Interim Remedial Measure Work Plan
Sub-slab Depressurization System
Site No. C828193

Location:
Former Vacuum Oil Refinery
936 Exchange Street & 22 Flint Street
Rochester, New York

Prepared for:
Flint Redevelopment LLC
1400 Crossroads Building
2 State Street
Rochester, New York

Prepared by:
Dixon Rollins, P.E.
89 Village Drive
Meredith, New Hampshire

February 2018

900.003

CERTIFICATIONS

I, Dixon Rollins, P.E., am currently a registered professional engineer licensed by the State of New York and certify that this Interim Remedial Measures Work Plan was prepared in full accordance with all applicable statues and regulations and in substantial conformance with the Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10)."

59206	2/22/18	
NYS Professional Engineer #	Date	Signature

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Region 8
6274 East Avon-Lima Road, Avon, NY 14414-9516
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May 2, 2018

Mr. Alan Adams
Flint Redevelopment LLC
470 Long Pond Road, Suite 200
Rochester, NY 14612

Dear Mr. Adams:

Subject: **Vacuum Oil Refinery, Site #C828193**
Interim Remedial Measure Work Plan:
Sub-slab Depressurization System
February 2018
City of Rochester, Monroe County

The New York State Departments of Environmental Conservation (NYSDEC) and Health, collectively referred to as "the Departments," have completed their review of the document entitled *Interim Remedial Measure Work Plan: Sub-slab Depressurization System (the IRM Work Plan)* dated February 2018 and prepared by Dixon Rollins, P.E. for the Vacuum Oil Refinery site located in the City of Rochester. In accordance with 6 NYCRR Part 375-1.6, the Departments have determined that the Work Plan, with modifications, substantially addresses the requirements of the Brownfield Cleanup Agreement (BCA). The modifications are outlined as follows:

1. **Section 2.0:** The sentence:
   "Implementation of the IRM would reduce the scope of work of the remedial investigation, make the Site buildings safer for occupants to use, and would facilitate building improvements."
   is changed to:
   "Implementation of the IRM would make the Site buildings safer for occupants to use, and would facilitate building improvements."

2. **Section 3.4.2:** The sentence:
   "The locations will be selected based on the use or proposed use of the building at the time the system is installed."
   is changed to:
   "The locations will be selected to provide sufficient coverage to verify that all basement and first floor areas have been successfully mitigated."

3. A portion of Building E (see Figure 6 attached) is currently undergoing a major renovation. Vapor mitigation in this area will be addressed in the future as a separate project.

4. Figures 6 and 7 are replaced with the attached Department-modified revised versions.

With the understanding that the above noted modifications are agreed to, the IRM Work Plan is hereby approved. If you choose not to accept these modifications, you are required to notify this office within 20 days after receipt of this letter or prior to the start of field activities. In this event, I suggest a meeting be scheduled to discuss your concerns prior to the end of this 20-day period.

Prior to the start of field activities, please attach a copy of this letter to the IRM Work Plan and distribute the approved IRM Work Plan as follows:

- Frank Sowers (2 hardcopies, 1 with an original signature on the certification page);
- Sara Bogardus (electronic copy on CD);
- John Frazer (electronic copy on CD);
- Wade Silkworth (electronic copy on CD);
- Document repositories (1 hardcopy for each of the document repositories established for this site); and
- Copies to other interested parties upon request.

Per the approved schedule in the IRM Work Plan, pre-construction indoor air testing and air flow testing will be completed within 30 days of the date of this letter. Please notify me at least 7 days in advance of the start of field activities.

This letter represents approval of the first Work Plan for this site. Please begin submitting monthly progress by the 10th day of each month in accordance with the BCA. The first progress report is due by June 10, 2018.

We look forward to working together to bring this site back into productive use. If you have questions or concerns on this matter, please contact me at 585-226-5357.

Sincerely,

Frank Sowers

Frank Sowers, P.E.
Professional Engineer 1

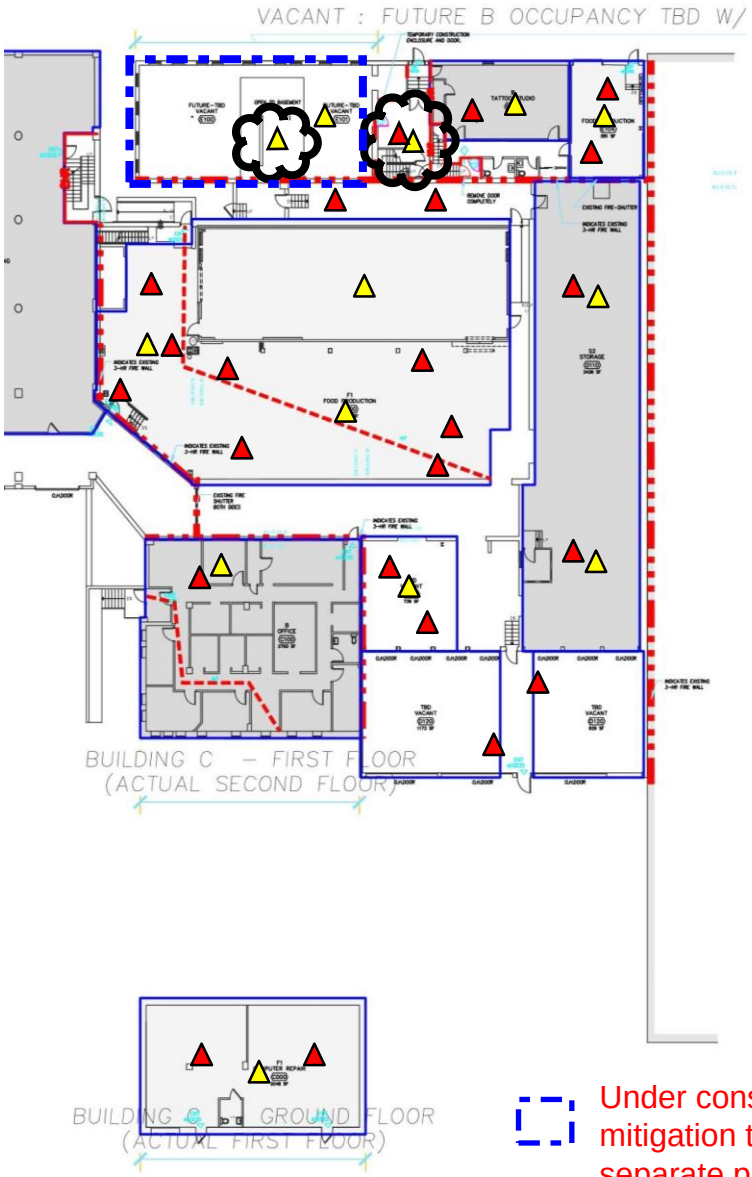
Attach:
1. Revised Figures 6 and 7.

ec: w/attach

Sara Bogardus	Dixon Rollins
Justin Deming	Michael Rumrill
Ben Conlon	Melissa Valle
Bernette Schilling	Alan Knauf
Wade Silkworth	Peter Von Schondorf

Exchange Street

Flint Street



Under construction. Vapor mitigation to be addressed as a separate project in this area. Only pre-mitigation baseline indoor air samples at this time.

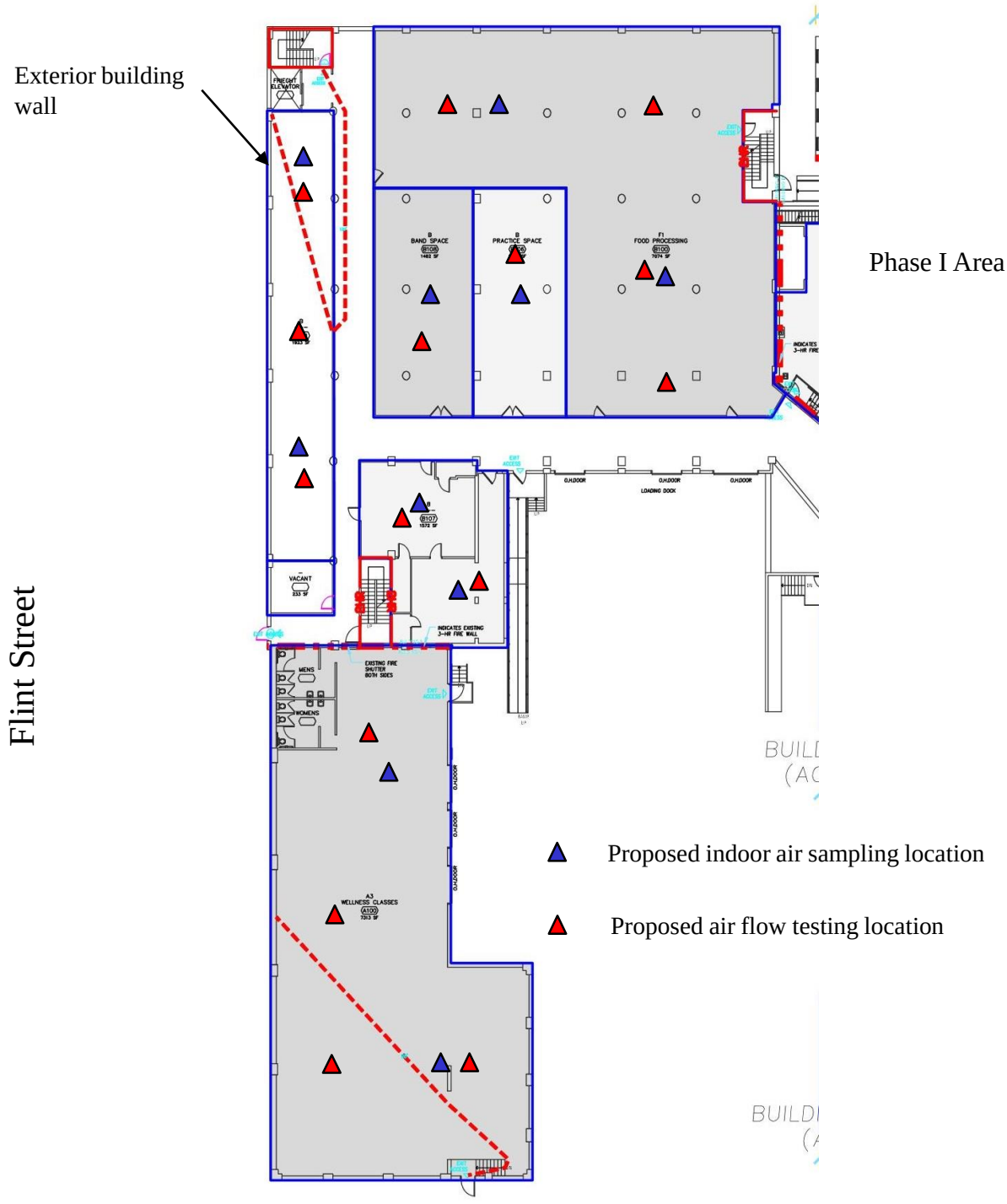
▲ Air flow testing locations

△ Proposed indoor air quality testing locations

Basement test locations added by the Departments.

Title:	Testing Locations Phase 1 - 936 Exchange Street Vacuum Oil Refinery 936 Exchange St. and 22 Flint St. Rochester, New York
Prepared For:	Flint Redevelopment LLC 2 State Street Rochester, New York

Project	900.003
Date	April 2, 2018
Scale	NTS
Drawn	PVS
Checked	ED
File Name	Location Map
Figure	6



Title: Proposed Phase 2 Testing Locations 936 Exchange St. Vacuum Oil Refinery 936 Exchange St. and 22 Flint St. Rochester, New York

Prepared For: Flint Redevelopment LLC
2 State Street
Rochester, New York

Project 900.003
Date April 2, 2018
Scale NTS

Drawn PVS
Checked ED
File Name Location Map

Figure 7

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APPENDICES

1.0 INTRODUCTION

This Interim Remedial Measure ("IRM") Work Plan for a sub-slab depressurization system ("SSDS") has been prepared on behalf of Flint Redevelopment, LLC ("Flint Redevelopment") for the former Vacuum Oil Refinery facility located at 936 Exchange Street and 22 Flint Street in the City of Rochester ("the Site"). Figure 1 provides a Site location map. Flint Redevelopment has entered the Site into the New York State Department of Environmental Conservation ("NYSDEC") Brownfield Cleanup Program ("BCP") and was subsequently assigned NYSDEC BCP number C828193.

Due to the adverse soil vapor, soil, and groundwater conditions beneath the Site, the SSDS is being proposed as an IRM to mitigate the potential for off-gassing to occur from the subsurface and into the interior building spaces. The construction of the SSDS would also help facilitate future renovation work inside the Site's buildings for existing and future tenants.

Dixon Rollins, P.E. has prepared this Work Plan to document the scope of work, procedures, goals and reporting responsibilities of this project.

2.0 BACKGROUND

Flint Redevelopment is leasing, with an option to purchase, properties at 936 Exchange Street and 22 Flint Street that are located within an area referred to as the Vacuum Oil site by the City of Rochester and the NYSDEC. The Site is located on part of the Vacuum Oil Brownfield Opportunity Area (BOA) being administered by the City of Rochester ("City"). The Vacuum Oil site is under investigation and remedial design by different parties for the future use of residential housing, commercial/retail housing (with a possible hotel), and to improve access to the Genesee River and the surrounding community. The concept development plan being proposed by Flint Redevelopment will further augment the proposals of the adjacent property by adding commercial and retail options and commercial residential rental space.

The former Vacuum Oil Refinery facility operated from approximately 1866 until 1935 as an oil refinery using the Site, but also utilized the adjacent parcels. Subsequent to Vacuum Oil's use of the subject property, other companies conducted operations at the property including: Rochester Distilling Company, Socony Vacuum Oil Company, Kolko Paper Company, Genesee Brewery, Company, Inc. Exchange Flint Corporation, and the Genesee Development Corporation.

The Site is currently owned by Foodlink Foundation, Inc., which operated a food storage and distribution warehouse at the site until recently. The Site is currently leased to Flint Redevelopment. The building at 396 Exchange Street has several tenants. On the first floor there is tattoo shop and a meat jerky business on the west side of the building. On the eastside of the shop on the ground floor there is a computer shop storing equipment, a not-for-profit used bicycle shop which uses the space for storage, and a professional rental space. Other tenants use

parts of the other floors of the building, see Figures 2 for an updated list of tenants. 22 Flint Street has one occupant who leases the entire building. The tenant uses the second floor of the 2-story building for office space. The first floor is used by the tenant as vehicle and equipment storage, client's personal item storage, cleaning and restoration rooms, and product storage, see Figure 3.

The contaminants left behind from the Vacuum Oil Refinery operations include primarily petroleum products and intermediates to the refining process. Additionally, chlorinated solvents have been identified in the soil, groundwater, and soil gas. These compounds may be an artifact of former operators or from the operations of the neighboring property. In addition to the dissolved-phase contaminants, floating free petroleum product contamination was found on the groundwater in two locations, and free petroleum product was found in several soil samples. Remediation will be conducted to commensurate with the future use of the subject property to address soil gas, soil, and groundwater contamination. Implementation of the IRM would reduce the scope of work of the remedial investigation, make the Site buildings safer for occupants to use, and would facilitate building improvements.

In June of 2016, Leader and Roux Associates, Inc. ("Roux") conducted a sub-slab soil vapor sampling to evaluate potential impacts to the 936 Exchange and 22 Flint Street building. Roux conducted this work on behalf of Exxon-Mobil. A copy of the Leader report is provided as Appendix 1. Roux did not prepare a report on their finding. However, Appendix 1, Figure 4, and Figure 5 to this report provide combined Leader and Roux data for both sub-slab sample results and indoor air sample results.

3.0 SCOPE OF WORK

The scope of work for this IRM Work Plan will test, measure and calculate parameters used for the design, construction, and post-construction verification of the SSDS performance. In addition to defining the testing to be completed to obtain design criteria, this IRM Work Plan will describe the design process and the SSDS post-construction performance criteria. The actual design of the SSDS system will be based on the testing measurements and data collected during the construction phase of the project, and the planned renovations for the spaces.

3.1 Predesign Sub-Slab Air Flow Testing

The design parameters for the SSDS were obtained by conducting a series of sub-slab air flow tests in the occupied areas of the 936 Exchange Street building, see Figure 6. The referenced sub-slab air flow tests were completed over several days between March 28 and March 30, 2017. Appendix 2 provides the March air flow test data. The tentative testing locations for the remaining areas of 936 Exchange Street and the 22 Flint Street building are shown on Figure 7 and Figure 8. The final number of tests may increase in response to the findings of the construction of the SSDS.

Each test will begin with drilling a nominal 0.75 to 1.0-inch diameter hole (or larger to fit the testing equipment) through the floor slab. Then, a series of smaller diameter holes approximately 0.25 to 0.375-inches in diameter radiating out from the larger hole will be drilled. The larger holes will be used to place a vacuum on the sub-slab materials, and the smaller holes will be used to measure the vacuum response. The location of the measurement holes will be based on several factors including the dimensions of the room or section of the building being tested, the location of foundations or other sub-slab features, and the response to testing. In general, the starting point for measurements will be 10 to 20-feet from the suction hole.

The larger suction holes will be centrally located in an area of the building and away from foundations (i.e., interior walls as well as exterior wall foundations) and other sub-slab features (i.e., basements, pits, elevators). Locating the suction hole in a central location will allow measurement and mapping of the applied vacuum 360-degrees around the suction point.

Each test will be conducted over a range of vacuums ranging from one to four-inches of water (vacuum) and air flow to 20 cubic feet per minute. The actual amount of vacuum and air flow achieved will be dependent on the sub-slab conditions. The goal of the test will be to identify where 0.004-inches of water column vacuum is located. The location of 0.004-inches of water column vacuum from the suction point will identify the area of influence ("AOI") or radius of influence ("ROI") for specific vacuums and air flows. USEPA's guidance document "Technical Guidance for Radon Prevention in the Design and Construction of Schools and Other Large Buildings" (EPA/625/R-92/016, June 1994), recommends the AOI be defined by a sub-slab vacuum of 0.002-inch of water column vacuum.

3.1.1 Test Procedures

3.1.1.1 Suction and Measuring Hole Procedures

The suction and measuring holes will be drilled using a hammer drill with a concrete drilling bit. Each hole will be drilled through the floor and into the subsurface approximately four-inches to ensure there are no subfloors. The holes will be vacuumed to remove debris. At the measuring hole, a section of 0.25 to 0.375-inch diameter PVC tubing will then be placed into the hole to a point approximately two to three-inches below the floor surface. The remaining void at the surface will be filled with closed cell foam to provide an air tight seal. Finally, the area around the suction hole will be swept clean to provide a seal between the vacuum hose and the floor.

3.1.1.2 Measurements

Measurements for each test will be collected from the vacuum source and each of the measurement points. The vacuum source is an industrial vacuum with a HEPA filter. The operation of the vacuum is uncontrolled unless needed. The vacuum produces a maximum vacuum of four-inches of water at an air flow of 20-cubic feet per minute.

Measurements are made using either a vacuum/air flow digital gauge, analog gauge, or a U-tube manometer. Measurements are made until the vacuum has equilibrated at the suction hole and the measurement point(s). Equilibrium is generally achieved in a few

seconds to a minute. When equilibrium is obtained and the vacuum at the measurement point is more or less than the goal vacuum (0.004-inches of water), a new measurement point is drilled several feet further from or closer to the suction hole. The process will continue until the ROI is defined. As necessary, unused measurement holes will be sealed to avoid potential vacuum leaks. At the completion of the testing, all holes will be sealed with cement.

The discharge from the industrial vacuum will be filtered using a HEPA filter to remove dust particles. The exhaust will be discharged outdoors or through a charcoal filter when working in occupied spaces. A PID will be used to monitor the air in the work area and at the discharge.

3.1.1.3 Vapor Monitoring

During the 2016 sub-slab sampling, the measured PID levels were found to be less than 5 parts per million ("ppm") initially, then dropped to 0 ppm prior to sampling. During the testing, the building was largely unoccupied with the exception of Building E and the basement (ground floor) of Building C. The exhaust in those areas was directed outdoors or into unoccupied spaces. The monitoring was completed by Mitigation Tech of Brockport, New York.

