 U | <1.5 U | <3 U | <3.8 U | <7.5 U | <7.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <1 U | <0.5 U | 0.53 J | 0.69 J | 0.88 J | 1.2 J |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <4 U | <2 U | <4 U | <5 U | <10 U | <10 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <4 U | <2 U | <4 U | <5 U | <10 U | <10 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <2.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <1 U | <1 U | <1 U | <2 U | <2 U | <1 U | <2 U | <2.5 U | <5 U | <5 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <4 U | <2 U | <4 U | <5 U | <10 U | <10 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 U | <250 UJ | <250 U | <250 U | <250 UJ | <500 U | <500 UJ | <250 U | <500 U | <620 UJ | <1,200 U | <1,200 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <10 U | <5 U | <10 U | <12 U | <25 U | <25 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <4 U | <2 U | <4 U | <5 U | <10 U | <10 U |
| Acetone | 67-64-1 | **50** | ug/l | 19 | 17 | 33 | 8.8 | 6.7 | 31 | 23 | 19 | 34 | 25 | 26 | 30 |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <10 U | <5 U | <10 U | <12 U | <25 U | <25 U |
| Benzene | 71-43-2 | **1** | ug/l | <0.5 U | <0.5 U | <0.5 U | 0.16 J | <0.5 U | **1.1** | **1.1** | 0.34 J | 0.63 J | 0.46 J | <2.5 U | <2.5 U |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <2.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <4 U | <2 U | <4 U | <5 U | <10 U | <10 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <10 U | <5 U | <10 U | <12 U | <25 U | <25 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <2.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Chloroform | 67-66-3 | **7** | ug/l | **55** | **56** | **55** | **24** | **25** | <5 U | <5 U | 1.8 J | 2.9 J | 2.5 J | <12 U | <12 U |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | 4.3 | 4 | 3.8 | **17** | **16** | **170** | **180** | **100** | **330** | **390** | **480** | **710** |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <2.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <2.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <10 U | <5 U | <10 U | <12 U | <25 U | <25 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | 1 J | <10 U | <10 U | <5 U | <10 U | <12 U | <25 U | <25 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | 2.7 J | <5 UJ | <5 U | <5 U | <5 UJ | <10 U | <10 UJ | <5 U | <10 U | <12 UJ | <25 U | <25 U |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <10 U | <5 U | <10 U | <12 U | <25 U | <25 U |
| Methylene Chloride | 75-09-2 | **5** | ug/l | 3.9 | 4 | 3.6 | 2.6 | 2.9 | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | 0.19 J | 0.18 J | <0.5 U | **25** | **24** | **12** | **9.4** | 2.1 | **11** | **23** | **31** | **26** |
| Toluene | 108-88-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 4.3 | 4 | 3.8 | 17 | 16 | 170 | 180 | 100 | 330 | 390 | 480 | 710 |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <2.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <2.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | 0.29 J | 0.34 J | 0.18 J | **10** | **9.7** | **20** | **20** | **8.2** | **50** | **90** | **110** | **86** |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <12 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <10 U | <5 U | <10 U | <12 U | <25 U | <25 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | <1 U | 0.09 J | 0.12 J | 0.31 J | 0.34 J | 1 J | 1 J | 1 | 1.1 J | 1.1 J | 1.2 J | 1.6 J |

**Table 2A**
**Site Management Plan**
**Passive Diffusion Bag (PDB) Groundwater Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-9R-D | LMW-9R-D | LMW-9R-D | LMW-9R-D | LMW-9R-D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-8R-D_46.5 | LMW-8R-D_48.5 | LMW-8R-D_58 | LMW-8R-D_73 | LMW-8R-D_77 | LMW-8R-S_15 | LMW-8R-S_17.5 | LMW-8R-S_22.5 | LMW-8R-S_27 | LMW-9R-D_43.5 | LMW-9R-D_46.5 | LMW-9R-D_60.5 | LMW-9R-D_63.5 | LMW-9R-D_76 |
| | | | Sample Date | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 |
| | | | Pump Intake Depth | 46.5 | 48.5 | 58 | 73 | 77 | 15 | 17.5 | 22.5 | 27 | 43.5 | 46.5 | 60.5 | 63.5 | 76 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <3 U | <7.5 U | <7.5 U | <7.5 U | <7.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <2 U | <2 U | <4 U | <10 U | <10 U | <10 U | <10 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <2 U | <2 U | <4 U | <10 U | <10 U | <10 U | <10 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <1 U | <1 U | <2 U | <5 U | <5 U | <5 U | <5 U | <1 U | <1 U | <1 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <4 U | <10 U | <10 U | <10 U | <10 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 U | <250 U | <250 UJ | <250 U | <500 U | <1,200 U | <1,200 UJ | <1,200 U | <1,200 UJ | <250 U | <250 U | <250 U | <250 UJ | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <5 U | <5 U | <10 U | <25 U | <25 U | <25 U | <25 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <4 U | <10 U | <10 U | <10 U | <10 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Acetone | 67-64-1 | **50** | ug/l | 8.5 | 10 | 11 | 28 | 17 | 17 J | 27 | 17 J | 26 | 8.4 | 6.8 | 20 | 6.2 | 13 |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <10 U | <25 U | <25 U | <25 U | <25 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | **31** | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 0.6 | 0.56 | 0.65 | **1.6** | 0.19 J |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <2 U | <2 U | <4 U | <10 U | <10 U | <10 U | <10 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <5 U | <5 U | <5 U | <10 U | <25 U | <25 U | <25 U | <25 U | <5 U | <5 U | <5 U | <5 U | 1 J |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | 1.5 J | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | 1.2 J | 1.2 J | <2.5 U | 3.8 | **34** |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | 0.8 J | 0.85 J | 1 J | 0.86 J | **200** | **200** | **190** | **190** | **180** | **9.6** | **8.8** | **9.6** | **11** | 2.3 J |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <10 U | <25 U | <25 U | <25 U | <25 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <10 U | <25 U | <25 U | <25 U | <25 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <5 U | <5 U | <5 UJ | <5 U | <10 U | <25 U | <25 UJ | <25 U | <25 UJ | 2 J | <5 U | 1.9 J | <5 UJ | <5 U |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <10 U | <25 U | <25 U | <25 U | <25 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Methylene Chloride | 75-09-2 | **5** | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | **8** |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | <0.5 U | <0.5 U | 0.25 J | <0.5 U | 0.41 J | **540** | **600** | **640** | **570** | 2.7 | 2.5 | 2.4 | 2.1 | 0.34 J |
| Toluene | 108-88-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 0.8 J | 0.85 J | 1 J | 0.86 J | 200 | 200 | 190 | 190 | 180 | 9.6 | 8.8 | 9.6 | 11 | 2.3 J |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | <0.5 U | <0.5 U | 0.18 J | <0.5 U | 0.39 J | **380** | **390** | **390** | **350** | 0.75 | 0.68 | 0.65 | 0.65 | <0.5 U |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <12 U | <12 U | <12 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <10 U | <25 U | <25 U | <25 U | <25 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | <1 U | <1 U | <1 U | <1 U | **6.7** | <5 U | 0.42 J | <5 U | 0.41 J | 0.2 J | 0.19 J | 0.23 J | 0.6 J | 0.13 J |

**Table 2A**
**Site Management Plan**
**Passive Diffusion Bag (PDB) Groundwater Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-9R-S | LMW-9R-S | LMW-9R-S | LMW-10R-D | LMW-10R-D | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-9R-S_15 | LMW-9R-S_22 | LMW-9R-S_30.5 | LMW-10R-D_49 | LMW-10R-D_63 | LMW-10R-S_21.5 | LMW-10R-S_26.5 | LMW-10R-S_28.5 | LMW-10R-S_34 | LMW-10R-S_36 |
| | | | Sample Date | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 |
| | | | Pump Intake Depth | 15 | 22 | 30.5 | 49 | 63 | 21.5 | 26.5 | 28.5 | 34 | 36 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <3 U | <3.8 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 UJ | <2.5 UJ | <2.5 UJ |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <2 U | <2.5 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 U | <500 UJ | <620 UJ | <250 UJ | <250 U | <250 U | <250 UJ | <250 U | <250 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Acetone | 67-64-1 | **50** | ug/l | 12 | 16 | 26 | **100** | **91** | **91** | **84** | **88** | **100** | **160** |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | **8** | **8.5** | **7.4** | <0.5 U | <0.5 U | 0.26 J | 0.25 J | 0.24 J | 0.25 J | 0.25 J |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | **8.9** | **7.9** | **7.5** | **52** | **47** | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | **28** | **28** | **28** | 5 | 4.3 | **100** | **110** | **90** | **91** | **92** |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <5 U | <10 UJ | <12 UJ | 23 J | 21 | 21 | 17 J | 21 | 24 | 35 |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Methylene Chloride | 75-09-2 | **5** | ug/l | <2.5 U | <5 U | <6.2 U | 3 | 2.5 | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | **140** | **190** | **250** | 0.78 | 0.74 | 2.7 | 2.6 | 2 | 2 | 2.1 |
| Toluene | 108-88-3 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 28 | 28 | 28 | 5 | 4.3 | 100 | 110 | 90 | 91 | 92 |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | **58** | **56** | **58** | 1.6 | 1.6 | **5.4** | **5.5** | 4.9 | 4.8 | 4.7 |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | 1.1 | 1 J | 0.96 J | <1 U | <1 U | 0.63 J | 0.6 J | 0.39 J | 0.39 J | 0.4 J |

**Table 2A**
**Site Management Plan**
**Passive Diffusion Bag (PDB) Groundwater Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-11R-D | LMW-11R-D | LMW-11R-S | LMW-11R-S | LMW-11R-S | LMW-11R-S | LMW-11R-S |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-11R-D_57.5 | LMW-11R-D_76 | LMW-11R-S_20.5 | LMW-11R-S_23 | LMW-11R-S_26.5 | LMW-11R-S_29.5 | LMW-11R-S_40.5 |
| | | | Sample Date | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 |
| | | | Pump Intake Depth | 57.5 | 76 | 20.5 | 23 | 26.5 | 29.5 | 40.5 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 UJ | <2.5 UJ | <2.5 UJ | <2.5 U | <2.5 UJ | <2.5 UJ |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 UJ | <250 U | <250 U | <250 U | <250 UJ | <250 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Acetone | 67-64-1 | **50** | ug/l | 14 | 25 | 11 | 10 | 12 | 9.2 | 8.9 |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | **15** | **13** | 0.6 | 0.63 | 0.79 | 0.64 | 0.61 |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | **24** | **20** | **7.2** | **7.4** | **8.4** | 6.9 | 6.7 |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | **17** | **15** | **28** | **29** | **35** | **28** | **28** |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <5 UJ | <5 U | <5 U | <5 U | <5 UJ | <5 U | <5 U |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Methylene Chloride | 75-09-2 | **5** | ug/l | <2.5 U | <2.5 U | 0.94 J | 0.99 J | 1.2 J | 0.97 J | 0.91 J |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | 3.6 | 2.9 | **12** | **12** | **14** | **12** | **12** |
| Toluene | 108-88-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 17 | 15 | 28 | 29 | 35 | 28 | 28 |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | 1.9 | 1.6 | **11** | **12** | **14** | **11** | **11** |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | 0.17 J | 0.13 J | 0.2 J | 0.24 J | 0.32 J | 0.2 J | 0.2 J |

**Table 2A**
**Site Management Plan**
**Passive Diffusion Bag (PDB) Groundwater Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-12R-D | LMW-12R-D | LMW-12R-S | LMW-12R-S | LMW-12R-S | LMW-12R-S | LMW-12R-S | LMW-13R-D | LMW-13R-D | LMW-13R-S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-12R-D_53 | LMW-12R-D_67 | LMW-12R-S_17 | LMW-12R-S_20.5 | LMW-12R-S_24.5 | LMW-12R-S_28.5 | LMW-12R-S_36 | LMW-13R-D_55.5 | LMW-13R-D_75 | LMW-13R-S_26 |
| | | | Sample Date | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 |
| | | | Pump Intake Depth | 53 | 67 | 17 | 20.5 | 24.5 | 28.5 | 36 | 55.5 | 75 | 26 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 UJ | <2.5 UJ | <2.5 UJ | <2.5 UJ | <2.5 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 UJ | <250 U | <250 U | <250 U | <250 U | <250 UJ | <250 U | <250 UJ | <250 UJ | <250 UJ |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Acetone | 67-64-1 | **50** | ug/l | 10 | **170** | 11 | 26 | 26 | 12 | 22 | 11 | 14 | 8.2 |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | 0.21 J | 0.16 J | 0.28 J | 0.31 J | 0.2 J | 0.24 J | 0.23 J | **28** | **27** | 0.39 J |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | **7.4** | 6.3 | **18** | **18** | **16** | **20** | **8.8** | **30** | **29** | **19** |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | **28** | **23** | **27** | **29** | **27** | **32** | **35** | **9.6** | **9.6** | **33** |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <5 UJ | 41 | <5 U | 2.2 J | <5 U | <5 UJ | 2.4 J | <5 UJ | <5 UJ | <5 UJ |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Methylene Chloride | 75-09-2 | **5** | ug/l | **9.4** | **8.1** | 2.3 J | 2.4 J | 3.5 | 4.1 | 1.8 J | <2.5 U | <2.5 U | 2.6 |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | 1 | 0.97 | 3.3 | 3.6 | 1.4 | 2.5 | 3 | 3.9 | 3.7 | 1.7 |
| Toluene | 108-88-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 28 | 23 | 27 | 29 | 27 | 32 | 35 | 9.6 | 9.6 | 33 |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | 0.66 | 0.54 | 3.7 | 3.8 | 3.7 | 4.2 | 4.9 | 1.3 | 1.3 | 3.3 |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | **3.8** | **2.7** | 0.08 J | 0.07 J | 0.17 J | 0.23 J | 0.2 J | 0.25 J | 0.29 J | 0.1 J |

**Table 2A**
**Site Management Plan**
**Passive Diffusion Bag (PDB) Groundwater Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

**Notes:**

CAS - Chemical Abstract Service
NS - No standard
ug/l - microgram per liter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Groundwater sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 703.5 and the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water (herein collectively referenced as "NYSDEC SGVs").

**Qualifiers:**

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 NYSDEC SGVs

**Table 2B**
**Site Management Plan**
**Baseline Bedrock Groundwater Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-6R-D | LMW-6R-S | LMW-7R-D | LMW-7R-D | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-S | LMW-8R-S | LMW-10R-D | LMW-10R-S | LMW-10R-S | LMW-13R-D | LMW-13R-S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-6R-D_47.75 | LMW-6R-S_20.5 | LMW-7R-D_42 | LMW-7R-D_66 | LMW-7R-S_20 | LMW-7R-S_25.5 | LMW-7R-S_38 | LMW-8R-D_47.25 | LMW-8R-D_56.75 | LMW-8R-D_76 | LMW-8R-S_14.5 | LMW-8R-S_24.75 | LMW-10R-D_40.5 | LMW-10R-S_13 | LMW-10R-S_18.25 | LMW-13R-D_45.25 | LMW-13R-S_25.75 |
| | | | Sample Date | 12/28/2022 | 12/28/2022 | 12/21/2022 | 12/21/2022 | 12/19/2022 | 12/20/2022 | 12/21/2022 | 12/27/2022 | 12/27/2022 | 12/27/2022 | 12/22/2022 | 12/22/2022 | 12/23/2022 | 12/22/2022 | 12/23/2022 | 12/28/2022 | 12/28/2022 |
| | | | Pump Intake Depth | 47.75 | 20.5 | 42 | 66 | 20 | 25.5 | 38 | 47.25 | 56.75 | 76 | 14.5 | 24.75 | 40.5 | 13 | 18.25 | 45.25 | 25.75 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <3 U | <1.5 U | <1.5 U | <3 U | <3.8 U | <1.5 U | <1.5 U | <1.5 U | <15 U | <3.8 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <0.5 U | 0.42 J | 0.31 J | 0.34 J | 0.47 J | 0.75 J | <0.5 U | <0.5 U | <0.5 U | <5 U | 0.74 J | <0.5 U | <0.5 U | 0.23 J | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <4 U | <2 U | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <20 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 UJ | <2.5 UJ | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <4 U | <2 U | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <20 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <2 U | <1 U | <1 U | <2 U | <2.5 U | <1 U | <1 U | <1 U | <10 U | <2.5 U | <1 U | <1 U | <1 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <4 U | <2 U | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <20 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 U | <250 U | <500 U | <250 U | <250 U | <500 U | <620 U | <250 U | <250 U | <250 U | <2,500 U | <620 U | <250 U | <250 U | <250 U | <250 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <10 U | <5 U | <5 UJ | <10 U | <12 U | <5 U | <5 U | <5 U | <50 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <4 U | <2 U | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <20 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Acetone | 67-64-1 | 50 | ug/l | 4.4 J | 10 J | 9.5 J | 6 | <5 U | 6 J | 26 | 24 J | 29 J | 5.5 J | <50 U | <12 U | 2.3 J | <5 U | 2.1 J | 12 J | 4.5 J |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <10 U | <5 UJ | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <50 UJ | <12 UJ | <5 U | <5 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | <0.5 U | 0.72 | 0.77 J | 0.52 | 0.52 | 0.47 J | 0.51 J | 0.16 J | **2** | **5.5** | <5 U | <1.2 U | 0.2 J | <0.5 U | 0.25 J | **8.5** | 0.45 J |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <4 U | <2 U | <2 U | <4 U | <5 U | <2 U | <2 U | <2 U | <20 U | <5 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <5 U | <10 U | <5 U | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <50 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | **7.4** | 1.4 J | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | 2.6 | <2.5 U | <2.5 U | 2.2 J | 1.7 J |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | 3.1 | **29** | **220** | **160** | **120** | **340** | **400** | **8.2** | **7.7** | **47** | **270** | **390** | **18** | **16** | **140** | **10** | **47** |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <10 U | <5 U | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <50 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | <10 U | <5 U | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <50 U | <12 U | <5 U | <5 U | <5 U | <5 U | 1 J |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <5 U | <5 U | <10 U | 2 J | <5 U | <10 U | <12 U | 8.7 | 4.6 J | <5 U | <50 UJ | <12 UJ | <5 U | <5 U | <5 U | <5 U | <5 U |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <5 U | <10 U | <5 UJ | <5 U | <10 U | <12 U | 1.5 J | <5 U | <5 U | <50 UJ | <12 UJ | <5 U | <5 U | <5 U | <5 U | <5 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | 1.6 J | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | 0.57 | **10** | **18** | 2.5 | **20** | **43** | **50** | 0.18 J | 0.54 | 0.21 J | **900** | **63** | 2.1 | **10** | **26** | **7.2** | **35** |
| Toluene | 108-88-3 | **5** | ug/l | 1.5 J | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | **9** | 2 J | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 3.1 | 29 | 220 | 160 | 120 | 340 J | 400 J | 8.2 | 7.7 | 47 | 270 | 390 J | 18 | 16 | 140 | 10 | 47 |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | 1.9 J | 2 J | <2.5 U | <2.5 U | <2.5 U | <25 U | 1.8 J | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <1 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | 0.33 J | **6.3** | **22** | **16** | **18** | **56** | **61** | 0.37 J | 0.24 J | 0.24 J | **360** | **52** | 1.1 | **8.8** | **33** | 2.2 | **9.7** |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <5 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <10 U | <5 U | <5 U | <10 U | <12 U | <5 U | <5 U | <5 U | <50 U | <12 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | <1 U | <1 U | 0.62 J | **4.4** | 0.44 J | 0.64 J | 0.71 J | <1 U | 1 | **6.4** | 2 J | 1.2 J | 0.11 J | <1 U | 0.37 J | 0.18 J | 0.27 J |
| **Metals** | | | | | | | | | | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | 90,800 | 220,000 | 205,000 | 146,000 | 200,000 | 234,000 | 236,000 | 54,400 | 58,500 | 95,000 | 289,000 | 234,000 | 97,700 | 264,000 | 184,000 | 136,000 | 178,000 |
| Hardness (As CaCO3) | HARDNESS | NS | ug/l | 235,400 | 788,400 | 995,100 | 547,900 | 800,300 | 864,600 | 1,048,000 | 174,600 | 185,100 | 303,800 | 1,146,000 | 868,600 | 362,800 | 891,400 | 693,900 | 508,600 | 641,300 |
| Iron | 7439-89-6 | **300** | ug/l | **7,230** | **14,900** | **98,500** | **25,600** | **17,700** | **29,500** | **76,300** | **5,660** | **9,480** | **6,650** | **31,300** | **34,200** | **12,600** | **17,500** | **33,000** | **17,500** | **12,600** |
| Magnesium | 7439-95-4 | **35000** | ug/l | 2,140 | **58,100** | **117,000** | **44,200** | **73,100** | **67,700** | **111,000** | 9,420 | 9,450 | 16,200 | **103,000** | **68,700** | 28,800 | **56,600** | **57,100** | **40,800** | **47,800** |
| Manganese | 7439-96-5 | **300** | ug/l | 108 | **2,978** | **7,510** | **2,320** | **5,733** | **4,074** | **8,344** | 235.1 | **363.8** | **448.3** | **9,421** | **6,069** | **1,638** | **4,386** | **2,861** | **2,363** | **2,307** |
| **General Chemistry - Total** | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | 193,000 J | 158,000 | 119,000 | 187,000 | 158,000 | 128,000 | 129,000 | 85,800 J | 116,000 | 141,000 | 163,000 | 155,000 | 177,000 | 220,000 | 156,000 | 220,000 | 185,000 |
| Chloride (As Cl) | 16887-00-6 | **250000** | ug/l | 25,000 | 110,000 | **340,000** | 190,000 | **520,000** | **600,000** | **600,000** | 54,000 | 48,000 | 83,000 | 110,000 | **340,000** | 66,000 | 88,000 | 97,000 | 45,000 | 85,000 |
| Dissolved Organic Carbon | DOC | NS | ug/l | 8,000 J | 8,200 | 3,700 | 8,900 J | 2,400 J | 1,100 | 2,500 | 6,900 | 8,700 | 4,000 J | 6,100 J | 4,400 J | 5,300 | 7,800 | 5,600 | 14,000 | 7,000 |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10000 | ug/l | <100 U | 93 J | 429 | 89 J | 261 | 212 | 175 | 27 J | 104 | 44 J | 120 | 116 | 47 J | 153 | 79 J | <100 U | <100 U |
| Sulfate (As SO4) | 14808-79-8 | **250000** | ug/l | 55,000 | **580,000** | **610,000** | **670,000** | **520,000** | **510,000** | **510,000** | 140,000 | 130,000 | 130,000 | **1,100,000** | **600,000** | 190,000 | **630,000** | **530,000** | **540,000** | **560,000** |
| Total Organic Carbon | TOC | NS | ug/l | 7,600 | 8,400 | 3,100 | 9,200 J | 2,200 | 920 | 2,300 | 7,100 | 8,500 | 3,500 | 6,200 | 3,800 | 5,700 | 7,800 | 5,500 | 14,000 | 7,100 |

**Table 2B**
**Site Management Plan**
**Baseline Bedrock Groundwater Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

**Notes:**

CAS - Chemical Abstract Service
NS - No standard
ug/l - microgram per liter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
Groundwater sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 703.5 and the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water (herein collectively referenced as "NYSDEC SGVs").

**Qualifiers:**

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 NYSDEC SGVs

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-6R-S | LMW-6R-S | LMW-6R-S | LMW-6R-S | LMW-6R-S | LMW-6R-S | LMW-6R-S | LMW-6R-D | LMW-6R-D | LMW-6R-D | LMW-6R-D | LMW-6R-D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-6R-S_21.5 | LMW-6R-S_20.5 | LMW-6R-S_31 | LMW-6R-S_18.75 | LMW-6R-S_18.75 | LMW-6R-S_18.75 | LMW-6R-S_18.75 | LMW-6R-D_46 | LMW-6R-D_47.75 | LMW-6R-D_32.75 | LMW-6R-D_32.75 | LMW-6R-D_32.75 |
| | | | Sample Date | 09/29/2022 | 12/28/2022 | 09/29/2022 | 02/14/2024 | 8/13/2024 | 11/22/2024 | 3/5/2025 | 09/29/2022 | 12/28/2022 | 02/13/2024 | 08/12/2024 | 11/20/2024 |
| | | | Sample Event | Pre-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections |
| | | | Sample Depth | 21.5 | 20.5 | 31 | 18.75-23.75 | 18.75-23.75 | 18.75-23.75 | 18.75-23.75 | 46 | 47.75 | 32.75-37.75 | 32.75-37.75 | 32.75-37.75 |
| | | | Sample El. | 9.77 - 7.77 | 10.77 - 5.77 | 0.27 - -1.73 | -4 - -9 | -4 - -9 | -4 - -9 | -4 - -9 | -14.43 - -16.43 | -16.18 - -21.18 | -18 - -23 | -18 - -23 | -18 - -23 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 UJ | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <3 UJ | <15 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 UJ | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <2 U | <2 U | <4 UJ | <20 U | <2 UJ | <2 U | <2 U | 0.55 J | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | 1 J | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <2 U | <2 U | <4 UJ | <20 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 UJ | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | 0.27 J |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <1 U | <1 U | <2 UJ | <10 U | <1 UJ | <1 U | <1 U | <1 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <4 UJ | <20 U | <2 UJ | <2 U | <2 U | 0.79 J | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 U | <250 U | <250 UJ | <250 U | <500 UJ | <2,500 U | <250 U | <250 U | <250 U | <250 U | <250 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <5 U | <5 U | <10 UJ | <50 U | <5 U | <5 U | <5 U | 1.2 J | 2.3 J | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <4 UJ | <20 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Acetone | 67-64-1 | 50 | ug/l | 8.8 | 10 J | 6.7 | 22 | **390** | <50 U | 21 | 19 | 4.4 J | **59** | 6.5 | 15 |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <10 UJ | <50 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | 0.16 J | 0.72 | <0.5 U | 0.23 J | 0.44 J | <5 U | 0.47 J | <0.5 U | <0.5 U | 0.17 J | 0.17 J | <0.5 U |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 UJ | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <2 U | <2 U | <4 UJ | <20 U | <2 UJ | <2 U | <2 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <5 U | <5 U | <5 U | <10 UJ | <50 U | 1.1 J | <5 U | <5 U | <5 U | <5 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 UJ | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | **24** | 1.4 J | **25** | <2.5 U | <5 UJ | <25 U | <2.5 U | **55** | **7.4** | <2.5 U | <2.5 U | <2.5 U |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | **17** | **29** | **16** | 3.3 | <5 UJ | <25 U | <2.5 U | 4.3 | 3.1 | 1.2 J | <2.5 U | <2.5 U |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 UJ | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 UJ | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <10 UJ | <50 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | 1 J | <5 U | <10 UJ | <50 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | 1.1 J | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | 1 J | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <5 U | <5 U | <5 UJ | 4.8 J | **420** | <50 U | 24 | 2.7 J | <5 U | **57** | 3.2 J | 8.3 |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | 2.1 J | <50 U | 2.8 J | <5 U | <5 U | <5 UJ | 1 J | <5 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | 2.6 | <2.5 U | 2.9 | <2.5 U | <5 UJ | <25 U | <2.5 U | 3.9 | 1.6 J | <2.5 U | <2.5 U | 1.7 J |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | 0.87 J | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | **25** | **10** | **24** | 0.28 J | <1 UJ | <5 U | <0.5 UJ | 0.19 J | 0.57 | <0.5 U | <0.5 U | 1.1 |
| Toluene | 108-88-3 | **5** | ug/l | <2.5 U | <2.5 U | <2.5 U | **8.3** | 3.4 J | <25 U | **9.3** | <2.5 U | 1.5 J | **13** | 3.4 | **7.6** |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 17 | 29 | 16 | 3.3 | <5 UJ | <25 U | <2.5 U | 4.3 | 3.1 | 1.2 J | <2.5 U | <2.5 U |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | 1.9 J | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 UJ | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 UJ | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | **10** | **6.3** | **9.7** | 0.31 J | <1 UJ | <5 U | <0.5 U | 0.29 J | 0.33 J | <0.5 U | <0.5 U | 0.35 J |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 UJ | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <10 UJ | <50 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | 0.31 J | <1 U | 0.34 J | **2.8** | 0.14 J | <10 U | 0.19 J | <1 U | <1 U | 1.2 | 0.36 J | 0.46 J |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | NA | 220,000 | NA | 133,000 | NA | NA | NA | NA | 90,800 | NA | NA | NA |
| Hardness (As CaCO3) | HARDNESS | NS | ug/l | NA | 788,400 | NA | 411,500 | NA | NA | NA | NA | 235,400 | NA | NA | NA |
| Iron | 7439-89-6 | **300** | ug/l | NA | **14,900** | NA | **25,700** | NA | NA | NA | NA | **7,230** | NA | NA | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | NA | **58,100** | NA | 19,200 | NA | NA | NA | NA | 2,140 | NA | NA | NA |
| Manganese | 7439-96-5 | **300** | ug/l | NA | **2,978** | NA | **666** | NA | NA | NA | NA | 108 | NA | NA | NA |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | NA | 158,000 | NA | 494,000 | NA | NA | NA | NA | 193,000 J | NA | NA | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | NA | 110,000 | NA | 180,000 | NA | NA | NA | NA | 25,000 | NA | NA | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | NA | 8,200 | NA | 14,000 | NA | NA | NA | NA | 8,000 J | NA | NA | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | NA | 93 J | NA | 100 | NA | NA | NA | NA | <100 U | NA | NA | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | NA | **580,000** | NA | 3,500 J | NA | NA | NA | NA | 55,000 | NA | NA | NA |
| Total Organic Carbon | TOC | NS | ug/l | NA | 8,400 | NA | 15,000 | NA | NA | NA | NA | 7,600 | NA | NA | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-6R-D | LMW-6R-D | LMW-6R-D | LMW-6R-D | LMW-6R-D | LMW-6R-D | LMW-6R-D | LMW-6R-D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-6R-D_42.75 | LMW-6R-D_42.75 | LMW-6R-D_42.75 | LMW-6R-D_70 | LMW-6R-D_75 | LMW-6R-D_54.75 | LMW-6R-D_54.75 | LMW-6R-D_54.75 |
| | | | Sample Date | 02/13/2024 | 08/15/2024 | 11/20/2024 | 09/29/2022 | 09/29/2022 | 02/13/2024 | 08/14/2024 | 11/20/2024 |
| | | | Sample Event | Post-Injections | Post-Injections | Post-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections |
| | | | Sample Depth | 42.75-47.75 | 42.75-47.75 | 42.75-47.75 | 70 | 75 | 52.75-59.75 | 42.75-47.75 | 42.75-47.75 |
| | | | Sample El. | -28 - -33 | -28 - -33 | -28 - -33 | -38.43 - -40.43 | -43.43 - -45.43 | -38 - -45 | -38 - -45 | -38 - -45 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | 0.21 J | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | 0.95 J | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 0.74 J | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | 0.28 J |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 U | <250 UJ | <250 U | <250 UJ | <250 U | <250 U | <250 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Acetone | 67-64-1 | 50 | ug/l | **51** | 15 | 13 | 17 | 33 | 44 | 6.1 | **54** |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | 0.16 J | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | 1 J | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | 2.3 J |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | <2.5 U | <2.5 U | <2.5 U | **56** | **55** | <2.5 U | <2.5 U | <2.5 U |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | 1.2 J | <2.5 U | <2.5 U | 4 | 3.8 | 0.8 J | <2.5 U | <2.5 U |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | **53** | 6.3 | 7.6 | <5 UJ | <5 U | **55** | 3.3 J | 9.7 |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 UJ | <5 U | <5 U | <5 U | <5 U | <5 UJ | <5 U | <5 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | <2.5 U | <2.5 U | 0.73 J | 4 | 3.6 | 0.81 J | <2.5 U | 1.6 J |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | <0.5 U | <0.5 U | 0.67 | 0.18 J | <0.5 U | <0.5 U | <0.5 U | 0.63 |
| Toluene | 108-88-3 | **5** | ug/l | **12** | 3.1 | **7.6** | <2.5 U | <2.5 U | **7.8** | <2.5 U | **5.8** |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 1.2 J | <2.5 U | <2.5 U | 4 | 3.8 | 0.8 J | <2.5 U | <2.5 U |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | <0.5 U | 0.18 J | 0.18 J | 0.34 J | 0.18 J | <0.5 U | <0.5 U | 0.23 J |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | 1.1 | 0.38 J | 0.5 J | 0.09 J | 0.12 J | 0.61 J | <1 U | 0.33 J |
| **Metals** | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| Hardness (As CaCO3) | HARDNESS | NS | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| Iron | 7439-89-6 | **300** | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 7439-96-5 | **300** | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| **General Chemistry** | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |
| Total Organic Carbon | TOC | NS | ug/l | NA | NA | NA | NA | NA | NA | NA | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-7R-S_21.5 | LMW-7R-S_20 | LMW-7R-S_25.5 | LMW-7R-S_27 | LMW-7R-S_6.75 | LMW-7R-S_6.75 | LMW-7R-S_6.75 | LMW-7R-S_39 | LMW-7R-S_38 | LMW-7R-S_16.75 | LMW-7R-S_16.75 | LMW-7R-S_16.75 |
| | | | Sample Date | 09/29/2022 | 12/19/2022 | 12/20/2022 | 09/29/2022 | 02/13/2024 | 08/12/2024 | 11/22/2024 | 09/29/2022 | 12/21/2022 | 02/13/2024 | 8/13/2024 | 11/21/2024 |
| | | | Sample Event | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections |
| | | | Sample Depth | 21.5 | 20 | 25.5 | 27 | 6.75-11.75 | 6.75-11.75 | 6.75-11.75 | 39 | 38 | 16.75-21.75 | 16.75-21.75 | 16.75-21.75 |
| | | | Sample El. | 12.67 - 10.67 | 14.17 - 9.17 | 8.67 - 3.67 | 7.17 - 5.17 | 8 - 3 | 8 - 3 | 8 - 3 | -4.83 - -6.83 | -3.83 - -8.83 | -2 - -7 | -2 - -7 | -2 - -7 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <5 UJ | <20 U | <2.5 U | <1.2 U | <2.5 U | <1,000 U | <2.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <3 U | <1.5 U | <3 U | <3.8 U | <7.5 U | <15 UJ | <60 U | <7.5 U | <3.8 U | <7.5 U | <3,000 U | <7.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | 0.53 J | 0.34 J | 0.47 J | 0.69 J | <2.5 U | <5 UJ | <20 U | 0.88 J | 0.75 J | <2.5 U | <1,000 U | <2.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <4 U | <2 U | <4 U | <5 U | <10 U | <20 UJ | <80 U | <10 U | <5 U | <10 U | <4,000 U | <10 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <4 U | <2 U | <4 U | <5 U | <10 U | <20 UJ | <80 U | <10 U | <5 U | <10 U | <4,000 U | <10 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <5 UJ | <20 U | <2.5 U | <1.2 U | <2.5 U | <1,000 U | <2.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <2 U | <1 U | <2 U | <2.5 U | <5 U | <10 UJ | <40 U | <5 U | <2.5 U | <5 U | <2,000 U | <5 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <4 U | <2 U | <4 U | <5 U | <10 U | <20 UJ | <80 U | <10 U | <5 U | <10 U | <4,000 U | <10 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <500 U | <250 U | <500 U | <620 UJ | <1,200 U | <2,500 UJ | <10,000 U | <1,200 U | <620 U | <1,200 U | <500,000 U | <1,200 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <10 U | <5 UJ | <10 U | <12 U | <25 U | 12 J | <200 U | <25 U | <12 U | <25 U | <10,000 U | <25 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <4 U | <2 U | <4 U | <5 U | <10 U | <20 UJ | <80 U | <10 U | <5 U | <10 U | <4,000 U | <10 U |
| Acetone | 67-64-1 | 50 | ug/l | 34 | <5 U | 6 J | 25 | 9.1 J | **220 J** | **170 J** | 26 | 26 | <25 U | <10,000 U | **64** |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <10 U | <5 U | <10 U | <12 U | <25 U | <50 UJ | <200 U | <25 U | <12 U | <25 U | <10,000 U | <25 U |
| Benzene | 71-43-2 | **1** | ug/l | 0.63 J | 0.52 | 0.47 J | 0.46 J | <2.5 U | <5 UJ | <20 U | <2.5 U | 0.51 J | <2.5 U | <1,000 U | <2.5 U |
| Bromobenzene | 108-86-1 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <5 UJ | <20 U | <2.5 U | <1.2 U | <2.5 U | <1,000 U | <2.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <4 U | <2 U | <4 U | <5 U | <10 U | <20 UJ | <80 U | <10 U | <5 U | <10 U | <4,000 U | <10 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <10 U | <5 U | <10 U | <12 U | <25 U | <50 UJ | <200 U | <25 U | <12 U | <25 U | <10,000 U | <25 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <5 UJ | <20 U | <2.5 U | <1.2 U | <2.5 U | <1,000 U | <2.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Chloroform | 67-66-3 | **7** | ug/l | 2.9 J | <2.5 U | <5 U | 2.5 J | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | 3.8 J |
| Chloromethane | 74-87-3 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | **330** | **120** | **340** | **390** | **500** | **42 J** | <100 U | **480** | **400** | **560** | <5,000 U | <12 U |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <5 UJ | <20 U | <2.5 U | <1.2 U | <2.5 U | <1,000 U | <2.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <5 UJ | <20 U | <2.5 U | <1.2 U | <2.5 U | <1,000 U | <2.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <10 U | <5 U | <10 U | <12 U | <25 U | <50 UJ | <200 U | <25 U | <12 U | <25 U | <10,000 U | <25 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <10 U | <5 U | <10 U | <12 U | <25 U | <50 UJ | <200 U | <25 U | <12 U | <25 U | <10,000 U | <25 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <10 U | <5 U | <10 U | <12 UJ | <25 U | **3,400** | **640** | <25 U | <12 U | <25 U | <10,000 U | 42 |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <10 U | <5 U | <10 U | <12 U | <25 UJ | <50 UJ | <200 U | <25 U | <12 U | <25 U | <10,000 U | <25 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | **9.1 J** | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Styrene | 100-42-5 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | **11** | **20** | **43** | **23** | **21** | <5 UJ | <20 U | **31** | **50** | **25** | <1,000 U | <2.5 U |
| Toluene | 108-88-3 | **5** | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | **5.3 J** | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 330 | 120 | 340 J | 390 | 500 J | 42 J | <100 U | 480 | 400 J | 570 J | <5,000 U | <12 U |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <5 UJ | <20 U | <2.5 U | <1.2 U | <2.5 U | <1,000 U | <2.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <5 U | <2.5 U | 1.9 J | <6.2 U | 4 J | <25 UJ | <100 U | <12 U | 2 J | **5.1 J** | <5,000 U | <12 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <1 U | <0.5 U | <1 U | <1.2 U | <2.5 U | <5 UJ | <20 U | <2.5 U | <1.2 U | <2.5 U | <1,000 U | <2.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | **50** | **18** | **56** | **90** | **21** | <5 UJ | <20 U | **110** | **61** | **25** | <1,000 U | <2.5 U |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <5 U | <2.5 U | <5 U | <6.2 U | <12 U | <25 UJ | <100 U | <12 U | <6.2 U | <12 U | <5,000 U | <12 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <10 U | <5 U | <10 U | <12 U | <25 U | <50 UJ | <200 U | <25 U | <12 U | <25 U | <10,000 U | <25 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | 1.1 J | 0.44 J | 0.64 J | 1.1 J | **46** | **4 J** | <40 U | 1.2 J | 0.71 J | **70** | <2,000 U | <5 U |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | NA | 200,000 | 234,000 | NA | NA | 124,000 | NA | NA | 236,000 | 371,000 | 660,000 J | NA |
| Hardness (As CaCO3) | HARD | NS | ug/l | NA | 800,300 | 864,600 | NA | NA | 450,100 | NA | NA | 1,048,000 | 1,413,000 | 2,566,000 | NA |
| Iron | 7439-89-6 | **300** | ug/l | NA | **17,700** | **29,500** | NA | NA | **302,000** | NA | NA | **76,300** | **88,200** | **1,860,000 J** | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | NA | **73,100** | **67,700** | NA | NA | 34,200 | NA | NA | **111,000** | **118,000** | **223,000 J** | NA |
| Manganese | 7439-96-5 | **300** | ug/l | NA | **5,733** | **4,074** | NA | NA | **860.3** | NA | NA | **8,344** | **6,149** | **9,277 J** | NA |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | NA | 158,000 | 128,000 | NA | NA | 2,060,000 J | NA | NA | 129,000 | 166,000 | 3,260,000 J | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | NA | **520,000** | **600,000** | NA | NA | 100,000 | NA | NA | **600,000** | **1,200,000** | **490,000** | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | NA | 2,400 J | 1,100 | NA | NA | 3,500,000 | NA | NA | 2,500 | <2,000 U | 7,100,000 | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | NA | 261 | 212 | NA | NA | 100 | NA | NA | 175 | 117 | 107 | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | NA | **520,000** | **510,000** | NA | NA | <10,000 U | NA | NA | **510,000** | 150,000 | <100,000 U | NA |
| Total Organic Carbon | TOC | NS | ug/l | NA | 2,200 | 920 | NA | NA | 3,500,000 | NA | NA | 2,300 | <1,000 U | 7,700,000 | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-7R-S | LMW-7R-D | LMW-7R-D | LMW-7R-D | LMW-7R-D | LMW-7R-D | LMW-7R-D | LMW-7R-D | LMW-7R-D | LMW-7R-D | LMW-7R-D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-7RS_42.5 | LMW-7R-D_42 | LMW-7R-D_23.75 | LMW-7R-D_23.75 | LMW-7R-D_23.75 | LMW-7R-D_23.75 | LMW-7R-D_48 | LMW-7R-D_66 | LMW-7R-D_68.5 | LMW-7R-D_49.75 | LMW-7R-D_75 |
| | | | Sample Date | 09/29/2022 | 12/21/2022 | 02/13/2024 | 8/13/2024 | 11/22/2024 | 3/7/2025 | 09/29/2022 | 12/21/2022 | 09/29/2022 | 02/13/2024 | 09/29/2022 |
| | | | Sample Event | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Post-Injections | Pre-Injections |
| | | | Sample Depth | 42.5 | 42 | 23.75-28.75 | 23.75-28.75 | 23.75-28.75 | 23.75-28.75 | 48 | 66 | 68.5 | 49.75-54.75 | 75 |
| | | | Sample El. | -8.33 - -10.33 | -8.66 - -13.66 | -9 - -14 | -9 - -14 | -9 - -14 | -9 - -14 | -13.83 - -15.83 | -32.66 - -37.66 | -35.16 - -37.16 | -35 - -40 | -41.66 - -43.66 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <2.5 U | <1 U | <2 U | <5 U | <120 U | <25 U | <1 U | <0.5 U | <1 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <7.5 U | <3 U | <6 U | <15 U | <380 U | <75 U | <3 U | <1.5 U | <3 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | 1.2 J | 0.42 J | <2 U | <5 U | <120 U | <25 U | <1 U | 0.31 J | <1 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <10 U | <4 U | <8 U | <20 U | <500 U | <100 U | <4 U | <2 U | <4 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <10 U | <4 U | <8 U | <20 U | <500 U | <100 U | <4 U | <2 U | <4 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <2.5 U | <1 U | <2 U | <5 U | <120 U | <25 U | <1 U | <0.5 U | <1 U | <0.5 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <5 U | <2 U | <4 U | <10 U | <250 U | <50 U | <2 U | <1 U | <2 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <10 U | <4 U | <8 U | <20 U | <500 U | <100 U | <4 U | <2 U | <4 U | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <1,200 U | <500 U | <1,000 U | <2,500 U | <62,000 U | <12,000 U | <500 U | <250 U | <500 UJ | <250 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <25 U | <10 U | <20 U | <50 U | <1,200 U | <250 U | <10 U | <5 U | <10 U | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <10 U | <4 U | <8 U | <20 U | <500 U | <100 U | <4 U | <2 U | <4 U | <2 U | <2 U |
| Acetone | 67-64-1 | 50 | ug/l | 30 | 9.5 J | **54** | **140** | **480 J** | **1,400 J** | 31 | 6 | 23 | **53** | 19 |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <25 U | <10 U | <20 U | <50 U | <1,200 U | <250 U | <10 U | <5 UJ | <10 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | <2.5 U | 0.77 J | <2 U | <5 U | <120 U | <25 U | **1.1** | 0.52 | **1.1** | 0.29 J | 0.34 J |
| Bromobenzene | 108-86-1 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <2.5 U | <1 U | <2 U | <5 U | <120 U | <25 U | <1 U | <0.5 U | <1 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <10 U | <4 U | <8 U | <20 U | <500 U | <100 U | <4 U | <2 U | <4 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <25 U | <10 U | <20 U | <50 U | <1,200 U | <250 U | <10 U | <5 U | <10 U | <5 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <2.5 U | <1 U | <2 U | <5 U | <120 U | <25 U | <1 U | <0.5 U | <1 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | 1.8 J |
| Chloromethane | 74-87-3 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | **710** | **220** | **29** | <25 U | <620 U | <120 U | **170** | **160** | **180** | **20** | **100** |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <2.5 U | <1 U | <2 U | <5 U | <120 U | <25 U | <1 U | <0.5 U | <1 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <2.5 U | <1 U | <2 U | <5 U | <120 U | <25 U | <1 U | <0.5 U | <1 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <25 U | <10 U | <20 U | <50 U | <1,200 U | <250 U | <10 U | <5 U | <10 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <25 U | <10 U | <20 U | <50 U | <1,200 U | <250 U | <10 U | <5 U | <10 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <25 U | <10 U | **410** | **4,000** | **6,100** | **5,600** | <10 U | 2 J | <10 UJ | **420** | <5 U |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <25 U | <10 U | <20 UJ | <50 U | <1,200 U | <250 U | <10 U | <5 UJ | <10 U | <5 UJ | <5 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | **26** | **18** | 1.2 J | <5 U | <120 U | <25 U | **12** | 2.5 | **9.4** | 0.28 J | 2.1 |
| Toluene | 108-88-3 | **5** | ug/l | <12 U | <5 U | 4.2 J | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | 4.2 | <2.5 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 710 | 220 | 29 | <25 U | <620 U | <120 U | 170 | 160 | 180 | 20 | 100 |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <2.5 U | <1 U | <2 U | <5 U | <120 U | <25 U | <1 U | <0.5 U | <1 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <2.5 U | <1 U | <2 U | <5 U | <120 U | <25 U | <1 U | <0.5 U | <1 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | **86** | **22** | 1 J | <5 U | <120 U | <25 U | **20** | **16** | **20** | 0.21 J | **8.2** |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <12 U | <5 U | <10 U | <25 U | <620 U | <120 U | <5 U | <2.5 U | <5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <25 U | <10 U | <20 U | <50 U | <1,200 U | <250 U | <10 U | <5 U | <10 U | <5 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | 1.6 J | 0.62 J | **17** | <10 U | <250 U | <50 U | 1 J | **4.4** | 1 J | **27** | 1 |
| **Metals** | | | | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | NA | 205,000 | NA | NA | NA | NA | NA | 146,000 | NA | NA | NA |
| Hardness (As CaCO3) | HARD | NS | ug/l | NA | 995,100 | NA | NA | NA | NA | NA | 547,900 | NA | NA | NA |
| Iron | 7439-89-6 | **300** | ug/l | NA | **98,500** | NA | NA | NA | NA | NA | **25,600** | NA | NA | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | NA | **117,000** | NA | NA | NA | NA | NA | **44,200** | NA | NA | NA |
| Manganese | 7439-96-5 | **300** | ug/l | NA | **7,510** | NA | NA | NA | NA | NA | **2,320** | NA | NA | NA |
| **General Chemistry** | | | | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | NA | 119,000 | NA | NA | NA | NA | NA | 187,000 | NA | NA | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | NA | **340,000** | NA | NA | NA | NA | NA | 190,000 | NA | NA | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | NA | 3,700 | NA | NA | NA | NA | NA | 8,900 J | NA | NA | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | NA | 429 | NA | NA | NA | NA | NA | 89 J | NA | NA | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | NA | **610,000** | NA | NA | NA | NA | NA | **670,000** | NA | NA | NA |
| Total Organic Carbon | TOC | NS | ug/l | NA | 3,100 | NA | NA | NA | NA | NA | 9,200 J | NA | NA | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-8R-S_17.5 | LMW-8R-S_22.5 | LMW-8R-S_27 | LMW-8R-S_24.75 | LMW-8R-S_6.75 | DUP01_021424 | LMW-8R-S_6.75 | LMW-8R-S_6.75 | LMW-8R-S_6.75 | LMW-8R-S_18.75 | LMW-8R-S_18.75 | LMW-8R-S_18.75 | LMW-8R-S_18.75 |
| | | | Sample Date | 09/29/2022 | 09/29/2022 | 09/29/2022 | 12/22/2022 | 02/14/2024 | 02/14/2024 | 8/15/2024 | 11/22/2024 | 3/7/2025 | 02/14/2024 | 8/12/2024 | 11/22/2024 | 3/5/2025 |
| | | | Sample Event | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections |
| | | | Sample Depth | 17.5 | 22.5 | 27 | 24.75 | 6.75-11.75 | 6.75-11.75 | 6.75-11.75 | 6.75-11.75 | 6.75-11.75 | 16.75-23.75 | 16.75-23.75 | 16.75-23.75 | 16.75-23.75 |
| | | | Sample El. | 14.68 - 12.68 | 9.68 - 7.68 | 5.18 - 3.18 | 7.43 - 2.43 | 8 - 3 | 8 - 3 | 8 - 3 | 8 - 3 | 8 - 3 | -2 - -9 | -2 - -9 | -2 - -9 | -2 - -9 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <1.2 U | <0.5 U | <0.5 U | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <7.5 U | <7.5 U | <7.5 U | <3.8 U | <1.5 U | <1.5 U | <3.8 U | <15 U | <3.8 U | <1.5 U | <1.5 U | <38 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | 0.74 J | <0.5 U | <0.5 U | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <10 U | <10 U | <10 U | <5 U | <2 U | <2 U | <5 U | <20 U | <5 U | <2 U | <2 U | <50 U | <2 UJ |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <10 U | <10 U | <10 U | <5 U | <2 U | <2 U | <5 U | <20 U | <5 U | <2 U | <2 U | <50 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <2.5 U | <2.5 U | <2.5 U | <1.2 U | <0.5 U | <0.5 U | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <5 U | <5 U | <5 U | <2.5 U | <1 U | <1 U | <2.5 U | <10 U | <2.5 U | <1 U | <1 U | <25 U | <1 UJ |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <10 U | <10 U | <10 U | <5 U | <2 U | <2 U | <5 U | <20 U | <5 U | <2 U | <2 U | <50 U | <2 UJ |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <1,200 UJ | <1,200 U | <1,200 UJ | <620 U | <250 U | <250 U | <620 U | <2,500 U | <620 U | <250 U | <250 U | <6,200 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <25 U | <25 U | <25 U | <12 U | <5 U | <5 U | <12 U | 25 J | 3.6 J | <5 U | <5 U | <120 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <10 U | <10 U | <10 U | <5 U | <2 U | <2 U | <5 U | <20 U | <5 U | <2 U | <2 U | <50 U | <2 U |
| Acetone | 67-64-1 | 50 | ug/l | 27 | 17 J | 26 | <12 U | 13 | 14 | **120** | **140** | 9.5 J | 3.5 J | 17 | 43 J | **180** |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <25 U | <25 U | <25 U | <12 UJ | <5 U | <5 U | <12 U | <50 U | <12 U | <5 U | <5 U | <120 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | <2.5 U | <2.5 U | <2.5 U | <1.2 U | 0.31 J | 0.29 J | 0.48 J | <5 U | 0.54 J | 0.18 J | 0.2 J | <12 U | 0.18 J |
| Bromobenzene | 108-86-1 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <2.5 U | <2.5 U | <2.5 U | <1.2 U | <0.5 U | <0.5 U | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <10 U | <10 U | <10 U | <5 U | <2 U | <2 U | <5 U | <20 U | <5 U | <2 U | <2 U | <50 U | <2 UJ |
| Bromomethane | 74-83-9 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <25 U | <25 U | <25 U | <12 U | <5 U | <5 U | <12 U | <50 U | 5.4 J | <5 U | <5 U | <120 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <1.2 U | <0.5 U | <0.5 U | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Chloromethane | 74-87-3 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | **190** | **190** | **180** | **390** | **14** | **17** | <6.2 U | <25 U | <6.2 U | 2.9 | 0.88 J | <62 U | <2.5 U |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <2.5 U | <2.5 U | <2.5 U | <1.2 U | <0.5 U | <0.5 U | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <2.5 U | <2.5 U | <2.5 U | <1.2 U | <0.5 U | <0.5 U | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <25 U | <25 U | <25 U | <12 U | <5 U | <5 U | <12 U | <50 U | <12 U | <5 U | <5 U | <120 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <25 U | <25 U | <25 U | <12 U | <5 U | <5 U | <12 U | <50 U | <12 U | <5 U | <5 U | <120 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | 2.7 J | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | 1.2 J | 1.4 J | <6.2 U | <25 U | 3.5 J | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <25 UJ | <25 U | <25 UJ | <12 UJ | 2 J | <5 U | **360** | **1,000** | 15 | 7.1 | 12 | **210** | 8.7 |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <25 U | <25 U | <25 U | <12 UJ | <5 U | <5 U | <12 U | <50 U | 2.6 J | <5 U | <5 U | <120 U | <5 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | 1 J | 1.2 J | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 UJ |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | **600** | **640** | **570** | **63** | 0.54 | 0.64 | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 UJ |
| Toluene | 108-88-3 | **5** | ug/l | <12 U | <12 U | <12 U | <6.2 U | **8.7** | **10** | <6.2 U | <25 U | **18** | 2.3 J | 3.5 | <62 U | 1.5 J |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 190 | 190 | 180 | 390 J | 14 | 17 | <6.2 U | <25 U | <6.2 U | 2.9 | 0.88 J | <62 U | <2.5 U |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | 2.2 J | 2.6 J | <6.2 U | <25 U | 3.5 J | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <2.5 U | <2.5 U | <2.5 U | <1.2 U | <0.5 U | <0.5 U | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <12 U | <12 U | <12 U | 1.8 J | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <2.5 U | <2.5 U | <2.5 U | <1.2 U | <0.5 U | <0.5 U | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | **390** | **390** | **350** | **52** | 0.56 | 0.7 | <1.2 U | <5 U | <1.2 U | <0.5 U | <0.5 U | <12 U | <0.5 U |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <12 U | <12 U | <12 U | <6.2 U | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <25 U | <25 U | <25 U | <12 U | <5 U | <5 U | <12 U | <50 U | <12 U | <5 U | <5 U | <120 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | 0.42 J | <5 U | 0.41 J | 1.2 J | **4.4** | **5.2** | 0.2 J | <10 U | <2.5 U | 1.6 | 1.3 | <25 U | 0.53 J |
| **Metals** | | | | | | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | NA | NA | NA | 234,000 | 127,000 | NA | 353,000 | NA | NA | NA | NA | NA | NA |
| Hardness (As CaCO3) | HARD | NS | ug/l | NA | NA | NA | 868,600 | 398,900 | NA | 1,327,000 | NA | NA | NA | NA | NA | NA |
| Iron | 7439-89-6 | **300** | ug/l | NA | NA | NA | **34,200** | **8,330** | NA | **1,180,000** | NA | NA | NA | NA | NA | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | NA | NA | NA | **68,700** | 19,900 | NA | **108,000** | NA | NA | NA | NA | NA | NA |
| Manganese | 7439-96-5 | **300** | ug/l | NA | NA | NA | **6,069** | **662.1** | NA | **2,066** | NA | NA | NA | NA | NA | NA |
| **General Chemistry** | | | | | | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | NA | NA | NA | 155,000 | 260,000 | NA | 1,840,000 J | NA | NA | NA | NA | NA | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | NA | NA | NA | **340,000** | **410,000** | NA | 88,000 | NA | NA | NA | NA | NA | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | NA | NA | NA | 4,400 J | 6,600 | NA | 5,400,000 J | NA | NA | NA | NA | NA | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | NA | NA | NA | 116 | 164 | NA | 89 J | NA | NA | NA | NA | NA | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | NA | NA | NA | **600,000** | 30,000 | NA | <10,000 U | NA | NA | NA | NA | NA | NA |
| Total Organic Carbon | TOC | NS | ug/l | NA | NA | NA | 3,800 | 6,700 | NA | 2,800,000 J | NA | NA | NA | NA | NA | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-8R-D_46.5 | LMW-8R-D_48.5 | LMW-8R-D_47.25 | LMW-8R-D_27.75 | LMW-8R-D_27.75 | LMW-8R-D_27.75 | LMW-8R-D_27.75 | LMW-8R-D_56.75 | LMW-8R-D_58 | LMW-8R-D_73 | LMW-8R-D_77 | LMW-8R-D_76 | LMW-8R-D_59.75 | LMW-8R-D_59.75 | LMW-8R-D_59.75 |
| | | | Sample Date | 09/29/2022 | 09/29/2022 | 12/27/2022 | 02/14/2024 | 8/13/2024 | 11/22/2024 | 3/5/2025 | 12/27/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 12/27/2022 | 02/14/2024 | 8/13/2024 | 11/22/2024 |
| | | | Sample Event | Pre-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections |
| | | | Sample Depth | 46.5 | 48.5 | 47.25 | 27.75-34.75 | 27.75-34.75 | 27.75-34.75 | 27.75-34.75 | 56.75 | 58 | 73 | 77 | 76 | 57.75-64.75 | 57.75-64.75 | 57.75-64.75 |
| | | | Sample EI. | -15.19 - -17.19 | -17.19 - -19.19 | -15.94 - -20.94 | -13 - -20 | -13 - -20 | -13 - -20 | -13 - -20 | -20.44 - -25.44 | -26.69 - -28.69 | -41.69 - -43.69 | -45.69 - -47.69 | -44.69 - -49.69 | -43 - -50 | -43 - -50 | -43 - -50 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <2 U | <10 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <7.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <3 U | <1.5 U | <1.5 U | <6 U | <30 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <2 U | <10 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <10 U | <2 UJ | <2 U | <2 U | <2 U | <4 U | <2 U | <2 U | <8 U | <40 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 UJ | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 UJ | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <10 U | <2 U | <2 U | <2 U | <2 U | <4 U | <2 U | <2 U | <8 U | <40 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <2 U | <10 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <1 U | <1 U | <1 U | <5 U | <1 UJ | <1 U | <1 U | <1 U | <2 U | <1 U | <1 U | <4 U | <20 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <10 U | <2 UJ | <2 U | <2 U | <2 U | <4 U | <2 U | <2 U | <8 U | <40 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 U | <250 U | <250 U | <250 U | <250 U | <1,200 U | <250 U | <250 U | <250 UJ | <250 U | <500 U | <250 U | <250 U | <1,000 U | <5,000 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <25 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | 7.4 J | <100 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <10 U | <2 U | <2 U | <2 U | <2 U | <4 U | <2 U | <2 U | <8 U | <40 U |
| Acetone | 67-64-1 | 50 | ug/l | 8.5 | 10 | 24 J | **69** | 1.6 J | <25 U | <4.9 U | 29 J | 11 | 28 | 17 | 5.5 J | **52** | **300** | **920** |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <25 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | <20 U | <100 U |
| Benzene | 71-43-2 | **1** | ug/l | <0.5 U | <0.5 U | 0.16 J | **3.8** | 0.95 | **1.2 J** | **1.3** | **2** | <0.5 U | <0.5 U | **31** | **5.5** | **8.1** | 0.8 J | <10 U |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <2 U | <10 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <10 U | <2 UJ | <2 U | <2 U | <2 U | <4 U | <2 U | <2 U | <8 U | <40 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | 0.94 J | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <25 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | <20 U | <100 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <2 U | <10 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Chloroform | 67-66-3 | **7** | ug/l | 1.5 J | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | 0.8 J | 0.85 J | **8.2** | 1.3 J | 1.2 J | <12 U | 1.3 J | **7.7** | 1 J | 0.86 J | **200** | **47** | 2.3 J | <10 U | <50 U |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <2 U | <10 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <2 U | <10 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <25 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | <20 U | <100 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <25 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | <20 U | <100 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <5 U | <5 U | 8.7 | **82** | <5 U | <25 U | 3.6 J | 4.6 J | <5 UJ | <5 U | <10 U | <5 U | **120** | **470** | **760** |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <5 U | 1.5 J | <5 UJ | 1.7 J | <25 U | 3.2 J | <5 U | <5 U | <5 U | <10 U | <5 U | <5 UJ | <20 U | <100 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | 3 J | <50 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | <0.5 U | <0.5 U | 0.18 J | <0.5 U | <0.5 U | <2.5 U | <0.5 UJ | 0.54 | 0.25 J | <0.5 U | 0.41 J | 0.21 J | <0.5 U | <2 U | <10 U |
| Toluene | 108-88-3 | **5** | ug/l | <2.5 U | <2.5 U | <2.5 U | 1.3 J | <2.5 U | <12 U | 1.3 J | **9** | <2.5 U | <2.5 U | <5 U | 2 J | <2.5 U | <10 U | <50 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 0.8 J | 0.85 J | 8.2 | 1.3 J | 1.2 J | <12 U | 1.3 J | 7.7 | 1 J | 0.86 J | 200 | 47 | 2.3 J | <10 U | <50 U |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <2 U | <10 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <2.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <2 U | <10 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | <0.5 U | <0.5 U | 0.37 J | <0.5 U | <0.5 U | <2.5 U | <0.5 U | 0.24 J | 0.18 J | <0.5 U | 0.39 J | 0.24 J | <0.5 U | <2 U | <10 U |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <12 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <10 U | <50 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <25 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | <20 U | <100 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | <1 U | <1 U | <1 U | 0.94 J | 0.18 J | <5 U | 0.24 J | 1 | <1 U | <1 U | **6.7** | **6.4** | **2.7** | <4 U | <20 U |
| **Metals** | | | | | | | | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | NA | NA | 54,400 | NA | NA | NA | NA | 58,500 | NA | NA | NA | 95,000 | NA | NA | NA |
| Hardness (As CaCO3) | HARD | NS | ug/l | NA | NA | 174,600 | NA | NA | NA | NA | 185,100 | NA | NA | NA | 303,800 | NA | NA | NA |
| Iron | 7439-89-6 | **300** | ug/l | NA | NA | **5,660** | NA | NA | NA | NA | **9,480** | NA | NA | NA | **6,650** | NA | NA | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | NA | NA | 9,420 | NA | NA | NA | NA | 9,450 | NA | NA | NA | 16,200 | NA | NA | NA |
| Manganese | 7439-96-5 | **300** | ug/l | NA | NA | 235.1 | NA | NA | NA | NA | **363.8** | NA | NA | NA | **448.3** | NA | NA | NA |
| **General Chemistry** | | | | | | | | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | NA | NA | 85,800 J | NA | NA | NA | NA | 116,000 | NA | NA | NA | 141,000 | NA | NA | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | NA | NA | 54,000 | NA | NA | NA | NA | 48,000 | NA | NA | NA | 83,000 | NA | NA | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | NA | NA | 6,900 | NA | NA | NA | NA | 8,700 | NA | NA | NA | 4,000 J | NA | NA | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | NA | NA | 27 J | NA | NA | NA | NA | 104 | NA | NA | NA | 44 J | NA | NA | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | NA | NA | 140,000 | NA | NA | NA | NA | 130,000 | NA | NA | NA | 130,000 | NA | NA | NA |
| Total Organic Carbon | TOC | NS | ug/l | NA | NA | 7,100 | NA | NA | NA | NA | 8,500 | NA | NA | NA | 3,500 | NA | NA | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-8R-D |
|---|---|---|---|---|
| | | | Sample Name | LMW-8R-D_59.75 |
| | | | Sample Date | 3/5/2025 |
| | | | Sample Event | Post-Injections |
| | | | Sample Depth | 57.75-64.75 |
| | | | Sample El. | -43 - -50 |
| | | | Unit | Result |
| **Volatile Organic Compounds** | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <50 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <50 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <10 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <30 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <50 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <10 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <50 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <50 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <50 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <40 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <50 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <50 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <50 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <40 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <50 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <10 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <20 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <50 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <50 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <50 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <50 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <40 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <5,000 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <50 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <50 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <100 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <50 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <40 U |
| Acetone | 67-64-1 | 50 | ug/l | **380** |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <100 U |
| Benzene | 71-43-2 | **1** | ug/l | <10 U |
| Bromobenzene | 108-86-1 | 5 | ug/l | <50 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <50 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <10 U |
| Bromoform | 75-25-2 | 50 | ug/l | <40 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <50 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <100 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <10 UJ |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <50 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <50 UJ |
| Chloroform | 67-66-3 | **7** | ug/l | <50 U |
| Chloromethane | 74-87-3 | 5 | ug/l | <50 UJ |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | <50 U |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <10 U |
| Cymene | 99-87-6 | 5 | ug/l | <50 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <10 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <100 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <100 UJ |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <50 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <50 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <50 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <50 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <50 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | 580 UJ |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <100 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | <50 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <50 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <50 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <50 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <50 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <50 U |
| Styrene | 100-42-5 | 5 | ug/l | <50 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <50 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <50 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | <10 U |
| Toluene | 108-88-3 | **5** | ug/l | <50 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | <50 U |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <50 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <10 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <50 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <10 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <50 UJ |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | <10 U |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <50 UJ |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <100 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | <20 UJ |
| **Metals** | | | | |
| Calcium | 7440-70-2 | NS | ug/l | NA |
| Hardness (As CaCO3) | HARD | NS | ug/l | NA |
| Iron | 7439-89-6 | **300** | ug/l | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | NA |
| Manganese | 7439-96-5 | **300** | ug/l | NA |
| **General Chemistry** | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | NA |
| Total Organic Carbon | TOC | NS | ug/l | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | | | | LMW-9R-S | LMW-9R-S | LMW-9R-S | LMW-9R-S | LMW-9R-S | LMW-9R-S | LMW-9R-D | LMW-9R-D | LMW-9R-D | LMW-9R-D | LMW-9R-D | LMW-9R-D | LMW-9R-D | LMW-9R-D |
| **Sample Name** | | | | LMW-9R-S_22 | LMW-9R-S_30.5 | LMW-9R-S_13.75 | LMW-9R-S_13.75 | LMW-9R-S_13.75 | LMW-9R-S_13.75 | LMW-9R-D_43.5 | LMW-9R-D_46.5 | LMW-9R-D_60.5 | LMW-9R-D_63.5 | LMW-9R-D_76 | LMW-9R-D_58.25 | LMW-9R-D_58.25 | DUP_11222024 |
| **Sample Date** | | | | 09/29/2022 | 09/29/2022 | 02/13/2024 | 8/15/2024 | 11/22/2024 | 3/7/2025 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 02/14/2024 | 8/14/2024 | 11/22/2024 |
| **Sample Event** | | | | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections |
| **Sample Depth** | | | | 22 | 30.5 | 13.75-19.75 | 13.75-19.75 | 13.75-19.75 | 13.75-19.75 | 43.5 | 46.5 | 60.5 | 63.5 | 76 | 55.25-63.25 | 55.25-63.25 | 55.25-63.25 |
| **Sample EI.** | | | | 11.34 - 9.34 | 2.84 - 0.84 | 1 - -5 | 1 - -5 | 1 - -5 | 1 - -5 | -10.16 - -12.16 | -13.16 - -15.16 | -26.6 - -28.6 | -29.6 - -31.6 | -42.1 - -44.1 | -40.5 - -48.5 | -40.5 - -48.5 | -40.5 - -48.5 |
| **Unit** | | | | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <1 U | <1.2 U | 0.18 J | <12 U | <25 U | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <3 U | <3.8 U | <1.5 U | <38 U | <75 U | <15 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <1 U | <1.2 U | <0.5 U | <12 U | <25 U | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 UJ |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <4 U | <5 U | <2 U | <50 U | <100 U | <20 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <4 U | <5 U | <2 U | <50 U | <100 U | <20 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <1 U | <1.2 U | <0.5 U | <12 U | <25 U | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <2 U | <2.5 U | <1 U | <25 U | <50 U | <10 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <4 U | <5 U | <2 U | <50 U | <100 U | <20 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <500 UJ | <620 UJ | <250 U | <6,200 U | <12,000 U | <2,500 U | <250 U | <250 U | <250 U | <250 UJ | <250 U | <250 U | <250 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <10 U | <12 U | 1.2 J | <120 U | **62 J** | 22 J | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <4 U | <5 U | <2 U | <50 U | <100 U | <20 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Acetone | 67-64-1 | 50 | ug/l | 16 | 26 | **100** | **650** | **1,200** | **70 J** | 8.4 | 6.8 | 20 | 6.2 | 13 | 9.7 | 2.2 J | 2 J | 3 J |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <10 U | <12 U | <5 U | <120 U | <250 U | <50 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | **8.5** | **7.4** | **1.3** | <12 U | <25 U | <5 U | 0.6 | 0.56 | 0.65 | **1.6** | 0.19 J | **5.7** | **3.9** | **3.2** | **3** |
| Bromobenzene | 108-86-1 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <1 U | <1.2 U | <0.5 U | <12 U | <25 U | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | 0.33 J |
| Bromoform | 75-25-2 | 50 | ug/l | <4 U | <5 U | <2 U | <50 U | <100 U | <20 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 UJ |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <10 U | <12 U | <5 U | <120 U | <250 U | 14 J | <5 U | <5 U | <5 U | <5 U | 1 J | <5 U | <5 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <1 U | <1.2 U | <0.5 U | <12 U | <25 U | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | **7.9** | **7.5** | <2.5 U | <62 U | <120 U | <25 U | 1.2 J | 1.2 J | <2.5 U | 3.8 | **34** | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloromethane | 74-87-3 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | **28** | **28** | <2.5 U | <62 U | <120 U | <25 U | **9.6** | **8.8** | **9.6** | **11** | 2.3 J | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <1 U | <1.2 U | <0.5 U | <12 U | <25 U | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <1 U | <1.2 U | <0.5 U | <12 U | <25 U | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | 0.43 J |
| Dibromomethane | 74-95-3 | 5 | ug/l | <10 U | <12 U | <5 U | <120 U | <250 U | <50 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <10 U | <12 U | <5 U | <120 U | <250 U | <50 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <10 UJ | <12 UJ | **82** | **3,600** | **6,000** | **360** | 2 J | <5 U | 1.9 J | <5 UJ | <5 U | 16 | <5 U | 6.5 J | 18 J |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <10 U | <12 U | 4.3 J | <120 U | <250 U | 12 J | <5 U | <5 U | <5 U | <5 U | <5 U | <5 UJ | <5 U | <5 U | <5 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | **8** | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 UJ | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 0.75 J | 0.65 J | 0.52 J | 0.7 J |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | **190** | **250** | 0.2 J | <12 U | <25 U | <5 U | 2.7 | 2.5 | 2.4 | 2.1 | 0.34 J | <0.5 U | <0.5 U | 0.27 J | 0.22 J |
| Toluene | 108-88-3 | **5** | ug/l | <5 U | <6.2 U | **85** | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 0.77 J | 0.77 J |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 28 | 28 | <2.5 U | <62 U | <120 U | <25 U | 9.6 | 8.8 | 9.6 | 11 | 2.3 J | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <1 U | <1.2 U | <0.5 U | <12 U | <25 U | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <1 U | <1.2 U | <0.5 U | <12 U | <25 U | <5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | **56** | **58** | <0.5 U | <12 U | <25 U | <5 U | 0.75 | 0.68 | 0.65 | 0.65 | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <5 U | <6.2 U | <2.5 U | <62 U | <120 U | <25 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <10 U | <12 U | <5 U | <120 U | <250 U | <50 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 UJ |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | 1 J | 0.96 J | **4.6** | <25 U | <50 U | <10 U | 0.2 J | 0.19 J | 0.23 J | 0.6 J | 0.13 J | 0.24 J | 0.27 J | 0.15 J | 0.19 J |
| **Metals** | | | | | | | | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | NA | NA | NA | 374,000 | NA | NA | NA | NA | NA | NA | NA | 148,000 | NA | NA | NA |
| Hardness (As CaCO3) | HARD | NS | ug/l | NA | NA | NA | 1,262,000 | NA | NA | NA | NA | NA | NA | NA | 478,100 | NA | NA | NA |
| Iron | 7439-89-6 | **300** | ug/l | NA | NA | NA | **1,210,000** | NA | NA | NA | NA | NA | NA | NA | **16,700** | NA | NA | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | NA | NA | NA | **79,500** | NA | NA | NA | NA | NA | NA | NA | 26,400 | NA | NA | NA |
| Manganese | 7439-96-5 | **300** | ug/l | NA | NA | NA | **744.2** | NA | NA | NA | NA | NA | NA | NA | **785.9** | NA | NA | NA |
| **General Chemistry** | | | | | | | | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | NA | NA | NA | 3,140,000 J | NA | NA | NA | NA | NA | NA | NA | 272,000 | NA | NA | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | NA | NA | NA | **460,000** | NA | NA | NA | NA | NA | NA | NA | 230,000 | NA | NA | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | NA | NA | NA | 9,200,000 | NA | NA | NA | NA | NA | NA | NA | 3,900 | NA | NA | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | NA | NA | NA | 60 J | NA | NA | NA | NA | NA | NA | NA | <100 U | NA | NA | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | NA | NA | NA | 34,000 | NA | NA | NA | NA | NA | NA | NA | <10,000 U | NA | NA | NA |
| Total Organic Carbon | TOC | NS | ug/l | NA | NA | NA | 8,600,000 | NA | NA | NA | NA | NA | NA | NA | 2,100 | NA | NA | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-D | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-10R-S_18.25 | LMW-10R-S_21.5 | LMW-10R-S_26.5 | LMW-10R-S_28.5 | LMW-10R-S_34 | LMW-10R-S_36 | LMW-10R-D_40.5 | LMW-10R-S_24.75 | LMW-10R-S_24.75 | LMW-10R-S_24.75 | LMW-10R-S_24.75 | DUP_20250306 |
| | | | Sample Date | 12/23/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 09/29/2022 | 12/23/2022 | 02/13/2024 | 8/14/2024 | 11/22/2024 | 3/6/2025 | 3/6/2025 |
| | | | Sample Event | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Pre-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections |
| | | | Sample Depth | 18.25 | 21.5 | 26.5 | 28.5 | 34 | 36 | 40.5 | 23.75-29.75 | 23.75-29.75 | 23.75-29.75 | 23.75-29.75 | 23.75-29.75 |
| | | | Sample El. | 12.67 - 7.67 | 9.42 - 7.42 | 4.42 - 2.42 | 2.42 - 0.42 | -3.08 - -5.08 | -5.08 - -7.08 | -11.93 - -16.93 | -9 - -15 | -9 - -15 | -9 - -15 | -9 - -15 | -9 - -15 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result | Result | Result | | |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | 0.17 J | <1 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <3 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | 0.23 J | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 UJ | <2.5 U | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <2 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 UJ | <2.5 UJ | <2.5 UJ | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <2 U | <1 U | <1 UJ | <1 UJ |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <2 U | <2 UJ | <2 UJ |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 U | <250 U | <250 UJ | <250 U | <250 U | <250 U | <250 U | <250 U | <500 U | <250 U | <250 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | 1.4 J | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 UJ | <2.5 UJ |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <2 U | <2 UJ | <2 UJ |
| Acetone | 67-64-1 | 50 | ug/l | 2.1 J | **91** | **84** | **88** | **100** | **160** | 2.3 J | 30 | **160** | 2.7 J | 5.3 J | 5.1 J |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | 0.25 J | 0.26 J | 0.25 J | 0.24 J | 0.25 J | 0.25 J | 0.2 J | <0.5 U | <1 U | 0.24 J | 0.23 J | 0.23 J |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | 0.81 | <1 U | <0.5 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <4 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | 0.7 J | <2.5 UJ |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 2.6 | **13** | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 UJ | <2.5 UJ |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | **140** | **100** | **110** | **90** | **91** | **92** | **18** | **7.5** | <5 U | 1.5 J | 1.2 J | 1.1 J |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | 2.5 | 2.4 J |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 0.84 J | <5 U | 0.71 J | 1.6 J | 1.3 J |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | <5 U | 21 | 17 J | 21 | 24 | 35 | <5 U | 5.6 | **100** | <5 U | 2.3 J | 2.4 J |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | 2.4 J | 1.7 J | 1 J | <5 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 0.82 J | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 UJ | <2.5 UJ |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | 0.78 J | 0.8 J |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | 0.84 J | 0.83 J |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | **26** | 2.7 | 2.6 | 2 | 2 | 2.1 | 2.1 | 0.41 J | <1 U | 0.34 J | 0.2 J | <0.5 U |
| Toluene | 108-88-3 | **5** | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | **8** | 4.2 J | **6.9** | **7.7** | **7.5** |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 140 | 100 | 110 | 90 | 91 | 92 | 18 | 7.5 | <5 U | 1.5 J | 1.2 J | 1.1 J |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 0.84 J | <5 U | 0.71 J | 2.4 J | 2.1 J |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <1 U | <0.5 U | <0.5 UJ | <0.5 UJ |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | **33** | **5.4** | **5.5** | 4.9 | 4.8 | 4.7 | 1.1 | 0.33 J | <1 U | 0.21 J | 0.33 J | 0.22 J |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <10 U | <5 UJ | <5 U | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | 0.37 J | 0.63 J | 0.6 J | 0.39 J | 0.39 J | 0.4 J | 0.11 J | 1.8 | <2 U | 0.69 J | 0.32 J | <1 UJ |
| **Metals** | | | | | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | 184,000 | NA | NA | NA | NA | NA | 97,700 | NA | 140,000 J | NA | NA | NA |
| Hardness (As CaCO3) | HARD | NS | ug/l | 693,900 | NA | NA | NA | NA | NA | 362,800 | NA | 458,900 | NA | NA | NA |
| Iron | 7439-89-6 | **300** | ug/l | **33,000** | NA | NA | NA | NA | NA | **12,600** | NA | **36,800 J** | NA | NA | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | **57,100** | NA | NA | NA | NA | NA | 28,800 | NA | 26,600 J | NA | NA | NA |
| Manganese | 7439-96-5 | **300** | ug/l | **2,861** | NA | NA | NA | NA | NA | **1,638** | NA | **1,017 J** | NA | NA | NA |
| **General Chemistry** | | | | | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | 156,000 | NA | NA | NA | NA | NA | 177,000 | NA | 477,000 J | NA | NA | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | 97,000 | NA | NA | NA | NA | NA | 66,000 | NA | 130,000 | NA | NA | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | 5,600 | NA | NA | NA | NA | NA | 5,300 | NA | 120,000 | NA | NA | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | 79 J | NA | NA | NA | NA | NA | 47 J | NA | 40 J | NA | NA | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | **530,000** | NA | NA | NA | NA | NA | 190,000 | NA | <10,000 U | NA | NA | NA |
| Total Organic Carbon | TOC | NS | ug/l | 5,500 | NA | NA | NA | NA | NA | 5,700 | NA | 120,000 | NA | NA | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDEC SGVs | Location | LMW-10R-D | LMW-10R-D | LMW-10R-D | LMW-10R-D | LMW-10R-D | LMW-10R-D | LMW-10R-D | LMW-10R-D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | LMW-10R-D_49 | LMW-10R-D_30.75 | LMW-10R-D_30.75 | LMW-10R-D_30.75 | LMW-10R-D_40.75 | LMW-10R-D_40.75 | LMW-10R-D_40.75 | LMW-10R-D_63 |
| | | | Sample Date | 09/29/2022 | 02/13/2024 | 8/14/2024 | 11/25/2024 | 02/13/2024 | 8/14/2024 | 11/25/2024 | 09/29/2022 |
| | | | Sample Event | Pre-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Post-Injections | Pre-Injections |
| | | | Sample Depth | 49 | 26.75-35.75 | 26.75-35.75 | 26.75-35.75 | 40.75-45.75 | 40.75-45.75 | 40.75-45.75 | 63 |
| | | | Sample El. | -20.43 - -22.43 | -12 - -21 | -12 - -21 | -12 - -21 | -26 - -31 | -26 - -31 | -26 - -31 | -34.43 - -36.43 |
| | | | Unit | Result | Result | Result | Result | Result | Result | Result | Result |
| **Volatile Organic Compounds** | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,1-Trichloroethane | 71-55-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1,2-Trichloroethane | 79-00-5 | 1 | ug/l | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U | <1.5 U |
| 1,1-Dichloroethane | 75-34-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,1-Dichloroethene | 75-35-4 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,1-Dichloropropene | 563-58-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 UJ | <2.5 U | <2.5 U | <2.5 UJ | <2.5 U |
| 1,2,3-Trichlorobenzene | 87-61-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,3-Trichloropropane | 96-18-4 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4,5-Tetramethylbenzene | 95-93-2 | 5 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dibromo-3-Chloropropane | 96-12-8 | 0.04 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 UJ |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | 0.0006 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,2-Dichlorobenzene | 95-50-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U | <1 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichlorobenzene | 541-73-1 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,3-Dichloropropane | 142-28-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Dichlorobenzene | 106-46-7 | 3 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 1,4-Diethyl Benzene | 105-05-5 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/l | <250 UJ | <250 U | <250 U | <250 U | <250 U | <250 U | <250 U | <250 U |
| 2,2-Dichloropropane | 594-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Chlorotoluene | 95-49-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 2-Hexanone (MBK) | 591-78-6 | 50 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| 4-Chlorotoluene | 106-43-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Acetone | 67-64-1 | 50 | ug/l | **100** | 4.3 J | 7.6 | <5 U | 5.1 | 7.8 | 2.9 J | **91** |
| Acrylonitrile | 107-13-1 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Benzene | 71-43-2 | **1** | ug/l | <0.5 U | 0.76 | 0.55 | 0.42 J | 0.66 | 0.53 | 0.31 J | <0.5 U |
| Bromobenzene | 108-86-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromochloromethane | 74-97-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Bromodichloromethane | 75-27-4 | 50 | ug/l | <0.5 U | 0.44 J | <0.5 U | <0.5 U | 0.42 J | <0.5 U | <0.5 U | <0.5 U |
| Bromoform | 75-25-2 | 50 | ug/l | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U | <2 U |
| Bromomethane | 74-83-9 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Carbon Disulfide | 75-15-0 | 60 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Carbon Tetrachloride | 56-23-5 | 5 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Chlorobenzene | 108-90-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroethane | 75-00-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | 67-66-3 | **7** | ug/l | **52** | 7 | <2.5 U | <2.5 U | 6.4 | <2.5 U | <2.5 U | **47** |
| Chloromethane | 74-87-3 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **5** | ug/l | 5 | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 4.3 |
| Cis-1,3-Dichloropropene | 10061-01-5 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Cymene | 99-87-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Dibromochloromethane | 124-48-1 | 50 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Dibromomethane | 74-95-3 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U | <5 U |
| Diethyl Ether (Ethyl Ether) | 60-29-7 | NS | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Ethylbenzene | 100-41-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Hexachlorobutadiene | 87-68-3 | 0.5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Isopropylbenzene (Cumene) | 98-82-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| M,P-Xylene | 179601-23-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | 50 | ug/l | 23 J | <5 U | 27 | <5 U | <5 U | 19 | <5 U | 21 |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/l | <5 U | <5 UJ | <5 U | <5 U | <5 UJ | <5 U | <5 U | <5 U |
| Methylene Chloride | 75-09-2 | 5 | ug/l | 3 | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 2.5 |
| Naphthalene | 91-20-3 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Butylbenzene | 104-51-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| n-Propylbenzene | 103-65-1 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Sec-Butylbenzene | 135-98-8 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Styrene | 100-42-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| T-Butylbenzene | 98-06-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tert-Butyl Methyl Ether | 1634-04-4 | 10 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 0.29 J | <2.5 U |
| Tetrachloroethene (PCE) | 127-18-4 | **5** | ug/l | 0.78 | <0.5 U | <0.5 U | 0.48 J | <0.5 U | <0.5 U | 0.23 J | 0.74 |
| Toluene | 108-88-3 | **5** | ug/l | <2.5 U | <2.5 U | 1.4 J | 1.7 J | <2.5 U | 3.4 | 2.7 | <2.5 U |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/l | 5 | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | 4.3 |
| Total Xylenes | 1330-20-7 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Total, 1,3-Dichloropropene (Cis And Trans) | 542-75-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,2-Dichloroethene | 156-60-5 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | 0.4 | ug/l | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Trans-1,4-Dichloro-2-Butene | 110-57-6 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 79-01-6 | **5** | ug/l | 1.6 | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | <0.5 U | 1.6 |
| Trichlorofluoromethane | 75-69-4 | 5 | ug/l | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Vinyl Acetate | 108-05-4 | NS | ug/l | <5 U | <5 U | <5 U | <5 UJ | <5 U | <5 U | <5 UJ | <5 U |
| Vinyl Chloride | 75-01-4 | **2** | ug/l | <1 U | 0.63 J | <1 U | <1 U | 0.75 J | 0.18 J | 0.16 J | <1 U |
| **Metals** | | | | | | | | | | | |
| Calcium | 7440-70-2 | NS | ug/l | NA | NA | NA | NA | 153,000 | NA | NA | NA |
| Hardness (As CaCO3) | HARD | NS | ug/l | NA | NA | NA | NA | 493,800 | NA | NA | NA |
| Iron | 7439-89-6 | **300** | ug/l | NA | NA | NA | NA | **15,200** | NA | NA | NA |
| Magnesium | 7439-95-4 | **35,000** | ug/l | NA | NA | NA | NA | 27,200 | NA | NA | NA |
| Manganese | 7439-96-5 | **300** | ug/l | NA | NA | NA | NA | **702.8** | NA | NA | NA |
| **General Chemistry** | | | | | | | | | | | |
| Alkalinity, Total (as CaCO3) | 471-34-1 | NS | ug/l | NA | NA | NA | NA | 335,000 | NA | NA | NA |
| Chloride (As Cl) | 16887-00-6 | **250,000** | ug/l | NA | NA | NA | NA | 160,000 | NA | NA | NA |
| Dissolved Organic Carbon | DOC | NS | ug/l | NA | NA | NA | NA | 3,400 | NA | NA | NA |
| Nitrogen, Nitrate (As N) | 14797-55-8 | 10,000 | ug/l | NA | NA | NA | NA | 63 J | NA | NA | NA |
| Sulfate (As SO4) | 14808-79-8 | **250,000** | ug/l | NA | NA | NA | NA | 11,000 | NA | NA | NA |
| Total Organic Carbon | TOC | NS | ug/l | NA | NA | NA | NA | 3,200 | NA | NA | NA |

**Table 3**
**Site Management Plan**
**Post-Remediation Groundwater Analytical Results**

**1487 First Avenue**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

CAS - Chemical Abstract Service
NS - No standard
ug/l - microgram per liter
NA - Not analyzed
RL - Reporting limit
<RL - Not detected
The following groundwater samples and groundwater monitoring wells are not shown on Table 5 due to excavation for the basement construction: LMW-8R-S_14.5, LMW-8R-S_15, LMW-9R-S_15, LMW-10R-S_13, LMW-11R-S, LMW-11R-D, LMW-12R-S, LMW-12R-D, LMW-13R-S, and LMW-13R-D and overburden wells LMW-6, LMW-7, LMW-8, LMW-9, and LMW-10.
Groundwater sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 Codes, Rules, and Regulations (NYCRR) Part 703.5 and the NYSDEC Technical and Operation Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water and published addenda (herein collectively referenced as "NYSDEC SGVs").

**Qualifiers:**
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 NYSDEC SGVs

**Table 4**
**Site Management Plan**
**Soil Vapor Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDOH Decision Matrices Minimum Concentrations | Location | AA | AA | AA | SV-01 | SV-01 | SV-02 | SV-03 | SV-04 | SV-5 | SV-6 | SV-6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | AA_080922 | AA_20220826 | AA_012523 | 027_SV-01_20211110 | 026_SVDUP_20211110 | 025_SV-02_20211110 | 028_SV-03_20211110 | 029_SV-04_20211110 | 033_SV-5 | 034_SV-6 | SV-6_080922 |
| | | | Sample Date | 08/09/2022 | 08/26/2022 | 01/25/2023 | 11/10/2021 | 11/10/2021 | 11/10/2021 | 11/10/2021 | 11/10/2021 | 01/25/2022 | 01/25/2022 | 08/09/2022 |
| | | | Sample Type | AA | AA | AA | SV | SV | SV | SV | SV | SV | SV | SV |
| | | | Unit | 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 | <1.21 U | <1 U | <12.4 U | <1.32 U | <4.16 U | NA | NA | NA |
| 1,1,1-Trichloroethane | 71-55-6 | 100 | ug/m3 | <1.09 U | <1.09 U | <1.09 U | <0.961 U | <0.796 U | <9.85 U | <1.05 U | <3.31 U | <1.09 U | <1.09 U | <1.09 UJ |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | NS | ug/m3 | <1.37 U | <1.37 U | <1.37 U | <1.21 U | <1 U | <12.4 U | <1.32 U | <4.16 U | <1.37 U | <1.37 U | <1.37 UJ |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | 76-13-1 | NS | ug/m3 | <1.53 U | <1.53 U | <1.53 U | <1.35 U | <1.12 U | <13.8 U | <1.48 U | <4.65 U | <1.53 U | <1.53 U | <1.53 UJ |
| 1,1,2-Trichloroethane | 79-00-5 | NS | ug/m3 | <1.09 U | <1.09 U | <1.09 U | <0.961 U | <0.796 U | <9.85 U | <1.05 U | <3.31 U | <1.09 U | <1.09 U | <1.09 UJ |
| 1,1-Dichloroethane | 75-34-3 | NS | ug/m3 | <0.809 U | <0.809 U | <0.809 U | <0.713 U | <0.59 U | <7.31 U | <0.781 U | <2.45 U | <0.809 U | <0.809 U | <0.809 UJ |
| 1,1-Dichloroethene | 75-35-4 | **6** | ug/m3 | <0.793 U | <0.793 U | <0.793 U | <0.349 U | <0.289 U | <3.58 U | <0.382 U | <1.2 U | <0.793 U | <0.793 U | <0.793 UJ |
| 1,2,4-Trichlorobenzene | 120-82-1 | NS | ug/m3 | <1.48 U | <1.48 U | <1.48 U | <1.31 U | <1.08 U | <13.4 U | <1.43 U | <4.5 U | <1.48 U | <1.48 U | <1.48 UJ |
| 1,2,4-Trimethylbenzene | 95-63-6 | NS | ug/m3 | 1.51 | <0.983 U | <0.983 U | 13.8 D | 12.5 D | 18.6 D | 21.9 D | 16.7 D | 20.6 | 10.9 | <0.983 UJ |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | NS | ug/m3 | <1.54 U | <1.54 U | <1.54 U | <1.35 U | <1.12 U | <13.9 U | <1.48 U | <4.66 U | <1.54 U | <1.54 U | <1.54 UJ |
| 1,2-Dichlorobenzene | 95-50-1 | NS | ug/m3 | <1.2 U | <1.2 U | <1.2 U | <1.06 U | <0.877 U | <10.9 U | <1.16 U | <3.65 U | <1.2 U | <1.2 U | <1.2 UJ |
| 1,2-Dichloroethane | 107-06-2 | NS | ug/m3 | <0.809 U | <0.809 U | <0.809 U | <0.713 U | <0.59 U | <7.31 U | <0.781 U | <2.45 U | <0.809 U | <0.809 U | <0.809 UJ |
| 1,2-Dichloropropane | 78-87-5 | NS | ug/m3 | <0.924 U | <0.924 U | <0.924 U | <0.814 U | <0.674 U | <8.35 U | <0.891 U | <2.8 U | <0.924 U | <0.924 U | <0.924 UJ |
| 1,2-Dichlorotetrafluoroethane | 76-14-2 | NS | ug/m3 | <1.4 U | <1.4 U | <1.4 U | <1.23 U | <1.02 U | <12.6 U | <1.35 U | <4.24 U | <1.4 U | <1.4 U | <1.4 UJ |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | NS | ug/m3 | <0.983 U | <0.983 U | <0.983 U | 1.65 D | 3.01 D | <8.88 U | 5.12 D | <2.98 U | 5.6 | 2.68 | <0.983 UJ |
| 1,3-Butadiene | 106-99-0 | NS | ug/m3 | <0.442 U | <0.442 U | <0.442 U | <1.17 U | <0.968 U | <12 U | <1.28 U | <4.02 U | 0.509 | <0.442 U | <0.442 UJ |
| 1,3-Dichlorobenzene | 541-73-1 | NS | ug/m3 | <1.2 U | <1.2 U | <1.2 U | <1.06 U | <0.877 U | <10.9 U | <1.16 U | <3.65 U | <1.2 U | <1.2 U | <1.2 UJ |
| 1,3-Dichloropropane | 142-28-9 | NS | ug/m3 | NA | NA | NA | <0.814 U | <0.674 U | <8.35 U | <0.891 U | <2.8 U | NA | NA | NA |
| 1,4-Dichlorobenzene | 106-46-7 | NS | ug/m3 | <1.2 U | <1.2 U | <1.2 U | <1.06 U | <0.877 U | <10.9 U | <1.16 U | <3.65 U | <1.2 U | <1.2 U | <1.2 UJ |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/m3 | <0.721 U | <0.721 U | <0.721 U | <1.27 U | <1.05 U | <13 U | <1.39 U | <4.37 U | <0.721 U | <0.721 U | <0.721 UJ |
| 2,2,4-Trimethylpentane | 540-84-1 | NS | ug/m3 | 7.33 | <0.934 U | <0.934 U | NA | NA | NA | NA | NA | 9.72 | 1.51 | <0.934 UJ |
| 2-Hexanone (MBK) | 591-78-6 | NS | ug/m3 | <0.82 U | <0.82 U | <0.82 U | <1.44 U | <1.19 U | <14.8 U | <1.58 U | <4.97 U | 9.71 | <0.82 U | <0.82 UJ |
| 4-Ethyltoluene | 622-96-8 | NS | ug/m3 | <0.983 U | <0.983 U | <0.983 U | 12.2 D | 11.5 D | 17.8 D | 20 D | 14.6 D | 6.19 | 3.17 | <0.983 UJ |
| Acetone | 67-64-1 | NS | ug/m3 | 118 | 22.4 | 5.37 | 69.8 D | 68.6 D | 23.6 D | 109 D | 63.2 D | 87.7 | 57 | <2.38 UJ |
| Acrylonitrile | 107-13-1 | NS | ug/m3 | NA | NA | NA | <0.382 U | <0.316 U | <3.92 U | <0.419 U | <1.32 U | NA | NA | NA |
| Allyl Chloride (3-Chloropropene) | 107-05-1 | NS | ug/m3 | <0.626 U | <0.626 U | <0.626 U | <2.76 U | <2.28 U | <28.3 U | <3.02 U | <9.49 U | <0.626 U | <0.626 U | <0.626 UJ |
| Benzene | 71-43-2 | NS | ug/m3 | 4.34 | 0.783 | 1.17 | 2.76 D | 2.65 D | <5.77 U | 1.79 D | 2.13 D | 14.8 | 1.63 | <0.639 UJ |
| Benzyl Chloride | 100-44-7 | NS | ug/m3 | <1.04 U | <1.04 U | <1.04 U | <0.912 U | <0.755 U | <9.35 U | <0.999 U | <3.14 U | <1.04 U | <1.04 U | <1.04 UJ |
| Bromodichloromethane | 75-27-4 | NS | ug/m3 | <1.34 U | <1.34 U | <1.34 U | <1.18 U | <0.977 U | <12.1 U | <1.29 U | <4.06 U | <1.34 U | <1.34 U | <1.34 UJ |
| Bromoethene | 593-60-2 | NS | ug/m3 | <0.874 U | <0.874 U | <0.874 U | <0.771 U | <0.638 U | <7.9 U | <0.844 U | <2.65 U | <0.874 U | <0.874 U | <0.874 UJ |
| Bromoform | 75-25-2 | NS | ug/m3 | <2.07 U | <2.07 U | <2.07 U | <1.82 U | <1.51 U | <18.7 U | <1.99 U | <6.27 U | <2.07 U | <2.07 U | <2.07 UJ |
| Bromomethane | 74-83-9 | NS | ug/m3 | <0.777 U | <0.777 U | <0.777 U | <0.684 U | <0.566 U | <7.01 U | <0.749 U | <2.35 U | <0.777 U | <0.777 U | <0.777 UJ |
| Carbon Disulfide | 75-15-0 | NS | ug/m3 | <0.623 U | <0.623 U | <0.623 U | 48.6 D | 49.2 D | <5.62 U | 25.4 D | 4.72 D | 6.38 | 7.79 | 2.23 J |
| Carbon Tetrachloride | 56-23-5 | 6 | ug/m3 | <1.26 U | <1.26 U | <1.26 U | 0.443 D | 0.367 D | <2.84 U | 0.364 D | <0.954 U | <1.26 U | <1.26 U | <1.26 UJ |
| Chlorobenzene | 108-90-7 | NS | ug/m3 | <0.921 U | <0.921 U | <0.921 U | <0.811 U | <0.671 U | <8.31 U | <0.888 U | <2.79 U | <0.921 U | <0.921 U | <0.921 UJ |
| Chloroethane | 75-00-3 | NS | ug/m3 | <0.528 U | <0.528 U | <0.528 U | <0.465 U | <0.385 U | <4.77 U | <0.509 U | <1.6 U | <0.528 U | <0.528 U | <0.528 UJ |
| Chloroform | 67-66-3 | NS | ug/m3 | <0.977 U | <0.977 U | <0.977 U | 1.81 D | 1.71 D | <8.82 U | 4.24 D | 2.96 D | 1.04 | 12.2 | 17.7 J |
| Chloromethane | 74-87-3 | NS | ug/m3 | 1.39 | 1.25 | 0.948 | <0.364 U | <0.301 U | <3.73 U | <0.398 U | <1.25 U | <0.413 U | <0.413 U | <0.413 UJ |
| Cis-1,2-Dichloroethene | 156-59-2 | **6** | ug/m3 | <0.793 U | <0.793 U | <0.793 U | <0.349 U | <0.289 U | **6.44 D** | <0.382 U | <1.2 U | <0.793 U | <0.793 U | <0.793 UJ |
| Cis-1,3-Dichloropropene | 10061-01-5 | NS | ug/m3 | <0.908 U | <0.908 U | <0.908 U | <0.8 U | <0.662 U | <8.2 U | <0.876 U | <2.75 U | <0.908 U | <0.908 U | <0.908 UJ |
| Cyclohexane | 110-82-7 | NS | ug/m3 | 3.24 | <0.688 U | <0.688 U | 0.667 D | 0.703 D | 33.6 D | 4.45 D | <2.09 U | 4.89 | <0.688 U | <0.688 UJ |
| Dibromochloromethane | 124-48-1 | NS | ug/m3 | <1.7 U | <1.7 U | <1.7 U | <1.5 U | <1.24 U | <15.4 U | <1.64 U | <5.17 U | <1.7 U | <1.7 U | <1.7 UJ |
| Dichlorodifluoromethane | 75-71-8 | NS | ug/m3 | 2.59 | 2.75 | 2.11 | 54.6 D | 52.9 D | 34.8 D | 85.7 D | 1,180 D | 2.59 | 2.54 | 2.66 J |
| Ethanol | 64-17-5 | NS | ug/m3 | 66.5 | 23.6 | 15.6 | NA | NA | NA | NA | NA | 41.1 | <9.42 U | <9.42 UJ |
| Ethyl Acetate | 141-78-6 | NS | ug/m3 | <1.8 U | <1.8 U | <1.8 U | <1.27 U | <1.05 U | <13 U | <1.39 U | <4.37 U | <1.8 U | <1.8 U | <1.8 UJ |
| Ethylbenzene | 100-41-4 | NS | ug/m3 | 1.88 | <0.869 U | <0.869 U | 7.96 D | 7.47 D | 13.3 D | 12.8 D | 10.3 D | 12.3 | 7.12 | <0.869 UJ |
| Hexachlorobutadiene | 87-68-3 | NS | ug/m3 | <2.13 U | <2.13 U | <2.13 U | <1.88 U | <1.55 U | <19.3 U | <2.06 U | <6.47 U | <2.13 U | <2.13 U | <2.13 UJ |
| Isopropanol | 67-63-0 | NS | ug/m3 | 4.79 | 9.86 | 2.01 | 2.17 D | 1.97 D | <8.88 U | 1.09 D | <2.98 U | 29.7 | 4.92 | <1.23 UJ |
| M,P-Xylene | 179601-23-1 | NS | ug/m3 | 6.56 | <1.74 U | <1.74 U | 43.1 D | 40.1 D | 69.8 D | 70 D | 56.9 D | 45.6 | 28.6 | <1.74 UJ |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | NS | ug/m3 | 3.1 | <1.47 U | <1.47 U | 8.47 D | 8.21 D | <5.33 U | 11.5 D | 3.58 D | 36.6 | 5.66 | <1.47 UJ |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/m3 | <2.05 U | <2.05 U | <2.05 U | <0.722 U | <0.597 U | <7.4 U | <0.79 U | <2.48 U | <2.05 U | <2.05 U | <2.05 UJ |
| Methyl Methacrylate | 80-62-6 | NS | ug/m3 | NA | NA | NA | 0.721 D | <0.597 U | <7.39 U | <0.79 U | <2.48 U | NA | NA | NA |
| Methylene Chloride | 75-09-2 | 100 | ug/m3 | <1.74 U | <1.74 U | <1.74 U | <1.22 U | 2.43 D | <12.5 U | 2.95 D | <4.21 U | <1.74 U | <1.74 U | <1.74 UJ |
| Naphthalene | 91-20-3 | NS | ug/m3 | NA | NA | NA | <1.85 U | <1.53 U | <18.9 U | <2.02 U | <6.36 U | NA | NA | NA |
| n-Heptane | 142-82-5 | NS | ug/m3 | 4.26 | <0.82 U | <0.82 U | 2.53 D | 2.57 D | <7.4 U | 3.16 D | <2.49 U | 11.7 | 13.5 | <0.82 UJ |
| n-Hexane | 110-54-3 | NS | ug/m3 | 78.9 | 0.945 | 2.53 | 6.65 D | 6.73 D | <6.37 U | 6.66 D | 2.99 D | 14 | 9.97 | <0.705 UJ |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | NS | ug/m3 | 2.46 | <0.869 U | <0.869 U | 12.5 D | 11.7 D | 23.5 D | 20.5 D | 15.8 D | 15.7 | 9.51 | <0.869 UJ |
| Propylene | 115-07-1 | NS | ug/m3 | NA | NA | NA | 32.1 D | 31.3 D | <3.11 U | <0.332 U | 16.4 D | NA | NA | NA |
| Styrene | 100-42-5 | NS | ug/m3 | <0.852 U | <0.852 U | <0.852 U | <0.751 U | <0.621 U | <7.69 U | <0.822 U | <2.58 U | 1.68 | 1.15 | <0.852 UJ |
| Tert-Butyl Alcohol | 75-65-0 | NS | ug/m3 | <1.52 U | <1.52 U | <1.52 U | NA | NA | NA | NA | NA | 1.53 | <1.52 U | <1.52 UJ |
| Tert-Butyl Methyl Ether | 1634-04-4 | NS | ug/m3 | <0.721 U | <0.721 U | <0.721 U | <0.635 U | <0.526 U | <6.51 U | <0.695 U | <2.19 U | <0.721 U | <0.721 U | <0.721 UJ |
| Tetrachloroethene (PCE) | 127-18-4 | **100** | ug/m3 | <1.36 U | <1.36 U | <1.36 U | 4.78 D | 4.65 D | **8,610 D** | 8.5 D | 13.2 D | 3.68 | 2.62 | 12.2 J |
| Tetrahydrofuran | 109-99-9 | NS | ug/m3 | <1.47 U | <1.47 U | <1.47 U | <1.04 U | <0.86 U | <10.7 U | <1.14 U | <3.58 U | 2.31 | <1.47 U | <1.47 UJ |
| Toluene | 108-88-3 | NS | ug/m3 | 11.3 | 2.36 | 2.31 | 27.9 D | 25.7 D | 45.6 D | 39.5 D | 35.6 D | 45.6 | 21 | <0.754 UJ |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/m3 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Total Xylenes | 1330-20-7 | NS | ug/m3 | 9.03 | NA | NA | NA | NA | NA | NA | NA | 61.2 | 38.1 | <0.869 UJ |
| Trans-1,2-Dichloroethene | 156-60-5 | NS | ug/m3 | <0.793 U | <0.793 U | <0.793 U | <0.699 U | <0.578 U | <7.16 U | <0.765 U | <2.4 U | <0.793 U | <0.793 U | <0.793 UJ |
| Trans-1,3-Dichloropropene | 10061-02-6 | NS | ug/m3 | <0.908 U | <0.908 U | <0.908 U | <0.8 U | <0.662 U | <8.2 U | <0.876 U | <2.75 U | <0.908 U | <0.908 U | <0.908 UJ |
| Trichloroethene (TCE) | 79-01-6 | **6** | ug/m3 | <1.07 U | <1.07 U | <1.07 U | 0.663 D | 0.627 D | **489 D** | 0.518 D | <0.815 U | <1.07 U | <1.07 U | <1.07 UJ |
| Trichlorofluoromethane | 75-69-4 | NS | ug/m3 | 1.14 | 1.35 | <1.12 U | 1.68 D | 1.56 D | <10.1 U | 1.84 D | <3.41 U | 1.31 | 1.25 | 1.78 J |
| Vinyl Acetate | 108-05-4 | NS | ug/m3 | NA | NA | NA | <0.62 U | <0.513 U | <6.36 U | <0.679 U | <2.14 U | NA | NA | NA |
| Vinyl Chloride | 75-01-4 | 6 | ug/m3 | <0.511 U | <0.511 U | <0.511 U | <0.225 U | <0.186 U | <2.31 U | <0.247 U | <0.775 U | <0.511 U | <0.511 U | <0.511 UJ |

**Table 4**
**Site Management Plan**
**Soil Vapor Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

| Analyte | CAS Number | NYSDOH Decision Matrices Minimum Concentrations | Location | SV-7 | SV-7 | LSV-8 | LSV-10 | LSV-11 | LSV-11 | LSV-12 | LSV-13 | LSV-14 | LSV-15 | LSV-16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Sample Name | 035_SV-7 | 036_DUP-2 | LSV-8_20220826 | LSV-10_20220826 | LSV-11_080922 | DUP_080922 | LSV-12_080922 | LSV-13_080922 | LSV-14_012523 | LSV-15_012523 | LSV-16_012523 |
| | | | Sample Date | 01/25/2022 | 01/25/2022 | 08/26/2022 | 08/26/2022 | 08/09/2022 | 08/09/2022 | 08/09/2022 | 08/09/2022 | 01/25/2023 | 01/25/2023 | 01/25/2023 |
| | | | Sample Type | SV | SV | SV | SV | SV | SV | SV | SV | SV | SV | SV |
| | | | Unit | 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 | NA | NA | NA | NA | NA | NA | NA | NA |
| 1,1,1-Trichloroethane | 71-55-6 | 100 | ug/m3 | <1.09 U | <1.09 U | <3.84 U | 1.92 | <1.09 U | <1.09 U | <1.09 U | <1.09 U | <1.09 U | <1.09 U | 1.17 |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | NS | ug/m3 | <1.37 U | <1.37 U | <48.3 U | <1.37 U | <1.37 U | <1.37 U | <1.37 U | <1.37 U | <1.37 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 | <54 U | <1.53 U | <1.53 U | <1.53 U | <1.53 U | <1.53 U | <1.53 U | <1.53 U | <1.53 U |
| 1,1,2-Trichloroethane | 79-00-5 | NS | ug/m3 | <1.09 U | <1.09 U | <38.4 U | <1.09 U | <1.09 U | <1.09 U | <1.09 U | <1.09 U | <1.09 U | <1.09 U | <1.09 U |
| 1,1-Dichloroethane | 75-34-3 | NS | ug/m3 | <0.809 U | <0.809 U | <28.5 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U |
| 1,1-Dichloroethene | 75-35-4 | **6** | ug/m3 | <0.793 U | <0.793 U | **7.97** | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U |
| 1,2,4-Trichlorobenzene | 120-82-1 | NS | ug/m3 | <1.48 U | <1.48 U | <52.3 U | <1.48 U | <1.48 U | <1.48 U | <1.48 U | <1.48 U | <1.48 U | <1.48 U | <1.48 U |
| 1,2,4-Trimethylbenzene | 95-63-6 | NS | ug/m3 | 6.05 | 7.57 | 71.3 | 18.3 | 6.59 | 7.77 | 13.5 | 9.93 | 5.56 | 6.93 | 8.9 |
| 1,2-Dibromoethane (Ethylene Dibromide) | 106-93-4 | NS | ug/m3 | <1.54 U | <1.54 U | <54.1 U | <1.54 U | <1.54 U | <1.54 U | <1.54 U | <1.54 U | <1.54 U | <1.54 U | <1.54 U |
| 1,2-Dichlorobenzene | 95-50-1 | NS | ug/m3 | <1.2 U | <1.2 U | <42.3 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U |
| 1,2-Dichloroethane | 107-06-2 | NS | ug/m3 | <0.809 U | <0.809 U | <28.5 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U | <0.809 U |
| 1,2-Dichloropropane | 78-87-5 | NS | ug/m3 | <0.924 U | <0.924 U | <32.5 U | <0.924 U | <0.924 U | <0.924 U | <0.924 U | <0.924 U | <0.924 U | <0.924 U | <0.924 U |
| 1,2-Dichlorotetrafluoroethane | 76-14-2 | NS | ug/m3 | <1.4 U | <1.4 U | <49.2 U | <1.4 U | <1.4 U | <1.4 U | <1.4 U | <1.4 U | <1.4 U | <1.4 U | <1.4 U |
| 1,3,5-Trimethylbenzene (Mesitylene) | 108-67-8 | NS | ug/m3 | 1.6 | 1.93 | 86 | 5.11 | 2.63 | 3.12 | 4.74 | 4.34 | 1.62 | 1.66 | 1.93 |
| 1,3-Butadiene | 106-99-0 | NS | ug/m3 | 0.611 | 0.58 | <15.6 U | 0.562 | <0.442 U | <0.442 U | <0.442 U | <0.442 U | 3.85 | <0.442 U | 4.87 |
| 1,3-Dichlorobenzene | 541-73-1 | NS | ug/m3 | <1.2 U | <1.2 U | <42.3 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U |
| 1,3-Dichloropropane | 142-28-9 | NS | ug/m3 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 1,4-Dichlorobenzene | 106-46-7 | NS | ug/m3 | <1.2 U | <1.2 U | <42.3 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U | <1.2 U |
| 1,4-Dioxane (P-Dioxane) | 123-91-1 | NS | ug/m3 | <0.721 U | <0.721 U | <25.4 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U |
| 2,2,4-Trimethylpentane | 540-84-1 | NS | ug/m3 | 2.82 | 2.68 | <32.9 U | <0.934 U | <0.934 U | <0.934 U | <0.934 U | 0.948 | 2.37 | <0.934 U | <0.934 U |
| 2-Hexanone (MBK) | 591-78-6 | NS | ug/m3 | <0.82 U | <0.82 U | <28.9 U | <0.82 U | <0.82 U | <0.82 U | 2.32 | 1.36 | <0.82 U | <0.82 U | <0.82 U |
| 4-Ethyltoluene | 622-96-8 | NS | ug/m3 | 1.96 | 2.56 | 65.9 | <0.983 U | 1.99 | 2.32 | 4.07 | 3.54 | 2.99 | 4.54 | 4.88 |
| Acetone | 67-64-1 | NS | ug/m3 | 173 | 161 | <83.6 U | 153 | 5.04 | 3.47 | 33.5 | 23.8 | 43 | 115 | 46.3 |
| Acrylonitrile | 107-13-1 | NS | ug/m3 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Allyl Chloride (3-Chloropropene) | 107-05-1 | NS | ug/m3 | <0.626 U | <0.626 U | <22 U | <0.626 U | <0.626 U | <0.626 U | <0.626 U | <0.626 U | <0.626 U | <0.626 U | <0.626 U |
| Benzene | 71-43-2 | NS | ug/m3 | 3.45 | 3.35 | 122 | 9.94 | 0.738 | 0.799 | 0.783 | 5.02 | 5.88 | 2.05 | 3.9 |
| Benzyl Chloride | 100-44-7 | NS | ug/m3 | <1.04 U | <1.04 U | <36.5 U | <1.04 U | <1.04 U | <1.04 U | <1.04 U | <1.04 U | <1.04 U | <1.04 U | <1.04 U |
| Bromodichloromethane | 75-27-4 | NS | ug/m3 | 10.5 | 10.7 | <47.2 U | <1.34 U | <1.34 U | <1.34 U | <1.34 U | <1.34 U | <1.34 U | <1.34 U | <1.34 U |
| Bromoethene | 593-60-2 | NS | ug/m3 | <0.874 U | <0.874 U | <30.8 U | <0.874 U | <0.874 U | <0.874 U | <0.874 U | <0.874 U | <0.874 U | <0.874 U | <0.874 U |
| Bromoform | 75-25-2 | NS | ug/m3 | <2.07 U | <2.07 U | <72.8 U | <2.07 U | <2.07 U | <2.07 U | <2.07 U | <2.07 U | <2.07 U | <2.07 U | <2.07 U |
| Bromomethane | 74-83-9 | NS | ug/m3 | <0.777 U | <0.777 U | <27.3 U | <0.777 U | <0.777 U | <0.777 U | <0.777 U | <0.777 U | <0.777 U | <0.777 U | <0.777 U |
| Carbon Disulfide | 75-15-0 | NS | ug/m3 | 6.79 | 6.48 | 111 | 41.7 | 72.2 J | 47.3 J | 8.41 | 14.4 | 8.16 | 0.984 | 19.9 |
| Carbon Tetrachloride | 56-23-5 | 6 | ug/m3 | <1.26 U | <1.26 U | <4.43 U | <1.26 U | <1.26 U | <1.26 U | <1.26 U | <1.26 U | <1.26 U | <1.26 U | <1.26 U |
| Chlorobenzene | 108-90-7 | NS | ug/m3 | <0.921 U | <0.921 U | <32.4 U | <0.921 U | <0.921 U | <0.921 U | <0.921 U | <0.921 U | <0.921 U | <0.921 U | <0.921 U |
| Chloroethane | 75-00-3 | NS | ug/m3 | <0.528 U | <0.528 U | <18.6 U | <0.528 U | <0.528 U | <0.528 U | <0.528 U | <0.528 U | <0.528 U | <0.528 U | <0.528 U |
| Chloroform | 67-66-3 | NS | ug/m3 | 249 | 241 | <34.4 U | 14.9 | 1.61 | 1.73 | 69.3 | 18.6 | 4.93 | 1.25 | 3.81 |
| Chloromethane | 74-87-3 | NS | ug/m3 | 0.981 | 1.07 | <14.5 U | <0.413 U | <0.413 U | <0.413 U | <0.413 U | 0.419 | <0.413 U | <0.413 U | <0.413 U |
| Cis-1,2-Dichloroethene | 156-59-2 | **6** | ug/m3 | <0.793 U | <0.793 U | **40.8** | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U |
| Cis-1,3-Dichloropropene | 10061-01-5 | NS | ug/m3 | <0.908 U | <0.908 U | <32 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U |
| Cyclohexane | 110-82-7 | NS | ug/m3 | 2.25 | 2.03 | 5,130 | 3.22 | <0.688 U | 0.716 | <0.688 U | 1.22 | 5.92 | 0.85 | 5.16 |
| Dibromochloromethane | 124-48-1 | NS | ug/m3 | <1.7 U | <1.7 U | <60 U | <1.7 U | <1.7 U | <1.7 U | <1.7 U | <1.7 U | <1.7 U | <1.7 U | <1.7 U |
| Dichlorodifluoromethane | 75-71-8 | NS | ug/m3 | 2.51 | 2.65 | 40.9 | 2.96 | 2.49 | 2.62 | 2.65 | 2.82 | 2.24 | 2.68 | 4.65 |
| Ethanol | 64-17-5 | NS | ug/m3 | 11.2 | 10.6 | <332 U | 15.3 | <9.42 U | <9.42 U | <9.42 U | <9.42 U | <9.42 U | 10.7 | 16.1 |
| Ethyl Acetate | 141-78-6 | NS | ug/m3 | <1.8 U | <1.8 U | <63.4 U | <1.8 U | <1.8 U | <1.8 U | <1.8 U | <1.8 U | <1.8 U | <1.8 U | <1.8 U |
| Ethylbenzene | 100-41-4 | NS | ug/m3 | 6.34 | 6.82 | 730 | 9.9 | 3.56 | 3.77 | 3.98 | 5.69 | 14.7 | 11.8 | 11.3 |
| Hexachlorobutadiene | 87-68-3 | NS | ug/m3 | <2.13 U | <2.13 U | <75.1 U | <2.13 U | <2.13 U | <2.13 U | <2.13 U | <2.13 U | <2.13 U | <2.13 U | <2.13 U |
| Isopropanol | 67-63-0 | NS | ug/m3 | 32.2 | 25.6 | <43.3 U | 6.93 | <1.23 U | <1.23 U | <1.23 U | 12.6 | 2.07 | 3.29 | 1.75 |
| M,P-Xylene | 179601-23-1 | NS | ug/m3 | 24.5 | 27.1 | 1,550 | 25.5 | 14 | 15.4 | 17.8 | 22.2 | 61.7 | 61.2 | 59.9 |
| Methyl Ethyl Ketone (2-Butanone) | 78-93-3 | NS | ug/m3 | 6.4 | 5.66 | <51.9 U | 15 | 1.61 | <1.47 U | 16.3 | 5.81 | 24.9 | 34.5 | 24.3 |
| Methyl Isobutyl Ketone (4-Methyl-2-Pentanone) | 108-10-1 | NS | ug/m3 | <2.05 U | <2.05 U | <72.1 U | 2.69 | <2.05 U | <2.05 U | <2.05 U | <2.05 U | <2.05 U | <2.05 U | <2.05 U |
| Methyl Methacrylate | 80-62-6 | NS | ug/m3 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Methylene Chloride | 75-09-2 | 100 | ug/m3 | 2.34 | 2.71 | <61.1 U | <1.74 U | <1.74 U | <1.74 U | 1.98 | <1.74 U | <1.74 U | <1.74 U | <1.74 U |
| Naphthalene | 91-20-3 | NS | ug/m3 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| n-Heptane | 142-82-5 | NS | ug/m3 | 3.83 | 3.66 | 6,800 | 7.21 | 2.21 | 2.3 | 1.68 | 2.75 | 48.4 | 4.39 | 5.66 |
| n-Hexane | 110-54-3 | NS | ug/m3 | 4.86 | 4.97 | 149 | 23.3 | 2.31 | 2.33 | 1.93 | 2.56 | 306 | 10.6 | 9.83 |
| o-Xylene (1,2-Dimethylbenzene) | 95-47-6 | NS | ug/m3 | 8.17 | 9.03 | 634 | 12.6 | 6.47 | 7.25 | 7.47 | 10.3 | 18.2 | 13.9 | 12.9 |
| Propylene | 115-07-1 | NS | ug/m3 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Styrene | 100-42-5 | NS | ug/m3 | 0.984 | 1.06 | <30 U | 3.64 | 1.62 | 1.78 | 1.61 | 1.69 | <0.852 U | 0.86 | <0.852 U |
| Tert-Butyl Alcohol | 75-65-0 | NS | ug/m3 | 2.09 | <1.52 U | <53.4 U | 22.3 | 1.63 | 1.76 | 11.5 | 1.94 | 5.34 | 4.79 | 2.29 |
| Tert-Butyl Methyl Ether | 1634-04-4 | NS | ug/m3 | <0.721 U | <0.721 U | <25.4 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U | <0.721 U |
| Tetrachloroethene (PCE) | 127-18-4 | **100** | ug/m3 | 1.95 | 1.95 | **339** | 10.2 | 54.2 | 64.4 | 15.6 | 39.7 | **466** | 61.3 | **292** |
| Tetrahydrofuran | 109-99-9 | NS | ug/m3 | 1.57 | <1.47 U | <51.9 U | <1.47 U | 1.56 | 2.25 | 5.54 | 2.54 | 40.4 | 36.6 | 36.3 |
| Toluene | 108-88-3 | NS | ug/m3 | 24 | 23.3 | 283 | 24.8 | 10.6 | 11.9 | 8.89 | 17.3 | 32 | 34.5 | 35.1 |
| Total 1,2-Dichloroethene (Cis and Trans) | 540-59-0 | NS | ug/m3 | NA | NA | 40.8 | NA | NA | NA | NA | NA | NA | NA | NA |
| Total Xylenes | 1330-20-7 | NS | ug/m3 | 32.7 | 36.1 | NA | NA | 20.5 | 22.7 | 25.3 | 32.5 | NA | NA | NA |
| Trans-1,2-Dichloroethene | 156-60-5 | NS | ug/m3 | <0.793 U | <0.793 U | <27.9 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U | <0.793 U |
| Trans-1,3-Dichloropropene | 10061-02-6 | NS | ug/m3 | <0.908 U | <0.908 U | <32 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U | <0.908 U |
| Trichloroethene (TCE) | 79-01-6 | **6** | ug/m3 | <1.07 U | <1.07 U | **169** | <1.07 U | <1.07 U | <1.07 U | <1.07 U | <1.07 U | 2.32 | <1.07 U | 1.68 |
| Trichlorofluoromethane | 75-69-4 | NS | ug/m3 | 1.25 | 1.33 | <39.6 U | 1.66 | 1.47 | 1.44 | 1.91 | 4.37 | 103 | 35 | 181 |
| Vinyl Acetate | 108-05-4 | NS | ug/m3 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Vinyl Chloride | 75-01-4 | 6 | ug/m3 | <0.511 U | <0.511 U | 1.89 | <0.511 U | <0.511 U | <0.511 U | <0.511 U | <0.511 U | <0.511 U | <0.511 U | <0.511 U |

**Table 4**
**Site Management Plan**
**Soil Vapor Sample Analytical Results**

**1487 1st Avenue Redevelopment Site**
**New York, New York**
**NYSDEC BCP Site No.: C231152**
**Langan Project No.: 100963701**

**Notes:**

AA - Ambient Air
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).

Ambient air sample analytical results are shown for reference only.

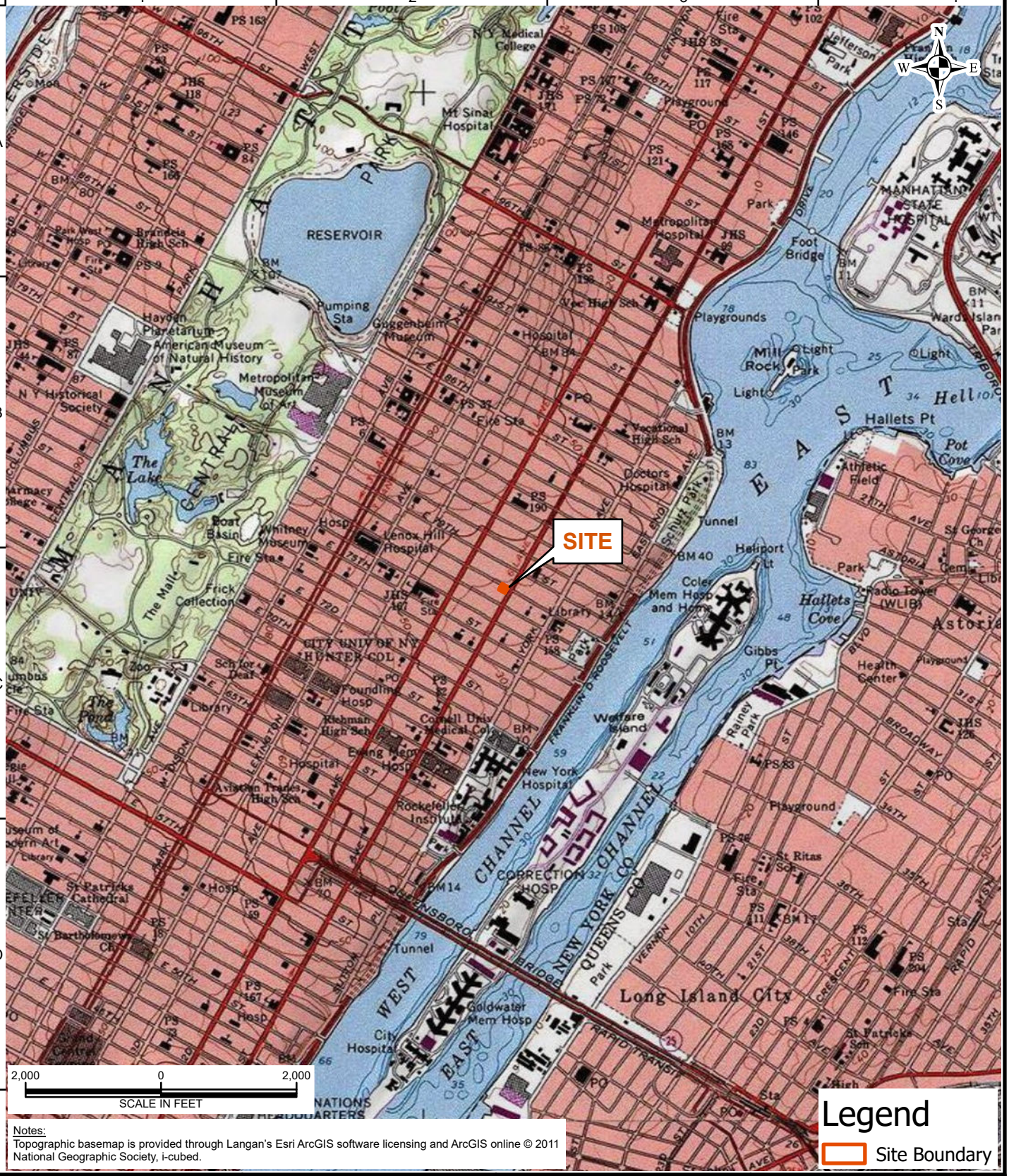
**Qualifiers:**

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




LANGAN
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Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

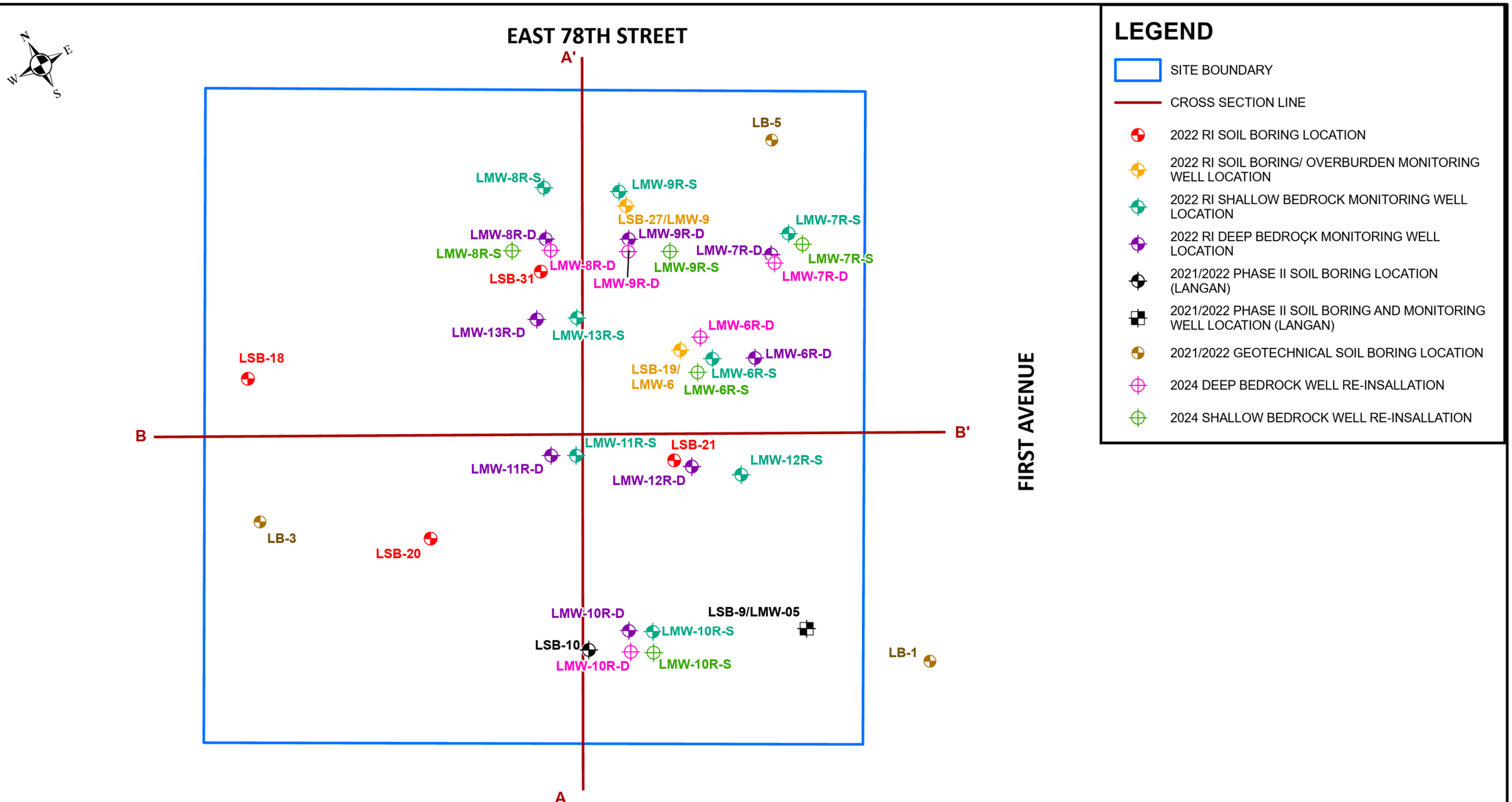
Project
1487 1ST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No.27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
SITE LOCATION MAP

| | |
|---|---|
| Project No. | 100963701 |
| Date | 7/31/2023 |
| Scale | 1"=2,000' |
| Drawn By | JF |
| Submission Date | |
| Figure | 1 |

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## LEGEND

- SITE BOUNDARY
- CROSS SECTION LINE
- 2022 RI SOIL BORING LOCATION
- 2022 RI SOIL BORING/ OVERBURDEN MONITORING WELL LOCATION
- 2022 RI SHALLOW BEDROCK MONITORING WELL LOCATION
- 2022 RI DEEP BEDROCK MONITORING WELL LOCATION
- 2021/2022 PHASE II SOIL BORING LOCATION (LANGAN)
- 2021/2022 PHASE II SOIL BORING AND MONITORING WELL LOCATION (LANGAN)
- 2021/2022 GEOTECHNICAL SOIL BORING LOCATION
- 2024 DEEP BEDROCK WELL RE-INSALLATION
- 2024 SHALLOW BEDROCK WELL RE-INSALLATION

NOTES:
1. SAMPLING LOCATIONS FOR THE MONITORING WELLS INSTALLED AS PART OF THE 2022 RI ARE BASED ON THE WELL AS-BUILT SURVEY PREPARED BY TRUE NORTH SURVEYORS, INC. DATED 21 OCTOBER 2022.
2. 2021/2022 SAMPLES LOCATIONS AS PRESENTED IN THE 2022 LANGAN PHASE II EI REPORT.

15 0 15
SCALE IN FEET

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Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

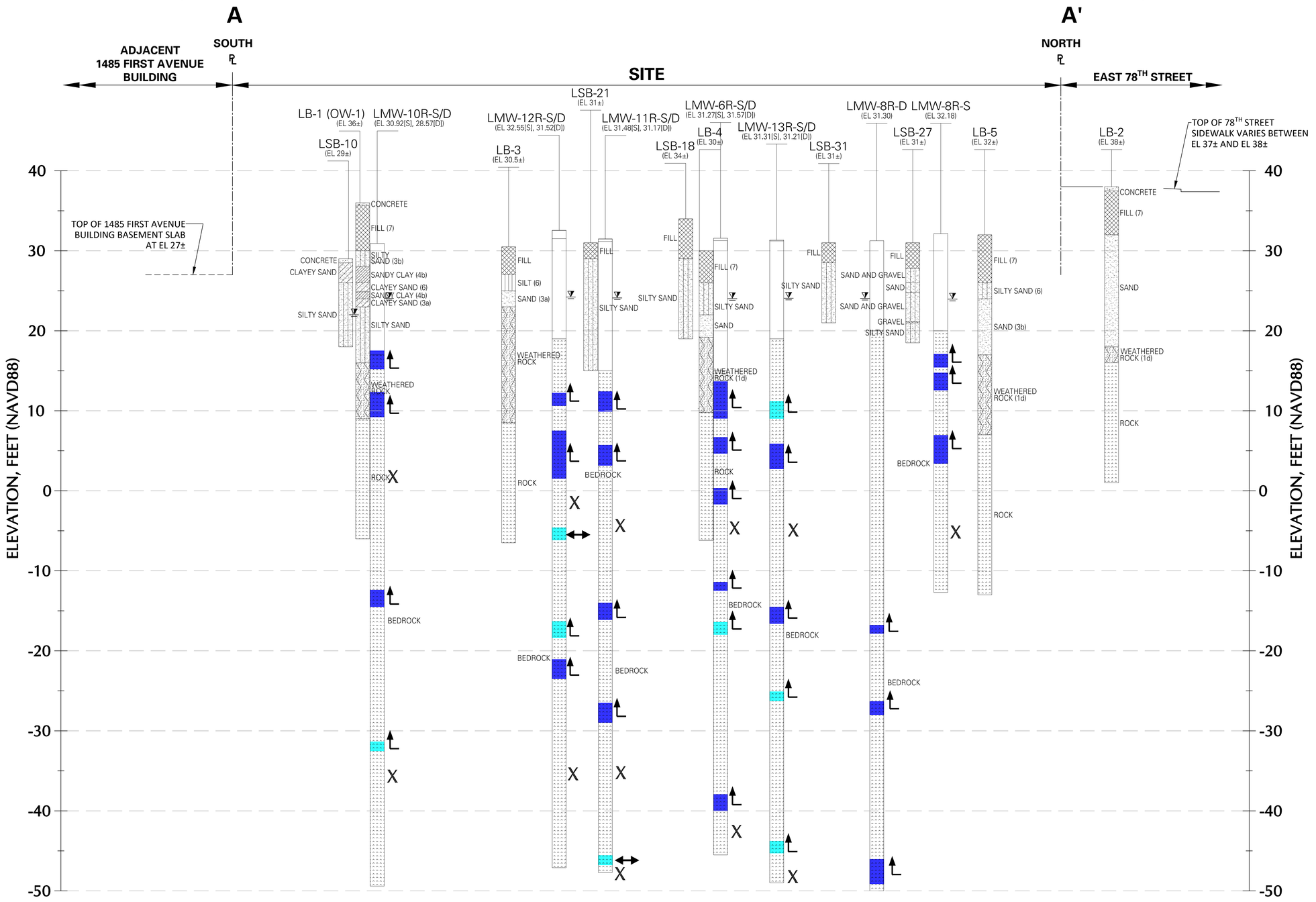
Project
**1487 FIRST AVENUE REDEVELOPMENT SITE**
BLOCK No. 1452, LOT No. 27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
**SITE PLAN**

| Project No. | Figure |
|---|---|
| 100963701 | 2 |
| Date: 2/25/2025 | |
| Scale: 1:180 | |
| Drawn By: IHB | |

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## BORING KEY:

LB-X (OW-X)
(EL XX±)
XX (XX)

## LEGEND:

| | |
|---|---|
| LB-X (OW-X) | DRILLED BORING AND TEMPORARY GROUNDWATER LEVEL OBSERVATION WELL IDENTIFICATION |
| EL XX± | APPROXIMATE GROUND SURFACE ELEVATION AT THE TIME OF THE BORING (NAVD88) |
| XX (XX) | GENERAL SOIL/ROCK DESCRIPTION (MAY INCLUDE2014 NYCBC CLASSIFICATION) |
| | GROUNDWATER LEVEL OBSERVED IN WELL DURING GAUGING COMPLETED ON 14 SEPTEMBER 2022 |

## NOTES:

1. THIS PROFILE SHOWS GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED IN THE DRILLED BORINGS, SEE BORING LOGS INCLUDED IN APPENDIX A.
2. THE ELEVATIONS FOR BORINGS LB-1(OW-1), LB-2, LB-3, LB-4, LB-5, LSB-10, LSB-18, LSB-21, LSB-27, AND LSB-31 ARE APPROXIMATE AND ARE INFERRED FROM A 22 FEBRUARY (REVISED 10 MARCH) 2022 SURVEY PREPARED BY TRUE NORTH SURVEYORS, PC. THE ELEVATIONS FOR BORINGS LMW-6R-S/D, LMW-8R-S, LMW-8R-D, LMW-10R-S/D, LMW-11R-S/D, LMW-12R-S/D, LMW-13R-S/D ARE BASED ON WELL AS-BUILT SURVEY PREAPRED BY TRUE NORTH SURVEYORS, INC. DATED 21 OCTOBER 2022.
3. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, NAVD88, WHICH IS 1.1 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM OF 1929, NGVD29, PER THE UNITED STATES GEOLOGIC SURVEY, USGS.
4. BORINGS LB-1 THROUGH LB-5 WERE INSTALLED AS PART OF THE INVESTIGATION DOCUMENTED IN THE APRIL 2022 GEOTECHNICAL INVESTIGATION REPORT. BORING LSB-10 WAS INSTALLED AS PART OF THE NOVEMBER 2021 AND JANUARY/FEBRUARY 2022 PHASE II ESI. BORINGS LSB-18, LSB-21, LSB-27, LSB-31, LMW-6R-S/D, LMW-8R-S/D, AND LMW-10R-S/D THROUGH LMW-13R-S/D WERE INSTALLED AS PART OF THE AUGUST 2022 RI.
5. BOREHOLE FLOW AND WATER PRODUCING LOGGING INTERVALS DERIVED FROM THE BOREHOLE GEOPHYSICAL LOGGING DATA REPORT PREPARED BY HAGER-RIGHTER GEOSCIENCE, INC. DATED NOVEMBER 2022.

## SECTION A-A'

**VERTICAL SCALE: 1" = 6'**
**HORIZONTAL SCALE: N.T.S.**

**FLOW UNDER PUMPING CONDITIONS WITHIN BOREHOLE:**

- FLOW INTO & UP BOREHOLE
- POSSIBLE FLOW IN OR OUT OF BOREHOLE
- X NO FLOW DETECTED
- GROUNDWATER PRODUCING INTERVAL
- MINOR GROUNDWATER PRODUCING INTERVAL

6 0 3 6
VERTICAL SCALE: 1 INCH = 6 FEET

**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, LAND SURVEYOR OR GEOLOGIST, TO ALTER THIS ITEM IN ANY WAY.

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400
MANHATTAN NEW YORK

Project: 1487 1ST AVENUE REDEVELOPMENT SITE

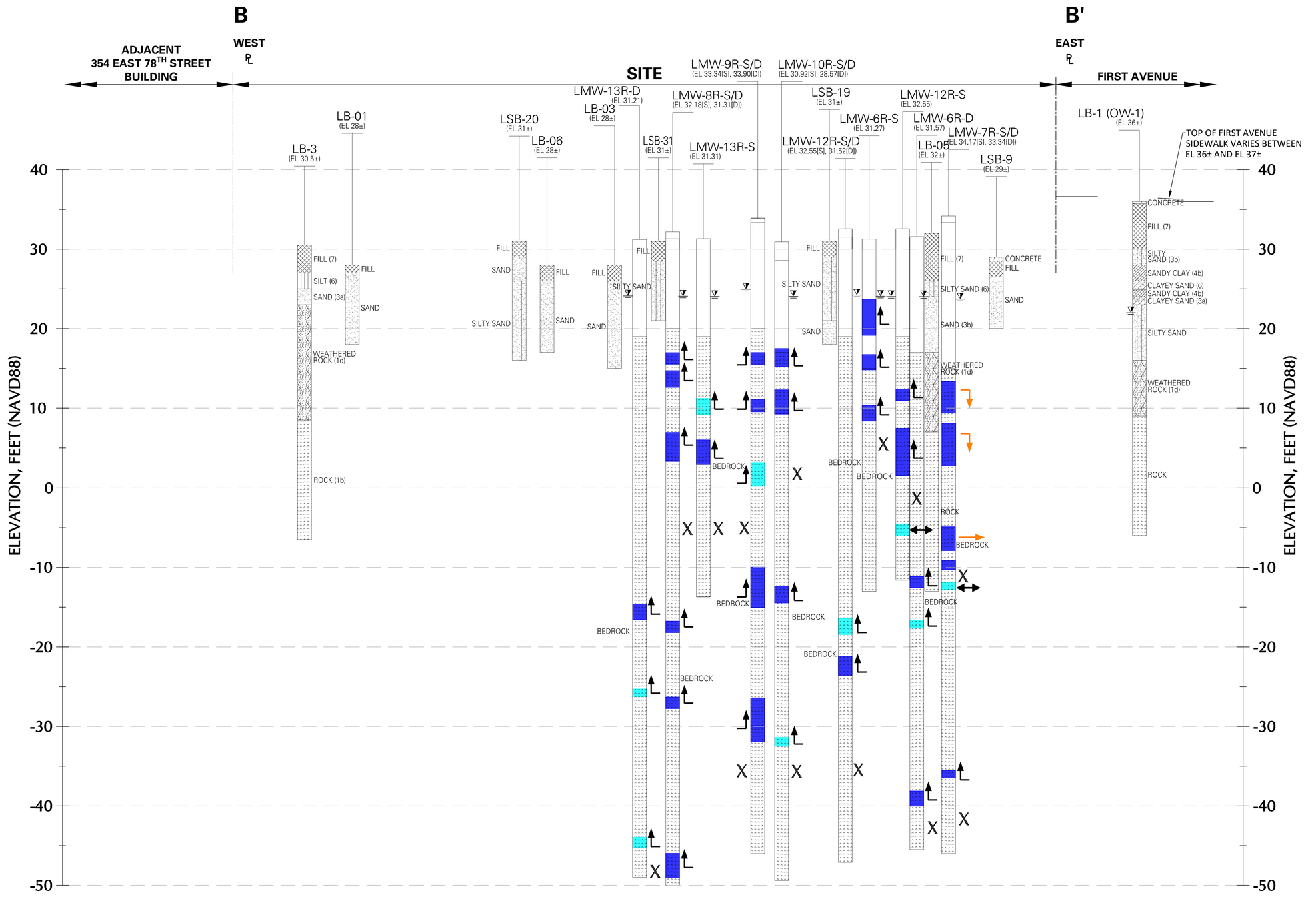
Drawing Title: BORING PROFILE A-A'

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|---|---|
| Project No. | 100963701 |
| Date | 11/17/2022 |
| Drawn By | AC |
| Checked By | CR |

Drawing No. 3A

LANGAN
PROJECT NO. 100963701

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## BORING KEY:

LB-X (OW-X)
(EL XX±)
XX (XX)

## LEGEND:

| | |
|---|---|
| LB-X (OW-X) | DRILLED BORING AND TEMPORARY GROUNDWATER LEVEL OBSERVATION WELL IDENTIFICATION |
| EL XX± | APPROXIMATE GROUND SURFACE ELEVATION AT THE TIME OF THE BORING (NAVD88) |
| XX (XX) | GENERAL SOIL/ROCK DESCRIPTION (MAY INCLUDE2014 NYCBC CLASSIFICATION) |
| ▽ | GROUNDWATER LEVEL OBSERVED IN WELL DURING GAUGING COMPLETED ON 14 SEPTEMBER 2022 |

## NOTES:

1. THIS PROFILE SHOWS GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED IN THE DRILLED BORINGS, SEE BORING LOGS INCLUDED IN APPENDIX A.
2. THE ELEVATIONS FOR BORINGS LB-1(OW-1), LB-2, LB-3, LB-4, LB-5, LSB-10, LSB-18, LSB-21, LSB-27, AND LSB-31 ARE APPROXIMATE AND ARE INFERRED FROM A 22 FEBRUARY (REVISED 10 MARCH) 2022 SURVEY PREPARED BY TRUE NORTH SURVEYORS, PC. THE ELEVATIONS FOR BORINGS LMW-6R-S/D, LMW-8R-D, LMW-10R-S/D, LMW-11R-S/D, LMW-12R-S/D, AND LMW-13R-S/D ARE BASED ON THE WELL AS-BUILT SURVEY PREPARED BY TRUE NORTH SURVEYORS, INC. DATED 21 OCTOBER 2022.
3. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, NAVD88, WHICH IS 1.1 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM OF 1929, NGVD29, PER THE UNITED STATES GEOLOGIC SURVEY, USGS.
4. BORINGS LB-1, LB-3, AND LB-5 WERE INSTALLED AS PART OF THE INVESTIGATION DOCUMENTED IN THE APRIL 2022 GEOTECHNICAL INVESTIGATION REPORT. BORINGS LB-01/LMW-1, LB-03/LMW-3, LB-06, AND LSB-9/MW-05 WERE INSTALLED AS PART OF THE NOVEMBER 2021 AND JANUARY/FEBRUARY 2022 PHASE II ESI. BORINGS LSB-19/LMW-6, LSB-20, LSB-31, LMW-6R-S/D, LMW-8R-S/D, LMW-9R-S/D, LMW-10R-S/D, LMW-11R-D, LMW-12R-S/D, LMW-13R-S, AND LMW-13R-D WERE INSTALLED AS PART OF THE AUGUST 2022 RI.
5. BOREHOLE FLOW AND WATER PRODUCING LOGGING INTERVALS DERIVED FROM THE BOREHOLE GEOPHYSICAL LOGGING DATA REPORT PREPARED BY HAGER-RIGHTER GEOSCIENCE, INC. DATED NOVEMBER 2022.

## FLOW UNDER PUMPING CONDITIONS WITHIN BOREHOLE:

- ↳ FLOW INTO & UP BOREHOLE
- ↔ POSSIBLE FLOW IN OR OUT OF BOREHOLE
- X NO FLOW DETECTED

## FLOW UNDER AMBIENT (NON-PUMPING) CONDITIONS WITHIN BOREHOLE:

- ↴ FLOW INTO & DOWN BOREHOLE
- → FLOW OUT OF BOREHOLE

*NO FLOW WAS DETECTED UNDER AMBIENT CONDITIONS AT ANY WELL EXCEPT LMW-7R-S

- GROUNDWATER PRODUCING INTERVAL
- MINOR GROUNDWATER PRODUCING INTERVAL

6 0 3 6
VERTICAL SCALE: 1 INCH = 6 FEET

# SECTION B-B'

**VERTICAL SCALE: 1" = 6'**
**HORIZONTAL SCALE: N.T.S.**

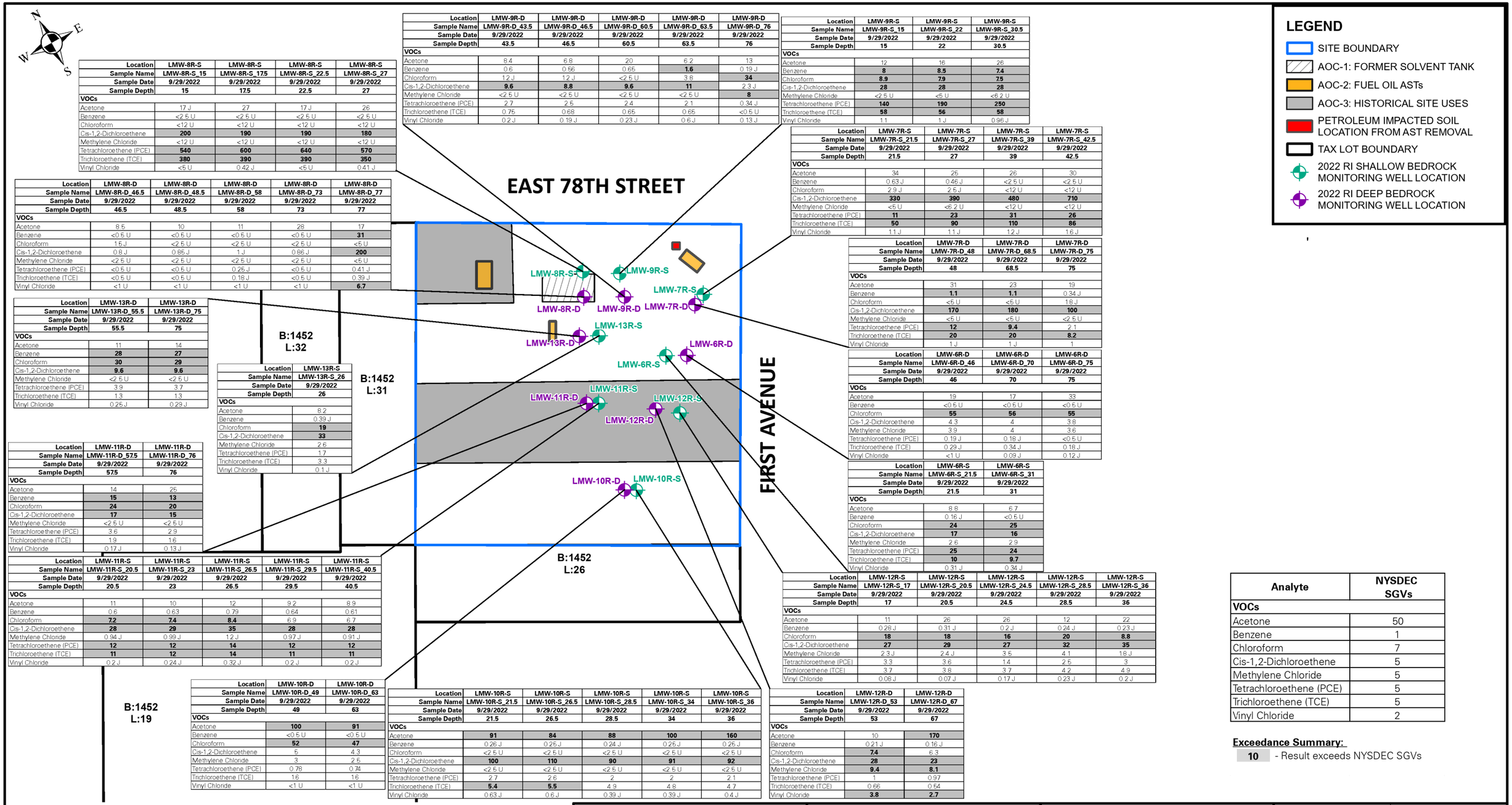
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MANHATTAN NEW YORK

| | |
|---|---|
| Project | 1487 1ST AVENUE REDEVELOPMENT SITE |
| Drawing Title | BORING PROFILE B-B′ |
| Project No. | 100963701 |
| Date | 11/17/2022 |
| Drawn By | AC |
| Checked By | CR |
| Drawing No. | 3B |

LANGAN PROJECT NO. 100963701

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| Location | LMW-8R-S | LMW-8R-S | LMW-8R-S | LMW-8R-S |
|---|---|---|---|---|
| Sample Name | LMW-8R-S_15 | LMW-8R-S_17.5 | LMW-8R-S_22.5 | LMW-8R-S_27 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 15 | 17.5 | 22.5 | 27 |
| **VOCs** | | | | |
| Acetone | 17 J | 27 | 17 J | 26 |
| Benzene | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Chloroform | <12 U | <12 U | <12 U | <12 U |
| Cis-1,2-Dichloroethene | **200** | **190** | **190** | **180** |
| Methylene Chloride | <12 U | <12 U | <12 U | <12 U |
| Tetrachloroethene (PCE) | **540** | **600** | **640** | **570** |
| Trichloroethene (TCE) | **380** | **390** | **390** | **350** |
| Vinyl Chloride | <5 U | 0.42 J | <5 U | 0.41 J |

| Location | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D | LMW-8R-D |
|---|---|---|---|---|---|
| Sample Name | LMW-8R-D_46.5 | LMW-8R-D_48.5 | LMW-8R-D_58 | LMW-8R-D_73 | LMW-8R-D_77 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 46.5 | 48.5 | 58 | 73 | 77 |
| **VOCs** | | | | | |
| Acetone | 8.5 | 10 | 11 | 28 | 17 |
| Benzene | <0.5 U | <0.5 U | <0.5 U | <0.5 U | **31** |
| Chloroform | 1.5 J | <2.5 U | <2.5 U | <2.5 U | <5 U |
| Cis-1,2-Dichloroethene | 0.8 J | 0.85 J | 1 J | 0.86 J | **200** |
| Methylene Chloride | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <5 U |
| Tetrachloroethene (PCE) | <0.5 U | <0.5 U | 0.25 J | <0.5 U | 0.41 J |
| Trichloroethene (TCE) | <0.5 U | <0.5 U | 0.18 J | <0.5 U | 0.39 J |
| Vinyl Chloride | <1 U | <1 U | <1 U | <1 U | **6.7** |

| Location | LMW-13R-D | LMW-13R-D |
|---|---|---|
| Sample Name | LMW-13R-D_55.5 | LMW-13R-D_75 |
| Sample Date | 9/29/2022 | 9/29/2022 |
| Sample Depth | 55.5 | 75 |
| **VOCs** | | |
| Acetone | 11 | 14 |
| Benzene | **28** | **27** |
| Chloroform | **30** | **29** |
| Cis-1,2-Dichloroethene | **9.6** | **9.6** |
| Methylene Chloride | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 3.9 | 3.7 |
| Trichloroethene (TCE) | 1.3 | 1.3 |
| Vinyl Chloride | 0.25 J | 0.29 J |

| Location | LMW-13R-S |
|---|---|
| Sample Name | LMW-13R-S_26 |
| Sample Date | 9/29/2022 |
| Sample Depth | 26 |
| **VOCs** | |
| Acetone | 8.2 |
| Benzene | 0.39 J |
| Chloroform | **19** |
| Cis-1,2-Dichloroethene | **33** |
| Methylene Chloride | 2.6 |
| Tetrachloroethene (PCE) | 1.7 |
| Trichloroethene (TCE) | 3.3 |
| Vinyl Chloride | 0.1 J |

| Location | LMW-11R-D | LMW-11R-D |
|---|---|---|
| Sample Name | LMW-11R-D_57.5 | LMW-11R-D_76 |
| Sample Date | 9/29/2022 | 9/29/2022 |
| Sample Depth | 57.5 | 76 |
| **VOCs** | | |
| Acetone | 14 | 25 |
| Benzene | **15** | **13** |
| Chloroform | **24** | **20** |
| Cis-1,2-Dichloroethene | **17** | **15** |
| Methylene Chloride | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 3.6 | 2.9 |
| Trichloroethene (TCE) | 1.9 | 1.6 |
| Vinyl Chloride | 0.17 J | 0.13 J |

| Location | LMW-11R-S | LMW-11R-S | LMW-11R-S | LMW-11R-S | LMW-11R-S |
|---|---|---|---|---|---|
| Sample Name | LMW-11R-S_20.5 | LMW-11R-S_23 | LMW-11R-S_26.5 | LMW-11R-S_29.5 | LMW-11R-S_40.5 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 20.5 | 23 | 26.5 | 29.5 | 40.5 |
| **VOCs** | | | | | |
| Acetone | 11 | 10 | 12 | 9.2 | 8.9 |
| Benzene | 0.6 | 0.63 | 0.79 | 0.64 | 0.61 |
| Chloroform | **7.2** | **7.4** | **8.4** | 6.9 | 6.7 |
| Cis-1,2-Dichloroethene | **28** | **29** | **35** | **28** | **28** |
| Methylene Chloride | 0.94 J | 0.99 J | 1.2 J | 0.97 J | 0.91 J |
| Tetrachloroethene (PCE) | **12** | **12** | **14** | **12** | **12** |
| Trichloroethene (TCE) | **11** | **12** | **14** | **11** | **11** |
| Vinyl Chloride | 0.2 J | 0.24 J | 0.32 J | 0.2 J | 0.2 J |

| Location | LMW-10R-D | LMW-10R-D |
|---|---|---|
| Sample Name | LMW-10R-D_49 | LMW-10R-D_63 |
| Sample Date | 9/29/2022 | 9/29/2022 |
| Sample Depth | 49 | 63 |
| **VOCs** | | |
| Acetone | **100** | **91** |
| Benzene | <0.5 U | <0.5 U |
| Chloroform | **52** | **47** |
| Cis-1,2-Dichloroethene | 5 | 4.3 |
| Methylene Chloride | 3 | 2.5 |
| Tetrachloroethene (PCE) | 0.78 | 0.74 |
| Trichloroethene (TCE) | 1.6 | 1.6 |
| Vinyl Chloride | <1 U | <1 U |

| Location | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-S | LMW-10R-S |
|---|---|---|---|---|---|
| Sample Name | LMW-10R-S_21.5 | LMW-10R-S_26.5 | LMW-10R-S_28.5 | LMW-10R-S_34 | LMW-10R-S_36 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 21.5 | 26.5 | 28.5 | 34 | 36 |
| **VOCs** | | | | | |
| Acetone | **91** | **84** | **88** | **100** | **160** |
| Benzene | 0.26 J | 0.25 J | 0.24 J | 0.25 J | 0.25 J |
| Chloroform | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | **100** | **110** | **90** | **91** | **92** |
| Methylene Chloride | <2.5 U | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | 2.7 | 2.6 | 2 | 2 | 2.1 |
| Trichloroethene (TCE) | **5.4** | **5.5** | 4.9 | 4.8 | 4.7 |
| Vinyl Chloride | 0.63 J | 0.6 J | 0.39 J | 0.39 J | 0.4 J |

| Location | LMW-12R-D | LMW-12R-D |
|---|---|---|
| Sample Name | LMW-12R-D_53 | LMW-12R-D_67 |
| Sample Date | 9/29/2022 | 9/29/2022 |
| Sample Depth | 53 | 67 |
| **VOCs** | | |
| Acetone | 10 | **170** |
| Benzene | 0.21 J | 0.16 J |
| Chloroform | **7.4** | 6.3 |
| Cis-1,2-Dichloroethene | **28** | **23** |
| Methylene Chloride | **9.4** | **8.1** |
| Tetrachloroethene (PCE) | 1 | 0.97 |
| Trichloroethene (TCE) | 0.66 | 0.54 |
| Vinyl Chloride | **3.8** | **2.7** |

| Location | LMW-9R-D | LMW-9R-D | LMW-9R-D | LMW-9R-D | LMW-9R-D |
|---|---|---|---|---|---|
| Sample Name | LMW-9R-D_43.5 | LMW-9R-D_46.5 | LMW-9R-D_60.5 | LMW-9R-D_63.5 | LMW-9R-D_76 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 43.5 | 46.5 | 60.5 | 63.5 | 76 |
| **VOCs** | | | | | |
| Acetone | 8.4 | 6.8 | 20 | 6.2 | 13 |
| Benzene | 0.6 | 0.56 | 0.65 | **1.6** | 0.19 J |
| Chloroform | 1.2 J | 1.2 J | <2.5 U | 3.8 | **34** |
| Cis-1,2-Dichloroethene | **9.6** | **8.8** | **9.6** | **11** | 2.3 J |
| Methylene Chloride | <2.5 U | <2.5 U | <2.5 U | <2.5 U | **8** |
| Tetrachloroethene (PCE) | 2.7 | 2.5 | 2.4 | 2.1 | 0.34 J |
| Trichloroethene (TCE) | 0.75 | 0.68 | 0.65 | 0.65 | <0.5 U |
| Vinyl Chloride | 0.2 J | 0.19 J | 0.23 J | 0.6 J | 0.13 J |

| Location | LMW-9R-S | LMW-9R-S | LMW-9R-S |
|---|---|---|---|
| Sample Name | LMW-9R-S_15 | LMW-9R-S_22 | LMW-9R-S_30.5 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 15 | 22 | 30.5 |
| **VOCs** | | | |
| Acetone | 12 | 16 | 26 |
| Benzene | **8** | **8.5** | **7.4** |
| Chloroform | **8.9** | **7.9** | **7.5** |
| Cis-1,2-Dichloroethene | **28** | **28** | **28** |
| Methylene Chloride | <2.5 U | <5 U | <6.2 U |
| Tetrachloroethene (PCE) | **140** | **190** | **250** |
| Trichloroethene (TCE) | **58** | **56** | **58** |
| Vinyl Chloride | 1.1 | 1 J | 0.96 J |

| Location | LMW-7R-S | LMW-7R-S | LMW-7R-S | LMW-7R-S |
|---|---|---|---|---|
| Sample Name | LMW-7R-S_21.5 | LMW-7R-S_27 | LMW-7R-S_39 | LMW-7R-S_42.5 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 21.5 | 27 | 39 | 42.5 |
| **VOCs** | | | | |
| Acetone | 34 | 25 | 26 | 30 |
| Benzene | 0.63 J | 0.46 J | <2.5 U | <2.5 U |
| Chloroform | 2.9 J | 2.5 J | <12 U | <12 U |
| Cis-1,2-Dichloroethene | **330** | **390** | **480** | **710** |
| Methylene Chloride | <5 U | <6.2 U | <12 U | <12 U |
| Tetrachloroethene (PCE) | **11** | **23** | **31** | **26** |
| Trichloroethene (TCE) | **50** | **90** | **110** | **86** |
| Vinyl Chloride | 1.1 J | 1.1 J | 1.2 J | 1.6 J |

| Location | LMW-7R-D | LMW-7R-D | LMW-7R-D |
|---|---|---|---|
| Sample Name | LMW-7R-D_48 | LMW-7R-D_68.5 | LMW-7R-D_75 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 48 | 68.5 | 75 |
| **VOCs** | | | |
| Acetone | 31 | 23 | 19 |
| Benzene | **1.1** | **1.1** | 0.34 J |
| Chloroform | <5 U | <5 U | 1.8 J |
| Cis-1,2-Dichloroethene | **170** | **180** | **100** |
| Methylene Chloride | <5 U | <5 U | <2.5 U |
| Tetrachloroethene (PCE) | **12** | **9.4** | 2.1 |
| Trichloroethene (TCE) | **20** | **20** | **8.2** |
| Vinyl Chloride | 1 J | 1 J | 1 |

| Location | LMW-6R-D | LMW-6R-D | LMW-6R-D |
|---|---|---|---|
| Sample Name | LMW-6R-D_46 | LMW-6R-D_70 | LMW-6R-D_75 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 46 | 70 | 75 |
| **VOCs** | | | |
| Acetone | 19 | 17 | 33 |
| Benzene | <0.5 U | <0.5 U | <0.5 U |
| Chloroform | **55** | **56** | **55** |
| Cis-1,2-Dichloroethene | 4.3 | 4 | 3.8 |
| Methylene Chloride | 3.9 | 4 | 3.6 |
| Tetrachloroethene (PCE) | 0.19 J | 0.18 J | <0.5 U |
| Trichloroethene (TCE) | 0.29 J | 0.34 J | 0.18 J |
| Vinyl Chloride | <1 U | 0.09 J | 0.12 J |

| Location | LMW-6R-S | LMW-6R-S |
|---|---|---|
| Sample Name | LMW-6R-S_21.5 | LMW-6R-S_31 |
| Sample Date | 9/29/2022 | 9/29/2022 |
| Sample Depth | 21.5 | 31 |
| **VOCs** | | |
| Acetone | 8.8 | 6.7 |
| Benzene | 0.16 J | <0.5 U |
| Chloroform | **24** | **25** |
| Cis-1,2-Dichloroethene | **17** | **16** |
| Methylene Chloride | 2.6 | 2.9 |
| Tetrachloroethene (PCE) | **25** | **24** |
| Trichloroethene (TCE) | **10** | **9.7** |
| Vinyl Chloride | 0.31 J | 0.34 J |

| Location | LMW-12R-S | LMW-12R-S | LMW-12R-S | LMW-12R-S | LMW-12R-S |
|---|---|---|---|---|---|
| Sample Name | LMW-12R-S_17 | LMW-12R-S_20.5 | LMW-12R-S_24.5 | LMW-12R-S_28.5 | LMW-12R-S_36 |
| Sample Date | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 | 9/29/2022 |
| Sample Depth | 17 | 20.5 | 24.5 | 28.5 | 36 |
| **VOCs** | | | | | |
| Acetone | 11 | 26 | 26 | 12 | 22 |
| Benzene | 0.28 J | 0.31 J | 0.2 J | 0.24 J | 0.23 J |
| Chloroform | **18** | **18** | **16** | **20** | **8.8** |
| Cis-1,2-Dichloroethene | **27** | **29** | **27** | **32** | **35** |
| Methylene Chloride | 2.3 J | 2.4 J | 3.5 | 4.1 | 1.8 J |
| Tetrachloroethene (PCE) | 3.3 | 3.6 | 1.4 | 2.5 | 3 |
| Trichloroethene (TCE) | 3.7 | 3.8 | 3.7 | 4.2 | 4.9 |
| Vinyl Chloride | 0.08 J | 0.07 J | 0.17 J | 0.23 J | 0.2 J |

## LEGEND

- SITE BOUNDARY
- AOC-1: FORMER SOLVENT TANK
- AOC-2: FUEL OIL ASTs
- AOC-3: HISTORICAL SITE USES
- PETROLEUM IMPACTED SOIL LOCATION FROM AST REMOVAL
- TAX LOT BOUNDARY
- 2022 RI SHALLOW BEDROCK MONITORING WELL LOCATION
- 2022 RI DEEP BEDROCK MONITORING WELL LOCATION

| Analyte | NYSDEC SGVs |
|---|---|
| **VOCs** | |
| Acetone | 50 |
| Benzene | 1 |
| Chloroform | 7 |
| Cis-1,2-Dichloroethene | 5 |
| Methylene Chloride | 5 |
| Tetrachloroethene (PCE) | 5 |
| Trichloroethene (TCE) | 5 |
| Vinyl Chloride | 2 |

**Exceedance Summary:**

**10** - Result exceeds NYSDEC SGVs

NOTES:
1. SAMPLING LOCATIONS FOR THE MONITORING WELLS INSTALLED AS PART OF THE 2022 RI ARE BASED ON THE WELL AS-BUILT SURVEY PREPARED BY TRUE NORTH SURVEYORS, INC. DATED 21 OCTOBER 2022.
2. AOC-4 CONSISTS OF HISTORIC FILL, WHICH IS PRESENT THROUGHOUT THE SITE.

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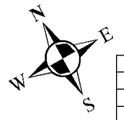

Project
1487 1ST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No. 27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
PASSIVE DIFFUSION BAG (PDB) GROUNDWATER ANALYTICAL RESULTS

Project No. 100963701
Date 7/31/2023
Scale 1"=30'
Drawn By PDT
Figure 4A

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| Location | LMW-8R-D | LMW-8R-D | LMW-8R-D |
|---|---|---|---|
| Sample Name | LMW-8R-D_47.25 | LMW-8R-D_56.75 | LMW-8R-D_76 |
| Sample Date | 12/27/2022 | 12/27/2022 | 12/27/2022 |
| Sample Depth | 47.25 | 56.75 | 76 |
| **VOCs** | | | |
| Benzene | 0.16 J | 2 | 5.5 |
| Chloroform | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 8.2 | 7.7 | 47 |
| Tetrachloroethene (PCE) | 0.18 J | 0.54 | 0.21 J |
| Toluene | <2.5 U | 9 | 2 J |
| Trichloroethene (TCE) | 0.37 J | 0.24 J | 0.24 J |
| Vinyl Chloride | <1 U | 1 | 6.4 |
| **Metals** | | | |
| Iron | 5,660 | 9,480 | 6,650 |
| Magnesium | 9,420 | 9,450 | 16,200 |
| Manganese | 235.1 | 363.8 | 448.3 |
| **General Chemistry** | | | |
| Chloride (As Cl) | 54,000 | 48,000 | 83,000 |
| Sulfate (As SO4) | 140,000 | 130,000 | 130,000 |

| Location | LMW-13R-D |
|---|---|
| Sample Name | LMW-13R-D_45.25 |
| Sample Date | 12/28/2022 |
| Sample Depth | 45.25 |
| **VOCs** | |
| Benzene | 8.5 |
| Chloroform | 2.2 J |
| Cis-1,2-Dichloroethene | 10 |
| Tetrachloroethene (PCE) | 7.2 |
| Toluene | <2.5 U |
| Trichloroethene (TCE) | 2.2 |
| Vinyl Chloride | 0.18 J |
| **Metals** | |
| Iron | 17,500 |
| Magnesium | 40,800 |
| Manganese | 2,363 |
| **General Chemistry** | |
| Chloride (As Cl) | 45,000 |
| Sulfate (As SO4) | 540,000 |

| Location | LMW-13R-S |
|---|---|
| Sample Name | LMW-13R-S_25.75 |
| Sample Date | 12/28/2022 |
| Sample Depth | 25.75 |
| **VOCs** | |
| Benzene | 0.45 J |
| Chloroform | 1.7 J |
| Cis-1,2-Dichloroethene | 47 |
| Tetrachloroethene (PCE) | 35 |
| Toluene | <2.5 U |
| Trichloroethene (TCE) | 9.7 |
| Vinyl Chloride | 0.27 J |
| **Metals** | |
| Iron | 12,600 |
| Magnesium | 47,800 |
| Manganese | 2,307 |
| **General Chemistry** | |
| Chloride (As Cl) | 85,000 |
| Sulfate (As SO4) | 560,000 |

| Location | LMW-8R-S | LMW-8R-S |
|---|---|---|
| Sample Name | LMW-8R-S_14.5 | LMW-8R-S_24.75 |
| Sample Date | 12/22/2022 | 12/22/2022 |
| Sample Depth | 14.5 | 24.75 |
| **VOCs** | | |
| Benzene | <5 U | <1.2 U |
| Chloroform | <25 U | <6.2 U |
| Cis-1,2-Dichloroethene | 270 | 390 |
| Tetrachloroethene (PCE) | 900 | 63 |
| Toluene | <25 U | <6.2 U |
| Trichloroethene (TCE) | 360 | 52 |
| Vinyl Chloride | 2 J | 1.2 J |
| **Metals** | | |
| Iron | 31,300 | 34,200 |
| Magnesium | 103,000 | 68,700 |
| Manganese | 9,421 | 6,069 |
| **General Chemistry** | | |
| Chloride (As Cl) | 110,000 | 340,000 |
| Sulfate (As SO4) | 1,100,000 | 600,000 |

| Location | LMW-7R-S | LMW-7R-S | LMW-7R-S |
|---|---|---|---|
| Sample Name | LMW-7R-S_20 | LMW-7R-S_25.5 | LMW-7R-S_38 |
| Sample Date | 12/19/2022 | 12/20/2022 | 12/21/2022 |
| Sample Depth | 20 | 25.5 | 38 |
| **VOCs** | | | |
| Benzene | 0.52 | 0.47 J | 0.51 J |
| Chloroform | <2.5 U | <5 U | <6.2 U |
| Cis-1,2-Dichloroethene | 120 | 340 | 400 |
| Tetrachloroethene (PCE) | 20 | 43 | 50 |
| Toluene | <2.5 U | <5 U | <6.2 U |
| Trichloroethene (TCE) | 18 | 56 | 61 |
| Vinyl Chloride | 0.44 J | 0.64 J | 0.71 J |
| **Metals** | | | |
| Iron | 17,700 | 29,500 | 76,300 |
| Magnesium | 73,100 | 67,700 | 111,000 |
| Manganese | 5,733 | 4,074 | 8,344 |
| **General Chemistry** | | | |
| Chloride (As Cl) | 520,000 | 600,000 | 600,000 |
| Sulfate (As SO4) | 520,000 | 510,000 | 510,000 |

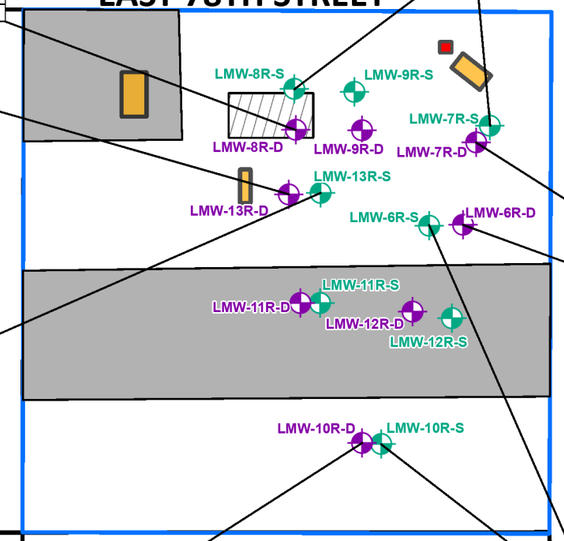
| Location | LMW-7R-D | LMW-7R-D |
|---|---|---|
| Sample Name | LMW-7R-D_42 | LMW-7R-D_66 |
| Sample Date | 12/21/2022 | 12/21/2022 |
| Sample Depth | 42 | 66 |
| **VOCs** | | |
| Benzene | 0.77 J | 0.52 |
| Chloroform | <5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 220 | 160 |
| Tetrachloroethene (PCE) | 18 | 2.5 |
| Toluene | <5 U | <2.5 U |
| Trichloroethene (TCE) | 22 | 16 |
| Vinyl Chloride | 0.62 J | 4.4 |
| **Metals** | | |
| Iron | 98,500 | 25,600 |
| Magnesium | 117,000 | 44,200 |
| Manganese | 7,510 | 2,320 |
| **General Chemistry** | | |
| Chloride (As Cl) | 340,000 | 190,000 |
| Sulfate (As SO4) | 610,000 | 670,000 |

| Location | LMW-6R-D |
|---|---|
| Sample Name | LMW-6R-D_47.75 |
| Sample Date | 12/28/2022 |
| Sample Depth | 47.75 |
| **VOCs** | |
| Benzene | <0.5 U |
| Chloroform | 7.4 |
| Cis-1,2-Dichloroethene | 3.1 |
| Tetrachloroethene (PCE) | 0.57 |
| Toluene | 1.5 J |
| Trichloroethene (TCE) | 0.33 J |
| Vinyl Chloride | <1 U |
| **Metals** | |
| Iron | 7,230 |
| Magnesium | 2,140 |
| Manganese | 108 |
| **General Chemistry** | |
| Chloride (As Cl) | 25,000 |
| Sulfate (As SO4) | 55,000 |

| Location | LMW-10R-D |
|---|---|
| Sample Name | LMW-10R-D_40.5 |
| Sample Date | 12/23/2022 |
| Sample Depth | 40.5 |
| **VOCs** | |
| Benzene | 0.2 J |
| Chloroform | 2.6 |
| Cis-1,2-Dichloroethene | 18 |
| Tetrachloroethene (PCE) | 2.1 |
| Toluene | <2.5 U |
| Trichloroethene (TCE) | 1.1 |
| Vinyl Chloride | 0.11 J |
| **Metals** | |
| Iron | 12,600 |
| Magnesium | 28,800 |
| Manganese | 1,638 |
| **General Chemistry** | |
| Chloride (As Cl) | 66,000 |
| Sulfate (As SO4) | 190,000 |

| Location | LMW-10R-S | LMW-10R-S |
|---|---|---|
| Sample Name | LMW-10R-S_13 | LMW-10R-S_18.25 |
| Sample Date | 12/22/2022 | 12/23/2022 |
| Sample Depth | 13 | 18.25 |
| **VOCs** | | |
| Benzene | <0.5 U | 0.25 J |
| Chloroform | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 16 | 140 |
| Tetrachloroethene (PCE) | 10 | 26 |
| Toluene | <2.5 U | <2.5 U |
| Trichloroethene (TCE) | 8.8 | 33 |
| Vinyl Chloride | <1 U | 0.37 J |
| **Metals** | | |
| Iron | 17,500 | 33,000 |
| Magnesium | 56,600 | 57,100 |
| Manganese | 4,386 | 2,861 |
| **General Chemistry** | | |
| Chloride (As Cl) | 88,000 | 97,000 |
| Sulfate (As SO4) | 630,000 | 530,000 |

| Location | LMW-6R-S |
|---|---|
| Sample Name | LMW-6R-S_20.5 |
| Sample Date | 12/28/2022 |
| Sample Depth | 20.5 |
| **VOCs** | |
| Benzene | 0.72 |
| Chloroform | 1.4 J |
| Cis-1,2-Dichloroethene | 29 |
| Tetrachloroethene (PCE) | 10 |
| Toluene | <2.5 U |
| Trichloroethene (TCE) | 6.3 |
| Vinyl Chloride | <1 U |
| **Metals** | |
| Iron | 14,900 |
| Magnesium | 58,100 |
| Manganese | 2,978 |
| **General Chemistry** | |
| Chloride (As Cl) | 110,000 |
| Sulfate (As SO4) | 580,000 |




## LEGEND

- SITE BOUNDARY
- PETROLEUM IMPACTED SOIL LOCATION FROM AST REMOVAL
- AOC-1: FORMER SOLVENT TANK
- AOC-2: FUEL OIL ASTs
- AOC-3: HISTORICAL SITE USES
- TAX LOT BOUNDARY
- 2022 RI SHALLOW BEDROCK MONITORING WELL LOCATION
- 2022 RI DEEP BEDROCK MONITORING WELL LOCATION

| Analyte | NYSDEC SGVs |
|---|---|
| **VOCs** | |
| Benzene | 1 |
| Chloroform | 7 |
| Cis-1,2-Dichloroethene | 5 |
| Tetrachloroethene (PCE) | 5 |
| Toluene | 5 |
| Trichloroethene (TCE) | 5 |
| Vinyl Chloride | 2 |
| **Metals** | |
| Iron | 300 |
| Magnesium | 35000 |
| Manganese | 300 |
| **General Chemistry** | |
| Chloride (As Cl) | 250000 |
| Sulfate (As SO4) | 250000 |

**Exceedance Summary:**

10 - Result exceeds NYSDEC SGVs

NOTES:
1. SAMPLING LOCATIONS FOR THE MONITORING WELLS INSTALLED AS PART OF THE 2022 RI ARE BASED ON THE WELL AS-BUILT SURVEY PREPARED BY TRUE NORTH SURVEYORS, INC. DATED 21 OCTOBER 2022.
2. AOC-4 CONSISTS OF HISTORIC FILL, WHICH IS PRESENT THROUGHOUT THE SITE.