3.1.2 Data Quality Objectives

The goal of testing is to define the ROI or AOI under different vacuum/air flow conditions. The ROI or AOI defines the vapor capture zone with a vacuum of at least 0.004-inch of water column vacuum. To measure vacuum to 0.004-inches of water column, instruments and gauges must be capable of measuring to 0.001-inches. The instruments will be calibrated by the manufacturer, the firm which the instruments are obtained, or by following the instructions provided by the manufacturer. All instruments will be used per the manufacturer's instructions. Once every 10 measurements, a sampling point will be retested to determine if the readings are within the tolerance/level of error for the instrument. Instruments capable of measuring air flow are less critical but will be measured and calculated to the nearest cubic foot per minute. Distances between measuring points will be measured to the nearest inch.

3.2 Indoor Air Quality Testing

Prior to the start of sub-slab air flow testing, indoor ambient air testing will be completed during the heating season. If the schedule for completing the project falls outside of the heating season NYSDEC and NYSDOH will be consulted.

Sampling will be conducted at the locations where previous sub-slab sampling was conducted in the previous study and in every occupied space of the site's buildings. The sampling will be done to evaluate the potential exposure to users of the buildings prior to the initiation of the sub-slab depressurization system. Figure 6 provides the locations of the proposed indoor air sampling. Not shown on Figure 6 is an outdoor ambient air sampling location, which will be included during each event. Outdoor sampling locations will be determined on the day of sampling and the wind direction. Ideally a roof top location will be selected, but at a location up

wind of vents (sewer, heating system exhaust, etc.) and fresh air intakes for the building's HVAC system.

Samples will be analyzed using USEPA Method TO-15 and will be collected over an 8-hour period. The laboratory analysis will be conducted, and data package (Category B type data deliverable) will be prepared following the NYSDOH's Analytical Services Protocols. Once the Category B data deliverable is received, a data usability summary report ("DUSR") will be prepared and submitted with the project's completion report.

Prior to the sampling event, the indoor air quality questionnaire and building inventory will be completed following NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in New York State (October 2006). While conducting the building inventory, the building will be inspected for exposure pathways, sampling locations, and possible interferences with the sampling (e.g., locations, air flow patterns, and chemical interferences).

The pre-sampling building inspection will be conducted to evaluate the different uses of the building, how those uses might influence testing (e.g., materials being used, connectivity via building ventilation, doorways and corridors, perforations (drains, ducts, cracks, etc.)), obtain an inventory of building materials, furnishings, products/materials being used, and to identify sampling locations (e.g., occupied spaces, limited occupancy areas, etc.). Information learned from the pre-sampling inspection will be used to complete the forms provided in Appendix 3. Drawings of the building will be prepared to identify the building area uses, probable sampling locations, the location of areas used to store products and materials which might influence testing, and, if possible, to overlay a diagram of the heating, ventilation, and air conditioning ("HVAC") system. Ideal sample locations will be in areas that are typically occupied (i.e., placed approximately 3 to 5-feet above the ground (floor) surface), and located away from HVAC system ducts, windows, doors, and significant penetrations or cracks. The sampling will be completed over an 8-hour period while the building is occupied and while the HVAC system is in heating mode.

The testing will be done using batch certified 6-liter summa canisters at a NYSDOH ELAP certified laboratory. The laboratory's analytical methods and method detection limits will be consistent with the current ASP requirements and NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in New York State (October 2006) and the 2016 guidance amendment/update.

Figure 6, Figure 7, and Figure 8 provide proposed sampling locations based on the current occupancy and potential future uses of these areas.

3.3 Design

The design of the SSDS will be based on the ROI or AOI and will also be designed based on the layout of the buildings (i.e., locations of foundations, basements, etc.). As a result, a single design is not practical for both buildings or for the different rooms in a single building. However, all designs must be capable of creating a vacuum beneath the floor slab of at least 0.004-inches of water column vacuum at any given point below the floor.

Due to the variability of the building, spaces, and sub-slab conditions, the preparation of the design was changed from a traditional design-bid-build to a design-build process. This streamlines the process and provides efficiencies in selecting fans, pipe routing, and locating extraction points.

Ultimately, the design will conform to national standards, the New York State and City of Rochester building codes (Fire, Electric, etc.), and the "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006 and associated updates.

The design-build process is an interactive process where testing, design, and construction evolves. Currently, the following design is planned:

Fans

1. **Building C – occupied basement** – (1) RADONAWAY GE-501 fan with (1) suction cavity.
2. **Building D – USDA room** – (1) RADONAWAY RP-265 with (3) suction cavities.
3. **Building D – central area** (1) AMG Force fan with (2) suction cavities upper loading dock, (2) suction cavities main corridor, (3) suction cavities at C-101; C-103; C-105.
4. **Building D – northern receiving and storage** – (1) AMG Force fan with (3) suction cavities.
5. **Building D/E – west area** – (1) AMG Force fan with (5) suction cavities at corridor adjacent to offices, (1) suction cavity at sprinkler utility area, (2) suction cavities office corridor.

Common Design Elements

1. Continuous building assessment and sub-slab vacuum measurement to optimize design.
2. Mitigation Tech to consult and make reasonable efforts to accommodate tenants at the property on all activities.
3. System configuration – all fans subject to field modification; fans sidewall or roof mount to provide sub-slab depressurization via 4-inch and/ or 3-inch. Schedule-40 PVC pipe to roof exhaust.
4. Suction points as follows:
    - connection via 3-inch Schedule-40 PVC pipe to sub-floor with urethane seal to consist of approximately 1-cubic foot excavated material in sub-slab;
    - access hole to suction cavity by 5-inch core drill or hand drill;
    - trenching around footers where required with concrete restoration; and,
    - soil removed from the excavation or drilling of holes will be containerized and assumed to be contaminated until sampling can be conducted to verify the soil quality.

5. Suction point locations approximately as provided above with additional placements where required to meet performance objectives.
6. Proportioning valves or plates for suction risers where required.
7. Sufficient quantity of vacuum monitoring points to verify system effectiveness.
8. All exhaust points will be located:
    - at least 10 feet above the ground surface;
    - a minimum of 10 feet from adjacent or adjoining buildings, HVAC air intakes, or supply registers; and
    - at least 10 feet away from any opening that is less than 2-feet below the exhaust point.
9. In accordance with the City of Rochester building codes (Fire, Electric, Ventilation, etc.) and with the "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," dated October 2006 and associated updates, the NYSDEC will be notified if there is a conflict between building codes and the guidance such as;
    - above the eave of the roof (preferably above the highest eave of the building); or
    - at least 12 inches above the roof or adjacent parapet, if present.
10. Exterior switch and *Sealtight* and/or MC conduit from fan housings to vicinity of electrical panel; assumes adequate capacity for addition of dedicated circuit in electrical panel nearest fan location.
11. Dial type or oil filled vacuum indicators, on vertical pipe runs; one device per fan system, location to be determined.
12. Urethane sealant at floor joints, accessible cracks and penetrations in the depressurized area.
13. Horizontal pipe located near ceiling, will be fastened using bracketing attached to the structure, and sloped as required toward the suction hole.
14. At completion of construction; perform backdraft testing, measurement of pressure differentials and vacuum, label system components; provide system description and as-built drawings, and system operational instructions.
15. Permits (as they may apply to renovations/additions to the electrical system of the building, or general building permits) and inspections.

3.4 Post Construction Testing

Post-construction testing will focus on the performance of the system, to demonstrate the depressurization of the concrete building floors in contact with the ground, and to confirm the quality of the indoor air.

3.4.1 System Vacuum Performance

The system vacuum performance will be determined by measuring various locations beneath the floor to demonstrate that the system, at any particular location, is achieving the minimum 0.004 of an inch of water column vacuum. Locations selected to measure the vacuum will depend on several factors, including the known location of barriers to air flow, the location of the extraction fan and the accessibility of the location at the time of measuring. In general, vacuum measurements will be taken initially at locations near the extraction fan's intake hole and will then work outward toward potential barriers to air flow (i.e., foundation walls, exterior walls, etc.). Approximately one vacuum reading will be taken per 1,000-square of building footprint space, or at least one point per occupied room that is less than 1,000-square feet.

In addition to sub-slab vacuum readings, the vacuum in the individual fan stacks will be verified, either by observing the vacuum gauge on each stack or by measuring with a hand-held instrument. Measuring the vacuum will be performed with a manometer. Manometers, or a gauge used for sub-slab measurements, will be capable of measuring to 0.001-inches of water column.

Manometers/gauges used for measuring vacuum extraction stacks will be capable of measuring at least 0.1 inches of water column vacuum. At the stack exhaust, the air flow will be measured, or the differential pressure and temperature will be measured so the air flow rate can be calculated.

Each measurement will be recorded in field notes or on a field measurement form. The measurement will include the vacuum and location of each point.

3.4.2 Indoor Air Quality Sampling

Indoor air quality sampling will be completed following the same procedures identified in Section 3.2. The locations will be selected based on the use or proposed use of the building at the time the system is installed. In general, the indoor air quality sampling will be conducted to replicate the pre-construction sampling identified on Figure 6, Figure 7 and Figure 8.

3.4.3 Emissions

Emissions from the SSDS will be calculated based on the performance of the fans and past sub-slab vapor quality results. The calculations will be performed to provide an estimate of the amount of Tetrachloroethene, Trichloroethylene, and ozone-depleting gases being released. The calculations will result in an estimate of the number of pounds per hour of these compounds potentially being released from the system. Since the system will have more than one emission point, the emission rate will assume one discharge point using an average air flow rate from the fans multiplied by the number of fans. For example, if the average flow rate of nine fans is 120-cubic feet per hour, then the total flow rate will be 1,080-cubic feet per hour. The vapor concentration found in the discharge will assume an average concentration for each of the compounds of interest identified in the sub-slab sample results. For the average concentration calculation, compounds reported as less than or not detected, will use one half the laboratory method detection limit ("MDL") in the calculation of the average emission concentration.

The equation used for the emission calculations will be as follows:

$$Kg/M^3 * 0.0624 \text{ Lbs./Ft}^3 * Ft.^3/Hr. = Lbs./Hr.$$

Compound average concentration * Conversion of kilograms per cubic meter into pounds per cubic foot * Average flow rate = Pounds per hour

Using the existing data and making assumptions on the air flow from the buildings we have estimated the following emissions in pounds per hour:

Building	Air Flow	TCE	PCE	ODC
936 Exchange St.[2]	136 CFM[1]	$2.6x10^{-4}$	$2.6x10^{-4}$	$1.02x10^{-6}$
22 Flint St.[2]	136 CFM[3]	$2.9x10^{-4}$	$1.46x10^{-4}$	$5.36x10^{-7}$

1. Air flow assumes there are multiple systems with an average air flow rate of 136 CFM.
2. Air sample data assumes an average concentration of each compound(s) across the building.
3. Air flow assumes there are multiple systems extracting air, but the air flow characteristics are assumed to be the same as 936 Exchange Street and the number of extraction points is based on the number of points used at 936 Exchange per square footage of building footprint.

4.0 REPORTING

At the completion of build and post-construction testing, an IRM Construction Completion Report ("CCR") and an Operation, Maintenance and Monitoring ("OM&M") Plan will be prepared in substantial conformance with NYSDEC's Program Policy, DER-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.

The IRM CCR will summarize the construction activity, provide construction and post construction testing results (both digital testing and indoor air testing). All data will be submitted to the NYSDEC in an approved Electronic Data Deliverable format and submitted when the data validation has been completed, if necessary. Under no circumstances will the data submission be delayed more than 90-days after it has been received by the remedial party or their consultant.

An OM&M Plan will be submitted with the CCR. The OM&M Plan will be provided to the owner and occupants to facilitate their understanding of the system's operation, maintenance and monitoring. The OM&M Plan will include the following:

- A description of the SSDS installation and its basic operating principles, with diagrams;
- The process by which the owner or tenant can check that the SSDS is operating properly;
- How the SSDS will be maintained and monitored and by whom;
- A description of long-term reporting and annual SSDS certification requirements;

- A list of appropriate actions for the owner or tenant to take if a SSDS warning device (manometer) indicates system degradation or failure;
- A description of the proper operating procedures for the SSDS, including manufacturer's operation and maintenance instructions and warrantees; and
- Contact information if the owner or tenant has questions, comments or concerns.

5.0 PROJECT MANAGEMENT

Dixon Rollins, P.E. will serve as the Project Engineer for this project. Mr. Rollins responsibilities will include quality assurance, coordinating with Flint Redevelopment, NYSDEC and the City of Rochester, the design and construction of the SSDS, and conducting the construction oversight of the SSDS. Leader's Qualified Environmental Professional and staff will assist Mr. Rollins with the collection of samples, review of results and preparation of reports, as needed.

Evan Dumrese, P.E. from Leader will serve as the Project Manager for this project. Mr. Dumrese will be responsible for managing the project for Flint Redevelopment and ensure activities are scheduled and reporting is conducted in a timely manner.

Mitigation Tech (Northeast Health Association/National Radon Proficiency Program Identification Number 100722) will perform the project design work at testing work under contract with Flint Redevelopment.

All DUSRs will be prepared by Mary Ellen Holvey, CIH of ME Holvey Consulting, LLC for all chemical analytical data generated as a part of the IRM Work Plan. The resume for Ms. Holvey is provided as Appendix 6.

The NYSDEC Project Manager is Frank Sowers, P.E. Mr. Sowers can be contacted at (585) 226-5357.

6.0 SCHEDULE

Upon approval and implementation of the IRM Work Plan, Mitigation Tech will complete the scope of work which involves making electrical connections to fans and power sources, and leak checking. Following completion of the construction work, vacuum testing will be completed within 10-days. Within 30 to 45 days of system start up, indoor air testing will be completed. An IRM CCR and OM&M Plan will be prepared for NYSDEC within 20 days of receipt of the performance indoor air quality results.

Indoor air quality testing and air flow testing of the remaining spaces in 936 Exchange Street and 22 Flint Street will be conducted within 30 days following approval of the IRM Work Plan.

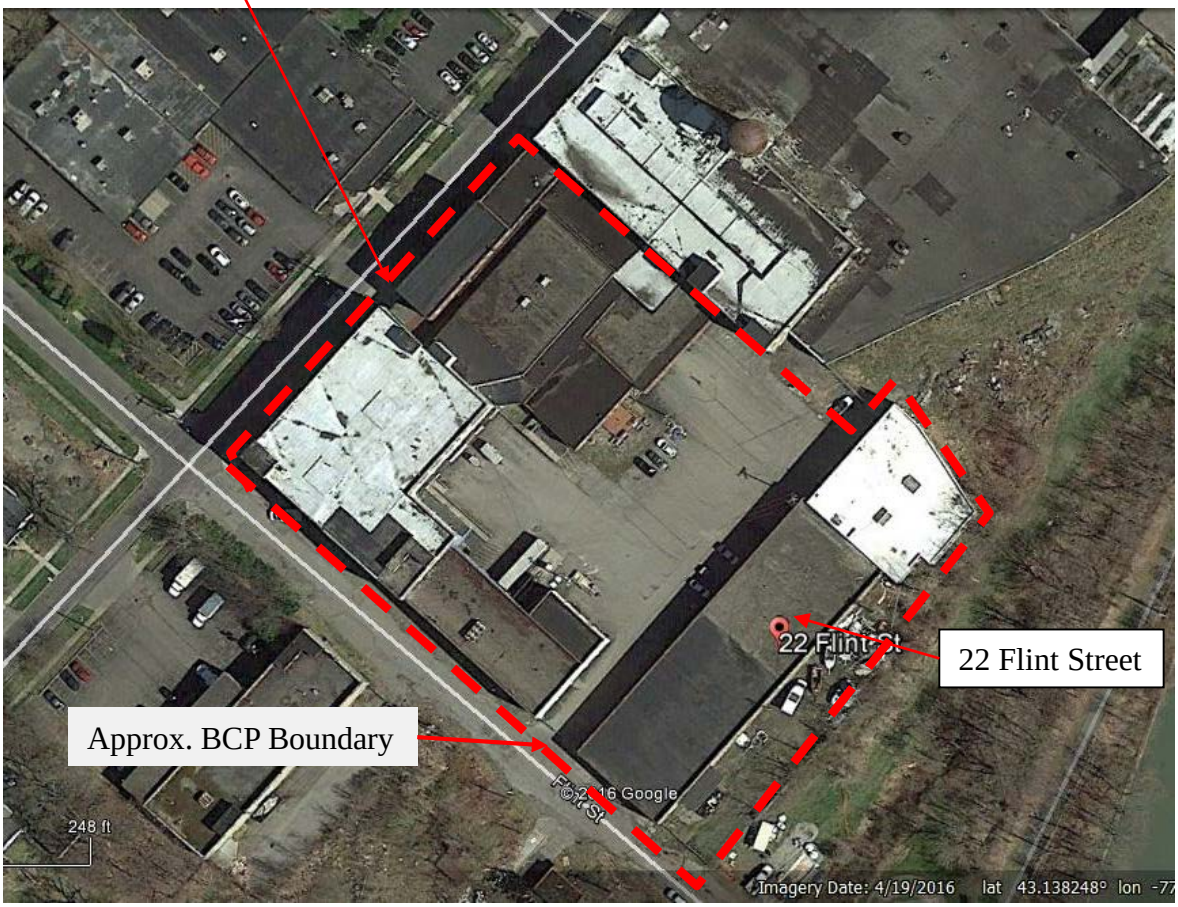
7.0 HEALTH & SAFETY

A site-specific Health and Safety Plan ("HASP") in general accordance with 29 CRF 1910.120 was developed for this project. Appendix 4 provides a copy of the HASP. The HASP will be implemented by the project's health and safety coordinator ("H&SC"). The H&SC will provide and implement the health and safety procedures for all project employees and any subcontractors who may be working on the Site. Prior to beginning the field activities, field team members are required to read and sign this HASP. All Site contractors will be responsible for their employee's health and safety while on-site.

8.0 COMMUNITY AIR MONITORING PLAN

The CAMP will be conducted in cooperation with the HASP to monitor air quality at the perimeter of the unique work areas (i.e. drilling locations, inside of buildings, etc.), the perimeter of the exclusion area, and at property boundary. The goal of the CAMP is to protect air quality in areas where tenants, residents and passersby might be impacted. Appendix 5 provides a CAMP for the project.

FIGURES



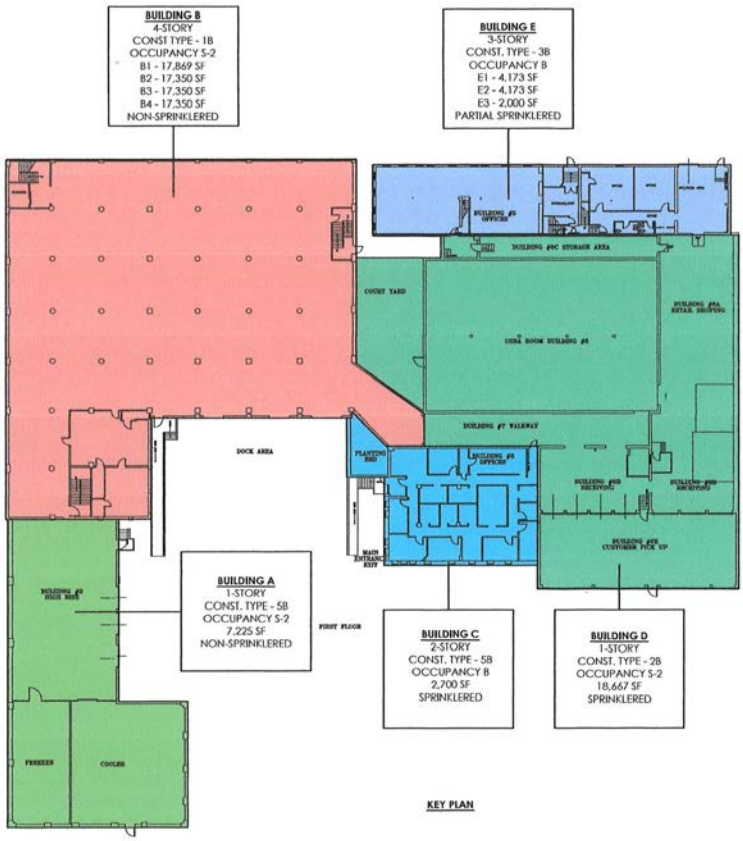
Title:	Site Map Vacuum Oil Refinery 936 Exchange St. and 22 Flint St. Rochester, New York
Prepared For:	Flint Redevelopment LLC 2 State Street Rochester, New York

Project	900.003
Date	November 30, 2017
Scale	NTS
Drawn	PVS
Checked	DR
File Name	Location Map
Figure	1

Building Occupants

Name	Use	Building
Saint's Place	Site Occupant	A
Sweet Beez	Site Occupant	A
Kaleidescope Inc.	Wellness Classes	A
Smugtown Mushroom Co. LLC	Mushroom Cultivation, sales, processing, work-shops and classes	B
Redshield-1391 Inc.	Events and Classes	B
Sole Rehab	Music Studio	B
Lizz DeSimone	Art Studio	B
Saint's Place	Storage	B
Spotted Rabbit Creative Arts Therapy PLLC	Art Studio	B
Phill Coleman	Art Studio	B
Lorenzo Guerrini	Art Studio	B
Joel Thompson	Band Practice	B
Darrel Ashford	Storage	B
Jon Mueller	Storage	B
Cameron Yager	Storage	B
PCHO Inc.	Office space and storage	B
Aaron Rubin	Computer repair and storage	C
Chloe Smith Illustration	Art Studio	C
Kate Huggler	Office	C
Stomping Ground Camp, Inc.	Office Space	C
Joseph Klem	Storage and Vehicle Parking	D
R Community Bikes Inc.	Storage	D
Brian Trzaskos	Vehicle Storage	D
Community Composting LLC	Equipment Storage, Cleaning and Maintenance	D
Lighthouse Tattoo LLC	Tattoo Studio	E
Perl Lifestyle LLC	Beauty and Wellness Consulting	E
Smoke Shack Jerky LLC	Food Production	E
Joseph Vella	Art Studio	E
Tim Cerqua	Artist Studio	E
Tykwaun Allen	Music Studio	E
Pure Mint Beauty Lab	Hair Salon	E
Chris's Affordable Tree Service	Vehicle Storage	Outside

Exchange Street



Notes: Most building occupants have space on 2nd, 3rd or 4th floors

Title: 936 Exchange Street Occupancy
Vacuum Oil Refinery 936 Exchange St. and 22 Flint St.
Rochester, New York

Prepared For: Flint Redevelopment LLC
2 State Street
Rochester, New York

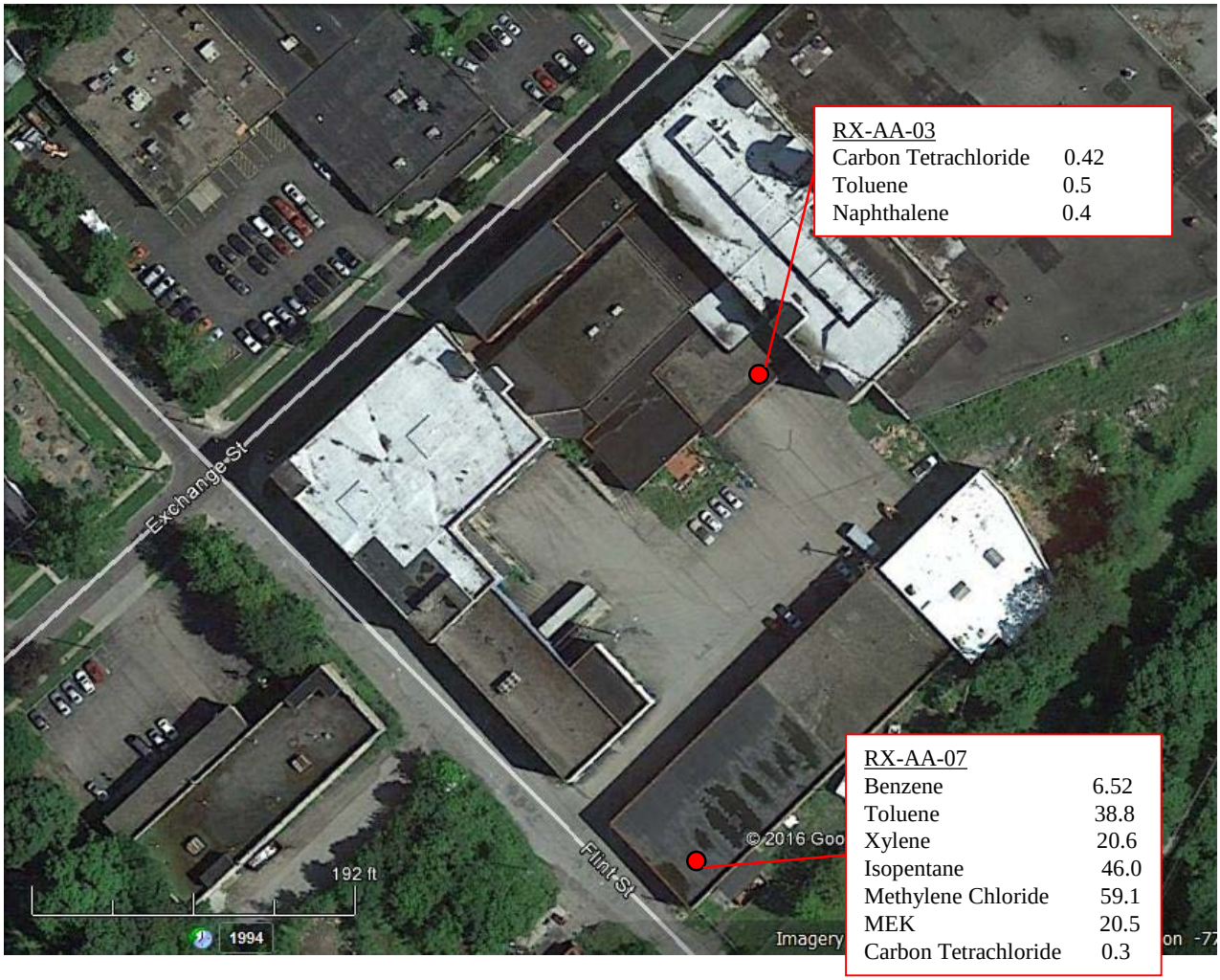
Project 900.003
Date November 30, 2017
Scale NTS

Drawn PVS
Checked DR
File Name Location Map

Figure 2

BCP Boundary

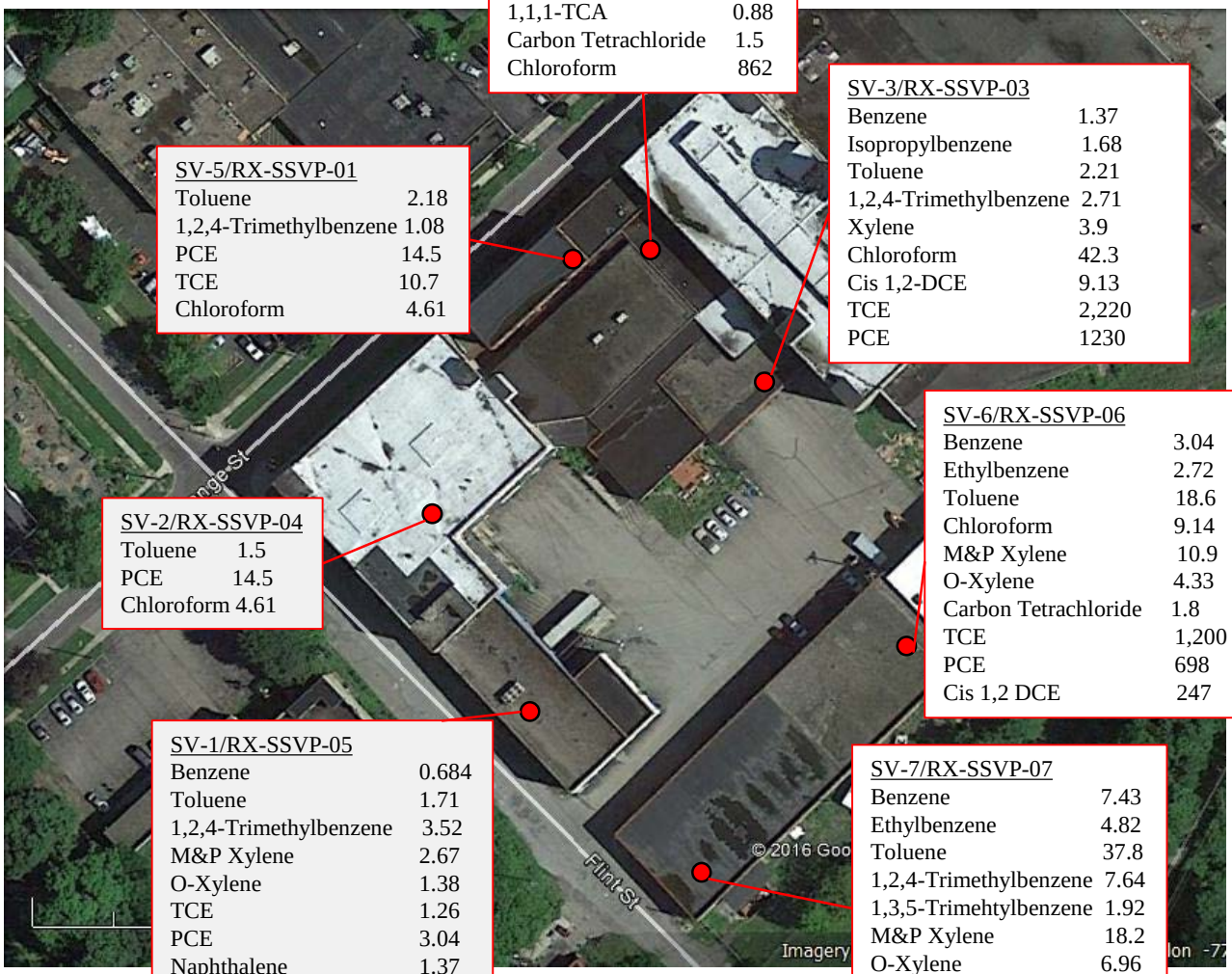
Title:	22 Flint Street Occupancy Vacuum Oil Refinery 936 Exchange St. and 22 Flint St. Rochester, New York
Prepared For:	Flint Redevelopment LLC 2 State Street Rochester, New York
Project	900.003
Date	November 30, 2017
Scale	NTS
Drawn	PVS
Checked	DR
File Name	Location Map
Figure	3



AA-1 = Indoor Air Sampling Location

All concentrations shown in units of micrograms per cubic meter.

Title	Indoor Air Sample Result Summary Vacuum Oil Refinery 936 Exchange St. and 22 Flint St. Rochester, New York
Prepared For	Flint Redevelopment, LLC 1400 Crossroads Building Rochester, New York
Project	900.004
Date	November 30, 2017
Scale	NTS
Drawn	PVS
Checked	DR
File Name	Indoor Air
Figure	4



● SV-1 = Sub-slab Vapor Sampling Location

All concentrations shown in units of micrograms per cubic meter.

Title: Subslab Sample Results Concentrations and Locations
Vacuum Oil Refinery 22 Flint St. and 936 Exchange St.
Rochester, New York

Prepared For: Flint Redevelopment, LLC
2 State Street
Rochester, New York

Project: 900.003
Date: 11/30/17
Scale: NTS

Drawn: PVS
Checked: DR
File Name: SVI Map

Figure: 5

Exchange Street

Flint Street

▲ Air flow testing locations

△ Proposed indoor air quality testing locations

Title:	Testing Locations 936 Exchange Street Vacuum Oil Refinery 936 Exchange St. and 22 Flint St. Rochester, New York
Prepared For:	Flint Redevelopment LLC 2 State Street Rochester, New York

Project	900.003
Date	February 5, 2018
Scale	NTS
Drawn	PVS
Checked	ED
File Name	Location Map
Figure	6

Exchange Street

Flint Street

▲ Proposed air flow testing location

▲ Proposed indoor air quality testing location

Title: Proposed Testing Locations 936 Exchange Street
Vacuum Oil Refinery 936 Exchange St. and 22 Flint St.
Rochester, New York

Prepared For: Flint Redevelopment LLC
2 State Street
Rochester, New York

Project 900.003
Date February 5 2018
Scale NTS

Drawn PVS
Checked ED
File Name Location Map

Figure 7

BCP Boundary

Proposed air flow testing locations

Proposed indoor air quality testing locations (locations were selected based on estimated locations of first floor rooms)

Title:	Proposed Testing Locations 22 Flint St. Vacuum Oil Refinery 936 Exchange St. and 22 Flint St. Rochester, New York
Prepared For:	Flint Redevelopment LLC 2 State Street Rochester, New York

Project	900.003
Date	November 30, 2017
Scale	NTS
Drawn	PVS
Checked	DR
File Name	Location Map
Figure	8

Appendix 1

June 2016 Sub-Slab Vapor Sampling Report and Figures

Leader Professional Services, Inc.
271 Marsh Road, Suite 2
Pittsford, New York 14534

(585) 248-2413
(585) 248-2834 (Fax)
www.leaderlink.com

900.002

June 22, 2016

Alan J. Knauf, Esq.
Flint Redevelopment LLC
c/o Knauf Shaw LLP
1400 Crossroads Building
2 State Street
Rochester, New York 14614

Re: Supplemental Phase II Environmental Site Investigation
Sub-slab Vapor Sampling
936 Exchange Street and 22 Flint Street
Rochester, New York

Dear Mr. Knauf:

Leader Professional Services, Inc. ("Leader") has received the sample results from our Supplemental Phase II Environmental Site Investigation ("Phase II") conducted on June 2, 2016 to evaluate the sub-slab vapor impacts beneath the buildings located at the referenced property.

SCOPE OF WORK

The goal of the Phase II was to sample the sub-slab soil vapor and evaluate the potential for impacts to the indoor environment. As a result of our Phase II soil and groundwater sampling project conducted on March 10 and 11, 2016, volatile organic compounds were found and organic compounds were tentatively found and strong evidence (stains, odors and free product) of more significant contamination was present.

Also, we recognized the potential for many interferences to be present within the buildings that could cause false positives with the sample results. These interferences included the storage of bicycles and bicycle parts, vehicles, unused equipment and maintenance and cleaning products. To minimize this effect on the resulting data, no indoor air samples were collected and each sampling location was tested with Helium to ensure the sample boring was sealed from the ambient air.

Each sample was split with Roux Associates, Inc. ("Roux"), ExxonMobil's consultant. After discussing the mechanics of splitting the samples with Roux and the New York State Department of Environmental Conservation ("NYSDEC"), Roux and Leader agreed to use the same size sample Summa canisters and the same flow rate during sampling. The flow rate was set by the laboratories providing the sample flow valves and Summa canisters. The sampling train consisted of the following:

- The sampling point was selected and constructed by Leader, which included using a food and beverage grade Polyethylene tubing sealed into a 3/8 to 1/2 inch diameter hole drilled through the floor slab and into the subsurface.

- The tubing was connected to a stainless steel flow splitter provided by Roux with two legs; one leg going to Leader's and one to Roux's Summa canister. The length of food and beverage grade tubing from the splitter to the Summa canisters was approximately the same.

- The samples were collected over approximately one hour; however, the conditions of the subsurface below the floor slab and the differences between flow valves varied causing in some cases for sampling to exceed one hour. During the sampling, the regulator on the Summa canister was monitored so the vacuum remaining in the canister did not drop to zero. If one canister filled faster than the other, the canister that filled faster was closed to allow the other canister to fill.

- Each sample collected by Leader was analyzed for volatile organic compounds following USEPA Method TO-15.

Discussion

Sample locations were selected by Leader to provide information on the sub-slab vapor conditions below the buildings 936 Exchange Street and 22 Flint Street. The interior of each building was inspected prior to sampling to evaluate building conditions which might impact sampling. These conditions included holes in the floor, tenant traffic within the building area, presence of basements or crawl spaces and the sample locations relative to soil and groundwater samples collected during the previous Phase II. During the assessment, certain areas of both buildings were avoided because of the presence of a concrete floor heating system located in the southeast corner of the 936 Exchange Street building and crawl space beneath the north side of 22 Flint Street. The sampling locations are shown on Figure 1.

Prior to the collection of samples, each hole was tested to determine if the seal formed around the sample tube the day before was competent. This was determined by placing and sealing a sheet of plastic over the sample location, connecting the sample tube to an instrument with a Helium detector, and then introducing Helium beneath the plastic sheet and monitoring the Helium detector. The monitoring was performed for several minutes. If Helium was detected then the seal was repaired and retested. Following seal testing the soil vapor was measured using a Mini Rae 3000 volatile organic analyzer using a photoionization detector ("PID") with a 10.6 electron volt lamp.

The results of the TO-15 analysis and the PID measurements are shown on Table 1. In general, the PID measurements did not show any elevated concentrations. The laboratory report for the testing is provided in Attachment 1. In general, the most significant of the results is the presence of chlorinated solvents: Tetrachloroethene ranging in concentration from 1.73 $\mu g/m^3$ to 652.0

micrograms per cubic meter ("µg/m^3"); Trichloroethene ranging in concentration from 1.26 µg/m^3 to 1,230.0 µg/m^3; cis-1,2-Dichloroethene found at 9.13 µg/m^3 and 247.0 µg/m^3; Trans 1,2-Dichlorothene was found at 4.77 µg/m^{3}and 9.78 µg/m^3. Figure 2 provides the distribution of the chlorinated solvents on the site.

Petroleum related products were also found widespread across the site. These included: Benzene was found at concentrations ranging from 0.684 µg/m^3 to 7.43 µg/m^3; Toluene was found at concentrations ranging from 1.5 µg/m^3 to 37.8 µg/m^3; M&P Xylene was found at concentrations ranging from 2.67 µg/m^3 to 18.2 µg/m^3; O-Xylene was found at concentrations ranging from 1.2 µg/m^3 to 6.96 µg/m^3; Trimethylbenzenes were found at concentrations ranging from 1.08 µg/m^3 to 7.64 µg/m^3; and Ethylbenzene was found at two locations at 2.72 µg/m^3 and 4.82 µg/m^3.

Other compounds were also found at relatively low concentrations. The following are of interest because of their detected concentration, but also because they were all found at location SV-7 located at 22 Flint Street at the southernmost end of the building: Acetone was found at a concentration of 22.4 µg/m^3; Ethanol was found at a concentration of 109.0 µg/m^3; Heptane was found at a concentration of 5.79 µg/m^3; N-Hexane was found at a concentration of 20.2 µg/m^3; Methylene Chloride was found at a concentration of 40.8 µg/m^3 (also found at lower concentrations in sample blanks); 2-Butanone was found at a concentration of 16.0 µg/m^3; 2-Propanol was found at a concentration of 9.81 µg/m^3; and 2,2,4-Trimethylpentane was found at a concentration of 10.3 µg/m^3.

Findings

NYSDEC and the New York State Department of Health ("NYSDOH") has not developed guidelines or standards for sub-slab soil vapor samples to compare to the sample results. The United States Environmental Protection Agency ("USEPA") has screening levels for shallow soil gas concentrations which are used in their vapor intrusion attenuation models to meet risk based indoor air quality values.[1] The risk-based shallow soil gas values use a risk of 10^{-5} which would be suitable for a commercial building setting. Comparing the results to the risk-based shallow soil gas values, three compounds appear potentially problematic: Chloroform, Trichloroethene and Tetrachloroethene.

Aside from the potential health risks, the sampling results show that the Site has widespread contamination, potentially from various sources.

[1] USEPA Office of Solid Waste and Emergency Response, "Draft Guidance for Evaluating the Vapor to Indoor Air Pathway from Groundwater and Soils,"
November 2002.