30 0 30
SCALE IN FEET

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

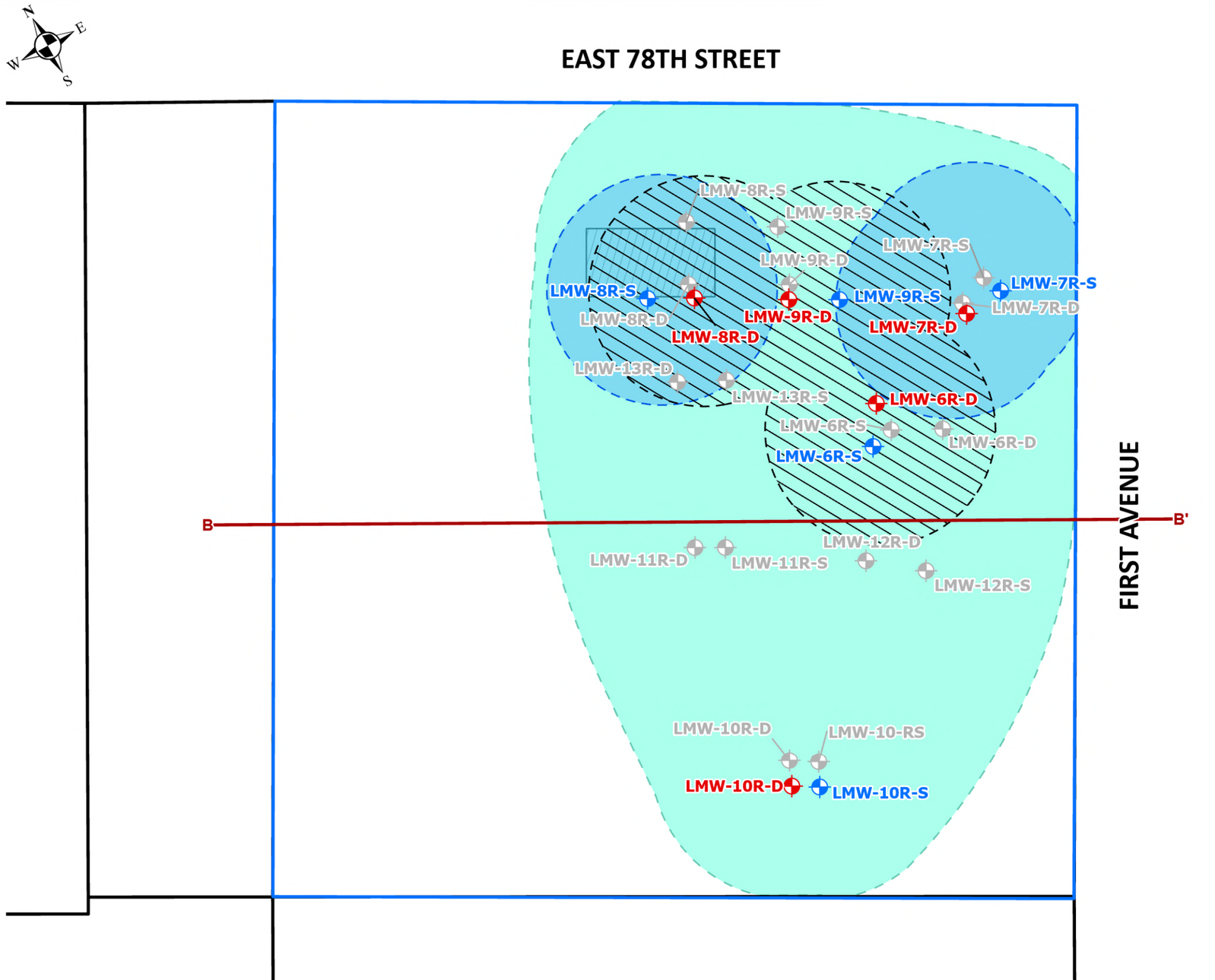
Project
1487 1ST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No. 27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
BASELINE BEDROCK GROUNDWATER ANALYTICAL RESULTS

Project No. 100963701
Date 7/31/2023
Scale 1"=30'
Drawn By PDT
Figure 4B

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## LEGEND

- SITE BOUNDARY
- AOC-2: FORMER SOLVENT TANK
- TAX LOT BOUNDARY
- CROSS SECTION
- 2023 TREATMENT ZONE
- 2024 EZVI TREATMENT ZONE
- 2024 EVO INJECTION ZONE
- DEEP BEDROCK WELL RE-INSALLATION LOCATION
- SHALLOW BEDROCK WELL RE-INSALLATION LOCATION
- SHALLOW AND DEEP BEDROCK MONITORING WELLS INSTALLED DURING THE 2022 RI

NOTES:
1. TAX PARCEL DATA PROVIDED BY THE NEW YORK CITY DEPARTMENT OF CITY PLANNING, MAPPLUTO 23V2.
2. 2022 RI MONITORING WELL LOCATIONS ARE BASED ON THE WELL AS-BUILT SURVEY PREPARED BY TRUE NORTH SURVEYORS, INC. DATED 21 OCTOBER 2022.
4. RE-INSTALLED MONITORING WELL LOCATIONS WERE SURVEYED IN THE FIELD BEFORE ROCK CORING BEGAN.
3. 2023 TREATMENT ZONE IS SHOWN AS PRESENTED IN THE MARCH 2023 EMULSIFIED ZERO-VALENT IRON REMEDIAL DESIGN.

15 0 15
SCALE IN FEET

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Collectively known as Langan
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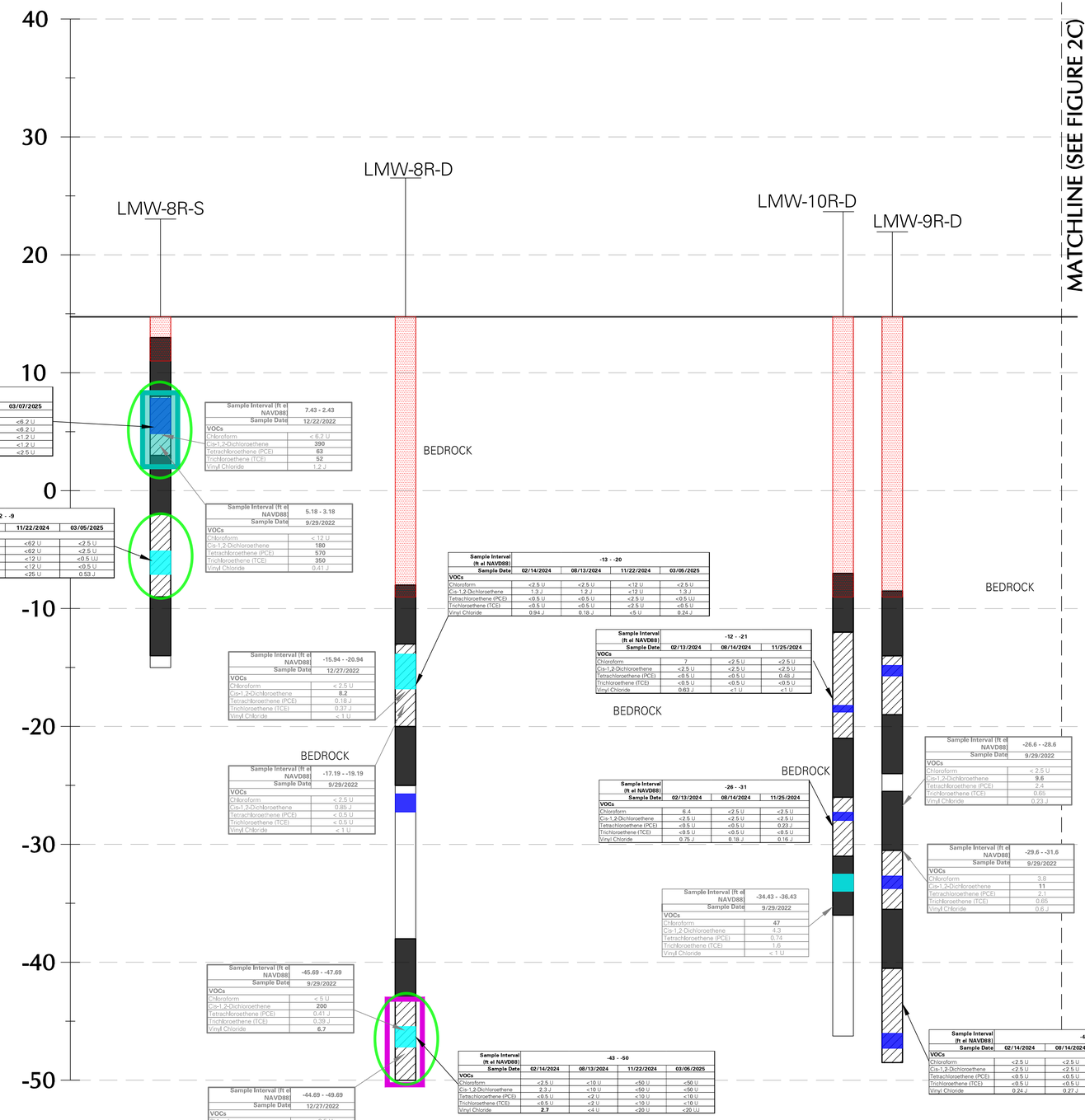
Project
**1487 FIRST AVENUE REDEVELOPMENT SITE**
BLOCK No. 1452, LOT No. 27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
**INJECTION LOCATION PLAN**

| Project No. | Figure |
|---|---|
| 100963701 | 5A |
| Date: 6/5/2025 | |
| Scale: 1"=15' | |
| Drawn By: IHB | |

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| Sample Interval (ft el NAVD88) | 8 - 3 | | | | |
|---|---|---|---|---|---|
| Sample Date | 02/14/2024 | 02/14/2024 | 08/15/2024 | 11/22/2024 | 03/07/2025 |
| **VOCs** | | | | | |
| Chloroform | <2.5 U | <2.5 U | <6.2 U | <25 U | <6.2 U |
| Cis-1,2-Dichloroethene | **14** | **17** | <6.2 U | <25 U | <6.2 U |
| Tetrachloroethene (PCE) | 0.54 | 0.64 | <1.2 U | <5 U | <1.2 U |
| Trichloroethene (TCE) | 0.56 | 0.7 | <1.2 U | <5 U | <1.2 U |
| Vinyl Chloride | **4.4** | **5.2** | 0.2 J | <10 U | <2.5 U |

| Sample Interval (ft el NAVD88) | 7.43 - 2.43 |
|---|---|
| Sample Date | 12/22/2022 |
| **VOCs** | |
| Chloroform | < 6.2 U |
| Cis-1,2-Dichloroethene | 390 |
| Tetrachloroethene (PCE) | 63 |
| Trichloroethene (TCE) | 52 |
| Vinyl Chloride | 1.2 J |

| Sample Interval (ft el NAVD88) | 5.18 - 3.18 |
|---|---|
| Sample Date | 9/29/2022 |
| **VOCs** | |
| Chloroform | < 12 U |
| Cis-1,2-Dichloroethene | 180 |
| Tetrachloroethene (PCE) | 570 |
| Trichloroethene (TCE) | 350 |
| Vinyl Chloride | 0.41 J |

| Sample Interval (ft el NAVD88) | -2 - -9 | | | |
|---|---|---|---|---|
| Sample Date | 02/14/2024 | 08/12/2024 | 11/22/2024 | 03/05/2025 |
| **VOCs** | | | | |
| Chloroform | <2.5 U | <2.5 U | <62 U | <2.5 U |
| Cis-1,2-Dichloroethene | 2.9 | 0.88 J | <62 U | <2.5 U |
| Tetrachloroethene (PCE) | <0.5 U | <0.5 U | <12 U | <0.5 UJ |
| Trichloroethene (TCE) | <0.5 U | <0.5 U | <12 U | <0.5 U |
| Vinyl Chloride | 1.6 | 1.3 | <25 U | 0.53 J |

| Sample Interval (ft el NAVD88) | -13 - -20 | | | |
|---|---|---|---|---|
| Sample Date | 02/14/2024 | 08/13/2024 | 11/22/2024 | 03/05/2025 |
| **VOCs** | | | | |
| Chloroform | <2.5 U | <2.5 U | <12 U | <2.5 U |
| Cis-1,2-Dichloroethene | 1.3 J | 1.2 J | <12 U | 1.3 J |
| Tetrachloroethene (PCE) | <0.5 U | <0.5 U | <2.5 U | <0.5 UJ |
| Trichloroethene (TCE) | <0.5 U | <0.5 U | <2.5 U | <0.5 U |
| Vinyl Chloride | 0.94 J | 0.18 J | <5 U | 0.24 J |

| Sample Interval (ft el NAVD88) | -15.94 - -20.94 |
|---|---|
| Sample Date | 12/27/2022 |
| **VOCs** | |
| Chloroform | < 2.5 U |
| Cis-1,2-Dichloroethene | 8.2 |
| Tetrachloroethene (PCE) | 0.18 J |
| Trichloroethene (TCE) | 0.37 J |
| Vinyl Chloride | < 1 U |

| Sample Interval (ft el NAVD88) | -12 - -21 | | |
|---|---|---|---|
| Sample Date | 02/13/2024 | 08/14/2024 | 11/25/2024 |
| **VOCs** | | | |
| Chloroform | .7 | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | <0.5 U | <0.5 U | 0.48 J |
| Trichloroethene (TCE) | <0.5 U | <0.5 U | <0.5 U |
| Vinyl Chloride | 0.63 J | <1 U | <1 U |

| Sample Interval (ft el NAVD88) | -17.19 - -19.19 |
|---|---|
| Sample Date | 9/29/2022 |
| **VOCs** | |
| Chloroform | < 2.5 U |
| Cis-1,2-Dichloroethene | 0.85 J |
| Tetrachloroethene (PCE) | < 0.5 U |
| Trichloroethene (TCE) | < 0.5 U |
| Vinyl Chloride | < 1 U |

| Sample Interval (ft el NAVD88) | -26 - -31 | | |
|---|---|---|---|
| Sample Date | 02/13/2024 | 08/14/2024 | 11/25/2024 |
| **VOCs** | | | |
| Chloroform | 6.4 | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | <0.5 U | <0.5 U | 0.23 J |
| Trichloroethene (TCE) | <0.5 U | <0.5 U | <0.5 U |
| Vinyl Chloride | 0.75 J | 0.18 J | 0.16 J |

| Sample Interval (ft el NAVD88) | -26.6 - -28.6 |
|---|---|
| Sample Date | 9/29/2022 |
| **VOCs** | |
| Chloroform | < 2.5 U |
| Cis-1,2-Dichloroethene | 9.6 |
| Tetrachloroethene (PCE) | 2.4 |
| Trichloroethene (TCE) | 0.65 |
| Vinyl Chloride | 0.23 J |

| Sample Interval (ft el NAVD88) | -29.6 - -31.6 |
|---|---|
| Sample Date | 9/29/2022 |
| **VOCs** | |
| Chloroform | 3.8 |
| Cis-1,2-Dichloroethene | 11 |
| Tetrachloroethene (PCE) | 2.1 |
| Trichloroethene (TCE) | 0.65 |
| Vinyl Chloride | 0.6 J |

| Sample Interval (ft el NAVD88) | -34.43 - -36.43 |
|---|---|
| Sample Date | 9/29/2022 |
| **VOCs** | |
| Chloroform | 47 |
| Cis-1,2-Dichloroethene | 4.3 |
| Tetrachloroethene (PCE) | 0.74 |
| Trichloroethene (TCE) | 1.6 |
| Vinyl Chloride | < 1 U |

| Sample Interval (ft el NAVD88) | -45.69 - -47.69 |
|---|---|
| Sample Date | 9/29/2022 |
| **VOCs** | |
| Chloroform | < 5 U |
| Cis-1,2-Dichloroethene | 200 |
| Tetrachloroethene (PCE) | 0.41 J |
| Trichloroethene (TCE) | 0.39 J |
| Vinyl Chloride | 6.7 |

| Sample Interval (ft el NAVD88) | -44.69 - -49.69 |
|---|---|
| Sample Date | 12/27/2022 |
| **VOCs** | |
| Chloroform | < 2.5 U |
| Cis-1,2-Dichloroethene | 47 |
| Tetrachloroethene (PCE) | 0.21 J |
| Trichloroethene (TCE) | 0.24 J |
| Vinyl Chloride | 6.4 |

| Sample Interval (ft el NAVD88) | -43 - -60 | | | |
|---|---|---|---|---|
| Sample Date | 02/14/2024 | 08/13/2024 | 11/22/2024 | 03/05/2025 |
| **VOCs** | | | | |
| Chloroform | <2.5 U | <10 U | <50 U | <50 U |
| Cis-1,2-Dichloroethene | 2.3 J | <10 U | <50 U | <50 U |
| Tetrachloroethene (PCE) | <0.5 U | <2 U | <10 U | <10 U |
| Trichloroethene (TCE) | <0.5 U | <2 U | <10 U | <10 U |
| Vinyl Chloride | **2.7** | <4 U | <20 U | <20 UJ |

| Sample Interval (ft el NAVD88) | -40.5 - -48.5 | | | |
|---|---|---|---|---|
| Sample Date | 02/14/2024 | 08/14/2024 | 11/22/2024 | 11/22/2024 |
| **VOCs** | | | | |
| Chloroform | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | <2.5 U | <2.5 U | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | <0.5 U | <0.5 U | 0.27 J | 0.22 J |
| Trichloroethene (TCE) | <0.5 U | <0.5 U | <0.5 U | <0.5 U |
| Vinyl Chloride | 0.24 J | 0.27 J | 0.15 J | 0.19 J |

## LEGEND:

- GROUNDWATER PRODUCING INTERVAL
- MINOR GROUNDWATER PRODUCING INTERVAL
- PACKER INTERVAL
- MONITORING ZONE
- CASING LENGTH
- PROPOSED PERFORMANCE MONITORING INTERVAL

**EZVI**

- SHALLOW BEDROCK INJECTION INTERVAL
- DEEP BEDROCK INJECTION INTERVAL

**EVO ONLY**

- SHALLOW BEDROCK INJECTION INTERVAL
- DEEP BEDROCK INJECTION INTERVAL

## WELL KEY:

LMW-X

## NOTES:

1. THE ELEVATIONS FOR THE TOP OF SLAB IS TAKEN FROM FO-100.0 FOUNDATION PLAN BY MCNAMARA SALVIA, DATED 7 SEPTEMBER 2022.
2. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, NAVD88, WHICH IS 1.1 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM OF 1929, NGVD29, PER THE UNITED STATES GEOLOGIC SURVEY, USGS.
3. BOREHOLE WATER PRODUCING LOGGING INTERVALS DERIVED FROM THE BOREHOLE GEOPHYSICAL LOGGING DATA REPORT PREPARED BY HAGER-RIGHTER GEOSCIENCE, INC. DATED JANUARY 2024.
4. ALL CURRENT AND HISTORICAL DATA ARE PRESENTED AT THE CURRENT WELL REINSTALLATION LOCATION.
5. ANALYTICAL RESULTS IN GRAY ARE FROM THE 2022 RI AND WERE PRESENTED IN THE MARCH 2023 EMULSIFIED ZERO-VALENT IRON REMEDIAL DESIGN. ANALYTICAL RESULTS IN BLACK ARE FROM THE FEBRUARY, AUGUST AND NOVEMBER 2024 AND MARCH 2025 PERFORMANCE GROUNDWATER MONITORING EVENTS.

# SECTION B-B' WEST

**VERTICAL SCALE: 1" = 5'**
**HORIZONTAL SCALE: N.T.S.**

6 0 3 6
VERTICAL SCALE: 1 INCH = 6 FEET

| Analyte | NYSDEC SGVs |
|---|---|
| **VOCs** | |
| Chloroform | 7 |
| Cis-1,2-Dichloroethene | 5 |
| Tetrachloroethene (PCE) | 5 |
| Trans-1,2-Dichloroethene | 5 |
| Trichloroethene (TCE) | 5 |
| Vinyl Chloride | 2 |

**Exceedance Summary:**
**10** - Result exceeds NYSDEC SGVs

**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, LAND SURVEYOR OR GEOLOGIST, TO ALTER THIS ITEM IN ANY WAY.


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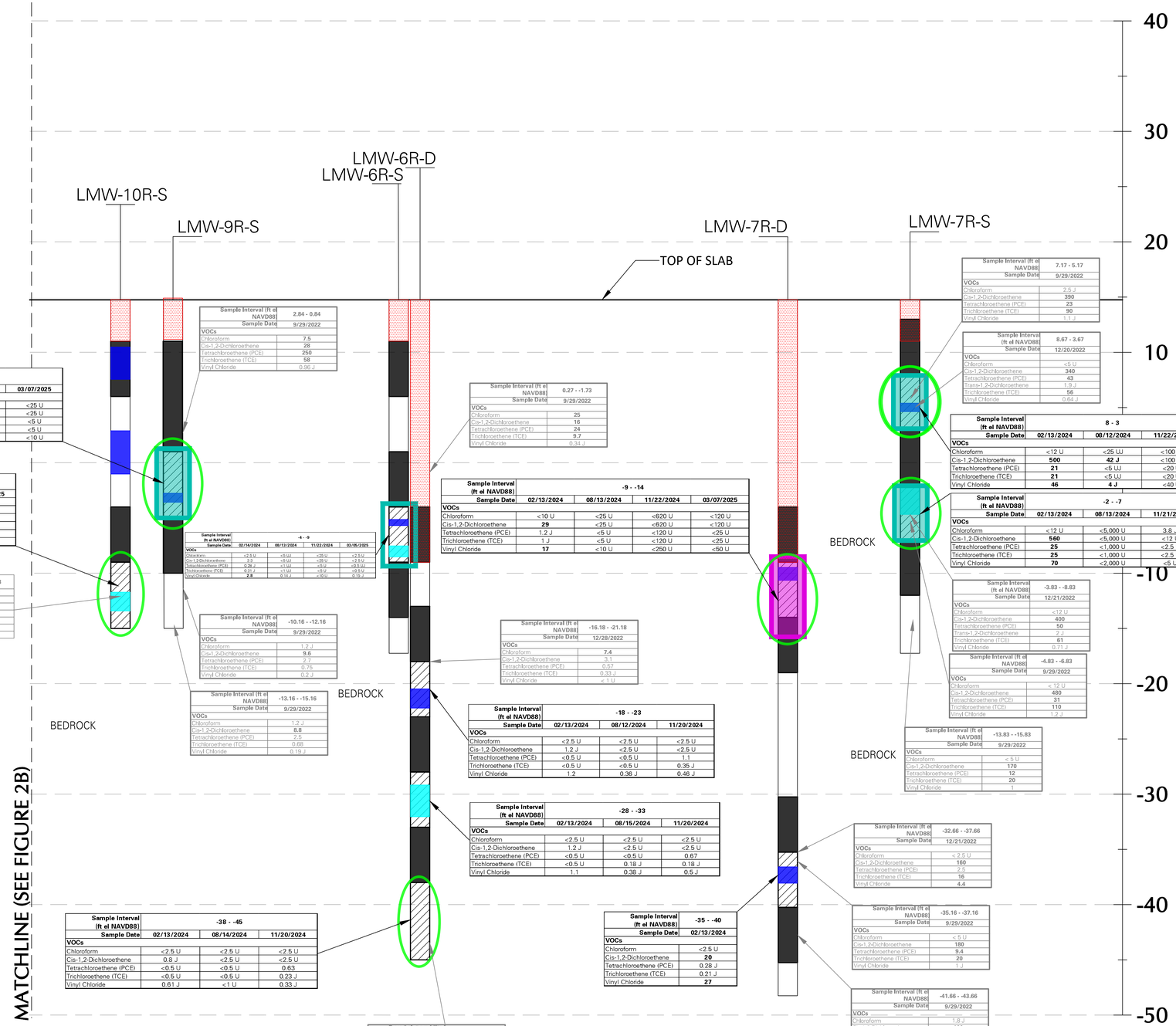
Drawing Title
POST-REMEDIATION CVOC GROUNDWATER ANALYTICAL RESULTS ON SUBSURFACE PROFILE B-B' WEST

| Project No. | Drawing No. |
|---|---|
| 100963701 | 5B |
| Date: 05/30/2025 | |
| Drawn By: AR | |
| Checked By: CR | |

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PROJECT NO. 100963701

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Filename: \\langan.com\data\PAR\data7\100963701\Project Data\ArcGIS\CAD\FG06-100963701-0201-BI201-0101_Monitoring_Report_04-2025.dwg Date: 8/14/2025 Time: 14:04 User: ibaker Style Table: Langan.stb Layout: Figure 2B - Chlorinated VOC Analytical Results




| Sample Interval (ft el NAVD88) | 1 - -5 | | | |
|---|---|---|---|---|
| Sample Date | 02/13/2024 | 08/15/2024 | 11/22/2024 | 03/07/2025 |
| **VOCs** | | | | |
| Chloroform | <2.5 U | <62 U | <120 U | <25 U |
| Cis-1,2-Dichloroethene | <2.5 U | <62 U | <120 U | <25 U |
| Tetrachloroethene (PCE) | 0.2 J | <12 U | <25 U | <5 U |
| Trichloroethene (TCE) | <0.5 U | <12 U | <25 U | <5 U |
| Vinyl Chloride | **4.6** | <25 U | <50 U | <10 U |

| Sample Interval (ft el NAVD88) | -9 - -15 | | | | |
|---|---|---|---|---|---|
| Sample Date | 02/13/2024 | 08/14/2024 | 11/22/2024 | 03/06/2025 | 03/06/2025 |
| **VOCs** | | | | | |
| Chloroform | **13** | <5 U | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | **7.5** | <5 U | 1.5 J | 1.2 J | 1.1 J |
| Tetrachloroethene (PCE) | 0.41 J | <1 U | 0.34 J | 0.2 J | <0.5 U |
| Trichloroethene (TCE) | 0.33 J | <1 U | 0.21 J | 0.33 J | 0.22 J |
| Vinyl Chloride | 1.8 | <2 U | 0.69 J | 0.32 J | <1 UJ |

| Sample Interval (ft el NAVD88) | -9.58 - -14.58 |
|---|---|
| Sample Date | 12/23/2022 |
| VOCs | |
| Chloroform | 2.6 |
| Cis-1,2-Dichloroethene | 18 |
| Tetrachloroethene (PCE) | 2.1 |
| Trichloroethene (TCE) | 1.1 |
| Vinyl Chloride | 0.11 J |

| Sample Interval (ft el NAVD88) | 2.84 - 0.84 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | 7.5 |
| Cis-1,2-Dichloroethene | 28 |
| Tetrachloroethene (PCE) | 250 |
| Trichloroethene (TCE) | 58 |
| Vinyl Chloride | 0.96 J |

| Sample Interval (ft el NAVD88) | -4 - -9 | | | |
|---|---|---|---|---|
| Sample Date | 02/14/2024 | 08/13/2024 | 11/22/2024 | 03/05/2025 |
| VOCs | | | | |
| Chloroform | <2.5 U | <5 U | <25 U | <2.5 U |
| Cis-1,2-Dichloroethene | 3.3 | <5 U | <25 U | <2.5 U |
| Tetrachloroethene (PCE) | 0.29 J | <1 U | <5 U | <0.5 U |
| Trichloroethene (TCE) | 0.31 J | <1 U | <5 U | <0.5 U |
| Vinyl Chloride | **2.8** | 0.14 J | <10 U | 0.19 J |

| Sample Interval (ft el NAVD88) | -10.16 - -12.16 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | 1.2 J |
| Cis-1,2-Dichloroethene | **9.6** |
| Tetrachloroethene (PCE) | 2.7 |
| Trichloroethene (TCE) | 0.75 |
| Vinyl Chloride | 0.2 J |

| Sample Interval (ft el NAVD88) | -13.16 - -15.16 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | 1.2 J |
| Cis-1,2-Dichloroethene | **8.8** |
| Tetrachloroethene (PCE) | 2.5 |
| Trichloroethene (TCE) | 0.68 |
| Vinyl Chloride | 0.19 J |

| Sample Interval (ft el NAVD88) | 0.27 - -1.73 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | 25 |
| Cis-1,2-Dichloroethene | 16 |
| Tetrachloroethene (PCE) | 24 |
| Trichloroethene (TCE) | 9.7 |
| Vinyl Chloride | 0.34 J |

| Sample Interval (ft el NAVD88) | -9 - -14 | | | |
|---|---|---|---|---|
| Sample Date | 02/13/2024 | 08/13/2024 | 11/22/2024 | 03/07/2025 |
| **VOCs** | | | | |
| Chloroform | <10 U | <25 U | <620 U | <120 U |
| Cis-1,2-Dichloroethene | **29** | <25 U | <620 U | <120 U |
| Tetrachloroethene (PCE) | 1.2 J | <5 U | <120 U | <25 U |
| Trichloroethene (TCE) | 1 J | <5 U | <120 U | <25 U |
| Vinyl Chloride | **17** | <10 U | <250 U | <50 U |

| Sample Interval (ft el NAVD88) | -16.18 - -21.18 |
|---|---|
| Sample Date | 12/28/2022 |
| VOCs | |
| Chloroform | **7.4** |
| Cis-1,2-Dichloroethene | 3.1 |
| Tetrachloroethene (PCE) | 0.57 |
| Trichloroethene (TCE) | 0.33 J |
| Vinyl Chloride | < 1 U |

| Sample Interval (ft el NAVD88) | -18 - -23 | | |
|---|---|---|---|
| Sample Date | 02/13/2024 | 08/12/2024 | 11/20/2024 |
| **VOCs** | | | |
| Chloroform | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 1.2 J | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | <0.5 U | <0.5 U | 1.1 |
| Trichloroethene (TCE) | <0.5 U | <0.5 U | 0.35 J |
| Vinyl Chloride | 1.2 | 0.36 J | 0.46 J |

| Sample Interval (ft el NAVD88) | -28 - -33 | | |
|---|---|---|---|
| Sample Date | 02/13/2024 | 08/15/2024 | 11/20/2024 |
| **VOCs** | | | |
| Chloroform | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 1.2 J | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | <0.5 U | <0.5 U | 0.67 |
| Trichloroethene (TCE) | <0.5 U | 0.18 J | 0.18 J |
| Vinyl Chloride | 1.1 | 0.38 J | 0.5 J |

| Sample Interval (ft el NAVD88) | -38 - -45 | | |
|---|---|---|---|
| Sample Date | 02/13/2024 | 08/14/2024 | 11/20/2024 |
| **VOCs** | | | |
| Chloroform | <2.5 U | <2.5 U | <2.5 U |
| Cis-1,2-Dichloroethene | 0.8 J | <2.5 U | <2.5 U |
| Tetrachloroethene (PCE) | <0.5 U | <0.5 U | 0.63 |
| Trichloroethene (TCE) | <0.5 U | <0.5 U | 0.23 J |
| Vinyl Chloride | 0.61 J | <1 U | 0.33 J |

| Sample Interval (ft el NAVD88) | -43.43 - -45.43 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | 55 |
| Cis-1,2-Dichloroethene | 3.8 |
| Tetrachloroethene (PCE) | < 0.5 U |
| Trichloroethene (TCE) | 0.18 J |
| Vinyl Chloride | 0.12 J |

| Sample Interval (ft el NAVD88) | -35 - -40 |
|---|---|
| Sample Date | 02/13/2024 |
| **VOCs** | |
| Chloroform | <2.5 U |
| Cis-1,2-Dichloroethene | **20** |
| Tetrachloroethene (PCE) | 0.28 J |
| Trichloroethene (TCE) | 0.21 J |
| Vinyl Chloride | **27** |

| Sample Interval (ft el NAVD88) | 7.17 - 5.17 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | 2.5 J |
| Cis-1,2-Dichloroethene | **390** |
| Tetrachloroethene (PCE) | **23** |
| Trichloroethene (TCE) | **90** |
| Vinyl Chloride | 1.1 J |

| Sample Interval (ft el NAVD88) | 8.67 - 3.67 |
|---|---|
| Sample Date | 12/20/2022 |
| VOCs | |
| Chloroform | <5 U |
| Cis-1,2-Dichloroethene | **340** |
| Tetrachloroethene (PCE) | **43** |
| Trans-1,2-Dichloroethene | 1.9 J |
| Trichloroethene (TCE) | **56** |
| Vinyl Chloride | 0.64 J |

| Sample Interval (ft el NAVD88) | 8 - 3 | | |
|---|---|---|---|
| Sample Date | 02/13/2024 | 08/12/2024 | 11/22/2024 |
| **VOCs** | | | |
| Chloroform | <12 U | <25 UJ | <100 U |
| Cis-1,2-Dichloroethene | **500** | **42 J** | <100 U |
| Tetrachloroethene (PCE) | **21** | <5 UJ | <20 U |
| Trichloroethene (TCE) | **21** | <5 UJ | <20 U |
| Vinyl Chloride | **46** | **4 J** | <40 U |

| Sample Interval (ft el NAVD88) | -2 - -7 | | |
|---|---|---|---|
| Sample Date | 02/13/2024 | 08/13/2024 | 11/21/2024 |
| **VOCs** | | | |
| Chloroform | <12 U | <5,000 U | 3.8 J |
| Cis-1,2-Dichloroethene | **560** | <5,000 U | <12 U |
| Tetrachloroethene (PCE) | **25** | <1,000 U | <2.5 U |
| Trichloroethene (TCE) | **25** | <1,000 U | <2.5 U |
| Vinyl Chloride | **70** | <2,000 U | <5 U |

| Sample Interval (ft el NAVD88) | -3.83 - -8.83 |
|---|---|
| Sample Date | 12/21/2022 |
| VOCs | |
| Chloroform | <12 U |
| Cis-1,2-Dichloroethene | **400** |
| Tetrachloroethene (PCE) | **50** |
| Trans-1,2-Dichloroethene | 2 J |
| Trichloroethene (TCE) | **61** |
| Vinyl Chloride | 0.71 J |

| Sample Interval (ft el NAVD88) | -4.83 - -6.83 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | < 12 U |
| Cis-1,2-Dichloroethene | **480** |
| Tetrachloroethene (PCE) | **31** |
| Trichloroethene (TCE) | **110** |
| Vinyl Chloride | 1.2 J |

| Sample Interval (ft el NAVD88) | -13.83 - -15.83 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | < 5 U |
| Cis-1,2-Dichloroethene | **170** |
| Tetrachloroethene (PCE) | **12** |
| Trichloroethene (TCE) | **20** |
| Vinyl Chloride | 1 |

| Sample Interval (ft el NAVD88) | -32.66 - -37.66 |
|---|---|
| Sample Date | 12/21/2022 |
| VOCs | |
| Chloroform | < 2.5 U |
| Cis-1,2-Dichloroethene | **160** |
| Tetrachloroethene (PCE) | 2.5 |
| Trichloroethene (TCE) | **16** |
| Vinyl Chloride | **4.4** |

| Sample Interval (ft el NAVD88) | -35.16 - -37.16 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | < 5 U |
| Cis-1,2-Dichloroethene | **180** |
| Tetrachloroethene (PCE) | **9.4** |
| Trichloroethene (TCE) | **20** |
| Vinyl Chloride | 1 J |

| Sample Interval (ft el NAVD88) | -41.66 - -43.66 |
|---|---|
| Sample Date | 9/29/2022 |
| VOCs | |
| Chloroform | 1.8 J |
| Cis-1,2-Dichloroethene | **100** |
| Tetrachloroethene (PCE) | 2.1 |
| Trichloroethene (TCE) | **8.2** |
| Vinyl Chloride | 1 |

## LEGEND:

- GROUNDWATER PRODUCING INTERVAL
- MINOR GROUNDWATER PRODUCING INTERVAL
- PACKER INTERVAL
- MONITORING ZONE
- CASING LENGTH
- PROPOSED PERFORMANCE MONITORING INTERVAL

**EZVI**

- SHALLOW BEDROCK INJECTION INTERVAL
- DEEP BEDROCK INJECTION INTERVAL

**EVO ONLY**

- SHALLOW BEDROCK INJECTION INTERVAL
- DEEP BEDROCK INJECTION INTERVAL

## WELL KEY:

LMW-X

## NOTES:

1. THE ELEVATIONS FOR THE TOP OF SLAB IS TAKEN FROM FO-100.0 FOUNDATION PLAN BY MCNAMARA SALVIA, DATED 7 SEPTEMBER 2022.
2. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, NAVD88, WHICH IS 1.1 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM OF 1929, NGVD29, PER THE UNITED STATES GEOLOGIC SURVEY, USGS.
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# SECTION B-B' EAST

**VERTICAL SCALE: 1" = 5'**
**HORIZONTAL SCALE: N.T.S.**

| Analyte | NYSDEC SGVs |
|---|---|
| **VOCs** | |
| Chloroform | 7 |
| Cis-1,2-Dichloroethene | 5 |
| Tetrachloroethene (PCE) | 5 |
| Trans-1,2-Dichloroethene | 5 |
| Trichloroethene (TCE) | 5 |
| Vinyl Chloride | 2 |

**Exceedance Summary:**

**10** - Result exceeds NYSDEC SGVs

**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, LAND SURVEYOR OR GEOLOGIST, TO ALTER THIS ITEM IN ANY WAY.

6 0 3 6
VERTICAL SCALE: 1 INCH = 6 FEET


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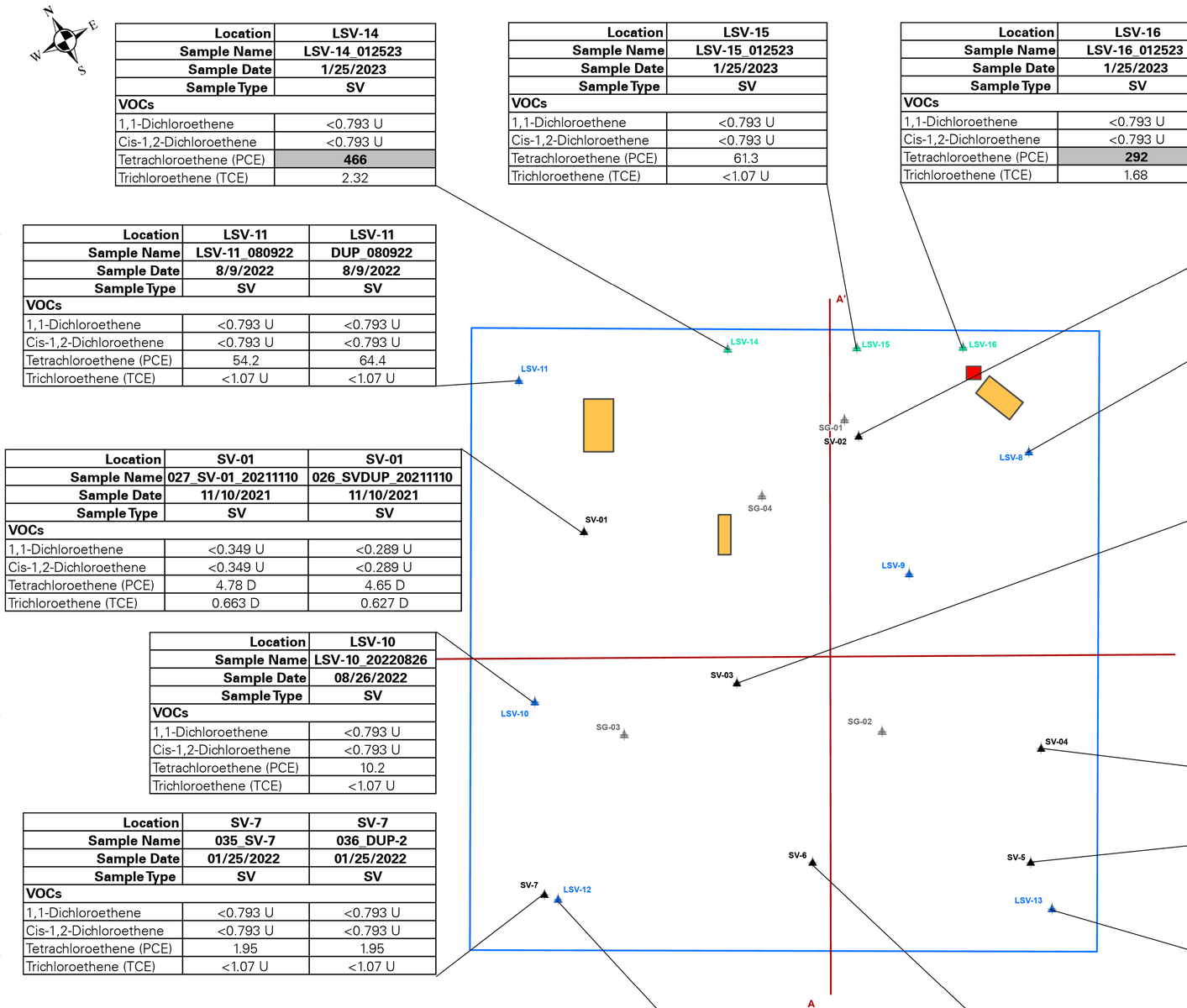
Drawing Title
POST-REMEDIATION CVOC GROUNDWATER ANALYTICAL RESULTS ON SUBSURFACE PROFILE B-B' EAST

| Project No. | Drawing No. |
|---|---|
| 100963701 | 5C |
| Date: 05/30/2025 | |
| Drawn By: AR | |
| Checked By: CR | |

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| Location | LSV-14 |
|---|---|
| Sample Name | LSV-14_012523 |
| Sample Date | 1/25/2023 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U |
| Tetrachloroethene (PCE) | **466** |
| Trichloroethene (TCE) | 2.32 |

| Location | LSV-15 |
|---|---|
| Sample Name | LSV-15_012523 |
| Sample Date | 1/25/2023 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U |
| Tetrachloroethene (PCE) | 61.3 |
| Trichloroethene (TCE) | <1.07 U |

| Location | LSV-16 |
|---|---|
| Sample Name | LSV-16_012523 |
| Sample Date | 1/25/2023 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U |
| Tetrachloroethene (PCE) | **292** |
| Trichloroethene (TCE) | 1.68 |

| Location | SV-02 |
|---|---|
| Sample Name | 025_SV-02_20211110 |
| Sample Date | 11/10/2021 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <3.58 U |
| Cis-1,2-Dichloroethene | **6.44 D** |
| Tetrachloroethene (PCE) | **8,610 D** |
| Trichloroethene (TCE) | **489 D** |

| Location | LSV-11 | LSV-11 |
|---|---|---|
| Sample Name | LSV-11_080922 | DUP_080922 |
| Sample Date | 8/9/2022 | 8/9/2022 |
| Sample Type | SV | SV |
| **VOCs** | | |
| 1,1-Dichloroethene | <0.793 U | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U | <0.793 U |
| Tetrachloroethene (PCE) | 54.2 | 64.4 |
| Trichloroethene (TCE) | <1.07 U | <1.07 U |

| Location | LSV-8 |
|---|---|
| Sample Name | LSV-8_20220826 |
| Sample Date | 08/26/2022 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | **7.97** |
| Cis-1,2-Dichloroethene | **40.8** |
| Tetrachloroethene (PCE) | **339** |
| Trichloroethene (TCE) | **169** |

| Location | SV-01 | SV-01 |
|---|---|---|
| Sample Name | 027_SV-01_20211110 | 026_SVDUP_20211110 |
| Sample Date | 11/10/2021 | 11/10/2021 |
| Sample Type | SV | SV |
| **VOCs** | | |
| 1,1-Dichloroethene | <0.349 U | <0.289 U |
| Cis-1,2-Dichloroethene | <0.349 U | <0.289 U |
| Tetrachloroethene (PCE) | 4.78 D | 4.65 D |
| Trichloroethene (TCE) | 0.663 D | 0.627 D |

| Location | SV-03 |
|---|---|
| Sample Name | 028_SV-03_20211110 |
| Sample Date | 11/10/2021 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <0.382 U |
| Cis-1,2-Dichloroethene | <0.382 U |
| Tetrachloroethene (PCE) | 8.5 D |
| Trichloroethene (TCE) | 0.518 D |

| Location | LSV-10 |
|---|---|
| Sample Name | LSV-10_20220826 |
| Sample Date | 08/26/2022 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U |
| Tetrachloroethene (PCE) | 10.2 |
| Trichloroethene (TCE) | <1.07 U |

| Location | SV-04 |
|---|---|
| Sample Name | 029_SV-04_20211110 |
| Sample Date | 11/10/2021 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <1.2 U |
| Cis-1,2-Dichloroethene | <1.2 U |
| Tetrachloroethene (PCE) | 13.2 D |
| Trichloroethene (TCE) | <0.815 U |

| Location | SV-7 | SV-7 |
|---|---|---|
| Sample Name | 035_SV-7 | 036_DUP-2 |
| Sample Date | 01/25/2022 | 01/25/2022 |
| Sample Type | SV | SV |
| **VOCs** | | |
| 1,1-Dichloroethene | <0.793 U | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U | <0.793 U |
| Tetrachloroethene (PCE) | 1.95 | 1.95 |
| Trichloroethene (TCE) | <1.07 U | <1.07 U |

| Location | SV-5 |
|---|---|
| Sample Name | 033_SV-5 |
| Sample Date | 01/25/2022 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U |
| Tetrachloroethene (PCE) | 3.68 |
| Trichloroethene (TCE) | <1.07 U |

| Location | AA | AA | AA |
|---|---|---|---|
| Sample Name | AA_012523 | AA_080922 | AA_20220826 |
| Sample Date | 1/25/2023 | 8/9/2022 | 8/26/2022 |
| Sample Type | AA | AA | AA |
| **VOCs** | | | |
| 1,1-Dichloroethene | <0.793 U | <0.793 U | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U | <0.793 U | <0.793 U |
| Tetrachloroethene (PCE) | <1.36 U | <1.36 U | <1.36 U |
| Trichloroethene (TCE) | <1.07 U | <1.07 U | <1.07 U |

| Location | LSV-12 |
|---|---|
| Sample Name | LSV-12_080922 |
| Sample Date | 8/9/2022 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U |
| Tetrachloroethene (PCE) | 15.6 |
| Trichloroethene (TCE) | <1.07 U |

| Location | SV-6 |
|---|---|
| Sample Name | 034_SV-6 |
| Sample Date | 01/25/2022 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U |
| Tetrachloroethene (PCE) | 2.62 |
| Trichloroethene (TCE) | <1.07 U |

| Location | LSV-13 |
|---|---|
| Sample Name | LSV-13_080922 |
| Sample Date | 8/9/2022 |
| Sample Type | SV |
| **VOCs** | |
| 1,1-Dichloroethene | <0.793 U |
| Cis-1,2-Dichloroethene | <0.793 U |
| Tetrachloroethene (PCE) | 39.7 |
| Trichloroethene (TCE) | <1.07 U |

## Legend

- SITE BOUNDARY
- AOC-2: FUEL OIL AST LOCATION
- PETROLEUM IMPACTED SOIL LOCATION FROM AST REMOVAL
- CROSS SECTION A-A'
- 2022 RI SOIL VAPOR SAMPLE LOCATION
- 2023 SUPPLEMENTAL SOIL VAPOR SAMPLE LOCATION
- 2021/2022 PHASE II SOIL VAPOR SAMPLE LOCATION (LANGAN)
- 2016 SOIL GAS LOCATION (CIDER)

| Analyte | NYSDOH Decision Matrices Minimum Concentrations |
|---|---|
| **VOCs** | |
| 1,1-Dichloroethene | 6 |
| Cis-1,2-Dichloroethene | 6 |
| Tetrachloroethene (PCE) | 100 |
| Trichloroethene (TCE) | 6 |

**Exceedance Summary:**

**10** - Result exceeds minimum soil vapor concentrations recommending mitigation

**Notes:**
AA - Ambient Air
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).
Ambient air sample analytical results are shown for reference only.

**Qualifiers:**
D - The concentration reported is a result of a diluted sample.
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.

NOTES:
1. SAMPLING LOCATIONS ARE BASED ON FIELD MEASUREMENTS.
2. 2016 SOIL BORING AND SOIL GAS LOCATIONS SAMPLED DURING THE CIDER PHASE II ESA.
3. 2021/2022 SAMPLES LOCATIONS AS PRESENTED IN THE 2022 LANGAN PHASE II ESI REPORT.
4. AOC-4 CONSISTS OF HISTORIC FILL, WHICH IS PRESENT THROUGHOUT THE SITE.

0 10 20
SCALE IN FEET

LANGAN
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NEW JERSEY NEW YORK VIRGINIA CALIFORNIA
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Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

1487 1ST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No. 27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
SOIL VAPOR SAMPLE ANALYTICAL RESULTS

| Project No. | Figure |
|---|---|
| 100963701 | 6 |
| Date: 2/27/2025 | |
| Scale: 1"=10' | |
| Drawn By: IHB | |

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EAST 78TH STREET

FIRST AVENUE

LMW-8R-S
LMW-9R-S
LMW-9R-D
LMW-7R-S
LMW-7R-S
LMW-8R-S
LMW-9R-D
LMW-9R-S
LMW-7R-D
LMW-8R-D
LMW-8R-D
LMW-7R-D
LMW-13R-D
LMW-6R-D
LMW-13R-S
LMW-6R-D
LMW-6R-S
LMW-6R-S

B: 1452
L: 27

B: 1452
L: 32

B: 1452
L: 31

B

B'

LMW-12R-D
LMW-11R-D
LMW-11R-S
LMW-12R-S

LMW-10R-D
LMW-10-RS
LMW-10R-D
LMW-10R-S

B: 1452
L: 19

B: 1452
L: 26

15 0 15
SCALE IN FEET

## LEGEND

- SITE BOUNDARY
- TAX LOT BOUNDARY
- AOC-2: FORMER SOLVENT TANK
- CROSS SECTION
- DEEP BEDROCK WELL RE-INSALLATION LOCATION
- SHALLOW BEDROCK WELL RE-INSALLATION LOCATION
- SHALLOW AND DEEP BEDROCK MONITORING WELLS INSTALLED DURING THE 2022 RI
- PROPOSED PERFORMANCE MONITORING WELLS

NOTES:
1. TAX PARCEL DATA PROVIDED BY THE NEW YORK CITY DEPARTMENT OF CITY PLANNING, MAPPLUTO 23V2.
2. MONITORING WELL LOCATIONS ARE BASED ON THE WELL AS-BUILT SURVEY PREPARED BY TRUE NORTH SURVEYORS, INC. DATED 21 OCTOBER 2022.


LANGAN

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

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400


Project

1487 FIRST AVENUE REDEVELOPMENT SITE

BLOCK No. 1452, LOT No. 27

MANHATTAN

NEW YORK NEW YORK

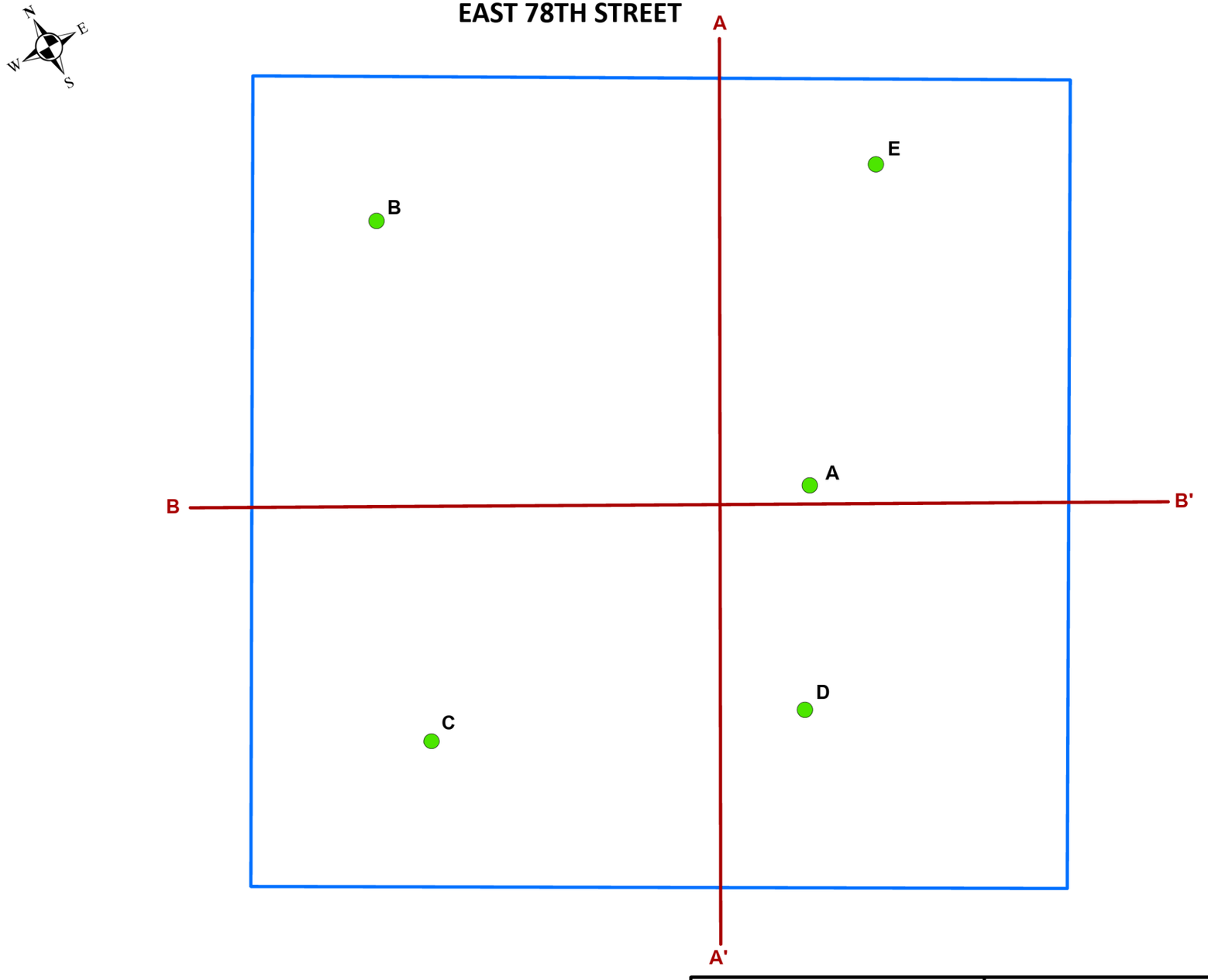
Drawing Title

BEDROCK WELL LOCATION PLAN

| | |
|---|---|
| Project No. 100963701 | Figure 7 |
| Date 8/14/2025 | |
| Scale 1"=15' | |
| Drawn By PDT | |

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Path: \\langan.com\data\PAR\data7\100963701\Project Data\ArcGIS\APRX\100963701\100963701.aprx Date: 8/14/2025 User: ibaker Time: 11:49 AM




## LEGEND

- SITE BOUNDARY
- CROSS SECTION A-A'
- VACUUM MONITORING POINT SLEEVE LOCATIONS

NOTES:
1. SAMPLING LOCATIONS FOR THE MONITORING WELLS INSTALLED AS PART OF THE 2022 RI ARE BASED ON THE WELL AS-BUILT SURVEY PREPARED BY TRUE NORTH SURVEYORS, INC. DATED 21 OCTOBER 2022.
2. 2021/2022 SAMPLES LOCATIONS AS PRESENTED IN THE 2022 LANGAN PHASE II EI REPORT.

15 0 15
SCALE IN FEET

LANGAN
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Parsippany, NJ 07054
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Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
**1487 1ST AVENUE REDEVELOPMENT SITE**
BLOCK No. 1452, LOT No. 27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
**VAPOR INTRUSION EVALUATION MAP**

| | |
|---|---|
| Project No. | 100963701 |
| Date | 2/27/2025 |
| Scale | 1:180 |
| Drawn By | PDT |
| Figure | 8 |

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Path: \\langan.com\data\PAR\data7\100963701\Project Data\ArcGIS\APRX\2024-03 - Monitoring Report\Monitoring Report_2025.aprx Date: 2/27/2025 User: ibaker Time: 3:30 PM

# APPENDIX A

# Environmental Easement

**KEVIN A. ROGERS**
DIRECT DIAL: 646.378.7275
KROGERS@SPRLAW.COM

November 1, 2023

**VIA FEDEX AND FTS**

Environmental Easement Attorney
Bureau of Remediation
Office of General Counsel, 14th Floor
New York State Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233-1500

Re: Brownfield Cleanup Program,
1487 1st Avenue Redevelopment Site, Site No. C231152
Proofs of Recording and Mailing of Municipal Notice of Environmental Easement

Dear Sir or Madam,

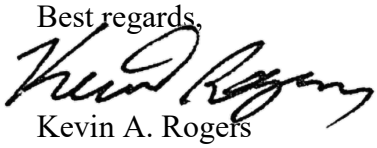
Enclosed please find the following documents that are being submitted to the Department as proofs that the environmental easement for the above-referenced BCP Site has been recorded in the New York City Register and that the Municipal Notice of Environmental Easement has been mailed to the affected local government:

1) Environmental Easement for 1487 1st Avenue, Manhattan, Block 1452, Lot 27, dated October 23, 2023, and recorded in the Office of the City Register of the City of New York ("City Register") on October 31, 2023, as City Register File Number ("CRFN") 2023000282567;
2) Copy of the Municipal Notice of Environmental Easement that was sent via United States Postal Service ("USPS") certified mail, return receipt requested, to New York City Mayor Eric Adams on November 1, 2023;
3) Scanned copy of the USPS certified mailing slip for the Municipal Notice of Environmental Easement sent to Mayor Adams.

Electronic (PDF) copies of the enclosed documents have also been uploaded to the Department's File Transfer Service ("FTS") portal and were directed to Ms. Cheryl Salem of the Office of General Counsel ("OGC"). Additional electronic copies were directly submitted to the Project Attorney, Mr. Kyle Pero, Esq., via email.

Please do not hesitate to contact me if there are any questions or concerns. Thank you for your time and attention to this matter.

Best regards,



Kevin A. Rogers

**NYC DEPARTMENT OF FINANCE**
**OFFICE OF THE CITY REGISTER**

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument.The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.

2023103000510001001E78C8

**RECORDING AND ENDORSEMENT COVER PAGE** **PAGE 1 OF 10**

**Document ID: 2023103000510001** Document Date: 10-23-2023 Preparation Date: 10-30-2023
Document Type: EASEMENT
Document Page Count: 9

**PRESENTER:**
SIVE PAGET & RIESEL, P.C.
560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

**RETURN TO:**
SIVE PAGET & RIESEL, P.C.
560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

**PROPERTY DATA**

| Borough | Block | Lot | Unit | Address |
|---|---|---|---|---|
| MANHATTAN | 1452 | 27 | Entire Lot | 1487 1 AVENUE |

**Property Type:** NON-RESIDENTIAL VACANT LAND Easement

**CROSS REFERENCE DATA**

CRFN_____ *or* DocumentID_____ *or* _____ Year_____ Reel____ Page_____ *or* File Number_____

**PARTIES**

**GRANTOR/SELLER:**
CP VII 78TH STREET OWNER, LLC
C/O: CARMEL PARTNERS, 510 MADISON AVENUE, 8TH FLOOR
NEW YORK, NY 10022

**GRANTEE/BUYER:**
PEOPLE OF NEW YORK BY DEPT. ENVIRONMENTAL CONSERVA
625 BROADWAY
ALBANY, NY 12233

**FEES AND TAXES**

**Mortgage :**

| | | |
|---|---|---|
| Mortgage Amount: | $ | 0.00 |
| Taxable Mortgage Amount: | $ | 0.00 |
| Exemption: | | |
| TAXES: County (Basic): | $ | 0.00 |
| City (Additional): | $ | 0.00 |
| Spec (Additional): | $ | 0.00 |
| TASF: | $ | 0.00 |
| MTA: | $ | 0.00 |
| NYCTA: | $ | 0.00 |
| Additional MRT: | $ | 0.00 |
| TOTAL: | $ | 0.00 |
| Recording Fee: | $ | 82.00 |
| Affidavit Fee: | $ | 0.00 |

Filing Fee: $ 100.00

NYC Real Property Transfer Tax: $ 0.00

NYS Real Estate Transfer Tax: $ 0.00

**RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK**
Recorded/Filed 10-31-2023 16:59
City Register File No.(CRFN): **2023000282567**

*City Register Official Signature*

## ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

**THIS INDENTURE** made this 23rd day of October, 2023 between Owner, CP VII 78th Street Owner, LLC, having an office at 510 Madison Avenue, 8th Floor, New York, NY 10022 (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

**WHEREAS,** the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

**WHEREAS,** the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

**WHEREAS,** the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

**WHEREAS,** Grantor, is the owner of real property located at the address of 1487 1st Avenue, in the City of New York, County of New York and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 1452 Lot 27, being the same as that property conveyed to Grantor by deed dated January 06, 2022, and recorded in the City Register of the City of New York as CRFN # 2022000029939. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.23 +/- acres, and is hereinafter more fully described in the Land Title Survey dated May 25, 2023 prepared by John J. Vida, License No. 050298, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

**WHEREAS**, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is

extinguished pursuant to ECL Article 71, Title 36; and

**NOW THEREFORE**, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C231152-06-22, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

**Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)**

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

**This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation**

**pursuant to Title 36 of Article 71 of the Environmental Conservation Law.**

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C231152
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and

communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

**Remainder of Page Intentionally Left Blank**

**IN WITNESS WHEREOF,** Grantor has caused this instrument to be signed in its name.

CP VII 78th Street Owner, LLC:

By: _____

Print Name: Matthew Feldman

Title: Authorized Signatory Date: 9/28/23

**Grantor's Acknowledgment**

STATE OF NEW YORK )
) ss:
COUNTY OF NY )

On the 28 day of SEPTEMBER, in the year 2023, before me, the undersigned, personally appeared MATTHEW FELDMAN, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

ALLISON KELLER
Notary Public - State of New York
NO. 01KE0005603
Qualified in Queens County
My Commission Expires Apr 14, 2027

**THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK**, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Andrew O. Guglielmi, Director
Division of Environmental Remediation

**Grantee's Acknowledgment**

STATE OF NEW YORK )
) ss:
COUNTY OF ALBANY )

On the 23rd day of October in the year 2023 before me, the undersigned, personally appeared Andrew O. Guglielmi, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

Cheryl A. Salem
Notary Public State of New York
Registration No. 01SA0002177
Qualified in Albany County
My Commission Expires March 3, 2027

## SCHEDULE "A" PROPERTY DESCRIPTION

**BOROUGH OF MANHATTAN, BLOCK: 1452, CURRENT LOT: 27**

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Manhattan, County, City and State of New York, bounded and described as follows:

BEGINNING at the corner formed by the intersection of the southerly side of East 78th Street with the westerly side of 1st Avenue.

RUNNING THENCE southerly along the said westerly line of 1st Avenue, 100.50 feet;

THENCE westerly and parallel with the said southerly side of East 78th Street, 100.00 feet;

THENCE northerly and parallel with the said westerly side of 1st Avenue, 100.50 feet to the said southerly side of East 78th Street.

THENCE easterly along the said southerly side of East 78th Street, 100.00 feet to the point or place of BEGINNING.

Environmental Easement Area: 10,050.00 Sq. Ft / 0.23 Acres±

**KEVIN A. ROGERS**
DIRECT DIAL: 646.378.7275
KROGERS@SPRLAW.COM

November 1, 2023

**VIA CERTIFIED MAIL**

Mayor Eric Adams
City Hall
New York, NY 10007

Re: Notice of Environmental Easement:
1487 1st Avenue Redevelopment Site,
1487 1st Avenue, Manhattan
Block 1452, Lot 27
DEC Site No. C231152

Dear Mayor Eric Adams,

Attached please find a copy of an Environmental Easement granted to the New York State Department of Environmental Conservation ("Department") on October 23, 2023 by CP VII 78th Street Owner, LLC ("Grantor") for property located at 1487 1st Avenue, Block 1452, Lot 27, known as DEC Site No. C231152 and by the DEC Site name, 1487 1st Avenue Redevelopment Site.

This Environmental Easement restricts future use of the above referenced property to restricted-residential, commercial, and industrial uses. Any on-site activity must be done in accordance with the Environmental Easement and Site Management Plan, which is incorporated into the Environmental Easement. Department approval is also required prior to any groundwater use. Article 71, Section 71-3607 of the New York State Environmental Conservation Law requires that:

1. Whenever the Department is granted an Environmental Easement, it shall provide each affected local government with a copy of such Easement and shall also provide a copy of any documents modifying or terminating such Environmental Easement.

2. Whenever an affected local government receives an application for a building permit or any other application affecting land use or development of land that is subject to an Environmental Easement and that may relate to or impact such Easement, the affected local government shall notify the Department and refer such application to the Department. The Department shall evaluate whether the application is consistent with the Environmental Easement, and shall notify the

affected local government of its determination in a timely fashion, considering the time frame for the local government's review of the application. The affected local government shall not approve the application until it receives formal approval from the Department.

An electronic version of every Environmental Easement that has been accepted by the Department is available to the public at: http://www.dec.ny.gov/chemical/36045.html. Please forward this notice to your Building and/or Planning Departments, as applicable, to ensure your compliance with the provisions of the New York State Environmental Conservation Law. If you have any questions or comments regarding this matter, please do not hesitate to contact me.

Best regards,

Kevin A. Rogers

Enclosure

7019 2280 0001 0227 1747

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**CERTIFIED MAIL® RECEIPT**
*Domestic Mail Only*

For delivery information, visit our website at *www.usps.com®*.

OFFICIAL USE

Certified Mail Fee
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Extra Services & Fees *(check box, add fee as appropriate)*
- ☐ Return Receipt (hardcopy) $
- ☐ Return Receipt (electronic) $
- ☐ Certified Mail Restricted Delivery $
- ☐ Adult Signature Required $
- ☐ Adult Signature Restricted Delivery $

Postage
$

**Total Postage and Fees**
$

Postmark Here

*Sent To* MAYOR ERIC ADAMS
*Street and Apt. No., or PO Box No.* CITY HALL
*City, State, ZIP+4®* NEW YORK CITY, N.Y. 10007

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

# APPENDIX B

# List of Site Contacts

# LIST OF SITE CONTACTS

1487 1ST AVENUE REDEVELOPMENT SITE, NEW YORK, NEW YORK
BROWNFIELD CLEANUP PROGRAM SITE NO. C231152

Key contacts for this project are as follows:

| | |
|---|---|
| Site Owner and Remedial Party: | CP VII 78th Street Owner, LLC<br>Matthew Feldman<br>Telephone: (212) 202-5794<br>E-mail: 78thstreet@carmelpartners.com |
| Remedial Party's Consultant: | Langan Engineering Project Manager<br>Amanda Forsburg, CHMM<br>Telephone: (973) 560-4900<br>E-mail: aforsburg@langan.com<br><br>Langan Engineering Remedial Engineer<br>Stewart Abrams, P.E.<br>Telephone: (609) 282-8000<br>E-mail: sabrams@langan.com<br><br>Langan Engineering Health & Safety Officer<br>Tony Moffa<br>Telephone: (215) 756-2523<br>E-mail: tmoffa@langan.com<br><br>Langan Engineering Field Safety Officer<br>Ashley Sandve<br>Telephone: (973) 560-4900<br>E-mail: asandve@langan.com |
| Qualified Environmental Professional: | Langan Engineering Project Manager<br>Steve Ciambruschini, P.G.<br>Telephone: (973) 560-4900<br>E-mail: sciambruschini@langan.com |

| | |
|---|---|
| NYSDEC: | NYSDEC Section Chief<br>Ms. Sarah Quandt<br>Telephone: (518) 402-9116<br>E-mail: sarah.quandt@dec.ny.gov<br><br>NYSDEC Project Manager<br>Mr. Daniel Nierenberg<br>Telephone: (518) 402-9554<br>E-mail: daniel.nierenberg@dec.ny.gov<br><br>NYSDEC Site Control<br>Ms. Kelly Lewandowski<br>Telephone: (518) 402-0193<br>E-mail: kelly.lewandowski@dec.ny.gov |
| NYSDOH: | NYSDOH Project Manager<br>Mr. Johnathan Robinson<br>Telephone: (518) 402-7881<br>Email: beei@health.ny.gov |
| Remedial Party's Attorney: | Sive, Paget & Riesel, PC<br>Mr. Michael Bogin<br>Telephone: (646) 378-7210<br>E-mail: mbogin@sprlaw.com |

# APPENDIX C

# Boring Logs

# LANGAN

Log of Boring **LMW-6R-D** Sheet 1 of 4

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/25/2022 / Date Finished: 08/31/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 82.5 ft / Rock Depth: 20 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 7 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 50 | Water Level (ft.): First ▽ - / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: David Pacheco |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) +30.1 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Four-inch steel casing was driven to a depth of 41.5 feet below ground surface (approximately 47.5 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |

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Log of Boring **LMW-6R-D** Sheet 2 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) +10.1 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 | | | | | | |

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# LANGAN

Log of Boring **LMW-6R-D** Sheet 3 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -14.9 | | | 45 | | | | | | Begin rock coring at 41.5 feet below ground surface (approximately 47.5 feet below sidewalk level). |
| | | | | 46 | | | | | | |
| | | | | 47 | | | | | | |
| | -17.4 | Gray SCHIST; very close to moderate fracture spacing; rock quality good; [BEDROCK] | 6:40 | 48 | C-1 | NX Core | REC=56"/60" =93% | RQD=44"/60" =73% | | |
| | | | 4:18 | 49 | | | | | | |
| | | | 4:21 | 50 | | | | | | |
| | | | 5:40 | 51 | | | | | | |
| | | | 8:51 | 52 | | | | | | |
| | -22.4 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 4:14 | 53 | C-2 | NX Core | REC=58"/60" =97% | RQD=51"/60" =85% | | |
| | | | 6:20 | 54 | | | | | | |
| | | | 4:43 | 55 | | | | | | |
| | | | 5:49 | 56 | | | | | | |
| | | | 7:10 | 57 | | | | | | |
| | -27.4 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 5:54 | 58 | C-3 | NX Core | REC=60"/60" =100% | RQD=52"/60" =87% | | |
| | | | 5:36 | 59 | | | | | | |
| | | | 5:09 | 60 | | | | | | |
| | | | 5:38 | 61 | | | | | | |
| | | | 5:54 | 62 | | | | | | |
| | -32.4 | Gray SCHIST; very close to close fracture spacing; rock quality fair; [BEDROCK] | 15:31 | 63 | C-4 | NX Core | REC=49"/60" =82% | RQD=28"/60" =47% | | |
| | | | 11:22 | 64 | | | | | | |
| | | | 7:07 | 65 | | | | | | |
| | | | 7:47 | 66 | | | | | | |
| | | | 6:23 | 67 | | | | | | |
| | -37.4 | Gray SCHIST; close to wide fracture spacing; rock quality excellent; [BEDROCK] | 5:24 | 68 | C-5 | NX Core | REC=60"/60" =100% | RQD=55"/60" =92% | | |
| | | | 5:37 | 69 | | | | | | |
| | | | | 70 | | | | | | |

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# LANGAN

Log of Boring **LMW-6R-D** Sheet 4 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -39.9 | | 4:47 | 70 | | | | | 10 20 30 40 | |
| | | | 4:03 | 71 | C-5 | NX Core | | | | |
| | | | 4:53 | 72 | | | | | | |
| | -42.4 | Gray SCHIST; very close to moderate fracture spacing; rock quality good; [BEDROCK] | 6:49 | 73 | C-6 | NX Core | REC=55"/60" =92% | RQD=43"/60" =72% | | |
| | | | 4:10 | 74 | | | | | | |
| | | | 4:17 | 75 | | | | | | |
| | | | 4:59 | 76 | | | | | | |
| | | | 4:55 | 77 | | | | | | |
| | -47.4 | Gray SCHIST; very close to close fracture spacing; rock quality fair; [BEDROCK] | 8:01 | 78 | C-7 | NX Core | REC=60"/60" =100% | RQD=20"/60" =33% | | |
| | | | 5:05 | 79 | | | | | | |
| | | | 4:09 | 80 | | | | | | |
| | | | 4:04 | 81 | | | | | | |
| | | | 4:58 | 82 | | | | | | |
| | -52.4 | | | 83 | | | | | | Bottom of boring at 76.5 feet below ground surface (approximately 82.5 feet below sidewalk level). |
| | | | | 84 | | | | | | |
| | | | | 85 | | | | | | |
| | | | | 86 | | | | | | |
| | | | | 87 | | | | | | |
| | | | | 88 | | | | | | |
| | | | | 89 | | | | | | |
| | | | | 90 | | | | | | |
| | | | | 91 | | | | | | |
| | | | | 92 | | | | | | |
| | | | | 93 | | | | | | |
| | | | | 94 | | | | | | |
| | | | | 95 | | | | | | |

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# LANGAN

Log of Boring **LMW-6R-S** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/24/2022 / Date Finished: 08/24/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 50.7 ft / Rock Depth: 20 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 6 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 22 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: David Pacheco |
| Sampler: -- | Field Engineer: Andres Valenzuela Navarrete |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) +30.5 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Four-inch steel casing was driven to a depth of 16 feet below ground surface (approximately 22 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |

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Log of Boring **LMW-6R-S** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +10.5 | | | 20 | | | | | | Begin rock coring at 16 feet below ground surface (approximately 22 feet below sidwalk level). |
| | | | | 21 | | | | | | |
| | +8.5 | Gray SCHIST; extremely close to close fracture spacing; rock quality poor; [BEDROCK] | 7:14 | 22 | C-1 | NX Core | REC=28"/60" =47% | RQD=12.5"/60" =21% | | |
| | | | 8:57 | 23 | | | | | | |
| | | | 5:06 | 24 | | | | | | |
| | | | 6:04 | 25 | | | | | | |
| | | | 7:51 | 26 | | | | | | |
| | +3.5 | Gray SCHIST; very close to close fracture spacing; rock quality poor; [BEDROCK] | 6:33 | 27 | C-2 | NX Core | REC=43"/60" =72% | RQD=8"/60" =13% | | |
| | | | 6:02 | 28 | | | | | | |
| | | | 8:57 | 29 | | | | | | |
| | | | 10:06 | 30 | | | | | | |
| | | | 5:44 | 31 | | | | | | |
| | -1.5 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 3:50 | 32 | C-3 | NX Core | REC=54"/60" =90% | RQD=50"/60" =83% | | |
| | | | 4:24 | 33 | | | | | | |
| | | | 3:09 | 34 | | | | | | |
| | | | 3:28 | 35 | | | | | | |
| | | | 3:32 | 36 | | | | | | |
| | -6.5 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 3:53 | 37 | C-4 | NX Core | REC=50"/60" =83% | RQD=49"/60" =82% | | |
| | | | 4:26 | 38 | | | | | | |
| | | | 4:24 | 39 | | | | | | |
| | | | 7:27 | 40 | | | | | | |
| | | | 4:50 | 41 | | | | | | |
| | -11.5 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 3:17 | 42 | C-5 | NX Core | REC=59"/60" =98% | RQD=54"/60" =90% | | |
| | | | 4:42 | 43 | | | | | | |
| | | | 4:16 | 44 | | | | | | |
| | | | | 45 | | | | | | |

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Log of Boring **LMW-6R-S** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -14.5 | | 4:29 | 45 | C-5 | NX Core | | | | |
| | | | 4:44 | 46 | | | | | | |
| | -16.5 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 3:18 | 47 | C-6 | NX Core | REC=94% | RQD=78% | | |
| | | | 5:17 | 48 | | | | | | |
| | | | 3:41 | 49 | | | | | | |
| | -19.5 | | | 50 | | | | | | Bottom of boring at 44 feet below ground surface (approxiamtely 50 feet below sidewalk level). |
| | | | | 51 | | | | | | |
| | | | | 52 | | | | | | |
| | | | | 53 | | | | | | |
| | | | | 54 | | | | | | |
| | | | | 55 | | | | | | |
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| | | | | 61 | | | | | | |
| | | | | 62 | | | | | | |
| | | | | 63 | | | | | | |
| | | | | 64 | | | | | | |
| | | | | 65 | | | | | | |
| | | | | 66 | | | | | | |
| | | | | 67 | | | | | | |
| | | | | 68 | | | | | | |
| | | | | 69 | | | | | | |
| | | | | 70 | | | | | | |

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Log of Boring **LMW-7R-D** Sheet 1 of 4

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/12/2022 / Date Finished: 08/12/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 83.8 ft / Rock Depth: 20 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 7 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 48 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +32.3 | Four-inch steel casing was driven to a depth of 44 feet below ground surface (approximately 48 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 4 feet bsl due to the grade of the site. |

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Log of Boring **LMW-7R-D** Sheet 2 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) +12.3 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 | | | | | | |

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# LANGAN

Log of Boring **LMW-7R-D** Sheet 3 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | -12.7 | | | 45 | | | | | | (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
| | | | | 46 | | | | | | |
| | | | | 47 | | | | | | |
| | -15.7 | Gray SCHIST; very close to close fracture spacing; rock quality poor; [BEDROCK] | 3:59 | 48 | C-1 | NX Core | REC=39"/60" =65% | RQD=11"/60" =18% | | Begin rock coring at 44 feet below ground surface (approximately 48 feet below sidewalk level). |
| | | | 5:04 | 49 | | | | | | |
| | | | 4:05 | 50 | | | | | | |
| | | | 8:13 | 51 | | | | | | |
| | | | 6:40 | 52 | | | | | | |
| | -20.7 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 3:45 | 53 | C-2 | NX Core | REC=60"/60" =100% | RQD=56"/60" =93% | | |
| | | | 4:12 | 54 | | | | | | |
| | | | 2:02 | 55 | | | | | | |
| | | | 5:03 | 56 | | | | | | |
| | | | 2:39 | 57 | | | | | | |
| | -25.7 | Gray SCHIST; very close to close fracture spacing; rock quality fair; [BEDROCK] | 6:04 | 58 | C-3 | NX Core | REC=60"/60" =100% | RQD=18"/60" =30% | | |
| | | | 6:26 | 59 | | | | | | |
| | | | 5:09 | 60 | | | | | | |
| | | | 3:59 | 61 | | | | | | |
| | | | 4:04 | 62 | | | | | | |
| | -30.7 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 3:42 | 63 | C-4 | NX Core | REC=60"/60" =100% | RQD=56"/60" =93% | | |
| | | | 3:41 | 64 | | | | | | |
| | | | 3:49 | 65 | | | | | | |
| | | | 3:20 | 66 | | | | | | |
| | | | 2:10 | 67 | | | | | | |
| | -35.7 | Gray SCHIST; very close to wide fracture spacing; rock quality good; [BEDROCK] | 4:12 | 68 | C-5 | NX Core | | | | |
| | | | 3:09 | 69 | | | | | | |
| | | | | 70 | | | | | | |

N-Value (Blows/ft) scale: 10 20 30 40

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Log of Boring **LMW-7R-D** Sheet 4 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -37.7 | | 3:27 | 70 | C-5 | NX Core | REC=60"/60" =100% | RQD=41"/60" =68% | | |
| | | | 4:53 | 71 | | | | | | |
| | | | 13:24 | 72 | | | | | | |
| | -40.7 | Gray SCHIST; very close to wide fracture spacing; rock quality excellent; [BEDROCK] | 5:13 | 73 | C-6 | NX Core | REC=60"/60" =100% | RQD=53"/60" =88% | | |
| | | | 3:44 | 74 | | | | | | |
| | | | 2:55 | 75 | | | | | | |
| | | | 1:47 | 76 | | | | | | |
| | | | 2:30 | 77 | | | | | | |
| | -45.7 | Gray SCHIST; very close to moderate fracture spacing; rock quality good; [BEDROCK] | 4:05 | 78 | C-7 | NX Core | REC=60"/60" =100% | RQD=41"/60" =68% | | |
| | | | 4:18 | 79 | | | | | | Bottom of boring at 79 feet below ground surface (approximately 83 feet below sidewalk level). |
| | | | 2:18 | 80 | | | | | | |
| | | | 1:46 | 81 | | | | | | |
| | | | 3:28 | 82 | | | | | | |
| | -50.7 | | | 83 | | | | | | |
| | | | | 84 | | | | | | |
| | | | | 85 | | | | | | |
| | | | | 86 | | | | | | |
| | | | | 87 | | | | | | |
| | | | | 88 | | | | | | |
| | | | | 89 | | | | | | |
| | | | | 90 | | | | | | |
| | | | | 91 | | | | | | |
| | | | | 92 | | | | | | |
| | | | | 93 | | | | | | |
| | | | | 94 | | | | | | |
| | | | | 95 | | | | | | |

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Log of Boring **LMW-7R-S** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/11/2022 / Date Finished: 08/15/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 52 ft / Rock Depth: 20 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 7 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 22 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) +33.0 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Four-inch steel casing was driven to a depth of 18 feet below ground surface (approximately 22 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 4 feet bsl due to the grade of the site. |

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Log of Boring **LMW-7R-S** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +13.0 | | | 20 | | | | | | |
| | | | | 21 | | | | | | |
| | +11.0 | Gray SCHIST; extremely close to close fracture spacing; rock quality very poor; [BEDROCK] | 5:09 | 22 | C-1 | NX Core | REC=25% | RQD=0% | | Begin rock coring at 18 feet below ground surface (approximately 22 feet below sidewalk level). |
| | | | 9:33 | 23 | | | | | | |
| | | | 7:18 | 24 | | | | | | |
| | +8.0 | Gray SCHIST; extremely close to close fracture spacing; rock quality very poor; [BEDROCK] | 10:35 | 25 | C-2 | NX Core | REC=75% | RQD=0% | | |
| | | | 5:48 | 26 | | | | | | |
| | +6.0 | Gray SCHIST; very close to close fracture spacing; rock quality fair; [BEDROCK] | 4:06 | 27 | C-3 | NX Core | REC=50"/60" =83% | RQD=27"/60" =45% | | |
| | | | 3:53 | 28 | | | | | | |
| | | | 8:39 | 29 | | | | | | |
| | | | 9:16 | 30 | | | | | | |
| | | | 9:09 | 31 | | | | | | |
| | +1.0 | Gray SCHIST; very close to close fracture spacing; rock quality fair; [BEDROCK] | 4:36 | 32 | C-4 | NX Core | REC=60"/60" =100% | RQD=18"/60" =30% | | |
| | | | 12:31 | 33 | | | | | | |
| | | | 10:21 | 34 | | | | | | |
| | | | 9:32 | 35 | | | | | | |
| | | | 7:33 | 36 | | | | | | |
| | -4.0 | Gray SCHIST; very close to close fracture spacing; rock quality poor; [BEDROCK] | 6:10 | 37 | C-5 | NX Core | REC=54"/60" =90% | RQD=8"/60" =13% | | |
| | | | 5:11 | 38 | | | | | | |
| | | | 3:57 | 39 | | | | | | |
| | | | 4:52 | 40 | | | | | | |
| | | | 3:05 | 41 | | | | | | |
| | -9.0 | Gray SCHIST; very close to moderate fracture spacing; rock quality fair; [BEDROCK] | 7:20 | 42 | C-6 | NX Core | REC=52"/60" =87% | RQD=24"/60" =40% | | |
| | | | 4:46 | 43 | | | | | | |
| | | | 4:21 | 44 | | | | | | |
| | | | | 45 | | | | | | |

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Log of Boring **LMW-7R-S** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -12.0 | | 2:47 | 45 | C-6 | NX Core | | | 10 20 30 40 | |
| | | | 2:52 | 46 | | | | | | |
| | -14.0 | Gray SCHIST; very close to close fracture spacing; rock quality very poor; [BEDROCK] | 5:13 | 47 | C-7 | NX Core | REC=60"/60" =100% | RQD=0"/60" =0% | | |
| | | | 5:09 | 48 | | | | | | |
| | | | 5:37 | 49 | | | | | | |
| | | | 5:46 | 50 | | | | | | |
| | | | 8:27 | 51 | | | | | | |
| | -19.0 | | | 52 | | | | | | Bottom of boring at 48 feet below ground surface (approximately 52 feet below sidewalk level). |
| | | | | 53 | | | | | | |
| | | | | 54 | | | | | | |
| | | | | 55 | | | | | | |
| | | | | 56 | | | | | | |
| | | | | 57 | | | | | | |
| | | | | 58 | | | | | | |
| | | | | 59 | | | | | | |
| | | | | 60 | | | | | | |
| | | | | 61 | | | | | | |
| | | | | 62 | | | | | | |
| | | | | 63 | | | | | | |
| | | | | 64 | | | | | | |
| | | | | 65 | | | | | | |
| | | | | 66 | | | | | | |
| | | | | 67 | | | | | | |
| | | | | 68 | | | | | | |
| | | | | 69 | | | | | | |
| | | | | 70 | | | | | | |

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Log of Boring **LMW-8R-D** Sheet 1 of 4

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/17/2022 / Date Finished: 08/19/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 87 ft / Rock Depth: 17 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 7 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 52 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +31.2 | Four-inch steel casing was driven to a depth of 46 feet below ground surace (approximately 52 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |

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Log of Boring **LMW-8R-D** Sheet 2 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) +11.2 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 | | | | | | |

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Log of Boring **LMW-8R-D** Sheet 3 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -13.8 | | | 45 | | | | | | |
| | | | | 46 | | | | | | |
| | | | | 47 | | | | | | |
| | | | | 48 | | | | | | |
| | | | | 49 | | | | | | |
| | | | | 50 | | | | | | |
| | | | | 51 | | | | | | |
| | -20.8 | Gray SCHIST; extremely close to close fracture spacing; rock quality poor; [BEDROCK] | 5:40 | 52 | C-1 | NX Core | REC=54"/60" =90% | RQD=10"/60" =17% | | Begin rock coring at 46 feet below ground surface (approximately 52 feet below sidewalk level). |
| | | | 7:37 | 53 | | | | | | |
| | | | 4:44 | 54 | | | | | | |
| | | | 6:52 | 55 | | | | | | |
| | | | 3:45 | 56 | | | | | | |
| | -25.8 | Gray SCHIST; very close to moderate fracture spacing; rock quality good; [BEDROCK] | 4:56 | 57 | C-2 | NX Core | REC=60"/60" =100% | RQD=41"/60" =68% | | |
| | | | 3:53 | 58 | | | | | | |
| | | | 2:52 | 59 | | | | | | |
| | | | 3:04 | 60 | | | | | | |
| | | | 3:46 | 61 | | | | | | |
| | -30.8 | Gray SCHIST; extremely close to moderate fracture spacing; rock quality fair; [BEDROCK] | 2:13 | 62 | C-3 | NX Core | REC=56"/60" =93% | RQD=16"/60" =27% | | |
| | | | 3:48 | 63 | | | | | | |
| | | | 3:04 | 64 | | | | | | |
| | | | 2:47 | 65 | | | | | | |
| | | | 4:11 | 66 | | | | | | |
| | -35.8 | Gray SCHIST; extremely close to moderate fracture spacing; rock quality good; [BEDROCK] | 3:51 | 67 | C-4 | NX Core | REC=60"/60" =100% | RQD=35"/60" =58% | | |
| | | | 3:26 | 68 | | | | | | |
| | | | 2:52 | 69 | | | | | | |
| | | | | 70 | | | | | | |

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Log of Boring **LMW-8R-D** Sheet 4 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -38.8 | | 2:20 | 70 | C-4 | NX Core | | | | |
| | | | 3:30 | 71 | | | | | | |
| | -40.8 | Gray SCHIST; very close to moderate fracture spacing; rock quality fair; [BEDROCK] | 18:48 | 72 | C-5 | NX Core | REC=54"/60" =90% | RQD=21"/60" =35% | | |
| | | | 21:49 | 73 | | | | | | |
| | | | 5:39 | 74 | | | | | | |
| | | | 7:36 | 75 | | | | | | |
| | | | 5:47 | 76 | | | | | | |
| | -45.8 | Gray SCHIST; close to wide fracture spacing; rock quality excellent; [BEDROCK] | 5:31 | 77 | C-6 | NX Core | REC=60"/60" =100% | RQD=56"/60" =93% | | |
| | | | 6:16 | 78 | | | | | | |
| | | | 5:19 | 79 | | | | | | |
| | | | 5:36 | 80 | | | | | | |
| | | | 6:56 | 81 | | | | | | |
| | -50.8 | Gray SCHIST; very close to close fracture spacing; rock quality fair; [BEDROCK] | 8:42 | 82 | C-7 | NX Core | REC=54"/60" =90% | RQD=21"/60" =35% | | |
| | | | 6:27 | 83 | | | | | | |
| | | | 3:53 | 84 | | | | | | |
| | | | 6:10 | 85 | | | | | | |
| | | | 6:04 | 86 | | | | | | |
| | -55.8 | | | 87 | | | | | | Bottom of boring at 81 feet below ground surface (approximately 87 feet below sidewalk level). |
| | | | | 88 | | | | | | |
| | | | | 89 | | | | | | |
| | | | | 90 | | | | | | |
| | | | | 91 | | | | | | |
| | | | | 92 | | | | | | |
| | | | | 93 | | | | | | |
| | | | | 94 | | | | | | |
| | | | | 95 | | | | | | |

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# LANGAN

Log of Boring **LMW-8R-S** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/16/2022 / Date Finished: 08/18/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 49.7 ft / Rock Depth: 17 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 6 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 19 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +31.2 | Four-inch steel casing was driven to a depth of 13 feet below ground surface (approximately 19 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |
| | +12.2 | Gray SCHIST; close to moderate fracture spacing; rock quality fair; [BEDROCK] | | 19 | C-1 | NX Core | | | | Begin rock coring at 13 feet below ground surface (appriximately 19 feet below sidewalk level). |

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Log of Boring **LMW-8R-S** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +11.2 | | | 20 | | | | | 10 20 30 40 | |
| | | | | 21 | | | | | | |
| | | | | 22 | C-1 | NX Core | REC=45.6"/60" =76% | RQD=16"/60" =27% | | |
| | | | | 23 | | | | | | |
| | +7.2 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | | 24 | | | | | | |
| | | | | 25 | | | | | | |
| | | | | 26 | C-2 | NX Core | REC=54"/60" =90% | RQD=45"/60" =75% | | |
| | | | | 27 | | | | | | |
| | | | | 28 | | | | | | |
| | +2.2 | Gray SCHIST; extremely close to close fracture spacing; rock quality fair; [BEDROCK] | 5:05 | 29 | | | | | | |
| | | | 4:33 | 30 | | | | | | |
| | | | 4:11 | 31 | C-3 | NX Core | REC=32"/60" =53% | RQD=18"/60" =30% | | |
| | | | 4:08 | 32 | | | | | | |
| | | | 10:59 | 33 | | | | | | |
| | -2.8 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 7:56 | 34 | | | | | | |
| | | | 5:22 | 35 | | | | | | |
| | | | 3:07 | 36 | C-4 | NX Core | REC=58"/60" =97% | RQD=55"/60" =92% | | |
| | | | 4:20 | 37 | | | | | | |
| | | | 3:21 | 38 | | | | | | |
| | -7.8 | Gray SCHIST; extremely close to close fracture spacing; rock quality poor; [BEDROCK] | 3:08 | 39 | | | | | | |
| | | | 2:55 | 40 | | | | | | |
| | | | 3:01 | 41 | C-5 | NX Core | REC=60"/60" =100% | RQD=9"/60" =15% | | |
| | | | 3:47 | 42 | | | | | | |
| | | | 4:02 | 43 | | | | | | |
| | -12.8 | Gray SCHIST; close to moderate fracture spacing; rock quality fair; [BEDROCK] | 3:03 | 44 | C-6 | NX Core | | | | |
| | | | | 45 | | | | | | |

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Log of Boring **LMW-8R-S** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -13.8 | | 4:47 | 45 | C-6 | NX Core | REC=60"/60" =100% | RQD=23"/60" =38% | 10 20 30 40 | |
| | | | 3:54 | 46 | | | | | | |
| | | | 4:50 | 47 | | | | | | |
| | | | 3:24 | 48 | | | | | | |
| | -17.8 | | | 49 | | | | | | Bottom of boring at 43 feet below ground surface (approximately 49 feet below sidewalk level). |
| | | | | 50 | | | | | | |
| | | | | 51 | | | | | | |
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Log of Boring **LMW-9R-D** Sheet 1 of 4

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/15/2022 / Date Finished: 08/17/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 83 ft / Rock Depth: 17 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 7 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 46 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: David Pacheco |
| Sampler: -- | Field Engineer: Maye Yassin |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +32.7 | Four-inch steel casing was driven to a depth of 42 feet below ground surface (approximately 48 feet below sidewalk level [bs]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |

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Log of Boring **LMW-9R-D** Sheet 2 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) +12.7 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 | | | | | | |

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Log of Boring **LMW-9R-D** Sheet 3 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -12.3 | | | 45 | | | | | 10 20 30 40 | |
| | -13.3 | | | 46 | | | | | | |
| | | | | 47 | | | | | | |
| | | Gray SCHIST; very close to close fracture spacing; rock quality good | 4:27 | 48 | C-1 | NX Core | REC=56"/60" =93% | RQD=34"/60" =57% | | Begin rock coring at 42 feet below ground surface (approximately 48 feet below sidewalk level). |
| | | | 2:56 | 49 | | | | | | |
| | | | 3:00 | 50 | | | | | | |
| | | | 4:04 | 51 | | | | | | |
| | | | 3:33 | 52 | | | | | | |
| | -20.3 | Gray SCHIST; very close to close fracture spacing; rock quality good | 3:13 | 53 | C-2 | NX Core | REC=55.5"/60" =93% | RQD=33"/60" =55% | | |
| | | | 4:26 | 54 | | | | | | |
| | | | 5:15 | 55 | | | | | | |
| | | | 3:25 | 56 | | | | | | |
| | | | 3:55 | 57 | | | | | | |
| | -25.3 | Gray SCHIST; very close to moderate fracture spacing; rock quality good | 4:41 | 58 | C-3 | NX Core | REC=60"/60" =100% | RQD=41"/60" =68% | | |
| | | | 3:19 | 59 | | | | | | |
| | | | 3:37 | 60 | | | | | | |
| | | | 3:25 | 61 | | | | | | |
| | | | 3:25 | 62 | | | | | | |
| | -30.3 | Gray SCHIST; extremely close to close fracture spacing; rock quality very poor | 3:47 | 63 | C-4 | NX Core | REC=27.5"/60" =46% | RQD=0"/60" =0% | | |
| | | | 4:17 | 64 | | | | | | |
| | | | 3:27 | 65 | | | | | | |
| | | | 3:33 | 66 | | | | | | |
| | | | 4:30 | 67 | | | | | | |
| | -35.3 | Gray SCHIST; close to moderate fracture spacing; rock quality good | 3:13 | 68 | C-5 | NX Core | | | | |
| | | | 3:25 | 69 | | | | | | |
| | | | | 70 | | | | | | |

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Log of Boring **LMW-9R-D** Sheet 4 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -37.3 | | 3:39 | 70 | C-5 | NX Core | REC=58"/60" =97% | RQD=36"/60" =60% | | |
| | | | 3:14 | 71 | | | | | | |
| | | | 5:01 | 72 | | | | | | |
| | -40.3 | Gray SCHIST; very close to moderate fracture spacing; rock quality fair | 4:26 | 73 | C-6 | NX Core | REC=58.5"/60" =98% | RQD=24"/60" =40% | | |
| | | | 3:32 | 74 | | | | | | |
| | | | 4:51 | 75 | | | | | | |
| | | | 4:33 | 76 | | | | | | |
| | | | 4:37 | 77 | | | | | | |
| | -45.3 | Gray SCHIST; very close to moderate fracture spacing; rock quality good | 4:09 | 78 | C-7 | NX Core | REC=56.5"/60" =94% | RQD=30"/60" =50% | | |
| | | | 4:40 | 79 | | | | | | |
| | | | 3:40 | 80 | | | | | | |
| | | | 2:38 | 81 | | | | | | |
| | | | 3:36 | 82 | | | | | | |
| | -50.3 | | | 83 | | | | | | Bottom of boring at 77 feet below ground surface (approximately 83 feet below sidewalk level). |
| | | | | 84 | | | | | | |
| | | | | 85 | | | | | | |
| | | | | 86 | | | | | | |
| | | | | 87 | | | | | | |
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Log of Boring **LMW-9R-S** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/22/2022 / Date Finished: 08/24/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 49.4 ft / Rock Depth: 17 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 7 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 19 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: David Pacheco |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +31.3 | Four-inch steel casing was driven to a depth of 13 feet below ground surface (approximately 19 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |
| | +12.3 | Gray SCHIST; very close to close fracture spacing; rock quality good; [BEDROCK] | 2:26 | 19 | C-1 | NX Core | | | | Begin rock coring at 13 feet below ground surface (approximately 19 feet below sidewalk level). |
| | | | | 20 | | | | | | |

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Log of Boring **LMW-9R-S** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +11.3 | | 3:45 | 20 | | | | | | |
| | | | 2:57 | 21 | | | | | | |
| | | | 3:45 | 22 | C-1 | NX Core | REC=52"/60" =87% | RQD=31"/60" =52% | | |
| | | | 4:24 | 23 | | | | | | |
| | +7.3 | Gray SCHIST; very close to moderate fracture spacing; rock quality good; [BEDROCK] | | 24 | | | | | | |
| | | | 4:00 | 25 | | | | | | |
| | | | 2:43 | 26 | | | | | | |
| | | | 3:31 | 27 | C-2 | NX Core | REC=49"/60" =82% | RQD=32"/60" =53% | | |
| | | | 3:35 | 28 | | | | | | |
| | | | 3:33 | 29 | | | | | | |
| | +2.3 | Gray SCHIST; close fracture spacing; rock quality excellent; [BEDROCK] | | | | | | | | |
| | | | 7:54 | 30 | C-3 | NX Core | REC=100% | RQD=100% | | |
| | | | 4:07 | 31 | | | | | | |
| | +0.3 | Gray SCHIST; close fracture spacing; rock quality excellent; [BEDROCK] | | | | | | | | |
| | | | 6:02 | 32 | | | | | | |
| | | | 5:34 | 33 | C-4 | NX Core | REC=100% | RQD=83% | | |
| | | | 4:18 | 34 | | | | | | |
| | -2.7 | Gray SCHIST; very close to close fracture spacing; rock quality good; [BEDROCK] | | | | | | | | |
| | | | 4:50 | 35 | | | | | | |
| | | | 4:25 | 36 | | | | | | |
| | | | 2:15 | 37 | C-5 | NX Core | REC=51"/60" =85% | RQD=34"/60" =57% | | |
| | | | 2:53 | 38 | | | | | | |
| | | | 2:39 | 39 | | | | | | |
| | -7.7 | Gray SCHIST; very close to moderate fracture spacing; rock quality good; [BEDROCK] | | | | | | | | |
| | | | 3:27 | 40 | | | | | | |
| | | | 3:01 | 41 | | | | | | |
| | | | 3:35 | 42 | C-6 | NX Core | REC=60"/60" =100% | RQD=40"/60" =67% | | |
| | | | 3:50 | 43 | | | | | | |
| | | | 4:29 | 44 | | | | | | |
| | -12.7 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 4:30 | 45 | C-7 | NX Core | | | | |

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Log of Boring **LMW-9R-S** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -13.7 | | 3:33 | 45 | C-7 | NX Core | REC=60"/60" =100% | RQD=54"/60" =90% | 10 20 30 40 | |
| | | | 3:05 | 46 | | | | | | |
| | | | 3:10 | 47 | | | | | | |
| | | | 3:51 | 48 | | | | | | |
| | -17.7 | | | 49 | | | | | | Bottom of boring at 43 feet below ground surface (approximately 49 feet below sidewalk level). |
| | | | | 50 | | | | | | |
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Log of Boring **LMW-10R-D** Sheet 1 of 4

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/12/2022 — Date Finished: 08/16/2022 |
| Drilling Equipment: Acker Kodiak | Completion Depth: 86.4 ft — Rock Depth: 20 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 7 |
| Casing Diameter (in): 3" I.D. Steel — Casing Depth (ft): 51 | Water Level (ft.): First ▽ -- / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- — Weight (lbs): -- — Drop (in): -- | Drilling Foreman: Charles Blumberg |
| Sampler: -- | Field Engineer: Maye Yassin |
| Sampler Hammer: -- — Weight (lbs): -- — Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +28.6 | Three-inch steel casing was driven to a depth of 40.5 feet below ground surface (approximately 48.5 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing from the first floor of the southern building. |

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Log of Boring **LMW-10R-D** Sheet 2 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) +8.6 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 | | | | | | |

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# LANGAN

Log of Boring **LMW-10R-D** Sheet 3 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -16.4 | | | 45 | | | | | 10 20 30 40 | |
| | | | | 46 | | | | | | |
| | | | | 47 | | | | | | |
| | | | | 48 | | | | | | |
| | -19.9 | Gray micaceous SCHIST; moderately weathered; very close to close fracture spacing; rock quality good | 2:03 | 49 | C-1 | NX Core | REC=47"/60" =78% | RQD=30"/60" =50% | | Begin rock coring at 40.5 feet below ground surface (approximately 48.5 feet bsl). |
| | | | 3:43 | 50 | | | | | | |
| | | | 5:14 | 51 | | | | | | |
| | | | 4:43 | 52 | | | | | | |
| | | | 6:16 | 53 | | | | | | |
| | -24.9 | Gray micaceous SCHIST; moderately weathered; very close to close fracture spacing; rock quality fair | 3:26 | 54 | C-2 | NX Core | REC=60"/60" =100% | RQD=29.25"/60" =49% | | |
| | | | 2:53 | 55 | | | | | | |
| | | | 2:56 | 56 | | | | | | |
| | | | 5:33 | 57 | | | | | | |
| | | | 7:55 | 58 | | | | | | |
| | -29.9 | Gray micaceous SCHIST; moderately weathered; very close to close fracture spacing; rock quality excellent | 3:44 | 59 | C-3 | NX Core | REC=60"/60" =100% | RQD=45"/60" =75% | | |
| | | | 14:16 | 60 | | | | | | |
| | | | 7:56 | 61 | | | | | | |
| | | | 6:43 | 62 | | | | | | |
| | | | 6:11 | 63 | | | | | | |
| | -34.9 | Gray micaceous SCHIST; moderately weathered; very close to close fracture spacing; rock quality good | 1:43 | 64 | C-4 | NX Core | REC=60"/60" =100% | RQD=30"/60" =50% | | |
| | | | 1:57 | 65 | | | | | | |
| | | | 2:17 | 66 | | | | | | |
| | | | 2:01 | 67 | | | | | | |
| | | | 3:08 | 68 | | | | | | |
| | -39.9 | Gray micaceous SCHIST; moderately weathered; very close to close fracture spacing; rock quality poor | 4:05 | 69 | C-5 | NX Core | | | | |
| | | | | 70 | | | | | | |

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Log of Boring **LMW-10R-D** Sheet 4 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -41.4 | | 6:48 | 70 | | | | | | |
| | | | 4:50 | 71 | C-5 | NX Core | REC=44"/60" =73% | RQD=14"/60" =23% | | |
| | | | 2:43 | 72 | | | | | | |
| | | | 4:12 | 73 | | | | | | |
| | -44.9 | Gray micaceous SCHIST; moderately weathered; very close to close fracture spacing; rock quality fair | 4:37 | 74 | | | | | | |
| | | | 3:40 | 75 | C-6 | NX Core | REC=60"/60" =100% | RQD=16.5"/60" =28% | | |
| | | | 3:14 | 76 | | | | | | |
| | | | 3:27 | 77 | | | | | | |
| | | | 2:42 | 78 | | | | | | |
| | -49.9 | Gray micaceous SCHIST; moderately weathered; very close to close fracture spacing; rock quality poor | 4:02 | 79 | | | | | | |
| | | | 5:22 | 80 | | | | | | |
| | | | 4:37 | 81 | C-7 | NX Core | REC=60"/60" =100% | RQD=13"/60" =22% | | |
| | | | 3:26 | 82 | | | | | | |
| | | | 2:24 | 83 | | | | | | |
| | -54.9 | | | 84 | | | | | | Bottom of boring at 75.5 feet below ground surface (approximately 83.5 feet bsl). |
| | | | | 85 | | | | | | |
| | | | | 86 | | | | | | |
| | | | | 87 | | | | | | |
| | | | | 88 | | | | | | |
| | | | | 89 | | | | | | |
| | | | | 90 | | | | | | |
| | | | | 91 | | | | | | |
| | | | | 92 | | | | | | |
| | | | | 93 | | | | | | |
| | | | | 94 | | | | | | |
| | | | | 95 | | | | | | |

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Log of Boring **LMW-10R-S** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/11/2022 — Date Finished: 08/12/2022 |
| Drilling Equipment: Acker Kodiak | Completion Depth: 50.5 ft — Rock Depth: 20 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 6 |
| Casing Diameter (in): 3" I.D. Steel — Casing Depth (ft): 22 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- — Weight (lbs): -- — Drop (in): -- | Drilling Foreman: Charles Blumberg |
| Sampler: -- | Field Engineer: Maye Yassin |
| Sampler Hammer: -- — Weight (lbs): -- — Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +28.6 | Three-inch steel casing was driven to a depth of 10.5 feet below ground surface (approximately 18.5 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 | | | | | | Started driving casing from the first floor of the southern building. |
| | +10.1 | Gray SCHIST; close to moderate fracture spacing; rock quality good | 3:07 | 19 | C-1 | NX Core | | | | Begin rock coring at 10.5 feet below ground surface (approximately 18.5 feet below sidewalk level) |

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Log of Boring **LMW-10R-S** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +8.6 | | 3:57 | 20 | C-1 | NX Core | REC=44.5"/60" =74% | RQD=32"/60" =53% | 10 20 30 40 | |
| | | | 2:26 | 21 | | | | | | |
| | | | 2:36 | 22 | | | | | | |
| | | | 4:01 | 23 | | | | | | |
| | +5.1 | Gray SCHIST; very close to close fracture spacing; rock quality poor | 6:00 | 24 | C-2 | NX Core | REC=30.75"/48" =64% | RQD=5"/48" =10% | | |
| | | | 4:51 | 25 | | | | | | |
| | | | 5:35 | 26 | | | | | | |
| | | | 12:11 | 27 | | | | | | |
| | | | 2:26 | 28 | | | | | | |
| | +0.1 | Gray SCHIST; close to moderate fracture spacing; rock quality good | 2:37 | 29 | C-3 | NX Core | REC=48"/48" =100% | RQD=31.5"/48" =66% | | |
| | | | 2:47 | 30 | | | | | | |
| | | | 2:23 | 31 | | | | | | |
| | | | 3:44 | 32 | | | | | | |
| | | | 3:40 | 33 | | | | | | |
| | -4.9 | Gray SCHIST; very close to close fracture spacing; rock quality poor | 4:44 | 34 | C-4 | NX Core | REC=42"/60" =70% | RQD=11"/60" =18% | | |
| | | | 6:05 | 35 | | | | | | |
| | | | 2:49 | 36 | | | | | | |
| | | | 2:28 | 37 | | | | | | |
| | | | 5:57 | 38 | | | | | | |
| | -9.9 | Gray SCHIST; very close to close fracture spacing; rock quality fair | 3:28 | 39 | C-5 | NX Core | REC=60"/60" =100% | RQD=24"/60" =40% | | |
| | | | 3:15 | 40 | | | | | | |
| | | | 3:29 | 41 | | | | | | |
| | -12.9 | Gray SCHIST; very close to close fracture spacing; rock quality poor | 4:03 | 42 | C-6 | NX Core | REC=53"/60" =88% | RQD=7.5"/60" =13% | | |
| | | | 4:46 | 43 | | | | | | |
| | | | 10:08 | 44 | | | | | | |
| | | | | 45 | | | | | | |

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Log of Boring **LMW-10R-S** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -16.4 | | 9:05 | 45 | | | | | | |
| | | | 7:05 | 46 | C-6 | NX Core | | | | |
| | -19.9 | | | 47 | | | | | | |
| | | | | 48 | | | | | | |
| | | | | 49 | | | | | | Bottom of boring at 38.5 feet below ground surface (approximately 46.5 feet below sidewalk level). |
| | | | | 50 | | | | | | |
| | | | | 51 | | | | | | |
| | | | | 52 | | | | | | |
| | | | | 53 | | | | | | |
| | | | | 54 | | | | | | |
| | | | | 55 | | | | | | |
| | | | | 56 | | | | | | |
| | | | | 57 | | | | | | |
| | | | | 58 | | | | | | |
| | | | | 59 | | | | | | |
| | | | | 60 | | | | | | |
| | | | | 61 | | | | | | |
| | | | | 62 | | | | | | |
| | | | | 63 | | | | | | |
| | | | | 64 | | | | | | |
| | | | | 65 | | | | | | |
| | | | | 66 | | | | | | |
| | | | | 67 | | | | | | |
| | | | | 68 | | | | | | |
| | | | | 69 | | | | | | |
| | | | | 70 | | | | | | |

N-Value (Blows/ft): 10 20 30 40

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Log of Boring **LMW-11R-D** Sheet 1 of 4

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/19/2022 / Date Finished: 08/22/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 84.7 ft / Rock Depth: 22 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 8 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 47 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) +30.7 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Four-inch steel casing was driven to a depth of 41 feet below ground surface (approximately 47 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |

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Log of Boring **LMW-11R-D** Sheet 2 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) +10.7 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 | | | | | | |

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Log of Boring **LMW-11R-D** Sheet 3 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -14.3 | | | 45 | | | | | 10 20 30 40 | |
| | | | | 46 | | | | | | |
| | -16.3 | Gray SCHIST; extremely close to very close fracture spacing; rock quality very poor; [BEDROCK] | 3:24 | 47 | C-1 | NX Core | REC=33% | RQD=0% | | Begin rock coring at 41 feet below ground surface (approximately 47 feet below sidewalk level). |
| | | | 3:11 | 48 | | | | | | |
| | | | 2:01 | 49 | | | | | | |
| | -19.3 | Gray SCHIST; very close to close fracture spacing; rock quality fair; [BEDROCK] | 4:48 | 50 | C-2 | NX Core | REC=50"/60" =83% | RQD=17"/60" =28% | | |
| | | | 5:27 | 51 | | | | | | |
| | | | 6:35 | 52 | | | | | | |
| | | | 6:14 | 53 | | | | | | |
| | | | 7:43 | 54 | | | | | | |
| | -24.3 | Gray SCHIST; close to wide fracture spacing; rock quality excellent; [BEDROCK] | 3:54 | 55 | C-3 | NX Core | REC=58"/60" =97% | RQD=57"/60" =95% | | |
| | | | 4:51 | 56 | | | | | | |
| | | | 5:40 | 57 | | | | | | |
| | | | 4:58 | 58 | | | | | | |
| | | | 4:05 | 59 | | | | | | |
| | -29.3 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 4:37 | 60 | C-4 | NX Core | REC=55"/60" =92% | RQD=45"/60" =75% | | |
| | | | 5:31 | 61 | | | | | | |
| | | | 6:17 | 62 | | | | | | |
| | | | 4:30 | 63 | | | | | | |
| | | | 5:34 | 64 | | | | | | |
| | -34.3 | Gray SCHIST; moderate to wide fracture spacing; rock quality excellent; [BEDROCK] | 5:24 | 65 | C-5 | NX Core | REC=60"/60" =100% | RQD=60"/60" =100% | | |
| | | | 4:06 | 66 | | | | | | |
| | | | 3:41 | 67 | | | | | | |
| | | | 3:49 | 68 | | | | | | |
| | | | 3:20 | 69 | | | | | | |
| | -39.3 | | | 70 | | | | | | |

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Log of Boring **LMW-11R-D** Sheet 4 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -39.3 | Gray SCHIST; moderate to wide fracture spacing; rock quality excellent; [BEDROCK] | 4:08 | 70 | C-6 | NX Core | REC=58"/60" =97% | RQD=54"/60" =90% | | |
| | | | 6:05 | 71 | | | | | | |
| | | | 3:17 | 72 | | | | | | |
| | | | 3:27 | 73 | | | | | | |
| | | | 3:54 | 74 | | | | | | |
| | -44.3 | Gray SCHIST; moderate to wide fracture spacing; rock quality excellent; [BEDROCK] | 5:48 | 75 | C-7 | NX Core | REC=56"/60" =93% | RQD=51"/60" =85% | | |
| | | | 6:45 | 76 | | | | | | |
| | | | 4:17 | 77 | | | | | | |
| | | | 4:50 | 78 | | | | | | |
| | | | 7:16 | 79 | | | | | | |
| | -49.3 | Gray SCHIST; close to moderate fracture spacing; rock quality good; [BEDROCK] | 7:16 | 80 | C-8 | NX Core | REC=60"/60" =100% | RQD=42"/60" =70% | | |
| | | | 4:19 | 81 | | | | | | |
| | | | 4:36 | 82 | | | | | | |
| | | | 3:36 | 83 | | | | | | |
| | | | 3:47 | 84 | | | | | | |
| | -54.3 | | | 85 | | | | | | Bottom of boring 79 feet below ground surface (approximately 85 feet below sidewalk level) |
| | | | | 86 | | | | | | |
| | | | | 87 | | | | | | |
| | | | | 88 | | | | | | |
| | | | | 89 | | | | | | |
| | | | | 90 | | | | | | |
| | | | | 91 | | | | | | |
| | | | | 92 | | | | | | |
| | | | | 93 | | | | | | |
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| | | | | 95 | | | | | | |

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Log of Boring **LMW-11R-S** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/22/2022 / Date Finished: 08/22/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 54.6 ft / Rock Depth: 22 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 6 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 24 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: David Pacheco |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) +30.3 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Four-inch steel casing was driven to a depth of 18 feet below ground surface (approximately 24 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |

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Log of Boring **LMW-11R-S** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +10.3 | | | 20 | | | | | 10 20 30 40 | |
| | | | | 21 | | | | | | |
| | | | | 22 | | | | | | |
| | | | | 23 | | | | | | |
| | +6.3 | Gray SCHIST; very close to close fracture spacing; rock quality good; [BEDROCK] | 5:32 | 24 | C-1 | NX Core | REC=55"/60" =92% | RQD=33"/60" =55% | | Begin rock coring at 18 feet below ground surface (approximately 24 feet below sidewalk level). |
| | | | 5:58 | 25 | | | | | | |
| | | | 5:09 | 26 | | | | | | |
| | | | 5:30 | 27 | | | | | | |
| | | | 5:09 | 28 | | | | | | |
| | +1.3 | Gray SCHIST; very close to moderate fracture spacing; rock quality fair; [BEDROCK] | 5:41 | 29 | C-2 | NX Core | REC=50"/60" =83% | RQD=21"/60" =35% | | |
| | | | 4:54 | 30 | | | | | | |
| | | | 3:51 | 31 | | | | | | |
| | | | 3:06 | 32 | | | | | | |
| | | | 2:11 | 33 | | | | | | |
| | -3.7 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 4:31 | 34 | C-3 | NX Core | REC=58"/60" =97% | RQD=55"/60" =92% | | |
| | | | 2:48 | 35 | | | | | | |
| | | | 2:45 | 36 | | | | | | |
| | | | 2:28 | 37 | | | | | | |
| | | | 3:39 | 38 | | | | | | |
| | -8.7 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 5:05 | 39 | C-4 | NX Core | REC=60"/60" =100% | RQD=54"/60" =90% | | |
| | | | 4:24 | 40 | | | | | | |
| | | | 3:02 | 41 | | | | | | |
| | | | 3:07 | 42 | | | | | | |
| | | | 2:52 | 43 | | | | | | |
| | -13.7 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 4:55 | 44 | C-5 | NX Core | | | | |
| | | | | 45 | | | | | | |

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Log of Boring **LMW-11R-S** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -14.7 | | 4:08 | 45 | C-5 | NX Core | REC=58"/60" =97% | RQD=46"/60" =77% | | |
| | | | 2:38 | 46 | | | | | | |
| | | | 3:41 | 47 | | | | | | |
| | | | 3:02 | 48 | | | | | | |
| | -18.7 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 4:08 | 49 | C-6 | NX Core | REC=60"/60" =100% | RQD=60"/60" =100% | | |
| | | | 3:24 | 50 | | | | | | |
| | | | 4:32 | 51 | | | | | | |
| | | | 4:09 | 52 | | | | | | |
| | | | 2:39 | 53 | | | | | | |
| | -23.7 | | | 54 | | | | | | Bottom of boring at 48 feet below ground surface (approximately 54 feet below sidewalk level). |
| | | | | 55 | | | | | | |
| | | | | 56 | | | | | | |
| | | | | 57 | | | | | | |
| | | | | 58 | | | | | | |
| | | | | 59 | | | | | | |
| | | | | 60 | | | | | | |
| | | | | 61 | | | | | | |
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| | | | | 68 | | | | | | |
| | | | | 69 | | | | | | |
| | | | | 70 | | | | | | |

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# LANGAN

Log of Boring **LMW-12R-D** Sheet 1 of 4

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/09/2022 / Date Finished: 08/12/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 84.1 ft / Rock Depth: 18 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 8 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 50 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +31.0 | Four-inch steel casing was driven to a depth of 44 feet below ground surface (approximately 50 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |

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Log of Boring **LMW-12R-D** Sheet 2 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) +11.0 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 | | | | | | |

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Log of Boring **LMW-12R-D** Sheet 3 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -14.0 | | | 45 | | | | | | |
| | | | | 46 | | | | | | |
| | | | | 47 | | | | | | |
| | | | | 48 | | | | | | |
| | | | | 49 | | | | | | |
| | -19.0 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 4:17 | 50 | C-1 | NX Core | REC=51"/60" =85% | RQD=48"/60" =80% | | Begin coring at 44 feet below ground surface (approximately 50 feet below sidewalk level). |
| | | | 4:43 | 51 | | | | | | |
| | | | 5:39 | 52 | | | | | | |
| | | | 4:43 | 53 | | | | | | |
| | | | 4:15 | 54 | | | | | | |
| | -24.0 | Gray SCHIST; very close to close fracture spacing; rock quality good; [BEDROCK] | 7:33 | 55 | C-2 | NX Core | REC=100% | RQD=50% | | |
| | | | 15:17 | 56 | | | | | | |
| | -26.0 | Gray SCHIST; very close fracture spacing; rock quality very poor; [BEDROCK] | 11:19 | 57 | C-3 | NX Core | REC=17% | RQD=0% | | |
| | | | 10:51 | 58 | | | | | | |
| | | | 10:11 | 59 | | | | | | |
| | -29.0 | Gray SCHIST; very close to close fracture spacing; rock quality poor; [BEDROCK] | 21:33 | 60 | C-4 | NX Core | REC=40"/48" =83% | RQD=4"/48" =8% | | |
| | | | 13:03 | 61 | | | | | | |
| | | | 9:29 | 62 | | | | | | |
| | | | 8:10 | 63 | | | | | | |
| | -33.0 | Gray SCHIST; very close to close fracture spacing; rock quality poor; [BEDROCK] | 14:41 | 64 | C-5 | NX Core | REC=44"/60" =73% | RQD=4"/60" =7% | | |
| | | | 18:14 | 65 | | | | | | |
| | | | 11:08 | 66 | | | | | | |
| | | | 9:11 | 67 | | | | | | |
| | | | 12:04 | 68 | | | | | | |
| | -38.0 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 8:38 | 69 | C-6 | NX Core | | | | |
| | | | | 70 | | | | | | |

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Log of Boring **LMW-12R-D** Sheet 4 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -39.0 | | 11:40 | 70 | C-6 | NX Core | REC=58"/60" =97% | RQD=47"/60" =78% | | |
| | | | 7:42 | 71 | | | | | | |
| | | | 5:46 | 72 | | | | | | |
| | | | 6:00 | 73 | | | | | | |
| | | | 6:13 | 74 | | | | | | |
| | -44.0 | Gray SCHIST; extremely close to very close fracture spacing; rock quality very poor; [BEDROCK] | 6:26 | 75 | C-7 | NX Core | REC=57"/60" =95% | RQD=0"/60" =0% | | |
| | | | 8:59 | 76 | | | | | | |
| | | | 6:47 | 77 | | | | | | |
| | | | 5:34 | 78 | | | | | | |
| | -48.0 | Gray SCHIST; very close to close fracture spacing; rock quality fair; [BEDROCK] | 6:43 | 79 | C-8 | NX Core | REC=60"/60" =100% | RQD=16"/60" =27% | | |
| | | | 7:33 | 80 | | | | | | |
| | | | 3:51 | 81 | | | | | | |
| | | | 3:53 | 82 | | | | | | |
| | | | 4:43 | 83 | | | | | | |
| | -53.0 | | | 84 | | | | | | Bottom of boring at 78 feet below ground surface (approximately 84 feet below sidewalk level). |
| | | | | 85 | | | | | | |
| | | | | 86 | | | | | | |
| | | | | 87 | | | | | | |
| | | | | 88 | | | | | | |
| | | | | 89 | | | | | | |
| | | | | 90 | | | | | | |
| | | | | 91 | | | | | | |
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| | | | | 93 | | | | | | |
| | | | | 94 | | | | | | |
| | | | | 95 | | | | | | |

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Log of Boring **LMW-12R-S** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/05/2022 / Date Finished: 08/08/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 48.6 ft / Rock Depth: 18 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 7 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 20 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +30.6 | Four-inch steel casing was driven to a depth of 14 feet below ground surface (approimately 20 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |
| | | | | 1 | | | | | | |
| | | | | 2 | | | | | | |
| | | | | 3 | | | | | | |
| | | | | 4 | | | | | | |
| | | | | 5 | | | | | | |
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| | | | | 16 | | | | | | |
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| | | | | 18 | | | | | | |
| | | | | 19 | | | | | | |
| | +10.6 | | | 20 | | | | | | |

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Log of Boring **LMW-12R-S** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +10.6 | Gray SCHIST; very close to close fracture spacing; rock quality very poor; 1 fracture at 11 inches; [BEDROCK] | 2:16 | 20 | C-1 | NX Core | REC=19"/60" =32% | RQD=0"/60" =0% | | Begin rock coring at 14 feet below ground surface (approximately 20 feet below sidewalk level). |
| | | | 3:39 | 21 | | | | | | |
| | | | 5:07 | 22 | | | | | | |
| | | | 5:47 | 23 | | | | | | |
| | | | 11:46 | 24 | | | | | | |
| | +5.6 | Gray SCHIST; very close to close fracture spacing; rock quality very poor; [BEDROCK] | 5:48 | 25 | C-2 | NX Core | REC=15"/60" =25% | RQD=4"/60" =7% | | |
| | | | 5:46 | 26 | | | | | | |
| | | | 5:58 | 27 | | | | | | |
| | | | 23:11 | 28 | | | | | | |
| | | | 15:11 | 29 | | | | | | |
| | +0.6 | Gray SCHIST; very close to close fracture spacing; rock quality very poor; [BEDROCK] | 2:19 | 30 | C-3 | NX Core | REC=33"/60" =55% | RQD=0"/60" =0% | | |
| | | | 4:42 | 31 | | | | | | |
| | | | 7:43 | 32 | | | | | | |
| | | | 6:01 | 33 | | | | | | |
| | | | 3:38 | 34 | | | | | | |
| | -4.5 | Gray SCHIST; very close to close fracture spacing; rock quality very poor; [BEDROCK] | 12:05 | 35 | C-4 | NX Core | REC=26"/60" =43% | RQD=0"/60" =0% | | |
| | | | 10:21 | 36 | | | | | | |
| | | | 8:46 | 37 | | | | | | |
| | | | 6:24 | 38 | | | | | | |
| | | | 8:40 | 39 | | | | | | |
| | -9.5 | Gray SCHIST; close fracture spacing; rock quality good; [BEDROCK] | 9:54 | 40 | C-5 | NX Core | REC=94% | RQD=69% | | |
| | | | 9:30 | 41 | | | | | | |
| | | | 11:01 | 42 | | | | | | |
| | -12.5 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 4:21 | 43 | C-6 | NX Core | | | | |
| | | | 4:04 | 44 | | | | | | |
| | | | | 45 | | | | | | |

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Log of Boring **LMW-12R-S** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -14.5 | | 3:14 | 45 | C-6 | NX Core | REC=25"/60" =42% | RQD=52"/60" =87% | 10 20 30 40 | |
| | | | 9:52 | 46 | | | | | | |
| | | | 7:10 | 47 | | | | | | |
| | -17.5 | | 11:58 | 48 | | | | | | Bottom of boring at 42 feet below ground surface (approximately 48 feet below sidewalk level). |
| | | | 5:19 | 49 | | | | | | |
| | | | 7:39 | 50 | | | | | | |
| | | | 5:36 | 51 | | | | | | |
| | | | 4:57 | 52 | | | | | | |
| | | | | 53 | | | | | | |
| | | | | 54 | | | | | | |
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Log of Boring **LMW-13R-D** Sheet 1 of 4

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/23/2022 / Date Finished: 08/25/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 86 ft / Rock Depth: 18 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 7 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 55 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: David Pacheco |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +30.5 | Four-inch steel casing was driven to a depth of 45 feet below ground surface (approximately 51 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |

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Log of Boring **LMW-13R-D** Sheet 2 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) +10.5 | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) 10 20 30 40 | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 | | | | | | |

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Log of Boring **LMW-13R-D** Sheet 3 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | -14.5 | | | 45 | | | | | | Begin rock coring at 45 feet below ground surface (approximately 51 feet below sidewalk level). |
| | | | | 46 | | | | | | |
| | | | | 47 | | | | | | |
| | | | | 48 | | | | | | |
| | | | | 49 | | | | | | |
| | | | | 50 | | | | | | |
| | -20.5 | Gray SCHIST; very close to moderate fracture spacing; rock quality good; [BEDROCK] | 3:09 | 51 | C-1 | NX Core | REC=45"/60" =75% | RQD=37"/60" =62% | | |
| | | | 6:56 | 52 | | | | | | |
| | | | 5:19 | 53 | | | | | | |
| | | | 4:48 | 54 | | | | | | |
| | | | 5:05 | 55 | | | | | | |
| | -25.5 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 5:26 | 56 | C-2 | NX Core | REC=60"/60" =100% | RQD=48"/60" =80% | | |
| | | | 3:47 | 57 | | | | | | |
| | | | 6:33 | 58 | | | | | | |
| | | | 4:46 | 59 | | | | | | |
| | | | 4:20 | 60 | | | | | | |
| | -30.5 | Gray SCHIST; very close to close fracture spacing; rock quality poor; [BEDROCK] | 7:08 | 61 | C-3 | NX Core | REC=46"/60" =77% | RQD=11"/60" =18% | | |
| | | | 5:23 | 62 | | | | | | |
| | | | 3:26 | 63 | | | | | | |
| | | | 4:41 | 64 | | | | | | |
| | | | 6:06 | 65 | | | | | | |
| | -35.5 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 8:34 | 66 | C-4 | NX Core | REC=60"/60" =100% | RQD=57"/60" =95% | | |
| | | | 3:08 | 67 | | | | | | |
| | | | 4:40 | 68 | | | | | | |
| | | | 3:27 | 69 | | | | | | |
| | | | | 70 | | | | | | |

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# LANGAN

Log of Boring **LMW-13R-D** Sheet 4 of 4

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | N-Value (Blows/ft) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -39.5 | | 5:00 | 70 | C-4 | NX Core | | | | |
| | -40.5 | Gray SCHIST; moderate fracture spacing; rock quality excellent; [BEDROCK] | 7:45 | 71 | C-5 | NX Core | REC=60"/60" =100% | RQD=60"/60" =100% | | |
| | | | 5:20 | 72 | | | | | | |
| | | | 6:49 | 73 | | | | | | |
| | | | 4:03 | 74 | | | | | | |
| | | | 5:08 | 75 | | | | | | |
| | -45.5 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 5:12 | 76 | C-6 | NX Core | REC=60"/60" =100% | RQD=51"/60" =85% | | |
| | | | 4:52 | 77 | | | | | | |
| | | | 4:54 | 78 | | | | | | |
| | | | 4:18 | 79 | | | | | | |
| | | | 3:08 | 80 | | | | | | |
| | -50.5 | Gray SCHIST; very close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 5:49 | 81 | C-7 | NX Core | REC=54"/60" =90% | RQD=47"/60" =78% | | |
| | | | 4:04 | 82 | | | | | | |
| | | | 4:10 | 83 | | | | | | |
| | | | 4:01 | 84 | | | | | | |
| | | | 2:33 | 85 | | | | | | |
| | -55.5 | | | 86 | | | | | | Bottom of boring at 80 feet below ground surface (approximately 86 feet below sidewalk level). |
| | | | | 87 | | | | | | |
| | | | | 88 | | | | | | |
| | | | | 89 | | | | | | |
| | | | | 90 | | | | | | |
| | | | | 91 | | | | | | |
| | | | | 92 | | | | | | |
| | | | | 93 | | | | | | |
| | | | | 94 | | | | | | |
| | | | | 95 | | | | | | |

N-Value (Blows/ft): 10 20 30 40

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# LANGAN

Log of Boring **LMW-13R-S** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/23/2022 / Date Finished: 08/24/2022 |
| Drilling Equipment: Geoprobe 8140 LC / Geoprobe 7822 DT | Completion Depth: 50.7 ft / Rock Depth: 18 ft |
| Size and Type of Bit: 2-7/8in Tricone Roller Bit | Number of Samples: Disturbed -- / Undisturbed -- / Core 6 |
| Casing Diameter (in): 4" I.D. Steel / Casing Depth (ft): 20 | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: David Pacheco |
| Sampler: -- | Field Engineer: Andres Valenzuela Navarrete |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +30.8 | Four-inch steel casing was driven to a depth of 14 feet below ground surface (approximately 20 feet below sidewalk level [bsl]) to accomodate rock coring. | | 0 | | | | | | Started driving casing at 6 feet bsl due to the grade of the site. |
| | | | | 1 | | | | | | |
| | | | | 2 | | | | | | |
| | | | | 3 | | | | | | |
| | | | | 4 | | | | | | |
| | | | | 5 | | | | | | |
| | | | | 6 | | | | | | |
| | | | | 7 | | | | | | |
| | | | | 8 | | | | | | |
| | | | | 9 | | | | | | |
| | | | | 10 | | | | | | |
| | | | | 11 | | | | | | |
| | | | | 12 | | | | | | |
| | | | | 13 | | | | | | |
| | | | | 14 | | | | | | |
| | | | | 15 | | | | | | |
| | | | | 16 | | | | | | |
| | | | | 17 | | | | | | |
| | | | | 18 | | | | | | |
| | | | | 19 | | | | | | |
| | +10.8 | | | 20 | | | | | | |

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Log of Boring **LMW-13R-S** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | +10.8 | Gray SCHIST; very close fracture spacing; rock quality poor; [BEDROCK] | 3:03 | 20 | | | | | | Begin rock coring at 14 feet below ground surface (approximately 20 feet below sidewalk level). |
| | | | 1:58 | 21 | | | | | | |
| | | | 4:26 | 22 | C-1 | NX Core | REC=15"/60" =25% | RQD=4"/60" =7% | | |
| | | | 3:01 | 23 | | | | | | |
| | | | 3:05 | 24 | | | | | | |
| | +5.8 | Gray SCHIST; close to moderate fracture spacing; rock quality good; [BEDROCK] | 5:00 | 25 | | | | | | |
| | | | 5:03 | 26 | | | | | | |
| | | | 4:03 | 27 | C-2 | NX Core | REC=54"/60" =90% | RQD=36"/60" =60% | | |
| | | | 3:29 | 28 | | | | | | |
| | | | 5:03 | 29 | | | | | | |
| | +0.8 | Gray SCHIST; close to moderate fracture spacing; rock quality good; [BEDROCK] | 4:47 | 30 | | | | | | |
| | | | 4:50 | 31 | | | | | | |
| | | | 6:20 | 32 | C-3 | NX Core | REC=45"/60" =75% | RQD=40"/60" =67% | | |
| | | | 3:04 | 33 | | | | | | |
| | | | 6:49 | 34 | | | | | | |
| | -4.2 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 5:25 | 35 | | | | | | |
| | | | 3:34 | 36 | | | | | | |
| | | | 4:43 | 37 | C-4 | NX Core | REC=59"/60" =98% | RQD=52"/60" =87% | | |
| | | | 4:07 | 38 | | | | | | |
| | | | 6:22 | 39 | | | | | | |
| | -9.2 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 6:32 | 40 | | | | | | |
| | | | 6:03 | 41 | | | | | | |
| | | | 6:15 | 42 | C-5 | NX Core | REC=60"/60" =100% | RQD=54"/60" =90% | | |
| | | | 5:29 | 43 | | | | | | |
| | | | 4:08 | 44 | | | | | | |
| | -14.2 | | | 45 | | | | | | |

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# LANGAN

Log of Boring **LMW-13R-S** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | -14.2 | Gray SCHIST; close to moderate fracture spacing; rock quality excellent; [BEDROCK] | 4:51 | 45 | C-6 | NX Core | REC=60"/60" =100% | RQD=57"/60" =95% | | |
| | | | 6:59 | 46 | | | | | | |
| | | | 6:18 | 47 | | | | | | |
| | | | 5:33 | 48 | | | | | | |
| | | | 3:04 | 49 | | | | | | |
| | -19.2 | | | 50 | | | | | | Bottom of boring at 44 feet below ground surface (approximately 50 feet below sidewalk level). |
| | | | | 51 | | | | | | |
| | | | | 52 | | | | | | |
| | | | | 53 | | | | | | |
| | | | | 54 | | | | | | |
| | | | | 55 | | | | | | |
| | | | | 56 | | | | | | |
| | | | | 57 | | | | | | |
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| | | | | 62 | | | | | | |
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| | | | | 66 | | | | | | |
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| | | | | 70 | | | | | | |

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# LANGAN

Log of Boring **LSB-16** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/02/2022 / Date Finished: 08/02/2022 |
| Drilling Equipment: Jackhammer | Completion Depth: 14 ft / Rock Depth: 14 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 2 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Mike Tarter |
| Sampler: 1.75-inch x 3-foot acetate liner | Field Engineer: Andres Valenzuela Navarrete |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/2/2022 at 8 feet below sidewalk level (bsl) due to grade of site |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | | 5 | | | | | | |
| | | | 6 | | | | | | |
| | | | 7 | | | | | | |
| | | | 8 | | | | | 0.0 | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 9 | M-1 | MACROCORE | 10 | | 0.0 | |
| | | | 10 | | | | | 0.0 | Collect LSB-16_8-10 from 8 to 10-feet bsl; VOCs collected from 9 to 9.5-feet bsl |
| | | | | | | | | 0.2 | |
| | | | | | | | | 0.1 | |
| | | | 11 | | | | | 0.1 | |
| | | Dark brown to grayish brown sandy SILT, some gravel, trace brick (moist) | | | | | | 0.2 | |
| | | | 12 | | | | | 0.1 | |
| | | Tannish brown to light brown SILT (moist) | | M-2 | MACROCORE | 30 | | 0.0 | Collect LSB-16_12-14 from 12 to 14-feet bsl; VOCs collected from 13 to 13.5-feet bsl |
| | | | 13 | | | | | 0.1 | |
| | | | | | | | | 0.1 | |
| | | | 14 | | | | | | Refusal encountered at 14 feet bsl |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-17** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/03/2022 / Date Finished: 08/03/2022 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 19 ft / Rock Depth: 19 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 4 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/3/2022 at 1 foot below sidewalk level (bsl) due to grade of site |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 1 | M-1 | MACROCORE | 15 | | 0.0 | |
| | | | 2 | | | | | 0.0 | |
| | | | 3 | | | | | 0.0 | |
| | | | 4 | | | | | 0.0 | |
| | | | 5 | | | | | 0.0 | |
| | | | 6 | M-2 | MACROCORE | 36 | | 0.0 | |
| | | | 7 | | | | | 0.0 | |
| | | | 8 | | | | | 0.0 | |
| | | | 9 | | | | | 0.0 | Collect LSB-17_8-10 from 8 to 10-feet bsl; VOCs collected from 8.5 to 9-feet bsl |
| | | | 10 | | | | | 0.0 | |
| | | Brown to reddish brown silty medium-coarse SAND, some gravel, trace brick (dry) | 11 | M-3 | MACROCORE | 25 | | 0.0 | |
| | | | 12 | | | | | 0.0 | |
| | | | 13 | | | | | 0.0 | |
| | | | 14 | | | | | 0.0 | Collect LSB-17_13-15 from 13 to 15-feet bsl; VOCs collected from 14 to 14.5-feet bsl |
| | | | 15 | | | | | 0.0 | |
| | | | 16 | | | | | 0.0 | |
| | | Yellowish brown to reddish brown silty medium-coarse SAND, some gravel, trace brick (moist) | 17 | M-4 | MACROCORE | 25 | | 0.0 | Collect LSB-17_17-19 from 17 to 19-feet bsl; VOCs collected from 17 to 17.5-feet bsl |
| | | | 18 | | | | | 0.0 | |
| | | | 19 | | | | | | Refusal encountered at 9 feet bsl |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-18** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/03/2022 / Date Finished: 08/03/2022 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 18 ft / Rock Depth: 18 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/3/2022 at 3 feet below sidewalk level (bsl) due to grade of site |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | 0.0 | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 4 | M-1 | MACROCORE | 24 | | 0.0 | |
| | | | 5 | | | | | 0.0 | |
| | | | 6 | | | | | 0.0 | |
| | | | 7 | | | | | 0.0 | |
| | | | 8 | | | | | 0.0 | |
| | | Dark brown silty medium-coarse SAND, some gravel (dry) | 9 | | | | | 0.0 | Collect LSB-18_8-10 from 8 to 10-feet bsl; VOCs collected from 9 to 9.5-feet bsl |
| | | Light brown to brown silty medium-coarse SAND, some gravel (moist) | 10 | M-2 | MACROCORE | 36 | | 0.0 | |
| | | | 11 | | | | | 0.0 | |
| | | | 12 | | | | | 0.0 | |
| | | | 13 | | | | | 0.0 | |
| | | Brown to dark brown silty medium-coarse SAND, trace gravel (moist) | 14 | M-3 | MACROCORE | 24 | | 0.0 | Collect LSB-18_13-15 from 13 to 15-feet bsl; VOCs collected from 13.5 to 14-feet bsl |
| | | | 15 | | | | | 0.0 | |
| | | | 16 | | | | | 0.0 | Collect LSB-18_16-18 from 16 to 18-feet bsl; VOCs collected from 17 to 17.5-feet bsl |
| | | | 17 | | | | | 0.0 | |
| | | | 18 | | | | | | Refusal encountered at 18 feet bsl |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-19/LMW-6** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/02/2022 / Date Finished: 08/02/2022 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 19 ft / Rock Depth: 19 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3, Undisturbed --, Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 13, Completion ▼ --, 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Ron Dixon |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/2/2022 at 6 feet below sidewalk level (bsl) due to grade of site |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | | 5 | | | | | | |
| | | | 6 | | | | | 0.0 | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 7 | | | | | 0.0 | |
| | | | 8 | M-1 | MACROCORE | 53 | | 0.0 | |
| | | Light brown to yellowish brown silty medium-coarse SAND, some gravel (dry) | 9 | | | | | 0.0 | Collect LSB-19_8-10 from 8 to 10-feet bsl; VOCs collected from 8.5 to 9-feet bsl |
| | | | 10 | | | | | 0.0 | |
| | | | 11 | | | | | 0.0 | |
| | | Yellowish brown silty medium-coarse SAND, trace gravel (dry) | 12 | | | | | 0.0 | |
| | | | 13 | | | | | 0.0 | |
| | | Brown silty medium-coarse SAND, trace gravel (moist) ▽ | 14 | M-2 | MACROCORE | 54 | | 0.0 | Collect LSB-19_12.5-14.5 from 12.5 to 14.5-feet bsl; VOCs collected from 13 to 13.5-feet bsl |
| | | | 15 | | | | | 0.0 | |
| | | | 16 | | | | | 0.0 | |
| | | Brown medium-coarse SAND, some gravel (wet) | 17 | | | | | 0.0 | |
| | | | 18 | M-3 | MACROCORE | 36 | | 0.0 | Collect LSB-19_16-18 from 16 to 18-feet bsl; VOCs collected from 16.5 to 17-feet bsl |
| | | | 19 | | | | | 0.0 | Refusal encountered at 19 feet bsl |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-20** Sheet 1 of 2

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/04/2022 / Date Finished: 08/04/2022 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 21 ft / Rock Depth: 21 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 16 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/4/2022 at 6 feet below sidewalk level (bsl) due to grade of site |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | | 5 | | | | | | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 6 | M-1 | MACROCORE | 20 | | 0.0 | |
| | | | 7 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Gray to grayish brown medium-coarse SAND, some gravel (dry) | 8 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 9 | | | | | 0.0 | Collect LSB-20_8-10 from 8 to 10-feet bsl; VOCs collected from 8.5 to 9-feet bsl |
| | | | | | | | | 0.0 | |
| | | | 10 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Brown silty medium-coarse SAND, some gravel (dry) | 11 | M-2 | MACROCORE | 40 | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 12 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Brown silty medium-coarse SAND, some gravel (moist) | 13 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 14 | | | | | 0.0 | Collect LSB-20_13-15 and MS/MSD-1-20220804 from 13 to 15-feet bsl; VOCs collected from 14 to 14.5-feet bsl |
| | | | | | | | | 0.0 | |
| | | | 15 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Brown silty medium-coarse SAND, some gravel (wet) ▽ | 16 | M-3 | MACROCORE | 40 | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 17 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 18 | | | | | 0.0 | Collect LSB-20_18-20 and DUP-1-20220804 from 18 to 20-feet bsl; VOCs collected from 19 to 19.5-feet bsl |
| | | | | | | | | 0.0 | |
| | | Gray silty medium-coarse SAND, trace gravel (wet) | 19 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-20** Sheet 2 of 2

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | M-3 | | 40 | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 21 | | | | | | Refusal encountered at 21 feet bsl |
| | | | 22 | | | | | | |
| | | | 23 | | | | | | |
| | | | 24 | | | | | | |
| | | | 25 | | | | | | |
| | | | 26 | | | | | | |
| | | | 27 | | | | | | |
| | | | 28 | | | | | | |
| | | | 29 | | | | | | |
| | | | 30 | | | | | | |
| | | | 31 | | | | | | |
| | | | 32 | | | | | | |
| | | | 33 | | | | | | |
| | | | 34 | | | | | | |
| | | | 35 | | | | | | |
| | | | 36 | | | | | | |
| | | | 37 | | | | | | |
| | | | 38 | | | | | | |
| | | | 39 | | | | | | |
| | | | 40 | | | | | | |
| | | | 41 | | | | | | |
| | | | 42 | | | | | | |
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| | | | 44 | | | | | | |
| | | | 45 | | | | | | |

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# LANGAN

Log of Boring **LSB-21** Sheet 1 of 2

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/04/2022 / Date Finished: 08/04/2022 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 22 ft / Rock Depth: 22 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 4, Undisturbed --, Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 16, Completion ▼ --, 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/4/2022 at 6 feet below sidewalk level (bsl) due to grade of site |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | | 5 | | | | | | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 6 | | | | | 0.0 | |
| | | | 7 | | | | | 0.0 | |
| | | | 8 | M-1 | MACROCORE | 31 | | 0.0 | |
| | | Light brown silty medium-coarse SAND, trace gravel (dry) | 9 | | | | | 0.0 | Collect LSB-21_8-10 from 8 to 10-feet bsl; VOCs collected from 9 to 9.5-feet bsl |
| | | | 10 | | | | | 0.0 | |
| | | | 11 | | | | | 0.0 | |
| | | Light brown to brown silty medium-coarse SAND, trace gravel (moist) | 12 | | | | | 0.0 | |
| | | | 13 | M-2 | MACROCORE | 34 | | 0.0 | |
| | | | 14 | | | | | 0.0 | Collect LSB-21_13-15 and MS/MSD-2-20220804 from 13 to 15-feet bsl; VOCs collected from 14 to 14.5-feet bsl |
| | | | 15 | | | | | 0.0 | |
| | | ▽ | 16 | | | | | 0.0 | |
| | | Brown to dark brown silty medium-coarse SAND, trace gravel (wet) | 17 | | | | | 0.0 | |
| | | | 18 | M-3 | MACROCORE | 34 | | 0.0 | |
| | | | 19 | | | | | 0.0 | |
| | | | 20 | | | | | 0.0 | |

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Log of Boring **LSB-21** Sheet 2 of 2

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 37 NAVD88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 20 | M-3 | MACROCORE | 34 | | 0.0<br>0.0 | Collect LSB-21_19-21 and DUP-2-20220804 from 19 to 21-feet bsl; VOCs collected from 19.5 to 20-feet bsl |
| | | Brown to dark brown silty medium-coarse SAND, trace gravel (wet) | 21 | M-4 | | 12 | | 0.0<br>0.0 | Refusal encountered at 22 feet bsl |
| | | | 22 | | | | | | |
| | | | 23 | | | | | | |
| | | | 24 | | | | | | |
| | | | 25 | | | | | | |
| | | | 26 | | | | | | |
| | | | 27 | | | | | | |
| | | | 28 | | | | | | |
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| | | | 32 | | | | | | |
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| | | | 37 | | | | | | |
| | | | 38 | | | | | | |
| | | | 39 | | | | | | |
| | | | 40 | | | | | | |
| | | | 41 | | | | | | |
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| | | | 44 | | | | | | |
| | | | 45 | | | | | | |

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Log of Boring **LSB-22** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/01/2022 / Date Finished: 08/01/2022 |
| Drilling Equipment: Geoprobe 420M | Completion Depth: 16.5 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 4, Undisturbed --, Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 13, Completion ▼ --, 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 3-foot acetate liner | Field Engineer: Ashley Sandve |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/1/2022 within the southern bulding basement. Started drilling at 8 feet below sidewalk level (bsl) due to grade of site. |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | | 5 | | | | | | |
| | | | 6 | | | | | | |
| | | | 7 | | | | | | |
| | | CONCRETE | 8 | | | | | 0.0 | |
| | | Brown CLAY, trace fine sand (dry) | 9 | M-1 | MACROCORE | 14.4 | | 0.0 | Collect LSB-22_9-11 from 1 to 3-feet below basement slab (9 to 11-feet bsl); VOCs collected from 1.5 to 2-feet below basement slab (9.5 to 10 feet bsl). |
| | | | 10 | | | | | 0.0 | |
| | | | 11 | | | | | 0.0 | |
| | | Brown silty SAND, some clay, trace f gravel (moist) | 12 | M-2 | MACROCORE | 36 | | 0.0 | Collect LSB-22_11-13 from 3 to 5-feet below basement slab (11 to 13-feet bsl); VOCs collected from 4 to 4.5-feet below basement slab (12 to 12.5 feet bsl). |
| | | Brown silty SAND, trace clay (wet) ▽ | 13 | | | | | 0.0 | |
| | | Brown silty SAND, trace clay (wet) | 14 | M-3 | MACROCORE | 24 | | 0.0 | Collect LSB-22_14.5-16.5 from 6.5 to 8.5-feet below basement slab (14.5 to 16.5-feet bsl); VOCs collected from 8 to 8.5-feet below basement slab (16 to 16.5 feet bsl). |
| | | | 15 | | | | | 0.0 | |
| | | | 16 | | | | | 0.0 | Refusal at 8.5 feet below basement slab (16.5 feet bsl). |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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Log of Boring **LSB-23/LMW-10** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/01/2022 — Date Finished: 08/01/2022 |
| Drilling Equipment: Geoprobe 420M | Completion Depth: 17.5 ft — Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 4 — Undisturbed -- — Core -- |
| Casing Diameter (in): -- — Casing Depth (ft): -- | Water Level (ft.): First ▽ 14 — Completion ▼ — 24 HR. ▼ |
| Casing Hammer: -- — Weight (lbs): -- — Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 3-foot acetate liner | Field Engineer: Ashley Sandve |
| Sampler Hammer: -- — Weight (lbs): -- — Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/1/2022 within the southern bulding basement. Started drilling at 8 feet below sidewalk level (bsl) due to grade of site. |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | | 5 | | | | | | |
| | | | 6 | | | | | | |
| | | | 7 | | | | | | |
| | | | 8 | | | | | | |
| | | CONCRETE | | | | | | 0.0 | |
| | | Black to dark brown medium-coarse SAND, some fine gravel, trace silt (dry) | 9 | M-1 | MACROCORE | 24 | | 0.0 | Collect LSB-23_8-10 from 0 to 2-feet below basement slab (8 to 10-feet bsl); VOCs collected from 1.5 to 2-feet below basement slab (9.5 to 10 feet bsl). |
| | | Brown to gray SILT, trace fine sand (dry) | 10 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 11 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Brown SILT, some fine sand, trace clay (dry) | 12 | | | | | 0.0 | |
| | | Brown silty SAND, trace clay (moist) | | M-2 | MACROCORE | 36 | | 0.0 | Collect LSB-23_12-14 from 4 to 6-feet below basement slab (12 to 14-feet bsl); VOCs collected from 5.5 to 6-feet below basement slab (13.5 to 14 feet bsl). |
| | | | 13 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Brown silty SAND, trace clay (wet) | 14 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 15 | | | | | 0.0 | Collect LSB-23_15.5-17.5 from 7.5 to 9.5-feet below basement slab (15.5 to 17.5-feet bsl); VOCs collected from 8 to 8.5-feet below basement slab (16 to 16.5 feet bsl). |
| | | | | M-3 | MACROCORE | 24 | | 0.0 | |
| | | | 16 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Brown silty SAND, trace clay (wet) | 17 | M-4 | MACROCORE | 6 | | 0.0 | |
| | | | | | | | | | Refusal at 9.5 feet below basement slab (17.5 feet bsl). |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-26/LMW-8** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/02/2022 / Date Finished: 08/02/2022 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 15 ft / Rock Depth: 15 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 2 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 14.3 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Ron Dixon |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/2/2022 at 6 feet below sidewalk level (bsl) due to grade of site |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | | 5 | | | | | | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 6 | M-1 | MACROCORE | 37.5 | | 0.0 | |
| | | | 7 | | | | | 0.0 | |
| | | Dark brown silty medium-coarse SAND and angular GRAVEL (dry) | 8 | | | | | 0.0 | |
| | | | 9 | | | | | 0.0 | |
| | | | 10 | | | | | 0.0 | |
| | | | 11 | | | | | 0.0 | |
| | | Brown gravelly medium-coarse SAND (dry) | | | | | | 0.0 | |
| | | Brown silty medium-coarse SAND, some gravel (moist) | 12 | M-2 | MACROCORE | 59 | | 0.0 | |
| | | | 13 | | | | | 0.0 | Collect LSB-26-13-15 from 13 to 15-feet bsl; VOCs collected from 14 to 14.5-feet bsl |
| | | ▽ | 14 | | | | | 0.0 | |
| | | Brown silty medium-coarse SAND, some gravel (wet) | | | | | | 0.0 | |
| | | | 15 | | | | | | Refusal encountered at 15 feet bsl |
| | | | 16 | | | | | | |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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Log of Boring **LSB-27/LMW-9** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/02/2022 / Date Finished: 08/02/2022 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 18.5 ft / Rock Depth: 18.5 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 2 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Ron Dixon |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/2/2022 at 6 ft below sidewalk level (bsl) due to grade of site |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | | 5 | | | | | | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 6 | M-1 | MACROCORE | 48 | | 0.0 | |
| | | | 7 | | | | | 0.0 | |
| | | | 8 | | | | | 0.0 | |
| | | | 9 | | | | | 0.0 | |
| | | Brown silty medium-coarse SAND and angular GRAVEL (moist) | 10 | | | | | 0.0 | |
| | | | 11 | M-2 | MACROCORE | 54 | | 0.0 | |
| | | Grayish brown to red medium-coarse SAND, some gravel (dry) | 12 | | | | | 0.0 | |
| | | Light brown silty medium-coarse SAND and angular GRAVEL | 13 | | | | | 0.0 | |
| | | | 14 | | | | | 0.0 | |
| | | | 15 | | | | | 0.0 | Collect LSB-27_14-16 from 14 to 16-feet bsl; VOCs collected from 14.5 to 15-feet bsl |
| | | Gray angular GRAVEL (dry) | 16 | M-3 | MACROCORE | 24 | | 0.0 | |
| | | Grayish brown silty fine-coarse SAND (dry) | 17 | | | | | 0.0 | |
| | | | 18 | | | | | 0.0 | |
| | | | 19 | | | | | | Refusal at 18.5 ft bsl |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-29** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/02/2022 / Date Finished: 08/02/2022 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 17.5 ft / Rock Depth: 17.5 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3, Undisturbed --, Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 14.5, Completion ▼ --, 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Ron Dixon |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/2/2022 at 5 ft below sidewalk level (bsl) due to grade of site |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 5 | M-1 | MACROCORE | 50 | | 0.0 | |
| | | | 6 | | | | | 0.0 | |
| | | | 7 | | | | | 0.0 | |
| | | | 8 | | | | | 0.0 | |
| | | Brown silty medium-coarse SAND, some gravel (dry) | 9 | | | | | 0.0 | |
| | | | 10 | | | | | 0.0 | |
| | | Gray to red medium-coarse angular GRAVEL and medium-coarse SAND (dry) | 11 | M-2 | MACROCORE | 42 | | 0.0 | |
| | | Light brown silty medium-coarse SAND, trace gravel (dry) | 12 | | | | | 0.0 | |
| | | | 13 | | | | | 0.0 | |
| | | | 14 | | | | | 0.0 | |
| | | | 15 | | | | | 0.0 | LSB-29_15.5-17.5 from 15.5 to 17.5-feet bsl; VOCs collected from 16 to 16.5-feet bsl |
| | | Red to brown medium-coarse SAND, some gravel (dry) | 16 | M-3 | MACROCORE | 38 | | 0.0 | |
| | | | 17 | | | | | 0.0 | |
| | | | 18 | | | | | | Refusal at 17.5 ft bsl |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-30** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/02/2022 / Date Finished: 08/02/2022 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 20 ft / Rock Depth: 20 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First -- / Completion -- / 24 HR. -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Ron Dixon |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/2/2022 at 5 ft below sidewalk level (bsl) due to grade of site |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | | 3 | | | | | | |
| | | | 4 | | | | | | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 5 | | | | | 0.0 | |
| | | | 6 | | | | | 0.0 | |
| | | | 7 | M-1 | MACROCORE | 45 | | 0.0 | |
| | | Dark brown silty medium-coarse SAND, trace gravel (dry) | 8 | | | | | 0.0 | |
| | | | 9 | | | | | 0.0 | |
| | | Grayish brown silty medium-coarse SAND, trace gravel (dry) | 10 | | | | | 0.0 | |
| | | | 11 | | | | | 0.2 | |
| | | | 12 | M-2 | MACROCORE | 50 | | 2.0 | |
| | | | 13 | | | | | 0.1 | |
| | | | 14 | | | | | 0.0 | |
| | | Grayish brown to light brown silty medium-coarse SAND, trace gravel (dry) | 15 | | | | | 0.0 | |
| | | | 16 | | | | | 0.0 | |
| | | | 17 | M-3 | MACROCORE | 60 | | 0.0 | Collect LSB-30_16.5-18.5, DUP-1-20220803, and MS/MSD-1-20220803 from 16.5 to 18.5-feet bsl; VOCs collected from 17.5 to 18-feet bsl |
| | | | 18 | | | | | 0.0 | |
| | | White fine-medium SAND, some gravel (dry) | 19 | | | | | 0.0 | |
| | | | 20 | | | | | 0.0 | Refusal at 20 ft bsl |

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# LANGAN

Log of Boring **LMW-7** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 37 NAVD88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 08/02/2022 / Date Finished: 08/02/2022 |
| Drilling Equipment: Geoprobe 7822DT | Completion Depth: 16 ft / Rock Depth: 16 ft |
| Size and Type of Bit: 2-inch Direct Push | Number of Samples: Disturbed 3 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 15.5 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Ron Dixon |
| Sampler: -- | Field Engineer: Connor Zingale |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | | | | | Started Drilling on 8/2/2022 at 3 feet below sidwalk level (bsl) due to grade of site. |
| | | | 1 | | | | | | |
| | | | 2 | | | | | | |
| | | FILL consisting of remnant demolition debris, medium-coarse sand, and trace gravel (dry) | 3 | M-1 | MACROCORE | 21 | | 0.0 | |
| | | | 4 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Light brown silty medium-coarse SAND, some gravel (dry) | 5 | | | | | 0.0 | |
| | | | 6 | | | | | 0.0 | |
| | | | 7 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Light brown silty medium-coarse SAND, some gravel (dry) | 8 | M-2 | MACROCORE | 28 | | 0.0 | |
| | | | 9 | | | | | 0.0 | |
| | | | 10 | | | | | 0.0 | |
| | | | 11 | | | | | 0.0 | |
| | | | 12 | | | | | 0.0 | |
| | | Light brown to brown silty medium-coarse SAND, some gravel (moist) | | | | | | 0.0 | |
| | | Light brown silty medium-coarse SAND, trace gravel (moist) | 13 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | Light brown silty medium-coarse SAND, trace gravel (wet) | 14 | M-3 | MACROCORE | 12 | | 0.0 | |
| | | ▽ | 15 | | | | | 0.0 | |
| | | | | | | | | 0.0 | |
| | | | 16 | | | | | | Bottom of boring at 16 feet bsl |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LB-01/MW-01** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 28 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 11/9/21 / Date Finished: 11/9/21 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 10 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 2 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 8.5 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Molly Mattern |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Brown SAND, trace brick, trace organics (dry) | 0 | M-1 | Macrocore | 48 | | 0.0 | Started Drilling on 11/9/2021. |
| | | Tannish brown to mottled tannish gray fine SAND, some silt, trace clay (dry) | 1 | | | | | 0.0 | Collect 009_LB-01_0-1 from 0- to 1-ft bgs. VOCs collected from 0.5- to 1-ft bgs. |
| | | | 2 | | | | | 0.0 | |
| | | | 3 | | | | | 0.0 | |
| | | | 4 | | | | | 0.0 | |
| | | | 5 | | | | | 0.0 | |
| | | Reddish brown fine-medium SAND, trace silt, trace fine gravel (moist) | 6 | M-2 | Macrocore | 48 | | 0.0 | |
| | | | 7 | | | | | 0.0 | Collect 010_LB-01_6.5-8.5 from 6.5- to 8.5-ft bgs. VOCs collected from 6.5- to 7-ft bgs. |
| | | | 8 | | | | | 0.0 | |
| | | Reddish brown fine SAND, trace clay, trace silt, trace f-m gravel (wet) ▽ | 9 | | | | | 0.0 | |
| | | | 10 | | | | | 0.0 | Refusal encountered at 10' bgs. |
| | | | 11 | | | | | | |
| | | | 12 | | | | | | |
| | | | 13 | | | | | | |
| | | | 14 | | | | | | |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LB-02/MW-02** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 29 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 11/9/21 / Date Finished: 11/9/21 |
| Drilling Equipment: Geoprobe 420M | Completion Depth: 10 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 4 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 8 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 3-foot acetate liner | Field Engineer: Molly Mattern |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Brown fine-medium SAND, some organics, trace f-m gravel (dry) | 0 | | | | | 0.0 | Started Drilling on 11/9/2021. |
| | | | 1 | M-1 | Macrocore | 36 | | 0.0 | |
| | | Tannish brown to grayish brown fine SAND, some silt, trace clay (dry) | 2 | | | | | 0.0 | |
| | | | 3 | | | | | 0.0 | |
| | | | 4 | M-2 | Macrocore | 36 | | 0.0 | |
| | | | 5 | | | | | 0.0 | |
| | | Reddish brown fine-medium SAND, trace clay, trace silt (moist) | 6 | | | | | 1.0 | |
| | | Reddish brown fine-medium SAND, trace clay, trace silt (moist) | 7 | M-3 | Macrocore | 36 | | 0.9 | Collect 007_LB-02_6-8 from 6- to 8-ft bgs. VOCs collected from 6- to 6.5-ft bgs. |
| | | ▽ | 8 | | | | | 3.6 | |
| | | Reddish brown fine-medium SAND, trace clay, trace silt (wet) | 9 | | | | | 7.0 | |
| | | | 10 | M-4 | Macrocore | 12 | | 5.7 | Collect 008_LB-02_8-10 from 8- to 10-ft bgs. VOCs collected from 8- to 8.5-ft bgs. |
| | | | 11 | | | | | 12.0 | |
| | | | 12 | | | | | 2.4 | |
| | | | 13 | | | | | 3.6 | |
| | | | 14 | | | | | 4.1 | |
| | | | 15 | | | | | | Refusal encountered at 10' bgs. |
| | | | 16 | | | | | | |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LB-03/MW-03** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 28 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 11/9/21 / Date Finished: 11/9/21 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 13 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 9 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Molly Mattern |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Brown fine-medium SAND, some wood, some organics, trace concrete, trace f-m gravel (dry) | 0 | M-1 | Macrocore | 48 | | 0.0 | Started Drilling on 11/9/2021. |
| | | | 1 | | | | | 0.0 | Collect 004_LB-3_0-2 from 0- to 2-ft bgs. VOCs collected from 1- to 1.5-ft bgs. |
| | | Mottled grayish tan fine SAND, some silt, trace clay (dry) | 2 | | | | | 0.0 | |
| | | | 3 | | | | | 0.0 | |
| | | | 4 | | | | | 0.0 | |
| | | Reddish brown fine-medium SAND, trace silt, trace fine gravel (moist) | 5 | M-2 | Macrocore | 48 | | 0.0 | |
| | | | 6 | | | | | 0.0 | |
| | | | 7 | | | | | 0.0 | Collect 005_LB-3_7-9 from 7- to 9-ft bgs. VOCs collected from 7- to 7.5-ft bgs. |
| | | | 8 | | | | | 0.0 | |
| | | Reddish brown fine-medium SAND, trace silt, trace fine gravel (wet) ▽ | 9 | | | | | 0.0 | |
| | | | 10 | | | | | 0.0 | |
| | | | 11 | M-3 | Macrocore | 36 | | 0.0 | |
| | | Brownish gray fine-medium SAND, some silt, some weathered mica schist (moist) | 12 | | | | | 0.0 | |
| | | | 13 | | | | | | Refusal encounterd at 13' bgs. |
| | | | 14 | | | | | | |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LB-04** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 28 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 11/10/21 — Date Finished: 11/10/21 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 11 ft — Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3 — Undisturbed -- — Core -- |
| Casing Diameter (in): -- — Casing Depth (ft): -- | Water Level (ft.): First ▽ 7.5 — Completion ▼ -- — 24 HR. ▼ -- |
| Casing Hammer: -- — Weight (lbs): -- — Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Audrey Seery |
| Sampler Hammer: -- — Weight (lbs): -- — Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Dark brown to light brown fine SAND, trace fine gravel, Brick, woody vegetation (moist) | 0 | | | | | 0.0 | Started drilling on 11/10/2021. |
| | | | 1 | | | | | 0.0 | |
| | | | 2 | | | | | 0.0 | Collected 016_LB-04_0-2 from 0- to 2-ft bgs. VOCs collected from 0.5- to 1-ft bgs. |
| | | Dark brown to light brown fine SAND, trace fine gravel (moist) | 3 | M-1 | Macrocore | 36 | | 0.0 | |
| | | | 4 | | | | | 0.0 | |
| | | | 5 | | | | | 0.0 | |
| | | | 6 | | | | | 0.0 | |
| | | | 7 | M-2 | Macrocore | 42 | | 0.0 | Collected 017_LB-04_6.5-7.5 from 6.5- to 7.5-ft bgs. VOCs collected from 6.5- to 7-ft bgs. |
| | | Brown fine SAND, some silt, trace fine gravel (wet) | 8 | | | | | 0.0 | |
| | | | 9 | | | | | 0.0 | |
| | | | 10 | M-3 | Macrocore | 12 | | 0.0 | |
| | | Gray to black fine SAND, some weathered mica schist (dry) | 11 | | | | | 0.0 | Refusal encountered at 11' bgs. |
| | | | 12 | | | | | | |
| | | | 13 | | | | | | |
| | | | 14 | | | | | | |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LB-05** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 28 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 11/10/21 / Date Finished: 11/10/21 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 13 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 8 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Audrey Seery |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Brown to light brown fine SAND, trace silt, trace fine gravel, woody vegetation, brick (moist) | 0 | | | | | 0.0 | Started drilling on 11/10/2021. |
| | | | 1 | | | | | 0.0 | |
| | | | 2 | | | | | 0.0 | |
| | | Light brown silty fine SAND (moist) | 3 | M-1 | Macrocore | 40 | | 0.0 | |
| | | | 4 | | | | | 0.0 | |
| | | | 5 | | | | | 0.0 | |
| | | | 6 | | | | | 0.0 | |
| | | Gray to reddish brown fine SAND, some silt (moist) | 7 | | | | | 0.0 | |
| | | ▽ | 8 | M-2 | Macrocore | 40 | | 0.3 | Collected 018_LB-05_6.5-8 from 6.5- to 8-ft bgs. VOCs collected from 6.5- to 7-ft bgs. |
| | | Gray to reddish brown fine SAND, some silt (wet) | 9 | | | | | 0.0 | Slight odor at 7-ft bgs. Collected 019_LB-05_8-9 from 8- to 9-ft bgs. VOCs collected from 8- to 8.5-ft bgs. Odor between 8- and 9-ft bgs. |
| | | | 10 | | | | | 0.0 | |
| | | | 11 | M-3 | Macrocore | 16 | | 0.0 | |
| | | Grayish brown to olive silty fine SAND (wet) | 12 | | | | | 0.0 | |
| | | | 13 | | | | | 0.0 | Refusal encountered at 13' bgs. |
| | | | 14 | | | | | | |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LB-06** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 28 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 11/9/21 / Date Finished: 11/9/21 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 11 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 8 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Molly Mattern |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Brown SAND, some organics, trace concrete (dry) | 0 | | | | | 0.0 | Started Drilling on 11/9/2021. |
| | | | 1 | | | | | 0.0 | Collect 011_LB-06_0-2 from 0- to 2-ft bgs. VOCs collected from 1- to 1.5-ft bgs. |
| | | Grayish tan to mottled gray fine SAND, some clay, some silt (dry) | 2 | M-1 | Macrocore | 48 | | 0.0 | |
| | | | 3 | | | | | 0.0 | |
| | | | 4 | | | | | 0.0 | |
| | | Reddish brown fine SAND, some silt, trace clay (moist) | 5 | | | | | 0.0 | |
| | | | 6 | | | | | 0.0 | Collect 012_LB-06_6-8 from 6- to 8-ft bgs. VOCs collected from 6- to 6.5-ft bgs. |
| | | ▽ | 7 | M-2 | Macrocore | 48 | | 0.0 | |
| | | Tannish brown to reddish brown fine-medium SAND, trace silt, trace fine gravel (wet) | 8 | | | | | 0.0 | |
| | | | 9 | | | | | 0.0 | |
| | | Tannish brown to reddish brown fine-medium SAND, trace silt, trace fine gravel, some weathered mica schist (wet) | 10 | M-3 | Macrocore | 12 | | 0.0 | |
| | | | 11 | | | | | | Refusal encounterd at 11' bgs. |
| | | | 12 | | | | | | |
| | | | 13 | | | | | | |
| | | | 14 | | | | | | |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
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| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LB-07** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 28 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 11/10/21 / Date Finished: 11/10/21 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 10 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 2 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 7 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Audrey Seery |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Dark brown to gray fine SAND, some silt, trace fine gravel, brick, woody vegetation (moist) | 0 | M-1 | Macrocore | 42 | | 0.0 | Started drilling on 11/10/2021. |
| | | | 1 | | | | | 0.0 | |
| | | | 2 | | | | | 0.0 | Collected 015_LB-07_0-2 from 0- to 2-ft bgs. VOCs collected from 1- to 1.5' bgs. |
| | | Light brown to olive SILT, trace fine sand, trace fine gravel (moist) | | | | | | 0.0 | |
| | | Orangish brown to light gray fine SAND, some silt, trace fine gravel (moist) | 3 | | | | | 0.0 | |
| | | | 4 | | | | | 0.0 | |
| | | | 5 | | | | | 0.0 | Collected 014_LB-07_5-7 from 5- to 7-ft bgs. VOCs collected from 5- to 5.5-ft bgs. |
| | | | 6 | M-2 | Macrocore | 48 | | 0.0 | |
| | | Brown fine SAND, trace silt, trace fine gravel (moist) ▽ | 7 | | | | | 0.0 | |
| | | | 8 | | | | | 0.0 | |
| | | | 9 | | | | | 0.0 | |
| | | Gray to black fine SAND, weathered mica schist (dry) | 10 | | | | | 0.0 | Refusal encountered at 10' bgs. |
| | | | 11 | | | | | | |
| | | | 12 | | | | | | |
| | | | 13 | | | | | | |
| | | | 14 | | | | | | |
| | | | 15 | | | | | | |
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| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LB-08/MW-04** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 28 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 11/9/21 / Date Finished: 11/9/21 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 14 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 9.5 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Molly Mattern |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | Brown fine-medium SAND, trace wood, trace fine gravel, trace organics (dry) | 0 | M-1 | Macrocore | 42 | | 0.0 | Started Drilling on 11/9/2021. |
| | | | 1 | | | | | 0.0 | Collect 001_LB-08_0-2 from 0- to 2-ft bgs. VOCs collected from 0.5- to 1-ft bgs. |
| | | Mottled grayish tan fine SAND, some clay, trace silt (moist) | 2 | | | | | 0.0 | |
| | | | 3 | | | | | 0.0 | |
| | | | 4 | | | | | 0.0 | |
| | | | 5 | M-2 | Macrocore | 48 | | 0.0 | |
| | | Reddish brown fine-medium SAND, trace gravel (moist) | 6 | | | | | 0.0 | |
| | | Reddish brown to brown fine-medium SAND, trace clay, trace silt, trace fine gravel (moist) | 7 | | | | | 0.0 | Collect 002_LB-08_7.5-9.5 and 003_DUP-1 from 7.5- to 9.5-ft bgs. VOCs collected from 7.5- to 8-ft bgs. |
| | | | 8 | | | | | 0.0 | |
| | | | 9 | | | | | 0.0 | |
| | | Reddish brown to tannish brown fine-medium SAND, trace silt (wet) ▽ | 10 | | | | | 0.0 | |
| | | Brown fine-medium SAND, trace fine gravel (wet) | 11 | M-3 | Macrocore | 48 | | 0.0 | |
| | | | 12 | | | | | 0.0 | |
| | | Brown fine-medium SAND, some weathered mica schist (moist) | 13 | | | | | 0.0 | |
| | | | 14 | | | | | | Refusal encountered at 14' bgs. |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
| | | | 17 | | | | | | |
| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-9/MW-05** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 29 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 1/25/22 / Date Finished: 1/25/22 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 9 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 3 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 6 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Morgan McBride |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | CONCRETE | 0 | | | | | 0 | Started drilling on 1/25/2022. |
| | | Brown fine-medium SAND, trace silt, trace gravel (dry) | 1 | M-1 | Macrocore | 30 | | 0 | 11:15 AM - Collect sample 038_LSB-9_0-2 from 0-2' below cellar slab. VOCs collected from 0.5-1' below cellar slab. |
| | | | 2 | | | | | 0 | |
| | | Brown fine-medium SAND, some clay, trace silt (dry) | 3 | | | | | 0 | |
| | | Brown fine-medium SAND, some clay, trace silt (moist) | 4 | M-2 | Macrocore | 36 | | 0 | 11:20 AM - Collect sample 038_LSB-9_4-6 from 4-6' below cellar slab. VOCs collected from 4.5-5' below cellar slab. |
| | | | 5 | | | | | 0 | |
| | | ▽ | 6 | | | | | 0 | |
| | | Brown fine-medium SAND, some clay, trace silt (wet) | 7 | M-3 | Macrocore | 34 | | 0 | |
| | | | 8 | | | | | 0 | |
| | | | 9 | | | | | 0 | Bottom of boring 9' below cellar slab. Refusal encountered at 9.5' below cellar slab. |
| | | | 10 | | | | | | |
| | | | 11 | | | | | | |
| | | | 12 | | | | | | |
| | | | 13 | | | | | | |
| | | | 14 | | | | | | |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
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| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-10** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 29 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 1/25/22 / Date Finished: 1/25/22 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 11 ft / Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 4 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 6 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Morgan McBride |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | CONCRETE | 0 | | | | | 0 | Started Drilling on 1/25/2022. |
| | | Brown clayey fine SAND, some silt (dry) | 1 | M-1 | Macrocore | 24 | | 0 | 12:30 PM - Collect sample 039_LSB-10_0-2 and 040_DUP-1 from 0-2' below cellar slab. VOCs collected from 0.5-1' below cellar slab. |
| | | | 2 | | | | | 0 | |
| | | Brown silty SAND, trace clay (dry) | 3 | | | | | 0 | |
| | | | 4 | M-2 | Macrocore | 36 | | 0 | 12:40 AM - Collect sample 041_LSB-10_4-6 from 4-6' below cellar slab. VOCs collected from 4.5-5' below cellar slab. |
| | | Brown silty SAND, some clay (moist) | 5 | | | | | 0 | |
| | | ▽ Brown silty SAND, trace clay (wet) | 6 | | | | | 0 | |
| | | | 7 | M-3 | Macrocore | 36 | | 0 | |
| | | | 8 | | | | | 0 | |
| | | | 9 | | | | | 0 | |
| | | | 10 | M-4 | Macrocore | 18 | | 0 | |
| | | | 11 | | | | | 0 | Bottom of boring at 11' below cellar slab. Refusal encountered at 11' below cellar slab. |
| | | | 12 | | | | | | |
| | | | 13 | | | | | | |
| | | | 14 | | | | | | |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
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| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-11** Sheet 1 of 1

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 29 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 1/25/22 — Date Finished: 1/25/22 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 6 ft — Rock Depth: -- |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 2 — Undisturbed -- — Core -- |
| Casing Diameter (in): -- — Casing Depth (ft): -- | Water Level (ft.): First ▽ 4 — Completion ▼ -- — 24 HR. ▼ -- |
| Casing Hammer: -- — Weight (lbs): -- — Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 1.75-inch x 5-foot acetate liner | Field Engineer: Morgan McBride |
| Sampler Hammer: -- — Weight (lbs): -- — Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|
| | | CONCRETE | 0 | | | | | 0 | Started Drilling on 1/25/2022. |
| | | Light brown sandy CLAY, some silt, trace brick (dry) | 1 | M-1 | Macrocore | 18 | | 0 | 2:25 PM - Collect sample 042_LSB-11_0-2 from 0-2' below cellar slab. VOCs collected from 0.5-1' below cellar slab. |
| | | | 2 | | | | | 0 | |
| | | Brown silty fine-medium SAND, trace clay (moist) | 3 | | | | | 0 | 2:30 PM - Collect sample 0043_LSB-11_2-4 from 2-4' below cellar slab. VOCs collected from 2.5-3' below cellar slab. |
| | | ▽ Brown silty fine-medium SAND, trace clay (wet) | 4 | M-2 | Macrocore | 36 | | 0 | |
| | | Brown sandy CLAY (wet) | 5 | | | | | 0 | |
| | | | 6 | | | | | 0 | Bottom of boring at 6' below cellar slab. Refusal encountered at 6' below cellar slab. |
| | | | 7 | | | | | | |
| | | | 8 | | | | | | |
| | | | 9 | | | | | | |
| | | | 10 | | | | | | |
| | | | 11 | | | | | | |
| | | | 12 | | | | | | |
| | | | 13 | | | | | | |
| | | | 14 | | | | | | |
| | | | 15 | | | | | | |
| | | | 16 | | | | | | |
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| | | | 18 | | | | | | |
| | | | 19 | | | | | | |
| | | | 20 | | | | | | |

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Log of Boring **LSB-12/MW-6** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 29 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 1/31/33 — Date Finished: 1/31/22 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 50 ft — Rock Depth: 27 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 7 — Undisturbed -- — Core 5 |
| Casing Diameter (in): -- — Casing Depth (ft): -- | Water Level (ft.): First ▽ 18 — Completion ▼ -- — 24 HR. ▼ -- |
| Casing Hammer: -- — Weight (lbs): -- — Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 2-inch-diameter split spoon; Shelby tube | Field Engineer: Morgan McBride |
| Sampler Hammer: -- — Weight (lbs): -- — Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | | | | | Started Drilling on 1/31/2022. Started drilling at 8 feet below sidewalk level (bsl) due to grade of site. |
| | | | | 1 | | | | | | |
| | | | | 2 | | | | | | |
| | | | | 3 | | | | | | |
| | | | | 4 | | | | | | |
| | | | | 5 | | | | | | |
| | | | | 6 | | | | | | |
| | | | | 7 | | | | | | |
| | | | | 8 | | | | | 0 | |
| | | Brown fine SAND, brick fragments (dry) | | 9 | S-1 | SS | 6 | | 0 | |
| | | | | 10 | | | | | 0 | |
| | | Brown fine-medium SAND, trace brick, trace silt, trace gravel (dry) | | 11 | S-2 | SS | 18 | | 0 | |
| | | | | 12 | | | | | 0 | |
| | | Brown fine-medium SAND, trace gravel (dry) | | 13 | S-3 | SS | 6 | | 0 | |
| | | | | 14 | | | | | 0 | |
| | | Brown fine-medium SAND, trace silt, trace gravel (dry) | | 15 | S-4 | SS | 12 | | 0 | 9:30 AM - Collect sample 046_LSB-12_15-17 from 15-17' bsl. VOCs collected from 15.5-16' bsl. |
| | | | | 16 | | | | | 0 | |
| | | | | 17 | S-5 | SS | 18 | | 0 | |
| | | ▽ | | 18 | | | | | 0 | |
| | | Brown fine-medium SAND, trace silt, trace gravel (wet) | | 19 | S-6 | SS | 18 | | 0 | 9:45 AM - Collect sample 047_LSB-12_18-20 from 18-20' bsl. VOCs collected from 18.5-19' bsl. |
| | | | | 20 | | | | | 0 | |

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# LANGAN

Log of Boring **LSB-12/MW-6** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 29 NAVD 88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 20 | | | | | 0 | 9:55 AM - Collect sample 048_LSB-12_20-22 from 20-22' bsl. VOCs collected from 20.5-21' bsl. |
| | | | | 21 | S-7 | SS | 18 | | 0 | |
| | | | | 22 | | | | | 0 | |
| | | Black WEATHERED ROCK (moist) | | 23 | | | | | 0 | Refusal encountered at 22' bsl. Begin rock coring at 22' bsl. |
| | | | | 24 | C-1 | NX CORE BARREL | 12 | | | |
| | | | | 25 | | | | | | |
| | | | | 26 | | | | | | |
| | | | | 27 | | | | | | |
| | | Gray MICA SCHIST; moderately weathered; extremely close to very close fracture spacing | 3:56 | 28 | | | | | | |
| | | | 3:22 | 29 | | | | | | |
| | | | 3:17 | 30 | C-2 | NX CORE BARREL | 49 | | | |
| | | | 4:02 | 31 | | | | | | |
| | | | 4:48 | 32 | | | | | | |
| | | Gray MICA SCHIST; moderately weathered; extremely close to very close fracture spacing | 3:39 | 33 | | | | | | |
| | | | 3:52 | 34 | C-3 | NX CORE BARREL | 36 | | | |
| | | | 4:12 | 35 | | | | | | |
| | | Gray MICA SCHIST; moderately weathered; extremely close to very close fracture spacing | 3:41 | 36 | | | | | | |
| | | | 3:18 | 37 | | | | | | |
| | | | 3:11 | 38 | C-4 | NX CORE BARREL | 51 | | | |
| | | | 4:37 | 39 | | | | | | |
| | | | 4:10 | 40 | | | | | | |
| | | Gray MICA SCHIST; moderately weathered; extremely close to very close fracture spacing | 4:03 | 41 | | | | | | |
| | | | 5:58 | 42 | | | | | | |
| | | | 4:53 | 43 | C-5 | NX CORE BARREL | 60 | | | |
| | | | 2:55 | 44 | | | | | | |
| | | | 4:26 | 45 | | | | | | |

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Log of Boring **LSB-12/MW-6** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 29 NAVD 88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Gray MICA SCHIST; moderately weathered; extremely close to very close fracture spacing | 8:24 | 45 | C-6 | NX CORE BARREL | 60 | | | |
| | | | 5:58 | 46 | | | | | | |
| | | | 4:22 | 47 | | | | | | |
| | | | 4:01 | 48 | | | | | | |
| | | | 3:37 | 49 | | | | | | |
| | | | | 50 | | | | | | Bottom of boring at 50' bsl. |
| | | | | 51 | | | | | | |
| | | | | 52 | | | | | | |
| | | | | 53 | | | | | | |
| | | | | 54 | | | | | | |
| | | | | 55 | | | | | | |
| | | | | 56 | | | | | | |
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| | | | | 66 | | | | | | |
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| | | | | 70 | | | | | | |

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# LANGAN

Log of Boring **LSB-13/MW-7** Sheet 1 of 3

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 33 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 1/28/22 / Date Finished: 1/28/22 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 50 ft / Rock Depth: 17 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 7 / Undisturbed -- / Core 7 |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 10 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 2-inch-diameter split spoon; Shelby tube | Field Engineer: Morgan McBride |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | | | | | |
| | | | | 1 | | | | | | |
| | | | | 2 | | | | | | |
| | | | | 3 | | | | | | |
| | | | | 4 | | | | | 0 | Started Drilling on 1/28/2022. Started drilling at 4 feet below sidewalk level (bsl) due to grade of site. |
| | | Brown fine-medium SAND, brick fragments (dry) | | 5 | S-1 | SS | 18 | | 0 | |
| | | | | | | | | | 0 | |
| | | | | 6 | | | | | 0 | |
| | | Brown fine-medium SAND, some brick (dry) | | | S-2 | SS | 18 | | 0 | |
| | | | | 7 | | | | | 0 | |
| | | | | | | | | | 0 | |
| | | Brown fine-medium SAND, trace brick, trace gravel (dry) | | 8 | S-3 | SS | 12 | | 0 | |
| | | | | | | | | | 0 | |
| | | | | 9 | | | | | 0 | |
| | | | | | | | | | 0 | |
| | | Brown fine-medium SAND, trace gravel (wet) ▽ | | 10 | S-4 | SS | 12 | | 4.8 | |
| | | | | | | | | | 7.2 | |
| | | | | 11 | | | | | 21.6 | Slight product and odors observed at 11-11.5' bsl. |
| | | | | | | | | | 11.6 | |
| | | | | 12 | S-5 | SS | 18 | | 0.5 | |
| | | | | | | | | | 0.3 | |
| | | | | 13 | | | | | 0 | |
| | | | | | | | | | 0 | |
| | | | | 14 | S-6 | SS | 20 | | 0 | |
| | | | | | | | | | 0 | |
| | | | | 15 | | | | | 0 | 9:50 AM - Collect sample 055_LSB-13_15-17 from 15-17' bsl. VOCs collected from 15.5-16' bsl. |
| | | | | | | | | | 0 | |
| | | | | 16 | | | | | 0 | |
| | | | | | S-7 | SS | 12 | | 0 | |
| | | Black WEATHERED ROCK (moist) | | 17 | | | | | | |
| | | Gray MICA SCHIST; slightly weathered; extremely close to very close fracture spacing | 5:24 | | C-1 | NX CORE BARREL | 23 | | | Refusal encountered at 17' bsl. Begin rock coring at 17' bsl. |
| | | | 5:03 | 18 | | | | | | |
| | | | 5:31 | 19 | | | | | | |
| | | | | 20 | | | | | | |

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# LANGAN

Log of Boring **LSB-13/MW-7** Sheet 2 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 33 NAVD 88 |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 5:10 | 20 | | | | | | |
| | | | 4:46 | 21 | C-1 | | 23 | | | |
| | | Gray MICA SCHIST; slightly weathered; extremely close to very close fracture spacing | 3:47 | 22 | | | | | | |
| | | | 5:16 | 23 | C-2 | NX CORE BARREL | 32 | | | |
| | | | 5:33 | 24 | | | | | | |
| | | Gray MICA SCHIST; slightly weathered; extremely close to very close fracture spacing | 6:27 | 25 | | | | | | |
| | | | 6:05 | 26 | | | | | | |
| | | | 6:13 | 27 | C-3 | NX CORE BARREL | 56 | | | |
| | | | 4:02 | 28 | | | | | | |
| | | | 5:09 | 29 | | | | | | |
| | | Gray MICA SCHIST; slightly weathered; extremely close to very close fracture spacing | 3:47 | 30 | | | | | | |
| | | | 4:28 | 31 | | | | | | |
| | | | 6:09 | 32 | C-4 | NX CORE BARREL | 53 | | | |
| | | | 8:45 | 33 | | | | | | |
| | | | 6:32 | 34 | | | | | | |
| | | Gray MICA SCHIST; slightly weathered; extremely close to very close fracture spacing | 7:14 | 35 | | | | | | |
| | | | 4:18 | 36 | | | | | | |
| | | | 2:58 | 37 | C-5 | NX CORE BARREL | 54 | | | |
| | | | 4:47 | 38 | | | | | | |
| | | | 12:45 | 39 | | | | | | |
| | | Gray MICA SCHIST; slightly weathered; extremely close to very close fracture spacing | 3:52 | 40 | | | | | | |
| | | | 4:13 | 41 | | | | | | |
| | | | 4:51 | 42 | C-6 | NX CORE BARREL | 35 | | | |
| | | | 5:30 | 43 | | | | | | |
| | | | 4:07 | 44 | | | | | | |
| | | | | 45 | | | | | | |

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Log of Boring **LSB-13/MW-7** Sheet 3 of 3

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 33 NAVD 88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Gray MICA SCHIST; slightly weathered; extremely close to very close fracture spacing | 5:30 | 45 | C-7 | NX CORE BARREL | 39 | | | |
| | | | 5:22 | 46 | | | | | | |
| | | | 4:47 | 47 | | | | | | |
| | | | 4:53 | 48 | | | | | | |
| | | | 5:28 | 49 | | | | | | |
| | | | | 50 | | | | | | Bottom of boring at 50' bsl. |
| | | | | 51 | | | | | | |
| | | | | 52 | | | | | | |
| | | | | 53 | | | | | | |
| | | | | 54 | | | | | | |
| | | | | 55 | | | | | | |
| | | | | 56 | | | | | | |
| | | | | 57 | | | | | | |
| | | | | 58 | | | | | | |
| | | | | 59 | | | | | | |
| | | | | 60 | | | | | | |
| | | | | 61 | | | | | | |
| | | | | 62 | | | | | | |
| | | | | 63 | | | | | | |
| | | | | 64 | | | | | | |
| | | | | 65 | | | | | | |
| | | | | 66 | | | | | | |
| | | | | 67 | | | | | | |
| | | | | 68 | | | | | | |
| | | | | 69 | | | | | | |
| | | | | 70 | | | | | | |

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Log of Boring **LSB-14** Sheet 1 of 2

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 31 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 2/1/22 / Date Finished: 2/1/22 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 21 ft / Rock Depth: 18 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 7 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 16 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 2-inch-diameter split spoon; Shelby tube | Field Engineer: Morgan McBride |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | | | | | |
| | | | | 1 | | | | | | |
| | | | | 2 | | | | | | |
| | | | | 3 | | | | | | |
| | | | | 4 | | | | | | |
| | | | | 5 | | | | | | |
| | | | | 6 | | | | | 0 | Started drilling on 2/1/2022. Started drilling at 6 feet below sidewalk level (bsl) due to grade of site. |
| | | Gray coarse GRAVEL (dry) | | | | | | | 0 | |
| | | Red brick (dry) | | 7 | S-1 | SS | 6 | | 0 | |
| | | | | | | | | | 0 | |
| | | Brown sandy SILT, trace brick, trace gravel (dry) | | 8 | | | | | 0 | |
| | | | | | | | | | 0 | |
| | | | | 9 | S-2 | SS | 12 | | 0 | |
| | | | | | | | | | 0 | |
| | | Brown sandy SILT, trace gravel (dry) | | 10 | | | | | 0 | |
| | | | | | | | | | 0 | |
| | | | | 11 | S-3 | SS | 18 | | 0.1 | |
| | | | | | | | | | 0 | |
| | | Brown sandy SILT, trace brick, trace gravel (dry) | | 12 | | | | | 0 | |
| | | | | | | | | | 0 | |
| | | | | 13 | S-4 | SS | 18 | | 0 | |
| | | | | | | | | | 0 | |
| | | Reddish brown sandy SILT, trace gravel (wet) | | 14 | | | | | 0 | |
| | | Reddish brown silty CLAY (moist) | | | | | | | 0.1 | |
| | | Brown sandy SILT, trace gravel (moist) | | 15 | S-5 | SS | 22 | | 0.1 | 9:00 AM - Collect sample 056_LSB-14_15-17 and 057_DUP-4 from 15-17' bsl. VOCs collected from 15.5-16' bsl. |
| | | ▽ | | | | | | | 0.1 | |
| | | Reddish brown medium-coarse SAND, trace gravel (wet) | | 16 | | | | | 0.1 | |
| | | Brown silty fine-medium SAND, trace gravel (wet) | | | | | | | 0 | |
| | | | | 17 | S-6 | SS | 18 | | 0 | |
| | | Black WEATHERED ROCK (moist) | | | | | | | 0 | |
| | | Dark gray MICA SCHIST; slightly weathered; very close fracture spacing | 3:30 | 18 | C-1 | NX CORE BARREL | 1.5 | | | Refusal encountered at 18' bsl. Begin rock coring at 18' bsl. |
| | | | 3:17 | 19 | | | | | | |
| | | | | 20 | | | | | | |

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Log of Boring **LSB-14** Sheet 2 of 2

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 31 NAVD 88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 6:12 | 20 | C-1 | | 1.5 | | | |
| | | | | 21 | | | | | | Bottom of boring at 21' bsl. |
| | | | | 22 | | | | | | |
| | | | | 23 | | | | | | |
| | | | | 24 | | | | | | |
| | | | | 25 | | | | | | |
| | | | | 26 | | | | | | |
| | | | | 27 | | | | | | |
| | | | | 28 | | | | | | |
| | | | | 29 | | | | | | |
| | | | | 30 | | | | | | |
| | | | | 31 | | | | | | |
| | | | | 32 | | | | | | |
| | | | | 33 | | | | | | |
| | | | | 34 | | | | | | |
| | | | | 35 | | | | | | |
| | | | | 36 | | | | | | |
| | | | | 37 | | | | | | |
| | | | | 38 | | | | | | |
| | | | | 39 | | | | | | |
| | | | | 40 | | | | | | |
| | | | | 41 | | | | | | |
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| | | | | 44 | | | | | | |
| | | | | 45 | | | | | | |

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Log of Boring **LSB-15** Sheet 1 of 2

| | |
|---|---|
| Project: 1487 First Avenue Development | Project No.: 100963701 |
| Location: 1487 First Avenue, New York, NY | Elevation and Datum: Approximate el. 31 NAVD 88 |
| Drilling Company: AARCO Environmental Services Corp. | Date Started: 2/1/22 / Date Finished: 2/1/22 |
| Drilling Equipment: Geoprobe 7822 DT | Completion Depth: 20.5 ft / Rock Depth: 17.5 ft |
| Size and Type of Bit: 2in Direct Push | Number of Samples: Disturbed 7 / Undisturbed -- / Core -- |
| Casing Diameter (in): -- / Casing Depth (ft): -- | Water Level (ft.): First ▽ 12 / Completion ▼ -- / 24 HR. ▼ -- |
| Casing Hammer: -- / Weight (lbs): -- / Drop (in): -- | Drilling Foreman: Jose Garcia |
| Sampler: 2-inch-diameter split spoon; Shelby tube | Field Engineer: Morgan McBride |
| Sampler Hammer: -- / Weight (lbs): -- / Drop (in): -- | |

| Material Symbol | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | | | | | | Started drilling on 2/1/2022. Started drilling at 6 feet below sidewalk level (bsl) due to grade on site. |
| | | | | 1 | | | | | | |
| | | | | 2 | | | | | | |
| | | | | 3 | | | | | | |
| | | | | 4 | | | | | | |
| | | | | 5 | | | | | | |
| | | | | 6 | | | | | 0 | |
| | | Brown fine-medium SAND, some brick, some gravel, trace wood (dry) | | 7 | S-1 | SS | 8 | | 0 | |
| | | | | 8 | | | | | 0 | |
| | | Brown fine-medium SAND, some gravel, trace brick, concrete (dry) | | 9 | S-2 | SS | 10 | | 0 | |
| | | | | 10 | | | | | 0 | |
| | | Brown fine-medium SAND, some gravel, trace brick (dry) | | | | | | | 0 | |
| | | Brown sandy SILT, trace clay (dry) | | 11 | S-3 | SS | 22 | | 0.1 | |
| | | ▽ | | | | | | | 0.1 | |
| | | Brown sandy SILT, trace clay, trace gravel (wet) | | 12 | | | | | 0 | |
| | | | | 13 | S-4 | SS | 18 | | 0 | |
| | | | | | | | | | 0.1 | |
| | | | | | | | | | 0.1 | |
| | | Brown sandy SILT, trace gravel (wet) | | 14 | | | | | 0.1 | |
| | | | | | | | | | 0.1 | |
| | | | | 15 | S-5 | SS | 14 | | 0.1 | 10:45:AM - Collect sample 058_LSB-15_15-17 from 15-17' bsl. VOCs collected from 15.5-16' bsl. |
| | | | | | | | | | 0.1 | |
| | | | | 16 | | | | | 0 | |
| | | Black WEATHERED ROCK (moist) | | | S-6 | SS | 18 | | 0 | |
| | | | | 17 | | | | | 0 | |
| | | Gray MICA SCHIST; slightly weathered; extremely close to very close fracture spacing; [BEDROCK] | 3:23 | 18 | C-1 | NX CORE BARREL | 18 | | 0 | Refusal at 17.5' bsl. Begin rock coring at 17.5' bsl. |
| | | | 3:41 | 19 | | | | | | |
| | | | | 20 | | | | | | |

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Log of Boring **LSB-15** Sheet 2 of 2

| Project | Project No. |
|---|---|
| 1487 First Avenue Development | 100963701 |
| **Location** | **Elevation and Datum** |
| 1487 First Avenue, New York, NY | Approximate el. 31 NAVD 88 |

| MATERIAL SYMBOL | Elev. (ft) | Sample Description | Coring (min) | Depth Scale | Sample Data: Number | Type | Recov. (in) | Penetr. resist BL/6in | PID Reading (ppm) | Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2:26 | 20 | | | 18 | | | Bottom of boring at 20.5' bsl. |
| | | | | 21 | | | | | | |
| | | | | 22 | | | | | | |
| | | | | 23 | | | | | | |
| | | | | 24 | | | | | | |
| | | | | 25 | | | | | | |
| | | | | 26 | | | | | | |
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# APPENDIX D

# Health and Safety Plan

LANGAN

# HEALTH AND SAFETY PLAN

# for

# SITE MANAGEMENT

## 1487 First Avenue
## New York, New York

***Prepared For:***

**CP VII 78th Street Owner, LLC**
**510 Madison Avenue, 8th Floor**
**New York, New York 10022**

***Prepared By:***

**Langan Engineering, Environmental, Surveying,**
**Landscape Architecture and Geology, D.P.C.**
**300 Kimball Drive**
**Parsippany, New Jersey 07054**

**February 2025**
**100963701**

# ENVIRONMENTAL HEALTH AND SAFETY PLAN

| | |
|---|---|
| *Client:* | **CP VII 78th Street Owner, LLC** |
| *Project:* | **Site Management Plan** |
| *Location:* | **1487 First Avenue, New York, NY** |
| *Chemical Hazards:* | **Chlorinated volatile organic compounds (VOCs), Semi-volatile organic compounds (SVOCs), Metals** |
| *Prepared By:* | **LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C.** |
| *Version:* | **1** |
| *Date:* | **February 2025** |

| | | |
|---|---|---|
| *Client Contact:* | **Kyle Becker** | **(212) 202-5794** |
| *Langan Project Manager (PM):* | **Amanda Forsburg** | **(973) 560-4900** |
| *Langan Health & Safety Manager (HSM):* | **Tony Moffa, CHMM** | **(215) 491-6545** |
| *Langan Health and Safety Officer (HSO):* | **Field Personnel** | |
| *WorkCare:* | **1-888-449-7787** | |
| *Langan Incident/Injury Hotline:* | **(973) 560-4699** | |

LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C., (LANGAN), AND LANGAN SUBCONTRACTORS, DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE WITHOUT PRIOR RESEARCH AND EVALUATION BY A TRAINED HEALTH AND SAFETY SPECIALIST. THIS HASP HAS BEEN PREPARED FOR LANGAN EMPLOYEES ONLY. ALL OTHER PARTIES WORKING ON THE SITE THAT HAVE THE POTENTIAL TO BE EXPOSED TO HAZARDOUS MATERIALS MUST DEVELOP AND IMPLEMENT THEIR OWN HASP FOR USE BY THEIR EMPLOYEES.