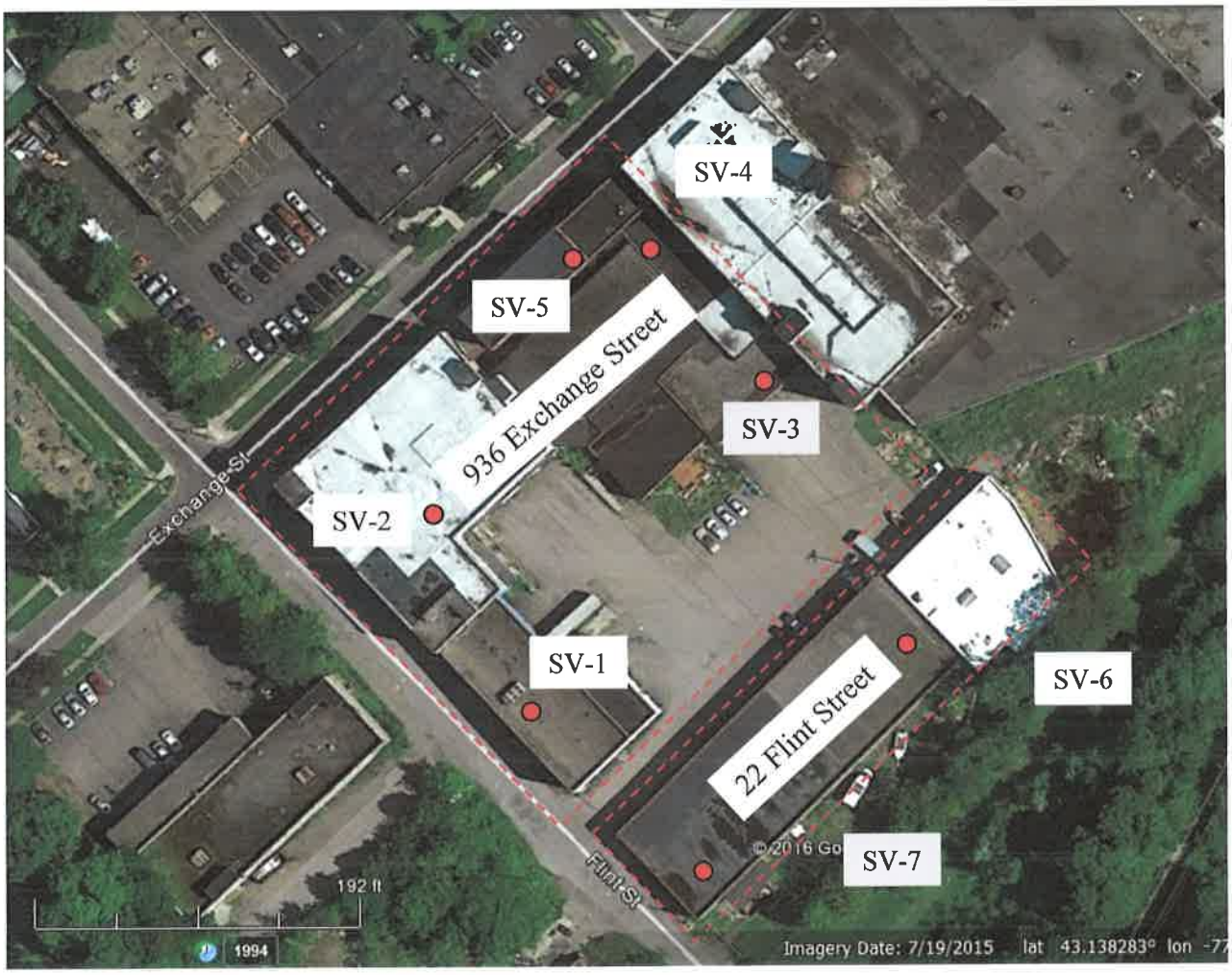
We appreciate the opportunity to conduct the investigation and provide you with this report. Please call us at (585) 248-2413 if you have any questions or comments.

Very truly yours,
LEADER PROFESSIONAL SERVICES, INC.

Peter von Schondorf
Senior Project Manager

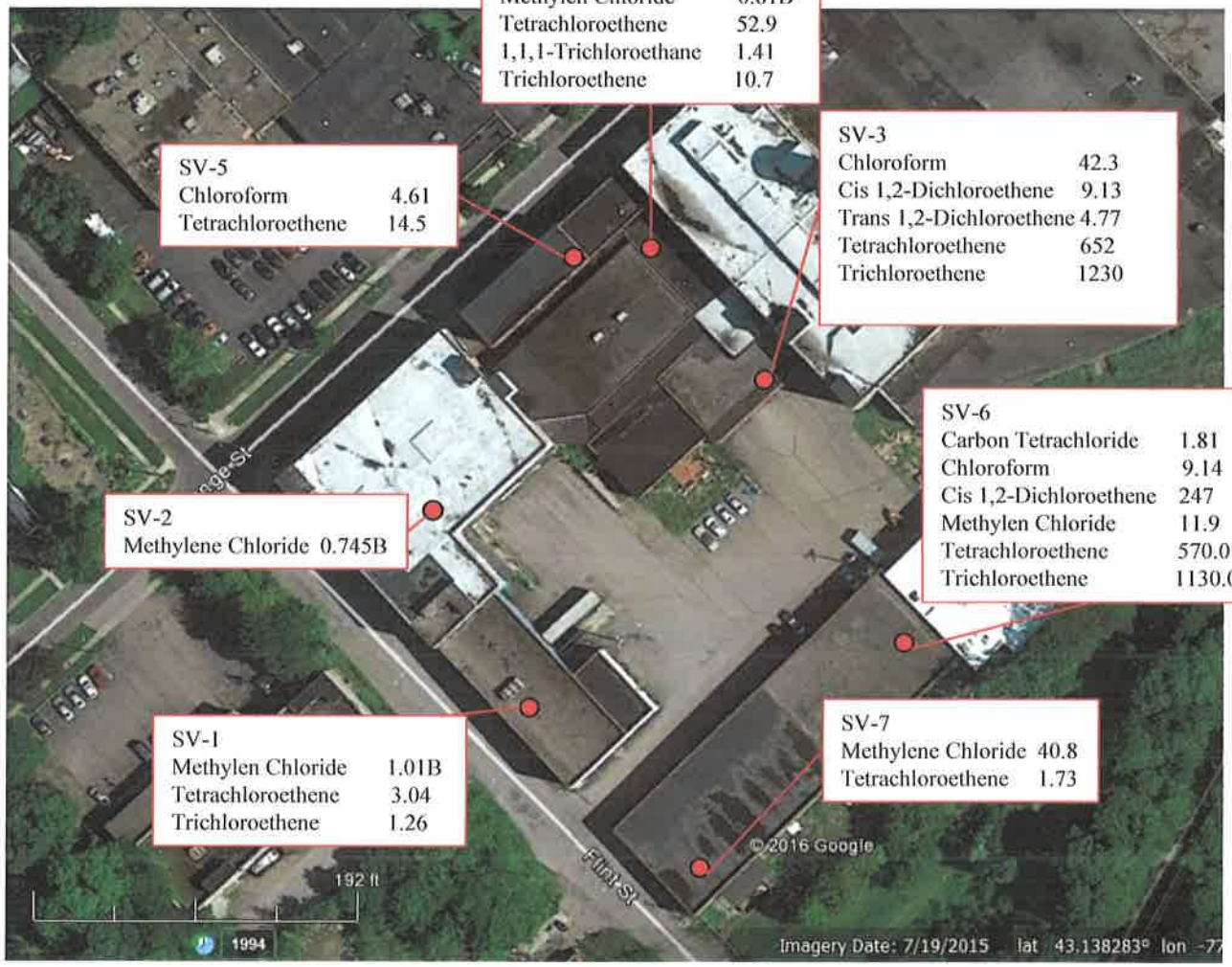
Michael P. Rumrill
President

Enclosures as noted



● SV-1 = Sub-slab Vapor Sampling Location

Title: Soil Vapor Sample Location Map 22 Flint Street and 936 Exchange Street Rochester, New York	LEADER Leader Professional Services 271 Marsh Road, Suite 2 Pittsford, NY 14534 (585) 248-2413 FAX (585) 248-2834	Project: 900.002 Date: 6/16/16 Scale: NTS	Drawn: PVS Checked: MPR File Name: Site Map	Figure: 1
Prepared For: Flint Redevelopment, LLC 1400 Crossroads Building Rochester, New York				

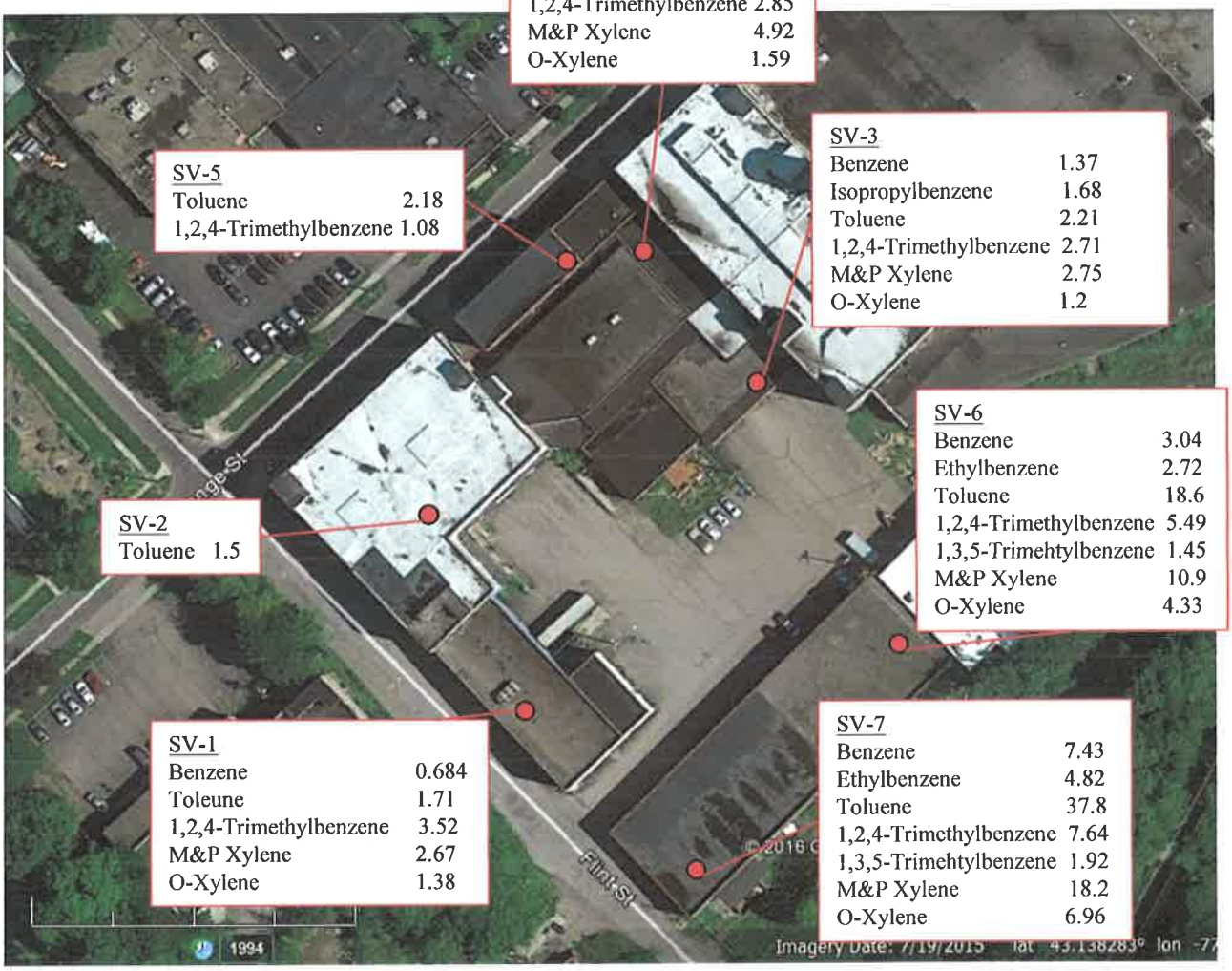


● SV-1 = Sub-slab Vapor Sampling Location

All concentrations shown in units of micrograms per cubic meter.

B = Compound was found with the laboratory blank analyzed with the sample and is a possible laboratory contaminant.

Title: Chlorinated Solvent Contaminants Concentrations and their Locations 22 Flint Street and 936 Exchange Street	LEADER Leader Professional Services 271 Marsh Road, Suite 2 Pittsford, NY 14534 (585) 248-2413 FAX (585) 248-2834	Project 900.002 Date 6/16/16 Scale NTS	Drawn PVS Checked MPR File Name Site Map	Figure 2
Prepared For: Flint Redevelopment, LLC 1400 Crossroads Building Rochester, New York				



● SV-1 = Sub-slab Vapor Sampling Location

All concentrations shown in units of micrograms per cubic meter.

Title: Petroleum Related Contaminants Concentrations and Locations 22 Flint Street and 936 Exchange Street	LEADER Leader Professional Services 271 Marsh Road, Suite 2 Pittsford, NY 14534 (585) 248-2413 FAX (585) 248-2834	Project 900.002	Drawn PVS	Figure 3
Prepared For: Flint Redevelopment, LLC 1400 Crossroads Building Rochester, New York		Date 6/16/16	Checked MPR	
		Scale NTS	File Name Site Map	

TABLE 1
Summary of Sample Results
Sub-slab Vapor Sampling 936 Exchange and 15 Flint Street
Rochester, New York

Lab Sample ID		L839577-01		L839577-02		L839577-03		L839577-04		L839577-05		L839577-06		L839577-07	
Client Sample ID		SV-1		SV-2		SV-3		SV-4		SV-5		SV-6		SV-7	
Date Collected		06/02/2016		06/02/2016		06/02/2016		06/02/2016		06/02/2016		06/02/2016		06/02/2016	
Analyte	Units	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
ACETONE	ug/m3	**6.38**		**7.04**		**10.1**		ND		ND		**6.32**		**22.4**	
ALLYL CHLORIDE	ug/m3	ND		**0.93**		ND		ND		ND		ND		ND	
BENZENE	ug/m3	**0.684**		ND		**1.37**		**1.35**		ND		**3.04**		**7.43**	
CARBON DISULFIDE	ug/m3	ND		ND		ND		**1.1**		ND		ND		ND	
CARBON TETRACHLORIDE	ug/m3	ND		ND		ND		**1.51**		ND		**1.81**		ND	
CHLOROFORM	ug/m3	ND		ND		**42.3**		**862**		**4.61**		**9.14**		ND	
CHLOROMETHANE	ug/m3	ND		**1.12**		**0.83**		ND		ND		ND		**0.887**	
CYCLOHEXANE	ug/m3	ND		ND		**0.745**		ND		ND		**1.79**		**3.34**	
CIS-1,2-DICHLOROETHENE	ug/m3	ND		ND		**9.13**		ND		ND		**247**		ND	
TRANS-1,2-DICHLOROETHENE	ug/m3	ND		ND		**4.77**		**9.78**		ND		ND		ND	
ETHANOL	ug/m3	**15.3**		**10.7**		**9.85**		**17.2**		**23.3**		**41.5**		**109**	
ETHYLBENZENE	ug/m3	ND		ND		ND		ND		ND		**2.72**		**4.82**	
4-ETHYLTOLUENE	ug/m3	ND		ND		ND		ND		ND		**3.25**		**4.62**	
TRICHLOROFLUOROMETHANE	ug/m3	**2**		**1.35**		**1.94**		**3.42**		**1.56**		**2.28**		**2.02**	
DICHLORODIFLUOROMETHANE	ug/m3	**1.71**		**3.31**		**1.79**		**1.8**		**1.58**		**2.24**		**2.08**	
HEPTANE	ug/m3	ND		ND		ND		**0.846**		ND		**3.58**		**5.79**	
N-HEXANE	ug/m3	**0.958**		ND		ND		**0.866**		ND		**9.35**		**20.2**	
ISOPROPYLBENZENE	ug/m3	ND		ND		**1.68**		ND		ND		ND		ND	
METHYLENE CHLORIDE	ug/m3	**1.01**	B	**0.745**	B	ND		**0.81**	B	ND		**11.9**		**40.8**	
2-BUTANONE (MEK)	ug/m3	ND		ND		ND		ND		ND		ND		**16**	
2-PROPANOL	ug/m3	ND		**5.39**		ND		ND		ND		**3.79**		**9.81**	
PROPENE	ug/m3	**0.836**	B	ND		ND		ND		ND	J3	ND	J3	ND	J3
STYRENE	ug/m3	**1.45**		ND		**0.895**		ND		ND		**1**		ND	
TETRACHLOROETHENE	ug/m3	**3.04**		ND		**652**		**52.9**		**14.5**		**570**		**1.73**	
TETRAHYDROFURAN	ug/m3	ND		ND		ND		**2.09**		ND		ND		ND	
TOLUENE	ug/m3	**1.71**		**1.5**		**2.21**		**3.9**		**2.18**		**18.6**		**37.8**	
1,1,1-TRICHLOROETHANE	ug/m3	ND		ND		ND		**1.41**		ND		ND		ND	
TRICHLOROETHENE	ug/m3	**1.26**		ND		**1230**		**10.7**		ND		**1130**		ND	
1,2,4-TRIMETHYLBENZENE	ug/m3	**3.52**		ND		**2.71**		**2.85**		**1.08**		**5.49**		**7.64**	
1,3,5-TRIMETHYLBENZENE	ug/m3	ND		ND		ND		ND		ND		**1.45**		**1.92**	
2,2,4-TRIMETHYLPENTANE	ug/m3	**3.18**		**1.31**		**1.58**		**0.966**		ND		**5.44**		**10.3**	
M&P-XYLENE	ug/m3	**2.67**		ND		**2.75**		**4.92**		ND		**10.9**		**18.2**	
O-XYLENE	ug/m3	**1.38**		ND		**1.2**		**1.59**		ND		**4.33**		**6.96**	
PID Results	PPM	4.6		0		1.5		1.6		1.8		0.3		1.7	

Notes:
ug/M^3 = micrograms per cubic liter.
ND = Not detected above reporting limits.
B= Contaminant was also found in laboratory blank.
J3 = The associated batch QA/QC was outside the established quality control range for precision.
PID = Total volatile organic vapors measured using a photoionization detector.
PPM = parts per million.

TABLE 2

Summary of Sample Results Compared to USEPA Shallow Soil Gas Concentrations for 10^{-5} Cancer Risk Within Indoor Air
Sub-slab Vapor Sampling 936 Exchange and 15 Flint Street
Rochester, New York

Lab Sample ID			L839577-01		L839577-02		L839577-03		L839577-04		L839577-05		L839577-06		L839577-07	
Client Sample ID			SV-1		SV-2		SV-3		SV-4		SV-5		SV-6		SV-7	
Date Collected			06/02/2016		06/02/2016		06/02/2016		06/02/2016		06/02/2016		06/02/2016		06/02/2016	
Analyte	Units	USEPA Guidance	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
ACETONE	ug/m3	2,100	6.38		7.04		10.1		ND		ND		6.32		22.4	
ALLYL CHLORIDE	ug/m3	NS	ND		0.93		ND		ND		ND		ND		ND	
BENZENE	ug/m3	31	0.684		ND		1.37		1.35		ND		3.04		7.43	
CARBON DISULFIDE	ug/m3	7,000	ND		ND		ND		1.1		ND		ND		ND	
CARBON TETRACHLORIDE	ug/m3	16	ND		ND		ND		1.51		ND		1.81		ND	
CHLOROFORM	ug/m3	11	ND		ND		**42.3**		**862**		4.61		**9.14**		ND	
CHLOROMETHANE	ug/m3	NS	ND		1.12		0.83		ND		ND		ND		0.887	
CYCLOHEXANE	ug/m3	NS	ND		ND		0.745		ND		ND		1.79		3.34	
CIS-1,2-DICHLOROETHENE	ug/m3	350	ND		ND		9.13		ND		ND		247		ND	
TRANS-1,2-DICHLOROETHENE	ug/m3	700	ND		ND		4.77		9.78		ND		ND		ND	
ETHANOL	ug/m3	NS	15.3		10.7		9.85		17.2		23.3		41.5		109	
ETHYLBENZENE	ug/m3	220	ND		ND		ND		ND		ND		2.72		4.82	
4-ETHYLTOLUENE	ug/m3	NS	ND		ND		ND		ND		ND		3.25		4.62	
TRICHLOROFLUOROMETHANE	ug/m3	NS	2		1.35		1.94		3.42		1.56		2.28		2.02	
DICHLORODIFLUOROMETHANE	ug/m3	NS	1.71		3.31		1.79		1.8		1.58		2.24		2.08	
HEPTANE	ug/m3	NS	ND		ND		ND		0.846		ND		3.58		5.79	
N-HEXANE	ug/m3	2,000	0.958		ND		ND		0.866		ND		9.35		20.2	
ISOPROPYLBENZENE	ug/m3	4,000	ND		ND		1.68		ND		ND		ND		ND	
METHYLENE CHLORIDE	ug/m3	240	1.01	B	0.745	B	ND		0.81	B	ND		11.9		40.8	
2-BUTANONE (MEK)	ug/m3	10,000	ND		ND		ND		ND		ND		ND		16	
2-PROPANOL	ug/m3	NS	ND		5.39		ND		ND		ND		3.79		9.81	
PROPENE	ug/m3	NS	0.836	B	ND		ND		ND		ND	J3	ND	J3	ND	J3
STYRENE	ug/m3	10,000	1.45		ND		0.895		ND		ND		1		ND	
TETRACHLOROETHENE	ug/m3	81	3.04		ND		**652**		52.9		14.5		**570**		1.73	
TETRAHYDROFURAN	ug/m3	NS	ND		ND		ND		2.09		ND		ND		ND	
TOLUENE	ug/m3	4,000	1.71		1.5		2.21		3.9		2.18		18.6		37.8	
1,1,1-TRICHLOROETHANE	ug/m3	22,000	ND		ND		ND		1.41		ND		ND		ND	
TRICHLOROETHENE	ug/m3	2.2	1.26		ND		**1230**		**10.7**		ND		**1130**		ND	
1,2,4-TRIMETHYLBENZENE	ug/m3	60	3.52		ND		2.71		2.85		1.08		5.49		7.64	
1,3,5-TRIMETHYLBENZENE	ug/m3	60	ND		ND		ND		ND		ND		1.45		1.92	
2,2,4-TRIMETHYLPENTANE	ug/m3	NS	3.18		1.31		1.58		0.966		ND		5.44		10.3	
M&P-XYLENE	ug/m3	70,000	2.67		ND		2.75		4.92		ND		10.9		18.2	
O-XYLENE	ug/m3	70,000	1.38		ND		1.2		1.59		ND		4.33		6.96	

Notes:
USEPA Values from "OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and soils, November 2002.
ND =Not detected
NS = No standard or guidance level
ug/M3 = micrograms per cubic meter.