**APPROVALS**

By signature, the personnel identified below hereby acknowledge that they have reviewed this Health and Safely Plan (HASP) and agree to comply with the requirements contained therein as well as the applicable provisions of 29 CFR Parts 1910 and 1926. Furthermore, in reviewing and accepting this HASP, as currently written, the undersigned agree that to the best of their knowledge, this HASP adequately identifies the activities and hazards associated with work at this site and describes the appropriate and necessary precautions and protections for site workers required by the applicable OSHA statutes and regulations.

| | |
|---|---|
| Amanda M. Forsburg | 2/26/2025 |
| LANGAN Project Manager - PM (Amanda Forsburg) | Date |
| | |
| LANGAN Health and Safety Manager (Tony Moffa, CHMM) | Date |
| | |
| LANGAN Health and Safety Officer – HSO | Date |

## TABLE OF CONTENTS


ENVIRONMENTAL HEALTH AND SAFETY PLAN ..... i
APPROVALS ..... ii
1.0 INTRODUCTION ..... 1
1.1 Purpose and Policy ..... 1
1.2 Site Description ..... 3
1.3 Scope of Work ..... 4
2.0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES ..... 4
2.1 Langan Project Manager ..... 4
2.2 Health and Safety Manager (HSM) ..... 5
2.3 Langan Health and Safety Officer (HSO) ..... 5
3.0 HAZARDS ANALYSIS ..... 6
3.1 General Hazard Assessment ..... 6
3.2 Chemical Exposure Hazards ..... 7
3.2.1 Specific Chemical Hazards Previously Detected at the Site ..... 7
3.2.2 Injection Reagent Hazards ..... 7
3.2.3 Chemical Hazard Exposure Routes ..... 7
3.2.4 Control of Exposure to Chemical Hazards ..... 8
3.3 Physical Hazards ..... 8
3.3.1 Temperature Extremes ..... 8
3.3.2 Noise Resources ..... 9
3.3.3 Hand and Power Tools ..... 9
3.3.4 Slips, Trips, and Falls ..... 9
3.3.5 Fire and Explosion ..... 10
3.3.6 Material Handling ..... 10
3.3.7 Confined Space/Excavation Hazards ..... 11
3.3.8 Working Near Equipment ..... 11
3.3.9 Drill Rig Operations ..... 11
3.3.10 Electrical Safety ..... 12
3.3.11 Utilities ..... 12
3.3.12 Vehicular Traffic ..... 12
3.4 Biological Hazards ..... 13
3.4.1 Animals ..... 13
3.4.2 Insects ..... 13
3.4.3 Wound Care ..... 13
3.5 Coronavirus ..... 14
3.6 Task Hazard Analysis ..... 15
3.6.1 Groundwater, Soil Vapor, and Indoor Air Sample Collection ..... 15
3.6.2 In-Situ Chlorinated Volatile Organic Compound Treatment ..... 15
4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE) ..... 16
4.1 Levels of Protection ..... 16
4.2 Respirator Fit-Test ..... 17
4.3 Respirator Cartridge Change-Out Schedule ..... 17




LANGAN

**TABLE OF CONTENTS**
**(Continued)**


5.0 AIR QUALITY MONITORING AND ACTIONS LEVELS ..... 18
5.1 Monitoring During Site Operations ..... 18
5.1.1 Volatile Organic Compounds ..... 19
5.1.2 Dust ..... 19
5.1.3 Determination of Background Levels ..... 19
5.2 Monitoring Equipment Calibration and Maintenance ..... 20
5.3 Noise Monitoring ..... 20
6.0 COMMUNITY HEALTH AND SAFETY CONSIDERATIONS ..... 20
7.0 WORK ZONES and DECONTAMINATION ..... 20
7.1 Site Control ..... 20
7.2 Contamination Control ..... 21
7.2.1 Personnel Decontamination Station ..... 21
7.2.2 Minimization of Contact with Contaminants ..... 21
7.2.3 Personnel Decontamination Sequence ..... 22
7.2.4 Emergency Decontamination ..... 22
7.2.5 Hand-Held Equipment Decontamination ..... 22
7.2.6 Heavy Equipment Decontamination ..... 23
7.3 Communications ..... 23
8.0 MEDICAL SURVEILLANCE ..... 24
9.0 EMERGENCY RESPONSE PLAN ..... 24
9.1 Responsibilities ..... 24
9.1.1 Langan Health and Safety Officer (HSO) ..... 24
9.1.2 Emergency Coordinator ..... 25
9.1.3 Site Personnel ..... 25
9.2 Communications ..... 25
9.3 Local Emergency Support Units ..... 25
9.4 Pre-Emergency Planning ..... 26
9.5 Emergency Medical Treatment ..... 26
9.6 Non-Emergency Medical Treatment ..... 27
9.7 Emergency Site Evacuation Routes and Procedures ..... 27
9.8 Fire Prevention and Protection ..... 27
9.8.1 Fire Prevention ..... 28
9.9 Significant Vapor Release ..... 28
9.10 Overt Chemical Exposure ..... 28
9.11 Decontamination During Medical Emergencies ..... 29
9.12 Incident Reporting ..... 29
9.13 Adverse Weather Conditions ..... 30
9.14 Spill Control and Response ..... 30
9.15 Emergency Equipment ..... 32
9.16 Restoration and Salvage ..... 32
10.0 TRAINING ..... 32
10.1 General Health and Safety Training ..... 32
10.2 Site Specific Training ..... 33
10.3 Onsite Safety Briefings ..... 33




LANGAN

**TABLE OF CONTENTS**
**(Continued)**


10.4 Hazard Communication ..... 33
11.0 RECORDKEEPING ..... 34
11.1 Field Change Authorization Request ..... 34
11.2 Medical and Training Records ..... 34
11.3 Onsite Log ..... 34
11.4 Daily Safety Meetings ("Tailgate Talks") ..... 34
11.5 Exposure Records ..... 34
11.6 Hazard Communication Program/SDS ..... 35
11.7 Documentation ..... 35
12.0 FIELD PERSONNEL REVIEW ..... 36


## TABLES


Table 1 Contaminants of Concern
Table 2 Chemical Exposure Limits and Health Effects
Table 3 Hazard Analysis
Table 4 Instrumentation Action Levels
Table 5 Personal Protective Equipment


## FIGURES


Figure 1 Site Location Map
Figure 2 Emergency Hospital Route Map


## ATTACHMENTS


ATTACHMENT A Health and Safety Briefing Statement
ATTACHMENT B Field Procedures Change Authorization Form
ATTACHMENT C Unsafe Conditions and Practices Form
ATTACHMENT D Calibration Log
ATTACHMENT E Emergency Notification Numbers
ATTACHMENT F Accident / Incident Report Form
ATTACHMENT G Jobsite Safety Inspection Checklist
ATTACHMENT H Safety Data Sheets (SDS)
ATTACHMENT I Langan Guidelines

# 1.0 INTRODUCTION

## 1.1 Purpose and Policy

This Health and Safety Plan (HASP) has been developed to comply with the regulations under Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(b)(4), Hazardous Waste Operations and Emergency Response. It addresses foreseeable activities associated with the site work activities to be conducted at 1487 First Avenue (see Figure 1). This HASP establishes personnel protection standards and mandatory safety practices and procedures. Additionally, it assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted at known or suspected hazardous waste sites.

Langan personnel involved with inspection of site work activities which involve the displacement of groundwater and/or material during the proposed groundwater, soil vapor, and indoor air sampling activities and during the proposed groundwater treatment activities shall comply with the requirements of this HASP. All Langan personnel engaged in onsite activities will read this document carefully and complete the Safety Briefing Form (Attachment A), a copy of which will be provided to Langan's Project files. Contractors and subcontractors conducting activities which will disturb or displace soil in the identified AOC and/or perform the injections are required to develop and follow their own HASP based on the identified hazards. All sampling data and environmental reports pertaining to the site that are available to Langan will be provided upon request to the Langan PM. Contractors and subcontractors are responsible for their own workers Health and Safety and providing a safe working environment in accordance with all applicable federal, state and local requirements. Each Subcontractor will have a designated Site Health and Safety Manager who will be responsible for ensuring that the designated procedures are implemented in the field. Personnel who have any questions or concerns regarding implementation of this plan are encouraged to request clarification from the Langan PM. Langan field personnel must follow the designated health and safety procedures, be alert to the hazards associated with working close to vehicles and equipment, and use common sense and exercise reasonable caution at all times.

This HASP covers site management-related field activities which have the potential to disturb and/or displace potentially contaminated soil, soil vapor, and groundwater. These activities include, but are not limited to: the collection of groundwater samples, the collection of indoor air and soil vapor samples, and groundwater treatment injections.

This HASP was prepared in accordance with the following documents and/or guidelines:

- Occupational Safety and Health Administration (OSHA) regulations for hazardous site workers (29 CFR 1910.120 and 29 CFR 1926); and,
- NIOSH/OSHA/USCG/USEPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.*

Langan's Health and Safety Program and Safe Operating Procedures support this site-specific HASP.

The level of protection and the procedures specified in this HASP represent the minimum health and safety requirements to be observed by Langan site personnel engaged in the referenced site management activities. Unknown conditions may exist, and known conditions may change. Should an employee find himself or herself in a potentially hazardous situation, the employee will immediately discontinue the hazardous procedure(s) and either personally effect appropriate preventative or corrective measures, or immediately notify the Health and Safety Officer or the Langan PM of the nature of the hazard. In the event of an immediately dangerous or life threatening situation, the employee always has "stop work" authority. Any necessary revision to the Health and Safety procedures will be recorded in the Field Procedure Change Authorization Form (Attachment B), and will require authorization from the Langan Health and Safety Manager and Langan PM.

The provisions of this HASP address worker health and safety within defined contaminant zones and assume that work will be completed within vacant building cellars and outdoor vacant lots. Additional provisions including air sampling and modifications to drilling techniques to further limit potential exposure to sensitive populations will be required if work is to be conducted within occupied building areas or in occupied areas that may be impacted by the proposed work. Additional

provisions including the use of traffic control measures will be employed in order to avoid possible hazards associated with vehicular traffic and pedestrians

THE ULTIMATE RESPONSIBILITY FOR THE HEALTH AND SAFETY OF THE INDIVIDUAL EMPLOYEE RESTS WITH THE EMPLOYEE AND HIS OR HER COLLEAGUES. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her own health and safety and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the attention of the appropriate health and safety personnel as designated above and to follow-up the verbal notification by completing the Unsafe Conditions and Practices Form provided in Attachment C, a copy of which will be provided to the Langan Health and Safety Officer.

"Extenuating" circumstances such as budget or time constraints, equipment breakdown, changing or unexpected conditions, never justify unsafe work practices or procedures. In fact, the opposite is true. Under stressful circumstances all project personnel must be mindful of the potential to consciously or unconsciously compromise health and safety standards, and be especially safety conscious. **ALL SITE PERSONNEL ARE EXPECTED TO CONSIDER "SAFETY FIRST" AT ALL TIMES.**

## 1.2 Site Description

The Site is located in the Upper East Side neighborhood of Manhattan, New York and is identified as Block 1452, Lot 27. A Site Location Plan is provided as Figure 1. The Site is an approximately 10,050-square foot parcel bordered by the four-story 354 East 78th Street building to the west, East 78th Street to the north, 1st Avenue to the east, and the nine-story 1485 1st Avenue building to the south. After remediation and upon completion of construction, the development will consist of a new 35-story mixed-use residential and commercial building that will occupy the entirety of the Site footprint.

### 1.3 Scope of Work

The site work activities which will require the oversight by a Langan Engineer include the following scope and will include the completion of:

- Task 1: Collection of groundwater samples; and,
- Task 2: In-Situ Groundwater Treatment.

Details of the scopes of work to be completed for this project are provided within the July 2023 (revised in 2025) Site Management Plan (SMP).

## 2.0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES

This section specifies the Langan Project Organization.

### 2.1 Langan Project Manager

The Langan Project Manager (PM) is Amanda Forsburg. The PM responsibilities include:

- Prepares and organizes the background review of site conditions, the site HASP, and the field team;
- Obtains permission for site access and coordinates activities with appropriate officials;
- Briefs the field team on their specific assignments;
- Coordinates with the Health and Safety Officer (HSO) to ensure that health and safety requirements are met;
- Serves as the liaison with public officials;
- 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 Health and Safety Manager (HSM)

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

- Serving as a resource in the development and implementation of HASPs;
- Assist in reviewing results of Jobsite Safety Inspections;
- Assisting site Health and Safety Officer (HSO) with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc.;
- Maintaining all records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

## 2.3 Langan Health and Safety Officer (HSO)

The Langan Health and Safety Officer (HSO) is to be identified prior to the start of field work. The HSO responsibilities include:

- Participating in the development and implementation of this HASP;
- Conducting Jobsite Safety Inspections (Attachment G) and correcting any shortcomings in a timely manner;
- Helping to select proper Personal Protective Equipment (PPE) and periodically inspecting it;
- Ensuring that PPE is properly stored and maintained;
- Controlling entry into and exit from the contaminated areas or zones of the site;
- Confirming each team member's suitability for work based on a current physician's recommendation;
- Monitoring the work parties 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;
- Resolves conflicting situations which may arise concerning safety requirements and working conditions.

- Conducting daily tailgate meetings to review applicable Hazard Analyses (Table 3) as well as check-in with site personnel.

## 3.0 HAZARDS ANALYSIS

This section presents an assessment of the general, chemical, physical, and biological hazards that may be encountered during the tasks specified under this HASP (Section 1.3). A detail on types of potential contaminants of concerns Langan anticipates to encounter at different locations during the intrusive activities is listed in Tables 1 and 2 of this HASP.

### 3.1 General Hazard Assessment

A general hazard assessment was conducted for the required field work described in Section 1.3 and the following potential hazards have been identified:

- Inhalation of volatile organic compounds (VOCs) including chlorinated VOCs with high volatilization potential;
- Inhalation of polycyclic aromatic hydrocarbons (PAHs) with low volatilization potential;
- Skin and eye contact with contaminants;
- Ingestion of contaminants;
- Inhalation of dusts impacted with polycyclic aromatic hydrocarbons and/or metals;
- Physical hazards associated with the use of heavy equipment;
- Excavation hazards;
- Tripping hazards;
- Injection reagent handling hazards;
- Noise exposure;
- Heat stress (depending on weather conditions);
- Cold exposure (depending on weather conditions);
- Flammable hazards;
- Electrical hazards; and,
- Use of personal protective equipment.

These hazards are further described in the task-by-task hazard analysis in Table 3. Specific chemical, physical and biological hazards are discussed below.

Mitigation and controls will include as needed work procedures, work/rest regiment, dust control measures, personal protective equipment, and respiratory protection as appropriate.

## 3.2 Chemical Exposure Hazards

The following chemical hazard evaluation for the proposed site management activities is based on the previous environmental investigation of the site and typical compounds commonly associated with contaminated fill and historical dry cleaning operations. The evaluation has been conducted to identify chemicals/ materials that potentially may be present at the site, and to ensure that work activities, personnel protection, and emergency response are consistent with the specific contaminants that potentially could be encountered.

### 3.2.1 Specific Chemical Hazards Previously Detected at the Site

Impacted fill material and an impacted sand layer have been identified on the subject property as reported in the November 2022 Remedial Investigation Report. In addition, impacted groundwater and soil vapor was identified on-site. Table 1 lists Contaminants of Concern and potentially affected media. The potential contaminants that might be encountered during the field activities and the exposure limits are listed in Table 2.

### 3.2.2 Injection Reagent Hazards

Injection reagents that may be used at the site include SRS®-SD small droplet emulsified vegetable oil, zero valent iron (ZVI), SDC-9TM (bioaugmentation culture), and NutriPlusTM (nutrients). Safety data sheets (SDSs) for each reagent are provided in Attachment H.

### 3.2.3 Chemical Hazard Exposure Routes

Potential hazards and their exposure routes include:

- Inhalation of organic vapors due to the presence of volatile organic compounds in soil, groundwater, and soil vapor and from diesel-powered equipment and minimal volatilization potential related to the presence of SVOCs in soil.

- Inhalation of dust impacted with SVOCs or metals associated with soil borings and/or soil sampling activity.
- Inadvertent ingestion of potentially toxic substances via hand to mouth contact or deliberate ingestion of materials inadvertently contaminated with potentially toxic materials or injection reagents.
- Dermal exposure and possible percutaneous (skin) absorption of certain lipophilic (readily absorbed through the skin) SVOCs.
- Skin and eye contact with contaminants or injection reagents at the site and decontamination activities.

Exposure limits and health effects of selected chemicals are in Table 2. The probability of exposure for each task is outlined in Table 3.

### 3.2.4 Control of Exposure to Chemical Hazards

To protect potentially exposed personnel the following procedures and protocols will be adopted and used as needed: work procedures will be adhered to, work zones will be established, dust control will be utilized, respirators (if required) and personal protective equipment will be worn, Dust monitoring will be conducted during times of disturbance of the impacted soil to assess the potential inhalation pathway of exposure and strict personnel decontamination procedures will be followed.

## 3.3 Physical Hazards

### 3.3.1 Temperature Extremes

Hot Temperatures

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE, in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. If onsite workers exhibit the signs of heat exhaustion or heat stroke, they should seek immediate medical attention.

Cold Temperatures

Workers may be exposed to the hazard of working in a cold environment. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery surfaces, brittle equipment, poor judgment, and unauthorized procedural changes. In order

to prevent frostbite, hypothermia, trench foot and immersion foot, the workers are responsible for dressing warmly in layers with thick socks, gloves, and appropriate head and face gear. Upon the onset of discomfort due to the cold, onsite workers should take regular five to ten minute breaks to warm up inside nearby buildings and to drink warm fluids. Please note that the NYCDEP statute prohibits idling an engine for more than three minutes (one-minute if adjacent to a school). This statue includes the use of a vehicle for the purpose of warming up employees. As such, all contractors and employees shall identify a place to warm up in advance. If discomfort continues and the onsite workers start to exhibit the signs of frostbite, hypothermia, trench foot or immersion foot, they should seek immediate medical attention.

### 3.3.2 Noise Resources

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Hearing protection is required and shall be used in designated areas of the site as indicated by the posted signs.

### 3.3.3 Hand and Power Tools

In order to complete the various tasks for the project, personnel will utilize 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. Hand and power tools will be inspected prior to use. Proper personal protective equipment shall be worn while utilizing hand and power tools. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

### 3.3.4 Slips, Trips, and Falls

Working in and around the site will pose slip, trip and fall hazards due to equipment, piping, slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice. Potential adverse health effects include falling to the ground and becoming injured or twisting an ankle. Good housekeeping at the site must be maintained at all times.

### 3.3.5 Fire and Explosion

Prior to starting all intrusive work, a review of appropriate New York City maps will be conducted to identify potential hazards. The possibility of encountering fire and explosion hazards exists from under- ground utilities and gases. Therefore, all excavation equipment must be grounded.

### 3.3.6 Material Handling

Manual lifting of heavy objects may be required. Failure to follow proper lifting techniques can result in back injuries and strains. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

Whenever possible, heavy objects must be lifted and moved by mechanical devices rather than by manual effort. The mechanical devices will be appropriate for the lifting or moving task and will be operated only by trained and authorized personnel. Objects that require special handling or rigging will only be moved under the guidance of a person who has been specifically trained to move such objects, such as a Master Rigger or equivalent. Lifting devices, including equipment, slings, ropes, chains, and straps, will be inspected, certified, and labeled to confirm their weight capacities. Defective equipment will be taken out of service immediately and repaired or destroyed.

The lift and swing path of a crane/equipment will be watched and maintained clear of obstructions. Personnel will not pass under a raised load, nor will a suspended load be left unattended. Personnel will not be carried on lifting equipment, unless it is specifically designed to carry passengers.

All reciprocating, rotating, or other moving parts will be guarded at all times. Accessible fire extinguishers will be made available in all mechanical lifting devices. All material must be stored in tiers, racked, blocked, or otherwise secure to prevent sliding, falling, or collapse. All loads/material will be verified to be secure before transportation.

### 3.3.7 Confined Space/Excavation Hazards

Personnel entry into confined spaces, trenches, or unshored (e.g., lagging) excavations is not anticipated and will not be permitted. No other confined spaces are known to exist on Site. If entry into trenches or excavations is required, all work will stop until the HASP has been revised to address the new hazards.

### 3.3.8 Working Near Equipment

Personnel working in the immediate vicinity of heavy equipment (*e.g.*, drill rigs, excavators, loaders, etc.) may encounter physical hazards resulting from contact with equipment. Field personnel should be aware of the presence of these hazards at all times and take appropriate action to avoid them. Due to the limited ability to communicate when wearing respiratory protection, the risk is increased. Workers must be careful to communicate with heavy equipment operators regarding their location, and should maintain a safe distance from operating equipment at all times. Prior to working around equipment, the site personnel will review appropriate hand signals with the operator.

Equipment will be equipped with back up alarms.

### 3.3.9 Drill Rig Operations

In order to complete soil borings, a track mounted drill rig will be used. Working with and near this equipment and associated power generators pose many potential hazards, including being struck by or against, or pinched/caught by moving parts. These hazards can result in serious physical harm. Other hazards include electrocution and explosion due to encountering overhead or underground utilities.

Drill rigs for hollow stem auger drilling and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and other field personnel must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter. The driller and helper shall not simultaneously handle augers unless there is a standby person to activate the emergency switch. Only equipment that has been approved by the manufacturer may

be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers shall not be allowed.

The driller must never leave the controls while the tools are rotating unless all personnel are kept clear of rotating equipment. A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or near the rotating equipment. Drillers, helpers, and other field personnel must secure all loose clothing when in the vicinity of drilling operations. No person shall climb the drill mast while tools are rotating or without the use of ANSI-approved fall protection (approved belts, lanyards and a fall protection slide rail) or portable ladder that meets the requirement of the OSHA standard.

### 3.3.10 Electrical Safety

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. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

### 3.3.11 Utilities

Prior to the start of any intrusive work, the location of above-ground and underground utilities and other structures will be completed by the contractor/subcontractor responsible for completing site management activities.

### 3.3.12 Vehicular Traffic

Portions of site activities (load in and load out) will be conducted in the street. As such, vehicular and pedestrian traffic will be present. Appropriate precautions to protect the on-site workers and civilians should be used including the use of cones and traffic vests as appropriate.

## 3.4 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals and insects. As the potential for exposure to blood borne pathogens during the site management activities is anticipated to be low, a Blood Borne Pathogen Exposure Plan (BBPEP) is not required. A BBPEP will be prepared if site operation requires its implementation.

### 3.4.1 Animals

During site operations, animals such as dogs, cats, pigeons, mice, and rats may be encountered. Workers shall use discretion and avoid all contact with animals. Bites and scratches from dogs and cats can be painful and if the animal is rabid, the potential for contracting rabies exists. Contact with rat and mice droppings may lead to contracting hantavirus. Inhalation of dried pigeon droppings may lead to psittacosis. Cryptococcosis and histoplasmosis are also diseases associated with exposure to dried bird droppings but these are less likely to occur in this occupational setting.

### 3.4.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, spiders, and ticks may be present at the site. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. In addition, mosquito bites may lead to St. Louis encephalitis or West Nile encephalitis.

### 3.4.3 Wound Care

A source of occupational exposure may occur when an employee gives First Aid and or CPR to an individual who had infectious blood. The occupational exposure occurs when there is the possibility for an employee's eyes, mucous membranes, non-intact skin (i.e., cut and abraded skin) to come into contact with potentially infectious materials from another employee. If an accident were to occur where First Aid would need to be administered, the person administering the First Aid will presume that any wounds and materials used are contaminated with BBP and should wear the appropriate PPE to prevent contact with these materials. Additionally, should the use of First Aid materials and or clothing

that was potentially contaminated with BBP be encountered these materials should be property containerized and transported to the nearest hospital for proper disposal.

## 3.5 Coronavirus

**General Preventative Measures**

Field personnel must follow general proper hygiene measures while in the field including:

- Avoid touching eyes, nose and mouth.
- Cover cough or sneeze with tissue, and throw in trash.
- Wash hands often with soap and water for 20 seconds after going to bathroom, before eating, after blowing nose, coughing or sneezing.
- Use hand sanitizer with at least 60% alcohol if soap and water are not available.
- Avoid physical contact with other people (e.g., no handshakes).
- Maintain a safe distance of at least 6 feet from other people (social distancing).
- Wear face coverings when around other worker to minimize spread of COVID-19. (May be required in certain states or locations.)

**Construction Trailers**

Employees should avoid use of shared construction trailers or where employees cannot maintain a safe distance (minimum 6 feet) from other workers. If trailer use is needed, areas such as desks, phones, chairs and other common areas, should be cleaned and disinfected before and after use. Protocols should be developed to minimize trailer use to essential personal, restrict use from any workers who are ill or showing symptoms of being ill, use if face coverings and ensure a safe distance of 6 feet can be established between workers.

**Communication**

Include Coronavirus topics and prevention topics in daily tailgate meetings to ensure Coronavirus awareness is communicated daily. Discussions can focus on general topics including: social distancing, prevention measures for field personnel, signs and symptoms and recent news on the Coronavirus. Site-specific topics should include minimizing face-to-face contact, disinfecting/sterilizing field equipment, use of PPE to reduce exposure, site security, use of face coverings and other potential exposure issues/concerns.

**Sick/Ill Workers**

No Langan employee is permitted to be onsite when ill and/or showing potential symptoms of the Coronavirus. Symptoms of the Coronavirus may appear 2-14 days after exposure and can range from mild to severe. The most common symptoms include: fever, fatigue, dry cough, shortness of breath chills, repeated shaking with chills, muscle pain, headache, sore throat, or new loss of taste or smell. If an employee or subcontractor is observed being ill or exhibiting symptoms of Coronavirus, employees must immediately utilize their Stop Work Authority and contact their project manager to address the situation. If an employee observes another worker onsite exhibiting symptoms of Coronavirus, immediately utilize Stop Work Authority and notify their project manager and site construction manager or safety officer. Work should resume when the safety and health of Langan and subcontractors is adequately addressed.

## 3.6 Task Hazard Analysis

The tasks to be completed during the proposed site work activities, as summarized in Section 1.3, are listed in Table 3 with a Hazard Analysis for each task. Chemical exposures may occur, as described in Table 1. For all tasks, if evidence of historical contamination is encountered other than what is anticipated as part of the intended site management activities, work will be stopped and emergency contacts listed in Attachment D of this HASP will be immediately notified. Activities will be conducted in Level D, but personnel should be prepared to upgrade to Level C, as appropriate, based on field screening criteria.

### 3.6.1 Groundwater Sample Collection

Groundwater samples will be collected from the subsurface. Chemical exposure may occur as these samples are collected and handled as described in Table 1.

### 3.6.2 In-Situ Chlorinated Volatile Organic Compound Treatment

Groundwater treatment with zero-valent iron (ZVI) and carbon substrate or other reagents via injection points will be completed.

## 4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

### 4.1 Levels of Protection

PPE must protect workers from the specific hazards they are likely to encounter 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 for work completed within the defined exclusion zone. This will include any work within the defined drilling areas. Level D Protection will be required for all personnel working outside the investigation area but engaged with site management activities. The upgrading/downgrading of these levels of protection will be based on continuous air monitoring results as described in Section 5.0. The decision to modify standard PPE will be made by the HSO after conferring with the Project Manager. The levels of protection are described below.

- **Level D Protection**

  a. Safety glasses w/ sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Hard hat
  d. Long sleeve work shirt and work pants
  e. Nitrile gloves
  f. Hearing protection (as needed)
  g. Reflective traffic vest

- **Level D Protection (Modified)**

  a. Safety glasses w/ sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Disposable chemical-resistant boot covers
  d. Coveralls Tyvek or equivalent to be worn when contact with contaminated soil or groundwater, or non-aqueous phase liquids is anticipated)
  e. Hard hat
  f. Long sleeve work shirt and work pants
  g. Nitrile gloves
  h. Hearing protection (as needed)
  i. Reflective traffic vest

- **Level C Protection**

    a. Full face-piece, air-purifying, cartridge*-equipped, NIOSH-approved respirator [*combo cartridge P100/OV/CL/HC/SD/CD/HS (escape)]
    b. Inner (latex) and outer (nitrile) chemical-resistant glove
    c. Chemical-resistant safety boots/shoes (toe-protected)
    d. Disposable chemical-resistant boot covers
    e. Hard hat
    f. Long sleeve work shirt and work pants
    g. Coveralls (Tyvek or equivalent, poly-coated Tyvek will be worn when contact, or anticipated contact with wet contaminated soils, ground water, and/or non-aqueous phase liquids (NAPL) is anticipated))
    h. Hearing protection (as needed)
    i. Reflective traffic 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 Langan's H&S Department in Langan's Doylestown, Pennsylvania office. The monitoring procedures and equipment are outlined in Section 5.0.

## 4.2 Respirator Fit-Test

All Langan employees and subcontractors performing site work who could be exposed to hazardous substances at the work site are in possession of a full face-piece, air-purifying respirator and have been successfully quantitative fit-tested within the past year. Quantitative fit-test records are maintained by Langan's H&S Department.

## 4.3 Respirator Cartridge Change-Out Schedule

Respiratory protection is required to be worn when certain action levels (Table 2) are reached. A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows:

- Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first.

- If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short the time period was the previous day they were used.

## 5.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

### 5.1 Monitoring During Site Operations

Atmospheric air monitoring results are used to provide data to determine when exclusion zones need to be established and when certain levels of personal protective equipment are required. For all instruments there are Site-specific action level criteria which are used in making field health and safety determinations. Other data, such as the visible presence of contamination or the steady state nature of air contaminant concentration, are also used in making field health and safety decisions. Therefore, the Langan Health and Safety Officer may expand the exclusion zone beyond the extents of the excavation or sampling area or require a person to wear a respirator even though atmospheric air contaminant concentrations are below established HASP action levels.

During site work involving disturbance of impacted soils, real time air monitoring will be conducted to assess the potential for exposure to airborne contaminants of concern including VOCs, chlorinated VOCs, SVOCs, and metals. A photoionization detector (PID) and/or flame ionization detector (FID) will be used to monitor concentrations of VOCs at personnel breathing-zone height to assess the potential exposure to petroleum related VOCs related to use of machinery including backhoes, drill rigs, compressors etc. Dust monitoring will be completed with an aerosol monitor. Air monitoring will be the responsibility of the Langan Health and Safety Officer or designee. Air monitoring will be conducted during intrusive activities associated with the completion of soil borings, installation of permanent monitoring wells, installation of soil vapor and sub-slab soil vapor sampling points, and collection of soil and soil vapor samples. All manufacturers' instructions for instrumentation and calibration will be available onsite.

Subcontractors' air monitoring plans must be equal or more stringent as the Langan plan.

An air monitoring calibration log is provided in Attachment D of this HASP.

### 5.1.1 Volatile Organic Compounds

Monitoring with a PID, such as a MiniRAE 2000 (10.6v) or equivalent will occur during all intrusive activities. Colormetric Indicator Tubes for benzene may be used as backup for the PID, if measurements remain above background monitor every 2 hours. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, appearance of drill cuttings, etc.) since the last measurement. If VOC levels are observed above 5 ppm for longer than 5 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the workzone every 30 minutes in additional to the employee breathing zone. Instrument action levels for monitored gases are provided in Table 4.

### 5.1.2 Dust

During invasive procedures that have the potential for creating airborne dust, real time air monitoring with an aerosol monitor, such as a Thermo MEI person DataRAM-1000 (pDR-1000) will occur. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (appearance of visible dust) since the last measurement. If dust levels are observed to be greater than 0.100 mg/m3 or visible dust is observed for longer than 15 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the AOC every 30 minutes in addition to the employee breathing zone. If dust is generated during disturbance activities, dust suppression methods will be employed to minimize potential for exposure. Action levels for dust monitoring are provided in Table 4.

### 5.1.3 Determination of Background Levels

Background (BKD) levels for VOCs and dust will be established prior to intrusive activities within the work zone. A notation of BKD levels will be referenced in the daily monitoring log. BKD levels are a function of

prevailing conditions. BKD levels will be taken in an appropriate upwind location as determined by the Langan Health and Safety Officer.

### 5.2 Monitoring Equipment Calibration and Maintenance

Instrument calibration shall be documented and included in a dedicated safety and health logbook or on separate calibration pages of the field book. All instruments shall be calibrated before and after each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

All instruments shall be operated in accordance with the manufacturers' specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on site by the HSO for reference.

### 5.3 Noise Monitoring

As a standard work practice, hearing protection will be worn within the area that exceeds 85 dBA created by any loud machinery as a precaution. Work areas or tasks which pose an exposure risk greater than 85 dBA will require hearing protection. Hearing protection is required and should be used in the exclusion zone while the drill rig is operating.

## 6.0 COMMUNITY HEALTH AND SAFETY CONSIDERATIONS

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP outlined in Appendix E of the RIWP.

## 7.0 WORK ZONES AND DECONTAMINATION

### 7.1 Site Control

Work zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas.

Any person working in an area where the potential for exposure to site contaminants exists will only be allowed access after providing the HSO with proper training and medical documentation.

***Exclusion Zone (EZ) -*** All activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an EZ. Decontamination of field equipment will also be conducted in the Contaminant Reduction Zone (CRZ) which will be located on the perimeter of the EZ. The EZ and the CRZ will be clearly delineated by cones, tapes or other means. The Langan Health and Safety Officer may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the Langan Health and Safety Officer allowing adequate space for the activity to be completed, field members and emergency equipment. For purposes of this HASP the exclusion zones are defined by ta 10-foot buffer around each soil boring, soil vapor sampling location, and groundwater monitoring well location but may be expanded based on the results of air monitoring or any other field conditions identified by the HSO. All personnel working in the EZ must have 40 hours HAZWOPER training and be enrolled in a medical monitoring program prior to conducting any site activities.

## 7.2 Contamination Control

### 7.2.1 Personnel Decontamination Station

Personal hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

### 7.2.2 Minimization of Contact with Contaminants

During completion of all site activities, personnel should attempt to minimize the chance of contact with contaminated materials. This involves a conscientious effort to keep "clean" during site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination as PPE is intended to minimize accidental contact. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

Field procedures will be developed to control over spray and runoff and to ensure that unprotected personnel working nearby are not affected.

### 7.2.3 Personnel Decontamination Sequence

Decontamination will be performed by removing all PPE used in EZ and placing it in drums/trash cans at the CRZ. Baby wipes shall be available for wiping hands and face. Drums/trash cans will be labeled by the field crews in accordance with all local, state, and federal requirements. Management plans for contaminated PPE, tools and investigative-derived waste (i.e., soil cutting) are provided below.

### 7.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination and wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment.

If the injured person can be moved, he/she will be decontaminated by site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury), provisions shall be made to ensure that emergency response personnel will be able to respond to the victim without being exposed to potentially hazardous atmospheric conditions. If the potential for inhalation hazards exists, such as with open excavation, this area will be covered with polyethylene sheeting to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent data.

### 7.2.5 Hand-Held Equipment Decontamination

Hand-held equipment includes all monitoring instruments as stated earlier, samples, hand tools, and notebooks. The hand-held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the CRZ.

To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using wipes or

paper towels if contamination is visually evident. Sampling equipment, hand tools, etc. will be cleaned with non-phosphorous soap to remove any potentially contaminated soil, and rinsed with deionized water. All decontamination fluids will be containerized and stored on-site pending waste characterization sampling and appropriate off-site disposal.

### 7.2.6 Heavy Equipment Decontamination

All heavy equipment and vehicles arriving at the work site will be free from contamination from offsite sources. Any vehicles arriving to work that are suspected of being impacted will not be permitted on the work site. Potentially contaminated heavy equipment will not be permitted to leave the EZ unless it has been thoroughly decontaminated and visually inspected by the HSO or his designee.

## 7.3 Communications

The following communications equipment will be utilized as appropriate.

- Telephones - A cellular telephone will be located with the HSO for communication with the HSM and emergency support services/facilities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals are the following:

| Signal | Meaning |
|---|---|
| Hand gripping throat | Out of air, can't breathe |
| Grip on partner's wrist or placement of both hands around partner's waist | Leave area immediately, no debate |
| Hands on top of head | Need assistance |
| Thumbs up | Okay, I'm all right, I understand |
| Thumbs down | No, negative |

## 8.0 MEDICAL SURVEILLANCE

All personnel who will be performing field work involving potential exposure to toxic and hazardous substances will be required to have passed an initial baseline medical examination, with annual 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. Results of medical evaluations are maintained by Langan's H&S Department.

## 9.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures. In case of emergency, in addition to 911 the Langan Incident/Injury Hotline (973-560-4699) should be called as soon as possible.

### 9.1 Responsibilities

#### 9.1.1 Langan Health and Safety Officer (HSO)

The HSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The HSO is responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The HSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can notify OSHA within the required time frame.

### 9.1.2 Emergency Coordinator

For this project the Emergency Coordinator is the HSO.

The Emergency Coordinator shall locate emergency phone numbers and identify hospital routes prior *to beginning* work on the sites. The Emergency Coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator is responsible for implementing the Emergency Response/ Contingency Plan whenever conditions resulting from the Site Investigation warrant such action.

### 9.1.3 Site Personnel

Project site personnel are responsible for knowing the Emergency Response Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency. Project site personnel, including all subcontractors will be trained in the Emergency Response Plan.

## 9.2 Communications

Once an emergency situation has been stabilized or as soon as practically possible, the HSO will contact the Langan Incident/Injury Hotline (973-560-4699) and Project Manager to identify any emergency situation.

## 9.3 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during investigative activities at the site, Attachment E Emergency Notification Numbers, will be available in the field vehicles and provided to all personnel conducting work within the EZ.

Figure 2 is the hospital route map. Outside emergency number 911 and local ambulance should be relied on for response to medical emergencies and transport to emergency rooms. Due to traffic congestion that is prevalent in the New York metropolitan area, alternate hospital routes will need to be considered. The Emergency Coordinator will determine the appropriate route based on time of day and traffic patterns. Changes in the referenced primary facilities shall be

documented with the HASP Field Change Authorization Request Form (Attachment B).

The Emergency Phone Numbers listed are preliminary. Upon mobilization, the HSO shall verify all numbers and document the changes in the Site Logbook. Any changes shall also be documented with the HASP Field Change Authorization Request Form.

A Hospital route map is provided as Figure 2.

### 9.4 Pre-Emergency Planning

Langan will communicate directly with administrative personnel from the emergency room at the hospital in order to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

### 9.5 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the HSO on site immediately. First-aid equipment will be available on site at the following locations:

| | |
|---|---|
| First Aid Kit: | Vehicles |
| Emergency Eye Wash: | Vehicles |

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

Personnel with current first aid and CPR certification will be identified.

Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance.

**Nearest hospital**: **New York Presbyterian Hospital**
**520 East 70th Street**
**New York, NY 10021**
**(212) 746-5454**
*(directions from site to hospital found on Figure 2)*

## 9.6 Non-Emergency Medical Treatment

In case of injury to personnel, which is not a medical emergency the employee will contact WorkCare at (1-888-449-7787). WorkCare provides access 24 hours / 7 days a week to experienced occupational health nurses and physicians who confer with employees at the onset of a work-related injury or illness. WorkCare will provide over the phone injury treatment or direct employees to medical treatment by third party provider, if appropriate.

## 9.7 Emergency Site Evacuation Routes and Procedures

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs as a result of the site management activities, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, the Langan Project Manager will be verbally notified immediately. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the nearest intersection to be accounted for and to receive further instructions.

## 9.8 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site and notification of the Langan Project Manager of the site management activities. Portable fire extinguishers will be provided at the work zone. The extinguishers located in the various locations should also be identified prior to the start of work. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

### 9.8.1 Fire Prevention

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities.

The person responsible for the control of fuel source hazards and the maintenance of fire prevention and/or control equipment is the HSO.

## 9.9 Significant Vapor Release

Based on the proposed tasks, the potential for a significant vapor release is low. However, if a release occurs, the following steps will be taken:

- Move all personnel to an upwind location. All non-essential personnel shall evacuate.
- Upgrade to Level C Respiratory Protection.
- Downwind perimeter locations shall be monitored for volatile organics..
- If the release poses a potential threat to human health or the environment in the community, the Emergency Coordinator shall notify the Langan Project Manager.
- Local emergency response coordinators will be notified.

## 9.10 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Safety Data Sheet (SDS) will be followed, when necessary.

SKIN AND EYE: Use copious amounts of soap and water from eye-wash kits and portable hand wash stations.

CONTACT: Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Skin shall also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs. Affected items of clothing shall also be removed from contact with skin.

Providing wash water and soap will be the responsibility of each individual contractor or subcontractor on-site.

## 9.11 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or omitted. The HSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

## 9.12 Incident Reporting

Once first aid and/or emergency response needs have been met, the following parties are to be contacted:

- WorkCare (1-888-449-7787)
- Langan Incident/Injury Report Hotline (973-560-4699)
- Langan Project Manager, Amanda Forsburg (973-560-4574)

- Langan Health and Safety Manager, Tony Moffa (215-491-6500)
- The employer of any injured worker who is not a Langan employee

For emergencies involving personal injury and/or exposure including near-misses, the HSO or designee will complete and submit an Accident/Incident Report Form (Attachment F) within 24 hours. If the employee involved is not a Langan employee, his employer shall receive a copy of the report.

### 9.13 Adverse Weather Conditions

In the event of adverse weather conditions, the HSO will determine if work will continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds).
- Limited visibility (fog).
- Potential for electrical storms.
- Earthquakes.
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The HSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

### 9.14 Spill Control and Response

All small spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the SDS will be consulted to assist in determining proper waste characterization and the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting

recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill.

All contractor vehicles shall have spill kits on them with enough material to contain and absorb the worst-case spill from that vehicle. All vehicles and equipment shall be inspected prior to be admitted on site. Any vehicle or piece of equipment that develops a leak will be taken out of service and removed from the job site.

The following seven steps shall be taken by the Emergency Coordinator:

1. Determine the nature, identity and amounts of major spills.
2. Make sure all unnecessary persons are removed from the spill area.
3. Notify the HSO immediately.
4. Use proper PPE in consultation with the HSO.
5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosion-proof equipment to contain or clean up the spill (diesel-only vehicles, air-operated pumps, etc.).
6. If possible, try to stop the leak with appropriate material.
7. Remove all surrounding materials that can react or compound with the spill.

In addition to the spill control and response procedures described in this HASP, Langan personnel will coordinate with the designated project manager relative to spill response and control actions. Notification to the Project Manager must be immediate and, to the extent possible, include the following information:

- Time and location of the spill.
- Type and nature of the material spilled.
- Amount spilled.
- Whether the spill has affected or has a potential to affect a waterway or sewer.
- A brief description of affected areas/equipment.
- Whether the spill has been contained.

- Expected time of cleanup completion. If spill cleanup cannot be handled by Langan's on-site personnel alone, such fact must be conveyed to the Project Manager immediately.

Langan shall not make any notification of spills to outside agencies. The client will notify regulatory agencies as per their reporting procedures.

### 9.15 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on site:

- Industrial first aid kit.
- Fire extinguishers (one per site).
- Absorbent material.

### 9.16 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers.
- Refilling medical supplies.
- Recharging eyewashes and/or showers.
- Replenishing spill control supplies.

## 10.0 TRAINING

### 10.1 General Health and Safety Training

Completion of an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training program (or its equivalent) as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees who will perform work in areas where the potential for a toxic exposure exists. Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment.

## 10.2 Site Specific Training

Prior to commencement of site activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include a documented verbal review of the entire HASP and all the provisions within the HASP document. Should any new employees arrive on-site, they will also be given a documented full HASP review – or one that address the appropriate tasks that remain at the time of the new employee's arrival.

## 10.3 Onsite Safety Briefings

Project personnel and visitors will participate in documented daily on-site health and safety briefings ("Tailgate Talks") led by the HSO to assist site personnel in safely conducting their work activities. The briefings will include information on operations to be conducted that shift, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity for the work crews to be updated on monitoring results. Prior to starting any new activity, a training session will be held for crew members involved in the activity. The Health and Safety Briefing Statement (Attachment A) can be used to facilitate this effort.

## 10.4 Hazard Communication

All material brought on-site will be in the appropriate containers and will be properly labeled. The SDS for contaminants typically associated with historic fill and previously identified on the site are attached. Langan's written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by Langan's H&S Department.

## 11.0 RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping.

### 11.1 Field Change Authorization Request

A Field Procedures Change Authorization Request Form is to be completed for requesting a change to this HASP (Attachment B). Any changes to the work to be performed that is not included in the HASP will require an Addendum that is approved by the Langan Project Manager and Langan HSM to be prepared. Approved changes will be reviewed with all field personnel at a safety briefing.

### 11.2 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training, documentation of three-day OJT, and respirator fit-test records) and medical clearance for Site work and respirator use will be maintained in the office and available upon request. Records for all subcontractor employees must also be available upon request. All employee medical records will be maintained by Langan's H&S Department.

### 11.3 Onsite Log

A log of personnel on site each day will be kept by the Site Supervisor or designee.

### 11.4 Daily Safety Meetings ("Tailgate Talks")

Completed Safety Briefing forms will be maintained by the HSO.

### 11.5 Exposure Records

All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained by the HSO during site work. At the end of the project they will be maintained according to 29 CFR 1910.1020.

## 11.6 Hazard Communication Program/SDS

Safety Data Sheets (SDS) have been obtained for applicable substances and are included in this HASP (Attachment H). Langan's written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by Langan's H&S Department.

## 11.7 Documentation

Employees are required to contact WorkCare at 1-888-449-7787 to document incidents/injuries which are not medical emergencies. 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 973-560-4699 and the client representative to report the incident or near miss. A written report must be completed and submitted to the client representative within 24 hours of the incident. For emergencies involving personnel injury and/or exposure, employee will complete and submit the Langan Incident/Injury Report to the Langan Corporate Health and Safety Manager as soon as possible following the incident. Accidents will be investigated in-depth to identify all causes and to recommend hazard control measures.

## 12.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have been verbally given a full HASP review by Langan personnel, and understand the provisions of this EHS Plan. It is maintained on site by the HSO as a project record.

Each field team member shall sign this section after Site-specific training is completed and before being permitted to work onsite.

| ***Name (Print and Sign)*** | ***Company*** | ***Date*** |
|---|---|---|
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# TABLES

**TABLE 1**
**CONTAMINANTS OF CONCERN**
**1487 FIRST AVENUE**
**NEW YORK, NEW YORK**

| Contaminant of Concern | Affected Media |
|---|---|
| **VOLATILES** | |
| Acetone | Soil |
| Chloroform | Groundwater |
| Cis-1,2-Dichloroethene | Groundwater / Soil Vapor |
| Tetrachlorethylene | Soil / Groundwater / Soil Vapor |
| Trichloroethylene | Groundwater / Soil Vapor |
| Chlorinated VOCs | Soil / Groundwater / Soil Vapor |
| Total Volatiles | Soil / Groundwater / Soil Vapor |
| **SEMI-VOLATILES** | |
| Common Historic Fill Contaminants: | |
| Benzo(a)anthracene | Soil / Groundwater |
| Benzo(b)flouranthene | Soil / Groundwater |
| Benzo(k)flouranthene | Soil / Groundwater |
| Benzo(a)pyrene | Soil / Groundwater |
| Chrysene | Soil / Groundwater |
| Dibenzo(a,h)anthracene | Soil / Groundwater |
| Indeno (1,2,3-cd) pyrene | Soil / Groundwater |
| Flouranthene | Soil / Groundwater |
| Pyrene | Soil / Groundwater |
| Diesel Fuel / Fuel Oils | Soil / Groundwater |
| Hydraulic Oil | Soil / Groundwater |
| **METALS** | |
| Barium | Soil |
| Lead | Soil / Groundwater |
| Chromium | Soil / Groundwater |
| Iron | Groundwater |
| Mercury | Soil |
| Magnesium | Groundwater |
| Manganese | Groundwater |
| Copper | Soil |
| Nickel | Soil / Groundwater |
| Silver | Soil |
| Selenium | Groundwater |
| Sodium | Groundwater |
| Zinc | Soil |

**TABLE 2**
**SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS**
**1487 FIRST AVENUE**
**NEW YORK, NEW YORK**

| Chemical | Permissible Exposure Limit | IDLH Limit | Exposure Routes | Exposure Symptoms |
|---|---|---|---|---|
| Acetone | 1,000 ppm | 2,500 ppm | Inhalation, Ingestion, Skin and/or Eye Contact | Irritation eyes, nose throat; headache, dizziness, central nervous system depression; dermatitits |
| Chloroform | 50 ppm | 500 ppm | Inhalation, Skin Absorption, Ingestion, Skin and/or Eye Contact | Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen] |
| Cis-1,2-Dichloroethene | 200 ppm | 1,000 ppm | Inhalation, ingestion, skin and/or eye contact | Irritation eyes, respiratory system; central nervous system depression |
| Tetrachloroethene | 15 ppm | 150 ppm | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Nausea, vomiting, abdominal pain, tremor fingers, jaundice, hepatitis, liver tenderness, dermatitis, monocytosis, kidney damage [potential occupational carcinogen] |
| Trichloroethene | 100 ppm | 1,000 ppm | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen] |
| Total Volatile Organics | 15 ppm | 150 ppm | Inhalation, Skin Absorption, Ingestion | Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen] |
| Benzo(a)anthracene | 0.2 $mg/m^3$ | 80 $mg/m^3$ | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Benzo(b)fluoranthene | 0.2 $mg/m^3$ | 80 $mg/m^3$ | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |

**TABLE 2**
**SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS**
**1487 FIRST AVENUE**
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| Chemical | Permissible Exposure Limit | IDLH Limit | Exposure Routes | Exposure Symptoms |
|---|---|---|---|---|
| Benzo(k)fluoranthene | 0.2 mg/m$^3$ | 80 mg/m$^3$ | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Benzo(a)pyrene | 0.2 mg/m$^3$ | 80 mg/m$^3$ | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Chrysene | 0.2 mg/m$^3$ | 80 mg/m$^3$ | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Dibenzo(a,h)anthracene | 0.2 mg/m$^3$ | 80 mg/m$^3$ | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Flouranthene | 0.2 mg/m$^3$ | 80 mg/m$^3$ | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Indeno (1,2,3-cd) pyrene | 0.2 mg/m$^3$ | 80 mg/m$^3$ | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Pyrene | 0.2 mg/m$^3$ | 80 mg/m$^3$ | Inhalation, Skin Absorption, Ingestion | Irritate eyes, skin, upper respiratory system, cough |
| Lead | 0.05 mg/m$^3$ | 100 mg/m$^3$ | 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 eyes; hypertension |
| Arsenic | 0.010 mg/m$^3$ | 5 mg/m$^3$ | Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact | Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen] |
| Barium | 0.5 mg/m$^3$ | 50 mg/m$^3$ | Inhalation, ingestion, skin and/or eye contact | Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia |
| Iron | -- | -- | Inhalation, ingestion, skin and/or eye contact | Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage |

**TABLE 2**
**SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS**
**1487 FIRST AVENUE**
**NEW YORK, NEW YORK**

| Chemical | Permissible Exposure Limit | IDLH Limit | Exposure Routes | Exposure Symptoms |
|---|---|---|---|---|
| Magnesium | 15 $mg/m^3$ | 750 $mg/m^3$ | Inhalation, ingestion, skin and/or eye contact | Irritation eyes, nose, throat, lungs; metallic taste, headache, fever, chills, chest tightness, cough |
| Manganese | 5 $mg/m^3$ | 500 $mg/m^3$ | Inhalation, ingestion | Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage |
| Total Chromium | 5 $mg/m^3$ | 250 $mg/m^3$ | Inhalation, Ingestion, Skin and/or Eye Contact | Irritation eyes, skin; lung fibrosis (histologic) |
| Mercury | 0.1 mg/m3 | 10 mg/m3 | Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact | Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria |
| Copper | 1 mg/m3 | 100 mg/m3 | Inhalation, Ingestion, skin and/or eye contact | Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing; [potential occupational carcinogen] |
| Nickel | 1 mg/m3 | 10 mg/m3 | Inhalation, Skin Absorption, Ingestion, skin and/or eye contact | Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria |

**TABLE 2**
**SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS**
**1487 FIRST AVENUE**
**NEW YORK, NEW YORK**

| Chemical | Permissible Exposure Limit | IDLH Limit | Exposure Routes | Exposure Symptoms |
|---|---|---|---|---|
| Silver | 0.01 mg/m3 | 10 mg/m3 | Inhalation, ingestion, skin and/or eye contact | Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance |
| Selenium | 0.02 mg/m3 | 1 mg/m3 | Inhalation, ingestion, skin and/or eye contact | Irritation 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 |
| Sodium | --- | --- | Inhalation, ingestion, skin and/or eye contact | Irritation eyes, skin, nose, and throat; cough, shortness of breath, headache, nausea, vomiting, diarrhea, and abdominal pain |
| Zinc | --- | --- | Inhalation, ingestions, skin and/or eye contact | Irritation eyes, skin; cough, wheezing, metallic taste, headache, fever and chills, chest tightness and cough |

--- No exposure limits listed in the NIOSH Pocket Guide to Chemical Hazards dated November 2010.

# TABLE 3
# HAZARD ANALYSIS
# 1487 FIRST AVENUE
# NEW YORK, NEW YORK

| Task | Potential Risk | Description | Control Measure |
|---|---|---|---|
| 1, 2 | Lifting equipment | Improper lifting/carrying of equipment and materials | Follow safe lifting and general material handling |
| 1, 2 | Noise | Loud sounds caused by the machines during drilling, or excavation | Wear proper PPE (hearing protection) |
| 1, 2 | Working near heavy machinery | Close proximity to drill rig and/or construction equipment | Be aware of surroundings, wear safety vest and hard hat |
| 1, 2 | Slips, trips, and falls | Any number of injuries from slips, trips, and falls in carrying out these tasks | Good housekeeping at site, constant awareness and focus on the task |
| 1, 2 | Inhalation of Dust | Breathing in visible dust from earthwork using drills or excavators | Wear proper PPE, monitor air for dust concentrations, use dust suppression techniques |
| 1, 2 | Inhalation of Volatiles | Breathing in volatiles from earthwork using drills or excavators causing dust | Wear proper PPE, monitor air for volatile concentrations, use dust suppression techniques |
| 1, 2 | Utilities | Hitting utility lines during drilling and or excavating | Use proper mark out of underground utilities before beginning earthwork |
| 1, 2 | Skin contact with contaminated material | Material falls on skin; gets in eye | Wear proper PPE; follow safe work practices |
| 1, 2 | Ingestion of contaminated material | Material falls on skin; gets into mouth | Wear proper PPE; follow safe work practices |
| 1, 2 | Skin and eye contact with contaminated material | Material falls on skin; gets in eye | Wear proper PPE; follow safe work practices |
| 1, 2 | Heat Stress | Stress or exhaustion related to high temperatures | Hydrate and rest as needed |
| 1, 2 | Cold Stress | Stress or exhaustion related to low temperatures; hypothermia | Wear proper PPE; follow safe work practices |
| 1, 2 | Bites and stings | Bee stings, ticks, snake bites | Wear proper PPE, be watchful, follow safe work practices |
| 1, 2 | Lacerations and abrasions | Many opportunities working with hand tools | Inspect equipment being used for sharp edges, wear proper PPE; follow safe work practices |

# TABLE 4
# INSTRUMENTATION ACTION LEVELS
# 1487 FIRST AVENUE
# NEW YORK, NEW YORK

| Instrument | Action Level | Level of Protection / Action Required |
|---|---|---|
| PID | Background to 5 ppm | Level D/No respirator; no further action required |
| | > 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.<br>2. If PID readings remain above 5 ppm, temporarily discontinue work and upgrade to Level C protection.<br>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 | Level C/<br>1. Discontinue all work; all workers shall move to an area upwind of the jobsite.<br>2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm.<br>3. Level C protection will continue to be used until PID readings fall below 1 ppm. |
| | > 30 ppm (steady state condition) within AOC zone | Stop Work / Suppress Emissions / Evacuate and re-evaluate. |
| | > 150 ppm | Evacuate the work area |
| Total Dust Aerosol Monitor | > 0.100 mg/$m^3$ above BKD (steady state condition) at perimeter of AOC zone for 15-minutes or visible dust. | Stop Work / Implement dust control / Continue dust monitoring if dust levels are less than 0.150 mg/$m^3$ |
| | > 0.150 mg/m3 above BKD (following dust suppression measures) | Stop Work / implement dust control, continue work once levels are <0.150 mg/$m^3$ |
| | >5 mg/$m^3$ | Level C |

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 vinyl chloride for any 15 minute period.
3. 150 ppm level based on NIOSH Immediately Dangerous to Life and Health (IDLH) for tetrachloroethylene

# TABLE 5
# PERSONAL PROTECTIVE EQUIPMENT
# 1487 FIRST AVENUE
# New York, New York

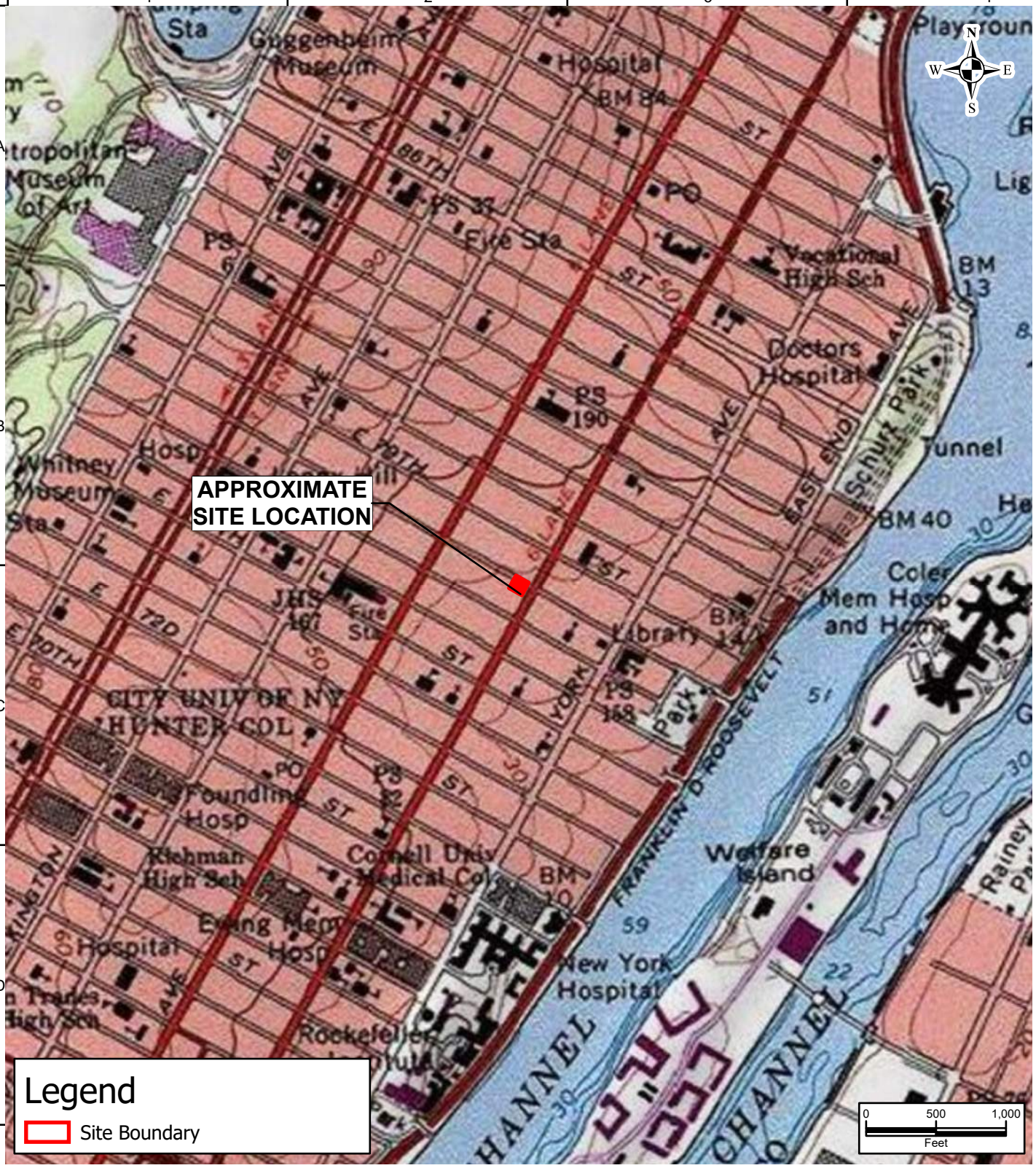
**Respiratory Protection*:***

| | |
|---|---|
| Level D: | No respirator required. |
| Level C: | Half-face, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols) and organic vapor cartridges. The respirator will be NIOSH-approved. |
| Level C - supplemental by task | Fullface, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols), acid gas, organic vapor cartridges. The respirator will be NIOSH-approved. |

**Personal Protective Clothing*:***

| | |
|---|---|
| Level D: | Hard-hat, traffic vest (if working on or adjacent to the roadway), long sleeve work shirt & work pants of natural fibers, safety glasses or goggles, steel-toed boots, hearing protection (if needed), nitril inner gloves and leather outer gloves. |
| Level D - supplemental PPE by task | Tyvek disposal suit |
| Level C: | Chemically resistant outer boots and Chemical resistant Tyvek disposal suite. |

# FIGURES



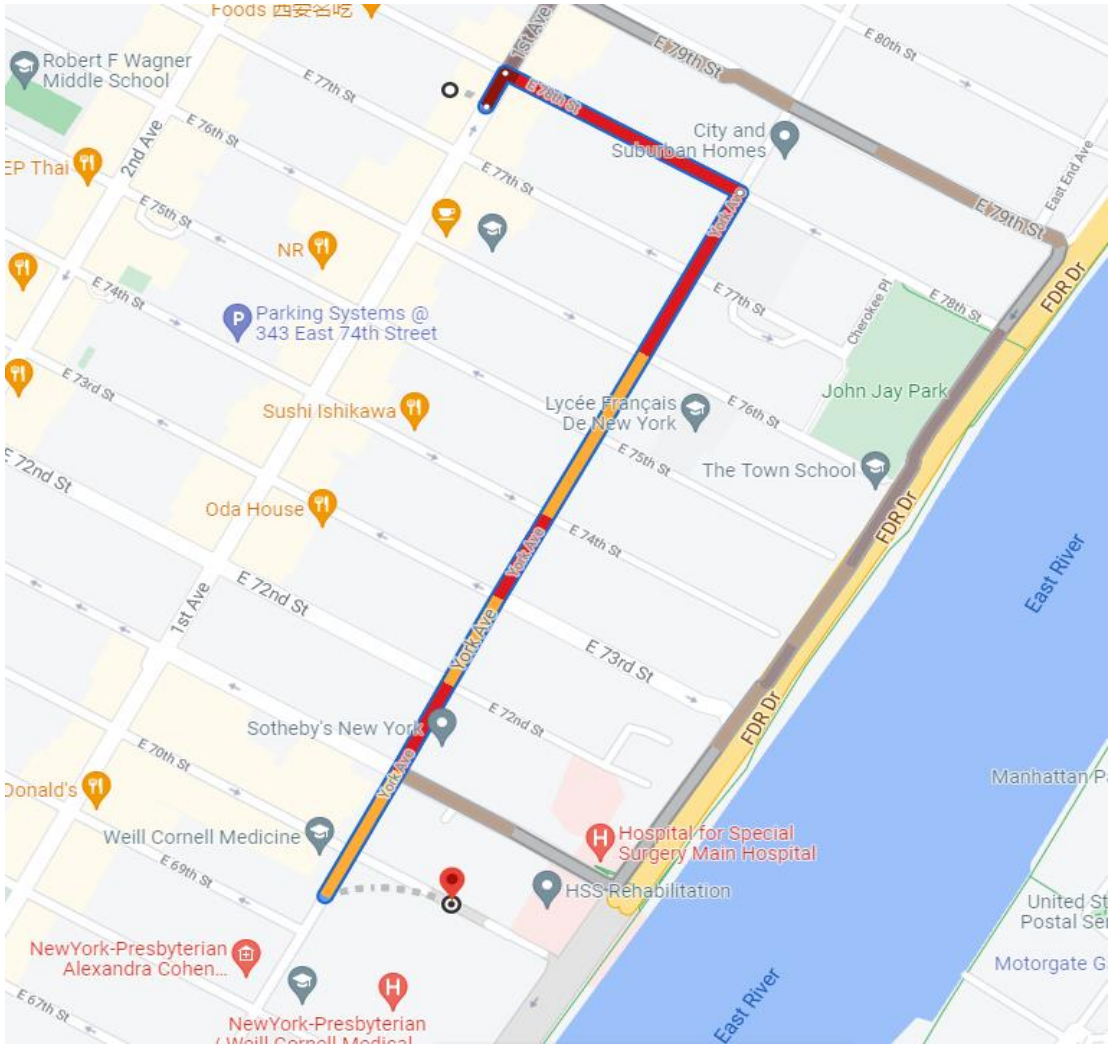

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Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

| | |
|---|---|
| Project | 1487 First Avenue |
| | NEW YORK |
| COUNTY | NEW YORK |
| NEW YORK | NEW YORK |
| Drawing Title | SITE LOCATION |
| Project No. | |
| Date | 11/5/2021 |
| Scale | 1:1,000 |
| Drawn By | Site Analyzer |
| Submission Date | 11/05/2021 |
| Figure | 1 |
| | Sheet 1 of 1 |

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Spatial Reference: NAD 1983 StatePlane New York Long Island FIPS 3104 Feet
Warning: It is a violation of the NYS Education Law Article 145 for any person, unless acting under the direction of a licensed professional engineer, land surveyor or geologist, to alter this item in any way.




**Emergency Route to New York Presbyterian Hospital (Phone # (212) 746-5454) :**

1 Head northeast on 1st Ave toward E 78th Street
2 Turn right onto E 78th Street
3 Turn right onto York Avenue
4 Destination will be on the left in .4 miles
5 Arrive at New York Presbyterian Hospital on the left (520 E 70th Street, NY, NY)

**MAP REFERENCE: Google Maps**

LANGAN

**Project**

**1487 First Avenue**
**EMERGENGY HOSPITAL ROUTE MAP**

**Manhattan** **New York**

| Project | DATE | SCALE | FIGURE NO. |
|---|---|---|---|
| **100963701** | **11/5/2021** | **NTS** | **2** |

# ATTACHMENT A

# Health and Safety Briefing Statement

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## ATTACHMENT A

## HEALTH AND SAFETY BRIEFING STATEMENT

The following personnel were present at a pre-job safety briefing conducted at _____(time) on _____ (date) at _____(location), and have read this Health and Safety Plan for the above Site and are familiar with its provisions:

| Name | Signature |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Fully charged ABC class fire extinguisher available on Site? _____
Fully stocked First Aid Kit available on Site? _____
All project personnel advised of location of nearest phone? _____
All project personnel advised of location of designated medical facility? _____

_____
Name of Field Team Leader or Site Safety Officer

_____
Signature Date

# ATTACHMENT B

# Field Procedures Change Authorization Form

## ATTACHMENT B

## FIELD PROCEDURES CHANGE AUTHORIZATION FORM

Section to be changed:_____

Duration of Authorization Requested Date:_____

_____ Today only

_____ Duration of Task

_____ Other_____

_____

_____

Description of Procedures Modification:

_____

_____

_____

Justification:

_____ _____

Person Requesting Change Verbal Authorization Received From:

_____ _____

Name Name Time

_____ _____

Title Title

_____

Signature

Approvals:

_____

_____

_____

# ATTACHMENT C

# Unsafe Conditions and Practices Form

LANGAN

## ATTACHMENT C

## UNSAFE CONDITIONS AND PRACTICES FORM

DESCRIPTION OF CIRCUMSTANCES REGARDING UNSAFE CONDITION OR PRACTICE:

_____

_____

_____

_____

_____

_____

_____

IS THIS CONDITION EXISTING OR POTENTIAL?_____

REPORTED TO: _____

REPORTED BY:_____

DATE REPORTED:_____

COMMENTS:_____

_____

_____

# ATTACHMENT D

# Calibration Log

# ATTACHMENT D

**PROJECT:_____**

**DATE:_____**

## CALIBRATION LOG

| Time | Inst Type | Inst # | Media | Initial Reading | Span # | Calib Reading | Performed By: |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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# ATTACHMENT E

# Emergency Notification Numbers

# ATTACHMENT E

## EMERGENCY NOTIFICATION NUMBERS

The following list provides names and telephone numbers for emergency contact personnel.

| ORGANIZATION | CONTACT | | TELEPHONE |
|---|---|---|---|
| New York City Police | | | 911 |
| New York City Fire | | | 911 |
| New York Presbyterian | | | (212) 746-5454 |
| Langan Incident/Injury Hotline | | | 1-800-952-6426 or (973)560-4699 |
| Langan Project Manager | Amanda Forsburg | | 973-560-4574 |
| National Response Center | | | 800-424-8802 |
| Center for Disease Control | | | 404-488-4100 |
| CHEMTREC | | | 800-424-9300 |
| TSCA HOTLINE | | | 202-554-1404 |
| RCRA HOTLINE | | | 800-424-9346 |
| CDC | | (DAY)<br>(NIGHT) | 404-452-4100<br>404-329-2888 |
| BUREAU OF ALCOHOL, TOBACCO & FIREARMS | | | 800-424-9555<br>202-566-7777 |
| NATIONAL RESPONSE CENTER | | | 800-424-8802 |
| PESTICIDE INFORMATION SERVICE | | | 800-424-9346 |
| BUREAU OF EXPLOSIVES, A.A. RAILWAYS | | | 202-835-9500 |
| FEDERAL EXPRESS - HAZARDOUS MATERIAL INFO | | | 901-922-1666 |

# ATTACHMENT F

# Accident / Incident Report Form

## ATTACHMENT F

## INCIDENT REPORT

### LANGAN EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT
### (Submit a Separate Report for Each Employee and/or Incident)

Date: _____

Employee's Name:_____ Employee No:_____

Sex: M _____ F _____ Age: _____

Region: _____ Location:_____

Project: _____ Project No: _____

Incident:_____

Type: Possible Exposure _____ Exposure _____ Physical Injury _____

Location: _____

Date of Incident: _____ Time of Incident: _____

Date of Report Incident: _____

Person(s) to Whom Incident was Reported: _____

Weather Conditions During Incident: Temperature _____ Humidity _____

Wind Speed and Direction: _____ Cloud Cover: _____

Clear: _____ Precipitation: _____

Materials Potentially Encountered: _____

Chemical (give name of description - liquid, solid, gas, vapor, fume, mist):

_____

_____

Radiological:_____

Other: _____

Nature of the Exposure/Injury: (State the nature of the exposure/injury in detail and list the parts of the body affected. Attach extra sheets if necessary).

_____

_____

_____

_____

_____

Did you receive medical care? Yes _____ No _____ If so, when _____

Where? On-Site _____ Off-Site _____

By Whom: Name of Paramedic: _____

Name of Physician: _____

Other: _____

If Off-Site, name facility (hospital, clinic, etc):_____

_____

Length of stay at the facility?_____

Was the Site Safety Officer contacted? Yes _____ No _____ When?_____

Was the Corporate Health and Safety Officer contacted? Yes _____ No _____

If so, who was the contact?_____

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

If so, explain:_____

_____

_____

_____

Has the employee returned to work? Yes _____ No _____

List the names of other persons affected during this incident:

_____

_____

_____

_____

_____

_____

_____

List the names of persons who witnessed the exposure/injury incident:

_____

_____

_____

_____

Possible cause of the exposure/injury incident: _____

_____

_____

_____

_____

_____

What was the name and title of the field team leader or immediate supervisor at the site of the incident?

_____

Was the operation being conducted under an established Health and Safety Plan?

Yes _____ No _____ If yes, attach a copy. If no, explain

_____

_____

_____

_____

_____

_____

Describe protective equipment and clothing used by the employee:

_____

_____

_____

_____

_____

_____

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

_____

_____

_____

What was the employee doing when the exposure/injury occurred? (Describe briefly as Site Reconnaissance, Site Characterization, or Sampling, etc.):

_____

_____

_____

_____

Where exactly on site or off site did the exposure/injury occur?

_____

_____

_____

_____

_____

How did the exposure/injury occur? (Describe fully what factors led up to and/or contributed to the incident):

_____

_____

_____

_____

_____

Name of person(s) initiating report, job title, phone number:

_____

_____

_____

_____ _____

Employee Signature Date

_____ _____

Site Safety Officer Signature or Field Team Leader Signature Date

# ATTACHMENT G

# Jobsite Safety Inspection Checklist

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**JOBSITE SAFETY INSPECTION CHECKLIST**

Client: _____ Inspection Date: _____

Site: _____ Inspector: _____

Employees: _____

**Notes:**_____

_____

_____

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

| | A | NA | D | Remarks |
|---|---|---|---|---|
| **GENERAL** | | | | |
| Appropriate PPE being worn by Langan employees and subcontractors? | | | | |
| Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet? | | | | |
| Air monitoring readings recorded on the air monitoring data sheet/field log book? | | | | |
| Incident reporting procedures known? | | | | |
| Site security an issue? | | | | |
| Vehicle /pedestrian traffic issue? | | | | |
| Adequate size/type fire extinguisher supplied? | | | | |
| Evidence that drilling operator is responsible for the safety of his rig. | | | | |
| First Aid kit available? | | | | |
| **PERSONAL PROTECTIVE EQUIPMENT** | | | | |
| Eye Protection? | | | | |
| Head protection? | | | | |
| Safety Shoes? | | | | |
| Safety vests? | | | | |
| Hand protection? | | | | |
| Other? | | | | |
| Deficiencies?? | | | | |
| **HOUSEKEEPING** | | | | |
| Work area kept clean/tidy to minimize potential hazards? | | | | |
| Waste being disposed of quickly and properly | | | | |
| Adequate lighting for job? | | | | |
| Portable water available? | | | | |
| **HAND TOOLS** | | | | |
| Are tools in good condition and properly used? (INSPECT) | | | | |
| Are proper tools being used? | | | | |
| Are tools safety stored when not in use? | | | | |
| Have tools been inspected prior to use? | | | | |
| Are employees familiar with using tools? | | | | |
| Is additional PPE required for tools? Available? | | | | |
| **POWER TOOLS** | | | | |
| Are tools in good condition and properly used? (INSPECT) | | | | |
| Are tools properly grounded? | | | | |
| Safety guards in place and used correctly? | | | | |
| Competent instruction / supervision? | | | | |
| Cords include in inspection? | | | | |

| | | | | |
|---|---|---|---|---|
| **HAZWOPER** | | | | |
| Employees have current 40-hr./8-hr./Supervisor HAZWOPER training? | | | | |
| Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed? | | | | |
| Respiratory protection readily available? | | | | |
| Subcontract workers have current 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate? | | | | |
| Subcontract workers medically cleared to work on site, and fit-tested for respirator wear? | | | | |
| Subcontract workers have respirators readily available? | | | | |
| **HEALTH & SAFETY PLAN** | | | | |
| HASP available on site for inspection? | | | | |
| Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and subcontractors? | | | | |
| Hospital route map with directions posted on site? | | | | |
| Emergency Notification List posted on site? | | | | |
| Personnel trained in CPR/First Aid on site? | | | | |
| MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed? | | | | |
| Project site safe practices ("Standing Orders") posted? | | | | |
| Health & Safety Incident Report forms available? | | | | |
| Decontamination procedures being followed as outlined in HASP? | | | | |
| **UNDERGROUND UTILITY** | | | | |
| Mark outs of underground utilities done prior to initiating any subsurface activities? | | | | |
| Underground utilities located and authorities contacted before digging? | | | | |
| Visually observed mark-outs? | | | | |
| Is subsurface work within three feet of underground utilities? | | | | |
| - Is so, is or was soft dig techniques used? | | | | |
| Drilling performed in areas free from underground utilities? | | | | |
| **EXCAVATION / TRENCH** | | | | |
| Are excavations/trenches over 5 feet deep sloped, shored or a trench box used? | | | | |
| Operations supervised by a Competent Person? | | | | |
| Is Competent Person preforming daily inspections of excavation/trench? | | | | |
| Adequate barricades in place? | | | | |
| Have underground utilities been identified? | | | | |
| Ladders / means of egress in trench with 25-foot of every worker? | | | | |
| Has PE designed or approved protective system? | | | | |
| Excavated material and other objects placed more than 2 feet away from excavation edge? | | | | |
| Public protected from exposure to open excavation? | | | | |
| **CONFINED / PERMIT-ENTRY CONFINED SPACE** | | | | |
| People entering the excavation regarding it as a permit-required confined space and following appropriate procedures? | | | | |
| Confined space entry permit is completed and posted? | | | | |
| All persons knowledgeable about the conditions and characteristics of the confined space? | | | | |
| All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)? | | | | |
| Full body harnesses, lifelines, and hoisting apparatus available for rescue needs? | | | | |
| Attendant and/or supervisor certified in basic first aid and CPR? | | | | |
| Confined space atmosphere checked before entry and continuously while the work is going on? | | | | |
| Results of confined space atmosphere testing recorded? | | | | |
| Evidence of coordination with off-site rescue services to perform entry rescue, if needed? | | | | |
| **ELECTRICAL SAFETY** | | | | |
| Equipment at least 10 feet from overhead power lines? | | | | |
| Is equipment grounded? | | | | |
| GFCI used and tested where required? | | | | |
| Are extension cords rated for this work being used and are they properly maintained? | | | | |
| Electrical dangers posted at site? | | | | |

| | | | | |
|---|---|---|---|---|
| **FLAMMABLE LIQUIDS** | | | | |
| Are flammable liquids used at site? | | | | |
| Are flammable liquids stored in appropriate containers? | | | | |
| Are flammable liquids kept away from combustion sources? | | | | |
| Do flammable liquid containers have warning labels? | | | | |
| **LADDERS** | | | | |
| Are ladders used at site? | | | | |
| Were ladders inspected prior to use? | | | | |
| Are ladders in good working condition? | | | | |
| Are ladders secured to prevent slipping, sliding or falling? | | | | |
| Do side rails extend three feet above top of landing area? | | | | |
| Are top two steps of stepladders being used? | | | | |
| Is extension on ladder facing out? | | | | |
| Are ladders sufficient for task? | | | | |
| Are ladders sufficient for task? | | | | |

**Unsafe acts observed?** _____

**Additional remarks** _____

**Notes:**_____

**Distribution:** Project Manager - Name: _____
Health & Safety Officer - Name: _____
Health & Safety Manager- Name: Anthony Moffa, CHMM

Q:\Other\HealthandSafety\GenericAppendixAJobsiteSafetyInspectionChecklist

# ATTACHMENT H

# Safety Data Sheets
# (SDS)

LANGAN

Safety Data Sheet

# 1,1-Dichloro-2,2-bis(4-chlorophenyl-$d_4$)ethylene

## Section 1. Chemical product and company identifications

**Product code:** D-3005
**Chemical formula:** $C_{14}D_8Cl_4$
**CAS:** 93952-19-3
**CAS (unlabelled):** 72-55-9
**Synonyms:** 4,4'-DDE, 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene

**Supplier / Manufacturer:**

**C/D/N Isotopes Inc.**
88 Leacock Street
Pointe-Claire (Québec) H9R 1H1
Phone: 514-697-6254
Toll-Free (Canada & USA): 1-800-565-4696
Fax: 514-697-6148
Website: www.cdnisotopes.com

**In case of emergency:**

**TOXYSCAN HOTLINE: 1-855-780-0599**

## Section 2. Hazards identifications

**Physical state:** Solid
**Warning:** Harmful if swallowed. Suspected of causing cancer.
**Routes of entry:** Inhalation, skin and eyes

**GHS (Globally Harmonized System of Classification and Labelling of Chemicals):**

**GHS Classification:**
- Acute toxicity, Oral (Category 4)
- Carcinogenicity (Category 2)

**GHS Label elements:**
- Pictograms: 
- Signal word: Warning

**Hazards statement:**
- H302 Harmful if swallowed.
- H351 Suspected of causing cancer.

**Precautionary statement:** - P281 Use personal protective equipment as required.

## Section 3. Composition and information on ingredients

| Name | CAS | Concentration % |
|---|---|---|
| 1,1-Dichloro-2,2-bis(4-chlorophenyl-$d_4$)ethylene | 93952-19-3 | > 98 |

## Section 4. First aid measures

**Eye contact:** Flush eyes with water as a precaution.
**Skin contact:** Wash off with soap and plenty of water. Consult a physician.
**Inhalation:** If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
**Ingestion:** Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.
**General advice:** Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

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## Section 5. Firefighting measures

**Flammability of the product:** Not flammable or combustible.
**Lower explosion limit:** No data available.
**Upper explosion limit:** No data available.
**Auto-ignition temperature:** No data available.
**Flash point:** No data available.
**Products of combustion:** Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas.
**Firefighting media and instructions:** Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
**Special protective equipment for firefighters:** Wear self-contained breathing apparatus for firefighting if necessary.

## Section 6. Accidental release measures

**Personal precautions:** Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
**Environmental precautions:** Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
**Methods for cleaning up:** Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

## Section 7. Handling and storage

**Handling:** Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.
**Storage:** Store at room temperature. Adequate ventilation. Protect from light.

## Section 8. Exposure Controls, Personal Protections

**Engineering controls:** Use mechanical exhaust or laboratory fumehood to avoid exposure.
**Eyes:** Safety glasses with side-shields conforming to NIOSH (US).
**Respiratory:** Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US).
**Hands:** Handle with gloves. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
**Skin/body:** Impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

## Section 9. Physical and chemical properties (unlabelled)

**Molecular weight:** 318.03 g/mol
**Physical status:** Solid
**Color:** White-pale yellow
**Odour:** No data available
**Density:** No data available
**Melting point:** 88 - 90 °C (190 - 194 °F)
**Boiling point:** 336 °C (637 °F)
**Vapour pressure:** < 0.00001 hPa (< 0.00001 mmHg)
**Vapour density:** No data available
**Partition coefficient (octanol/water):** log Pow: 6.51
**Water solubility:** 0.04 mg/L

## Section 10. Stability and reactivity

**Stability and reactivity:** Stable under recommended storage conditions.
**Incompatibility:** Strong oxidizing agents, strong bases.
**Products of combustion:** Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas.
**Reactivity conditions:** No data available.

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## Section 11. Toxicological information (unlabelled)

**Toxicological data:** 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene

**Information on ingredients:**

| Name | CAS | $LD_{50}$ | $LC_{50}$ |
|---|---|---|---|
| 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene | 72-55-9 | Oral - rat - 880 mg/kg | No data available |

**Potential acute effects**

- **Eyes:** May cause eye irritation.
- **Skin:** Harmful if absorbed through skin. May cause skin irritation.
- **Inhalation:** May be harmful if inhaled. May cause respiratory tract irritation.
- **Ingestion:** Harmful if swallowed.

**Potential chronic effects**

- **Carcinogenic effects:** This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification. Limited evidence of carcinogenicity in animal studies. IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
- **Mutagenic effects:** No data available.
- **Teratogenic effects:** No data available.
- **Medical conditions aggravated by overexposure:** No data available.

## Section 12. Ecological information

**Ecological data:**

| Name | Results | Species | Period |
|---|---|---|---|
| 1,1-Dichloro-2,2-bis | 0.2 - 0.3 mg/l LC50 | Lepomis macrochirus | 96 h |
| (4-chlorophenyl)ethylene | 0.03 - 0.04 mg/l LC50 | Oncorhynchus mykiss | 96 h |
| | 0.05 - 0.18 mg/l LC50 | Salmo salar | 96 h |

**Effects on environment:** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
**Mobility:** No data available.
**Environmental precautions:** No data available.
**Persistence and degradability:** No data available.
**Bioaccumulative potential:** Gambusia affinis (Mosquito fish) - 33 d. Bioconcentration factor (BCF): 12,037.

## Section 13. Disposal considerations

**Waste disposal:** Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

## Section 14. Transportation information

**Classification DOT/IMDG/IATA label:**

**Shipping name:** Not dangerous goods
**UN number:** None
**Class:** None
**Packaging group:** None

**Additional information:** None

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## Section 15. Regulatory information

**UNITED STATES:**
**NFPA classification**



Health: 1
Flammable: 0
Reactivity: 0
Specials conditions: None

**Legend: 4: Severe, 3: High, 2: Moderate, 1: Slightly, 0: Not hazardous**

**U.S. Federal regulations:**

**TSCA 8(b) inventory:** 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene
**SARA 302/304/311/312 extremely hazardous substances:** Not Listed
**SARA 302/304 emergency planning and notification:** Not Listed
**SARA 302/304/311/312 hazardous chemicals:** Not Listed
**SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard:** Not Listed
**CWA (Clean Water Act) 307:** Not Listed
**CWA (Clean Water Act) 311:** Not Listed
**CAA (Clean Air Act) 112 accidental release prevention:** Not Listed
**CAA (Clean Air Act) 112 regulated flammable substances:** Not Listed
**CAA (Clean Air Act) 112 regulated toxic substances:** Not Listed

**State regulations:**

**DEA List I Chemicals (Precursor Chemicals):** Not Listed
**DEA List II Chemicals (Essential Chemicals):** Not Listed
**Substances in Massachusetts:** Not Listed
**Dangerous substances in New Jersey:** Not Listed
**New York – Dangerous substances with acute effects:** Not Listed
**Dangerous substances in Pennsylvania – right to know:** Not Listed

**WHMIS (Canada):**



Not WHMIS controlled.

## Section 16. Additional information

**References:**

- ANSI Z400.1, MSDS Standard, 2001.
- Manufacturer's Material Safety Data Sheet.
- 29CFR Part1910.1200 OSHA MSDS Requirements.
- 49CFR Table List of Hazardous Materials, UN#, Proper Shipping Names, PG. -Canada
- Gazette Part II, Vol. 122, No. 2 Registration SOR/88-64 31 December, 1987 Hazardous Products Act "Ingredient Disclosure List".
- Federal act on the controlled products
- Canadian Transport of Dangerous Goods, Regulations and Schedules, Clear Language version 2002.
- Toxicological repertory, HSC.
- Material safety data sheet from the components.

**Date of issue:** **February 20th, 2017**
**Version:** 1
**Elaborated by:** **Toxyscan Inc., 1-866-780-0599**
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# Safety Data Sheet

**Revision Date: 12/23/16**
www.restek.com

## 1. IDENTIFICATION

| | |
|---|---|
| **Catalog Number / Product Name:** | **32203 / 4,4'-DDT Standard** |
| **Company:** | Restek Corporation |
| **Address:** | 110 Benner Circle<br>Bellefonte, Pa. 16823 |
| **Phone#:** | 814-353-1300 |
| **Fax#:** | 814-353-1309 |
| **Emergency#:** | 800-424-9300 (CHEMTREC)<br>703-527-3887 (Outside the US) |
| **Email:** | www.restek.com |
| **Revision Number:** | 8 |
| **Intended use:** | For Laboratory use only |

## 2. HAZARD(S)IDENTIFICATION

**Emergency Overview:**

**GHS Hazard Symbols:**



**GHS Classification:**
Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1
Flammable Liquid Category 2
Acute Toxicity - Inhalation Dust / Mist Category 3
Acute Toxicity - Dermal Category 3
Acute Toxicity - Oral Category 3

**GHS Signal Word:**
Danger

**GHS Hazard:**
Highly flammable liquid and vapour.
Toxic if swallowed, in contact with skin or if inhaled.
Causes damage to organs.

**GHS Precautions:**

**Safety Precautions:**
Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilation and lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe dust/fume/gas/mist/vapours/spray.
Wash hands and skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/protective clothing/eye protection/face protection.

**First Aid Measures:**
IF SWALLOWED: Immediately call a POISON CENTER/doctor/....
IF ON SKIN: Wash with plenty of soap and water.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF exposed: Call a POISON CENTER or doctor/physician.
Call a POISON CENTER or doctor/physician.
Call a POISON CENTER or doctor/physician if you feel unwell.
Specific treatment see section 4.
Rinse mouth.
Take off immediately all contaminated clothing and wash it before reuse.
In case of fire: Use extinguishing media in section 5 for extinction.

**Storage:** Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.

**Disposal:** Dispose of contents/container according to section 13 of the SDS.

**Single Exposure Target Organs:** No data available.

**Repeated Exposure Target Organs:** No data available.

## 3. COMPOSITION / INFORMATION ON INGREDIENT

| Chemical Name | CAS # | EINEC # | % Composition |
|---|---|---|---|
| methanol | 67-56-1 | 200-659-6 | 99.900000 |
| 4,4'-DDT | 50-29-3 | 200-024-3 | 0.100000 |

## 4. FIRST-AID MEASURES

**Inhalation:** Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

**Eyes:** Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

**Skin Contact:** Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

**Ingestion:** Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

## 5. FIRE- FIGHTING MEASURES

**Extinguishing Media:** Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

**Fire and/or Explosion Hazards:** Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

**Fire Fighting Methods and Protection:** Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

**Hazardous Combustion Products:** Carbon dioxide, Carbon monoxide

## 6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions and Equipment:** Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

**Methods for Clean-up:** Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

## 7. HANDLING AND STORAGE

**Handling Technical Measures and Precautions:** Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

**Storage Technical Measures and Conditions:** Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**United States:**

| Chemical Name | CAS No. | IDLH | ACGIH STEL | ACGIH TLV-TWA | OSHA Exposure Limit |
|---|---|---|---|---|---|
| methanol | 67-56-1 | 6000 ppm IDLH | 250 ppm STEL | 200 ppm TWA | 200 ppm TWA; 260 mg/m3 TWA |
| 4,4'-DDT | 50-29-3 | 500 mg/m3 IDLH | | 1 mg/m3 TWA | 1 mg/m3 TWA (listed under Dichlorodiphenyltrichloroethane) |

**Personal Protection:**

**Engineering Measures:** Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

**Respiratory Protection:** Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection.

**Eye Protection:** Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

**Skin Protection:** Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **Appearance, color:** | No data available. |
| **Odor:** | Mild |
| **Physical State:** | No data available. |
| **pH:** | No data available. |
| **Vapor Pressure:** | No data available. |
| **Vapor Density:** | 1.1 (air = 1) |
| **Boiling Point:** | No data available. |
| **Melting Point:** | -98 °C |
| **Flash Point:** | 52 |
| **Flammability:** | Highly Flammable |
| **Upper Flammable/Explosive Limit, % in air:** | 36 |
| **Lower Flammable/Explosive Limit, % in air:** | 6 |
| **Autoignition Temperature:** | 464 deg C |
| **Decomposition Temperature:** | No data available. |
| **Specific Gravity:** | 0.791 - 0.792 g/cm3 at 20 °C |
| **Evaporation Rate:** | No data available. |
| **Odor Threshold:** | No data available. |
| **Solubility:** | Moderate; 50-99% |
| **Partition Coefficient: n-octanol in water:** | No data available. |
| **VOC % by weight:** | 99.9 |
| **Molecular Weight:** | 32.04 |

## 10. STABILITY AND REACTIVITY

| | |
|---|---|
| **Stability:** | Stable under normal conditions. |
| **Conditions to Avoid:** | No data available. |
| **Materials to Avoid / Chemical Incompatiability:** | Strong oxidizing agents |
| **Hazardous Decomposition Products:** | Carbon dioxide Carbon monoxide |

## 11. TOXICOLOGICAL INFORMATION

| | |
|---|---|
| **Routes of Entry:** | Inhalation, Skin Contact, Eye Contact, Ingestion |
| **Target Organs Potentially Affected By Exposure:** | Eyes, Central nervous system stimulation, Skin, GI Tract, Respiratory Tract |
| **Chemical Interactions That Change Toxicity:** | None Known |

**Immediate (Acute) Health Effects by Route of Exposure:**

| | |
|---|---|
| **Inhalation Irritation:** | Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache. |
| **Inhalation Toxicity:** | Harmful! Can cause systemic damage (see "Target Organs)Methanol can cause central nervous system depression and overexposure can cause damage to the optic nerve resulting in visual impairment or blindness. |
| **Skin Contact:** | Can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage. |
| **Eye Contact:** | Can cause moderate irritation, tearing and reddening, but not likely to permanently injure eye tissue. |
| **Ingestion Irritation:** | Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.Highly toxic and may be fatal if swallowed. |
| **Ingestion Toxicity:** | Toxic if swallowed. May cause target organ failure and/or death.May be fatal if swallowed. |

**Long-Term (Chronic) Health Effects:**

| | |
|---|---|
| **Carcinogenicity:** | Contains a probable or known human carcinogen. |
| **Reproductive and Developmental Toxicity:** | Contains a known human reproductive and/or developmental hazard. |
| **Inhalation:** | Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs) |
| **Skin Contact:** | Upon prolonged or repeated contact, can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage. |
| **Ingestion:** | Toxic if swallowed. May cause target organ failure and/or death. |

**Component Toxicological Data:**

**NIOSH:**

| Chemical Name | CAS No. | LD50/LC50 |
|---|---|---|
| Methanol | 67-56-1 | Inhalation LC50 Rat 22500 ppm 8 h |
| DDT | 50-29-3 | Dermal LD50 Rabbit 300 - 2820 mg/kg |

**Component Carcinogenic Data:**

**OSHA:**

| Chemical Name | CAS No. | |
|---|---|---|
| DDT | 50-29-3 | Present |

**ACGIH:**

| Chemical Name | CAS No. | |
|---|---|---|
| DDT | 50-29-3 | A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans |

**NIOSH:**

| Chemical Name | CAS No. | |
|---|---|---|
| DDT | 50-29-3 | potential occupational carcinogen |

**NTP:**

| Chemical Name | CAS No. |
|---|---|
| No data available. | |

**IARC:**

| Chemical Name | CAS No. | Group No. |
|---|---|---|
| No data. | | Group 1 |
| DDT | 50-29-3 | Group 2A |
| No data. | | Group 2B |

## 12. ECOLOGICAL INFORMATION

| | |
|---|---|
| **Overview:** | Moderate ecological hazard. This product may be dangerous |

to plants and/or wildlife.

**Mobility:** No data
**Persistence:** No data
**Bioaccumulation:** No data
**Degradability:** Biodegrades slowly.
**Ecological Toxicity Data:** No data available.

## 13. DISPOSAL CONSIDERATIONS

**Waste Description of Spent Product:** Spent or discarded material is a hazardous waste.
**Disposal Methods:** Dispose of by incineration following Federal, State, Local, or Provincial regulations.
**Waste Disposal of Packaging:** Comply with all Local, State, Federal, and Provincial Environmental Regulations.

## 14. TRANSPORTATION INFORMATION

**United States:**
**DOT Proper Shipping Name:** Methanol
**UN Number:** UN1230
**Hazard Class:** 3
**Packing Group:** II

**International:**
**IATA Proper Shipping Name:** Methanol
**UN Number:** UN1230
**Hazard Class:** 3(6.1)
**Packing Group:** II

**Marine Pollutant:** No

| Chemical Name | CAS# | Marine Pollutant | Severe Marine Pollutant |
|---|---|---|---|
| No data available. | | | |

## 15. REGULATORY INFORMATION

**United States:**

| Chemical Name | CAS# | CERCLA | SARA 313 | SARA EHS 313 | TSCA |
|---|---|---|---|---|---|
| methanol | 67-56-1 | X | X | - | X |
| 4,4'-DDT | 50-29-3 | X | - | - | X |

**The following chemicals are listed on CA Prop 65:**

| Chemical Name | CAS # | Regulation |
|---|---|---|
| DDT | 50-29-3 | Prop 65 Cancer |
| Methanol | 67-56-1 | Prop 65 Devolop Tox |
| p,p''-DDT | 50-29-3 | Prop 65 Devolop Tox |
| p,p''-DDT | 50-29-3 | Prop 65 Rep Female |
| p,p''-DDT | 50-29-3 | Prop 65 Rep Male |

**State Right To Know Listing:**

| Chemical Name | CAS# | New Jersey | Massachusetts | Pennsylvania | California |
|---|---|---|---|---|---|
| methanol | 67-56-1 | X | X | X | X |
| 4,4'-DDT | 50-29-3 | X | X | X | X |

## 16. OTHER INFORMATION

**Prior Version Date:** 09/30/14
**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
**References:** No data available.
**Disclaimer:** Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose

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# SAFETY DATA SHEET

Version 4.7
Revision Date 05/23/2016
Print Date 06/23/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Arsenic

Product Number : 202657
Brand : Aldrich
Index-No. : 033-001-00-X

CAS-No. : 7440-38-2

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 3), H331
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H302 Harmful if swallowed.
H331 Toxic if inhaled.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.

| | |
|---|---|
| P301 + P312 + P330 | IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth. |
| P304 + P340 + P311 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor. |
| P391 | Collect spillage. |
| P403 + P233 | Store in a well-ventilated place. Keep container tightly closed. |
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.1 Substances**

| | | |
|---|---|---|
| Formula | : | As |
| Molecular weight | : | 74.92 g/mol |
| CAS-No. | : | 7440-38-2 |
| EC-No. | : | 231-148-6 |
| Index-No. | : | 033-001-00-X |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Arsenic** | | |
| | Acute Tox. 4; Acute Tox. 3; Aquatic Acute 1; Aquatic Chronic 1; H302, H331, H410 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

**4.1 Description of first aid measures**

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

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

**In case of skin contact**
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**
No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**
No data available

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information
No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

### 6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections
For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

### 7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Arsenic | 7440-38-2 | TWA | 0.01 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Lung cancer<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed human carcinogen | | |
| | | C | 0.0020 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A<br>15 minute ceiling value | | |

**Biological occupational exposure limits**

| Component | CAS-No. | Parameters | Value | Biological specimen | Basis |
|---|---|---|---|---|---|
| Arsenic | 7440-38-2 | inorganic arsenic plus methylated metabolites | 35µg As/l | In urine | ACGIH - Biological Exposure Indices (BEI) |
| | Remarks | End of the workweek (After four or five consecutive working days | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | with exposure) | | | |
| | | inorganic arsenic plus methylated metabolites | 35µg As/l | Urine | ACGIH - Biological Exposure Indices (BEI) |
| | | End of the workweek (After four or five consecutive working days with exposure) | | | |

### 8.2 Exposure controls

**Appropriate engineering controls**
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

**Personal protective equipment**

**Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: Pieces<br>Colour: grey |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |

| | | |
|---|---|---|
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 817 °C (1,503 °F) - lit. |
| f) | Initial boiling point and boiling range | 613 °C (1,135 °F) - lit. |
| g) | Flash point | Not applicable |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | 5.727 g/mL at 25 °C (77 °F) |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

**9.2 Other safety information**
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
Heat Exposure to air may affect product quality.

**10.5 Incompatible materials**
Oxidizing agents, Halogens, Palladium undergoes a violent reaction with arsenic, Zinc, Platinum oxide, Nitrogen trichloride, Bromine azide

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Arsenic oxides
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

**Acute toxicity**
LD50 Oral - Rat - 763 mg/kg
Remarks: Behavioral:Ataxia. Diarrhoea

LD50 Oral - Mouse - 145 mg/kg
Remarks: Behavioral:Ataxia. Diarrhoea

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

| | |
|---|---|
| IARC: | 1 - Group 1: Carcinogenic to humans (Arsenic) |
| NTP: | Known to be human carcinogen (Arsenic) |
| | Known to be human carcinogen (Arsenic) |
| OSHA: | OSHA specifically regulated carcinogen (Arsenic) |

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: CG0525000

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | LC50 - Pimephales promelas (fathead minnow) - 9.9 mg/l - 96.0 h |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 3.8 mg/l - 48 h |

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic
Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 1558 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: ARSENIC
Marine pollutant:yes

**IATA**
UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| Arsenic | 7440-38-2 | 2007-07-01 |

**SARA 311/312 Hazards**
Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Arsenic | 7440-38-2 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Arsenic | 7440-38-2 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Arsenic | 7440-38-2 | 2007-07-01 |

**California Prop. 65 Components**

| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. | Revision Date |
|---|---|---|
| Arsenic | 7440-38-2 | 2008-10-10 |

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Acute Tox. | Acute toxicity |
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| H302 | Harmful if swallowed. |
| H331 | Toxic if inhaled. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7 Revision Date: 05/23/2016 Print Date: 06/23/2016

# SAFETY DATA SHEET

Version 5.6
Revision Date 06/02/2016
Print Date 07/20/2017

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

| | | |
|---|---|---|
| Product name | : | Benz[*a*]anthracene |
| Product Number | : | 48563 |
| Brand | : | Supelco |
| Index-No. | : | 601-033-00-9 |
| CAS-No. | : | 56-55-3 |

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

| | | |
|---|---|---|
| Identified uses | : | Laboratory chemicals, Synthesis of substances |

### 1.3 Details of the supplier of the safety data sheet

| | | |
|---|---|---|
| Company | : | Sigma-Aldrich<br>3050 Spruce Street<br>SAINT LOUIS MO 63103<br>USA |
| Telephone | : | +1 800-325-5832 |
| Fax | : | +1 800-325-5052 |

### 1.4 Emergency telephone number

| | | |
|---|---|---|
| Emergency Phone # | : | +1-703-527-3887 (CHEMTREC) |

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word: Danger

Hazard statement(s)

| | |
|---|---|
| H350 | May cause cancer. |
| H410 | Very toxic to aquatic life with long lasting effects. |

Precautionary statement(s)

| | |
|---|---|
| P201 | Obtain special instructions before use. |
| P202 | Do not handle until all safety precautions have been read and understood. |
| P273 | Avoid release to the environment. |
| P281 | Use personal protective equipment as required. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |
| P391 | Collect spillage. |

| | |
|---|---|
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.1 Substances**

| | | |
|---|---|---|
| Synonyms | : | 1,2-Benzanthracene<br>Tetraphene |
| Formula | : | $C_{18}H_{12}$ |
| Molecular weight | : | 228.29 g/mol |
| CAS-No. | : | 56-55-3 |
| EC-No. | : | 200-280-6 |
| Index-No. | : | 601-033-00-9 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Benz[a]anthracene** | | |
| | Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

**4.1 Description of first aid measures**

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

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

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

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**
No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**
No data available

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

### 6.2 Environmental precautions

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

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**
Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber

Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: solid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 157 - 159 °C (315 - 318 °F) |
| f) | Initial boiling point and boiling range | 437.6 °C (819.7 °F) |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | No data available |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |

t) Oxidizing properties No data available

**9.2 Other safety information**
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - > 200 mg/kg

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

| | |
|---|---|
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene) |
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene) |
| NTP: | Reasonably anticipated to be a human carcinogen (Benz[a]anthracene) |
| NTP: | Reasonably anticipated to be a human carcinogen (Benz[a]anthracene) |
| OSHA: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. |

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

## 12. ECOLOGICAL INFORMATION

**12.1 Toxicity**
No data available

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
Not dangerous goods

**IMDG**
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[a]anthracene)
Marine pollutant:yes

**IATA**
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)

**Further information**
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Benz[a]anthracene | 56-55-3 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Benz[a]anthracene | 56-55-3 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Benz[a]anthracene | 56-55-3 | 1993-04-24 |

**California Prop. 65 Components**

| | | |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene | CAS-No. 56-55-3 | Revision Date 2007-09-28 |
| WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene | CAS-No. 56-55-3 | Revision Date 2007-09-28 |

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| Carc. | Carcinogenicity |
| H350 | May cause cancer. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6 Revision Date: 06/02/2016 Print Date: 07/20/2017

# SAFETY DATA SHEET

**Revision Date** 22-May-2017 **Revision Number** 2

## 1. Identification

**Product Name** **Benzo[a]pyrene, 98%**

**Cat No. :** **AC105600010; AC105601000**

**Synonyms** Benzo[def]chrysene.; 3,4-Benzopyrene; 3,4-Benzpyrene

**Recommended Use** Laboratory chemicals.
**Uses advised against** Not for food, drug, pesticide or biocidal product use

**Details of the supplier of the safety data sheet**

**Company**
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

## 2. Hazard(s) identification

**Classification**
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Skin Sensitization | Category 1 |
| Germ Cell Mutagenicity | Category 1A |
| Carcinogenicity | Category 1A |
| Reproductive Toxicity | Category 1A |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
May cause an allergic skin reaction
May cause genetic defects
May cause cancer
May damage fertility or the unborn child



**Precautionary Statements**
**Prevention**
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Avoid breathing dust/fume/gas/mist/vapors/spray
Contaminated work clothing should not be allowed out of the workplace
Wear protective gloves
**Response**
IF exposed or concerned: Get medical attention/advice
**Skin**
IF ON SKIN: Wash with plenty of soap and water
If skin irritation or rash occurs: Get medical advice/attention
Wash contaminated clothing before reuse
**Storage**
Store locked up
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Very toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Benzo[a]pyrene | 50-32-8 | > 96 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes.

**Inhalation** Move to fresh air.

**Ingestion** Do not induce vomiting.

**Most important symptoms/effects** May cause allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Unsuitable Extinguishing Media** No information available

**Flash Point**
**Method -** No information available

**Autoignition Temperature** No information available

**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Keep product and empty container away from heat and sources of ignition.

**Hazardous Combustion Products**
None known
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 0 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment.
**Environmental Precautions** See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** No information available.

## 7. Handling and storage

**Handling** Ensure adequate ventilation.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH | Mexico OEL (TWA) |
|---|---|---|---|---|
| Benzo[a]pyrene | | TWA: 0.2 mg/m³ | | |

*Legend*

*OSHA - Occupational Safety and Health Administration*

**Engineering Measures** Ensure adequate ventilation, especially in confined areas.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Powder Solid |
| **Appearance** | Dark yellow |
| **Odor** | aromatic |
| **Odor Threshold** | No information available |
| **pH** | |
| **Melting Point/Range** | 175 179 °C |
| **Boiling Point/Range** | °C @ 760 mmHg |

| | |
|---|---|
| **Flash Point** | |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | No information available |
| **Vapor Density** | No information available |
| **Specific Gravity** | No information available |
| **Solubility** | Insoluble in water |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | C20H12 |
| **Molecular Weight** | 252.31 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products.

**Incompatible Materials** Strong oxidizing agents

**Hazardous Decomposition Products** None under normal use conditions

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Component Information**

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** No information available

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Benzo[a]pyrene | 50-32-8 | Group 1 | Reasonably Anticipated | A2 | X | Not listed |

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** None known

**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

**Endocrine Disruptor Information** No information available

| Component | EU - Endocrine Disrupters Candidate List | EU - Endocrine Disruptors - Evaluated Substances | Japan - Endocrine Disruptor Information |
|---|---|---|---|
| Benzo[a]pyrene | Group III Chemical | Not applicable | Not applicable |

**Other Adverse Effects** The toxicological properties have not been fully investigated.

## 12. Ecological information

**Ecotoxicity**

Do not empty into drains.

**Persistence and Degradability** No information available

**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

| Component | log Pow |
|---|---|
| Benzo[a]pyrene | 6.06 |

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

| Component | RCRA - U Series Wastes | RCRA - P Series Wastes |
|---|---|---|
| Benzo[a]pyrene - 50-32-8 | U022 | - |

## 14. Transport information

**DOT**

**UN-No** UN3077
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
**Hazard Class** 9
**Packing Group** III

**TDG**

**UN-No** UN3077
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
**Hazard Class** 9
**Packing Group** III

**IATA**

**UN-No** UN3077
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
**Hazard Class** 9
**Packing Group** III

**IMDG/IMO**

**UN-No** UN3077
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
**Hazard Class** 9
**Packing Group** III

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzo[a]pyrene | X | X | - | 200-028-5 | - | | X | - | - | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313**

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---|---|---|---|
| Benzo[a]pyrene | 50-32-8 | > 96 | 0.1 |

**SARA 311/312 Hazard Categories**

| | |
|---|---|
| **Acute Health Hazard** | Yes |
| **Chronic Health Hazard** | Yes |
| **Fire Hazard** | No |
| **Sudden Release of Pressure Hazard** | No |
| **Reactive Hazard** | No |

**CWA (Clean Water Act)**

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|---|---|---|---|---|
| Benzo[a]pyrene | - | - | X | X |

**Clean Air Act** Not applicable

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**
Not applicable

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Benzo[a]pyrene | 1 lb | - |

**California Proposition 65** This product does not contain any Proposition 65 chemicals

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Benzo[a]pyrene | 50-32-8 | Carcinogen | 0.06 µg/day | Carcinogen |

**U.S. State Right-to-Know Regulations**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Benzo[a]pyrene | X | X | X | X | X |

**U.S. Department of Transportation**

Reportable Quantity (RQ): N

| | |
|---|---|
| DOT Marine Pollutant | N |
| DOT Severe Marine Pollutant | N |

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

## 16. Other information

**Prepared By**
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Revision Date** 22-May-2017
**Print Date** 22-May-2017
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**
**The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text**

**End of SDS**

# SAFETY DATA SHEET

**Revision Date** 10-Feb-2015 **Revision Number** 1

## 1. Identification

**Product Name** **Barium**

**Cat No. :** **AC317860000; AC317860250; AC317861000; AC317865000**

**Synonyms** None Known.

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

## 2. Hazard(s) identification

**Classification**
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Flammable solids | Category 2 |
| Acute oral toxicity | Category 3 |
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Flammable solid
Toxic if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation



**Precautionary Statements**
**Prevention**
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
**Response**
Call a POISON CENTER or doctor/physician if you feel unwell
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Skin**
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
**Eyes**
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
**Ingestion**
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
**Fire**
Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
**Storage**
Store locked up
Store in a closed container
Store in a well-ventilated place. Keep cool
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
None identified

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Barium | 7440-39-3 | 99.9 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

**Ingestion** Do not induce vomiting. Call a physician or Poison Control Center immediately.

**Most important symptoms/effects** No information available.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Dry chemical.

**Unsuitable Extinguishing Media** No information available

**Flash Point** No information available
**Method -** No information available

**Autoignition Temperature** No information available
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Contact with water liberates toxic gas. Water reactive. Combustible material. Produce flammable gases on contact with water.

**Hazardous Combustion Products**
None known
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 3 | 3 | 0 | W |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment.
**Environmental Precautions** See Section 12 for additional ecological information.

**Methods for Containment and Clean Up** Sweep up or vacuum up spillage and collect in suitable container for disposal.

## 7. Handling and storage

**Handling** Avoid contact with skin and eyes. Do not breathe dust. Do not breathe vapors or spray mist. Handle under inert gas, protect from moisture. Wear personal protective equipment.

**Storage** Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Protect from moisture. Never allow product to get in contact with water during storage. Store under an inert atmosphere.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Barium | TWA: 0.5 mg/m$^3$ | (Vacated) TWA: 0.5 mg/m$^3$ | |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Barium | | | TWA: 0.5 mg/m³ |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*
*OSHA - Occupational Safety and Health Administration*

**Engineering Measures** Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | Grey |
| **Odor** | Odorless |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | 725 °C / 1337 °F |
| **Boiling Point/Range** | 1640 °C / 2984 °F |
| **Flash Point** | No information available |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 10 mmHg @ 1094 °C |
| **Vapor Density** | No information available |
| **Relative Density** | 3.51 @ 20 °C |
| **Solubility** | No information available |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | Ba |
| **Molecular Weight** | 137.34 |

## 10. Stability and reactivity

**Reactive Hazard** Yes

**Stability** Moisture sensitive. Air sensitive.

**Conditions to Avoid** Exposure to air. Incompatible products. Exposure to moisture.

**Incompatible Materials** Acids, Water, Alcohols, Halogens

**Hazardous Decomposition Products** None under normal use conditions

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**
**Oral LD50** Category 3. ATE = 50 - 300 mg/kg.
**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Barium | 132 mg/kg ( Rat ) | Not listed | Not listed |

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** Irritating to eyes, respiratory system and skin

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Barium | 7440-39-3 | Not listed | Not listed | Not listed | Not listed | Not listed |

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Respiratory system
**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** No information available
**Endocrine Disruptor Information** No information available

**Other Adverse Effects** The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

## 12. Ecological information

**Ecotoxicity**
Do not empty into drains.

**Persistence and Degradability** No information available
**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

**DOT**

| | |
|---|---|
| **UN-No** | UN1400 |
| **Proper Shipping Name** | BARIUM |
| **Hazard Class** | 4.3 |
| **Packing Group** | II |

**TDG**

| | |
|---|---|
| **UN-No** | UN1400 |
| **Proper Shipping Name** | BARIUM |
| **Hazard Class** | 4.3 |
| **Packing Group** | II |

**IATA**

| | |
|---|---|
| **UN-No** | UN1400 |
| **Proper Shipping Name** | Barium |
| **Hazard Class** | 4.3 |
| **Packing Group** | II |

**IMDG/IMO**

| | |
|---|---|
| **UN-No** | UN1400 |
| **Proper Shipping Name** | Barium |
| **Hazard Class** | 4.3 |
| **Packing Group** | II |

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium | X | X | - | 231-149-1 | - | | X | - | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313**

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---|---|---|---|
| Barium | 7440-39-3 | 99.9 | 1.0 |

**SARA 311/312 Hazardous Categorization**

| | |
|---|---|
| **Acute Health Hazard** | Yes |
| **Chronic Health Hazard** | No |
| **Fire Hazard** | Yes |
| **Sudden Release of Pressure Hazard** | No |
| **Reactive Hazard** | Yes |

**Clean Water Act** Not applicable

**Clean Air Act** Not applicable

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**
Not applicable

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Barium | 1000 lb | - |

**California Proposition 65** This product does not contain any Proposition 65 chemicals

**State Right-to-Know**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Barium | X | X | X | - | X |

**U.S. Department of Transportation**

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**
**This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR**

**WHMIS Hazard Class**
B4 Flammable solid
B6 Reactive flammable material
D2B Toxic materials
D1A Very toxic materials



## 16. Other information

**Prepared By**
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Revision Date** 10-Feb-2015
**Print Date** 10-Feb-2015
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**
**The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage,**

**transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.**

## End of SDS

# Safety Data Sheet

**Revision Date: 12/08/16**
www.restek.com

## 1. IDENTIFICATION

| | |
|---|---|
| **Catalog Number / Product Name:** | **31272 / Benzo(b)fluoranthene Standard** |
| **Company:** | Restek Corporation |
| **Address:** | 110 Benner Circle<br>Bellefonte, Pa. 16823 |
| **Phone#:** | 814-353-1300 |
| **Fax#:** | 814-353-1309 |
| **Emergency#:** | 800-424-9300 (CHEMTREC)<br>703-527-3887 (Outside the US) |
| **Email:** | www.restek.com |
| **Revision Number:** | 9 |
| **Intended use:** | For Laboratory use only |

## 2. HAZARD(S)IDENTIFICATION

**Emergency Overview:**

**GHS Hazard Symbols:**





| | |
|---|---|
| **GHS Classification:** | Flammable Liquid Category 2<br>Serious Eye Damage/Eye Irritation Category 2<br>Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3 |
| **GHS Signal Word:** | Danger |
| **GHS Hazard:** | Highly flammable liquid and vapour.<br>Causes serious eye irritation.<br>May cause drowsiness or dizziness. |
| **GHS Precautions:** | |
| **Safety Precautions:** | Keep away from heat/sparks/open flames/hot surfaces. – No smoking.<br>Ground/bond container and receiving equipment.<br>Use explosion-proof electrical/ventilation and lighting equipment.<br>Use only non-sparking tools.<br>Take precautionary measures against static discharge.<br>Avoid breathing dust/fume/gas/mist/vapours/spray.<br>Wash hands and skin thoroughly after handling.<br>Use only outdoors or in a well-ventilated area.<br>Wear protective gloves/protective clothing/eye protection/face protection. |
| **First Aid Measures:** | IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.<br>IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.<br>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.<br>Call a POISON CENTER or doctor/physician if you feel unwell.<br>If eye irritation persists: Get medical advice/attention.<br>In case of fire: Use extinguishing media in section 5 for extinction. |
| **Storage:** | Store in a well-ventilated place. Keep container tightly closed.<br>Store in a well-ventilated place. Keep cool.<br>Store locked up. |
| **Disposal:** | Dispose of contents/container according to section 13 of the SDS. |

**Single Exposure Target Organs:** No data available.

**Repeated Exposure Target Organs:** No data available.

## 3. COMPOSITION / INFORMATION ON INGREDIENT

| Chemical Name | CAS # | EINEC # | % Composition |
|---|---|---|---|
| Acetone | 67-64-1 | 200-662-2 | 99.900000 |
| benzo (b) fluoranthene | 205-99-2 | 205-911-9 | 0.100000 |

## 4. FIRST-AID MEASURES

**Inhalation:** Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

**Eyes:** Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

**Skin Contact:** Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

**Ingestion:** Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

## 5. FIRE- FIGHTING MEASURES

**Extinguishing Media:** Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

**Fire and/or Explosion Hazards:** Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back

**Fire Fighting Methods and Protection:** Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling.

**Hazardous Combustion Products:** Carbon dioxide, Carbon monoxide

## 6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions and Equipment:** Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

**Methods for Clean-up:** Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

## 7. HANDLING AND STORAGE

**Handling Technical Measures and Precautions:** Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

**Storage Technical Measures and Conditions:** Store in a cool dry ventilated location. Isolate from

incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**United States:**

| Chemical Name | CAS No. | IDLH | ACGIH STEL | ACGIH TLV-TWA | OSHA Exposure Limit |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | 2500 ppm IDLH (10% LEL) | 500 ppm STEL 750 ppm STEL; 1782 mg/m3 STEL | 250 ppm TWA 500 ppm TWA; 1188 mg/m3 TWA | 1000 ppm TWA; 2400 mg/m3 TWA |
| benzo (b) fluoranthene | 205-99-2 | ND | | No TLV | No data available. |

**Personal Protection:**

**Engineering Measures:** Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

**Respiratory Protection:** No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.

**Eye Protection:** Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

**Skin Protection:** Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

**Medical Conditions Aggravated By Exposure:** Respiratory disease including asthma and bronchitis

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance, color:** Depends upon product selection
**Odor:** Strong
**Physical State:** No data available.
**pH:** No data available.
**Vapor Pressure:** No data available.
**Vapor Density:** 2.0 (air = 1)
**Boiling Point:** No data available.
**Melting Point:** -95.4 °C Melting Point
**Flash Point:** 39
**Flammability:** Highly Flammable
**Upper Flammable/Explosive Limit, % in air:** No data available.
**Lower Flammable/Explosive Limit, % in air:** No data available.
**Autoignition Temperature:** 465 deg C
**Decomposition Temperature:** No data available.
**Specific Gravity:** 0.7845 g/cm3 at 25 °C
**Evaporation Rate:** No data available.
**Odor Threshold:** ND
**Solubility:** Complete; 100%
**Partition Coefficient: n-octanol in water:** No data available.
**VOC % by weight:** 0
**Molecular Weight:** 58.08

## 10. STABILITY AND REACTIVITY

**Stability:** Stable under normal conditions.
**Conditions to Avoid:** No data available.
**Materials to Avoid / Chemical Incompatiability:** Strong oxidizing agents Strong acids
**Hazardous Decomposition Products:** Carbon dioxide Carbon monoxide

## 11. TOXICOLOGICAL INFORMATION

**Routes of Entry:** Inhalation, Skin Contact, Eye Contact, Ingestion
**Target Organs Potentially Affected By Exposure:** Eyes, Central nervous system stimulation, Respiratory Tract, Skin
**Chemical Interactions That Change Toxicity:** None Known

**Immediate (Acute) Health Effects by Route of Exposure:**

| | |
|---|---|
| **Inhalation Irritation:** | Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache. |
| **Skin Contact:** | Can cause minor skin irritation, defatting, and dermatitis. |
| **Eye Contact:** | Can cause minor irritation, tearing and reddening. |
| **Ingestion Irritation:** | May be harmful if swallowed. |
| **Ingestion Toxicity:** | Harmful if swallowed. May cause systemic poisoning. |

**Long-Term (Chronic) Health Effects:**

| | |
|---|---|
| **Carcinogenicity:** | Contains a probable or known human carcinogen. |
| **Reproductive and Developmental Toxicity:** | No data available to indicate product or any components present at greater than 0.1% may cause birth defects. |
| **Inhalation:** | Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache. |
| **Skin Contact:** | Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis. |

**Component Toxicological Data:**
**NIOSH:**

| **Chemical Name** | **CAS No.** | **LD50/LC50** |
|---|---|---|
| Acetone | 67-64-1 | Dermal LD50 Rabbit >15700 mg/kg; Oral LD50 Rat 5800 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h |

**Component Carcinogenic Data:**
**OSHA:**

| **Chemical Name** | **CAS No.** | |
|---|---|---|
| Benzo(b)fluoranthene | 205-99-2 | Present |

**ACGIH:**

| **Chemical Name** | **CAS No.** | |
|---|---|---|
| Acetone | 67-64-1 | A4 - Not Classifiable as a Human Carcinogen |
| Benzo[b]fluoranthene | 205-99-2 | A2 - Suspected Human Carcinogen |

**NIOSH:**

| **Chemical Name** | **CAS No.** |
|---|---|
| No data available. | |

**NTP:**

| **Chemical Name** | **CAS No.** |
|---|---|
| No data available. | |

**IARC:**

| **Chemical Name** | **CAS No.** | **Group No.** |
|---|---|---|
| No data. | | Group 1 |
| No data. | | Group 2A |
| Benzo(b)fluoranthene | 205-99-2 | Group 2B |

## 12. ECOLOGICAL INFORMATION

| | |
|---|---|
| **Overview:** | This material is not expected to be harmful to the ecology. |
| **Mobility:** | No data |
| **Persistence:** | No data |
| **Bioaccumulation:** | No data |
| **Degradability:** | No data |
| **Ecological Toxicity Data:** | No data available. |

## 13. DISPOSAL CONSIDERATIONS

| | |
|---|---|
| **Waste Description of Spent Product:** | Spent or discarded material is a hazardous waste. |
| **Disposal Methods:** | Dispose of by incineration following Federal, State, Local, or Provincial regulations. |
| **Waste Disposal of Packaging:** | Comply with all Local, State, Federal, and Provincial Environmental Regulations. |

## 14. TRANSPORTATION INFORMATION

**United States:**
**DOT Proper Shipping Name:** Acetone

**UN Number:** UN1090
**Hazard Class:** 3
**Packing Group:** II

**International:**
**IATA Proper Shipping Name:** Acetone
**UN Number:** UN1090
**Hazard Class:** 3
**Packing Group:** II

**Marine Pollutant:** No

| Chemical Name | CAS# | Marine Pollutant | Severe Marine Pollutant |
|---|---|---|---|
| No data available. | | | |

## 15. REGULATORY INFORMATION

**United States:**

| Chemical Name | CAS# | CERCLA | SARA 313 | SARA EHS 313 | TSCA |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | X | - | - | X |
| benzo (b) fluoranthene | 205-99-2 | X | X | - | - |

**The following chemicals are listed on CA Prop 65:**

| Chemical Name | CAS # | Regulation |
|---|---|---|
| Benzo[b]fluoranthene | 205-99-2 | Prop 65 Cancer |

**State Right To Know Listing:**

| Chemical Name | CAS# | New Jersey | Massachusetts | Pennsylvania | California |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | X | X | X | X |
| benzo (b) fluoranthene | 205-99-2 | X | X | X | X |

## 16. OTHER INFORMATION

**Prior Version Date:** 03/23/15
**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
**References:** No data available.
**Disclaimer:** Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding prodcuts described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

## 1 Identification

**Product identifier**

**Product name: Benzene**

**Stock number:** L14012
**CAS Number:**
71-43-2
**EC number:**
200-753-7
**Index number:**
601-020-00-8
**Relevant identified uses of the substance or mixture and uses advised against.**
**Identified use:** SU24 Scientific research and development

**Details of the supplier of the safety data sheet**
**Manufacturer/Supplier:**
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
**Information Department:** Health, Safety and Environmental Department
**Emergency telephone number:**
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

## 2 Hazard(s) identification

**Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)**


GHS02 Flame

Flam. Liq. 2 H225 Highly flammable liquid and vapor.


GHS08 Health hazard

Muta. 1B H340 May cause genetic defects.
Carc. 1A H350 May cause cancer.
STOT RE 1 H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
Asp. Tox. 1 H304 May be fatal if swallowed and enters airways.


GHS07

Skin Irrit. 2 H315 Causes skin irritation.
Eye Irrit. 2 H319 Causes serious eye irritation.
**Hazards not otherwise classified** No information known.

**Label elements**
**GHS label elements** The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
**Hazard pictograms**


GHS02 GHS07 GHS08

**Signal word** Danger
**Hazard statements**
H225 Highly flammable liquid and vapor.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
H304 May be fatal if swallowed and enters airways.
**Precautionary statements**
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
**WHMIS classification**
B2 - Flammable liquid
D2A - Very toxic material causing other toxic effects



**Classification system**
**HMIS ratings (scale 0-4)**
**(Hazardous Materials Identification System)**



Health (acute effects) = 2
Flammability = 3
Physical Hazard = 1

(Contd. on page 2)

**Product name: Benzene**

(Contd. of page 1)

**Other hazards**
**Results of PBT and vPvB assessment**
**PBT:** Not applicable.
**vPvB:** Not applicable.

## 3 Composition/information on ingredients

**Chemical characterization: Substances**
**CAS# Description:**
71-43-2 Benzene
**Identification number(s):**
**EC number:** 200-753-7
**Index number:** 601-020-00-8

## 4 First-aid measures

**Description of first aid measures**
**After inhalation**
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
**After skin contact**
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
**After eye contact** Rinse opened eye for several minutes under running water. Then consult a doctor.
**After swallowing** Seek medical treatment.
**Information for doctor**
**Most important symptoms and effects, both acute and delayed** No further relevant information available.
**Indication of any immediate medical attention and special treatment needed** No further relevant information available.

## 5 Fire-fighting measures

**Extinguishing media**
**Suitable extinguishing agents** Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
**Special hazards arising from the substance or mixture**
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
**Advice for firefighters**
**Protective equipment:**
Wear self-contained respirator.
Wear fully protective impervious suit.

## 6 Accidental release measures

**Personal precautions, protective equipment and emergency procedures**
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources
**Environmental precautions:** Do not allow product to reach sewage system or any water course.
**Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose of contaminated material as waste according to section 13.
Ensure adequate ventilation.
**Prevention of secondary hazards:** Keep away from ignition sources.
**Reference to other sections**
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

## 7 Handling and storage

**Handling**
**Precautions for safe handling**
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Open and handle container with care.
**Information about protection against explosions and fires:**
Protect against electrostatic charges.
Fumes can combine with air to form an explosive mixture.
Keep ignition sources away.

**Conditions for safe storage, including any incompatibilities**
**Storage**
**Requirements to be met by storerooms and receptacles:** Store in a cool location.
**Information about storage in one common storage facility:**
Do not store together with acids.
Store away from strong bases.
Store away from oxidizing agents.
Store away from halogens.
**Further information about storage conditions:**
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
**Specific end use(s)** No further relevant information available.

## 8 Exposure controls/personal protection

**Additional information about design of technical systems:**
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

(Contd. on page 3)

**Product name: Benzene**

(Contd. of page 2)

**Control parameters**

**Components with limit values that require monitoring at the workplace:**

**71-43-2 Benzene (100.0%)**

| | |
|---|---|
| PEL (USA) | Short-term value: 15* mg/m³, 5* ppm<br>Long-term value: 3* mg/m³, 1* ppm<br>*table Z-2 for exclusions in 29CFR1910.1028(d) |
| REL (USA) | Short-term value: 1 ppm<br>Long-term value: 0.1 ppm<br>See Pocket Guide App. A |
| TLV (USA) | Short-term value: 8 mg/m³, 2.5 ppm<br>Long-term value: 1.6 mg/m³, 0.5 ppm<br>Skin; BEI |
| EL (Canada) | Short-term value: 2.5 ppm<br>Long-term value: 0.5 ppm<br>Skin; ACGIH A1; IARC 1 |
| EV (Canada) | Short-term value: 2.5 ppm<br>Long-term value: 0.5 ppm<br>Skin |

**Ingredients with biological limit values:**

**71-43-2 Benzene (100.0%)**

| | |
|---|---|
| BEI (USA) | 25 µg/g creatinine<br>Medium: urine<br>Time: end of shift Parameter<br>Parameter: S-Phenylmercapturic acid (background<br><br>500 µg/g creatinine<br>Medium: urine<br>Time: end of shift<br>Parameter: t,t-Muconic acid (background) |

**Additional information:** No data

**Exposure controls**
**Personal protective equipment**
**General protective and hygienic measures**
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
Avoid contact with the eyes and skin.
Maintain an ergonomically appropriate working environment.
**Breathing equipment:** Use suitable respirator when high concentrations are present.
**Recommended filter device for short term use:**
Use a respirator with organic vapor/acid gas cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards such as NIOSH (USA) or CEN (EU).
**Protection of hands:**
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
**Material of gloves** Fluorocarbon rubber (Viton)
**Penetration time of glove material (in minutes)** Not determined
**Eye protection:** Safety glasses
**Body protection:** Protective work clothing.

## 9 Physical and chemical properties

**Information on basic physical and chemical properties**
**General Information**
**Appearance:**

| | |
|---|---|
| **Form:** | Liquid |
| **Color:** | Colorless |
| **Odor:** | Aromatic |
| **Odor threshold:** | Not determined. |
| **pH-value:** | Not determined. |
| **Change in condition** | |
| **Melting point/Melting range:** | 5 °C (41 °F) |
| **Boiling point/Boiling range:** | 80 °C (176 °F) |
| **Sublimation temperature / start:** | Not determined |
| **Flash point:** | -11 °C (12 °F) |
| **Flammability (solid, gaseous)** | Not determined. |
| **Ignition temperature:** | 555 °C (1031 °F) |
| **Decomposition temperature:** | Not determined |
| **Auto igniting:** | Not determined. |
| **Danger of explosion:** | Product is not explosive. However, formation of explosive air/vapor mixtures is possible. |
| **Explosion limits:** | |
| **Lower:** | 1.2 Vol % |
| **Upper:** | 8 Vol % |
| **Vapor pressure at 20 °C (68 °F):** | 101 hPa (76 mm Hg) |
| **Density at 20 °C (68 °F):** | 0.874 g/cm³ (7.294 lbs/gal) |
| **Relative density** | Not determined. |
| **Vapor density** | Not determined. |
| **Evaporation rate** | Not determined. |
| **Solubility in / Miscibility with** | |
| **Water at 25 °C (77 °F):** | 1.8 g/l |
| **Partition coefficient (n-octanol/water):** | Not determined. |
| **Viscosity:** | |
| **dynamic at 20 °C (68 °F):** | 0.66 mPas |
| **kinematic:** | Not determined. |

(Contd. on page 4)

**Product name: Benzene**

(Contd. of page 3)

**Other information** No further relevant information available.

## 10 Stability and reactivity

**Reactivity** No information known.
**Chemical stability** Stable under recommended storage conditions.
**Thermal decomposition / conditions to be avoided:** Decomposition will not occur if used and stored according to specifications.
**Possibility of hazardous reactions** Reacts with strong oxidizing agents
**Conditions to avoid** No further relevant information available.
**Incompatible materials:**
Acids
Oxidizing agents
Bases
Halogens
**Hazardous decomposition products:** Carbon monoxide and carbon dioxide

## 11 Toxicological information

**Information on toxicological effects**
**Acute toxicity:** The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.

**LD/LC50 values that are relevant for classification:**

| | | |
|---|---|---|
| Oral | LD50 | 930 mg/kg (rat) |
| Dermal | LD50 | >9400 µL/kg (rabbit) |
| Inhalative | LC50/7H | 10000 ppm/7H (rat) |

**Skin irritation or corrosion:** Causes skin irritation.
**Eye irritation or corrosion:** Causes serious eye irritation.
**Sensitization:** No sensitizing effects known.
**Germ cell mutagenicity:**
May cause genetic defects.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.
**Carcinogenicity:**
May cause cancer.
EPA-A: human carcinogen: sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer.
IARC-1: Carcinogenic to humans: sufficient evidence of carcinogenicity.
ACGIH A1: Confirmed human carcinogen: Agent is carcinogenic to humans based on epidemiologic studies of, or convincing clinical evidence in, exposed humans.
EPA-K: Known human carcinogens.
Carcinogen as defined by OSHA.
NTP-K: Known to be carcinogenic: sufficient evidence from human studies.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
**Reproductive toxicity:** The Registry of Toxic Effects of Chemical Substances (RTECS) contains reproductive data for this substance.
**Specific target organ system toxicity - repeated exposure:**
Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
**Specific target organ system toxicity - single exposure:** No effects known.
**Aspiration hazard:** May be fatal if swallowed and enters airways.
**Subacute to chronic toxicity:** The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
**Additional toxicological information:** To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

## 12 Ecological information

**Toxicity**
**Aquatic toxicity:** No further relevant information available.
**Persistence and degradability** No further relevant information available.
**Bioaccumulative potential** No further relevant information available.
**Mobility in soil** No further relevant information available.
**Additional ecological information:**
**General notes:**
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
Avoid transfer into the environment.
**Results of PBT and vPvB assessment**
**PBT:** Not applicable.
**vPvB:** Not applicable.
**Other adverse effects** No further relevant information available.

## 13 Disposal considerations

**Waste treatment methods**
**Recommendation** Consult state, local or national regulations to ensure proper disposal.
**Uncleaned packagings:**
**Recommendation:** Disposal must be made according to official regulations.

## 14 Transport information

| | |
|---|---|
| **UN-Number** | |
| **DOT, IMDG, IATA** | UN1114 |
| **UN proper shipping name** | |
| **DOT** | RQ Benzene |
| **IMDG, IATA** | BENZENE |
| **Transport hazard class(es)** | |
| **DOT** | |



| | |
|---|---|
| **Class** | 3 Flammable liquids. |
| **Label** | 3 |
| **Class** | 3 (F1) Flammable liquids |

(Contd. on page 5)

**Product name: Benzene**

(Contd. of page 4)

| | |
|---|---|
| **Label**<br>**IMDG, IATA** | 3 |
|  | |
| **Class**<br>**Label** | 3 Flammable liquids.<br>3 |
| **Packing group**<br>**DOT, IMDG, IATA** | II |
| **Environmental hazards:** | Not applicable. |
| **Special precautions for user**<br>**EMS Number:** | Warning: Flammable liquids<br>F-E,S-D |
| **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code** | Not applicable. |
| **Transport/Additional information:** | |
| **DOT**<br>**Hazardous substance:**<br>**Marine Pollutant (DOT):** | <br>10 lbs, 4.54 kg<br>No |
| **UN "Model Regulation":** | UN1114, Benzene, 3, II |

## 15 Regulatory information

**Safety, health and environmental regulations/legislation specific for the substance or mixture**
**GHS label elements** The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
**Hazard pictograms**



GHS02 GHS07 GHS08

**Signal word** Danger
**Hazard statements**
H225 Highly flammable liquid and vapor.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
H304 May be fatal if swallowed and enters airways.
**Precautionary statements**
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
**National regulations**
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).

**SARA Section 313 (specific toxic chemical listings)**
71-43-2 | Benzene

**California Proposition 65**

**Prop 65 - Chemicals known to cause cancer**
71-43-2 | Benzene

**Prop 65 - Developmental toxicity**
71-43-2 | Benzene

**Prop 65 - Developmental toxicity, female** Substance is not listed.

**Prop 65 - Developmental toxicity, male**
71-43-2 | Benzene

**Information about limitation of use:**
Workers are not allowed to be exposed to this hazardous material. Exceptions can be made by the authorities in certain cases.
For use only by technically qualified individuals.
**Other regulations, limitations and prohibitive regulations**
**Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006.** Substance is not listed.
**The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.**
Substance is not listed.
**Annex XIV of the REACH Regulations (requiring Authorisation for use)** Substance is not listed.
**Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

## 16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

**Department issuing SDS:** Global Marketing Department
**Date of preparation / last revision** 11/23/2015 / -
**Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative

(Contd. on page 6)

**Product name: Benzene**

(Contd. of page 5)

ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

# SAFETY DATA SHEET

Version 4.6
Revision Date 12/29/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Beryllium

Product Number : 378135
Brand : Aldrich

CAS-No. : 7440-41-7

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 2), H330
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Specific target organ toxicity - repeated exposure (Category 1), H372

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H301 Toxic if swallowed.
H315 Causes skin irritation.
H317 May cause an allergic skin reaction.
H319 Causes serious eye irritation.
H330 Fatal if inhaled.
H335 May cause respiratory irritation.
H350 May cause cancer.

| | |
|---|---|
| H372 | Causes damage to organs through prolonged or repeated exposure. |

Precautionary statement(s)

| | |
|---|---|
| P201 | Obtain special instructions before use. |
| P202 | Do not handle until all safety precautions have been read and understood. |
| P260 | Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. |
| P264 | Wash skin thoroughly after handling. |
| P270 | Do not eat, drink or smoke when using this product. |
| P271 | Use only outdoors or in a well-ventilated area. |
| P272 | Contaminated work clothing should not be allowed out of the workplace. |
| P280 | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P284 | Wear respiratory protection. |
| P301 + P310 + P330 | IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician. Rinse mouth. |
| P302 + P352 | IF ON SKIN: Wash with plenty of soap and water. |
| P304 + P340 + P310 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician. |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |
| P333 + P313 | If skin irritation or rash occurs: Get medical advice/ attention. |
| P337 + P313 | If eye irritation persists: Get medical advice/ attention. |
| P362 | Take off contaminated clothing and wash before reuse. |
| P403 + P233 | Store in a well-ventilated place. Keep container tightly closed. |
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.1 Substances**

| | | |
|---|---|---|
| Formula | : | Be |
| Molecular weight | : | 9.01 g/mol |
| CAS-No. | : | 7440-41-7 |
| EC-No. | : | 231-150-7 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Berylium foil** | | |
| | Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 1B; STOT SE 3; STOT RE 1; H301, H315, H317, H319, H330, H335, H350, H372 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

**4.1 Description of first aid measures**

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

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

**In case of skin contact**
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

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

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**
No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**
Beryllium oxides

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

**6.1 Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

**6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

**6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

**6.4 Reference to other sections**
For disposal see section 13.

## 7. HANDLING AND STORAGE

**7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

**7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

**7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**8.1 Control parameters**

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Berylium foil | 7440-41-7 | TWA | 2.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | CEIL | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Peak | 25.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | TWA | 2.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | Remarks | Z27.29-1970 | | |
| | | CEIL | 5.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | Peak | 25.000000micro gram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | TWA | 0.000050 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Beryllium sensitization<br>Chronic beryllium disease (berylliosis)<br>Confirmed human carcinogen<br>Danger of cutaneous absorption<br>Sensitizer | | |
| | | C | 0.000500 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |
| | | See Table Z-2 | | |
| | | TWA | 2.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | TWA | 2.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | CEIL | 5.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | CEIL | 5.000000microg ram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | Peak | 25.000000micro gram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | Peak | 25.000000micro gram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | TWA | 0.000050 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Beryllium sensitization | | |

| | | | | |
|---|---|---|---|---|
| | | Chronic beryllium disease (berylliosis)<br>Adopted values or notations enclosed are those for which changes are proposed in the NIC<br>See Notice of Intended Changes (NIC)<br>Confirmed human carcinogen<br>Danger of cutaneous absorption<br>Sensitizer | | |
| | | C | 0.000500 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |
| | | See Table Z-2 | | |
| | | TWA | 2microgram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | CEIL | 5microgram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | Peak | 25microgram per cubic meter | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z27.29-1970 | | |
| | | C | 0.0005 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |

## 8.2 Exposure controls

**Appropriate engineering controls**
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

**Personal protective equipment**

**Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: powder<br>Colour: grey |
| b) | Odour | odourless |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 1,278 °C (2,332 °F) - lit. |
| f) | Initial boiling point and boiling range | 2,970 °C (5,378 °F) - lit. |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | 1.85 g/cm3 at 25 °C (77 °F) |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information
No data available

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity
No data available

### 10.2 Chemical stability
Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Alkali metals

**10.6 Hazardous decomposition products**
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - 0.496 mg/kg
Remarks: Liver:Hepatitis (hepatocellular necrosis), zonal.

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
Hamster
Lungs
Result: negative

**Carcinogenicity**

Carcinogenicity - Rat - Intratracheal
Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma.

Carcinogenicity - Rabbit - Intravenous
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

Possible human carcinogen

| | |
|---|---|
| IARC: | 1 - Group 1: Carcinogenic to humans (Berylium foil) |
| NTP: | Known to be human carcinogen (Berylium foil) |
| | Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Berylium foil) |
| OSHA: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. |

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: DS1750000

## 12. ECOLOGICAL INFORMATION

**12.1 Toxicity**
No data available

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

No data available

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium, powder
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 1567 Class: 6.1 (4.1) Packing group: II EMS-No: F-G, S-G
Proper shipping name: BERYLLIUM POWDER

**IATA**
UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium powder

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| Berylium foil | 7440-41-7 | 1993-04-24 |

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Berylium foil | 7440-41-7 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Berylium foil | 7440-41-7 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Berylium foil | 7440-41-7 | 1993-04-24 |

**California Prop. 65 Components**

| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. | Revision Date |
|---|---|---|
| Berylium foil | 7440-41-7 | 2008-10-10 |

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Acute Tox. | Acute toxicity |
| Carc. | Carcinogenicity |
| Eye Irrit. | Eye irritation |
| H301 | Toxic if swallowed. |
| H315 | Causes skin irritation. |
| H317 | May cause an allergic skin reaction. |
| H319 | Causes serious eye irritation. |
| H330 | Fatal if inhaled. |
| H335 | May cause respiratory irritation. |
| H350 | May cause cancer. |
| H372 | Causes damage to organs through prolonged or repeated exposure. |
| Skin Irrit. | Skin irritation |
| Skin Sens. | Skin sensitisation |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 4 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 4 |
| Fire Hazard: | 3 |
| Reactivity Hazard: | 3 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

# Safety Data Sheet

**Revision Date: 12/30/16**
www.restek.com

## 1. IDENTIFICATION

| | |
|---|---|
| **Catalog Number / Product Name:** | **31274 / Benzo(k)fluoranthene Standard** |
| **Company:** | Restek Corporation |
| **Address:** | 110 Benner Circle<br>Bellefonte, Pa. 16823 |
| **Phone#:** | 814-353-1300 |
| **Fax#:** | 814-353-1309 |
| **Emergency#:** | 800-424-9300 (CHEMTREC)<br>703-527-3887 (Outside the US) |
| **Email:** | www.restek.com |
| **Revision Number:** | 10 |
| **Intended use:** | For Laboratory use only |

## 2. HAZARD(S)IDENTIFICATION

**Emergency Overview:**

**GHS Hazard Symbols:**





| | |
|---|---|
| **GHS Classification:** | Flammable Liquid Category 2<br>Serious Eye Damage/Eye Irritation Category 2<br>Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3 |
| **GHS Signal Word:** | Danger |
| **GHS Hazard:** | Highly flammable liquid and vapour.<br>Causes serious eye irritation.<br>May cause drowsiness or dizziness. |
| **GHS Precautions:** | |
| **Safety Precautions:** | Keep away from heat/sparks/open flames/hot surfaces. – No smoking.<br>Ground/bond container and receiving equipment.<br>Use explosion-proof electrical/ventilation and lighting equipment.<br>Use only non-sparking tools.<br>Take precautionary measures against static discharge.<br>Avoid breathing dust/fume/gas/mist/vapours/spray.<br>Wash hands and skin thoroughly after handling.<br>Use only outdoors or in a well-ventilated area.<br>Wear protective gloves/protective clothing/eye protection/face protection. |
| **First Aid Measures:** | IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.<br>IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.<br>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.<br>Call a POISON CENTER or doctor/physician if you feel unwell.<br>If eye irritation persists: Get medical advice/attention.<br>In case of fire: Use extinguishing media in section 5 for extinction. |
| **Storage:** | Store in a well-ventilated place. Keep container tightly closed.<br>Store in a well-ventilated place. Keep cool.<br>Store locked up. |
| **Disposal:** | Dispose of contents/container according to section 13 of the SDS. |

**Single Exposure Target Organs:** No data available.

**Repeated Exposure Target Organs:** No data available.

## 3. COMPOSITION / INFORMATION ON INGREDIENT

| Chemical Name | CAS # | EINEC # | % Composition |
|---|---|---|---|
| Acetone | 67-64-1 | 200-662-2 | 99.900000 |
| benzo (k) fluoranthene | 207-08-9 | 205-916-6 | 0.100000 |

## 4. FIRST-AID MEASURES

**Inhalation:** Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

**Eyes:** Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

**Skin Contact:** Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

**Ingestion:** Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

## 5. FIRE- FIGHTING MEASURES

**Extinguishing Media:** Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

**Fire and/or Explosion Hazards:** Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back

**Fire Fighting Methods and Protection:** Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling.

**Hazardous Combustion Products:** Carbon dioxide, Carbon monoxide

## 6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions and Equipment:** Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

**Methods for Clean-up:** Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

## 7. HANDLING AND STORAGE

**Handling Technical Measures and Precautions:** Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

**Storage Technical Measures and Conditions:** Store in a cool dry ventilated location. Isolate from

incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**United States:**

| Chemical Name | CAS No. | IDLH | ACGIH STEL | ACGIH TLV-TWA | OSHA Exposure Limit |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | 2500 ppm IDLH (10% LEL) | 500 ppm STEL 750 ppm STEL; 1782 mg/m3 STEL | 250 ppm TWA 500 ppm TWA; 1188 mg/m3 TWA | 1000 ppm TWA; 2400 mg/m3 TWA |
| benzo (k) fluoranthene | 207-08-9 | ND | | No TLV | No data available. |

**Personal Protection:**

**Engineering Measures:** Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

**Respiratory Protection:** No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.

**Eye Protection:** Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

**Skin Protection:** Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

**Medical Conditions Aggravated By Exposure:** Respiratory disease including asthma and bronchitis

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance, color:** Depends upon product selection
**Odor:** Strong
**Physical State:** No data available.
**pH:** No data available.
**Vapor Pressure:** No data available.
**Vapor Density:** 2.0 (air = 1)
**Boiling Point:** No data available.
**Melting Point:** -95.4 °C Melting Point
**Flash Point:** 39
**Flammability:** Highly Flammable
**Upper Flammable/Explosive Limit, % in air:** No data available.
**Lower Flammable/Explosive Limit, % in air:** No data available.
**Autoignition Temperature:** 465 deg C
**Decomposition Temperature:** No data available.
**Specific Gravity:** 0.7845 g/cm3 at 25 °C
**Evaporation Rate:** No data available.
**Odor Threshold:** ND
**Solubility:** Complete; 100%
**Partition Coefficient: n-octanol in water:** No data available.
**VOC % by weight:** 0
**Molecular Weight:** 58.08

## 10. STABILITY AND REACTIVITY

**Stability:** Stable under normal conditions.
**Conditions to Avoid:** No data available.
**Materials to Avoid / Chemical Incompatiability:** Strong oxidizing agents Strong acids
**Hazardous Decomposition Products:** Carbon dioxide Carbon monoxide

## 11. TOXICOLOGICAL INFORMATION

**Routes of Entry:** Inhalation, Skin Contact, Eye Contact, Ingestion
**Target Organs Potentially Affected By Exposure:** Eyes, Central nervous system stimulation, Respiratory Tract, Skin
**Chemical Interactions That Change Toxicity:** None Known

**Immediate (Acute) Health Effects by Route of Exposure:**

| | |
|---|---|
| **Inhalation Irritation:** | Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache. |
| **Skin Contact:** | Can cause minor skin irritation, defatting, and dermatitis. |
| **Eye Contact:** | Can cause minor irritation, tearing and reddening. |
| **Ingestion Irritation:** | May be harmful if swallowed. |
| **Ingestion Toxicity:** | Harmful if swallowed. May cause systemic poisoning. |

**Long-Term (Chronic) Health Effects:**

| | |
|---|---|
| **Carcinogenicity:** | Contains a probable or known human carcinogen. |
| **Reproductive and Developmental Toxicity:** | No data available to indicate product or any components present at greater than 0.1% may cause birth defects. |
| **Inhalation:** | Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache. |
| **Skin Contact:** | Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis. |

**Component Toxicological Data:**
**NIOSH:**

| **Chemical Name** | **CAS No.** | **LD50/LC50** |
|---|---|---|
| Acetone | 67-64-1 | Dermal LD50 Rabbit >15700 mg/kg; Oral LD50 Rat 5800 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h |

**Component Carcinogenic Data:**
**OSHA:**

| **Chemical Name** | **CAS No.** | |
|---|---|---|
| Benzo(k)fluoranthene | 207-08-9 | Present |

**ACGIH:**

| **Chemical Name** | **CAS No.** | |
|---|---|---|
| Acetone | 67-64-1 | A4 - Not Classifiable as a Human Carcinogen |

**NIOSH:**

| **Chemical Name** | **CAS No.** |
|---|---|
| No data available. | |

**NTP:**

| **Chemical Name** | **CAS No.** |
|---|---|
| No data available. | |

**IARC:**

| **Chemical Name** | **CAS No.** | **Group No.** |
|---|---|---|
| No data. | | Group 1 |
| No data. | | Group 2A |
| Benzo(k)fluoranthene | 207-08-9 | Group 2B |

## 12. ECOLOGICAL INFORMATION

| | |
|---|---|
| **Overview:** | This material is not expected to be harmful to the ecology. |
| **Mobility:** | No data |
| **Persistence:** | No data |
| **Bioaccumulation:** | No data |
| **Degradability:** | No data |
| **Ecological Toxicity Data:** | No data available. |

## 13. DISPOSAL CONSIDERATIONS

| | |
|---|---|
| **Waste Description of Spent Product:** | Spent or discarded material is a hazardous waste. |
| **Disposal Methods:** | Dispose of by incineration following Federal, State, Local, or Provincial regulations. |
| **Waste Disposal of Packaging:** | Comply with all Local, State, Federal, and Provincial Environmental Regulations. |

## 14. TRANSPORTATION INFORMATION

| | |
|---|---|
| **United States:** | |
| **DOT Proper Shipping Name:** | Acetone |
| **UN Number:** | UN1090 |

**Hazard Class:** 3
**Packing Group:** II

**International:**
**IATA Proper Shipping Name:** Acetone
**UN Number:** UN1090
**Hazard Class:** 3
**Packing Group:** II

**Marine Pollutant:** No

| Chemical Name | CAS# | Marine Pollutant | Severe Marine Pollutant |
|---|---|---|---|
| No data available. | | | |

## 15. REGULATORY INFORMATION

**United States:**

| Chemical Name | CAS# | CERCLA | SARA 313 | SARA EHS 313 | TSCA |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | X | - | - | X |
| benzo (k) fluoranthene | 207-08-9 | X | X | - | - |

**The following chemicals are listed on CA Prop 65:**

| Chemical Name | CAS # | Regulation |
|---|---|---|
| Benzo[k]fluoranthene | 207-08-9 | Prop 65 Cancer |

**State Right To Know Listing:**

| Chemical Name | CAS# | New Jersey | Massachusetts | Pennsylvania | California |
|---|---|---|---|---|---|
| Acetone | 67-64-1 | X | X | X | X |
| benzo (k) fluoranthene | 207-08-9 | X | X | X | X |

## 16. OTHER INFORMATION

**Prior Version Date:** 05/15/15
**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
**References:** No data available.
**Disclaimer:** Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding prodcuts described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

# SAFETY DATA SHEET

**Creation Date** 14-May-2010 **Revision Date** 23-Dec-2014 **Revision Number** 1

## 1. Identification

**Product Name** **Carbazole**

**Cat No. :** **AC108260000; AC108260010; AC108260050; AC108260250; AC108262500; AC108265000**

**Synonyms** 9-Azafluorene; Dibenzopyrrole; Diphenylenimine

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

## 2. Hazard(s) identification

**Classification**
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Carcinogenicity | Category 1B |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
May cause cancer



**Precautionary Statements**
**Prevention**
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
**Response**
IF exposed or concerned: Get medical attention/advice
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Skin**
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
**Eyes**
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Very toxic to aquatic life with long lasting effects

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| 9H-Carbazole | 86-74-8 | >95 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Obtain medical attention.

**Inhalation** Remove from exposure, lie down. Move to fresh air. Obtain medical attention.

**Ingestion** Clean mouth with water. Get medical attention.

**Most important symptoms/effects** No information available.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Water spray. Carbon dioxide ($CO_2$). Dry chemical. chemical foam.

**Unsuitable Extinguishing Media** No information available

**Flash Point** 220 °C / 428 °F
**Method -** No information available

**Autoignition Temperature** 540 °C / 1004 °F
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Do not allow run-off from fire fighting to enter drains or water courses.

**Hazardous Combustion Products**
Nitrogen oxides (NOx) Carbon monoxide (CO) Carbon dioxide ($CO_2$)
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 1 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment.
**Environmental Precautions** Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** Sweep up or vacuum up spillage and collect in suitable container for disposal. Do not let this chemical enter the environment.

## 7. Handling and storage

**Handling** Avoid contact with skin and eyes. Do not breathe dust. Do not ingest. Use only in area provided with appropriate exhaust ventilation.

**Storage** Keep in a dry, cool and well-ventilated place. Keep container tightly closed.

## 8. Exposure controls / personal protection

**Exposure Guidelines** This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

**Engineering Measures** Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | Beige |
| **Odor** | pungent |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | 240 - 246 °C / 464 - 474.8 °F |
| **Boiling Point/Range** | 355 °C / 671 °F @ 760 mmHg |
| **Flash Point** | 220 °C / 428 °F |
| **Evaporation Rate** | Not applicable |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 400 mmHg @ 323 °C |
| **Vapor Density** | Not applicable |
| **Relative Density** | 1.1 |
| **Solubility** | insoluble |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | 540 °C / 1004 °F |
| **Decomposition Temperature** | No information available |
| **Viscosity** | Not applicable |
| **Molecular Formula** | C12 H9 N |
| **Molecular Weight** | 167.21 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products.

**Incompatible Materials** Strong oxidizing agents, Strong bases

**Hazardous Decomposition Products** Nitrogen oxides (NOx), Carbon monoxide (CO), Carbon dioxide ($CO_2$)

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| 9H-Carbazole | >5000 mg/kg ( Rat ) | Not listed | Not listed |

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** No information available

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen. Limited evidence of a carcinogenic effect.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| 9H-Carbazole | 86-74-8 | Group 2B | Not listed | Not listed | X | Not listed |

**Mutagenic Effects** Not mutagenic in AMES Test

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Respiratory system
**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** No information available
**Endocrine Disruptor Information** No information available

**Other Adverse Effects** The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

## 12. Ecological information

**Ecotoxicity**
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| 9H-Carbazole | 6.7 mg/L EC50 = 60 h | 1 mg/L LC50 48 h | EC50 = 10.6 mg/L 15 min<br>EC50 = 11.6 mg/L 30 min<br>EC50 = 13.6 mg/L 5 min | Not listed |

**Persistence and Degradability** Insoluble in water Persistence is unlikely
**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Is not likely mobile in the environment due its low water solubility.

| Component | log Pow |
|---|---|
| 9H-Carbazole | 3.84 |

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

**DOT**

**UN-No** UN3077
**Proper Shipping Name** Environmentally hazardous substance, solid, n.o.s.
**Proper technical name** 9H-Carbazole
**Hazard Class** 9
**Packing Group** III

**TDG**

**UN-No** UN3077
**Proper Shipping Name** Environmentally hazardous substance, solid, n.o.s.
**Hazard Class** 9
**Packing Group** III

**IATA**
**UN-No** UN3077
**Proper Shipping Name** Environmentally hazardous substance, solid, n.o.s.
**Hazard Class** 9
**Packing Group** III

**IMDG/IMO**
**UN-No** UN3077
**Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
**Hazard Class** 9
**Packing Group** III

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9H-Carbazole | X | X | - | 201-696-0 | - | | X | X | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313** Not applicable

**SARA 311/312 Hazardous Categorization**
**Acute Health Hazard** Yes
**Chronic Health Hazard** Yes
**Fire Hazard** No
**Sudden Release of Pressure Hazard** No
**Reactive Hazard** No

**Clean Water Act** Not applicable

**Clean Air Act** Not applicable

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**
Not applicable

**California Proposition 65** This product contains the following Proposition 65 chemicals:

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 9H-Carbazole | 86-74-8 | Carcinogen | 4.1 µg/day | Carcinogen |

**State Right-to-Know** Not applicable

**U.S. Department of Transportation**

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**
**This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR**

**WHMIS Hazard Class** D2A Very toxic materials



## 16. Other information

**Prepared By**
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Creation Date** 14-May-2010
**Revision Date** 23-Dec-2014
**Print Date** 23-Dec-2014
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**
**The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.**

**End of SDS**

# SAFETY DATA SHEET

Version 5.4
Revision Date 04/21/2015
Print Date 05/13/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Chlordane - Sandy Loam 2

Product Number : CRM825
Brand : Sigma-Aldrich

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Carcinogenicity (Category 1A), H350
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), H373
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)

| | |
|---|---|
| H350 | May cause cancer. |
| H373 | May cause damage to organs through prolonged or repeated exposure if inhaled. |
| H412 | Harmful to aquatic life with long lasting effects. |

Precautionary statement(s)

| | |
|---|---|
| P201 | Obtain special instructions before use. |
| P202 | Do not handle until all safety precautions have been read and understood. |
| P260 | Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. |
| P273 | Avoid release to the environment. |
| P281 | Use personal protective equipment as required. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |

| | |
|---|---|
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.2 Mixtures**

**Hazardous components**

| Component | | Classification | Concentration |
|---|---|---|---|
| **Quartz** | | | |
| CAS-No.<br>EC-No. | 14808-60-7<br>238-878-4 | Carc. 2; STOT RE 2; H351, H373 | >= 90 - <= 100 % |
| **Chlordane** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 57-74-9<br>200-349-0<br>602-047-00-8 | Acute Tox. 3; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H410 | < 0.1 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

**4.1 Description of first aid measures**

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

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

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

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**
No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**
silicon oxides

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

### 6.2 Environmental precautions

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

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Store at Room Temperature.
Storage class (TRGS 510): Non Combustible Solids

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Quartz | 14808-60-7 | TWA | 0.025 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Suspected human carcinogen | | |
| | | TWA | 0.025 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Lung cancer<br>Pulmonary fibrosis<br>Suspected human carcinogen | | |

### 8.2 Exposure controls

**Appropriate engineering controls**

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

**Personal protective equipment**

**Eye/face protection**

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: solid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | No data available |
| f) | Initial boiling point and boiling range | No data available |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | No data available |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents

**10.6 Hazardous decomposition products**
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

| | |
|---|---|
| IARC: | 1 - Group 1: Carcinogenic to humans (Quartz) |
| ACGIH: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH. |
| NTP: | Known to be human carcinogen (Quartz) |
| OSHA: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. |

**Reproductive toxicity**
No data available
No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Liver - Irregularities - Based on Human Evidence
Liver - Irregularities - Based on Human Evidence
Nerves. - (Chlordane)

## 12. ECOLOGICAL INFORMATION

**12.1 Toxicity**
No data available

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
Not dangerous goods

**IMDG**
Not dangerous goods

**IATA**
Not dangerous goods

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**

CAS-No. Revision Date

| | | |
|---|---|---|
| Quartz | 14808-60-7 | 1994-04-01 |
| Chlordane | 57-74-9 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Quartz | 14808-60-7 | 1994-04-01 |
| Chlordane | 57-74-9 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Quartz | 14808-60-7 | 1994-04-01 |

**California Prop. 65 Components**

| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. | Revision Date |
|---|---|---|
| Chlordane | 57-74-9 | 2007-09-28 |
| Quartz | 14808-60-7 | 2007-09-28 |

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Acute Tox. | Acute toxicity |
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| Carc. | Carcinogenicity |
| H301 + H311 | Toxic if swallowed or in contact with skin |
| H350 | May cause cancer. |
| H351 | Suspected of causing cancer. |
| H373 | May cause damage to organs through prolonged or repeated exposure if inhaled. |
| H402 | Harmful to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |
| H412 | Harmful to aquatic life with long lasting effects. |
| STOT RE | Specific target organ toxicity - repeated exposure |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.4 Revision Date: 04/21/2015 Print Date: 05/13/2016

# SAFETY DATA SHEET

Methyl Chloride (R40)

## Section 1. Identification

**GHS product identifier** : Methyl Chloride (R40)

**Chemical name** : chloromethane

**Other means of identification** : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

**Product use** : Synthetic/Analytical chemistry.

**Synonym** : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

**SDS #** : 001036

**Supplier's details** : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

**Emergency telephone number (with hours of operation)** : 1-866-734-3438

## Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas
ACUTE TOXICITY (inhalation) - Category 4
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) - Category 2

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Danger

**Hazard statements** : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.
Harmful if inhaled.
Suspected of causing cancer.
May cause damage to organs through prolonged or repeated exposure. (central nervous system (CNS))

**Precautionary statements**



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## Section 2. Hazards identification

**General** : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

**Prevention** : Never Put cylinders into unventilated areas of passenger vehicles. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use only outdoors or in a well-ventilated area. Do not breathe gas. Use and store only outdoors or in a well ventilated place.