ATTACHMENT 1
LABORATORY REPORT

ANALYTICAL REPORT

June 13, 2016

Leader Environmental

Sample Delivery Group:	L839577
Samples Received:	06/04/2016
Project Number:	900002
Description:	Flint Street Redevelopment Project 2

Report To:

Mr. Peter von Schondorf
271 Marsh Road, Suite 2
Pittsford, NY 14534

Entire Report Reviewed By:

Terrie Fudge
Technical Service Representative

TABLE OF CONTENTS

SV-1 L839577-01 Air

Collected by: Pete Von Schondorf
Collected date/time: 06/02/16 10:55
Received date/time: 06/04/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (MS) by Method TO-15	WG878843	1	06/09/16 07:01	06/09/16 07:01	SNH
Volatile Organic Compounds (MS) by Method TO-15	WG879370	1	06/10/16 15:27	06/10/16 15:27	SNH

SV-2 L839577-02 Air

Collected by: Pete Von Schondorf
Collected date/time: 06/02/16 11:10
Received date/time: 06/04/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (MS) by Method TO-15	WG878843	1	06/09/16 07:43	06/09/16 07:43	SNH
Volatile Organic Compounds (MS) by Method TO-15	WG879370	1	06/10/16 16:16	06/10/16 16:16	SNH

SV-3 L839577-03 Air

Collected by: Pete Von Schondorf
Collected date/time: 06/02/16 11:30
Received date/time: 06/04/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (MS) by Method TO-15	WG878843	1	06/09/16 08:24	06/09/16 08:24	SNH
Volatile Organic Compounds (MS) by Method TO-15	WG879340	1	06/10/16 11:08	06/10/16 11:08	MBF
Volatile Organic Compounds (MS) by Method TO-15	WG879340	20	06/10/16 13:56	06/10/16 13:56	MBF

SV-4 L839577-04 Air

Collected by: Pete Von Schondorf
Collected date/time: 06/02/16 12:15
Received date/time: 06/04/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (MS) by Method TO-15	WG878843	1	06/09/16 09:06	06/09/16 09:06	SNH
Volatile Organic Compounds (MS) by Method TO-15	WG879340	20	06/10/16 11:54	06/10/16 11:54	MBF

SV-5 L839577-05 Air

Collected by: Pete Von Schondorf
Collected date/time: 06/02/16 14:04
Received date/time: 06/04/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (MS) by Method TO-15	WG878625	1	06/08/16 21:35	06/08/16 21:35	MBF

SV-6 L839577-06 Air

Collected by: Pete Von Schondorf
Collected date/time: 06/02/16 14:20
Received date/time: 06/04/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (MS) by Method TO-15	WG878625	1	06/08/16 22:25	06/08/16 22:25	MBF
Volatile Organic Compounds (MS) by Method TO-15	WG879045	20	06/09/16 23:22	06/09/16 23:22	MBF

SV-7 L839577-07 Air

Collected by: Pete Von Schondorf
Collected date/time: 06/02/16 15:10
Received date/time: 06/04/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (MS) by Method TO-15	WG878625	1	06/08/16 23:11	06/08/16 23:11	MBF
Volatile Organic Compounds (MS) by Method TO-15	WG879045	10	06/10/16 00:02	06/10/16 00:02	MBF

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Terrie Fudge
Technical Service Representative

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	1.25	2.97	2.68	6.38		1	WG879370
Allyl chloride	107-05-1	76.53	0.200	0.626	ND	ND		1	WG878843
Benzene	71-43-2	78.10	0.200	0.639	0.214	0.684		1	WG878843
Benzyl Chloride	100-44-7	127	0.200	1.04	ND	ND		1	WG878843
Bromodichloromethane	75-27-4	164	0.200	1.34	ND	ND		1	WG878843
Bromoform	75-25-2	253	0.600	6.21	ND	ND		1	WG878843
Bromomethane	74-83-9	94.90	0.200	0.776	ND	ND		1	WG878843
1,3-Butadiene	106-99-0	54.10	2.00	4.43	ND	ND		1	WG878843
Carbon disulfide	75-15-0	76.10	0.200	0.622	ND	ND		1	WG878843
Carbon tetrachloride	56-23-5	154	0.200	1.26	ND	ND		1	WG878843
Chlorobenzene	108-90-7	113	0.200	0.924	ND	ND		1	WG878843
Chloroethane	75-00-3	64.50	0.200	0.528	ND	ND		1	WG878843
Chloroform	67-66-3	119	0.200	0.973	ND	ND		1	WG878843
Chloromethane	74-87-3	50.50	0.200	0.413	ND	ND		1	WG878843
2-Chlorotoluene	95-49-8	126	0.200	1.03	ND	ND		1	WG878843
Cyclohexane	110-82-7	84.20	0.200	0.689	ND	ND		1	WG878843
Dibromochloromethane	124-48-1	208	0.200	1.70	ND	ND		1	WG878843
1,2-Dibromoethane	106-93-4	188	0.200	1.54	ND	ND		1	WG878843
1,2-Dichlorobenzene	95-50-1	147	0.200	1.20	ND	ND		1	WG878843
1,3-Dichlorobenzene	541-73-1	147	0.200	1.20	ND	ND		1	WG878843
1,4-Dichlorobenzene	106-46-7	147	0.200	1.20	ND	ND		1	WG878843
1,2-Dichloroethane	107-06-2	99	0.200	0.810	ND	ND		1	WG878843
1,1-Dichloroethane	75-34-3	98	0.200	0.802	ND	ND		1	WG878843
1,1-Dichloroethene	75-35-4	96.90	0.200	0.793	ND	ND		1	WG878843
cis-1,2-Dichloroethene	156-59-2	96.90	0.200	0.793	ND	ND		1	WG878843
trans-1,2-Dichloroethene	156-60-5	96.90	0.200	0.793	ND	ND		1	WG878843
1,2-Dichloropropane	78-87-5	113	0.200	0.924	ND	ND		1	WG878843
cis-1,3-Dichloropropene	10061-01-5	111	0.200	0.908	ND	ND		1	WG878843
trans-1,3-Dichloropropene	10061-02-6	111	0.200	0.908	ND	ND		1	WG878843
1,4-Dioxane	123-91-1	88.10	0.200	0.721	ND	ND		1	WG878843
Ethanol	64-17-5	46.10	0.630	1.19	8.14	15.3		1	WG878843
Ethylbenzene	100-41-4	106	0.200	0.867	ND	ND		1	WG878843
4-Ethyltoluene	622-96-8	120	0.200	0.982	ND	ND		1	WG878843
Trichlorofluoromethane	75-69-4	137.40	0.200	1.12	0.355	2.00		1	WG878843
Dichlorodifluoromethane	75-71-8	120.92	0.200	0.989	0.346	1.71		1	WG878843
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	0.200	1.53	ND	ND		1	WG878843
1,2-Dichlorotetrafluoroethane	76-14-2	171	0.200	1.40	ND	ND		1	WG878843
Heptane	142-82-5	100	0.200	0.818	ND	ND		1	WG878843
Hexachloro-1,3-butadiene	87-68-3	261	0.630	6.73	ND	ND		1	WG878843
n-Hexane	110-54-3	86.20	0.200	0.705	0.272	0.958		1	WG878843
Isopropylbenzene	98-82-8	120.20	0.200	0.983	ND	ND		1	WG878843
Methylene Chloride	75-09-2	84.90	0.200	0.694	0.291	1.01	B	1	WG878843
Methyl Butyl Ketone	591-78-6	100	1.25	5.11	ND	ND		1	WG878843
2-Butanone (MEK)	78-93-3	72.10	1.25	3.69	ND	ND		1	WG878843
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1.25	5.12	ND	ND		1	WG878843
Methyl methacrylate	80-62-6	100.12	0.200	0.819	ND	ND		1	WG878843
MTBE	1634-04-4	88.10	0.200	0.721	ND	ND		1	WG878843
Naphthalene	91-20-3	128	0.630	3.30	ND	ND		1	WG878843
2-Propanol	67-63-0	60.10	1.25	3.07	ND	ND		1	WG878843
Propene	115-07-1	42.10	0.400	0.689	0.485	0.836	B	1	WG878843
Styrene	100-42-5	104	0.200	0.851	0.340	1.45		1	WG878843
1,1,2,2-Tetrachloroethane	79-34-5	168	0.200	1.37	ND	ND		1	WG878843
Tetrachloroethylene	127-18-4	166	0.200	1.36	0.447	3.04		1	WG878843
Tetrahydrofuran	109-99-9	72.10	0.200	0.590	ND	ND		1	WG878843
Toluene	108-88-3	92.10	0.200	0.753	0.454	1.71		1	WG878843
1,2,4-Trichlorobenzene	120-82-1	181	0.630	4.66	ND	ND		1	WG878843

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	0.200	1.09	ND	ND		1	WG878843
1,1,2-Trichloroethane	79-00-5	133	0.200	1.09	ND	ND		1	WG878843
Trichloroethylene	79-01-6	131	0.200	1.07	0.234	1.26		1	WG878843
1,2,4-Trimethylbenzene	95-63-6	120	0.200	0.982	0.718	3.52		1	WG878843
1,3,5-Trimethylbenzene	108-67-8	120	0.200	0.982	ND	ND		1	WG878843
2,2,4-Trimethylpentane	540-84-1	114.22	0.200	0.934	0.680	3.18		1	WG878843
Vinyl chloride	75-01-4	62.50	0.200	0.511	ND	ND		1	WG878843
Vinyl Bromide	593-60-2	106.95	0.200	0.875	ND	ND		1	WG878843
Vinyl acetate	108-05-4	86.10	0.200	0.704	ND	ND		1	WG878843
m&p-Xylene	1330-20-7	106	0.400	1.73	0.616	2.67		1	WG878843
o-Xylene	95-47-6	106	0.200	0.867	0.319	1.38		1	WG878843
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*101*				WG878843
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*96.9*				WG879370

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	1.25	2.97	2.96	7.04		1	WG879370
Allyl chloride	107-05-1	76.53	0.200	0.626	0.297	0.930		1	WG878843
Benzene	71-43-2	78.10	0.200	0.639	ND	ND		1	WG878843
Benzyl Chloride	100-44-7	127	0.200	1.04	ND	ND		1	WG878843
Bromodichloromethane	75-27-4	164	0.200	1.34	ND	ND		1	WG878843
Bromoform	75-25-2	253	0.600	6.21	ND	ND		1	WG878843
Bromomethane	74-83-9	94.90	0.200	0.776	ND	ND		1	WG878843
1,3-Butadiene	106-99-0	54.10	2.00	4.43	ND	ND		1	WG878843
Carbon disulfide	75-15-0	76.10	0.200	0.622	ND	ND		1	WG878843
Carbon tetrachloride	56-23-5	154	0.200	1.26	ND	ND		1	WG878843
Chlorobenzene	108-90-7	113	0.200	0.924	ND	ND		1	WG878843
Chloroethane	75-00-3	64.50	0.200	0.528	ND	ND		1	WG878843
Chloroform	67-66-3	119	0.200	0.973	ND	ND		1	WG878843
Chloromethane	74-87-3	50.50	0.200	0.413	0.542	1.12		1	WG878843
2-Chlorotoluene	95-49-8	126	0.200	1.03	ND	ND		1	WG878843
Cyclohexane	110-82-7	84.20	0.200	0.689	ND	ND		1	WG878843
Dibromochloromethane	124-48-1	208	0.200	1.70	ND	ND		1	WG878843
1,2-Dibromoethane	106-93-4	188	0.200	1.54	ND	ND		1	WG878843
1,2-Dichlorobenzene	95-50-1	147	0.200	1.20	ND	ND		1	WG878843
1,3-Dichlorobenzene	541-73-1	147	0.200	1.20	ND	ND		1	WG878843
1,4-Dichlorobenzene	106-46-7	147	0.200	1.20	ND	ND		1	WG878843
1,2-Dichloroethane	107-06-2	99	0.200	0.810	ND	ND		1	WG878843
1,1-Dichloroethane	75-34-3	98	0.200	0.802	ND	ND		1	WG878843
1,1-Dichloroethene	75-35-4	96.90	0.200	0.793	ND	ND		1	WG878843
cis-1,2-Dichloroethene	156-59-2	96.90	0.200	0.793	ND	ND		1	WG878843
trans-1,2-Dichloroethene	156-60-5	96.90	0.200	0.793	ND	ND		1	WG878843
1,2-Dichloropropane	78-87-5	113	0.200	0.924	ND	ND		1	WG878843
cis-1,3-Dichloropropene	10061-01-5	111	0.200	0.908	ND	ND		1	WG878843
trans-1,3-Dichloropropene	10061-02-6	111	0.200	0.908	ND	ND		1	WG878843
1,4-Dioxane	123-91-1	88.10	0.200	0.721	ND	ND		1	WG878843
Ethanol	64-17-5	46.10	0.630	1.19	5.67	10.7		1	WG878843
Ethylbenzene	100-41-4	106	0.200	0.867	ND	ND		1	WG878843
4-Ethyltoluene	622-96-8	120	0.200	0.982	ND	ND		1	WG878843
Trichlorofluoromethane	75-69-4	137.40	0.200	1.12	0.241	1.35		1	WG878843
Dichlorodifluoromethane	75-71-8	120.92	0.200	0.989	0.669	3.31		1	WG878843
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	0.200	1.53	ND	ND		1	WG878843
1,2-Dichlorotetrafluoroethane	76-14-2	171	0.200	1.40	ND	ND		1	WG878843
Heptane	142-82-5	100	0.200	0.818	ND	ND		1	WG878843
Hexachloro-1,3-butadiene	87-68-3	261	0.630	6.73	ND	ND		1	WG878843
n-Hexane	110-54-3	86.20	0.200	0.705	ND	ND		1	WG878843
Isopropylbenzene	98-82-8	120.20	0.200	0.983	ND	ND		1	WG878843
Methylene Chloride	75-09-2	84.90	0.200	0.694	0.215	0.745	B	1	WG878843
Methyl Butyl Ketone	591-78-6	100	1.25	5.11	ND	ND		1	WG878843
2-Butanone (MEK)	78-93-3	72.10	1.25	3.69	ND	ND		1	WG878843
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1.25	5.12	ND	ND		1	WG878843
Methyl methacrylate	80-62-6	100.12	0.200	0.819	ND	ND		1	WG878843
MTBE	1634-04-4	88.10	0.200	0.721	ND	ND		1	WG878843
Naphthalene	91-20-3	128	0.630	3.30	ND	ND		1	WG878843
2-Propanol	67-63-0	60.10	1.25	3.07	2.19	5.39		1	WG878843
Propene	115-07-1	42.10	0.400	0.689	ND	ND		1	WG878843
Styrene	100-42-5	104	0.200	0.851	ND	ND		1	WG878843
1,1,2,2-Tetrachloroethane	79-34-5	168	0.200	1.37	ND	ND		1	WG878843
Tetrachloroethylene	127-18-4	166	0.200	1.36	ND	ND		1	WG878843
Tetrahydrofuran	109-99-9	72.10	0.200	0.590	ND	ND		1	WG878843
Toluene	108-88-3	92.10	0.200	0.753	0.397	1.50		1	WG878843
1,2,4-Trichlorobenzene	120-82-1	181	0.630	4.66	ND	ND		1	WG878843

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	0.200	1.09	ND	ND		1	WG878843
1,1,2-Trichloroethane	79-00-5	133	0.200	1.09	ND	ND		1	WG878843
Trichloroethylene	79-01-6	131	0.200	1.07	ND	ND		1	WG878843
1,2,4-Trimethylbenzene	95-63-6	120	0.200	0.982	ND	ND		1	WG878843
1,3,5-Trimethylbenzene	108-67-8	120	0.200	0.982	ND	ND		1	WG878843
2,2,4-Trimethylpentane	540-84-1	114.22	0.200	0.934	0.279	1.31		1	WG878843
Vinyl chloride	75-01-4	62.50	0.200	0.511	ND	ND		1	WG878843
Vinyl Bromide	593-60-2	106.95	0.200	0.875	ND	ND		1	WG878843
Vinyl acetate	108-05-4	86.10	0.200	0.704	ND	ND		1	WG878843
m&p-Xylene	1330-20-7	106	0.400	1.73	ND	ND		1	WG878843
o-Xylene	95-47-6	106	0.200	0.867	ND	ND		1	WG878843
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*97.6*				WG879370
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*101*				WG878843

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	1.25	2.97	4.26	10.1		1	WG879340
Allyl chloride	107-05-1	76.53	0.200	0.626	ND	ND		1	WG878843
Benzene	71-43-2	78.10	0.200	0.639	0.430	1.37		1	WG878843
Benzyl Chloride	100-44-7	127	0.200	1.04	ND	ND		1	WG878843
Bromodichloromethane	75-27-4	164	0.200	1.34	ND	ND		1	WG878843
Bromoform	75-25-2	253	0.600	6.21	ND	ND		1	WG878843
Bromomethane	74-83-9	94.90	0.200	0.776	ND	ND		1	WG878843
1,3-Butadiene	106-99-0	54.10	2.00	4.43	ND	ND		1	WG878843
Carbon disulfide	75-15-0	76.10	0.200	0.622	ND	ND		1	WG878843
Carbon tetrachloride	56-23-5	154	0.200	1.26	ND	ND		1	WG878843
Chlorobenzene	108-90-7	113	0.200	0.924	ND	ND		1	WG878843
Chloroethane	75-00-3	64.50	0.200	0.528	ND	ND		1	WG878843
Chloroform	67-66-3	119	0.200	0.973	8.68	42.3		1	WG878843
Chloromethane	74-87-3	50.50	0.200	0.413	0.402	0.830		1	WG878843
2-Chlorotoluene	95-49-8	126	0.200	1.03	ND	ND		1	WG878843
Cyclohexane	110-82-7	84.20	0.200	0.689	0.216	0.745		1	WG878843
Dibromochloromethane	124-48-1	208	0.200	1.70	ND	ND		1	WG878843
1,2-Dibromoethane	106-93-4	188	0.200	1.54	ND	ND		1	WG878843
1,2-Dichlorobenzene	95-50-1	147	0.200	1.20	ND	ND		1	WG878843
1,3-Dichlorobenzene	541-73-1	147	0.200	1.20	ND	ND		1	WG878843
1,4-Dichlorobenzene	106-46-7	147	0.200	1.20	ND	ND		1	WG878843
1,2-Dichloroethane	107-06-2	99	0.200	0.810	ND	ND		1	WG878843
1,1-Dichloroethane	75-34-3	98	0.200	0.802	ND	ND		1	WG878843
1,1-Dichloroethene	75-35-4	96.90	0.200	0.793	ND	ND		1	WG878843
cis-1,2-Dichloroethene	156-59-2	96.90	0.200	0.793	2.30	9.13		1	WG878843
trans-1,2-Dichloroethene	156-60-5	96.90	0.200	0.793	1.20	4.77		1	WG878843
1,2-Dichloropropane	78-87-5	113	0.200	0.924	ND	ND		1	WG878843
cis-1,3-Dichloropropene	10061-01-5	111	0.200	0.908	ND	ND		1	WG878843
trans-1,3-Dichloropropene	10061-02-6	111	0.200	0.908	ND	ND		1	WG878843
1,4-Dioxane	123-91-1	88.10	0.200	0.721	ND	ND		1	WG878843
Ethanol	64-17-5	46.10	0.630	1.19	5.22	9.85		1	WG878843
Ethylbenzene	100-41-4	106	0.200	0.867	ND	ND		1	WG878843
4-Ethyltoluene	622-96-8	120	0.200	0.982	ND	ND		1	WG878843
Trichlorofluoromethane	75-69-4	137.40	0.200	1.12	0.345	1.94		1	WG878843
Dichlorodifluoromethane	75-71-8	120.92	0.200	0.989	0.362	1.79		1	WG878843
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	0.200	1.53	ND	ND		1	WG878843
1,2-Dichlorotetrafluoroethane	76-14-2	171	0.200	1.40	ND	ND		1	WG878843
Heptane	142-82-5	100	0.200	0.818	ND	ND		1	WG878843
Hexachloro-1,3-butadiene	87-68-3	261	0.630	6.73	ND	ND		1	WG878843
n-Hexane	110-54-3	86.20	0.200	0.705	ND	ND		1	WG878843
Isopropylbenzene	98-82-8	120.20	0.200	0.983	0.342	1.68		1	WG878843
Methylene Chloride	75-09-2	84.90	0.200	0.694	ND	ND		1	WG878843
Methyl Butyl Ketone	591-78-6	100	1.25	5.11	ND	ND		1	WG878843
2-Butanone (MEK)	78-93-3	72.10	1.25	3.69	ND	ND		1	WG878843
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1.25	5.12	ND	ND		1	WG878843
Methyl methacrylate	80-62-6	100.12	0.200	0.819	ND	ND		1	WG878843
MTBE	1634-04-4	88.10	0.200	0.721	ND	ND		1	WG878843
Naphthalene	91-20-3	128	0.630	3.30	ND	ND		1	WG878843
2-Propanol	67-63-0	60.10	1.25	3.07	ND	ND		1	WG878843
Propene	115-07-1	42.10	0.400	0.689	ND	ND		1	WG878843
Styrene	100-42-5	104	0.200	0.851	0.210	0.895		1	WG878843
1,1,2,2-Tetrachloroethane	79-34-5	168	0.200	1.37	ND	ND		1	WG878843
Tetrachloroethylene	127-18-4	166	4.00	27.2	96.0	652		20	WG879340
Tetrahydrofuran	109-99-9	72.10	0.200	0.590	ND	ND		1	WG878843
Toluene	108-88-3	92.10	0.200	0.753	0.587	2.21		1	WG878843
1,2,4-Trichlorobenzene	120-82-1	181	0.630	4.66	ND	ND		1	WG878843

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	0.200	1.09	ND	ND		1	WG878843
1,1,2-Trichloroethane	79-00-5	133	0.200	1.09	ND	ND		1	WG878843
Trichloroethylene	79-01-6	131	4.00	21.4	229	1230		20	WG879340
1,2,4-Trimethylbenzene	95-63-6	120	0.200	0.982	0.552	2.71		1	WG878843
1,3,5-Trimethylbenzene	108-67-8	120	0.200	0.982	ND	ND		1	WG878843
2,2,4-Trimethylpentane	540-84-1	114.22	0.200	0.934	0.338	1.58		1	WG878843
Vinyl chloride	75-01-4	62.50	0.200	0.511	ND	ND		1	WG878843
Vinyl Bromide	593-60-2	106.95	0.200	0.875	ND	ND		1	WG878843
Vinyl acetate	108-05-4	86.10	0.200	0.704	ND	ND		1	WG878843
m&p-Xylene	1330-20-7	106	0.400	1.73	0.634	2.75		1	WG878843
o-Xylene	95-47-6	106	0.200	0.867	0.276	1.20		1	WG878843
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*100*				WG878843
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*93.4*				WG879340
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*102*				WG879340

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	25.0	59.4	ND	ND		20	WG879340
Allyl chloride	107-05-1	76.53	0.200	0.626	ND	ND		1	WG878843
Benzene	71-43-2	78.10	0.200	0.639	0.423	1.35		1	WG878843
Benzyl Chloride	100-44-7	127	0.200	1.04	ND	ND		1	WG878843
Bromodichloromethane	75-27-4	164	0.200	1.34	ND	ND		1	WG878843
Bromoform	75-25-2	253	0.600	6.21	ND	ND		1	WG878843
Bromomethane	74-83-9	94.90	0.200	0.776	ND	ND		1	WG878843
1,3-Butadiene	106-99-0	54.10	2.00	4.43	ND	ND		1	WG878843
Carbon disulfide	75-15-0	76.10	0.200	0.622	0.354	1.10		1	WG878843
Carbon tetrachloride	56-23-5	154	0.200	1.26	0.239	1.51		1	WG878843
Chlorobenzene	108-90-7	113	0.200	0.924	ND	ND		1	WG878843
Chloroethane	75-00-3	64.50	0.200	0.528	ND	ND		1	WG878843
Chloroform	67-66-3	119	4.00	19.5	177	862		20	WG879340
Chloromethane	74-87-3	50.50	0.200	0.413	ND	ND		1	WG878843
2-Chlorotoluene	95-49-8	126	0.200	1.03	ND	ND		1	WG878843
Cyclohexane	110-82-7	84.20	0.200	0.689	ND	ND		1	WG878843
Dibromochloromethane	124-48-1	208	0.200	1.70	ND	ND		1	WG878843
1,2-Dibromoethane	106-93-4	188	0.200	1.54	ND	ND		1	WG878843
1,2-Dichlorobenzene	95-50-1	147	0.200	1.20	ND	ND		1	WG878843
1,3-Dichlorobenzene	541-73-1	147	0.200	1.20	ND	ND		1	WG878843
1,4-Dichlorobenzene	106-46-7	147	0.200	1.20	ND	ND		1	WG878843
1,2-Dichloroethane	107-06-2	99	0.200	0.810	ND	ND		1	WG878843
1,1-Dichloroethane	75-34-3	98	0.200	0.802	ND	ND		1	WG878843
1,1-Dichloroethene	75-35-4	96.90	0.200	0.793	ND	ND		1	WG878843
cis-1,2-Dichloroethene	156-59-2	96.90	0.200	0.793	ND	ND		1	WG878843
trans-1,2-Dichloroethene	156-60-5	96.90	0.200	0.793	2.47	9.78		1	WG878843
1,2-Dichloropropane	78-87-5	113	0.200	0.924	ND	ND		1	WG878843
cis-1,3-Dichloropropene	10061-01-5	111	0.200	0.908	ND	ND		1	WG878843
trans-1,3-Dichloropropene	10061-02-6	111	0.200	0.908	ND	ND		1	WG878843
1,4-Dioxane	123-91-1	88.10	0.200	0.721	ND	ND		1	WG878843
Ethanol	64-17-5	46.10	0.630	1.19	9.10	17.2		1	WG878843
Ethylbenzene	100-41-4	106	0.200	0.867	ND	ND		1	WG878843
4-Ethyltoluene	622-96-8	120	0.200	0.982	ND	ND		1	WG878843
Trichlorofluoromethane	75-69-4	137.40	0.200	1.12	0.608	3.42		1	WG878843
Dichlorodifluoromethane	75-71-8	120.92	0.200	0.989	0.364	1.80		1	WG878843
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	0.200	1.53	ND	ND		1	WG878843
1,2-Dichlorotetrafluoroethane	76-14-2	171	0.200	1.40	ND	ND		1	WG878843
Heptane	142-82-5	100	0.200	0.818	0.207	0.846		1	WG878843
Hexachloro-1,3-butadiene	87-68-3	261	0.630	6.73	ND	ND		1	WG878843
n-Hexane	110-54-3	86.20	0.200	0.705	0.246	0.866		1	WG878843
Isopropylbenzene	98-82-8	120.20	0.200	0.983	ND	ND		1	WG878843
Methylene Chloride	75-09-2	84.90	0.200	0.694	0.233	0.810	B	1	WG878843
Methyl Butyl Ketone	591-78-6	100	1.25	5.11	ND	ND		1	WG878843
2-Butanone (MEK)	78-93-3	72.10	1.25	3.69	ND	ND		1	WG878843
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1.25	5.12	ND	ND		1	WG878843
Methyl methacrylate	80-62-6	100.12	0.200	0.819	ND	ND		1	WG878843
MTBE	1634-04-4	88.10	0.200	0.721	ND	ND		1	WG878843
Naphthalene	91-20-3	128	0.630	3.30	ND	ND		1	WG878843
2-Propanol	67-63-0	60.10	1.25	3.07	ND	ND		1	WG878843
Propene	115-07-1	42.10	0.400	0.689	ND	ND		1	WG878843
Styrene	100-42-5	104	0.200	0.851	ND	ND		1	WG878843
1,1,2,2-Tetrachloroethane	79-34-5	168	0.200	1.37	ND	ND		1	WG878843
Tetrachloroethylene	127-18-4	166	0.200	1.36	7.79	52.9		1	WG878843
Tetrahydrofuran	109-99-9	72.10	0.200	0.590	0.708	2.09		1	WG878843
Toluene	108-88-3	92.10	0.200	0.753	1.04	3.90		1	WG878843
1,2,4-Trichlorobenzene	120-82-1	181	0.630	4.66	ND	ND		1	WG878843

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	0.200	1.09	0.260	1.41		1	WG878843
1,1,2-Trichloroethane	79-00-5	133	0.200	1.09	ND	ND		1	WG878843
Trichloroethylene	79-01-6	131	0.200	1.07	2.00	10.7		1	WG878843
1,2,4-Trimethylbenzene	95-63-6	120	0.200	0.982	0.581	2.85		1	WG878843
1,3,5-Trimethylbenzene	108-67-8	120	0.200	0.982	ND	ND		1	WG878843
2,2,4-Trimethylpentane	540-84-1	114.22	0.200	0.934	0.207	0.966		1	WG878843
Vinyl chloride	75-01-4	62.50	0.200	0.511	ND	ND		1	WG878843
Vinyl Bromide	593-60-2	106.95	0.200	0.875	ND	ND		1	WG878843
Vinyl acetate	108-05-4	86.10	0.200	0.704	ND	ND		1	WG878843
m&p-Xylene	1330-20-7	106	0.400	1.73	1.13	4.92		1	WG878843
o-Xylene	95-47-6	106	0.200	0.867	0.366	1.59		1	WG878843
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*106*				WG878843
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*94.9*				WG879340

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	1.25	2.97	ND	ND		1	WG878625
Allyl chloride	107-05-1	76.53	0.200	0.626	ND	ND		1	WG878625
Benzene	71-43-2	78.10	0.200	0.639	ND	ND		1	WG878625
Benzyl Chloride	100-44-7	127	0.200	1.04	ND	ND		1	WG878625
Bromodichloromethane	75-27-4	164	0.200	1.34	ND	ND		1	WG878625
Bromoform	75-25-2	253	0.600	6.21	ND	ND		1	WG878625
Bromomethane	74-83-9	94.90	0.200	0.776	ND	ND		1	WG878625
1,3-Butadiene	106-99-0	54.10	2.00	4.43	ND	ND		1	WG878625
Carbon disulfide	75-15-0	76.10	0.200	0.622	ND	ND		1	WG878625
Carbon tetrachloride	56-23-5	154	0.200	1.26	ND	ND		1	WG878625
Chlorobenzene	108-90-7	113	0.200	0.924	ND	ND		1	WG878625
Chloroethane	75-00-3	64.50	0.200	0.528	ND	ND		1	WG878625
Chloroform	67-66-3	119	0.200	0.973	0.948	4.61		1	WG878625
Chloromethane	74-87-3	50.50	0.200	0.413	ND	ND		1	WG878625
2-Chlorotoluene	95-49-8	126	0.200	1.03	ND	ND		1	WG878625
Cyclohexane	110-82-7	84.20	0.200	0.689	ND	ND		1	WG878625
Dibromochloromethane	124-48-1	208	0.200	1.70	ND	ND		1	WG878625
1,2-Dibromoethane	106-93-4	188	0.200	1.54	ND	ND		1	WG878625
1,2-Dichlorobenzene	95-50-1	147	0.200	1.20	ND	ND		1	WG878625
1,3-Dichlorobenzene	541-73-1	147	0.200	1.20	ND	ND		1	WG878625
1,4-Dichlorobenzene	106-46-7	147	0.200	1.20	ND	ND		1	WG878625
1,2-Dichloroethane	107-06-2	99	0.200	0.810	ND	ND		1	WG878625
1,1-Dichloroethane	75-34-3	98	0.200	0.802	ND	ND		1	WG878625
1,1-Dichloroethene	75-35-4	96.90	0.200	0.793	ND	ND		1	WG878625
cis-1,2-Dichloroethene	156-59-2	96.90	0.200	0.793	ND	ND		1	WG878625
trans-1,2-Dichloroethene	156-60-5	96.90	0.200	0.793	ND	ND		1	WG878625
1,2-Dichloropropane	78-87-5	113	0.200	0.924	ND	ND		1	WG878625
cis-1,3-Dichloropropene	10061-01-5	111	0.200	0.908	ND	ND		1	WG878625
trans-1,3-Dichloropropene	10061-02-6	111	0.200	0.908	ND	ND		1	WG878625
1,4-Dioxane	123-91-1	88.10	0.200	0.721	ND	ND		1	WG878625
Ethanol	64-17-5	46.10	0.630	1.19	12.4	23.3		1	WG878625
Ethylbenzene	100-41-4	106	0.200	0.867	ND	ND		1	WG878625
4-Ethyltoluene	622-96-8	120	0.200	0.982	ND	ND		1	WG878625
Trichlorofluoromethane	75-69-4	137.40	0.200	1.12	0.278	1.56		1	WG878625
Dichlorodifluoromethane	75-71-8	120.92	0.200	0.989	0.319	1.58		1	WG878625
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	0.200	1.53	ND	ND		1	WG878625
1,2-Dichlorotetrafluoroethane	76-14-2	171	0.200	1.40	ND	ND		1	WG878625
Heptane	142-82-5	100	0.200	0.818	ND	ND		1	WG878625
Hexachloro-1,3-butadiene	87-68-3	261	0.630	6.73	ND	ND		1	WG878625
n-Hexane	110-54-3	86.20	0.200	0.705	ND	ND		1	WG878625
Isopropylbenzene	98-82-8	120.20	0.200	0.983	ND	ND		1	WG878625
Methylene Chloride	75-09-2	84.90	0.200	0.694	ND	ND		1	WG878625
Methyl Butyl Ketone	591-78-6	100	1.25	5.11	ND	ND		1	WG878625
2-Butanone (MEK)	78-93-3	72.10	1.25	3.69	ND	ND		1	WG878625
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1.25	5.12	ND	ND		1	WG878625
Methyl methacrylate	80-62-6	100.12	0.200	0.819	ND	ND		1	WG878625
MTBE	1634-04-4	88.10	0.200	0.721	ND	ND		1	WG878625
Naphthalene	91-20-3	128	0.630	3.30	ND	ND		1	WG878625
2-Propanol	67-63-0	60.10	1.25	3.07	ND	ND		1	WG878625
Propene	115-07-1	42.10	0.400	0.689	ND	ND	J3	1	WG878625
Styrene	100-42-5	104	0.200	0.851	ND	ND		1	WG878625
1,1,2,2-Tetrachloroethane	79-34-5	168	0.200	1.37	ND	ND		1	WG878625
Tetrachloroethylene	127-18-4	166	0.200	1.36	2.13	14.5		1	WG878625
Tetrahydrofuran	109-99-9	72.10	0.200	0.590	ND	ND		1	WG878625
Toluene	108-88-3	92.10	0.200	0.753	0.579	2.18		1	WG878625
1,2,4-Trichlorobenzene	120-82-1	181	0.630	4.66	ND	ND		1	WG878625

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	0.200	1.09	ND	ND		1	WG878625
1,1,2-Trichloroethane	79-00-5	133	0.200	1.09	ND	ND		1	WG878625
Trichloroethylene	79-01-6	131	0.200	1.07	ND	ND		1	WG878625
1,2,4-Trimethylbenzene	95-63-6	120	0.200	0.982	0.220	1.08		1	WG878625
1,3,5-Trimethylbenzene	108-67-8	120	0.200	0.982	ND	ND		1	WG878625
2,2,4-Trimethylpentane	540-84-1	114.22	0.200	0.934	ND	ND		1	WG878625
Vinyl chloride	75-01-4	62.50	0.200	0.511	ND	ND		1	WG878625
Vinyl Bromide	593-60-2	106.95	0.200	0.875	ND	ND		1	WG878625
Vinyl acetate	108-05-4	86.10	0.200	0.704	ND	ND		1	WG878625
m&p-Xylene	1330-20-7	106	0.400	1.73	ND	ND		1	WG878625
o-Xylene	95-47-6	106	0.200	0.867	ND	ND		1	WG878625
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*95.7*				WG878625