**Response** : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

**Storage** : Store locked up. Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

**Disposal** : Dispose of contents and container in accordance with all local, regional, national and international regulations.

**Hazards not otherwise classified** : Liquid can cause burns similar to frostbite.

## Section 3. Composition/information on ingredients

**Substance/mixture** : Substance

**Chemical name** : chloromethane

**Other means of identification** : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

**CAS number/other identifiers**

**CAS number** : 74-87-3

**Product code** : 001036

| Ingredient name | % | CAS number |
|---|---|---|
| chloromethane | 100 | 74-87-3 |

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

**Occupational exposure limits, if available, are listed in Section 8.**

## Section 4. First aid measures

**Description of necessary first aid measures**

**Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.



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# Section 4. First aid measures

**Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.

**Ingestion** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section.

## Most important symptoms/effects, acute and delayed

### Potential acute health effects

**Eye contact** : Liquid can cause burns similar to frostbite.

**Inhalation** : Harmful if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

**Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Frostbite** : Try to warm up the frozen tissues and seek medical attention.

**Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

### Over-exposure signs/symptoms

**Eye contact** : Adverse symptoms may include the following:
frostbite

**Inhalation** : No specific data.

**Skin contact** : Adverse symptoms may include the following:
frostbite

**Ingestion** : Adverse symptoms may include the following:
frostbite

## Indication of immediate medical attention and special treatment needed, if necessary

**Notes to physician** : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**Specific treatments** : No specific treatment.

**Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

**See toxicological information (Section 11)**



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# Section 5. Fire-fighting measures

## Extinguishing media

**Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.

**Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion.

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

**Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

# Section 6. Accidental release measures

## Personal precautions, protective equipment and emergency procedures

**For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

**For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

**Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

## Methods and materials for containment and cleaning up

**Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

**Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.



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# Section 7. Handling and storage

## Precautions for safe handling

**Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

**Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

# Section 8. Exposure controls/personal protection

## Control parameters

### Occupational exposure limits

| Ingredient name | Exposure limits |
|---|---|
| chloromethane | **ACGIH TLV (United States, 3/2012).**<br>**Absorbed through skin.**<br>TWA: 50 ppm 8 hours.<br>TWA: 103 mg/m³ 8 hours.<br>STEL: 100 ppm 15 minutes.<br>STEL: 207 mg/m³ 15 minutes.<br>**OSHA PEL 1989 (United States, 3/1989).**<br>TWA: 50 ppm 8 hours.<br>TWA: 105 mg/m³ 8 hours.<br>STEL: 100 ppm 15 minutes.<br>STEL: 210 mg/m³ 15 minutes.<br>**OSHA PEL Z2 (United States, 11/2006).**<br>TWA: 100 ppm 8 hours.<br>CEIL: 200 ppm<br>AMP: 300 ppm 5 minutes. |

**Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.



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## Section 8. Exposure controls/personal protection

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

**Individual protection measures**

**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

**Skin protection**

**Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

**Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

**Appearance**

**Physical state** : Gas. [Liquefied compressed gas.]

**Color** : Colorless.

**Molecular weight** : 50.49 g/mole

**Molecular formula** : C-H3-Cl

**Boiling/condensation point** : -23.7°C (-10.7°F)

**Melting/freezing point** : -97°C (-142.6°F)

**Critical temperature** : 143.65°C (290.6°F)

**Odor** : Mild. Sweetish.

**Odor threshold** : Not available.

**pH** : Not available.

**Flash point** : Closed cup: 10°C (50°F)



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## Section 9. Physical and chemical properties

**Burning time** : Not applicable.

**Burning rate** : Not applicable.

**Evaporation rate** : Not available.

**Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

**Lower and upper explosive (flammable) limits** : Lower: 8.1%
Upper: 17.4%

**Vapor pressure** : 58.7 (psig)

**Vapor density** : 1.8 (Air = 1)

**Specific Volume ($ft^3/lb$)** : 1.0977

**Gas Density ($lb/ft^3$)** : 0.911 (25°C / 77 to °F)

**Relative density** : Not applicable.

**Solubility** : Not available.

**Solubility in water** : 5.32 g/l

**Partition coefficient: n-octanol/water** : 0.91

**Auto-ignition temperature** : 632°C (1169.6°F)

**Decomposition temperature** : Not available.

**SADT** : Not available.

**Viscosity** : Not applicable.

## Section 10. Stability and reactivity

**Reactivity** : No specific test data related to reactivity available for this product or its ingredients.

**Chemical stability** : The product is stable.

**Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.

**Conditions to avoid** : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow gas to accumulate in low or confined areas.

**Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: oxidizing materials.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

**Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.



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# Section 11. Toxicological information

## Information on toxicological effects

### Acute toxicity

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| chloromethane | LC50 Inhalation Gas. | Rat | 8300 ppm | 4 hours |

### Irritation/Corrosion

Not available.

### Sensitization

Not available.

### Mutagenicity

Not available.

### Carcinogenicity

Not available.

### Classification

| Product/ingredient name | OSHA | IARC | NTP |
|---|---|---|---|
| chloromethane | - | 3 | - |

### Reproductive toxicity

Not available.

### Teratogenicity

Not available.

### Specific target organ toxicity (single exposure)

Not available.

### Specific target organ toxicity (repeated exposure)

| Name | Category | Route of exposure | Target organs |
|---|---|---|---|
| chloromethane | Category 2 | Not determined | central nervous system (CNS) |

### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

**Eye contact** : Liquid can cause burns similar to frostbite.

**Inhalation** : Harmful if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

**Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

### Symptoms related to the physical, chemical and toxicological characteristics

**Eye contact** : Adverse symptoms may include the following:
frostbite



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# Section 11. Toxicological information

**Inhalation** : No specific data.

**Skin contact** : Adverse symptoms may include the following:
frostbite

**Ingestion** : Adverse symptoms may include the following:
frostbite

## Delayed and immediate effects and also chronic effects from short and long term exposure

### Short term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

### Long term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

### Potential chronic health effects

Not available.

**General** : May cause damage to organs through prolonged or repeated exposure.

**Carcinogenicity** : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

**Mutagenicity** : No known significant effects or critical hazards.

**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : No known significant effects or critical hazards.

## Numerical measures of toxicity

### Acute toxicity estimates

Not available.

# Section 12. Ecological information

## Toxicity

| Product/ingredient name | Result | Species | Exposure |
|---|---|---|---|
| chloromethane | Acute LC50 270000 µg/l Marine water | Fish - Menidia beryllina | 96 hours |

## Persistence and degradability

Not available.

## Bioaccumulative potential

| Product/ingredient name | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| chloromethane | 0.91 | - | low |

## Mobility in soil



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# Section 12. Ecological information

**Soil/water partition coefficient ($K_{OC}$)** : Not available.

**Other adverse effects** : No known significant effects or critical hazards.

# Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

**United States - RCRA Toxic hazardous waste "U" List**

| Ingredient | CAS # | Status | Reference number |
|---|---|---|---|
| Methyl chloride (I,T); Methane, chloro- (I, T) | 74-87-3 | Listed | U045 |

# Section 14. Transport information

| | DOT | TDG | Mexico | IMDG | IATA |
|---|---|---|---|---|---|
| **UN number** | UN1063 | UN1063 | UN1063 | UN1063 | UN1063 |
| **UN proper shipping name** | METHYL CHLORIDE, OR REFRIGERANT GAS R 40 | METHYL CHLORIDE; OR REFRIGERANT GAS R 40 | METHYL CHLORIDE, OR REFRIGERANT GAS R 40 | METHYL CHLORIDE (REFRIGERANT GAS R 40) | METHYL CHLORIDE |
| **Transport hazard class(es)** | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   |
| **Packing group** | - | - | - | - | - |
| **Environment** | No. | No. | No. | No. | No. |
| **Additional information** | **Reportable quantity** 100 lbs / 45.4 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.<br><br>**Limited quantity** Yes.<br><br>**Packaging instruction** **Passenger aircraft** Quantity limitation: 5 kg<br><br>**Cargo aircraft** Quantity limitation: 100 kg | **Explosive Limit and Limited Quantity Index** 0.125<br><br>**ERAP Index** 3000<br><br>**Passenger Carrying Ship Index** Forbidden<br><br>**Passenger Carrying Road or Rail Index** Forbidden | - | - | **Passenger and Cargo Aircraft** Quantity limitation: 0 Forbidden<br>**Cargo Aircraft Only** Quantity limitation: 100 kg |



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# Section 14. Transport information

| | | | | | |
|---|---|---|---|---|---|
| | **Special provisions**<br>T50 | | | | |

**"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."**

**Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** : Not available.

# Section 15. Regulatory information

**U.S. Federal regulations** : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

**United States inventory (TSCA 8b)**: This material is listed or exempted.

**Clean Water Act (CWA) 307**: chloromethane

**Clean Air Act (CAA) 112 regulated toxic substances**: chloromethane

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Listed

**Clean Air Act Section 602 Class I Substances** : Not listed

**Clean Air Act Section 602 Class II Substances** : Not listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed

**DEA List II Chemicals (Essential Chemicals)** : Not listed

**SARA 302/304**

**Composition/information on ingredients**

No products were found.

**SARA 304 RQ** : Not applicable.

**SARA 311/312**

**Classification** : Fire hazard
Sudden release of pressure
Immediate (acute) health hazard
Delayed (chronic) health hazard

**Composition/information on ingredients**

| Name | % | Fire hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|---|---|---|---|---|---|---|
| chloromethane | 100 | Yes. | Yes. | No. | Yes. | Yes. |

**SARA 313**



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# Section 15. Regulatory information

| | Product name | CAS number | % |
|---|---|---|---|
| **Form R - Reporting requirements** | chloromethane | 74-87-3 | 100 |
| **Supplier notification** | chloromethane | 74-87-3 | 100 |

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

## State regulations

**Massachusetts** : This material is listed.

**New York** : This material is listed.

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

## California Prop. 65

**WARNING:** This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

| Ingredient name | Cancer | Reproductive | No significant risk level | Maximum acceptable dosage level |
|---|---|---|---|---|
| chloromethane | No. | Yes. | No. | No. |

**Canada inventory** : This material is listed or exempted.

## International regulations

**International lists** : **Australia inventory (AICS)**: This material is listed or exempted.
**China inventory (IECSC)**: This material is listed or exempted.
**Japan inventory**: This material is listed or exempted.
**Korea inventory**: This material is listed or exempted.
**Malaysia Inventory (EHS Register)**: Not determined.
**New Zealand Inventory of Chemicals (NZIoC)**: This material is listed or exempted.
**Philippines inventory (PICCS)**: This material is listed or exempted.
**Taiwan inventory (CSNN)**: Not determined.

**Chemical Weapons Convention List Schedule I Chemicals** : Not listed

**Chemical Weapons Convention List Schedule II Chemicals** : Not listed

**Chemical Weapons Convention List Schedule III Chemicals** : Not listed

## Canada

**WHMIS (Canada)** : Class A: Compressed gas.
Class B-1: Flammable gas.
Class B-6: Reactive flammable material
Class D-2A: Material causing other toxic effects (Very toxic).

**CEPA Toxic substances**: This material is not listed.
**Canadian ARET**: This material is not listed.
**Canadian NPRI**: This material is listed.
**Alberta Designated Substances**: This material is not listed.
**Ontario Designated Substances**: This material is not listed.
**Quebec Designated Substances**: This material is not listed.



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# Section 16. Other information

**Canada Label requirements** : Class A: Compressed gas.
Class B-1: Flammable gas.
Class B-6: Reactive flammable material
Class D-2A: Material causing other toxic effects (Very toxic).

**Hazardous Material Information System (U.S.A.)**

| | | |
|---|---|---|
| Health | * | 2 |
| Flammability | | 4 |
| Physical hazards | | 2 |

**Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.**

**The customer is responsible for determining the PPE code for this material.**

**National Fire Protection Association (U.S.A.)**




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**Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.**

**History**

**Date of printing** : 5/20/2015.

**Date of issue/Date of revision** : 5/20/2015.

**Date of previous issue** : 10/15/2014.

**Version** : 0.03

**Key to abbreviations** : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United NationsACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
CAS – Chemical Abstract Services
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act



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# Section 16. Other information

(EPA)
CFR – United States Code of Federal Regulations
CPR – Controlled Products Regulations
DSL – Domestic Substances List
GWP – Global Warming Potential
IARC – International Agency for Research on Cancer
ICAO – International Civil Aviation Organisation
Inh – Inhalation
LC – Lethal concentration
LD – Lethal dosage
NDSL – Non-Domestic Substances List
NIOSH – National Institute for Occupational Safety and Health
TDG – Canadian Transportation of Dangerous Goods Act and Regulations
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
WEEL – Workplace Environmental Exposure Level
WHMIS – Canadian Workplace Hazardous Material Information System

**References** : Not available.

**Indicates information that has changed from previously issued version.**

## Notice to reader

**To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.**
**Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.**



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Fisher Scientific

Part of Thermo Fisher Scientific

# SAFETY DATA SHEET

**Creation Date** 13-Sep-2013 **Revision Date** 21-Jul-2015 **Revision Number** 2

## 1. Identification

**Product Name** **Chromium**

**Cat No. :** **C318-500**

**Synonyms** Chrome

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

**Emergency Telephone Number**
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

## 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Specific target organ toxicity (single exposure)<br>Target Organs - Respiratory system. | Category 3 |

**Label Elements**

**Signal Word**
Warning

**Hazard Statements**
May cause respiratory irritation



**Precautionary Statements**
**Prevention**
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area

**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
**Storage**
Store in a well-ventilated place. Keep container tightly closed
Store locked up
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Very toxic to aquatic life

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Chromium | 7440-47-3 | >95 |

## 4. First-aid measures

**General Advice** If symptoms persist, call a physician.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

**Ingestion** Do not induce vomiting. Obtain medical attention.

**Most important symptoms/effects** None reasonably foreseeable.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Unsuitable Extinguishing Media** Carbon dioxide (CO2)

**Flash Point** Not applicable
**Method -** No information available

**Autoignition Temperature** Not applicable
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Dust can form an explosive mixture in air. Do not allow run-off from fire fighting to enter drains or water courses.

**Hazardous Combustion Products**
Chromium oxide
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 1 | 1 | N/A |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation.

**Environmental Precautions** Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal.

## 7. Handling and storage

**Handling** Avoid dust formation. Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Chromium | TWA: 0.5 mg/m³ | (Vacated) TWA: 1 mg/m³<br>TWA: 1 mg/m³ | IDLH: 250 mg/m³<br>TWA: 0.5 mg/m³ |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Chromium | TWA: 0.5 mg/m³ | TWA: 0.5 mg/m³ | TWA: 0.5 mg/m³ |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*
*OSHA - Occupational Safety and Health Administration*
*NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health*

**Engineering Measures** Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Powder |
| **Appearance** | Silver |
| **Odor** | Odorless |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | 1857.2 °C / 3375 °F |

| | |
|---|---|
| **Boiling Point/Range** | 2640 °C / 4784 °F |
| **Flash Point** | Not applicable |
| **Evaporation Rate** | Not applicable |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | No information available |
| **Vapor Density** | Not applicable |
| **Relative Density** | 7.2 |
| **Solubility** | Insoluble in water |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | Not applicable |
| **Decomposition Temperature** | No information available |
| **Viscosity** | Not applicable |
| **Molecular Formula** | Cr |
| **Molecular Weight** | 51.996 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Sensitive to air.

**Conditions to Avoid** Incompatible products. Excess heat. Avoid dust formation.

**Incompatible Materials** Strong oxidizing agents, Strong acids

**Hazardous Decomposition Products** Chromium oxide

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Component Information**

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** May cause irritation of respiratory tract

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Chromium | 7440-47-3 | Not listed | Not listed | Not listed | Not listed | Not listed |

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Respiratory system

**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** No information available

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

## 12. Ecological information

**Ecotoxicity**

The product contains following substances which are hazardous for the environment. Very toxic to aquatic organisms.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| Chromium | Not listed | LC50: 14.3 mg/l/96 H (Pimephales promelas) | Not listed | EC50: 0.07 mg/l/48 H |

**Persistence and Degradability** Insoluble in water

**Bioaccumulation/ Accumulation** No information available.

**Mobility** Is not likely mobile in the environment due its low water solubility.

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

**DOT**

- **UN-No** UN3077
- **Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.
- **Proper technical name** Chromium
- **Hazard Class** 9
- **Packing Group** III

**TDG** Not regulated

- **UN-No** UN3077
- **Proper Shipping Name** ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.
- **Hazard Class** 9
- **Packing Group** III

**IATA**

- **UN-No** UN3077
- **Proper Shipping Name** Environmentally hazardous substance, solid, n.o.s
- **Hazard Class** 9
- **Packing Group** III

**IMDG/IMO**

- **UN-No** UN3077
- **Proper Shipping Name** Environmentally hazardous substance, solid, n.o.s
- **Hazard Class** 9
- **Packing Group** III

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chromium | X | X | - | 231-157-5 | - | | X | - | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**

**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

## U.S. Federal Regulations

**TSCA 12(b)** Not applicable

**SARA 313**

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---|---|---|---|
| Chromium | 7440-47-3 | >95 | 1.0 |

**SARA 311/312 Hazardous Categorization**

| | |
|---|---|
| **Acute Health Hazard** | Yes |
| **Chronic Health Hazard** | No |
| **Fire Hazard** | No |
| **Sudden Release of Pressure Hazard** | No |
| **Reactive Hazard** | No |

**Clean Water Act**

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|---|---|---|---|---|
| Chromium | - | - | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Chromium | X | | - |

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**
Not applicable

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Chromium | 5000 lb 10 lb | - |

**California Proposition 65** This product does not contain any Proposition 65 chemicals

**State Right-to-Know**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Chromium | X | X | X | X | X |

**U.S. Department of Transportation**

| | |
|---|---|
| Reportable Quantity (RQ): | N |
| DOT Marine Pollutant | N |
| DOT Severe Marine Pollutant | N |

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

## Other International Regulations

**Mexico - Grade** No information available

**Canada**
**This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR**

**WHMIS Hazard Class** D2B Toxic materials



## 16. Other information

**Prepared By**
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Creation Date** 13-Sep-2013
**Revision Date** 21-Jul-2015
**Print Date** 21-Jul-2015
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**
**The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.**

**End of SDS**

# SAFETY DATA SHEET

Version 5.3
Revision Date 03/04/2015
Print Date 05/13/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Chrysene

Product Number : 35754
Brand : Sigma-Aldrich
Index-No. : 601-048-00-0

CAS-No. : 218-01-9

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H341 Suspected of causing genetic defects.
H350 May cause cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.

| | |
|---|---|
| P391 | Collect spillage. |
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.1 Substances**

| | | |
|---|---|---|
| Formula | : | $C_{18}H_{12}$ |
| Molecular weight | : | 228.29 g/mol |
| CAS-No. | : | 218-01-9 |
| EC-No. | : | 205-923-4 |
| Index-No. | : | 601-048-00-0 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Chrysene** | | |
| | Muta. 2; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H341, H350, H410 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

**4.1 Description of first aid measures**

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

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

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

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**
No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**
Carbon oxides

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

### 6.2 Environmental precautions

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

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| | Remarks | Cancer<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs)<br>Exposure by all routes should be carefully controlled to levels as low as possible.<br>Confirmed animal carcinogen with unknown relevance to humans | | |
| Chrysene | 218-01-9 | TWA | 0.200000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 0.200000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | 1910.1002<br>As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard<br>OSHA specifically regulated carcinogen | | |
| | | TWA | 0.100000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar | | |

| | | |
|---|---|---|
| | | products.<br>cyclohexane-extractable fraction<br>See Appendix C<br>See Appendix A |

**Biological occupational exposure limits**

| Component | CAS-No. | Parameters | Value | Biological specimen | Basis |
|---|---|---|---|---|---|
| Chrysene | 218-01-9 | 1-Hydroxypyrene (1-HP) | | Urine | ACGIH - Biological Exposure Indices (BEI) |
| | Remarks | End of shift at end of workweek | | | |

## 8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: solid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 252 - 254 °C (486 - 489 °F) - lit. |
| f) | Initial boiling point and boiling range | 448 °C (838 °F) - lit. |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | No data available |
| n) | Water solubility | insoluble |
| o) | Partition coefficient: n-octanol/water | log Pow: 5.73 |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information

No data available

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

No data available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - > 320 mg/kg

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

**Carcinogenicity**

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

| | |
|---|---|
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Chrysene) |
| NTP: | No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP. |
| OSHA: | OSHA specifically regulated carcinogen (Chrysene) |

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: GC0700000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 h |

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

No data available

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chrysene)
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chrysene)
Marine pollutant:yes

**IATA**
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chrysene)

**Further information**
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| Chrysene | 218-01-9 | 1994-04-01 |

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|

| | | |
|---|---|---|
| Chrysene | 218-01-9 | 1994-04-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Chrysene | 218-01-9 | 1994-04-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Chrysene | 218-01-9 | 1994-04-01 |

**California Prop. 65 Components**

| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. | Revision Date |
|---|---|---|
| Chrysene | 218-01-9 | 2007-09-28 |

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| Carc. | Carcinogenicity |
| H341 | Suspected of causing genetic defects. |
| H350 | May cause cancer. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.3 Revision Date: 03/04/2015 Print Date: 05/13/2016

# SAFETY DATA SHEET

**Creation Date** 22-Sep-2009 **Revision Date** 10-Feb-2015 **Revision Number** 1

## 1. Identification

**Product Name** **cis-1,2-Dichloroethylene**

**Cat No. :** **AC113380000; AC113380025; AC113380100; AC113380500**

**Synonyms** cis-Acetylene dichloride.

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

## 2. Hazard(s) identification

**Classification**
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Flammable liquids | Category 2 |
| Acute oral toxicity | Category 4 |
| Acute Inhalation Toxicity - Vapors | Category 4 |
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Highly flammable liquid and vapor
Harmful if swallowed
Harmful if inhaled
Causes serious eye irritation
Causes skin irritation
May cause respiratory irritation



**Precautionary Statements**
**Prevention**
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Avoid breathing dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Take precautionary measures against static discharge
Do not eat, drink or smoke when using this product
**Response**
Call a POISON CENTER or doctor/physician if you feel unwell
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
**Skin**
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation occurs: Get medical advice/attention
**Eyes**
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
**Ingestion**
Rinse mouth
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
**Fire**
Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
**Storage**
Store in a well-ventilated place. Keep cool
Store in a closed container
Store locked up
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
None identified

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| cis-1,2-Dichloroethylene | 156-59-2 | 97 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

**Ingestion** Do not induce vomiting. Obtain medical attention.

**Most important symptoms/effects** Breathing difficulties. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Water spray. Carbon dioxide ($CO_2$). Dry chemical. Use water spray to cool unopened containers. chemical foam.

**Unsuitable Extinguishing Media** No information available

**Flash Point** 6 °C / 42.8 °F
**Method -** No information available

**Autoignition Temperature** 440 °C / 824 °F

**Explosion Limits**
**Upper** 12.80%
**Lower** 9.70%
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Flammable. Vapors may travel to source of ignition and flash back.

**Hazardous Combustion Products**
Hydrogen chloride gas Carbon monoxide (CO) Carbon dioxide ($CO_2$)
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 3 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes and clothing.

**Environmental Precautions** See Section 12 for additional ecological information.

**Methods for Containment and Clean Up** Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

## 7. Handling and storage

**Handling** Ensure adequate ventilation. Wear personal protective equipment. Use explosion-proof equipment. Use only non-sparking tools. Avoid contact with skin, eyes and clothing. Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges.

**Storage** Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition. Flammables area.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| cis-1,2-Dichloroethylene | TWA: 200 ppm | | |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| cis-1,2-Dichloroethylene | | | TWA: 200 ppm |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*

**Engineering Measures** Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Liquid |
| **Appearance** | Colorless |
| **Odor** | aromatic |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | -80 °C / -112 °F |
| **Boiling Point/Range** | 60 °C / 140 °F @ 760 mmHg |
| **Flash Point** | 6 °C / 42.8 °F |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | 12.80% |
| **Lower** | 9.70% |
| **Vapor Pressure** | 201 mmHg @ 25 °C |
| **Vapor Density** | 3.34 (Air = 1.0) |
| **Relative Density** | 1.280 |
| **Solubility** | No information available |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | 440 °C / 824 °F |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | C2 H2 Cl2 |
| **Molecular Weight** | 96.94 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Keep away from open flames, hot surfaces and sources of ignition. Exposure to air. Exposure to light. Incompatible products. Exposure to moist air or water.

**Incompatible Materials** Bases

**Hazardous Decomposition Products** Hydrogen chloride gas, Carbon monoxide (CO), Carbon dioxide ($CO_2$)

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information** No acute toxicity information is available for this product

**Component Information**

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** Irritating to eyes, respiratory system and skin

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| cis-1,2-Dichloroethylene | 156-59-2 | Not listed | Not listed | Not listed | Not listed | Not listed |

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Respiratory system

**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

## 12. Ecological information

**Ecotoxicity**

Do not empty into drains. Do not flush into surface water or sanitary sewer system.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| cis-1,2-Dichloroethylene | Not listed | Not listed | EC50 = 721 mg/L 5 min<br>EC50 = 905 mg/L 30 min | Not listed |

**Persistence and Degradability** No information available

**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

**DOT**

| | |
|---|---|
| **UN-No** | UN1150 |
| **Proper Shipping Name** | 1,2-DICHLOROETHYLENE |
| **Hazard Class** | 3 |
| **Packing Group** | II |

**TDG**

| | |
|---|---|
| **UN-No** | UN1150 |
| **Proper Shipping Name** | 1,2-DICHLOROETHYLENE |
| **Hazard Class** | 3 |
| **Packing Group** | II |

**IATA**

| | |
|---|---|
| **UN-No** | 1150 |
| **Proper Shipping Name** | 1,2-DICHLOROETHYLENE |
| **Hazard Class** | 3 |
| **Packing Group** | II |

**IMDG/IMO**

| | |
|---|---|
| **UN-No** | 1150 |
| **Proper Shipping Name** | 1,2-DICHLOROETHYLENE |
| **Hazard Class** | 3 |
| **Packing Group** | II |

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| cis-1,2-Dichloroethylene | X | - | X | 205-859-7 | - | | - | X | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313** Not applicable

**SARA 311/312 Hazardous Categorization**

| | |
|---|---|
| **Acute Health Hazard** | Yes |
| **Chronic Health Hazard** | No |
| **Fire Hazard** | Yes |

**Sudden Release of Pressure Hazard** No
**Reactive Hazard** No

**Clean Water Act** Not applicable

**Clean Air Act** Not applicable

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| cis-1,2-Dichloroethylene | 1000 lb | - |

**California Proposition 65** This product does not contain any Proposition 65 chemicals

**State Right-to-Know**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| cis-1,2-Dichloroethylene | X | - | X | - | - |

**U.S. Department of Transportation**

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**
**This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR**

**WHMIS Hazard Class** B2 Flammable liquid
D1B Toxic materials
D2B Toxic materials



## 16. Other information

**Prepared By** Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Creation Date** 22-Sep-2009
**Revision Date** 10-Feb-2015
**Print Date** 10-Feb-2015
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally

Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**

**The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.**

## End of SDS

# SAFETY DATA SHEET

**COPPER**

## Section 1. Identification

| | | |
|---|---|---|
| **GHS product identifier** | : | COPPER |
| **Chemical name** | : | Mixture |
| **CAS number** | : | Mixture |
| **Other means of identification** | : | CC01053472 |
| **Product type** | : | liquid |

**Relevant identified uses of the substance or mixture and uses advised against**

| | | |
|---|---|---|
| **Product use** | : | Industrial applications. Plastics. |

| | | |
|---|---|---|
| **Supplier's details** | : | **POLYONE CORPORATION**<br>ColorMatrix Group Inc.<br>680 North Rocky River Drive, Berea, Ohio, 44017-1628, USA<br><br>+1 216 622 0100 |
| **Emergency telephone number (with hours of operation)** | : | **CHEMTREC 1-800-424-9300 (24hrs for spill, leak, fire, exposure or accident).** |

## Section 2. Hazards identification

This mixture has not been evaluated as a whole for health effects. Information provided on health effects of this product is based on the individual components. However, some vapors or contaminants may be released upon heating and the end-user (fabricator) must take the necessary precautions (mechanical ventilation, respiratory protection, etc.) to protect employees from exposure. See sections 8 and 11 for special precautions. After handling, always wash hands thoroughly with soap and water.

| | | |
|---|---|---|
| **OSHA/HCS status** | : | This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). |
| **Classification of the substance or mixture** | : | SKIN CORROSION/IRRITATION - Category 2 |

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Warning
**Hazard statements** : Causes skin irritation.

**Precautionary statements**

**General** : Not applicable.
**Prevention** : Wear protective gloves. Wash hands thoroughly after handling.
**Response** : IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention.
**Storage** : Not applicable.
**Disposal** : Not applicable.
**Supplemental label elements** : None known.
**Hazards not otherwise classified** : None known.

## Section 3. Composition/information on ingredients

**Substance/mixture** : Mixture
**Chemical name** : Mixture
**Other means of identification** : CC01053472

**CAS number/other identifiers**

| Ingredient name | % | CAS number |
|---|---|---|
| Miscellaneous Compounds Distillates, petroleum, hydrotreated middle | 10 - 30 | Not available. |
| Titanium dioxide | 5 - 10 | 13463-67-7 |

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

**Occupational exposure limits, if available, are listed in Section 8.**

# Section 4. First aid measures

**Description of necessary first aid measures**

| | | |
|---|---|---|
| **Eye contact** | : | Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention. |
| **Inhalation** | : | Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. |
| **Skin contact** | : | Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse. |
| **Ingestion** | : | Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. |

**Most important symptoms/effects, acute and delayed**

**Potential acute health effects**

| | | |
|---|---|---|
| **Eye contact** | : | Causes serious eye irritation. |
| **Inhalation** | : | No known significant effects or critical hazards. |
| **Skin contact** | : | Causes skin irritation. |
| **Ingestion** | : | Irritating to mouth, throat and stomach. |

**Over-exposure signs/symptoms**

| | | |
|---|---|---|
| **Eye contact** | : | Adverse symptoms may include the following:<br>pain or irritation |

watering
redness

| | | |
|---|---|---|
| **Inhalation** | : | No specific data. |
| **Skin contact** | : | Adverse symptoms may include the following:<br>irritation<br>redness |
| **Ingestion** | : | No specific data. |

**Indication of immediate medical attention and special treatment needed, if necessary**

| | | |
|---|---|---|
| **Notes to physician** | : | Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. |
| **Specific treatments** | : | No specific treatment. |
| **Protection of first-aiders** | : | No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. |

**See toxicological information (Section 11)**

# Section 5. Fire-fighting measures

**Extinguishing media**

| | | |
|---|---|---|
| **Suitable extinguishing media** | : | In case of fire, use water spray (fog), foam, dry chemical or $CO_2$. |
| **Unsuitable extinguishing media** | : | None known. |
| **Specific hazards arising from the chemical** | : | In a fire or if heated, a pressure increase will occur and the container may burst. |
| **Hazardous thermal decomposition products** | : | Decomposition products may include the following materials:<br>carbon dioxide<br>carbon monoxide<br>metal oxide/oxides |
| **Special protective actions for fire-fighters** | : | Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. |
| **Special protective equipment for fire-fighters** | : | Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. |

# Section 6. Accidental release measures

**Personal precautions, protective equipment and emergency procedures**

| | | |
|---|---|---|
| **For non-emergency personnel** | : | No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. |
| **For emergency responders** | : | If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel". |
| **Environmental precautions** | : | Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). |

**Methods and materials for containment and cleaning up**

| | | |
|---|---|---|
| **Small spill** | : | Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor. |
| **Large spill** | : | Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. |

# Section 7. Handling and storage

**Precautions for safe handling**

| | | |
|---|---|---|
| **Protective measures** | : | Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container. |

| | | |
|---|---|---|
| **Advice on general occupational hygiene** | : | Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures. |
| **Conditions for safe storage, including any incompatibilities** | : | Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. |

# Section 8. Exposure controls/personal protection

**Control parameters**

**Occupational exposure limits**

| Ingredient name | Exposure limits |
|---|---|
| Titanium dioxide | **OSHA PEL 1989 (1989-03-01)**<br>PEL: Permissible Exposure Level 10 mg/m3 Form: Total dust<br>**OSHA PEL (1993-06-30)**<br>PEL: Permissible Exposure Level 15 mg/m3 Form: Total dust<br>**ACGIH TLV (1996-05-18)**<br>TLV-TWA: Threshold Limit Value - Time weighted average PEL: Permissible Exposure Level 10 mg/m3 |

| | | |
|---|---|---|
| **Appropriate engineering controls** | : | Good general ventilation should be sufficient to control worker exposure to airborne contaminants. |
| **Environmental exposure controls** | : | Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels. |

**Individual protection measures**

| | | |
|---|---|---|
| **Hygiene measures** | : | Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated |

clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

**Skin protection**

**Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

**Appearance**

| | | |
|---|---|---|
| **Physical state** | : | liquid [liquid] |
| **Color** | : | BROWN |
| **Odor** | : | Faint odor. |
| **Odor threshold** | : | Not available. |
| **pH** | : | Not available. |
| **Melting point** | : | Not available. |
| **Boiling point** | : | Not available. |
| **Flash point** | : | Not available. |
| **Burning time** | : | Not available. |

| | | |
|---|---|---|
| **Burning rate** | : | Not available. |
| **Evaporation rate** | : | Not available. |
| **Flammability (solid, gas)** | : | Not available. |
| **Lower and upper explosive (flammable) limits** | : | **Lower:** Not available.<br>**Upper:** Not available. |
| **Vapor pressure** | : | Not available. |
| **Vapor density** | : | Not available. |
| **Relative density** | : | Not available. |
| **Solubility** | : | Not available. |
| **Solubility in water** | : | insoluble in water. |
| **Partition coefficient: n-octanol/water** | : | Not available. |
| **Auto-ignition temperature** | : | Not available. |
| **Decomposition temperature** | : | Not available. |
| **SADT** | : | Not available. |
| **Viscosity** | : | **Dynamic:** Not available.<br>**Kinematic:** Not available. |

## Section 10. Stability and reactivity

| | | |
|---|---|---|
| **Reactivity** | : | No specific test data related to reactivity available for this product or its ingredients. |
| **Chemical stability** | : | Stable under recommended storage and handling conditions (see Section 7). |
| **Possibility of hazardous reactions** | : | Under normal conditions of storage and use, hazardous reactions will not occur. |
| **Conditions to avoid** | : | Keep away from extreme heat and oxidizing agents. |
| **Incompatible materials** | : | Keep away from strong acids.<br>Oxidizer. |
| **Hazardous decomposition products** | : | Under normal conditions of storage and use, hazardous decomposition products should not be produced. |

## Section 11. Toxicological information

This mixture has not been evaluated as a whole for health effects. Exposure effects listed are based on existing health data for the individual components which comprise the mixture.

**Information on toxicological effects**

**Acute toxicity**

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| Titanium dioxide | | | | |

| | | | | |
|---|---|---|---|---|
| | LC50 Inhalation | Rat - Male | 6.82 Mg/l | 4 h |
| | LD50 Dermal | Rabbit | > 5,000 mg/kg | - |

**Conclusion/Summary** : Mixture.Not fully tested.

**Irritation/Corrosion**

**Conclusion/Summary**
**Skin** : Mixture.Not fully tested.
**Eyes** : Mixture.Not fully tested.
**Respiratory** : Mixture.Not fully tested.

**Sensitization**

**Conclusion/Summary**
**Skin** : Mixture.Not fully tested.
**Respiratory** : Mixture.Not fully tested.

**Mutagenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Carcinogenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Classification**

| Product/ingredient name | OSHA | IARC | NTP |
|---|---|---|---|
| Titanium dioxide | | 2B | |

**Reproductive toxicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Teratogenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Specific target organ toxicity (single exposure)**
Not available.

**Specific target organ toxicity (repeated exposure)**
Not available.

**Aspiration hazard**

| Product/ingredient name | Result |
|---|---|

| | |
|---|---|
| Miscellaneous Compounds Distillates, petroleum, hydrotreated middle | ASPIRATION HAZARD - Category 1 |

**Information on the likely routes of exposure** : Not available.

**Potential acute health effects**

**Eye contact** : Causes serious eye irritation.
**Inhalation** : No known significant effects or critical hazards.
**Skin contact** : Causes skin irritation.
**Ingestion** : Irritating to mouth, throat and stomach.

**Symptoms related to the physical, chemical and toxicological characteristics**

**Eye contact** : Adverse symptoms may include the following:
pain or irritation
watering
redness
**Inhalation** : No specific data.
**Skin contact** : Adverse symptoms may include the following:
irritation
redness
**Ingestion** : No specific data.

**Delayed and immediate effects and also chronic effects from short and long term exposure**

**Short term exposure**

**Potential immediate effects** : Not available.
**Potential delayed effects** : Not available.

**Long term exposure**

**Potential immediate effects** : Not available.
**Potential delayed effects** : Not available.

**Potential chronic health effects**

**Conclusion/Summary** : Mixture.Not fully tested.

**General** : No known significant effects or critical hazards.
**Carcinogenicity** : No known significant effects or critical hazards.
**Mutagenicity** : No known significant effects or critical hazards.
**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.
**Fertility effects** : No known significant effects or critical hazards.

**Numerical measures of toxicity**

**Acute toxicity estimates**

| Route | ATE value |
|---|---|
| Inhalation (dusts and mists) | 7.81 mg/l |

# Section 12. Ecological information

**Toxicity**

| Product/ingredient name | Result | Species | Exposure |
|---|---|---|---|
| Titanium dioxide | | | |
| | Acute LC50 > 1,000,000 µg/l Marine water | Fish - Mummichog | 96 h |
| | Acute LC50 > 1,000 mg/l Fresh water | Fish - Fathead minnow | 96 h |
| | Acute LC50 13 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute LC50 6.5 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 19.3 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 27.8 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 35.306 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |

**Conclusion/Summary** : Not available.

**Persistence and degradability**

**Conclusion/Summary** : Not available.

**Bioaccumulative potential**

| Product/ingredient name | LogPow | BCF | Potential |
|---|---|---|---|
| Titanium dioxide | | 352.00 | low |

**Mobility in soil**

| | | |
|---|---|---|
| **Soil/water partition coefficient (KOC)** | : | Not available. |
| **Other adverse effects** | : | No known significant effects or critical hazards. |

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

**United States - RCRA Acute hazardous waste "P" List:** Not listed

**United States - RCRA Toxic hazardous waste "U" List:** Not listed

## Section 14. Transport information

| | | |
|---|---|---|
| U.S. DOT Classification | : | Not regulated for transportation. |
| ICAO/IATA | : | Not classified as dangerous good under transport regulations. |
| IMO/IMDG (maritime) | : | Not classified as dangerous good under transport regulations. |

## Section 15. Regulatory information

**U.S. Federal regulations** : **United States - TSCA 12(b) - Chemical export notification:** None of the components are listed.
**United States - TSCA 4(a) - Final Test Rules:** Not listed
**United States - TSCA 4(a) - ITC Priority list:** Not listed
**United States - TSCA 4(a) - Proposed test rules:** Not listed

**United States - TSCA 4(f) - Priority risk review:** Not listed
**United States - TSCA 5(a)2 - Final significant new use rules:** Not listed
**United States - TSCA 5(a)2 - Proposed significant new use rules:** Not listed
**United States - TSCA 5(e) - Substances consent order:** Not listed
**United States - TSCA 6 - Final risk management:** Not listed
**United States - TSCA 6 - Proposed risk management:** Not listed
**United States - TSCA 8(a) - Chemical risk rules:** Not listed
**United States - TSCA 8(a) - Dioxin/Furane precusor:** Not listed
**United States - TSCA 8(a) - Chemical Data Reporting (CDR):** Not determined
**United States - TSCA 8(a) - Preliminary assessment report (PAIR):** Not listed
**United States - TSCA 8(c) - Significant adverse reaction (SAR):** Not listed
**United States - TSCA 8(d) - Health and safety studies:** Not listed
**United States - EPA Clean water act (CWA) section 307 - Priority pollutants:** Not listed
**United States - EPA Clean water act (CWA) section 311 - Hazardous substances:** Not listed
**United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Flammable substances:** Not listed
**United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Toxic substances:** Not listed
**United States - Department of commerce - Precursor chemical:** Not listed

| | | |
|---|---|---|
| **Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)** | : | Not listed |
| **Clean Air Act Section 602 Class I Substances** | : | Not listed |
| **Clean Air Act Section 602 Class II Substances** | : | Not listed |
| **DEA List I Chemicals (Precursor Chemicals)** | : | Not listed |
| **DEA List II Chemicals (Essential Chemicals)** | : | Not listed |

**US. EPA CERCLA Hazardous Substances (40 CFR 302)**

not applicable

**SARA 311/312**

| | | |
|---|---|---|
| **Classification** | : | Immediate (acute) health hazard |

**Composition/information on ingredients**

| Name | % | Classification |
|---|---|---|
| **Miscellaneous Compounds Distillates, petroleum, hydrotreated middle** | 10 - 30 | AH |
| **Titanium dioxide** | 5 - 10 | CH |

**SARA 313**
Not applicable.

**State regulations**

**Massachusetts** : The following components are listed:
Mica
Iron oxide
Titanium dioxide

**New York** : None of the components are listed.

**New Jersey** : The following components are listed:
Mica
Iron oxide
Titanium dioxide

**Pennsylvania** : The following components are listed:
Iron oxide
Titanium dioxide

**California Prop. 65**
WARNING: This product contains a chemical known to the State of California to cause cancer.

**United States inventory (TSCA 8b)** : All components are listed or exempted.

**Canada inventory** : All components are listed or exempted.

**International regulations**

**International lists** : **Australia inventory (AICS):** All components are listed or exempted.
**Taiwan inventory (CSNN):** Not determined.
**Malaysia Inventory (EHS Register):** Not determined.
**EINECS:** All components are listed or exempted.
**Japan inventory:** Not determined.
**China inventory (IECSC):** All components are listed or exempted.
**Korea inventory:** All components are listed or exempted.
**New Zealand Inventory of Chemicals (NZIoC):** Not determined.

**Philippines inventory (PICCS):** All components are listed or exempted.

| | | |
|---|---|---|
| **Chemical Weapons Convention List Schedule I Chemicals** | : | Not listed |
| **Chemical Weapons Convention List Schedule II Chemicals** | : | Not listed |
| **Chemical Weapons Convention List Schedule III Chemicals** | : | Not listed |

## Section 16. Other information

**History**

| | | |
|---|---|---|
| **Date of printing** | : | 05/21/2015 |
| **Date of issue/Date of revision** | : | 05/18/2015 |
| **Date of previous issue** | : | 10/30/2014 |
| **Version** | : | 1.1 |
| **Key to abbreviations** | : | ATE = Acute Toxicity Estimate<br>BCF = Bioconcentration Factor<br>GHS = Globally Harmonized System of Classification and Labelling of Chemicals<br>IATA = International Air Transport Association<br>IBC = Intermediate Bulk Container<br>IMDG = International Maritime Dangerous Goods<br>LogPow = logarithm of the octanol/water partition coefficient<br>MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)<br>UN = United Nations |
| **References** | : | Not available. |

**Notice to reader**

**To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. Particularly this information may not be valid for such material used in conjunction with any other materials or in any process, unless specified in the text.**

# Safety Data Sheet

**Revision Date: 01/06/17**
www.restek.com

## 1. IDENTIFICATION

| | |
|---|---|
| **Catalog Number / Product Name:** | **31276 / Dibenzo(a,h)anthracene Standard** |
| **Company:** | Restek Corporation |
| **Address:** | 110 Benner Circle<br>Bellefonte, Pa. 16823 |
| **Phone#:** | 814-353-1300 |
| **Fax#:** | 814-353-1309 |
| **Emergency#:** | 800-424-9300 (CHEMTREC)<br>703-527-3887 (Outside the US) |
| **Email:** | www.restek.com |
| **Revision Number:** | 7 |
| **Intended use:** | For Laboratory use only |

## 2. HAZARD(S)IDENTIFICATION

**Emergency Overview:**

**GHS Hazard Symbols:**



| | |
|---|---|
| **GHS Classification:** | Carcinogenicity Category 2 |
| **GHS Signal Word:** | Warning |
| **GHS Hazard:** | Suspected of causing cancer. |
| **GHS Precautions:** | |
| **Safety Precautions:** | Obtain special instructions before use.<br>Do not handle until all safety precautions have been read and understood.<br>Wear protective gloves/protective clothing/eye protection/face protection. |
| **First Aid Measures:** | IF exposed or concerned: Get medical advice/attention. |
| **Storage:** | Store locked up. |
| **Disposal:** | Dispose of contents/container according to section 13 of the SDS. |
| **Single Exposure Target Organs:** | No data available. |
| **Repeated Exposure Target Organs:** | No data available. |

## 3. COMPOSITION / INFORMATION ON INGREDIENT

| Chemical Name | CAS # | EINEC # | % Composition |
|---|---|---|---|
| Dichloromethane | 75-09-2 | 200-838-9 | 99.900000 |
| dibenz (a,h) anthracene | 53-70-3 | 200-181-8 | 0.100000 |

## 4. FIRST-AID MEASURES

| | |
|---|---|
| **Inhalation:** | Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately |
| **Eyes:** | Immediately flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention and monitor the eye daily as advised by your physician. Serious harm (damage) may result if treatment is delayed. Continue to flush eyes while awaiting medical attention |
| **Skin Contact:** | Wash with soap and water. Remove contaminated clothing, launder immediately, and discard contaminated leather goods. Get medical attention immediately. |
| **Ingestion:** | Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS. Never give anything by mouth to an unconscious person |

## 5. FIRE- FIGHTING MEASURES

| | |
|---|---|
| **Extinguishing Media:** | Use alcohol resistant foam, carbon dioxide, or dry chemical when fighting fires. Water or foam may cause frothing if liquid is burning but it still may be a useful extinguishing agent if carefully applied to the surface of the fire. Do Not direct a stream of water into the hot burning liquid. Use methods suitable to fight surrounding fire. |
| **Fire and/or Explosion Hazards:** | No data. |
| **Fire Fighting Methods and Protection:** | Use methods for the surrounding fire. |
| **Hazardous Combustion Products:** | Carbon dioxide, Carbon monoxide |

## 6. ACCIDENTAL RELEASE MEASURES

| | |
|---|---|
| **Personal Precautions and Equipment:** | Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits. |
| **Methods for Clean-up:** | Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation. |

## 7. HANDLING AND STORAGE

| | |
|---|---|
| **Handling Technical Measures and Precautions:** | Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. |
| **Storage Technical Measures and Conditions:** | Store in a cool dry place. Isolate from incompatible materials. |

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**United States:**

| Chemical Name | CAS No. | IDLH | ACGIH STEL | ACGIH TLV-TWA | OSHA Exposure Limit |
|---|---|---|---|---|---|
| Dichloromethane | 75-09-2 | 2300 ppm IDLH | No data available. | 50 ppm TWA | 25 ppm TWA; 125 ppm STEL (15 min. TWA) |
| dibenz (a,h) anthracene | 53-70-3 | No data available. | No data available. | No data available. | No data available. |

**Personal Protection:**

| | |
|---|---|
| **Engineering Measures:** | Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure. |
| **Respiratory Protection:** | Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms. |
| **Eye Protection:** | Wear chemically resistant safety glasses with side shields when handling this product. Wear additional eye protection such as chemical splash goggles and/or face shield when the possibility exists for eye contact with splashing or spraying |

| | |
|---|---|
| | liquid, or airborne material. Do not wear contact lenses. Have an eye wash station available. |
| **Skin Protection:** | Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work. |
| **Medical Conditions Aggravated By Exposure:** | Eye disease Skin disease including eczema and sensitization Respiratory disease including asthma and bronchitis |

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **Appearance, color:** | Colorless |
| **Odor:** | Strong |
| **Physical State:** | No data available. |
| **pH:** | No data available. |
| **Vapor Pressure:** | No data available. |
| **Vapor Density:** | 2.93 (air = 1) |
| **Boiling Point:** | No data available. |
| **Melting Point:** | -96.7 °C |
| **Flash Point:** | No data available. |
| **Upper Flammable/Explosive Limit, % in air:** | No data available. |
| **Lower Flammable/Explosive Limit, % in air:** | No data available. |
| **Autoignition Temperature:** | 556 deg C |
| **Decomposition Temperature:** | No data available. |
| **Specific Gravity:** | 1.3254 - 1.3258 g/cm3 at 20 °C |
| **Evaporation Rate:** | No data available. |
| **Odor Threshold:** | ND |
| **Solubility:** | Moderate; 50-99% |
| **Partition Coefficient: n-octanol in water:** | No data available. |
| **VOC % by weight:** | 0 |
| **Molecular Weight:** | No data available. |

## 10. STABILITY AND REACTIVITY

| | |
|---|---|
| **Stability:** | Stable under normal conditions. |
| **Conditions to Avoid:** | No data available.Contamination High temperatures |
| **Materials to Avoid / Chemical Incompatiability:** | Strong oxidizing agents Caustics (bases) |
| **Hazardous Decomposition Products:** | Carbon dioxide Carbon monoxide |

## 11. TOXICOLOGICAL INFORMATION

| | |
|---|---|
| **Routes of Entry:** | Inhalation Absorption Ingestion Skin contact Eye contact |
| **Target Organs Potentially Affected By Exposure:** | Skin, Cardiovascular System, Eyes, Liver |
| **Chemical Interactions That Change Toxicity:** | None Known |

**Immediate (Acute) Health Effects by Route of Exposure:**

| | |
|---|---|
| **Inhalation Irritation:** | Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache. |
| **Inhalation Toxicity:** | Harmful! Can cause systemic damage (see "Target Organs)Inhalation may cause severe central nervous system depression (including unconsciousness). |
| **Skin Contact:** | Contact causes severe skin irritation and possible burns. |
| **Skin Absorption:** | Harmful if absorbed through the skin. May cause severe irritation and systemic damage. |
| **Eye Contact:** | Contact with the eyes may cause moderate to severe eye injury. Eye contact may result in tearing and reddening, but not likely to permanently injure eye tissue. Temporary vision impairment (cloudy or blurred vision) is possible. |
| **Ingestion Irritation:** | Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea. |
| **Ingestion Toxicity:** | Harmful if swallowed. May cause systemic poisoning. |

**Long-Term (Chronic) Health Effects:**

| | |
|---|---|
| **Carcinogenicity:** | Contains a probable or known human carcinogen. |
| **Reproductive and Developmental Toxicity:** | No data available to indicate product or any components present at greater than 0.1% may cause birth defects. |
| **Inhalation:** | Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic |

damage upon prolonged and/or repeated exposure (see "Target Organs)

**Skin Absorption:** Upon prolonged or repeated exposure, harmful if absorbed through the skin. May cause severe irritation and systemic damage

**Component Toxicological Data:**
**NIOSH:**

| Chemical Name | CAS No. | LD50/LC50 |
|---|---|---|
| Methane, dichloro- | 75-09-2 | Inhalation LC50 Rat 53 mg/L 6 h |

**Component Carcinogenic Data:**
**OSHA:**

| Chemical Name | CAS No. | |
|---|---|---|
| Methylene chloride | 75-09-2 | 25 ppm TWA (8 hr.); 125 ppm STEL (15 min.); 12.5 ppm Action Level (see 29 CFR 1910.1051); effective date for respiratory protection for certain employers to acheive the 8-hour TWA PEL is August 31, 1998; the start up date to install engineering controls is December 10, 1998.; {OSHA - 29 CFR 1910 Specifically Regulate |
| Dibenz[a,h]anthracene | 53-70-3 | Present |

**ACGIH:**

| Chemical Name | CAS No. | |
|---|---|---|
| Dichloromethane | 75-09-2 | A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans |

**NIOSH:**

| Chemical Name | CAS No. | |
|---|---|---|
| Methylene chloride | 75-09-2 | potential occupational carcinogen |

**NTP:**

| Chemical Name | CAS No. |
|---|---|
| No data available. | |

**IARC:**

| Chemical Name | CAS No. | Group No. |
|---|---|---|
| No data. | | Group 1 |
| Dichloromethane | 75-09-2 | Group 2A |
| Dibenz[a,h]anthracene | 53-70-3 | Group 2A |
| No data. | | Group 2B |

## 12. ECOLOGICAL INFORMATION

**Overview:** Moderate ecological hazard. This product may be dangerous to plants and/or wildlife. Keep out of waterways.
**Mobility:** No data
**Persistence:** No data
**Bioaccumulation:** No data
**Degradability:** No data
**Ecological Toxicity Data:** No data available.

## 13. DISPOSAL CONSIDERATIONS

**Waste Description of Spent Product:** Spent or discarded material is a hazardous waste.
**Disposal Methods:** Incinerate spent or discarded material a permitted hazardous waste facility.
**Waste Disposal of Packaging:** Comply with all Local, State, Federal, and Provincial Environmental Regulations.

## 14. TRANSPORTATION INFORMATION

**United States:**
**DOT Proper Shipping Name:** Dichloromethane
**UN Number:** UN1593
**Hazard Class:** 6.1
**Packing Group:** III

**International:**

| | |
|---|---|
| **IATA Proper Shipping Name:** | Dichloromethane |
| **UN Number:** | UN1593 |
| **Hazard Class:** | 6.1 |
| **Packing Group:** | III |

**Marine Pollutant:** No

| Chemical Name | CAS# | Marine Pollutant | Severe Marine Pollutant |
|---|---|---|---|
| No data available. | | | |

## 15. REGULATORY INFORMATION

**United States:**

| Chemical Name | CAS# | CERCLA | SARA 313 | SARA EHS 313 | TSCA |
|---|---|---|---|---|---|
| Dichloromethane | 75-09-2 | X | X | - | X |
| dibenz (a,h) anthracene | 53-70-3 | X | X | - | X |

**The following chemicals are listed on CA Prop 65:**

| Chemical Name | CAS # | Regulation |
|---|---|---|
| Dichloromethane<br>Dichloromethane (Methylene chloride) | 75-09-2 | Prop 65 Cancer |
| Dibenz[a,h]anthracene | 53-70-3 | Prop 65 Cancer |

**State Right To Know Listing:**

| Chemical Name | CAS# | New Jersey | Massachusetts | Pennsylvania | California |
|---|---|---|---|---|---|
| Dichloromethane | 75-09-2 | X | X | X | X |
| dibenz (a,h) anthracene | 53-70-3 | X | X | X | X |

## 16. OTHER INFORMATION

**Prior Version Date:** 05/15/14

**Other Information:** Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

**References:** No data available.

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# SAFETY DATA SHEET

Version 5.5
Revision Date 05/27/2016
Print Date 07/04/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Dieldrin

Product Number : 33491
Brand : Sigma-Aldrich
Index-No. : 602-049-00-9

CAS-No. : 60-57-1

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Acute toxicity, Oral (Category 2), H300
Acute toxicity, Dermal (Category 1), H310
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H300 + H310 Fatal if swallowed or in contact with skin
H351 Suspected of causing cancer.
H372 Causes damage to organs through prolonged or repeated exposure if swallowed.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.

| | |
|---|---|
| P202 | Do not handle until all safety precautions have been read and understood. |
| P260 | Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. |
| P262 | Do not get in eyes, on skin, or on clothing. |
| P264 | Wash skin thoroughly after handling. |
| P270 | Do not eat, drink or smoke when using this product. |
| P273 | Avoid release to the environment. |
| P280 | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P301 + P310 + P330 | IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth. |
| P302 + P350 + P310 | IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |
| P362 | Take off contaminated clothing and wash before reuse. |
| P391 | Collect spillage. |
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Synonyms : 1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,7,8,8a-octahydro-6,7-epoxy-1,4:5,8-dimethanonaphthalene

Formula : $C_{12}H_8Cl_6O$

Molecular weight : 380.91 g/mol

CAS-No. : 60-57-1

EC-No. : 200-484-5

Index-No. : 602-049-00-9

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Dieldrin** | | |
| | Acute Tox. 2; Acute Tox. 1; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H300 + H310, H351, H372, H410 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

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

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

**In case of skin contact**
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed
No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### 5.2 Special hazards arising from the substance or mixture
No data available

### 5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information
No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

### 6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections
For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

### 7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Dieldrin | 60-57-1 | TWA | 0.100000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Central Nervous System impairment<br>Liver damage<br>Reproductive effects<br>Confirmed animal carcinogen with unknown relevance to humans | | |

| | | | | |
|---|---|---|---|---|
| | | Danger of cutaneous absorption | | |
| | | TWA | 0.250000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A<br>Potential for dermal absorption | | |
| | | TWA | 0.250000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Skin designation | | |
| | | TWA | 0.1 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>Liver damage<br>Reproductive effects<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption | | |
| | | TWA | 0.25 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A<br>Potential for dermal absorption | | |
| | | TWA | 0.25 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Skin designation | | |
| | | TWA | 0.25 mg/m3 | USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000 |
| | | Skin notation | | |
| | | PEL | 0.25 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
| | | Skin | | |

## 8.2 Exposure controls

**Appropriate engineering controls**
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

**Personal protective equipment**

**Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: solid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 143 - 144 °C (289 - 291 °F) - lit. |
| f) | Initial boiling point and boiling range | No data available |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | No data available |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
LD50 Oral - Rat - 38.3 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

| | |
|---|---|
| IARC: | No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. |
| NTP: | No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP. |
| OSHA: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. |

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
Ingestion - Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard**
No data available

**Additional Information**
RTECS: IO1750000

Discomfort, Headache, Nausea, Vomiting, Dizziness, Tremors, tonic convulsions, clonic spasms, Coma., respiratory failure, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Blood - Irregularities - Based on Human Evidence
Blood - Irregularities - Based on Human Evidence

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | mortality LC50 - Carassius auratus (goldfish) - 1.6 µg/l - 96.0 h |
| Toxicity to daphnia and other aquatic invertebrates | Immobilization EC50 - Daphnia magna (Water flea) - 79.5 µg/l - 48 h |

### 12.2 Persistence and degradability
No data available

### 12.3 Bioaccumulative potential
No data available

### 12.4 Mobility in soil
No data available

### 12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solids, organic, n.o.s. (Dieldrin)
Reportable Quantity (RQ): 1 lbs
Marine pollutant:yes
Poison Inhalation Hazard: No

**IMDG**
UN number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Dieldrin)

Marine pollutant:yes

**IATA**

UN number: 2811 Class: 6.1 Packing group: I

Proper shipping name: Toxic solid, organic, n.o.s. (Dieldrin)

IATA Passenger: Not permitted for transport

## 15. REGULATORY INFORMATION

**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Dieldrin | 60-57-1 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Dieldrin | 60-57-1 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Dieldrin | 60-57-1 | 1993-04-24 |

**California Prop. 65 Components**

| | | |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer. Dieldrin | CAS-No. 60-57-1 | Revision Date 2007-09-28 |

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Acute Tox. | Acute toxicity |
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| Carc. | Carcinogenicity |
| H300 | Fatal if swallowed. |
| H300 + H310 | Fatal if swallowed or in contact with skin |
| H310 | Fatal in contact with skin. |
| H351 | Suspected of causing cancer. |
| H372 | Causes damage to organs through prolonged or repeated exposure if swallowed. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 4 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 4 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5 Revision Date: 05/27/2016 Print Date: 07/04/2016

# SAFETY DATA SHEET

Version 5.7
Revision Date 06/03/2016
Print Date 07/04/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Diesel Fuel No. 2

Product Number : UST147
Brand : Sigma-Aldrich

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, Central nervous system, H335, H336
Specific target organ toxicity - repeated exposure, Oral (Category 2), Liver, Blood, H373
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Central nervous system, H373

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Warning

Hazard statement(s)

| | |
|---|---|
| H315 | Causes skin irritation. |
| H319 | Causes serious eye irritation. |
| H335 | May cause respiratory irritation. |
| H336 | May cause drowsiness or dizziness. |
| H351 | Suspected of causing cancer. |
| H373 | May cause damage to organs (Liver, Blood) through prolonged or repeated exposure if swallowed. |
| H373 | May cause damage to organs (Central nervous system) through prolonged or repeated exposure if inhaled. |

Precautionary statement(s)

| | |
|---|---|
| P201 | Obtain special instructions before use. |
| P202 | Do not handle until all safety precautions have been read and understood. |
| P260 | Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. |
| P264 | Wash skin thoroughly after handling. |
| P271 | Use only outdoors or in a well-ventilated area. |
| P280 | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P302 + P352 | IF ON SKIN: Wash with plenty of soap and water. |
| P304 + P340 + P312 | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell. |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |
| P332 + P313 | If skin irritation occurs: Get medical advice/ attention. |
| P337 + P313 | If eye irritation persists: Get medical advice/ attention. |
| P362 | Take off contaminated clothing and wash before reuse. |
| P403 + P233 | Store in a well-ventilated place. Keep container tightly closed. |
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.2 Mixtures

**Hazardous components**

| Component | | Classification | Concentration |
|---|---|---|---|
| **Methylene chloride** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 75-09-2<br>200-838-9<br>602-004-00-3 | Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; STOT RE 2; H315, H319, H335, H336, H351, H373, H373 | >= 90 - <= 100 % |
| **Fuels, diesel, no. 2** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 68476-34-6<br>270-676-1<br>649-227-00-2 | Flam. Liq. 4; Carc. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 2; H227, H304, H336, H351, H411 | >= 0.1 - < 1 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

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

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

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

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

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**
No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**
No data available

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

**6.1 Personal precautions, protective equipment and emergency procedures**
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

**6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

**6.3 Methods and materials for containment and cleaning up**
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

**6.4 Reference to other sections**
For disposal see section 13.

## 7. HANDLING AND STORAGE

**7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

**7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store at Room Temperature.

**7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**8.1 Control parameters**

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| | Remarks | Potential Occupational Carcinogen<br>See Appendix A | | |
| Methylene chloride | 75-09-2 | TWA | 50.000000 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>Carboxyhemoglobinemia<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section) | | |

| | | | | |
|---|---|---|---|---|
| | | Confirmed animal carcinogen with unknown relevance to humans | | |
| | | TWA | 50 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>Carboxyhemoglobinemia<br>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)<br>Confirmed animal carcinogen with unknown relevance to humans | | |
| | | Substance listed; for more information see OSHA document 1910.1052 | | |
| | | Substance listed; for more information see OSHA document 1910.1052 | | |
| | | See Table Z-2 | | |
| | | PEL | 25.000000 ppm | OSHA Specifically Regulated Chemicals/Carcinogens |
| | | 1910.1052<br>This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole<br>OSHA specifically regulated carcinogen | | |
| | | STEL | 125.000000 ppm | OSHA Specifically Regulated Chemicals/Carcinogens |
| | | 1910.1052<br>This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole<br>OSHA specifically regulated carcinogen | | |
| | | PEL | 25 ppm<br>87 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
| | | see section 5202 | | |
| | | STEL | 125 ppm<br>435 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
| | | see section 5202 | | |
| Fuels, diesel, no. 2 | 68476-34-6 | TWA | 100.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Dermatitis<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption<br>varies | | |
| | | TWA | 100.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Dermatitis<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption<br>varies | | |
| | | TWA | 100 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Dermatitis<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption<br>varies | | |

**Biological occupational exposure limits**

| Component | CAS-No. | Parameters | Value | Biological specimen | Basis |
|---|---|---|---|---|---|
| Methylene chloride | 75-09-2 | Dichloromethane | 0.3000 mg/l | Urine | ACGIH - Biological Exposure Indices (BEI) |
| | Remarks | End of shift (As soon as possible after exposure ceases) | | | |

### 8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: liquid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | No data available |
| f) | Initial boiling point and boiling range | No data available |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | No data available |

| | | |
|---|---|---|
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

**9.2 Other safety information**
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
No data available

Inhalation: No data available

No data available

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a

known or anticipated carcinogen by NTP.

OSHA: OSHA specifically regulated carcinogen (Methylene chloride)

**Reproductive toxicity**
No data available
No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

## 12. ECOLOGICAL INFORMATION

**12.1 Toxicity**
No data available

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**
No data available

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 1593 Class: 6.1 Packing group: III
Proper shipping name: Dichloromethane, solution
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 1593 Class: 6.1 Packing group: III EMS-No: F-A, S-A

Proper shipping name: DICHLOROMETHANE, SOLUTION

**IATA**
UN number: 1593 Class: 6.1 Packing group: III
Proper shipping name: Dichloromethane, solution

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**
Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Methylene chloride | 75-09-2 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Methylene chloride | 75-09-2 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Methylene chloride | 75-09-2 | 2007-07-01 |

**California Prop. 65 Components**

| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. | Revision Date |
|---|---|---|
| Methylene chloride | 75-09-2 | 2007-09-28 |

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| Asp. Tox. | Aspiration hazard |
| Carc. | Carcinogenicity |
| Eye Irrit. | Eye irritation |
| Flam. Liq. | Flammable liquids |
| H227 | Combustible liquid. |
| H304 | May be fatal if swallowed and enters airways. |
| H315 | Causes skin irritation. |
| H319 | Causes serious eye irritation. |
| H335 | May cause respiratory irritation. |
| H336 | May cause drowsiness or dizziness. |
| H351 | Suspected of causing cancer. |
| H373 | May cause damage to organs (/$/*_2ORG_REP_ORA/$/) through prolonged or repeated exposure if swallowed. |
| H411 | Toxic to aquatic life with long lasting effects. |
| Skin Irrit. | Skin irritation |
| STOT RE | Specific target organ toxicity - repeated exposure |
| STOT SE | Specific target organ toxicity - single exposure |

**HMIS Rating**
Health hazard: 2
Chronic Health Hazard: *

| | |
|---|---|
| Flammability: | 0 |
| Physical Hazard | 1 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.7 Revision Date: 06/03/2016 Print Date: 07/04/2016

# SAFETY DATA SHEET

**Creation Date** 06-Aug-2010 **Revision Date** 30-Oct-2014 **Revision Number** 2

## 1. Identification

**Product Name** **Ethylbenzene**

**Cat No. :** **AC433800000; AC433800010; AC433801000**

**Synonyms** Ethylbenzol; Phenylethane

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

## 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Flammable liquids | Category 2 |
| Acute Inhalation Toxicity - Vapors | Category 4 |
| Carcinogenicity | Category 2 |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system, Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Aspiration Toxicity | Category 1 |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Highly flammable liquid and vapor
May be fatal if swallowed and enters airways
Harmful if inhaled
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer
May cause damage to organs through prolonged or repeated exposure



**Precautionary Statements**
**Prevention**
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
**Response**
IF exposed or concerned: Get medical attention/advice
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Skin**
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
**Ingestion**
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
**Fire**
In case of fire: Use CO2, dry chemical, or foam for extinction
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Harmful to aquatic life with long lasting effects

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Ethylbenzene | 100-41-4 | >95 |

## 4. First-aid measures

**General Advice** If symptoms persist, call a physician.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention. Aspiration into lungs can produce severe lung damage.

**Ingestion** Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately. If vomiting occurs naturally, have victim lean forward.

**Most important symptoms/effects** Breathing difficulties. . Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: May cause central nervous system depression

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

**Unsuitable Extinguishing Media** Do not use a solid water stream as it may scatter and spread fire

**Flash Point** 15 °C / 59 °F
**Method -** No information available

**Autoignition Temperature** 432 °C / 810 °F
**Explosion Limits**
**Upper** 6.8%
**Lower** 1.2%
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** Yes

**Specific Hazards Arising from the Chemical**
Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

**Hazardous Combustion Products**
Carbon monoxide (CO) Carbon dioxide ($CO_2$)
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 3 | 3 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

**Environmental Precautions** Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

## 7. Handling and storage

**Handling** Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Ethylbenzene | TWA: 20 ppm | (Vacated) TWA: 100 ppm<br>(Vacated) TWA: 435 mg/m³<br>(Vacated) STEL: 125 ppm<br>(Vacated) STEL: 545 mg/m³<br>TWA: 100 ppm<br>TWA: 435 mg/m³ | IDLH: 800 ppm<br>TWA: 100 ppm<br>TWA: 435 mg/m³<br>STEL: 125 ppm<br>STEL: 545 mg/m³ |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Ethylbenzene | TWA: 100 ppm<br>TWA: 434 mg/m³<br>STEL: 125 ppm<br>STEL: 543 mg/m³ | TWA: 100 ppm<br>TWA: 435 mg/m³<br>STEL: 125 ppm<br>STEL: 545 mg/m³ | TWA: 20 ppm |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*
*OSHA - Occupational Safety and Health Administration*
*NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health*

**Engineering Measures** Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure adequate ventilation, especially in confined areas.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Long sleeved clothing.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Liquid |
| **Appearance** | Colorless |
| **Odor** | aromatic |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | -95 °C / -139 °F |
| **Boiling Point/Range** | 136 °C / 276.8 °F |
| **Flash Point** | 15 °C / 59 °F |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | Not applicable |
| **Flammability or explosive limits** | |
| **Upper** | 6.8% |
| **Lower** | 1.2% |
| **Vapor Pressure** | No information available |
| **Vapor Density** | No information available |
| **Relative Density** | 0.860 |
| **Solubility** | Slightly soluble in water |
| **Partition coefficient; n-octanol/water** | No data available |

| | |
|---|---|
| **Autoignition Temperature** | 432 °C / 810 °F |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | C8 H10 |
| **Molecular Weight** | 106.17 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

**Incompatible Materials** Strong oxidizing agents

**Hazardous Decomposition Products** Carbon monoxide (CO), Carbon dioxide ($CO_2$)

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Ethylbenzene | 3500 mg/kg ( Rat ) | 15400 mg/kg ( Rabbit ) | 17.2 mg/L ( Rat ) 4 h |

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** May cause eye, skin, and respiratory tract irritation

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Ethylbenzene | 100-41-4 | Group 2B | Not listed | A3 | X | Not listed |

*IARC: (International Agency for Research on Cancer)*
*Group 2B - Possibly Carcinogenic to Humans*
*IARC: (International Agency for Research on Cancer)*
*Group 1 - Carcinogenic to Humans*
*Group 2A - Probably Carcinogenic to Humans*

*ACGIH: (American Conference of Governmental Industrial Hygienists)*
*A1 - Known Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Animal Carcinogen*
*ACGIH: (American Conference of Governmental Industrial Hygienists)*

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Respiratory system Central nervous system (CNS)
**STOT - repeated exposure** None known

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: May cause central nervous system depression

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** See actual entry in RTECS for complete information.

## 12. Ecological information

**Ecotoxicity**

Do not empty into drains. The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| Ethylbenzene | 2.6 - 11.3 mg/L EC50 72 h 438 mg/L EC50 > 96 h 4.6 mg/L EC50 = 72 h 1.7 - 7.6 mg/L EC50 96 h | 9.6 mg/L LC50 96 h 9.1 - 15.6 mg/L LC50 96 h 32 mg/L LC50 96 h 7.55 - 11 mg/L LC50 96 h 4.2 mg/L LC50 96 h 11.0 - 18.0 mg/L LC50 96 h | EC50 = 9.68 mg/L 30 min EC50 = 96 mg/L 24 h | 1.8 - 2.4 mg/L EC50 48 h |

**Persistence and Degradability** Insoluble in water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

| Component | log Pow |
|---|---|
| Ethylbenzene | 3.118 |

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

**DOT**

**UN-No** UN1175
**Proper Shipping Name** ETHYLBENZENE
**Hazard Class** 3
**Packing Group** II

**TDG**

**UN-No** UN1175
**Proper Shipping Name** ETHYLBENZENE
**Hazard Class** 3
**Packing Group** II

**IATA**

**UN-No** UN1175
**Proper Shipping Name** ETHYLBENZENE
**Hazard Class** 3
**Packing Group** II

**IMDG/IMO**

**UN-No** UN1175
**Proper Shipping Name** ETHYLBENZENE
**Hazard Class** 3
**Packing Group** II

## 15. Regulatory information

**All of the components in the product are on the following Inventory lists:** X = listed The product is classified and labeled

according to EC directives or corresponding national laws The product is classified and labeled in accordance with Directive 1999/45/EC

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ethylbenzene | X | X | - | 202-849-4 | - | | X | X | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313**

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---|---|---|---|
| Ethylbenzene | 100-41-4 | >95 | 0.1 |

**SARA 311/312 Hazardous Categorization**

| | |
|---|---|
| **Acute Health Hazard** | Yes |
| **Chronic Health Hazard** | Yes |
| **Fire Hazard** | Yes |
| **Sudden Release of Pressure Hazard** | No |
| **Reactive Hazard** | No |

**Clean Water Act**

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|---|---|---|---|---|
| Ethylbenzene | X | 1000 lb | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Ethylbenzene | X | | - |

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Ethylbenzene | 1000 lb | - |

**California Proposition 65** This product contains the following Proposition 65 chemicals:

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Ethylbenzene | 100-41-4 | Carcinogen | 54 µg/day<br>41 µg/day | Carcinogen |

**State Right-to-Know**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Ethylbenzene | X | X | X | X | X |

**U.S. Department of Transportation**

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** Serious risk, Grade 3

**Canada**
**This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR**

**WHMIS Hazard Class** B2 Flammable liquid
D2A Very toxic materials



## 16. Other information

**Prepared By** Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Creation Date** 06-Aug-2010
**Revision Date** 30-Oct-2014
**Print Date** 30-Oct-2014
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**
**The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.**

**End of SDS**

# SAFETY DATA SHEET

Version 4.17
Revision Date 03/03/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Trichlorofluoromethane

Product Number : 254991
Brand : Aldrich

CAS-No. : 75-69-4

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Acute toxicity, Dermal (Category 4), H312

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Warning

Hazard statement(s)
H312 Harmful in contact with skin.

Precautionary statement(s)
P280 Wear protective gloves/ protective clothing.
P302 + P352 + P312 IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P363 Wash contaminated clothing before reuse.
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Synonyms : Fluorotrichloromethane
CFC-11

| | | |
|---|---|---|
| Formula | : | $CCl_3F$ $CCl_3F$ |
| Molecular weight | : | 137.37 g/mol |
| CAS-No. | : | 75-69-4 |
| EC-No. | : | 200-892-3 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Trichlorofluoromethane** | | |
| | Acute Tox. 4; H312 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

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

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

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

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed
No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### 5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas, Hydrogen fluoride

### 5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information
No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

### 6.2 Environmental precautions
Do not let product enter drains.

### 6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections
For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature 2 - 8 °C

Contents under pressure.
Storage class (TRGS 510): Non Combustible Liquids

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Trichlorofluoromethane | 75-69-4 | C | 1,000.000000 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Cardiac sensitization<br>Not classifiable as a human carcinogen | | |
| | | C | 1,000.000000 ppm<br>5,600.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 1,000.000000 ppm<br>5,600.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | The value in mg/m3 is approximate. | | |

### 8.2 Exposure controls

**Appropriate engineering controls**

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

**Personal protective equipment**

**Eye/face protection**

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 30 min

Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

**Control of environmental exposure**
Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: liquid, clear<br>Colour: colourless |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | -110.99 - -109.99 °C (-167.78 - -165.98 °F) |
| f) | Initial boiling point and boiling range | 23.7 °C (74.7 °F) - lit. |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | 885.7 hPa (664.3 mmHg) at 20.0 °C (68.0 °F)<br>2,701.2 hPa (2,026.1 mmHg) at 55.0 °C (131.0 °F) |
| l) | Vapour density | No data available |
| m) | Relative density | 1.494 g/cm3 at 25 °C (77 °F) |
| n) | Water solubility | 1 g/l |
| o) | Partition coefficient: n-octanol/water | log Pow: 2.53 |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |

t) Oxidizing properties No data available

**9.2 Other safety information**

Surface tension 18.0 mN/m at 25.0 °C (77.0 °F)

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents, Sodium/sodium oxides, Potassium, Magnesium, Aluminum, Zinc

**10.6 Hazardous decomposition products**
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
LD50 Oral - Rat - > 15,000 mg/kg

LC50 Inhalation - Rat - 0.3 h - 130000 ppm
Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold. Respiratory disorder

No data available

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: PB6125000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated., Nausea, Dizziness, Headache, Vomiting, Diarrhoea, Abdominal pain, Weakness, Unconsciousness

Liver -

## 12. ECOLOGICAL INFORMATION

**12.1 Toxicity**
No data available

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Trichlorofluoromethane)
Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

**IMDG**
Not dangerous goods

**IATA**
Not dangerous goods

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| Trichlorofluoromethane | 75-69-4 | 2007-07-01 |

**SARA 311/312 Hazards**
Acute Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Trichlorofluoromethane | 75-69-4 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Trichlorofluoromethane | 75-69-4 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Trichlorofluoromethane | 75-69-4 | 2007-07-01 |

**California Prop. 65 Components**

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Acute Tox. | Acute toxicity |
| H312 | Harmful in contact with skin. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 1 |
| Chronic Health Hazard: | |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 1 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.17 Revision Date: 03/03/2015 Print Date: 05/01/2016

# SAFETY DATA SHEET

Halocarbon R-12 (Dichlorodifluoromethane)

## Section 1. Identification

**GHS product identifier** : Halocarbon R-12 (Dichlorodifluoromethane)

**Chemical name** : dichlorodifluoromethane

**Other means of identification** : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12

**Product use** : Synthetic/Analytical chemistry.

**Synonym** : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12

**SDS #** : 001018

**Supplier's details** : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

**Emergency telephone number (with hours of operation)** : 1-866-734-3438

## Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** : GASES UNDER PRESSURE - Liquefied gas
HAZARDOUS TO THE OZONE LAYER - Category 1

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Warning

**Hazard statements** : Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.
Harms public health and the environment by destroying ozone in the upper atmosphere.

**Precautionary statements**

**General** : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position.

**Prevention** : Use and store only outdoors or in a well ventilated place.

**Response** : Not applicable.

**Storage** : Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

**Disposal** : Refer to manufacturer/supplier for information on recovery/recycling.



Powered by IHS

# Section 2. Hazards identification

**Hazards not otherwise classified** : Liquid can cause burns similar to frostbite.

# Section 3. Composition/information on ingredients

**Substance/mixture** : Substance

**Chemical name** : dichlorodifluoromethane

**Other means of identification** : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12

## CAS number/other identifiers

**CAS number** : 75-71-8

**Product code** : 001018

| Ingredient name | % | CAS number |
|---|---|---|
| Methane, dichlorodifluoro- | 100 | 75-71-8 |

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

**Occupational exposure limits, if available, are listed in Section 8.**

# Section 4. First aid measures

## Description of necessary first aid measures

**Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

**Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.

**Ingestion** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if adverse health effects persist or are severe. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section.

## Most important symptoms/effects, acute and delayed

### Potential acute health effects

**Eye contact** : Liquid can cause burns similar to frostbite.

**Inhalation** : Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.



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# Section 4. First aid measures

**Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Frostbite** : Try to warm up the frozen tissues and seek medical attention.

**Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

## Over-exposure signs/symptoms

**Eye contact** : Adverse symptoms may include the following:
frostbite

**Inhalation** : No specific data.

**Skin contact** : Adverse symptoms may include the following:
frostbite

**Ingestion** : Adverse symptoms may include the following:
frostbite

## Indication of immediate medical attention and special treatment needed, if necessary

**Notes to physician** : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**Specific treatments** : No specific treatment.

**Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

**See toxicological information (Section 11)**

# Section 5. Fire-fighting measures

## Extinguishing media

**Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.

**Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

**Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.



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# Section 6. Accidental release measures

## Personal precautions, protective equipment and emergency procedures

**For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

**For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

**Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). May be harmful to the environment if released in large quantities.

## Methods and materials for containment and cleaning up

**Small spill** : Immediately contact emergency personnel. Stop leak if without risk.

**Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

# Section 7. Handling and storage

## Precautions for safe handling

**Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Avoid breathing gas. Avoid release to the environment. Refer to special instructions/safety data sheet. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

**Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

# Section 8. Exposure controls/personal protection

## Control parameters

### Occupational exposure limits



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# Section 8. Exposure controls/personal protection

| Ingredient name | Exposure limits |
|---|---|
| Methane, dichlorodifluoro- | **ACGIH TLV (United States, 3/2012).**<br>TWA: 4950 mg/m³ 8 hours.<br>TWA: 1000 ppm 8 hours.<br>**NIOSH REL (United States, 1/2013).**<br>TWA: 4950 mg/m³ 10 hours.<br>TWA: 1000 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 4950 mg/m³ 8 hours.<br>TWA: 1000 ppm 8 hours.<br>**OSHA PEL 1989 (United States, 3/1989).**<br>TWA: 4950 mg/m³ 8 hours.<br>TWA: 1000 ppm 8 hours. |

**Appropriate engineering controls** : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

## Individual protection measures

**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

### Skin protection

**Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.



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# Section 9. Physical and chemical properties

**Appearance**

**Physical state** : Gas. [Liquefied gas]

**Color** : Colorless.

**Molecular weight** : 120.91 g/mole

**Molecular formula** : C-Cl2-F2

**Boiling/condensation point** : -29.8°C (-21.6°F)

**Melting/freezing point** : -158°C (-252.4°F)

**Critical temperature** : 111.85°C (233.3°F)

**Odor** : Characteristic.

**Odor threshold** : Not available.

**pH** : Not available.

**Flash point** : [Product does not sustain combustion.]

**Burning time** : Not applicable.

**Burning rate** : Not applicable.

**Evaporation rate** : Not available.

**Flammability (solid, gas)** : Not available.

**Lower and upper explosive (flammable) limits** : Not available.

**Vapor pressure** : 84.9 (psia)

**Vapor density** : 4.2 (Air = 1)

**Specific Volume ($ft^3/lb$)** : 3.1746

**Gas Density ($lb/ft^3$)** : 0.315

**Relative density** : Not applicable.

**Solubility** : Not available.

**Solubility in water** : 0.3 g/l

**Partition coefficient: n-octanol/water** : 2.16

**Auto-ignition temperature** : Not available.

**Decomposition temperature** : Not available.

**SADT** : Not available.

**Viscosity** : Not applicable.

# Section 10. Stability and reactivity

**Reactivity** : No specific test data related to reactivity available for this product or its ingredients.

**Chemical stability** : The product is stable.

**Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.

**Conditions to avoid** : No specific data.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.



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# Section 10. Stability and reactivity

**Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

# Section 11. Toxicological information

## Information on toxicological effects

### Acute toxicity

Not available.

### Irritation/Corrosion

Not available.

### Sensitization

Not available.

### Mutagenicity

Not available.

### Carcinogenicity

Not available.

### Reproductive toxicity

Not available.

### Teratogenicity

Not available.

### Specific target organ toxicity (single exposure)

Not available.

### Specific target organ toxicity (repeated exposure)

Not available.

### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

## Potential acute health effects

**Eye contact** : Liquid can cause burns similar to frostbite.

**Inhalation** : Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

**Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

## Symptoms related to the physical, chemical and toxicological characteristics

**Eye contact** : Adverse symptoms may include the following:
frostbite

**Inhalation** : No specific data.

**Skin contact** : Adverse symptoms may include the following:
frostbite



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# Section 11. Toxicological information

**Ingestion** : Adverse symptoms may include the following:
frostbite

## Delayed and immediate effects and also chronic effects from short and long term exposure

### Short term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

### Long term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

### Potential chronic health effects

Not available.

**General** : No known significant effects or critical hazards.

**Carcinogenicity** : No known significant effects or critical hazards.

**Mutagenicity** : No known significant effects or critical hazards.

**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : No known significant effects or critical hazards.

## Numerical measures of toxicity

### Acute toxicity estimates

Not available.

# Section 12. Ecological information

## Toxicity

Not available.

## Persistence and degradability

Not available.

## Bioaccumulative potential

| Product/ingredient name | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| Methane, dichlorodifluoro- | 2.16 | 6.17 | low |

## Mobility in soil

**Soil/water partition coefficient ($K_{OC}$)** : Not available.

**Other adverse effects** : No known significant effects or critical hazards.



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# Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

**United States - RCRA Toxic hazardous waste "U" List**

| Ingredient | CAS # | Status | Reference number |
|---|---|---|---|
| Dichlorodifluoromethane; Methane, dichlorodifluoro- | 75-71-8 | Listed | U075 |

# Section 14. Transport information

| | DOT | TDG | Mexico | IMDG | IATA |
|---|---|---|---|---|---|
| **UN number** | UN1028 | UN1028 | UN1028 | UN1028 | UN1028 |
| **UN proper shipping name** | DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12 | DICHLORODIFLUOROMETHANE; OR REFRIGERANT GAS R 12 | DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12 | DICHLORODIFLUOROMETHANE (REFRIGERANT GAS R 12) | DICHLORODIFLUOROMETHANE |
| **Transport hazard class(es)** | 2.2   | 2.2   | 2.2   | 2.2   | 2.2   |
| **Packing group** | - | - | - | - | - |
| **Environment** | No. | No. | No. | No. | No. |
| **Additional information** | **Reportable quantity** 5000 lbs / 2270 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.<br><br>**Limited quantity** Yes.<br><br>**Packaging instruction**<br>**Passenger aircraft** Quantity limitation: 75 kg<br><br>**Cargo aircraft** Quantity limitation: 150 kg<br><br>**Special provisions** T50 | **Explosive Limit and Limited Quantity Index** 0.125<br><br>**Passenger Carrying Road or Rail Index** 75 | - | - | **Passenger and Cargo Aircraft** Quantity limitation: 75 kg<br>**Cargo Aircraft Only** Quantity limitation: 150 kg |

**"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."**



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# Section 14. Transport information

**Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** : Not available.

# Section 15. Regulatory information

**U.S. Federal regulations** : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

**TSCA 12(b) annual export notification**: dichlorodifluoromethane

**United States inventory (TSCA 8b)**: This material is listed or exempted.

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Not listed

**Clean Air Act Section 602 Class I Substances** : Listed

**Clean Air Act Section 602 Class II Substances** : Not listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed

**DEA List II Chemicals (Essential Chemicals)** : Not listed

## SARA 302/304

### Composition/information on ingredients

No products were found.

**SARA 304 RQ** : Not applicable.

## SARA 311/312

**Classification** : Sudden release of pressure

### Composition/information on ingredients

| Name | % | Fire hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|---|---|---|---|---|---|---|
| Methane, dichlorodifluoro- | 100 | No. | Yes. | No. | No. | No. |

## SARA 313

| | Product name | CAS number | % |
|---|---|---|---|
| Form R - Reporting requirements | dichlorodifluoromethane | 75-71-8 | 100 |
| Supplier notification | dichlorodifluoromethane | 75-71-8 | 100 |

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

## State regulations

**Massachusetts** : This material is listed.

**New York** : This material is listed.



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# Section 15. Regulatory information

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

**Canada inventory** : This material is listed or exempted.

**International regulations**

**International lists** : **Australia inventory (AICS)**: This material is listed or exempted.
**China inventory (IECSC)**: This material is listed or exempted.
**Japan inventory**: This material is listed or exempted.
**Korea inventory**: This material is listed or exempted.
**Malaysia Inventory (EHS Register)**: Not determined.
**New Zealand Inventory of Chemicals (NZIoC)**: This material is listed or exempted.
**Philippines inventory (PICCS)**: This material is listed or exempted.
**Taiwan inventory (CSNN)**: Not determined.

**Chemical Weapons Convention List Schedule I Chemicals** : Not listed

**Chemical Weapons Convention List Schedule II Chemicals** : Not listed

**Chemical Weapons Convention List Schedule III Chemicals** : Not listed

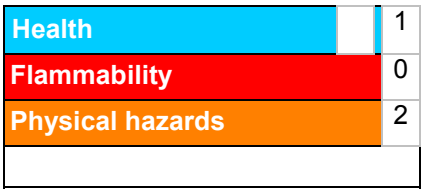
**Canada**

**WHMIS (Canada)** : Class A: Compressed gas.
**CEPA Toxic substances**: This material is listed.
**Canadian ARET**: This material is not listed.
**Canadian NPRI**: This material is listed.
**Alberta Designated Substances**: This material is not listed.
**Ontario Designated Substances**: This material is not listed.
**Quebec Designated Substances**: This material is not listed.

# Section 16. Other information

**Canada Label requirements** : Class A: Compressed gas.

**Hazardous Material Information System (U.S.A.)**




**Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.**

**The customer is responsible for determining the PPE code for this material.**

**National Fire Protection Association (U.S.A.)**






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# Section 16. Other information

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**Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.**

## History

**Date of printing** : 5/21/2015.

**Date of issue/Date of revision** : 5/21/2015.

**Date of previous issue** : 5/21/2015.

**Version** : 2

**Key to abbreviations** : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United NationsACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
CAS – Chemical Abstract Services
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
CFR – United States Code of Federal Regulations
CPR – Controlled Products Regulations
DSL – Domestic Substances List
GWP – Global Warming Potential
IARC – International Agency for Research on Cancer
ICAO – International Civil Aviation Organisation
Inh – Inhalation
LC – Lethal concentration
LD – Lethal dosage
NDSL – Non-Domestic Substances List
NIOSH – National Institute for Occupational Safety and Health
TDG – Canadian Transportation of Dangerous Goods Act and Regulations
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
WEEL – Workplace Environmental Exposure Level
WHMIS – Canadian Workplace Hazardous Material Information System

**References** : Not available.

**Indicates information that has changed from previously issued version.**

**Other special considerations** : WARNING: Contains (Dichlorodifluoromethane), a substance which harms the public health and environment by destroying ozone in the upper atmosphere.

## Notice to reader



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# Section 16. Other information

**To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.**

**Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.**



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# SAFETY DATA SHEET

Version 5.5
Revision Date 05/27/2016
Print Date 07/13/2017

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Indeno[1,2,3-*cd*]pyrene

Product Number : 48499
Brand : Supelco

CAS-No. : 193-39-5

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Warning

Hazard statement(s)
H351 Suspected of causing cancer.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Formula : $C_{22}H_{12}$
Molecular weight : 276.33 g/mol
CAS-No. : 193-39-5
EC-No. : 205-893-2

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Indeno[1,2,3-cd]pyrene** | | |
| | Carc. 2; H351 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

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

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

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

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed

No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### 5.2 Special hazards arising from the substance or mixture

No data available

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information

No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non Combustible Solids

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**
Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Body Protection**
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: solid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |

| | | |
|---|---|---|
| d) | pH | No data available |
| e) | Melting point/freezing point | 163.6 °C (326.5 °F) |
| f) | Initial boiling point and boiling range | 536.0 °C (996.8 °F) |
| g) | Flash point | No data available |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | No data available |
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

**9.2 Other safety information**
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

| | |
|---|---|
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene) |
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene) |
| ACGIH: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH. |
| NTP: | Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene) |
| NTP: | Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene) |
| OSHA: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. |
| | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. |

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

## 12. ECOLOGICAL INFORMATION

**12.1 Toxicity**
No data available

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**

No data available

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
Not dangerous goods

**IMDG**
Not dangerous goods

**IATA**
Not dangerous goods

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 1993-04-24 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 1993-04-24 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 1993-04-24 |

**California Prop. 65 Components**

| | | |
|---|---|---|
| WARNING! This product contains a chemical known to the State of California to cause cancer. Indeno[1,2,3-cd]pyrene | CAS-No. 193-39-5 | Revision Date 2007-09-28 |
| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. 193-39-5 | Revision Date 2007-09-28 |

Indeno[1,2,3-cd]pyrene

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Carc. | Carcinogenicity |
| H351 | Suspected of causing cancer. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 1 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5 Revision Date: 05/27/2016 Print Date: 07/13/2017

**Iron Filings, 40 mesh**

## SECTION 1 : Identification of the substance/mixture and of the supplier

**Product name** : **Iron Filings, 40 mesh**

**Manufacturer/Supplier Trade name**:

**Manufacturer/Supplier Article number**: **S25369**

**Recommended uses of the product and uses restrictions on use**:

**Manufacturer Details**:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

**Supplier Details**:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

**Emergency telephone number**:

Fisher Science Education Emergency Telephone No.: 800-535-5053

## SECTION 2 : Hazards identification

**Classification of the substance or mixture**:

Not classified for physical or health hazards under GHS.

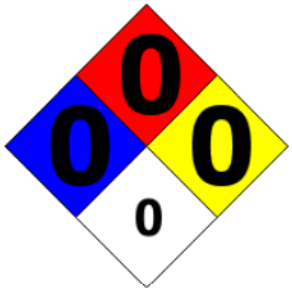
**Signal word** :Warning

**Hazard statements**:
**Precautionary statements**:
If medical advice is needed, have product container or label at hand
Keep out of reach of children
Read label before use
Do not eat, drink or smoke when using this product

**Combustible Dust Hazard: :**
May form combustible dust concentrations in air (during processing).

**Other Non-GHS Classification**:

**WHMIS**
**NFPA/HMIS**




NFPA SCALE (0-4)




HMIS RATINGS (0-4)

## SECTION 3 : Composition/information on ingredients

| **Ingredients:** | | |
|---|---|---|
| CAS 7439-89-6 | Iron | 100 % |
| | | Percentages are by weight |

## SECTION 4 : First aid measures

**Description of first aid measures**

**After inhalation:** Loosen clothing as necessary and position individual in a comfortable position.Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen.Get medical assistance if cough or other symptoms appear.

**After skin contact:** Rinse/flush exposed skin gently using soap and water for 15-20 minutes.Seek medical advice if discomfort or irritation persists.

**After eye contact:** Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if concerned.

**After swallowing:** Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists.Never give anything by mouth to an unconscious person.

**Most important symptoms and effects, both acute and delayed:**

Irritation, Nausea,Headache, Shortness of breath.;

**Indication of any immediate medical attention and special treatment needed:**

If seeking medical attention, provide SDS document to physician.Physician should treat symptomatically.

## SECTION 5 : Firefighting measures

**Extinguishing media**

**Suitable extinguishing agents:** Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition. Use water, dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam.

**For safety reasons unsuitable extinguishing agents:**

**Special hazards arising from the substance or mixture:**

Combustion products may include carbon oxides or other toxic vapors.Thermal decomposition can lead to release of irritating gases and vapors.

**Advice for firefighters:**

**Protective equipment:** Use NIOSH-approved respiratory protection/breathing apparatus.

**Additional information (precautions):** Move product containers away from fire or keep cool with water spray as a protective measure, where feasible.Use spark-proof tools and explosion-proof equipment.Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols.Avoid contact with skin, eyes, and clothing.

## SECTION 6 : Accidental release measures

**Personal precautions, protective equipment and emergency procedures:**

Wear protective equipment. Use spark-proof tools and explosion-proof equipment.Ensure that air-handling systems are operational.Ensure adequate ventilation.

**Environmental precautions:**

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13. Should not be released into environment.

**Methods and material for containment and cleaning up:**

Keep in suitable closed containers for disposal.Wear protective eyeware, gloves, and clothing. Refer to Section 8.Always obey local regulations.Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect solids in powder form using vacuum with (HEPA filter). Evacuate personnel to safe areas.

**Reference to other sections:**

## SECTION 7 : Handling and storage

**Precautions for safe handling:**

Minimize dust generation and accumulation. Follow good hygiene procedures when handling chemical materials. Refer to Section 8.Do not eat, drink, smoke, or use personal products when handling chemical substances. Avoid contact with eyes, skin, and clothing.

**Conditions for safe storage, including any incompatibilities:**

Store away from incompatible materials.Protect from freezing and physical damage.Keep away from food and beverages.Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store in cool, dry conditions in well sealed containers. Store with like hazards

## SECTION 8 : Exposure controls/personal protection





| | |
|---|---|
| **Control Parameters:** | , , OSHA PEL TWA (Total Dust) 15 mg/m3 (50 mppcf*)<br>, , ACGIH TLV TWA (inhalable particles) 10 mg/m3 |
| **Appropriate Engineering controls:** | Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling.Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment.Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).Use under a fume hood |
| **Respiratory protection:** | Not required under normal conditions of use. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls.When necessary use NIOSH approved breathing equipment. |
| **Protection of skin:** | Select glove material impermeable and resistant to the substance.Select glove material based on rates of diffusion and degradation.Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves.Wear protective clothing. |

**Eye protection:** Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).Safety glasses or goggles are appropriate eye protection.

**General hygienic measures:** Perform routine housekeeping.Wash hands before breaks and at the end of work.Avoid contact with skin, eyes, and clothing.Before wearing wash contaminated clothing.

## SECTION 9 : Physical and chemical properties

| | | | |
|---|---|---|---|
| **Appearance (physical state,color)**: | Solid | **Explosion limit lower**:<br>**Explosion limit upper**: | Not determined<br>Not determined |
| **Odor**: | Not Determined | **Vapor pressure**: | Not determined |
| **Odor threshold**: | Not determined | **Vapor density**: | Not determined |
| **pH-value**: | Not Determined | **Relative density**: | Not determined |
| **Melting/Freezing point**: | Not determined | **Solubilities**: | |
| **Boiling point/Boiling range**: | Not determined | **Partition coefficient (n-octanol/water)**: | Not determined |
| **Flash point (closed cup)**: | Not determined | **Auto/Self-ignition temperature**: | Not determined |
| **Evaporation rate**: | Not determined | **Decomposition temperature**: | Not determined |
| **Flammability (solid,gaseous)**: | Not determined | **Viscosity**: | a. Kinematic:Not determined<br>b. Dynamic: Not determined |
| **Density**: Not determined | | | |

## SECTION 10 : Stability and reactivity

**Reactivity:**Nonreactive under normal conditions.
**Chemical stability:**Stable under normal conditions.
**Possible hazardous reactions:**None under normal processing
**Conditions to avoid:**Incompatible Materials.
**Incompatible materials:**Strong acids.Strong bases.Oxidizing agents.
**Hazardous decomposition products:**

## SECTION 11 : Toxicological information

| | |
|---|---|
| **Acute Toxicity**: No additional information. | |
| **Chronic Toxicity**: No additional information. | |
| **Corrosion Irritation**: No additional information. | |
| **Sensitization**: | No additional information. |
| **Single Target Organ (STOT)**: | No additional information. |
| **Numerical Measures**: | No additional information. |

| | |
|---|---|
| **Carcinogenicity**: | No additional information. |
| **Mutagenicity**: | No additional information. |
| **Reproductive Toxicity**: | No additional information. |

## SECTION 12 : Ecological information

**Ecotoxicity Persistence and degradability**:
**Bioaccumulative potential**:
**Mobility in soil**:
**Other adverse effects**:

## SECTION 13 : Disposal considerations

**Waste disposal recommendations**:

Contact a licensed professional waste disposal service to dispose of this material.Dispose of empty containers as unused product.Product or containers must not be disposed with household garbage.It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11).Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

## SECTION 14 : Transport information

**UN-Number**

Not Regulated.

**UN proper shipping name**

Not Regulated.

**Transport hazard class(es)**
**Packing group**:Not Regulated
**Environmental hazard**:
**Transport in bulk**:
**Special precautions for user**:

## SECTION 15 : Regulatory information

**United States (USA)**

**SARA Section 311/312 (Specific toxic chemical listings)**:

None of the ingredients is listed

**SARA Section 313 (Specific toxic chemical listings)**:

None of the ingredients is listed

**RCRA (hazardous waste code)**:

None of the ingredients is listed

**TSCA (Toxic Substances Control Act)**:

All ingredients are listed.

**CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act)**:

None of the ingredients is listed

**Proposition 65 (California)**:

**Chemicals known to cause cancer**:

None of the ingredients is listed

**Chemicals known to cause reproductive toxicity for females**:

None of the ingredients is listed

**Chemicals known to cause reproductive toxicity for males**:

None of the ingredients is listed

**Chemicals known to cause developmental toxicity**:

None of the ingredients is listed

**Canada**

**Canadian Domestic Substances List (DSL)**:

All ingredients are listed.

**Canadian NPRI Ingredient Disclosure list (limit 0.1%)**:

None of the ingredients is listed

**Canadian NPRI Ingredient Disclosure list (limit 1%)**:

None of the ingredients is listed

## SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.Note:. The responsibility to provide a safe workplace remains with the user.The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.The information contained herein is, to the best of our knowledge and belief, accurate.However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material.It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

**GHS Full Text Phrases**:

**Abbreviations and acronyms**:
IMDG: International Maritime Code for Dangerous Goods
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
DNEL: Derived No-Effect Level (REACH)
PNEC: Predicted No-Effect Concentration (REACH)
CFR: Code of Federal Regulations (USA)
SARA: Superfund Amendments and Reauthorization Act (USA)
RCRA: Resource Conservation and Recovery Act (USA)
TSCA: Toxic Substances Control Act (USA)
NPRI: National Pollutant Release Inventory (Canada)
DOT: US Department of Transportation

**Effective date** : 10.24.2014
**Last updated** : 03.23.2015

# SAFETY DATA SHEET

Isobutylene

## Section 1. Identification

**GHS product identifier** : Isobutylene

**Chemical name** : 2-methylpropene

**Other means of identification** : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

**Product use** : Synthetic/Analytical chemistry.

**Synonym** : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

**SDS #** : 001031

**Supplier's details** : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

**24-hour telephone** : 1-866-734-3438

## Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Danger

**Hazard statements** : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.

**Precautionary statements**

**General** : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

**Prevention** : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

**Response** : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

**Storage** : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

**Disposal** : Not applicable.

**Hazards not otherwise classified** : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

# Section 3. Composition/information on ingredients

**Substance/mixture** : Substance

**Chemical name** : 2-methylpropene

**Other means of identification** : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

## CAS number/other identifiers

**CAS number** : 115-11-7

**Product code** : 001031

| Ingredient name | % | CAS number |
|---|---|---|
| Isobutylene | 100 | 115-11-7 |

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

**Occupational exposure limits, if available, are listed in Section 8.**

# Section 4. First aid measures

## Description of necessary first aid measures

**Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

**Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

**Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

**Ingestion** : As this product is a gas, refer to the inhalation section.

## Most important symptoms/effects, acute and delayed

### Potential acute health effects

**Eye contact** : No known significant effects or critical hazards.

**Inhalation** : No known significant effects or critical hazards.

**Skin contact** : No known significant effects or critical hazards.

**Frostbite** : Try to warm up the frozen tissues and seek medical attention.

**Ingestion** : As this product is a gas, refer to the inhalation section.

### Over-exposure signs/symptoms

**Eye contact** : No specific data.

**Inhalation** : No specific data.

**Skin contact** : No specific data.

**Ingestion** : No specific data.

## Indication of immediate medical attention and special treatment needed, if necessary

**Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

**Specific treatments** : No specific treatment.

# Section 4. First aid measures

**Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

**See toxicological information (Section 11)**

# Section 5. Fire-fighting measures

## Extinguishing media

**Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.

**Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

**Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

# Section 6. Accidental release measures

## Personal precautions, protective equipment and emergency procedures

**For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

**For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

**Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

## Methods and materials for containment and cleaning up

**Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

**Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

# Section 7. Handling and storage

## Precautions for safe handling

**Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

**Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

# Section 8. Exposure controls/personal protection

## Control parameters

### Occupational exposure limits

| Ingredient name | Exposure limits |
|---|---|
| Isobutylene | **ACGIH TLV (United States, 3/2015).** TWA: 250 ppm 8 hours. |

**Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

## Individual protection measures

**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

## Skin protection

## Section 8. Exposure controls/personal protection

**Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

**Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

**Appearance**

**Physical state** : Gas. [Liquefied compressed gas.]

**Color** : Colorless.

**Molecular weight** : 56.12 g/mole

**Molecular formula** : C4-H8

**Boiling/condensation point** : -6.9°C (19.6°F)

**Melting/freezing point** : -140.7°C (-221.3°F)

**Critical temperature** : 144.75°C (292.6°F)

**Odor** : Characteristic.

**Odor threshold** : Not available.

**pH** : Not available.

**Flash point** : Closed cup: -76.1°C (-105°F)

**Burning time** : Not applicable.

**Burning rate** : Not applicable.

**Evaporation rate** : Not available.

**Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

**Lower and upper explosive (flammable) limits** : Lower: 1.8%
Upper: 9.6%

**Vapor pressure** : 24.3 (psig)

**Vapor density** : 1.94 (Air = 1)

**Specific Volume (ft $^3$/lb)** : 6.6845

**Gas Density (lb/ft $^3$)** : 0.1496 (25°C / 77 to °F)

**Relative density** : Not applicable.

**Solubility** : Not available.

**Solubility in water** : 0.263 g/l

**Partition coefficient: n-octanol/water** : 2.34

**Auto-ignition temperature** : 465°C (869°F)

**Decomposition temperature** : Not available.

**SADT** : Not available.

## Section 9. Physical and chemical properties

**Viscosity** : Not applicable.

## Section 10. Stability and reactivity

**Reactivity** : No specific test data related to reactivity available for this product or its ingredients.

**Chemical stability** : The product is stable.

**Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.

**Conditions to avoid** : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

**Incompatible materials** : Oxidizers

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

**Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

## Section 11. Toxicological information

### Information on toxicological effects

#### Acute toxicity

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| Isobutylene | LC50 Inhalation Vapor | Rat | 550000 mg/m³ | 4 hours |

#### Irritation/Corrosion

Not available.

#### Sensitization

Not available.

#### Mutagenicity

Not available.

#### Carcinogenicity

Not available.

#### Reproductive toxicity

Not available.

#### Teratogenicity

Not available.

#### Specific target organ toxicity (single exposure)

Not available.

#### Specific target organ toxicity (repeated exposure)

Not available.

#### Aspiration hazard

Not available.

# Section 11. Toxicological information

**Information on the likely routes of exposure** : Not available.

## Potential acute health effects

**Eye contact** : No known significant effects or critical hazards.

**Inhalation** : No known significant effects or critical hazards.

**Skin contact** : No known significant effects or critical hazards.

**Ingestion** : As this product is a gas, refer to the inhalation section.

## Symptoms related to the physical, chemical and toxicological characteristics

**Eye contact** : No specific data.

**Inhalation** : No specific data.

**Skin contact** : No specific data.

**Ingestion** : No specific data.

## Delayed and immediate effects and also chronic effects from short and long term exposure

### Short term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

### Long term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

### Potential chronic health effects

Not available.

**General** : No known significant effects or critical hazards.

**Carcinogenicity** : No known significant effects or critical hazards.

**Mutagenicity** : No known significant effects or critical hazards.

**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : No known significant effects or critical hazards.

## Numerical measures of toxicity

### Acute toxicity estimates

Not available.

# Section 12. Ecological information

## Toxicity

Not available.

## Persistence and degradability

Not available.

## Bioaccumulative potential

| Product/ingredient name | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| Isobutylene | 2.34 | - | low |

## Section 12. Ecological information

**Mobility in soil**

**Soil/water partition coefficient ($K_{OC}$)** : Not available.

**Other adverse effects** : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

## Section 14. Transport information

| | DOT | TDG | Mexico | IMDG | IATA |
|---|---|---|---|---|---|
| **UN number** | UN1055 | UN1055 | UN1055 | UN1055 | UN1055 |
| **UN proper shipping name** | ISOBUTYLENE | ISOBUTYLENE | ISOBUTYLENE | ISOBUTYLENE | ISOBUTYLENE |
| **Transport hazard class(es)** | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   |
| **Packing group** | - | - | - | - | - |
| **Environment** | No. | No. | No. | No. | No. |
| **Additional information** | **Limited quantity** Yes.<br><br>**Packaging instruction**<br>**Passenger aircraft** Quantity limitation: Forbidden.<br><br>**Cargo aircraft** Quantity limitation: 150 kg<br><br>**Special provisions** 19, T50 | Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).<br><br>**Explosive Limit and Limited Quantity Index** 0.125<br><br>**ERAP Index** 3000<br><br>**Passenger Carrying Ship Index** Forbidden<br><br>**Passenger Carrying Road or Rail Index** Forbidden<br><br>**Special provisions** 29 | - | - | **Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden<br>**Cargo Aircraft Only** Quantity limitation: 150 kg |

**"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."**

# Section 14. Transport information

**Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** : Not available.

# Section 15. Regulatory information

**U.S. Federal regulations** : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

**United States inventory (TSCA 8b)**: This material is listed or exempted.

**Clean Air Act (CAA) 112 regulated flammable substances**: isobutylene

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Not listed

**Clean Air Act Section 602 Class I Substances** : Not listed

**Clean Air Act Section 602 Class II Substances** : Not listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed

**DEA List II Chemicals (Essential Chemicals)** : Not listed

## SARA 302/304

### Composition/information on ingredients

No products were found.

**SARA 304 RQ** : Not applicable.

## SARA 311/312

**Classification** : Fire hazard
Sudden release of pressure

### Composition/information on ingredients

| Name | % | Fire hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|---|---|---|---|---|---|---|
| Isobutylene | 100 | Yes. | Yes. | No. | No. | No. |

## State regulations

**Massachusetts** : This material is listed.

**New York** : This material is not listed.

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

## International regulations

### International lists

### National inventory

**Australia** : This material is listed or exempted.

**Canada** : This material is listed or exempted.

**China** : This material is listed or exempted.

**Europe** : This material is listed or exempted.

**Japan** : This material is listed or exempted.

**Malaysia** : Not determined.

# Section 15. Regulatory information

**New Zealand** : This material is listed or exempted.

**Philippines** : This material is listed or exempted.

**Republic of Korea** : This material is listed or exempted.

**Taiwan** : This material is listed or exempted.

## Canada

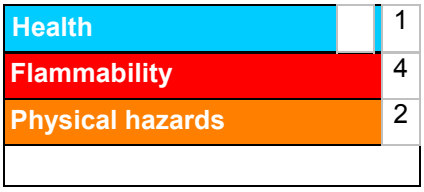
**WHMIS (Canada)** : Class A: Compressed gas.
Class B-1: Flammable gas.

**CEPA Toxic substances**: This material is not listed.
**Canadian ARET**: This material is not listed.
**Canadian NPRI**: This material is listed.
**Alberta Designated Substances**: This material is not listed.
**Ontario Designated Substances**: This material is not listed.
**Quebec Designated Substances**: This material is not listed.

# Section 16. Other information

**Canada Label requirements** : Class A: Compressed gas.
Class B-1: Flammable gas.

## Hazardous Material Information System (U.S.A.)




**Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.**

**The customer is responsible for determining the PPE code for this material.**

## National Fire Protection Association (U.S.A.)




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**Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.**

## Procedure used to derive the classification

| Classification | Justification |
|---|---|
| Flam. Gas 1, H220<br>Press. Gas Liq. Gas, H280 | Expert judgment<br>Expert judgment |

## History

**Date of printing** : 7/11/2016

**Date of issue/Date of revision** : 7/11/2016

**Date of previous issue** : No previous validation

# Section 16. Other information

**Version** : 0.01

**Key to abbreviations** : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

**References** : Not available.

**Indicates information that has changed from previously issued version.**

## Notice to reader

**To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.**
**Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.**

Fisher Scientific

Part of Thermo Fisher Scientific

# SAFETY DATA SHEET

**Creation Date** 12-Sep-2014 **Revision Date** 12-Dec-2014 **Revision Number** 1

## 1. Identification

**Product Name** **Lead**

**Cat No. :** **L27-1RL**

**Synonyms** Lead metal.

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Emergency Telephone Number**
Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

## 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Acute oral toxicity | Category 4 |
| Acute Inhalation Toxicity - Dusts and Mists | Category 4 |
| Carcinogenicity | Category 1B |
| Reproductive Toxicity | Category 1A |
| Specific target organ toxicity (single exposure) Target Organs - Central nervous system (CNS). | Category 3 |
| Specific target organ toxicity - (repeated exposure) Target Organs - Kidney, Blood. | Category 2 |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Harmful if swallowed
Harmful if inhaled
May cause drowsiness or dizziness
May cause cancer
May damage the unborn child. Suspected of damaging fertility
May cause damage to organs through prolonged or repeated exposure



**Precautionary Statements**
**Prevention**
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
**Response**
IF exposed or concerned: Get medical attention/advice
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Ingestion**
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Very toxic to aquatic life with long lasting effects
**Other hazards**
WARNING! This product contains a chemical known in the State of California to cause cancer. WARNING! This product contains a chemical known in the State of California to cause birth defects or other reproductive harm.

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Lead | 7439-92-1 | > 99 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes.

**Inhalation** Move to fresh air.

**Ingestion** Do not induce vomiting.

**Most important symptoms/effects** No information available.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Unsuitable Extinguishing Media** No information available

**Flash Point** No information available

**Method -** No information available

**Autoignition Temperature** No information available
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Keep product and empty container away from heat and sources of ignition.

**Hazardous Combustion Products**
None known
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 0 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment.
**Environmental Precautions** See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** No information available.

## 7. Handling and storage

**Handling** Wear personal protective equipment. Ensure adequate ventilation.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Lead | TWA: 0.05 mg/m³ | TWA: 50 µg/m³ | IDLH: 100 mg/m³<br>TWA: 0.050 mg/m³ |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Lead | TWA: 0.05 mg/m³ | TWA: 0.15 mg/m³ | TWA: 0.05 mg/m³ |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*
*OSHA - Occupational Safety and Health Administration*
*NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health*

**Engineering Measures** Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal Protective Equipment**
**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

| | |
|---|---|
| **Respiratory Protection** | Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced. |
| **Hygiene Measures** | Handle in accordance with good industrial hygiene and safety practice. |

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | Light blue |
| **Odor** | Odorless |
| **Odor Threshold** | No information available |
| **pH** | Not applicable |
| **Melting Point/Range** | 327.4 °C / 621.3 °F |
| **Boiling Point/Range** | 1740 °C / 3164 °F |
| **Flash Point** | No information available |
| **Evaporation Rate** | No information available |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 1.3 mmHg @ 970 °C |
| **Vapor Density** | No information available |
| **Relative Density** | 11.3 |
| **Solubility** | Insoluble in water |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | No information available |
| **Viscosity** | No information available |
| **Molecular Formula** | Pb |
| **Molecular Weight** | 207.19 |

## 10. Stability and reactivity

| | |
|---|---|
| **Reactive Hazard** | None known, based on information available |
| **Stability** | Stable under normal conditions. |
| **Conditions to Avoid** | Incompatible products. |
| **Incompatible Materials** | Strong oxidizing agents |
| **Hazardous Decomposition Products** | None under normal use conditions |
| **Hazardous Polymerization** | Hazardous polymerization does not occur. |
| **Hazardous Reactions** | None under normal processing. |

## 11. Toxicological information

**Acute Toxicity**

**Component Information**

| | |
|---|---|
| **Toxicologically Synergistic Products** | No information available |

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

| | |
|---|---|
| **Irritation** | No information available |
| **Sensitization** | No information available |
| **Carcinogenicity** | The table below indicates whether each agency has listed any ingredient as a carcinogen. |

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Lead | 7439-92-1 | Group 2B | Reasonably Anticipated | A3 | X | A3 |

*IARC: (International Agency for Research on Cancer)*

*NTP: (National Toxicity Program)*

*ACGIH: (American Conference of Governmental Industrial Hygienists)*

*Mexico - Occupational Exposure Limits - Carcinogens*

*IARC: (International Agency for Research on Cancer)*
*Group 1 - Carcinogenic to Humans*
*Group 2A - Probably Carcinogenic to Humans*
*Group 2B - Possibly Carcinogenic to Humans*

*NTP: (National Toxicity Program)*
*Known - Known Carcinogen*
*Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*

*A1 - Known Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Animal Carcinogen*
*ACGIH: (American Conference of Governmental Industrial Hygienists)*

*Mexico - Occupational Exposure Limits - Carcinogens*
*A1 - Confirmed Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Confirmed Animal Carcinogen*
*A4 - Not Classifiable as a Human Carcinogen*
*A5 - Not Suspected as a Human Carcinogen*

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Central nervous system (CNS)
**STOT - repeated exposure** Kidney Blood

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** No information available

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** The toxicological properties have not been fully investigated.

## 12. Ecological information

(Bad file name)

**Ecotoxicity**

.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| Lead | Not listed | 1.32 mg/L LC50 96 h 1.17 mg/L LC50 96 h 0.44 mg/L LC50 96 h | Not listed | 600 µg/L EC50 = 48 h |

**Persistence and Degradability** No information available

**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

**DOT** Not regulated
**TDG** Not regulated
**IATA** Not regulated
**IMDG/IMO** Not regulated

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lead | X | X | - | 231-100-4 | - | | X | X | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313**

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---|---|---|---|
| Lead | 7439-92-1 | > 99 | 0.1 |

**SARA 311/312 Hazardous Categorization**

**Acute Health Hazard** Yes
**Chronic Health Hazard** Yes
**Fire Hazard** No
**Sudden Release of Pressure Hazard** No
**Reactive Hazard** No

**Clean Water Act**

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|---|---|---|---|---|
| Lead | - | - | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Lead | X | | - |

**OSHA** Occupational Safety and Health Administration
Not applicable

| Component | Specifically Regulated Chemicals | Highly Hazardous Chemicals |
|---|---|---|
| Lead | 30 µg/m³ Action Level<br>50 µg/m³ TWA | - |

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Lead | 10 lb | - |

**California Proposition 65** This product contains the following Proposition 65 chemicals:

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Lead | 7439-92-1 | Carcinogen<br>Developmental<br>Female Reproductive<br>Male Reproductive | 15 µg/day | Developmental<br>Carcinogen |

**State Right-to-Know**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Lead | X | X | X | X | X |

**U.S. Department of Transportation**

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**
**This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR**

**WHMIS Hazard Class** D2A Very toxic materials
D1B Toxic materials



## 16. Other information

**Prepared By** Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Creation Date** 12-Sep-2014
**Revision Date** 12-Dec-2014
**Print Date** 12-Dec-2014
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**

**The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.**

## End of SDS

# SAFETY DATA SHEET

**Creation Date** 17-Jan-2011 **Revision Date** 03-Aug-2015 **Revision Number** 3

## 1. Identification

**Product Name** **Magnesium**

**Cat No. :** **AC191080000; AC191080025; AC191080100; AC191085000**

**Synonyms** Magnesium metal (ribbons/turnings)

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

## 2. Hazard(s) identification

**Classification**
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Flammable solids | Category 1 |
| Self-heating substances and mixtures | Category 2 |
| Substances/mixtures which, in contact with water, emit flammable gases | Category 2 |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Flammable solid
Self-heating in large quantities; may catch fire
In contact with water releases flammable gas



**Precautionary Statements**
**Prevention**
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool. Protect from sunlight
Keep away from any possible contact with water, because of violent reaction and possible flash fire
Handle under inert gas. Protect from moisture
**Skin**
Brush off loose particles from skin. Immerse in cool water/wrap with wet bandages
**Fire**
In case of fire: Use CO2, dry chemical, or foam for extinction
**Storage**
Maintain air gap between stacks/pallets
Store away from other materials
Store in a dry place. Store in a closed container
Store bulk masses at temperatures not exceeding manufacturer recommendations
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
May form combustible dust concentrations in air

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Magnesium | 7439-95-4 | >95 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Remove from exposure, lie down. Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration.

**Ingestion** Do not induce vomiting. Get medical attention.

**Most important symptoms/effects** No information available.
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Dry chemical. approved class D extinguishers. clay. sodium carbonate. Do not use a solid water stream as it may scatter and spread fire.

**Unsuitable Extinguishing Media** No information available

**Flash Point** 500 °C / 932 °F
**Method -** No information available

**Autoignition Temperature** 472.8 °C / 883 °F
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available

**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Dust can form an explosive mixture in air. Water reactive. Produce flammable gases on contact with water. Flammable.

**Hazardous Combustion Products**
Magnesium oxides
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 0 | 4 | 2 | W |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Remove all sources of ignition.

**Environmental Precautions** See Section 12 for additional ecological information.

**Methods for Containment and Clean Up** Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation. Remove all sources of ignition. Ground and bond containers when transferring material. Use spark-proof tools and explosion-proof equipment.

## 7. Handling and storage

**Handling** Avoid contact with skin and eyes. Do not breathe dust. Use explosion-proof equipment. Use only non-sparking tools. Wash hands before breaks and immediately after handling the product. Ensure adequate ventilation. Wear personal protective equipment. Avoid dust formation.

**Storage** Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition. Never allow product to get in contact with water during storage. Store under an inert atmosphere.

## 8. Exposure controls / personal protection

**Exposure Guidelines** This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

**Engineering Measures** Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | Silver |
| **Odor** | Odorless |
| **Odor Threshold** | No information available |
| **pH** | 7 |
| **Melting Point/Range** | 651 °C / 1203.8 °F |
| **Boiling Point/Range** | 1107 °C / 2024.6 °F |
| **Flash Point** | 500 °C / 932 °F |
| **Evaporation Rate** | Not applicable |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | negligible |
| **Vapor Density** | Not applicable |
| **Specific Gravity** | No information available |
| **Solubility** | No information available |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | 472.8 °C / 883 °F |
| **Decomposition Temperature** | No information available |
| **Viscosity** | Not applicable |
| **Molecular Formula** | Mg |
| **Molecular Weight** | 24.3 |

## 10. Stability and reactivity

**Reactive Hazard** Yes

**Stability** Stable under normal conditions. Air sensitive. Water reactive.

**Conditions to Avoid** Protect from water. Exposure to air. Incompatible products. Exposure to moist air or water.

**Incompatible Materials** Acids, Strong oxidizing agents, Halogens, Acid chlorides

**Hazardous Decomposition Products** Magnesium oxides

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Magnesium | 230 mg/kg ( Rat ) | Not listed | Not listed |

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** May cause irritation

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Magnesium | 7439-95-4 | Not listed | Not listed | Not listed | Not listed | Not listed |

| | |
|---|---|
| **Mutagenic Effects** | No information available |
| **Reproductive Effects** | No information available. |
| **Developmental Effects** | No information available. |
| **Teratogenicity** | No information available. |
| **STOT - single exposure** | None known |
| **STOT - repeated exposure** | None known |
| **Aspiration hazard** | No information available |
| **Symptoms / effects,both acute and delayed** | No information available |
| **Endocrine Disruptor Information** | No information available |
| **Other Adverse Effects** | See actual entry in RTECS for complete information. |

## 12. Ecological information

**Ecotoxicity**

Do not empty into drains.

| | |
|---|---|
| **Persistence and Degradability** | Insoluble in water |
| **Bioaccumulation/ Accumulation** | No information available. |
| **Mobility** | Is not likely mobile in the environment due its low water solubility. |

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

**DOT**

| | |
|---|---|
| **UN-No** | UN1869 |
| **Proper Shipping Name** | MAGNESIUM |
| **Hazard Class** | 4.1 |
| **Packing Group** | III |

**TDG**

| | |
|---|---|
| **UN-No** | UN1869 |
| **Proper Shipping Name** | MAGNESIUM |
| **Hazard Class** | 4.1 |
| **Packing Group** | III |

**IATA**

| | |
|---|---|
| **UN-No** | UN1869 |
| **Proper Shipping Name** | MAGNESIUM |
| **Hazard Class** | 4.1 |
| **Packing Group** | III |

**IMDG/IMO**

| | |
|---|---|
| **UN-No** | UN1869 |
| **Proper Shipping Name** | MAGNESIUM |
| **Hazard Class** | 4.1 |
| **Packing Group** | III |

## 15. Regulatory information

**All of the components in the product are on the following Inventory lists:** X = listed

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Magnesium | X | X | - | 231-104-6 | - | | X | - | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313** Not applicable

**SARA 311/312 Hazardous Categorization**

| | |
|---|---|
| **Acute Health Hazard** | No |
| **Chronic Health Hazard** | No |
| **Fire Hazard** | Yes |
| **Sudden Release of Pressure Hazard** | No |
| **Reactive Hazard** | Yes |

**Clean Water Act** Not applicable

**Clean Air Act** Not applicable

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**
Not applicable

**California Proposition 65** This product does not contain any Proposition 65 chemicals

**State Right-to-Know**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Magnesium | X | X | X | - | X |

**U.S. Department of Transportation**

| | |
|---|---|
| Reportable Quantity (RQ): | N |
| DOT Marine Pollutant | N |
| DOT Severe Marine Pollutant | N |

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**

**This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR**

| | |
|---|---|
| **WHMIS Hazard Class** | B6 Reactive flammable material<br>B4 Flammable solid<br>F Dangerously reactive material |



## 16. Other information

| | |
|---|---|
| **Prepared By** | Regulatory Affairs<br>Thermo Fisher Scientific<br>Email: EMSDS.RA@thermofisher.com |
| **Creation Date** | 17-Jan-2011 |
| **Revision Date** | 03-Aug-2015 |
| **Print Date** | 03-Aug-2015 |
| **Revision Summary** | This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) |

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**End of SDS**

# SAFETY DATA SHEET

Version 4.6
Revision Date 10/09/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Manganese

Product Number : 266167
Brand : Aldrich

CAS-No. : 7439-96-5

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram none

Signal word none

Hazard statement(s)
H401 Toxic to aquatic life.

Precautionary statement(s)
P273 Avoid release to the environment.
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Formula : Mn
Molecular weight : 54.94 g/mol
CAS-No. : 7439-96-5
EC-No. : 231-105-1

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Manganese** | | |
| | Aquatic Acute 2; H401 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

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

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

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

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed
No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### 5.2 Special hazards arising from the substance or mixture
Manganese/manganese oxides

### 5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information
No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

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

### 6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections
For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

**7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.

Moisture sensitive. Handle and store under inert gas.
Storage class (TRGS 510): Non Combustible Solids

**7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Manganese | 7439-96-5 | TWA | 0.200000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Central Nervous System impairment<br>Adopted values or notations enclosed are those for which changes are proposed in the NIC<br>See Notice of Intended Changes (NIC) | | |
| | | C | 5 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Ceiling limit is to be determined from breathing-zone air samples. | | |
| | | C | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Ceiling limit is to be determined from breathing-zone air samples. | | |
| | | TWA | 1.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | ST | 3.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 1.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | ST | 3.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | C | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | Ceiling limit is to be determined from breathing-zone air samples. | | |
| | | TWA | 1.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | ST | 3.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 0.200000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>Adopted values or notations enclosed are those for which changes are proposed in the NIC<br>See Notice of Intended Changes (NIC)<br>varies | | |
| | | TWA | 0.100000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>2015 Adoption<br>varies | | |

| | | | | |
|---|---|---|---|---|
| | | TWA | 0.020000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>2015 Adoption<br>varies | | |
| | | TWA | 0.1 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>varies | | |
| | | TWA | 0.02 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Central Nervous System impairment<br>varies | | |

### 8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Body Protection**
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: chips<br>Colour: grey, brown, silver |
| b) | Odour | odourless |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 1,244 °C (2,271 °F) - lit. |
| f) | Initial boiling point and boiling range | 1,962 °C (3,564 °F) - lit. |
| g) | Flash point | Not applicable |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |

| | | |
|---|---|---|
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | No data available |
| l) | Vapour density | No data available |
| m) | Relative density | 7.3 g/mL at 25 °C (77 °F) |
| n) | Water solubility | 0.0007 g/l at 20 °C (68 °F) - slightly soluble |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

**9.2 Other safety information**
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
No data available

**10.4 Conditions to avoid**
Avoid moisture.

**10.5 Incompatible materials**
acids, Halogens, Bases, Phosphorus, Sulphur oxides, Hydrogen peroxide, Oxidizing agents, Nitric acid, Sodium Hydroxide, Carbon dioxide ($CO_2$), Nitryl Flouride, Steam

**10.6 Hazardous decomposition products**
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
LD50 Oral - Rat - female - > 2,000 mg/kg
(OECD Test Guideline 420)

LC50 Inhalation - Rat - male and female - 4 h - > 5.14 mg/l
(OECD Test Guideline 403)

Dermal: No data available

No data available

**Skin corrosion/irritation**
Skin - Rabbit
Result: No skin irritation
(OECD Test Guideline 404)

**Serious eye damage/eye irritation**
Eyes - Rabbit
Result: No eye irritation - 72 h
(OECD Test Guideline 405)

**Respiratory or skin sensitisation**
- Mouse
Result: Does not cause skin sensitisation.
(OECD Test Guideline 429)

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: Not available

Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | semi-static test NOEC - Oncorhynchus mykiss (rainbow trout) - 3.6 mg/l - 96 h<br>(OECD Test Guideline 203) |
| Toxicity to daphnia and other aquatic invertebrates | Immobilization NOEC - Daphnia magna (Water flea) - 1.6 mg/l - 48 h<br>(OECD Test Guideline 202) |
| Toxicity to algae | Growth inhibition EC50 - Desmodesmus subspicatus (Scenedesmus subspicatus) - 4.5 mg/l - 72 h<br>(OECD Test Guideline 201) |
| Toxicity to bacteria | Respiration inhibition EC50 - Sludge Treatment - 1,000 mg/l - 3 h<br>(OECD Test Guideline 209) |

**12.2 Persistence and degradability**
No data available

**12.3 Bioaccumulative potential**
No data available

**12.4 Mobility in soil**
No data available

**12.5 Results of PBT and vPvB assessment**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Other adverse effects**
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

## 13. DISPOSAL CONSIDERATIONS

**13.1 Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
Not dangerous goods

**IMDG**
Not dangerous goods

**IATA**
Not dangerous goods

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| Manganese | 7439-96-5 | 2007-07-01 |

**SARA 311/312 Hazards**
Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Manganese | 7439-96-5 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Manganese | 7439-96-5 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Manganese | 7439-96-5 | 2007-07-01 |

**California Prop. 65 Components**
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Aquatic Acute | Acute aquatic toxicity |
| H401 | Toxic to aquatic life. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.6 Revision Date: 10/09/2015 Print Date: 05/01/2016

# Safety Data Sheet
# Mercury (Metallic)

**SDS Revision Date:** **05/01/2015**

## 1. Identification

**1.1. Product identifier**

| | |
|---|---|
| **Product Identity** | Mercury (Metallic) |
| **Alternate Names** | Quicksilver; Hydrargyrum; Liquid Silver |

**1.2. Relevant identified uses of the substance or mixture and uses advised against**

| | |
|---|---|
| **Intended use** | See Technical Data Sheet. |
| **Application Method** | See Technical Data Sheet. |

**1.3. Details of the supplier of the safety data sheet**

| | |
|---|---|
| **Company Name** | WM Mercury Waste Inc.<br>21211 Durand Avenue<br>Union Grove, WI 53182 |
| **Emergency** | |
| **CHEMTREC (USA)** | (800) 424-9300 |
| **Customer Service: WM Mercury Waste Inc.** | (800) 741-3343 |

## 2. Hazard(s) identification

**2.1. Classification of the substance or mixture**

| | |
|---|---|
| Acute Tox. 2;H330 | Fatal if inhaled. |
| Repr. 1B;H360D | May damage the unborn child. |
| STOT RE 1;H372 | Causes damage to organs through prolonged or repeated exposure. Specific Target Organs: (Central Nervous System) |
| Aquatic Chronic 1;H410 | Very toxic to aquatic life with long lasting effects. |

**2.2. Label elements**

Using the Toxicity Data listed in section 11 and 12 the product is labeled as follows.



**Danger**

H330 Fatal if inhaled.

H360D May damage the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure.

H410 Very toxic to aquatic life with long lasting effects.

**SDS Revision Date:** **05/01/2015**

**[Prevention]:**

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P260 Do not breathe mist / vapors / spray.

P264 Wash thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P271 Use only outdoors or in a well-ventilated area.

P273 Avoid release to the environment.

P281 Use personal protective equipment as required.

P284 Wear respiratory protection.

**[Response]:**

P304+340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P308+313 IF exposed or concerned: Get medical advice / attention.

P310 Immediately call a POISON CENTER or doctor / physician.

P314 Get Medical advice / attention if you feel unwell.

P320 Specific treatment is urgent (see information on this label).

P391 Collect spillage.

**[Storage]:**

P403+233 Store in a well ventilated place. Keep container tightly closed.

P405 Store locked up.

**[Disposal]:**

P501 Dispose of contents / container in accordance with local / national regulations.

## 3. Composition/information on ingredients

This product contains the following substances that present a hazard within the meaning of the relevant State and Federal Hazardous Substances regulations.

| Ingredient/Chemical Designations | Weight % | GHS Classification | Notes |
|---|---|---|---|
| **Mercury**<br>**CAS Number: 0007439-97-6** | **100** | **Repr. 1B;H360D**<br>**Acute tox. 2;H330**<br>**STOT RE 1;H372**<br>**Aquatic Acute 1;H400**<br>**Aquatic Chronic 1;H410** | **[1][2]** |

In accordance with paragraph (i) of §1910.1200, the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

[1] Substance classified with a health or environmental hazard.

[2] Substance with a workplace exposure limit.

[3] PBT-substance or vPvB-substance.

*The full texts of the phrases are shown in Section 16.

# 4. First aid measures

### 4.1. Description of first aid measures

**General** In all cases of doubt, or when symptoms persist, seek medical attention.
Never give anything by mouth to an unconscious person.

**Inhalation** Remove to fresh air, keep patient warm and at rest. If breathing is irregular or stopped, give artificial respiration. If unconscious place in the recovery position and obtain immediate medical attention. Give nothing by mouth.

**Eyes** Irrigate copiously with clean water for at least 15 minutes, holding the eyelids apart and seek medical attention.

**Skin** Remove contaminated clothing. Wash skin thoroughly with soap and water or use a recognized skin cleanser.

**Ingestion** If swallowed, wash out mouth with water, obtain immediate medical attention. Keep at rest. Do NOT induce vomiting.

### 4.2. Most important symptoms and effects, both acute and delayed

**Overview** **Eye:** Contact with eyes may cause severe irritation, and possible eye burns. Vapors may cause eye irritation.
**Skin:** May cause skin irritation. May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.
**Ingestion:** May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause effects similar to those for inhalation exposure.
**Inhalation:** Causes respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. May cause severe respiratory tract irritation.
**Chronic:** Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.

**Notes to Physician:** Treat symptomatically and supportively.
**Antidote:** The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel. The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. See section 2 for further details.

**Inhalation** Fatal if inhaled.

# 5. Fire-fighting measures

### 5.1. Extinguishing media

Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

### 5.2. Special hazards arising from the substance or mixture

Hazardous decomposition: Mercury/mercury oxides.

Do not breathe mist / vapors / spray.

### 5.3. Advice for fire-fighters

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Combustion generates toxic fumes.

**ERG Guide No.** 172

## 6. Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Put on appropriate personal protective equipment (see section 8).

### 6.2. Environmental precautions

Do not allow spills to enter drains or waterways.

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

### 6.3. Methods and material for containment and cleaning up

Vacuum or sweep up material and place into a suitable disposal container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section).

## 7. Handling and storage

### 7.1. Precautions for safe handling

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid breathing dust, vapor, mist, or gas. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

See section 2 for further details. - [Prevention]:

### 7.2. Conditions for safe storage, including any incompatibilities

Handle containers carefully to prevent damage and spillage.

Incompatible materials: Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Poison room locked.

See section 2 for further details. - [Storage]:

### 7.3. Specific end use(s)

No data available.

**SDS Revision Date:** **05/01/2015**

# 8. Exposure controls and personal protection

### 8.1. Control parameters

**Exposure**

| CAS No. | Ingredient | Source | Value |
|---|---|---|---|
| 0007439-97-6 | Mercury | OSHA | TWA 0.1 mg/m3 |
| | | ACGIH | Alkyl compounds TWA: 0.01 mg/m3 STEL 0.03 mg/m3 Skin<br>Aryl compounds TWA: 0.05 mg/m3 C 0.1 mg/m3 Skin<br>Elemental/Inorganic 0.025mg/m3 Skin |
| | | NIOSH | No Established Limit |
| | | Supplier | No Established Limit |

**Carcinogen Data**

| CAS No. | Ingredient | Source | Value |
|---|---|---|---|
| 0007439-97-6 | Mercury | OSHA | Select Carcinogen: No |
| | | NTP | Known: No; Suspected: No |
| | | IARC | Group 1: No; Group 2a: No; Group 2b: No; Group 3: Yes; Group 4: No; |

### 8.2. Exposure controls

**Respiratory** Follow the OSHA respirator regulations found in 29CFR §1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**Eyes** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin** Wear appropriate protective clothing to prevent skin exposure. Wear appropriate gloves to prevent skin exposure.

**Engineering Controls** Provide adequate ventilation. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and any vapor below occupational exposure limits suitable respiratory protection must be worn.

**Other Work Practices** Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

See section 2 for further details. - [Prevention]:

# 9. Physical and chemical properties

| | |
|---|---|
| **Appearance** | Silver Liquid |
| **Odor** | Odorless |
| **Odor threshold** | Not Measured |
| **pH** | Not Applicable |
| **Melting point / freezing point** | -38.87 deg C |

**SDS Revision Date:** **05/01/2015**

| | |
|---|---|
| **Initial boiling point and boiling range** | 356.5 deg C @ 760.00mmHg |
| **Flash Point** | Not Measured |
| **Evaporation rate (Ether = 1)** | Not Available |
| **Flammability (solid, gas)** | Not Applicable |
| **Upper/lower flammability or explosive limits** | **Lower Explosive Limit:** Not Measured<br>**Upper Explosive Limit:** Not Measured |
| **Vapor pressure (Pa)** | 0.002 mmHg @ 25C |
| **Vapor Density** | 7 (Air=1) |
| **Specific Gravity** | 13.5400g/cm3 (Water=1) |
| **Solubility in Water** | Insoluble |
| **Partition coefficient n-octanol/water (Log Kow)** | Not Measured |
| **Auto-ignition temperature** | Not Measured |
| **Decomposition temperature** | Not Available |
| **Viscosity (cSt)** | 1.554 cP 20.00 |
| **Molecular Formula** | Hg |
| **Molecular Weight** | 200.59 |

**9.2. Other information**

No other relevant information.

## 10. Stability and reactivity

**10.1. Reactivity**

Hazardous Polymerization will not occur.

**10.2. Chemical stability**

Stable under normal circumstances.

**10.3. Possibility of hazardous reactions**

No data available.

**10.4. Conditions to avoid**

High temperatures, incompatible materials, metals.

**10.5. Incompatible materials**

Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

**10.6. Hazardous decomposition products**

Mercury/mercury oxides.

## 11. Toxicological information

**Acute toxicity**

| Ingredient | Oral LD50, mg/kg | Skin LD50, mg/kg | Inhalation Vapor LC50, mg/L/4hr | Inhalation Dust/Mist LC50, mg/L/4hr | Inhalation Gas LC50, ppm |
|---|---|---|---|---|---|

**SDS Revision Date:** **05/01/2015**

| | | | | | |
|---|---|---|---|---|---|
| Mercury - (7439-97-6) | 37.00, Rat - Category: 2 | No data available | No data available | No data available | No data available |

Note: When no route specific LD50 data is available for an acute toxin, the converted acute toxicity point estimate was used in the calculation of the product's ATE (Acute Toxicity Estimate).

| Classification | Category | Hazard Description |
|---|---|---|
| Acute toxicity (oral) | 2 | Fatal if swallowed. |
| Acute toxicity (dermal) | --- | Not Applicable |
| Acute toxicity (inhalation) | 2 | Fatal if inhaled. |
| Skin corrosion/irritation | --- | Not Applicable |
| Serious eye damage/irritation | --- | Not Applicable |
| Respiratory sensitization | --- | Not Applicable |
| Skin sensitization | --- | Not Applicable |
| Germ cell mutagenicity | --- | Not Applicable |
| Carcinogenicity | --- | Not Applicable |
| Reproductive toxicity | 1B | May damage the unborn child. |
| STOT-single exposure | --- | Not Applicable |
| STOT-repeated exposure | 1 | Causes damage to organs through prolonged or repeated exposure. |
| Aspiration hazard | --- | Not Applicable |

## 12. Ecological information

### 12.1. Toxicity

Very toxic to aquatic life with long lasting effects.

No additional information provided for this product. See Section 3 for chemical specific data.

**Aquatic Ecotoxicity**

| Ingredient | 96 hr LC50 fish, mg/l | 48 hr EC50 crustacea, mg/l | ErC50 algae, mg/l |
|---|---|---|---|
| Mercury - (7439-97-6) | Not Available | 0.0052, Daphnia magna | Not Available |

### 12.2. Persistence and degradability

There is no data available on the preparation itself.

### 12.3. Bioaccumulative potential

Not Measured

### 12.4. Mobility in soil

No data available.

### 12.5. Results of PBT and vPvB assessment

**SDS Revision Date:** **05/01/2015**

This product contains no PBT/vPvB chemicals.

**12.6. Other adverse effects**

No data available.

## 13. Disposal considerations

**13.1. Waste treatment methods**

Observe all federal, state and local regulations when disposing of this substance.

## 14. Transport information

| | DOT (Domestic Surface Transportation) | IMO / IMDG (Ocean Transportation) | ICAO/IATA |
|---|---|---|---|
| **14.1. UN number** | UN2809 | UN2809 | UN2809 |
| **14.2. UN proper shipping name** | UN2809, Mercury, 8, III | Mercury | Mercury |
| **14.3. Transport hazard class(es)** | **DOT Hazard Class:** 8 (6.1) | **IMDG:** 8<br>**Sub Class:** 6.1 | **Air Class:** 8 |
| **14.4. Packing group** | III | III | III |

**14.5. Environmental hazards**

**IMDG** Marine Pollutant: Yes ( Mercury )

**14.6. Special precautions for user**

No further information

## 15. Regulatory information

**Regulatory Overview** The regulatory data in Section 15 is not intended to be all-inclusive, only selected regulations are represented.

**Toxic Substance Control Act ( TSCA)** All components of this material are either listed or exempt from listing on the TSCA Inventory.

**WHMIS Classification** D1A

**US EPA Tier II Hazards**

**Fire:** No
**Sudden Release of Pressure:** No
**Reactive:** No
**Immediate (Acute):** Yes
**Delayed (Chronic):** Yes

**EPCRA 311/312 Chemicals and RQs (lbs):**

Mercury ( 1.00)

**EPCRA 302 Extremely Hazardous:**

To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

**SDS Revision Date:** **05/01/2015**

**EPCRA 313 Toxic Chemicals:**

Mercury

**Proposition 65 - Carcinogens (>0.0%):**
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

**Proposition 65 - Developmental Toxins (>0.0%):**
Mercury

**Proposition 65 - Female Repro Toxins (>0.0%):**
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

**Proposition 65 - Male Repro Toxins (>0.0%):**
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

**New Jersey RTK Substances (>1%):**

Mercury

**Pennsylvania RTK Substances (>1%):**

Mercury

## 16. Other information

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is:

H330 Fatal if inhaled.

H360D May damage the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure.

H400 Very toxic to aquatic life.

H410 Very toxic to aquatic life with long lasting effects.

**This is the first version in the GHS SDS format. Listings of changes from previous versions in other formats are not applicable.**

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall WM Mercury Waste Inc. be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages.

End of Document

# Safety Data Sheet

**Material Name: Hess 10W30 Motor Oil**

**SDS No. 8957**
**US GHS**

**Synonyms:** Valvoline Product Code 52670413

## * * * Section 1 - Product and Company Identification * * *

**Manufacturer Information**

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

## * * * Section 2 - Hazards Identification * * *

### GHS Classification:

Skin Corrosion/Irritation – Category 2
Specific Target Organ Toxicity – Category 3 (narcosis)
Carcinogenicity - Category 1B

### GHS LABEL ELEMENTS

### Symbol(s)



### Signal Word

WARNING

### Hazard Statements

Causes skin irritation.
May cause cancer.
May cause drowsiness or dizziness.

### Precautionary Statements

**Prevention**

Wash hands and forearms thoroughly after handling.
Wear protective gloves/protective clothing/eye protection.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing fume/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.

**Response**

If on skin: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
If exposed or concerned: Get medical advice/attention.
If inhaled: Remove person to fresh air and keep in a position comfortable for breathing. Call poison center or doctor if you feel unwell.

**Storage**

Store locked up.
Store in a well-ventilated place.
Keep container tightly closed.

**Disposal**

Dispose of contents/container in accordance with local/regional/national/international regulations.

## * * * Section 3 - Composition / Information on Ingredients * * *

| CAS # | Component | Percent |
|---|---|---|
| 64742-65-0 | Petroleum distillates, solvent dewaxed heavy paraffinic | 83-93 |

Petroleum-based lubricating oil with detergent/dispersant engine oil package with zinc compounds.

## * * * Section 4 - First Aid Measures * * *

### First Aid: Eyes

If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is visual difficulty, seek medical attention.

### First Aid: Skin

Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

### First Aid: Ingestion

Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

### First Aid: Inhalation

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

### First Aid: Notes to Physician

Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard. Patients who aspirate these oils should be followed for the development of long-term sequelae. Repeated aspiration of mineral oil can produce chronic inflammation of the lungs (i.e. lipoid pneumonia) that may progress to pulmonary fibrosis. Symptoms are often subtle and radiological changes appear worse than clinical abnormalities. Occasionally, persistent cough, irritation of the upper respiratory tract, shortness of breath with exertion, fever, and bloody sputum occur. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities. Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin.

## * * * Section 5 - Fire Fighting Measures * * *

### General Fire Hazards

See Section 9 for Flammability Properties.
Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. No special fire hazards are known to be associated with this product. Dense smoke may be generated while burning.

### Hazardous Combustion Products

May form: carbon dioxide and carbon monoxide, oxides of sulfur, nitrogen and phosphorous, various hydrocarbons.

### Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

### Unsuitable Extinguishing Media

None

### Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

## * * * Section 6 - Accidental Release Measures * * *

### Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

### Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

SMALL SPILL: Absorb liquid on vermiculite, floor absorbent or other absorbent material. Persons not wearing proper personal protective equipment should be excluded from area of spill.

LARGE SPILL: Prevent run-off to sewers, streams, or other bodies of water. If run-off occurs, notify authorities as required, that a spill has occurred. Persons not wearing proper personal protective equipment should be excluded from area of spill until clean-up has been completed.

### Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

### Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

### Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

### Prevention of Secondary Hazards

None

## * * * Section 7 - Handling and Storage * * *

### Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

### Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

### Incompatibilities

Avoid contact with: acids, halogens, strong oxidizing agents.

## * * * Section 8 - Exposure Controls / Personal Protection * * *

### Component Exposure Limits

ACGIH, OSHA, and NIOSH have not developed exposure limits for any of this product's components.

### Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

### Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

### Personal Protective Equipment: Hands

Not normally required. However, wear resistant gloves such as nitrile rubber to prevent irritation which may result from prolonged or repeated skin contact with product.

### Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

### Personal Protective Equipment: Skin and Body

To prevent repeated or prolonged skin contact, wear impervious clothing and boots. Wear normal work clothing covering arms and legs.

### Hygiene Measures

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

## * * * Section 9 - Physical & Chemical Properties * * *

| | | | |
|---|---|---|---|
| **Appearance:** | Dry, clear and bright | **Odor:** | None |
| **Physical State:** | Liquid | **pH:** | ND |
| **Vapor Pressure:** | ND | **Vapor Density:** | ND |
| **Boiling Point:** | >425 °F (218.3°C) @ 760.00 mmHg | **Melting Point:** | ND |
| **Solubility (H2O):** | Negligible | **Specific Gravity:** | 0.881 @ 60°F (16°C) |
| **Evaporation Rate:** | Slower than ethyl ether | **VOC:** | ND |
| **Viscosity:** | <= 3300.0 cps @ -20°C; 10.0 - 11.0 cst @ 100°C | **Octanol/H2O Coeff.:** | ND |
| **Flash Point:** | 430 °F (221.1 °C) | **Flash Point Method:** | COC |
| **Upper Flammability Limit (UFL):** | ND | **Lower Flammability Limit (LFL):** | ND |
| **Burning Rate:** | ND | **Auto Ignition:** | ND |

## * * * Section 10 - Chemical Stability & Reactivity Information * * *

### Chemical Stability

This is a stable material.

### Hazardous Reaction Potential

Will not occur.

### Conditions to Avoid

None

### Incompatible Products

Avoid contact with: acids, halogens, strong oxidizing agents.

### Hazardous Decomposition Products

May form: aldehydes, carbon dioxide and carbon monoxide, hydrogen sulfide, oxides of sulfur, nitrogen and phosphorus, toxic fumes, various hydrocarbons.

## * * * Section 11 - Toxicological Information * * *

### Acute Toxicity

#### A: General Product Information

Harmful if large amounts are swallowed.

#### B: Component Analysis - LD50/LC50

**Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)**

Inhalation LC50 Rat >4.7 mg/L 4 h; Oral LD50 Rat >5000 mg/kg; Dermal LD50 Rabbit >5000 mg/kg

### Potential Health Effects: Skin Corrosion Property/Stimulativeness

May cause mild skin irritation. Prolonged or repeated contact may dry the skin. Symptoms include redness, burning, drying and cracking of the skin, and skin burns. Additional symptoms of skin contact include: acne. Passage of this material into the body through the skin is possible, but it is unlikely that this would result in harmful effects during safe handling and use.

### Potential Health Effects: Eye Critical Damage/ Stimulativeness

May cause mild eye irritation. Symptoms include stinging, tearing, and redness.

### Potential Health Effects: Ingestion

Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

### Potential Health Effects: Inhalation

It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful. Symptoms usually occur at air concentrations higher than the recommended exposure limits.

### Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

### Generative Cell Mutagenicity

This product is not reported to have any mutagenic effects.

### Carcinogenicity

#### A: General Product Information

May cause cancer.

Used motor oil has been shown to cause skin cancer in laboratory animal continually exposed by repeated applications.

#### B: Component Carcinogenicity

None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

### Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

### Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

### Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

### Aspiration Respiratory Organs Hazard

Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard.

## * * * Section 12 - Ecological Information * * *

### Ecotoxicity

#### A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

#### B: Component Analysis - Ecotoxicity - Aquatic Toxicity

**Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)**

| Test & Species | Conditions |
|---|---|
| 96 Hr LC50 Oncorhynchus mykiss | >5000 mg/L |
| 48 Hr EC50 Daphnia magna | >1000 mg/L |

### Persistence/Degradability

No information available.

### Bioaccumulation

No information available.

### Mobility in Soil

No information available.

## * * * Section 13 - Disposal Considerations * * *

### Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

### Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

## * * * Section 14 - Transportation Information * * *

### DOT Information

**Shipping Name:** Not Regulated

## * * * Section 15 - Regulatory Information * * *

### Regulatory Information

**Component Analysis**

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).

**SARA Section 311/312 – Hazard Classes**

| Acute Health | Chronic Health | Fire | Sudden Release of Pressure | Reactive |
|---|---|---|---|---|
| X | X | -- | -- | -- |

**SARA SECTION 313 - SUPPLIER NOTIFICATION**

ZINC C1-C14 ALKYLDITHIOPHOSPHATE (CAS No. 68649-42-3)

**State Regulations**

**Component Analysis - State**

None of this product's components are listed on the state lists from CA, MA, MN, NJ, PA, or RI.

**Component Analysis - WHMIS IDL**

No components are listed in the WHMIS IDL.

**Additional Regulatory Information**

**Component Analysis - Inventory**

| Component | CAS # | TSCA | CAN | EEC |
|---|---|---|---|---|
| Petroleum distillates, solvent dewaxed heavy paraffinic | 64742-65-0 | Yes | DSL | EINECS |

## * * * Section 16 - Other Information * * *

**NFPA® Hazard Rating**

| | |
|---|---|
| Health | 1 |
| Fire | 1 |
| Reactivity | 0 |




**HMIS® Hazard Rating**

| | | |
|---|---|---|
| Health | 1* | Slight |
| Fire | 1 | Slight |
| Physical | 0 | Minimal |
| | | *Chronic |

### Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

### Literature References

None

### Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

# SAFETY DATA SHEET

Version 5.5
Revision Date 05/27/2016
Print Date 07/13/2017

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Methyl *tert*-butyl ether

Product Number : 48027
Brand : Supelco
Index-No. : 603-181-00-X

CAS-No. : 1634-04-4

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H315 Causes skin irritation.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/ eye protection/ face protection.

| | |
|---|---|
| P303 + P361 + P353 | IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower. |
| P332 + P313 | If skin irritation occurs: Get medical advice/ attention. |
| P362 | Take off contaminated clothing and wash before reuse. |
| P370 + P378 | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction. |
| P403 + P235 | Store in a well-ventilated place. Keep cool. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.1 Substances**

Synonyms : MTBE
*tert*-Butyl methyl ether
Methyl *tert*-butyl ether

Formula : $C_5H_{12}O$
Molecular weight : 88.15 g/mol
CAS-No. : 1634-04-4
EC-No. : 216-653-1
Index-No. : 603-181-00-X
Registration number : 01-2119452786-27-XXXX

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **tert-Butyl methyl ether** | | |
| | Flam. Liq. 2; Skin Irrit. 2; H225, H315 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

**4.1 Description of first aid measures**

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

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

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

**In case of eye contact**
Flush eyes with water as a precaution.

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

**4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**
No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### 5.2 Special hazards arising from the substance or mixture
No data available

### 5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information
Use water spray to cool unopened containers.

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

### 6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

### 6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

### 6.4 Reference to other sections
For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): Flammable liquids

### 7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | TWA | 50.000000 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Upper Respiratory Tract irritation<br>Kidney damage<br>Confirmed animal carcinogen with unknown relevance to humans | | |
| | | PEL | 40 ppm<br>144 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

### 8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 230 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Impervious clothing, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

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

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: liquid |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: -108.6 °C (-163.5 °F) |
| f) | Initial boiling point and boiling range | 55 - 56 °C (131 - 133 °F) - lit. |
| g) | Flash point | -33.0 °C (-27.4 °F) - closed cup |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | Upper explosion limit: 15.1 %(V)<br>Lower explosion limit: 1.6 %(V) |
| k) | Vapour pressure | 1,018.7 hPa (764.1 mmHg) at 55.0 °C (131.0 °F)<br>279.2 hPa (209.4 mmHg) at 20.0 °C (68.0 °F) |
| l) | Vapour density | No data available |
| m) | Relative density | 0.74 g/cm3 at 25 °C (77 °F) |

| | | |
|---|---|---|
| n) | Water solubility | 42 g/l at 20 °C (68 °F) - OECD Test Guideline 105 |
| o) | Partition coefficient: n-octanol/water | log Pow: 1.06 |
| p) | Auto-ignition temperature | 374.0 °C (705.2 °F) |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | 0.464 mm2/s at 20 °C (68 °F) - 0.409 mm2/s at 40 °C (104 °F) - |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

**9.2 Other safety information**
No data available

## 10. STABILITY AND REACTIVITY

**10.1 Reactivity**
No data available

**10.2 Chemical stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
Vapours may form explosive mixture with air.

**10.4 Conditions to avoid**
Heat, flames and sparks.

**10.5 Incompatible materials**
Oxidizing agents, Strong acids

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
LD50 Oral - Rat - 4,000 mg/kg

LC50 Inhalation - Rat - 4 h - 23576 ppm

Dermal: No data available

No data available

**Skin corrosion/irritation**
Skin - Rabbit
Result: Skin irritation

**Serious eye damage/eye irritation**
Eyes - Rabbit
Result: No eye irritation

**Respiratory or skin sensitisation**
Will not occur

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**Additional Information**
RTECS: KN5250000

Nausea, Vomiting, Dizziness, Central nervous system depression, Aspiration or inhalation may cause chemical pneumonitis., MTBE (methyl-tert-butyl ether) is reported to metabolize to tert-butyl alcohol and formaldehyde by microsomal demethylation, MTBE (methyl-tert-butyl ether) should be considered a "potential human carcinogen" due to an increase in leydig interstitial cell tumors of testes in male rats and an increase in lymphomas, leukemias, and uterine sarcomas in female rats., In another unpublished study MTBE was shown to be carcinogenic due to "increased incidence of a rare type of kidney tumor" in male rats and an "increase in the incidence of hepatocellular adenomas" in female mice., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | LC50 - Pimephales promelas (fathead minnow) - 672.00 mg/l - 96 h |
| | LC50 - other fish - > 1,000.00 mg/l - 96 h |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 472 mg/l - 48 h |
| Toxicity to algae | EC50 - Pseudokirchneriella subcapitata (green algae) - 491 mg/l - 96 h |

### 12.2 Persistence and degradability

| | |
|---|---|
| Biodegradability | Result: 0 % - Not readily biodegradable.<br>(OECD Test Guideline 301D) |

### 12.3 Bioaccumulative potential
No data available

### 12.4 Mobility in soil
No data available

### 12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

No data available

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

**Product**
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 2398 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: METHYL tert-BUTYL ETHER

**IATA**
UN number: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | 2007-07-01 |

**SARA 311/312 Hazards**
Fire Hazard, Acute Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| tert-Butyl methyl ether | 1634-04-4 | 2007-07-01 |

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Flam. Liq. | Flammable liquids |
| H225 | Highly flammable liquid and vapour. |
| H315 | Causes skin irritation. |
| Skin Irrit. | Skin irritation |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Chronic Health Hazard: | |
| Flammability: | 3 |
| Physical Hazard | 0 |

**NFPA Rating**
Health hazard: 2

| | |
|---|---|
| Fire Hazard: | 3 |
| Reactivity Hazard: | 0 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5 Revision Date: 05/27/2016 Print Date: 07/13/2017

Fisher Scientific

Part of Thermo Fisher Scientific

# SAFETY DATA SHEET

**Creation Date** 27-Sep-2010 **Revision Date** 12-Oct-2015 **Revision Number** 3

## 1. Identification

**Product Name** **Naphthalene**

**Cat No. :** **N7-500**

**Synonyms** Tar camphor; Naphthalin; Coal tar camphor

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Emergency Telephone Number**
Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

## 2. Hazard(s) identification

**Classification**
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Flammable solids | Category 2 |
| Acute oral toxicity | Category 4 |
| Carcinogenicity | Category 1B |
| Target Organs - Liver, Kidney. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Flammable solid
Harmful if swallowed
May cause cancer



**Precautionary Statements**
**Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment

**Response**

IF exposed or concerned: Get medical attention/advice

**Inhalation**

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

**Ingestion**

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth

**Fire**

In case of fire: Use CO2, dry chemical, or foam for extinction

**Storage**

Store locked up
Store in a well-ventilated place. Keep container tightly closed

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Very toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Naphthalene | 91-20-3 | >95 |

## 4. First-aid measures

**General Advice** If symptoms persist, call a physician.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

**Ingestion** Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

**Most important symptoms/effects** . Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

**Unsuitable Extinguishing Media** No information available

**Flash Point** 78 °C / 172.4 °F
**Method -** No information available

| | |
|---|---|
| **Autoignition Temperature** | Not applicable 526 °C / 978.8 °F |
| **Explosion Limits** | |
| **Upper** | 5.9 vol % |
| **Lower** | 0.9 vol % |
| **Sensitivity to Mechanical Impact** | No information available |
| **Sensitivity to Static Discharge** | No information available |

**Specific Hazards Arising from the Chemical**
Combustible material. Containers may explode when heated. Do not allow run-off from fire fighting to enter drains or water courses.

**Hazardous Combustion Products**
Carbon monoxide (CO) Carbon dioxide ($CO_2$)
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 2 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Remove all sources of ignition. Take precautionary measures against static discharges.

**Environmental Precautions** Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

**Methods for Containment and Clean Up** Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal. Remove all sources of ignition.

## 7. Handling and storage

**Handling** Wear personal protective equipment. Ensure adequate ventilation. Avoid ingestion and inhalation. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Naphthalene | TWA: 10 ppm<br>Skin | (Vacated) TWA: 10 ppm<br>(Vacated) TWA: 50 mg/m³<br>(Vacated) STEL: 15 ppm<br>(Vacated) STEL: 75 mg/m³<br>TWA: 10 ppm<br>TWA: 50 mg/m³ | IDLH: 250 ppm<br>TWA: 10 ppm<br>TWA: 50 mg/m³<br>STEL: 15 ppm<br>STEL: 75 mg/m³ |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Naphthalene | TWA: 10 ppm<br>TWA: 52 mg/m³<br>STEL: 15 ppm<br>STEL: 79 mg/m³ | TWA: 10 ppm<br>TWA: 50 mg/m³<br>STEL: 15 ppm<br>STEL: 75 mg/m³ | TWA: 10 ppm<br>STEL: 15 ppm<br>Skin |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*
*OSHA - Occupational Safety and Health Administration*
*NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health*

**Engineering Measures** Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure adequate ventilation, especially in confined areas.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Long sleeved clothing.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Solid |
| **Appearance** | White |
| **Odor** | Characteristic |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | 79 - 82 °C / 174.2 - 179.6 °F |
| **Boiling Point/Range** | 218 °C / 424.4 °F |
| **Flash Point** | 78 °C / 172.4 °F |
| **Evaporation Rate** | Not applicable |
| **Flammability (solid,gas)** | No information available |
| **Flammability or explosive limits** | |
| **Upper** | 5.9 vol % |
| **Lower** | 0.9 vol % |
| **Vapor Pressure** | 0.08 mbar @ 20 °C |
| **Vapor Density** | Not applicable |
| **Specific Gravity** | 0.990 |
| **Solubility** | slightly soluble |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | Not applicable 526 °C / 978.8 °F |
| **Decomposition Temperature** | 540 °C |
| **Viscosity** | Not applicable |
| **Molecular Formula** | C10H8 |
| **Molecular Weight** | 128.17 |

## 10. Stability and reactivity

**Reactive Hazard** Yes

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products. Excess heat. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

**Incompatible Materials** Strong oxidizing agents

**Hazardous Decomposition Products** Carbon monoxide (CO), Carbon dioxide ($CO_2$)

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Naphthalene | LD50 = 490 mg/kg ( Rat )<br>LD50 = 1110 mg/kg ( Rat ) | LD50 > 20 g/kg ( Rabbit )<br>LD50 = 1120 mg/kg ( Rabbit ) | LC50 > 340 mg/m³ ( Rat ) 1 h |

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** No information available

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Naphthalene | 91-20-3 | Group 2B | Reasonably Anticipated | A3 | X | Not listed |

*IARC: (International Agency for Research on Cancer)*

*IARC: (International Agency for Research on Cancer)*
*Group 1 - Carcinogenic to Humans*
*Group 2A - Probably Carcinogenic to Humans*
*Group 2B - Possibly Carcinogenic to Humans*

*NTP: (National Toxicity Program)*

*NTP: (National Toxicity Program)*
*Known - Known Carcinogen*
*Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*

*ACGIH: (American Conference of Governmental Industrial Hygienists)*

*A1 - Known Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Animal Carcinogen*
*ACGIH: (American Conference of Governmental Industrial Hygienists)*

**Mutagenic Effects** Not mutagenic in AMES Test

**Reproductive Effects** Experiments have shown reproductive toxicity effects on laboratory animals.

**Developmental Effects** Developmental effects have occurred in experimental animals.

**Teratogenicity** Teratogenic effects have occurred in experimental animals.

**STOT - single exposure** None known

**STOT - repeated exposure** Liver Kidney

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** Tumorigenic effects have been reported in experimental animals.

## 12. Ecological information

**Ecotoxicity**

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| Naphthalene | EC50: = 0.4 mg/L, 72h (Skeletonema costatum) | LC50 96 h 1-6.5 mg/L (Pimephales promelas) | EC50 = 0.93 mg/L 30 min EC50 > 20 mg/L 18 h | EC50: 1.09 - 3.4 mg/L, 48h Static (Daphnia magna) EC50: = 1.96 mg/L, 48h Flow through (Daphnia magna) LC50: = 2.16 mg/L, 48h (Daphnia magna) |

**Persistence and Degradability** Soluble in water Persistence is unlikely based on information available.
**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Will likely be mobile in the environment due to its water solubility.

| Component | log Pow |
|---|---|
| Naphthalene | 3.3 |

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

| Component | RCRA - U Series Wastes | RCRA - P Series Wastes |
|---|---|---|
| Naphthalene - 91-20-3 | U165 | - |

## 14. Transport information

**DOT**
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

**TDG**
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

**IATA**
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

**IMDG/IMO**
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

## 15. Regulatory information

**All of the components in the product are on the following Inventory lists:** X = listed

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Naphthalene | X | X | - | 202-049-5 | - | | X | X | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**

**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)**

**SARA 313**

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---|---|---|---|
| Naphthalene | 91-20-3 | >95 | 0.1 |

**SARA 311/312 Hazard Categories**

| | |
|---|---|
| **Acute Health Hazard** | Yes |
| **Chronic Health Hazard** | Yes |
| **Fire Hazard** | Yes |
| **Sudden Release of Pressure Hazard** | No |
| **Reactive Hazard** | Yes |

**CWA (Clean Water Act)**

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|---|---|---|---|---|
| Naphthalene | X | 100 lb | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Naphthalene | X | | - |

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Naphthalene | 100 lb 1 lb | - |

**California Proposition 65** This product contains the following proposition 65 chemicals

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Naphthalene | 91-20-3 | Carcinogen | 5.8 µg/day | Carcinogen |

**U.S. State Right-to-Know Regulations**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Naphthalene | X | X | X | X | X |

**U.S. Department of Transportation**

| | |
|---|---|
| Reportable Quantity (RQ): | N |
| DOT Marine Pollutant | N |
| DOT Severe Marine Pollutant | N |

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** Moderate risk, Grade 2

**Canada**
**This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR**

**WHMIS Hazard Class**
B3 Combustible liquid
D1B Toxic materials
D2A Very toxic materials



## 16. Other information

**Prepared By**
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Creation Date** 27-Sep-2010
**Revision Date** 12-Oct-2015
**Print Date** 12-Oct-2015
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**
**The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.**

**End of SDS**

# SAFETY DATA SHEET

Version 4.7
Revision Date 12/28/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Nickel

Product Number : 268259
Brand : Aldrich
Index-No. : 028-002-00-7

CAS-No. : 7440-02-0

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), H372
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H317 May cause an allergic skin reaction.
H351 Suspected of causing cancer.
H372 Causes damage to organs through prolonged or repeated exposure if inhaled.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and

| | |
|---|---|
| | understood. |
| P260 | Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. |
| P264 | Wash skin thoroughly after handling. |
| P270 | Do not eat, drink or smoke when using this product. |
| P272 | Contaminated work clothing should not be allowed out of the workplace. |
| P273 | Avoid release to the environment. |
| P280 | Wear protective gloves/ protective clothing/ eye protection/ face protection. |
| P302 + P352 | IF ON SKIN: Wash with plenty of soap and water. |
| P308 + P313 | IF exposed or concerned: Get medical advice/ attention. |
| P333 + P313 | If skin irritation or rash occurs: Get medical advice/ attention. |
| P363 | Wash contaminated clothing before reuse. |
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

**2.3 Hazards not otherwise classified (HNOC) or not covered by GHS** - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**3.1 Substances**

| | | |
|---|---|---|
| Formula | : | Ni |
| Molecular weight | : | 58.69 g/mol |
| CAS-No. | : | 7440-02-0 |
| EC-No. | : | 231-111-4 |
| Index-No. | : | 028-002-00-7 |

**Hazardous components**

| Component | Classification | Concentration |
|---|---|---|
| **Nickel** | | |
| | Skin Sens. 1; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; H317, H351, H372, H412 | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

**4.1 Description of first aid measures**

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

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

**In case of skin contact**
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

**4.3 Indication of any immediate medical attention and special treatment needed**
No data available

## 5. FIREFIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**5.2 Special hazards arising from the substance or mixture**
Nickel/nickel oxides

**5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

**5.4 Further information**
No data available

## 6. ACCIDENTAL RELEASE MEASURES

**6.1 Personal precautions, protective equipment and emergency procedures**
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

**6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

**6.4 Reference to other sections**
For disposal see section 13.

## 7. HANDLING AND STORAGE

**7.1 Precautions for safe handling**
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

**7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

**7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**8.1 Control parameters**

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Nickel | 7440-02-0 | TWA | 1.500000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | Dermatitis<br>Pneumoconiosis<br>Not suspected as a human carcinogen | | |
| | | TWA | 1.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 0.015000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |

| | | | | |
|---|---|---|---|---|
| | | TWA | 1.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 0.015000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |
| | | TWA | 1.5 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | Dermatitis<br>Pneumoconiosis<br>Not suspected as a human carcinogen | | |
| | | TWA | 1 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 0.015 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | Potential Occupational Carcinogen<br>See Appendix A | | |

## 8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: Foil<br>Colour: white, silver, metallic |
| b) | Odour | No data available |
| c) | Odour Threshold | No data available |
| d) | pH | No data available |
| e) | Melting point/freezing point | Melting point/range: 1,453 °C (2,647 °F) - lit. |
| f) | Initial boiling point and boiling range | 2,732 °C (4,950 °F) - lit. |
| g) | Flash point | Not applicable |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | No data available |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | 1 hPa (1 mmHg) at 1,810 °C (3,290 °F) |
| l) | Vapour density | No data available |
| m) | Relative density | 8.9 g/mL at 25 °C (77 °F) |
| n) | Water solubility | insoluble |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information
No data available

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity
No data available

### 10.2 Chemical stability
Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions
No data available

### 10.4 Conditions to avoid
No data available

**10.5 Incompatible materials**
acids, Oxidizing agents, Sulphur compounds, Hydrogen gas, Oxygen, Methanol, organic solvents, Aluminium, Fluorine, Ammonia

**10.6 Hazardous decomposition products**
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

**11.1 Information on toxicological effects**

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
May cause sensitisation by skin contact.

**Germ cell mutagenicity**
No data available

**Carcinogenicity**

Limited evidence of carcinogenicity in animal studies

| | |
|---|---|
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Nickel) |
| | 1 - Group 1: Carcinogenic to humans (Nickel) |
| | 2B - Group 2B: Possibly carcinogenic to humans (Nickel) |
| IARC: | 2B - Group 2B: Possibly carcinogenic to humans (Nickel) |
| | 1 - Group 1: Carcinogenic to humans (Nickel) |
| | 2B - Group 2B: Possibly carcinogenic to humans (Nickel) |
| NTP: | Reasonably anticipated to be a human carcinogen (Nickel) |
| | Reasonably anticipated to be a human carcinogen (Nickel) |
| OSHA: | No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA. |

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
Inhalation - Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard**
No data available

**Additional Information**
RTECS: QR5950000

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | LC50 - Cyprinus carpio (Carp) - 1.3 mg/l - 96 h |
| Toxicity to daphnia and other aquatic invertebrates | EC50 - Daphnia magna (Water flea) - 1 mg/l - 48 h |

### 12.2 Persistence and degradability
Not applicable

### 12.3 Bioaccumulative potential
No data available

### 12.4 Mobility in soil
No data available

### 12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
Not dangerous goods

**IMDG**
Not dangerous goods

**IATA**
Not dangerous goods

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| Nickel | 7440-02-0 | 2007-07-01 |

**SARA 311/312 Hazards**
Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Nickel | 7440-02-0 | 2007-07-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Nickel | 7440-02-0 | 2007-07-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Nickel | 7440-02-0 | 2007-07-01 |

**California Prop. 65 Components**

| WARNING! This product contains a chemical known to the State of California to cause cancer. | CAS-No. | Revision Date |
|---|---|---|
| Nickel | 7440-02-0 | 2007-09-28 |

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| Carc. | Carcinogenicity |
| H317 | May cause an allergic skin reaction. |
| H351 | Suspected of causing cancer. |
| H372 | Causes damage to organs through prolonged or repeated exposure if inhaled. |
| H402 | Harmful to aquatic life. |
| H412 | Harmful to aquatic life with long lasting effects. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Chronic Health Hazard: | * |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 2 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7 Revision Date: 12/28/2015 Print Date: 05/01/2016

# SAFETY DATA SHEET

**Creation Date** 10-Dec-2009 **Revision Date** 26-May-2017 **Revision Number** 4

## 1. Identification

**Product Name** **Tetrachloroethylene**

**Cat No. :** **AC445690000; ACR445690010; AC445690025; AC445691000**

**Synonyms** Perchloroethylene

**Recommended Use** Laboratory chemicals.
**Uses advised against** Not for food, drug, pesticide or biocidal product use

**Details of the supplier of the safety data sheet**

**Company**
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

## 2. Hazard(s) identification

**Classification**
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Skin Sensitization | Category 1 |
| Carcinogenicity | Category 1B |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Target Organs - Kidney, Liver, Blood. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure



**Precautionary Statements**
**Prevention**
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
**Response**
IF exposed or concerned: Get medical attention/advice
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Skin**
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention
**Eyes**
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Tetrachloroethylene | 127-18-4 | >95 |

## 4. First-aid measures

**General Advice** If symptoms persist, call a physician.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

**Inhalation** Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

**Ingestion** Clean mouth with water and drink afterwards plenty of water.

**Most important symptoms/effects** None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Unsuitable Extinguishing Media** No information available

**Flash Point** No information available
**Method -** No information available

**Autoignition Temperature** No information available
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

**Hazardous Combustion Products**
Chlorine Hydrogen chloride gas Phosgene
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 0 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation.
**Environmental Precautions** Do not flush into surface water or sanitary sewer system.

**Methods for Containment and Clean Up** Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

## 7. Handling and storage

**Handling** Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH | Mexico OEL (TWA) |
|---|---|---|---|---|
| Tetrachloroethylene | TWA: 25 ppm<br>STEL: 100 ppm | (Vacated) TWA: 25 ppm<br>(Vacated) TWA: 170 mg/m$^3$<br>Ceiling: 200 ppm<br>TWA: 100 ppm | IDLH: 150 ppm | TWA: 100 ppm<br>TWA: 670 mg/m$^3$<br>TWA: 200 ppm<br>TWA: 1250 mg/m$^3$<br>STEL: 200 ppm<br>STEL: 1340 mg/m$^3$ |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*
*OSHA - Occupational Safety and Health Administration*
*NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health*

**Engineering Measures** Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Long sleeved clothing.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Liquid |
| **Appearance** | Colorless |
| **Odor** | Characteristic, sweet |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | -22 °C / -7.6 °F |
| **Boiling Point/Range** | 120 - 122 °C / 248 - 251.6 °F @ 760 mmHg |
| **Flash Point** | No information available |
| **Evaporation Rate** | 6.0 (Ether = 1.0) |
| **Flammability (solid,gas)** | Not applicable |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 18 mbar @ 20 °C |
| **Vapor Density** | No information available |
| **Density** | 1.619 |
| **Specific Gravity** | 1.625 |
| **Solubility** | 0.15 g/L water (20°C) |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | > 150°C |
| **Viscosity** | 0.89 mPa s at 20 °C |
| **Molecular Formula** | C2 Cl4 |
| **Molecular Weight** | 165.83 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products. Excess heat. Exposure to moist air or water.