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	1.25	2.97	2.66	6.32		1	WG878625
Allyl chloride	107-05-1	76.53	0.200	0.626	ND	ND		1	WG878625
Benzene	71-43-2	78.10	0.200	0.639	0.952	3.04		1	WG878625
Benzyl Chloride	100-44-7	127	0.200	1.04	ND	ND		1	WG878625
Bromodichloromethane	75-27-4	164	0.200	1.34	ND	ND		1	WG878625
Bromoform	75-25-2	253	0.600	6.21	ND	ND		1	WG878625
Bromomethane	74-83-9	94.90	0.200	0.776	ND	ND		1	WG878625
1,3-Butadiene	106-99-0	54.10	2.00	4.43	ND	ND		1	WG878625
Carbon disulfide	75-15-0	76.10	0.200	0.622	ND	ND		1	WG878625
Carbon tetrachloride	56-23-5	154	0.200	1.26	0.288	1.81		1	WG878625
Chlorobenzene	108-90-7	113	0.200	0.924	ND	ND		1	WG878625
Chloroethane	75-00-3	64.50	0.200	0.528	ND	ND		1	WG878625
Chloroform	67-66-3	119	0.200	0.973	1.88	9.14		1	WG878625
Chloromethane	74-87-3	50.50	0.200	0.413	ND	ND		1	WG878625
2-Chlorotoluene	95-49-8	126	0.200	1.03	ND	ND		1	WG878625
Cyclohexane	110-82-7	84.20	0.200	0.689	0.521	1.79		1	WG878625
Dibromochloromethane	124-48-1	208	0.200	1.70	ND	ND		1	WG878625
1,2-Dibromoethane	106-93-4	188	0.200	1.54	ND	ND		1	WG878625
1,2-Dichlorobenzene	95-50-1	147	0.200	1.20	ND	ND		1	WG878625
1,3-Dichlorobenzene	541-73-1	147	0.200	1.20	ND	ND		1	WG878625
1,4-Dichlorobenzene	106-46-7	147	0.200	1.20	ND	ND		1	WG878625
1,2-Dichloroethane	107-06-2	99	0.200	0.810	ND	ND		1	WG878625
1,1-Dichloroethane	75-34-3	98	0.200	0.802	ND	ND		1	WG878625
1,1-Dichloroethene	75-35-4	96.90	0.200	0.793	ND	ND		1	WG878625
cis-1,2-Dichloroethene	156-59-2	96.90	4.00	15.9	62.3	247		20	WG879045
trans-1,2-Dichloroethene	156-60-5	96.90	0.200	0.793	ND	ND		1	WG878625
1,2-Dichloropropane	78-87-5	113	0.200	0.924	ND	ND		1	WG878625
cis-1,3-Dichloropropene	10061-01-5	111	0.200	0.908	ND	ND		1	WG878625
trans-1,3-Dichloropropene	10061-02-6	111	0.200	0.908	ND	ND		1	WG878625
1,4-Dioxane	123-91-1	88.10	0.200	0.721	ND	ND		1	WG878625
Ethanol	64-17-5	46.10	0.630	1.19	22.0	41.5		1	WG878625
Ethylbenzene	100-41-4	106	0.200	0.867	0.627	2.72		1	WG878625
4-Ethyltoluene	622-96-8	120	0.200	0.982	0.661	3.25		1	WG878625
Trichlorofluoromethane	75-69-4	137.40	0.200	1.12	0.406	2.28		1	WG878625
Dichlorodifluoromethane	75-71-8	120.92	0.200	0.989	0.453	2.24		1	WG878625
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	0.200	1.53	ND	ND		1	WG878625
1,2-Dichlorotetrafluoroethane	76-14-2	171	0.200	1.40	ND	ND		1	WG878625
Heptane	142-82-5	100	0.200	0.818	0.875	3.58		1	WG878625
Hexachloro-1,3-butadiene	87-68-3	261	0.630	6.73	ND	ND		1	WG878625
n-Hexane	110-54-3	86.20	0.200	0.705	2.65	9.35		1	WG878625
Isopropylbenzene	98-82-8	120.20	0.200	0.983	ND	ND		1	WG878625
Methylene Chloride	75-09-2	84.90	0.200	0.694	3.44	11.9		1	WG878625
Methyl Butyl Ketone	591-78-6	100	1.25	5.11	ND	ND		1	WG878625
2-Butanone (MEK)	78-93-3	72.10	1.25	3.69	ND	ND		1	WG878625
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1.25	5.12	ND	ND		1	WG878625
Methyl methacrylate	80-62-6	100.12	0.200	0.819	ND	ND		1	WG878625
MTBE	1634-04-4	88.10	0.200	0.721	ND	ND		1	WG878625
Naphthalene	91-20-3	128	0.630	3.30	ND	ND		1	WG878625
2-Propanol	67-63-0	60.10	1.25	3.07	1.54	3.79		1	WG878625
Propene	115-07-1	42.10	0.400	0.689	ND	ND	J3	1	WG878625
Styrene	100-42-5	104	0.200	0.851	0.235	1.00		1	WG878625
1,1,2,2-Tetrachloroethane	79-34-5	168	0.200	1.37	ND	ND		1	WG878625
Tetrachloroethylene	127-18-4	166	4.00	27.2	83.9	570		20	WG879045
Tetrahydrofuran	109-99-9	72.10	0.200	0.590	ND	ND		1	WG878625
Toluene	108-88-3	92.10	0.200	0.753	4.95	18.6		1	WG878625
1,2,4-Trichlorobenzene	120-82-1	181	0.630	4.66	ND	ND		1	WG878625

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	0.200	1.09	ND	ND		1	WG878625
1,1,2-Trichloroethane	79-00-5	133	0.200	1.09	ND	ND		1	WG878625
Trichloroethylene	79-01-6	131	4.00	21.4	212	1130		20	WG879045
1,2,4-Trimethylbenzene	95-63-6	120	0.200	0.982	1.12	5.49		1	WG878625
1,3,5-Trimethylbenzene	108-67-8	120	0.200	0.982	0.295	1.45		1	WG878625
2,2,4-Trimethylpentane	540-84-1	114.22	0.200	0.934	1.17	5.44		1	WG878625
Vinyl chloride	75-01-4	62.50	0.200	0.511	ND	ND		1	WG878625
Vinyl Bromide	593-60-2	106.95	0.200	0.875	ND	ND		1	WG878625
Vinyl acetate	108-05-4	86.10	0.200	0.704	ND	ND		1	WG878625
m&p-Xylene	1330-20-7	106	0.400	1.73	2.52	10.9		1	WG878625
o-Xylene	95-47-6	106	0.200	0.867	0.998	4.33		1	WG878625
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*96.3*				WG878625
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*95.9*				WG879045

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
Acetone	67-64-1	58.10	1.25	2.97	9.45	22.4		1	WG878625
Allyl chloride	107-05-1	76.53	0.200	0.626	ND	ND		1	WG878625
Benzene	71-43-2	78.10	0.200	0.639	2.33	7.43		1	WG878625
Benzyl Chloride	100-44-7	127	0.200	1.04	ND	ND		1	WG878625
Bromodichloromethane	75-27-4	164	0.200	1.34	ND	ND		1	WG878625
Bromoform	75-25-2	253	0.600	6.21	ND	ND		1	WG878625
Bromomethane	74-83-9	94.90	0.200	0.776	ND	ND		1	WG878625
1,3-Butadiene	106-99-0	54.10	2.00	4.43	ND	ND		1	WG878625
Carbon disulfide	75-15-0	76.10	0.200	0.622	ND	ND		1	WG878625
Carbon tetrachloride	56-23-5	154	0.200	1.26	ND	ND		1	WG878625
Chlorobenzene	108-90-7	113	0.200	0.924	ND	ND		1	WG878625
Chloroethane	75-00-3	64.50	0.200	0.528	ND	ND		1	WG878625
Chloroform	67-66-3	119	0.200	0.973	ND	ND		1	WG878625
Chloromethane	74-87-3	50.50	0.200	0.413	0.430	0.887		1	WG878625
2-Chlorotoluene	95-49-8	126	0.200	1.03	ND	ND		1	WG878625
Cyclohexane	110-82-7	84.20	0.200	0.689	0.970	3.34		1	WG878625
Dibromochloromethane	124-48-1	208	0.200	1.70	ND	ND		1	WG878625
1,2-Dibromoethane	106-93-4	188	0.200	1.54	ND	ND		1	WG878625
1,2-Dichlorobenzene	95-50-1	147	0.200	1.20	ND	ND		1	WG878625
1,3-Dichlorobenzene	541-73-1	147	0.200	1.20	ND	ND		1	WG878625
1,4-Dichlorobenzene	106-46-7	147	0.200	1.20	ND	ND		1	WG878625
1,2-Dichloroethane	107-06-2	99	0.200	0.810	ND	ND		1	WG878625
1,1-Dichloroethane	75-34-3	98	0.200	0.802	ND	ND		1	WG878625
1,1-Dichloroethene	75-35-4	96.90	0.200	0.793	ND	ND		1	WG878625
cis-1,2-Dichloroethene	156-59-2	96.90	0.200	0.793	ND	ND		1	WG878625
trans-1,2-Dichloroethene	156-60-5	96.90	0.200	0.793	ND	ND		1	WG878625
1,2-Dichloropropane	78-87-5	113	0.200	0.924	ND	ND		1	WG878625
cis-1,3-Dichloropropene	10061-01-5	111	0.200	0.908	ND	ND		1	WG878625
trans-1,3-Dichloropropene	10061-02-6	111	0.200	0.908	ND	ND		1	WG878625
1,4-Dioxane	123-91-1	88.10	0.200	0.721	ND	ND		1	WG878625
Ethanol	64-17-5	46.10	6.30	11.9	57.9	109		10	WG879045
Ethylbenzene	100-41-4	106	0.200	0.867	1.11	4.82		1	WG878625
4-Ethyltoluene	622-96-8	120	0.200	0.982	0.941	4.62		1	WG878625
Trichlorofluoromethane	75-69-4	137.40	0.200	1.12	0.359	2.02		1	WG878625
Dichlorodifluoromethane	75-71-8	120.92	0.200	0.989	0.421	2.08		1	WG878625
1,1,2-Trichlorotrifluoroethane	76-13-1	187.40	0.200	1.53	ND	ND		1	WG878625
1,2-Dichlorotetrafluoroethane	76-14-2	171	0.200	1.40	ND	ND		1	WG878625
Heptane	142-82-5	100	0.200	0.818	1.42	5.79		1	WG878625
Hexachloro-1,3-butadiene	87-68-3	261	0.630	6.73	ND	ND		1	WG878625
n-Hexane	110-54-3	86.20	0.200	0.705	5.74	20.2		1	WG878625
Isopropylbenzene	98-82-8	120.20	0.200	0.983	ND	ND		1	WG878625
Methylene Chloride	75-09-2	84.90	0.200	0.694	11.8	40.8		1	WG878625
Methyl Butyl Ketone	591-78-6	100	1.25	5.11	ND	ND		1	WG878625
2-Butanone (MEK)	78-93-3	72.10	1.25	3.69	5.44	16.0		1	WG878625
4-Methyl-2-pentanone (MIBK)	108-10-1	100.10	1.25	5.12	ND	ND		1	WG878625
Methyl methacrylate	80-62-6	100.12	0.200	0.819	ND	ND		1	WG878625
MTBE	1634-04-4	88.10	0.200	0.721	ND	ND		1	WG878625
Naphthalene	91-20-3	128	0.630	3.30	ND	ND		1	WG878625
2-Propanol	67-63-0	60.10	1.25	3.07	3.99	9.81		1	WG878625
Propene	115-07-1	42.10	0.400	0.689	ND	ND	J3	1	WG878625
Styrene	100-42-5	104	0.200	0.851	ND	ND		1	WG878625
1,1,2,2-Tetrachloroethane	79-34-5	168	0.200	1.37	ND	ND		1	WG878625
Tetrachloroethylene	127-18-4	166	0.200	1.36	0.254	1.73		1	WG878625
Tetrahydrofuran	109-99-9	72.10	0.200	0.590	ND	ND		1	WG878625
Toluene	108-88-3	92.10	0.200	0.753	10.0	37.8		1	WG878625
1,2,4-Trichlorobenzene	120-82-1	181	0.630	4.66	ND	ND		1	WG878625

Volatile Organic Compounds (MS) by Method TO-15

Analyte	CAS #	Mol. Wt.	RDL1 ppbv	RDL2 ug/m3	Result ppbv	Result ug/m3	Qualifier	Dilution	Batch
1,1,1-Trichloroethane	71-55-6	133	0.200	1.09	ND	ND		1	WG878625
1,1,2-Trichloroethane	79-00-5	133	0.200	1.09	ND	ND		1	WG878625
Trichloroethylene	79-01-6	131	0.200	1.07	ND	ND		1	WG878625
1,2,4-Trimethylbenzene	95-63-6	120	0.200	0.982	1.56	7.64		1	WG878625
1,3,5-Trimethylbenzene	108-67-8	120	0.200	0.982	0.390	1.92		1	WG878625
2,2,4-Trimethylpentane	540-84-1	114.22	0.200	0.934	2.21	10.3		1	WG878625
Vinyl chloride	75-01-4	62.50	0.200	0.511	ND	ND		1	WG878625
Vinyl Bromide	593-60-2	106.95	0.200	0.875	ND	ND		1	WG878625
Vinyl acetate	108-05-4	86.10	0.200	0.704	ND	ND		1	WG878625
m&p-Xylene	1330-20-7	106	0.400	1.73	4.19	18.2		1	WG878625
o-Xylene	95-47-6	106	0.200	0.867	1.60	6.96		1	WG878625
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*96.6*				WG878625
(S) 1,4-Bromofluorobenzene	*460-00-4*	*175*	*60.0-140*		*96.5*				WG879045

Method Blank (MB)

(MB) R3142483-3 06/08/16 09:46

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Acetone	U		0.0569	1.25
Allyl Chloride	U		0.0546	0.200
Benzene	U		0.0460	0.200
Benzyl Chloride	U		0.0598	0.200
Bromodichloromethane	U		0.0436	0.200
Bromoform	U		0.0786	0.600
Bromomethane	U		0.0609	0.200
1,3-Butadiene	U		0.0563	2.00
Carbon disulfide	U		0.0544	0.200
Carbon tetrachloride	U		0.0585	0.200
Chlorobenzene	U		0.0601	0.200
Chloroethane	U		0.0489	0.200
Chloroform	U		0.0574	0.200
Chloromethane	U		0.0544	0.200
2-Chlorotoluene	U		0.0605	0.200
Cyclohexane	U		0.0534	0.200
Dibromochloromethane	U		0.0494	0.200
1,2-Dibromoethane	U		0.0185	0.200
1,2-Dichlorobenzene	U		0.0603	0.200
1,3-Dichlorobenzene	U		0.0597	0.200
1,4-Dichlorobenzene	U		0.0557	0.200
1,2-Dichloroethane	U		0.0616	0.200
1,1-Dichloroethane	U		0.0514	0.200
1,1-Dichloroethene	U		0.0490	0.200
cis-1,2-Dichloroethene	U		0.0389	0.200
trans-1,2-Dichloroethene	U		0.0464	0.200
1,2-Dichloropropane	U		0.0599	0.200
cis-1,3-Dichloropropene	U		0.0588	0.200
trans-1,3-Dichloropropene	U		0.0435	0.200
1,4-Dioxane	U		0.0554	0.200
Ethylbenzene	U		0.0506	0.200
4-Ethyltoluene	U		0.0666	0.200
Trichlorofluoromethane	U		0.0673	0.200
Dichlorodifluoromethane	U		0.0601	0.200
1,1,2-Trichlorotrifluoroethane	U		0.0687	0.200
1,2-Dichlorotetrafluoroethane	U		0.0458	0.200
Heptane	U		0.0626	0.200
Hexachloro-1,3-butadiene	U		0.0656	0.630
n-Hexane	U		0.0457	0.200
Isopropylbenzene	U		0.0563	0.200

Method Blank (MB)

(MB) R3142483-3 06/08/16 09:46

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Methylene Chloride	U		0.0465	0.200
Methyl Butyl Ketone	U		0.0682	1.25
2-Butanone (MEK)	U		0.0493	1.25
4-Methyl-2-pentanone (MIBK)	U		0.0650	1.25
Methyl Methacrylate	U		0.0773	0.200
MTBE	U		0.0505	0.200
Naphthalene	U		0.154	0.630
2-Propanol	U		0.0882	1.25
Propene	U		0.0932	0.400
Styrene	U		0.0465	0.200
1,1,2,2-Tetrachloroethane	U		0.0576	0.200
Tetrachloroethylene	U		0.0497	0.200
Tetrahydrofuran	U		0.0508	0.200
Toluene	U		0.0499	0.200
1,2,4-Trichlorobenzene	U		0.148	0.630
1,1,1-Trichloroethane	U		0.0665	0.200
1,1,2-Trichloroethane	U		0.0287	0.200
Trichloroethylene	U		0.0545	0.200
1,2,4-Trimethylbenzene	U		0.0483	0.200
1,3,5-Trimethylbenzene	U		0.0631	0.200
2,2,4-Trimethylpentane	U		0.0456	0.200
Vinyl chloride	U		0.0457	0.200
Vinyl Bromide	U		0.0727	0.200
Vinyl acetate	U		0.0639	0.200
m&p-Xylene	U		0.0946	0.400
o-Xylene	U		0.0633	0.200
Ethanol	U		0.0832	0.630
(S) 1,4-Bromofluorobenzene	*96.9*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3142483-1 06/08/16 08:16 • (LCSD) R3142483-2 06/08/16 09:01

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Ethanol	3.75	3.88	3.95	103	105	34.3-167			2.03	25
Propene	3.75	3.75	2.34	100	62.5	53.9-143		J3	46.2	25
Dichlorodifluoromethane	3.75	3.77	3.65	101	97.3	56.7-140			3.34	25
1,2-Dichlorotetrafluoroethane	3.75	3.82	4.05	102	108	70.0-130			5.90	25
Chloromethane	3.75	3.78	4.01	101	107	70.0-130			6.12	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3142483-1 06/08/16 08:16 • (LCSD) R3142483-2 06/08/16 09:01

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Vinyl chloride	3.75	3.86	4.09	103	109	70.0-130			5.82	25
1,3-Butadiene	3.75	3.60	4.11	96.0	110	70.0-130			13.2	25
Bromomethane	3.75	4.36	4.44	116	118	70.0-130			1.86	25
Chloroethane	3.75	4.35	4.52	116	120	70.0-130			3.86	25
Trichlorofluoromethane	3.75	4.31	4.39	115	117	70.0-130			1.70	25
1,1,2-Trichlorotrifluoroethane	3.75	4.24	4.33	113	116	70.0-130			2.28	25
1,1-Dichloroethene	3.75	4.05	4.15	108	111	70.0-130			2.40	25
1,1-Dichloroethane	3.75	3.97	3.94	106	105	70.0-130			0.690	25
Acetone	3.75	4.00	4.18	107	111	70.0-130			4.27	25
2-Propanol	3.75	3.80	3.88	101	103	50.4-152			1.97	25
Carbon disulfide	3.75	4.13	4.26	110	113	70.0-130			2.99	25
Methylene Chloride	3.75	3.53	3.55	94.2	94.6	70.0-130			0.460	25
MTBE	3.75	3.95	3.95	105	105	70.0-130			0.0800	25
trans-1,2-Dichloroethene	3.75	3.95	3.95	105	105	70.0-130			0.140	25
n-Hexane	3.75	3.96	3.98	106	106	70.0-130			0.480	25
Vinyl acetate	3.75	4.03	4.05	107	108	70.0-130			0.480	25
Methyl Ethyl Ketone	3.75	4.04	4.06	108	108	70.0-130			0.400	25
cis-1,2-Dichloroethene	3.75	3.98	3.99	106	106	70.0-130			0.270	25
Chloroform	3.75	3.95	3.94	105	105	70.0-130			0.450	25
Cyclohexane	3.75	4.01	4.02	107	107	70.0-130			0.290	25
1,1,1-Trichloroethane	3.75	3.94	3.96	105	105	70.0-130			0.280	25
Carbon tetrachloride	3.75	3.99	4.00	107	107	70.0-130			0.180	25
Benzene	3.75	3.99	3.98	106	106	70.0-130			0.0300	25
1,2-Dichloroethane	3.75	3.96	3.90	106	104	70.0-130			1.40	25
Heptane	3.75	4.05	4.07	108	108	70.0-130			0.410	25
Trichloroethylene	3.75	4.02	3.94	107	105	70.0-130			1.99	25
1,2-Dichloropropane	3.75	3.96	3.92	106	104	70.0-130			1.16	25
1,4-Dioxane	3.75	4.28	4.23	114	113	48.0-156			1.09	25
Bromodichloromethane	3.75	3.98	3.96	106	106	70.0-130			0.530	25
cis-1,3-Dichloropropene	3.75	4.04	4.02	108	107	70.0-130			0.630	25
4-Methyl-2-pentanone (MIBK)	3.75	4.06	4.04	108	108	55.3-154			0.390	25
Toluene	3.75	4.03	4.02	107	107	70.0-130			0.270	25
trans-1,3-Dichloropropene	3.75	4.04	3.99	108	106	70.0-130			1.37	25
1,1,2-Trichloroethane	3.75	3.99	3.95	106	105	70.0-130			0.870	25
Tetrachloroethylene	3.75	4.08	4.06	109	108	70.0-130			0.540	25
Methyl Butyl Ketone	3.75	4.11	4.10	109	109	47.9-165			0.110	25
Dibromochloromethane	3.75	4.16	4.10	111	109	70.0-130			1.34	25
1,2-Dibromoethane	3.75	4.07	4.03	108	107	70.0-130			0.980	25
Chlorobenzene	3.75	4.07	4.02	108	107	70.0-130			1.13	25
Ethylbenzene	3.75	4.04	4.03	108	108	70.0-130			0.0300	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3142483-1 06/08/16 08:16 • (LCSD) R3142483-2 06/08/16 09:01