**Incompatible Materials** Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines, Aluminium

**Hazardous Decomposition Products** Chlorine, Hydrogen chloride gas, Phosgene

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Tetrachloroethylene | LD50 = 2629 mg/kg ( Rat ) | LD50 > 10000 mg/kg (Rat) | LC50 = 27.8 mg/L ( Rat ) 4 h |

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** Irritating to eyes and skin

**Sensitization** No information available

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | Group 2A | Reasonably Anticipated | A3 | X | A3 |

*IARC: (International Agency for Research on Cancer)*

*IARC: (International Agency for Research on Cancer)*
*Group 1 - Carcinogenic to Humans*
*Group 2A - Probably Carcinogenic to Humans*
*Group 2B - Possibly Carcinogenic to Humans*

*NTP: (National Toxicity Program)*

*NTP: (National Toxicity Program)*
*Known - Known Carcinogen*
*Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*

*ACGIH: (American Conference of Governmental Industrial Hygienists)*

*A1 - Known Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Animal Carcinogen*
*ACGIH: (American Conference of Governmental Industrial Hygienists)*

*Mexico - Occupational Exposure Limits - Carcinogens*

*Mexico - Occupational Exposure Limits - Carcinogens*
*A1 - Confirmed Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Confirmed Animal Carcinogen*
*A4 - Not Classifiable as a Human Carcinogen*
*A5 - Not Suspected as a Human Carcinogen*

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Central nervous system (CNS)
**STOT - repeated exposure** Kidney Liver Blood

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest

pain, muscle pain or flushing

**Endocrine Disruptor Information**

| Component | EU - Endocrine Disrupters Candidate List | EU - Endocrine Disruptors - Evaluated Substances | Japan - Endocrine Disruptor Information |
|---|---|---|---|
| Tetrachloroethylene | Group II Chemical | Not applicable | Not applicable |

**Other Adverse Effects** Tumorigenic effects have been reported in experimental animals.

## 12. Ecological information

**Ecotoxicity**

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| Tetrachloroethylene | EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata) | LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss)<br>LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus)<br>LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas)<br>LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas) | EC50 = 100 mg/L 24 h<br>EC50 = 112 mg/L 24 h<br>EC50 = 120.0 mg/L 30 min | EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna) |

**Persistence and Degradability** Insoluble in water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

| Component | log Pow |
|---|---|
| Tetrachloroethylene | 2.88 |

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

| Component | RCRA - U Series Wastes | RCRA - P Series Wastes |
|---|---|---|
| Tetrachloroethylene - 127-18-4 | U210 | - |

## 14. Transport information

**DOT**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**TDG**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**IATA**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1

**Packing Group** III

**IMDG/IMO**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Subsidiary Hazard Class** P
**Packing Group** III

## 15. Regulatory information

**All of the components in the product are on the following Inventory lists:** X = listed

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloroethylene | X | X | - | 204-825-9 | - | | X | X | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313**

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | >95 | 0.1 |

**SARA 311/312 Hazard Categories**

**Acute Health Hazard** Yes
**Chronic Health Hazard** Yes
**Fire Hazard** No
**Sudden Release of Pressure Hazard** No
**Reactive Hazard** No

**CWA (Clean Water Act)**

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|---|---|---|---|---|
| Tetrachloroethylene | - | - | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Tetrachloroethylene | X | | - |

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Tetrachloroethylene | 100 lb 1 lb | - |

**California Proposition 65** This product contains the following proposition 65 chemicals

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | Carcinogen | 14 µg/day | Carcinogen |

**U.S. State Right-to-Know Regulations**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Tetrachloroethylene | X | X | X | X | X |

**U.S. Department of Transportation**

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

## 16. Other information

**Prepared By**
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Creation Date** 10-Dec-2009
**Revision Date** 26-May-2017
**Print Date** 26-May-2017
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**
**The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text**

**End of SDS**

# SAFETY DATA SHEET

## Section 1. Identification

**CHS Inc.**
**P.O. Box 64089**
**Mail station 525**
**St. Paul, MN 55164-0089**

**Transportation Emergency (CHEMTREC)** : **1-800-424-9300**
**Technical Information** : **1-651-355-8443**
**SDS Information** : **1-651-355-8445**

| | | | | | |
|---|---|---|---|---|---|
| **Product name** | : | Regular, Midgrade & Premium Unleaded Gasoline | **SDS no.** | : | 0147- M6A0 |
| **Common name** | : | Unleaded Gasoline, Premium Unleaded Gasoline | **Revision date** | : | 11/15/2013 |
| **Chemical name** | : | Light Petroleum Distillate | **Chemical formula** | : | Mixture |
| **Chemical family** | : | Mixed Petroleum Hydrocarbon | | | |

**Relevant identified uses of the substance or mixture and uses advised against**

Not available.

## Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** :
FLAMMABLE LIQUIDS - Category 1
SKIN CORROSION/IRRITATION - Category 2
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1A
TOXIC TO REPRODUCTION (Fertility) - Category 2
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1
ASPIRATION HAZARD - Category 1
AQUATIC HAZARD (ACUTE) - Category 3
AQUATIC HAZARD (LONG-TERM) - Category 3

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Danger

**Hazard statements** :
Extremely flammable liquid and vapor.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
Suspected of damaging fertility or the unborn child.
May be fatal if swallowed and enters airways.
May cause drowsiness and dizziness.
Causes damage to organs through prolonged or repeated exposure.
Harmful to aquatic life with long lasting effects.

**Precautionary statements**

**General** : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazardous Material Information System (U.S.A.)** | **Health :** | 2 | * | **Flammability :** | 4 | **Physical hazards :** | 0 |
| **National Fire Protection Association (U.S.A.)** | **Health :** | 2 | | **Flammability :** | 4 | **Instability :** | 0 |

## Section 3. Composition/information on ingredients

**Substance/mixture** : Mixture

**Chemical name** : Light Petroleum Distillate

**Other means of identification** : Unleaded Gasoline, Premium Unleaded Gasoline

| Ingredient name | % | CAS number |
|---|---|---|
| Toluene | 10 - 30 | 108-88-3 |
| Xylene | 10 - 30 | 1330-20-7 |
| Tert-butyl methyl ether | 10 - 30 | 1634-04-4 |
| Benzene | 1 - 5 | 71-43-2 |
| 1,2,4-Trimethylbenzene | 1 - 5 | 95-63-6 |
| Ethylbenzene | 1 - 5 | 100-41-4 |
| n-Hexane | 1 - 5 | 110-54-3 |
| Butyl ethyl ether | 0.1 - 1 | 628-81-9 |
| Naphthalene | 0.1 - 1 | 91-20-3 |

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

**Occupational exposure limits, if available, are listed in Section 8.**

## Section 4. First aid measures

**Description of necessary first aid measures**

**Eye contact** : If material comes in contact with the eyes, immediately wash the eyes with large amounts of water for 15 minutes, occasionally lifting the lower and upper lids. Get medical attention.

**Inhalation** : If person breathes in large amounts of material, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the person warm and at rest. Get medical attention as soon as possible.

**Skin contact** : If the material comes in contact with the skin, wash the contaminated skin with soap and water promptly. If the material penetrates through clothing, remove the clothing and wash the skin with soap and water promptly. If irritation persists after washing, get medical attention immediately.

**Ingestion** : If material has been swallowed, do not induce vomiting. Get medical attention immediately.

**Most important symptoms/effects, acute and delayed**

**Potential acute health effects**

**Eye contact** : Causes serious eye irritation.

**Inhalation** : Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness.

**Skin contact** : Causes skin irritation.

**Ingestion** : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways. Irritating to mouth, throat and stomach.

**Over-exposure signs/symptoms**

**Eye contact** : Adverse symptoms may include the following: pain or irritation, watering, redness.

**Inhalation** : Adverse symptoms may include the following: respiratory tract irritation, coughing.

**Skin contact** : Adverse symptoms may include the following: irritation, redness.

**Ingestion** : No known significant effects or critical hazards.

**Indication of immediate medical attention and special treatment needed, if necessary**

**Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

**Specific treatments** : No specific treatment.

**Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

**See toxicological information (Section 11)**

## Section 5. Fire-fighting measures

**Extinguishing media**

**Suitable extinguishing media** : Use dry chemical, $CO_2$, water spray (fog) or foam.

**Unsuitable extinguishing media** : Do not use water jet or water-based fire extinguishers.

**Specific hazards arising from the chemical** : Highly volatile material. Flowing gasoline can be ignited by self-generated static electricity; containers should be bonded and grounded. Vapors may travel along the ground to a source of ignition (pilot light, heater, electric motor) some distance away. Containers, drums (even empty) can explode when heat (welding, cutting, etc.) is applied.

**Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

**Special protective actions for fire-fighters** : Water may be ineffective on flames, but should be used to keep fire-exposed containers cool. Large fires, such as tank fires, should be fought with caution. If possible, pump the contents from the tank and keep adjoining structures cool and protect personnel. Avoid spreading burning liquid with water used for cooling purposes. Do not flush down public sewers. The use of a self-contained breathing apparatus and protective clothing is recommended for fire fighters. Avoid inhalation of vapors.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## Section 6. Accidental release measures

**Personal precautions, protective equipment and emergency procedures**

**For non-emergency personnel** : Keep unnecessary and unprotected personnel from entering. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

**Methods and materials for containment and cleaning up**

**Spill** : Contain with dikes or absorbent to prevent migration to sewers/streams. Take up small spill with dry chemical absorbent; large spills may require pump or vacuum prior to absorbent. May require excavation of severely contaminated soil.

## Section 7. Handling and storage

**Precautions for safe handling**

**Protective measures** : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate.

**Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking.

**Conditions for safe storage, including any incompatibilities** : Do not store above the following temperature: 113°C (235.4°F). Odorous and toxic fumes may form from the decomposition of this product if stored at excessive temperatures for extended periods of time. Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Use appropriate containment to avoid environmental contamination.

## Section 8. Exposure controls/personal protection

**Control parameters**

**Occupational exposure limits**

| Ingredient name | Exposure limits |
|---|---|
| Toluene | **NIOSH REL (United States, 6/2009).**<br>STEL: 560 mg/m³ 15 minutes.<br>STEL: 150 ppm 15 minutes.<br>TWA: 375 mg/m³ 10 hours.<br>TWA: 100 ppm 10 hours.<br>**OSHA PEL Z2 (United States, 11/2006).**<br>AMP: 500 ppm 10 minutes.<br>CEIL: 300 ppm<br>TWA: 200 ppm 8 hours.<br>**ACGIH TLV (United States, 3/2012).**<br>TWA: 20 ppm 8 hours. |
| Xylene | **ACGIH TLV (United States, 3/2012).**<br>STEL: 651 mg/m³ 15 minutes.<br>STEL: 150 ppm 15 minutes.<br>TWA: 434 mg/m³ 8 hours.<br>TWA: 100 ppm 8 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 100 ppm 8 hours. |

| | |
|---|---|
| | TWA: 435 mg/m³ 8 hours. |
| Tert-butyl methyl ether | **ACGIH TLV (United States, 1/2005).**<br>TWA: 50 ppm 8 hours. Form: All forms.<br>**ACGIH TLV (United States, 2/2010).**<br>TWA: 50 ppm 8 hours. |
| Benzene | **ACGIH TLV (United States, 3/2012). Absorbed through skin.**<br>STEL: 8 mg/m³ 15 minutes.<br>STEL: 2.5 ppm 15 minutes.<br>TWA: 1.6 mg/m³ 8 hours.<br>TWA: 0.5 ppm 8 hours.<br>**NIOSH REL (United States, 6/2009).**<br>STEL: 1 ppm 15 minutes.<br>TWA: 0.1 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>STEL: 5 ppm 15 minutes.<br>TWA: 1 ppm 8 hours.<br>**OSHA PEL Z2 (United States, 11/2006).**<br>AMP: 50 ppm 10 minutes.<br>CEIL: 25 ppm<br>TWA: 10 ppm 8 hours. |
| 1,2,4-Trimethylbenzene | **ACGIH TLV (United States, 3/2012).**<br>TWA: 123 mg/m³ 8 hours.<br>TWA: 25 ppm 8 hours.<br>**NIOSH REL (United States, 1/2013).**<br>TWA: 125 mg/m³ 10 hours.<br>TWA: 25 ppm 10 hours.<br>**OSHA PEL 1989 (United States, 3/1989).**<br>TWA: 25 ppm 8 hours.<br>TWA: 125 mg/m³ 8 hours. |
| Ethylbenzene | **ACGIH TLV (United States, 3/2012).**<br>TWA: 20 ppm 8 hours.<br>**NIOSH REL (United States, 6/2009).**<br>STEL: 545 mg/m³ 15 minutes.<br>STEL: 125 ppm 15 minutes.<br>TWA: 435 mg/m³ 10 hours.<br>TWA: 100 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 435 mg/m³ 8 hours.<br>TWA: 100 ppm 8 hours. |
| n-Hexane | **ACGIH TLV (United States, 3/2012). Absorbed through skin.**<br>TWA: 50 ppm 8 hours.<br>**NIOSH REL (United States, 6/2009).**<br>TWA: 180 mg/m³ 10 hours.<br>TWA: 50 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 1800 mg/m³ 8 hours.<br>TWA: 500 ppm 8 hours. |
| Naphthalene | **ACGIH TLV (United States, 3/2012). Absorbed through skin.**<br>STEL: 79 mg/m³ 15 minutes.<br>STEL: 15 ppm 15 minutes.<br>TWA: 52 mg/m³ 8 hours.<br>TWA: 10 ppm 8 hours.<br>**NIOSH REL (United States, 1/2013).**<br>STEL: 75 mg/m³ 15 minutes.<br>STEL: 15 ppm 15 minutes.<br>TWA: 50 mg/m³ 10 hours.<br>TWA: 10 ppm 10 hours.<br>**OSHA PEL (United States, 6/2010).**<br>TWA: 50 mg/m³ 8 hours.<br>TWA: 10 ppm 8 hours. |

**Appropriate engineering controls** : Use only with adequate ventilation.

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

**Individual protection measures**

**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Recommended: Splash goggles and a face shield, where splash hazard exists.

**Skin protection**

**Hand protection** : 4 - 8 hours (breakthrough time): Nitrile gloves.

**Body protection** : Recommended: Long sleeved coveralls.

**Other skin protection** : Recommended: Impervious boots.

**Respiratory protection** : If ventilation is inadequate, use a NIOSH-certified respirator with an organic vapor cartridge and P95 particulate filter.

## Section 9. Physical and chemical properties

**Appearance**

**Physical state** : Liquid.

**Color** : Reddish golden brown.

**Odor** : Gasoline

**Odor threshold** : 10 ppm

**pH** : Not available.

**Melting point** : Not available.

**Boiling point** : 26.66°C (80°F)

**Flash point** : Closed cup: -40°C (-40°F) [Pensky-Martens.]

**Flammability** : Not available.

**Lower and upper explosive (flammable) limits** : Lower: 1.4%
Upper: 7.6%

**Relative density** : 0.72

**Evaporation rate** : Slower.

**Solubility** : Insoluble in the following materials: cold water and hot water.

**Solubility in water** : Negligible.

**Partition coefficient: n-octanol/water** : Not available.

**Auto-ignition temperature** : 257.22 to 454.44°C (495 to 850°F)

**Decomposition temperature** : Not available.

**SADT** : Not available.

**Viscosity** : Not available.

**Vapor pressure** : 53.3 kPa (400 mm Hg) (68°F)

**Vapor density** : 4 [Air = 1]

## Section 10. Stability and reactivity

**Reactivity** : No specific test data related to reactivity available for this product or its ingredients.

**Chemical stability** : The product is stable.

**Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.

**Conditions to avoid** : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

**Incompatible materials** : Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.

**Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## Section 11. Toxicological information

**Information on toxicological effects**

**Acute toxicity**

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| Toluene | LC50 Inhalation Vapor | Rat | 49 g/m³ | 4 hours |
| | LD50 Oral | Rat | 636 mg/kg | - |
| Xylene | LC50 Inhalation Gas. | Rat | 5000 ppm | 4 hours |
| | LD50 Oral | Rat | 4300 mg/kg | - |
| Tert-butyl methyl ether | LC50 Inhalation Gas. | Rat | 23576 ppm | 4 hours |
| | LC50 Inhalation Vapor | Rat | 41000 mg/m³ | 4 hours |
| | LD50 Oral | Rat | >4 g/kg | - |
| Benzene | LD50 Oral | Rat | 930 mg/kg | - |
| 1,2,4-Trimethylbenzene | LC50 Inhalation Vapor | Rat | 18000 mg/m³ | 4 hours |
| | LD50 Oral | Rat | 5 g/kg | - |
| Ethylbenzene | LD50 Dermal | Rabbit | >5000 mg/kg | - |
| | LD50 Oral | Rat | 3500 mg/kg | - |
| n-Hexane | LC50 Inhalation Gas. | Rat | 48000 ppm | 4 hours |
| | LD50 Oral | Rat | 15840 mg/kg | - |
| Butyl ethyl ether | LD50 Oral | Rat | 1870 mg/kg | - |
| Naphthalene | LD50 Dermal | Rabbit | >20 g/kg | - |
| | LD50 Oral | Rat | 490 mg/kg | - |

**Irritation/Corrosion**

| Product/ingredient name | Result | Species | Score | Exposure | Observation |
|---|---|---|---|---|---|
| Toluene | Eyes - Mild irritant | Rabbit | - | 0.5 minutes 100 mg | - |
| | Skin - Moderate irritant | Rabbit | - | 24 hours 20 mg | - |
| | Eyes - Mild irritant | Rabbit | - | 870 µg | - |
| | Eyes - Severe irritant | Rabbit | - | 24 hours 2 mg | - |
| | Skin - Mild irritant | Pig | - | 24 hours 250 µL | - |
| | Skin - Mild irritant | Rabbit | - | 435 mg | - |
| | Skin - Moderate irritant | Rabbit | - | 500 mg | - |
| Xylene | Eyes - Mild irritant | Rabbit | - | 87 mg | - |
| | Eyes - Severe irritant | Rabbit | - | 24 hours 5 mg | - |
| | Skin - Mild irritant | Rat | - | 8 hours 60 µL | - |
| | Skin - Moderate irritant | Rabbit | - | 24 hours 500 mg | - |
| | Skin - Moderate irritant | Rabbit | - | 100% | - |
| Benzene | Eyes - Moderate irritant | Rabbit | - | 88 mg | - |
| | Skin - Moderate irritant | Rabbit | - | 24 hours 20 mg | - |
| | Eyes - Severe irritant | Rabbit | - | 24 hours 2 mg | - |
| | Skin - Mild irritant | Rat | - | 8 hours 60 µL | - |
| | Skin - Mild irritant | Rabbit | - | 24 hours 15 mg | - |
| Ethylbenzene | Eyes - Severe irritant | Rabbit | - | 500 mg | - |
| | Skin - Mild irritant | Rabbit | - | 24 hours 15 mg | - |
| n-Hexane | Eyes - Mild irritant | Rabbit | - | 10 mg | - |
| Naphthalene | Skin - Mild irritant | Rabbit | - | 495 mg | - |
| | Skin - Severe irritant | Rabbit | - | 24 hours 0.05 mL | - |

**Sensitization**

**Skin** : There is no data available.

**Respiratory** : There is no data available.

**Mutagenicity**

There is no data available.

**Carcinogenicity**

There is no data available.

**Classification**

| Product/ingredient name | OSHA | IARC | NTP |
|---|---|---|---|
| Toluene | - | 3 | - |
| Xylene | - | 3 | - |
| Tert-butyl methyl ether | - | 3 | - |
| Benzene | + | 1 | Known to be a human carcinogen. |
| Ethylbenzene | - | 2B | - |
| Naphthalene | - | 2B | Reasonably anticipated to be a human carcinogen. |

**Reproductive toxicity**

There is no data available.

**Teratogenicity**

There is no data available.

**Specific target organ toxicity (single exposure)**

| Name | Category | Route of exposure | Target organs |
|---|---|---|---|
| Toluene | Category 3 | Not applicable. | Narcotic effects |
| 1,2,4-Trimethylbenzene | Category 3 | Not applicable. | Respiratory tract irritation |
| n-Hexane | Category 3 | Not applicable. | Narcotic effects |

**Specific target organ toxicity (repeated exposure)**

| Name | Category | Route of exposure | Target organs |
|---|---|---|---|
| Toluene | Category 2 | Not determined | Not determined |
| Benzene | Category 1 | Not determined | Not determined |
| n-Hexane | Category 2 | Not determined | Not determined |

**Aspiration hazard**

| Name | Result |
|---|---|
| Toluene | ASPIRATION HAZARD - Category 1 |
| Benzene | ASPIRATION HAZARD - Category 1 |
| n-Hexane | ASPIRATION HAZARD - Category 1 |

**Information on the likely routes of exposure** : Dermal contact. Eye contact. Inhalation. Ingestion.

## Section 12. Ecological information

**Toxicity**

| Product/ingredient name | Result | Species | Exposure |
|---|---|---|---|
| Toluene | Acute EC50 433 ppm Marine water | Algae - Skeletonema costatum | 96 hours |
| | Acute EC50 12500 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 72 hours |
| | Acute EC50 11600 µg/l Fresh water | Crustaceans - Gammarus pseudolimnaeus - Adult | 48 hours |
| | Acute EC50 6000 µg/l Fresh water | Daphnia - Daphnia magna - Juvenile (Fledgling, Hatchling, Weanling) | 48 hours |
| | Acute LC50 5500 µg/l Fresh water | Fish - Oncorhynchus kisutch - Fry | 96 hours |
| | Chronic NOEC 500000 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 96 hours |
| | Chronic NOEC 1000 µg/l Fresh water | Daphnia - Daphnia magna | 21 days |
| Xylene | Acute IC50 10 mg/L | Algae | 72 hours |
| | Acute LC50 8500 µg/l Marine water | Crustaceans - Palaemonetes pugio | 48 hours |
| | Acute LC50 13400 µg/l Fresh water | Fish - Pimephales promelas | 96 hours |
| Tert-butyl methyl ether | Acute LC50 672000 µg/l Fresh water | Fish - Pimephales promelas | 96 hours |
| Benzene | Acute EC50 29000 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 72 hours |
| | Acute EC50 1360000 µg/l Fresh water | Algae - Scenedesmus abundans | 96 hours |
| | Acute EC50 9230 µg/l Fresh water | Daphnia - Daphnia magna - Neonate | 48 hours |
| | Acute LC50 21000 µg/l Marine water | Crustaceans - Artemia salina - Nauplii | 48 hours |
| | Acute LC50 5.28 ul/L Fresh water | Fish - Oncorhynchus gorbuscha - Fry | 96 hours |
| | Chronic NOEC 1.5 to 5.4 ul/L Marine water | Fish - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling) | 4 weeks |
| 1,2,4-Trimethylbenzene | Acute LC50 4910 µg/l Marine water | Crustaceans - Elasmopus pectenicrus - Adult | 48 hours |
| | Acute LC50 22.4 mg/L Fresh water | Fish - Tilapia zillii | 96 hours |
| Ethylbenzene | Acute EC50 4600 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 72 hours |
| | Acute EC50 3600 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 96 hours |
| | Acute EC50 2970 µg/l Fresh water | Daphnia - Daphnia magna - Neonate | 48 hours |
| | Acute LC50 5200 µg/l Marine water | Crustaceans - Americamysis bahia | 48 hours |
| | Acute LC50 4200 µg/l Fresh water | Fish - Oncorhynchus mykiss | 96 hours |
| | Chronic NOEC 1000 µg/l Fresh water | Algae - Pseudokirchneriella subcapitata | 96 hours |
| n-Hexane | Acute LC50 113000 µg/l Fresh water | Fish - Oreochromis mossambicus | 96 hours |
| Naphthalene | Acute EC50 1600 µg/l Fresh water | Daphnia - Daphnia magna - Neonate | 48 hours |
| | Acute LC50 2350 µg/l Marine water | Crustaceans - Palaemonetes pugio | 48 hours |
| | Acute LC50 213 µg/l Fresh water | Fish - Melanotaenia fluviatilis - Larvae | 96 hours |

**Persistence and degradability**

There is no data available.

**Bioaccumulative potential**

| Product/ingredient name | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| Toluene | 2.73 | 90 | low |
| Xylene | 3.12 | 8.1 to 25.9 | low |
| Tert-butyl methyl ether | 1.04 | 1.5 | low |
| Benzene | 2.13 | 11 | low |
| 1,2,4-Trimethylbenzene | 3.63 | 243 | low |
| Ethylbenzene | 3.6 | - | low |
| n-Hexane | 4 | 501.187 | high |
| Butyl ethyl ether | 2.03 | - | low |
| Naphthalene | 3.4 | 36.5 to 168 | low |

**Mobility in soil**

**Soil/water partition coefficient ($K_{OC}$)** : There is no data available.

**Other adverse effects** : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

## Section 14. Transport information

**DOT IDENTIFICATION NUMBER** UN1203 **DOT proper shipping name** GASOLINE (Toluene, Xylene) RQ (Benzene, Xylene)

**DOT Hazard Class(es)** 3 **PG** I **DOT EMER. RESPONSE GUIDE NO.** 128

## Section 15. Regulatory information

**U.S. Federal regulations** : **TSCA 8(a) PAIR**: Naphthalene
**TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
**United States inventory (TSCA 8b)**: All components are listed or exempted.
**Clean Water Act (CWA) 307**: Toluene; Benzene; Ethylbenzene; Naphthalene
**Clean Water Act (CWA) 311**: Toluene; Xylene; Benzene; Ethylbenzene; Naphthalene

**Clean Air Act Section 602 Class I Substances** : Not listed
**Clean Air Act Section 602 Class II Substances** : Not listed
**Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)** : Listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed
**DEA List II Chemicals (Essential Chemicals)** : Listed

**SARA 302/304**

**Composition/information on ingredients**

No products were found.

**SARA 304 RQ** : Not applicable.

**SARA 311/312**

**Classification** : Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

**Composition/information on ingredients**

| Name | % | Fire hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|---|---|---|---|---|---|---|
| Toluene | 10 - 30 | Yes. | No. | No. | Yes. | Yes. |
| Xylene | 10 - 30 | Yes. | No. | No. | Yes. | No. |
| Tert-butyl methyl ether | 10 - 30 | Yes. | No. | No. | Yes. | No. |
| Benzene | 1 - 5 | Yes. | No. | No. | Yes. | Yes. |
| 1,2,4-Trimethylbenzene | 1 - 5 | Yes. | No. | No. | Yes. | No. |
| Ethylbenzene | 1 - 5 | Yes. | No. | No. | Yes. | Yes. |
| n-Hexane | 1 - 5 | Yes. | No. | No. | Yes. | Yes. |
| Butyl ethyl ether | 0.1 - 1 | Yes. | No. | No. | Yes. | No. |
| Naphthalene | 0.1 - 1 | No. | No. | No. | Yes. | Yes. |

**SARA 313** : This product (does/not) contain toxic chemicals subject to the reporting requirements of SARA Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372.

| Product name | CAS number | % |
|---|---|---|
| Toluene | 108-88-3 | Up to 18.1 |
| Xylene | 1330-20-7 | Up to 15.3 |
| Benzene | 71-43-2 | Up to 5.3 |
| 1,2,4-Trimethylbenzene | 95-63-6 | Up to 4.8 |
| Ethylbenzene | 100-41-4 | Up to 2.6 |
| n-Hexane | 110-54-3 | Up to 4 |
| Naphthalene | 91-20-3 | Up to 1 |

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

**State regulations**

**Massachusetts** : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2,4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether

**New York** : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; Ethylbenzene; n-Hexane; Naphthalene

**New Jersey** : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2,4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether; Naphthalene

**Pennsylvania** : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2,4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether; Naphthalene

**California Prop. 65** : **WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

| Ingredient name | Cancer | Reproductive | No significant risk level | Maximum acceptable dosage level |
|---|---|---|---|---|
| Toluene | No. | Yes. | No. | 7000 µg/day (ingestion)<br>13000 µg/day (inhalation) |
| Benzene | Yes. | Yes. | 6.4 µg/day (ingestion)<br>13 µg/day (inhalation) | 24 µg/day (ingestion)<br>49 µg/day (inhalation) |
| Ethylbenzene | Yes. | No. | 41 µg/day (ingestion)<br>54 µg/day (inhalation) | No. |
| Naphthalene | Yes. | No. | Yes. | No. |

## Section 16. Other information

**Revision date** : 11/15/2013 **Supersedes** : 01/23/2013

**Revised Section(s)** : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16. **Prepared by** : KMK Regulatory Services Inc.

Notice to reader
THE INFORMATION CONTAINED IN THIS SDS RELATES ONLY TO THE SPECIFIC MATERIAL IDENTIFIED. IT DOES NOT COVER USE OF THAT MATERIAL IN COMBINATION WITH ANY OTHER MATERIAL OR IN ANY PARTICULAR PROCESS. IN COMPLIANCE WITH 29 C.F.R. 1910.1200(g), CHS HAS PREPARED THIS SDS IN SEGMENTS, WITH THE INTENT THAT THOSE SEGMENTS BE READ TOGETHER AS A WHOLE WITHOUT TEXTUAL OMISSIONS OR ALTERATIONS. CHS BELIEVES THE INFORMATION CONTAINED HEREIN TO BE ACCURATE, BUT MAKES NO REPRESENTATION, GUARANTEE, OR WARRANTY, EXPRESS OR IMPLIED, ABOUT THE ACCURACY, RELIABILITY, OR COMPLETENESS OF THE INFORMATION OR ABOUT THE FITNESS OF CONTENTS HEREIN FOR EITHER GENERAL OR PARTICULAR PURPOSES. PERSONS REVIEWING THIS SDS SHOULD MAKE THEIR OWN DETERMINATION AS TO THE MATERIAL'S SUITABILITY AND COMPLETENESS FOR USE IN THEIR PARTICULAR APPLICATIONS.

CENEX®
OUR ENERGY COMES THROUGH®

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**RegenOx® – Part A (Oxidizer Complex)**

**Material Safety Data Sheet (MSDS)**

**Last Revised:** June 24, 2010

## Section 1 – Supplier Information and Material Identification

**Supplier:**



1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

| | |
|---|---|
| Chemical Description: | A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H_2O_2$], sodium carbonate [$Na_2CO_3$], sodium silicate and silica gel. |
| Chemical Family: | Inorganic Chemicals |
| Trade Name: | RegenOx® – Part A (Oxidizer Complex) |
| Product Use: | Used to remediate contaminated soil and groundwater (environmental applications) |

## Section 2 – Chemical Information/Other Designations

| CAS No. | Chemical | Percentage |
|---|---|---|
| 15630-89-4 | Sodium Percarbonate | 60 -100 % |
| 5968-11-6 | Sodium Carbonate Monohydrate | 10 – 30 % |
| 7699-11-6 | Silicic Acid | < 1 % |
| 63231-67-4 | Silica Gel | < 1 % |

## Section 3 – Physical Data

| | |
|---|---|
| **Form:** | Powder |
| **Color:** | White |
| **Odor:** | Odorless |
| **Melting Point:** | NA |
| **Boiling Point:** | NA |

| Section 3 – Physical Data (cont) | |
|---|---|
| **Flammability/Flash Point:** | NA |
| **Vapor Pressure:** | NA |
| **Bulk Density:** | 0.9 – 1.2 g/cm$^3$ |
| **Solubility:** | Min 14.5g/100g water @ 20 ºC |
| **Viscosity:** | NA |
| **pH (3% solution):** | ≈ 10.5 |
| **Decomposition Temperature:** | Self-accelerating decomposition with oxygen release starts at 50 ºC. |

| Section 4 – Reactivity Data | |
|---|---|
| **Stability:** | Stable under normal conditions |
| **Conditions to Avoid/Incompatibility:** | Acids, bases, salts of heavy metals, reducing agents, and flammable substances |
| **Hazardous Decomposition Products:** | Oxygen. Contamination with many substances will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of oxygen and steam. |

| Section 5 – Regulations | |
|---|---|
| **TSCA Inventory Listed:** | Yes |
| **CERCLA Hazardous Substance (40 CFR Part 302)** | |
| **Listed Substance:** | *No* |
| **Unlisted Substance:** | *Yes* |
| **SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know** | |
| **Extremely Hazardous Substance:** | No |
| **WHMIS Classification:** | C, D2B |
| **Canadian Domestic Substance List:** | Appears |

## Section 6 – Protective Measures, Storage and Handling

**Technical Protective Measures**

| | |
|---|---|
| **Storage:** | Oxidizer. Store in a cool, well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 °C.<br><br>Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers.<br><br>Protect from moisture. Do not store near combustible materials. Keep containers well sealed.<br><br>Store separately from reducing materials. Avoid contamination which may lead to decomposition. |
| **Handling:** | Avoid contact with eyes, skin and clothing. Use with adequate ventilation.<br><br>Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area.<br><br>Label containers and keep them tightly closed when not in use.<br><br>Wash hands thoroughly after handling. |

**Personal Protective Equipment (PPE)**

| | |
|---|---|
| **Engineering Controls:** | General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis. |
| **Respiratory Protection:** | For many conditions, no respiratory protection is necessary; however, in dusty or unknown conditions or when exposures exceed limit values a NIOSH approved respirator should be used. |
| **Hand Protection:** | Wear chemical resistant gloves (neoprene, rubber, or PVC). |

## Section 6 – Protective Measures, Storage and Handling (cont)

| | |
|---|---|
| **Eye Protection:** | Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles. |
| **Skin Protection:** | Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use. |
| **Other:** | Eye wash station. |
| **Protection Against Fire & Explosion:** | Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers. |

## Section 7 – Hazards Identification

**Potential Health Effects**

| | |
|---|---|
| **Inhalation:** | Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat. |
| **Eye Contact:** | Causes irritation, redness and pain. |
| **Skin Contact:** | Causes slight irritation. |
| **Ingestion:** | May be harmful if swallowed (vomiting and diarrhea). |

## Section 8 – Measures in Case of Accidents and Fire

| | |
|---|---|
| **After Spillage/Leakage:** | Eliminate all ignition sources. Evacuate unprotected personnel and never exceed any occupational exposure limit. Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory. |
| **Extinguishing Media:** | Water |

**First Aid**

| | |
|---|---|
| **Eye Contact:** | Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist. |
| **Inhalation:** | Remove affected person to fresh air. Seek medical attention if the effects persist. |
| **Ingestion:** | If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **Do Not** induce vomiting. |

## Section 8 – Measures in Case of Accidents and Fire (cont)

| | |
|---|---|
| **Skin Contact:** | Wash affected areas with soap and a mild detergent and large amounts of water. |

## Section 9 – Accidental Release Measures

| | |
|---|---|
| **Precautions:** | |
| **Cleanup Methods:** | Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory. |

## Section 10 – Information on Toxicology

| | |
|---|---|
| **Toxicity Data** | |
| **LD50 Oral (rat):** | 2,400 mg/kg |
| **LD50 Dermal (rabbit):** | Min 2,000 mg/kg |
| **LD50 Inhalation (rat):** | Min 4,580 mg/kg |

## Section 11 – Information on Ecology

| | |
|---|---|
| **Ecology Data** | |
| **Ecotoxicological Information:** | NA |

## Section 12 – Disposal Considerations

| | |
|---|---|
| **Waste Disposal Method** | |
| **Waste Treatment:** | Dispose of in an approved waste facility operated by an authorized contactor in compliance with local regulations. |
| **Package (Pail) Treatment:** | The empty and clean containers are to be recycled or disposed of in conformity with local regulations. |

## Section 13 – Shipping/Transport Information

| | |
|---|---|
| **D.O.T. Shipping Name:** | Oxidizing Solid, N.O.S. [A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H2O_2$], sodium carbonate [$Na_2CO_3$], sodium silicate and silica gel.] |
| **UN Number:** | 1479 |
| **Hazard Class:** | 5.1 |
| **Labels:** | 5.1 (Oxidizer) |
| **Packaging Group:** | III |

## Section 14 – Other Information

| | | |
|---|---|---|
| **HMIS® Rating** | Health – 1 (slight) | Reactivity – 1 (slight) |
| | Flammability – 0 (none) | Lab PPE – goggles, gloves, and lab coat |

HMIS® is a registered trademark of the National Painting and Coating Association.

## Section 15 – Further Information

**The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.**

**RegenOx® – Part B (Activator Complex)**

**Material Safety Data Sheet (MSDS)**

**Last Revised:** June 4, 2010

## Section 1 – Supplier Information and Material Identification

**Supplier:**

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

| | |
|---|---|
| Chemical Description: | A mixture of sodium silicate solution, silica gel and ferrous sulfate |
| Chemical Family: | Inorganic Chemicals |
| Trade Name: | RegenOx® – Part B (Activator Complex) |
| Product Use: | Used for environmental remediation of contaminated soils and groundwater |

## Section 2 – Chemical Information/Other Designations

| CAS No. | Chemical |
|---|---|
| 1344-09-8 | Silicic Acid, Sodium Salt, Sodium Silicate |
| 63231-67-4 | Silica Gel |
| 7720-78-7 | Ferrous Sulfate |
| 7732-18-5 | Water |

## Section 3 – Physical Data

| | |
|---|---|
| **Form:** | Liquid |
| **Color:** | Blue/Green |
| **Odor:** | Odorless |
| **Melting Point:** | NA |
| **Boiling Point:** | NA |
| **Flammability/Flash Point:** | NA |
| **Vapor Pressure:** | NA |

| Section 3 – Physical Data ( cont) | |
|---|---|
| **Specific Gravity** | 1.39 g/cm$^3$ |
| **Solubility:** | Miscible |
| **Viscosity:** | NA |
| **pH (3% solution):** | 11 |
| **Hazardous Decomposition Products:** | Oxides of carbon and silicon may be formed when heated to decomposition. |

| Section 4 – Reactivity Data | |
|---|---|
| **Stability:** | Stable under normal conditions. |
| **Conditions to Avoid:** | None. |
| **Incompatibility:** | Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers. |

| Section 5 – Regulations | |
|---|---|
| **TSCA Inventory Listed:** | Yes |
| **CERCLA Hazardous Substance (40 CFR Part 302)** | |
| **Listed Substance:** | *No* |
| **Unlisted Substance:** | *Yes* |
| **SARA, Title III, Sections 302/303 (40 CFR Part 355) – Emergency Planning and Notification** | |
| **Extremely Hazardous Substance:** | No |
| **SARA, Title III, Sections 311/312 (40 CFR Part 370) – Hazardous Chemical Reporting: Community Right-To-Know** | |
| **Hazard Category:** | Acute |
| **SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know** | |
| **Extremely Hazardous Substance:** | No |

## Section 6 – Protective Measures, Storage and Handling

**Technical Protective Measures**

| | |
|---|---|
| **Storage:** | Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat above 60 degrees C and colder than 10 degrees C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers. |
| **Handling:** | Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation.<br>Do not use product if it is brownish-yellow in color. |

**Personal Protective Equipment (PPE)**

| | |
|---|---|
| **Engineering Controls:** | General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Safety shower and eyewash station should be within direct access. |
| **Respiratory Protection:** | Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134. |
| **Hand Protection:** | Wear chemical resistant gloves. |
| **Eye Protection:** | Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles. |
| **Skin Protection:** | Try to avoid skin contact with this product. Gloves and protective clothing should be worn during use. |
| **Other:** | |
| **Protection Against Fire & Explosion:** | Product is non-explosive and non-combustible. |

## Section 7 – Hazards Identification

**Potential Health Effects**

| | |
|---|---|
| **Inhalation:** | Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat. |
| **Eye Contact:** | Causes irritation, redness and pain. |
| **Skin Contact:** | Causes irritation. Symptoms include redness, itching and pain. |
| **Ingestion:** | May cause irritation to mouth, esophagus, and stomach. |

## Section 8 – Measures in Case of Accidents and Fire

| | |
|---|---|
| **After Spillage/Leakage (small):** | Mop up and neutralize liquid, then discharge to sewer in accordance with local, state and federal regulations. |
| **After Spillage/Leakage (large):** | Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoff from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, neutralize the contaminated area and flush with large quantities of water. |
| **Extinguishing Media:** | Material is compatible with all extinguishing media. |
| **Further Information:** | |

**First Aid**

| | |
|---|---|
| **Eye Contact:** | Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist. |
| **Inhalation:** | Remove affected person to fresh air. Give artificial respiration if individual is not breathing. If breathing is difficult, give oxygen. Seek medical attention if the effects persist. |
| **Ingestion:** | If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **DO NOT** induce vomiting. |
| **Skin Contact:** | Wash affected areas with soap and a mild detergent and large amounts of water. Remove contaminated clothing and shoes. |

## Section 9 – Accidental Release Measures

**Precautions:**

| | |
|---|---|
| **PPE:** | Wear chemical goggles, body-covering protective clothing, chemical resistant gloves, and rubber boots (see Section 6). |
| **Environmental Hazards:** | Sinks and mixes with water. High pH of this material may be harmful to aquatic life. Only water will evaporate from a spill of this material. |
| **Cleanup Methods:** | Pick-up and place in an appropriate container for reclamation or disposal. US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. |

## Section 10 – Information on Toxicology

**Toxicity Data**

| | |
|---|---|
| **Sodium Silicate:** | When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist.<br><br>The acute oral toxicity of this product has not been tested. |
| **Ferrous Sulfate:** | LD50 Oral (rat): 319 mg/kg not a suspected carcinogen. |

## Section 11 – Information on Ecology

**Ecology Data**

| | |
|---|---|
| **Ecotoxicological Information:** | Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L. |

## Section 12 – Disposal Considerations

**Waste Disposal Method**

| | |
|---|---|
| **Waste Treatment:** | Neutralize and landfill solids in an approved waste facility operated by an authorized contactor in compliance with local regulations. |
| **Package (Pail) Treatment:** | The empty and clean containers are to be recycled or disposed of in conformity with local regulations. |

## Section 13 – Shipping/Transport Information

| | |
|---|---|
| **D.O.T.** | This product is not regulated as a hazardous material so there are no restrictions. |

## Section 14 – Other Information

| | | |
|---|---|---|
| **HMIS® Rating** | Health – 2 (moderate) | Reactivity – 0 (none) |
| | Flammability – 0 (none) | Lab PPE – goggles, gloves, and lab coat |
| | Contact – 1 (slight) | |

HMIS® is a registered trademark of the National Painting and Coating Association.

## Section 15 – Further Information

**The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.**

# SAFETY DATA SHEET

**SILVER**

## Section 1. Identification

| | | |
|---|---|---|
| **GHS product identifier** | : | SILVER |
| **Chemical name** | : | Mixture |
| **CAS number** | : | Mixture |
| **Other means of identification** | : | CC01054908 |
| **Product type** | : | liquid |

**Relevant identified uses of the substance or mixture and uses advised against**

| | | |
|---|---|---|
| **Product use** | : | Industrial applications. Plastics. |

| | | |
|---|---|---|
| **Supplier's details** | : | **POLYONE CORPORATION**<br>ColorMatrix Group Inc.<br>680 North Rocky River Drive, Berea, Ohio, 44017-1628, USA<br><br>+1 216 622 0100 |
| **Emergency telephone number (with hours of operation)** | : | **CHEMTREC 1-800-424-9300 (24hrs for spill, leak, fire, exposure or accident).** |

## Section 2. Hazards identification

This mixture has not been evaluated as a whole for health effects. Information provided on health effects of this product is based on the individual components. However, some vapors or contaminants may be released upon heating and the end-user (fabricator) must take the necessary precautions (mechanical ventilation, respiratory protection, etc.) to protect employees from exposure. See sections 8 and 11 for special precautions. After handling, always wash hands thoroughly with soap and water.

| | | |
|---|---|---|
| **OSHA/HCS status** | : | This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). |
| **Classification of the substance or mixture** | : | SKIN CORROSION/IRRITATION - Category 2 |

**GHS label elements**

**Hazard pictograms** :



**Signal word** : Warning
**Hazard statements** : Causes skin irritation.

**Precautionary statements**

**General** : Not applicable.
**Prevention** : Wear protective gloves. Wash hands thoroughly after handling.
**Response** : IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention.
**Storage** : Not applicable.
**Disposal** : Not applicable.
**Supplemental label elements** : None known.
**Hazards not otherwise classified** : None known.

## Section 3. Composition/information on ingredients

**Substance/mixture** : Mixture
**Chemical name** : Mixture
**Other means of identification** : CC01054908

**CAS number/other identifiers**

| Ingredient name | % | CAS number |
|---|---|---|
| Miscellaneous Compounds Distillates, petroleum, hydrotreated middle | 10 - 30 | Not available. |
| Titanium dioxide | 10 - 30 | 13463-67-7 |

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

**Occupational exposure limits, if available, are listed in Section 8.**

# Section 4. First aid measures

**Description of necessary first aid measures**

| | | |
|---|---|---|
| **Eye contact** | : | Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention. |
| **Inhalation** | : | Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. |
| **Skin contact** | : | Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse. |
| **Ingestion** | : | Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. |

**Most important symptoms/effects, acute and delayed**

**Potential acute health effects**

| | | |
|---|---|---|
| **Eye contact** | : | Causes serious eye irritation. |
| **Inhalation** | : | No known significant effects or critical hazards. |
| **Skin contact** | : | Causes skin irritation. |
| **Ingestion** | : | Irritating to mouth, throat and stomach. |

**Over-exposure signs/symptoms**

| | | |
|---|---|---|
| **Eye contact** | : | Adverse symptoms may include the following:<br>pain or irritation |

watering
redness

| | | |
|---|---|---|
| **Inhalation** | : | No specific data. |
| **Skin contact** | : | Adverse symptoms may include the following:<br>irritation<br>redness |
| **Ingestion** | : | No specific data. |

**Indication of immediate medical attention and special treatment needed, if necessary**

| | | |
|---|---|---|
| **Notes to physician** | : | Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. |
| **Specific treatments** | : | No specific treatment. |
| **Protection of first-aiders** | : | No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. |

**See toxicological information (Section 11)**

# Section 5. Fire-fighting measures

**Extinguishing media**

| | | |
|---|---|---|
| **Suitable extinguishing media** | : | In case of fire, use water spray (fog), foam, dry chemical or $CO_2$. |
| **Unsuitable extinguishing media** | : | None known. |
| **Specific hazards arising from the chemical** | : | In a fire or if heated, a pressure increase will occur and the container may burst. |
| **Hazardous thermal decomposition products** | : | Decomposition products may include the following materials:<br>carbon dioxide<br>carbon monoxide<br>metal oxide/oxides |
| **Special protective actions for fire-fighters** | : | Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. |
| **Special protective equipment for fire-fighters** | : | Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. |

# Section 6. Accidental release measures

**Personal precautions, protective equipment and emergency procedures**

| | | |
|---|---|---|
| **For non-emergency personnel** | : | No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. |
| **For emergency responders** | : | If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel". |
| **Environmental precautions** | : | Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). |

**Methods and materials for containment and cleaning up**

| | | |
|---|---|---|
| **Small spill** | : | Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor. |
| **Large spill** | : | Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. |

# Section 7. Handling and storage

**Precautions for safe handling**

| | | |
|---|---|---|
| **Protective measures** | : | Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container. |

| | | |
|---|---|---|
| **Advice on general occupational hygiene** | : | Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures. |
| **Conditions for safe storage, including any incompatibilities** | : | Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. |

# Section 8. Exposure controls/personal protection

**Control parameters**

**Occupational exposure limits**

| Ingredient name | Exposure limits |
|---|---|
| Titanium dioxide | **OSHA PEL 1989 (1989-03-01)**<br>PEL: Permissible Exposure Level 10 mg/m3 Form: Total dust<br>**OSHA PEL (1993-06-30)**<br>PEL: Permissible Exposure Level 15 mg/m3 Form: Total dust<br>**ACGIH TLV (1996-05-18)**<br>TLV-TWA: Threshold Limit Value - Time weighted average PEL: Permissible Exposure Level 10 mg/m3 |

| | | |
|---|---|---|
| **Appropriate engineering controls** | : | Good general ventilation should be sufficient to control worker exposure to airborne contaminants. |
| **Environmental exposure controls** | : | Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels. |

**Individual protection measures**

| | | |
|---|---|---|
| **Hygiene measures** | : | Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated |

clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

**Skin protection**

**Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

**Appearance**

**Physical state** : liquid [liquid]
**Color** : SILVER
**Odor** : Faint odor.
**Odor threshold** : Not available.
**pH** : Not available.
**Melting point** : Not available.
**Boiling point** : Not available.
**Flash point** : Not available.
**Burning time** : Not available.

| | | |
|---|---|---|
| **Burning rate** | : | Not available. |
| **Evaporation rate** | : | Not available. |
| **Flammability (solid, gas)** | : | Not available. |
| **Lower and upper explosive (flammable) limits** | : | **Lower:** Not available.<br>**Upper:** Not available. |
| **Vapor pressure** | : | Not available. |
| **Vapor density** | : | Not available. |
| **Relative density** | : | Not available. |
| **Solubility** | : | Not available. |
| **Solubility in water** | : | insoluble in water. |
| **Partition coefficient: n-octanol/water** | : | Not available. |
| **Auto-ignition temperature** | : | Not available. |
| **Decomposition temperature** | : | Not available. |
| **SADT** | : | Not available. |
| **Viscosity** | : | **Dynamic:** Not available.<br>**Kinematic:** Not available. |

## Section 10. Stability and reactivity

| | | |
|---|---|---|
| **Reactivity** | : | No specific test data related to reactivity available for this product or its ingredients. |
| **Chemical stability** | : | Stable under recommended storage and handling conditions (see Section 7). |
| **Possibility of hazardous reactions** | : | Under normal conditions of storage and use, hazardous reactions will not occur. |
| **Conditions to avoid** | : | Keep away from extreme heat and oxidizing agents. |
| **Incompatible materials** | : | Keep away from strong acids.<br>Oxidizer. |
| **Hazardous decomposition products** | : | Under normal conditions of storage and use, hazardous decomposition products should not be produced. |

## Section 11. Toxicological information

This mixture has not been evaluated as a whole for health effects. Exposure effects listed are based on existing health data for the individual components which comprise the mixture.

**Information on toxicological effects**

**Acute toxicity**

| Product/ingredient name | Result | Species | Dose | Exposure |
|---|---|---|---|---|
| Titanium dioxide | | | | |

| | | | | |
|---|---|---|---|---|
| | LC50 Inhalation | Rat - Male | 6.82 Mg/l | 4 h |
| | LD50 Dermal | Rabbit | > 5,000 mg/kg | - |

**Conclusion/Summary** : Mixture.Not fully tested.

**Irritation/Corrosion**

**Conclusion/Summary**
**Skin** : Mixture.Not fully tested.
**Eyes** : Mixture.Not fully tested.
**Respiratory** : Mixture.Not fully tested.

**Sensitization**

**Conclusion/Summary**
**Skin** : Mixture.Not fully tested.
**Respiratory** : Mixture.Not fully tested.

**Mutagenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Carcinogenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Classification**

| Product/ingredient name | OSHA | IARC | NTP |
|---|---|---|---|
| Titanium dioxide | | 2B | |

**Reproductive toxicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Teratogenicity**

**Conclusion/Summary** : Mixture.Not fully tested.

**Specific target organ toxicity (single exposure)**
Not available.

**Specific target organ toxicity (repeated exposure)**
Not available.

**Aspiration hazard**

| Product/ingredient name | Result |
|---|---|

| | |
|---|---|
| Miscellaneous Compounds Distillates, petroleum, hydrotreated middle | ASPIRATION HAZARD - Category 1 |

**Information on the likely routes of exposure** : Not available.

**Potential acute health effects**

**Eye contact** : Causes serious eye irritation.
**Inhalation** : No known significant effects or critical hazards.
**Skin contact** : Causes skin irritation.
**Ingestion** : Irritating to mouth, throat and stomach.

**Symptoms related to the physical, chemical and toxicological characteristics**

**Eye contact** : Adverse symptoms may include the following:
pain or irritation
watering
redness
**Inhalation** : No specific data.
**Skin contact** : Adverse symptoms may include the following:
irritation
redness
**Ingestion** : No specific data.

**Delayed and immediate effects and also chronic effects from short and long term exposure**

**Short term exposure**

**Potential immediate effects** : Not available.
**Potential delayed effects** : Not available.

**Long term exposure**

**Potential immediate effects** : Not available.
**Potential delayed effects** : Not available.

**Potential chronic health effects**

**Conclusion/Summary** : Mixture.Not fully tested.

**General** : No known significant effects or critical hazards.
**Carcinogenicity** : No known significant effects or critical hazards.
**Mutagenicity** : No known significant effects or critical hazards.
**Teratogenicity** : No known significant effects or critical hazards.

**Developmental effects** : No known significant effects or critical hazards.
**Fertility effects** : No known significant effects or critical hazards.

**Numerical measures of toxicity**

**Acute toxicity estimates**

| Route | ATE value |
|---|---|
| Inhalation (dusts and mists) | 8.073 mg/l |

# Section 12. Ecological information

**Toxicity**

| Product/ingredient name | Result | Species | Exposure |
|---|---|---|---|
| Titanium dioxide | | | |
| | Acute LC50 > 1,000,000 µg/l Marine water | Fish - Mummichog | 96 h |
| | Acute LC50 > 1,000 mg/l Fresh water | Fish - Fathead minnow | 96 h |
| | Acute LC50 13 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute LC50 6.5 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 19.3 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 27.8 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |
| | Acute EC50 35.306 mg/l Fresh water | Aquatic invertebrates. Water flea | 48 h |

**Conclusion/Summary** : Not available.

**Persistence and degradability**

**Conclusion/Summary** : Not available.

**Bioaccumulative potential**

| Product/ingredient name | LogPow | BCF | Potential |
|---|---|---|---|
| Titanium dioxide | | 352.00 | low |

**Mobility in soil**

| | | |
|---|---|---|
| **Soil/water partition coefficient (KOC)** | : | Not available. |
| **Other adverse effects** | : | No known significant effects or critical hazards. |

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

**United States - RCRA Acute hazardous waste "P" List:** Not listed

**United States - RCRA Toxic hazardous waste "U" List:** Not listed

## Section 14. Transport information

| | | |
|---|---|---|
| U.S. DOT Classification | : | Not regulated for transportation. |
| ICAO/IATA | : | Not classified as dangerous good under transport regulations. |
| IMO/IMDG (maritime) | : | Not classified as dangerous good under transport regulations. |

## Section 15. Regulatory information

**U.S. Federal regulations** : **United States - TSCA 12(b) - Chemical export notification:** None of the components are listed.
**United States - TSCA 4(a) - Final Test Rules:** Not listed
**United States - TSCA 4(a) - ITC Priority list:** Not listed
**United States - TSCA 4(a) - Proposed test rules:** Not listed

**United States - TSCA 4(f) - Priority risk review:** Not listed
**United States - TSCA 5(a)2 - Final significant new use rules:** Not listed
**United States - TSCA 5(a)2 - Proposed significant new use rules:** Not listed
**United States - TSCA 5(e) - Substances consent order:** Not listed
**United States - TSCA 6 - Final risk management:** Not listed
**United States - TSCA 6 - Proposed risk management:** Not listed
**United States - TSCA 8(a) - Chemical risk rules:** Not listed
**United States - TSCA 8(a) - Dioxin/Furane precusor:** Not listed
**United States - TSCA 8(a) - Chemical Data Reporting (CDR):** Not determined
**United States - TSCA 8(a) - Preliminary assessment report (PAIR):** Not listed
**United States - TSCA 8(c) - Significant adverse reaction (SAR):** Not listed
**United States - TSCA 8(d) - Health and safety studies:** Not listed
**United States - EPA Clean water act (CWA) section 307 - Priority pollutants:** Listed **Chromium (III) oxide**

**United States - EPA Clean water act (CWA) section 311 - Hazardous substances:** Not listed
**United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Flammable substances:** Not listed
**United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Toxic substances:** Not listed
**United States - Department of commerce - Precursor chemical:** Not listed

| | | |
|---|---|---|
| **Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)** | : | Not listed |
| **Clean Air Act Section 602 Class I Substances** | : | Not listed |
| **Clean Air Act Section 602 Class II Substances** | : | Not listed |
| **DEA List I Chemicals (Precursor Chemicals)** | : | Not listed |
| **DEA List II Chemicals (Essential Chemicals)** | : | Not listed |

**US. EPA CERCLA Hazardous Substances (40 CFR 302)**

not applicable

**SARA 311/312**

**Classification** : Immediate (acute) health hazard

**Composition/information on ingredients**

| Name | % | Classification |
|---|---|---|
| **Miscellaneous Compounds Distillates, petroleum, hydrotreated middle** | 10 - 30 | AH |
| **Titanium dioxide** | 10 - 30 | CH |

**SARA 313**

| | Product name | CAS number | % |
|---|---|---|---|
| **Form R - Reporting requirements** | Aluminum | 7429-90-5 | 1 - 5 |
| **Supplier notification** | Aluminum | 7429-90-5 | 1 - 5 |

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

**State regulations**

**Massachusetts** : The following components are listed:
Mica
Titanium dioxide
Aluminum

**New York** : None of the components are listed.

**New Jersey** : The following components are listed:
Mica
Titanium dioxide
Aluminum

**Pennsylvania** : The following components are listed:
Titanium dioxide
Aluminum

**California Prop. 65**

WARNING: This product contains a chemical known to the State of California to cause cancer.

**United States inventory (TSCA 8b)** : All components are listed or exempted.

**Canada inventory** : All components are listed or exempted.

**International regulations**

| | | |
|---|---|---|
| **International lists** | : | **Australia inventory (AICS):** Not determined.<br>**Taiwan inventory (CSNN):** Not determined.<br>**Malaysia Inventory (EHS Register):** Not determined.<br>**EINECS:** All components are listed or exempted.<br>**Japan inventory:** Not determined.<br>**China inventory (IECSC):** All components are listed or exempted.<br>**Korea inventory:** All components are listed or exempted.<br>**New Zealand Inventory of Chemicals (NZIoC):** Not determined.<br>**Philippines inventory (PICCS):** All components are listed or exempted. |
| **Chemical Weapons Convention List Schedule I Chemicals** | : | Not listed |
| **Chemical Weapons Convention List Schedule II Chemicals** | : | Not listed |
| **Chemical Weapons Convention List Schedule III Chemicals** | : | Not listed |

## Section 16. Other information

**History**

| | | |
|---|---|---|
| **Date of printing** | : | 06/04/2015 |
| **Date of issue/Date of revision** | : | 06/03/2015 |
| **Date of previous issue** | : | 11/20/2014 |
| **Version** | : | 1.1 |
| **Key to abbreviations** | : | ATE = Acute Toxicity Estimate<br>BCF = Bioconcentration Factor<br>GHS = Globally Harmonized System of Classification and Labelling of Chemicals<br>IATA = International Air Transport Association<br>IBC = Intermediate Bulk Container<br>IMDG = International Maritime Dangerous Goods<br>LogPow = logarithm of the octanol/water partition coefficient<br>MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)<br>UN = United Nations |
| **References** | : | Not available. |

**Notice to reader**

**To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution.**

**Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. Particularly this information may not be valid for such material used in conjunction with any other materials or in any process, unless specified in the text.**

# SAFETY DATA SHEET

## 1. Identification

**Product identifier:** Trichloroethylene

**Other means of identification**
**Product No.:** 9464, 8600, 9458, 9454

**Recommended use and restriction on use**

**Recommended use:** Not available.
**Restrictions on use:** Not known.

**Manufacturer/Importer/Supplier/Distributor Information**

**Manufacturer**

| | |
|---|---|
| Company Name: | Avantor Performance Materials, Inc. |
| Address: | 3477 Corporate Parkway, Suite 200<br>Center Valley, PA 18034 |
| Telephone: | |
| | Customer Service: 855-282-6867 |
| Fax: | |
| Contact Person: | Environmental Health & Safety |
| e-mail: | info@avantormaterials.com |

**Emergency telephone number:**
24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

## 2. Hazard(s) identification

**Hazard Classification**

**Health Hazards**

| | |
|---|---|
| Skin Corrosion/Irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2A |
| Germ Cell Mutagenicity | Category 2 |
| Carcinogenicity | Category 1B |
| Specific Target Organ Toxicity - Single Exposure | Category 3 |

**Environmental Hazards**

| | |
|---|---|
| Chronic hazards to the aquatic environment | Category 3 |

**Label Elements**

**Hazard Symbol:**



**Signal Word:** Danger

**Hazard Statement:** May cause cancer.
Suspected of causing genetic defects.
Causes serious eye irritation.
Causes skin irritation.
Harmful to aquatic life with long lasting effects.

**Precautionary Statement**

**Prevention:** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid release to the environment.

**Response:** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash before reuse. Call a POISON CENTER or doctor/physician if you feel unwell. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

**Storage:** Store locked up. Store in a well-ventilated place. Keep container tightly closed.

**Disposal:** Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

**Other hazards which do not result in GHS classification:** None.

## 3. Composition/information on ingredients

**Substances**

| Chemical Identity | Common name and synonyms | CAS number | Content in percent (%)* |
|---|---|---|---|
| TRICHLOROETHYLENE | | 79-01-6 | 99 - 100% |

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

## 4. First-aid measures

**General information:** Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

**Ingestion:** Rinse mouth. Get medical attention if symptoms occur. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

**Inhalation:** Move to fresh air. Get medical attention if symptoms persist. If breathing stops, provide artificial respiration.

**Skin Contact:** Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention if irritation persists after washing. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

**Eye contact:** Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention if irritation persists after washing.

**Most important symptoms/effects, acute and delayed**

**Symptoms:** Irritating to eyes, respiratory system and skin.

**Indication of immediate medical attention and special treatment needed**

**Treatment:** Treat symptomatically. Symptoms may be delayed.

## 5. Fire-fighting measures

**General Fire Hazards:** In case of fire and/or explosion do not breathe fumes.

**Suitable (and unsuitable) extinguishing media**

**Suitable extinguishing media:** Use fire-extinguishing media appropriate for surrounding materials.

**Unsuitable extinguishing media:** Do not use water jet as an extinguisher, as this will spread the fire.

**Specific hazards arising from the chemical:** Contact with metals may evolve flammable hydrogen gas. Fire may produce irritating, corrosive and/or toxic gases.

**Special protective equipment and precautions for firefighters**

**Special fire fighting procedures:** Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out.

**Special protective equipment for fire-fighters:** Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

## 6. Accidental release measures

**Personal precautions, protective equipment and emergency procedures:** Keep unauthorized personnel away. Use personal protective equipment. See Section 8 of the MSDS for Personal Protective Equipment. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

**Methods and material for containment and cleaning up:** Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

**Notification Procedures:** Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.

**Environmental Precautions:** Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

## 7. Handling and storage

**Precautions for safe handling:** Use personal protective equipment as required. Do not breathe mist or vapor. Do not taste or swallow. Do not eat, drink or smoke when using the product. Use only with adequate ventilation. Wash hands thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment. Avoid contact with eyes. Avoid contact with skin. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Wash contaminated clothing before reuse.

**Conditions for safe storage, including any incompatibilities:** Store locked up. Keep in a cool, well-ventilated place. Store in a dry place.

## 8. Exposure controls/personal protection

### Control Parameters

#### Occupational Exposure Limits

| Chemical Identity | Type | Exposure Limit Values | Source |
|---|---|---|---|
| TRICHLOROETHYLENE | TWA | 10 ppm | US. ACGIH Threshold Limit Values (2011) |
| | STEL | 25 ppm | US. ACGIH Threshold Limit Values (2011) |
| | REL | 25 ppm | US. NIOSH: Pocket Guide to Chemical Hazards (2010) |
| | TWA | 50 ppm 270 mg/m3 | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |
| | STEL | 200 ppm 1,080 mg/m3 | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |
| | TWA | 100 ppm | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | Ceiling | 200 ppm | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | MAX. CONC | 300 ppm | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | AN ESL | 54 µg/m3 | US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010) |

#### Biological Limit Values

| Chemical Identity | Exposure Limit Values | Source |
|---|---|---|
| TRICHLOROETHYLENE (Trichloroacetic acid: Sampling time: End of shift at end of work week.) | 15 mg/l (Urine) | ACGIH BEL (03 2013) |
| TRICHLOROETHYLENE (Trichloroethanol, without hydrolysis: Sampling time: End of shift at end of work week.) | 0.5 mg/l (Blood) | ACGIH BEL (03 2013) |

**Appropriate Engineering Controls** No data available.

**Individual protection measures, such as personal protective equipment**

**General information:** Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

**Eye/face protection:** Wear safety glasses with side shields (or goggles) and a face shield.

**Skin Protection**

**Hand Protection:** Chemical resistant gloves

**Other:** Wear suitable protective clothing.

**Respiratory Protection:** In case of inadequate ventilation use suitable respirator.

**Hygiene measures:** Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not eat, drink or smoke when using the product. Wash contaminated clothing before reuse.

## 9. Physical and chemical properties

**Appearance**

| | |
|---|---|
| **Physical state:** | Liquid |
| **Form:** | Liquid |
| **Color:** | Colorless |
| **Odor:** | Ether-like odor |
| **Odor threshold:** | No data available. |
| **pH:** | No data available. |
| **Melting point/freezing point:** | -84.7 °C |
| **Initial boiling point and boiling range:** | 87.2 °C |
| **Flash Point:** | Not applicable |
| **Evaporation rate:** | No data available. |
| **Flammability (solid, gas):** | No data available. |
| **Upper/lower limit on flammability or explosive limits** | |
| **Flammability limit - upper (%):** | 10.5 %(V)<br>90 %(V) |
| **Flammability limit - lower (%):** | 8 %(V)<br>12.5 %(V) |
| **Explosive limit - upper (%):** | No data available. |
| **Explosive limit - lower (%):** | No data available. |
| **Vapor pressure:** | 9.2 kPa (25 °C) |
| **Vapor density:** | 4.53 AIR=1 |
| **Relative density:** | 1.47 (20 °C) |
| **Solubility(ies)** | |
| **Solubility in water:** | 1 g/l (20 °C) |
| **Solubility (other):** | acetone: Soluble<br>ethanol: Soluble |
| **Partition coefficient (n-octanol/water):** | 2.61 |
| **Auto-ignition temperature:** | 420 °C |
| **Decomposition temperature:** | No data available. |
| **Viscosity:** | No data available. |

**Other information**

| | |
|---|---|
| **Molecular weight:** | 131.39 g/mol ($C_2HCl_3$) |

## 10. Stability and reactivity

**Reactivity:** No dangerous reaction known under conditions of normal use.

| | |
|---|---|
| **Chemical Stability:** | Material is stable under normal conditions. |
| **Possibility of Hazardous Reactions:** | Hazardous polymerization does not occur. |
| **Conditions to Avoid:** | Heat, sparks, flames. Light. Moisture. Contact with incompatible materials. |
| **Incompatible Materials:** | Strong oxidizing agents. Alkalies. Caustics. Chemically active metals. |
| **Hazardous Decomposition Products:** | By heating and fire, toxic vapors/gases may be formed. Oxides of Carbon. Phosgene. |

## 11. Toxicological information

**Information on likely routes of exposure**

| | |
|---|---|
| **Ingestion:** | May be harmful if swallowed. |
| **Inhalation:** | May be harmful if inhaled. |
| **Skin Contact:** | Causes skin irritation. |
| **Eye contact:** | Causes serious eye irritation. |

**Information on toxicological effects**

**Acute toxicity (list all possible routes of exposure)**

**Oral**
**Product:** LD 50 (Rat): 4,920 mg/kg

**Dermal**
**Product:** No data available.

**Inhalation**
**Product:** LC 50 (Rat, 4 h): 12000 ppm

**Repeated Dose Toxicity**
**Product:** No data available.

**Skin Corrosion/Irritation**
**Product:** Causes skin irritation.

**Serious Eye Damage/Eye Irritation**
**Product:** Causes serious eye irritation.

**Respiratory or Skin Sensitization**
**Product:** Not a skin sensitizer.

**Carcinogenicity**
**Product:** May cause cancer.

**IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:**

| | |
|---|---|
| TRICHLOROETHYLENE | Overall evaluation: 1. Carcinogenic to humans. |

**US. National Toxicology Program (NTP) Report on Carcinogens:**

| | |
|---|---|
| TRICHLOROETHYLENE | Reasonably Anticipated to be a Human Carcinogen. |

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):**
No carcinogenic components identified

**Germ Cell Mutagenicity**

**In vitro**
**Product:** Suspected of causing genetic defects.

**In vivo**
**Product:** Suspected of causing genetic defects.

**Reproductive Toxicity**
**Product:** No components toxic to reproduction

**Specific Target Organ Toxicity - Single Exposure**
**Product:** May cause respiratory irritation. May cause drowsiness or dizziness.

**Specific Target Organ Toxicity - Repeated Exposure**
**Product:** No data available.

**Aspiration Hazard**
**Product:** Not classified

**Other Effects:** None known.

## 12. Ecological information

**Ecotoxicity:**

**Acute hazards to the aquatic environment:**

**Fish**
**Product:** No data available.

**Specified substance(s):**
TRICHLOROETHYLENE — LC 50 (Fathead minnow (Pimephales promelas), 96 h): 31.4 - 71.8 mg/l Mortality
LC 50 (Bluegill (Lepomis macrochirus), 96 h): 39 - 54 mg/l Mortality
EC 50 (Fathead minnow (Pimephales promelas), 96 h): 18.4 - 28.5 mg/l Intoxication

**Aquatic Invertebrates**
**Product:** No data available.

**Specified substance(s):**
TRICHLOROETHYLENE — LC 50 (Water flea (Daphnia magna), 48 h): 12 - 26 mg/l Mortality

**Chronic hazards to the aquatic environment:**

**Fish**
**Product:** No data available.

**Aquatic Invertebrates**
**Product:** No data available.

**Toxicity to Aquatic Plants**
**Product:** No data available.

**Persistence and Degradability**

**Biodegradation**
**Product:** There are no data on the degradability of this product.

**BOD/COD Ratio**
**Product:** No data available.

**Bioaccumulative Potential**
**Bioconcentration Factor (BCF)**
**Product:** No data available on bioaccumulation.

**Partition Coefficient n-octanol / water (log Kow)**
**Product:** Log Kow: 2.61

**Mobility in Soil:** The product is water soluble and may spread in water systems.

**Other Adverse Effects:** Harmful to aquatic life with long lasting effects.

## 13. Disposal considerations

**Disposal instructions:** Discharge, treatment, or disposal may be subject to national, state, or local laws.

**Contaminated Packaging:** Since emptied containers retain product residue, follow label warnings even after container is emptied.

## 14. Transport information

**DOT**

| | |
|---|---|
| UN Number: | UN 1710 |
| UN Proper Shipping Name: | Trichloroethylene |
| Transport Hazard Class(es) | |
| Class(es): | 6.1 |
| Label(s): | 6.1 |
| Packing Group: | III |
| Marine Pollutant: | No |

**IMDG**

| | |
|---|---|
| UN Number: | UN 1710 |
| UN Proper Shipping Name: | TRICHLOROETHYLENE |
| Transport Hazard Class(es) | |
| Class(es): | 6.1 |
| Label(s): | 6.1 |
| EmS No.: | F-A, S-A |
| Packing Group: | III |
| Marine Pollutant: | No |

**IATA**

| | |
|---|---|
| UN Number: | UN 1710 |
| Proper Shipping Name: | Trichloroethylene |
| Transport Hazard Class(es): | |
| Class(es): | 6.1 |
| Label(s): | 6.1 |
| Marine Pollutant: | No |
| Packing Group: | III |

## 15. Regulatory information

**US Federal Regulations**

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**
None present or none present in regulated quantities.

**CERCLA Hazardous Substance List (40 CFR 302.4):**
TRICHLOROETHYLENE Reportable quantity: 100 lbs.

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**Hazard categories**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| X | Acute (Immediate) | X | Chronic (Delayed) | | Fire | | Reactive | | Pressure Generating |

**SARA 302 Extremely Hazardous Substance**
None present or none present in regulated quantities.

**SARA 304 Emergency Release Notification**

| Chemical Identity | RQ |
|---|---|
| TRICHLOROETHYLENE | 100 lbs. |

**SARA 311/312 Hazardous Chemical**

| Chemical Identity | Threshold Planning Quantity |
|---|---|
| TRICHLOROETHYLENE | 500 lbs |

**SARA 313 (TRI Reporting)**

| Chemical Identity | Reporting threshold for other users | Reporting threshold for manufacturing and processing |
|---|---|---|
| TRICHLOROETHYLENE | 10000 lbs | 25000 lbs. |

**Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)**
TRICHLOROETHYLENE Reportable quantity: 100 lbs.

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):**
None present or none present in regulated quantities.

**US State Regulations**

**US. California Proposition 65**
TRICHLOROETHYLENE Carcinogenic.
TRICHLOROETHYLENE Male reproductive toxin.
TRICHLOROETHYLENE Developmental toxin.

**US. New Jersey Worker and Community Right-to-Know Act**
TRICHLOROETHYLENE Listed

**US. Massachusetts RTK - Substance List**
TRICHLOROETHYLENE Listed

**US. Pennsylvania RTK - Hazardous Substances**
TRICHLOROETHYLENE Listed

**US. Rhode Island RTK**
TRICHLOROETHYLENE Listed

**Inventory Status:**

| | |
|---|---|
| Australia AICS: | On or in compliance with the inventory |
| Canada DSL Inventory List: | On or in compliance with the inventory |
| EINECS, ELINCS or NLP: | On or in compliance with the inventory |
| Japan (ENCS) List: | On or in compliance with the inventory |
| China Inv. Existing Chemical Substances: | Not in compliance with the inventory. |
| Korea Existing Chemicals Inv. (KECI): | On or in compliance with the inventory |
| Canada NDSL Inventory: | Not in compliance with the inventory. |
| Philippines PICCS: | On or in compliance with the inventory |
| US TSCA Inventory: | On or in compliance with the inventory |
| New Zealand Inventory of Chemicals: | On or in compliance with the inventory |
| Japan ISHL Listing: | On or in compliance with the inventory |
| Japan Pharmacopoeia Listing: | Not in compliance with the inventory. |

## 16.Other information, including date of preparation or last revision

**NFPA Hazard ID**




Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

| | |
|---|---|
| **Issue Date:** | 01-08-2015 |
| **Revision Date:** | No data available. |
| **Version #:** | 1.1 |
| **Further Information:** | No data available. |

**Disclaimer:**

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# SAFETY DATA SHEET

**Creation Date** 10-Dec-2009 **Revision Date** 06-Nov-2015 **Revision Number** 2

## 1. Identification

**Product Name** **Tetrachloroethylene**

**Cat No. :** **AC167890000; AC167890010; AC167890025; AC167890100; AC167891000; AC167895000**

**Synonyms** Perchloroethylene

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

**Entity / Business Name**
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

**Emergency Telephone Number**
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
**CHEMTREC** Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

## 2. Hazard(s) identification

**Classification**
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|---|---|
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Skin Sensitization | Category 1 |
| Carcinogenicity | Category 1B |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system, Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Target Organs - Kidney, Liver, Blood. | |

**Label Elements**

**Signal Word**
Danger

**Hazard Statements**
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure



**Precautionary Statements**
**Prevention**
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
**Response**
IF exposed or concerned: Get medical attention/advice
**Inhalation**
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
**Skin**
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention
**Eyes**
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
**Storage**
Store locked up
Store in a well-ventilated place. Keep container tightly closed
**Disposal**
Dispose of contents/container to an approved waste disposal plant
**Hazards not otherwise classified (HNOC)**
Toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

## 3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|---|---|---|
| Tetrachloroethylene | 127-18-4 | >95 |

## 4. First-aid measures

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Obtain medical attention.

**Ingestion** Do not induce vomiting. Obtain medical attention.

**Most important symptoms/effects** Breathing difficulties. . May cause allergic skin reaction. Inhalation of high vapor

concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

**Notes to Physician** Treat symptomatically

## 5. Fire-fighting measures

**Suitable Extinguishing Media** Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

**Unsuitable Extinguishing Media** No information available

**Flash Point** No information available
**Method -** No information available

**Autoignition Temperature** No information available
**Explosion Limits**
**Upper** No data available
**Lower** No data available
**Sensitivity to Mechanical Impact** No information available
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

**Hazardous Combustion Products**
Chlorine Hydrogen chloride gas Phosgene
**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

| Health | Flammability | Instability | Physical hazards |
|---|---|---|---|
| 2 | 0 | 0 | N/A |

## 6. Accidental release measures

**Personal Precautions** Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

**Environmental Precautions** Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

## 7. Handling and storage

**Handling** Use only under a chemical fume hood. Wear personal protective equipment. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH |
|---|---|---|---|
| Tetrachloroethylene | TWA: 25 ppm<br>STEL: 100 ppm | (Vacated) TWA: 25 ppm<br>(Vacated) TWA: 170 mg/m$^3$<br>Ceiling: 200 ppm<br>TWA: 100 ppm | IDLH: 150 ppm |

| Component | Quebec | Mexico OEL (TWA) | Ontario TWAEV |
|---|---|---|---|
| Tetrachloroethylene | TWA: 25 ppm<br>TWA: 170 mg/m³<br>STEL: 100 ppm<br>STEL: 685 mg/m³ | TWA: 100 ppm<br>TWA: 670 mg/m³<br>TWA: 200 ppm<br>TWA: 1250 mg/m³<br>STEL: 200 ppm<br>STEL: 1340 mg/m³ | TWA: 25 ppm<br>STEL: 100 ppm |

*Legend*

*ACGIH - American Conference of Governmental Industrial Hygienists*
*OSHA - Occupational Safety and Health Administration*
*NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health*

**Engineering Measures** Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

| | |
|---|---|
| **Physical State** | Liquid |
| **Appearance** | Colorless |
| **Odor** | Characteristic, sweet |
| **Odor Threshold** | No information available |
| **pH** | No information available |
| **Melting Point/Range** | -22 °C / -7.6 °F |
| **Boiling Point/Range** | 120 - 122 °C / 248 - 251.6 °F @ 760 mmHg |
| **Flash Point** | No information available |
| **Evaporation Rate** | 6.0 (Ether = 1.0) |
| **Flammability (solid,gas)** | Not applicable |
| **Flammability or explosive limits** | |
| **Upper** | No data available |
| **Lower** | No data available |
| **Vapor Pressure** | 18 mbar @ 20 °C |
| **Vapor Density** | No information available |
| **Specific Gravity** | 1.625 |
| **Solubility** | 0.15 g/L water (20°C) |
| **Partition coefficient; n-octanol/water** | No data available |
| **Autoignition Temperature** | No information available |
| **Decomposition Temperature** | > 150°C |
| **Viscosity** | 0.89 mPa s at 20 °C |
| **Molecular Formula** | C2 Cl4 |
| **Molecular Weight** | 165.83 |

## 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

**Stability** Stable under normal conditions.

**Conditions to Avoid** Incompatible products. Excess heat. Exposure to moist air or water.

**Incompatible Materials** Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines

**Hazardous Decomposition Products** Chlorine, Hydrogen chloride gas, Phosgene

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

## 11. Toxicological information

**Acute Toxicity**

**Product Information**

**Component Information**

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Tetrachloroethylene | LD50 = 2629 mg/kg ( Rat ) | LD50 > 10000 mg/kg (Rat) | LC50 = 27.8 mg/L ( Rat ) 4 h |

**Toxicologically Synergistic Products** No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation** Irritating to eyes and skin

**Sensitization** May cause sensitization by skin contact

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---|---|---|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | Group 2A | Reasonably Anticipated | A3 | X | A3 |

*IARC: (International Agency for Research on Cancer)*

*IARC: (International Agency for Research on Cancer)*
*Group 1 - Carcinogenic to Humans*
*Group 2A - Probably Carcinogenic to Humans*
*Group 2B - Possibly Carcinogenic to Humans*

*NTP: (National Toxicity Program)*

*NTP: (National Toxicity Program)*
*Known - Known Carcinogen*
*Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*

*ACGIH: (American Conference of Governmental Industrial Hygienists)*

*A1 - Known Human Carcinogen*
*A2 - Suspected Human Carcinogen*
*A3 - Animal Carcinogen*
*ACGIH: (American Conference of Governmental Industrial Hygienists)*

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** Respiratory system Central nervous system (CNS)

**STOT - repeated exposure** Kidney Liver Blood

**Aspiration hazard** No information available

**Symptoms / effects,both acute and delayed** Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest

pain, muscle pain or flushing

**Endocrine Disruptor Information**

| Component | EU - Endocrine Disrupters Candidate List | EU - Endocrine Disruptors - Evaluated Substances | Japan - Endocrine Disruptor Information |
|---|---|---|---|
| Tetrachloroethylene | Group II Chemical | Not applicable | Not applicable |

**Other Adverse Effects** Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information.

## 12. Ecological information

**Ecotoxicity**

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---|---|---|---|---|
| Tetrachloroethylene | EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata) | LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss)<br>LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus)<br>LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas)<br>LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas) | EC50 = 100 mg/L 24 h<br>EC50 = 112 mg/L 24 h<br>EC50 = 120.0 mg/L 30 min | EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna) |

**Persistence and Degradability** Insoluble in water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

| Component | log Pow |
|---|---|
| Tetrachloroethylene | 2.88 |

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

| Component | RCRA - U Series Wastes | RCRA - P Series Wastes |
|---|---|---|
| Tetrachloroethylene - 127-18-4 | U210 | - |

## 14. Transport information

**DOT**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**TDG**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**IATA**

**UN-No** UN1897
**Proper Shipping Name** TETRACHLOROETHYLENE
**Hazard Class** 6.1
**Packing Group** III

**IMDG/IMO**

| | |
|---|---|
| **UN-No** | UN1897 |
| **Proper Shipping Name** | TETRACHLOROETHYLENE |
| **Hazard Class** | 6.1 |
| **Packing Group** | III |

## 15. Regulatory information

**International Inventories**

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloroethylene | X | X | - | 204-825-9 | - | | X | X | X | X | X |

**Legend:**
**X - Listed**
**E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.**
**F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.**
**N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.**
**P - Indicates a commenced PMN substance**
**R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.**
**S - Indicates a substance that is identified in a proposed or final Significant New Use Rule**
**T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.**
**XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).**
**Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.**
**Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.**

**U.S. Federal Regulations**

**TSCA 12(b)** Not applicable

**SARA 313**

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | >95 | 0.1 |

**SARA 311/312 Hazard Categories**

| | |
|---|---|
| **Acute Health Hazard** | Yes |
| **Chronic Health Hazard** | Yes |
| **Fire Hazard** | No |
| **Sudden Release of Pressure Hazard** | No |
| **Reactive Hazard** | No |

**CWA (Clean Water Act)**

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|---|---|---|---|---|
| Tetrachloroethylene | - | - | X | X |

**Clean Air Act**

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---|---|---|---|
| Tetrachloroethylene | X | | - |

**OSHA** Occupational Safety and Health Administration
Not applicable

**CERCLA**
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---|---|---|
| Tetrachloroethylene | 100 lb 1 lb | - |

**California Proposition 65** This product contains the following proposition 65 chemicals

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---|---|---|---|---|
| Tetrachloroethylene | 127-18-4 | Carcinogen | 14 µg/day | Carcinogen |

**U.S. State Right-to-Know Regulations**

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---|---|---|---|---|---|
| Tetrachloroethylene | X | X | X | X | X |

**U.S. Department of Transportation**

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**
This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**
**This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR**

**WHMIS Hazard Class** D1B Toxic materials
D2A Very toxic materials



## 16. Other information

**Prepared By** Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

**Creation Date** 10-Dec-2009
**Revision Date** 06-Nov-2015
**Print Date** 06-Nov-2015
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**
**The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text**

**End of SDS**

# SAFETY DATA SHEET

## 1. Identification

**Product identifier:** TOLUENE

**Other means of identification**
**Product No.:** 9457, 4483, V560, 8604, 9476, 9466, 9460, 9456, 9364, 9351, 9336, 8608

**Recommended use and restriction on use**

**Recommended use:** Not available.
**Restrictions on use:** Not known.

**Manufacturer/Importer/Supplier/Distributor information**

**Manufacturer**

| | |
|---|---|
| Company Name: | Avantor Performance Materials, Inc. |
| Address: | 3477 Corporate Parkway, Suite 200<br>Center Valley, PA 18034 |
| Telephone: | Customer Service: 855-282-6867 |
| Fax: | |
| Contact Person: | Environmental Health & Safety |
| e-mail: | info@avantormaterials.com |

**Emergency telephone number:**
24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

## 2. Hazard(s) identification

**Hazard classification**

**Physical hazards**

| | |
|---|---|
| Flammable liquids | Category 2 |

**Health hazards**

| | |
|---|---|
| Acute toxicity (Oral) | Category 4 |
| Acute toxicity (Inhalation - vapor) | Category 4 |
| Skin corrosion/irritation | Category 2 |
| Serious eye damage/eye irritation | Category 2A |
| Toxic to reproduction | Category 2 |
| Specific target organ toxicity - single exposure | Category 3 |
| Specific target organ toxicity - repeated exposure | Category 2 |
| Aspiration hazard | Category 1 |

**Environmental hazards**

| | |
|---|---|
| Acute hazards to the aquatic environment | Category 2 |

**Label elements**

**Hazard symbol:**



**Signal word:** Danger

**Hazard statement:**
Highly flammable liquid and vapor.
Harmful if swallowed or if inhaled.
Causes skin irritation.
Causes serious eye irritation.
Suspected of damaging fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.
May cause damage to organs through prolonged or repeated exposure.
Toxic to aquatic life.

**Precautionary statement**

**Prevention:** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves/protective clothing/eye protection/face protection. Use only outdoors or in a well-ventilated area. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment.

**Response:** In case of fire: Use water spray, foam, dry powder or carbon dioxide for extinction. IF exposed or concerned: Get medical advice/attention. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting.

**Storage:** Store locked up. Store in a well-ventilated place. Keep cool. Keep container tightly closed.

**Disposal:** Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

**Other hazards which do not result in GHS classification:** Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor. May cause flash fire or explosion.

## 3. Composition/information on ingredients

**Substances**

| Chemical identity | Common name and synonyms | CAS number | Content in percent (%)* |
|---|---|---|---|
| TOLUENE | | 108-88-3 | 99 - 100% |

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

## 4. First-aid measures

**General information:** Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

**Ingestion:** Call a physician or poison control center immediately. Do NOT induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

**Inhalation:** Move to fresh air. Get medical attention immediately.

**Skin contact:** Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

**Eye contact:** Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.

**Most important symptoms/effects, acute and delayed**

**Symptoms:** Harmful if swallowed. May be fatal if swallowed. Harmful if inhaled. Irritating to eyes, respiratory system and skin.

**Indication of immediate medical attention and special treatment needed**

**Treatment:** Treat symptomatically. Symptoms may be delayed.

## 5. Fire-fighting measures

**General fire hazards:** In case of fire and/or explosion do not breathe fumes.

**Suitable (and unsuitable) extinguishing media**

**Suitable extinguishing media:** Water spray, foam, dry powder or carbon dioxide.

**Unsuitable extinguishing media:** Avoid water in straight hose stream; will scatter and spread fire.

**Specific hazards arising from the chemical:** Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back. Prevent buildup of vapors or gases to explosive concentrations.

**Special protective equipment and precautions for firefighters**

**Special fire fighting procedures:** Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out. Water may be ineffective in fighting the fire. Fight fire from a protected location. Move containers from fire area if you can do so without risk.

| | |
|---|---|
| **Special protective equipment for fire-fighters:** | Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. |

## 6. Accidental release measures

| | |
|---|---|
| **Personal precautions, protective equipment and emergency procedures:** | ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Keep upwind. Use personal protective equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. See Section 8 of the MSDS for Personal Protective Equipment. |
| **Methods and material for containment and cleaning up:** | Eliminate all ignition sources if safe to do so. Take precautionary measures against static discharges. Stop leak if possible without any risk. Use only non-sparking tools. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal. |
| **Notification Procedures:** | Prevent entry into waterways, sewer, basements or confined areas. Inform authorities if large amounts are involved. |
| **Environmental precautions:** | Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. |

## 7. Handling and storage

| | |
|---|---|
| **Precautions for safe handling:** | DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Wear protective gloves/protective clothing/eye protection/face protection. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Wash hands thoroughly after handling. |
| **Conditions for safe storage, including any incompatibilities:** | Keep away from food, drink and animal feeding stuffs. Keep container tightly closed in a cool, well-ventilated place. Ground container and transfer equipment to eliminate static electric sparks. Comply with all national, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids. |

## 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

| Chemical identity | Type | Exposure Limit values | | Source |
|---|---|---|---|---|
| TOLUENE | TWA | 20 ppm | | US. ACGIH Threshold Limit Values (2011) |
| | STEL | 150 ppm | 560 mg/m3 | US. NIOSH: Pocket Guide to Chemical Hazards (2010) |
| | REL | 100 ppm | 375 mg/m3 | US. NIOSH: Pocket Guide to Chemical Hazards (2010) |
| | TWA | 100 ppm | 375 mg/m3 | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |
| | STEL | 150 ppm | 560 mg/m3 | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |
| | TWA | 200 ppm | | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | Ceiling | 300 ppm | | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |
| | MAX. CONC | 500 ppm | | US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006) |

#### Biological limit values

| Chemical identity | Exposure Limit values | Source |
|---|---|---|
| TOLUENE (o-Cresol, with hydrolysis: Sampling time: End of shift.) | 0.3 mg/g (Creatinine in urine) | ACGIH BEL (2011) |
| TOLUENE (toluene: Sampling time: Prior to last shift of work week.) | 0.02 mg/l (Blood) | ACGIH BEL (2011) |
| TOLUENE (toluene: Sampling time: End of shift.) | 0.03 mg/l (Urine) | ACGIH BEL (2011) |

**Appropriate engineering controls** No data available.

**Individual protection measures, such as personal protective equipment**

**General information:** Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area. Use explosion-proof ventilation equipment.

**Eye/face protection:** Wear safety glasses with side shields (or goggles) and a face shield.

**Skin protection**

**Hand protection:** Chemical resistant gloves

**Other:** Wear suitable protective clothing.

**Respiratory protection:** In case of inadequate ventilation use suitable respirator.

**Hygiene measures:** Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

## 9. Physical and chemical properties

**Appearance**

| | |
|---|---|
| **Physical state:** | Liquid |
| **Form:** | Liquid |
| **Color:** | Colorless |
| **Odor:** | Sweet aromatic odor |
| **Odor threshold:** | No data available. |
| **pH:** | No data available. |
| **Melting point/freezing point:** | -94.9 °C |
| **Initial boiling point and boiling range:** | 110 °C |
| **Flash Point:** | 4 °C (Closed Cup) |
| **Evaporation rate:** | 2.24 (butyl acetate=1) |
| **Flammability (solid, gas):** | No data available. |
| **Upper/lower limit on flammability or explosive limits** | |
| **Flammability limit - upper (%):** | 7.1 %(V) |
| **Flammability limit - lower (%):** | 1.1 %(V) |
| **Explosive limit - upper (%):** | No data available. |
| **Explosive limit - lower (%):** | No data available. |
| **Vapor pressure:** | 3.8 kPa (25 °C) |
| **Vapor density:** | 3.1 AIR=1 |
| **Relative density:** | 0.86 (20 °C) |
| **Solubility(ies)** | |
| **Solubility in water:** | 0.7 g/l (23.3 °C) |
| **Solubility (other):** | No data available. |
| **Partition coefficient (n-octanol/water):** | 2.73 |
| **Auto-ignition temperature:** | 480 °C |
| **Decomposition temperature:** | No data available. |
| **Viscosity:** | No data available. |

**Other information**

| | |
|---|---|
| **Molecular weight:** | 92.14 g/mol (C7H8) |

## 10. Stability and reactivity

| | |
|---|---|
| **Reactivity:** | No dangerous reaction known under conditions of normal use. |
| **Chemical stability:** | Material is stable under normal conditions. |
| **Possibility of hazardous reactions:** | Hazardous polymerization does not occur. |
| **Conditions to avoid:** | Heat, sparks, flames. |
| **Incompatible materials:** | Strong oxidizing agents. Chlorine. |
| **Hazardous decomposition products:** | Thermal decomposition may release oxides of carbon. |

## 11. Toxicological information

**Information on likely routes of exposure**

| | |
|---|---|
| **Ingestion:** | Harmful if swallowed. |
| **Inhalation:** | Harmful if inhaled. May cause irritation to the mucous membranes and upper respiratory tract. |

**Skin contact:** Causes skin irritation.

**Eye contact:** Causes serious eye irritation.

**Information on toxicological effects**

**Acute toxicity (list all possible routes of exposure)**

**Oral**
**Product:** LD 50 (Rat): 636 mg/kg

**Dermal**
**Product:** LD 50 (Rabbit): 12,124 mg/kg

**Inhalation**
**Product:** LC 50 (Mouse, 24 h): 400 mg/l
LC 50 (Rat, 4 h): 8,000 mg/l

**Repeated dose toxicity**
**Product:** No data available.

**Skin corrosion/irritation**
**Product:** Causes skin irritation.

**Serious eye damage/eye irritation**
**Product:** Causes serious eye irritation.

**Respiratory or skin sensitization**
**Product:** Not a skin sensitizer.

**Carcinogenicity**
**Product:** This substance has no evidence of carcinogenic properties.

**IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:**
No carcinogenic components identified

**US. National Toxicology Program (NTP) Report on Carcinogens:**
No carcinogenic components identified

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):**
No carcinogenic components identified

**Germ cell mutagenicity**

**In vitro**
**Product:** No mutagenic components identified

**In vivo**
**Product:** No mutagenic components identified

**Reproductive toxicity**
**Product:** May damage fertility or the unborn child.

**Specific target organ toxicity - single exposure**
**Product:** Narcotic effect. Respiratory tract irritation.

**Specific target organ toxicity - repeated exposure**
**Product:** Peripheral nervous system Central nervous system. Kidneys. auditory organs

**Aspiration hazard**
**Product:** May be fatal if swallowed and enters airways.

**Other effects:** No data available.

## 12. Ecological information

**Ecotoxicity:**

**Acute hazards to the aquatic environment:**

**Fish**

**Product:** No data available.

**Specified substance(s):**

TOLUENE — LC 50 (Fathead minnow (Pimephales promelas), 96 h): 12.6 mg/l Mortality
LC 50 (Coho salmon,silver salmon (Oncorhynchus kisutch), 96 h): 5.5 mg/l Mortality

**Aquatic invertebrates**

**Product:** No data available.

**Specified substance(s):**

TOLUENE — EC 50 (Brine shrimp (Artemia sp.), 24 h): 22.1 - 54.1 mg/l Intoxication
EC 50 (Water flea (Daphnia magna), 48 h): 5.46 - 9.83 mg/l Intoxication

**Chronic hazards to the aquatic environment:**

**Fish**

**Product:** No data available.

**Aquatic invertebrates**

**Product:** No data available.

**Toxicity to Aquatic Plants**

**Product:** No data available.

**Persistence and degradability**

**Biodegradation**

**Product:** Expected to be readily biodegradable.

**BOD/COD ratio**

**Product:** No data available.

**Bioaccumulative potential**

**Bioconcentration factor (BCF)**

**Product:** Bioaccumulation is unlikely to be significant because of the low water solubility of this product.

**Partition coefficient n-octanol / water (log Kow)**

**Product:** Log Kow: 2.73

**Mobility in soil:** The product is insoluble in water and will spread on the water surface.

**Other adverse effects:** Toxic to aquatic organisms.

## 13. Disposal considerations

**Disposal instructions:** Discharge, treatment, or disposal may be subject to national, state, or local laws. Residual vapors may explode on ignition; do not cut, drill, grind, or weld on or near this container.

**Contaminated packaging:** Since emptied containers retain product residue, follow label warnings even after container is emptied.

## 14. Transport information

**DOT**

| | |
|---|---|
| UN number: | UN 1294 |
| UN proper shipping name: | Toluene |
| Transport hazard class(es) | |
| Class(es): | 3 |
| Label(s): | 3 |
| Packing group: | II |
| Marine Pollutant: | No |

**IMDG**

| | |
|---|---|
| UN number: | UN 1294 |
| UN proper shipping name: | TOLUENE |
| Transport hazard class(es) | |
| Class(es): | 3 |
| Label(s): | 3 |
| EmS No.: | F-E, S-D |
| Packing group: | II |
| Marine Pollutant: | No |

**IATA**

| | |
|---|---|
| UN number: | UN 1294 |
| Proper Shipping Name: | Toluene |
| Transport hazard class(es): | |
| Class(es): | 3 |
| Label(s): | 3 |
| Marine Pollutant: | No |
| Packing group: | II |

## 15. Regulatory information

**US federal regulations**

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

None present or none present in regulated quantities.

**CERCLA Hazardous Substance List (40 CFR 302.4):**

TOLUENE Reportable quantity: 1000 lbs.

**Superfund amendments and reauthorization act of 1986 (SARA)**

**Hazard categories**

[X] Acute (Immediate) [X] Chronic (Delayed) [X] Fire [ ] Reactive [ ] Pressure Generating

**SARA 302 Extremely hazardous substance**

None present or none present in regulated quantities.

**SARA 304 Emergency release notification**

| Chemical identity | RQ |
|---|---|
| TOLUENE | 1000 lbs. |

**SARA 311/312 Hazardous chemical**

| Chemical identity | Threshold Planning Quantity |
|---|---|
| TOLUENE | 500 lbs |

**SARA 313 (TRI reporting)**

| Chemical identity | Reporting threshold for other users | Reporting threshold for manufacturing and processing |
|---|---|---|
| TOLUENE | 10000 lbs | 25000 lbs. |

**Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)**

TOLUENE Reportable quantity: 1000 lbs.

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):**

None present or none present in regulated quantities.

**US state regulations**

**US. California Proposition 65**

TOLUENE Developmental toxin.
TOLUENE Female reproductive toxin.

**US. New Jersey Worker and Community Right-to-Know Act**

TOLUENE Listed

**US. Massachusetts RTK - Substance List**

TOLUENE Listed

**US. Pennsylvania RTK - Hazardous Substances**

TOLUENE Listed

**US. Rhode Island RTK**

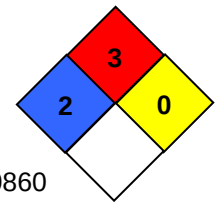
TOLUENE Listed

**Inventory Status:**

| | |
|---|---|
| Australia AICS: | On or in compliance with the inventory |
| Canada DSL Inventory List: | On or in compliance with the inventory |
| EU EINECS List: | On or in compliance with the inventory |
| EU ELINCS List: | Not in compliance with the inventory. |
| Japan (ENCS) List: | On or in compliance with the inventory |
| EU No Longer Polymers List: | Not in compliance with the inventory. |
| China Inv. Existing Chemical Substances: | On or in compliance with the inventory |
| Korea Existing Chemicals Inv. (KECI): | On or in compliance with the inventory |
| Canada NDSL Inventory: | Not in compliance with the inventory. |
| Philippines PICCS: | On or in compliance with the inventory |
| US TSCA Inventory: | On or in compliance with the inventory |
| New Zealand Inventory of Chemicals: | On or in compliance with the inventory |
| Switzerland Consolidated Inventory: | Not in compliance with the inventory. |
| Japan ISHL Listing: | On or in compliance with the inventory |
| Japan Pharmacopoeia Listing: | Not in compliance with the inventory. |

## 16.Other information, including date of preparation or last revision

**NFPA Hazard ID**




Flammability
Health

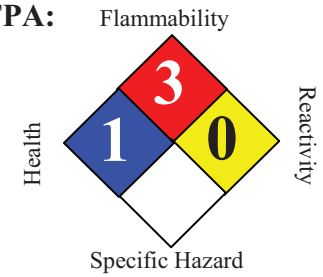



Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

| | |
|---|---|
| **Issue date:** | 06-12-2014 |
| **Revision date:** | No data available. |
| **Version #:** | 1.0 |
| **Further information:** | No data available. |
| **Disclaimer:** | THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED “AS IS,” AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION<(>,<)> WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES. |

# Safety Data Sheet
# Gasoline, Unleaded

**NFPA:**




TESORO

## SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

| | | | | | |
|---|---|---|---|---|---|
| **Product name** | : | Gasoline, Unleaded | | | |
| **Synonyms** | : | Blend of Highly Flammable Petroleum Distillates, Regular, Mid-Grade, Premium, 888100008809 | | | |
| **SDS Number** | : | 888100008809 | **Version** | : | 1.1 |
| **Product Use Description** | : | Fuel | | | |
| **Company** | : | For: Tesoro Refining & Marketing Co.<br>19100 Ridgewood Parkway, San Antonio, TX 78259 | | | |
| **Tesoro Call Center** | : | (877) 783-7676 | **Chemtrec (Emergency Contact)** | : | (800) 424-9300 |

## SECTION 2. HAZARDS IDENTIFICATION

**Classifications** :

Flammable Liquid – Category 1 or 2 depending on formulation.
Aspiration Hazard – Category 1
Carcinogenicity – Category 2
Specific Target Organ Toxicity (Repeated Exposure) – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Skin Irritation – Category 2
Eye Irritation – Category 2B
Chronic Aquatic Toxicity – Category 2

**Pictograms** :



**Signal Word** : **Danger**

**Hazard Statements**

Extremely flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
Suspected of causing blood cancer if repeated over-exposure by inhalation and/or skin contact occurs.
May cause damage to liver, kidneys and nervous system by repeated and prolonged inhalation or skin contact. Causes eye irritation. Can be absorbed through skin.
May cause drowsiness or dizziness. Extreme exposure such as intentional inhalation may cause unconsciousness, asphyxiation and death.
Repeated or prolonged skin contact can cause irritation and dermatitis.

Harmful to aquatic life.

**Precautionary statements**

**Prevention** : Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, welding and hot surfaces.
No smoking.
Keep container tightly closed.
Ground and/or bond container and receiving equipment.
Use explosion-proof electrical equipment.
Use only non-sparking tools (if tools are used in flammable atmosphere).
Take precautionary measures against static discharge.
Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
Wash hands or liquid-contacted skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Do not breathe vapors.
Use only outdoors or in a well-ventilated area.

**Response** : In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish.
If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If skin or eye irritation persists, get medical attention.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Get medical attention if you feel unwell.

**Storage** : Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers. Some containers not approved for gasoline may dissolve and release flammable gasoline liquid and vapors.

**Disposal** : Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

## SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

| Component | CAS-No. | Weight % |
|---|---|---|
| **Gasoline, natural; Low boiling point naphtha** | 8006-61-9 | 10 - 30% |
| **Toluene** | 108-88-3 | 10 - 30% |
| **Xylene** | 1330-20-7 | 10 - 30% |
| **Ethanol; ethyl alcohol** | 64-17-5 | 0-8.2% |
| **Trimethylbenzene** | 25551-13-7 | 1 - 5% |
| **Isopentane; 2-methylbutane** | 78-78-4 | 1 - 5% |

| | | |
|---|---|---|
| **Naphthalene** | 91-20-3 | 1 - 5% |
| **Benzene** | 71-43-2 | Less than 1.3% |
| **Pentane** | 109-66-0 | 1 - 5% |
| **Cyclohexane** | 110-82-7 | 1 - 5% |
| **Ethylbenzene** | 100-41-4 | 1 - 5% |
| **Butane** | 106-97-8 | 1 - 20% |
| **Heptane [and isomers]** | 142-82-5 | 0.5 - 0.75% |
| **N-hexane** | 110-54-3 | 0.5 - 0.75% |

## SECTION 4. FIRST AID MEASURES

**Inhalation** : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical attention immediately.

**Skin contact** : In case of contact, immediately flush skin with plenty of water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Contaminated leather, particularly footwear, must be discarded. Note that contaminated clothing may be a fire hazard. Seek medical advice if symptoms persist or develop.

**Eye contact** : Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice if symptoms persist or develop.

**Ingestion** : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Obtain medical attention.

**Notes to physician** : Symptoms: Dizziness, Discomfort, Headache, Nausea, Kidney disorders, Liver disorders. Aspiration may cause pulmonary edema and pneumonitis. Swallowing gasoline is more likely to be fatal for small children than adults, even if aspiration does not occur.

## SECTION 5. FIRE-FIGHTING MEASURES

**Suitable extinguishing media** : SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray or fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Keep containers and surroundings cool with water spray.

**Specific hazards during fire fighting** : Extremely flammable liquid and vapor. This material is combustible/flammable and is sensitive to fire, heat, and static discharge.

**Special protective equipment for fire-fighters** : Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

| | | |
|---|---|---|
| **Further information** | : | Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam. Exposure to decomposition products may be a hazard to health. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. |

## SECTION 6. ACCIDENTAL RELEASE MEASURES

| | | |
|---|---|---|
| **Personal precautions** | : | Evacuate personnel to safe areas. Ventilate the area. Remove all sources of ignition. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8). |
| **Environmental precautions** | : | Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities. |
| **Methods for cleaning up** | : | Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations. |

## SECTION 7. HANDLING AND STORAGE

**Precautions for safe handling** :

Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.

(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).

(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

**Conditions for safe storage, including incompatibilities** : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Reports suggest that government-mandated ethanol, if present, may not be compatible with fiberglass gasoline tanks. Ethanol may dissolve fiberglass resin, causing engine damage and possibly allow leakage of explosive gasoline.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

No decomposition if stored and applied as directed. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Store only in containers approved and labeled for gasoline.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### Exposure Guidelines

| List | Components | CAS-No. | Type: | Value |
|---|---|---|---|---|
| **OSHA** | Benzene | 71-43-2 | TWA | 1 ppm |
| | | 71-43-2 | STEL | 5 ppm |
| | | 71-43-2 | OSHA_ACT | 0.5 ppm |
| **OSHA Z1** | Xylene | 1330-20-7 | PEL | 100 ppm 435 mg/m3 |
| | Ethanol; Ethyl alcohol | 64-17-5 | PEL | 1,000 ppm 1,900 mg/m3 |
| | Naphthalene | 91-20-3 | PEL | 10 ppm 50 mg/m3 |
| | Cyclohexane | 110-82-7 | PEL | 300 ppm 1,050 mg/m3 |
| | Ethylbenzene | 100-41-4 | PEL | 100 ppm 435 mg/m3 |
| | Heptane [and isomers] | 142-82-5 | PEL | 500 ppm 2,000 mg/m3 |
| | N-hexane | 110-54-3 | PEL | 500 ppm 1,800 mg/m3 |
| **ACGIH** | Toluene | 108-88-3 | TWA | 50 ppm |
| | Xylene | 1330-20-7 | TWA | 100 ppm |
| | | 1330-20-7 | STEL | 150 ppm |
| | Ethanol; Ethyl alcohol | 64-17-5 | TWA | 1,000 ppm |
| | Trimethylbenzene | 25551-13-7 | TWA | 25 ppm |
| | Isopentane; 2-Methylbutane | 78-78-4 | TWA | 600 ppm |
| | Naphthalene | 91-20-3 | TWA | 10 ppm |
| | | 91-20-3 | STEL | 15 ppm |
| | Benzene | 71-43-2 | TWA | 0.5 ppm |
| | | 71-43-2 | STEL | 2.5 ppm |
| | Pentane | 109-66-0 | TWA | 600 ppm |
| | Cyclohexane | 110-82-7 | TWA | 100 ppm |
| | Ethylbenzene | 100-41-4 | TWA | 100 ppm |
| | | 100-41-4 | STEL | 125 ppm |
| | Heptane [and isomers] | 142-82-5 | TWA | 400 ppm |
| | | 142-82-5 | STEL | 500 ppm |

| | | | | |
|---|---|---|---|---|
| | N-hexane | 110-54-3 | TWA | 50 ppm |

**Engineering measures** : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.

**Eye protection** : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Ensure that eyewash stations and safety showers are close to the workstation location.

**Hand protection** : Gloves constructed of nitrile or neoprene are recommended. Consult manufacturer specifications for further information.

**Skin and body protection** : If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.

**Respiratory protection** : A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

**Work / Hygiene practices** : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance** : Clear to straw colored liquid

**Odor** : Characteristic hydrocarbon-like

**Odor threshold** 0.5 - 1.1 ppm

**pH** : Not applicable

**Melting point/freezing point** About -101°C (-150°F)

**Initial boiling point & range** Boiling point varies: 30 – 200°C (85 – 392°F)

**Flash point** < -21°C (-5.8°F)

**Evaporation rate** : Higher initially and declining as lighter components evaporate

**Flammability (solid, gas)** : Flammable vapor released by liquid

| | |
|---|---|
| **Upper explosive limit** | 7.6 %(V) |
| **Lower explosive limit** | 1.3 %(V) |
| **Vapor pressure** | 345 - 1,034 hPa at 37.8 °C (100.0 °F) |
| **Vapor density (air = 1)** | Approximately 3 to 4 |
| **Relative density (water = 1)** | 0.8 g/mL |
| **Solubility (in water)** | Negligible |
| **Partition coefficient (n-octanol/water)** | 2 – 7 as log Pow |
| **Auto-ignition temperature** | Approximately 250°C (480°F) |
| **Decomposition temperature** | Will evaporate or boil and possibly ignite before decomposition occurs. |
| **Kinematic viscosity** | 0.64 to 0.88 mm²/s range reported for gasoline |
| **Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature)** | : Hydrocarbon liquids without static dissipater additive may have conductivity below 1 picoSiemens per meter (pS/m). The highest electro-static ignition risks are associated with "ultra-low conductivities" below 5 pS/m. See Section 7 for sources of information on defining safe loading and handling procedures for low conductivity products. |

## SECTION 10. STABILITY AND REACTIVITY

| | |
|---|---|
| **Reactivity** | : Vapors may form explosive mixture with air. Hazardous polymerization does not occur. |
| **Chemical stability** | : Stable under normal conditions. |
| **Possibility of hazardous reactions** | Can react with strong oxidizing agents, peroxides, alkaline products and strong acids. Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently. |
| **Conditions to avoid** | : Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7). |
| **Hazardous decomposition products** | : Ignition and burning can release carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). |

## SECTION 11. TOXICOLOGICAL INFORMATION

| | |
|---|---|
| **Skin contact** | : Irritating to skin. Can be partially absorbed through skin. |
| **Eye contact** | : Irritating to eyes. |
| **Ingestion** | : Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur. |

**Inhalation and further information**

Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, over excitation. Exposure to very high levels can result in unconsciousness and death.

Repeated over-exposure may cause liver and kidney injuries.
Components of the product may affect the nervous system.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.
This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

**Component**:

| | | |
|---|---|---|
| **Gasoline, natural; Low boiling point naphtha** | 8006-61-9 | Acute oral toxicity: LD50 rat<br>Dose: 18.8 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 20.7 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Moderate eye irritation |
| **Toluene** | 108-88-3 | Acute oral toxicity: LD50 rat<br>Dose: 636 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: 12,124 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 49 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br>Prolonged skin contact may defat the skin and produce dermatitis.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **Xylene** | 1330-20-7 | Acute oral toxicity: LD50 rat<br>Dose: 2,840 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: ca. 4,500 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 6,350 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation |

| | | |
|---|---|---|
| | | Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **Ethanol; Ethyl alcohol** | 64-17-5 | Acute oral toxicity: LD50 rat<br>Dose: 6,200 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: 19,999 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 8,001 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br>Prolonged skin contact may cause skin irritation and/or dermatitis.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation<br>Mild eye irritation |
| **Naphthalene** | 91-20-3 | Acute oral toxicity: LD50 rat<br>Dose: 2,001 mg/kg<br><br>Acute dermal toxicity: LD50 rat<br>Dose: 2,501 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 101 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation<br><br>Carcinogenicity: N11.00422130 |
| **Benzene** | 71-43-2 | Acute oral toxicity: LD50 rat<br>Dose: 930 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 44 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br>Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Risk of serious damage to eyes. |
| **Pentane** | 109-66-0 | Acute oral toxicity: LD50 rat<br>Dose: 2,001 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 364 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **Cyclohexane** | 110-82-7 | Acute dermal toxicity: LD50 rabbit<br>Dose: 2,001 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 14 mg/l<br>Exposure time: 4 h |

| | | |
|---|---|---|
| | | Skin irritation: Classification: Irritating to skin.<br>Result: Skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **Ethylbenzene** | 100-41-4 | Acute oral toxicity: LD50 rat<br>Dose: 3,500 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: 15,500 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 18 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Mild skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Risk of serious damage to eyes. |
| **Heptane [and isomers]** | 142-82-5 | Acute oral toxicity: LD50 rat<br>Dose: 15,001 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 103 g/m3<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Skin irritation<br>Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.<br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation |
| **N-hexane** | 110-54-3 | Acute oral toxicity: LD50 rat<br>Dose: 25,000 mg/kg<br><br>Acute dermal toxicity: LD50 rabbit<br>Dose: 2,001 mg/kg<br><br>Acute inhalation toxicity: LC50 rat<br>Dose: 171.6 mg/l<br>Exposure time: 4 h<br><br>Skin irritation: Classification: Irritating to skin.<br>Result: Skin irritation<br><br>Eye irritation: Classification: Irritating to eyes.<br>Result: Mild eye irritation<br><br>Teratogenicity: N11.00418960 |

**Carcinogenicity**

| | | |
|---|---|---|
| **NTP** | : | Naphthalene (CAS-No.: 91-20-3)<br>Benzene (CAS-No.: 71-43-2) |
| **IARC** | : | Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9)<br>Naphthalene (CAS-No.: 91-20-3)<br>Benzene (CAS-No.: 71-43-2)<br>Ethylbenzene (CAS-No.: 100-41-4) |
| **OSHA** | : | Benzene (CAS-No.: 71-43-2) |
| **CA Prop 65** | : | WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.<br>Toluene (CAS-No.: 108-88-3) |

Benzene (CAS-No.: 71-43-2)

## SECTION 12. ECOLOGICAL INFORMATION

**Additional ecological information** : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

**Component:**

| | | |
|---|---|---|
| **Toluene** | 108-88-3 | Toxicity to fish:<br>LC50<br>Species: Carassius auratus (goldfish)<br>Dose: 13 mg/l<br>Exposure time: 96 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 11.5 mg/l<br>Exposure time: 48 h<br><br>Toxicity to algae:<br>IC50<br>Species: Selenastrum capricornutum (green algae)<br>Dose: 12 mg/l<br>Exposure time: 72 h |
| **Ethanol; Ethyl alcohol** | 64-17-5 | Toxicity to fish:<br>LC50<br>Species: Leuciscus idus (Golden orfe)<br>Dose: 8,140 mg/l<br>Exposure time: 48 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 9,268 - 14,221 mg/l<br>Exposure time: 48 h |
| **Isopentane; 2-Methylbutane** | 78-78-4 | Toxicity to fish:<br>LC50<br>Species: Oncorhynchus mykiss (rainbow trout)<br>Dose: 3.1 mg/l<br>Exposure time: 96 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 2.3 mg/l<br>Exposure time: 96 h |
| **Naphthalene** | 91-20-3 | Toxicity to algae:<br>EC50<br>Species:<br>Dose: 33 mg/l<br>Exposure time: 24 h |
| **Pentane** | 109-66-0 | Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 9.74 mg/l<br>Exposure time: 48 h |
| **Cyclohexane** | 110-82-7 | Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 3.78 mg/l<br>Exposure time: 48 h |

| | | |
|---|---|---|
| **Heptane [and isomers]** | 142-82-5 | Toxicity to fish:<br>LC50<br>Species: Carassius auratus (goldfish)<br>Dose: 4 mg/l<br>Exposure time: 24 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 1.5 mg/l<br>Exposure time: 48 h |
| **N-hexane** | 110-54-3 | Toxicity to fish:<br>LC50<br>Species: Pimephales promelas (fathead minnow)<br>Dose: 2.5 mg/l<br>Exposure time: 96 h<br><br>Acute and prolonged toxicity for aquatic invertebrates:<br>EC50<br>Species: Daphnia magna (Water flea)<br>Dose: 2.1 mg/l<br>Exposure time: 48 h |

## SECTION 13. DISPOSAL CONSIDERATIONS

**Disposal** : Dispose of container and unused contents in accordance with federal, state and local requirements.

## SECTION 14. TRANSPORT INFORMATION

**CFR**

| | |
|---|---|
| Proper shipping name | : Petrol |
| UN-No. | : 1203 |
| Class | : 3 |
| Packing group | : II |

**TDG**

| | |
|---|---|
| Proper shipping name | : Gasoline |
| UN-No. | : UN1203 |
| Class | : 3 |
| Packing group | : II |

**IATA Cargo Transport**

| | |
|---|---|
| UN UN-No. | : UN1203 |
| Description of the goods | : Gasoline |
| Class | : 3 |
| Packaging group | : II |
| ICAO-Labels | : 3 |
| Packing instruction (cargo aircraft) | : 364 |
| Packing instruction (cargo aircraft) | : Y341 |

**IATA Passenger Transport**

| | |
|---|---|
| UN UN-No. | : UN1203 |
| Description of the goods | : Gasoline |
| Class | : 3 |

| | | |
|---|---|---|
| Packaging group | : | II |
| ICAO-Labels | : | 3 |
| Packing instruction (passenger aircraft) | : | 353 |
| Packing instruction (passenger aircraft) | : | Y341 |

**IMDG-Code**

| | | |
|---|---|---|
| UN-No. | : | UN 1203 |
| Description of the goods | : | Gasoline |
| Class | : | 3 |
| Packaging group | : | II |
| IMDG-Labels | : | 3 |
| EmS Number | : | F-E S-E |
| Marine pollutant | : | No |

## SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Flammable liquid
Highly toxic by ingestion
Moderate skin irritant
Severe eye irritant
Carcinogen

TSCA Status : On TSCA Inventory

DSL Status : . All components are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

**CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)**
The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

| | |
|---|---|
| Toluene | 108-88-3 |
| Benzene | 71-43-2 |

## SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

**Revision Date** : 08/09/2012

6, 8, 10, 12, 14, 16, 64, 68, 91, 112, 306, 1092, 1106, 1500, 1570, 1571, 1651, 1652, 1654, 1700, 1701, 1702, 1710, 1711, 1714, 1726, 1729, 1730, 1732, 1733, 1826, 1848, 1880, 1950

# SAFETY DATA SHEET

**Creation Date** 13-Feb-2015 **Revision Date** 21-Feb-2014 **Revision Number** 3

## SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

### 1.1. Product identification

**Product Description:** Xylene
**Cat No. :** **6601, 6615, 6655, 9900-5, 9900-55, 6601E**
**Synonyms** Dimethylbenzene; Methyltoluene
**Molecular Formula** C8H10

### 1.2. Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Laboratory chemicals.
**Uses advised against** No Information available

### 1.3. Details of the supplier of the safety data sheet

**Company**
Richard Allan Scientific
A Subsidiary of Thermo Fisher Scientific
4481 Campus Drive
Kalamazoo, MI 49008
Tel: (800) 522-7270
**E-mail address** begel.sdsdesk@thermofisher.com

### 1.4. Emergency telephone number

Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

## SECTION 2: HAZARDS IDENTIFICATION

### 2.1. Classification of the substance or mixture

**CLP Classification - Regulation (EC) No 1272/2008**

**Physical hazards**

| | |
|---|---|
| Flammable liquids | Category 3 |

**Health hazards**

| | |
|---|---|
| Aspiration Toxicity | Category 1 |
| Acute dermal toxicity | Category 4 |
| Acute Inhalation Toxicity - Vapors | Category 4 |
| Skin Corrosion/irritation | Category 2 |
| Specific target organ toxicity - (repeated exposure) | Category 2 |

**Environmental hazards**
Based on available data, the classification criteria are not met

**Classification according to EU Directives 67/548/EEC or 1999/45/EC**

**Symbol(s)** Xn - Harmful
**R-phrase(s)** R10 - Flammable
R38 - Irritating to skin
R20/21 - Harmful by inhalation and in contact with skin

*For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.*

### 2.2. Label elements



**Signal Word** **Danger**

**Hazard Statements**

H226 - Flammable liquid and vapor
H312 - Harmful in contact with skin
H332 - Harmful if inhaled
H315 - Causes skin irritation
H304 - May be fatal if swallowed and enters airways
H373 - May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements**

P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P280 - Wear protective gloves/ protective clothing
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P312 - Call a POISON CENTER or doctor/ physician if you feel unwell
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician
P331 - Do NOT induce vomiting
P362 - Take off contaminated clothing and wash before reuse
P260 - Do not breathe dust/fume/gas/mist/vapors/spray

### 2.3. Other hazards

No information available

## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

| Component | CAS-No | EC-No. | Weight % | CLP Classification - Regulation (EC) No 1272/2008 | DSD Classification - 67/548/EEC |
|---|---|---|---|---|---|
| Ethylbenzene | 100-41-4 | EEC No. 202-849-4 | 10 - 15 | Flam. Liq. 2 (H225)<br>Acute Tox. 4 (H332)<br>Asp. Tox. 1 (H304)<br>STOT RE 2 (H373)<br>Aquatic Chronic 3 (H412) | F; R11<br>Xn; R20-48/20<br>R65 |
| Xylenes (o-, m-, p- isomers) | 1330-20-7 | EEC No. 215-535-7 | 85 | Acute Tox. 4 (H312)<br>Acute Tox. 4 (H332)<br>Skin Irrit. 2 (H315)<br>Flam. Liq. 3 (H226) | R10<br>Xn; R20/21<br>Xi; R38 |
| Toluene | 108-88-3 | EEC No. 203-625-9 | 0 - 0.5 | Skin Irrit. 2 (H315)<br>Repr. 2 (H361d)<br>STOT SE 3 (H336)<br>STOT RE 2 (H373)<br>Asp. Tox. 1 (H304)<br>Flam. Liq. 2 (H225) | F; R11<br>Xi; R38<br>Xn; R48/20-65<br>Repr.Cat.3; R63<br>R67 |
| Benzene | 71-43-2 | EEC No. 200-753-7 | 0 - 0.01 | Skin Irrit. 2 (H315)<br>Eye Irrit. 2 (H319)<br>Muta. 1B (H340)<br>Carc. 1A (H350)<br>STOT RE 1 (H372) | F; R11<br>Xi; R36/38<br>Carc.Cat.1; R45<br>Muta.Cat.2; R46<br>T; R48/23/24/25 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Asp. Tox. 1 (H304)<br>Flam. Liq. 2 (H225) | Xn; R65 |

*For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.*

## SECTION 4: FIRST AID MEASURES

### 4.1. Description of first aid measures

**General Advice** If symptoms persist, call a physician. Show this safety data sheet to the doctor in attendance.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required. Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. If symptoms persist, call a physician.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required. Call a physician immediately. SPEEDY ACTION IS CRITICAL, GET MEDICAL AID IMMEDIATELY. If symptoms persist, call a physician. If skin irritation persists, call a physician. Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes.

**Ingestion** Do not induce vomiting. Call a physician or Poison Control Center immediately. Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Consult a physician.

**Inhalation** Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required. Immediate medical attention is not required. Move to fresh air in case of accidental inhalation of vapors. If symptoms persist, call a physician.

**Protection of First-aiders** Use personal protective equipment.

### 4.2. Most important symptoms and effects, both acute and delayed

Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

### 4.3. Indication of any immediate medical attention and special treatment needed

**Notes to Physician** Treat symptomatically.

## SECTION 5: FIREFIGHTING MEASURES

### 5.1. Extinguishing media

**Suitable Extinguishing Media**
$CO_2$, dry chemical, dry sand, alcohol-resistant foam. Cool closed containers exposed to fire with water spray.

**Extinguishing media which must not be used for safety reasons**
No information available.

### 5.2. Special hazards arising from the substance or mixture

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Keep product and empty container away from heat and sources of ignition.

**Hazardous Combustion Products**

Carbon monoxide (CO), Carbon dioxide ($CO_2$), Hydrocarbons, Aldehydes.

**5.3. Advice for firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Do not get in eyes, on skin, or on clothing. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

**6.2. Environmental precautions**

Should not be released into the environment. See Section 12 for additional ecological information. Do not flush into surface water or sanitary sewer system. Prevent further leakage or spillage if safe to do so. Prevent product from entering drains.

**6.3. Methods and material for containment and cleaning up**

Remove all sources of ignition. Soak up with inert absorbent material. Take precautionary measures against static discharges. Keep in suitable, closed containers for disposal.

**6.4. Reference to other sections**

Refer to protective measures listed in Sections 8 and 13.

## SECTION 7: HANDLING AND STORAGE

**7.1. Precautions for safe handling**

Use only under a chemical fume hood. Wear personal protective equipment. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Do not ingest. Pay attention to flashback. No information available. Do not take internally.

**7.2. Conditions for safe storage, including any incompatibilities**

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area. Keep containers tightly closed in a cool, well-ventilated place. Keep in properly labeled containers.

**7.3. Specific end use(s)**

Use in laboratories

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

**8.1. Control parameters**

**Exposure limits**

| Component | European Union | The United Kingdom | France | Belgium | Spain |
|---|---|---|---|---|---|
| Ethylbenzene | TWA: 100 ppm 8 hr<br>TWA: 442 mg/m³ 8 hr<br>STEL: 200 ppm 15 min<br>STEL: 884 mg/m³ 15 min<br>Possibility of significant uptake through the skin | STEL: 125 ppm 15 min<br>STEL: 552 mg/m³ 15 min<br>TWA: 100 ppm 8 hr<br>TWA: 441 mg/m³ 8 hr<br>Skin | TWA / VME: 20 ppm (8 heures). restrictive limit<br>TWA / VME: 88.4 mg/m³ (8 heures). restrictive limit<br>TWA / VME: 1000 mg/m³ (8 heures).<br>STEL / VLCT: 100 ppm. restrictive limit<br>STEL / VLCT: 442 | TWA: 100 ppm 8 uren<br>TWA: 442 mg/m³ 8 uren<br>STEL: 125 ppm 15 minuten<br>STEL: 551 mg/m³ 15 minuten<br>Huid | STEL / VLA-EC: 200 ppm (15 minutos).<br>STEL / VLA-EC: 884 mg/m³ (15 minutos).<br>TWA / VLA-ED: 100 ppm (8 horas)<br>TWA / VLA-ED: 441 mg/m³ (8 horas)<br>Piel |

| | | | | | |
|---|---|---|---|---|---|
| | | | mg/m³. restrictive limit<br>STEL / VLCT: 1500 mg/m³.<br>Peau | | |
| Xylenes (o-, m-, p-isomers) | TWA: 50 ppm 8 hr<br>TWA: 221 mg/m³ 8 hr<br>STEL: 100 ppm 15 min<br>STEL: 442 mg/m³ 15 min<br>Possibility of significant uptake through the skin | STEL: 100 ppm 15 min<br>STEL: 441 mg/m³ 15 min<br>TWA: 50 ppm 8 hr<br>TWA: 220 mg/m³ 8 hr<br>Skin | TWA / VME: 50 ppm (8 heures). restrictive limit<br>TWA / VME: 221 mg/m³ (8 heures). restrictive limit<br>TWA / VME: 1000 mg/m³ (8 heures).<br>STEL / VLCT: 100 ppm. restrictive limit<br>STEL / VLCT: 442 mg/m³. restrictive limit<br>STEL / VLCT: 1500 mg/m³.<br>Peau | TWA: 50 ppm 8 uren<br>TWA: 221 mg/m³ 8 uren<br>STEL: 100 ppm 15 minuten<br>STEL: 442 mg/m³ 15 minuten<br>Huid | STEL / VLA-EC: 100 ppm (15 minutos).<br>STEL / VLA-EC: 442 mg/m³ (15 minutos).<br>TWA / VLA-ED: 50 ppm (8 horas)<br>TWA / VLA-ED: 221 mg/m³ (8 horas)<br>Piel |
| Toluene | TWA: 50 ppm 8 hr<br>TWA: 192 mg/m³ 8 hr<br>STEL: 100 ppm 15 min<br>STEL: 384 mg/m³ 15 min<br>Skin | STEL: 100 ppm 15 min<br>STEL: 384 mg/m³ 15 min<br>TWA: 50 ppm 8 hr<br>TWA: 191 mg/m³ 8 hr<br>Skin | TWA / VME: 20 ppm (8 heures). restrictive limit<br>TWA / VME: 76.8 mg/m³ (8 heures). restrictive limit<br>TWA / VME: 1000 mg/m³ (8 heures).<br>STEL / VLCT: 100 ppm. restrictive limit<br>STEL / VLCT: 384 mg/m³. restrictive limit<br>STEL / VLCT: 1500 mg/m³.<br>Peau | TWA: 20 ppm 8 uren<br>TWA: 77 mg/m³ 8 uren<br>STEL: 100 ppm 15 minuten<br>STEL: 384 mg/m³ 15 minuten<br>Huid | STEL / VLA-EC: 100 ppm (15 minutos).<br>STEL / VLA-EC: 384 mg/m³ (15 minutos).<br>TWA / VLA-ED: 50 ppm (8 horas)<br>TWA / VLA-ED: 192 mg/m³ (8 horas)<br>Piel |
| Benzene | TWA: 1 ppm 8 hr measured or calculated in relation to a reference period of eight hours<br>TWA: 3.25 mg/m³ 8 hr measured or calculated in relation to a reference period of eight hours<br>Substantial contribution to the total body burden via dermal exposure possible | STEL: 3 ppm 15 min<br>STEL: 9.75 mg/m³ 15 min<br>TWA: 1 ppm 8 hr<br>TWA: 3.25 mg/m³ 8 hr<br>Carc.<br>Skin | TWA / VME: 1 ppm (8 heures). restrictive limit<br>TWA / VME: 3.25 mg/m³ (8 heures). restrictive limit<br>TWA / VME: 1000 mg/m³ (8 heures).<br>STEL / VLCT: 1500 mg/m³.<br>Peau | TWA: 1 ppm 8 uren<br>TWA: 3.25 mg/m³ 8 uren<br>Huid | TWA / VLA-ED: 1 ppm (8 horas)<br>TWA / VLA-ED: 3.25 mg/m³ (8 horas)<br>Piel |

| Component | Italy | Germany | Portugal | The Netherlands | Finland |
|---|---|---|---|---|---|
| Ethylbenzene | TWA: 100 ppm 8 ore.<br>TWA: 442 mg/m³ 8 ore.<br>STEL: 200 ppm 15 minuti. Breve termine<br>STEL: 884 mg/m³ 15 minuti. Breve termine<br>Pelle | TWA: 20 ppm (8 Stunden). AGW - exposure factor 2<br>TWA: 88 mg/m³ (8 Stunden). AGW - exposure factor 2<br>TWA: 20 ppm (8 Stunden). MAK<br>TWA: 88 mg/m³ (8 Stunden). MAK<br>Höhepunkt: 40 ppm<br>Höhepunkt: 176 mg/m³<br>Haut | STEL: 200 ppm 15 minutos<br>STEL: 884 mg/m³ 15 minutos<br>TWA: 100 ppm 8 horas<br>TWA: 442 mg/m³ 8 horas<br>Pele | huid<br>STEL: 430 mg/m³ 15 minuten<br>TWA: 215 mg/m³ 8 uren | TWA: 50 ppm 8 tunteina<br>TWA: 220 mg/m³ 8 tunteina<br>STEL: 200 ppm 15 minuutteina<br>STEL: 880 mg/m³ 15 minuutteina<br>Iho |
| Xylenes (o-, m-, p-isomers) | TWA: 50 ppm 8 ore. pure<br>TWA: 221 mg/m³ 8 ore. pure<br>STEL: 100 ppm 15 minuti. Breve termine pure<br>STEL: 442 mg/m³ 15 minuti. Breve termine pure<br>Pelle | TWA: 100 ppm (8 Stunden). AGW - exposure factor 2<br>TWA: 440 mg/m³ (8 Stunden). AGW - exposure factor 2<br>TWA: 100 ppm (8 Stunden). MAK all isomers<br>TWA: 440 mg/m³ (8 Stunden). MAK all isomers | STEL: 100 ppm 15 minutos<br>STEL: 442 mg/m³ 15 minutos<br>TWA: 50 ppm 8 horas<br>TWA: 221 mg/m³ 8 horas<br>Pele | huid<br>STEL: 442 mg/m³ 15 minuten<br>TWA: 210 mg/m³ 8 uren | TWA: 50 ppm 8 tunteina<br>TWA: 220 mg/m³ 8 tunteina<br>STEL: 100 ppm 15 minuutteina<br>STEL: 440 mg/m³ 15 minuutteina<br>Iho |

| | | | | | |
|---|---|---|---|---|---|
| | | Höhepunkt: 200 ppm<br>Höhepunkt: 880 mg/m³<br>Haut<br>Haut all isomers | | | |
| Toluene | TWA: 50 ppm 8 ore.<br>TWA: 192 mg/m³ 8 ore.<br>Pelle | TWA: 50 ppm (8 Stunden). AGW - exposure factor 4<br>TWA: 190 mg/m³ (8 Stunden). AGW - exposure factor 4<br>TWA: 50 ppm (8 Stunden). MAK<br>TWA: 190 mg/m³ (8 Stunden). MAK<br>Höhepunkt: 200 ppm<br>Höhepunkt: 760 mg/m³<br>Haut | STEL: 100 ppm 15 minutos<br>STEL: 384 mg/m³ 15 minutos<br>TWA: 50 ppm 8 horas<br>TWA: 192 mg/m³ 8 horas<br>Pele | STEL: 384 mg/m³ 15 minuten<br>TWA: 150 mg/m³ 8 uren | TWA: 25 ppm 8 tunteina<br>TWA: 81 mg/m³ 8 tunteina<br>STEL: 100 ppm 15 minuutteina<br>STEL: 380 mg/m³ 15 minuutteina<br>Iho |
| Benzene | TWA: 1 ppm 8 ore.<br>TWA: 3.25 mg/m³ 8 ore.<br>Pelle | Haut | STEL: 2.5 ppm 15 minutos<br>TWA: 0.5 ppm 8 horas<br>Pele | huid<br>TWA: 3.25 mg/m³ 8 uren | TWA: 1 ppm 8 tunteina<br>TWA: 3.25 mg/m³ 8 tunteina<br>Iho |

| Component | Austria | Denmark | Switzerland | Poland | Norway |
|---|---|---|---|---|---|
| Ethylbenzene | Haut<br>MAK-KZW: 200 ppm 15 Minuten<br>MAK-KZW: 880 mg/m³ 15 Minuten<br>MAK-TMW: 100 ppm 8 Stunden<br>MAK-TMW: 440 mg/m³ 8 Stunden | TWA: 50 ppm 8 timer<br>TWA: 217 mg/m³ 8 timer<br>Hud | Haut/Peau<br>STEL: 50 ppm 15 Minuten<br>STEL: 220 mg/m³ 15 Minuten<br>TWA: 50 ppm 8 Stunden<br>TWA: 220 mg/m³ 8 Stunden | STEL: 400 mg/m³ 15 minutach<br>TWA: 200 mg/m³ 8 godzinach | TWA: 5 ppm 8 timer<br>TWA: 20 mg/m³ 8 timer<br>STEL: 10 ppm 15 minutter.<br>STEL: 30 mg/m³ 15 minutter.<br>Hud |
| Xylenes (o-, m-, p-isomers) | Haut<br>MAK-KZW: 100 ppm 15 Minuten<br>MAK-KZW: 442 mg/m³ 15 Minuten<br>MAK-TMW: 50 ppm 8 Stunden<br>MAK-TMW: 221 mg/m³ 8 Stunden | TWA: 25 ppm 8 timer<br>TWA: 109 mg/m³ 8 timer<br>Hud | Haut/Peau<br>STEL: 200 ppm 15 Minuten<br>STEL: 870 mg/m³ 15 Minuten<br>TWA: 100 ppm 8 Stunden<br>TWA: 435 mg/m³ 8 Stunden | TWA: 100 mg/m³ 8 godzinach | TWA: 25 ppm 8 timer<br>TWA: 108 mg/m³ 8 timer<br>STEL: 37.5 ppm 15 minutter.<br>STEL: 135 mg/m³ 15 minutter.<br>Hud |
| Toluene | Haut<br>MAK-KZW: 100 ppm 15 Minuten<br>MAK-KZW: 380 mg/m³ 15 Minuten<br>MAK-TMW: 50 ppm 8 Stunden<br>MAK-TMW: 190 mg/m³ 8 Stunden | TWA: 25 ppm 8 timer<br>TWA: 94 mg/m³ 8 timer<br>Hud | Haut/Peau<br>STEL: 200 ppm 15 Minuten<br>STEL: 760 mg/m³ 15 Minuten<br>TWA: 50 ppm 8 Stunden<br>TWA: 190 mg/m³ 8 Stunden | STEL: 200 mg/m³ 15 minutach<br>TWA: 100 mg/m³ 8 godzinach | TWA: 25 ppm 8 timer<br>TWA: 94 mg/m³ 8 timer<br>STEL: 37.5 ppm 15 minutter.<br>STEL: 141 mg/m³ 15 minutter.<br>Hud |
| Benzene | TRK-KZW: 4 ppm 15 Minuten<br>TRK-KZW: 12.8 mg/m³ 15 Minuten<br>Haut<br>TRK-TMW: 1 ppm<br>TRK-TMW: 3.2 mg/m³ | TWA: 0.5 ppm 8 timer<br>TWA: 1.6 mg/m³ 8 timer<br>Hud | Haut/Peau<br>TWA: 0.5 ppm 8 Stunden<br>TWA: 1.6 mg/m³ 8 Stunden | TWA: 1.6 mg/m³ 8 godzinach | TWA: 1 ppm 8 timer<br>TWA: 3 mg/m³ 8 timer<br>STEL: 3 ppm 15 minutter.<br>STEL: 6 mg/m³ 15 minutter. |

| Component | Bulgaria | Croatia | Ireland | Cyprus | Czech Republic |
|---|---|---|---|---|---|
| Ethylbenzene | TWA: 435 mg/m³<br>STEL : 545 mg/m³<br>Skin notation | kože<br>TWA-GVI: 100 ppm 8 satima.<br>TWA-GVI: 442 mg/m³ 8 satima.<br>STEL-KGVI: 200 ppm 15 minutama.<br>STEL-KGVI: 884 mg/m³ 15 minutama. | TWA: 100 ppm 8 hr.<br>TWA: 442 mg/m³ 8 hr.<br>STEL: 200 ppm 15 min<br>STEL: 884 mg/m³ 15 min<br>Skin | Skin-potential for cutaneous absorption<br>STEL: 200 ppm<br>STEL: 884 mg/m³<br>TWA: 100 ppm<br>TWA: 442 mg/m³ | TWA: 200 mg/m³ 8 hodinách.<br>Potential for cutaneous absorption<br>Ceiling: 500 mg/m³ |
| Xylenes (o-, m-, p- | TWA: 50 ppm | kože | TWA: 50 ppm 8 hr. | Skin-potential for | TWA: 200 mg/m³ 8 |

| | | | | | |
|---|---|---|---|---|---|
| isomers) | TWA: 221.0 mg/m³<br>STEL : 100 ppm<br>STEL : 442 mg/m³<br>Skin notation | TWA-GVI: 50 ppm 8 satima.<br>TWA-GVI: 221 mg/m³ 8 satima.<br>STEL-KGVI: 100 ppm 15 minutama.<br>STEL-KGVI: 442 mg/m³ 15 minutama. | TWA: 221 mg/m³ 8 hr.<br>STEL: 100 ppm 15 min<br>STEL: 442 mg/m³ 15 min<br>Skin | cutaneous absorption<br>STEL: 100 ppm<br>STEL: 442 mg/m³<br>TWA: 50 ppm<br>TWA: 221 mg/m³ | hodinách.<br>Potential for cutaneous absorption<br>Ceiling: 400 mg/m³ |
| Toluene | TWA: 50 ppm<br>TWA: 192.0 mg/m³<br>STEL : 100 ppm<br>STEL : 384.0 mg/m³<br>Skin notation | kože<br>TWA-GVI: 50 ppm 8 satima.<br>TWA-GVI: 192 mg/m³ 8 satima.<br>STEL-KGVI: 100 ppm 15 minutama.<br>STEL-KGVI: 384 mg/m³ 15 minutama. | TWA: 50 ppm 8 hr.<br>TWA: 192 mg/m³ 8 hr.<br>STEL: 384 mg/m³ 15 min<br>STEL: 100 ppm 15 min<br>Skin | Skin-potential for cutaneous absorption<br>STEL: 100 ppm<br>STEL: 384 mg/m³<br>TWA: 50 ppm<br>TWA: 192 mg/m³ | TWA: 200 mg/m³ 8 hodinách.<br>Potential for cutaneous absorption<br>Ceiling: 500 mg/m³ |
| Benzene | TWA: 3.25 mg/m³<br>Skin notation | kože<br>TWA-GVI: 1 ppm 8 satima.<br>TWA-GVI: 3.25 mg/m³ 8 satima. | TWA: 1 ppm 8 hr.<br>TWA: 3 mg/m³ 8 hr.<br>STEL: 3 ppm 15 min<br>STEL: 9 mg/m³ 15 min<br>Skin | Skin-potential for cutaneous absorption<br>TWA: 1 ppm<br>TWA: 3.25 mg/m³ | TWA: 3 mg/m³ 8 hodinách.<br>Potential for cutaneous absorption<br>Ceiling: 10 mg/m³ |

| Component | Estonia | Gibraltar | Greece | Hungary | Iceland |
|---|---|---|---|---|---|
| Ethylbenzene | Nahk<br>TWA: 100 ppm 8 tundides.<br>TWA: 442 mg/m³ 8 tundides.<br>STEL: 200 ppm 15 minutites.<br>STEL: 884 mg/m³ 15 minutites.<br>Ceiling: 0.01 ppm 5 min | Skin notation<br>TWA: 100 ppm 8 hr<br>TWA: 442 mg/m³ 8 hr<br>STEL: 200 ppm 15 min<br>STEL: 884 mg/m³ 15 min | STEL: 125 ppm<br>STEL: 545 mg/m³<br>TWA: 100 ppm<br>TWA: 435 mg/m³ | STEL: 884 mg/m³ 15 percekben. CK<br>TWA: 442 mg/m³ 8 órában. AK<br>lehetséges borön keresztüli felszívódás | STEL: 200 ppm<br>STEL: 884 mg/m³<br>TWA: 50 ppm 8 klukkustundum.<br>TWA: 200 mg/m³ 8 klukkustundum.<br>Skin notation<br>Ceiling: 100 ppm<br>Ceiling: 400 mg/m³ |
| Xylenes (o-, m-, p-isomers) | Nahk<br>TWA: 50 ppm 8 tundides.<br>TWA: 221 mg/m³ 8 tundides.<br>STEL: 100 ppm 15 minutites.<br>STEL: 442 mg/m³ 15 minutites. | Skin notation<br>TWA: 50 ppm 8 hr pure<br>TWA: 221 mg/m³ 8 hr pure<br>STEL: 100 ppm 15 min pure<br>STEL: 442 mg/m³ 15 min pure | skin - potential for cutaneous absorption<br>STEL: 150 ppm<br>STEL: 650 mg/m³<br>TWA: 100 ppm<br>TWA: 435 mg/m³ | STEL: 442 mg/m³ 15 percekben. CK<br>TWA: 221 mg/m³ 8 órában. AK<br>lehetséges borön keresztüli felszívódás | STEL: 100 ppm<br>STEL: 442 mg/m³<br>TWA: 25 ppm 8 klukkustundum.<br>TWA: 109 mg/m³ 8 klukkustundum.<br>Skin notation<br>Ceiling: 50 ppm<br>Ceiling: 218 mg/m³ |
| Toluene | Nahk<br>TWA: 50 ppm 8 tundides.<br>TWA: 192 mg/m³ 8 tundides.<br>STEL: 100 ppm 15 minutites.<br>STEL: 384 mg/m³ 15 minutites. | Skin notation<br>TWA: 50 ppm 8 hr<br>TWA: 192 mg/m³ 8 hr<br>STEL: 100 ppm 15 min<br>STEL: 384 mg/m³ 15 min | skin - potential for cutaneous absorption<br>STEL: 100 ppm<br>STEL: 384 mg/m³<br>TWA: 50 ppm<br>TWA: 192 mg/m³ | STEL: 380 mg/m³ 15 percekben. CK<br>TWA: 190 mg/m³ 8 órában. AK<br>lehetséges borön keresztüli felszívódás | STEL: 50 ppm<br>STEL: 188 mg/m³<br>TWA: 25 ppm 8 klukkustundum.<br>TWA: 94 mg/m³ 8 klukkustundum.<br>Skin notation<br>Ceiling: 50 ppm<br>Ceiling: 188 mg/m³ |
| Benzene | Nahk<br>TWA: 0.5 ppm 8 tundides.<br>TWA: 1.5 mg/m³ 8 tundides.<br>STEL: 3 ppm 15 minutites.<br>STEL: 9 mg/m³ 15 minutites. | | skin - potential for cutaneous absorption<br>TWA: 1.0 ppm<br>TWA: 3.19 mg/m³ | lehetséges borön keresztüli felszívódás<br>Ceiling: 3 mg/m³ MK | TWA: 0.5 ppm 8 klukkustundum.<br>TWA: 1.6 mg/m³ 8 klukkustundum.<br>Skin notation<br>Ceiling: 1 ppm<br>Ceiling: 3.2 mg/m³ |

| Component | Latvia | Lithuania | Luxembourg | Malta | Romania |
|---|---|---|---|---|---|
| Ethylbenzene | skin - potential for cutaneous exposure<br>STEL: 200 ppm<br>STEL: 884 mg/m³<br>TWA: 100 ppm | TWA: 100 ppm IPRD<br>TWA: 442 mg/m³ IPRD<br>Oda<br>STEL: 200 ppm<br>STEL: 884 mg/m³ | Possibility of significant uptake through the skin<br>TWA: 100 ppm 8 Stunden<br>TWA: 442 mg/m³ 8 | possibility of significant uptake through the skin<br>TWA: 100 ppm<br>TWA: 442 mg/m³<br>STEL: 200 ppm 15 | Skin notation<br>TWA: 100 ppm 8 ore<br>TWA: 442 mg/m³ 8 ore<br>STEL: 200 ppm 15 minute |

| | | | | | |
|---|---|---|---|---|---|
| | TWA: 442 mg/m³ | | Stunden<br>STEL: 200 ppm 15 Minuten<br>STEL: 884 mg/m³ 15 Minuten | minuti<br>STEL: 884 mg/m³ 15 minuti | STEL: 884 mg/m³ 15 minute |
| Xylenes (o-, m-, p-isomers) | skin - potential for cutaneous exposure<br>STEL: 100 ppm<br>STEL: 442 mg/m³<br>TWA: 50 ppm<br>TWA: 221 mg/m³ | TWA: 50 ppm IPRD<br>TWA: 200 mg/m³ IPRD Oda<br>STEL: 100 ppm<br>STEL: 450 mg/m³ | TWA: 50 ppm 8 Stunden<br>TWA: 221 mg/m³ 8 Stunden<br>STEL: 100 ppm 15 Minuten<br>STEL: 442 mg/m³ 15 Minuten | possibility of significant uptake through the skin<br>TWA: 50 ppm<br>TWA: 221 mg/m³<br>STEL: 100 ppm 15 minuti<br>STEL: 442 mg/m³ 15 minuti | Skin notation<br>TWA: 50 ppm 8 ore<br>TWA: 221 mg/m³ 8 ore<br>STEL: 100 ppm 15 minute<br>STEL: 442 mg/m³ 15 minute |
| Toluene | skin - potential for cutaneous exposure<br>STEL: 40 ppm<br>STEL: 150 mg/m³<br>TWA: 14 ppm<br>TWA: 50 mg/m³ | TWA: 50 ppm IPRD<br>TWA: 192 mg/m³ IPRD Oda<br>STEL: 100 ppm<br>STEL: 384 mg/m³ | Possibility of significant uptake through the skin<br>TWA: 50 ppm 8 Stunden<br>TWA: 192 mg/m³ 8 Stunden<br>STEL: 100 ppm 15 Minuten<br>STEL: 384 mg/m³ 15 Minuten | possibility of significant uptake through the skin<br>TWA: 50 ppm<br>TWA: 192 mg/m³<br>STEL: 100 ppm 15 minuti<br>STEL: 384 mg/m³ 15 minuti | Skin notation<br>TWA: 50 ppm 8 ore<br>TWA: 192 mg/m³ 8 ore<br>STEL: 100 ppm 15 minute<br>STEL: 384 mg/m³ 15 minute |
| Benzene | skin - potential for cutaneous exposure<br>TWA: 1 ppm<br>TWA: 3.25 mg/m³ | TWA: 1 ppm IPRD<br>TWA: 3.25 mg/m³ IPRD Oda<br>STEL: 6 ppm<br>STEL: 19 mg/m³ | TWA: 1 ppm 8 Stunden<br>TWA: 3.25 mg/m³ 8 Stunden | | Skin notation<br>TWA: 1 ppm 8 ore<br>TWA: 3.25 mg/m³ 8 ore |

| Component | Russia | Slovak Republic | Slovenia | Sweden | Turkey |
|---|---|---|---|---|---|
| Ethylbenzene | TWA: 50 mg/m³<br>STEL: 150 mg/m³ vapor | Ceiling: 884 mg/m³<br>Potential for cutaneous absorption<br>TWA: 100 ppm<br>TWA: 442 mg/m³ | TWA: 100 ppm 8 urah<br>TWA: 442 mg/m³ 8 urah<br>Koža<br>STEL: 200 ppm 15 minutah<br>STEL: 884 mg/m³ 15 minutah | STV: 100 ppm 15 minuter<br>STV: 450 mg/m³ 15 minuter<br>LLV: 50 ppm 8 timmar.<br>LLV: 200 mg/m³ 8 timmar. | Deri<br>TWA: 100 ppm 8 saat<br>TWA: 442 mg/m³ 8 saat<br>STEL: 200 ppm 15 dakika<br>STEL: 884 mg/m³ 15 dakika |
| Xylenes (o-, m-, p-isomers) | TWA: 50 mg/m³ 2-,3- and 4- isomers<br>STEL: 150 mg/m³ vapor | Ceiling: 442 mg/m³<br>Potential for cutaneous absorption<br>TWA: 50 ppm<br>TWA: 221 mg/m³ | TWA: 50 ppm 8 urah<br>TWA: 221 mg/m³ 8 urah<br>Koža<br>STEL: 100 ppm 15 minutah<br>STEL: 442 mg/m³ 15 minutah | STV: 100 ppm 15 minuter<br>STV: 442 mg/m³ 15 minuter<br>LLV: 50 ppm 8 timmar.<br>LLV: 221 mg/m³ 8 timmar.<br>Hud | Deri<br>TWA: 50 ppm 8 saat<br>TWA: 221 mg/m³ 8 saat<br>STEL: 100 ppm 15 dakika<br>STEL: 442 mg/m³ 15 dakika |
| Toluene | TWA: 50 mg/m³<br>STEL: 150 mg/m³ vapor | Ceiling: 384 mg/m³<br>Potential for cutaneous absorption<br>TWA: 50 ppm<br>TWA: 192 mg/m³ | TWA: 50 ppm 8 urah<br>TWA: 192 mg/m³ 8 urah<br>Koža<br>STEL: 200 ppm 15 minutah<br>STEL: 384 mg/m³ 15 minutah | STV: 100 ppm 15 minuter<br>STV: 384 mg/m³ 15 minuter<br>LLV: 50 ppm 8 timmar.<br>LLV: 192 mg/m³ 8 timmar.<br>Hud | Deri<br>TWA: 50 ppm 8 saat<br>TWA: 192 mg/m³ 8 saat<br>STEL: 100 ppm 15 dakika<br>STEL: 384 mg/m³ 15 dakika |
| Benzene | TWA: 5 mg/m³<br>Skin notation<br>STEL: 15 mg/m³ vapor | TWA: 1.0 ppm 8 hodinách<br>TWA: 3.25 mg/m³ 8 hodinách<br>Potential for cutaneous absorption<br>STEL: 5.0 ppm 15 minútach<br>STEL: 16.25 mg/m³ 15 minútach | TWA: 1 ppm 8 urah<br>TWA: 3.25 mg/m³ 8 urah<br>Koža<br>STEL: 4 ppm 15 minutah<br>STEL: 13 mg/m³ 15 minutah | STV: 3 ppm 15 minuter<br>STV: 9 mg/m³ 15 minuter<br>LLV: 0.5 ppm 8 timmar.<br>LLV: 1.5 mg/m³ 8 timmar.<br>Hud | |

**Biological limit values**

| Component | European Union | United Kingdom | France | Spain | Germany |
|---|---|---|---|---|---|
| Ethylbenzene | | | Mandelic acid: 1500 | Mandelic acid plus | Mandelic acid plus |

| | | | | | |
|---|---|---|---|---|---|
| | | | mg/g creatinine urine end of shift at end of workweek | Phenylglyoxylic acid: 700 mg/g Creatinine urine end of workweek | Phenylglyoxylic acid: 300 mg/g urine (end of shift ) |
| Xylenes (o-, m-, p-isomers) | | Methyl hippuric acid: 650 mmol/mol creatinine urine Post shift | Methylhippuric acid: 1500 mg/g creatinine urine end of shift | Methylhippuric acids: 1 g/g Creatinine urine end of shift | Xylene: 1.5 mg/L whole blood (end of shift all isomers) Methylhippuric(tolur-)acid: 2000 mg/L urine (end of shift all isomers) |
| Toluene | | | Toluene: 1 mg/L blood end of shift Hippuric acid: 2500 mg/g creatinine urine end of shift | o-Cresol: 0.5 mg/L urine end of shift Hippuric acid: 1.6 g/g Creatinine urine end of shift Toluene: 0.05 mg/L blood start of last shift of workweek | Toluene: 600 µg/L whole blood (end of shift ) o-Cresol: 1.5 mg/L urine (end of several shifts after hydrolysis; for long-term exposures) |
| Benzene | | | Muconic acid: 5 mg/L urine end of shift | S-Phenylmercapturic acid: 0.045 mg/g urine end of exposure or end of shift trans,trans-Muconic acid: 2 mg/L urine end of exposure or end of shift Total benzene: 5 µg/L blood end of exposure or end of shift | |

| Component | Italy | Finland | Denmark | Bulgaria | Romania |
|---|---|---|---|---|---|
| Ethylbenzene | | Mandelic acid: 5.2 mmol/L urine end of shift at end of workweek. | | Mandelic acid and Phenylglyoxylic acid - together: 2000 mg/g Creatinine urine at the end of exposure or end of shift Possible significant absorption through the skin | Mandelic acid: 1.5 g/g Creatinine urine end of work week |
| Xylenes (o-, m-, p-isomers) | | Methylhippuric acid: 5.0 mmol/L urine end of shift. | | | Methylhippuric acid: 3 g/L urine end of shift |
| Toluene | | Toluene concentrated: 500 nmol/L blood prior to shift. | | Hippuric acid: 1.6 mmol/mmol Creatinine urine at the end of exposure or end of shift | Hippuric acid: 2 g/L urine end of shift o-Cresol: 3 mg/L urine end of shift |
| Benzene | | | | Trans, trans-Muconic acid: 2.0 mg/L urine at the end of exposure or end of shift Possible significant absorption through the skin S-Phenyl Mercapturic acid: 0.045 mg/g Creatinine urine at the end of exposure or end of shift Possible significant absorption through the skin | S-Phenylmercapturic acid: 25 µg/g Creatinine urine end of shift total Phenols: 50 mg/L urine end of shift |

| Component | Gibraltar | Latvia | Slovak Republic | Luxembourg | Turkey |
|---|---|---|---|---|---|
| Ethylbenzene | | | 2 and 4-Ethylphenol: 12 mg/L urine end of exposure or work shift also after all work shifts for long-term exposure Mandelic acid and phenylglycolic acid: 1600 mg/L urine end of exposure or work shift | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | also after all work shifts for long-term exposure | | |
| Xylenes (o-, m-, p-isomers) | | | Xylene: 1.5 mg/L blood end of exposure or work shift all isomers Methylhippuric acid: 2000 mg/L urine end of exposure or work shift | | |
| Toluene | | Hippuric acid: 1.6 g/g Creatinine urine end of shift Toluene: 0.05 mg/l blood end of shift | Toluene: 600 µg/L blood end of exposure or work shift o-Cresol: 1.5 mg/L urine after all work shifts for long-term exposure o-Cresol: 1.5 mg/L urine end of exposure or work shift Hippuric acid: 1600 mg/g creatinine end of exposure or work shift | | |
| Benzene | | Phenol: 25 µg/g Creatinine urine end of shift | | | |

**Monitoring methods**
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.

**Derived No Effect Level (DNEL)** No information available

| Route of exposure | Acute effects (local) | Acute effects (systemic) | Chronic effects (local) | Chronic effects (systemic) |
|---|---|---|---|---|
| **Oral** | | | | |
| **Dermal** | | | | |
| **Inhalation** | | | | |

**Predicted No Effect Concentration (PNEC)** No information available.

**8.2. Exposure controls**

**Engineering Measures**
Use only under a chemical fume hood. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.
Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

**Personal protective equipment**

**Eye Protection** Safety glasses with side-shields (European standard - EN 166)

**Hand Protection** Protective gloves

| Glove material | Breakthrough time | Glove thickness | EU standard | Glove comments |
|---|---|---|---|---|
| Disposable gloves | See manufacturers recommendations | - | EN 374 | (minimum requirement) |

**Skin and body protection** Long sleeved clothing Apron Impervious gloves

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)
Ensure gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
Remove gloves with care avoiding skin contamination.

**Respiratory Protection** When workers are facing concentrations above the exposure limit they must use

| | |
|---|---|
| | appropriate certified respirators.<br>To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly |
| **Large scale/emergency use** | In case of insufficient ventilation wear suitable respiratory equipment |
| **Small scale/Laboratory use** | Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.<br>When RPE is used a face piece Fit Test should be conducted |
| **Hygiene Measures** | When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. |
| **Environmental exposure controls** | No information available. |

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### 9.1. Information on basic physical and chemical properties

| | | |
|---|---|---|
| **Appearance** | Clear, Colorless | |
| **Physical State** | Liquid | |
| **Odor** | aromatic | |
| **Odor Threshold** | No data available | |
| **pH** | No data available | |
| **Melting Point/Range** | -47.2 °C / -53 °F | |
| **Softening Point** | No data available | |
| **Boiling Point/Range** | 136.7 - 143.3 °C / 278 - 290 °F | |
| **Flash Point** | 27.7 °C / 82 °F | **Method -** No information available |
| **Evaporation Rate** | No information available | |
| **Flammability (solid,gas)** | No information available | |
| **Explosion Limits** | **Lower** 1.1 vol %<br>**Upper** 7.0 vol % | |
| **Vapor Pressure** | 9 mmHg @ 25 °C | |
| **Vapor Density** | 3.66 (Air = 1.0) | (Air = 1.0) |
| **Specific Gravity / Density** | No data available 0.87 | |
| **Bulk Density** | No data available | |
| **Water Solubility** | No information available | |
| **Solubility in other solvents** | No information available | |

**Partition Coefficient (n-octanol/water)**

| **Component** | **log Pow** |
|---|---|
| Ethylbenzene | 3.118 |
| Xylenes (o-, m-, p- isomers) | 3.15 |
| Toluene | 2.65 |
| Benzene | 1.83 |

| | |
|---|---|
| **Autoignition Temperature** | 527 °C / 980.6 °F |
| **Decomposition Temperature** | No data available |
| **Viscosity** | No data available |
| **Explosive Properties** | No information available |
| **Oxidizing Properties** | No information available |

### 9.2. Other information

| | |
|---|---|
| **Molecular Formula** | C8H10 |
| **Molecular Weight** | 106.17 |

## SECTION 10: STABILITY AND REACTIVITY

### 10.1. Reactivity

None known, based on information available

**10.2. Chemical stability**

Stable under normal conditions

**10.3. Possibility of hazardous reactions**

**Hazardous Polymerization** Hazardous polymerization does not occur.
**Hazardous Reactions** No information available.

**10.4. Conditions to avoid**

Incompatible products. Heat, flames and sparks.

**10.5. Incompatible materials**

Strong oxidizing agents. Strong acids.

**10.6. Hazardous decomposition products**

Carbon monoxide (CO). Carbon dioxide ($CO_2$). Hydrocarbons. Aldehydes.

## SECTION 11: TOXICOLOGICAL INFORMATION

**11.1. Information on toxicological effects**

**Product Information** No acute toxicity information is available for this product

**(a) acute toxicity;**
**Oral** No data available
**Dermal** No data available
**Inhalation** No data available

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---|---|---|---|
| Ethylbenzene | 3500 mg/kg ( Rat ) | 15400 mg/kg ( Rabbit ) | 17.2 mg/L ( Rat ) 4 h |
| Xylenes (o-, m-, p- isomers) | 3500 mg/kg ( Rat ) | 4350 mg/kg ( Rabbit ) 1700 mg/kg ( Rabbit ) | 29.08 mg/L [MOE Risk Assessment Vol.1, 2002] |
| Toluene | > 5000 mg/kg ( Rat ) | 12000 mg/kg ( Rabbit ) | 26700 ppm ( Rat ) 1 h |
| Benzene | 810 mg/kg ( Rat ) 1800 mg/kg ( Rat ) | 8200 mg/kg ( Rabbit ) | 44.66 mg/L ( Rat ) 4 h |

**(b) skin corrosion/irritation;** No data available

**(c) serious eye damage/irritation;** No data available

**(d) respiratory or skin sensitization;**
**Respiratory** No data available
**Skin** No data available

**(e) germ cell mutagenicity;** No data available

**(f) carcinogenicity;** No data available

The table below indicates whether each agency has listed any ingredient as a carcinogen

| Component | EU | UK | Germany | IARC |
|---|---|---|---|---|
| Ethylbenzene | | | | Group 2B |
| Benzene | Carc Cat. 1A | | Cat. 1 | Group 1 |

**(g) reproductive toxicity;** No data available
**Reproductive Effects** Experiments have shown reproductive toxicity effects on laboratory animals.
**Developmental Effects** Developmental effects have occurred in experimental animals.
**Teratogenicity** Teratogenic effects have occurred in experimental animals.

**(h) STOT-single exposure;** No data available

**(i) STOT-repeated exposure;** No data available

**Target Organs** Eyes, Skin, Central nervous system (CNS), Liver, Kidney, Respiratory system.

**(j) aspiration hazard;** No data available

**Other Adverse Effects** Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information

**Symptoms / effects,both acute and delayed** Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

## SECTION 12: ECOLOGICAL INFORMATION

**12.1. Toxicity**

**Ecotoxicity effects** Do not empty into drains.

| Component | Freshwater Fish | Water Flea | Freshwater Algae | Microtox |
|---|---|---|---|---|
| Ethylbenzene | 9.6 mg/L LC50 96 h 9.1 - 15.6 mg/L LC50 96 h 32 mg/L LC50 96 h 7.55 - 11 mg/L LC50 96 h 4.2 mg/L LC50 96 h 11.0 - 18.0 mg/L LC50 96 h | 1.8 - 2.4 mg/L EC50 48 h | 2.6 - 11.3 mg/L EC50 72 h 438 mg/L EC50 > 96 h 4.6 mg/L EC50 = 72 h 1.7 - 7.6 mg/L EC50 96 h | EC50 = 9.68 mg/L 30 min EC50 = 96 mg/L 24 h |
| Xylenes (o-, m-, p- isomers) | 30.26 - 40.75 mg/L LC50 96 h 780 mg/L LC50 96 h 23.53 - 29.97 mg/L LC50 96 h 7.711 - 9.591 mg/L LC50 96 h 19 mg/L LC50 96 h 13.1 - 16.5 mg/L LC50 96 h 13.5 - 17.3 mg/L LC50 96 h 2.661 - 4.093 mg/L LC50 96 h 13.4 mg/L LC50 96 h | 0.6 mg/L LC50 = 48 h 3.82 mg/L EC50 = 48 h | | EC50 = 0.0084 mg/L 24 h |
| Toluene | 50-70 mg/L LC50 96 h 5-7 mg/L LC50 96 h 15-19 mg/L LC50 96 h 28 mg/L LC50 96 h 12 mg/L LC50 96 h | 11.5 mg/L EC50 = 48 h 5.46 - 9.83 mg/L EC50 48 h | 12.5 mg/L EC50 = 72 h 433 mg/L EC50 > 96 h | EC50 = 19.7 mg/L 30 min |
| Benzene | 70000 - 142000 µg/L LC50 96 h 22330 - 41160 µg/L LC50 96 h 28.6 mg/L LC50 96 h 22.49 mg/L LC50 96 h 5.3 mg/L LC50 96 h 10.7 - 14.7 mg/L LC50 96 h | 10 mg/L EC50 = 48 h 8.76 - 15.6 mg/L EC50 48 h | 29 mg/L EC50 = 72 h | |

**12.2. Persistence and degradability** No information available

| Component | Degradability |
|---|---|
| Toluene 108-88-3 ( 0 - 0.5 ) | 86% (20d) |

**12.3. Bioaccumulative potential** No information available

| Component | log Pow | Bioconcentration factor (BCF) |
|---|---|---|
| Ethylbenzene | 3.118 | 15 |
| Xylenes (o-, m-, p- isomers) | 3.15 | 0.6 - 15 |
| Toluene | 2.65 | 90 |
| Benzene | 1.83 | 3.5 - 4.4 |

**12.4. Mobility in soil** .

**12.5. Results of PBT and vPvB assessment** No data available for assessment.

**12.6. Other adverse effects**

| | |
|---|---|
| **Endocrine Disruptor Information** | This product does not contain any known or suspected endocrine disruptors |
| **Persistent Organic Pollutant** | This product does not contain any known or suspected substance |
| **Ozone Depletion Potential** | This product does not contain any known or suspected substance |

## SECTION 13: DISPOSAL CONSIDERATIONS

**13.1. Waste treatment methods**

| | |
|---|---|
| **Waste from Residues / Unused Products** | Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification. |
| **Contaminated Packaging** | Empty remaining contents. Dispose of in accordance with local regulations. Do not re-use empty containers. |
| **European Waste Catalogue (EWC)** | According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. |
| **Other Information** | Waste codes should be assigned by the user based on the application for which the product was used. |

## SECTION 14: TRANSPORT INFORMATION

**IMDG/IMO**

| | |
|---|---|
| **14.1. UN number** | UN1307 |
| **14.2. UN proper shipping name** | XYLENES |
| **14.3. Transport hazard class(es)** | 3 |
| **14.4. Packing group** | III |

**ADR**

| | |
|---|---|
| **14.1. UN number** | UN1307 |
| **14.2. UN proper shipping name** | XYLENES |
| **14.3. Transport hazard class(es)** | 3 |
| **14.4. Packing group** | III |

**IATA**

| | |
|---|---|
| **14.1. UN number** | UN1307 |
| **14.2. UN proper shipping name** | XYLENES |
| **14.3. Transport hazard class(es)** | 3 |
| **14.4. Packing group** | III |

| | |
|---|---|
| **14.5. Environmental hazards** | No hazards identified |
| **14.6. Special precautions for user** | No special precautions required |
| **14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code** | Not applicable, packaged goods |

## SECTION 15: REGULATORY INFORMATION

**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture**

**International Inventories** Australia X = listed China Canada The product is classified and labeled according to EC directives or corresponding national laws The product is classified and labeled in accordance with Directive 1999/45/EC Europe TSCA Korea Philippines Japan

| Component | EINECS | ELINCS | NLP | TSCA | DSL | NDSL | PICCS | ENCS | IECSC | AICS | KECL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ethylbenzene | 202-849-4 | - | | X | X | - | X | X | X | X | X |
| Xylenes (o-, m-, p- isomers) | 215-535-7 | - | | X | X | - | X | X | X | X | X |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Toluene | 203-625-9 | - | | X | X | - | X | X | X | X | X |
| Benzene | 200-753-7 | - | | X | X | - | X | X | X | X | X |

| Component | REACH (1907/2006) - Annex XIV - Substances Subject to Authorization | REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances | REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC) |
|---|---|---|---|
| Toluene | | Use restricted. See item 48. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) | |
| Benzene | | Use restricted. See item 5. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) Use restricted. See item 28. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) Use restricted. See item 29. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) | |

**National Regulations**

| Component | Germany - Water Classification (VwVwS) | Germany - TA-Luft Class |
|---|---|---|
| Ethylbenzene | WGK 1 | |
| Xylenes (o-, m-, p- isomers) | WGK 2 | |
| Toluene | WGK 2 | |
| Benzene | WGK 3 | Krebserzeugende Stoffe - Class III : 1 mg/m³ (Massenkonzentration) |

| Component | France - INRS (Tables of occupational diseases) |
|---|---|
| Ethylbenzene | Tableaux des maladies professionnelles (TMP) - RG 84 |
| Xylenes (o-, m-, p- isomers) | Tableaux des maladies professionnelles (TMP) - RG 4bis,RG 84 |
| Toluene | Tableaux des maladies professionnelles (TMP) - RG 4bis,RG 84 |
| Benzene | Tableaux des maladies professionnelles (TMP) - RG 4,RG 4bis,RG 84 |

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment.
Take note of Dir 94/33/EC on the protection of young people at work
Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

**15.2. Chemical safety assessment**

A Chemical Safety Assessment/Report (CSA/CSR) has not been conducted

## SECTION 16: OTHER INFORMATION

**Full text of R-phrases referred to under sections 2 and 3**
R10 - Flammable
R11 - Highly flammable
R20 - Harmful by inhalation
R38 - Irritating to skin
R45 - May cause cancer
R46 - May cause heritable genetic damage
R63 - Possible risk of harm to the unborn child
R65 - Harmful: may cause lung damage if swallowed
R67 - Vapors may cause drowsiness and dizziness

R20/21 - Harmful by inhalation and in contact with skin
R36/38 - Irritating to eyes and skin
R48/20 - Harmful: danger of serious damage to health by prolonged exposure through inhalation
R48/23/24/25 - Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed

**Full text of H-Statements referred to under sections 2 and 3**
H226 - Flammable liquid and vapor
H225 - Highly flammable liquid and vapor
H312 - Harmful in contact with skin
H332 - Harmful if inhaled
H315 - Causes skin irritation
H304 - May be fatal if swallowed and enters airways
H373 - May cause damage to organs through prolonged or repeated exposure

**Legend**

**CAS** - Chemical Abstracts Service
**EINECS/ELINCS** - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
**PICCS** - Philippines Inventory of Chemicals and Chemical Substances
**IECSC** - Chinese Inventory of Existing Chemical Substances
**KECL** - Korean Existing and Evaluated Chemical Substances
**TSCA** - United States Toxic Substances Control Act Section 8(b) Inventory
**DSL/NDSL** - Canadian Domestic Substances List/Non-Domestic Substances List
**ENCS** - Japanese Existing and New Chemical Substances
**AICS** - Australian Inventory of Chemical Substances
**NZIoC** - New Zealand Inventory of Chemicals

**WEL** - Workplace Exposure Limit
**ACGIH** - American Conference of Governmental Industrial Hygienists
**DNEL** - Derived No Effect Level
**RPE** - Respiratory Protective Equipment
**LC50** - Lethal Concentration 50%
**NOEC** - No Observed Effect Concentration
**PBT** - Persistent, Bioaccumulative, Toxic
**TWA** - Time Weighted Average
**IARC** - International Agency for Research on Cancer
**PNEC** - Predicted No Effect Concentration
**LD50** - Lethal Dose 50%
**EC50** - Effective Concentration 50%
**POW** - Partition coefficient Octanol:Water
**vPvB** - very Persistent, very Bioaccumulative

**ADR** - European Agreement Concerning the International Carriage of Dangerous Goods by Road
**IMO/IMDG** - International Maritime Organization/International Maritime Dangerous Goods Code
**OECD** - Organisation for Economic Co-operation and Development
**BCF** - Bioconcentration factor
**ICAO/IATA** - International Civil Aviation Organization/International Air Transport Association
**MARPOL** - International Convention for the Prevention of Pollution from Ships
**ATE** - Acute Toxicity Estimate
**VOC** - Volatile Organic Compounds

**Key literature references and sources for data**
Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

**Training Advice**
Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.

| | |
|---|---|
| **Creation Date** | 13-Feb-2015 |
| **Revision Date** | 21-Feb-2014 |
| **Revision Summary** | Not applicable. |

## This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

**Disclaimer**

**The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.**

# End of Safety Data Sheet

# SAFETY DATA SHEET

Version 5.8
Revision Date 10/12/2015
Print Date 05/01/2016

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name : Zinc

Product Number : 96454
Brand : Sigma-Aldrich

CAS-No. : 7440-66-6

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Combustible dust,
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Warning

Hazard statement(s)

May form combustible dust concentrations in air
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P273 Avoid release to the environment.
P391 Collect spillage.
P501 Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.2 Mixtures

Formula : Zn
Molecular weight : 65.39 g/mol

**Hazardous components**

| Component | | Classification | Concentration |
|---|---|---|---|
| **Zinc powder (stabilized)** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 7440-66-6<br>231-175-3<br>030-001-01-9 | Aquatic Acute 1; Aquatic Chronic 1; H410 | <= 100 % |
| **Zinc oxide** | | | |
| CAS-No.<br>EC-No.<br>Index-No. | 1314-13-2<br>215-222-5<br>030-013-00-7 | Aquatic Acute 1; Aquatic Chronic 1; H410 | >= 5 - < 10 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

**General advice**
Consult a physician. Show this safety data sheet to the doctor in attendance.

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

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

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed

No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

**Suitable extinguishing media**
Special powder against metal fire Dry sandUse water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

**Unsuitable extinguishing media**
Water

### 5.2 Special hazards arising from the substance or mixture

Zinc/zinc oxides

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information

No data available

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

### 6.2 Environmental precautions

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

### 6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### 6.4 Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.
Storage class (TRGS 510): Non Combustible Solids

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

| Component | CAS-No. | Value | Control parameters | Basis |
|---|---|---|---|---|
| Zinc oxide | 1314-13-2 | TWA | 2.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | Remarks | metal fume fever | | |
| | | STEL | 10.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV) |
| | | metal fume fever | | |

| | | | | |
|---|---|---|---|---|
| | | TWA | 5.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 5.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | ST | 10.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | C | 15.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits |
| | | TWA | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 15.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
| | | TWA | 5.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |

## 8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | | |
|---|---|---|
| a) | Appearance | Form: powder<br>Colour: grey |
| b) | Odour | odourless |
| c) | Odour Threshold | No data available |
| d) | pH | Not applicable |
| e) | Melting point/freezing point | Melting point/range: 420 °C (788 °F) - lit. |
| f) | Initial boiling point and boiling range | 907 °C (1,665 °F) - lit. |
| g) | Flash point | Not applicable |
| h) | Evaporation rate | No data available |
| i) | Flammability (solid, gas) | May form combustible dust concentrations in air |
| j) | Upper/lower flammability or explosive limits | No data available |
| k) | Vapour pressure | Not applicable |
| l) | Vapour density | No data available |
| m) | Relative density | 7.133 g/mL at 25 °C (77 °F) |
| n) | Water solubility | insoluble |
| o) | Partition coefficient: n-octanol/water | Not applicable |
| p) | Auto-ignition temperature | does not ignite |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | During processing, dust may form explosive mixture in air. |
| t) | Oxidizing properties | No data available |

### 9.2 Other safety information

| | |
|---|---|
| Bulk density | 1.8 - 3.2 kg/m3 |

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity
No data available

### 10.2 Chemical stability
Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions
Dust may form explosive mixture in air.

**10.4 Conditions to avoid**
No data available

**10.5 Incompatible materials**
Strong oxidizing agents, Acids and bases

**10.6 Hazardous decomposition products**
Other decomposition products - No data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

**Acute toxicity**
No data available (Zinc powder (stabilized))

Inhalation: No data available (Zinc powder (stabilized))

Dermal: No data available (Zinc powder (stabilized))

No data available (Zinc powder (stabilized))

**Skin corrosion/irritation**
No data available (Zinc powder (stabilized))

**Serious eye damage/eye irritation**
No data available (Zinc powder (stabilized))

**Respiratory or skin sensitisation**
Did not cause sensitisation on laboratory animals. (Zinc powder (stabilized))

**Germ cell mutagenicity**
No data available (Zinc powder (stabilized))

**Carcinogenicity**

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**
No data available (Zinc powder (stabilized))

No data available (Zinc powder (stabilized))

**Specific target organ toxicity - single exposure**
No data available (Zinc powder (stabilized))

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available (Zinc powder (stabilized))

**Additional Information**
RTECS: ZG8600000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Effects due to ingestion may include:, chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness, Contact with eyes or skin may cause:, Irritation (Zinc powder (stabilized))

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

| | |
|---|---|
| Toxicity to fish | LC50 - Cyprinus carpio (Carp) - 450 µg/l - 96 h (Zinc powder (stabilized)) |
| Toxicity to daphnia and other aquatic invertebrates | LC50 - Daphnia magna (Water flea) - 0.068 mg/l - 48 h (Zinc powder (stabilized)) |
| | mortality NOEC - Daphnia (water flea) - 0.101 - 0.14 mg/l - 7 d (Zinc powder (stabilized)) |

### 12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

### 12.3 Bioaccumulative potential

| | |
|---|---|
| Bioaccumulation | Algae - 7 d<br>at 16 °C - 5 µg/l (Zinc powder (stabilized)) |
| | Bioconcentration factor (BCF): 466 |

### 12.4 Mobility in soil

No data available (Zinc powder (stabilized))

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

No data available

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company.

**Contaminated packaging**
Dispose of as unused product.

## 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Zinc powder (stabilized))
Reportable Quantity (RQ): 1020 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc powder (stabilized))
Marine pollutant:yes

**IATA**
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Zinc powder (stabilized))

**Further information**
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

## 15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---|---|---|
| Zinc oxide | 1314-13-2 | 2007-03-01 |
| Zinc powder (stabilized) | 7440-66-6 | 1993-04-24 |

**SARA 311/312 Hazards**
No SARA Hazards

**Massachusetts Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Zinc powder (stabilized) | 7440-66-6 | 1993-04-24 |
| Zinc oxide | 1314-13-2 | 2007-03-01 |

**Pennsylvania Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Zinc powder (stabilized) | 7440-66-6 | 1993-04-24 |
| Zinc oxide | 1314-13-2 | 2007-03-01 |

**New Jersey Right To Know Components**

| | CAS-No. | Revision Date |
|---|---|---|
| Zinc powder (stabilized) | 7440-66-6 | 1993-04-24 |
| Zinc oxide | 1314-13-2 | 2007-03-01 |

**California Prop. 65 Components**
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

## 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| | |
|---|---|
| | May form combustible dust concentrations in air |
| Aquatic Acute | Acute aquatic toxicity |
| Aquatic Chronic | Chronic aquatic toxicity |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |

**HMIS Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Chronic Health Hazard: | |
| Flammability: | 0 |
| Physical Hazard | 0 |

**NFPA Rating**

| | |
|---|---|
| Health hazard: | 0 |
| Fire Hazard: | 0 |
| Reactivity Hazard: | 0 |

**Further information**
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**Preparation Information**
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.8 Revision Date: 10/12/2015 Print Date: 05/01/2016

# ATTACHMENT I

# Langan Guidelines

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**ATTACHMENT I**

**LANGAN GUIDELINES**

## 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.

# APPENDIX E

# Generic NYSDEC Community Air Monitoring Plan

LANGAN

**New York State Department of Health Generic Community Air Monitoring Plan**

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area and when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.
Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

**Community Air Monitoring Plan**

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

**Continuous monitoring will be required at one upwind and two downwind stations for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures.** Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

**Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

**VOC Monitoring, Response Levels, and Actions**

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a **continuous** bases or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background

conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

**Particulate Monitoring, Response Levels, and Actions**

Particulate concentrations should be monitored **continuously** at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind 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 PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

**Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures**

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.

- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

**Special Requirements for Indoor Work with Co-Located Residences or Facilities**

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under “Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures” except that in this instance “nearby/occupied structures” would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.

# APPENDIX F

# Quality Assurance Project Plan

LANGAN

# QUALITY ASSURANCE PROJECT PLAN

# for

## 1487 First Avenue
## New York, New York
### NYSDEC BCP No. C231152

***Prepared For:***

**CP VII 78th Street Owner, LLC**
**510 Madison Avenue, 8th Floor**
**New York, New York 10022**

***Prepared By:***

**Langan Engineering, Environmental, Surveying,**
**Landscape Architecture and Geology, D.P.C.**
**300 Kimball Drive**
**Parsippany, New Jersey 07054**

**June 2025**
**100963701**

LANGAN

## TABLE OF CONTENTS


1.0 PROJECT DESCRIPTION....1

1.1 Introduction....1

1.2 Project Objectives....1

1.3 Scope of Work....1

2.0 DATA QUALITY OBJECTIVES AND PROCESS....2

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY....3

4.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION OF DATA....4

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES....7

5.1 Field Documentation Procedures....7

5.1.1 Field Data and Notes....8

5.1.2 Sample Labeling....9

5.2 Equipment Calibration and Preventative Maintenance....9

5.3 Sample Collection....10

5.3.1 Groundwater Samples....10

5.4 Sample Containers and Handling....12

5.5 Sample Preservation....12

5.6 Sample Shipment....13

5.6.1 Packaging....13

5.6.2 Shipping....13

5.7 Decontamination Procedures....13

5.8 Residuals Management....14

5.9 Chain of Custody Procedures....14

5.10 Laboratory Sample Storage Procedures....15

6.0 DATA REDUCTION, VALIDATION, AND REPORTING....16

6.1 Introduction....16

6.2 Data Reduction....16

6.3 Data Validation....17




LANGAN

## TABLE OF CONTENTS


**7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS ..... 18**

**7.1 Introduction ..... 18**

**7.2 System Audits ..... 18**

**7.3 Performance Audits ..... 19**

**7.4 Formal Audits ..... 19**

**8.0 CORRECTIVE ACTION ..... 19**

**8.1 Introduction ..... 19**

**8.2 Procedure Description ..... 20**

**FIGURE 8.1 ..... 22**

**9.0 REFERENCES ..... 23**


## LIST OF FIGURES


**Figure 1 Site Location Map**


## LIST OF ATTACHMENTS


**Attachment A Resumes**

**Attachment B Laboratory Reporting Limits and Method Detection Limits**

**Attachment C Analytical Methods / Quality Assurance Summary Table**

**Attachment D Sample Nomenclature**

**Attachment E ELAP Certification (Alpha Analytical, Inc.)**

# 1.0 PROJECT DESCRIPTION

## 1.1 Introduction

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) has prepared this Quality Assurance Project Plan (QAPP) on behalf of CP VII 78th Street Owner, LLC (the Volunteer) for the property at 1487 First Avenue identified as Block 1452, Lot 27in the Upper East Side neighborhood of Manhattan, New York (the Site). A Site Location Map is included as Figure 1.

This QAPP specifies analytical methods to be used to ensure that data collected during the Interim Remedial Measures (IRM) are precise, accurate, representative, comparable, complete, and meet the sensitivity requirements of the project.

## 1.2 Project Objectives

The Site Management Plan (SMP) covers groundwater performance monitoring and groundwater treatment injections (if needed) to be completed at the Site. A Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) for the protection of on-site workers, the community, and the environment has been developed and will be implemented during remediation and sampling activities.

This QAPP addresses sampling and analytical methods that will be necessary in support of 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 sampling that will occur during implementation of the SMP. The SMP requires collection of groundwater samples to evaluate the overall performance and effectiveness of the remedy.

## 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 objectives are:

- To evaluate the quality of soil through the collection of soil samples.

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.
- Required Analytical Level: The level of data quality, data precision, and quality assurance/quality control (QA/QC) documentation required for chemical analysis.
- Required Detection Limits: The detection limits necessary based on the above information.

The quality assurance and quality control objectives for all measurement data include:

- Precision – an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and/or matrix spike duplicates.
- Accuracy – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. For soil samples, accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), internal standards, laboratory method blanks, instrument calibration, and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks.

- Representativeness – expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. 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. Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is accomplished by following all applicable methods, laboratory-issued standard operating procedures (SOPs), the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.
- Completeness – the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.
- Comparability – expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for sampling and analysis as documented in the QAPP, using standard reporting units and reporting formats, and data validation.
- Sensitivity – 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.

## 3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Implementation of the SMP will be overseen by Langan for CP VII 78th Street Owner, 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 Mansfield, MA. (New York State Department of Health [NYSDOH] ELAP certification number 11148

[Westboro Laboratory] and 11627 [Mansfield Laboratory]). Data validation services will be performed by Joe Conboy; résumé attached (Attachment A).

Key contacts for this project are as follows:

| | |
|---|---|
| CP VII 78th Street Owner, LLC | Kyle Becker<br>Telephone: (212) 202-5794 |
| Langan Project Manager: | Amanda Forsburg<br>Telephone: (973) 560-4900 |
| Langan Quality Assurance Officer (QAO): | Steve Ciambruschini<br>Telephone: (973) 560-4900 |
| Langan Remedial Engineer: | Stewart Abrams<br>Telephone: (973) 560-4900 |
| Program Quality Assurance Monitor: | Ashley Sandve<br>Telephone: (973) 560-4900 |
| Data Validator: | Joseph Conboy<br>Telephone: (215) 845-8985 |
| Laboratory Representative: | Alpha Analytical, Inc.<br>Ben Rao<br>Telephone: (201) 847-9100 |

## 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 soil impacts at 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 accuracy or bias, sensitivity, completeness, representativeness, 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.

### 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. For field duplicates, results less than 2x the reporting limit (RL) meet the precision criteria if the absolute difference is less than ±2X the RL. For results greater than 2X the RL, the acceptance criteria is a relative percent difference (RPD) of ≤50% (soil), and <30% (groundwater). RLs and method detection limits (MDL) are provided in Attachment B.

**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 interferences, 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 blanks and through compliance to all sample handling, preservation, and holding time requirements. All field blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated field blank was 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/LCSDs, surrogate compound recoveries, internal standard responses and the results of method preparation blanks. MS/MSD, LCS/LCSD, internal standard responses and surrogate percent recoveries were 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.

**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 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.

**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 was 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 will be required to read, understand, and follow each document as it pertains to the tasks at hand.

Representativeness in the laboratory is ensured by compliance to 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 EPA and standard methods, laboratory-issued SOPs, the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

**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 was 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 were comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability was 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 were evaluated to determine whether they may be combined with contemporary data sets.

**Sensitivity**

Sensitivity is the ability of the instrument or method to detect target analytes at the levels of interest (e.g., at the NYSDEC Subpart 375-6 Soil Cleanup Objectives). 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. The concentration of the lowest level check standard in a multi-point calibration curve will represent the reporting limit.

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment C. The frequency of associated field blanks and duplicate samples will be based on the recommendations listed in DER-10 and as described in Section 5.3.2.

## 5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

Soil sampling will be conducted in accordance with the established NYSDEC protocols contained in DER-10/Technical Guidance for Site Investigation and Remediation (May 2010). 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 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. Incorrect entries 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;
- Date and time of activity;
- Sample identification numbers;
- Geographical location of sampling points with references to the site, other facilities or a map coordinate system. Sketches were 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.; and,
- 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 placed in an appropriate sample container. 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. Sample nomenclature procedures are included in Attachment D.

## 5.2 Equipment Calibration and Preventative Maintenance

A photoionization detector (PID) will be used during the sampling activities to evaluate work zone action levels and screen soil samples. Field calibration and/or field checking of the PID will be the responsibility of the field team leader and the site HSO, 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

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

### 5.3.1 Groundwater Samples

Nine (9) groundwater samples are currently included in the groundwater sampling program and the quantity of groundwater samples to be collected during future events may be modified based on feedback from the NYSDEC project manager. Performance monitoring samples for VOC analysis will be collected by lowering between one and four proprietary Westbay System 250 milliliter (ml) sample containers through the central access casing to the designated sampling zone. The number of sample containers lowered at one time depends on the length of the specific sampling zone. The sealed sample container(s) are then pulled to the surface and the collected sample placed in laboratory-provided bottleware,

sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to a NYSDOH ELAP-certified analytical laboratory. 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.

#### 5.3.1.1 Sample Field Blanks and Duplicates

Use of dedicated sampling equipment is planned; therefore, collection of field blanks is not anticipated. If the use of reusable sampling equipment is required, proper decontamination procedures will be employed (as further described in Section 5.7) and field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative groundwater samples. If required, 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 blanks will be collected at a rate of one per 20 samples and will be analyzed for the complete list of analytes on the day of sampling. If less than 20 samples are collected during a particular sampling event, one field blank sample will be collected. Trip blanks will be collected at a rate of one per day if groundwater samples are analyzed for VOCs during that day.

Duplicate groundwater samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples 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.

MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be taken at a frequency of one pair per 20 field samples. If less than 20 samples are collected

during a particular sampling event, one MS/MSD sample will be collected. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes.

## 5.4 Sample Containers and Handling

Certified, commercially clean sample containers will be obtained from the analytical laboratory. The laboratory will also prepare and supply the required field blank sample containers and reagent preservatives. Sample containers, including the field blank containers, will be placed in 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 regular ice only in Ziploc® bags (or equivalent) to maintain a temperature of 4°C±2° C.

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°C±2°C while on-site and during sample shipment to the analytical laboratory.

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

Sample containers will be placed in plastic coolers. Regular ice only 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 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 (third-party courier, 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 from the site or Langan office by a laboratory provided courier under the chain-of-custody protocols described in Section 5.9. A third-party courier may be used if necessary.
- 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

Though not anticipated, decontamination procedures will be used if non-dedicated sampling equipment is utilized during the RI. 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

Field sampling equipment that will be used for the collection of PFAS samples that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and clean, PFAS-free water scrub to remove visual contamination
2. Generous clean, PFAS-free water rinse

## 5.8 Residuals Management

Debris (e.g., paper, plastic and disposable PPE) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Debris is expected to be transported to a local municipal landfill for disposal. If applicable, residual solids (e.g., leftover soil cuttings) will be placed back in the borehole from which it was sampled. If gross contamination is observed, soil will be collected and stored in Department of Transportation (DOT)-approved 55-gallon drums in a designated storage area at the site. The residual materials stored in a designated storage area at the site for further characterization, treatment or disposal.

## 5.9 Chain of Custody Procedures

A chain-of-custody protocol has been established for collected samples was and 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 for third-party shipping couriers, 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 samples 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. 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/Field 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/Field 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.

Samples will be packaged for shipment or pickup via courier to the laboratory with the appropriate chain-of-custody form. If applicable, a shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form. A copy of the form will be retained by the Langan 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.

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 (LIMS) 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, Langan 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 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. 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.

# 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 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 American Standard Code for Information Interchange (ASCII) format from the 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 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 SOPs for data validation and USEPA'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);
- LCS and LCSD recoveries and RPDs;
- MS and MSD recoveries and RPDs;
- Laboratory duplicate RPDs; and
- Field duplicate RPDs

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.

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 QAO. 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 QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO 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 QAO 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. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.

### 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 QAO 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 QAO 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 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 QAO, 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 and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the 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). 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


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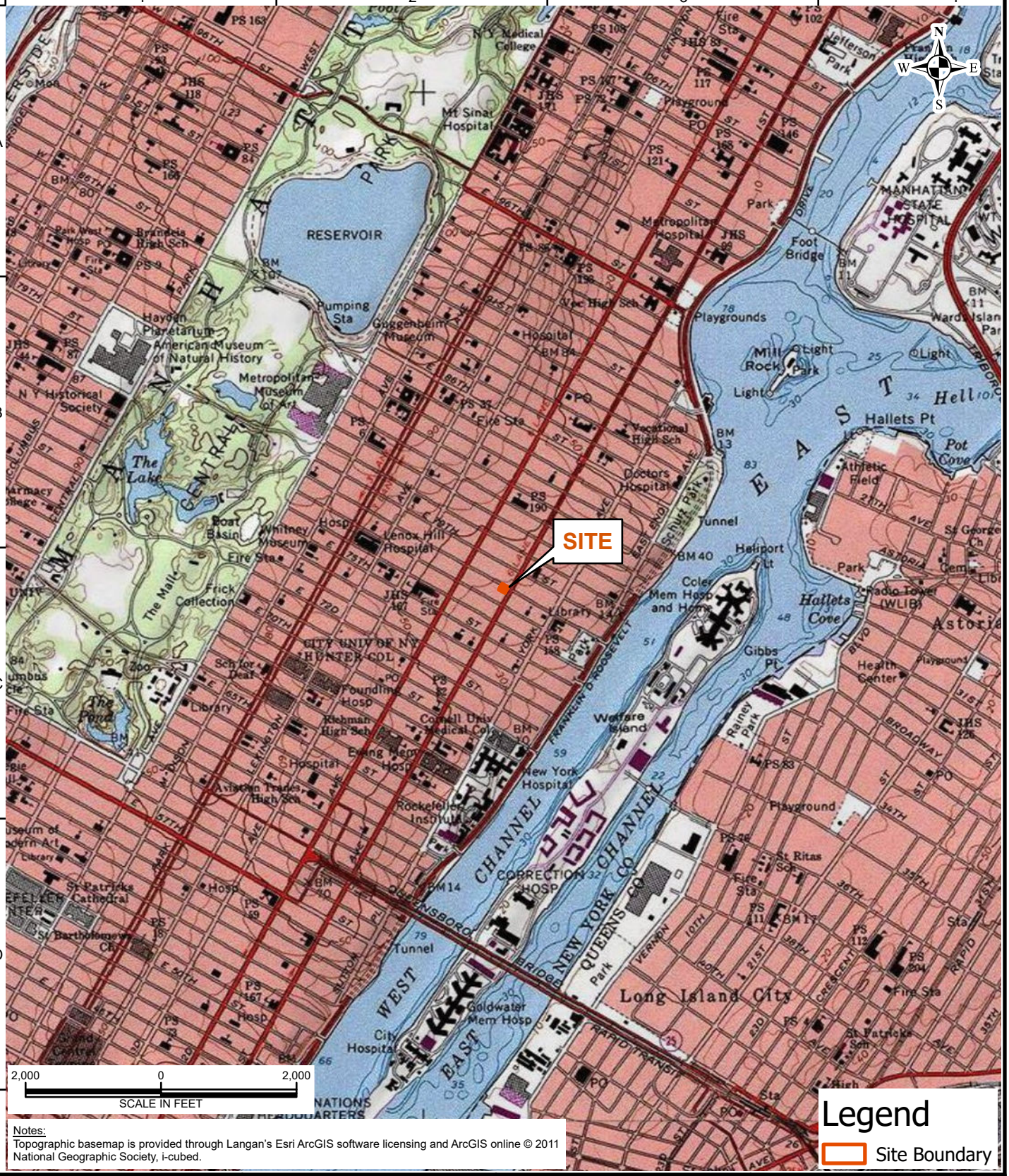
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# FIGURES




LANGAN
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Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

Project
1487 1ST AVENUE REDEVELOPMENT SITE
BLOCK No. 1452, LOT No.27
MANHATTAN
NEW YORK NEW YORK

Drawing Title
SITE LOCATION MAP

| | |
|---|---|
| Project No. | 100963701 |
| Date | 7/31/2023 |
| Scale | 1"=2,000' |
| Drawn By | JF |
| Submission Date | |
| Figure | 1 |

© 2013 Langan

Path: \\langan.com\data\PAR\data7\100963701\Project Data\ArcGIS\APRX\100963701\100963701.aprx Date: 7/31/2023 User: ibaker Time: 11:27 AM

# ATTACHMENT A

## Resumes

# STEWART H. ABRAMS, PE

## PRINCIPAL/VICE PRESIDENT

## CORPORATE DIRECTOR OF REMEDIATION TECHNOLOGY

Mr. Abrams has over 35 years of experience in soil and groundwater remediation, water treatment, Brownfields redevelopment, and engineering design. He is an expert in remedial technology, with particular emphasis on bioremediation, chemical oxidation/reduction technologies, soil vapor extraction, and air sparging. He also has extensive experience in water process engineering, notably water and wastewater treatment and industrial waste treatment for organics and metals. He is also involved in the fields of emerging contaminants and sustainable remediation. Before joining Langan, Mr. Abrams held positions of National Practice Leader for Remediation at a national consulting and engineering company and as vice president of operations at an environmental R&D firm. He is the founder of Langan's treatability facility, a joint venture with the New Jersey Institute of Technology (NJIT), whereby Langan personnel perform a wide variety of treatability and research studies for soil, groundwater and sediments.



### EDUCATION

M.S., Environmental Sciences Rutgers University

B.S., Civil Engineering Rutgers University

B.A., Political Science Rutgers University

### PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NJ, NY, PA, NC

### AFFILIATIONS

Battelle Conference on Bioremediation and Sustainable Remediation Technologies 2019 – Steering Committee Member

New Jersey Institute of Technology (NJIT) – Albert Dorman Honors College – Board of Visitors (2018-present)

PFAS Experts Symposium 2019, 2021. Chair – Available In-Situ Technologies Committee

Remediation Journal – Editorial Board (2019 – present)

### SELECTED PROJECTS

**Emerging Contaminants** – Technical Director for a complex treatment upgrade project. Onsite pump and treat systems that do not currently address 1,4-dioxane, are being upgraded via the addition of an advanced oxidation process (AOP). Offsite, a public water supply, which had included air stripping for trichloroethylene removal, requires upgrade to address 1,4-dioxane and PFAS. AOP coupled with granular activated carbon is the selected approach. Treatability studies for various AOP processes; as well GAC were performed prior to final to final process selection. Mr. Abrams consults to a Superfund site where he formulates natural attenuation and other strategies for 1,4-dioxane. For the Interstate Technology Regulatory Council (ITRC), Mr. Abrams is one of a handful of experts on PFAS treatment providing seminars nationwide.

**Peer Review Activities** – Mr. Abrams serves routinely as an independent third party reviewer of remediation plans for Fortune 500 clients. This work is often performed in a collaborative panel format with other reviewers.

**Technology Development Consulting** - Mr. Abrams has an ongoing consulting relationship with a venture-capital technology start-up in the PFAS treatment field. He advises the firm on the engineering aspects of various developmental technologies.

**Expert Testimony**. Mr. Abrams has served as a testifying expert witness in both State and Federal Court. He has also been deposed and has prepared expert reports for submission as evidence.

**Experimental Work** – At Langan's Treatability Facility at the NJIT, recently directed a bench scale research test of an emerging technology for PFOS treatment, i.e., electrocoagulation. Findings showed the electrochemical adsorption may be a feasible as a more cost-effective alternative to conventional GAC.

**Thermal Remediation** – Directed the installation and operation of an in-situ Thermal Conductive Heating project to remediate PCE and naphthalene in both groundwater and soil. System successfully remediated soils to stringent NJDEP standards. Subsequently, directed the use of bioremediation "polishing" to remove

**Injectable Activated Carbon** – Providing technical direction for several projects utilizing this technology for the remediation of VOCs in sources areas.

**MTBE/Propane Bioaugmentation –** First use of propane infusion at a gasoline station to bioremediate MTBE. Combined use of low-level propane with oxygen infusion has been shown to promote the direct remediation of ethers, notably MTBE, with concentrations driven to non-detect in less than four months. Used bioaugmentation.

**Zero Valent Iron** – Directed the use of injected zero-valent iron for remediating chlorinated solvents at a Brownfield site. Pneumatic fracturing was used to inject 500,000 pounds of micro-scale iron into the shallow bedrock source zone. This process resulted in remediation of the 20,000-square-foot source zone and conditions favorable to the long-term natural attenuation of the plume.

**Sulfate Reduction –** Directing the use of sulfate addition (Epsom salts) in the remediation of benzene-contaminated soils and groundwater. Microcosm and column treatability studies completed. Directed use of gypsum for full scale sulfate reduction at Brownfield site.

**Emulsified Zero Valent Iron (EZVI)** – Directed combined use of emulsified vegetable oil and zero valent iron (NASA Patented technology) at a two separate sites: A Brownfield site in Brooklyn, NY and a dry cleaner in New Jersey. NJ site combined EZVI with pneumatic fracturing injection under the floor of the operating dry cleaner.

**Ex-situ chemical oxidation mixing –**Technical Director of large iron-activated persulfate soil mixing project. Contaminants in soil and groundwater include primarily chlorinated benzenes. Mixing accomplished via "Lang Tool". On-site laboratory utilized for oxidation optimization in real-time.

**In-situ chromium remediation –** Directed the in-situ remediation of hexavalent chromium through the use of calcium polysulfide (CaSx) addition injection. Injections performed both inside the building as well as outside. Pneumatic fracturing used for injection in shallow bedrock. Monitoring showed that concentrations in the source area groundwater declined to non-detect from 15,000 ug/l in less than a week.

**Pump & Treat –** Directed the design, installation and operation of a pump and treat system located in southeastern Pennsylvania. Unit processes include filtration, air stripping and granular activated carbon. Constructed in 2013, the system mitigates migration of a plume into a potable water supply.

**New Jersey Turnpike, Cranbury, NJ** – Managed design (pilot testing, conceptual, and plans and specifications) of a remediation system consisting of 77 air-sparging (AS) wells and 37 soil vapor extraction (SVE) wells for the New Jersey Turnpike at the Molly Pitcher Service Area. Oversaw installation and system startup. Innovative one-day AS/SVE pilot test. Volatilization and destruction of 10,000 gallons of subsurface free product. First use of catalytic oxidation at a Turnpike facility for air-pollution control.

Sustainable Remediation Forum (SURF) (2009 – present)

ITRC Perfluorinated Contaminants Committee (2017 – present) – Subcommittee on Remediation & Treatment

ITRC Integrated Chlorinated Site Remedy Committee (2007 – 2009)

NJDEP Advisory Council on Environmental Justice (2002 - 2004, 2006 - 2013)

Governor-elect Corzine Environmental Policy Transition Committee (2005 – 2006)

NJDEP Remediation Stakeholders Committee (2007 - 2009)

**Woodlands Superfund Site, Woodland Twp., NJ** – As a subcontractor to *de maximis, inc.,* directed the subsurface design, installation and testing of a major air sparging/SVE system (+200 vertical wells) for a Superfund site in southern New Jersey. Work involved pilot testing of air sparging, SVE pneumatic modeling, early use of CPT/MIPS, and an extensive well-installation using sonic drilling.

**GE – Schenectady, NY** – Served as technical director for the design of a comprehensive remediation program for a New York state site involving the bioremediation of three VOC plumes and the collection and treatment of leachate seeps. Supported GE Researchers in performing flow-through laboratory column tests using innovative sulfate reduction techniques to remediate a BTEX plume. Led the scale-up of this column study into a design.

**BROS Superfund Site, Bridgeport, NJ** – Directed extensive laboratory treatability studies and design scale-up of aerobic and anaerobic bioremediation, in-situ Fenton's reagent for chlorinated solvents, and BTEX and cometabolic testing of BCEE degradation. Bench testing was correlated to a site conceptual model, with particular tests tailored to conditions in specific segments and zones of the aquifer. This included detailed work plans for submission to USEPA Laboratories in Cincinnati and Oklahoma.

**TCE & Chromium combined** – Site with both Cr+6 and TCE contamination being contained by a pump-and-treat system. Pursued pump-and-treat shutdown strategy through laboratory testing and a comprehensive feasibility study. Zero-valent iron, bioremediation, calcium polysulfide, and ferrous sulfate were all lab-tested. Directed the field pilot testing of bioaugmentation and nano-scale zero-valent iron at the sites. Bioaugmentation selected for full scale, since it was highly effective for both $Cr^{+6}$ and TCE.

**TCE Cometabolic Bioaugmentation** – Innovative first use of aerobic bioaugmentation for the shutdown of a 20-year-old pump-and-treat system in 1995. TCE and daughter products were the contaminants of concern. Shutdown occurred over six months through the repeated injection of bioaugmentation culture.

**Zero Valent Iron for P&T Shutdown** – Directed the use of injected zero-valent iron at a northern New Jersey site for the remediation of chlorinated solvents. Pneumatic fracturing used to inject micro-scale iron into the recovery zone. Temporary shutdown permission obtained from NJDEP. Injection was a significant success, resulting in permanent cessation of pump-and-treat activities at the site.

**TCE Bioaugmentation** – Directed the injection of emulsified vegetable oil, followed by bioaugmentation culture, in an aquifer contaminated with PCE. Aquifer preconditioned with baker's yeast and sugar, prior to injection of EVO. Bioaugmentation activities completed in April 2012. Second source area was remediated via in-situ thermal remediation in 2014.

**Horizontal Injection Wells for Permanganate Injection** – Directed the injection of over 400,000 pounds of potassium permanganate for chlorinated solvent destruction at a large Brownfields site in Maryland. Extensive use of horizontal wells. Work performed under a fixed-price contract with blended finite insurance. This project awarded the prestigious Phoenix Award for EPA Region 3 by the National Brownfields Association.

## Selected Publications, Reports, and Presentations

*PFAS Experts Symposium: White Paper.* Position paper prepared by a group of 40 experts convened under the auspices of Remediation Journal. September 2019.

*Treatment Technology for Perfluorinated Compounds.* Presented at ITRC PFAS Annual Meeting. Boston, MA. March 2019.

*Treatment Technology for Perfluorinated Compounds.* Presented at ITRC PFAS Training Program. Montclair State University, New Jersey. October 2018.

*Use of In-Situ Remediation Technology at Brownfield Sites – Case Studies*. Presented at Battelle Symposium on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, CA. (April 2018).

*Air Sparging Technology Status Review: Advanced Design and Implementation Tools.* Joint with Omer Uppal. Presented at Battelle Symposium on Bioremediation of Chlorinated and Recalcitrant Compounds, Palm Springs, CA. (May 2016).

*Evaluation of Remedial Alternatives via Three Bench-Scale Treatability Studies for a Mixed Dense Non-Aqueous Phase Plume*. Presented at Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Jacksonville, FL. (June 2013).

Geng, X., Boufadel, M.C., Lee, K., Abrams, S., Suidan, M. (2014). Biodegradation of subsurface oil in a tidally influenced sand beach: Impact of hydraulics and interaction with pore water chemistry. *AGU Water Resources Research, 51,* 3193 – 3218.

*From Flask to Field – The Role of Treatability and Pilot Tests in Remediation*. Presented to Association of Environmental & Engineering Geologists (AEG) New York/Philadelphia Section, Somerset, NJ. (December 2014).

*Evaluation of Remedial Alternatives via Three Bench-Scale Treatability Studies for a Mixed Dense Non-Aqueous Phase Plume*. Presented at Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Jacksonville, FL. (June 2013).

*Sustainable Remediation and SURF.* Presented at RE3 Conference, Atlantic City, NJ. (November 2012).

*Application of Pneumatic Fracturing and Zero-valent Iron for a Maryland Brownfield Site*. Presented at Battelle International Symposium on In-Situ and Sustainable Technologies, Monterey, CA. (May 2012).

*Integrating Remediation and Redevelopment*. Presented at Honeywell "All-Hands" RES Meeting, Morristown, NJ. (December 2011).

*Assessing Innovative Remedial Technologies*. Presented to Environmental Bankers Association, Charlotte, NC. (January 2009).
*Time, Cost & Effectiveness: Assessing Innovative Remedial Technologies.* Presented at ITRC/Langan Conference, East Brunswick, NJ. (June 2008).

*Remediation Technology Pitfalls*. Presented at Prudential Realty Investors Conference, New Orleans, LA. (December 2008).

*Selecting Innovative Remedial Technologies*. Presented at NJ Innovative Environmental Technology Conference, Newark, NJ. (October 2007).

*Bioaugmentation for Site Remediation.* Presented at AWMA Central New York Conference, Syracuse, NY. (March 2007).

*Selecting Innovative Remedial Technologies*. Presented at NJ Innovative Environmental Technology Conference, Newark, NJ. (October 2007).

*Use of Persulfate for MTBE Remediation.* Presented by Abrams, S.H. & E. Mott-Smith at AEHS West Conference, San Diego, CA. (March 2006).

*Innovative Approaches to Chlorinated Solvent Remediation*. Presented to Conference of Envirogen clients. Oak Brook, IL. (May 2002).

*Bioremediation*. Guest Lecturer at Rutgers Graduate School, New Brunswick, NJ. (October 2001).

*Biosparging and Bioventing for In-situ Cleanup*. Guest Lecturer at Rutgers Graduate School, New Brunswick, NJ. (April 1995).

*NPDES Permitting in the Pulp & Paper Industry*. Presented at Delaware Valley Section Meeting, Yardley, PA. (November 1991).

*Strategies to Minimize Liabilities Under the New Jersey Clean Water Enforcement Act*. Presented to New Jersey Business & Industry Association, West Windsor, NJ. (October 1990).

*Meeting EPA's Organic Chemicals Plastics and Synthetic Fibers Pretreatment Regulations*. Presented at Mid-Atlantic Industrial Waste Conference, Harrisburg, PA. (June 1989).

*Design of Packed Columns for Water Treatment*. Guest Lecturer at Rutgers Graduate School, New Brunswick, NJ. (March 1987).

*Workshop on Response to Volatile Organics in Public Water Supplies*. Presented to water suppliers at Technology transfer session. Edison, NJ (March 1987).

# AMANDA FORSBURG, CHMM

## SENIOR PROJECT SCIENTIST

## BROWNFIELD REDEVELOPMENT, DUE DILIGENCE AND SITE INVESTIGATION, REMEDIAL ACTIONS

Ms. Forsburg has 14 years of experience primarily focused on providing environmental support to redevelopment sites within the metropolitan New York area. She has experience with projects in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) and Spill Programs, New York City Office of Environmental Remediation (NYCOER) E-Designated and New York City Voluntary Cleanup Program (VCP) sites, and New York City Department of Environmental Protection (NYCDEP) remediation sites. Her field experience includes implementation and management of all phases of environmental projects involving soil, groundwater, and soil vapor contamination including Phase I inspections, Phase II site investigations, Remedial Investigations, and Remedial Actions.

During her tenure at Langan, Ms. Forsburg's experience has included schematic-, design-, and construction-phase project team involvement on numerous large scale construction projects requiring multi-disciplinary coordination and collaboration across different Langan teams and offices.

### SELECTED PROJECTS

- 101 Murray Street, New York, NY (NYSDEC Spill Site, Multi-discipline)
- 110 University Place, New York, NY (NYSDEC Spill Site, Multi-discipline)
- 138 Willoughby Street, Brooklyn, NY (NYCOER E-Designation Site, Multi-discipline)
- 180 East 125th Street, New York, NY (NYCOER E-Designation Site, Multi-discipline)
- 1905 Surf Avenue, Brooklyn, NY (NYCOER E-Designation Site, Multi-discipline)
- 1921 Atlantic Avenue, Brooklyn, NY (NYSDEC BCP Site)
- 225 East 39th Street, New York, NY (NYCDEP Remediation Site, Multi-Discipline)
- 23-30 Borden Avenue, Queens, NY (NYSDEC BCP Site, Multi-discipline)
- 28-90 Review Avenue, Queens, NY (NYSDEC BCP Site, Multi-discipline)
- 280 West 155th Street, New York, NY (NYSDEC BCP Site, Multi-discipline)
- 311 West 42nd Street, New York, NY (NYCOER E-Designation Site, Multi-discipline)
- 363 and 365 Bond Street, Brooklyn, NY (NYSDEC BCP Site, Multi-discipline)
- 400 Park Avenue South, New York, NY (NYCOER E-Designation and VCP Site)
- 412 Greenwich Street, New York, NY (NYCOER E-Designation Site, Multi-discipline)



### EDUCATION

B.A., Environmental Studies
Bucknell University

B.A., Environmental Geology
Bucknell University

### PROFESSIONAL REGISTRATION

Certified Hazardous Materials Manager (CHMM)

OSHA 29 CFR 1910.120 Certification (HAZWOPER)

### AFFILIATIONS

New Jersey Society of Women Environmental Professionals (NJSWEP) - MetroNet Committee

Association of Environmental and Engineering Geologists

Professional Women in Construction

Urban Land Institute, Norther New Jersey Chapter - Women's Leadership Initiative Co-Chair

- 42-50 24th Street, Queens, NY (NYSDEC Spill Site, Multi-discipline)
- 460 West 41st Street, New York, NY (NYCOER E-Designation Site, Multi-discipline)
- 505 West 19th Street, New York, NY (NYCOER E-Designation Site, Multi-discipline)
- 508 West 24th Street, New York, NY (NYCOER E-Designation and VCP Site, Multi-discipline)
- 525 West 52nd Street, New York, NY (NYCOER E-Designation Site, Multi-discipline)
- 53 West 53rd Street (MoMA Expansion), New York, NY (NYCOER E-Designation Site, Multi-discipline)
- 54 Crown Street, Brooklyn, NY (NYCOER E-Designation and VCP Site, Multi-discipline)
- 540 West 26th Street, New York, NY (NYSDEC Spill Site, Multi-discipline)
- 550 Tenth Avenue, New York, NY (NYCOER E-Designation Site, Multi-discipline)
- 68 Charlton Street, New York, NY (NYCOER E-Designation Site, Multi-discipline)
- Broome Street Parking Lot Site, New York, NY (NYSDEC BCP Site, Multi-discipline)
- Marble Collegiate Church Office Building, New York, NY (Multi-discipline)
- Norfolk Street Site, New York, NY (NYCOER E-Designation Site, Multi-discipline)

# Steven Ciambruschini, PG, LEP

**Principal/Vice President**
**Environmental Site Assessments/Investigations, Brownfield Remediation, UST Management**



## 33 years in the industry ~ 28 years with Langan

Mr. Ciambruschini has over 30 years of experience in hydrogeologic and environmental investigations including management of environmental and geotechnical investigations relating to petroleum and chlorinated solvent spill sites, underground storage tank sites, manufactured gas plant sites, landfills, wastewater treatment facilities and industrial/commercial sites. His experience includes managing environmental compliance audits, remedial investigation, pre-acquisition due diligence and permitting assessment, feasibility studies and design, construction and operation of complex innovative remediation systems to treat, contain and recover contaminated soil and groundwater. These projects are managed under various NJDEP, PADEP, NYDEC, NYCDEP and CTDEP programs. Mr. Ciambruschini provides consultation to a diverse group of clients including private developers, utilities, retail and industrial facilities and is expert in assessing remediation options and funding options under various state and federal grant, loan and tax reimbursement programs including Brownfield programs.

## Selected Projects

- Brodson Property, Montville NJ, (RCRA, NJDEP ACO Cleanup)
- Carroll Gardens, Brooklyn, NY (NY Brownfield, EPA Superfund, OER E-designated Site)
- Con Edison Appendix B Spill Sites - Various Locations, NY
- Former MGP Site, Brooklyn, NY (VCP Site)
- Extell Development, Hudson Yards, New York, NY (NYC E-designated, NYS Brownfield Site)
- Pan Graphics, Bergen County, NJ (ISRA, LSRP)
- New Jersey Turnpike General Environmental Services Contract, Various Sites, NJ
- Liberty Science Center, Jersey City, NJ ( EO 215)
- Blue Back Square, West Hartford, CT (UST, Transfer Act, Brownfield)
- Hershey, Act II Investigation (PA VCP)
- Hershey, Naugatuck, CT (CT Transfer Act)
- Halby Chemical Sites, Various Sites, DE (CERCLA)
- Unisys, Middletown CT, (CT Transfer Act, Brownfield)
- Ryder Rental, Various Sites in CT (CT Transfer Act)
- St. Marks Avenue, Brooklyn, NY (Vapor Mitigation)
- Pan Graphics, Lodi, NJ (Eco Risk Assessment, LSRP)

### Education

M.S., Geology
Montclair State University

M.A., Environmental Science
Montclair University

B.S., Environmental Science
Cook College, Rutgers University

### Professional Registration

Professional Geologist (PG) in NY, DE, KY

Licensed Environmental Professional (LEP) in CT

Underground Storage Tank License in NJ

### Affiliations

National Ground Water Association

Association of Ground Water Scientists and Engineers

American Association of Petroleum Geologists

Environmental Professionals of Connecticut

American Bar Association (ABA)

LANGAN

# ASHLEY SANDVE

## SENIOR STAFF ENGINEER

## ENVIRONMENTAL ENGINEERING

Ms. Sandve's 6 years of experience includes field work and office work on environmental investigation and remediation projects. Her field work experience includes soil, soil vapor, indoor air and groundwater sampling; drilling oversight; air monitoring; soil management; and remediation oversight, including excavation and off-site soil disposal. Her office work experience includes environmental site background research, state environmental database research, EQuIS database management, data evaluation, remedial design, and report work, including, but not limited to, Phase I ESAs, Preliminary Assessment/Site Investigations, Spill Closure Reports, Remedial Investigation Reports, Remedial Action Work Plans, and Remedial Action Reports. Ms. Sandve is proficient in excel and database management and has ample experience researching sites through the online NJDEP and NYSDEC portals.



**EDUCATION**

B.E., Environmental Engineering
Stevens Institute of Technology

**PROFESSIONAL REGISTRATION**

OSHA 29 CFR 1910.120 Certification (HAZWOPER)

**SELECTED PROJECTS**

- 1921 Atlantic Avenue, NYSDEC BCP Site Remediation, Brooklyn, New York
- 28-90 Review Avenue, NYSDEC BCP Site Remediation, Queens, NY
- 550 Tenth Avenue, NYSDEC BCP Site Remediation, New York, NY
- Norfolk Street Site, NYCOER E-Designation Remediation, New York, NY
- Broome Street Parking Lot Site, NYSDEC BCP Site Remediation, New York, NY
- 1538 Stillwell Avenue, NYCOER E-Designation and VCP Site Remediation, Bronx, NY
- 540 West 26th Street, NYSDEC Spills Redevelopment, Remedial Action, New York, NY
- 412 Greenwich Street, NYCOER E-Designation Remediation, New York, NY
- 125 Greenbush Road, Soil and Groundwater Investigation, Orangeburg, NY
- 12 West 48th Street, Phase II Environmental Investigation, New York, NY
- 68 Charlton Street, NYCOER E-Designation Remediation, New York, NY
- Carlyle Residential Portfolio, Brooklyn & Queens, NY
- Phase I Environmental Site Assessments and Due Diligence Investigations, Various Sites, NJ and NY
- Former Penick Corporation Facility RCRA Site, Data Management, Remedial Investigation, and Remedial Action, Montville, NJ
- Former Hess Terminal, Remediation Oversight, Edgewater, NJ
- Stop & Shop, Soil Vapor Intrusion Investigation, Emerson, NJ
- ThorLabs, Groundwater and Soil Vapor Intrusion Investigation, Andover, NJ
- Bright Horizons, Preliminary Assessment and Site Investigation, Roseland, NJ

# JOSEPH CONBOY

## STAFF CHEMIST

## ENVIRONMNETAL

Mr. Conboy has seven years of environmental chemistry, quality assurance, and environmental database management experience, with a current emphasis on validation of laboratory data for submittal to NJDEP via the New Jersey Data of Known Quality Protocols and to NYSDEC. Previous work experience includes performing validation of data for projects in USEPA Regions 2 and 3 while employing appropriate validation guidelines for each region, managing large data sets, updating appropriate regulatory limits, performing statistical evaluations, and preparing electronic data deliverables and report deliverables using the Earthsoft EQuIS database program, and acted as an intermediary between project managers, field staff, and laboratories. Mr. Conboy also has experience in field sampling techniques and maintains current OSHA HAZWOPER certification.



**EDUCATION**

B.Sc., Chemistry with a minor in Mathematics
Rowan University

**CERTIFICATIONS & TRAINING**

OSHA 40-Hour HAZWOPER 29 CFR 1910.120(e)(4) Certification

NJ Analytical Guidance and Data Usability Training

USEPA Data Validation Training

Earthsoft EQuIS Environmental Database Training

**SELECTED PROJECTS**

- 1400 Ferris, Bronx, NY – Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs and SVOCs including 1,4-dioxane, and tangentially used based on professional judgment to perform validation of PFAS data.
- Broome Street Parking Lot, NY - Completed validation of waste characterization data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs, SVOCs, herbicides, PCBs, pesticides, metals including mercury, ignitability temperature, pH, reactive cyanide, reactive sulfide, cyanide, and hexavalent chromium. Toxicity characteristic leachate procedure extraction data for VOCs, SVOCs, herbicides, pesticides, metals, and mercury were also validated.
- 215 North 10$^{th}$ Street, Brooklyn, NY - Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data.
- 35 Commercial Street, Brooklyn, NY - Completed validation of soil data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.
- Suffolk Street, Lower East Side, NY- Completed validation of soil, groundwater, and soil vapor data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II

guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, VOCs by USEPA TO-15, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.

- Managed a database for a confidential client containing 10+ years of environmental chemical data from multiple laboratories, requiring select data validation in accordance with New Jersey Data of Known Quality Protocols and identifying areas of delineation from historic field information. Once identified, NJDEP designated groundwater, surface water, soil, sediment, soil vapor, and custom screening criteria were researched and applied to each area, requiring individualized flagging for reporting.*
- Prepared the New Jersey Data of Known Quality Protocol Data Usability Evaluation and managed the database for a confidential client for a data set greater than 20 years old. A DUE or any validation effort was not prepared in the 20 years prior to current. This included data from variations of methods for volatile organic compounds, semivolatile organic compounds, total and dissolved metals, pesticides, herbicides, natural attenuation parameters, and per- and polyfluoroalkyl substances in multiple media.*
- Performed 200+ Stage 2a validations for a combined 87-acre USEPA designated Corrective Action site under the Resource Conservation and Recovery Act, including a quick-turn USEPA required PCB by soxhlet extraction investigation across multiple plants. Once a former train car painting facility, USEPA required a quick-turn PCB by soxhlet extraction soil investigation.
- Preparation of a quality assurance program for a confidential client in West Virginia. A quick turn QAPP was prepared in a service location new to the consultant, resulting in research into state requirements for data usability and auditing newly employed laboratories. The QAPP was understood to be prepared for groundwater only, but the client did not reveal the need for sediment and soil. Two QAPPs were submitted for review to governing agencies.*
- Used statistical software to determine a localized background upper confidence limit of chromium for a confidential client's sand and gravel site. Validation was used to confirm laboratory procedures, and data was used in ProUCL calculations to compare to researched background chromium levels for Pennsylvania soils. *
- Prepared daily perimeter dust and air monitoring summaries and validation of low level mirex data for a confidential client's superfund site. Low level mirex data was generated by university laboratories and subject to validation following national functional guidelines to aide in river clean-up, including sediment, surface water, and treatment system water matrices.*

**Project completed prior to employment at LANGAN.*

# MARLENA JEWETT

## DATA ANALYST

## CAD/GIS

**1 year in the industry**

**Proposed Title: Field Technician**



Ms. Jewett is a data analyst with experience in database design, management and visualization using EarthSoft's EQuIS™ database in support of environmental site characterizations for sites regulated under federal and state compliance programs. Her expertise includes integration of analytical databases and coordination with GIS users.

In her current role Marlena assists project teams with planning and implementation of project databases and data visualization. This includes coordinating with field staff and laboratories to define, workflows, SOPs and ensure the receipt of the proper deliverables for field and lab data; reviewing and managing project data and information using EQuIS™, Microsoft® Access, and Excel; generating data reports including tables, graphs, charts, and GIS compatible files; and generating and reviewing electronic data deliverables following project or agency specific formats.

**Education**

B.A., Environmental Economics
Colgate University

**Work History**

Equitable Advisors
Financial Advisor
9/7/2020-4/23/2021

Langan
Data Analyst
5/10/2021 – Present

### SELECTED PROJECTS

**EQuIS Management and NYSDEC deliverables** – Data Analyst. Loaded and maintained soil, groundwater, and soil vapor data in an EQuIS database for a remedial investigation and waste characterizations of New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), NYC Office of Environmental Remediation (OER), and due diligence sites. Provided final report deliverables including sample summaries; tags; and exceedance summary exports from EQuIS. Completed this work for the following projects:

- **2-8 Main Street**
- **28-90 Review Avenue**
- **34-15 10th Street**
- **37-11 30th Street**
- **44-01 Northern Boulevard**
- **45 Commercial Avenue**
- **50 Jersey Avenue**
- **111 Willow Street**
- **118 West 13th Street**
- **122 Fifth Avenue**
- **155 Third Street**
- **160 East 125th Street**
- **210 Clarkson Avenue**
- **241 West 28th Street**
- **266 West 96th Street**
- **445 Gerard Avenue**
- **475 Bay Street and 31 Wave Street**

- **495 Peninsula Boulevard**
- **561 Greenwich Street**
- **563 Sackett Street**
- **805-825 Atlantic Avenue**
- **1525 Bedford Avenue**
- **2455 Third Avenue**
- **4650 Broadway**
- **ABC Block 27**
- **Bay Crane**
- **Broome Street**
- **Former Grant Hardware**
- **Forsyth and Delancy Street**
- **Gowanus Canal Northside**
- **Greenpoint Landing E1**
- **Greenpoint Landing Parcel H3**
- **John Evans**
- **Kissena Boulevard**
- **NYCHA Farragut**
- **Remeeder**

# ATTACHMENT B

# Laboratory Reporting Limits and Method Detection Limits

LANGAN

**Date Created:** 01/29/20
**Created By:** Ben Rao
**File:** PM7986-1
**Page:** 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 | | | |
| 1,1-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 | | | |
| 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 | | | |
| Dibromomethane | 74-95-3 | 5 | 1 | ug/l | 70-130 | 20 | 70-130 | 20 | 20 | | | |
| 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 | | | |

***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.***

**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 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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* | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

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**Page:** 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 |

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**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 | 0.0000915 | mg/l | 80-120 | | 75-125 | 20 | 20 | | 28 days | 1 - Plastic 500ml HNO3 preserved |

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**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, Inc.***

# ATTACHMENT C

# Analytical Methods / Quality Assurance Summary Table

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**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 | Number of Samples to be Collected | Field Duplicate Samples | Equipment Blank Samples | Trip Blank Samples | Ambient Air Samples | MS/MSD Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Groundwater** | Headspace VOCs via PID, synoptic groundwater level measurement, 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 | 14 days | 9 | 1 per 20 samples (minimum 1) | 1 per 20 samples, if needed (minimum 1, if needed) | 1 per shipment of VOC samples | NA | 1 per 20 samples (minimum 1) |
| | | Sulfate | EPA 9038 | Cool to 4°C | 250-mL plastic | 28 days | TBD | | | | | |
| | | Chloride | SM4500 | Cool to 4°C | 250-mL plastic | 28 days | | | | | | |
| | | Part 375 + TAL Metals | EPA 6010C, EPA 7470, EPA 7196A, EPA 9014/9010C | Cool to 4°C | Two 1-Liter Amber Glass | 6 months, except Mercury 28 days | | | | | | |
| | | Hexavalent Chromium | EPA 7196A | Cool to 4°C | 250 mL Plastic | 24 hours | | | | | | |

Notes:
*can be combined in one or more 8 oz. jars
mL = milliliter
VOC = Volatile organic compound
SVOC = Semi-volatile organic compound
PCB = Polychlorinated biphenyls
TAL = Total Analyte List
TCL = Target Criteria List
PID = Photoionization detector
Part 375 = New York State Department of Environmental Conservation (NYSDEC) Title 6 New York City Rules and Regulation (NYCRR) Part 375 List.
ORP = Oxidation reduction potential
EPA = U.S. Environmental Protection Agency
NA = Not applicable
$^{0}$C = degree Celsius
The quantity of groundwater samples to be collected is to be determined based on feedback from the NYSDEC project manager.

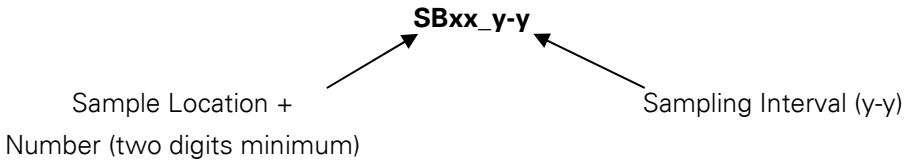
# ATTACHMENT D

# Sample Nomenclature

Requirements for Sample Nomenclature

The recommendations for sample nomenclature outlined below provide for consistency between sample events and projects but, most importantly, establish unique sample IDs that will avoid confusion months or years after the sample has been collected. Furthermore, unique sample IDs are required for any data submitted to the NYSDEC in EDD format or being uploaded to an EQuIS database.

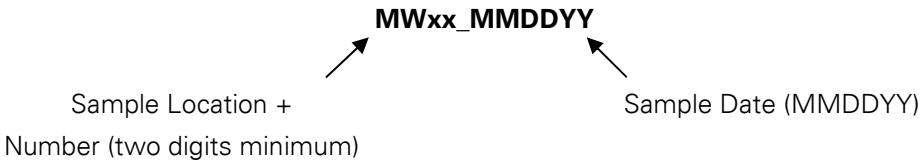
**Soil and Sediment Samples**




| Sample Type | Sample Location | Sample Depth (feet bgs) | Sample Name |
|---|---|---|---|
| **Phase II/Remedial Investigation** | | | |
| Grab | SB01 | 2 to 4 | **SB01_2-4** |
| | SB02 | 4 | **SB02_4** |
| **Waste Characterization** | | | |
| Grab | WC01 | 2 to 4 | **WC01_2-4** |
| | WC02 | 4 | **WC02_4** |
| Composite | WC01 + WC02 | 0 to 10 | **COMP01_0-10** |
| **Endpoint Sampling** | | | |
| Grab | EPSW01_N | 5 | **EPSW01_N_5** |
| | EPSW01_S | 5 | **EPSW01_S_5** |
| | EPSW01_E | 5 | **EPSW01_E_5** |
| | EPSW01_W | 5 | **EPSW01_W_5** |
| | EPB01 | 6 | **EPB01_6** |

- Boring ID (**SB01**_0-0.5) is a sequential number (starting with 01) and should be a minimum of two digits. Any additional characters do not count as part of the 2-digit minimum (SB01**A**, not SB1A).
- Sample Interval (SB01_**0-0.5**) is separated from the boring ID with an underscore, and the top and bottom interval with a dash. Soil and sediment sample intervals should always be in feet.

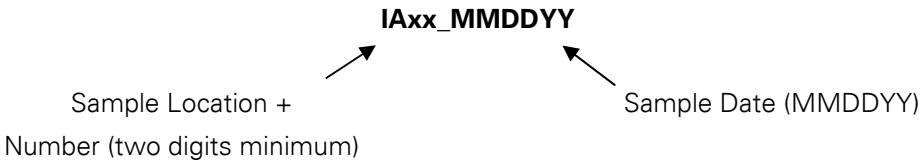
**Groundwater and Surface Water Samples**




| Sample Type | Sample Location | Sample Date | Sample Name |
|---|---|---|---|
| Groundwater Sample | MW01 | 02/21/2013 | **MW01_022113** |
| Surface Water Sample | SW01 | 02/21/2013 | **SW01_022113** |

- Well ID or surface water gauge ID (**MW01**_022113) is the common well name and should be a minimum of two digits. Any additional characters do not count as part of the 2-digit minimum (MW01**A**, not MW1A).
- Sample date (MW01_**022113**) is separated from the well ID (or gauge location) with an underscore and should be provided in MMDDYY format [the date can not contain "/" or "-"].
- If groundwater samples are collected from multiple intervals within one well, you may assign a letter designation (in lower case) to the well ID to differentiate between intervals (i.e., MW01a_022113, MW01b_022113, and MW01c_022113). The letter "a" would indicate the shallowest interval and "c" the deepest. The actual depth intervals should be documented in the project field book or field sheets and the letter designations should be used consistently between sampling events.

**Vapor Investigation Samples**




| Sample Type | Sample Location | Sample Date | Sample Name |
|---|---|---|---|
| Ambient Air Sample | AA01 | 02/21/2013 | **AA01_022113** |
| Air Sample | IA01 | 02/21/2013 | **IA01_022113** |
| Soil Vapor Sample | SV01 | 02/21/2013 | **SV01_022113** |
| Vapor Extraction Well Sample | SVE01 (Inlet/Midpoint/Outlet) | 02/21/2013 | **SVE01_IN_022113**<br>**SVE01_ MID_022113**<br>**SVE01_ OUT_022113** |

- Sample number (**IA01**_022113) should be separated from the sample date by an underscore. Sample numbers should be sequential in order and be a minimum of two digits. Any additional characters do not count as part of the 2-digit minimum (IA01**A**, not IA1A). The location of each sequential sample number should be documented/ illustrated in project field books or field sheets.
- Sample date (IA01**_022113**) is separated from the sample number with an underscore and should be provided in MMDDYY format [the date can not contain "/" or "-"].
- Ambient air samples also need their own unique sample location name. If you revisit a previous ambient air sample location, you can reuse the location name with the new sample date appended to the end.

**Duplicate Samples**

| Sample Type | Parent Sample Code | Date | Sample Name |
|---|---|---|---|
| Groundwater Duplicate Sample (DUP) | MW01_022113 | 02/21/2013 | **DUP01_022113** |

**Field Blanks and Trip Blanks**

| Sample Type | Date | Sample Name |
|---|---|---|
| Equipment Blank (EB) | 02/21/2013 | **EB01_022113** |
| Field Blank (FB) | 02/21/2013 | **FB01_022113** |
| Trip Blank (TB) | 02/21/2013 | **TB01_022113** |

**Matrix Spike/Matrix Spike Duplicate (MS/MSD)**

| Sample Type | Sample Location | Parent Sample Name | Sample Name |
|---|---|---|---|
| Matrix Spike (MS) | SB01 | SB01_2-4 | **SB01_2-4MS** |
| Matrix Spike Duplicate (MSD) | SB01 | SB01_2-4 | **SB01_2-4MSD** |

**NOTES**

1. Spaces should not be used in sample names.
2. Special characters should not be used in report naming with the exception of – and _.
3. Letter designations should be used consistently between sampling events.
4. According to USEPA's Contract Laboratory Program (CLP) Guidance for Field Samplers (January 2011), field duplicate samples should remain "blind" to the laboratory (i.e., they should have separate CLP Sample numbers). Assign two separate (unique) CLP sample numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory.

# ATTACHMENT E

# ELAP Certifications

LANGAN

**NEW YORK STATE DEPARTMENT OF HEALTH**
**WADSWORTH CENTER**

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

## CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

*MR. JOHN TRIMBLE*
*ALPHA ANALYTICAL*
*320 FORBES BOULEVARD*
*MANSFIELD, MA 02048*

*NY Lab Id No: 11627*

*is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS*
*All approved analytes are listed below:*

| | |
|---|---|
| **Acrylates** | |
| Acetonitrile | EPA TO-15 |
| Acrylonitrile | EPA TO-15 |
| Methyl methacrylate | EPA TO-15 |
| **Chlorinated Hydrocarbons** | |
| 1,2,4-Trichlorobenzene | EPA TO-15 |
| Hexachlorobutadiene | EPA TO-15 |
| **Polychlorinated Biphenyls** | |
| PCBs and Aroclors | EPA TO-10A |
| | EPA TO-4A |
| **Polynuclear Aromatics** | |
| Acenaphthene | EPA TO-13A |
| Acenaphthylene | EPA TO-13A |
| Anthracene | EPA TO-13A |
| Benzo(a)anthracene | EPA TO-13A |
| Benzo(a)pyrene | EPA TO-13A |
| Benzo(b)fluoranthene | EPA TO-13A |
| Benzo(g,h,i)perylene | EPA TO-13A |
| Benzo(k)fluoranthene | EPA TO-13A |
| Chrysene | EPA TO-13A |
| Dibenzo(a,h)anthracene | EPA TO-13A |
| Fluoranthene | EPA TO-13A |
| Fluorene | EPA TO-13A |
| Indeno(1,2,3-cd)pyrene | EPA TO-13A |
| Naphthalene | EPA TO-13A |
| | EPA TO-15 |
| Phenanthrene | EPA TO-13A |

Serial No.: 67090

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**Polynuclear Aromatics**

| | |
|---|---|
| Pyrene | EPA TO-13A |

**Purgeable Aromatics**

| | |
|---|---|
| 1,2,4-Trimethylbenzene | EPA TO-15 |
| 1,2-Dichlorobenzene | EPA TO-15 |
| 1,3,5-Trimethylbenzene | EPA TO-15 |
| 1,3-Dichlorobenzene | EPA TO-15 |
| 1,4-Dichlorobenzene | EPA TO-15 |
| 2-Chlorotoluene | EPA TO-15 |
| Benzene | EPA TO-15 |
| Chlorobenzene | EPA TO-15 |
| Ethyl benzene | EPA TO-15 |
| Isopropylbenzene | EPA TO-15 |
| m/p-Xylenes | EPA TO-15 |
| o-Xylene | EPA TO-15 |
| Styrene | EPA TO-15 |
| Toluene | EPA TO-15 |
| Total Xylenes | EPA TO-15 |

**Purgeable Halocarbons**

| | |
|---|---|
| 1,1,1-Trichloroethane | EPA TO-15 |
| 1,1,2,2-Tetrachloroethane | EPA TO-15 |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | EPA TO-15 |
| 1,1,2-Trichloroethane | EPA TO-15 |
| 1,1-Dichloroethane | EPA TO-15 |
| 1,1-Dichloroethene | EPA TO-15 |
| 1,2-Dibromo-3-chloropropane | EPA TO-15 |
| 1,2-Dibromoethane | EPA TO-15 |

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**Purgeable Halocarbons**

| | |
|---|---|
| 1,2-Dichloroethane | EPA TO-15 |
| 1,2-Dichloropropane | EPA TO-15 |
| 3-Chloropropene (Allyl chloride) | EPA TO-15 |
| Bromodichloromethane | EPA TO-15 |
| Bromoform | EPA TO-15 |
| Bromomethane | EPA TO-15 |
| Carbon tetrachloride | EPA TO-15 |
| Chloroethane | EPA TO-15 |
| Chloroform | EPA TO-15 |
| Chloromethane | EPA TO-15 |
| cis-1,2-Dichloroethene | EPA TO-15 |
| cis-1,3-Dichloropropene | EPA TO-15 |
| Dibromochloromethane | EPA TO-15 |
| Dichlorodifluoromethane | EPA TO-15 |
| Methylene chloride | EPA TO-15 |
| Tetrachloroethene | EPA TO-15 |
| trans-1,2-Dichloroethene | EPA TO-15 |
| trans-1,3-Dichloropropene | EPA TO-15 |
| Trichloroethene | EPA TO-15 |
| Trichlorofluoromethane | EPA TO-15 |
| Vinyl bromide | EPA TO-15 |
| Vinyl chloride | EPA TO-15 |

**Volatile Chlorinated Organics**

| | |
|---|---|
| Benzyl chloride | EPA TO-15 |

**Volatile Organics**

| | |
|---|---|
| 1,2-Dichlorotetrafluoroethane | EPA TO-15 |

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**Volatile Organics**

| | |
|---|---|
| 1,3-Butadiene | EPA TO-15 |
| 1,4-Dioxane | EPA TO-15 |
| 2,2,4-Trimethylpentane | EPA TO-15 |
| 2-Butanone (Methylethyl ketone) | EPA TO-15 |
| 4-Methyl-2-Pentanone | EPA TO-15 |
| Acetaldehyde | EPA TO-15 |
| Acetone | EPA TO-15 |
| Acrolein (Propenal) | EPA TO-15 |
| Carbon Disulfide | EPA TO-15 |
| Cyclohexane | EPA TO-15 |
| Hexane | EPA TO-15 |
| Isopropanol | EPA TO-15 |
| Methanol | EPA TO-15 |
| Methyl tert-butyl ether | EPA TO-15 |
| n-Heptane | EPA TO-15 |
| tert-butyl alcohol | EPA TO-15 |
| Vinyl acetate | EPA TO-15 |

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**Metals I**

| | |
|---|---|
| Arsenic, Total | EPA 200.8 Rev. 5.4 |
| Barium, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |
| Cadmium, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |
| Chromium, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |
| Copper, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |
| Iron, Total | EPA 200.7 Rev. 4.4 |
| Lead, Total | EPA 200.8 Rev. 5.4 |
| Manganese, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |
| Mercury, Total | EPA 245.1 Rev. 3.0 |
| Selenium, Total | EPA 200.8 Rev. 5.4 |
| Silver, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |
| Zinc, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |

**Metals II**

| | |
|---|---|
| Aluminum, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |
| Antimony, Total | EPA 200.8 Rev. 5.4 |
| Beryllium, Total | EPA 200.8 Rev. 5.4 |
| Nickel, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |
| Thallium, Total | EPA 200.8 Rev. 5.4 |

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**Metals II**

| | |
|---|---|
| Vanadium, Total | EPA 200.7 Rev. 4.4 |
| | EPA 200.8 Rev. 5.4 |

**Metals III**

| | |
|---|---|
| Boron, Total | EPA 200.7 Rev. 4.4 |
| Calcium, Total | EPA 200.7 Rev. 4.4 |
| Magnesium, Total | EPA 200.7 Rev. 4.4 |
| Potassium, Total | EPA 200.7 Rev. 4.4 |
| Sodium, Total | EPA 200.7 Rev. 4.4 |

**Miscellaneous**

| | |
|---|---|
| 1,4-Dioxane | EPA 522 |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | EPA 1613B |

**Non-Metals**

| | |
|---|---|
| Calcium Hardness | EPA 200.7 Rev. 4.4 |

**Perfluorinated Alkyl Acids**

| | |
|---|---|
| 11CL-PF3OUDS | EPA 533 |
| | EPA 537.1 |
| 4:2FTS | EPA 533 |
| 6:2FTS | EPA 533 |
| 8:2FTS | EPA 533 |
| 9CL-PF3ONS | EPA 533 |
| | EPA 537.1 |
| ADONA | EPA 533 |
| | EPA 537.1 |
| Hexafluoropropylene Oxide Dimer Acic | EPA 533 |
| | EPA 537.1 |
| NETFOSAA | EPA 537.1 |

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**Perfluorinated Alkyl Acids**

| | |
|---|---|
| NMEFOSAA | EPA 537.1 |
| Nonafluoro-3,6-Dioxaheptanoic Acid | EPA 533 |
| Perflourotridecanoic Acid (PFTRDA) | EPA 537.1 |
| Perfluordecanoic Acid (PFDA) | EPA 533 |
| | EPA 537.1 |
| Perfluoro-3-Methoxypropanoic Acid | EPA 533 |
| Perfluoro-4-Methoxybutanoic Acid | EPA 533 |
| Perfluorobutanesulfonic Acid (PFBS) | EPA 533 |
| | EPA 537.1 |
| Perfluorobutanoic Acid (PFBA) | EPA 533 |
| Perfluorododecanoic Acid (PFDOA) | EPA 533 |
| | EPA 537.1 |
| Perfluoroheptanesulfonic Acid (PFHPS | EPA 533 |
| Perfluoroheptanoic Acid (PFHPA) | EPA 533 |
| | EPA 537.1 |
| Perfluorohexanesulfonic Acid (PFHXS | EPA 533 |
| | EPA 537.1 |
| Perfluorohexanoic Acid (PFHXA) | EPA 533 |
| | EPA 537.1 |
| Perfluorononanoic Acid (PFNA) | EPA 533 |
| | EPA 537.1 |
| Perfluorooctanesulfonic Acid (PFOS) | EPA 533 |
| | EPA 537.1 |
| Perfluorooctanoic Acid (PFOA) | EPA 533 |
| | EPA 537.1 |
| Perfluoropentanesulfonic Acid (PFPES | EPA 533 |
| Perfluoropentanoic Acid (PFPEA) | EPA 533 |

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**Perfluorinated Alkyl Acids**

| | |
|---|---|
| Perfluorotetradecanoic Acid (PFTA) | EPA 537.1 |
| Perfluoroundecanoic Acid (PFUNA) | EPA 533 |
| | EPA 537.1 |
| PFEESA | EPA 533 |

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### Amines

| | |
|---|---|
| 1,2-Diphenylhydrazine | EPA 8270D |
| | EPA 8270E |
| 2-Nitroaniline | EPA 8270D |
| | EPA 8270E |
| 3-Nitroaniline | EPA 8270D |
| | EPA 8270E |
| 4-Chloroaniline | EPA 8270D |
| | EPA 8270E |
| 4-Nitroaniline | EPA 8270D |
| | EPA 8270E |
| Aniline | EPA 8270D |
| | EPA 8270E |
| Carbazole | EPA 8270D |
| | EPA 8270E |
| Pyridine | EPA 8270D |
| | EPA 8270E |

### Benzidines

| | |
|---|---|
| 3,3'-Dichlorobenzidine | EPA 8270E |
| Benzidine | EPA 8270E |

### Chlorinated Hydrocarbon Pesticides

| | |
|---|---|
| 4,4'-DDD | EPA 8081B |
| 4,4'-DDE | EPA 8081B |
| 4,4'-DDT | EPA 8081B |
| Aldrin | EPA 8081B |
| alpha-BHC | EPA 8081B |
| alpha-Chlordane | EPA 8081B |

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**Chlorinated Hydrocarbon Pesticides**

| | |
|---|---|
| beta-BHC | EPA 8081B |
| Chlordane Total | EPA 8081B |
| delta-BHC | EPA 8081B |
| Dieldrin | EPA 8081B |
| Endosulfan I | EPA 8081B |
| Endosulfan II | EPA 8081B |
| Endosulfan sulfate | EPA 8081B |
| Endrin | EPA 8081B |
| Endrin aldehyde | EPA 8081B |
| Endrin Ketone | EPA 8081B |
| gamma-Chlordane | EPA 8081B |
| Heptachlor | EPA 8081B |
| Heptachlor epoxide | EPA 8081B |
| Isodrin | EPA 8081B |
| Lindane | EPA 8081B |
| Methoxychlor | EPA 8081B |
| Mirex | EPA 8081B |
| PCNB | EPA 8270E |
| Toxaphene | EPA 8081B |

**Chlorinated Hydrocarbons**

| | |
|---|---|
| 1,2,4,5-Tetrachlorobenzene | EPA 8270E |
| 1,2,4-Trichlorobenzene | EPA 8270D |
| 2-Chloronaphthalene | EPA 8270E |
| Hexachlorobenzene | EPA 8081B |
| | EPA 8270E |
| Hexachlorobutadiene | EPA 8270E |
| Hexachlorocyclopentadiene | EPA 8270E |

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**Chlorinated Hydrocarbons**

| | |
|---|---|
| Hexachloroethane | EPA 8270E |

**Dioxins and Furans**

| | |
|---|---|
| 1,2,3,4,6,7,8,9-Octachlorodibenzofura | EPA 8290A |
| | EPA 1613B |
| 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-d | EPA 8290A |
| | EPA 1613B |
| 1,2,3,4,6,7,8-Heptachlorodibenzofurar | EPA 8290A |
| | EPA 1613B |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-di | EPA 8290A |
| | EPA 1613B |
| 1,2,3,4,7,8,9-Heptachlorodibenzofurar | EPA 8290A |
| | EPA 1613B |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | EPA 8290A |
| | EPA 1613B |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxi | EPA 8290A |
| | EPA 1613B |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | EPA 8290A |
| | EPA 1613B |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxi | EPA 8290A |
| | EPA 1613B |
| 1,2,3,7,8,9-Hexachlorodibenzofuran | EPA 8290A |
| | EPA 1613B |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxi | EPA 8290A |
| | EPA 1613B |
| 1,2,3,7,8-Pentachlorodibenzofuran | EPA 8290A |
| | EPA 1613B |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin | EPA 8290A |

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*ALPHA ANALYTICAL*
*320 FORBES BOULEVARD*
*MANSFIELD, MA 02048*

*NY Lab Id No: 11627*

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*All approved analytes are listed below:*

**Dioxins and Furans**

| | |
|---|---|
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin | EPA 1613B |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | EPA 8290A |
| | EPA 1613B |
| 2,3,4,7,8-Pentachlorodibenzofuran | EPA 8290A |
| | EPA 1613B |
| 2,3,7,8-Tetrachlorodibenzofuran | EPA 8290A |
| | EPA 1613B |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | EPA 8290A |
| | EPA 1613B |

**Dissolved Gases**

| | |
|---|---|
| Ethane | RSK-175 |
| Ethene (Ethylene) | RSK-175 |
| Methane | RSK-175 |
| Propane | RSK-175 |

**Fuel Oxygenates**

| | |
|---|---|
| Ethanol | EPA 8015D |
| tert-amyl alcohol | EPA 8015D |
| tert-butyl alcohol | EPA 8015D |

**Haloethers**

| | |
|---|---|
| 2,2'-Oxybis(1-chloropropane) | EPA 8270E |
| 4-Bromophenylphenyl ether | EPA 8270E |
| 4-Chlorophenylphenyl ether | EPA 8270E |
| Bis(2-chloroethoxy)methane | EPA 8270E |
| Bis(2-chloroethyl)ether | EPA 8270E |

**Low Level Polynuclear Aromatics**

| | |
|---|---|
| Acenaphthene Low Level | EPA 8270E SIM |

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**Low Level Polynuclear Aromatics**

| | |
|---|---|
| Acenaphthylene Low Level | EPA 8270E SIM |
| Anthracene Low Level | EPA 8270E SIM |
| Benzo(a)anthracene Low Level | EPA 8270E SIM |
| Benzo(a)pyrene Low Level | EPA 8270E SIM |
| Benzo(b)fluoranthene Low Level | EPA 8270E SIM |
| Benzo(g,h,i)perylene Low Level | EPA 8270E SIM |
| Benzo(k)fluoranthene Low Level | EPA 8270E SIM |
| Chrysene Low Level | EPA 8270E SIM |
| Dibenzo(a,h)anthracene Low Level | EPA 8270E SIM |
| Fluoranthene Low Level | EPA 8270E SIM |
| Fluorene Low Level | EPA 8270E SIM |
| Indeno(1,2,3-cd)pyrene Low Level | EPA 8270E SIM |
| Naphthalene Low Level | EPA 8270E SIM |
| Phenanthrene Low Level | EPA 8270E SIM |
| Pyrene Low Level | EPA 8270E SIM |

**Metals I**

| | |
|---|---|
| Barium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Cadmium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Calcium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |

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**Metals I**

| | |
|---|---|
| Chromium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Copper, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Iron, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Lead, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Magnesium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| Manganese, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Nickel, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |

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**Metals I**

| | |
|---|---|
| Potassium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Silver, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Sodium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Strontium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |

**Metals II**

| | |
|---|---|
| Aluminum, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Antimony, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Arsenic, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |

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**Metals II**

| | |
|---|---|
| Arsenic, Total | EPA 200.8, Rev. 5.4 (1994) |
| Beryllium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Mercury, Low Level | EPA 1631E |
| Mercury, Total | EPA 245.1, Rev. 3.0 (1994) |
| | EPA 7470A |
| Selenium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Vanadium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Zinc, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |

**Metals III**

| | |
|---|---|
| Cobalt, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Molybdenum, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |

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**Metals III**

| | |
|---|---|
| Molybdenum, Total | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Thallium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| | EPA 200.8, Rev. 5.4 (1994) |
| Tin, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| Titanium, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |

**Mineral**

| | |
|---|---|
| Hardness, Total | SM 2340B-2011 |

**Miscellaneous**

| | |
|---|---|
| Boron, Total | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |
| | EPA 6020B |
| Silica, Dissolved | EPA 200.7, Rev. 4.4 (1994) |
| | EPA 6010D |

**Nitroaromatics and Isophorone**

| | |
|---|---|
| 2,4-Dinitrotoluene | EPA 8270D |
| | EPA 8270E |
| 2,6-Dinitrotoluene | EPA 8270D |
| | EPA 8270E |
| Isophorone | EPA 8270D |
| | EPA 8270E |

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**Nitroaromatics and Isophorone**

| | |
|---|---|
| Nitrobenzene | EPA 8270D |
| | EPA 8270E |

**Nitrosoamines**

| | |
|---|---|
| N-Nitrosodimethylamine | EPA 8270E |
| N-Nitrosodi-n-propylamine | EPA 8270E |
| N-Nitrosodiphenylamine | EPA 8270E |

**Organophosphate Pesticides**

| | |
|---|---|
| Atrazine | EPA 8270E |

**Perfluorinated Alkyl Acids**

| | |
|---|---|
| 11CL-PF3OUDS | EPA 1633 (Draft) |
| 4:2FTS | EPA 1633 (Draft) |
| 6:2FTS | EPA 1633 (Draft) |
| 8:2FTS | EPA 1633 (Draft) |
| 9CL-PF3ONS | EPA 1633 (Draft) |
| ADONA | EPA 1633 (Draft) |
| Hexafluoropropylene Oxide Dimer Acic | EPA 1633 (Draft) |
| NETFOSAA | EPA 1633 (Draft) |
| NMEFOSAA | EPA 1633 (Draft) |
| Nonafluoro-3,6-Dioxaheptanoic Acid | EPA 1633 (Draft) |
| Perflourotridecanoic Acid (PFTRDA) | EPA 1633 (Draft) |
| Perfluordecanoic Acid (PFDA) | EPA 1633 (Draft) |
| Perfluoro-3-Methoxypropanoic Acid | EPA 1633 (Draft) |
| Perfluoro-4-Methoxybutanoic Acid | EPA 1633 (Draft) |
| Perfluorobutanesulfonic Acid (PFBS) | EPA 1633 (Draft) |
| Perfluorobutanoic Acid (PFBA) | EPA 1633 (Draft) |
| Perfluorododecanoic Acid (PFDOA) | EPA 1633 (Draft) |

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**Perfluorinated Alkyl Acids**

| | |
|---|---|
| Perfluoroheptanesulfonic Acid (PFHPS | EPA 1633 (Draft) |
| Perfluoroheptanoic Acid (PFHPA) | EPA 1633 (Draft) |
| Perfluorohexanesulfonic Acid (PFHXS | EPA 1633 (Draft) |
| Perfluorohexanoic Acid (PFHXA) | EPA 1633 (Draft) |
| Perfluorononanoic Acid (PFNA) | EPA 1633 (Draft) |
| Perfluorooctanesulfonic Acid (PFOS) | EPA 1633 (Draft) |
| Perfluorooctanoic Acid (PFOA) | EPA 1633 (Draft) |
| Perfluoropentanesulfonic Acid (PFPES | EPA 1633 (Draft) |
| Perfluoropentanoic Acid (PFPEA) | EPA 1633 (Draft) |
| Perfluorotetradecanoic Acid (PFTA) | EPA 1633 (Draft) |
| Perfluoroundecanoic Acid (PFUNA) | EPA 1633 (Draft) |
| PFEESA | EPA 1633 (Draft) |

**Petroleum Hydrocarbons**

| | |
|---|---|
| Diesel Range Organics | EPA 8015D |

**Phthalate Esters**

| | |
|---|---|
| Benzyl butyl phthalate | EPA 8270E |
| Bis(2-ethylhexyl) phthalate | EPA 8270E |
| Diethyl phthalate | EPA 8270E |
| Dimethyl phthalate | EPA 8270E |
| Di-n-butyl phthalate | EPA 8270E |
| Di-n-octyl phthalate | EPA 8270E |

**Polychlorinated Biphenyls**

| | |
|---|---|
| Aroclor 1016 (PCB-1016) | EPA 8082A |
| Aroclor 1221 (PCB-1221) | EPA 8082A |
| Aroclor 1232 (PCB-1232) | EPA 8082A |
| Aroclor 1242 (PCB-1242) | EPA 8082A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| Aroclor 1248 (PCB-1248) | EPA 8082A |
| Aroclor 1254 (PCB-1254) | EPA 8082A |
| Aroclor 1260 (PCB-1260) | EPA 8082A |
| Aroclor 1262 (PCB-1262) | EPA 8082A |
| Aroclor 1268 (PCB-1268) | EPA 8082A |
| PCB 1 | EPA 1668A |
| | EPA 1668C |
| PCB 10 | EPA 1668A |
| | EPA 1668C |
| PCB 100 | EPA 1668A |
| | EPA 1668C |
| PCB 101 | EPA 1668A |
| | EPA 1668C |
| PCB 102 | EPA 1668A |
| | EPA 1668C |
| PCB 103 | EPA 1668A |
| | EPA 1668C |
| PCB 104 | EPA 1668A |
| | EPA 1668C |
| PCB 105 | EPA 1668A |
| | EPA 1668C |
| PCB 106 | EPA 1668A |
| | EPA 1668C |
| PCB 107 | EPA 1668A |
| | EPA 1668C |
| PCB 108 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 109 | EPA 1668A |
| | EPA 1668C |
| PCB 11 | EPA 1668A |
| | EPA 1668C |
| PCB 110 | EPA 1668A |
| | EPA 1668C |
| PCB 111 | EPA 1668A |
| | EPA 1668C |
| PCB 112 | EPA 1668A |
| | EPA 1668C |
| PCB 113 | EPA 1668A |
| | EPA 1668C |
| PCB 114 | EPA 1668A |
| | EPA 1668C |
| PCB 115 | EPA 1668A |
| | EPA 1668C |
| PCB 116 | EPA 1668A |
| | EPA 1668C |
| PCB 117 | EPA 1668A |
| | EPA 1668C |
| PCB 118 | EPA 1668A |
| | EPA 1668C |
| PCB 119 | EPA 1668A |
| | EPA 1668C |
| PCB 12 | EPA 1668A |
| | EPA 1668C |
| PCB 120 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 120 | EPA 1668C |
| PCB 121 | EPA 1668A |
| | EPA 1668C |
| PCB 122 | EPA 1668A |
| | EPA 1668C |
| PCB 123 | EPA 1668A |
| | EPA 1668C |
| PCB 124 | EPA 1668A |
| | EPA 1668C |
| PCB 125 | EPA 1668A |
| | EPA 1668C |
| PCB 126 | EPA 1668A |
| | EPA 1668C |
| PCB 127 | EPA 1668A |
| | EPA 1668C |
| PCB 128 | EPA 1668A |
| | EPA 1668C |
| PCB 129 | EPA 1668A |
| | EPA 1668C |
| PCB 13 | EPA 1668A |
| | EPA 1668C |
| PCB 130 | EPA 1668A |
| | EPA 1668C |
| PCB 131 | EPA 1668A |
| | EPA 1668C |
| PCB 132 | EPA 1668A |
| | EPA 1668C |

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*All approved analytes are listed below:*

**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 133 | EPA 1668A |
| | EPA 1668C |
| PCB 134 | EPA 1668A |
| | EPA 1668C |
| PCB 135 | EPA 1668A |
| | EPA 1668C |
| PCB 136 | EPA 1668A |
| | EPA 1668C |
| PCB 137 | EPA 1668A |
| | EPA 1668C |
| PCB 138 | EPA 1668A |
| | EPA 1668C |
| PCB 139 | EPA 1668A |
| | EPA 1668C |
| PCB 14 | EPA 1668A |
| | EPA 1668C |
| PCB 140 | EPA 1668A |
| | EPA 1668C |
| PCB 141 | EPA 1668A |
| | EPA 1668C |
| PCB 142 | EPA 1668A |
| | EPA 1668C |
| PCB 143 | EPA 1668A |
| | EPA 1668C |
| PCB 144 | EPA 1668A |
| | EPA 1668C |
| PCB 145 | EPA 1668A |

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**NEW YORK STATE DEPARTMENT OF HEALTH**
**WADSWORTH CENTER**

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

## CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

*MR. JOHN TRIMBLE*
*ALPHA ANALYTICAL*
*320 FORBES BOULEVARD*
*MANSFIELD, MA 02048*

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 145 | EPA 1668C |
| PCB 146 | EPA 1668A |
| | EPA 1668C |
| PCB 147 | EPA 1668A |
| | EPA 1668C |
| PCB 148 | EPA 1668A |
| | EPA 1668C |
| PCB 149 | EPA 1668A |
| | EPA 1668C |
| PCB 15 | EPA 1668A |
| | EPA 1668C |
| PCB 150 | EPA 1668A |
| | EPA 1668C |
| PCB 151 | EPA 1668A |
| | EPA 1668C |
| PCB 152 | EPA 1668A |
| | EPA 1668C |
| PCB 153 | EPA 1668A |
| | EPA 1668C |
| PCB 154 | EPA 1668A |
| | EPA 1668C |
| PCB 155 | EPA 1668A |
| | EPA 1668C |
| PCB 156 | EPA 1668A |
| | EPA 1668C |
| PCB 157 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 158 | EPA 1668A |
| | EPA 1668C |
| PCB 159 | EPA 1668A |
| | EPA 1668C |
| PCB 16 | EPA 1668A |
| | EPA 1668C |
| PCB 160 | EPA 1668A |
| | EPA 1668C |
| PCB 161 | EPA 1668A |
| | EPA 1668C |
| PCB 162 | EPA 1668A |
| | EPA 1668C |
| PCB 163 | EPA 1668A |
| | EPA 1668C |
| PCB 164 | EPA 1668A |
| | EPA 1668C |
| PCB 165 | EPA 1668A |
| | EPA 1668C |
| PCB 166 | EPA 1668A |
| | EPA 1668C |
| PCB 167 | EPA 1668A |
| | EPA 1668C |
| PCB 168 | EPA 1668A |
| | EPA 1668C |
| PCB 169 | EPA 1668A |
| | EPA 1668C |
| PCB 17 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 17 | EPA 1668C |
| PCB 170 | EPA 1668A |
| | EPA 1668C |
| PCB 171 | EPA 1668A |
| | EPA 1668C |
| PCB 172 | EPA 1668A |
| | EPA 1668C |
| PCB 173 | EPA 1668A |
| | EPA 1668C |
| PCB 174 | EPA 1668A |
| | EPA 1668C |
| PCB 175 | EPA 1668A |
| | EPA 1668C |
| PCB 176 | EPA 1668A |
| | EPA 1668C |
| PCB 177 | EPA 1668A |
| | EPA 1668C |
| PCB 178 | EPA 1668A |
| | EPA 1668C |
| PCB 179 | EPA 1668A |
| | EPA 1668C |
| PCB 18 | EPA 1668A |
| | EPA 1668C |
| PCB 180 | EPA 1668A |
| | EPA 1668C |
| PCB 181 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 182 | EPA 1668A |
| | EPA 1668C |
| PCB 183 | EPA 1668A |
| | EPA 1668C |
| PCB 184 | EPA 1668A |
| | EPA 1668C |
| PCB 185 | EPA 1668A |
| | EPA 1668C |
| PCB 186 | EPA 1668A |
| | EPA 1668C |
| PCB 187 | EPA 1668A |
| | EPA 1668C |
| PCB 188 | EPA 1668A |
| | EPA 1668C |
| PCB 189 | EPA 1668A |
| | EPA 1668C |
| PCB 19 | EPA 1668A |
| | EPA 1668C |
| PCB 190 | EPA 1668A |
| | EPA 1668C |
| PCB 191 | EPA 1668A |
| | EPA 1668C |
| PCB 192 | EPA 1668A |
| | EPA 1668C |
| PCB 193 | EPA 1668A |
| | EPA 1668C |
| PCB 194 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 194 | EPA 1668C |
| PCB 195 | EPA 1668A |
| | EPA 1668C |
| PCB 196 | EPA 1668A |
| | EPA 1668C |
| PCB 197 | EPA 1668A |
| | EPA 1668C |
| PCB 198 | EPA 1668A |
| | EPA 1668C |
| PCB 199 | EPA 1668A |
| | EPA 1668C |
| PCB 2 | EPA 1668A |
| | EPA 1668C |
| PCB 20 | EPA 1668A |
| | EPA 1668C |
| PCB 200 | EPA 1668A |
| | EPA 1668C |
| PCB 201 | EPA 1668A |
| | EPA 1668C |
| PCB 202 | EPA 1668A |
| | EPA 1668C |
| PCB 203 | EPA 1668A |
| | EPA 1668C |
| PCB 204 | EPA 1668A |
| | EPA 1668C |
| PCB 205 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 206 | EPA 1668A |
| | EPA 1668C |
| PCB 207 | EPA 1668A |
| | EPA 1668C |
| PCB 208 | EPA 1668A |
| | EPA 1668C |
| PCB 209 | EPA 1668A |
| | EPA 1668C |
| PCB 21 | EPA 1668A |
| | EPA 1668C |
| PCB 22 | EPA 1668A |
| | EPA 1668C |
| PCB 23 | EPA 1668A |
| | EPA 1668C |
| PCB 24 | EPA 1668A |
| | EPA 1668C |
| PCB 25 | EPA 1668A |
| | EPA 1668C |
| PCB 26 | EPA 1668A |
| | EPA 1668C |
| PCB 27 | EPA 1668A |
| | EPA 1668C |
| PCB 28 | EPA 1668A |
| | EPA 1668C |
| PCB 29 | EPA 1668A |
| | EPA 1668C |
| PCB 3 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 3 | EPA 1668C |
| PCB 30 | EPA 1668A |
| | EPA 1668C |
| PCB 31 | EPA 1668A |
| | EPA 1668C |
| PCB 32 | EPA 1668A |
| | EPA 1668C |
| PCB 33 | EPA 1668A |
| | EPA 1668C |
| PCB 34 | EPA 1668A |
| | EPA 1668C |
| PCB 35 | EPA 1668A |
| | EPA 1668C |
| PCB 36 | EPA 1668A |
| | EPA 1668C |
| PCB 37 | EPA 1668A |
| | EPA 1668C |
| PCB 38 | EPA 1668A |
| | EPA 1668C |
| PCB 39 | EPA 1668A |
| | EPA 1668C |
| PCB 4 | EPA 1668A |
| | EPA 1668C |
| PCB 40 | EPA 1668A |
| | EPA 1668C |
| PCB 41 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 42 | EPA 1668A |
| | EPA 1668C |
| PCB 43 | EPA 1668A |
| | EPA 1668C |
| PCB 44 | EPA 1668A |
| | EPA 1668C |
| PCB 45 | EPA 1668A |
| | EPA 1668C |
| PCB 46 | EPA 1668A |
| | EPA 1668C |
| PCB 47 | EPA 1668A |
| | EPA 1668C |
| PCB 48 | EPA 1668A |
| | EPA 1668C |
| PCB 49 | EPA 1668A |
| | EPA 1668C |
| PCB 5 | EPA 1668A |
| | EPA 1668C |
| PCB 50 | EPA 1668A |
| | EPA 1668C |
| PCB 51 | EPA 1668A |
| | EPA 1668C |
| PCB 52 | EPA 1668A |
| | EPA 1668C |
| PCB 53 | EPA 1668A |
| | EPA 1668C |
| PCB 54 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 54 | EPA 1668C |
| PCB 55 | EPA 1668A |
| | EPA 1668C |
| PCB 56 | EPA 1668A |
| | EPA 1668C |
| PCB 57 | EPA 1668A |
| | EPA 1668C |
| PCB 58 | EPA 1668A |
| | EPA 1668C |
| PCB 59 | EPA 1668A |
| | EPA 1668C |
| PCB 6 | EPA 1668A |
| | EPA 1668C |
| PCB 60 | EPA 1668A |
| | EPA 1668C |
| PCB 61 | EPA 1668A |
| | EPA 1668C |
| PCB 62 | EPA 1668A |
| | EPA 1668C |
| PCB 63 | EPA 1668A |
| | EPA 1668C |
| PCB 64 | EPA 1668A |
| | EPA 1668C |
| PCB 65 | EPA 1668A |
| | EPA 1668C |
| PCB 66 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 67 | EPA 1668A |
| | EPA 1668C |
| PCB 68 | EPA 1668A |
| | EPA 1668C |
| PCB 69 | EPA 1668A |
| | EPA 1668C |
| PCB 7 | EPA 1668A |
| | EPA 1668C |
| PCB 70 | EPA 1668A |
| | EPA 1668C |
| PCB 71 | EPA 1668A |
| | EPA 1668C |
| PCB 72 | EPA 1668A |
| | EPA 1668C |
| PCB 73 | EPA 1668A |
| | EPA 1668C |
| PCB 74 | EPA 1668A |
| | EPA 1668C |
| PCB 75 | EPA 1668A |
| | EPA 1668C |
| PCB 76 | EPA 1668A |
| | EPA 1668C |
| PCB 77 | EPA 1668A |
| | EPA 1668C |
| PCB 78 | EPA 1668A |
| | EPA 1668C |
| PCB 79 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 79 | EPA 1668C |
| PCB 8 | EPA 1668A |
| | EPA 1668C |
| PCB 80 | EPA 1668A |
| | EPA 1668C |
| PCB 81 | EPA 1668A |
| | EPA 1668C |
| PCB 82 | EPA 1668A |
| | EPA 1668C |
| PCB 83 | EPA 1668A |
| | EPA 1668C |
| PCB 84 | EPA 1668A |
| | EPA 1668C |
| PCB 85 | EPA 1668A |
| | EPA 1668C |
| PCB 86 | EPA 1668A |
| | EPA 1668C |
| PCB 87 | EPA 1668A |
| | EPA 1668C |
| PCB 88 | EPA 1668A |
| | EPA 1668C |
| PCB 89 | EPA 1668A |
| | EPA 1668C |
| PCB 9 | EPA 1668A |
| | EPA 1668C |
| PCB 90 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 91 | EPA 1668A |
| | EPA 1668C |
| PCB 92 | EPA 1668A |
| | EPA 1668C |
| PCB 93 | EPA 1668A |
| | EPA 1668C |
| PCB 94 | EPA 1668A |
| | EPA 1668C |
| PCB 95 | EPA 1668A |
| | EPA 1668C |
| PCB 96 | EPA 1668A |
| | EPA 1668C |
| PCB 97 | EPA 1668A |
| | EPA 1668C |
| PCB 98 | EPA 1668A |
| | EPA 1668C |
| PCB 99 | EPA 1668A |
| | EPA 1668C |

**Polynuclear Aromatics**

| | |
|---|---|
| Acenaphthene | EPA 8270E |
| Acenaphthylene | EPA 8270E |
| Anthracene | EPA 8270E |
| Benzo(a)anthracene | EPA 8270E |
| Benzo(a)pyrene | EPA 8270E |
| Benzo(b)fluoranthene | EPA 8270E |
| Benzo(g,h,i)perylene | EPA 8270E |
| Benzo(k)fluoranthene | EPA 8270E |

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**Polynuclear Aromatics**

| | |
|---|---|
| Chrysene | EPA 8270E |
| Dibenzo(a,h)anthracene | EPA 8270E |
| Fluoranthene | EPA 8270E |
| Fluorene | EPA 8270E |
| Indeno(1,2,3-cd)pyrene | EPA 8270E |
| Naphthalene | EPA 8270E |
| Phenanthrene | EPA 8270E |
| Pyrene | EPA 8270E |

**Priority Pollutant Phenols**

| | |
|---|---|
| 2,3,4,6 Tetrachlorophenol | EPA 8270E |
| 2,4,5-Trichlorophenol | EPA 8270E |
| 2,4,6-Trichlorophenol | EPA 8270E |
| 2,4-Dichlorophenol | EPA 8270E |
| 2,4-Dimethylphenol | EPA 8270E |
| 2,4-Dinitrophenol | EPA 8270E |
| 2-Chlorophenol | EPA 8270E |
| 2-Methyl-4,6-dinitrophenol | EPA 8270E |
| 2-Methylphenol | EPA 8270E |
| 2-Nitrophenol | EPA 8270E |
| 3-Methylphenol | EPA 8270E |
| 4-Chloro-3-methylphenol | EPA 8270E |
| 4-Methylphenol | EPA 8270E |
| 4-Nitrophenol | EPA 8270E |
| Pentachlorophenol | EPA 8270E |
| Phenol | EPA 8270E |

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**WADSWORTH CENTER**

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## CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

*MR. JOHN TRIMBLE*
*ALPHA ANALYTICAL*
*320 FORBES BOULEVARD*
*MANSFIELD, MA 02048*

*NY Lab Id No: 11627*

*is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER*
*All approved analytes are listed below:*

**Semi-Volatile Organics**

| | |
|---|---|
| 1,1'-Biphenyl | EPA 8270D |
| | EPA 8270E |
| 1,2-Dichlorobenzene, Semi-volatile | EPA 8270D |
| | EPA 8270E |
| 1,3-Dichlorobenzene, Semi-volatile | EPA 8270D |
| | EPA 8270E |
| 1,4-Dichlorobenzene, Semi-volatile | EPA 8270D |
| | EPA 8270E |
| 2-Methylnaphthalene | EPA 8270D |
| | EPA 8270E |
| Acetophenone | EPA 8270D |
| | EPA 8270E |
| Benzaldehyde | EPA 8270D |
| | EPA 8270E |
| Benzoic Acid | EPA 8270D |
| | EPA 8270E |
| Benzyl alcohol | EPA 8270D |
| | EPA 8270E |
| Caprolactam | EPA 8270D |
| | EPA 8270E |
| Dibenzofuran | EPA 8270D |
| | EPA 8270E |

**Volatiles Organics**

| | |
|---|---|
| 1,4-Dioxane | EPA 8270D SIM |
| | EPA 8270E SIM |
| Ethylene Glycol | EPA 8015D |
| Isobutyl alcohol | EPA 8015D |

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**Volatiles Organics**

| | |
|---|---|
| Methanol | EPA 8015D |
| Propylene Glycol | EPA 8015D |

**Sample Preparation Methods**

| | |
|---|---|
| | EPA 3015A |
| | EPA 3005A |
| | EPA 3510C |

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**Amines**

| | |
|---|---|
| 1,2-Diphenylhydrazine | EPA 8270E |
| 2-Nitroaniline | EPA 8270E |
| 3-Nitroaniline | EPA 8270E |
| 4-Chloroaniline | EPA 8270E |
| 4-Nitroaniline | EPA 8270E |
| Aniline | EPA 8270E |
| Carbazole | EPA 8270E |

**Benzidines**

| | |
|---|---|
| 3,3'-Dichlorobenzidine | EPA 8270E |
| Benzidine | EPA 8270E |

**Chlorinated Hydrocarbon Pesticides**

| | |
|---|---|
| 4,4'-DDD | EPA 8081B |
| 4,4'-DDE | EPA 8081B |
| 4,4'-DDT | EPA 8081B |
| Aldrin | EPA 8081B |
| alpha-BHC | EPA 8081B |
| alpha-Chlordane | EPA 8081B |
| beta-BHC | EPA 8081B |
| Chlordane Total | EPA 8081B |
| delta-BHC | EPA 8081B |
| Dieldrin | EPA 8081B |
| Endosulfan I | EPA 8081B |
| Endosulfan II | EPA 8081B |
| Endosulfan sulfate | EPA 8081B |
| Endrin | EPA 8081B |
| Endrin aldehyde | EPA 8081B |

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**Chlorinated Hydrocarbon Pesticides**

| | |
|---|---|
| Endrin Ketone | EPA 8081B |
| gamma-Chlordane | EPA 8081B |
| Heptachlor | EPA 8081B |
| Heptachlor epoxide | EPA 8081B |
| Lindane | EPA 8081B |
| Methoxychlor | EPA 8081B |
| Mirex | EPA 8081B |
| Pentachloronitrobenzene | EPA 8270D |
| | EPA 8270E |
| Toxaphene | EPA 8081B |

**Chlorinated Hydrocarbons**

| | |
|---|---|
| 1,2,4,5-Tetrachlorobenzene | EPA 8270E |
| 1,2,4-Trichlorobenzene | EPA 8270E |
| 2-Chloronaphthalene | EPA 8270E |
| Hexachlorobenzene | EPA 8270E |
| Hexachlorobutadiene | EPA 8270E |
| Hexachlorocyclopentadiene | EPA 8270E |
| Hexachloroethane | EPA 8270E |

**Dioxins and Furans**

| | |
|---|---|
| 1,2,3,4,6,7,8,9-Octachlorodibenzofura | EPA 8290A |
| 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-d | EPA 8290A |
| 1,2,3,4,6,7,8-Heptachlorodibenzofurar | EPA 8290A |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-di | EPA 8290A |
| 1,2,3,4,7,8,9-Heptachlorodibenzofurar | EPA 8290A |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | EPA 8290A |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxi | EPA 8290A |

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**Dioxins and Furans**

| | |
|---|---|
| 1,2,3,6,7,8-Hexachlorodibenzofuran | EPA 8290A |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxi | EPA 8290A |
| 1,2,3,7,8,9-Hexachlorodibenzofuran | EPA 8290A |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxi | EPA 8290A |
| 1,2,3,7,8-Pentachlorodibenzofuran | EPA 8290A |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin | EPA 8290A |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | EPA 8290A |
| 2,3,4,7,8-Pentachlorodibenzofuran | EPA 8290A |
| 2,3,7,8-Tetrachlorodibenzofuran | EPA 8290A |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | EPA 8290A |

**Haloethers**

| | |
|---|---|
| 2,2'-Oxybis(1-chloropropane) | EPA 8270E |
| 4-Bromophenylphenyl ether | EPA 8270E |
| 4-Chlorophenylphenyl ether | EPA 8270E |
| Bis(2-chloroethoxy)methane | EPA 8270E |
| Bis(2-chloroethyl)ether | EPA 8270E |

**Low Level Polynuclear Aromatic Hydrocarbons**

| | |
|---|---|
| Acenaphthene Low Level | EPA 8270E SIM |
| Acenaphthylene Low Level | EPA 8270E SIM |
| Anthracene Low Level | EPA 8270E SIM |
| Benzo(a)anthracene Low Level | EPA 8270E SIM |
| Benzo(a)pyrene Low Level | EPA 8270E SIM |
| Benzo(b)fluoranthene Low Level | EPA 8270E SIM |
| Benzo(g,h,i)perylene Low Level | EPA 8270E SIM |
| Benzo(k)fluoranthene Low Level | EPA 8270E SIM |
| Chrysene Low Level | EPA 8270E SIM |

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**Low Level Polynuclear Aromatic Hydrocarbons**

| | |
|---|---|
| Dibenzo(a,h)anthracene Low Level | EPA 8270E SIM |
| Fluoranthene Low Level | EPA 8270E SIM |
| Fluorene Low Level | EPA 8270E SIM |
| Indeno(1,2,3-cd)pyrene Low Level | EPA 8270E SIM |
| Naphthalene Low Level | EPA 8270E SIM |
| Phenanthrene Low Level | EPA 8270E SIM |
| Pyrene Low Level | EPA 8270E SIM |

**Metals I**

| | |
|---|---|
| Barium, Total | EPA 6010D |
| | EPA 6020B |
| Cadmium, Total | EPA 6010D |
| | EPA 6020B |
| Calcium, Total | EPA 6010D |
| | EPA 6020B |
| Chromium, Total | EPA 6010D |
| | EPA 6020B |
| Copper, Total | EPA 6010D |
| | EPA 6020B |
| Iron, Total | EPA 6010D |
| | EPA 6020B |
| Lead, Total | EPA 6010D |
| | EPA 6020B |
| Magnesium, Total | EPA 6010D |
| | EPA 6020B |
| Manganese, Total | EPA 6010D |
| | EPA 6020B |
| Nickel, Total | EPA 6010D |

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**Metals I**

| | |
|---|---|
| Nickel, Total | EPA 6020B |
| Potassium, Total | EPA 6010D |
| | EPA 6020B |
| Silver, Total | EPA 6010D |
| | EPA 6020B |
| Sodium, Total | EPA 6010D |
| | EPA 6020B |
| Strontium, Total | EPA 6010D |
| | EPA 6020B |

**Metals II**

| | |
|---|---|
| Aluminum, Total | EPA 6010D |
| | EPA 6020B |
| Antimony, Total | EPA 6010D |
| | EPA 6020B |
| Arsenic, Total | EPA 6010D |
| | EPA 6020B |
| Beryllium, Total | EPA 6010D |
| | EPA 6020B |
| Mercury, Total | EPA 7471B |
| | EPA 7474 |
| Selenium, Total | EPA 6010D |
| | EPA 6020B |
| Vanadium, Total | EPA 6010D |
| | EPA 6020B |
| Zinc, Total | EPA 6010D |
| | EPA 6020B |

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**Metals III**

| | |
|---|---|
| Cobalt, Total | EPA 6010D |
| | EPA 6020B |
| Molybdenum, Total | EPA 6010D |
| | EPA 6020B |
| Thallium, Total | EPA 6010D |
| | EPA 6020B |
| Tin, Total | EPA 6010D |
| | EPA 6020B |
| Titanium, Total | EPA 6010D |

**Miscellaneous**

| | |
|---|---|
| Boron, Total | EPA 6010D |
| Organic Carbon, Total | Lloyd Kahn Method |
| | EPA 9060A |

**Nitroaromatics and Isophorone**

| | |
|---|---|
| 2,4-Dinitrotoluene | EPA 8270E |
| 2,6-Dinitrotoluene | EPA 8270E |
| Isophorone | EPA 8270E |
| Nitrobenzene | EPA 8270E |
| Pyridine | EPA 8270E |

**Nitrosoamines**

| | |
|---|---|
| N-Nitrosodimethylamine | EPA 8270E |
| N-Nitrosodi-n-propylamine | EPA 8270E |
| N-Nitrosodiphenylamine | EPA 8270E |

**Perfluorinated Alkyl Acids**

| | |
|---|---|
| 8:2FTS | EPA 1633 (Draft) |
| NETFOSAA | EPA 1633 (Draft) |

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**Perfluorinated Alkyl Acids**

| | |
|---|---|
| NMEFOSAA | EPA 1633 (Draft) |
| Perflourotridecanoic Acid (PFTRDA) | EPA 1633 (Draft) |
| Perfluordecanoic Acid (PFDA) | EPA 1633 (Draft) |
| Perfluorobutanoic Acid (PFBA) | EPA 1633 (Draft) |
| Perfluorododecanoic Acid (PFDOA) | EPA 1633 (Draft) |
| Perfluoroheptanoic Acid (PFHPA) | EPA 1633 (Draft) |
| Perfluorohexanoic Acid (PFHXA) | EPA 1633 (Draft) |
| Perfluorononanoic Acid (PFNA) | EPA 1633 (Draft) |
| Perfluorooctanesulfonic Acid (PFOS) | EPA 1633 (Draft) |
| Perfluorooctanoic Acid (PFOA) | EPA 1633 (Draft) |
| Perfluoropentanoic Acid (PFPEA) | EPA 1633 (Draft) |
| Perfluorotetradecanoic Acid (PFTA) | EPA 1633 (Draft) |
| Perfluoroundecanoic Acid (PFUNA) | EPA 1633 (Draft) |

**Petroleum Hydrocarbons**

| | |
|---|---|
| Diesel Range Organics | EPA 8015D |

**Phthalate Esters**

| | |
|---|---|
| Benzyl butyl phthalate | EPA 8270E |
| Bis(2-ethylhexyl) phthalate | EPA 8270E |
| Diethyl phthalate | EPA 8270E |
| Dimethyl phthalate | EPA 8270E |
| Di-n-butyl phthalate | EPA 8270E |
| Di-n-octyl phthalate | EPA 8270E |

**Polychlorinated Biphenyls**

| | |
|---|---|
| Aroclor 1016 (PCB-1016) | EPA 8082A |
| Aroclor 1221 (PCB-1221) | EPA 8082A |
| Aroclor 1232 (PCB-1232) | EPA 8082A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| Aroclor 1242 (PCB-1242) | EPA 8082A |
| Aroclor 1248 (PCB-1248) | EPA 8082A |
| Aroclor 1254 (PCB-1254) | EPA 8082A |
| Aroclor 1260 (PCB-1260) | EPA 8082A |
| Aroclor 1262 (PCB-1262) | EPA 8082A |
| Aroclor 1268 (PCB-1268) | EPA 8082A |
| PCB 1 | EPA 1668A |
| | EPA 1668C |
| PCB 10 | EPA 1668A |
| | EPA 1668C |
| PCB 100 | EPA 1668A |
| | EPA 1668C |
| PCB 101 | EPA 1668A |
| | EPA 1668C |
| PCB 102 | EPA 1668A |
| | EPA 1668C |
| PCB 103 | EPA 1668A |
| | EPA 1668C |
| PCB 104 | EPA 1668A |
| | EPA 1668C |
| PCB 105 | EPA 1668A |
| | EPA 1668C |
| PCB 106 | EPA 1668A |
| | EPA 1668C |
| PCB 107 | EPA 1668A |
| | EPA 1668C |
| PCB 108 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 108 | EPA 1668C |
| PCB 109 | EPA 1668A |
| | EPA 1668C |
| PCB 11 | EPA 1668A |
| | EPA 1668C |
| PCB 110 | EPA 1668A |
| | EPA 1668C |
| PCB 111 | EPA 1668A |
| | EPA 1668C |
| PCB 112 | EPA 1668A |
| | EPA 1668C |
| PCB 113 | EPA 1668A |
| | EPA 1668C |
| PCB 114 | EPA 1668A |
| | EPA 1668C |
| PCB 115 | EPA 1668A |
| | EPA 1668C |
| PCB 116 | EPA 1668A |
| | EPA 1668C |
| PCB 117 | EPA 1668A |
| | EPA 1668C |
| PCB 118 | EPA 1668A |
| | EPA 1668C |
| PCB 119 | EPA 1668A |
| | EPA 1668C |
| PCB 12 | EPA 1668A |
| | EPA 1668C |

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**NEW YORK STATE DEPARTMENT OF HEALTH**
**WADSWORTH CENTER**

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

## CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

*MR. JOHN TRIMBLE*
*ALPHA ANALYTICAL*
*320 FORBES BOULEVARD*
*MANSFIELD, MA 02048*

*NY Lab Id No: 11627*

*is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE*
*All approved analytes are listed below:*

**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 120 | EPA 1668A |
| | EPA 1668C |
| PCB 121 | EPA 1668A |
| | EPA 1668C |
| PCB 122 | EPA 1668A |
| | EPA 1668C |
| PCB 123 | EPA 1668A |
| | EPA 1668C |
| PCB 124 | EPA 1668A |
| | EPA 1668C |
| PCB 125 | EPA 1668A |
| | EPA 1668C |
| PCB 126 | EPA 1668A |
| | EPA 1668C |
| PCB 127 | EPA 1668A |
| | EPA 1668C |
| PCB 128 | EPA 1668A |
| | EPA 1668C |
| PCB 129 | EPA 1668A |
| | EPA 1668C |
| PCB 13 | EPA 1668A |
| | EPA 1668C |
| PCB 130 | EPA 1668A |
| | EPA 1668C |
| PCB 131 | EPA 1668A |
| | EPA 1668C |
| PCB 132 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 132 | EPA 1668C |
| PCB 133 | EPA 1668A |
| | EPA 1668C |
| PCB 134 | EPA 1668A |
| | EPA 1668C |
| PCB 135 | EPA 1668A |
| | EPA 1668C |
| PCB 136 | EPA 1668A |
| | EPA 1668C |
| PCB 137 | EPA 1668A |
| | EPA 1668C |
| PCB 138 | EPA 1668A |
| | EPA 1668C |
| PCB 139 | EPA 1668A |
| | EPA 1668C |
| PCB 14 | EPA 1668A |
| | EPA 1668C |
| PCB 140 | EPA 1668A |
| | EPA 1668C |
| PCB 141 | EPA 1668A |
| | EPA 1668C |
| PCB 142 | EPA 1668A |
| | EPA 1668C |
| PCB 143 | EPA 1668A |
| | EPA 1668C |
| PCB 144 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 145 | EPA 1668A |
| | EPA 1668C |
| PCB 146 | EPA 1668A |
| | EPA 1668C |
| PCB 147 | EPA 1668A |
| | EPA 1668C |
| PCB 148 | EPA 1668A |
| | EPA 1668C |
| PCB 149 | EPA 1668A |
| | EPA 1668C |
| PCB 15 | EPA 1668A |
| | EPA 1668C |
| PCB 150 | EPA 1668A |
| | EPA 1668C |
| PCB 151 | EPA 1668A |
| | EPA 1668C |
| PCB 152 | EPA 1668A |
| | EPA 1668C |
| PCB 153 | EPA 1668A |
| | EPA 1668C |
| PCB 154 | EPA 1668A |
| | EPA 1668C |
| PCB 155 | EPA 1668A |
| | EPA 1668C |
| PCB 156 | EPA 1668A |
| | EPA 1668C |
| PCB 157 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 157 | EPA 1668C |
| PCB 158 | EPA 1668A |
| | EPA 1668C |
| PCB 159 | EPA 1668A |
| | EPA 1668C |
| PCB 16 | EPA 1668A |
| | EPA 1668C |
| PCB 160 | EPA 1668A |
| | EPA 1668C |
| PCB 161 | EPA 1668A |
| | EPA 1668C |
| PCB 162 | EPA 1668A |
| | EPA 1668C |
| PCB 163 | EPA 1668A |
| | EPA 1668C |
| PCB 164 | EPA 1668A |
| | EPA 1668C |
| PCB 165 | EPA 1668A |
| | EPA 1668C |
| PCB 166 | EPA 1668A |
| | EPA 1668C |
| PCB 167 | EPA 1668A |
| | EPA 1668C |
| PCB 168 | EPA 1668A |
| | EPA 1668C |
| PCB 169 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 17 | EPA 1668A |
| | EPA 1668C |
| PCB 170 | EPA 1668A |
| | EPA 1668C |
| PCB 171 | EPA 1668A |
| | EPA 1668C |
| PCB 172 | EPA 1668A |
| | EPA 1668C |
| PCB 173 | EPA 1668A |
| | EPA 1668C |
| PCB 174 | EPA 1668A |
| | EPA 1668C |
| PCB 175 | EPA 1668A |
| | EPA 1668C |
| PCB 176 | EPA 1668A |
| | EPA 1668C |
| PCB 177 | EPA 1668A |
| | EPA 1668C |
| PCB 178 | EPA 1668A |
| | EPA 1668C |
| PCB 179 | EPA 1668A |
| | EPA 1668C |
| PCB 18 | EPA 1668A |
| | EPA 1668C |
| PCB 180 | EPA 1668A |
| | EPA 1668C |
| PCB 181 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 181 | EPA 1668C |
| PCB 182 | EPA 1668A |
| | EPA 1668C |
| PCB 183 | EPA 1668A |
| | EPA 1668C |
| PCB 184 | EPA 1668A |
| | EPA 1668C |
| PCB 185 | EPA 1668A |
| | EPA 1668C |
| PCB 186 | EPA 1668A |
| | EPA 1668C |
| PCB 187 | EPA 1668A |
| | EPA 1668C |
| PCB 188 | EPA 1668A |
| | EPA 1668C |
| PCB 189 | EPA 1668A |
| | EPA 1668C |
| PCB 19 | EPA 1668A |
| | EPA 1668C |
| PCB 190 | EPA 1668A |
| | EPA 1668C |
| PCB 191 | EPA 1668A |
| | EPA 1668C |
| PCB 192 | EPA 1668A |
| | EPA 1668C |
| PCB 193 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 194 | EPA 1668A |
| | EPA 1668C |
| PCB 195 | EPA 1668A |
| | EPA 1668C |
| PCB 196 | EPA 1668A |
| | EPA 1668C |
| PCB 197 | EPA 1668A |
| | EPA 1668C |
| PCB 198 | EPA 1668A |
| | EPA 1668C |
| PCB 199 | EPA 1668A |
| | EPA 1668C |
| PCB 2 | EPA 1668A |
| | EPA 1668C |
| PCB 20 | EPA 1668A |
| | EPA 1668C |
| PCB 200 | EPA 1668A |
| | EPA 1668C |
| PCB 201 | EPA 1668A |
| | EPA 1668C |
| PCB 202 | EPA 1668A |
| | EPA 1668C |
| PCB 203 | EPA 1668A |
| | EPA 1668C |
| PCB 204 | EPA 1668A |
| | EPA 1668C |
| PCB 205 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 205 | EPA 1668C |
| PCB 206 | EPA 1668A |
| | EPA 1668C |
| PCB 207 | EPA 1668A |
| | EPA 1668C |
| PCB 208 | EPA 1668A |
| | EPA 1668C |
| PCB 209 | EPA 1668A |
| | EPA 1668C |
| PCB 21 | EPA 1668A |
| | EPA 1668C |
| PCB 22 | EPA 1668A |
| | EPA 1668C |
| PCB 23 | EPA 1668A |
| | EPA 1668C |
| PCB 24 | EPA 1668A |
| | EPA 1668C |
| PCB 25 | EPA 1668A |
| | EPA 1668C |
| PCB 26 | EPA 1668A |
| | EPA 1668C |
| PCB 27 | EPA 1668A |
| | EPA 1668C |
| PCB 28 | EPA 1668A |
| | EPA 1668C |
| PCB 29 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 3 | EPA 1668A |
| | EPA 1668C |
| PCB 30 | EPA 1668A |
| | EPA 1668C |
| PCB 31 | EPA 1668A |
| | EPA 1668C |
| PCB 32 | EPA 1668A |
| | EPA 1668C |
| PCB 33 | EPA 1668A |
| | EPA 1668C |
| PCB 34 | EPA 1668A |
| | EPA 1668C |
| PCB 35 | EPA 1668A |
| | EPA 1668C |
| PCB 36 | EPA 1668A |
| | EPA 1668C |
| PCB 37 | EPA 1668A |
| | EPA 1668C |
| PCB 38 | EPA 1668A |
| | EPA 1668C |
| PCB 39 | EPA 1668A |
| | EPA 1668C |
| PCB 4 | EPA 1668A |
| | EPA 1668C |
| PCB 40 | EPA 1668A |
| | EPA 1668C |
| PCB 41 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 41 | EPA 1668C |
| PCB 42 | EPA 1668A |
| | EPA 1668C |
| PCB 43 | EPA 1668A |
| | EPA 1668C |
| PCB 44 | EPA 1668A |
| | EPA 1668C |
| PCB 45 | EPA 1668A |
| | EPA 1668C |
| PCB 46 | EPA 1668A |
| | EPA 1668C |
| PCB 47 | EPA 1668A |
| | EPA 1668C |
| PCB 48 | EPA 1668A |
| | EPA 1668C |
| PCB 49 | EPA 1668A |
| | EPA 1668C |
| PCB 5 | EPA 1668A |
| | EPA 1668C |
| PCB 50 | EPA 1668A |
| | EPA 1668C |
| PCB 51 | EPA 1668A |
| | EPA 1668C |
| PCB 52 | EPA 1668A |
| | EPA 1668C |
| PCB 53 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 54 | EPA 1668A |
| | EPA 1668C |
| PCB 55 | EPA 1668A |
| | EPA 1668C |
| PCB 56 | EPA 1668A |
| | EPA 1668C |
| PCB 57 | EPA 1668A |
| | EPA 1668C |
| PCB 58 | EPA 1668A |
| | EPA 1668C |
| PCB 59 | EPA 1668A |
| | EPA 1668C |
| PCB 6 | EPA 1668A |
| | EPA 1668C |
| PCB 60 | EPA 1668A |
| | EPA 1668C |
| PCB 61 | EPA 1668A |
| | EPA 1668C |
| PCB 62 | EPA 1668A |
| | EPA 1668C |
| PCB 63 | EPA 1668A |
| | EPA 1668C |
| PCB 64 | EPA 1668A |
| | EPA 1668C |
| PCB 65 | EPA 1668A |
| | EPA 1668C |
| PCB 66 | EPA 1668A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 66 | EPA 1668C |
| PCB 67 | EPA 1668A |
| | EPA 1668C |
| PCB 68 | EPA 1668A |
| | EPA 1668C |
| PCB 69 | EPA 1668A |
| | EPA 1668C |
| PCB 7 | EPA 1668A |
| | EPA 1668C |
| PCB 70 | EPA 1668A |
| | EPA 1668C |
| PCB 71 | EPA 1668A |
| | EPA 1668C |
| PCB 72 | EPA 1668A |
| | EPA 1668C |
| PCB 73 | EPA 1668A |
| | EPA 1668C |
| PCB 74 | EPA 1668A |
| | EPA 1668C |
| PCB 75 | EPA 1668A |
| | EPA 1668C |
| PCB 76 | EPA 1668A |
| | EPA 1668C |
| PCB 77 | EPA 1668A |
| | EPA 1668C |
| PCB 78 | EPA 1668A |
| | EPA 1668C |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 79 | EPA 1668A |
| | EPA 1668C |
| PCB 8 | EPA 1668A |
| | EPA 1668C |
| PCB 80 | EPA 1668A |
| | EPA 1668C |
| PCB 81 | EPA 1668A |
| | EPA 1668C |
| PCB 82 | EPA 1668A |
| | EPA 1668C |
| PCB 83 | EPA 1668A |
| | EPA 1668C |
| PCB 84 | EPA 1668A |
| | EPA 1668C |
| PCB 85 | EPA 1668A |
| | EPA 1668C |
| PCB 86 | EPA 1668A |
| | EPA 1668C |
| PCB 87 | EPA 1668A |
| | EPA 1668C |
| PCB 88 | EPA 1668A |
| | EPA 1668C |
| PCB 89 | EPA 1668A |
| | EPA 1668C |
| PCB 9 | EPA 1668A |
| | EPA 1668C |
| PCB 90 | EPA 1668A |

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*MANSFIELD, MA 02048*

*NY Lab Id No: 11627*

*is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE*
*All approved analytes are listed below:*

**Polychlorinated Biphenyls**

| | |
|---|---|
| PCB 90 | EPA 1668C |
| PCB 91 | EPA 1668A |
| | EPA 1668C |
| PCB 92 | EPA 1668A |
| | EPA 1668C |
| PCB 93 | EPA 1668A |
| | EPA 1668C |
| PCB 94 | EPA 1668A |
| | EPA 1668C |
| PCB 95 | EPA 1668A |
| | EPA 1668C |
| PCB 96 | EPA 1668A |
| | EPA 1668C |
| PCB 97 | EPA 1668A |
| | EPA 1668C |
| PCB 98 | EPA 1668A |
| | EPA 1668C |
| PCB 99 | EPA 1668A |
| | EPA 1668C |

**Polynuclear Aromatic Hydrocarbons**

| | |
|---|---|
| Acenaphthene | EPA 8270E |
| Acenaphthylene | EPA 8270E |
| Anthracene | EPA 8270E |
| Benzo(a)anthracene | EPA 8270E |
| Benzo(a)pyrene | EPA 8270E |
| Benzo(b)fluoranthene | EPA 8270E |
| Benzo(g,h,i)perylene | EPA 8270E |

Serial No.: 67089

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**WADSWORTH CENTER**

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**Polynuclear Aromatic Hydrocarbons**

| | |
|---|---|
| Benzo(k)fluoranthene | EPA 8270E |
| Chrysene | EPA 8270E |
| Dibenzo(a,h)anthracene | EPA 8270E |
| Fluoranthene | EPA 8270E |
| Fluorene | EPA 8270E |
| Indeno(1,2,3-cd)pyrene | EPA 8270E |
| Naphthalene | EPA 8270E |
| Phenanthrene | EPA 8270E |
| Pyrene | EPA 8270E |

**Priority Pollutant Phenols**

| | |
|---|---|
| 2,3,4,6 Tetrachlorophenol | EPA 8270E |
| 2,4,5-Trichlorophenol | EPA 8270E |
| 2,4,6-Trichlorophenol | EPA 8270E |
| 2,4-Dichlorophenol | EPA 8270E |
| 2,4-Dimethylphenol | EPA 8270E |
| 2,4-Dinitrophenol | EPA 8270E |
| 2-Chlorophenol | EPA 8270E |
| 2-Methyl-4,6-dinitrophenol | EPA 8270E |
| 2-Methylphenol | EPA 8270E |
| 2-Nitrophenol | EPA 8270E |
| 3-Methylphenol | EPA 8270E |
| 4-Chloro-3-methylphenol | EPA 8270E |
| 4-Methylphenol | EPA 8270E |
| 4-Nitrophenol | EPA 8270E |
| Pentachlorophenol | EPA 8270E |
| Phenol | EPA 8270E |

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**Semi-Volatile Organics**

| | |
|---|---|
| 1,1'-Biphenyl | EPA 8270E |
| 1,2-Dichlorobenzene, Semi-volatile | EPA 8270E |
| 1,3-Dichlorobenzene, Semi-volatile | EPA 8270E |
| 1,4-Dichlorobenzene, Semi-volatile | EPA 8270E |
| 2-Methylnaphthalene | EPA 8270E |
| Acetophenone | EPA 8270E |
| Benzaldehyde | EPA 8270E |
| Benzoic Acid | EPA 8270E |
| Benzyl alcohol | EPA 8270E |
| Caprolactam | EPA 8270E |
| Dibenzofuran | EPA 8270E |

**Volatile Organics**

| | |
|---|---|
| 1,4-Dioxane | EPA 8270E SIM |
| Ethylene Glycol | EPA 8015D |
| Isobutyl alcohol | EPA 8015D |
| tert-butyl alcohol | EPA 8015D |

**Sample Preparation Methods**

| | |
|---|---|
| | EPA 3570 |
| | EPA 3580A |
| | EPA 3050B |
| | EPA 3051A |

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*ALPHA ANALYTICAL*
*8 WALKUP DR*
*WESTBOROUGH, MA 01581-1019*

*NY Lab Id No: 11148*

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*All approved analytes are listed below:*

**Bacteriology**

| | |
|---|---|
| Coliform, Total / E. coli (Qualitative) | SM 20, 21-23 9223B (-04) (Colilert) |
| E. coli (Enumeration) | SM 20, 21-23 9223B (-04) (Colilert) |
| Heterotrophic Plate Count | SM 20, 21-23 9215B (-04) |

**Fuel Additives**

| | |
|---|---|
| Methyl tert-butyl ether | EPA 524.2 |
| Naphthalene | EPA 524.2 |

**Microextractables**

| | |
|---|---|
| 1,2,3-Trichloropropane, Low Level | EPA 504.1 |
| 1,2-Dibromo-3-chloropropane, Low Le | EPA 504.1 |
| 1,2-Dibromoethane, Low Level | EPA 504.1 |

**Miscellaneous**

| | |
|---|---|
| Odor | SM 21-23 2150 B (-97) |
| Organic Carbon, Dissolved | SM 21-23 5310C (-00) |
| Organic Carbon, Total | SM 21-23 5310C (-00) |
| Turbidity | SM 21-23 2130 B (-01) |
| | EPA 180.1 Rev. 2.0 |

**Non-Metals**

| | |
|---|---|
| Alkalinity | SM 21-23 2320B (-97) |
| Chloride | EPA 300.0 Rev. 2.1 |
| Color | SM 21-23 2120B (-01) |
| Cyanide | SM 20, 21-23 4500-CN E |
| Fluoride, Total | EPA 300.0 Rev. 2.1 |
| | SM 21-23 4500-F C (-97) |
| Nitrate (as N) | EPA 353.2 Rev. 2.0 |
| | EPA 300.0 Rev. 2.1 |
| | SM 21-23 4500-NO3 F (-00) |

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**Non-Metals**

| | |
|---|---|
| Nitrite (as N) | EPA 353.2 Rev. 2.0 |
| | SM 21-23 4500-NO3 F (-00) |
| | SM 21-23 4500-NO2 B (-00) |
| Orthophosphate (as P) | SM 19, 21-23 4500-P E (-99) |
| Solids, Total Dissolved | SM 21-23 2540C (-97) |
| Specific Conductance | SM 21-23 2510B (-97) |
| Sulfate (as SO4) | EPA 300.0 Rev. 2.1 |

**Trihalomethanes**

| | |
|---|---|
| Bromodichloromethane | EPA 524.2 |
| Bromoform | EPA 524.2 |
| Chloroform | EPA 524.2 |
| Dibromochloromethane | EPA 524.2 |
| Total Trihalomethanes | EPA 524.2 |

**Volatile Aromatics**

| | |
|---|---|
| 1,2,3-Trichlorobenzene | EPA 524.2 |
| 1,2,4-Trichlorobenzene | EPA 524.2 |
| 1,2,4-Trimethylbenzene | EPA 524.2 |
| 1,2-Dichlorobenzene | EPA 524.2 |
| 1,3,5-Trimethylbenzene | EPA 524.2 |
| 1,3-Dichlorobenzene | EPA 524.2 |
| 1,4-Dichlorobenzene | EPA 524.2 |
| 2-Chlorotoluene | EPA 524.2 |
| 4-Chlorotoluene | EPA 524.2 |
| Benzene | EPA 524.2 |
| Bromobenzene | EPA 524.2 |
| Chlorobenzene | EPA 524.2 |

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**Volatile Aromatics**

| | |
|---|---|
| Ethyl benzene | EPA 524.2 |
| Hexachlorobutadiene | EPA 524.2 |
| Isopropylbenzene | EPA 524.2 |
| n-Butylbenzene | EPA 524.2 |
| n-Propylbenzene | EPA 524.2 |
| p-Isopropyltoluene (P-Cymene) | EPA 524.2 |
| sec-Butylbenzene | EPA 524.2 |
| Styrene | EPA 524.2 |
| tert-Butylbenzene | EPA 524.2 |
| Toluene | EPA 524.2 |
| Total Xylenes | EPA 524.2 |

**Volatile Halocarbons**

| | |
|---|---|
| 1,1,1,2-Tetrachloroethane | EPA 524.2 |
| 1,1,1-Trichloroethane | EPA 524.2 |
| 1,1,2,2-Tetrachloroethane | EPA 524.2 |
| 1,1,2-Trichloroethane | EPA 524.2 |
| 1,1-Dichloroethane | EPA 524.2 |
| 1,1-Dichloroethene | EPA 524.2 |
| 1,1-Dichloropropene | EPA 524.2 |
| 1,2,3-Trichloropropane | EPA 524.2 |
| 1,2-Dichloroethane | EPA 524.2 |
| 1,2-Dichloropropane | EPA 524.2 |
| 1,3-Dichloropropane | EPA 524.2 |
| 2,2-Dichloropropane | EPA 524.2 |
| Bromochloromethane | EPA 524.2 |
| Bromomethane | EPA 524.2 |
| Carbon tetrachloride | EPA 524.2 |

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**Volatile Halocarbons**

| | |
|---|---|
| Chloroethane | EPA 524.2 |
| Chloromethane | EPA 524.2 |
| cis-1,2-Dichloroethene | EPA 524.2 |
| cis-1,3-Dichloropropene | EPA 524.2 |
| Dibromomethane | EPA 524.2 |
| Dichlorodifluoromethane | EPA 524.2 |
| Methylene chloride | EPA 524.2 |
| Tetrachloroethene | EPA 524.2 |
| trans-1,2-Dichloroethene | EPA 524.2 |
| trans-1,3-Dichloropropene | EPA 524.2 |
| Trichloroethene | EPA 524.2 |
| Trichlorofluoromethane | EPA 524.2 |
| Vinyl chloride | EPA 524.2 |

**Sample Preparation Methods**

SM 20, 21-23 4500-CN C (-99)

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**Acrylates**

| | |
|---|---|
| Acrolein (Propenal) | EPA 8260D |
| | EPA 624.1 |
| Acrylonitrile | EPA 8260D |
| | EPA 624.1 |
| Ethyl methacrylate | EPA 8260D |
| Methyl methacrylate | EPA 8260D |

**Amines**

| | |
|---|---|
| 1,2-Diphenylhydrazine | EPA 625.1 |
| | EPA 8270E |
| 2-Naphthylamine | EPA 8270E |
| 2-Nitroaniline | EPA 8270E |
| 3-Nitroaniline | EPA 8270E |
| 4-Chloroaniline | EPA 8270E |
| 4-Nitroaniline | EPA 8270E |
| Aniline | EPA 625.1 |
| | EPA 8270E |
| Carbazole | EPA 625.1 |
| | EPA 8270E |
| Diphenylamine | EPA 8270E |
| Pyridine | EPA 625.1 |
| | EPA 8270E |

**Bacteriology**

| | |
|---|---|
| Coliform, Fecal | Colilert-18 |
| E. coli (Enumeration) | SM 9223B-2016 |
| Heterotrophic Plate Count | SM 18-21 9215B |

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**Benzidines**

| | |
|---|---|
| 3,3'-Dichlorobenzidine | EPA 625.1 |
| | EPA 8270E |
| Benzidine | EPA 625.1 |
| | EPA 8270E |

**Chlorinated Hydrocarbon Pesticides**

| | |
|---|---|
| 4,4'-DDD | EPA 8081B |
| | EPA 608.3 |
| 4,4'-DDE | EPA 8081B |
| | EPA 608.3 |
| 4,4'-DDT | EPA 8081B |
| | EPA 608.3 |
| Aldrin | EPA 8081B |
| | EPA 608.3 |
| alpha-BHC | EPA 8081B |
| | EPA 608.3 |
| alpha-Chlordane | EPA 8081B |
| | EPA 608.3 |
| beta-BHC | EPA 8081B |
| | EPA 608.3 |
| Chlordane Total | EPA 8081B |
| | EPA 608.3 |
| delta-BHC | EPA 8081B |
| | EPA 608.3 |
| Dieldrin | EPA 8081B |
| | EPA 608.3 |
| Endosulfan I | EPA 8081B |
| | EPA 608.3 |

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**Chlorinated Hydrocarbon Pesticides**

| | |
|---|---|
| Endosulfan II | EPA 8081B |
| | EPA 608.3 |
| Endosulfan sulfate | EPA 8081B |
| | EPA 608.3 |
| Endrin | EPA 8081B |
| | EPA 608.3 |
| Endrin aldehyde | EPA 8081B |
| | EPA 608.3 |
| Endrin Ketone | EPA 8081B |
| gamma-Chlordane | EPA 8081B |
| | EPA 608.3 |
| Heptachlor | EPA 8081B |
| | EPA 608.3 |
| Heptachlor epoxide | EPA 8081B |
| | EPA 608.3 |
| Lindane | EPA 8081B |
| | EPA 608.3 |
| Methoxychlor | EPA 8081B |
| | EPA 608.3 |
| Mirex | EPA 608.3 |
| PCNB | EPA 8270E |
| Toxaphene | EPA 8081B |
| | EPA 608.3 |

**Chlorinated Hydrocarbons**

| | |
|---|---|
| 1,2,3-Trichlorobenzene | EPA 8260D |
| 1,2,4,5-Tetrachlorobenzene | EPA 8270E |
| 1,2,4-Trichlorobenzene | EPA 625.1 |

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**Chlorinated Hydrocarbons**

| | |
|---|---|
| 1,2,4-Trichlorobenzene | EPA 8270E |
| 2-Chloronaphthalene | EPA 625.1 |
| | EPA 8270E |
| Hexachlorobenzene | EPA 625.1 |
| | EPA 8270E |
| Hexachlorobutadiene | EPA 625.1 |
| | EPA 8270E |
| Hexachlorocyclopentadiene | EPA 625.1 |
| | EPA 8270E |
| Hexachloroethane | EPA 625.1 |
| | EPA 8270E |

**Chlorophenoxy Acid Pesticides**

| | |
|---|---|
| 2,4,5-T | EPA 8151A |
| 2,4,5-TP (Silvex) | EPA 8151A |
| 2,4-D | EPA 8151A |
| 2,4-DB | EPA 8151A |
| Dalapon | EPA 8151A |
| Dicamba | EPA 8151A |
| Dichloroprop | EPA 8151A |
| Dinoseb | EPA 8151A |

**Demand**

| | |
|---|---|
| Biochemical Oxygen Demand | SM 5210B-2016 |
| Carbonaceous BOD | SM 5210B-2016 |
| Chemical Oxygen Demand | EPA 410.4, Rev. 2.0 (1993) |
| | SM 5220D-2011 |

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**Fuel Oxygenates**

| | |
|---|---|
| Di-isopropyl ether | EPA 8260D |
| Ethanol | EPA 8260D |
| | EPA 624.1 |
| Methyl tert-butyl ether | EPA 8260D |
| | EPA 624.1 |
| tert-amyl methyl ether (TAME) | EPA 8260D |
| tert-butyl alcohol | EPA 8260D |
| | EPA 624.1 |
| tert-butyl ethyl ether (ETBE) | EPA 8260D |

**Haloethers**

| | |
|---|---|
| 2,2'-Oxybis(1-chloropropane) | EPA 625.1 |
| | EPA 8270E |
| 4-Bromophenylphenyl ether | EPA 625.1 |
| | EPA 8270E |
| 4-Chlorophenylphenyl ether | EPA 625.1 |
| | EPA 8270E |
| Bis(2-chloroethoxy)methane | EPA 625.1 |
| | EPA 8270E |
| Bis(2-chloroethyl)ether | EPA 625.1 |
| | EPA 8270E |

**Low Level Halocarbons**

| | |
|---|---|
| 1,2,3-Trichloropropane, Low Level | EPA 8011 |
| 1,2-Dibromo-3-chloropropane, Low Le | EPA 8011 |
| 1,2-Dibromoethane, Low Level | EPA 8011 |

**Low Level Polynuclear Aromatics**

| | |
|---|---|
| Acenaphthene Low Level | EPA 8270E SIM |

Serial No.: 67828

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*MR. MARCO SOARES*
*ALPHA ANALYTICAL*
*8 WALKUP DR*
*WESTBOROUGH, MA 01581-1019*

*NY Lab Id No: 11148*

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**Low Level Polynuclear Aromatics**

| | |
|---|---|
| Acenaphthylene Low Level | EPA 8270E SIM |
| Anthracene Low Level | EPA 8270E SIM |
| Benzo(a)anthracene Low Level | EPA 8270E SIM |
| Benzo(a)pyrene Low Level | EPA 8270E SIM |
| Benzo(b)fluoranthene Low Level | EPA 8270E SIM |
| Benzo(g,h,i)perylene Low Level | EPA 8270E SIM |
| Benzo(k)fluoranthene Low Level | EPA 8270E SIM |
| Chrysene Low Level | EPA 8270E SIM |
| Dibenzo(a,h)anthracene Low Level | EPA 8270E SIM |
| Fluoranthene Low Level | EPA 8270E SIM |
| Fluorene Low Level | EPA 8270E SIM |
| Indeno(1,2,3-cd)pyrene Low Level | EPA 8270E SIM |
| Naphthalene Low Level | EPA 8270E SIM |
| Phenanthrene Low Level | EPA 8270E SIM |
| Pyrene Low Level | EPA 8270E SIM |

**Metals I**

| | |
|---|---|
| Iron, Total | SM 3500-Fe B-2011 |

**Metals II**

| | |
|---|---|
| Chromium VI | EPA 7196A |
| | SM 3500-Cr B-2011 |

**Mineral**

| | |
|---|---|
| Acidity | SM 2310B-2011 |
| Alkalinity | SM 2320B-2011 |
| Chloride | EPA 300.0, Rev. 2.1 (1993) |
| | SM 4500-Cl- E-2011 |
| | EPA 9056A |

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**Mineral**

| | |
|---|---|
| Fluoride, Total | EPA 300.0, Rev. 2.1 (1993) |
| | SM 4500-F- C-2011 |
| | EPA 9056A |
| Sulfate (as SO4) | EPA 300.0, Rev. 2.1 (1993) |
| | SM 4500-SO4- E-2011 |
| | EPA 9056A |

**Miscellaneous**

| | |
|---|---|
| Bromide | EPA 300.0, Rev. 2.1 (1993) |
| Color | SM 2120B-2011 |
| Cyanide, Total | LACHAT QuikChem 10-204-00-1-X |
| | EPA 9014 |
| | SM 4500-CN E-2016 |
| | EPA 9012B |
| Formaldehyde | EPA 8315A |
| non-Polar Extractable Material (TPH) | EPA 1664B |
| Oil and Grease Total Recoverable | EPA 1664B |
| Organic Carbon, Total | SM 5310C-2014 |
| | EPA 9060A |
| Phenols | EPA 420.1 (Rev. 1978) |
| | EPA 9065 |
| Specific Conductance | EPA 120.1 (Rev. 1982) |
| | SM 2510B-2011 |
| | EPA 9050A |
| Sulfide (as S) | SM 4500-S2- D-2011 |
| Surfactant (MBAS) | SM 5540C-2011 |
| Turbidity | SM 2130 B-2011 |
| | EPA 180.1, Rev. 2.0 (1993) |

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**Nitroaromatics and Isophorone**

| | |
|---|---|
| 1,3-Dinitrobenzene | EPA 8270E |
| 2,4-Dinitrotoluene | EPA 625.1 |
| | EPA 8270E |
| 2,6-Dinitrotoluene | EPA 625.1 |
| | EPA 8270E |
| Isophorone | EPA 625.1 |
| | EPA 8270E |
| Nitrobenzene | EPA 625.1 |
| | EPA 8270E |

**Nitrosoamines**

| | |
|---|---|
| N-Nitrosodimethylamine | EPA 625.1 |
| | EPA 8270E |
| N-Nitrosodi-n-propylamine | EPA 625.1 |
| | EPA 8270E |
| N-Nitrosodiphenylamine | EPA 625.1 |
| | EPA 8270E |

**Nutrient**

| | |
|---|---|
| Ammonia (as N) | SM 4500-NH3 H-2011 |
| | EPA 350.1, Rev. 2.0 (1993) |
| Kjeldahl Nitrogen, Total | EPA 351.1 (Rev. 1978) |
| | SM 4500-NH3 H-2011 |
| Nitrate (as N) | EPA 353.2, Rev. 2.0 (1993) |
| | EPA 300.0, Rev. 2.1 (1993) |
| | SM 4500-NO3 F-2016 |
| | EPA 9056A |
| Nitrate-Nitrite (as N) | EPA 353.2, Rev. 2.0 (1993) |

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| | |
|---|---|
| **Nutrient** | |
| Nitrate-Nitrite (as N) | SM 4500-NO3 F-2016 |
| Nitrite (as N) | EPA 353.2, Rev. 2.0 (1993) |
| | SM 4500-NO3 F-2016 |
| | SM 4500-NO2 B-2011 |
| Orthophosphate (as P) | SM 4500-P E-2011 |
| Phosphorus, Total | SM 4500-P E-2011 |
| **Organophosphate Pesticides** | |
| Atrazine | EPA 625.1 |
| | EPA 8270E |
| Parathion ethyl | EPA 8270E |
| Thionazin | EPA 8270E |
| **Petroleum Hydrocarbons** | |
| Diesel Range Organics | EPA 8015D |
| Gasoline Range Organics | EPA 8015D |
| **Phthalate Esters** | |
| Benzyl butyl phthalate | EPA 625.1 |
| | EPA 8270E |
| Bis(2-ethylhexyl) phthalate | EPA 625.1 |
| | EPA 8270E |
| Diethyl phthalate | EPA 625.1 |
| | EPA 8270E |
| Dimethyl phthalate | EPA 625.1 |
| | EPA 8270E |
| Di-n-butyl phthalate | EPA 625.1 |
| | EPA 8270E |
| Di-n-octyl phthalate | EPA 625.1 |

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| | |
|---|---|
| **Phthalate Esters** | |
| Di-n-octyl phthalate | EPA 8270E |
| **Polychlorinated Biphenyls** | |
| Aroclor 1016 (PCB-1016) | EPA 8082A |
| | EPA 608.3 |
| Aroclor 1221 (PCB-1221) | EPA 8082A |
| | EPA 608.3 |
| Aroclor 1232 (PCB-1232) | EPA 8082A |
| | EPA 608.3 |
| Aroclor 1242 (PCB-1242) | EPA 8082A |
| | EPA 608.3 |
| Aroclor 1248 (PCB-1248) | EPA 8082A |
| | EPA 608.3 |
| Aroclor 1254 (PCB-1254) | EPA 8082A |
| | EPA 608.3 |
| Aroclor 1260 (PCB-1260) | EPA 8082A |
| | EPA 608.3 |
| Aroclor 1262 (PCB-1262) | EPA 8082A |
| Aroclor 1268 (PCB-1268) | EPA 8082A |
| **Polynuclear Aromatics** | |
| Acenaphthene | EPA 625.1 |
| | EPA 8270E |
| Acenaphthylene | EPA 625.1 |
| | EPA 8270E |
| Anthracene | EPA 625.1 |
| | EPA 8270E |
| Benzo(a)anthracene | EPA 625.1 |

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**Polynuclear Aromatics**

| | |
|---|---|
| Benzo(a)anthracene | EPA 8270E |
| Benzo(a)pyrene | EPA 625.1 |
| | EPA 8270E |
| Benzo(b)fluoranthene | EPA 625.1 |
| | EPA 8270E |
| Benzo(g,h,i)perylene | EPA 625.1 |
| | EPA 8270E |
| Benzo(k)fluoranthene | EPA 625.1 |
| | EPA 8270E |
| Chrysene | EPA 625.1 |
| | EPA 8270E |
| Dibenzo(a,h)anthracene | EPA 625.1 |
| | EPA 8270E |
| Fluoranthene | EPA 625.1 |
| | EPA 8270E |
| Fluorene | EPA 625.1 |
| | EPA 8270E |
| Indeno(1,2,3-cd)pyrene | EPA 625.1 |
| | EPA 8270E |
| Naphthalene | EPA 625.1 |
| | EPA 8270E |
| Phenanthrene | EPA 625.1 |
| | EPA 8270E |
| Pyrene | EPA 625.1 |
| | EPA 8270E |

**Priority Pollutant Phenols**

| | |
|---|---|
| 2,3,4,6 Tetrachlorophenol | EPA 8270E |

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**Priority Pollutant Phenols**

| | |
|---|---|
| 2,4,5-Trichlorophenol | EPA 625.1 |
| | EPA 8270E |
| 2,4,6-Trichlorophenol | EPA 625.1 |
| | EPA 8270E |
| 2,4-Dichlorophenol | EPA 625.1 |
| | EPA 8270E |
| 2,4-Dimethylphenol | EPA 625.1 |
| | EPA 8270E |
| 2,4-Dinitrophenol | EPA 625.1 |
| | EPA 8270E |
| 2-Chlorophenol | EPA 625.1 |
| | EPA 8270E |
| 2-Methyl-4,6-dinitrophenol | EPA 625.1 |
| | EPA 8270E |
| 2-Methylphenol | EPA 625.1 |
| | EPA 8270E |
| 2-Nitrophenol | EPA 625.1 |
| | EPA 8270E |
| 3-Methylphenol | EPA 625.1 |
| | EPA 8270E |
| 4-Chloro-3-methylphenol | EPA 625.1 |
| | EPA 8270E |
| 4-Methylphenol | EPA 625.1 |
| | EPA 8270E |
| 4-Nitrophenol | EPA 625.1 |
| | EPA 8270E |
| Cresols, Total | EPA 8270E |

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| | |
|---|---|
| **Priority Pollutant Phenols** | |
| Pentachlorophenol | EPA 625.1 |
| | EPA 8270E |
| Phenol | EPA 625.1 |
| | EPA 8270E |
| **Residue** | |
| Settleable Solids | SM 2540 F-2015 |
| Solids, Total | SM 2540 B-2015 |
| Solids, Total Dissolved | SM 2540 C-2015 |
| Solids, Total Suspended | SM 2540 D-2015 |
| Solids, Volatile | SM 2540 E-2015 |
| **Semi-Volatile Organics** | |
| 1,1'-Biphenyl | EPA 8270E |
| 1,2-Dichlorobenzene, Semi-volatile | EPA 8270E |
| 1,3-Dichlorobenzene, Semi-volatile | EPA 8270E |
| 1,4-Dichlorobenzene, Semi-volatile | EPA 8270E |
| 2-Methylnaphthalene | EPA 625.1 |
| | EPA 8270E |
| Acetophenone | EPA 625.1 |
| | EPA 8270E |
| Benzaldehyde | EPA 8270E |
| Benzoic Acid | EPA 8270E |
| Benzyl alcohol | EPA 8270E |
| Caprolactam | EPA 8270E |
| Dibenzofuran | EPA 8270E |
| n-Decane | EPA 625.1 |
| n-Octadecane | EPA 625.1 |

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**Volatile Aromatics**

| | |
|---|---|
| 1,2,4-Trichlorobenzene, Volatile | EPA 8260D |
| 1,2,4-Trimethylbenzene | EPA 8260D |
| 1,2-Dichlorobenzene | EPA 8260D |
| | EPA 624.1 |
| 1,3,5-Trimethylbenzene | EPA 8260D |
| 1,3-Dichlorobenzene | EPA 8260D |
| | EPA 624.1 |
| 1,4-Dichlorobenzene | EPA 8260D |
| | EPA 624.1 |
| 2-Chlorotoluene | EPA 8260D |
| 4-Chlorotoluene | EPA 8260D |
| Benzene | EPA 8260D |
| | EPA 624.1 |
| Bromobenzene | EPA 8260D |
| Chlorobenzene | EPA 8260D |
| | EPA 624.1 |
| Ethyl benzene | EPA 8260D |
| | EPA 624.1 |
| Isopropylbenzene | EPA 8260D |
| m/p-Xylenes | EPA 8260D |
| Naphthalene, Volatile | EPA 8260D |
| n-Butylbenzene | EPA 8260D |
| n-Propylbenzene | EPA 8260D |
| o-Xylene | EPA 8260D |
| p-Isopropyltoluene (P-Cymene) | EPA 8260D |
| sec-Butylbenzene | EPA 8260D |
| Styrene | EPA 8260D |

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**Volatile Aromatics**

| | |
|---|---|
| Styrene | EPA 624.1 |
| tert-Butylbenzene | EPA 8260D |
| Toluene | EPA 8260D |
| | EPA 624.1 |
| Total Xylenes | EPA 8260D |
| | EPA 624.1 |

**Volatile Halocarbons**

| | |
|---|---|
| 1,1,1,2-Tetrachloroethane | EPA 8260D |
| 1,1,1-Trichloroethane | EPA 8260D |
| | EPA 624.1 |
| 1,1,2,2-Tetrachloroethane | EPA 8260D |
| | EPA 624.1 |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | EPA 8260D |
| | EPA 624.1 |
| 1,1,2-Trichloroethane | EPA 8260D |
| | EPA 624.1 |
| 1,1-Dichloroethane | EPA 8260D |
| | EPA 624.1 |
| 1,1-Dichloroethene | EPA 8260D |
| | EPA 624.1 |
| 1,1-Dichloropropene | EPA 8260D |
| 1,2,3-Trichloropropane | EPA 8260D |
| 1,2-Dibromo-3-chloropropane | EPA 8260D |
| 1,2-Dibromoethane | EPA 8260D |
| 1,2-Dichloroethane | EPA 8260D |
| | EPA 624.1 |
| 1,2-Dichloropropane | EPA 8260D |

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**Volatile Halocarbons**

| | |
|---|---|
| 1,2-Dichloropropane | EPA 624.1 |
| 1,3-Dichloropropane | EPA 8260D |
| 2,2-Dichloropropane | EPA 8260D |
| 2-Chloroethylvinyl ether | EPA 8260D |
| | EPA 624.1 |
| Bromochloromethane | EPA 8260D |
| Bromodichloromethane | EPA 8260D |
| | EPA 624.1 |
| Bromoform | EPA 8260D |
| | EPA 624.1 |
| Bromomethane | EPA 8260D |
| | EPA 624.1 |
| Carbon tetrachloride | EPA 8260D |
| | EPA 624.1 |
| Chloroethane | EPA 8260D |
| | EPA 624.1 |
| Chloroform | EPA 8260D |
| | EPA 624.1 |
| Chloromethane | EPA 8260D |
| | EPA 624.1 |
| cis-1,2-Dichloroethene | EPA 8260D |
| | EPA 624.1 |
| cis-1,3-Dichloropropene | EPA 8260D |
| | EPA 624.1 |
| Dibromochloromethane | EPA 8260D |
| | EPA 624.1 |
| Dibromomethane | EPA 8260D |

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**WADSWORTH CENTER**

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Revised May 17, 2023

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*MR. MARCO SOARES*
*ALPHA ANALYTICAL*
*8 WALKUP DR*
*WESTBOROUGH, MA 01581-1019*

*NY Lab Id No: 11148*

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*All approved analytes are listed below:*

**Volatile Halocarbons**

| | |
|---|---|
| Dichlorodifluoromethane | EPA 8260D |
| | EPA 624.1 |
| Hexachlorobutadiene, Volatile | EPA 8260D |
| Methyl iodide | EPA 8260D |
| Methylene chloride | EPA 8260D |
| | EPA 624.1 |
| Tetrachloroethene | EPA 8260D |
| | EPA 624.1 |
| trans-1,2-Dichloroethene | EPA 8260D |
| | EPA 624.1 |
| trans-1,3-Dichloropropene | EPA 8260D |
| | EPA 624.1 |
| trans-1,4-Dichloro-2-butene | EPA 8260D |
| Trichloroethene | EPA 8260D |
| | EPA 624.1 |
| Trichlorofluoromethane | EPA 8260D |
| | EPA 624.1 |
| Vinyl chloride | EPA 8260D |
| | EPA 624.1 |

**Volatiles Organics**

| | |
|---|---|
| 1,4-Dioxane | EPA 8260D |
| | EPA 8260C SIM |
| | EPA 8260D SIM |
| | EPA 8270E SIM |
| 2-Butanone (Methylethyl ketone) | EPA 8260D |
| 2-Hexanone | EPA 8260D |
| 4-Methyl-2-Pentanone | EPA 8260D |

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**Volatiles Organics**

| | |
|---|---|
| 4-Methyl-2-Pentanone | EPA 624.1 |
| Acetone | EPA 8260D |
| | EPA 624.1 |
| Carbon Disulfide | EPA 8260D |
| Cyclohexane | EPA 8260D |
| Di-ethyl ether | EPA 8260D |
| Ethyl Acetate | EPA 8260D |
| Hexane | EPA 8260D |
| Isopropanol | EPA 8260D |
| Methyl acetate | EPA 8260D |
| Methyl cyclohexane | EPA 8260D |
| n-Butanol | EPA 8260D |
| o-Toluidine | EPA 8270E |
| Tetrahydrofuran | EPA 8260D |
| Vinyl acetate | EPA 8260D |
| | EPA 624.1 |

**Sample Preparation Methods**

SM 4500-P B(5)-2011
EPA 5030C
SM 4500-CN B-2016 and C-2016
EPA 9030B
EPA 3510C
SM 4500-NH3 B-2011
SM 4500-F B-2011
SM 4500-N Org B-2011 or C-2011
EPA 9010C

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**Acrylates**

| | |
|---|---|
| Acrolein (Propenal) | EPA 8260D |
| Acrylonitrile | EPA 8260D |
| Ethyl methacrylate | EPA 8260D |
| Methyl methacrylate | EPA 8260D |

**Amines**

| | |
|---|---|
| 1,2-Diphenylhydrazine | EPA 8270E |
| 2-Nitroaniline | EPA 8270E |
| 3-Nitroaniline | EPA 8270E |
| 4-Chloroaniline | EPA 8270E |
| 4-Nitroaniline | EPA 8270E |
| Aniline | EPA 8270E |
| Carbazole | EPA 8270E |
| Diphenylamine | EPA 8270E |

**Benzidines**

| | |
|---|---|
| 3,3'-Dichlorobenzidine | EPA 8270E |
| Benzidine | EPA 8270E |

**Characteristic Testing**

| | |
|---|---|
| Corrosivity (pH) | EPA 9040C |
| | EPA 9045D |
| Free Liquids | EPA 9095B |
| Ignitability | EPA 1030 |
| | EPA 1010A |
| Synthetic Precipitation Leaching Proc. | EPA 1312 |
| TCLP | EPA 1311 |

**Chlorinated Hydrocarbon Pesticides**

| | |
|---|---|
| 4,4'-DDD | EPA 8081B |

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**Chlorinated Hydrocarbon Pesticides**

| | |
|---|---|
| 4,4'-DDE | EPA 8081B |
| 4,4'-DDT | EPA 8081B |
| Aldrin | EPA 8081B |
| alpha-BHC | EPA 8081B |
| alpha-Chlordane | EPA 8081B |
| Atrazine | EPA 8270D |
| | EPA 8270E |
| beta-BHC | EPA 8081B |
| Chlordane Total | EPA 8081B |
| delta-BHC | EPA 8081B |
| Dieldrin | EPA 8081B |
| Endosulfan I | EPA 8081B |
| Endosulfan II | EPA 8081B |
| Endosulfan sulfate | EPA 8081B |
| Endrin | EPA 8081B |
| Endrin aldehyde | EPA 8081B |
| Endrin Ketone | EPA 8081B |
| gamma-Chlordane | EPA 8081B |
| Heptachlor | EPA 8081B |
| Heptachlor epoxide | EPA 8081B |
| Lindane | EPA 8081B |
| Methoxychlor | EPA 8081B |
| Pentachloronitrobenzene | EPA 8270D |
| | EPA 8270E |
| Toxaphene | EPA 8081B |

**Chlorinated Hydrocarbons**

| | |
|---|---|
| 1,2,3-Trichlorobenzene | EPA 8260D |

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**Chlorinated Hydrocarbons**

| | |
|---|---|
| 1,2,4,5-Tetrachlorobenzene | EPA 8270E |
| 1,2,4-Trichlorobenzene | EPA 8270E |
| 2-Chloronaphthalene | EPA 8270E |
| Hexachlorobenzene | EPA 8270E |
| Hexachlorobutadiene | EPA 8270E |
| Hexachlorocyclopentadiene | EPA 8270E |
| Hexachloroethane | EPA 8260D |
| | EPA 8270E |

**Chlorophenoxy Acid Pesticides**

| | |
|---|---|
| 2,4,5-T | EPA 8151A |
| 2,4,5-TP (Silvex) | EPA 8151A |
| 2,4-D | EPA 8151A |
| 2,4-DB | EPA 8151A |
| Dalapon | EPA 8151A |
| Dicamba | EPA 8151A |
| Dichloroprop | EPA 8151A |
| MCPA | EPA 8151A |
| MCPP | EPA 8151A |

**Haloethers**

| | |
|---|---|
| 2,2'-Oxybis(1-chloropropane) | EPA 8270E |
| 4-Bromophenylphenyl ether | EPA 8270E |
| 4-Chlorophenylphenyl ether | EPA 8270E |
| Bis(2-chloroethoxy)methane | EPA 8270E |
| Bis(2-chloroethyl)ether | EPA 8270E |

**Low Level Polynuclear Aromatic Hydrocarbons**

| | |
|---|---|
| Acenaphthene Low Level | EPA 8270E SIM |

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**Low Level Polynuclear Aromatic Hydrocarbons**

| | |
|---|---|
| Acenaphthylene Low Level | EPA 8270E SIM |
| Anthracene Low Level | EPA 8270E SIM |
| Benzo(a)anthracene Low Level | EPA 8270E SIM |
| Benzo(a)pyrene Low Level | EPA 8270E SIM |
| Benzo(b)fluoranthene Low Level | EPA 8270E SIM |
| Benzo(g,h,i)perylene Low Level | EPA 8270E SIM |
| Benzo(k)fluoranthene Low Level | EPA 8270E SIM |
| Chrysene Low Level | EPA 8270E SIM |
| Dibenzo(a,h)anthracene Low Level | EPA 8270E SIM |
| Fluoranthene Low Level | EPA 8270E SIM |
| Fluorene Low Level | EPA 8270E SIM |
| Indeno(1,2,3-cd)pyrene Low Level | EPA 8270E SIM |
| Naphthalene Low Level | EPA 8270E SIM |
| Phenanthrene Low Level | EPA 8270E SIM |
| Pyrene Low Level | EPA 8270E SIM |

**Metals II**

| | |
|---|---|
| Chromium VI | EPA 7196A |

**Minerals**

| | |
|---|---|
| Chloride | EPA 9251 |
| Sulfate (as SO4) | EPA 9038 |

**Miscellaneous**

| | |
|---|---|
| Cyanide, Total | EPA 9014 |
| | EPA 9012B |
| Extractable Organic Halides | EPA 9023 |
| Phenols | EPA 9065 |
| Specific Conductance | EPA 9050A |

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**Nitroaromatics and Isophorone**

| | |
|---|---|
| 2,4-Dinitrotoluene | EPA 8270E |
| 2,6-Dinitrotoluene | EPA 8270E |
| Isophorone | EPA 8270E |
| Nitrobenzene | EPA 8260D |
| | EPA 8270E |
| Pyridine | EPA 8270E |

**Nitrosoamines**

| | |
|---|---|
| N-Nitrosodimethylamine | EPA 8270E |
| N-Nitrosodi-n-propylamine | EPA 8270E |
| N-Nitrosodiphenylamine | EPA 8270E |

**Organophosphate Pesticides**

| | |
|---|---|
| Parathion ethyl | EPA 8270E |

**Petroleum Hydrocarbons**

| | |
|---|---|
| Diesel Range Organics | EPA 8015D |
| Gasoline Range Organics | EPA 8015D |
| Oil and Grease Total Recoverable | EPA 9071B (Solvent:Hexane) |

**Phthalate Esters**

| | |
|---|---|
| Benzyl butyl phthalate | EPA 8270E |
| Bis(2-ethylhexyl) phthalate | EPA 8270E |
| Diethyl phthalate | EPA 8270E |
| Dimethyl phthalate | EPA 8270E |
| Di-n-butyl phthalate | EPA 8270E |
| Di-n-octyl phthalate | EPA 8270E |

**Polychlorinated Biphenyls**

| | |
|---|---|
| Aroclor 1016 (PCB-1016) | EPA 8082A |

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**Polychlorinated Biphenyls**

| | |
|---|---|
| Aroclor 1016 (PCB-1016) in Oil | EPA 8082A |
| Aroclor 1221 (PCB-1221) | EPA 8082A |
| Aroclor 1221 (PCB-1221) in Oil | EPA 8082A |
| Aroclor 1232 (PCB-1232) | EPA 8082A |
| Aroclor 1232 (PCB-1232) in Oil | EPA 8082A |
| Aroclor 1242 (PCB-1242) | EPA 8082A |
| Aroclor 1242 (PCB-1242) in Oil | EPA 8082A |
| Aroclor 1248 (PCB-1248) | EPA 8082A |
| Aroclor 1248 (PCB-1248) in Oil | EPA 8082A |
| Aroclor 1254 (PCB-1254) | EPA 8082A |
| Aroclor 1254 (PCB-1254) in Oil | EPA 8082A |
| Aroclor 1260 (PCB-1260) | EPA 8082A |
| Aroclor 1260 (PCB-1260) in Oil | EPA 8082A |
| Aroclor 1262 (PCB-1262) | EPA 8082A |
| Aroclor 1262 (PCB-1262) in Oil | EPA 8082A |
| Aroclor 1268 (PCB-1268) | EPA 8082A |
| Aroclor 1268 (PCB-1268) in Oil | EPA 8082A |

**Polynuclear Aromatic Hydrocarbons**

| | |
|---|---|
| Acenaphthene | EPA 8270E |
| Acenaphthylene | EPA 8270E |
| Anthracene | EPA 8270E |
| Benzo(a)anthracene | EPA 8270E |
| Benzo(a)pyrene | EPA 8270E |
| Benzo(b)fluoranthene | EPA 8270E |
| Benzo(g,h,i)perylene | EPA 8270E |
| Benzo(k)fluoranthene | EPA 8270E |
| Chrysene | EPA 8270E |

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**Polynuclear Aromatic Hydrocarbons**

| | |
|---|---|
| Dibenzo(a,h)anthracene | EPA 8270E |
| Fluoranthene | EPA 8270E |
| Fluorene | EPA 8270E |
| Indeno(1,2,3-cd)pyrene | EPA 8270E |
| Naphthalene | EPA 8270E |
| Phenanthrene | EPA 8270E |
| Pyrene | EPA 8270E |

**Priority Pollutant Phenols**

| | |
|---|---|
| 2,3,4,6 Tetrachlorophenol | EPA 8270E |
| 2,4,5-Trichlorophenol | EPA 8270E |
| 2,4,6-Trichlorophenol | EPA 8270E |
| 2,4-Dichlorophenol | EPA 8270E |
| 2,4-Dimethylphenol | EPA 8270E |
| 2,4-Dinitrophenol | EPA 8270E |
| 2-Chlorophenol | EPA 8270E |
| 2-Methyl-4,6-dinitrophenol | EPA 8270E |
| 2-Methylphenol | EPA 8270E |
| 2-Nitrophenol | EPA 8270E |
| 3-Methylphenol | EPA 8270E |
| 4-Chloro-3-methylphenol | EPA 8270E |
| 4-Methylphenol | EPA 8270E |
| 4-Nitrophenol | EPA 8270E |
| Pentachlorophenol | EPA 8270E |
| Phenol | EPA 8270E |

**Semi-Volatile Organics**

| | |
|---|---|
| 1,1'-Biphenyl | EPA 8270E |

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**Semi-Volatile Organics**

| | |
|---|---|
| 1,2-Dichlorobenzene, Semi-volatile | EPA 8270E |
| 1,3-Dichlorobenzene, Semi-volatile | EPA 8270E |
| 1,4-Dichlorobenzene, Semi-volatile | EPA 8270E |
| 2-Methylnaphthalene | EPA 8270E |
| Acetophenone | EPA 8270E |
| Benzaldehyde | EPA 8270E |
| Benzoic Acid | EPA 8270E |
| Benzyl alcohol | EPA 8270E |
| Caprolactam | EPA 8270E |
| Dibenzofuran | EPA 8270E |

**Volatile Aromatics**

| | |
|---|---|
| 1,2,4-Trichlorobenzene, Volatile | EPA 8260D |
| 1,2,4-Trimethylbenzene | EPA 8260D |
| 1,2-Dichlorobenzene | EPA 8260D |
| 1,3,5-Trimethylbenzene | EPA 8260D |
| 1,3-Dichlorobenzene | EPA 8260D |
| 1,4-Dichlorobenzene | EPA 8260D |
| 2-Chlorotoluene | EPA 8260D |
| 4-Chlorotoluene | EPA 8260D |
| Benzene | EPA 8260D |
| Bromobenzene | EPA 8260D |
| Chlorobenzene | EPA 8260D |
| Ethyl benzene | EPA 8260D |
| Isopropylbenzene | EPA 8260D |
| m/p-Xylenes | EPA 8260D |
| Naphthalene, Volatile | EPA 8260D |
| n-Butylbenzene | EPA 8260D |

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**Volatile Aromatics**

| | |
|---|---|
| n-Propylbenzene | EPA 8260D |
| o-Xylene | EPA 8260D |
| p-Isopropyltoluene (P-Cymene) | EPA 8260D |
| sec-Butylbenzene | EPA 8260D |
| Styrene | EPA 8260D |
| tert-Butylbenzene | EPA 8260D |
| Toluene | EPA 8260D |
| Total Xylenes | EPA 8260D |

**Volatile Halocarbons**

| | |
|---|---|
| 1,1,1,2-Tetrachloroethane | EPA 8260D |
| 1,1,1-Trichloroethane | EPA 8260D |
| 1,1,2,2-Tetrachloroethane | EPA 8260D |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | EPA 8260D |
| 1,1,2-Trichloroethane | EPA 8260D |
| 1,1-Dichloroethane | EPA 8260D |
| 1,1-Dichloroethene | EPA 8260D |
| 1,1-Dichloropropene | EPA 8260D |
| 1,2,3-Trichloropropane | EPA 8260D |
| 1,2-Dibromo-3-chloropropane | EPA 8260D |
| 1,2-Dibromoethane | EPA 8260D |
| 1,2-Dichloroethane | EPA 8260D |
| 1,2-Dichloropropane | EPA 8260D |
| 1,3-Dichloropropane | EPA 8260D |
| 2,2-Dichloropropane | EPA 8260D |
| 2-Chloroethylvinyl ether | EPA 8260D |
| 3-Chloropropene (Allyl chloride) | EPA 8260D |
| Bromochloromethane | EPA 8260D |

Serial No.: 67829

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

**NEW YORK STATE DEPARTMENT OF HEALTH**
**WADSWORTH CENTER**

Expires 12:01 AM April 01, 2024
Issued April 01, 2023
Revised May 17, 2023

## CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

*MR. MARCO SOARES*
*ALPHA ANALYTICAL*
*8 WALKUP DR*
*WESTBOROUGH, MA 01581-1019*

*NY Lab Id No: 11148*

*is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE*
*All approved analytes are listed below:*

**Volatile Halocarbons**

| | |
|---|---|
| Bromodichloromethane | EPA 8260D |
| Bromoform | EPA 8260D |
| Bromomethane | EPA 8260D |
| Carbon tetrachloride | EPA 8260D |
| Chloroethane | EPA 8260D |
| Chloroform | EPA 8260D |
| Chloromethane | EPA 8260D |
| cis-1,2-Dichloroethene | EPA 8260D |
| cis-1,3-Dichloropropene | EPA 8260D |
| Dibromochloromethane | EPA 8260D |
| Dibromomethane | EPA 8260D |
| Dichlorodifluoromethane | EPA 8260D |
| Hexachlorobutadiene, Volatile | EPA 8260D |
| Methyl iodide | EPA 8260D |
| Methylene chloride | EPA 8260D |
| Tetrachloroethene | EPA 8260D |
| trans-1,2-Dichloroethene | EPA 8260D |
| trans-1,3-Dichloropropene | EPA 8260D |
| trans-1,4-Dichloro-2-butene | EPA 8260D |
| Trichloroethene | EPA 8260D |
| Trichlorofluoromethane | EPA 8260D |
| Vinyl chloride | EPA 8260D |

**Volatile Organics**

| | |
|---|---|
| 1,4-Dioxane | EPA 8260D |
| | EPA 8270E |
| 2-Butanone (Methylethyl ketone) | EPA 8260D |
| 2-Hexanone | EPA 8260D |

Serial No.: 67829

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**NEW YORK STATE DEPARTMENT OF HEALTH**
**WADSWORTH CENTER**

Expires 12:01 AM April 01, 2024
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*All approved analytes are listed below:*

**Volatile Organics**

| | |
|---|---|
| 2-Nitropropane | EPA 8260D |
| 4-Methyl-2-Pentanone | EPA 8260D |
| Acetone | EPA 8260D |
| Carbon Disulfide | EPA 8260D |
| Cyclohexane | EPA 8260D |
| Di-ethyl ether | EPA 8260D |
| Ethyl Acetate | EPA 8260D |
| Hexane | EPA 8260D |
| Methyl acetate | EPA 8260D |
| Methyl cyclohexane | EPA 8260D |
| Methyl tert-butyl ether | EPA 8260D |
| n-Butanol | EPA 8260D |
| tert-butyl alcohol | EPA 8260D |
| Tetrahydrofuran | EPA 8260D |
| Vinyl acetate | EPA 8260D |

**Sample Preparation Methods**

EPA 5035A-L
EPA 5035A-H
EPA 3580A
EPA 3540C
EPA 3546
EPA 3060A
EPA 9010C

Serial No.: 67829

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# APPENDIX G

# Site Management Forms

LANGAN

# SITE INSPECTION CHECKLIST

Site Name: 1487 First Avenue Redevelopment Site Location: New York, NY Project Number: 100963701

Inspector Name: _____ Date: _____ Weather Conditions: _____

Reason for Inspection (i.e., routine, severe condition, etc.): _____

Check one of the following:
(Y: Yes N: No N/A: Not Applicable)

| | | Y | N | N/A | Normal Situation | Remarks |
|---|---|---|---|---|---|---|
| | **General** | | | | | |
| 1 | What are the current site conditions? | - | - | - | | |
| 2 | Are all applicable site records (e.g., documentation of construction activity, most current easement, etc.) complete and up to date? | | | | | |
| | | | | | | |
| | **Environmental Easement** | | | | | |
| 3 | Has site use (Restricted-Residential) remained the same? | | | | | |
| 4 | Does it appear that all environmental easement restrictions have been followed? | | | | | |
| | | | | | | |
| | **Building Slab** | | | | | |
| 5 | Are there any indications of a breach in the building slab at the time of this inspection? | | | | | |
| 6 | Are there any cracks in the building slabs? | | | | | |
| 7 | Are there any cracks in the building walls? | | | | | |
| 8 | Is there any construction activity, or indication of any construction activity within the past certification year (including any tenant improvements), that included the breaching of the building slab, on-site at the time of this inspection? | | | | | |
| 9 | If YES to number 8, is there documentation that the Soil Management Plan, HASP, and CAMP for the site was/is being followed? | | | | | |
| | | | | | | |
| | **Bedrock Monitoring Wells** | | | | | |
| 10 | Do the monitoring wells appear to be accessible and intact at the time of this inspection? | | | | | |
| | | | | | | |
| | **Soil Vapor Monitoring Points** | | | | | |
| 11 | Do the soil vapor monitoring points appear to be accessible and intact at the time of this inspection? | | | | | |

***** If the answer to any of the above questions indicate non-compliance with any Institutional Controls (ICs) for the site, additional remarks must be provided and, where applicable, documentation attached to this checklist detailing additional inspection and repair activities.**

**Additional remarks:** _____

**Minimum Inspection Schedule:**

- Site-wide inspections will be conducted annually, per certification year, at a minimum.
- Additional inspections will also be conducted at times of severe weather condition events.
- All inspection events will use this checklist.

## LOW FLOW SAMPLING FIELD PARAMETER MEASUREMENTS

| | | | | |
|---|---|---|---|---|
| **Project:** | **Site Location:** | **Well No:** | **Date:** | |
| **Job Number:** | **Weather:** | **Sampler(s):** | | |
| **Initial DTW (ft):** | **Well Depth (ft):** | **Pump Depth (ft):** | | |
| **Background PID (ppm):** | **Well PID (ppm):** | **Screen Interval (ft):** | | |
| **Water Quality Meter:** | **Water Quality Meter ID:** | | | |

| TIME | TEMP. °C | pH (std. Units) | ORP (mV) | COND. (mS/cm) | Turbidity (NTU) | DO (mg/L) | DTW (ft) | Q (mL/m) | NOTES color, odor etc. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
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| | | | | | | | | | |
| | | +/- 0.1 pH | +/- 10 mV | +/- 3% | +/- 10 NTU | +/- 10% | <0.3' drawdown | | |

Notes:

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | | Sample Time: | | Sample Analyses: | |
| QA/QC Sample Number: | | QA/QC Sample Time: | | QA/QC Sample Analyses: | |

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# APPENDIX H

# RSO Report

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**REMEDIAL SYSTEM OPTIMIZATION REPORT**

**TABLE OF CONTENTS**


1.0 INTRODUCTION

- 1.1 SITE OVERVIEW
- 1.2 PROJECT OBJECTIVES AND SCOPE OF WORK
- 1.3 REPORT OVERVIEW

2.0 REMEDIAL ACTION DESCRIPTION

- 2.1 SITE LOCATION AND HISTORY
- 2.2 REGULATORY HISTORY AND REQUIREMENTS
- 2.3 CLEAN-UP GOALS AND SITE CLOSURE CRITERIA
- 2.4 PREVIOUS REMEDIAL ACTIONS
- 2.5 DESCRIPTION OF EXISTING REMEDY
  - 2.5.1 System Goals and Objectives
  - 2.5.2 System Description
  - 2.5.3 Maintenance Program

3.0 FINDINGS AND OBSERVATIONS

- 3.1 SUBSURFACE PERFORMANCE
- 3.2 TREATMENT SYSTEM PERFORMANCE
- 3.3 REGULATORY COMPLIANCE
- 3.4 MAJOR COST COMPONENTS OR PROCESSES
- 3.5 SAFETY RECORD

4.0 RECOMMENDATIONS

- 4.1 RECOMMENDATIONS TO ACHIEVE OR ACCELERATE SITE CLOSURE
  - 4.1.1 Source Reduction/Treatment
  - 4.1.2 Sampling
  - 4.1.3 Conceptual Site Model (Risk Assessment)
- 4.2 RECOMMENDATIONS TO IMPROVE PERFORMANCE
  - 4.2.1 Maintenance Improvements
  - 4.2.2 Monitoring Improvements
  - 4.2.3 Process Modifications

4.3 RECOMMENDATIONS TO REDUCE COSTS

4.3.1 Supply Management

4.3.2 Process Improvements or Changes

4.3.3 Optimize Monitoring Program

4.3.4 Maintenance and Repairs

4.4 RECOMMENDATIONS FOR IMPLEMENTATION

# APPENDIX I

# Well Construction Logs and Westbay System Installation Documentation

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**WELL CONSTRUCTION SUMMARY**

Well No. LMW-6R-S

| | |
|---|---|
| **PROJECT**<br>1487 1st Avenue | **PROJECT NO.**<br>100963701 |
| **LOCATION**<br>New York, NY | **ELEVATION AND DATUM**<br>14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY**<br>ECD NY | **DATE STARTED** / **DATE FINISHED**<br>11/18/2023 02/02/2024, 03/2025 |
| **DRILLING EQUIPMENT**<br>Comacchio MC 8D | **DRILLER**<br>Willmer |
| **SIZE AND TYPE OF BIT**<br>4-inch Air Hammer | **INSPECTOR**<br>Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-6R-S to a depth of 3.75-feet below top of slab (btos). 5-inch ID steel casing was grouted in place from 0-feet to 3.75-feet btos. Following casing installation, the borehole for LMW-6R-S was advanced with a 4-inch air hammer bit to a depth of 35.78-feet btos on 22 November 2023. Following drilling, the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 3.75-feet to 8.75-feet btos, 13.75-feet to 18.75-feet btos, and 23.75-feet to 28.75-feet btos, sampling ports at 8.75-feet, 18.75-feet, and 28.75-feet btos, and a pumping port at 23.75-feet btos on 2 February 2024.

In March 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was cored to expose the steel casing and outer steel sleeve, which were also lowered to install waterproofing consisting of DE NEEF® products, CFL PURe and Flex Cat Activator, in the annular space. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

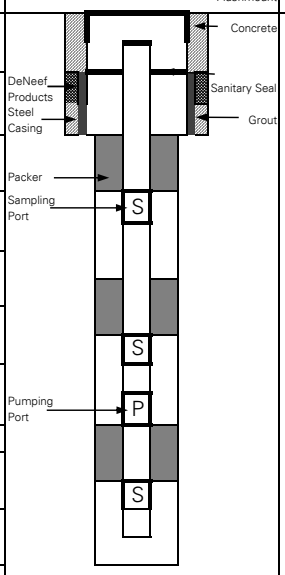
| | | | |
|---|---|---|---|
| **TYPE OF WELL CASING**<br>Steel | **DIAMETER**<br>5-inch | | **TYPE OF BACKFILL MATERIAL**<br>Grout and Bentonite |
| **BOTTOM OF CASING** | **ELEVATION**<br>11.00 | **DEPTH (ft)**<br>3.75 | **TYPE OF SEAL MATERIAL**<br>Bentonite, DeNeef Products |
| **BOREHOLE DIAMETER**<br>4-inch | | | **TOP OF SEAL** / **ELEVATION**<br>14.75 / **DEPTH (ft)**<br>0.00 |
| **BOTTOM OF WELL** | **ELEVATION**<br>-21.03 | **DEPTH (ft)**<br>35.78 | |

**WESTBAY SYSTEM**

| | | |
|---|---|---|
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -4 | 18.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -9 | 23.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | – | – |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | – | – |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | – | – |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | – | – |

**WESTBAY PIEZOMETRIC LEVELS**

| | | |
|---|---|---|
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| 18.75 | 2/2/2024 | -8.11 |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| | – | – |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| | – | – |




| SUMMARY SOIL CLASSIFICATION | DEPTH (FT) bgs |
|---|---|
| Bedrock | |
| | 3.75 |
| | 8.75 |
| | 13.75 |
| | 18.75 |
| | 23.75 |
| | 28.75 |
| | 31.75 |
| | 35.78 |

**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**
300 Kimball Drive, Parsippany, New Jersey 07054

## WELL CONSTRUCTION SUMMARY

Well No. LMW-6R-D

| PROJECT | PROJECT NO. |
|---|---|
| 1487 1st Avenue | 100963701 |
| **LOCATION** | **ELEVATION AND DATUM** |
| New York, NY | 14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY** | **DATE STARTED** / **DATE FINISHED** |
| ECD NY | 11/20/23 / 02/02/2024, 03/2025 |
| **DRILLING EQUIPMENT** | **DRILLER** |
| Comacchio MC 8D | Willmer |
| **SIZE AND TYPE OF BIT** | **INSPECTOR** |
| 4-inch Air Hammer | Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-6R-D to a depth of 23.75-feet below top of slab (btos). 5-inch ID steel casing was installed to 23.75-feet btos, bentonite was placed from 3 to 23.75-feet btos followed by grout between 0-feet and 3-feet btos. Following casing installation, the borehole for LMW-6R-D was advanced with a 4-inch air hammer bit to a depth of 59.79-feet btos on 28 November 2023. Following drilling the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 18.75-feet to 23.75-feet btos, 27.75-feet to 32.75-feet btos, 37.75-feet to 42.75-feet btos, and 47.75-feet to 52.75-feet btos, sampling ports at 23.75-feet, 32.75-feet, 42.75-feet, and 54.75-feet btos, and pumping ports at 37.75-feet, 47.75-feet, and 52.75-feet btos on 2 February 2024.

In March 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was cored to expose the steel casing and outer steel sleeve, which were also lowered to install waterproofing consisting of DE NEEF® products, CFL PURe and Flex Cat Activator, in the annular space. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

| TYPE OF WELL CASING | DIAMETER |
|---|---|
| Steel | 5-inch |

| BOTTOM OF CASING | ELEVATION | DEPTH (ft) |
|---|---|---|
| | -9.00 | 23.75 |

| BOREHOLE DIAMETER |
|---|
| 4-inch |

| BOTTOM OF WELL | ELEVATION | DEPTH (ft) |
|---|---|---|
| | -45.04 | 59.79 |

**WESTBAY SYSTEM**

| TOP OF SAMPLE INTERVAL | ELEVATION | DEPTH (ft) |
|---|---|---|
| | -18 | 32.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -23 | 37.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -28 | 42.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -33 | 47.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -38 | 52.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -45.04 | 59.79 |

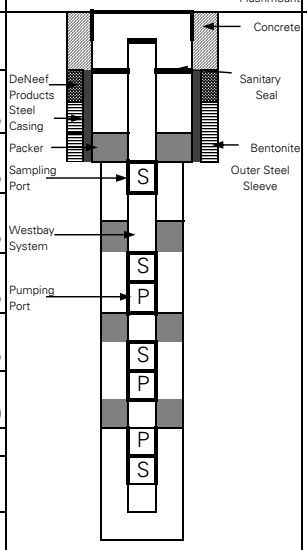
**WESTBAY PIEZOMETRIC LEVELS**

| SAMPLING PORT DEPTH | DATE | PIEZOMETRIC LEVEL |
|---|---|---|
| 32.75 | 2/2/2024 | -8.38 |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| 42.75 | 2/2/2024 | -9.78 |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| 54.75 | 2/2/2024 | -11.48 |

| TYPE OF BACKFILL MATERIAL |
|---|
| Grout and Bentonite |

| TYPE OF SEAL MATERIAL |
|---|
| Bentonite, DeNeef Products |

| TOP OF SEAL | ELEVATION | DEPTH (ft) |
|---|---|---|
| | 11.75 | 3.00 |

| WELL DETAILS | SUMMARY SOIL CLASSIFICATION | DEPTH (FT) bgs |
|---|---|---|
|  | Bedrock | 3.00 |
| | | 18.75 |
| | | 23.75 |
| | | 27.75 |
| | | 32.75 |
| | | 37.75 |
| | | 42.75 |
| | | 47.75 |
| | | 52.75 |
| | | 54.75 |
| | | 59.75 |
| | | 59.79 |



**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**

300 Kimball Drive, Parsippany, New Jersey 07054

## WELL CONSTRUCTION SUMMARY

Well No. LMW-7R-S

| | |
|---|---|
| **PROJECT**<br>1487 1st Avenue | **PROJECT NO.**<br>100963701 |
| **LOCATION**<br>New York, NY | **ELEVATION AND DATUM**<br>14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY**<br>ECD NY | **DATE STARTED** 11/16/2023 **DATE FINISHED** 02/05/2024, 03/2025 |
| **DRILLING EQUIPMENT**<br>Comacchio MC 8D | **DRILLER**<br>Willmer |
| **SIZE AND TYPE OF BIT**<br>4-inch Air Hammer | **INSPECTOR**<br>Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-7R-S to a depth of 3.75-feet below top of slab (btos). 5-inch ID steel casing was grouted in place from 0-feet to 3.75-feet btos. Following casing installation, the borehole for LMW-7R-S was advanced with a 4-inch air hammer bit to a depth of 34.78-feet btos on 24 November 2023. Following drilling the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 1.75-feet to 6.75-feet btos, 11.75-feet to 16.75-feet btos, and 21.75-feet to 26.75-feet btos, sampling ports at 6.75-feet, 11.75-feet, and 26.75-feet btos, and pumping ports at 11.75-feet and 21.75-feet btos on 5 February 2024.

In March 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was cored to expose the steel casing and outer steel sleeve, which were also lowered to install waterproofing consisting of DE NEEF® products, CFL PURe and Flex Cat Activator, in the annular space. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

| | | | |
|---|---|---|---|
| **TYPE OF WELL CASING**<br>Steel | **DIAMETER**<br>5-inch | | **TYPE OF BACKFILL MATERIAL**<br>Grout and Bentonite |
| **BOTTOM OF CASING** | **ELEVATION**<br>11.00 | **DEPTH (ft)**<br>3.75 | **TYPE OF SEAL MATERIAL**<br>Bentonite and DeNeef Products |
| **BOREHOLE DIAMETER**<br>4-inch | | | **TOP OF SEAL** **ELEVATION** 14.75 **DEPTH (ft)** 0.00 |
| **BOTTOM OF WELL** | **ELEVATION**<br>-20.03 | **DEPTH (ft)**<br>34.78 | |

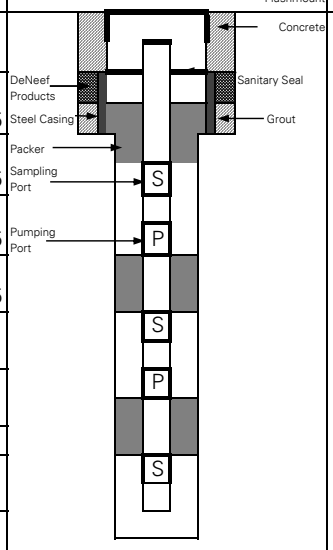
**WESTBAY SYSTEM**

| | | |
|---|---|---|
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>8 | **DEPTH (ft)**<br>6.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>3 | **DEPTH (ft)**<br>11.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>-2 | **DEPTH (ft)**<br>16.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>-7 | **DEPTH (ft)**<br>21.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>– | **DEPTH (ft)**<br>– |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>– | **DEPTH (ft)**<br>– |

**WESTBAY PIEZOMETRIC LEVELS**

| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
|---|---|---|
| 6.75 | 02/05/2024 | -9.50 |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| 16.75 | 02/05/2024 | -9.49 |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| | – | – |

**WELL DETAILS**




| **SUMMARY SOIL CLASSIFICATION** | **DEPTH (FT) bgs** |
|---|---|
| Bedrock | 1.75 |
| | 3.75 |
| | 6.75 |
| | 11.75 |
| | 16.75 |
| | 21.75 |
| | 26.75 |
| | 31.75 |
| | 34.78 |

**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**
300 Kimball Drive, Parsippany, New Jersey 07054

## WELL CONSTRUCTION SUMMARY

Well No. LMW-7R-D

| | |
|---|---|
| **PROJECT**<br>1487 1st Avenue | **PROJECT NO.**<br>100963701 |
| **LOCATION**<br>New York, NY | **ELEVATION AND DATUM**<br>14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY**<br>ECD NY | **DATE STARTED** / **DATE FINISHED**<br>11/16/2023 02/01/2024, 03/2025 |
| **DRILLING EQUIPMENT**<br>Comacchio MC 8D | **DRILLER**<br>Willmer |
| **SIZE AND TYPE OF BIT**<br>4-inch Air Hammer | **INSPECTOR**<br>Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-7R-D to a depth of 23.75-feet below top of slab (btos). 5-inch ID steel casing was installed to 23.75-feet btos, bentonite was placed from 3 to 23.75-feet btos followed by grout between 0-feet and 3-feet btos. Following casing installation, the borehole for LMW-7R-D was advanced with a 4-inch air hammer bit to a depth of 63.81-feet btos on 27 November 2023. Following drilling the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 18.75-feet to 23.75-feet btos, 28.75-feet to 33.75-feet btos, 44.75-feet to 49.75-feet btos, and 54.75-feet to 59.75-feet btos, sampling ports at 23.75-feet, 33.75-feet, 49.75-feet, and 59.75-feet btos, and pumping ports at 28.75-feet and 54.75-feet btos on 1 February 2024.

In March 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was cored to expose the steel casing and outer steel sleeve, which were also lowered to install waterproofing consisting of DE NEEF® products, CFL PURe and Flex Cat Activator, in the annular space. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

| | | | | |
|---|---|---|---|---|
| **TYPE OF WELL CASING**<br>Steel | | **DIAMETER**<br>5-inch | **TYPE OF BACKFILL MATERIAL**<br>Grout and Bentonite | |
| **BOTTOM OF CASING** | **ELEVATION**<br>-9.00 | **DEPTH (ft)**<br>23.75 | **TYPE OF SEAL MATERIAL**<br>Bentonite, DeNeef Products | |
| **BOREHOLE DIAMETER**<br>4-inch | | | **TOP OF SEAL**<br>11.75 | **DEPTH (ft)**<br>3.00 |
| **BOTTOM OF WELL** | **ELEVATION**<br>-49.06 | **DEPTH (ft)**<br>63.81 | | |

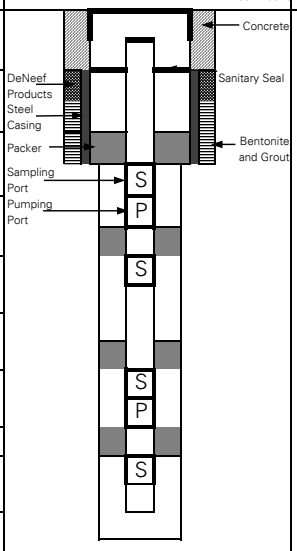
**WESTBAY SYSTEM**

| | | |
|---|---|---|
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -9 | 23.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -14 | 28.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -35 | 49.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -40 | 54.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | – | – |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | – | – |

**WESTBAY PIEZOMETRIC LEVELS**

| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
|---|---|---|
| 23.75 | 2/1/2024 | -6.98 |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| 49.75 | 2/1/2024 | -4.11 |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| | – | – |

**WELL DETAILS**




| **SUMMARY SOIL CLASSIFICATION** | **DEPTH (FT) bgs** |
|---|---|
| Bedrock | 3.00 |
| | 18.75 |
| | 23.75 |
| | 28.75 |
| | 33.75 |
| | 44.75 |
| | 49.75 |
| | 54.75 |
| | 59.75 |
| | 63.75 |
| | 63.81 |

**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**
300 Kimball Drive, Parsippany, New Jersey 07054

## WELL CONSTRUCTION SUMMARY

Well No. LMW-8R-S

| | |
|---|---|
| **PROJECT**<br>1487 1st Avenue | **PROJECT NO.**<br>100963701 |
| **LOCATION**<br>New York, NY | **ELEVATION AND DATUM**<br>14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY**<br>ECD NY | **DATE STARTED** / **DATE FINISHED**<br>11/18/2023 02/01/2024, 03/2025 |
| **DRILLING EQUIPMENT**<br>Comacchio MC 8D | **DRILLER**<br>Willmer |
| **SIZE AND TYPE OF BIT**<br>4-inch Air Hammer | **INSPECTOR**<br>Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-8R-S to a depth of 3.75-feet below top of slab (btos). 5-inch ID steel casing was grouted in place from 0-feet to 3.75-feet btos. Following casing installation, the borehole for LMW-7R-S was advanced with a 4-inch air hammer bit to a depth of 30.10-feet btos on 25 November 2023. Following drilling the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 1.75-feet to 6.75-feet btos, 11.75-feet to 16.75-feet btos, and 23.75-feet to 28.75-feet btos, sampling ports at 6.75-feet, 18.75-feet, and 28.75-feet btos, and pumping ports at 11.75-feet and 23.75-feet btos on 1 February 2024.

In March 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was cored to expose the steel casing and outer steel sleeve, which were also lowered to install waterproofing consisting of DE NEEF® products, CFL PURe and Flex Cat Activator, in the annular space. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

| | | | |
|---|---|---|---|
| **TYPE OF WELL CASING**<br>Steel | | **DIAMETER**<br>5-inch | **TYPE OF BACKFILL MATERIAL**<br>Grout and Bentonite |
| **BOTTOM OF CASING** | **ELEVATION**<br>11.00 | **DEPTH (ft)**<br>3.75 | **TYPE OF SEAL MATERIAL**<br>Bentonite, DeNeef Products |
| **BOREHOLE DIAMETER**<br>4-inch | | | **TOP OF SEAL** / **ELEVATION**<br>14.75 / **DEPTH (ft)**<br>0.00 |
| **BOTTOM OF WELL** | **ELEVATION**<br>-15.35 | **DEPTH (ft)**<br>30.10 | |

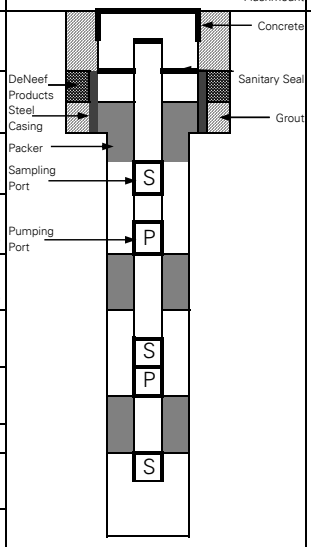
**WESTBAY SYSTEM**

| | | |
|---|---|---|
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>8 | **DEPTH (ft)**<br>6.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>3 | **DEPTH (ft)**<br>11.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>-2 | **DEPTH (ft)**<br>16.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>-9 | **DEPTH (ft)**<br>23.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>-- | **DEPTH (ft)**<br>-- |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>-- | **DEPTH (ft)**<br>-- |

**WESTBAY PIEZOMETRIC LEVELS**

| | | |
|---|---|---|
| **SAMPLING PORT DEPTH**<br>6.75 | **DATE**<br>02/01/2024 | **PIEZOMETRIC LEVEL**<br>-7.27 |
| **SAMPLING PORT DEPTH**<br>18.75 | **DATE**<br>02/01/2024 | **PIEZOMETRIC LEVEL**<br>-7.33 |
| **SAMPLING PORT DEPTH** | **DATE**<br>-- | **PIEZOMETRIC LEVEL**<br>-- |

**WELL DETAILS**




| **SUMMARY SOIL CLASSIFICATION** | **DEPTH (FT) bgs** |
|---|---|
| Bedrock | 1.75 |
| | 3.75 |
| | 6.75 |
| | 11.75 |
| | 16.75 |
| | 18.75 |
| | 23.75 |
| | 28.75 |
| | 29.75 |
| | 34.78 |

**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**
300 Kimball Drive, Parsippany, New Jersey 07054

## WELL CONSTRUCTION SUMMARY

Well No. LMW-8R-D

| | |
|---|---|
| **PROJECT**<br>1487 1st Avenue | **PROJECT NO.**<br>100963701 |
| **LOCATION**<br>New York, NY | **ELEVATION AND DATUM**<br>14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY**<br>ECD NY | **DATE STARTED** / **DATE FINISHED**<br>11/20/23 02/05/2024, 03/2025 |
| **DRILLING EQUIPMENT**<br>Comacchio MC 8D | **DRILLER**<br>Willmer |
| **SIZE AND TYPE OF BIT**<br>4-inch Air Hammer | **INSPECTOR**<br>Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-8R-D to a depth of 23.75-feet below top of slab (btos). The outer 7-inch steel casing was installed to a depth of 7-feet btos. The inner 5-inch ID steel casing was installed from 0-feet to 23.75-feet btos, bentonite was placed from 3 to 23.75-feet btos followed by grout between 0-feet and 3-feet btos. Following casing installation, the borehole for LMW-8R-D was advanced with a 4-inch air hammer bit to a depth of 64.77-feet btos on 25 November 2023. Following drilling the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 22.75-feet to 27.75-feet btos, 34.75-feet to 39.75-feet btos, and 52.75-feet to 57.75-feet btos, sampling ports at 27.75-feet, 39.75-feet, and 59.75-feet btos, and pumping ports at 32.75-fee and 57.75-feet btos on 5 February 2024.

In March 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was cored to expose the steel casing and outer steel sleeve, which were also lowered to install waterproofing consisting of DE NEEF® products, CFL PURe and Flex Cat Activator, in the annular space. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

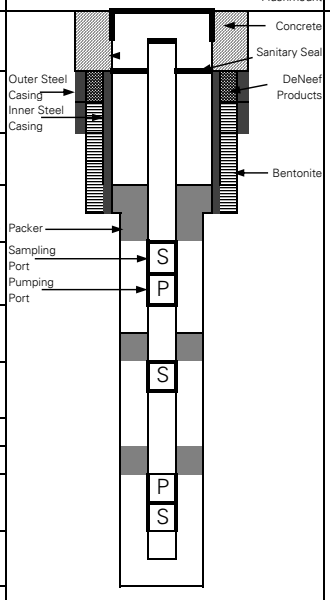
| | | | | |
|---|---|---|---|---|
| **TYPE OF WELL CASING**<br>Steel | | **DIAMETER**<br>5-inch | **TYPE OF BACKFILL MATERIAL**<br>Grout and Bentonite | |
| **BOTTOM OF CASING** | **ELEVATION**<br>-9.00 | **DEPTH (ft)**<br>23.75 | **TYPE OF SEAL MATERIAL**<br>Bentonite, DeNeef Products | |
| **BOREHOLE DIAMETER**<br>4-inch | | | **TOP OF SEAL** | **ELEVATION**<br>11.75 **DEPTH (ft)**<br>3.00 |
| **BOTTOM OF WELL** | **ELEVATION**<br>-50.02 | **DEPTH (ft)**<br>64.77 | | |

**WESTBAY SYSTEM**

| | | |
|---|---|---|
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>-13 | **DEPTH (ft)**<br>27.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>-20 | **DEPTH (ft)**<br>34.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>-43 | **DEPTH (ft)**<br>57.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>-50.02 | **DEPTH (ft)**<br>64.77 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>-- | **DEPTH (ft)**<br>-- |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>-- | **DEPTH (ft)**<br>-- |

**WESTBAY PIEZOMETRIC LEVELS**

| SAMPLING PORT DEPTH | DATE | PIEZOMETRIC LEVEL |
|---|---|---|
| 27.75 | 2/5/2024 | -3.57 |
| 59.75 | 2/5/2024 | -9.18 |
| | -- | -- |




| SUMMARY SOIL CLASSIFICATION | DEPTH (FT) bgs |
|---|---|
| Bedrock | 3.00 |
| | 7.00 |
| | 22.75 |
| | 23.75 |
| | 27.75 |
| | 32.75 |
| | 34.75 |
| | 39.75 |
| | 52.75 |
| | 57.75 |
| | 59.75 |
| | 64.75 |
| | 64.77 |

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## WELL CONSTRUCTION SUMMARY

Well No. LMW-9R-S

| | |
|---|---|
| **PROJECT**<br>1487 1st Avenue | **PROJECT NO.**<br>100963701 |
| **LOCATION**<br>New York, NY | **ELEVATION AND DATUM**<br>14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY**<br>ECD NY | **DATE STARTED** / **DATE FINISHED**<br>11/18/2023 02/06/2024, 03/2025 |
| **DRILLING EQUIPMENT**<br>Comacchio MC 8D | **DRILLER**<br>Willmer |
| **SIZE AND TYPE OF BIT**<br>4-inch Air Hammer | **INSPECTOR**<br>Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-9R-S to a depth of 3.75-feet below top of slab (btos). 5-inch ID steel casing was grouted in place from 0-feet to 3.75-feet btos. Following casing installation, the borehole for LMW-9R-S was advanced with a 4-inch air hammer bit to a depth of 30.76-feet btos on 22 November 2023. Following drilling the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 3.75-feet to 8.75-feet btos, 8.75-feet to 13.75-feet btos, and 19.75-feet to 24.75-feet btos, sampling ports at 8.75-feet, 13.75-feet, and 24.75-feet btos, and a pumping port at 18.75-feet btos on 6 February 2024.

In March 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was cored to expose the steel casing and outer steel sleeve, which were also lowered to install waterproofing consisting of DE NEEF® products, CFL PURe and Flex Cat Activator, in the annular space. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

| | | | |
|---|---|---|---|
| **TYPE OF WELL CASING**<br>Steel | | **DIAMETER**<br>5-inch | **TYPE OF BACKFILL MATERIAL**<br>Grout and Bentonite |
| **BOTTOM OF CASING** | **ELEVATION**<br>11.00 | **DEPTH (ft)**<br>3.75 | **TYPE OF SEAL MATERIAL**<br>Bentonite, DeNeef Products |
| **BOREHOLE DIAMETER**<br>4-inch | | | **TOP OF SEAL** / **ELEVATION**<br>14.75 |
| | | | **DEPTH (ft)**<br>0.00 |
| **BOTTOM OF WELL** | **ELEVATION**<br>-16.01 | **DEPTH (ft)**<br>30.76 | |

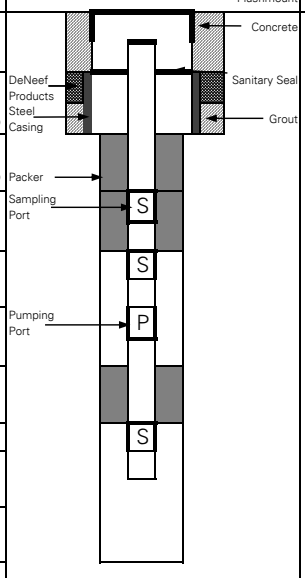
**WESTBAY SYSTEM**

| | | |
|---|---|---|
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>1 | **DEPTH (ft)**<br>13.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>-5 | **DEPTH (ft)**<br>19.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>-- | **DEPTH (ft)**<br>-- |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>-- | **DEPTH (ft)**<br>-- |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION**<br>-- | **DEPTH (ft)**<br>-- |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION**<br>-- | **DEPTH (ft)**<br>-- |

**WESTBAY PIEZOMETRIC LEVELS**

| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
|---|---|---|
| 13.75 | 2/6/2024 | -8.72 |
| -- | -- | -- |
| -- | -- | -- |

**WELL DETAILS**




| **SUMMARY SOIL CLASSIFICATION** | **DEPTH (FT) bgs** |
|---|---|
| Bedrock | 3.75 |
| | 8.75 |
| | 13.75 |
| | 18.75 |
| | 19.75 |
| | 24.75 |
| | 27.75 |
| | 30.76 |

**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**
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## WELL CONSTRUCTION SUMMARY

Well No. LMW-9R-D

| | |
|---|---|
| **PROJECT**<br>1487 1st Avenue | **PROJECT NO.**<br>100963701 |
| **LOCATION**<br>New York, NY | **ELEVATION AND DATUM**<br>14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY**<br>ECD NY | **DATE STARTED** / **DATE FINISHED**<br>11/20/23 02/06/2024, 03/2025 |
| **DRILLING EQUIPMENT**<br>Comacchio MC 8D | **DRILLER**<br>Willmer |
| **SIZE AND TYPE OF BIT**<br>4-inch Air Hammer | **INSPECTOR**<br>Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-9R-D to a depth of 23.75-feet below top of slab (btos). The outer 7-inch steel casing was installed to a depth of 7-feet btos. The inner 5-inch ID steel casing was installed from 0-feet to 23.75-feet btos, bentonite was placed from 3 to 23.75-feet btos followed by grout between 0-feet and 3-feet btos. Following casing installation, the borehole for LMW-9R-D was advanced with a 4-inch air hammer bit to a depth of 63.75-feet btos on 27 November 2023. Following drilling the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 23.25-feet to 28.25-feet btos, 33.25-feet to 38.25-feet btos, 40.25-feet to 45.25-feet btos, and 50.25-feet to 55.25-feet btos, sampling ports at 28.25-feet, 38.25-feet, 45.25-feet, and 58.25-feet btos, and pumping ports at 33.25-feet, 50.25-feet, and 55.25-feet btos on 6 February 2024.

In March 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was cored to expose the steel casing and outer steel sleeve, which were also lowered to install waterproofing consisting of DE NEEF® products, CFL PURe and Flex Cat Activator, in the annular space. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

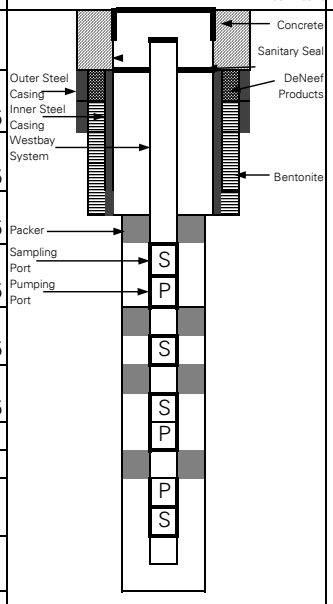
| | | |
|---|---|---|
| **TYPE OF WELL CASING**<br>Steel | **DIAMETER**<br>5-inch | **TYPE OF BACKFILL MATERIAL**<br>Grout and Bentonite |
| **BOTTOM OF CASING** | **ELEVATION** / **DEPTH (ft)**<br>-9.00 / 23.75 | **TYPE OF SEAL MATERIAL**<br>Bentonite, DeNeef Products |
| **BOREHOLE DIAMETER**<br>4-inch | | **TOP OF SEAL** / **ELEVATION** / **DEPTH (ft)**<br>11.75 / 3.00 |
| **BOTTOM OF WELL** | **ELEVATION** / **DEPTH (ft)**<br>-49.00 / 63.75 | |

**WESTBAY SYSTEM**

| | | |
|---|---|---|
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -13.5 | 28.25 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -18.5 | 33.25 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -30.5 | 45.25 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -35.5 | 50.25 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -40.5 | 55.25 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -49 | 63.75 |

**WESTBAY PIEZOMETRIC LEVELS**

| SAMPLING PORT DEPTH | DATE | PIEZOMETRIC LEVEL |
|---|---|---|
| 28.25 | 2/9/2024 | -8.10 |
| 45.25 | 2/9/2024 | -8.84 |
| 58.25 | 2/9/2024 | -9.15 |




| SUMMARY SOIL CLASSIFICATION | DEPTH (FT) bgs |
|---|---|
| Bedrock | 3.00 |
| | 7.00 |
| | 23.75 |
| | 28.25 |
| | 33.25 |
| | 38.25 |
| | 40.25 |
| | 45.25 |
| | 50.25 |
| | 55.25 |
| | 58.25 |
| | 63.25 |
| | 63.75 |

**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**
300 Kimball Drive, Parsippany, New Jersey 07054

## WELL CONSTRUCTION SUMMARY

Well No. LMW-10R-S

| | |
|---|---|
| **PROJECT**<br>1487 1st Avenue | **PROJECT NO.**<br>100963701 |
| **LOCATION**<br>New York, NY | **ELEVATION AND DATUM**<br>14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY**<br>ECD NY | **DATE STARTED** / **DATE FINISHED**<br>11/15/2023 02/07/2024, 05/2025 |
| **DRILLING EQUIPMENT**<br>Comacchio MC 8D | **DRILLER**<br>Willmer |
| **SIZE AND TYPE OF BIT**<br>4-inch Air Hammer | **INSPECTOR**<br>Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-10R-S to a depth of 3.75-feet below top of slab (btos). 5-inch ID steel casing was grouted in place from 0-feet to 3.75-feet btos. Following casing installation, the borehole for LMW-10R-S was advanced with a 4-inch air hammer bit to a depth of 29.75-feet btos on 22 November 2023. Following drilling the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 3.75-feet to 8.75-feet btos and 18.75-feet to 23.75-feet btos, sampling ports at 8.75-feet and 24.75-feet btos, and a pumping port at 23.75-feet btos on 7 February 2024.

In May 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was scored to expose the steel casing and outer steel sleeve, which were also lowered and welded together. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

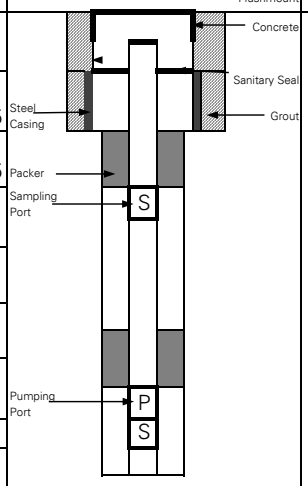
| | | | | |
|---|---|---|---|---|
| **TYPE OF WELL CASING** | | **DIAMETER** | **TYPE OF BACKFILL MATERIAL** | |
| Steel | | 5-inch | Grout and Bentonite | |
| **BOTTOM OF CASING** | **ELEVATION** | **DEPTH (ft)** | **TYPE OF SEAL MATERIAL** | |
| | 11.00 | 3.75 | Bentonite, Welding | |
| **BOREHOLE DIAMETER** | | | **TOP OF SEAL** | **ELEVATION** / **DEPTH (ft)** |
| 4-inch | | | | 14.75 / 0.00 |
| **BOTTOM OF WELL** | **ELEVATION** | **DEPTH (ft)** | | |
| | -15.00 | 29.75 | | |

**WESTBAY SYSTEM**

| | | |
|---|---|---|
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -9 | 23.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -15 | 29.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -- | -- |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -- | -- |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -- | -- |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -- | -- |

**WESTBAY PIEZOMETRIC LEVELS**

| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
|---|---|---|
| 24.75 | 2/7/2024 | -9.04 |
| -- | -- | -- |
| -- | -- | -- |




| **SUMMARY SOIL CLASSIFICATION** | **DEPTH (FT) bgs** |
|---|---|
| Bedrock | 3.75 |
| | 8.75 |
| | 13.75 |
| | 18.75 |
| | 23.75 |
| | 24.75 |
| | 29.75 |

**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**
300 Kimball Drive, Parsippany, New Jersey 07054

## WELL CONSTRUCTION SUMMARY

Well No. LMW-10R-D

| | |
|---|---|
| **PROJECT**<br>1487 1st Avenue | **PROJECT NO.**<br>100963701 |
| **LOCATION**<br>New York, NY | **ELEVATION AND DATUM**<br>14.75 NAVD 88 (Subcellar slab surface) |
| **DRILLING AGENCY**<br>ECD NY | **DATE STARTED** 11/15/2023 **DATE FINISHED** 02/08/2024, 05/2025 |
| **DRILLING EQUIPMENT**<br>Comacchio MC 8D | **DRILLER**<br>Willmer |
| **SIZE AND TYPE OF BIT**<br>4-inch Air Hammer | **INSPECTOR**<br>Leo Thottumari |

**METHOD OF INSTALLATION**

Drilling and Casing Installation: A Comacchio MC 8D track mounted air-rotary drill rig with a 5.75-inch air hammer bit was used to advance LMW-10R-D to a depth of 23.75-feet below top of slab (btos). 5-inch ID steel casing was installed to 23.75-feet btos, bentonite was placed from 3 to 23.75-feet btos followed by grout between 0-feet and 3-feet btos. Following casing installation, the borehole for LMW-10R-D was advanced with a 4-inch air hammer bit to a depth of 63.84-feet btos on 22 November 2023. Following drilling the borehole was flushed and capped until the Westbay System installation. All flushed water was containerized in a 55-gallon drum.

The Westbay System was installed with packers from 21.75-feet to 26.75-feet btos, 35.75-feet to 40.75-feet btos, and 45.75-feet to 50.75-feet btos, sampling ports at 30.75-feet, 40.75-feet, and 50.75-feet btos, and pumping ports at 35.75-feet and 45.75-feet btos on 8 February 2024.

In March 2025, the Westbay System was lowered to approximately 2-inches btos. The concrete slab was cored to expose the steel casing and outer steel sleeve, which were also lowered and welded together in May 2025. A flushmount and sanitary seal was then installed.

**SAMPLING INTERVAL PURGING**

Each sampling interval was purged by opening the associated pumping port and removing one interval-volume with a D-25 foot valve connected to 0.5-inch-tubing. All water purged was containerized in a 55-gallon drum.

| | | | | |
|---|---|---|---|---|
| **TYPE OF WELL CASING**<br>Steel | | **DIAMETER**<br>5-inch | **TYPE OF BACKFILL MATERIAL**<br>Grout and Bentonite | |
| **BOTTOM OF CASING** | **ELEVATION**<br>-9.00 | **DEPTH (ft)**<br>23.75 | **TYPE OF SEAL MATERIAL**<br>Bentonite, Welding | |
| **BOREHOLE DIAMETER**<br>4-inch | | | **TOP OF SEAL** | **ELEVATION**<br>11.75 **DEPTH (ft)**<br>3.00 |
| **BOTTOM OF WELL** | **ELEVATION**<br>-49.09 | **DEPTH (ft)**<br>63.84 | | |

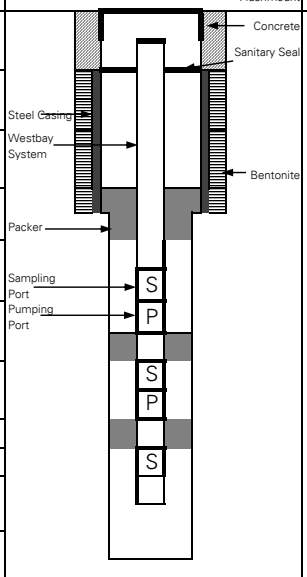
**WESTBAY SYSTEM**

| | | |
|---|---|---|
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -12 | 26.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -21 | 35.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -26 | 40.75 |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -31 | 45.75 |
| **TOP OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -- | -- |
| **BOTTOM OF SAMPLE INTERVAL** | **ELEVATION** | **DEPTH (ft)** |
| | -- | -- |

**WESTBAY PIEZOMETRIC LEVELS**

| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
|---|---|---|
| 30.75 | 2/8/2023 | -9.18 |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| 40.75 | 2/8/2023 | -9.10 |
| **SAMPLING PORT DEPTH** | **DATE** | **PIEZOMETRIC LEVEL** |
| | -- | -- |

**WELL DETAILS**




| **SUMMARY SOIL CLASSIFICATION** | **DEPTH (FT) bgs** |
|---|---|
| Bedrock | 3.00 |
| | 21.75 |
| | 23.75 |
| | 26.75 |
| | 30.75 |
| | 35.75 |
| | 40.75 |
| | 45.75 |
| | 50.75 |
| | 55.75 |
| | 63.84 |

**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**
300 Kimball Drive, Parsippany, New Jersey 07054

# Westbay Completion Report

Westbay Monitoring Wells: LMW-6R-S, LMW-6R-D, LMW-7R-S, LMW-7R-D, LMW-8R-S, LMW-8R-D, LMW-9R-S, LMW-9R-D, LMW-10R-S, LMW-10R-D

**1487 1st Ave.**
New York, NY
February 2024

Prepared for:

Langan
300 Kimball Dr.
Parsippany, NJ 07054

Prepared by:

Earth Data Northeast, Inc.
Whiteland Technology Center
924 Springdale Drive
Exton, PA 19341

# Contents

1. Introduction ..... 5

2. Previous Site Activities ..... 5

3. Installation ..... 6

3.1 Preparation of Monitoring Well Design ..... 6

3.2 Layout of Westbay Casing Components ..... 6

3.3 Lowering of Westbay Components ..... 6

3.4 Positioning of Westbay Components ..... 7

3.5 Hydraulic Integrity Testing ..... 7

3.6 Pre-inflation Profile ..... 10

3.7 Inflation of MP System Packers ..... 11

4. Fluid Pressure Measurements ..... 11

## Tables

Table 1: Summary of Westbay System Installations
Table 2: Integrity Test Result – LMW-6R-S
Table 3: Integrity Test Result – LMW-6R-D
Table 4: Integrity Test Result – LMW-7R-S
Table 5: Integrity Test Result – LMW-7R-D
Table 6: Integrity Test Result – LMW-8R-S
Table 7: Integrity Test Result – LMW-8R-D
Table 8: Integrity Test Result – LMW-9R-S
Table 9: Integrity Test Result – LMW-9R-D
Table 10: Integrity Test Result – LMW-10R-S
Table 11: Integrity Test Result – LMW-10R-D
Table 12: LMW-6R-S As-Built Packer and Port Summary (Appendix A)
Table 13: LMW-6R-D As-Built Packer and Port Summary (Appendix B)
Table 14: LMW-7R-S As-Built Packer and Port Summary (Appendix C)
Table 15: LMW-7R-D As-Built Packer and Port Summary (Appendix D)
Table 16: LMW-8R-S As-Built Packer and Port Summary (Appendix E)
Table 17: LMW-8R-D As-Built Packer and Port Summary (Appendix F)
Table 18: LMW-9R-S As-Built Packer and Port Summary (Appendix G)
Table 19: LMW-9R-D As-Built Packer and Port Summary (Appendix H)
Table 20: LMW-10R-S As-Built Packer and Port Summary (Appendix I)
Table 21: LMW-10R-D As-Built Packer and Port Summary (Appendix J)

## Figures

Figure 1: MOSDAX Transducer Position
Figure 2: Zone Dimensions and Packer Seals
Figure 3: LMW-6R-S Pre-Inflation Pressure Profile (Appendix A)
Figure 4: LMW-6R-S Post-Inflation Pressure Profile (Appendix A)
Figure 5: LMW-6R-D Pre-Inflation Pressure Profile (Appendix B)
Figure 6: LMW-6R-D Post-Inflation Pressure Profile (Appendix B)
Figure 7: LMW-7R-S Pre-Inflation Pressure Profile (Appendix C)
Figure 8: LMW-7R-S Post-Inflation Pressure Profile (Appendix C)
Figure 9: LMW-7R-D Pre-Inflation Pressure Profile (Appendix D)
Figure 10: LMW-7R-D Post-Inflation Pressure Profile (Appendix D)
Figure 11: LMW-8R-S Pre-Inflation Pressure Profile (Appendix E)
Figure 12: LMW-8R-S Post-Inflation Pressure Profile (Appendix E)
Figure 13: LMW-8R-D Pre-Inflation Pressure Profile (Appendix F)
Figure 14: LMW-8R-D Post-Inflation Pressure Profile (Appendix F)

Figure 15: LMW-9R-S Pre-Inflation Pressure Profile (Appendix G)
Figure 16: LMW-9R-S Post-Inflation Pressure Profile (Appendix G)
Figure 17: LMW-9R-D Pre-Inflation Pressure Profile (Appendix H)
Figure 18: LMW-9R-D Post-Inflation Pressure Profile (Appendix H)
Figure 19: LMW-10R-S Pre-Inflation Pressure Profile (Appendix I)
Figure 20: LMW-10R-S Post-Inflation Pressure Profile (Appendix I)
Figure 21: LMW-10R-D Pre-Inflation Pressure Profile (Appendix J)
Figure 22: LMW-10R-D Post-Inflation Pressure Profile (Appendix J)

## Appendices

Appendix A – LMW-6R-S
Appendix B – LMW-6R-D
Appendix C – LMW-7R-S
Appendix D – LMW-7R-D
Appendix E – LMW-8R-S
Appendix F – LMW-8R-D
Appendix G – LMW-9R-S
Appendix H – LMW-9R-D
Appendix I – LMW-10R-S
Appendix J – LMW-10R-D

# 1. Introduction

This report details the onsite technical services performed by Earth Data Northeast, Inc. (EDN) for Langan. Westbay System monitoring wells were installed in boreholes LMW-6R-S, LMW-6R-D, LMW-7R-S, LMW-7R-D, LMW-8R-S, LMW-8R-D, LMW-9R-S, LMW-9R-D, LMW-10R-S and LMW-10R-D at 1487 1st Ave., New York, NY.

EDN installation technician Mr. George Seidman was onsite to perform the installations from January 31, 2024 through February 8, 2024. The EDN technician was assisted onsite by Langan personnel. This report documents the installation tasks and related QA checks.

# 2. Previous Site Activities

The monitoring wells were completed as open bedrock boreholes, 4-inches in diameter. Surface casing was 5-inches in diameter an extended to various depths. Geophysical logging was performed in each of the boreholes prior to Westbay System installation.

**Table 1. Summary of Westbay System Installations**

| Well-ID | Installation Date | Borehole Depth | MP Casing Depth | No. Monitoring Zones |
|---|---|---|---|---|
| LMW-6R-S | February 2, 2024 | 32.0’ | 31.75’ | 1 |
| LMW-6R-D | February 2, 2024 | 60.0’ | 59.75’ | 3 |
| LMW-7R-S | February 5, 2024 | 32.0’ | 31.75’ | 2 |
| LMW-7R-D | February 1, 2024 | 63.0’ | 62.75’ | 2 |
| LMW-8R-S | February 1, 2024 | 30.0’ | 29.75’ | 2 |
| LMW-8R-D | February 5, 2024 | 65.0’ | 64.75’ | 2 |
| LMW-9R-S | February 6, 2024 | 28.0’ | 27.75’ | 1 |
| LMW-9R-D | February 6, 2024 | 64.0’ | 63.25’ | 3 |

| | | | | |
|---|---|---|---|---|
| LMW-10R-S | February 7, 2024 | 30.0’ | 29.75’ | 1 |
| LMW-10R-D | February 8, 2024 | 56.0’ | 55.75’ | 2 |

All depths are with respect to ground surface.

# 3. Installation

## 3.1 Preparation of Monitoring Well Design

Well designs were completed by EDN based on requested packer locations provided by Langan. Westbay casing installation logs were produced from the well design, and were reviewed and approved in the field by Langan. Copies of the well designs and installation logs are included in the Appendices.

All of the wells were completed with MP38 Westbay Systems. The monitoring intervals contained Model 0205 measurement port couplings, used to collect fluid pressures and groundwater samples. Each monitoring zone also contained a Model 0224 mechanical pumping port, which can be used for purging and hydraulic conductivity testing.

Langan declined to have optional synthetic filters installed over the measurement port couplings in each well.

## 3.2 Layout of Westbay Casing Components

Prior to the installation, the Westbay System casing components were laid out near the wellhead of the borehole in the order in which they were to be installed, as indicated on the approved installation log. Each casing component was numbered in order, beginning with the deepest components and continuing to the shallowest. Once numbered, each component received the proper Westbay System coupling as indicated on the installation log.

Magnetic Locating Collars were attached approximately 2.0 feet below the shallowest measurement port in each interval, where possible. Each casing component was visually inspected for any damage or defect prior to installation. Serial numbers for each Westbay packer and Westbay measurement port couplings were recorded on the Casing Installation Log. Each well component and attached coupling was confirmed with the log prior to being lowered into the well.

## 3.3 Lowering of Westbay Components

The open-hole water level of each borehole was above ground surface at the time of installation, allowing the Westbay Systems to be lowered by hand. As the components were joined, each

casing joint was tested with a minimum internal hydraulic pressure of 150 psi for 1 minute to confirm hydraulic seals. Check marks on the casing installation log provide a record of the joint testing.

Clean water was added to the Westbay casing when necessary to compensate for buoyancy effects during lowering. All data presented in this report is based on the final, as-built position of the Westbay components

### 3.4 Positioning of Westbay Components

After the components were lowered in to the well, the Westbay casing string was positioned as shown on the Summary Casing Logs. The Westbay casing string was supported in this position while packer inflation was carried out.

The positioning of the Westbay casing components is based on the "nominal" lengths of Westbay casing components. The positioning calculations do not include allowances for borehole temperature or deviation effects, which are site dependant. The attached figure titled "MOSDAX Transducer Position" provides information to correlate the position of MOSDAX Transducer sensors to the reference position at the top of the Measurement Port. The attached figure titled "Dimensions of Packer Seals and Monitoring Zones" outlines the calculations used to determine the packer centerline depths and zone lengths.

### 3.5 Hydraulic Integrity Testing

After the Westbay casing was lowered into in the borehole and prior to packer inflation, the water pressure inside the Westbay casing was monitored to confirm the hydraulic integrity of the casing. The water pressure inside the casing was monitored for a period of 30 minutes and observed for changes. In each of the wells the groundwater elevation was above the ground surface, so any leaks would result in an increasing water pressure inside the Westbay casing. The integrity tests indicated that the Westbay Systems were water tight prior to packer inflation. The results of the tests can be seen in Tables 2-11.

**Table 2. Integrity Test Results-LMW-6R-S**

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-6R-S | 14:25 | 24.89 |
| 2/2/24 | 14:35 | 24.88 |
| Borehole Depth to Water AGS | 14:45 | 24.89 |
| | 14:55 | 24.88 |

**Table 3. Integrity Test Results-LMW-6R-D**

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-6R-D | 9:57 | 34.17 |
| 2/2/24 | 10:07 | 34.16 |
| Borehole Depth to Water AGS | 10:17 | 34.16 |
| | 10:27 | 34.16 |

**Table 4. Integrity Test Results-LMW-7R-S**

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-7R-S | 10:29 | 25.03 |
| 2/5/24 | 10:39 | 25.02 |
| Borehole Depth to Water AGS | 10:49 | 25.03 |
| | 10:59 | 25.02 |

**Table 5. Integrity Test Results-LMW-7R-D**

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-7R-D | 15:39 | 32.07 |
| 2/1/24 | 15:49 | 32.08 |
| Borehole Depth to Water AGS | 15:59 | 32.07 |
| | 16:09 | 32.06 |

## Table 6. Integrity Test Results-LMW-8R-S

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-8R-S | 9:46 | 18.84 |
| 2/1/24 | 9:56 | 18.84 |
| Borehole Depth to Water AGS | 10:06 | 18.84 |
| | 10:16 | 18.83 |

## Table 7. Integrity Test Results-LMW-8R-D

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-8R-D | 15:01 | 31.80 |
| 2/5/24 | 15:11 | 31.79 |
| Borehole Depth to Water AGS | 15:21 | 31.78 |
| | 15:31 | 31.78 |

## Table 8. Integrity Test Results-LMW-9R-S

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-9R-S | 14:27 | 22.77 |
| 2/6/24 | 14:37 | 22.77 |
| Borehole Depth to Water AGS | 14:47 | 22.77 |
| | 14:57 | 22.77 |

**Table 9. Integrity Test Results-LMW-9R-D**

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-9R-D | 10:24 | 31.66 |
| 2/6/24 | 10:34 | 31.65 |
| Borehole Depth to Water AGS | 10:44 | 31.65 |
| | 10:54 | 31.65 |

**Table 10. Integrity Test Results-LMW-10R-S**

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-10R-S | 9:07 | 26.69 |
| 2/7/24 | 9:17 | 26.67 |
| Borehole Depth to Water AGS | 9:27 | 26.67 |
| | 9:37 | 26.67 |

**Table 11. Integrity Test Results-LMW-10R-D**

| Borehole | Time | Water Pressure (psi) Inside Westbay Casing |
|---|---|---|
| LMW-10R-D | 10:16 | 31.91 |
| 2/8/24 | 10:26 | 31.89 |
| Borehole Depth to Water AGS | 10:36 | 31.90 |
| | 10:46 | 31.90 |

### 3.6 Pre-inflation Profile

Prior to inflating the packers in each well, a pressure profile was performed. The goal of the pressure profile was to confirm the proper operation and location of the measurement ports and magnetic collars. A plot of the Pre-Inflation Piezometric levels in all zones in the wells is shown

on Figures 3, 5, 7, 9, 11, 13, 15, 17, 19 and 21 in the Appendices along with the field profile forms.

### 3.7 Inflation of MP System Packers

The Westbay packers were inflated sequentially beginning at the bottom of the well using clean water either brought to the Site by EDN or provided by Langan. Westbay model No. 6055 vented inflation tool was used for packer inflation. The data for inflation of each packer are provided on the Westbay Packer Inflation Records included in the Appendices.

## 4. Fluid Pressure Measurements

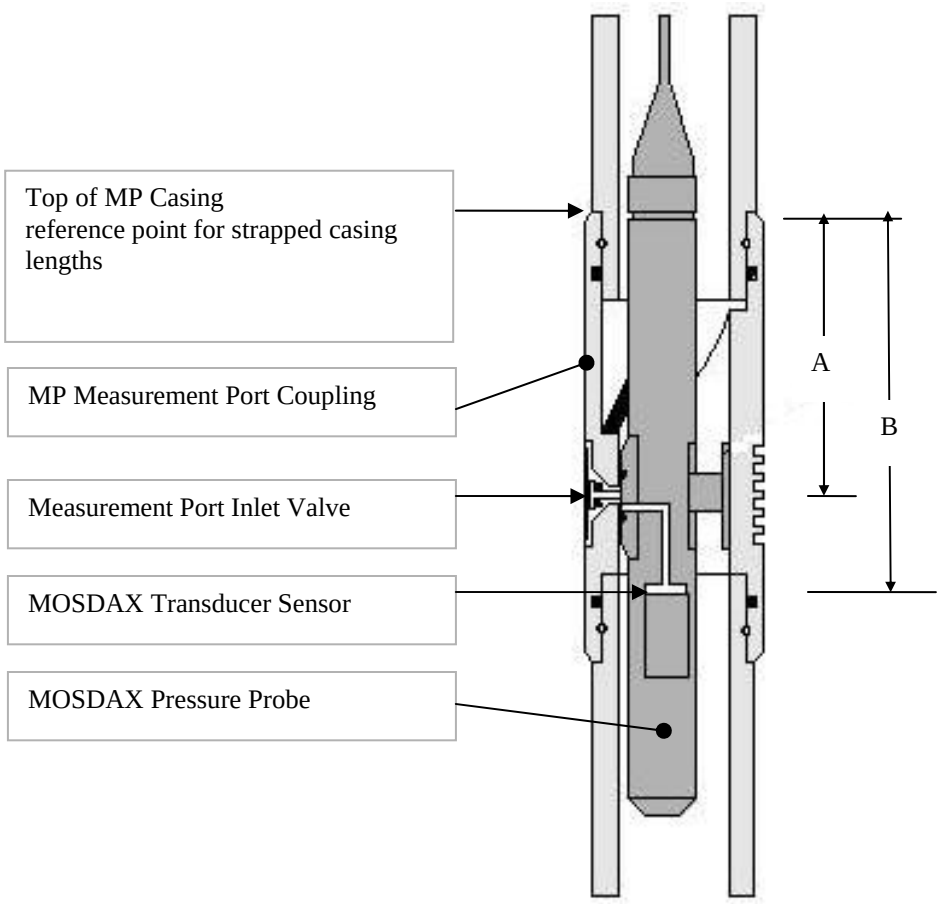
Following inflation of the packers, a post-inflation pressure profile was completed. At the time the measurements were taken, the isolated intervals may not have reached their final equilibrated fluid pressure levels. Longer term monitoring may be required to establish representative fluid pressures.

A plot of the Post –Inflation Piezometric levels is shown in Figure 4, 6, 8, 10, 12, 14, 16, 18, 20, and 22. The data was reviewed to confirm proper operation of the measurement ports and check the presence of the annulus seals between monitoring zones.

Figure 1

# MOSDAX Transducer Position

In an MP System Measurement Port Coupling



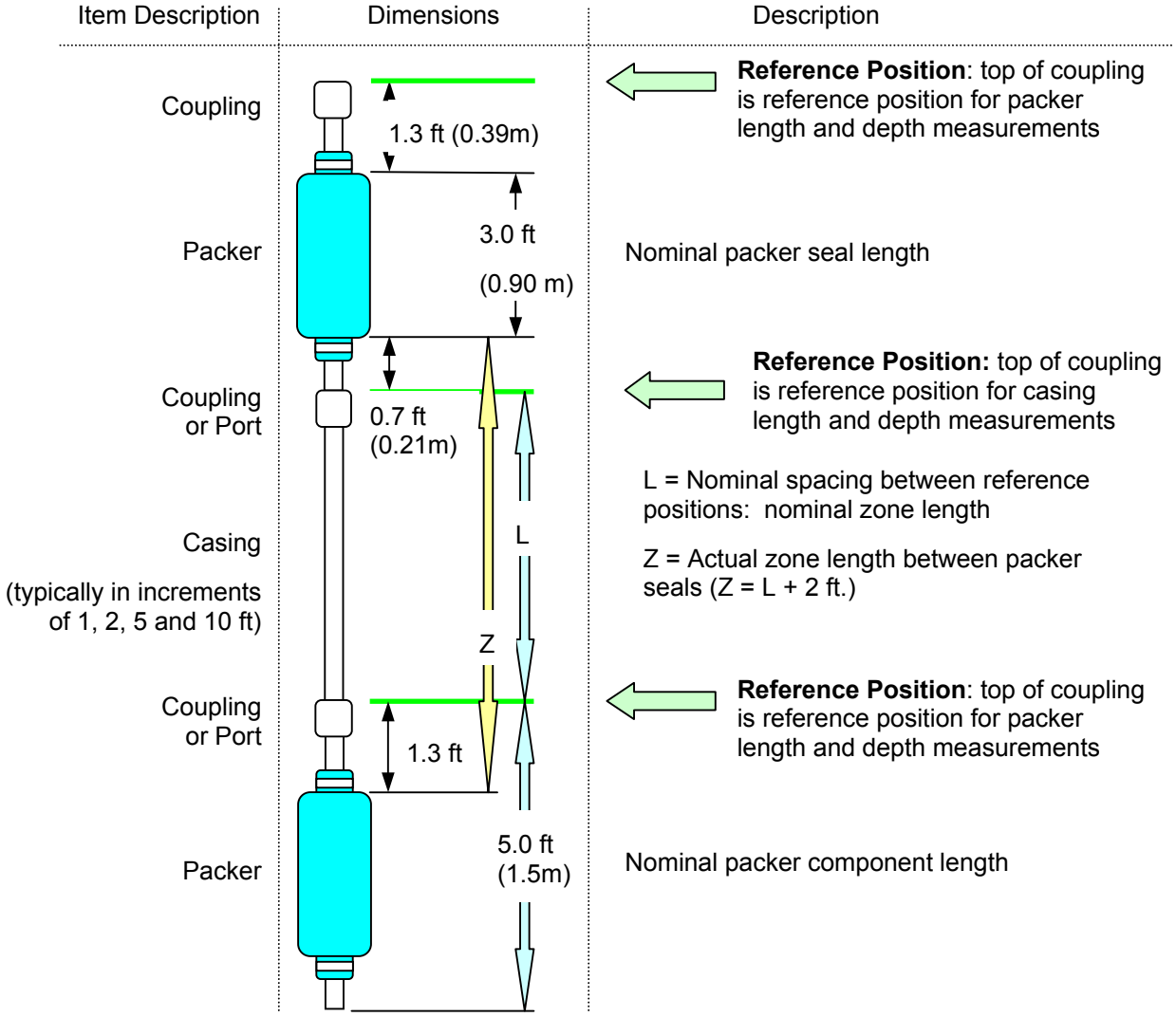

| System | Measurement Port Type | A | B |
|---|---|---|---|
| Plastic MP38 | 0222, 0205 | 4.5" (114.3 mm) | 6.5" (165.1 mm) |

Technical Note

Schlumberger WATER SERVICES

## Dimensions of Packer Seals and Monitoring Zones

## Westbay System – Plastic MP38




**Discussion Points:**

- The top of a coupling (Regular Coupling, Measurement Port or Pumping Port) is the reference point for describing nominal depths and nominal lengths. Actual positions of packer seals and zone lengths are determined with respect to the appropriate reference positions.
- Packer Position Example: A packer with a nominal depth of 50 ft (15.2m), will have a nominal packer seal position of 51.3 to 54.3 ft. (15.59 to 16.49m)
- Zone Length Example: A zone whose upper packer is at 50 ft (15.2m) and bottom packer is at 70 ft (21.3m) will have a nominal zone length of 15 ft (4.6m) and an actual zone length (between packer seals) of 15.0+1.3+0.7 = 17.0ft. (4.6 + 0.39 + 0.2 = 5.19m)
- Information on the position of Measurement Port Valve and MOSDAX Transducer sensor, used for detailed calculation of piezometric level measurements, are described separately.

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# APPENDIX A – LMW-6R-S


| | |
|---|---|
| As-Built Packer and Port Summary (Table 12) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 2, 2024) | - 1 Pages |
| Figure 3, Pre-Inflation Piezometric Pressure Profile | - 1 Page |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet ((February 2, 2024) | - 1 Pages |
| Figure 4, Post-Inflation Piezometric Pressure Profile | - 1 Page |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 3 Pages |

## Table 12. LMW-6R-S As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 3 | QA2 | 28.75 | 23.75 | 28.05 | 32.00 | |
| 2 | **Zone 1** | 18.75 | 13.75 | 18.05 | 25.05 | |
| 1 | QA1 | 8.75 | 3.75 | 8.05 | 15.05 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.
All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-6R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 31.91 ft.

Borehole Depth: 35.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-6R-S.WWD
Report Date: Tue Jan 30 17:03:43 2024

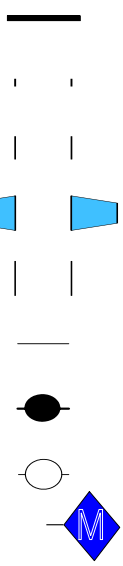
File Date: Jan 30 10:26:06 2024

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(2) 020101 - MP38 Casing 4 (1F/0.3M)

(2) 020103 - MP38 Casing 6 (3F/0.9M)

(3) 0238 - MP38 Packer - 74mm (5F/1.5M)

(2) 020105 - MP38 Casing 2 (5F/1.5M)

(5) 0202 - MP38 Regular Coupling

(3) 0205 - MP38 Measurement Port

(1) 0224 - MP38 Pumping Port

(1) 0216 - Magnetic Location Collar

## Geology

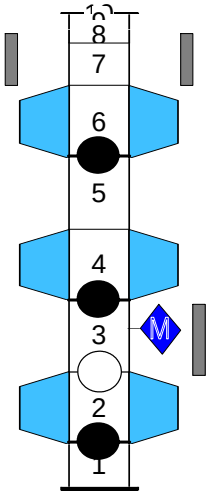
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-6R-S



# Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: LMW-CoR-S
Datum: GS
Elev. G.S.: –
Height of Westbay above G.S.: –
Elev. top of Westbay Casing: –
Reference Elevation: –
Boreholeangle: 90°

Probe Type: Sampler
Serial No.: 3555
Probe Range: 0-500
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/2/24
Client: Langan
Job No.: FS1419
Location: 1487 1st Ave
Weather: –
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.69 psi

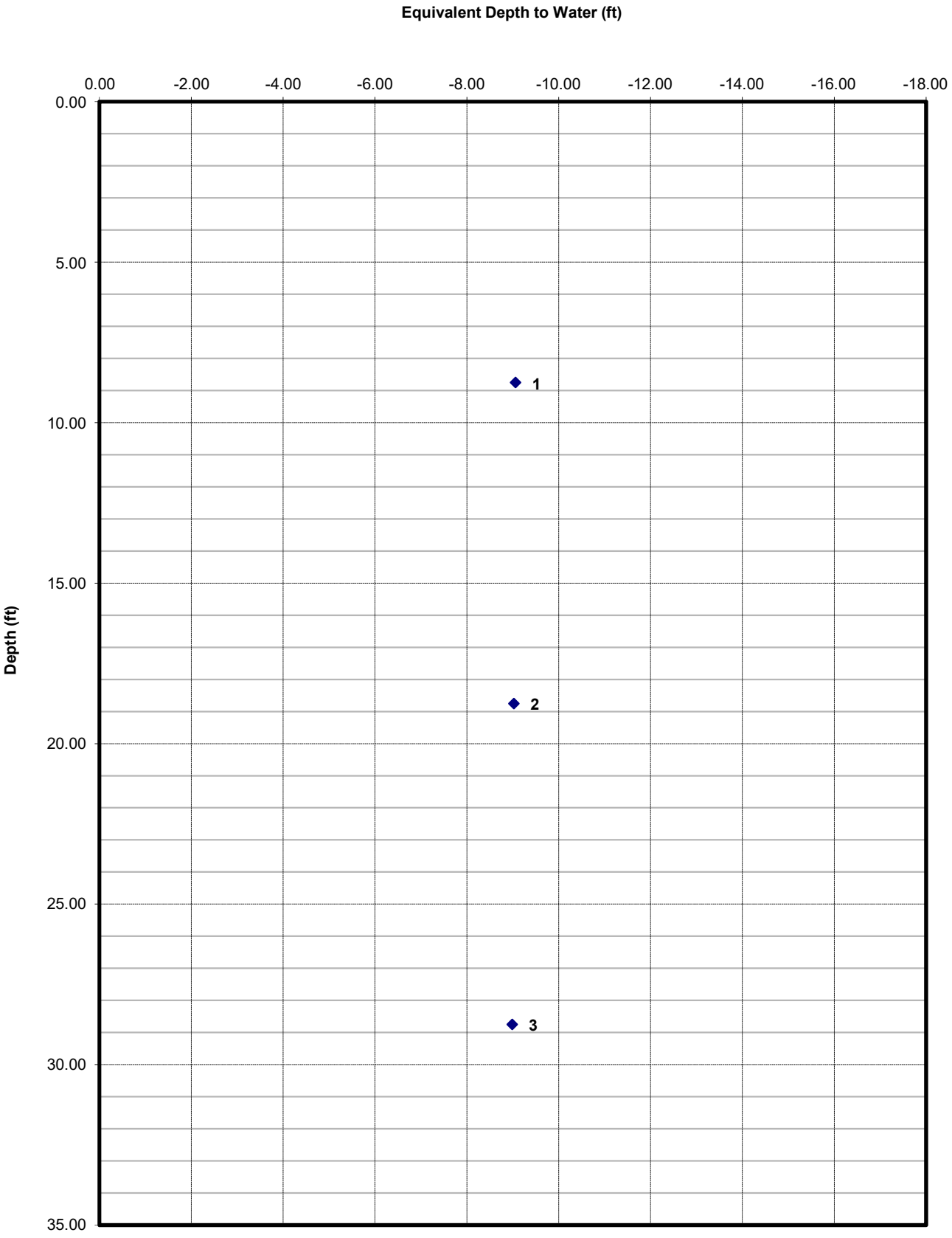
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | Start | Finish |
|---|---|---|
| Pressure | 14.69 | 14.67 |
| Temp | 6.67 | 16.50 |
| Time | 14:21 | 15:07 |

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 28.75 | 28.5 | – | 24.89 | 31.05 | 15:03 | 17.47 | 24.88 | 32.76 | -9.01 | Pro Tech |
| 2 | 18.75 | 18.6 | – | 20.54 | 26.73 | 15:05 | 17.47 | 20.54 | 27.77 | -9.02 | |
| 1 | 8.75 | 8.6 | – | 16.19 | 22.41 | 15:06 | 17.20 | 16.19 | 17.81 | -9.06 | |
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Notes: w = 0.4335 psi/ft (1.42psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 3**
**Well: LMW-6R-S**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Westbay Instruments

Well No.: CMW-6R-S
Datum: GS
Elev. G.S.: -
Height of Westbay above G.S.: -
Elev. top of Westbay Casing: -
Reference Elevation: -
Borehole angle: 90

Probe Type: Sampler
Serial No.: 3555
Probe Range: 0-520
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/5/24
Client: Langan
Job No.: FS1497
Location: 148 1st Ave
Weather: -
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.70 psi

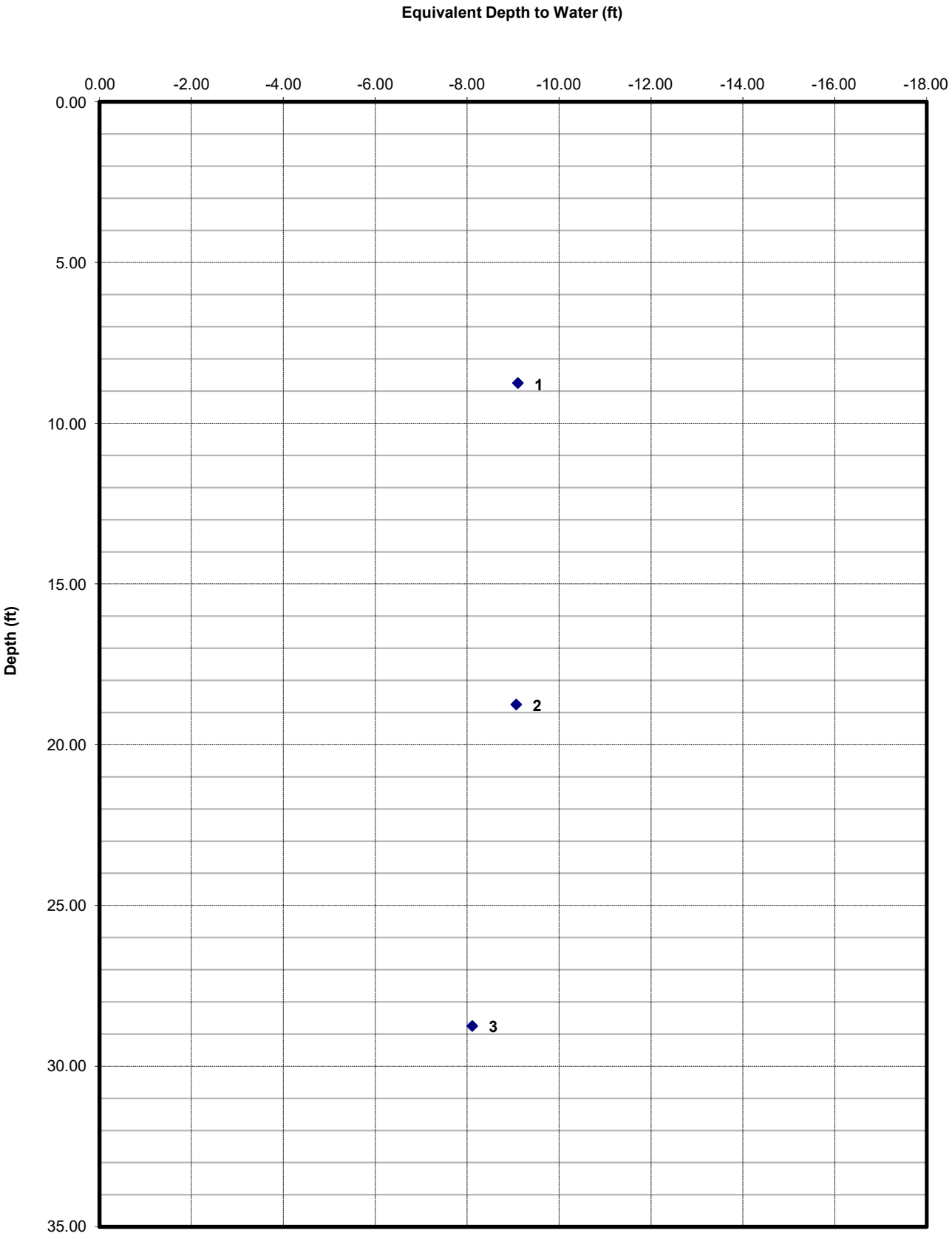
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | Start | Finish |
|---|---|---|
| Pressure | 14.76 | 14.69 |
| Temp | 41.7 | 13.59 |
| Time | 16:40 | 16:47 |

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings | | | | | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | | | |
| 3 | 28.75 | 29.0 | - | 30.15 | 30.68 | 16:43 | 12.01 | 30.16 | 26.86 | -8.11 | Psi mAbs |
| 2 | 18.75 | 19.0 | - | 25.82 | 24.76 | 16:45 | 12.87 | 25.82 | 27.82 | -9.07 | |
| 1 | 8.75 | 9.0 | - | 21.47 | 22.44 | 16:46 | 13.43 | 21.47 | 17.85 | -9.10 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 4**
**Well: LMW-6R-S**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-6R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 31.91 ft.

Borehole Depth: 35.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-6R-S.WWD
Report Date: Tue Jan 30 17:22:35 2024

File Date: Jan 30 17:05:16 2024

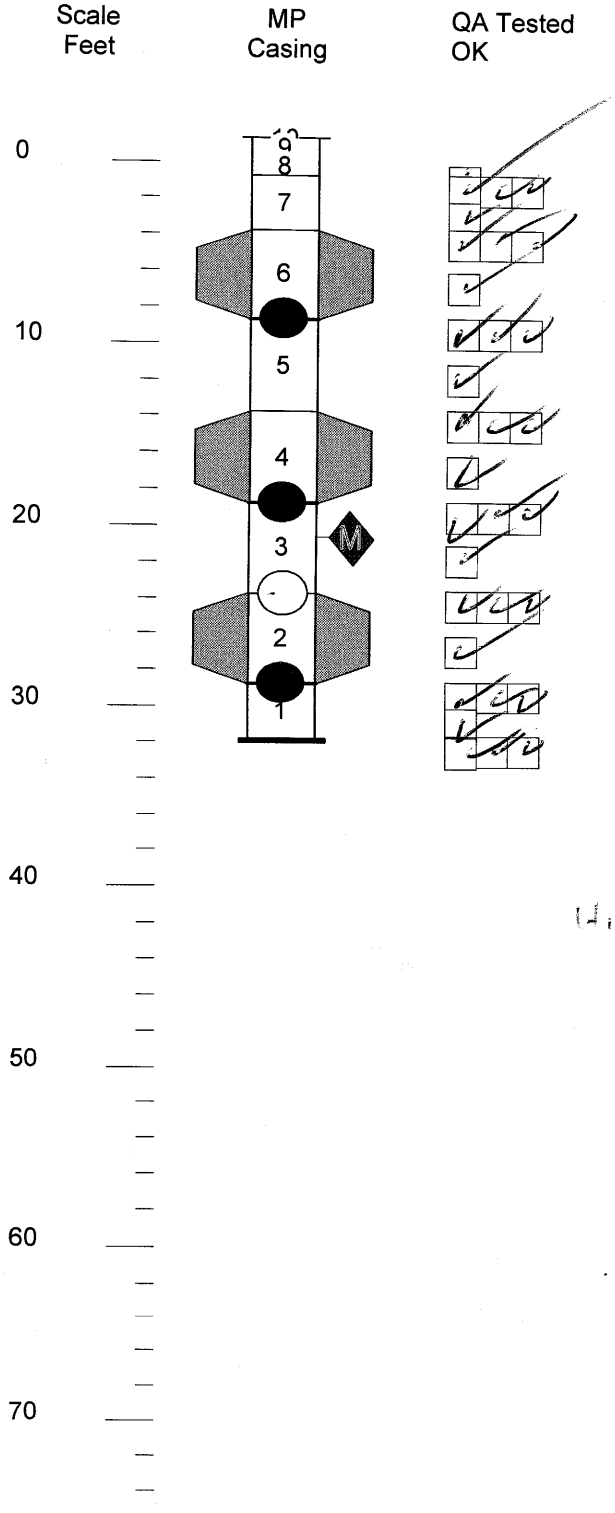
## Comments

## Log Information

| | | |
|---|---|---|
| *Borehole condition confirmed.* | *(method)* Logsh | Date: |
| MP well design & preparation. | By: | Date: 1/30/24 |
| MP well design checked. | By: | Date: 2/2/24 |
| MP well and borehole approved to install. | By: | Date: 2/2/24 |

# Well Designer Report
Langan

Job No:
Well: LMW-6R-S




MP Casing Description

020101 - MP38 Casing 4 (1F/0.3M)
020103 - MP38 Casing 6 (3F/0.9M)

0238 - MP38 Packer - 74mm (5F/1.5M 20071 170/145
0205 - MP38 Measurement Port 10287
020105 - MP38 Casing 2 (5F/1.5M)

0238 - MP38 Packer - 74mm (5F/1.5M 20170 170/145
0205 - MP38 Measurement Port 10289
020105 - MP38 Casing 2 (5F/1.5M)
0224 - MP38 Pumping Port 9240
0238 - MP38 Packer - 74mm (5F/1.5M ~~10285~~ 20171 170/145
0205 - MP38 Measurement Port 10285
020103 - MP38 Casing 6 (3F/0.9M)
0203 - MP38 End Cap

Unit bottom 31.30'
+ 0.4 ft above expected

Sheet 1 of 3

# Westbay Packer Inflation Record

Project: Langan - 1487 1st Ave  Project No.: FS1499  Well No.: LMW-6R-S

Location: 1487 1st Ave  Completed by: CJ  Date Inflated: 2/2/24

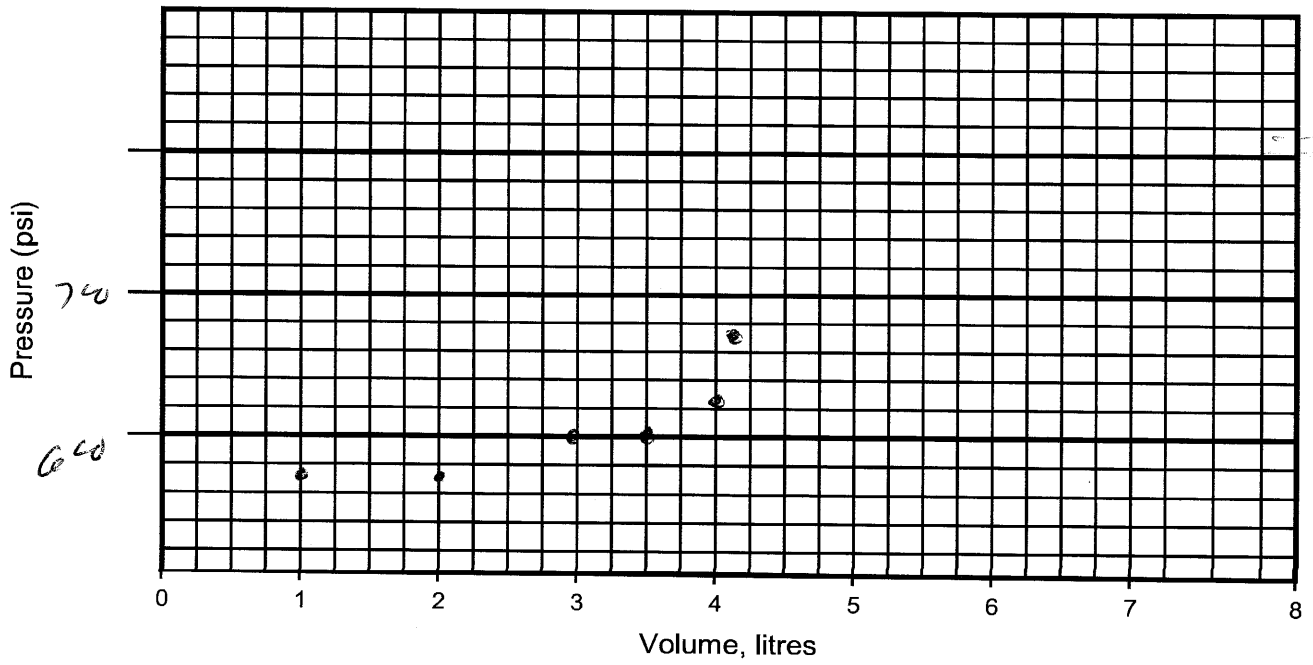
Packer No. 1 - 20171  Depth ( ft / m ): 23.75  Inflation Tool No.: TIW 3544

Packer Valve Pressure, $P_V$: 145 psi  Final Line Pressure, $P_L$: 675 psi  Tool Pressure, $P_T$: 400 psi

Borehole Water Level: - ( ft / m ) = ~ psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 120 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.10 | ~~4.10~~ | 4.10 | | |
| Pressure, psi | 575 | 575 | 600 | 600 | 625 | 675 | / | 0 | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 1  Time - 15:52

Sheet 2 of 3

# Westbay Packer Inflation Record

Project: Langan - 1487 1st Ave Project No.: FS1479 Well No.: LMW-6R-S

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/2/24

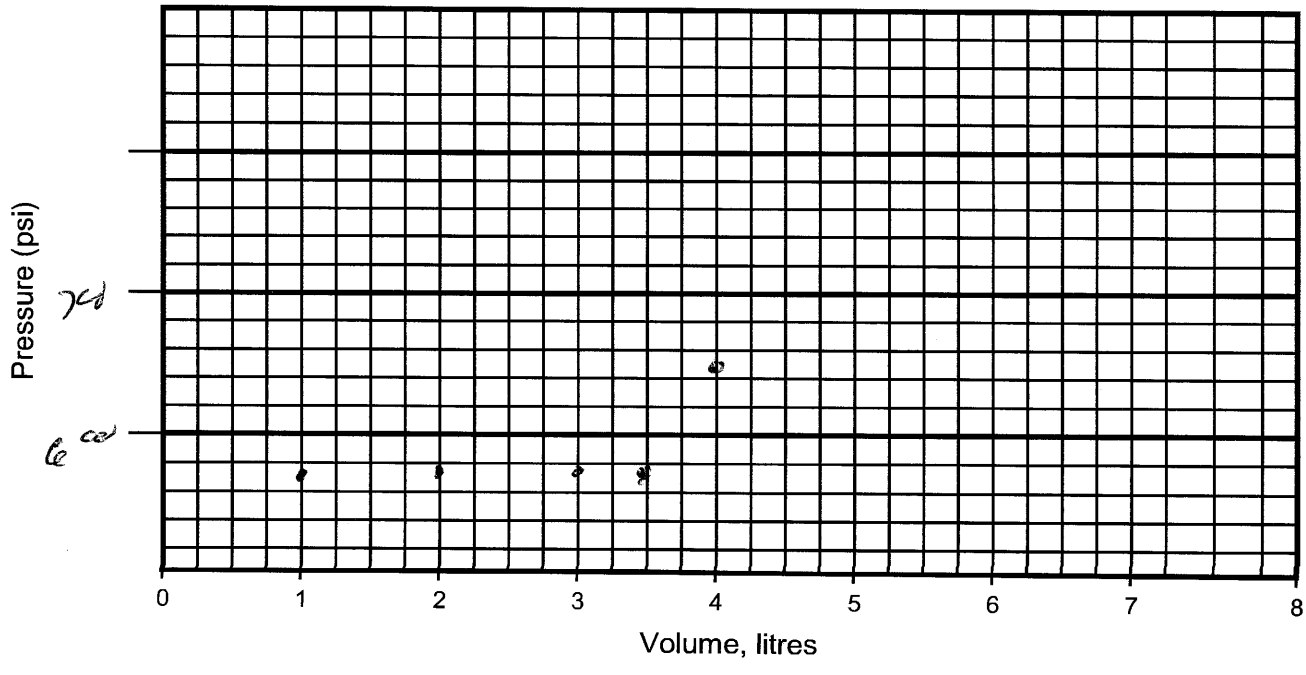
Packer No. 2 - 20170 Depth ( ft / m ): 13.75 Inflation Tool No.: TIW 3554

Packer Valve Pressure, $P_V$: 145 psi Final Line Pressure, $P_L$: 450 psi Tool Pressure, $P_T$: 460 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 105 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | / | 4.0 | | | |
| Pressure, psi | 575 | 575 | 575 | 575 | 610 | / | 0 | | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 2 Time - 14:06

Sheet 3 of 3

# Westbay Packer Inflation Record

Project: ~~1587~~ Langan - 1487 1st Ave  Project No.: F51499  Well No.: LMW-COR-5

Location: 1487 1st Ave  Completed by: CoS  Date Inflated: 2/2/24

Packer No. 3 - 20071  Depth ( ft / m ): 375  Inflation Tool No.: TIW 3594

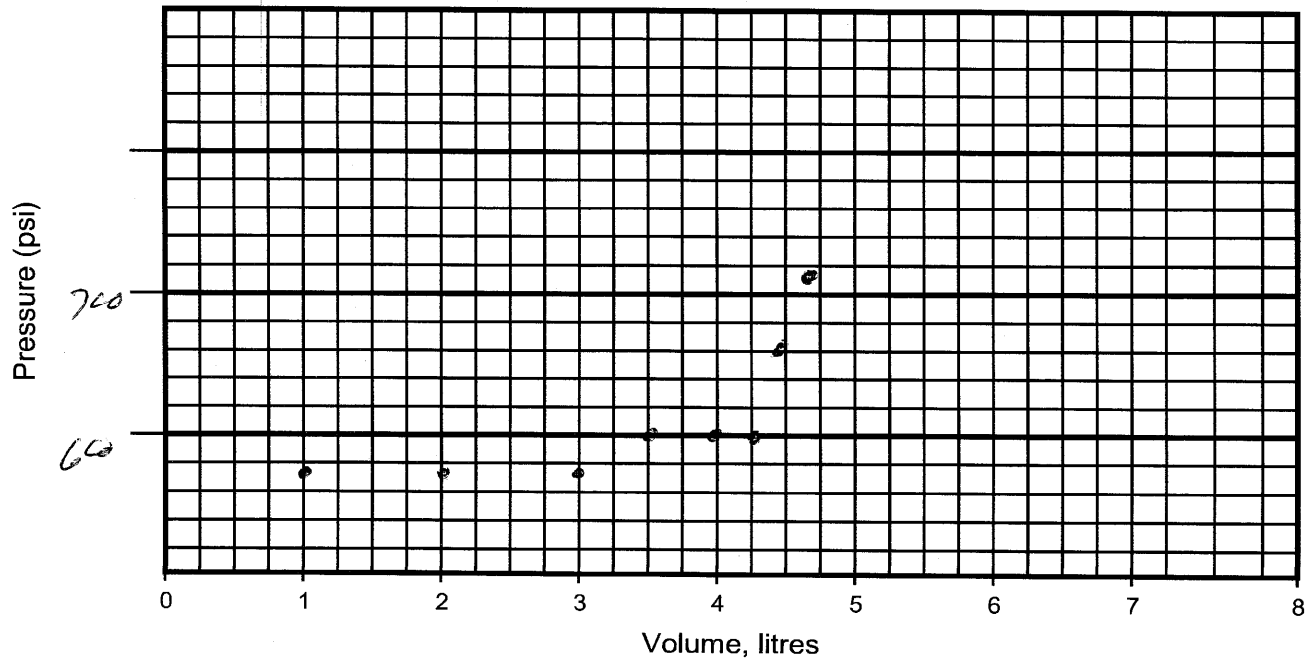
Packer Valve Pressure, $P_V$: 145 psi  Final Line Pressure, $P_L$: 660 psi  Tool Pressure, $P_T$: 460 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = ~~715~~ 165 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.25 | 4.50 | / | 4.40 | 4.55 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 575 | 575 | 575 | 660 | 660 | 660 | 660 | / | ¢ | 760 |
| Volume, litres | 4.60 | / | 4.60 | | | | | | | |
| Pressure, psi | 710 | / | 0 | | | | | | | |

Add pressure 2/5/24




Comments: Packer # 3  Time - 16:20

# APPENDIX B – LMW-6R-D


| | |
|---|---|
| As-Built Packer and Port Summary (Table 13) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 2, 2024) | - 1 Pages |
| Figure 5, Pre-Inflation Piezometric Pressure Profile | - 1 Page |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet February 2, 2024) | - 1 Pages |
| Figure 6, Post-Inflation Piezometric Pressure Profile | - 1 Page |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 4 Pages |

## Table 13. LMW-6R-D As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 4 | **Zone 3** | 54.75 | 47.75 | 52.05 | 60.00 | |
| 3 | **Zone 2** | 42.75 | 37.75 | 42.05 | 49.05 | |
| 2 | **Zone 1** | 32.75 | 27.75 | 32.05 | 39.05 | |
| 1 | QA1 | 23.75 | 18.75 | 23.05 | 29.05 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.

All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-6R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 59.91 ft.

Borehole Depth: 59.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-6R-D.WWD
Report Date: Tue Jan 30 11:18:13 2024

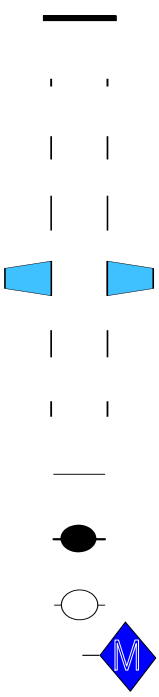
File Date: Sep 18 14:50:00 2023

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(2) 020101 - MP38 Casing 4 (1F/0.3M)

(1) 020103 - MP38 Casing 6 (3F/0.9M)

(6) 020105 - MP38 Casing 2 (5F/1.5M)

(4) 0238 - MP38 Packer - 74mm (5F/1.5M)

(1) 020104 - MP38 Casing 5 (4F/1.2M)

(1) 020102 - MP38 Casing 3 (2F/0.6M)

(8) 0202 - MP38 Regular Coupling

(4) 0205 - MP38 Measurement Port

(3) 0224 - MP38 Pumping Port

(3) 0216 - Magnetic Location Collar

## Geology

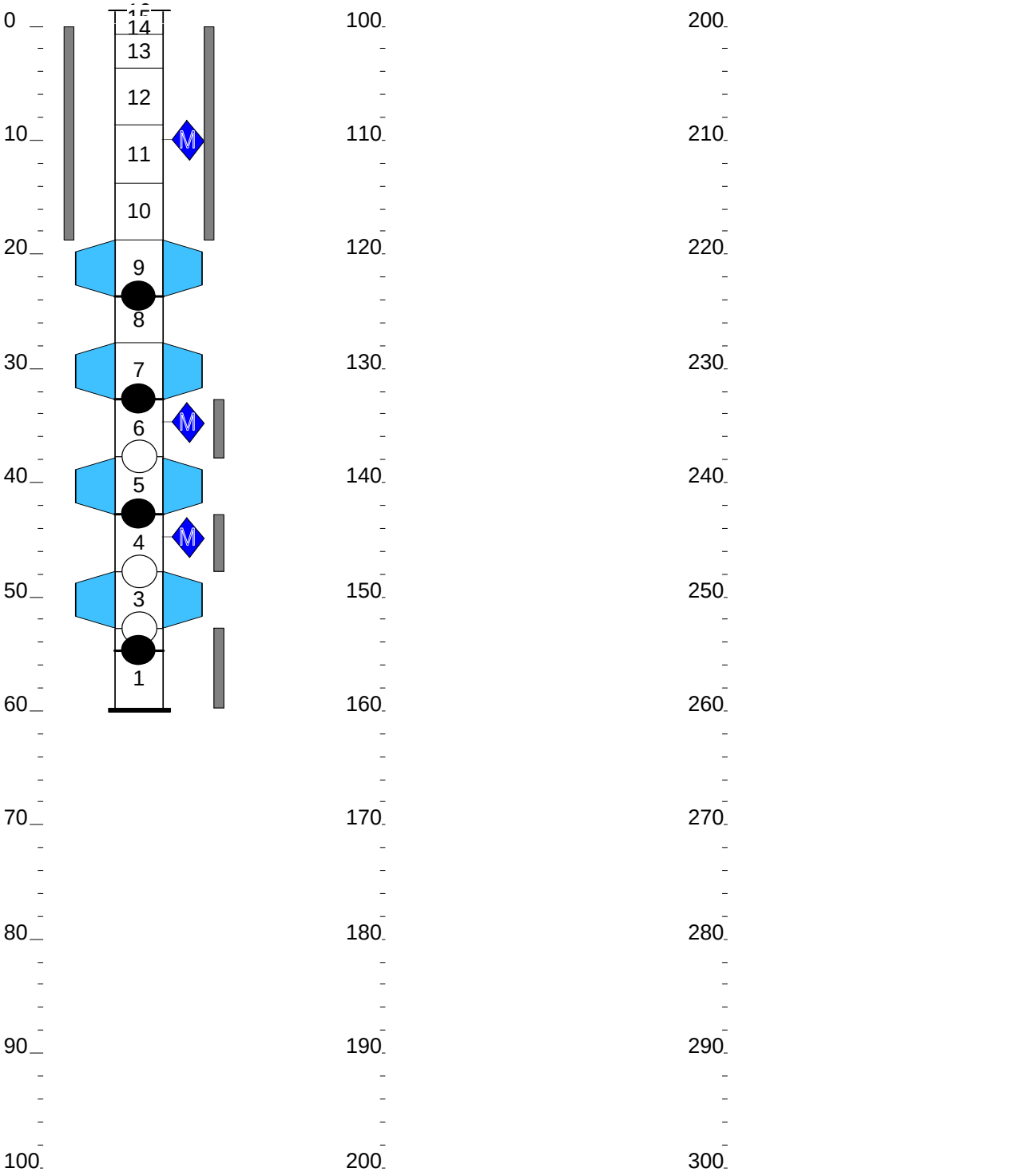
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-6R-D



# Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: LMW-6R-D
Datum: GS
Elev. G.S.: —
Height of Westbay above G.S.: —
Elev. top of Westbay Casing: —
Reference Elevation: —
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3555
Probe Range: 0-50
Westbay Casing Type: MP38
Sampler Valve Position: CLOSED

Date: 2/2/24
Client: Langan
Job No.: F3947.5
Location: 1487 1st Ave
Weather: —
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.65 psi

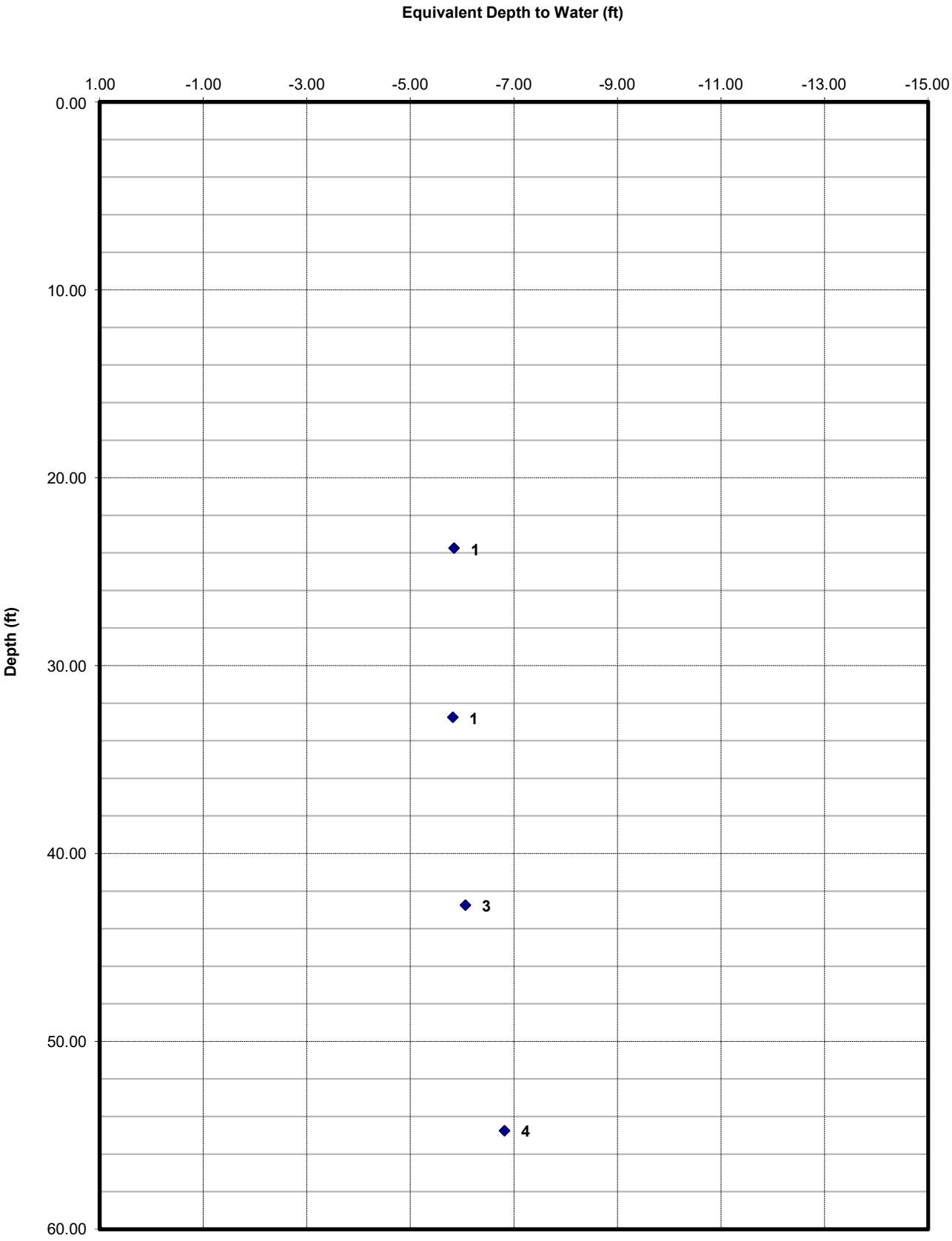
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | | Start: | Finish: |
|---|---|---|---|
| Pressure | | 14.65 | 14.66 |
| Temp | | 6.49 | 16.55 |
| Time | | 9:53 | 10:35 |

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 54.75 | 54.80 | — | 34.16 | 41.34 | 10:29 | 16.03 | 34.15 | 61.57 | 6.82 | Pre Inflate |
| 3 | 42.75 | 42.98 | — | 28.97 | 35.81 | 10:31 | 16.07 | 28.57 | 48.81 | 6.06 | |
| 2 | 32.75 | 32.90 | — | 24.64 | 31.37 | 10:32 | 16.03 | 24.64 | 38.57 | 5.81 | |
| 1 | 23.75 | 24.0 | — | 20.73 | 27.48 | 10:34 | 16.44 | 20.73 | 29.60 | 5.84 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 5**
**Well: LMW-6R-D**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Well No.: LMW-6R-1D
Datum: GS
Elev. G.S.: —
Height of Westbay above G.S.: —
Elev. top of Westbay Casing: —
Reference Elevation: —
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3355
Probe Range: 0-500
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/2/24
Client: Hargan
Job No.: FS1455
Location: 1487 1st Ave
Weather: —
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.68 psi

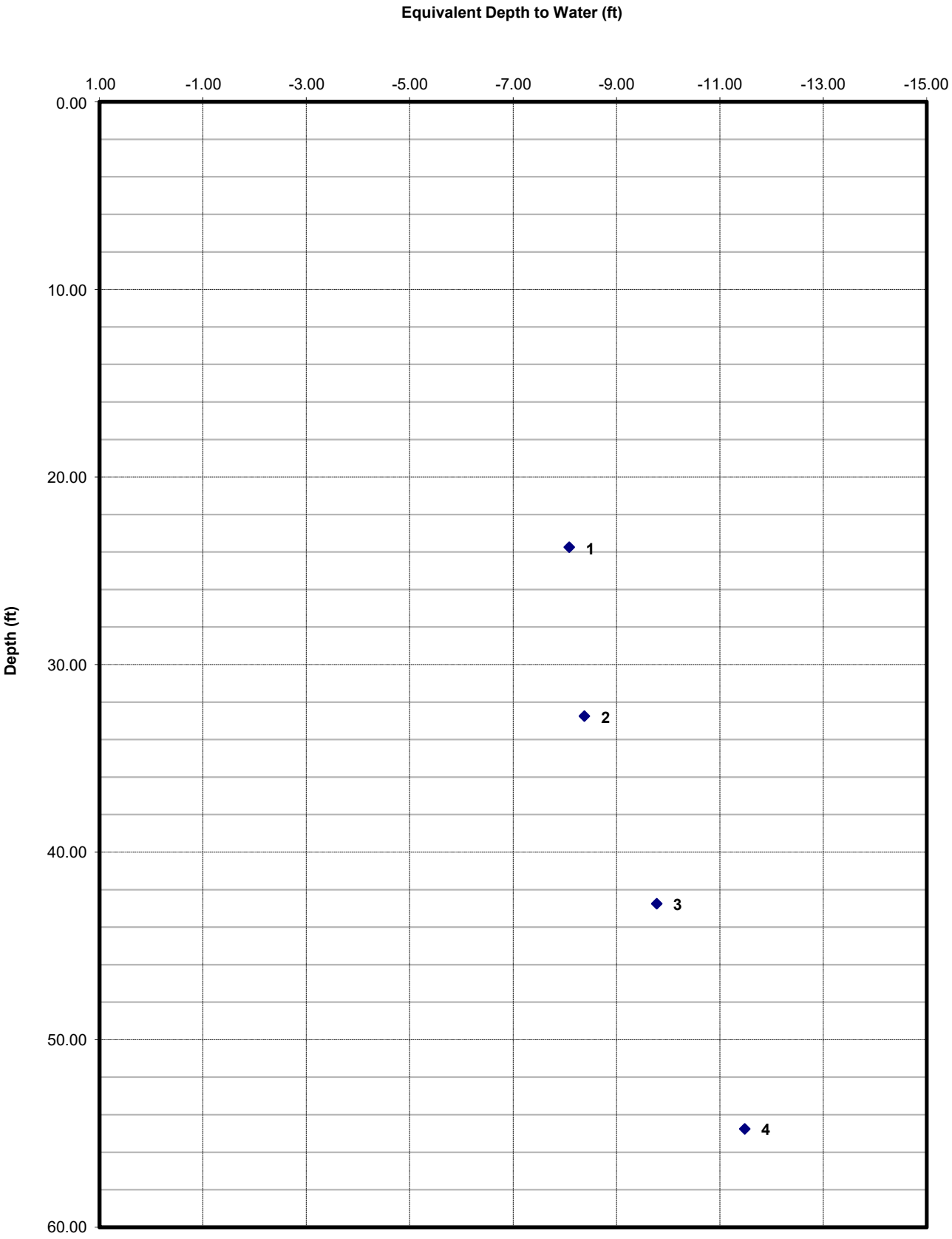
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | | | |
|---|---|---|---|
| Start: Pressure | 14.68 | Finish: | 14.69 |
| Temp | 11.30 | | 11.88 |
| Time | 12:08 | | 12:17 |

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings | | | | | Pressure Head Outside Port (ft) | Piez. Level Outside Port (ft) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | H = (P2-Patm)/w | Dz = Dp - H | |
| 4 | 54.75 | 54.5 | — | 41.22 | 43.39 | 12:11 | 12.46 | 41.22 | 46.23 | -11.48 | Post mlkh |
| 3 | 42.75 | 42.5 | — | 36.01 | 37.45 | 12:13 | 13.32 | 36.01 | 52.53 | -9.78 | |
| 2 | 32.75 | 32.6 | — | 31.68 | 32.51 | 12:14 | 13.96 | 31.69 | 41.13 | -8.38 | |
| 1 | 23.75 | 23.6 | — | 27.78 | 28.48 | 12:16 | 14.60 | 27.77 | 31.83 | -8.08 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 6**
**Well: LMW-6R-D**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-6R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 59.91 ft.

Borehole Depth: 59.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-6R-D.WWD
Report Date: Tue Jan 30 17:29:14 2024

File Date: Jan 30 11:22:20 2024

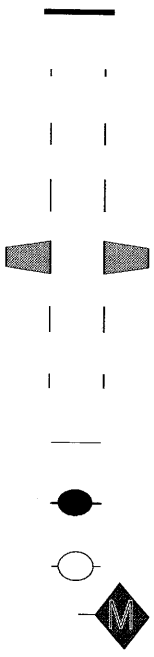
## Comments

## Log Information

Borehole condition confirmed. (method) Logging Date:
MP well design & preparation. By: [signature] Date: 1/30/24
MP well design checked. By: [signature] Date: 2/2/24
MP well and borehole approved to install. By: [signature] Date: 2/2/24

# Legend

## (Qty) MP Components
(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(2) 020101 - MP38 Casing 4 (1F/0.3M)

(1) 020103 - MP38 Casing 6 (3F/0.9M)

(6) 020105 - MP38 Casing 2 (5F/1.5M)

(4) 0238 - MP38 Packer - 74mm (5F/1.5M)

(1) 020104 - MP38 Casing 5 (4F/1.2M)

(1) 020102 - MP38 Casing 3 (2F/0.6M)

(8) 0202 - MP38 Regular Coupling

(4) 0205 - MP38 Measurement Port

(3) 0224 - MP38 Pumping Port

(3) 0216 - Magnetic Location Collar

## Geology

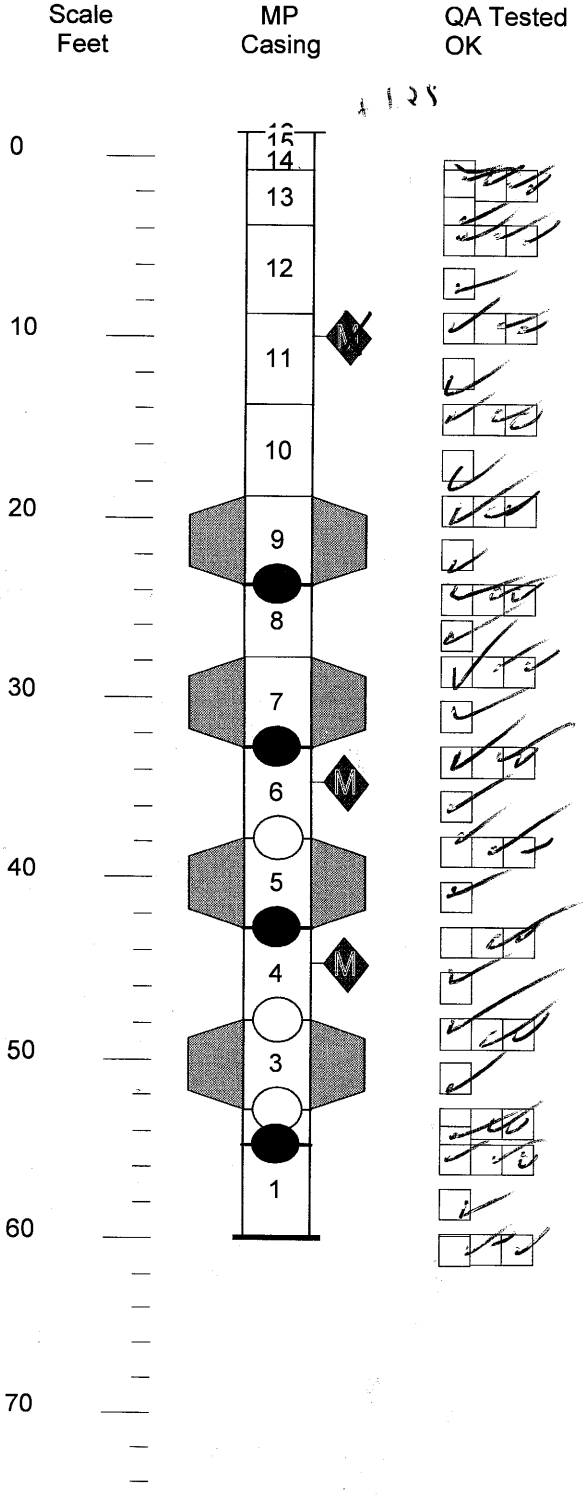
## Backfill/Casing

Mild Steel

(c) Westbay Instruments Inc. 2000

# Well Designer Report
Langan

Job No:
Well: LMW-6R-D




MP Casing Description

020101 - MP38 Casing 4 (1F/0.3M)
020103 - MP38 Casing 6 (3F/0.9M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
0238 - MP38 Packer - 74mm (5F/1.5M 20140 165/140
0205 - MP38 Measurement Port 10274
020104 - MP38 Casing 5 (4F/1.2M)
0238 - MP38 Packer - 74mm (5F/1.5M 20159 170/145
0205 - MP38 Measurement Port 10273
020105 - MP38 Casing 2 (5F/1.5M)
0224 - MP38 Pumping Port 9360
0238 - MP38 Packer - 74mm (5F/1.5M 20158 165/140
0205 - MP38 Measurement Port 10295
020105 - MP38 Casing 2 (5F/1.5M)
0224 - MP38 Pumping Port 9297
0238 - MP38 Packer - 74mm (5F/1.5M 20172 165/140
0224 - MP38 Pumping Port 9299
020102 - MP38 Casing 3 (2F/0.6M)
0205 - MP38 Measurement Port 10273
020105 - MP38 Casing 2 (5F/1.5M)
0203 - MP38 End Cap

(c) Westbay Instruments Inc. 2000

Tue Jan 30 17:30:12 2024

Sheet 1 of 1

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave Project No.: FS1499 Well No.: LMW-CO7-D

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/2/24

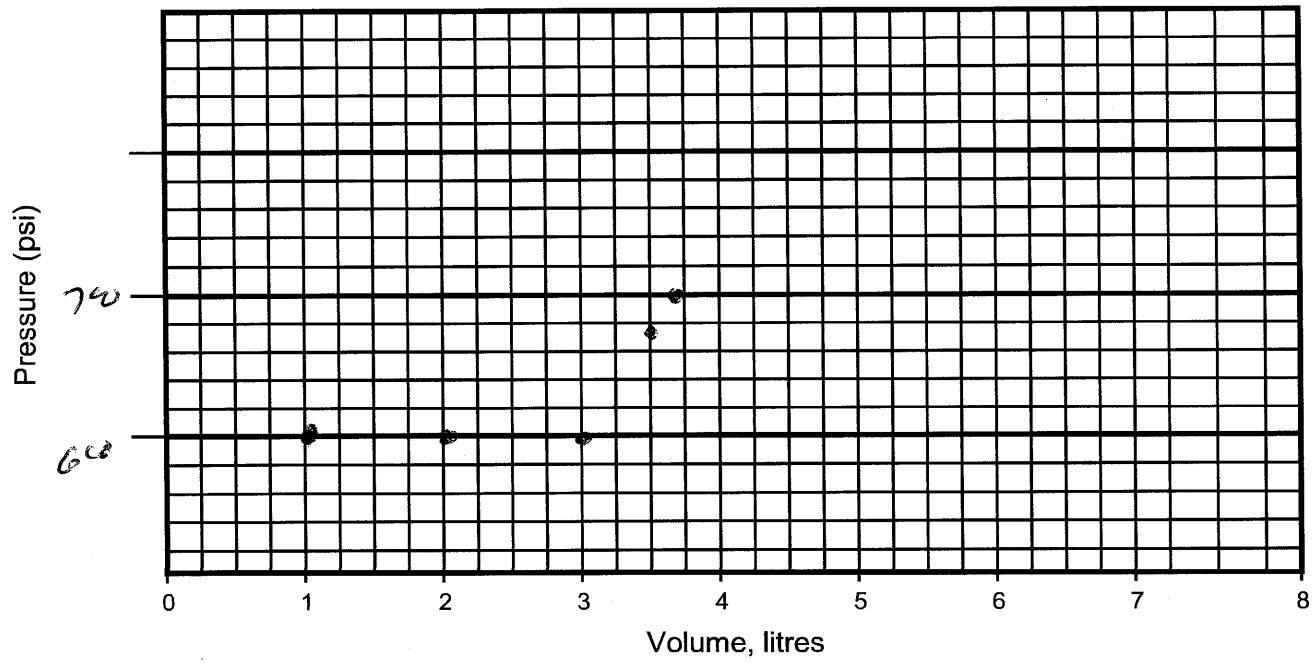
Packer No. 1 - 20172 Depth ( ft / m ): 47.85 Inflation Tool No.: TIV 3994

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 720 psi Tool Pressure, $P_T$: 425 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 135 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 3.65 | / | 3.45 | | | |
| Pressure, psi | 600 | 600 | 640 | 675 | 740 | / | 0 | | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 1 Time - 10:42

# Westbay Packer Inflation Record

Project: Langan - 1487 1st Ave Project No.: F5149.91 Well No.: LMW-CBR-D

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/2/24

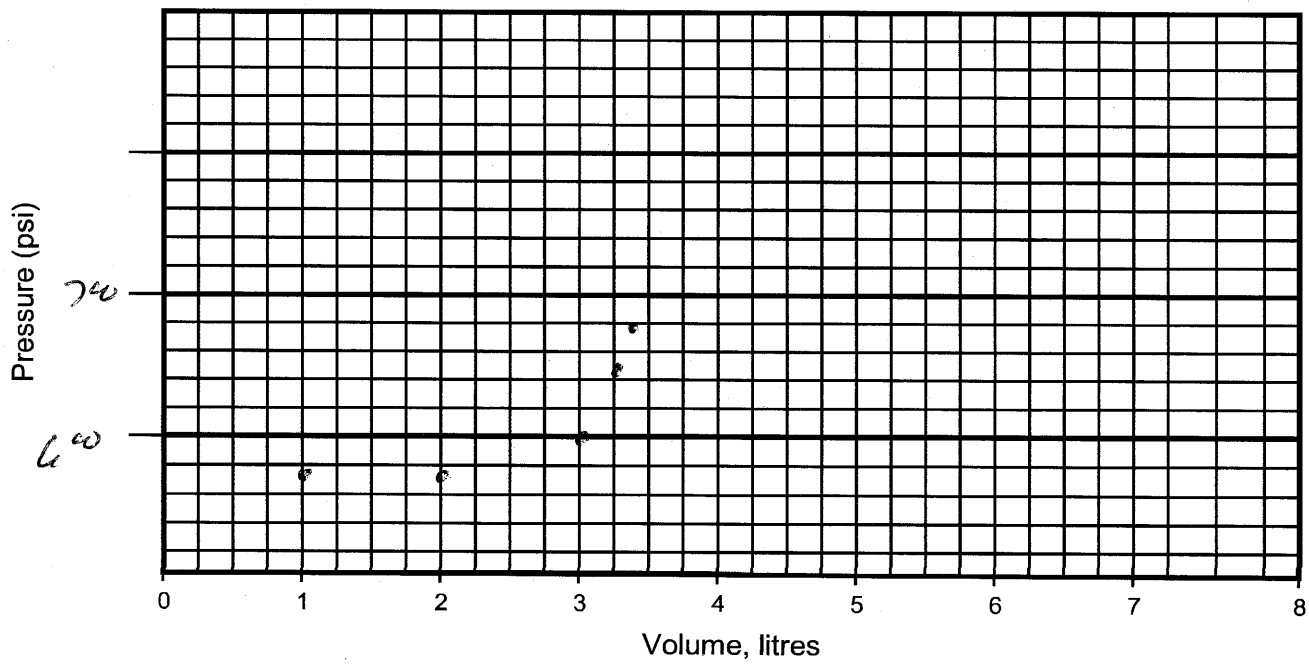
Packer No. 2 - 20158 Depth ( ft / m ): 37.75 Inflation Tool No.: TIW 3994

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 675 psi Tool Pressure, $P_T$: 425 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.25 ~~3.5~~ | 3.35 ~~4.0~~ | / | 3.55 | | | |
| Pressure, psi | 575 | 575 | 600 | 650 | 675 | / | 0 | | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 2 Time - 10:56

Sheet 3 of 4

# Westbay Packer Inflation Record

Project: Langan - 1487 1st Ave Project No.: FS1499 Well No.: LMW-CoR-1

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/2/24

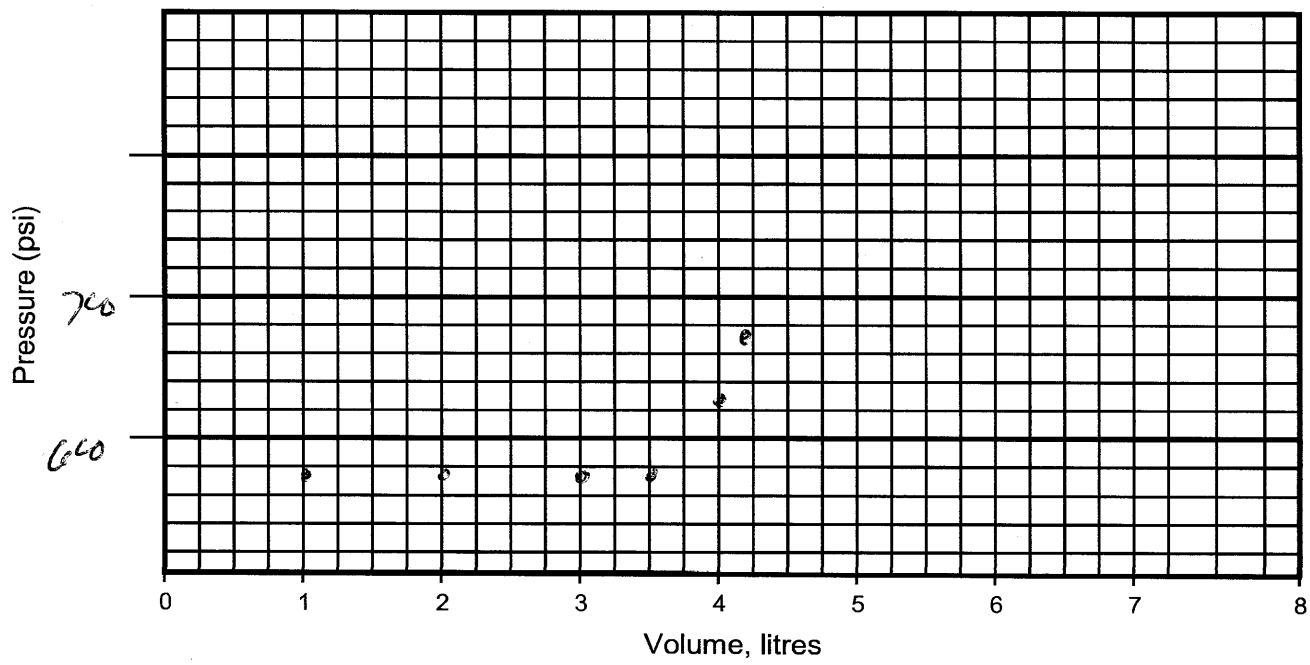
Packer No. 3-20159 Depth ( ft / m ): 2775 Inflation Tool No.: TW 3994

Packer Valve Pressure, $P_V$: 145 psi Final Line Pressure, $P_L$: 675 psi Tool Pressure, $P_T$: 425 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = ~~427~~ 105 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.20 | / | 4.20 | | |
| Pressure, psi | 575 | 575 | 575 | 575 | 625 | 675 | / | 0 | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 3 Time - 1127

Sheet 4 of 4

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave  Project No.: FS1499  Well No.: LMW-6A-D

Location: 1487 1st Ave  Completed by: CS  Date Inflated: 2/2/24

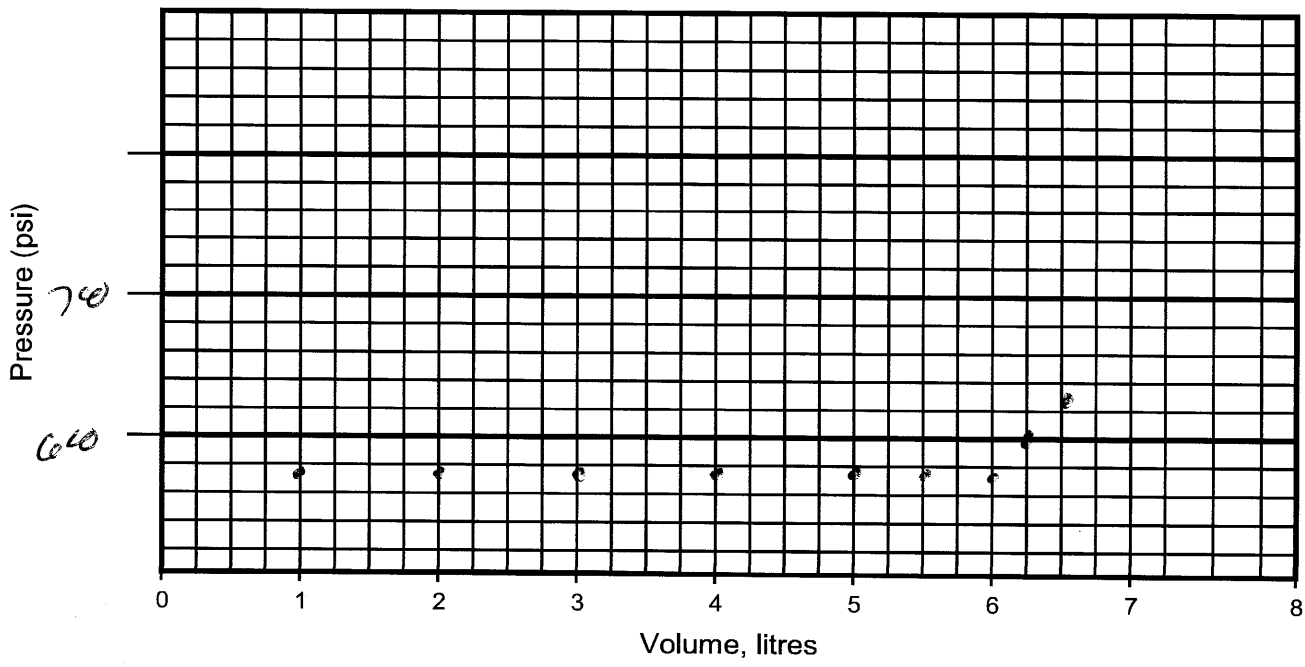
Packer No. 4 - 20160  Depth ( ft / m ): 18.75  Inflation Tool No.: TIW 3994

Packer Valve Pressure, $P_V$: 140 psi  Final Line Pressure, $P_L$: 625 psi  Tool Pressure, $P_T$: 425 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 5.5 | 6.0 | 6.25 | 6.50 | / |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 640 | 625 | / |
| Volume, litres | 6.5 | | | | | | | | | |
| Pressure, psi | 0 | | | | | | | | | |




Comments: Packer # 4  Time - 11:44

# APPENDIX C – LMW-7R-S


| | |
|---|---|
| As-Built Packer and Port Summary (Table 14) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 5, 2024) | - 1 Pages |
| Figure 7, Pre-Inflation Piezometric Pressure Profile | - 1 Pages |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 5, 2024) | - 1 Pages |
| Figure 8, Post-Inflation Piezometric Pressure Profile | - 1 Pages |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 3 Pages |

## Table 14. LMW-7R-S As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 3 | QA1 | 26.75 | 21.75 | 26.05 | 32.00 | |
| 2 | **Zone 2** | 16.75 | 11.75 | 16.05 | 23.05 | |
| 1 | **Zone 1** | 6.75 | 1.75 | 6.05 | 13.05 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.
All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-7R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 31.91 ft.

Borehole Depth: 34.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-7R-S.WWD
Report Date: Tue Jan 30 17:11:31 2024

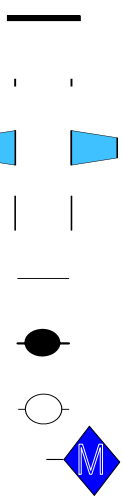
File Date: Jan 30 10:34:11 2024

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(3) 020101 - MP38 Casing 4 (1F/0.3M)

(3) 0238 - MP38 Packer - 74mm (5F/1.5M)

(3) 020105 - MP38 Casing 2 (5F/1.5M)

(4) 0202 - MP38 Regular Coupling

(3) 0205 - MP38 Measurement Port

(2) 0224 - MP38 Pumping Port

(2) 0216 - Magnetic Location Collar

## Geology

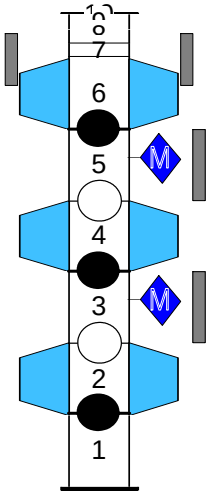
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-7R-S



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: LMW-70R-S
Datum: GS
Elev. G.S.: —
Height of Westbay above G.S.: —
Elev. top of Westbay Casing: —
Reference Elevation: —
Borehole angle: 50°

Probe Type: Sampler
Serial No.: 3535
Probe Range: 0-125
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/5/24
Client: Lenjan
Job No.: FS1499
Location: 1487 1st Ave
Weather: —
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

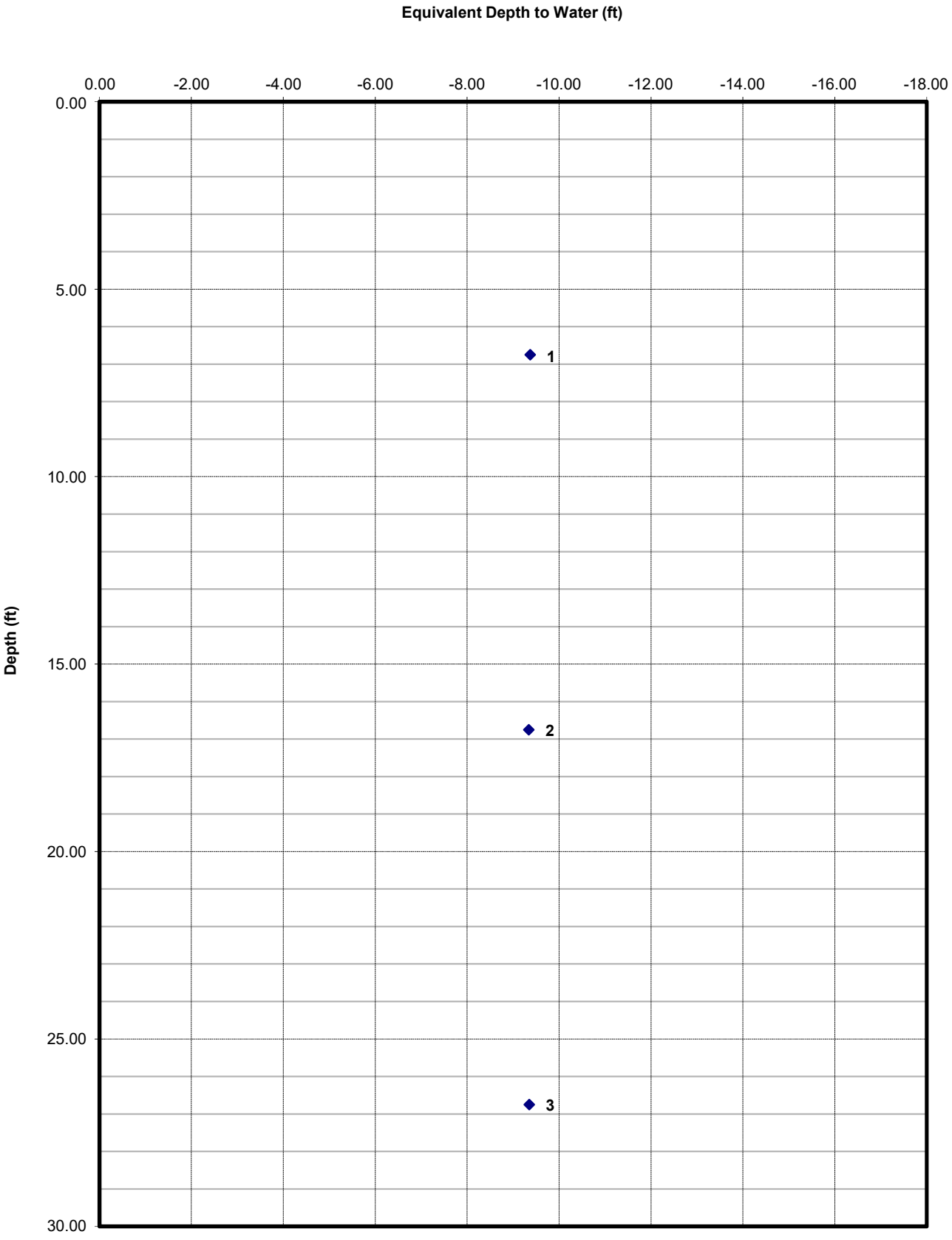
| | | Finish: |
|---|---|---|
| Start: Pressure | 14.71 | 14.71 |
| Temp | 74 | 74 |
| Time | 10:26 | 11:04 |

$P_{atm}$ 14.71 psi

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 2675 | 27.0 | — | 25.02 | 30.36 | 10:59 | 15.29 | 25.02 | 34.10 | -9.35 | Pre Install |
| 2 | 1675 | 17.2 | — | 20.68 | 24.02 | 11:01 | 15.28 | 20.68 | 24.09 | -9.34 | |
| 1 | 675 | 7.20 | — | 16.31 | 21.70 | 11:03 | 14.93 | 16.32 | 14.12 | -9.37 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 7**
**Well: LMW-7R-S**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: LMW-7R-S
Datum: GS
Elev. G.S.: –
Height of Westbay above G.S.: –
Elev. top of Westbay Casing: –
Reference Elevation: –
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3333
Probe Range: 0-520
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/5/24
Client: Langan
Job No.: F51495
Location: 1487 1st Ave
Weather: –
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.71 psi

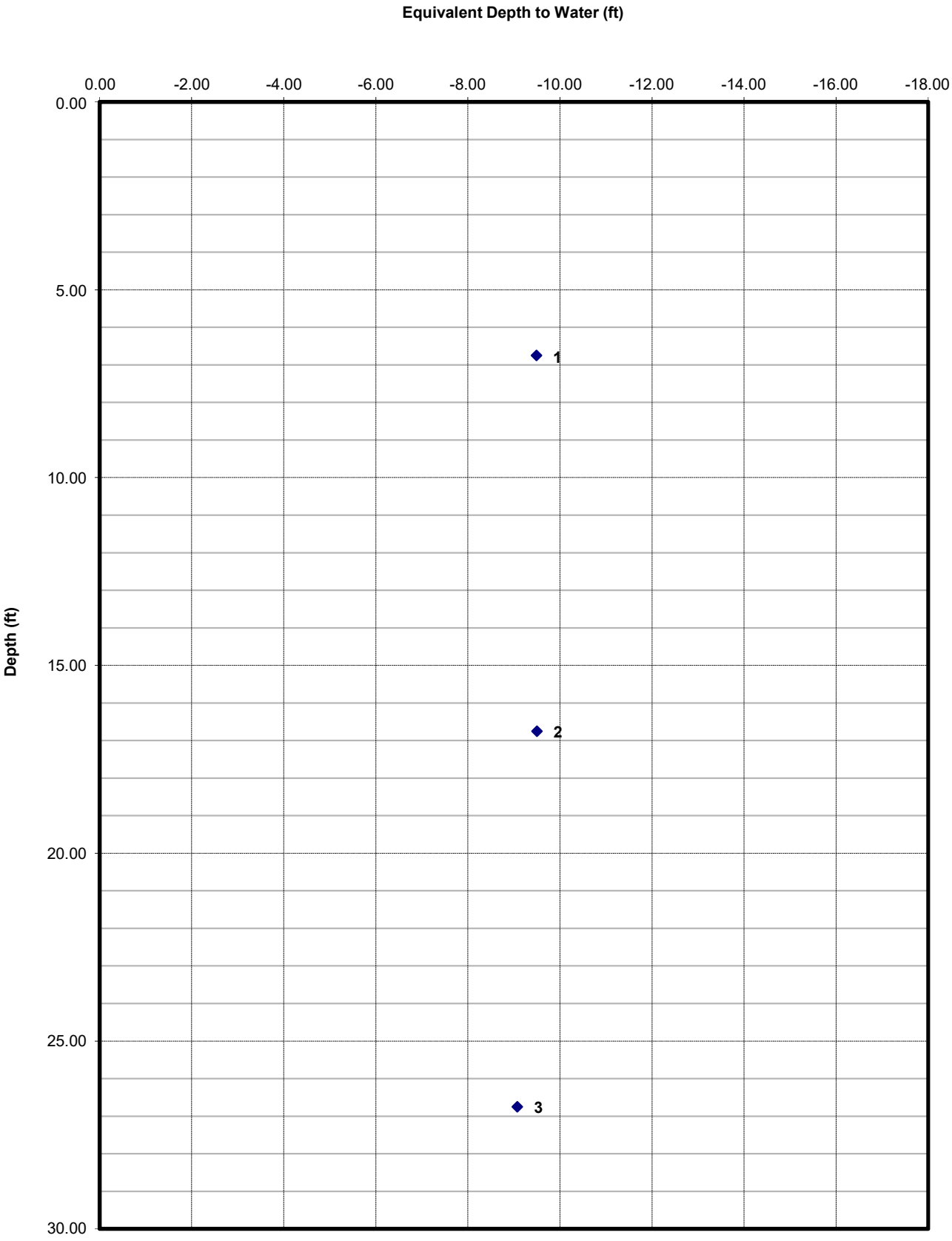
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | Start | Finish |
|---|---|---|
| Pressure | 14.71 | 14.72 |
| Temp | 34.5 | 11.95 |
| Time | 12:10 | 12:16 |

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings | | | | | Pressure Head Outside Port (ft) | Piez. Level Outside Port (ft) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | H = (P2-Patm)/w | Dz = Dp - H | |
| 3 | 26.75 | 26.6 | – | 29.62 | 30.24 | 12:12 | 10.54 | 29.63 | 35.82 | -9.07 | Post mtn |
| 2 | 16.75 | 16.6 | – | 25.28 | 26.09 | 12:13 | 11.40 | 25.28 | 26.25 | -9.50 | |
| 1 | 6.75 | 6.7 | – | 20.93 | 21.75 | 12:15 | 11.87 | 20.93 | 16.24 | -9.49 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 8**
**Well: LMW-7R-S**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-7R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 31.91 ft.

Borehole Depth: 34.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-7R-S.WWD
Report Date: Tue Jan 30 17:32:28 2024

File Date: Jan 30 17:13:04 2024

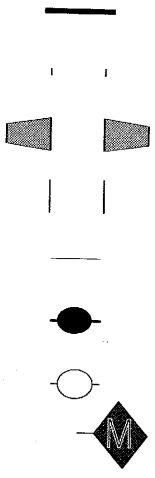
## Comments

## Log Information

Borehole condition confirmed. (method) hoses Date:
MP well design & preparation. By: Date: 2/5/24
MP well design checked. By: Date: 2/5/24
MP well and borehole approved to install. By: Date: 2/5/24

# Legend

## (Qty) MP Components
(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(3) 020101 - MP38 Casing 4 (1F/0.3M)

(3) 0238 - MP38 Packer - 74mm (5F/1.5M)

(3) 020105 - MP38 Casing 2 (5F/1.5M)

(4) 0202 - MP38 Regular Coupling

(3) 0205 - MP38 Measurement Port

(2) 0224 - MP38 Pumping Port

(2) 0216 - Magnetic Location Collar

## Geology

## Backfill/Casing

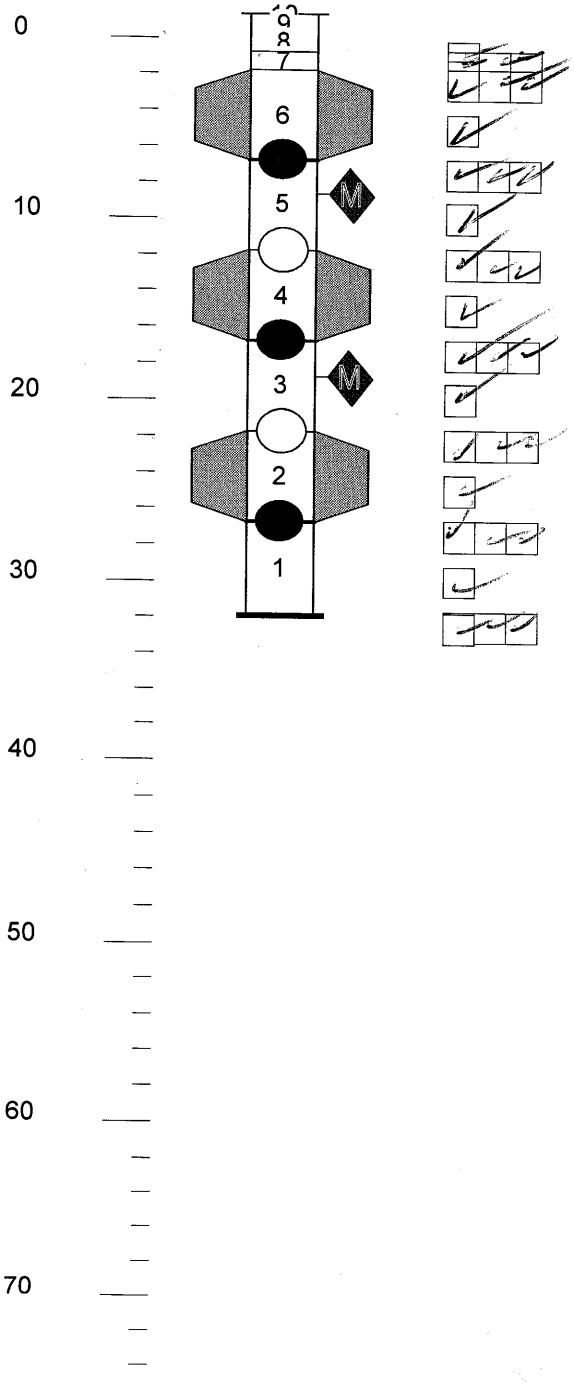


Mild Steel

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# Well Designer Report
Langan

Job No:
Well: LMW-7R-S




(c) Westbay Instruments Inc. 2000

Tue Jan 30 17:33:16 2024

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave  Project No.: FS1499  Well No.: LMW-7R-S

Location: 1487 1st Ave  Completed by: GS  Date Inflated: 2/5/24

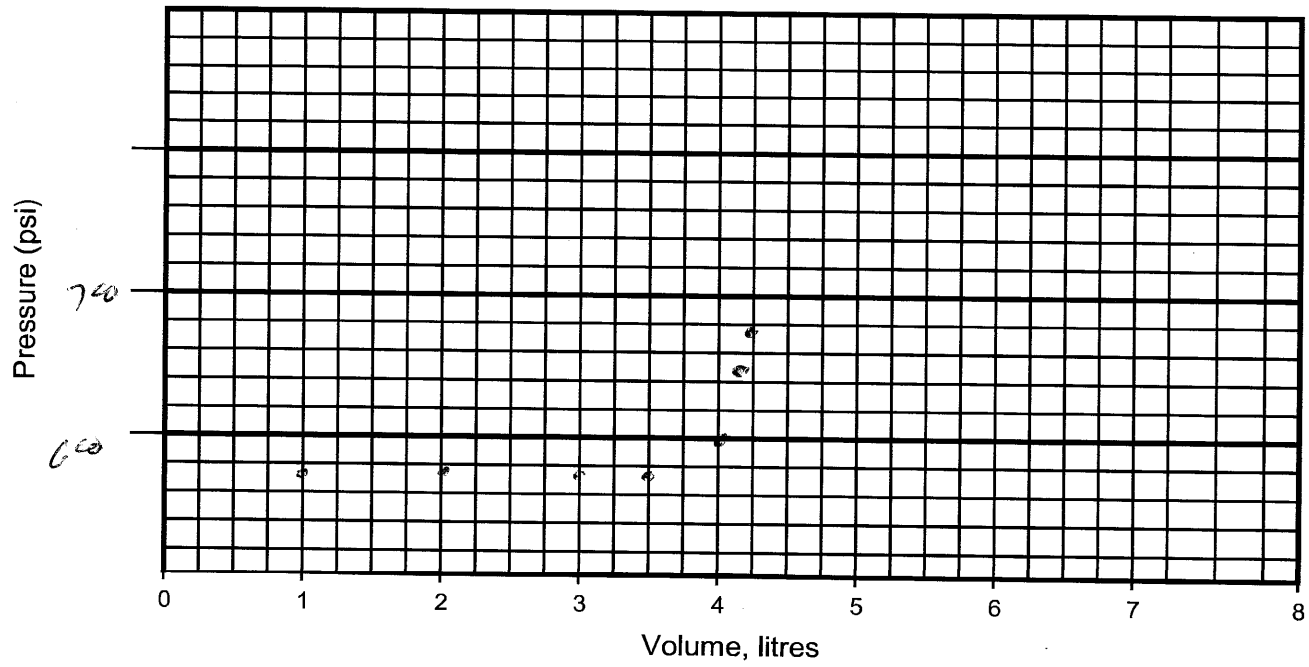
Packer No. 1 - 20167  Depth ( ft / m ): 2175  Inflation Tool No.: JW 3554

Packer Valve Pressure, $P_V$: 145 psi  Final Line Pressure, $P_L$: 675 psi  Tool Pressure, $P_T$: 460 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 130 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.05 | 4.20 | / | | | |
| Pressure, psi | 575 | 575 | 575 | 575 | 630 | 675 | / | 0 | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 1  Time - 11:11

# Westbay Packer Inflation Record

Project: Langan - 1487 1st Ave Project No.: F514 99 Well No.: LMW-79-S

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/5/24

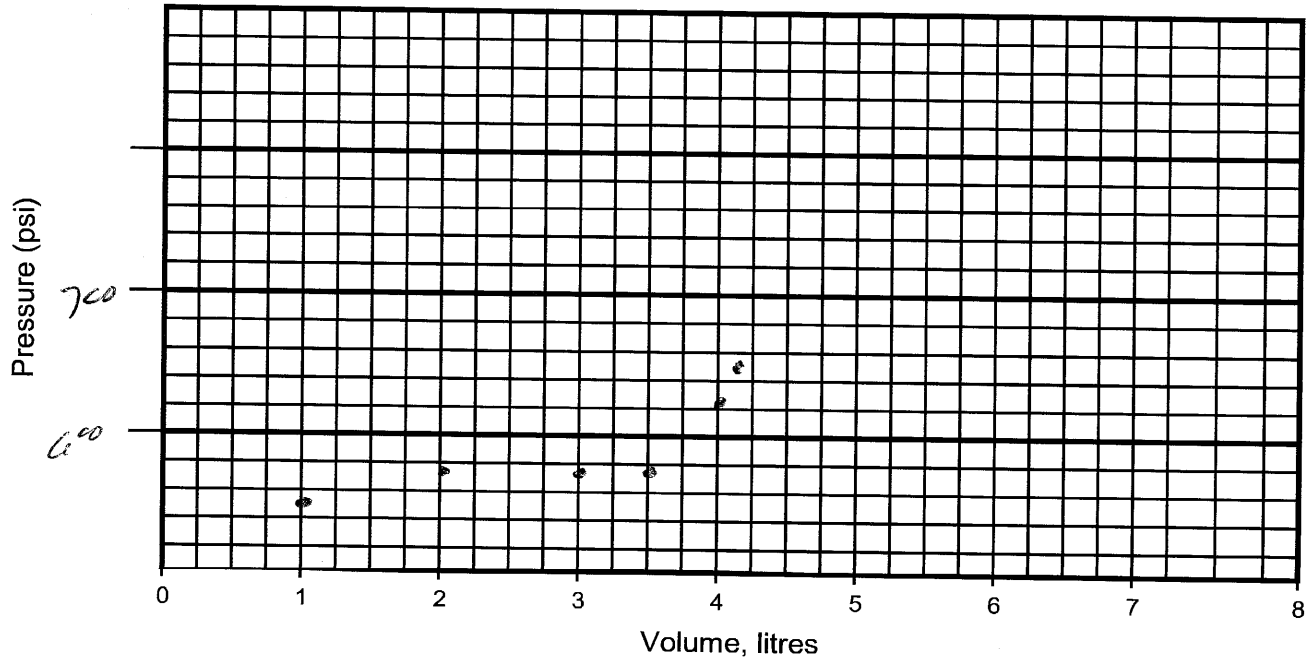
Packer No. 2 - 20168 Depth ( ft / m ): 11.75 Inflation Tool No.: TIW 3954

Packer Valve Pressure, $P_V$: 135 psi Final Line Pressure, $P_L$: 620 psi Tool Pressure, $P_T$: 400 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 115 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.10 | | | | |
| Pressure, psi | 538 | 525 | 525 | 525 | 425 | 632 | | | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 2 Time - 11:28

# Westbay Packer Inflation Record

Project: Langen - ~~Law~~ 1487 1st Ave  Project No.: FS1499  Well No.: Law-MW-5

Location: 1487 1st Ave  Completed by: CS  Date Inflated: 2/5/24

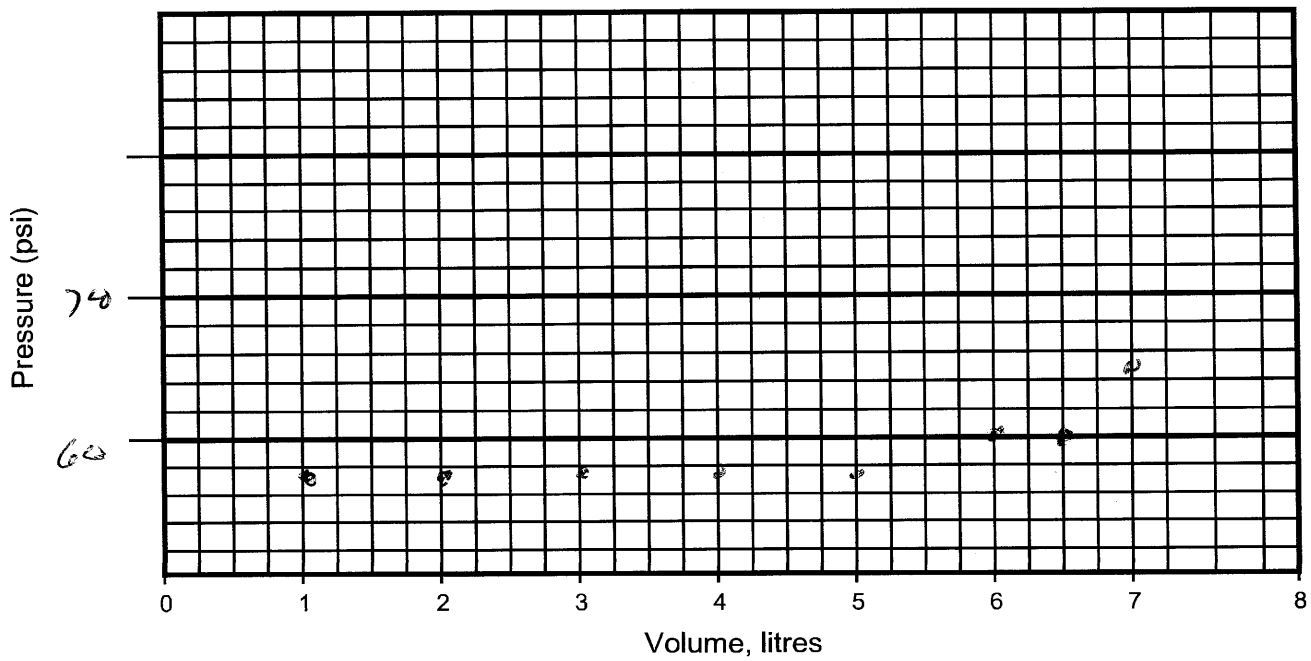
Packer No. 3 - 20169  Depth ( ft / m ): 1.75  Inflation Tool No.: JW 3554

Packer Valve Pressure, $P_V$: 150 psi  Final Line Pressure, $P_L$: 650 psi  Tool Pressure, $P_T$: 400 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 100 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 6.5 | 7.0 | / | 6.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 575 | 575 | 575 | 575 | 575 | 600 | 600 | 650 | / | 0 |
| Volume, litres | 7.25 | 7.40 | / | 7.40 | | | | | | |
| Pressure, psi | 650 | 675 | / | 0 | | | | | | |




Comments: Packer # 3  Time - 11:41

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# APPENDIX D – LMW-7R-D


| | |
|---|---|
| As-Built Packer and Port Summary (Table 15) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 1, 2024) | - 1 Pages |
| Figure 9, Pre-Inflation Piezometric Pressure Profile | - 1 Pages |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 1, 2024) | - 1 Pages |
| Figure 10, Post-Inflation Piezometric Pressure Profile | - 1 Pages |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 4 Pages |

## Table 15. LMW-7R-D As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 4 | QA2 | 59.75 | 54.75 | 59.05 | 64.00 | |
| 3 | **Zone 2** | 49.75 | 44.75 | 49.05 | 56.05 | |
| 2 | QA1 | 33.75 | 28.75 | 33.05 | 46.05 | |
| 1 | **Zone 1** | 23.75 | 18.75 | 23.05 | 30.05 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.

All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-7R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 62.91 ft.

Borehole Depth: 63.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-7R-D.WWD
Report Date: Tue Jan 30 17:17:52 2024

File Date: Jan 30 11:39:04 2024

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap



(3) 020101 - MP38 Casing 4 (1F/0.3M)



(2) 020103 - MP38 Casing 6 (3F/0.9M)



(7) 020105 - MP38 Casing 2 (5F/1.5M)



(4) 0238 - MP38 Packer - 74mm (5F/1.5M)



(10) 0202 - MP38 Regular Coupling



(4) 0205 - MP38 Measurement Port



(2) 0224 - MP38 Pumping Port




(3) 0216 - Magnetic Location Collar

## Geology

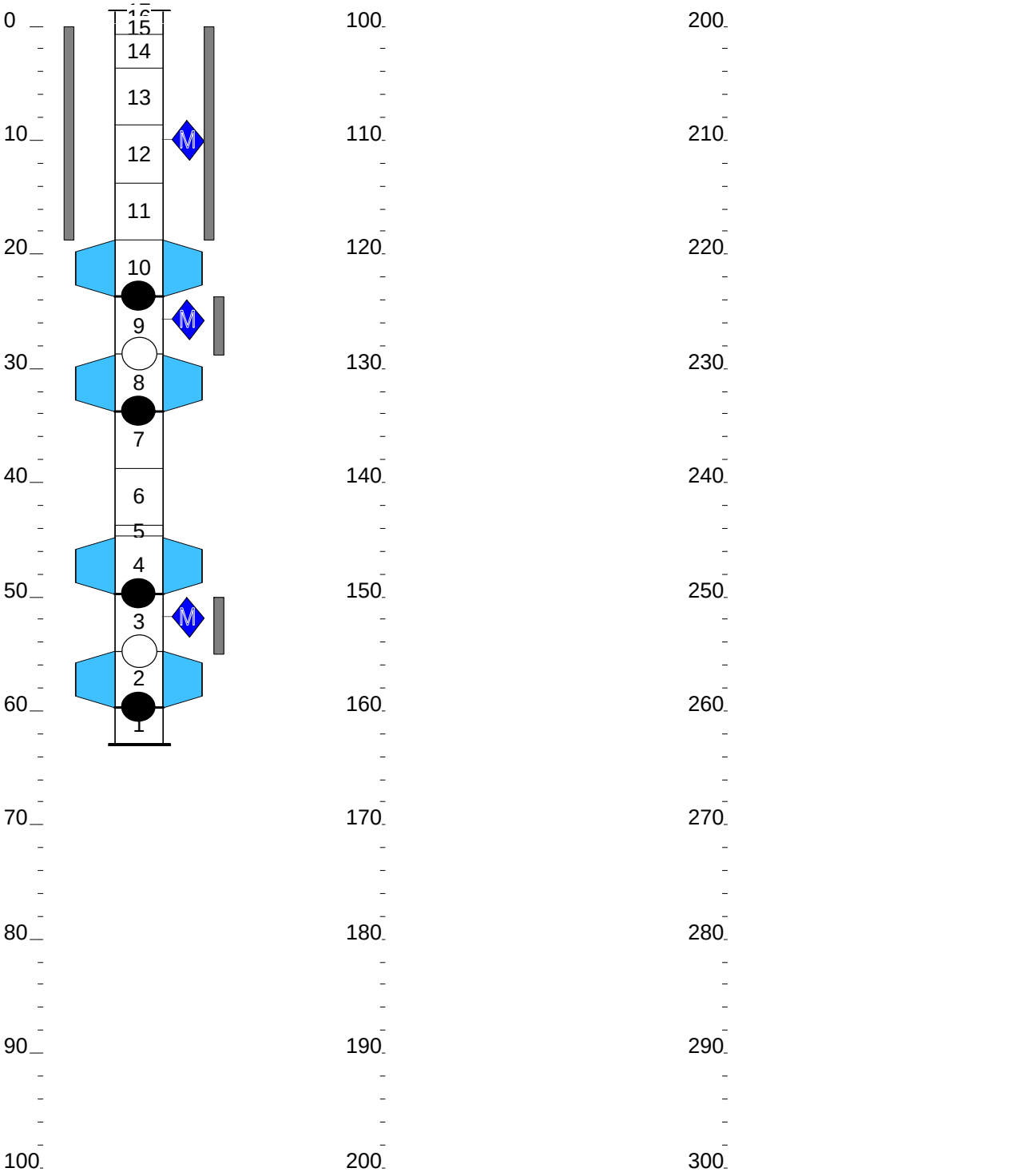
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-7R-D



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: LMW-7R-D
Datum: CS
Elev. G.S.: —
Height of Westbay above G.S.: —
Elev. top of Westbay Casing: —
Reference Elevation: —
Borehole angle: 30°

Probe Type: QS sampler
Serial No.: 3355
Probe Range: 0-50
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/1/24
Client: Langan
Job No.: FS1479
Location: 1487 1st Ave
Weather: —
Operator: CS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.72 psi

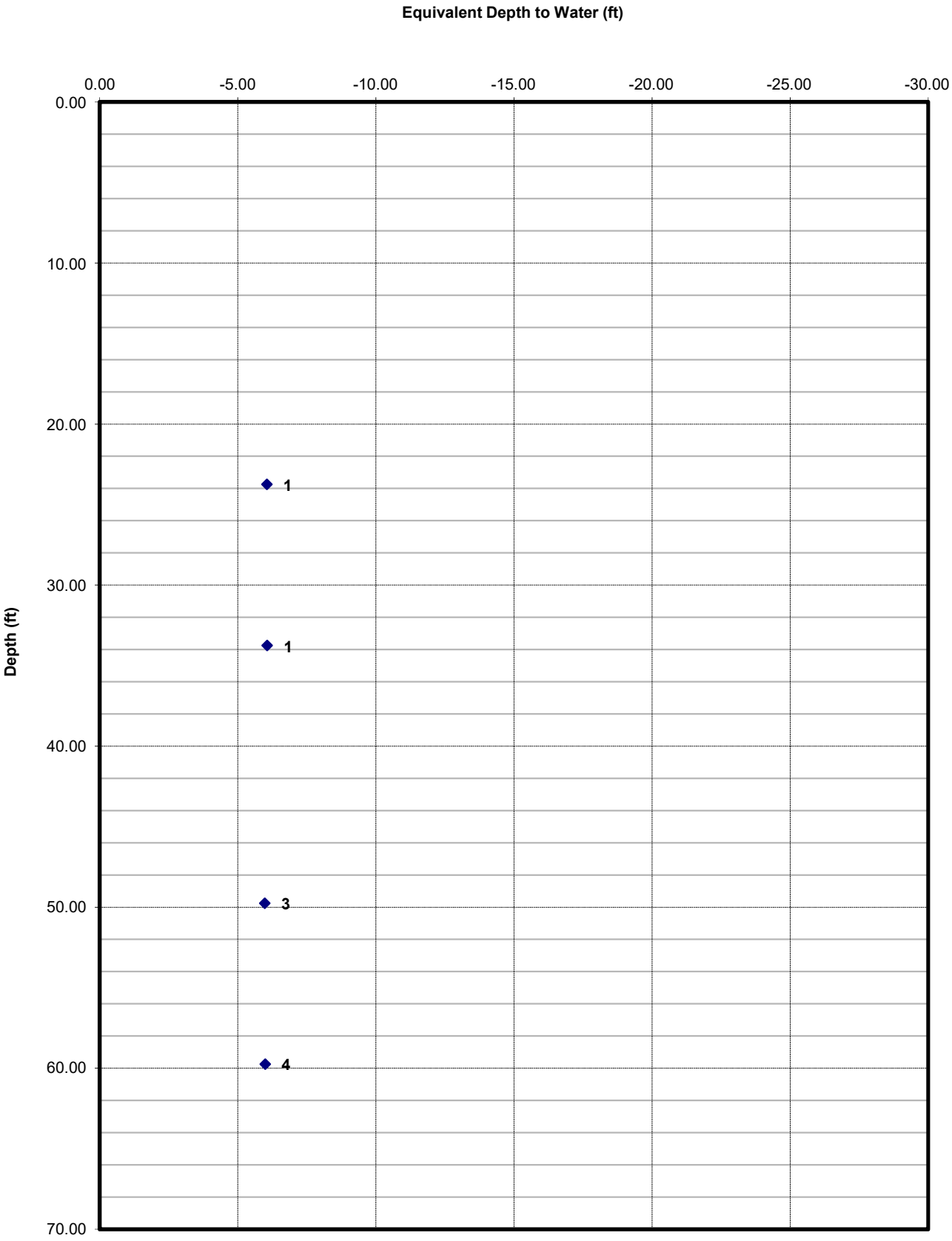
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | | Start | Finish |
|---|---|---|---|
| Pressure | | 14.72 | 14.73 |
| Temp | | 8.16 | 10.77 |
| Time | | 15:24 | 15:37 |

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings | | | | | Pressure Head Outside Port (ft) | Piez. Level Outside Port (ft) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | H = (P2-Patm)/w | Dz = Dp - H | |
| 4 | 59.75 | 59.6 | — | 31.43 | 43.22 | 15:29 | 9.24 | 31.43 | 45.74 | -5.99 | Pre Install |
| 3 | 49.75 | 49.6 | — | 27.10 | 38.58 | 15:30 | 10.37 | 27.10 | 55.73 | -5.98 | |
| 2 | 33.75 | 33.7 | — | 20.18 | 31.98 | 15:32 | 11.23 | 20.18 | 39.82 | -6.06 | |
| 1 | 23.75 | 23.7 | — | 15.83 | 27.64 | 15:35 | 12.53 | 15.84 | 29.80 | -6.05 | |
| | | | | | | | | | | | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 9**
**Well: LMW-7R-D**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: LMW-7R-D
Datum: GS
Elev. G.S.: –
Height of Westbay above G.S.: –
Elev. top of Westbay Casing: –
Reference Elevation: –
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 2335
Probe Range: 0-320
Westbay Casing Type: MP38
Sampler Valve Position: Close

Date: 2/1/24
Client: Langan
Job No.: F1917
Location: 1487 1st Ave
Weather: –
Operator: dr

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.71 psi

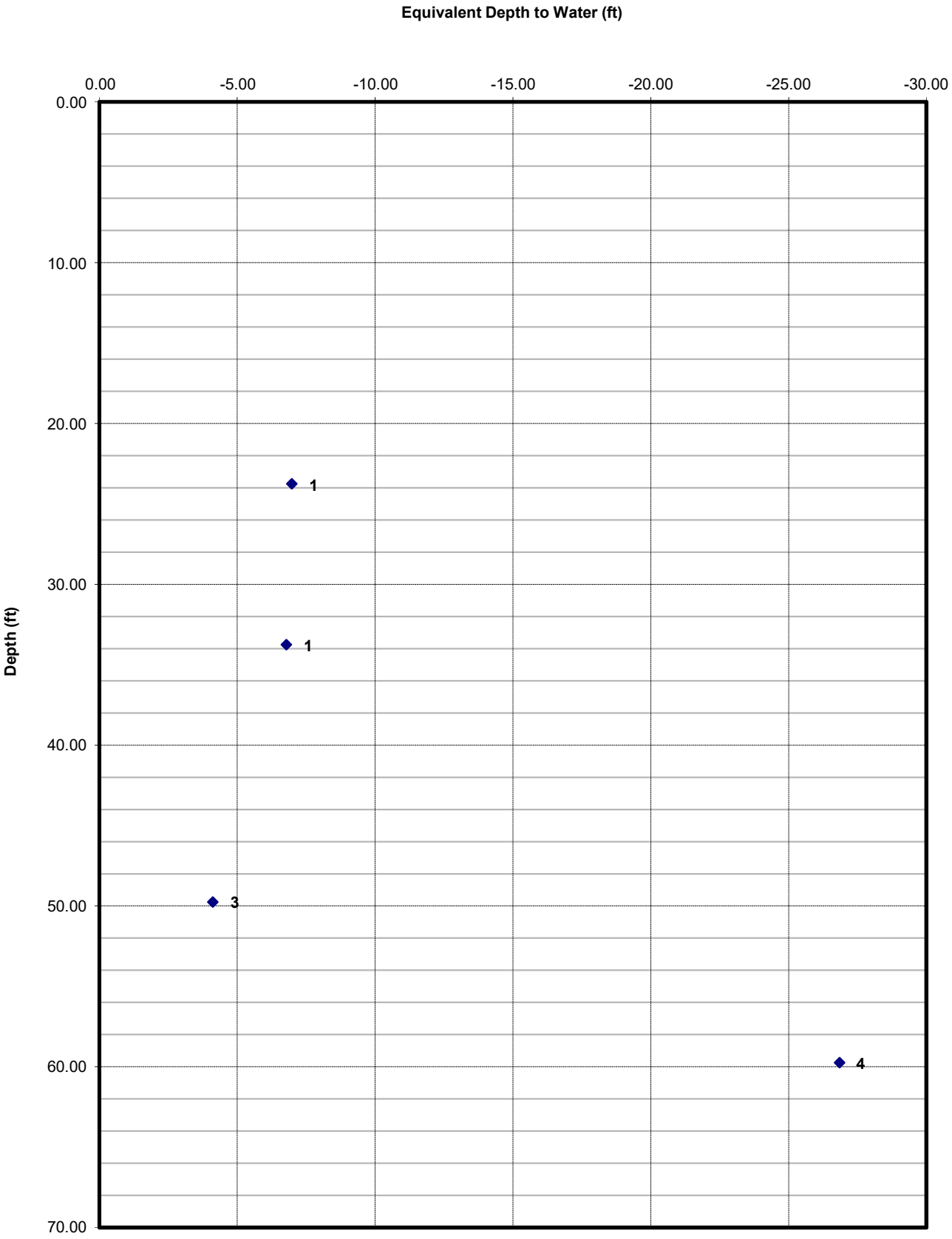
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | | Start: | Finish: |
|---|---|---|---|
| Pressure | | 14.73 | 14.72 |
| Temp | | 11.52 | 11.47 |
| Time | | 17:20 | 17:30 |

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 59.75 | 59.40 | – | 42.77 | 32.27 | 17:24 | 12.56 | 42.77 | 50.60 | -26.85 | Psi In Psi |
| 3 | 49.75 | 49.50 | – | 38.43 | 38.08 | 17:25 | 13.27 | 38.43 | 53.86 | -4.11 | |
| 2 | 33.75 | 33.60 | – | 31.50 | 32.30 | 17:27 | 13.91 | 31.50 | 40.53 | -6.78 | |
| 1 | 23.76 | 23.60 | – | 27.15 | 28.05 | 17:29 | 14.34 | 27.15 | 30.73 | -6.98 | |
| | | | | | | | | | | | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 10**
**Well: LMW-7R-D**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-7R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 62.91 ft.

Borehole Depth: 63.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-7R-D.WWD
Report Date: Tue Jan 30 17:30:47 2024

File Date: Jan 30 17:19:10 2024

## Comments

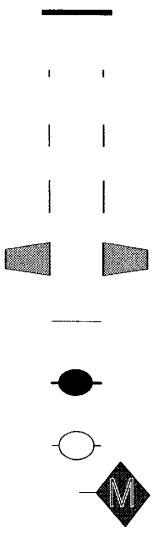
## Log Information

| | | |
|---|---|---|
| Borehole condition confirmed. | (method) Logging | Date: |
| MP well design & preparation. | By: [signature] | Date: 1/30/24 |
| MP well design checked. | By: [signature] | Date: 2/1/24 |
| MP well and borehole approved to install. | By: [signature] | Date: 2/1/24 |

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(3) 020101 - MP38 Casing 4 (1F/0.3M)

(2) 020103 - MP38 Casing 6 (3F/0.9M)

(7) 020105 - MP38 Casing 2 (5F/1.5M)

(4) 0238 - MP38 Packer - 74mm (5F/1.5M)

(10) 0202 - MP38 Regular Coupling

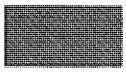
(4) 0205 - MP38 Measurement Port

(2) 0224 - MP38 Pumping Port

(3) 0216 - Magnetic Location Collar

## Geology

## Backfill/Casing

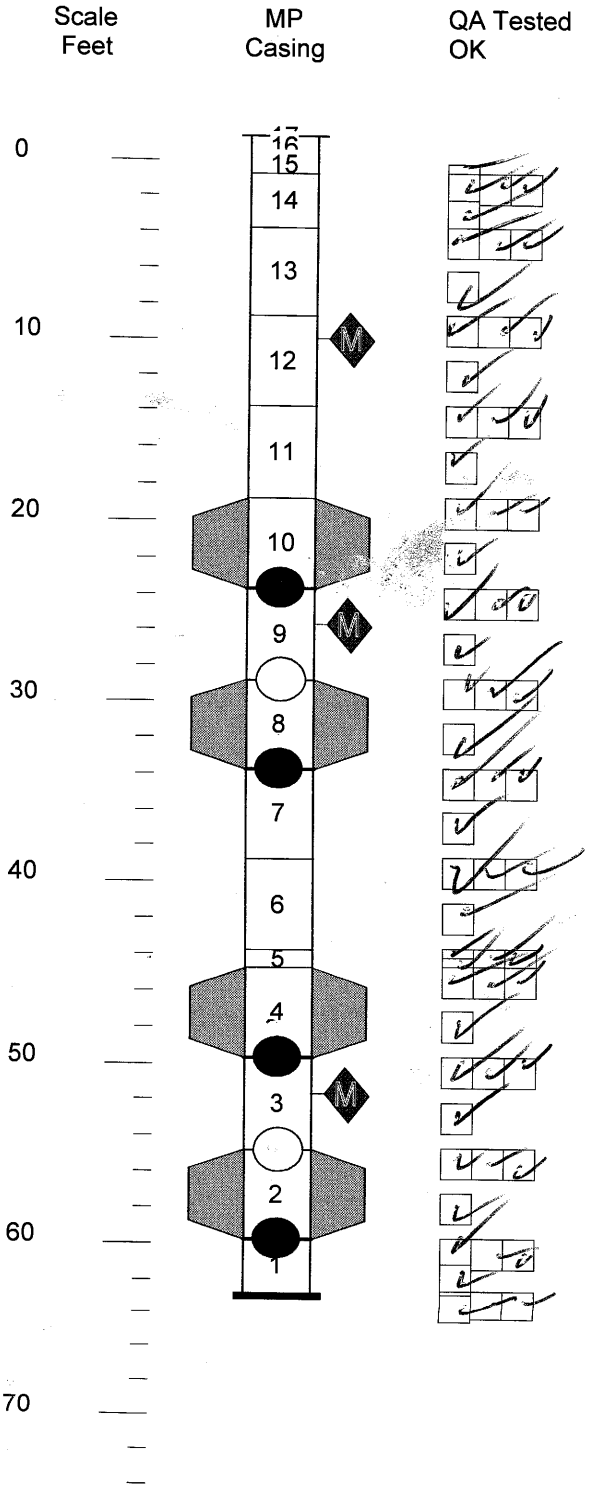


Mild Steel

(c) Westbay Instruments Inc. 2000

# Well Designer Report
Langan

Job No:
Well: LMW-7R-D




MP Casing Description

020101 - MP38 Casing 4 (1F/0.3M)
020103 - MP38 Casing 6 (3F/0.9M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
0238 - MP38 Packer - 74mm (5F/1.5M 20165 165/140
0205 - MP38 Measurement Port 10280
020105 - MP38 Casing 2 (5F/1.5M)
0224 - MP38 Pumping Port 9291
0238 - MP38 Packer - 74mm (5F/1.5M 20164 165/140
0205 - MP38 Measurement Port 10282
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
020101 - MP38 Casing 4 (1F/0.3M)
0238 - MP38 Packer - 74mm (5F/1.5M 20157 165/140
0205 - MP38 Measurement Port 10279
020105 - MP38 Casing 2 (5F/1.5M)
0224 - MP38 Pumping Port 9293
0238 - MP38 Packer - 74mm (5F/1.5M 20163 165/140
0205 - MP38 Measurement Port 10278
020103 - MP38 Casing 6 (3F/0.9M)
0203 - MP38 End Cap

(c) Westbay Instruments Inc. 2000

Tue Jan 30 17:31:33 2024

Sheet 1 of 4

# Westbay Packer Inflation Record

Project: Langan - 1487 1st Ave  Project No.: FS1499  Well No.: LMW-708-D

Location: 1487 1st Ave  Completed by: GS  Date Inflated: 2/16/04

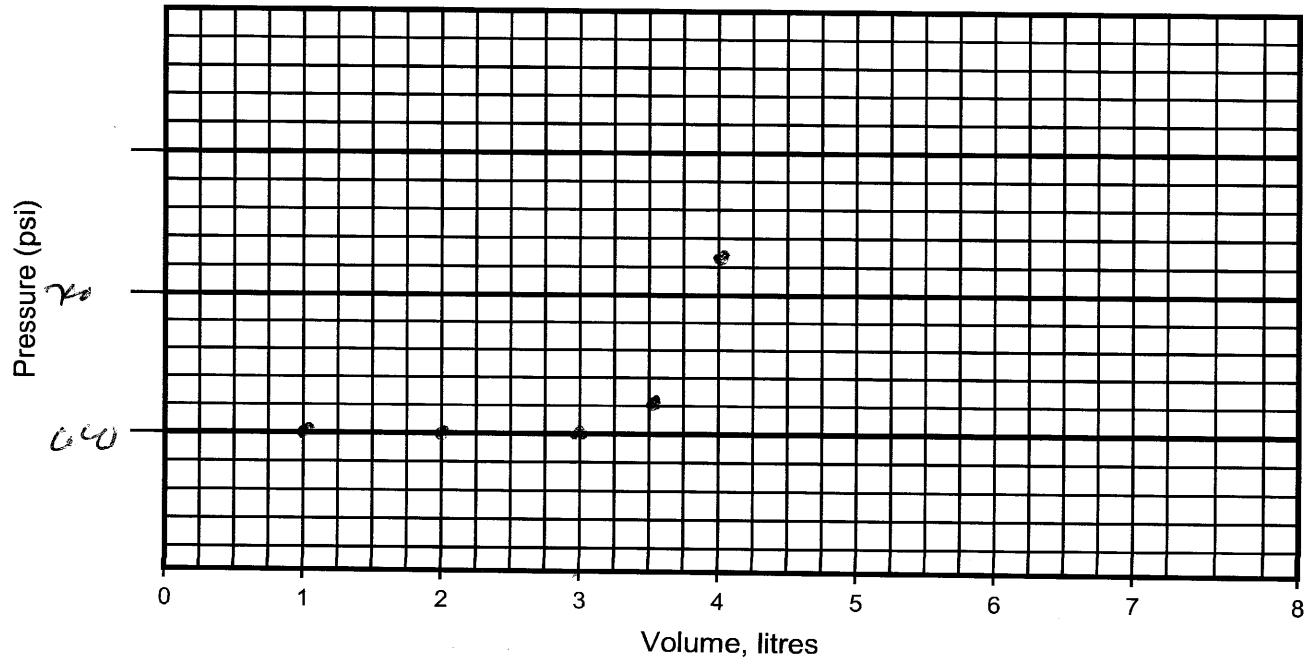
Packer No. 1 - 20163  Depth ( ft / m ): 547.5  Inflation Tool No.: TW 3594

Packer Valve Pressure, $P_V$: 1110 psi  Final Line Pressure, $P_L$: 725 psi  Tool Pressure, $P_T$: 450 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 135 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | / | 3.95 | | | |
| Pressure, psi | 640 | 640 | 640 | 625 | 725 | / | 0 | | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 1  Time - 1614

# Westbay Packer Inflation Record

Project: Langen – 1487 - 1st Ave  Project No.: FS1499  Well No.: LMW - 7R-D

Location: 1487 1st Ave  Completed by: GS  Date Inflated: 9/1/24

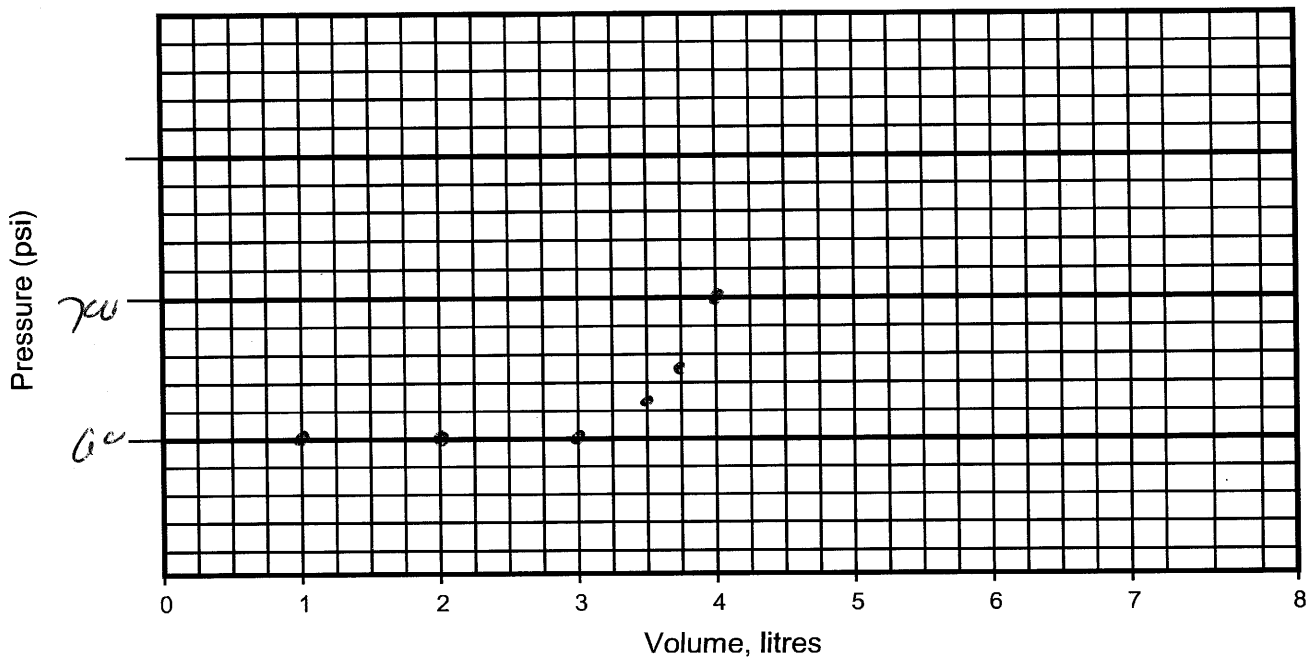
Packer No. 2 - 10279  Depth ( ft / m ): 49.75'  Inflation Tool No.: TW 3994

Packer Valve Pressure, $P_V$: 140 psi  Final Line Pressure, $P_L$: 700 psi  Tool Pressure, $P_T$: 450 psi

Borehole Water Level: – ( ft / m ) = – psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 3.75 | 4.0 | / | 4.0 | | |
| Pressure, psi | 600 | 600 | 600 | 625 | 650 | 700 | / | # | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 2  Time - 16:38

# Westbay Packer Inflation Record

Project: Langa - 1487 1st Ave  Project No.: FS1494  Well No.: LMW-709-D

Location: 1487 1st Ave  Completed by: CS  Date Inflated: 2/1/24

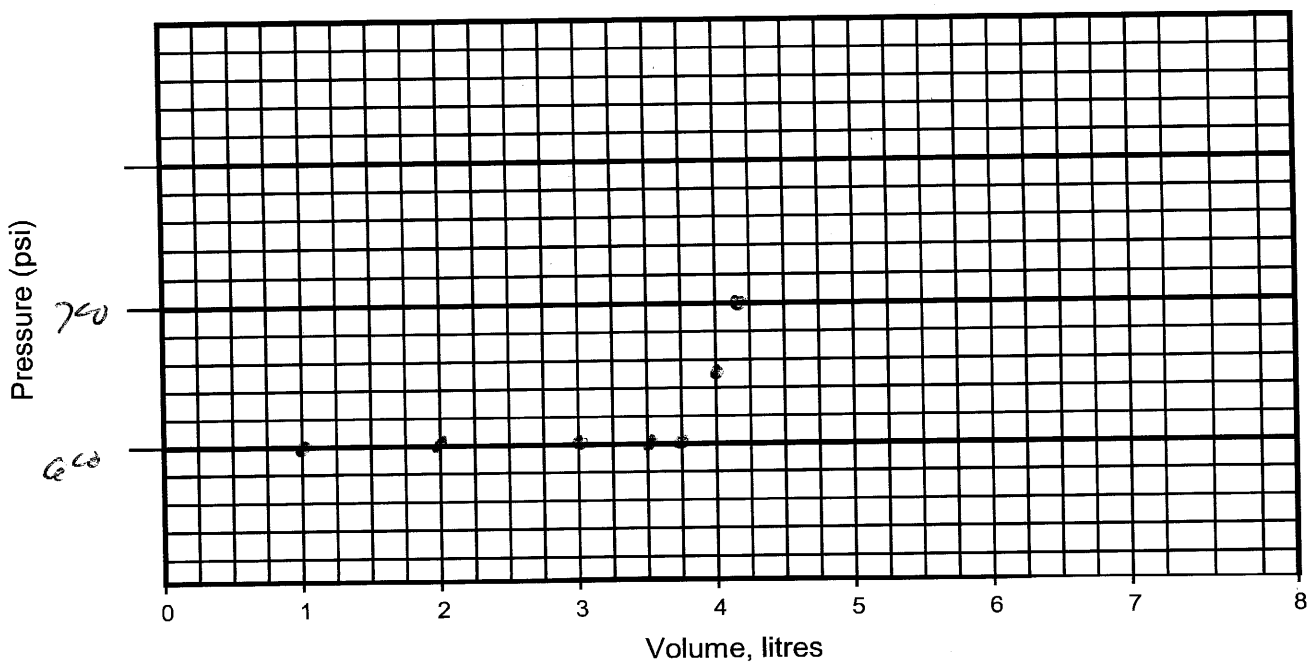
Packer No. 3 - 20164  Depth ( ft / m ): 28.75  Inflation Tool No.: JW 3594

Packer Valve Pressure, $P_V$: 140 psi  Final Line Pressure, $P_L$: 760 psi  Tool Pressure, $P_T$: 1520 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 3.75 | 4.0 | 4.15 | 4.15 | | |
| Pressure, psi | 600 | 600 | 600 | 600 | 600 | 650 | 760 | 760 | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 3  Time - 16:45

Sheet 4 of 4

# Westbay Packer Inflation Record

Project: Langa 1487 1st Ave. Project No.: F-51475 Well No.: LAW-7R-D

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/1/24

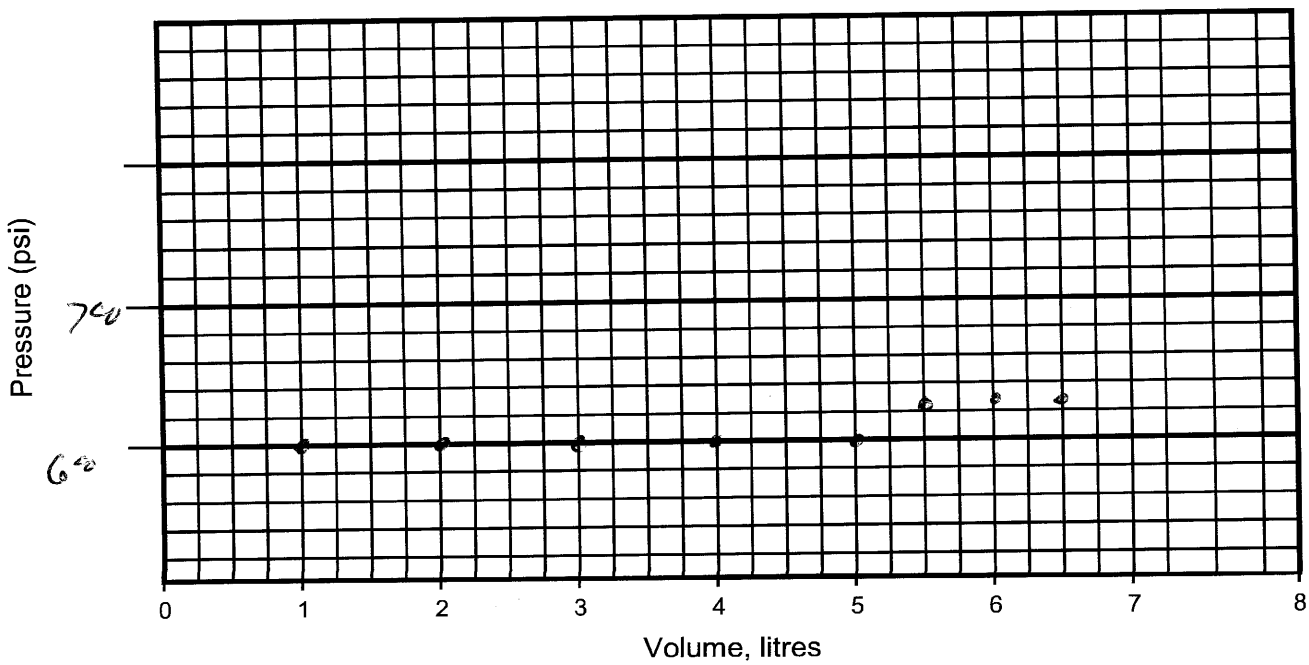
Packer No. 20165 - 4 Depth ( ft / m ): 18.75 Inflation Tool No.: TW 3545

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 425 psi Tool Pressure, $P_T$: 150 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 35 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 5.5 | 6.0 | 6.5 | / | 6.5 |
| Pressure, psi | 600 | 600 | 600 | 600 | 600 | 425 | 425 | 425 | / | 9 |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 4 Time - 16:56

# APPENDIX E – LMW-8R-S

| | |
|---|---|
| As-Built Packer and Port Summary (Table 16) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 1, 2024) | - 1 Pages |
| Figure 11, Pre-Inflation Piezometric Pressure Profile | - 1 Pages |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 1, 2023) | - 1 Pages |
| Figure 12, Post-Inflation Piezometric Pressure Profile | - 1 Pages |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 3 Pages |

## Table 16. LMW-8R-S As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 3 | QA1 | 28.75 | 23.75 | 28.05 | 30.00 | |
| 2 | **Zone 2** | 18.75 | 11.75 | 16.05 | 25.05 | |
| 1 | **Zone 1** | 6.75 | 0.75 | 5.05 | 13.05 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.
All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-8R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 29.91 ft.

Borehole Depth: 29.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-8R-S.WWD
Report Date: Tue Jan 30 10:44:05 2024

File Date: Jan 30 10:38:57 2024

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(4) 020101 - MP38 Casing 4 (1F/0.3M)

(3) 0238 - MP38 Packer - 74mm (5F/1.5M)

(2) 020105 - MP38 Casing 2 (5F/1.5M)

(1) 020102 - MP38 Casing 3 (2F/0.6M)

(5) 0202 - MP38 Regular Coupling

(3) 0205 - MP38 Measurement Port

(2) 0224 - MP38 Pumping Port

(2) 0216 - Magnetic Location Collar

## Geology

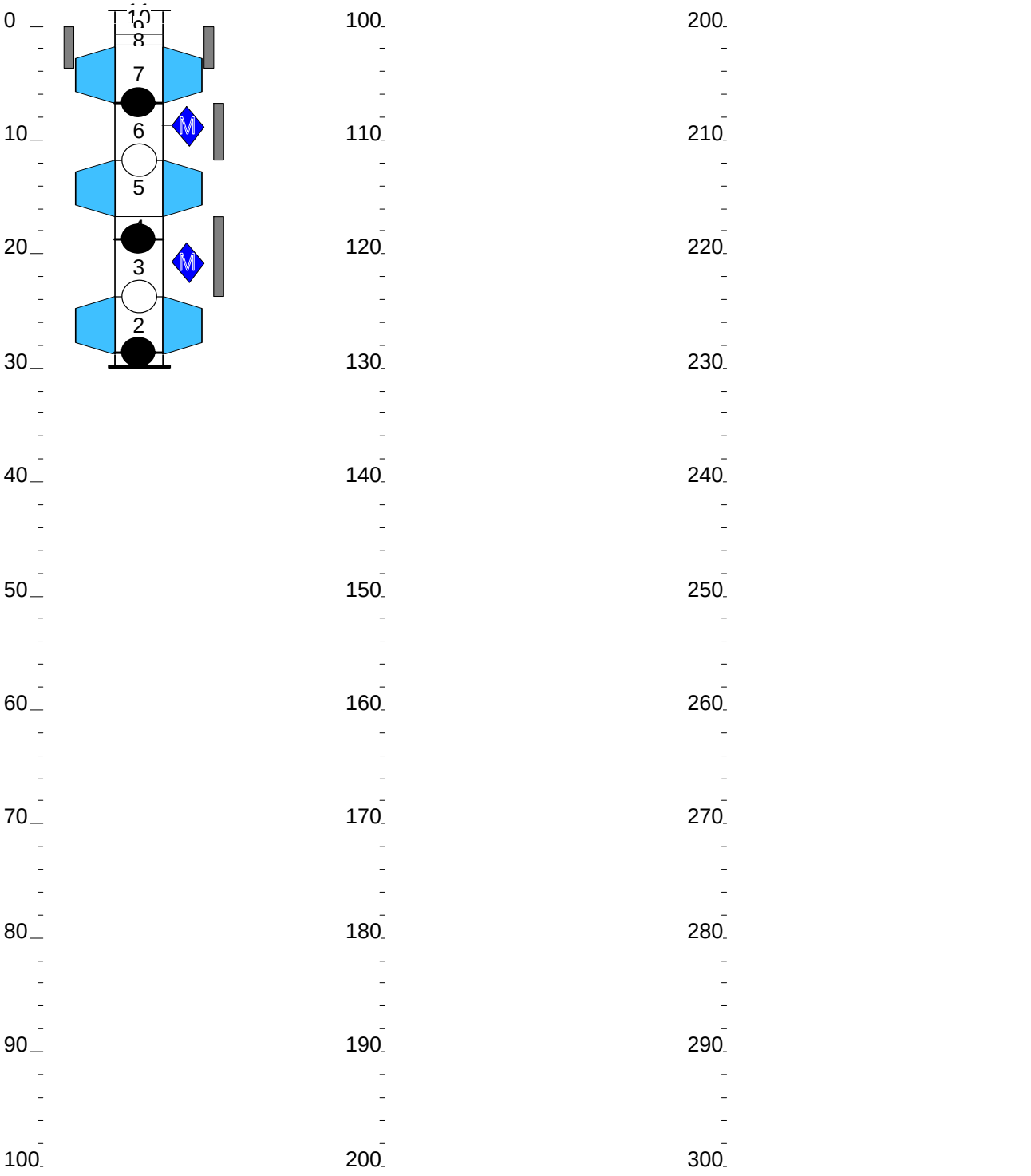
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-8R-S



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: LMW-8R-S
Datum: CGS
Elev.G.S.: —
Height of Westbay above G.S.: —
Elev. top of Westbay Casing: —
Reference Elevation: —
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3555
Probe Range: 0-52
Westbay Casing Type: MP35
Sampler Valve Position: Closed

Date: 2/1/24
Client: Langan
Job No.: FS1479
Location: 1487 First Ave
Weather: —
Operator: CC

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

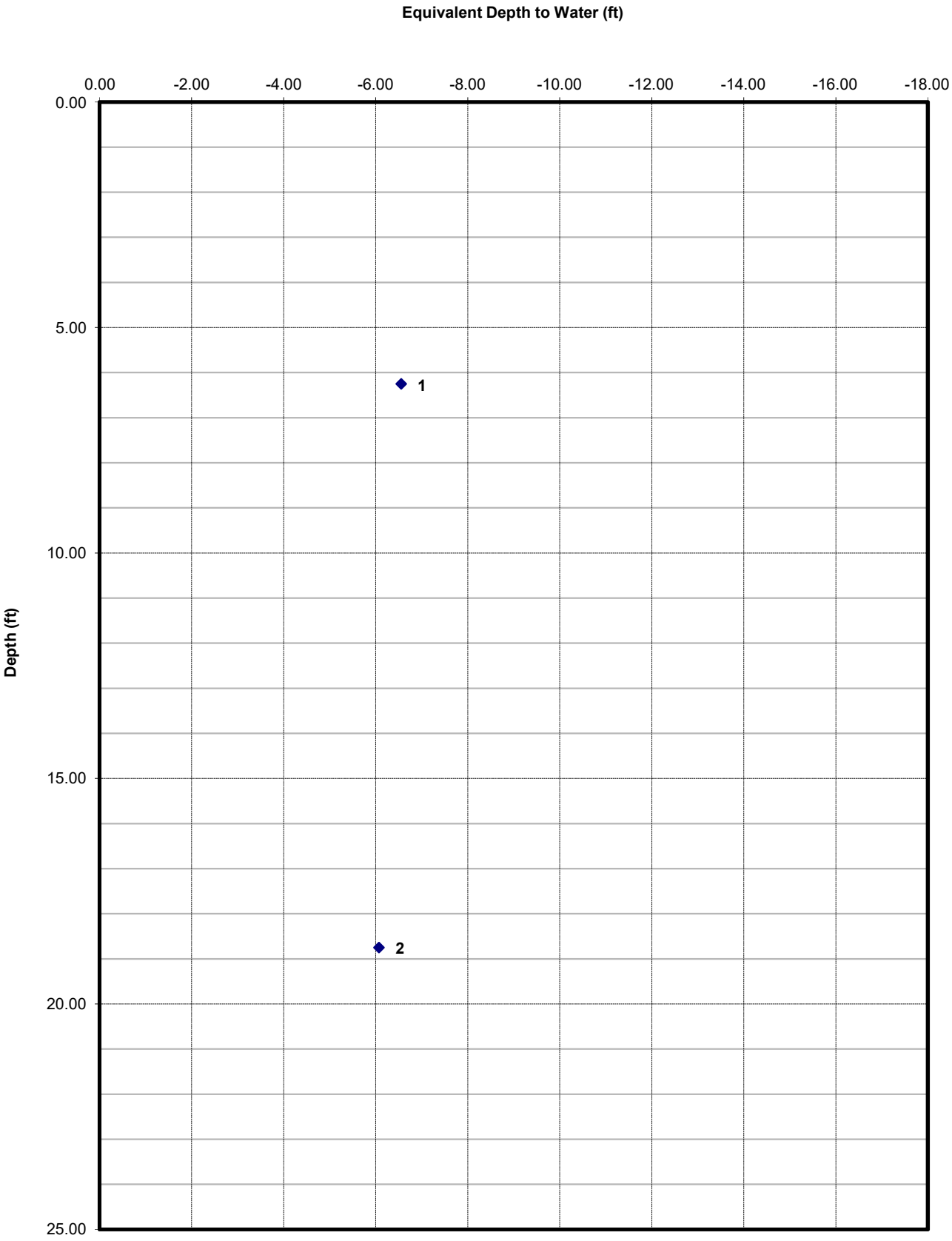
| | | |
|---|---|---|
| Start: Pressure | 14.80 | Finish: 14.75 |
| Temp | 15.91 | 15.53 |
| Time | 10:16 | 10:24 |

$P_{atm}$ 14.80 psi

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 18.75 | 19.0 | — | 18.82 | 25.56 | 10:19 | 15.75 | 18.83 | 24.52 | -6.07 | Pz Inflate |
| 1 | 6.75 | 17.0 | — | 14.77 | 20.35 | 10:22 | 15.62 | 14.78 | 12.80 | -6.05 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 11**
**Well: LMW-8R-S**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Westbay Instruments

Well No.: CMW-8A-S
Datum: CS
Elev.G.S.: -
Height of Westbay above G.S.: -
Elev. top of Westbay Casing: -
Reference Elevation: -
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3333
Probe Range: 0-50
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/1/24
Client: Lawson
Job No.: F31477
Location: 1487 1st Ave
Weather: -
Operator: CS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

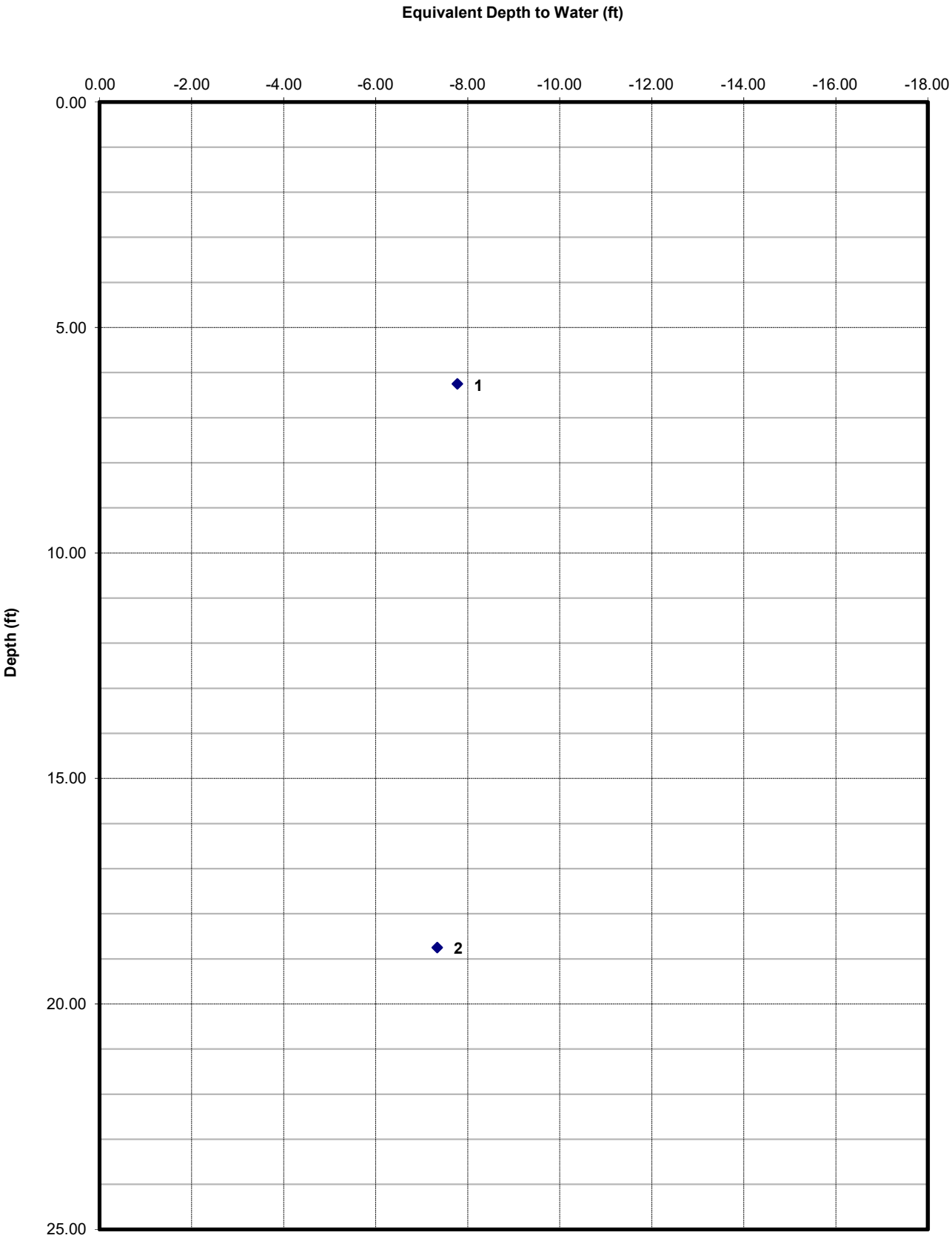
| | | Finish: |
|---|---|---|
| Start: Pressure | 14.77 | 14.77 |
| Temp | 10.5C | 12.99 |
| Time | 11:41 | 11:52 |

$P_{atm}$ 14.77 psi

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 18.75 | 18.90 | - | 25.03 | 26.09 | 11:47 | 11.96 | 25.03 | 26.09 | -7.33 | Post Install |
| 1 | 6.25 | 6.90 | - | 19.81 | 20.85 | 11:50 | 12.75 | 19.81 | 19.09 | -7.27 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 12**
**Well: LMW-8R-S**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-8R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 29.91 ft.

Borehole Depth: 29.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-8R-S.WWD
Report Date: Tue Jan 30 17:35:32 2024

File Date: Jan 30 10:46:06 2024

## Comments

## Log Information

Borehole condition confirmed. (method) Logging Date:
MP well design & preparation. By: Date: 1/31/24
MP well design checked. By: Date: 2/1/24
MP well and borehole approved to install. By: Date: 2/1/24

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)

- (2) 0203 - MP38 End Cap
- (4) 020101 - MP38 Casing 4 (1F/0.3M)
- (3) 0238 - MP38 Packer - 74mm (5F/1.5M)
- (2) 020105 - MP38 Casing 2 (5F/1.5M)
- (1) 020102 - MP38 Casing 3 (2F/0.6M)
- (5) 0202 - MP38 Regular Coupling
- (3) 0205 - MP38 Measurement Port
- (2) 0224 - MP38 Pumping Port
- (2) 0216 - Magnetic Location Collar

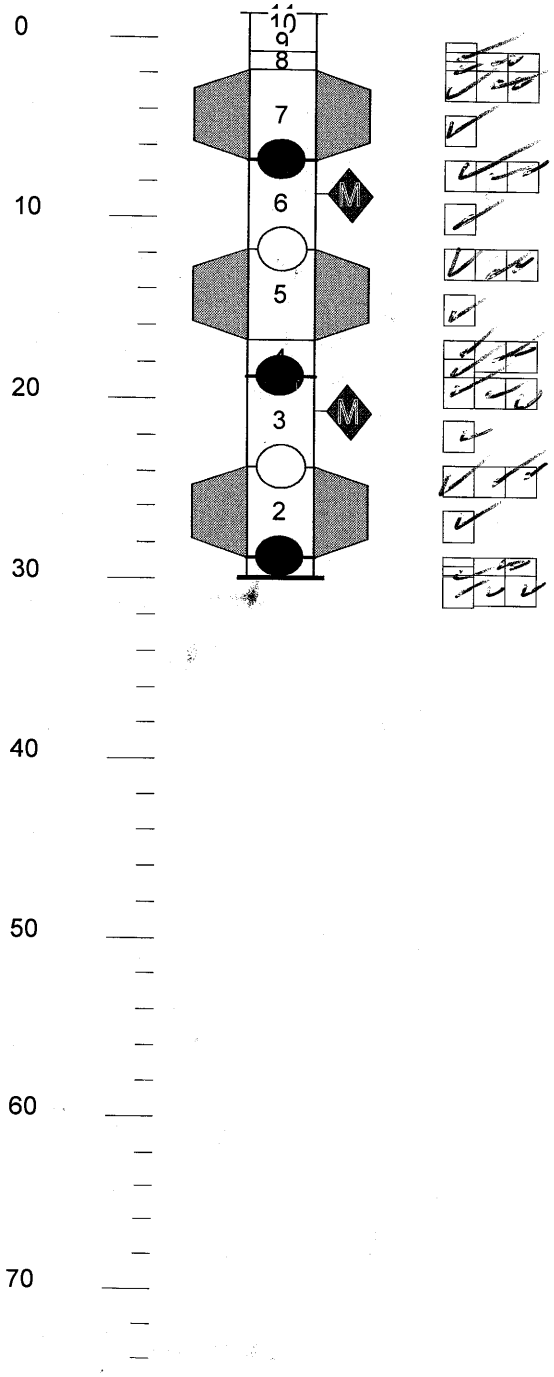
## Geology

## Backfill/Casing

- Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-8R-S




(c) Westbay Instruments Inc. 2000

Tue Jan 30 17:36:17 2024

Sheet 1 of 3

# Westbay Packer Inflation Record

Project: Langley - 1487 First Ave Project No.: FS1491 Well No.: LMW-8R-S

Location: 1487 - First Ave Completed by: GS Date Inflated: 01/12/17

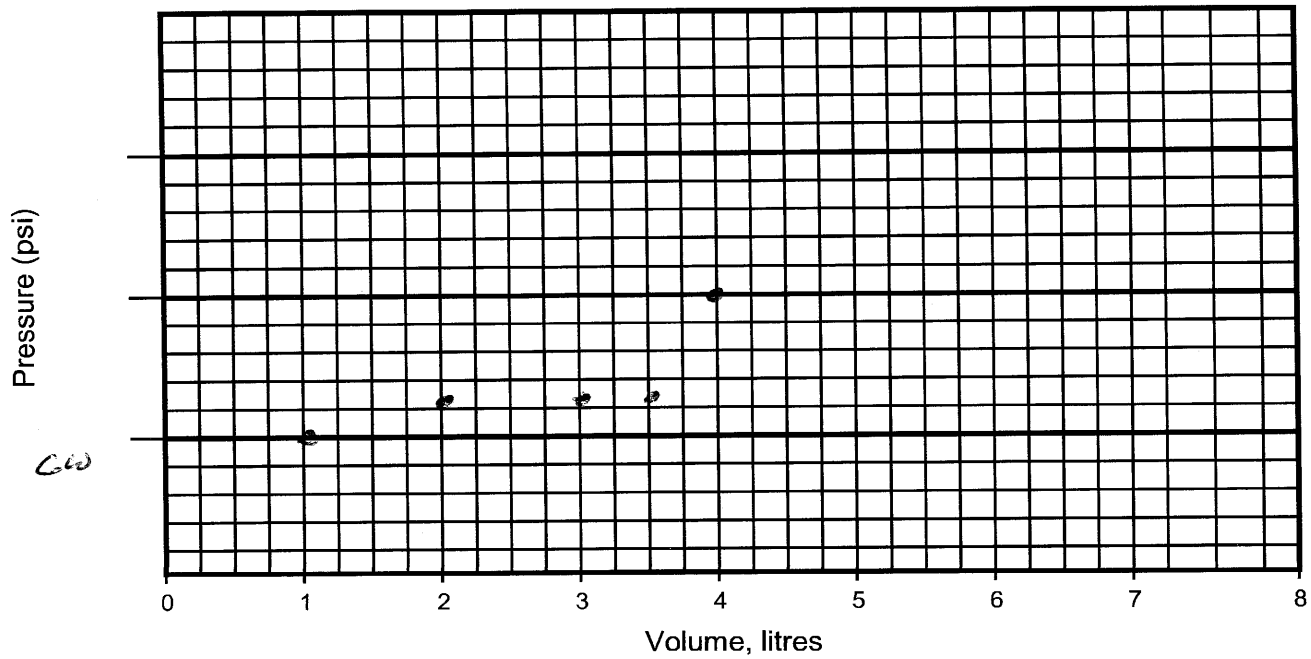
Packer No. 1 - 20162 Depth ( ft / m ): 2375 Inflation Tool No.: TIW ~~DCR~~ Y

Packer Valve Pressure, $P_V$: 145 psi Final Line Pressure, $P_L$: 740 psi Tool Pressure, $P_T$: 450 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 105 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 1 | 4.0 | | | |
| Pressure, psi | 600 | 625 | 625 | 625 | ~~625~~ 700 | 1 | 0 | | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 1 Time - 10:45

# Westbay Packer Inflation Record

Project: Langan - 1487 First Ave  Project No.: FS1477  Well No.: LMW-8R-S

Location: 1487 First Ave.  Completed by: CoS  Date Inflated: 2/1/24

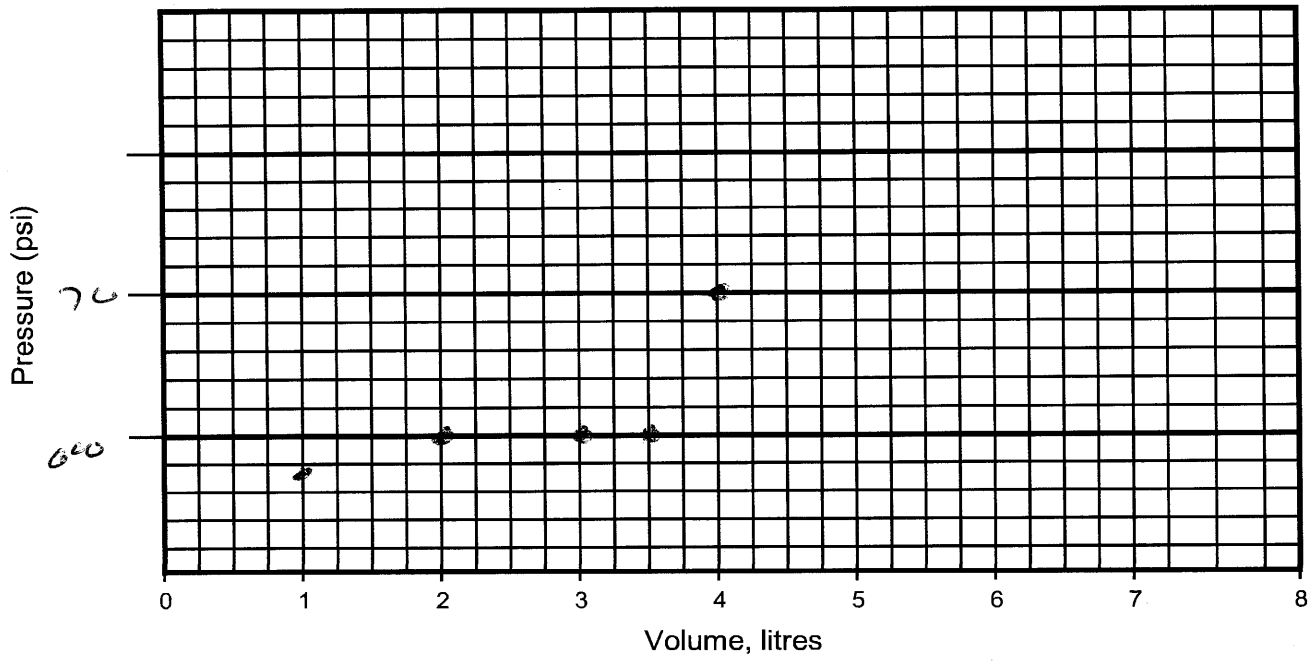
Packer No. 2 - 20156  Depth ( ft / m ): 11.75  Inflation Tool No.: TIW 3744

Packer Valve Pressure, $P_V$: 140 psi  Final Line Pressure, $P_L$: 700 psi  Tool Pressure, $P_T$: 450 psi

Borehole Water Level: - ( ft / m ) = - psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 2.0 | 3.5 | 4.0 | / | 4.0 | | | |
| Pressure, psi | 575 | 600 | 600 | 600 | 700 | / | 0 | | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 2  Time - 11:02

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave Project No.: ES1499 Well No.: LMW-8A-S

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/16/4

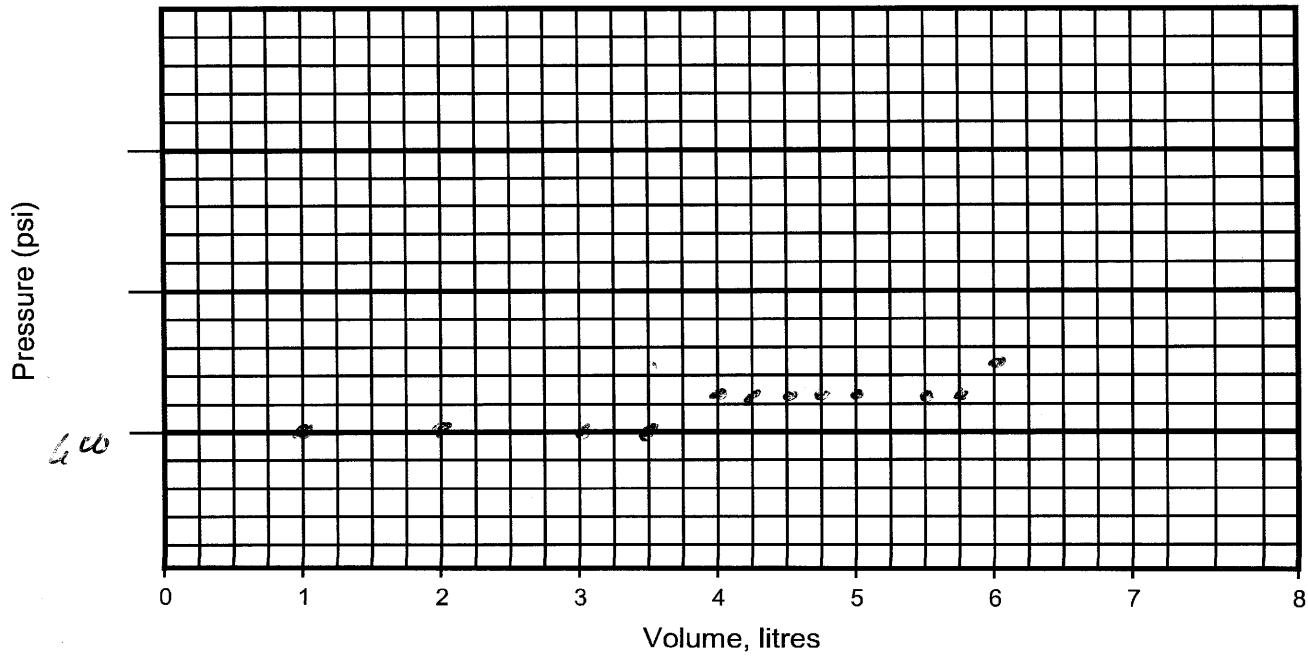
Packer No. 3 - 20141 Depth ( ft / m ): 1.75 Inflation Tool No.: JW 3554

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 650 psi Tool Pressure, $P_T$: 450 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.25 | 4.5 | 4.75 | / | 4.75 |
| Pressure, psi | 600 | 600 | 600 | 600 | 625 | 625 | 625 | 625 | / | ∅ |
| Volume, litres | 5.0 | 5.5 | 5.75 | 6.0 | / | 6.0 | | | | |
| Pressure, psi | 625 | 625 | 625 | 650 | / | ∅ | | | | |




Comments: Packer # 3 Time - 11:37

# APPENDIX F – LMW-8R-D

| | |
|---|---|
| As-Built Packer and Port Summary (Table 17) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 5, 2024) | - 1 Pages |
| Figure 13, Pre-Inflation Piezometric Pressure Profile | - 1 Pages |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 5, 2024) | - 1 Pages |
| Figure 14, Post-Inflation Piezometric Pressure Profile | - 1 Pages |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 3 Pages |

## Table 17. LMW-8R-D As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 3 | **Zone 2** | 59.75 | 52.75 | 57.05 | 65.00 | |
| 2 | QA1 | 39.75 | 34.75 | 39.05 | 54.05 | |
| 1 | **Zone 1** | 27.75 | 22.75 | 27.05 | 36.05 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.
All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-8R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 64.91 ft.

Borehole Depth: 64.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-8R-D.WWD
Report Date: Tue Jan 30 11:46:54 2024

File Date: Jan 30 11:43:10 2024

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 020101 - MP38 Casing 4 (1F/0.3M)

(3) 020102 - MP38 Casing 3 (2F/0.6M)

(8) 020105 - MP38 Casing 2 (5F/1.5M)

(3) 0238 - MP38 Packer - 74mm (5F/1.5M)

(1) 020103 - MP38 Casing 6 (3F/0.9M)

(1) 0203 - MP38 End Cap

(12) 0202 - MP38 Regular Coupling

(3) 0205 - MP38 Measurement Port

(2) 0224 - MP38 Pumping Port




(2) 0216 - Magnetic Location Collar

## Geology

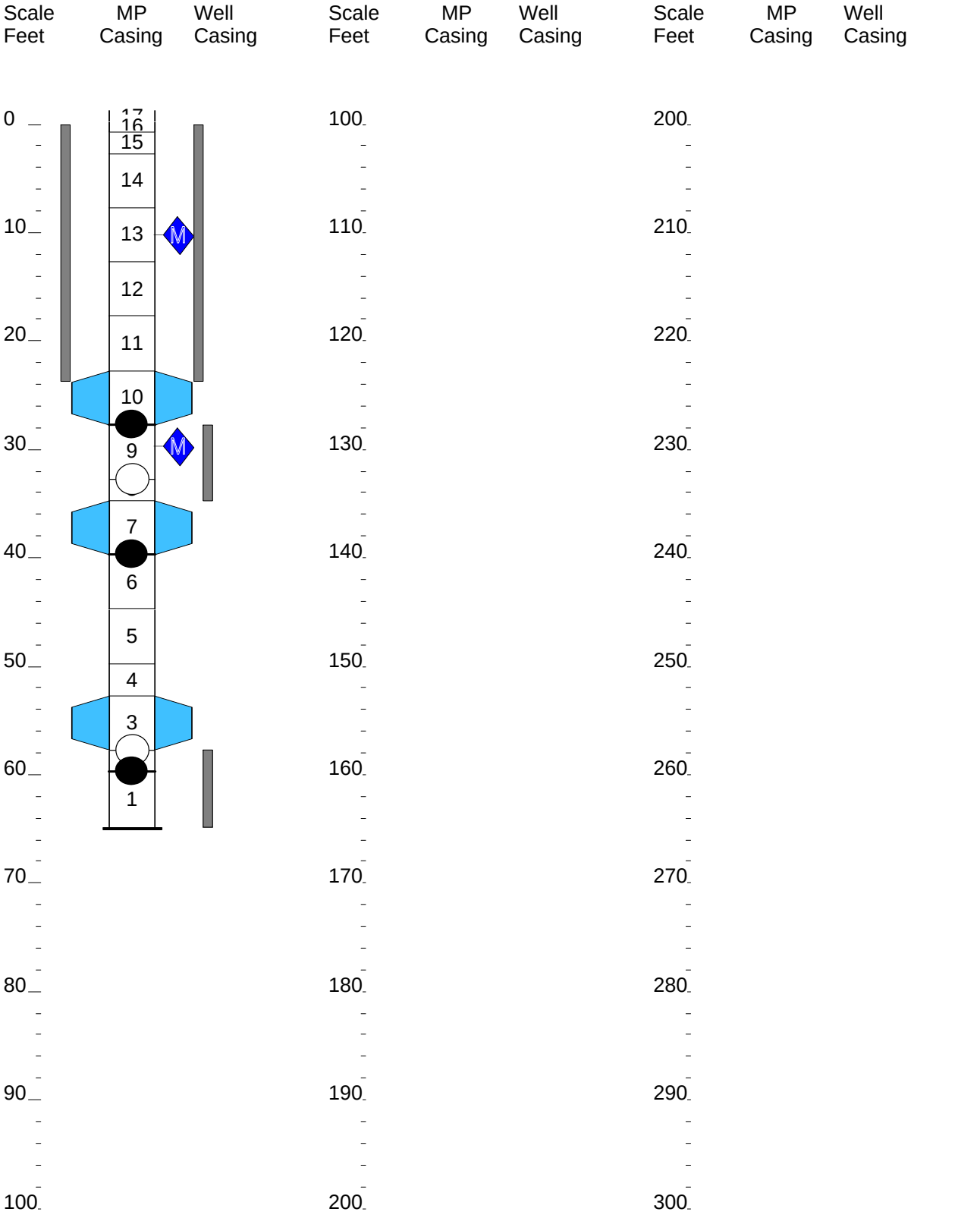
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-8R-D



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: WLM-8R-1
Datum: GS
Elev. G.S.: —
Height of Westbay above G.S.: —
Elev. top of Westbay Casing: —
Reference Elevation: —
Borehole angle: 90°

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

Probe Type: Sample
Serial No.: 3335
Probe Range: 0-320
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/5/24
Client: Langan
Job No.: F5[illegible]491
Location: 1487 1st Ave
Weather: —
Operator: GS

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

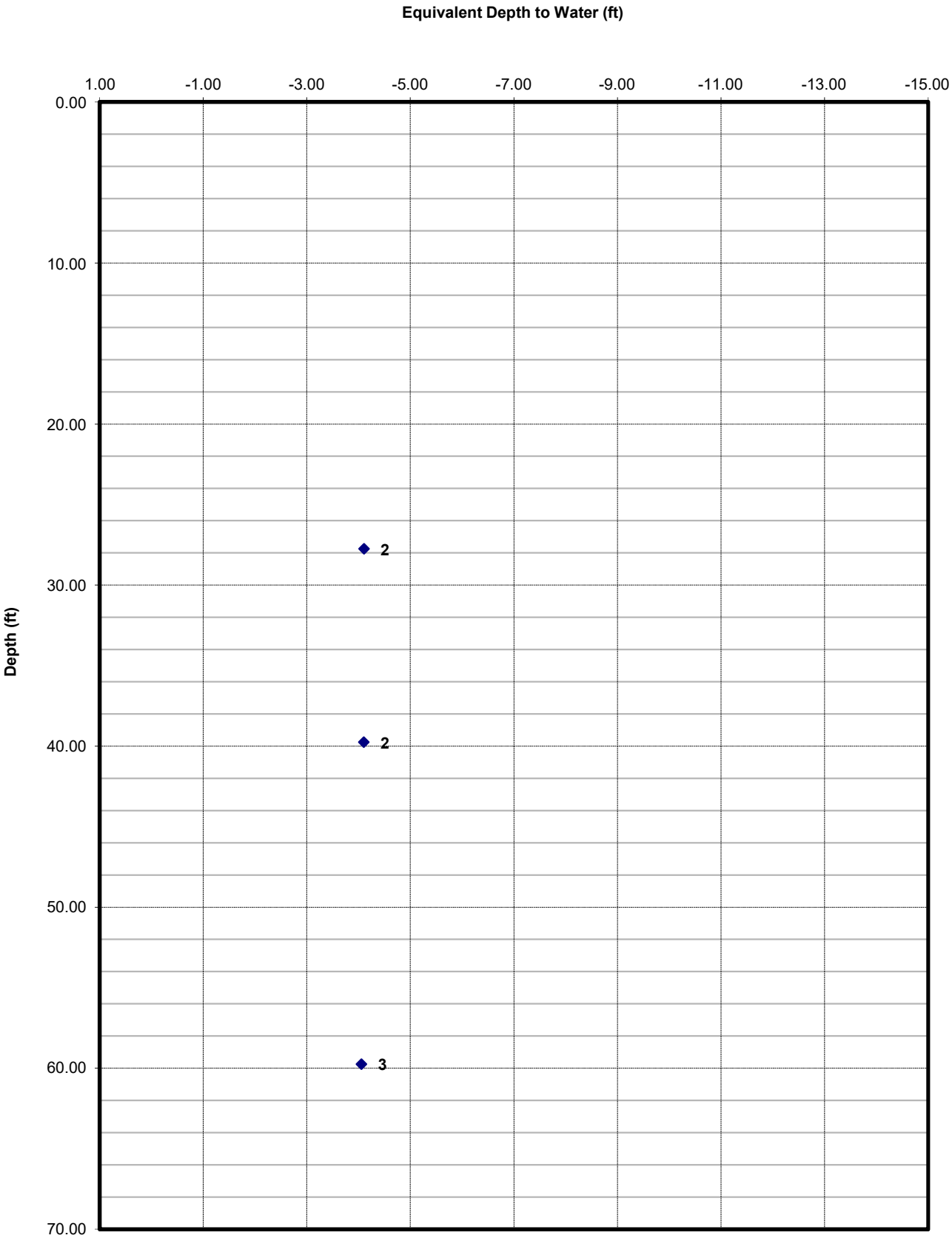
| | | Start | Finish |
|---|---|---|---|
| Pressure | | 14.70 | 14.64 |
| Temp | | 6.09° | 16.0C |
| Time | | 14:58 | 15:38 |

$P_{atm}$ 14.70 psi

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 59.75 | 59.4 | — | 31.74 | 42.36 | 15:31 | 15.60 | 31.74 | 63.81 | -4.06 | Pre Inflate |
| 2 | 39.75 | 39.5 | — | 23.12 | 33.71 | 15:32 | 15.68 | 23.12 | 43.85 | -4.10 | |
| 1 | 27.75 | 27.6 | — | 17.90 | 28.51 | 15:34 | 15.80 | 17.91 | 31.86 | -4.11 | |

Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 13**
**Well: LMW-8R-D**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Westbay Instruments

Well No.: LMW-8R2-D
Datum: GS
Elev. G.S.: -
Height of Westbay above G.S.: -
Elev. top of Westbay Casing: -
Reference Elevation: -
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3335
Probe Range: 0-320
Westbay Casing Type: MP35
Sampler Valve Position: Closed

Date: 2/5/24
Client: Langan
Job No.: TS1459
Location: 1487 1st Ave
Weather: -
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

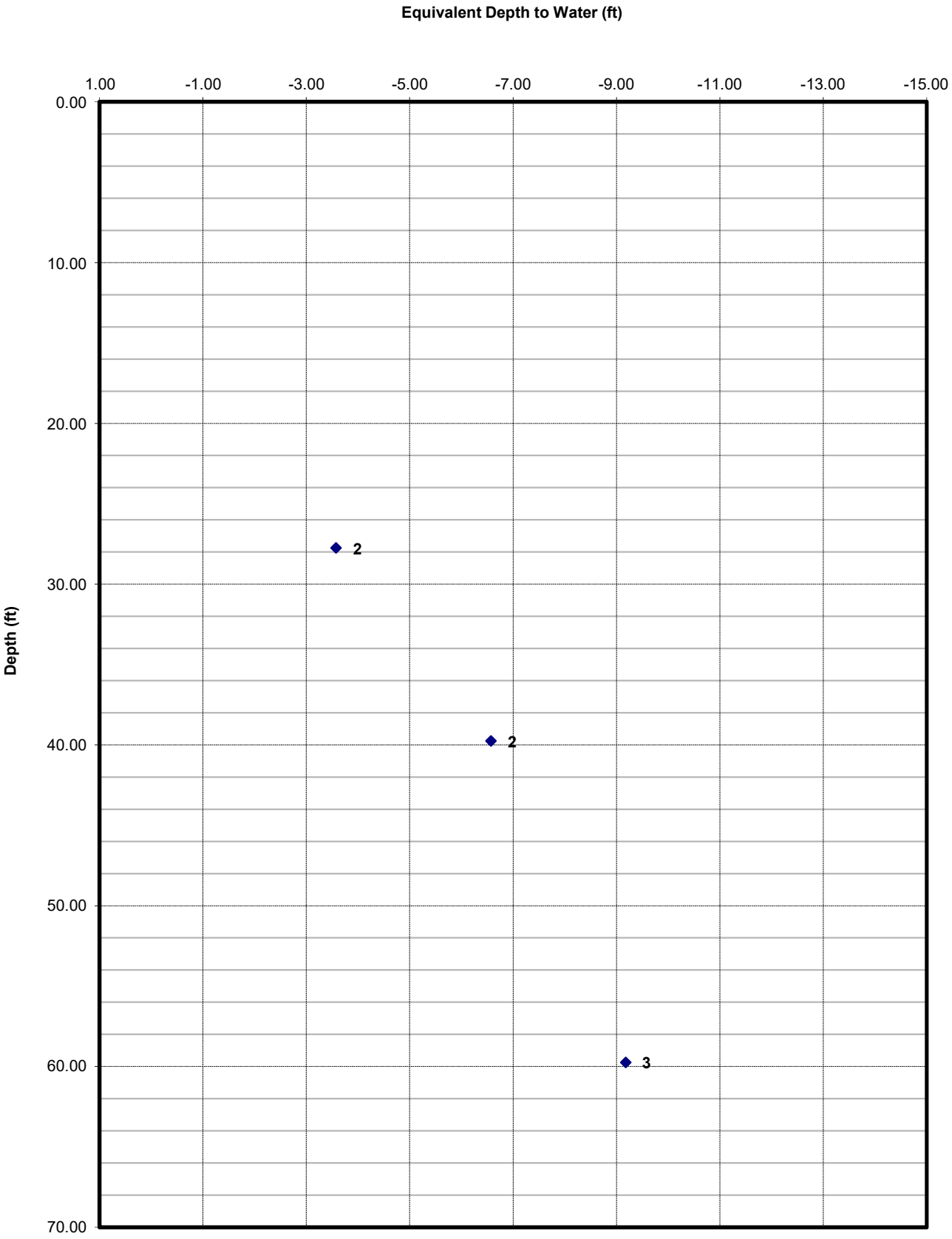
| | | Finish: |
|---|---|---|
| Start: Pressure | 14.70 | 14.72 |
| Temp | 10.78 | 15.10 |
| Time | 17:10 | 17:26 |

$P_{atm}$ 14.76 psi

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 59.75 | 59.8 | - | 41.02 | 41.58 | 17:14 | 11.77 | 41.01 | 08.93 | -9.18 | Post Install |
| 2 | 34.75 | 34.8 | - | 32.38 | ~~32.34~~ | 17:16 | 13.09 | 32.30 | ~~10.62~~ | -0.87 | 34.78 46.32 -6.57 |
| 1 | 27.75 | 27.8 | - | 27.12 | 27.10 | 17:17 | 13.86 | 27.13 | ~~28.60~~ | -0.85 | 28.28 31.33 -3.57 |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 14**
**Well: LMW-8R-D**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-8R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 64.91 ft.

Borehole Depth: 64.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-8R-D.WWD
Report Date: Tue Jan 30 17:34:10 2024

File Date: Jan 30 14:35:02 2024

## Comments

## Log Information

| | | |
|---|---|---|
| Borehole condition confirmed. | (method) Logging | Date: |
| MP well design & preparation. | By: | Date: 1/30/24 |
| MP well design checked. | By: | Date: 2/5/24 |
| MP well and borehole approved to install. | By: | Date: 2/5/24 |

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 020101 - MP38 Casing 4 (1F/0.3M)

(3) 020102 - MP38 Casing 3 (2F/0.6M)

(8) 020105 - MP38 Casing 2 (5F/1.5M)

(3) 0238 - MP38 Packer - 74mm (5F/1.5M)

(1) 020103 - MP38 Casing 6 (3F/0.9M)

(1) 0203 - MP38 End Cap

(12) 0202 - MP38 Regular Coupling

(3) 0205 - MP38 Measurement Port

(2) 0224 - MP38 Pumping Port

(2) 0216 - Magnetic Location Collar

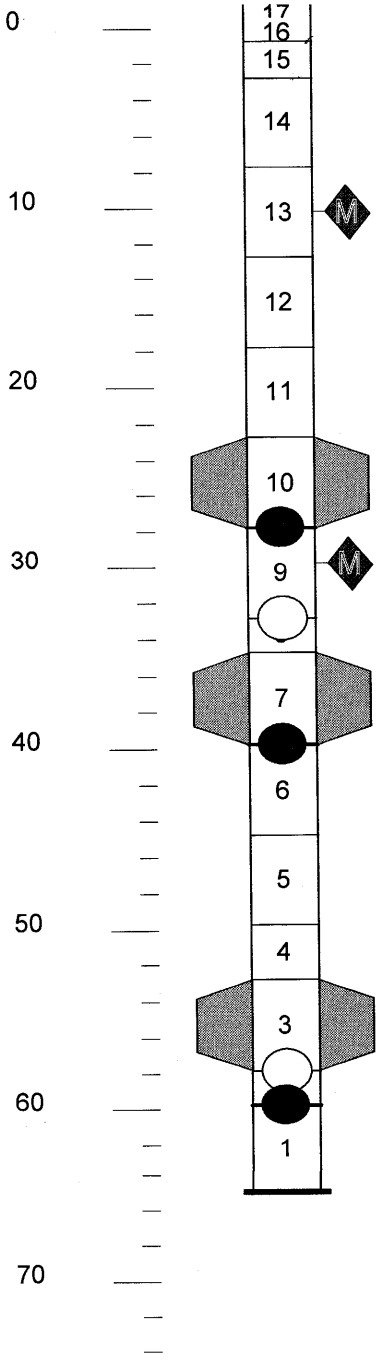
## Geology

## Backfill/Casing

Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-8R-D




MP Casing Description

020101 - MP38 Casing 4 (1F/0.3M)
020102 - MP38 Casing 3 (2F/0.6M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
0238 - MP38 Packer - 74mm (5F/1.5M
0205 - MP38 Measurement Port 10284
020105 - MP38 Casing 2 (5F/1.5M)
0224 - MP38 Pumping Port 9301
020102 - MP38 Casing 3 (2F/0.6M)
0238 - MP38 Packer - 74mm (5F/1.5M 20015 165/140
0205 - MP38 Measurement Port 10283
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
020103 - MP38 Casing 6 (3F/0.9M)
0238 - MP38 Packer - 74mm (5F/1.5M 20166 170/145
0224 - MP38 Pumping Port 9296
020102 - MP38 Casing 3 (2F/0.6M)
0205 - MP38 Measurement Port 10280
020105 - MP38 Casing 2 (5F/1.5M)
0203 - MP38 End Cap

# Westbay Packer Inflation Record

Project: Langan - 1487 1st Ave  Project No.: F514199  Well No.: LMW-8R-D

Location: 1487 1st Ave  Completed by: CS  Date Inflated: 2/5/24

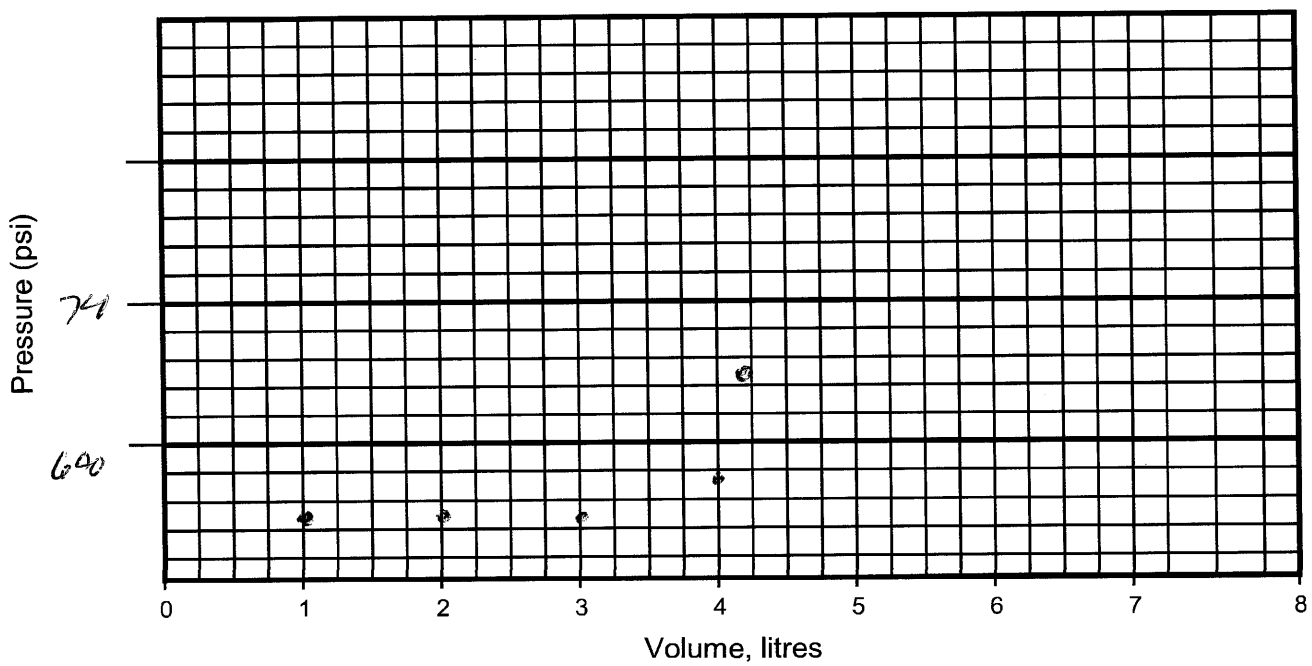
Packer No. 1 - 20166  Depth ( ft / m ): 52.75  Inflation Tool No.: TW3554

Packer Valve Pressure, $P_V$: 145 psi  Final Line Pressure, $P_L$: 630 psi  Tool Pressure, $P_T$: 460 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 105 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.15 | / | 4.05 | | |
| Pressure, psi | 550 | 550 | 550 | 550 | 575 | 650 | / | ∅ | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 1  Time - 15:46

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave Project No.: FS4999 Well No.: LMW-809-D

Location: 1487 1st Ave Completed by: CJ Date Inflated: 2/5/21

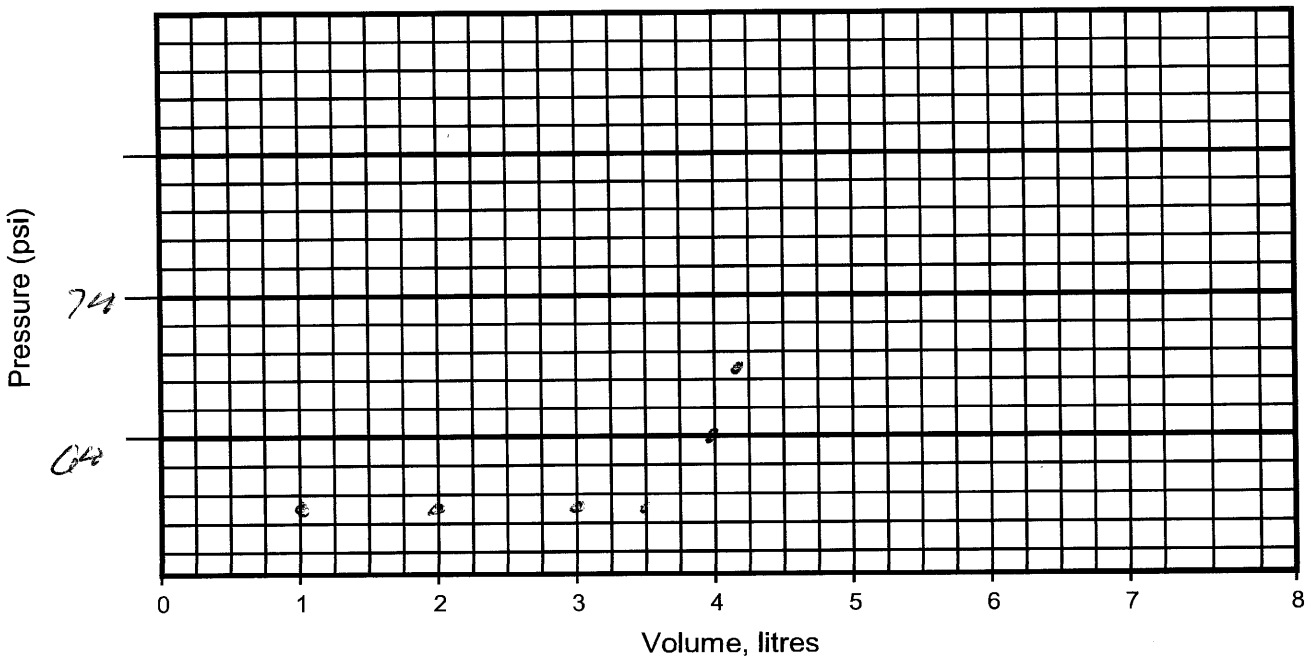
Packer No. 2 - 90015 Depth ( ft / m ): 3475 Inflation Tool No.: TW 3594

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 650 psi Tool Pressure, $P_T$: 90 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.20 | / | 4.20 | | |
| Pressure, psi | 550 | 550 | 550 | 550 | 600 | 650 | / | 0 | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 2 Time - 16:15

# Westbay Packer Inflation Record

Project: Kerger - 1487 1st Ave Project No.: F5149A Well No.: KMW-8A-D

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/5/24

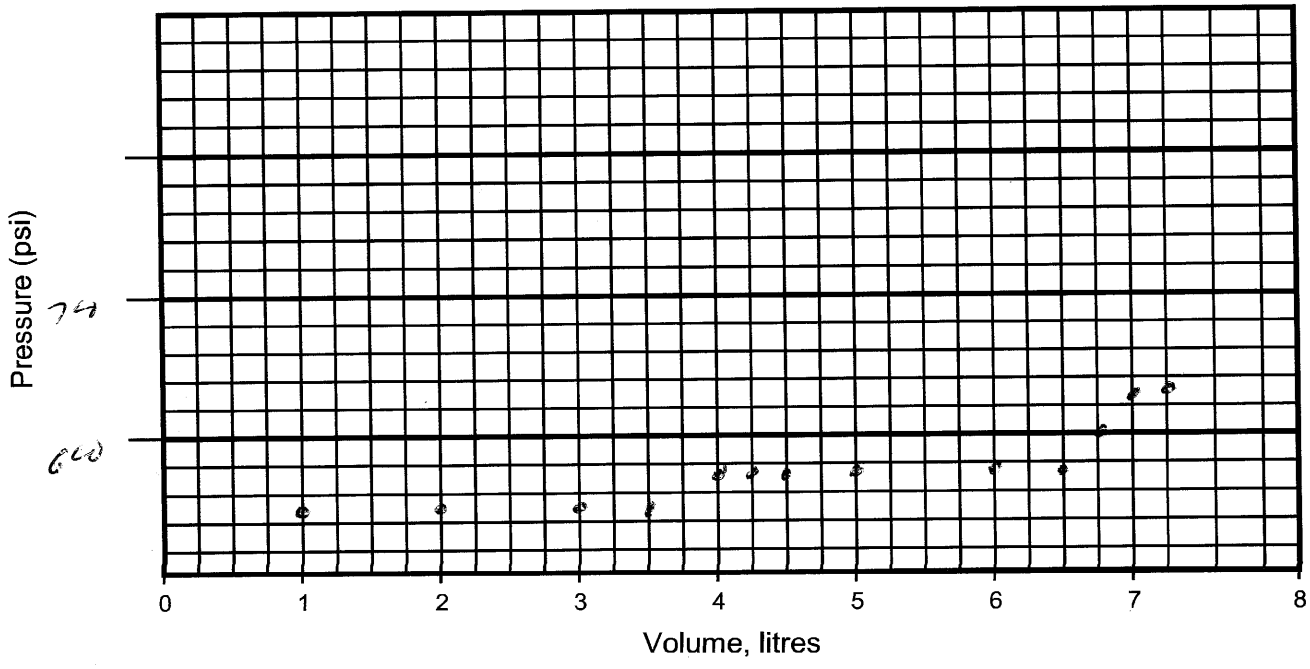
Packer No. 3 Depth ( ft / m ): 22.75 Inflation Tool No.: TIW 3754

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 625 psi Tool Pressure, $P_T$: 400 psi

Borehole Water Level: — ( ft / m ) = - psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 85 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.25 | 4.5 | 5.0 | 6.0 | 6.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 550 | 550 | 552 | 558 | 575 | 575 | 575 | 573 | 575 | 575 |
| Volume, litres | 6.25 | 7.0 | 7.25 | / | 3.5 | | | | | |
| Pressure, psi | 600 | 628 | 625 | / | 0 | | | | | |




Comments: Packer # 3 Time - 1635

# APPENDIX G – LMW-9R-S


| | |
|---|---|
| As-Built Packer and Port Summary (Table 18) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 6, 2024) | - 1 Pages |
| Figure 15, Pre-Inflation Piezometric Pressure Profile | - 1 Pages |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 6, 2024) | - 1 Pages |
| Figure 16, Post-Inflation Piezometric Pressure Profile | - 1 Pages |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 3 Pages |

## Table 18. LMW-9R-S As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 3 | QA2 | 24.75 | 19.75 | 24.05 | 28.00 | |
| 2 | **Zone 1** | 13.75 | 8.75 | 13.05 | 21.05 | |
| 1 | QA1 | 8.75 | 3.75 | 8.05 | 10.05 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.
All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-9R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 27.91 ft.

Borehole Depth: 30.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-9R-S.WWD
Report Date: Tue Jan 30 10:54:19 2024

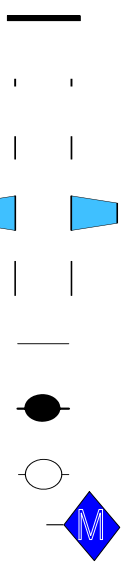
File Date: Jan 30 10:52:47 2024

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(3) 020101 - MP38 Casing 4 (1F/0.3M)

(2) 020103 - MP38 Casing 6 (3F/0.9M)

(3) 0238 - MP38 Packer - 74mm (5F/1.5M)

(1) 020105 - MP38 Casing 2 (5F/1.5M)

(5) 0202 - MP38 Regular Coupling

(3) 0205 - MP38 Measurement Port

(1) 0224 - MP38 Pumping Port

(1) 0216 - Magnetic Location Collar

## Geology

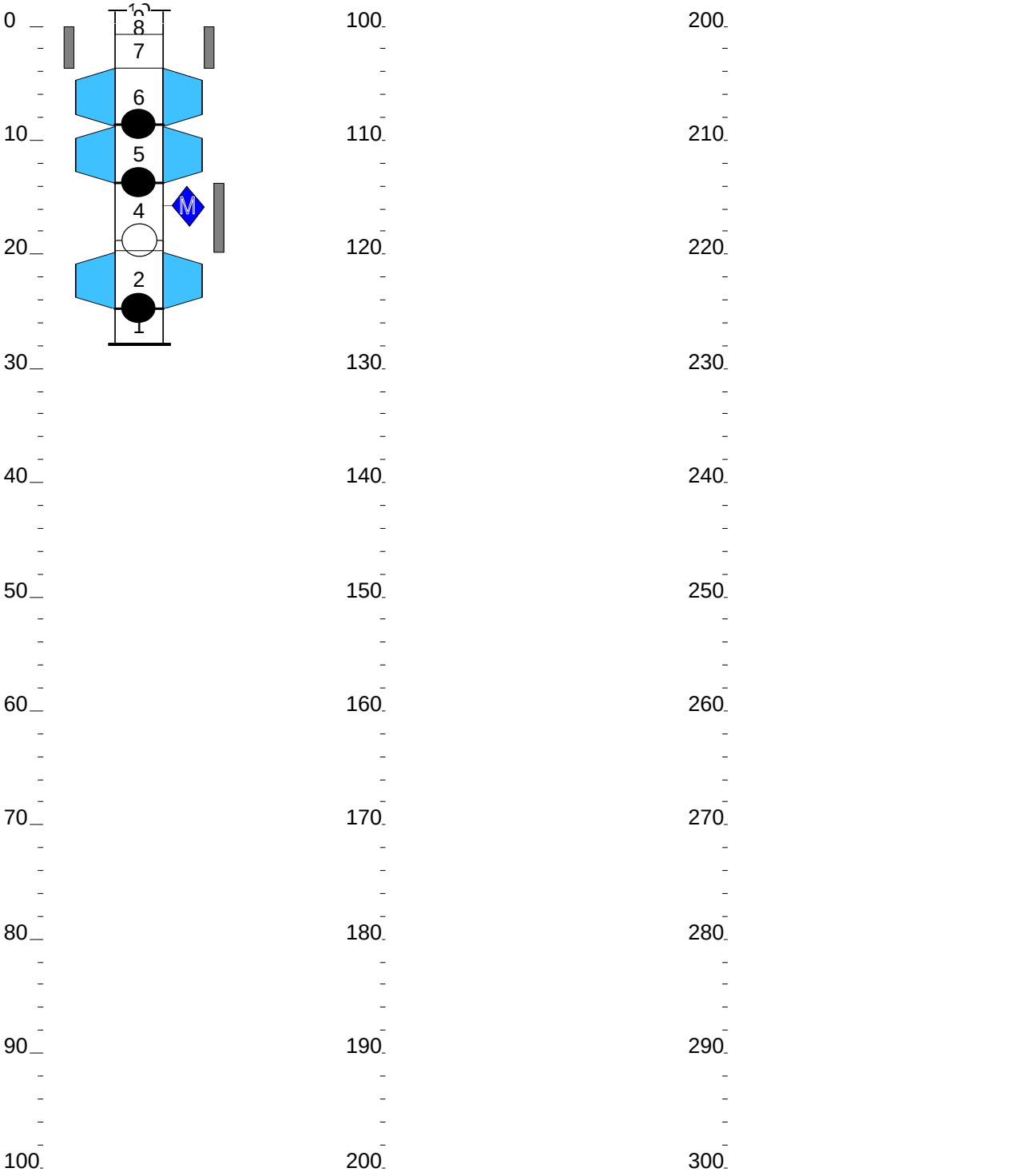
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-9R-S



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: LMW-9R-S
Datum: GS
Elev.G.S.: -
Height of Westbay above G.S.: -
Elev. top of Westbay Casing: -
Reference Elevation: -
Borehole angle: 90°

Probe Type: Sammler
Serial No.: 3535
Probe Range: 0-500
Westbay Casing Type: MP38
Sampler Valve Position: C/O 82

Date: 2/6/24
Client: Longview
Job No.: FSTV 99
Location: 1487 1st Ave
Weather: -
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

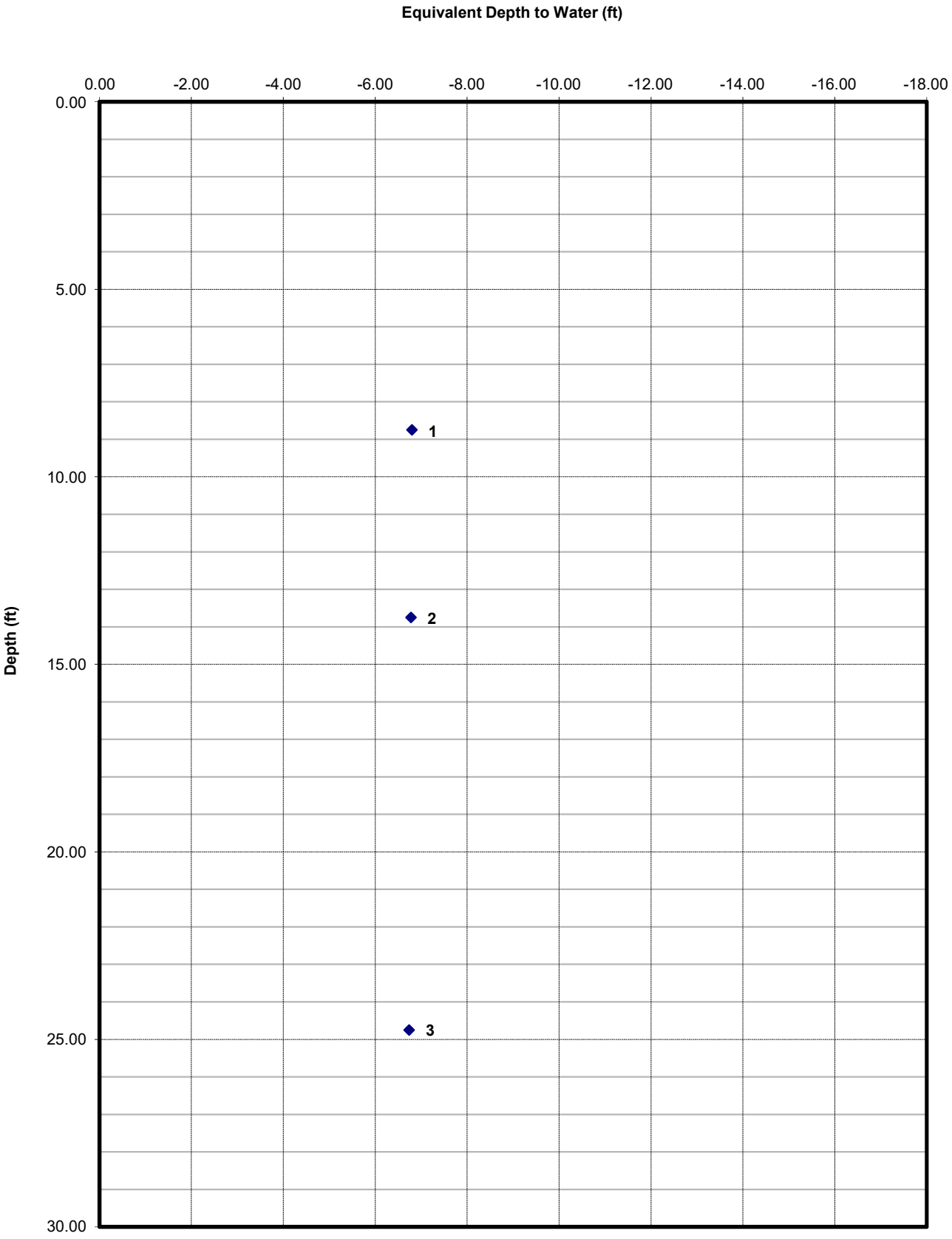
| | | Finish: |
|---|---|---|
| Start: Pressure | 14.82 | 14.82 |
| Temp | 9.51 | 12.68 |
| Time | 16:27 | 16:35 |

$P_{atm}$ 14.82 psi

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings | | | | | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | | | |
| 3 | 24.75 | 24.8 | - | 29.34 | 28.71 | 16:30 | 10.84 | 29.34 | 32.04 | -7.29 | Post mHalh |
| 2 | 13.75 | 13.8 | - | 24.55 | 24.56 | 16:32 | 11.83 | 24.55 | 22.47 | -8.72 | |
| 1 | 8.75 | 8.9 | - | 22.37 | 22.60 | 16:34 | 12.61 | 22.36 | 17.95 | -9.20 | |
| | | | | | | | | | | | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 15**
**Well: LMW-9R-S**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Westbay Instruments

Well No.: LMW-9R-S
Datum: GS
Elev.G.S.: —
Height of Westbay aboveG.S.: —
Elev. top of Westbay Casing: —
Reference Elevation: —
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3155
Probe Range: 0-50
Westbay Casing Type: MP35
Sampler Valve Position: Closed

Date: 2/6/24
Client: Langan
Job No.: FS1495
Location: 1487 1st Ave
Weather: —
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.81 psi

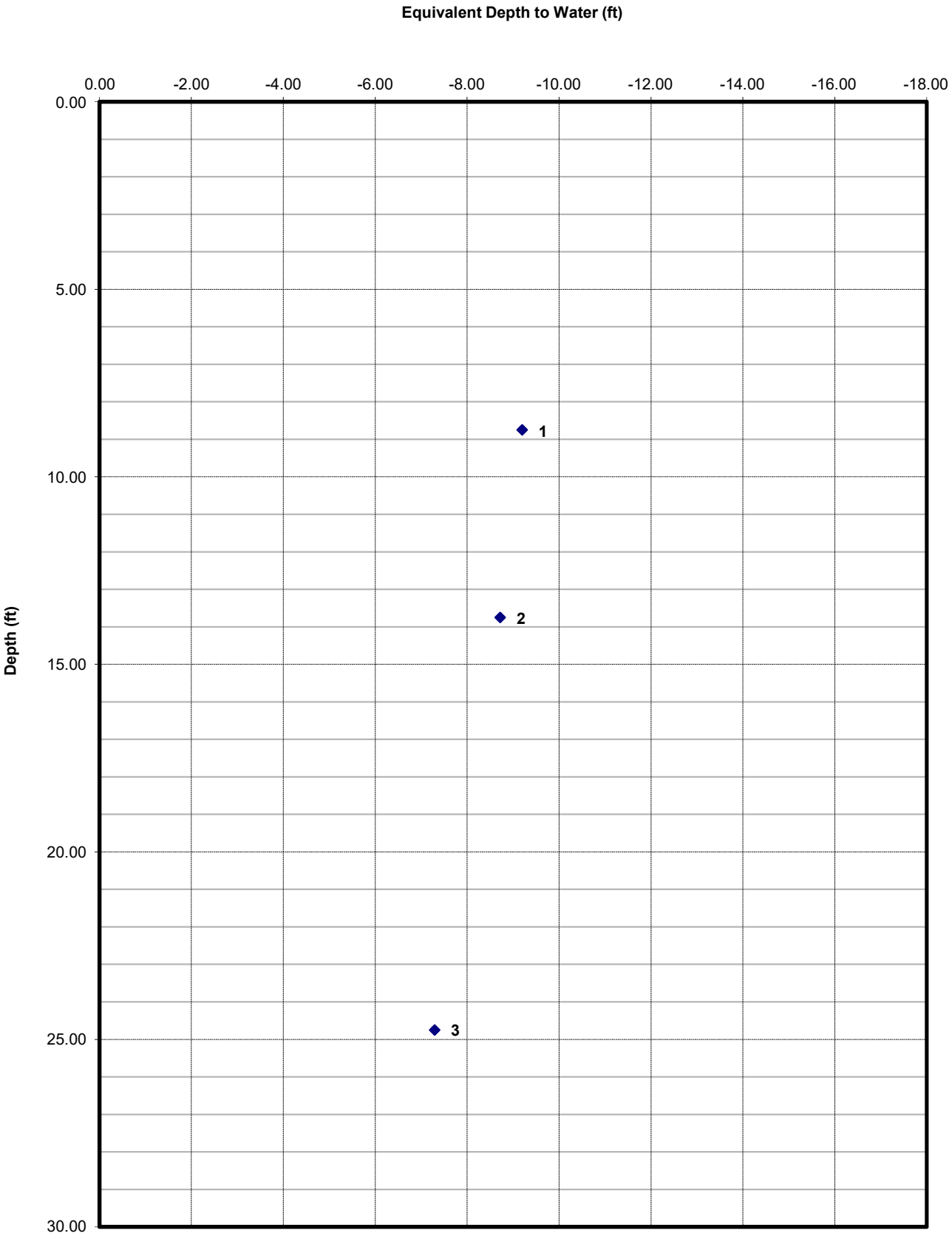
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | Start | Finish |
|---|---|---|
| Pressure | 14.81 | 14.81 |
| Temp | 7.15 | 14.19 |
| Time | 14:24 | 15:02 |

| Port No. | Port Position From Log (ft) | Port Position FromCable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 24.75 | 24.9 | — | 22.77 | 28.46 | 14:58 | 14.47 | 22.78 | 31.49 | -6.74 | Pz Inhib |
| 2 | 13.75 | 13.9 | — | 17.48 | 23.71 | 14:59 | 14.46 | 17.99 | 20.53 | -6.78 | |
| 1 | 8.75 | 9.0 | — | 15.81 | 21.55 | 15:01 | 14.43 | 15.81 | 15.55 | -6.80 | |
| | | | | | | | | | | | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 16**
**Well: LMW-9R-S**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-9R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 27.91 ft.

Borehole Depth: 30.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-9R-S.WWD
Report Date: Tue Jan 30 17:38:58 2024

File Date: Jan 30 10:55:24 2024

## Comments

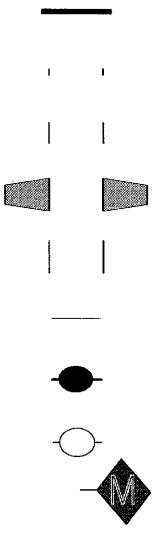
## Log Information

| | | |
|---|---|---|
| Borehole condition confirmed. | (method) Logging | Date: |
| MP well design & preparation. | By: | Date: 1/26/24 |
| MP well design checked. | By: | Date: 2/6/24 |
| MP well and borehole approved to install. | By: | Date: 2/6/24 |

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(3) 020101 - MP38 Casing 4 (1F/0.3M)

(2) 020103 - MP38 Casing 6 (3F/0.9M)

(3) 0238 - MP38 Packer - 74mm (5F/1.5M)

(1) 020105 - MP38 Casing 2 (5F/1.5M)

(5) 0202 - MP38 Regular Coupling

(3) 0205 - MP38 Measurement Port

(1) 0224 - MP38 Pumping Port

(1) 0216 - Magnetic Location Collar

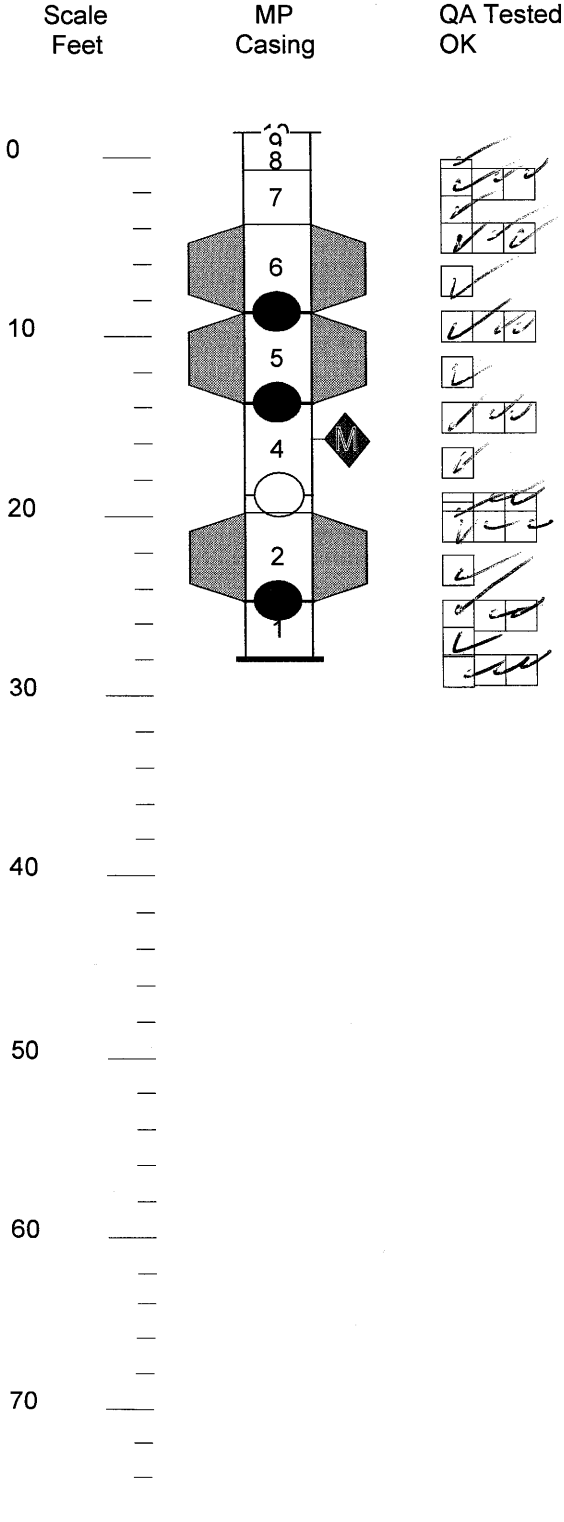
## Geology

## Backfill/Casing

Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-9R-S




MP Casing Description

020101 - MP38 Casing 4 (1F/0.3M)
020103 - MP38 Casing 6 (3F/0.9M)
0238 - MP38 Packer - 74mm (5F/1.5M 20150 170/145
0205 - MP38 Measurement Port 10296
0238 - MP38 Packer - 74mm (5F/1.5M 20149 165/140
0205 - MP38 Measurement Port 10295
020105 - MP38 Casing 2 (5F/1.5M)
020101 - MP38 Casing 4 (1F/0.3M) 5114
0238 - MP38 Packer - 74mm (5F/1.5M 20153 165/140
0205 - MP38 Measurement Port ~~10247~~ 10292
020103 - MP38 Casing 6 (3F/0.9M)
0203 - MP38 End Cap

(c) Westbay Instruments Inc. 2000

Tue Jan 30 17:40:10 2024

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave Project No.: FS1459 Well No.: LMW-9R-S

Location: 1487 1st Ave Completed by: CJ Date Inflated: 2/6/24

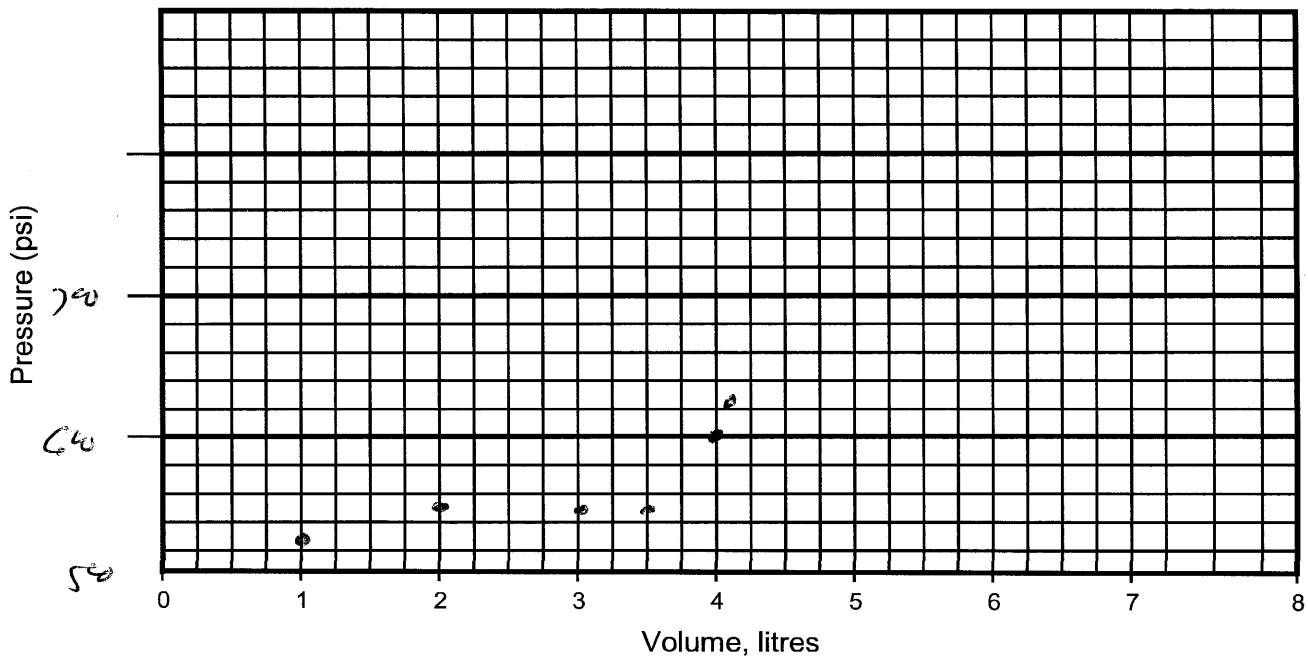
Packer No. 1 - 20153 Depth ( ft / m ): 1975 Inflation Tool No.: TW 3554

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 625 psi Tool Pressure, $P_T$: 375 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.05 | / | 4.0 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 525 | 550 | 550 | 550 | 600 | 625 | / | 0 | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 1 Time - 15:18

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave  Project No.: FSI4 99  Well No.: LMW-99-5

Location: 1487 1st Ave  Completed by: CS  Date Inflated: 2/6/24

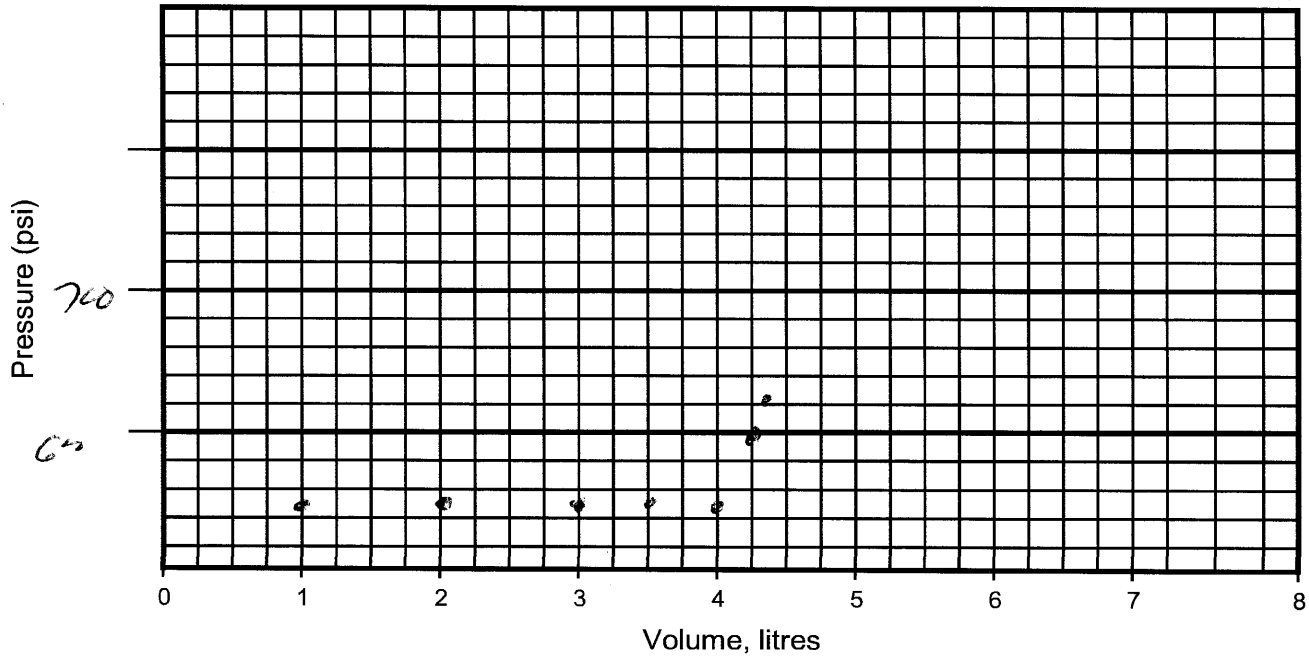
Packer No. 2 - 20149  Depth ( ft / m ): 8.75  Inflation Tool No.: TW 3594

Packer Valve Pressure, $P_V$: 140 psi  Final Line Pressure, $P_L$: 625 psi  Tool Pressure, $P_T$: 375 psi

Borehole Water Level: - ( ft / m ) = - psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.25 | 4.30 | / | 4.1 | |
| Pressure, psi | 550 | 550 | 550 | 550 | 550 | 600 | 625 | / | 0 | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 2  Time - 15:34

Sheet 3 of 3

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave  Project No.: FS1459  Well No.: LMW-9B-S

Location: 1487 1st Ave  Completed by: CS  Date Inflated: 2/4/24

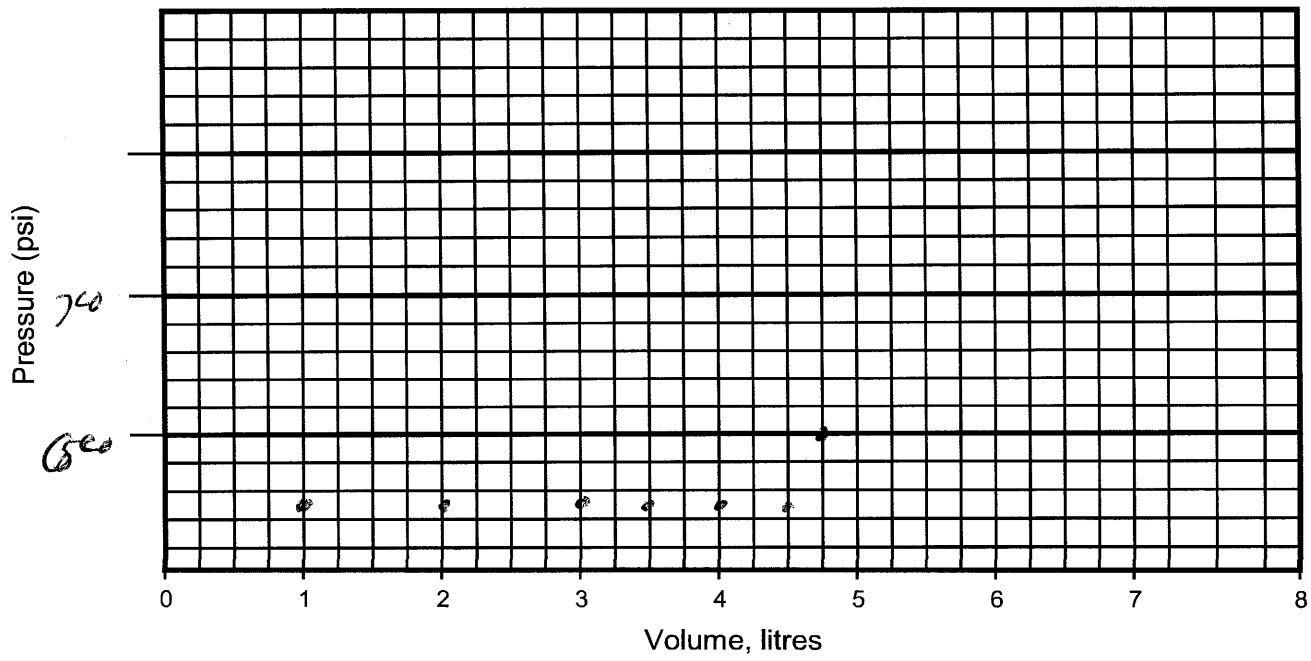
Packer No. 3 - 10250  Depth ( ft / m ): 375  Inflation Tool No.: TLW3954

Packer Valve Pressure, $P_V$: 145 psi  Final Line Pressure, $P_L$: 038 psi  Tool Pressure, $P_T$: 375 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 130 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.5 | 4.75 | 4.90 | 4.85 | 4.85 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 550 | 550 | 550 | 550 | 550 | 550 | 600 | 650 | / | 0 |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 3  Time - 15:52

# APPENDIX H – LMW-9R-D


| | |
|---|---|
| As-Built Packer and Port Summary (Table 19) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 6, 2024) | - 1 Pages |
| Figure 17, Pre-Inflation Piezometric Pressure Profile | - 1 Pages |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 6, 2024) | - 1 Pages |
| Figure 18, Post-Inflation Piezometric Pressure Profile | - 1 Pages |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 4 Pages |

## Table 19. LMW-9R-D As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 4 | **Zone 3** | 58.25 | 50.25 | 54.55 | 64.00 | |
| 3 | **Zone 2** | 45.25 | 40.25 | 44.55 | 51.55 | |
| 2 | QA1 | 38.25 | 33.25 | 37.55 | 41.55 | |
| 1 | **Zone 1** | 28.25 | 23.25 | 27.55 | 34.55 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.

All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-9R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 63.41 ft.

Borehole Depth: 63.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-9R-D.WWD
Report Date: Tue Jan 30 11:57:53 2024

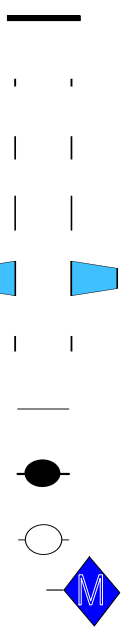
File Date: Sep 18 15:24:06 2023

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(2) 020101 - MP38 Casing 4 (1F/0.3M)

(2) 020103 - MP38 Casing 6 (3F/0.9M)

(7) 020105 - MP38 Casing 2 (5F/1.5M)

(4) 0238 - MP38 Packer - 74mm (5F/1.5M)

(1) 020102 - MP38 Casing 3 (2F/0.6M)

(9) 0202 - MP38 Regular Coupling

(4) 0205 - MP38 Measurement Port

(3) 0224 - MP38 Pumping Port

(3) 0216 - Magnetic Location Collar

## Geology

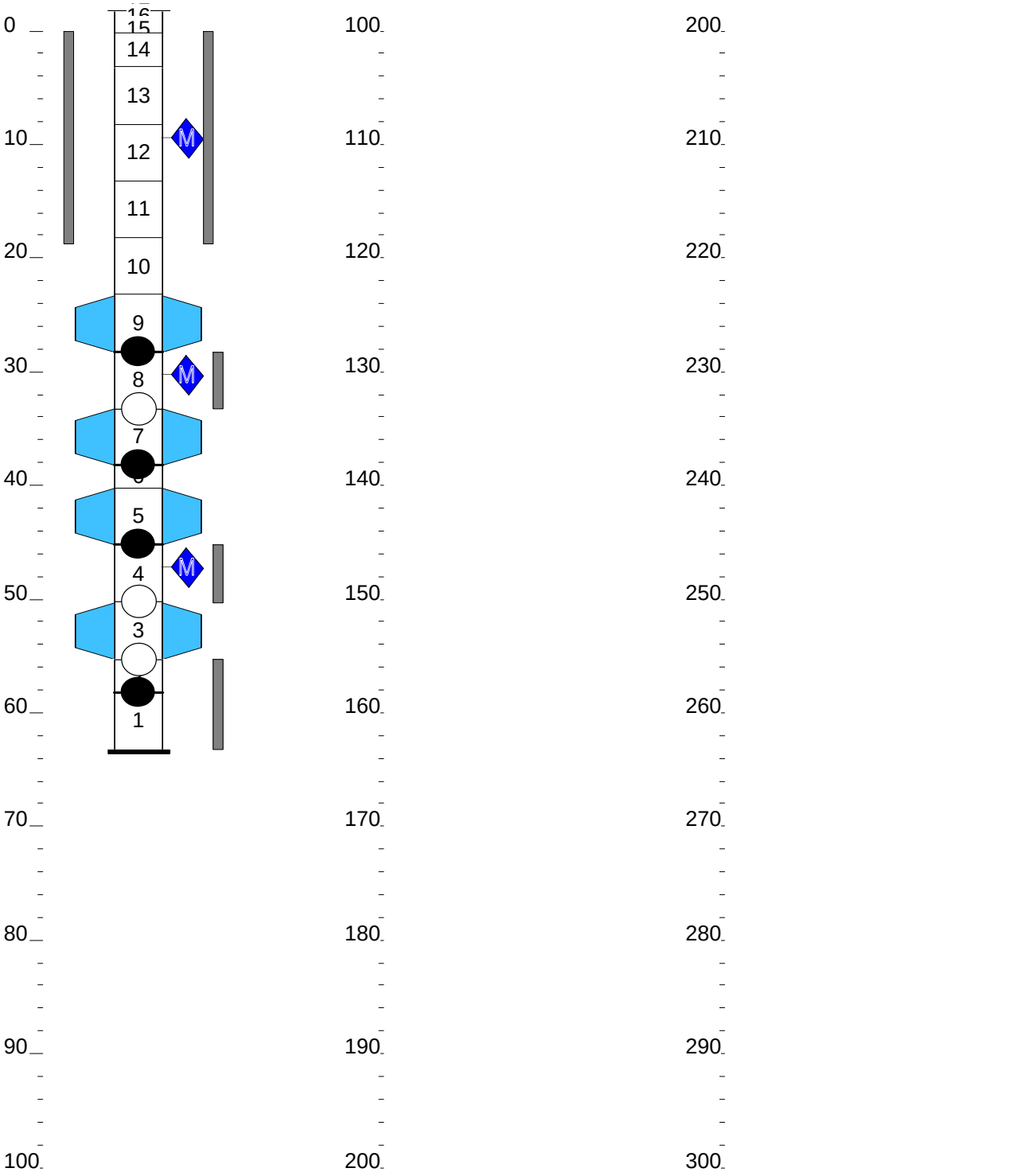
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-9R-D



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: LMW-9R-D
Datum: GS
Elev. G.S.: —
Height of Westbay above G.S.: —
Elev. top of Westbay Casing: —
Reference Elevation: —
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3555
Probe Range: 0-500
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/6/24
Client: Langan
Job No.: F514
Location: 1487 1st Ave
Weather: —
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.85 psi

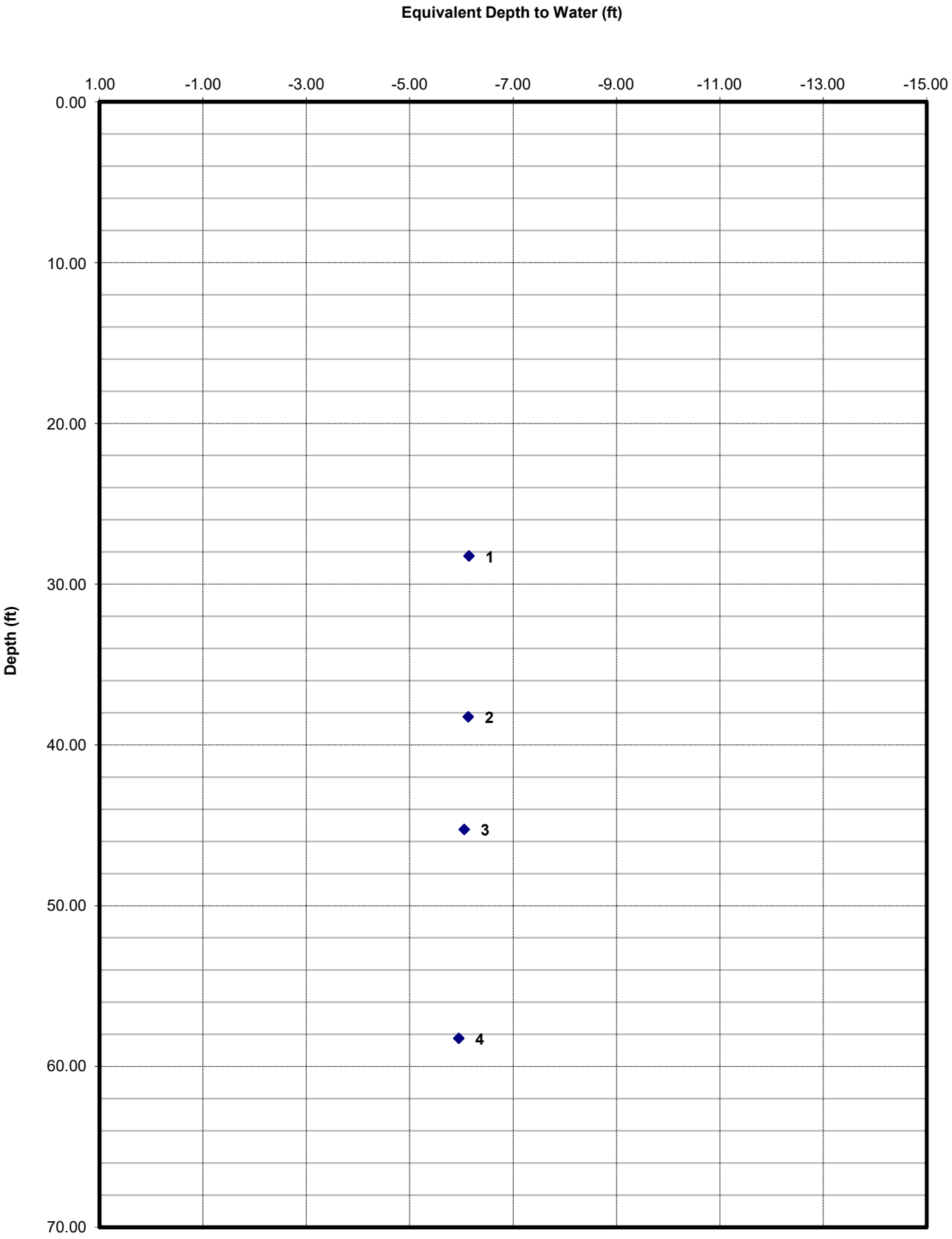
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | Start | Finish |
|---|---|---|
| Pressure | 14.85 | 14.83 |
| Temp | 6.67 | 15.53 |
| Time | 10:20 | 10:59 |

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings | | | | | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | | | |
| 4 | 55.25 | 58.40 | — | 31.45 | 42.68 | 10:54 | 15.39 | 31.45 | 64.20 | -5.95 | Pre Inflate |
| 3 | 45.25 | 45.40 | — | 26.03 | 37.09 | 10:55 | 15.43 | 26.03 | 51.30 | -6.05 | |
| 2 | 35.25 | 38.40 | — | 23.01 | 34.09 | 10:57 | 15.42 | 23.01 | 44.38 | -6.13 | |
| 1 | 25.25 | 28.40 | — | 18.68 | 29.76 | 10:58 | 15.46 | 18.69 | 34.39 | -6.14 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 17**
**Well: LMW-9R-D**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: MW-9R-D
Datum: GS
Elev. G.S.: -
Height of Westbay above G.S.: -
Elev. top of Westbay Casing: -
Reference Elevation: -
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3553
Probe Range: 0-500
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/6/24
Client: Langan
Job No.: ESPV
Location: 1483 1st Ave
Weather: -
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

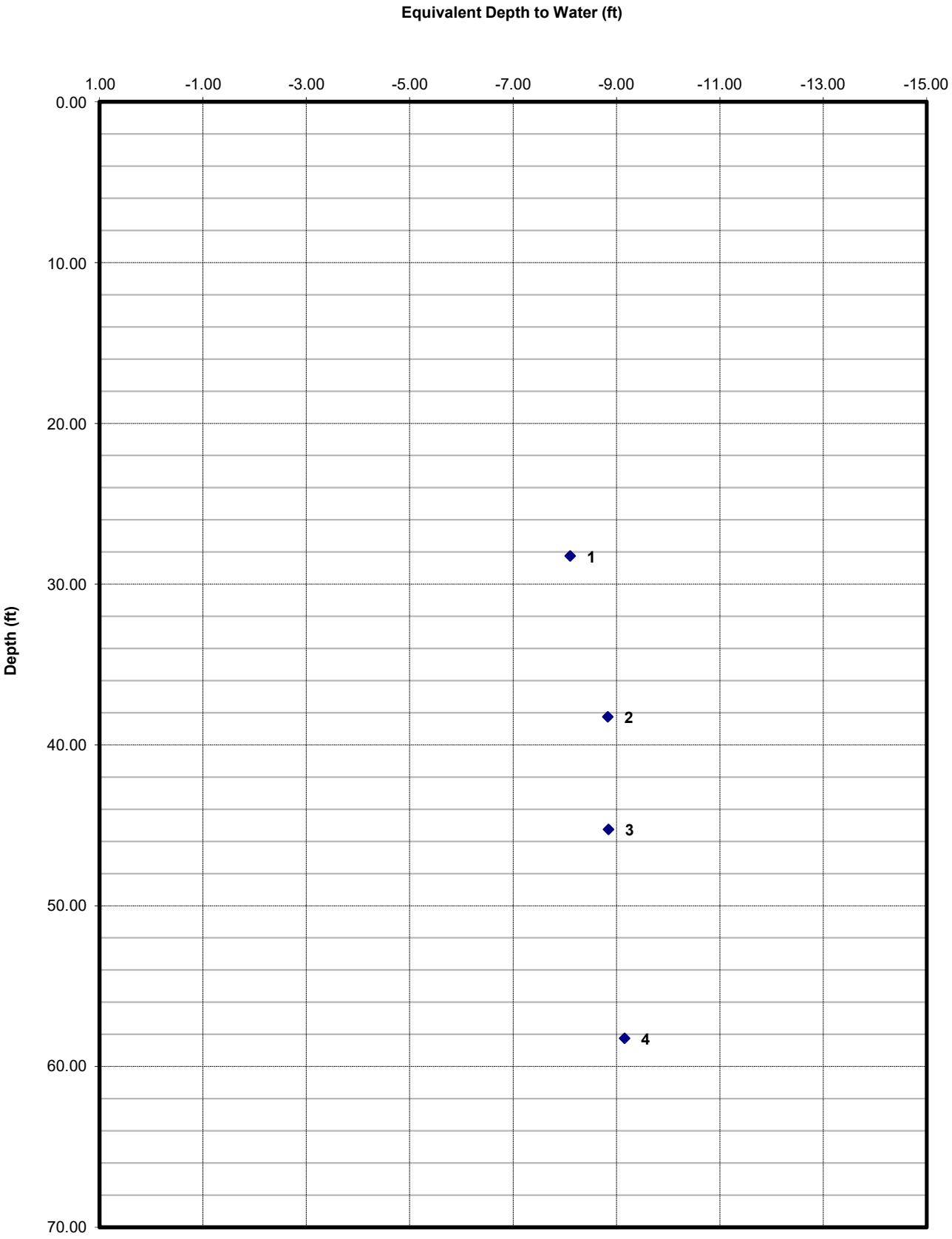
| | | |
|---|---|---|
| Start: Pressure | 11.84 | Finish: 14.83 |
| Temp | 10.43 | 14.15 |
| Time | 12:22 | 12:31 |

$P_{atm}$ 11.84 psi

| Port No. | Port Position From Log (ft) | Port position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 58.25 | 477 | - | 41.41 | 44.06 | 12:25 | 11.55 | 41.62 | 62.40 | -9.15 | Desi Inlet |
| 3 | 45.25 | 478 | - | 36.0 | 38.29 | 12:27 | 12.41 | 35.99 | 54.09 | -8.84 | |
| 2 | 38.25 | 378 | - | 32.97 | 35.25 | 12:28 | 13.23 | 32.97 | 47.08 | -8.83 | |
| 1 | 28.25 | 279 | - | 28.62 | 30.66 | 12:30 | 13.91 | 28.63 | 36.36 | -8.10 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 18**
**Well: LMW-9R-D**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-9R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 63.41 ft.

Borehole Depth: 63.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW-9R-D.WWD
Report Date: Tue Jan 30 17:36:56 2024

File Date: Jan 30 11:58:18 2024

## Comments

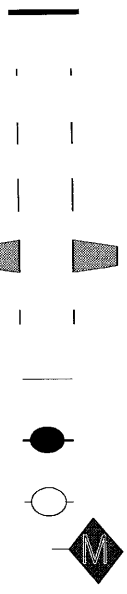
## Log Information

| | | |
|---|---|---|
| Borehole condition confirmed. | (method) Lessing | Date: |
| MP well design & preparation. | By: | Date: 1/30/24 |
| MP well design checked. | By: | Date: 2/6/24 |
| MP well and borehole approved to install. | By: | Date: 2/6/24 |

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap

(2) 020101 - MP38 Casing 4 (1F/0.3M)

(2) 020103 - MP38 Casing 6 (3F/0.9M)

(7) 020105 - MP38 Casing 2 (5F/1.5M)

(4) 0238 - MP38 Packer - 74mm (5F/1.5M)

(1) 020102 - MP38 Casing 3 (2F/0.6M)

(9) 0202 - MP38 Regular Coupling

(4) 0205 - MP38 Measurement Port

(3) 0224 - MP38 Pumping Port

(3) 0216 - Magnetic Location Collar

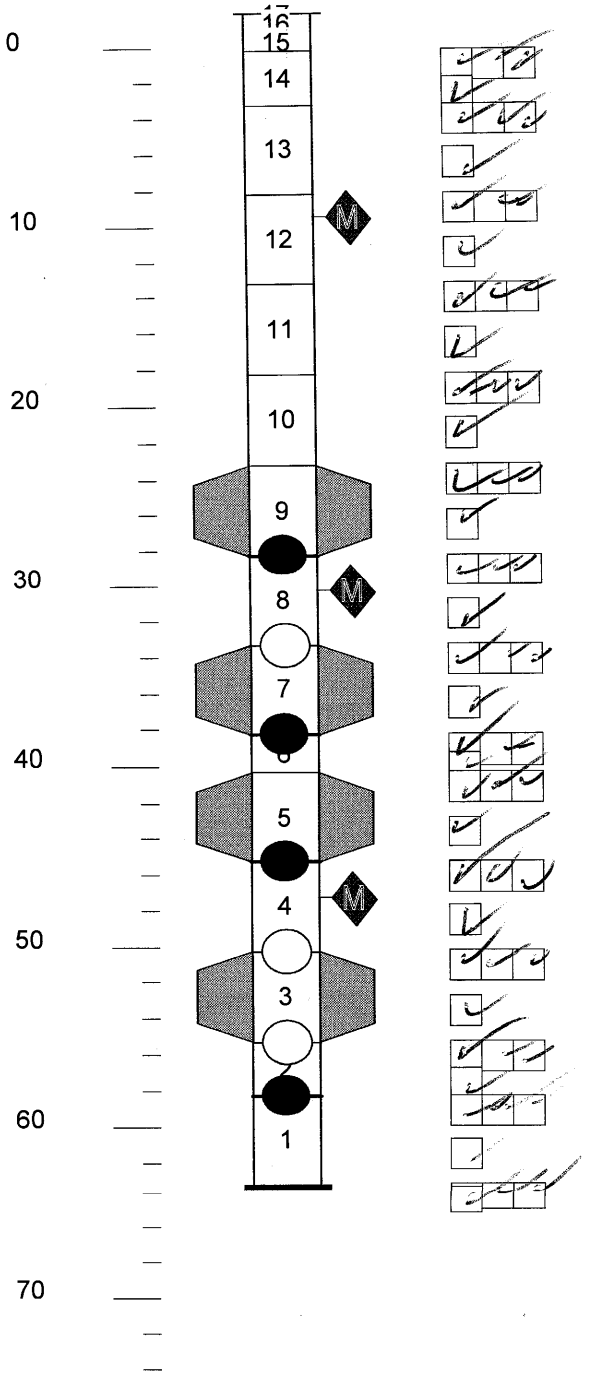
## Geology

## Backfill/Casing

Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-9R-D




MP Casing Description

020103 - MP38 Casing 6 (3F/0.9M)

020105 - MP38 Casing 2 (5F/1.5M)

020105 - MP38 Casing 2 (5F/1.5M)

020105 - MP38 Casing 2 (5F/1.5M)

020105 - MP38 Casing 2 (5F/1.5M)

0238 - MP38 Packer - 74mm (5F/1.5M 20151 165/140

0205 - MP38 Measurement Port 10294

020105 - MP38 Casing 2 (5F/1.5M)

0224 - MP38 Pumping Port 9295

0238 - MP38 Packer - 74mm (5F/1.5M 20152 165/140

0205 - MP38 Measurement Port 10295

020102 - MP38 Casing 3 (2F/0.6M)

0238 - MP38 Packer - 74mm (5F/1.5M 20153 175/150

0205 - MP38 Measurement Port 10291

020105 - MP38 Casing 2 (5F/1.5M)

0224 - MP38 Pumping Port 9287

0238 - MP38 Packer - 74mm (5F/1.5M 200154 165/140

0224 - MP38 Pumping Port 9289

020103 - MP38 Casing 6 (3F/0.9M)

0205 - MP38 Measurement Port 10293

020105 - MP38 Casing 2 (5F/1.5M)

0203 - MP38 End Cap

Sheet 1 of 4

# Westbay Packer Inflation Record

Project: Langen - 1487 1st Ave Project No.: FS1491 Well No.: LMW-9R-D

Location: 1487 1st Ave Completed by: CS Date Inflated: 9/6/24

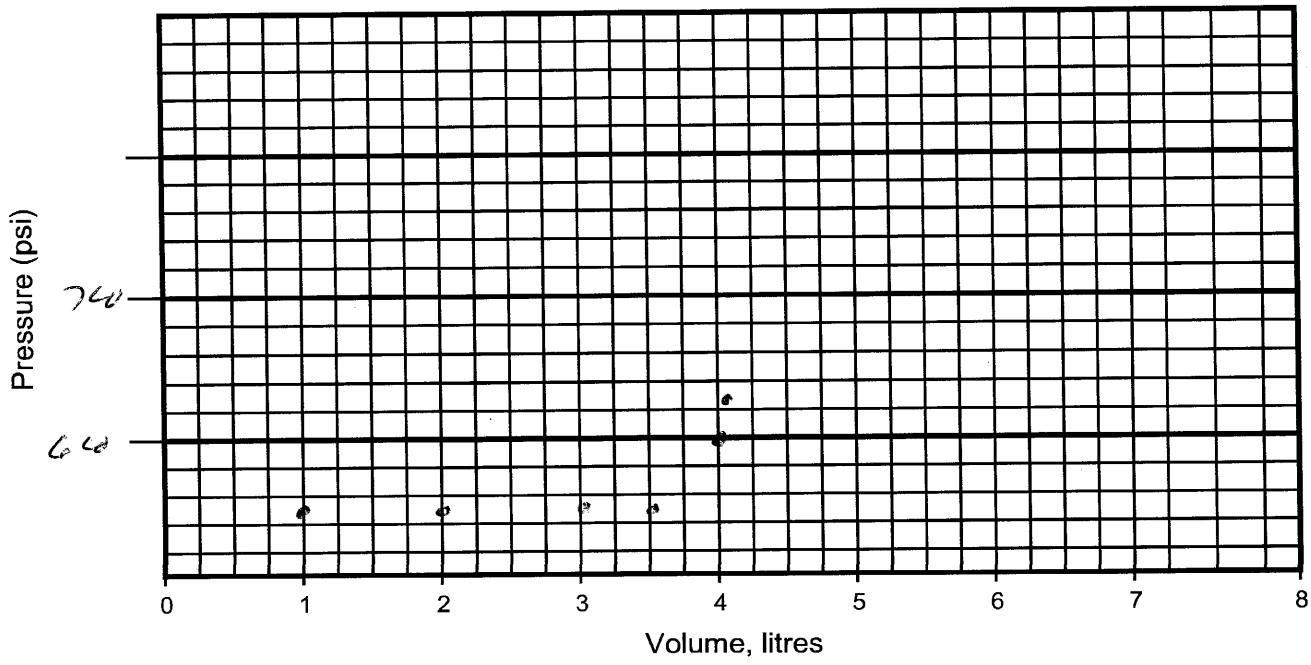
Packer No. 1 - 2CQ154 Depth ( ft / m ): 50.25 Inflation Tool No.: TU 3544

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 625 psi Tool Pressure, $P_T$: 375 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.05 | 1 | 4.05 | | |
| Pressure, psi | 550 | 550 | 548 | 550 | 600 | 625 | 1 | 0 | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 1 Time - 11:10

Sheet 2 of 4

# Westbay Packer Inflation Record

Project: Langan - 148T 1st Ave  Project No.: 151495  Well No.: LMW9R-D

Location: 148T 1st Ave  Completed by: CS  Date Inflated: 01/16/24

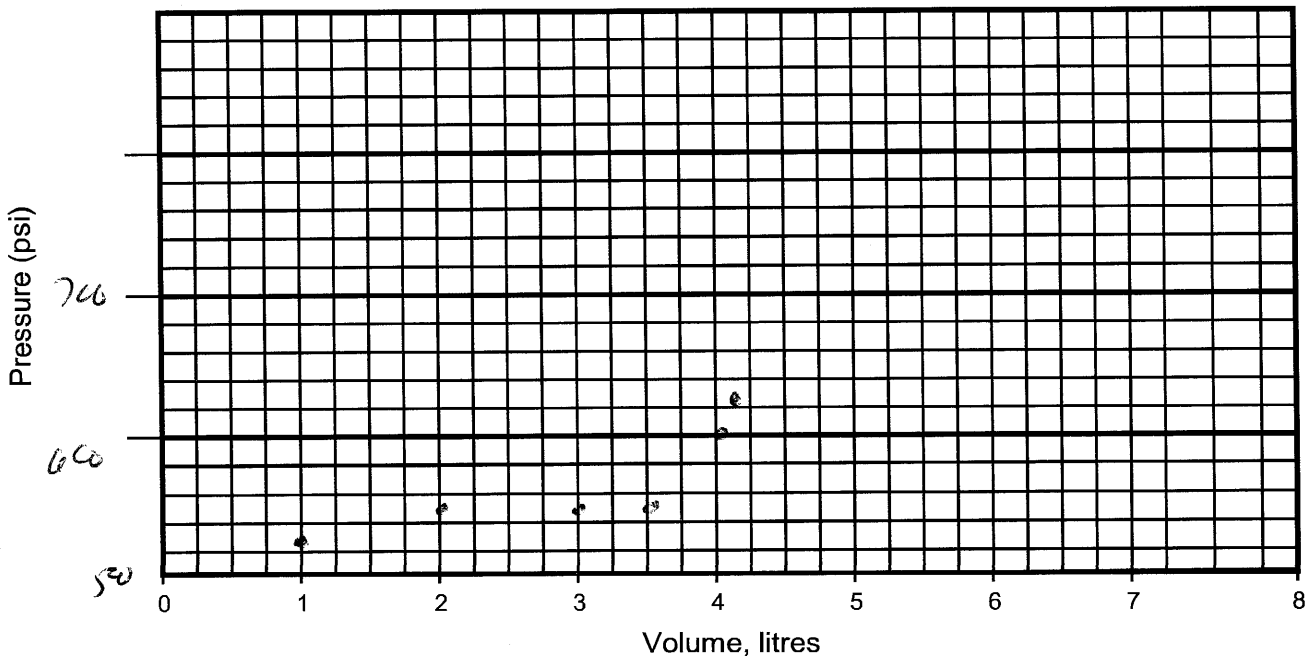
Packer No. 2 - 20153  Depth ( ft / m ): 40.25  Inflation Tool No.: TW 3546

Packer Valve Pressure, $P_V$: 150 psi  Final Line Pressure, $P_L$: 625 psi  Tool Pressure, $P_T$: 375 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 100 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.10 | 1 | 4.10 | | |
| Pressure, psi | 525 | 550 | 530 | 530 | 400 | 625 | 1 | 0 | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 2  Time - 1124

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave Project No.: FS1479 Well No.: LMW-9R-D

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/4/24

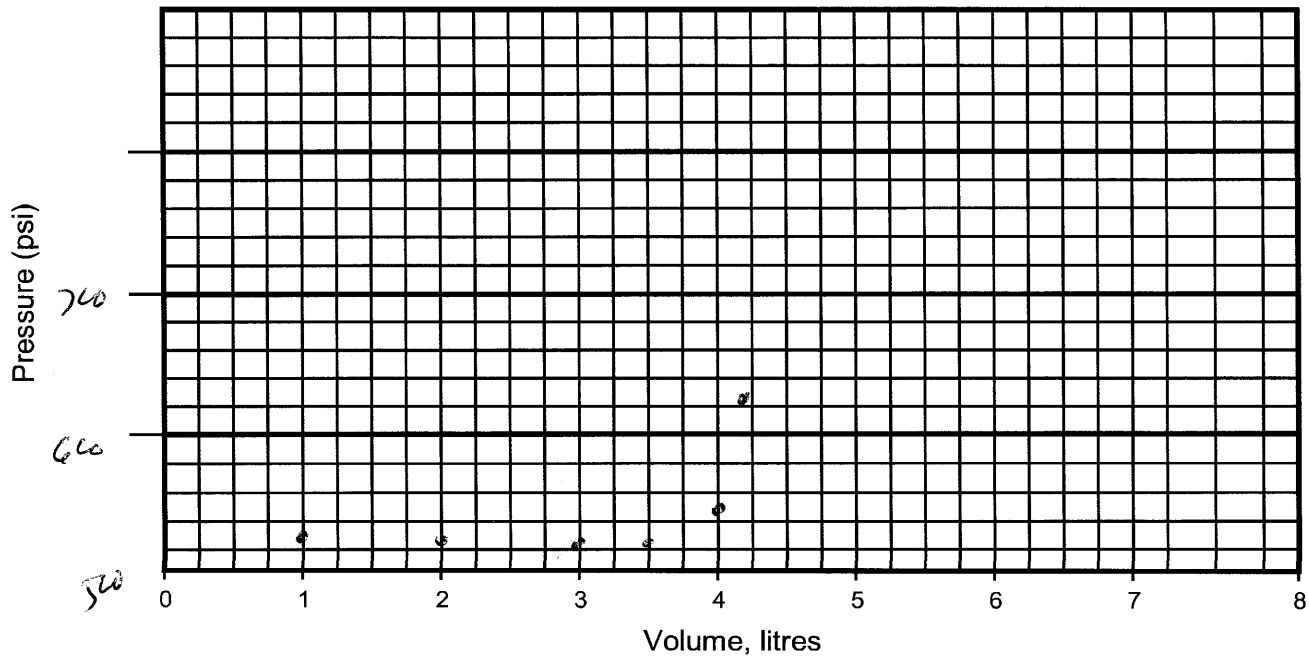
Packer No. 3 - 20152 Depth ( ft / m ): 33.35 Inflation Tool No.: TIW3996

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 625 psi Tool Pressure, $P_T$: 375 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.15 | / | 4.15 | | |
| Pressure, psi | 525 | 525 | 525 | 525 | 550 | 625 | / | ø | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 3 Time - 11:41

Sheet 4 of 4

# Westbay Packer Inflation Record

Project: Langa - 1487 1st Ave Project No.: FS14 Well No.: MW-9R-1

Location: 1487 1st Ave Completed by: CS Date Inflated: 5/6/24

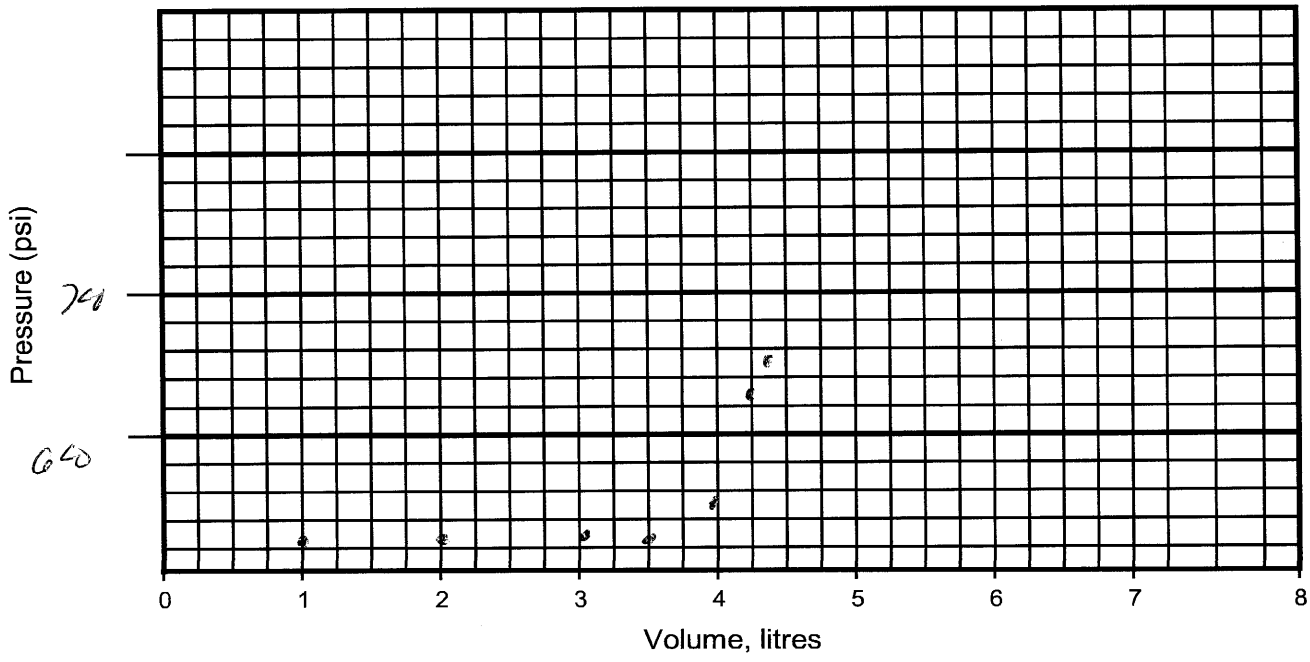
Packer No. 4-P6151 Depth ( ft / m ): 93.25 Inflation Tool No.: 714 3554

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 650 psi Tool Pressure, $P_T$: 325 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 135 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.25 | 4.35 | 1 | 4.30 | |
| Pressure, psi | 525 | 525 | 525 | 525 | 550 | 625 | 650 | 1 | 0 | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 4 Time - 12:01

# APPENDIX I – LMW-10R-S


| | |
|---|---|
| As-Built Packer and Port Summary (Table 20) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 7, 2024) | - 1 Pages |
| Figure 19, Pre-Inflation Piezometric Pressure Profile | - 1 Pages |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 7, 2024) | - 1 Pages |
| Figure 20, Post-Inflation Piezometric Pressure Profile | - 1 Pages |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 2 Pages |

## Table 20. LMW-10R-S As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 2 | **Zone 1** | 24.75 | 18.75 | 23.05 | 30.00 | |
| 1 | QA1 | 8.75 | 3.75 | 8.05 | 20.05 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.
All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-10R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 29.91 ft.

Borehole Depth: 29.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW10R-S.WWD
Report Date: Tue Jan 30 11:02:47 2024

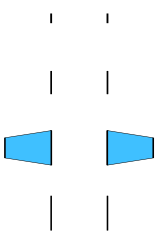
File Date: Nov 17 14:27:28 2023

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(3) 020101 - MP38 Casing 4 (1F/0.3M)

(1) 020103 - MP38 Casing 6 (3F/0.9M)

(2) 0238 - MP38 Packer - 74mm (5F/1.5M)

(3) 020105 - MP38 Casing 2 (5F/1.5M)

(1) 0203 - MP38 End Cap

(6) 0202 - MP38 Regular Coupling

(2) 0205 - MP38 Measurement Port

(1) 0224 - MP38 Pumping Port

## Geology

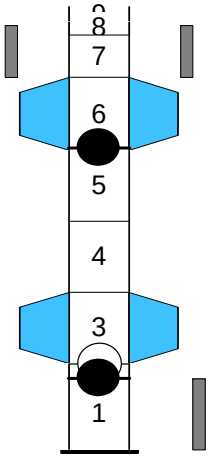
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-10R-S



# Westbay Piezometric Pressures/Levels

Field Data and Calculation Sheet

Westbay Instruments

Well No.: LAW-102-S
Datum: GS
Elev. G.S.: –
Height of Westbay above G.S.: –
Elev. top of Westbay Casing: –
Reference Elevation: –
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3553
Probe Range: 0-500
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/7/24
Client: Langan
Job No.: F514
Location: 1487 1st Ave
Weather: –
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

$P_{atm}$ 14.87 psi

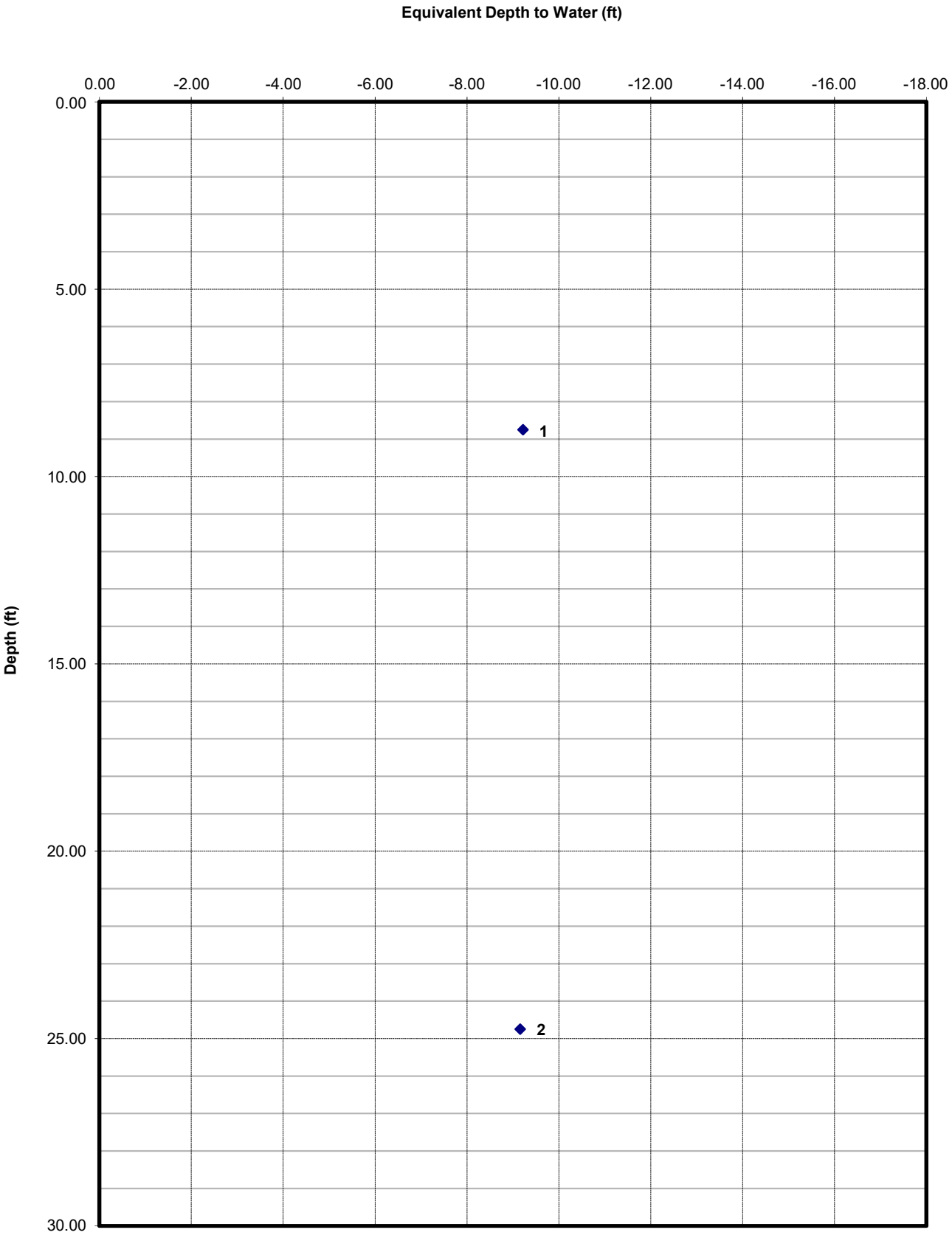
**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

| | Start | Finish |
|---|---|---|
| Pressure | 14.87 | 14.87 |
| Temp | 5.57 | 15.70 |
| Time | 9:04 | 9:41 |

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 24.75 | 24.9 | – | 24.67 | 29.57 | 9:39 | 16.19 | 26.67 | 33.91 | -9.16 | Pc Inlet |
| 1 | 8.75 | 9.0 | – | 19.71 | 22.66 | 9:40 | 16.05 | 19.72 | 17.97 | -9.22 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 19**
**Well: LMW-10R-S**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: SMW-10R-J
Datum: GS
Elev. G.S.: -
Height of Westbay above G.S.: -
Elev. top of Westbay Casing: -
Reference Elevation: -
Borehole angle: 90°

Probe Type: Sample
Serial No.: 3173
Probe Range: 0-320
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/7/24
Client: Kinross
Job No.: FJ1459
Location: 1487 1st floor
Weather: -
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

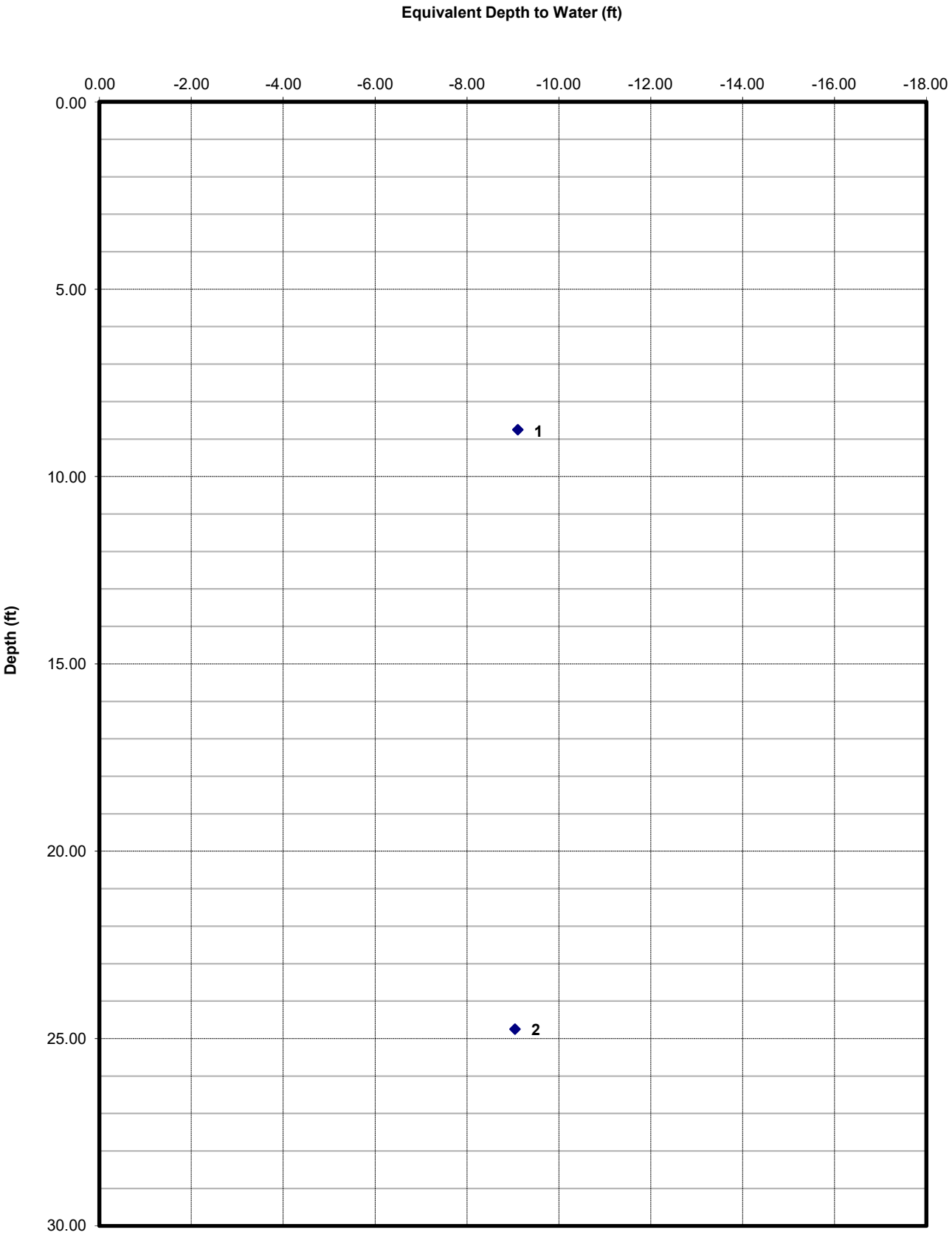
| | | | |
|---|---|---|---|
| Start: Pressure | 14.90 | Finish: | 14.88 |
| Temp | 71.2 | | ~~71.30~~ 11.73 |
| Time | 11:25 | | 11:30 |

$P_{atm}$ 14.90 psi

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 20.75 | 24.7 | - | 28.41 | 29.55 | 11:28 | 10.46 | 28.41 | 33.79 | -9.04 | Psi In/Hz |
| 1 | 8.75 | 8.80 | - | 21.66 | 22.09 | 11:29 | 11.39 | 21.65 | 17.85 | -9.10 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 20**
**Well: LMW-10R-S**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-10R-S**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 29.91 ft.

Borehole Depth: 29.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW10R-S.WWD
Report Date: Tue Jan 30 17:42:08 2024

File Date: Jan 30 11:05:07 2024

## Comments

## Log Information

| | | |
|---|---|---|
| Borehole condition confirmed. | (method) Logging | Date: |
| MP well design & preparation. | By: | Date: 1/30/24 |
| MP well design checked. | By: | Date: 2/7/24 |
| MP well and borehole approved to install. | By: | Date: 2/7/24 |

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)

- (3) 020101 - MP38 Casing 4 (1F/0.3M)
- (1) 020103 - MP38 Casing 6 (3F/0.9M)
- (2) 0238 - MP38 Packer - 74mm (5F/1.5M)
- (3) 020105 - MP38 Casing 2 (5F/1.5M)
- (1) 0203 - MP38 End Cap
- (6) 0202 - MP38 Regular Coupling
- (2) 0205 - MP38 Measurement Port
- (1) 0224 - MP38 Pumping Port

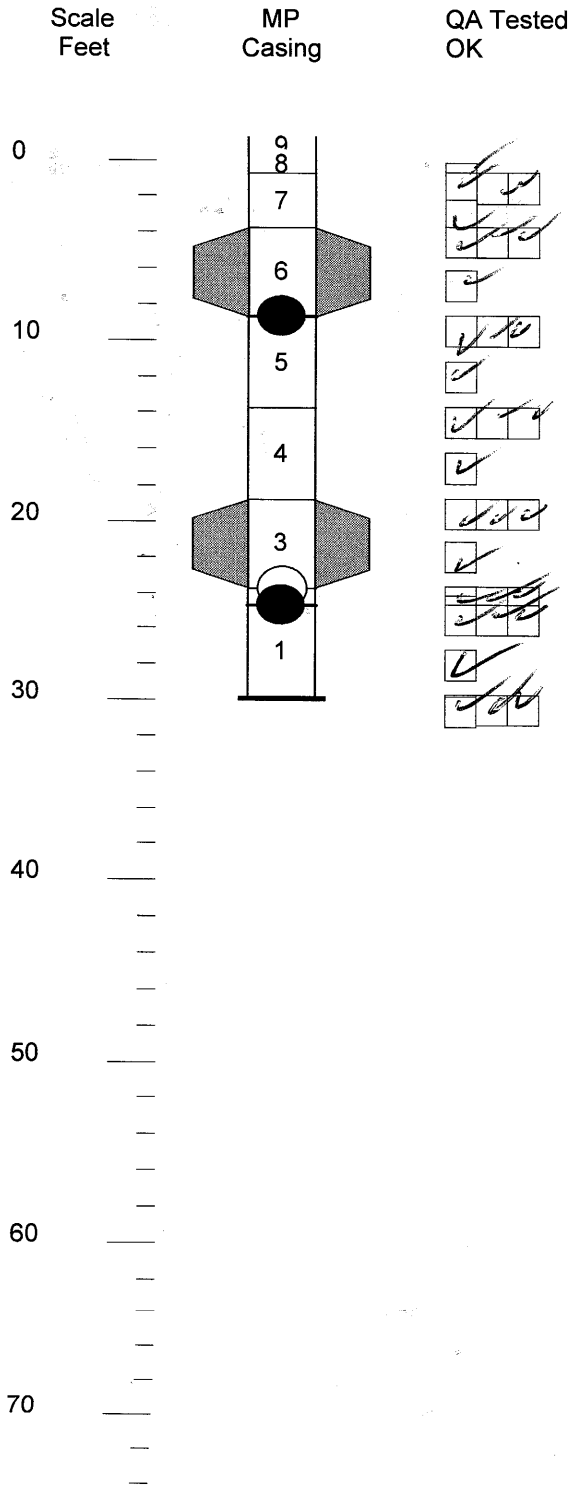
## Geology

## Backfill/Casing

- Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-10R-S




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Tue Jan 30 17:43:10 2024

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave Project No.: FS1499 Well No.: LMW-10-PZ-S

Location: 1487 1st Ave Completed by: CS Date Inflated: 2/7/24

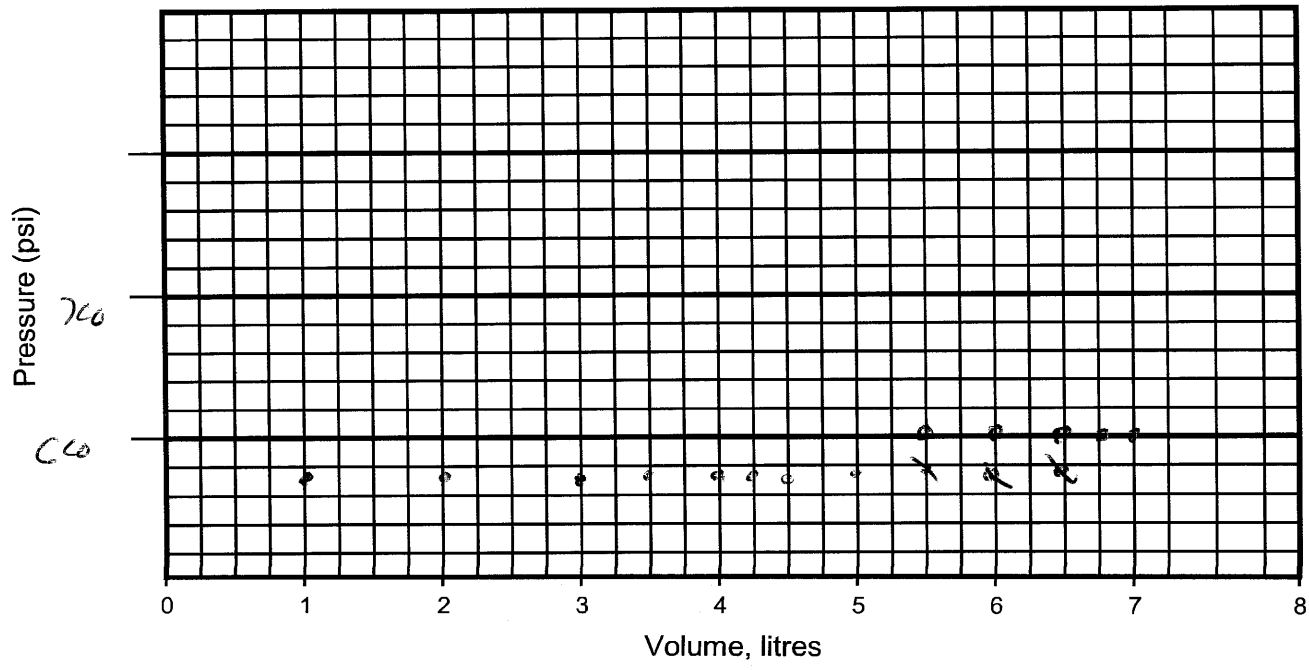
Packer No. 1 - Depth ( ft / m ): 18.75 Inflation Tool No.: TW 3554

Packer Valve Pressure, $P_V$: 140 psi Final Line Pressure, $P_L$: 60 psi Tool Pressure, $P_T$: 325 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 85 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.25 | 4.50 | 5.0 | 5.5 | 6.0 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 600 | 600 |
| Volume, litres | 6.5 | 7.0 | / | 7.0 | | | | | | |
| Pressure, psi | 600 | 600 | / | 0 | | | | | | |




Comments: Packer # 1 Time - 9:45

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Sheet 2 of 2

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave Project No.: FS1499 Well No.: LMW-10A-S

Location: 1487 1st Ave Completed by: GS Date Inflated: 01/12/14

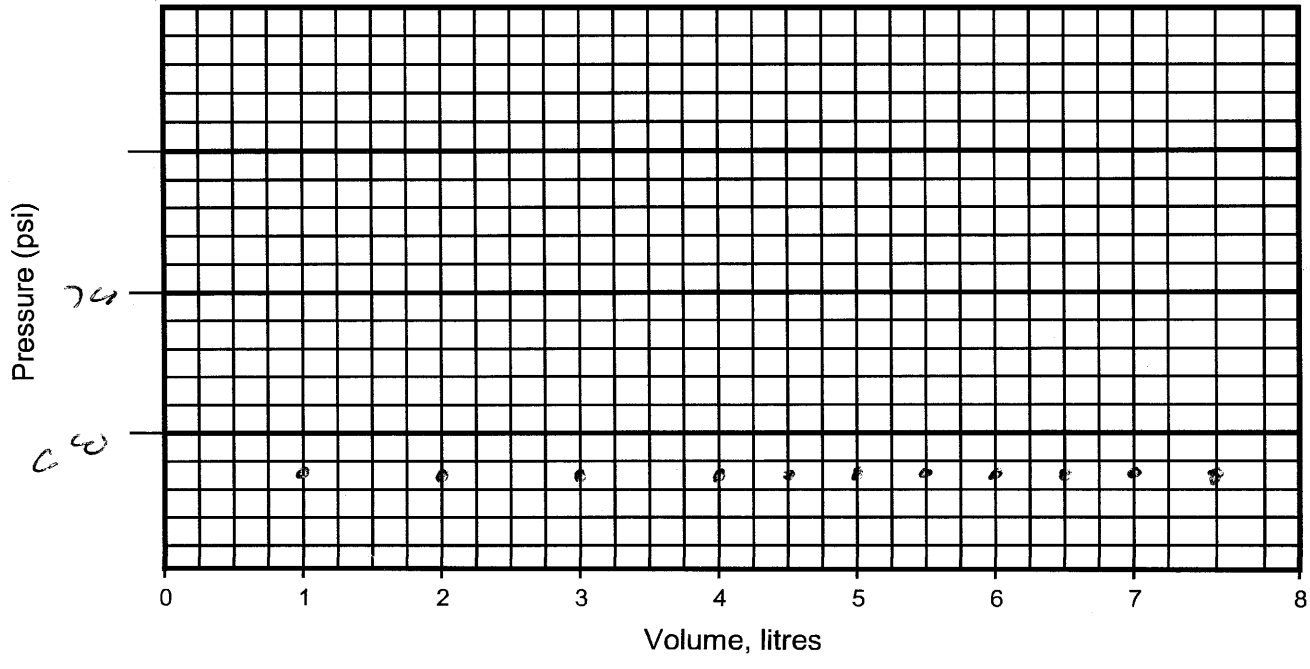
Packer No. 2 - 20146 Depth ( ft / m ): 3.75 Inflation Tool No.: TIW 5554

Packer Valve Pressure, $P_V$: 1475 psi Final Line Pressure, $P_L$: 575 psi Tool Pressure, $P_T$: 375 psi

Borehole Water Level: - ( ft / m ) = - psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 55 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 6.5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 575 |
| Volume, litres | 7.0 | 7.5 | 1 | | | | | | | |
| Pressure, psi | 575 | 575 | 1 | ϕ | | | | | | |




Comments: Packer # 2 Time - 10:32

# APPENDIX J – LMW-10R-D

| | |
|---|---|
| As-Built Packer and Port Summary (Table 21) | - 1 Page |
| Summary Casing Log | - 3 Pages |
| Pre-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 8, 2024) | - 1 Pages |
| Figure 21, Pre-Inflation Piezometric Pressure Profile | - 1 Pages |
| Post-Inflation Piezometric Pressure/Levels<br>Field Data and Calculation Sheet (February 8, 2024) | - 1 Pages |
| Figure 22, Post-Inflation Piezometric Pressure Profile | - 1 Pages |
| Casing Installation Log | - 3 Pages |
| MP Packer Inflation Records | - 3 Pages |

## Table 21. LMW-10R-D As-Built Packer and Port Summary

| Port No. | Zone | Measurement Port Depth (ft) | Depth to Top of Packer (ft) | Top of Zone (ft) | Bottom of Zone (ft) | Comments |
|---|---|---|---|---|---|---|
| 3 | QA1 | 50.75 | 45.75 | 50.05 | 56.00 | |
| 2 | **Zone 2** | 40.75 | 35.75 | 40.05 | 47.05 | |
| 1 | **Zone 1** | 30.75 | 21.75 | 26.05 | 37.05 | |

All depth measurements in feet below ground surface (bgs).

All depth measurements use 'Nominal' tubing lengths.

Not corrected for borehole deviation or borehole temperature effects.
All depth measurement to upper edge of Westbay System coupling item.

# Summary Casing Log

**Company: Langan**
**Well: LMW-10R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 55.91 ft.

Borehole Depth: 63.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW10R-D.WWD
Report Date: Tue Jan 30 14:40:35 2024

File Date: Jan 30 12:14:14 2024

## Sketch of Wellhead Completion

# Legend

## (Qty) MP Components

(Library - WD Library 04/29/15)



(2) 0203 - MP38 End Cap



(3) 020101 - MP38 Casing 4 (1F/0.3M)



(7) 020105 - MP38 Casing 2 (5F/1.5M)



(3) 0238 - MP38 Packer - 74mm (5F/1.5M)



(1) 020104 - MP38 Casing 5 (4F/1.2M)



(9) 0202 - MP38 Regular Coupling



(3) 0205 - MP38 Measurement Port



(2) 0224 - MP38 Pumping Port




(2) 0216 - Magnetic Location Collar

## Geology

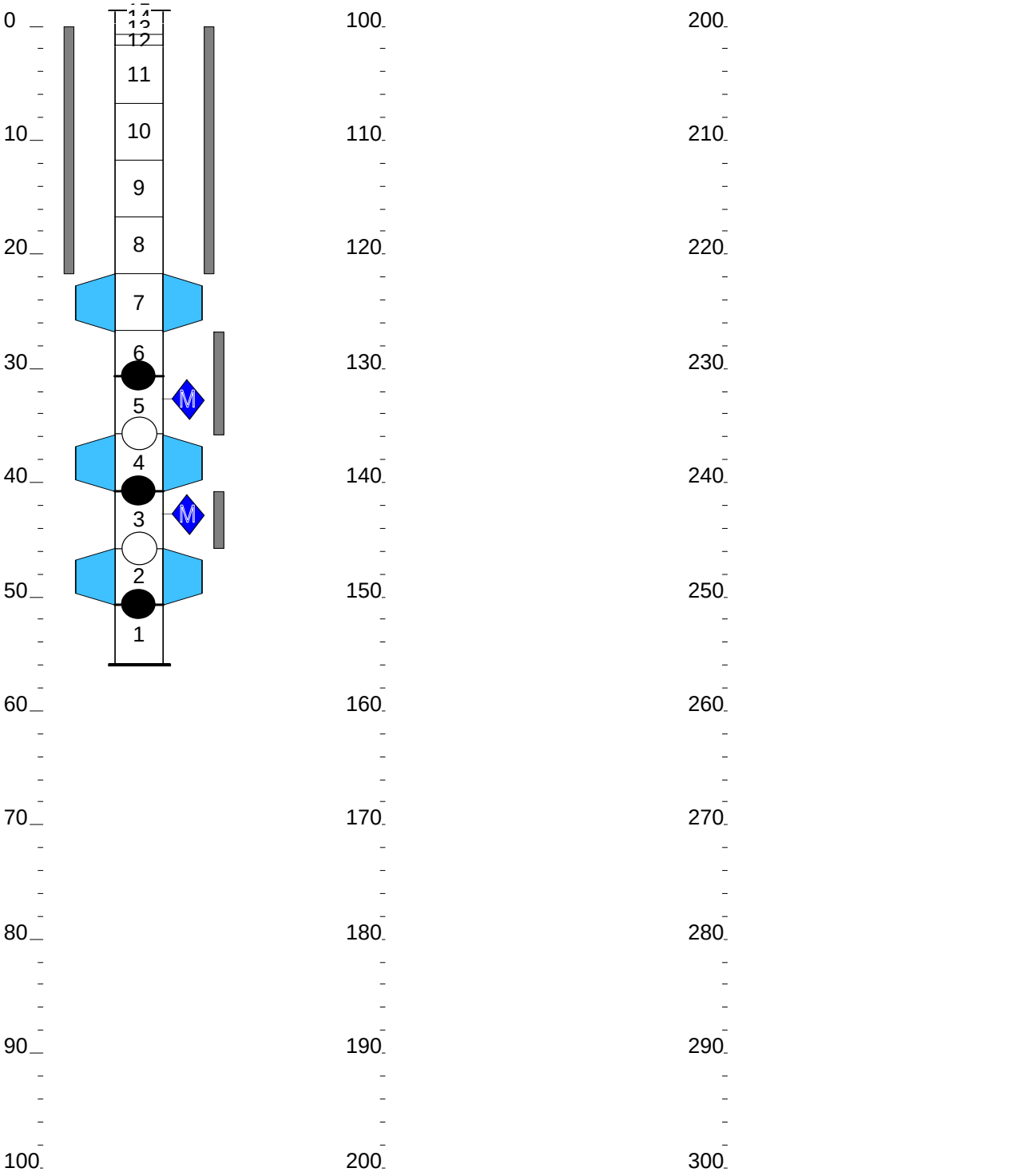
## Backfill/Casing



Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-10R-D



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Well No.: LMW-10R-D
Datum: GS
Elev. G.S.: —
Height of Westbay above G.S.: —
Elev. top of Westbay Casing: —
Reference Elevation: —
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3535
Probe Range: 0-500
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/8/24
Client: Langan
Job No.: F5[illegible]99
Location: 1487 1st Ave
Weather: —
Operator: GS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

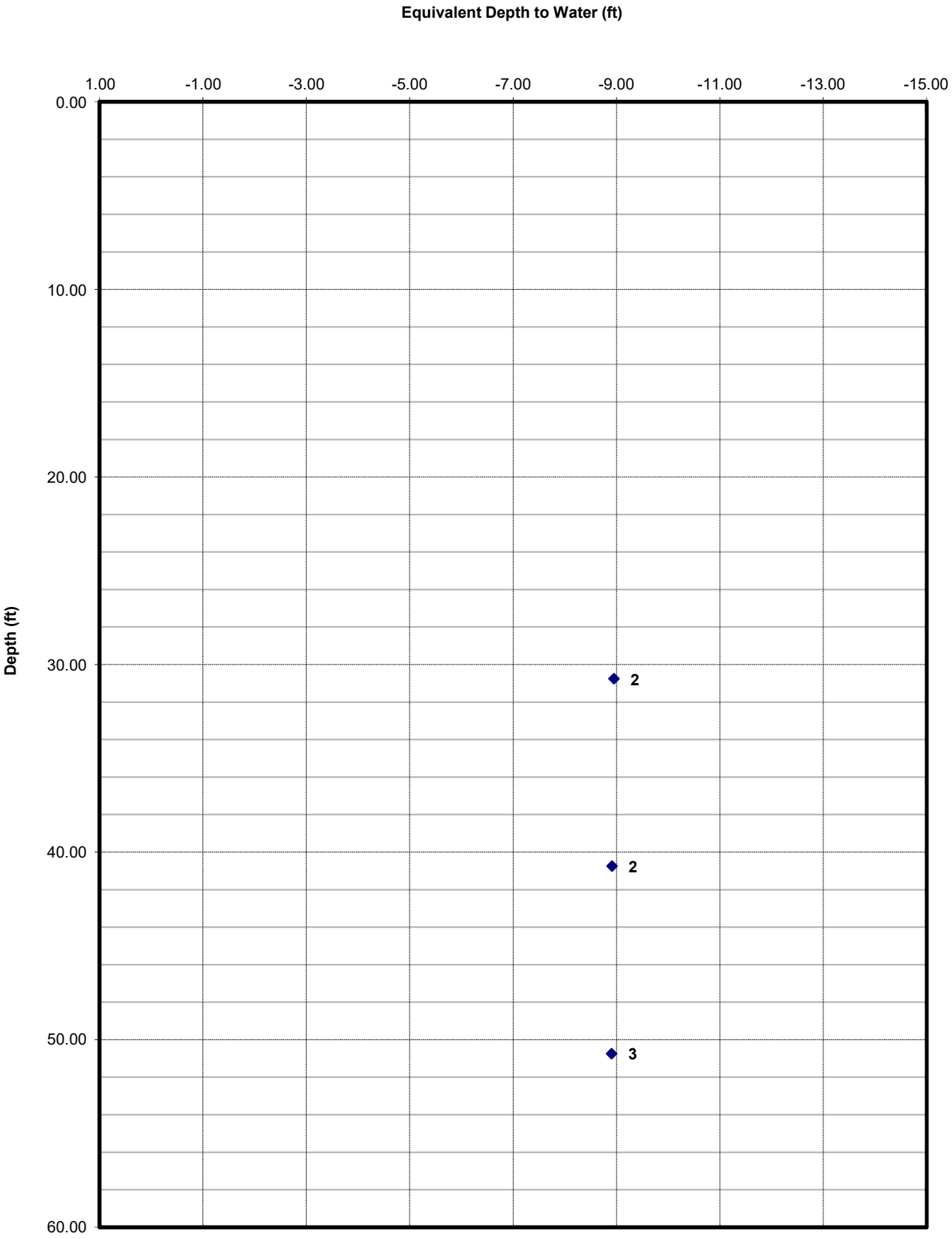
| | | | |
|---|---|---|---|
| Start: Pressure | 1488 | Finish: | 1488 |
| Temp | 6.6 | | 15.95 |
| Time | 10:13 | | 10:50 |

$P_{atm}$ 1488 psi

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 50.75 | 50.30 | — | 31.91 | 40.74 | 10:46 | 15.77 | 31.91 | 5965 | 8.90 | Pz In Hz |
| 2 | 40.75 | 40.30 | — | 27.57 | 36.41 | 10:48 | 15.81 | 2757 | 49.67 | 8.91 | |
| 1 | 30.75 | 30.40 | — | 23.23 | 32.09 | 10:49 | 15.93 | 2323 | 39.70 | 8.95 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 21**
**Well: LMW-10R-D**
**Pre-Inflation Pressure Profile**



# Westbay Piezometric Pressures/Levels

## Field Data and Calculation Sheet

Westbay Instruments

Well No.: LMW-10R-D
Datum: GS
Elev. G.S.: -
Height of Westbay above G.S.: -
Elev. top of Westbay Casing: -
Reference Elevation: -
Borehole angle: 90°

Probe Type: Sampler
Serial No.: 3337
Probe Range: 0-50
Westbay Casing Type: MP38
Sampler Valve Position: Closed

Date: 2/8/24
Client: Hengan
Job No.: FS1499
Location: 1487 1st Ave
Weather: -
Operator: CS

Note: "Port position" in angled boreholes refer to position along drillhole. True depth (Dp) needs to be calculated using borehole angle and deviation data to calculate zone piezometric level (Dz).

**Ambient Reading ($P_{atm}$) (pressure, temperature, time)**

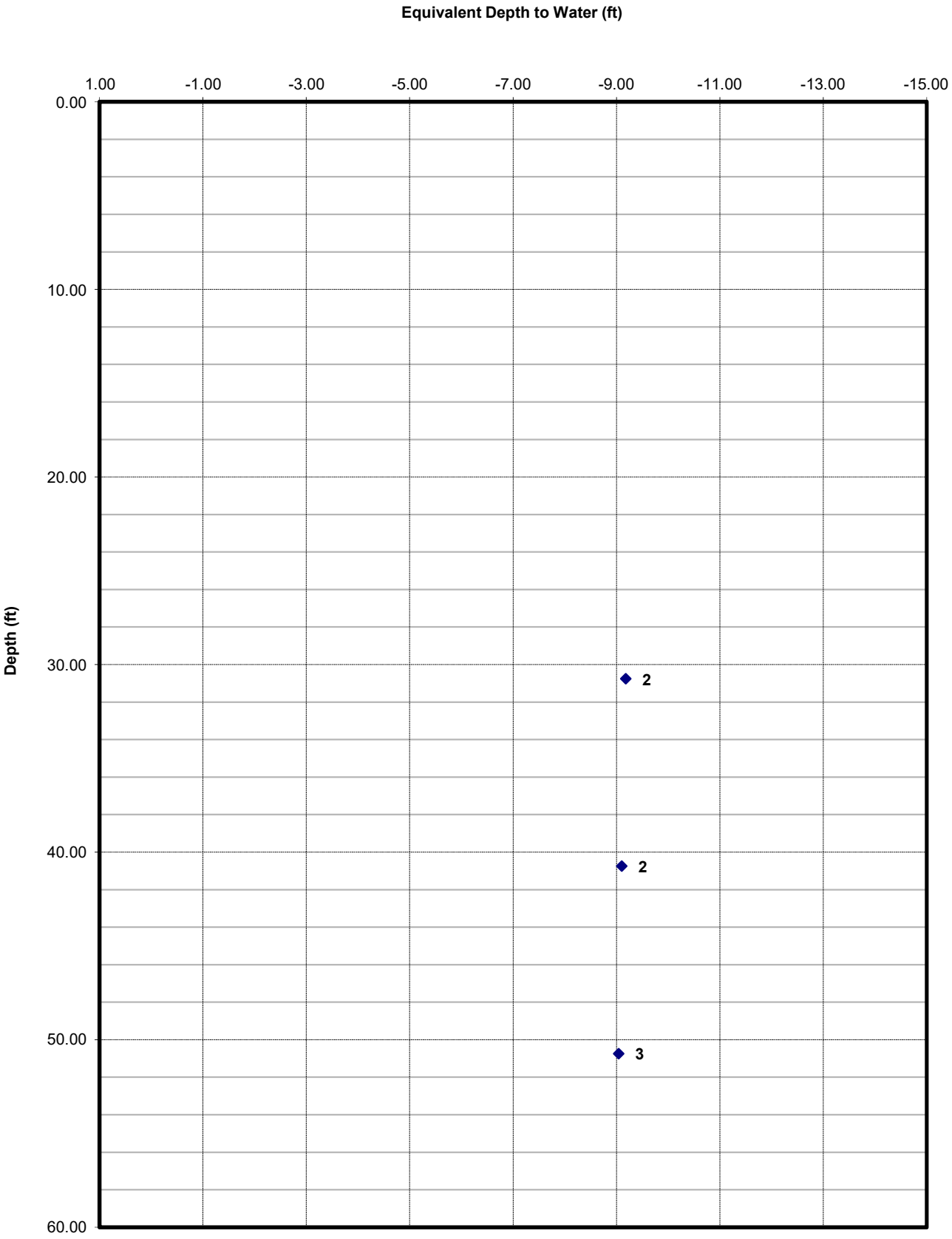
| | | | |
|---|---|---|---|
| Start: Pressure | 1487 | Finish: | 1487 |
| Temp | 11.22 | | 11.61 |
| Time | 12:21 | | 12:27 |

$P_{atm}$ 14.87 psi

| Port No. | Port Position From Log (ft) | Port Position From Cable (ft) | True Port Depth "Dp" (ft) | Fluid Pressure Readings: Inside Casing (P1) | Outside Casing (P2) | Time H:M:S | Probe Temp. (°C) | Inside Casing (P1) | Pressure Head Outside Port (ft) H = (P2-Patm)/w | Piez. Level Outside Port (ft) Dz = Dp - H | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 50.25 | 50.76 | - | 39.15 | 40.79 | 12:23 | 11.89 | 39.15 | 59.79 | 9.04 | Post Install |
| 2 | 40.25 | 40.80 | | 34.81 | 36.48 | 12:25 | 12.97 | 34.81 | 49.85 | 9.10 | |
| 1 | 30.75 | 30.9 | - | 30.45 | 32.18 | 12:27 | 13.70 | 30.45 | 39.93 | 9.18 | |
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Notes: w = 0.4335 psi/ft (1.422psi/m) of $H_2O$ Dz = piezometric level in zone Patm = atmospheric pressure H = pressure head of water in zone Dp = true depth of measurement port

**Figure 22**
**Well: LMW-10R-D**
**Post-Inflation Pressure Profile**



# Casing Installation Log

**Company: Langan**
**Well: LMW-10R-D**
**Site: 1487 First Ave**
**Project: Langan - 1487 First Ave.**

**Job No:**
**Author: GS**

## Well Information

Reference Datum:
Elevation of Datum: 0.00 ft.
MP Casing Top: 0.00 ft.
MP Casing Length: 55.91 ft.

Borehole Depth: 63.75 ft.
Borehole Inclination:
Borehole Diameter: 4.00 in.

Well Description:

Other References:

## File Information

File Name: LMW10R-D.WWD
Report Date: Tue Jan 30 17:40:45 2024

File Date: Jan 30 12:14:14 2024

## Comments

## Log Information

Borehole condition confirmed. (method) logging Date:
MP well design & preparation. By: [signature] Date: 1/30/24
MP well design checked. By: [signature] Date: 2/8/24
MP well and borehole approved to install. By: [signature] Date: 2/8/24

# Legend

## (Qty) MP Components
(Library - WD Library 04/29/15)

- (2) 0203 - MP38 End Cap
- (3) 020101 - MP38 Casing 4 (1F/0.3M)
- (7) 020105 - MP38 Casing 2 (5F/1.5M)
- (3) 0238 - MP38 Packer - 74mm (5F/1.5M)
- (1) 020104 - MP38 Casing 5 (4F/1.2M)
- (9) 0202 - MP38 Regular Coupling
- (3) 0205 - MP38 Measurement Port
- (2) 0224 - MP38 Pumping Port
- (2) 0216 - Magnetic Location Collar

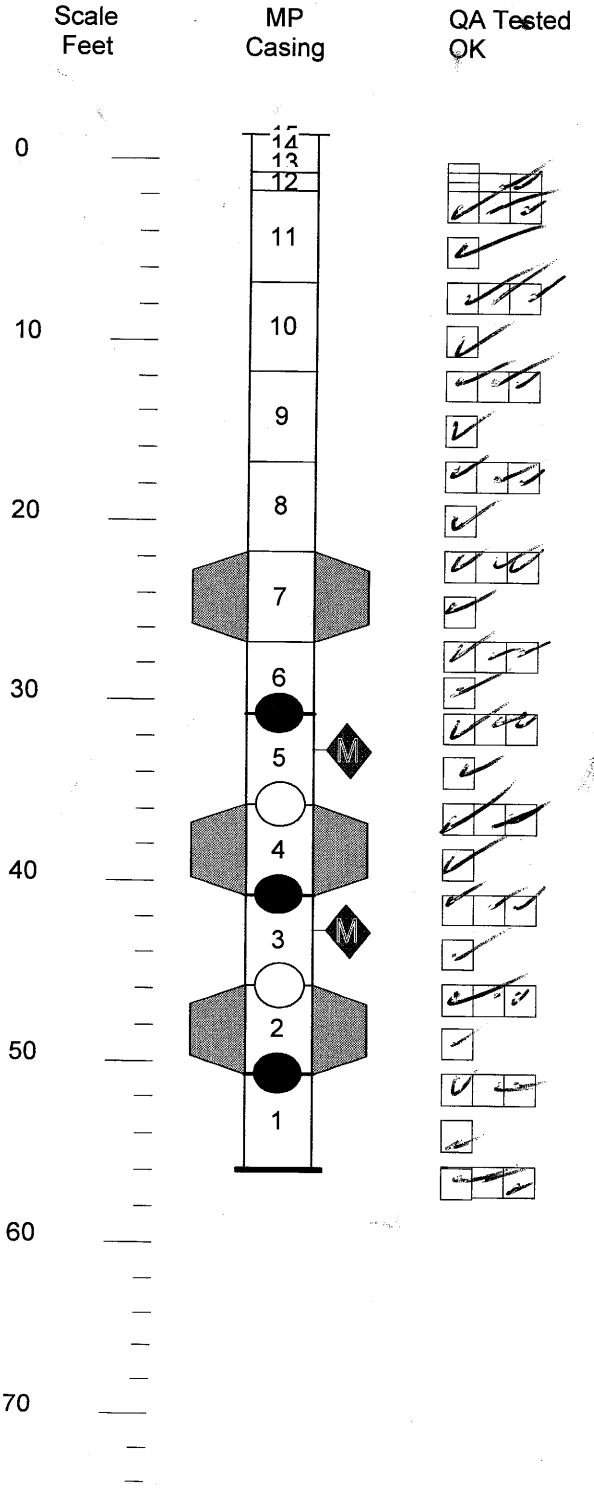
## Geology

## Backfill/Casing

- Mild Steel

# Well Designer Report
Langan

Job No:
Well: LMW-10R-D




MP Casing Description

020101 - MP38 Casing 4 (1F/0.3M)
020101 - MP38 Casing 4 (1F/0.3M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
020105 - MP38 Casing 2 (5F/1.5M)
0238 - MP38 Packer - 74mm (5F/1.5M 20147 165/140
020104 - MP38 Casing 5 (4F/1.2M)
0205 - MP38 Measurement Port 10202
020105 - MP38 Casing 2 (5F/1.5M)
0224 - MP38 Pumping Port 9245
0238 - MP38 Packer - 74mm (5F/1.5M 18180 165/145
0205 - MP38 Measurement Port 10203
020105 - MP38 Casing 2 (5F/1.5M)
0224 - MP38 Pumping Port 9288
0238 - MP38 Packer - 74mm (5F/1.5M 20148 165/140
0205 - MP38 Measurement Port 10297
020105 - MP38 Casing 2 (5F/1.5M)
0203 - MP38 End Cap

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Tue Jan 30 17:41:37 2024

Sheet 1 of 3

# Westbay Packer Inflation Record

Project: Langley - 1487 151st Ave  Project No.: FS1459  Well No.: LMW-101B-1

Location: 1487 151 Ave  Completed by: CS  Date Inflated: 2/8/24

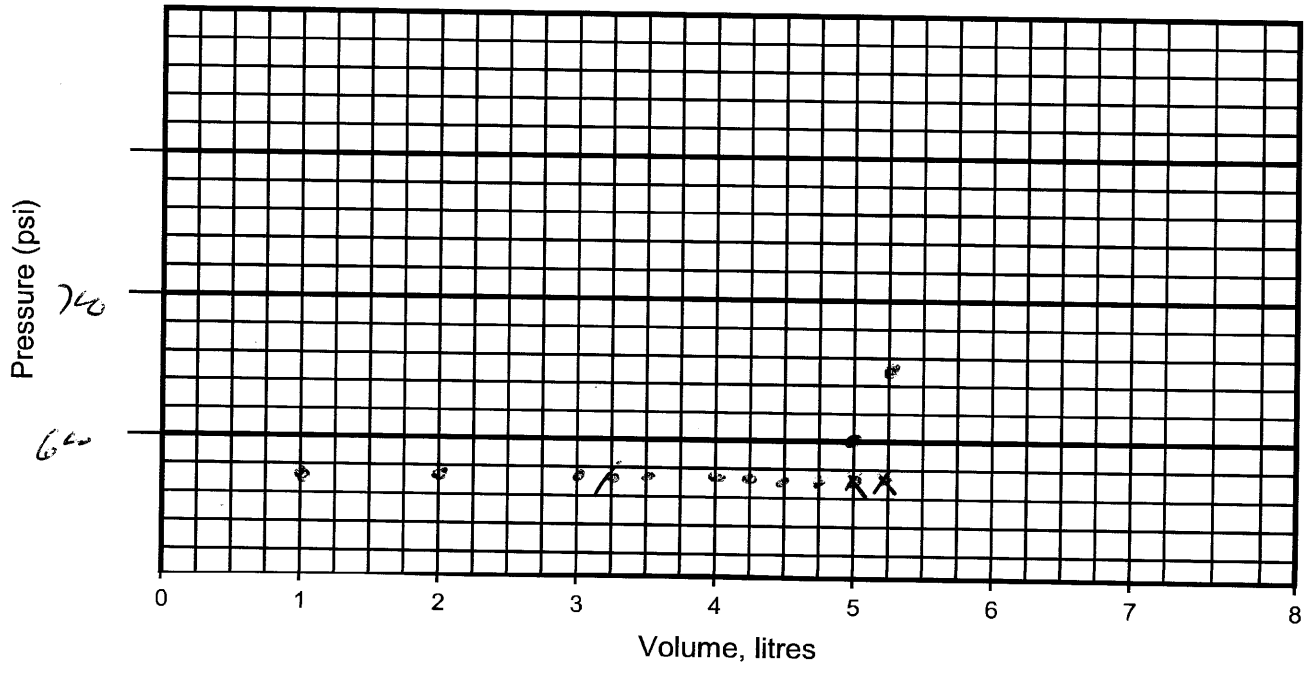
Packer No. 1 - 30148  Depth ( ft / m ): 45.75  Inflation Tool No.: TW 356

Packer Valve Pressure, $P_V$: 140 psi  Final Line Pressure, $P_L$: 650 psi  Tool Pressure, $P_T$: 400 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 110 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 3.5 | 4.0 | 4.25 | 4.50 | 4.75 | 5.0 | 5.25 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 640 | 650 |
| Volume, litres | / | 5.20 | | | | | | | | |
| Pressure, psi | / | 0 | | | | | | | | |




Comments: Packer # 1  Time - 10:58

Sheet 2 of 3

# Westbay Packer Inflation Record

Project: Langley - 1487 1st Ave  Project No.: P31454  Well No.: LMW-10B-D

Location: 1487 - 1st Ave  Completed by: CS  Date Inflated: 2/8/24

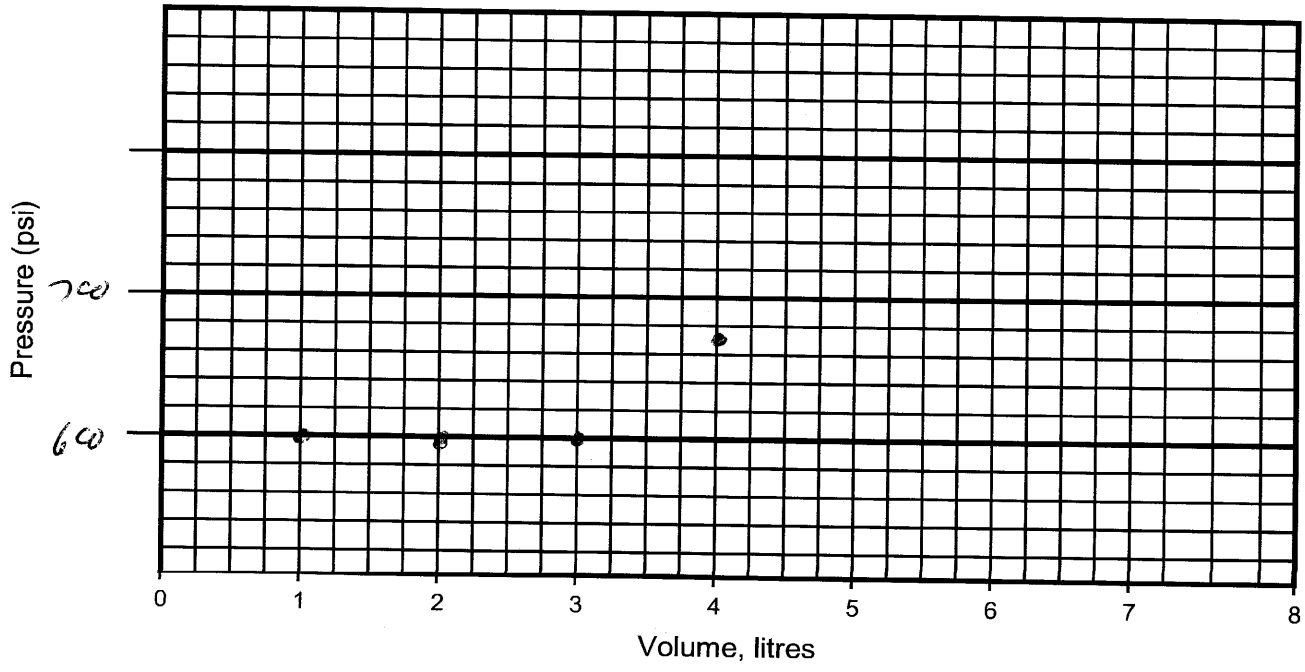
Packer No. 2 - ~~10207~~ 18180  Depth ( ft / m ): 3575  Inflation Tool No.: TW 3594

Packer Valve Pressure, $P_V$: 105 psi  Final Line Pressure, $P_L$: 675 psi  Tool Pressure, $P_T$: 900 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 130 psi

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume, litres | 1.0 | 2.0 | 3.0 | 4.0 | / | 4.0 | | | | |
| Pressure, psi | 600 | 600 | 600 | 675 | / | 6 | | | | |
| Volume, litres | | | | | | | | | | |
| Pressure, psi | | | | | | | | | | |




Comments: Packer # 2  Time - 11:21

# Westbay Packer Inflation Record

Project: Horgan - 1487 1st Ave  Project No.: FS1499  Well No.: L.M.W-10R-1

Location: 1487 1st Ave  Completed by: CS  Date Inflated: 2/8/24

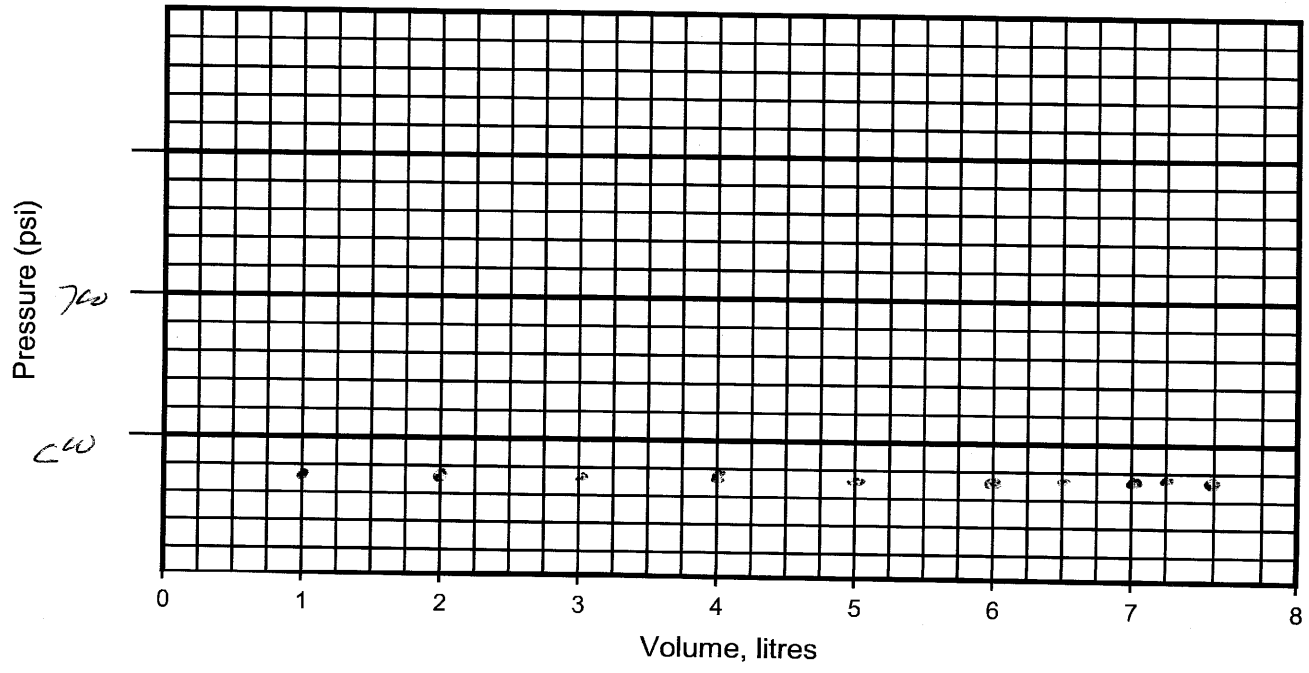
Packer No. 3 - 20147  Depth ( ft / m ): 01.75  Inflation Tool No.: T/W 3884

Packer Valve Pressure, $P_V$: 190 psi  Final Line Pressure, $P_L$: 575 psi  Tool Pressure, $P_T$: 460 psi

Borehole Water Level: — ( ft / m ) = — psi ($P_W$)

Calculated Packer Element Pressure, $P_E = P_L + P_W - P_V - P_T$ = 31 psi

| Volume, litres | 1.0 | 2.0 | 3.0 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 6.5 | 7.0 |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure, psi | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 575 | 575 |
| Volume, litres | 7.25 | 7.50 | / | 7.5 | | | | | | |
| Pressure, psi | 575 | 575 | / | 0 | | | | | | |




Comments: Packer # 3  Time - 11:54

# APPENDIX J

# Soil Vapor Intrusion Evaluation Photolog

LANGAN

LANGAN

**Appendix J**
**Photographic Log**
**1487 1st Avenue**
**New York, New York**



*Photo 1:* View of 1.5-inch PVC sleeve location A. Upon exposing the sleeve, groundwater and reagent was observed rising from below the slab. 25 February 2025.



*Photo 2:* View of 1.5-inch PVC sleeve location A. Upon exposing the sleeve, groundwater and reagent was observed rising from below the slab. 25 February 2025.

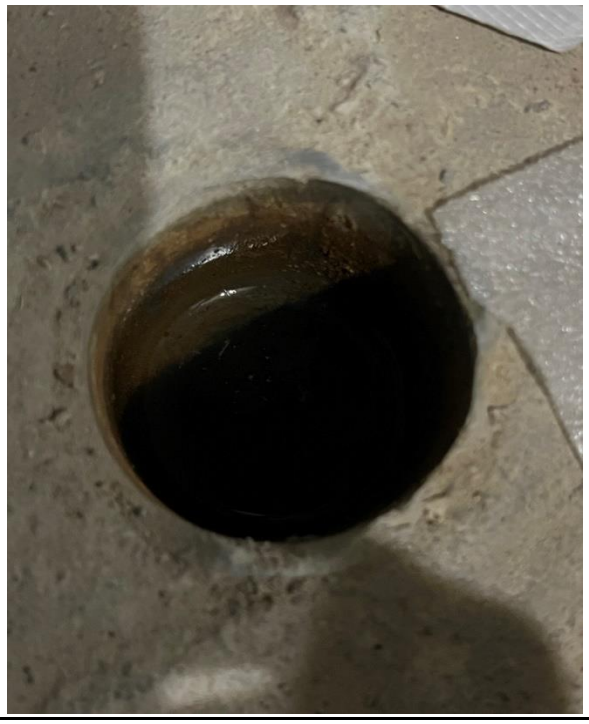


*Photo 3:* View of 1.5-inch PVC sleeve location B. Groundwater observed 1-inch below top of slab. 25 February 2025.



*Photo 4:* View of 1.5-inch PVC sleeve location B. Groundwater observed 1-inch below top of slab. 25 February 2025.



*Photo 5:* View of 1.5-inch PVC sleeve location C. Groundwater observed 6-inches below top of slab. 25 February 2025.

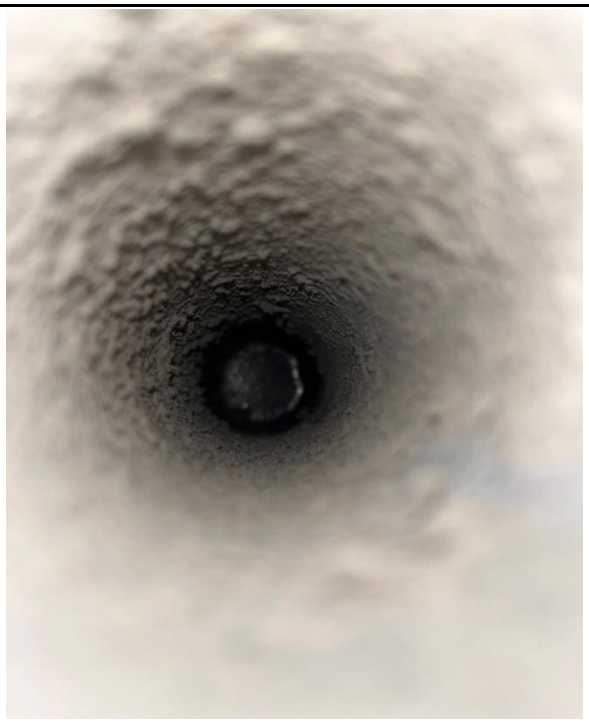


*Photo 6:* View of 1.5-inch PVC sleeve location C. Groundwater observed 6-inches below top of slab. 25 February 2025.



*Photo 7:* View of 1.5-inch PVC sleeve location D. Groundwater observed immediately below top of slab. 25 February 2025.