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
m&p-Xylene	7.50	7.97	7.97	106	106	70.0-130			0.0300	25
o-Xylene	3.75	4.08	4.06	109	108	70.0-130			0.370	25
Styrene	3.75	4.19	4.18	112	111	70.0-130			0.390	25
Bromoform	3.75	4.27	4.23	114	113	70.0-130			0.830	25
1,1,2,2-Tetrachloroethane	3.75	4.01	4.01	107	107	70.0-130			0.100	25
4-Ethyltoluene	3.75	4.12	4.12	110	110	70.0-130			0.170	25
1,3,5-Trimethylbenzene	3.75	4.11	4.11	110	110	70.0-130			0.0800	25
1,2,4-Trimethylbenzene	3.75	4.15	4.11	111	110	70.0-130			0.930	25
1,3-Dichlorobenzene	3.75	4.12	4.12	110	110	70.0-130			0.120	25
1,4-Dichlorobenzene	3.75	4.13	4.13	110	110	70.0-130			0.0400	25
Benzyl Chloride	3.75	4.18	4.16	112	111	55.6-160			0.670	25
1,2-Dichlorobenzene	3.75	4.12	4.10	110	109	70.0-130			0.540	25
1,2,4-Trichlorobenzene	3.75	4.39	4.39	117	117	53.6-154			0.0400	25
Hexachloro-1,3-butadiene	3.75	4.21	4.18	112	112	62.1-143			0.620	25
Naphthalene	3.75	4.38	4.37	117	116	52.0-158			0.360	25
Allyl Chloride	3.75	4.08	3.99	109	106	70.0-130			2.27	25
2-Chlorotoluene	3.75	4.03	4.04	108	108	70.0-130			0.250	25
Methyl Methacrylate	3.75	3.74	3.69	99.7	98.5	70.0-130			1.22	25
Tetrahydrofuran	3.75	4.01	4.00	107	107	65.0-140			0.160	25
2,2,4-Trimethylpentane	3.75	4.03	4.02	108	107	70.0-130			0.280	25
Vinyl Bromide	3.75	4.39	4.44	117	118	70.0-130			1.01	25
Isopropylbenzene	3.75	4.12	4.11	110	110	70.0-130			0.270	25
(S) 1,4-Bromofluorobenzene				*98.2*	*98.8*	*60.0-140*				

Method Blank (MB)

(MB) R3142646-2 06/09/16 04:01

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Allyl Chloride	U		0.0546	0.200
Benzene	U		0.0460	0.200
Benzyl Chloride	U		0.0598	0.200
Bromodichloromethane	U		0.0436	0.200
Bromoform	U		0.0786	0.600
Bromomethane	U		0.0609	0.200
1,3-Butadiene	U		0.0563	2.00
Carbon disulfide	U		0.0544	0.200
Carbon tetrachloride	U		0.0585	0.200
Chlorobenzene	U		0.0601	0.200
Chloroethane	U		0.0489	0.200
Chloroform	U		0.0574	0.200
Chloromethane	U		0.0544	0.200
2-Chlorotoluene	U		0.0605	0.200
Cyclohexane	U		0.0534	0.200
Dibromochloromethane	U		0.0494	0.200
1,2-Dibromoethane	U		0.0185	0.200
1,2-Dichlorobenzene	U		0.0603	0.200
1,3-Dichlorobenzene	U		0.0597	0.200
1,4-Dichlorobenzene	U		0.0557	0.200
1,2-Dichloroethane	U		0.0616	0.200
1,1-Dichloroethane	U		0.0514	0.200
1,1-Dichloroethene	U		0.0490	0.200
cis-1,2-Dichloroethene	U		0.0389	0.200
trans-1,2-Dichloroethene	U		0.0464	0.200
1,2-Dichloropropane	U		0.0599	0.200
cis-1,3-Dichloropropene	U		0.0588	0.200
trans-1,3-Dichloropropene	U		0.0435	0.200
1,4-Dioxane	U		0.0554	0.200
Ethylbenzene	U		0.0506	0.200
4-Ethyltoluene	U		0.0666	0.200
Trichlorofluoromethane	U		0.0673	0.200
Dichlorodifluoromethane	U		0.0601	0.200
1,1,2-Trichlorotrifluoroethane	U		0.0687	0.200
1,2-Dichlorotetrafluoroethane	U		0.0458	0.200
Heptane	U		0.0626	0.200
Hexachloro-1,3-butadiene	U		0.0656	0.630
n-Hexane	U		0.0457	0.200
Isopropylbenzene	U		0.0563	0.200
Methylene Chloride	0.0719	J	0.0465	0.200

Method Blank (MB)

(MB) R3142646-2 06/09/16 04:01

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Methyl Butyl Ketone	U		0.0682	1.25
2-Butanone (MEK)	U		0.0493	1.25
4-Methyl-2-pentanone (MIBK)	U		0.0650	1.25
Methyl Methacrylate	U		0.0773	0.200
MTBE	U		0.0505	0.200
Naphthalene	U		0.154	0.630
2-Propanol	U		0.0882	1.25
Propene	0.102	J	0.0932	0.400
Styrene	U		0.0465	0.200
1,1,2,2-Tetrachloroethane	U		0.0576	0.200
Tetrachloroethylene	U		0.0497	0.200
Tetrahydrofuran	U		0.0508	0.200
Toluene	U		0.0499	0.200
1,2,4-Trichlorobenzene	U		0.148	0.630
1,1,1-Trichloroethane	U		0.0665	0.200
1,1,2-Trichloroethane	U		0.0287	0.200
Trichloroethylene	U		0.0545	0.200
1,2,4-Trimethylbenzene	U		0.0483	0.200
1,3,5-Trimethylbenzene	U		0.0631	0.200
2,2,4-Trimethylpentane	U		0.0456	0.200
Vinyl chloride	U		0.0457	0.200
Vinyl Bromide	U		0.0727	0.200
Vinyl acetate	U		0.0639	0.200
m&p-Xylene	U		0.0946	0.400
o-Xylene	U		0.0633	0.200
Ethanol	U		0.0832	0.630
(S) 1,4-Bromofluorobenzene	*97.1*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3142646-1 06/09/16 03:20 • (LCSD) R3142646-3 06/09/16 11:40

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Ethanol	3.75	3.63	4.47	96.7	119	34.3-167			20.9	25
Propene	3.75	3.78	3.39	101	90.3	53.9-143			11.0	25
Dichlorodifluoromethane	3.75	3.82	3.44	102	91.7	56.7-140			10.5	25
1,2-Dichlorotetrafluoroethane	3.75	3.98	3.65	106	97.5	70.0-130			8.62	25
Chloromethane	3.75	3.91	3.41	104	91.0	70.0-130			13.5	25
Vinyl chloride	3.75	3.75	3.36	99.9	89.6	70.0-130			10.8	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3142646-1 06/09/16 03:20 • (LCSD) R3142646-3 06/09/16 11:40

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,3-Butadiene	3.75	3.55	3.10	94.8	82.6	70.0-130			13.7	25
Bromomethane	3.75	3.65	3.32	97.3	88.6	70.0-130			9.33	25
Chloroethane	3.75	3.70	3.25	98.6	86.7	70.0-130			12.9	25
Trichlorofluoromethane	3.75	3.82	4.03	102	108	70.0-130			5.51	25
1,1,2-Trichlorotrifluoroethane	3.75	3.72	4.47	99.3	119	70.0-130			18.2	25
1,1-Dichloroethene	3.75	3.88	4.42	103	118	70.0-130			13.0	25
1,1-Dichloroethane	3.75	3.57	4.33	95.2	115	70.0-130			19.2	25
2-Propanol	3.75	4.30	5.13	115	137	50.4-152			17.5	25
Carbon disulfide	3.75	3.82	4.75	102	127	70.0-130			21.7	25
Methylene Chloride	3.75	3.48	4.24	92.9	113	70.0-130			19.6	25
MTBE	3.75	3.74	4.37	99.8	117	70.0-130			15.5	25
trans-1,2-Dichloroethene	3.75	3.76	4.41	100	118	70.0-130			15.9	25
n-Hexane	3.75	3.70	4.73	98.8	126	70.0-130			24.3	25
Vinyl acetate	3.75	3.62	4.51	96.6	120	70.0-130			21.9	25
Methyl Ethyl Ketone	3.75	3.97	3.78	106	101	70.0-130			4.92	25
cis-1,2-Dichloroethene	3.75	3.92	3.73	104	99.3	70.0-130			4.97	25
Chloroform	3.75	3.91	3.65	104	97.4	70.0-130			6.66	25
Cyclohexane	3.75	4.00	3.83	107	102	70.0-130			4.38	25
1,1,1-Trichloroethane	3.75	3.94	3.69	105	98.3	70.0-130			6.75	25
Carbon tetrachloride	3.75	3.90	3.63	104	96.9	70.0-130			7.23	25
Benzene	3.75	3.93	3.60	105	96.0	70.0-130			8.85	25
1,2-Dichloroethane	3.75	3.94	3.57	105	95.1	70.0-130			10.0	25
Heptane	3.75	4.10	3.71	109	98.9	70.0-130			10.0	25
Trichloroethylene	3.75	3.90	3.64	104	97.1	70.0-130			6.82	25
1,2-Dichloropropane	3.75	3.92	3.58	105	95.5	70.0-130			9.05	25
1,4-Dioxane	3.75	4.44	4.02	118	107	48.0-156			9.93	25
Bromodichloromethane	3.75	3.92	3.58	105	95.5	70.0-130			9.13	25
cis-1,3-Dichloropropene	3.75	4.03	3.78	107	101	70.0-130			6.43	25
4-Methyl-2-pentanone (MIBK)	3.75	4.10	3.76	109	100	55.3-154			8.59	25
Toluene	3.75	4.00	3.69	107	98.3	70.0-130			8.28	25
trans-1,3-Dichloropropene	3.75	4.05	3.76	108	100	70.0-130			7.32	25
1,1,2-Trichloroethane	3.75	3.91	3.60	104	95.9	70.0-130			8.41	25
Tetrachloroethylene	3.75	3.89	3.58	104	95.5	70.0-130			8.41	25
Methyl Butyl Ketone	3.75	4.28	3.94	114	105	47.9-165			8.37	25
Dibromochloromethane	3.75	4.01	3.62	107	96.5	70.0-130			10.1	25
1,2-Dibromoethane	3.75	3.96	3.62	106	96.5	70.0-130			9.00	25
Chlorobenzene	3.75	3.89	3.56	104	95.0	70.0-130			8.95	25
Ethylbenzene	3.75	3.98	3.68	106	98.0	70.0-130			7.99	25
m&p-Xylene	7.50	8.09	7.42	108	98.9	70.0-130			8.62	25
o-Xylene	3.75	4.04	3.74	108	99.8	70.0-130			7.72	25

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3142646-1 06/09/16 03:20 • (LCSD) R3142646-3 06/09/16 11:40

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Styrene	3.75	4.14	3.83	110	102	70.0-130			7.79	25
Bromoform	3.75	4.07	3.69	109	98.4	70.0-130			9.90	25
1,1,2,2-Tetrachloroethane	3.75	3.96	3.54	106	94.5	70.0-130			11.1	25
4-Ethyltoluene	3.75	4.00	3.64	107	97.0	70.0-130			9.45	25
1,3,5-Trimethylbenzene	3.75	4.07	3.69	109	98.3	70.0-130			10.0	25
1,2,4-Trimethylbenzene	3.75	4.03	3.65	108	97.3	70.0-130			10.0	25
1,3-Dichlorobenzene	3.75	3.99	3.55	107	94.6	70.0-130			11.8	25
1,4-Dichlorobenzene	3.75	4.12	3.65	110	97.3	70.0-130			12.1	25
Benzyl Chloride	3.75	4.30	3.90	115	104	55.6-160			9.72	25
1,2-Dichlorobenzene	3.75	3.97	3.51	106	93.7	70.0-130			12.3	25
1,2,4-Trichlorobenzene	3.75	4.20	3.85	112	103	53.6-154			8.74	25
Hexachloro-1,3-butadiene	3.75	3.88	3.47	104	92.6	62.1-143			11.2	25
Naphthalene	3.75	4.27	3.86	114	103	52.0-158			10.2	25
Allyl Chloride	3.75	3.71	4.65	98.9	124	70.0-130			22.6	25
2-Chlorotoluene	3.75	4.04	3.58	108	95.3	70.0-130			12.3	25
Methyl Methacrylate	3.75	3.87	3.59	103	95.6	70.0-130			7.60	25
Tetrahydrofuran	3.75	4.00	3.73	107	99.5	65.0-140			6.87	25
2,2,4-Trimethylpentane	3.75	4.07	3.83	109	102	70.0-130			6.18	25
Vinyl Bromide	3.75	3.75	4.33	100	116	70.0-130			14.4	25
Isopropylbenzene	3.75	4.06	3.77	108	100	70.0-130			7.55	25
(S) 1,4-Bromofluorobenzene				*99.5*	*99.9*	*60.0-140*				

Method Blank (MB)

(MB) R3142703-3 06/09/16 09:38

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	ppbv		ppbv	ppbv
cis-1,2-Dichloroethene	U		0.0389	0.200
Tetrachloroethylene	U		0.0497	0.200
Trichloroethylene	U		0.0545	0.200
Ethanol	U		0.0832	0.630
(S) 1,4-Bromofluorobenzene	*96.3*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3142703-1 06/09/16 08:11 • (LCSD) R3142703-2 06/09/16 08:54

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
	ppbv	ppbv	ppbv	%	%	%			%	%
Ethanol	3.75	3.85	3.75	103	100	34.3-167			2.77	25
cis-1,2-Dichloroethene	3.75	4.04	4.07	108	109	70.0-130			0.740	25
Trichloroethylene	3.75	3.98	4.06	106	108	70.0-130			1.96	25
Tetrachloroethylene	3.75	4.16	4.20	111	112	70.0-130			0.920	25
(S) 1,4-Bromofluorobenzene				*96.4*	*97.7*	*60.0-140*				

Method Blank (MB)

(MB) R3142829-3 06/10/16 05:23

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Acetone	U		0.0569	1.25
Chloroform	U		0.0574	0.200
Tetrachloroethylene	0.0648	J	0.0497	0.200
Trichloroethylene	U		0.0545	0.200
(S) 1,4-Bromofluorobenzene	*95.4*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3142829-1 06/10/16 03:50 • (LCSD) R3142829-2 06/10/16 04:36

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	3.75	4.33	4.28	115	114	70.0-130			1.00	25
Chloroform	3.75	3.80	3.78	101	101	70.0-130			0.520	25
Trichloroethylene	3.75	3.80	3.77	101	101	70.0-130			0.770	25
Tetrachloroethylene	3.75	3.85	3.72	103	99.3	70.0-130			3.31	25
(S) 1,4-Bromofluorobenzene				*103*	*103*	*60.0-140*				

Method Blank (MB)

(MB) R3142904-3 06/10/16 09:25

Analyte	MB Result ppbv	MB Qualifier	MB MDL ppbv	MB RDL ppbv
Acetone	U		0.0569	1.25
(S) 1,4-Bromofluorobenzene	*95.2*			*60.0-140*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3142904-1 06/10/16 07:57 • (LCSD) R3142904-2 06/10/16 08:41

Analyte	Spike Amount ppbv	LCS Result ppbv	LCSD Result ppbv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acetone	3.75	3.89	3.28	104	87.5	70.0-130			16.9	25
(S) 1,4-Bromofluorobenzene				*94.9*	*95.1*	*60.0-140*				

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.

Qualifier	Description
B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**
***** Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660
Alaska	UST-080
Arizona	AZ0612
Arkansas	88-0469
California	01157CA
Colorado	TN00003
Conneticut	PH-0197
Florida	E87487
Georgia	NELAP
Georgia [1]	923
Idaho	TN00003
Illinois	200008
Indiana	C-TN-01
Iowa	364
Kansas	E-10277
Kentucky [1]	90010
Kentucky [2]	16
Louisiana	AI30792
Maine	TN0002
Maryland	324
Massachusetts	M-TN003
Michigan	9958
Minnesota	047-999-395
Mississippi	TN00003
Missouri	340
Montana	CERT0086
Nebraska	NE-OS-15-05
Nevada	TN-03-2002-34
New Hampshire	2975
New Jersey–NELAP	TN002
New Mexico	TN00003
New York	11742
North Carolina	Env375
North Carolina [1]	DW21704
North Carolina [2]	41
North Dakota	R-140
Ohio–VAP	CL0069
Oklahoma	9915
Oregon	TN200002
Pennsylvania	68-02979
Rhode Island	221
South Carolina	84004
South Dakota	n/a
Tennessee [1 4]	2006
Texas	T 104704245-07-TX
Texas [5]	LAB0152
Utah	6157585858
Vermont	VT2006
Virginia	109
Washington	C1915
West Virginia	233
Wisconsin	9980939910
Wyoming	A2LA

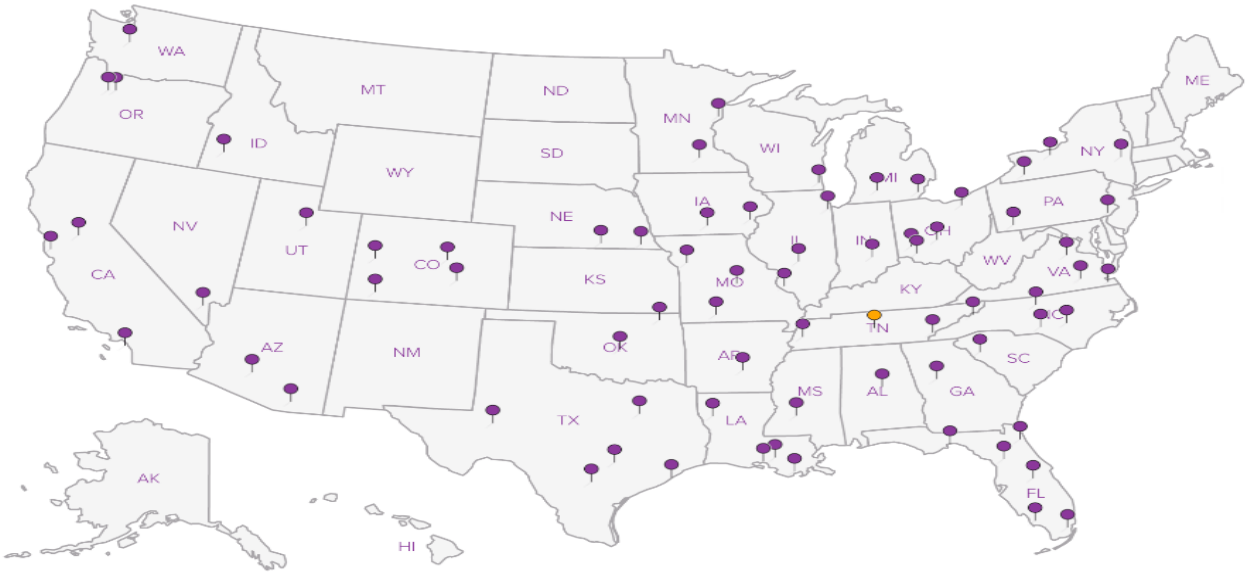
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	S-67674
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Leader Environmental

271 Marsh Road, Suite 2
Pittsford, NY 14534

Billing Information:
Accounts Payable
271 Marsh Road, Suite 2
Pittsford, NY 14534

Report to: Mr. Peter von Schondorf

Email To: pvonschondorf@leaderlink.com

Project Description: Flint Street Redevelopment Project 2

City/State Collected:

Phone: 585-248-2413
Fax:

Client Project # 900 002

Lab Project # LEADERPNY-FLINT

Collected by (print): PETE VON SCHONDORF

Site/Facility ID #

P.O. #

Collected by (signature): Pete von Schondorf

Immediately Packed on Ice N X Y ___

Rush? (Lab MUST Be Notified)
___ Same Day 200%
___ Next Day 100%
___ Two Day 50%
___ Three Day 25%

Date Results Needed

Email? ___No X__Yes
FAX? ___No ___Yes

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	TO-15 Summa	Rem./Contaminant	Sample # (lab only)
SV-1	G	Air		6-2-16	10:55	1	X		-01
SV-2	G	Air		"	11:10	1	X		-02
SV-3	G	Air		"	11:30	1	X		-03
SV-4	G	Air		"	12:15	1	X		-04
SV-5	G	Air		"	2:04	1	X		-05
SV-6	G	Air		"	2:20	1	X		-06
SV-7	G	Air		"	~~2:55~~ 3:10	1	X		-07

Analysis / Container / Preservative

Chain of Custody Page 1 of 1

ESC LABORATORY SCIENCES
YOUR LAB OF CHOICE
12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L839577

Ta F150

Acctnum: LEADERPNY
Template: T110779
Prelogin: P553717
TSR: 064 - Terrie Fudge
PB: BAK 5-18-16
Shipped Via: FedEX 2nd Day

* Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other_____

Remarks: 6711 0340 0778

pH _____ Temp _____
Flow _____ Other _____

Hold #

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Pete von Schondorf	6-3-16	5:00	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)
			Forrest Huff

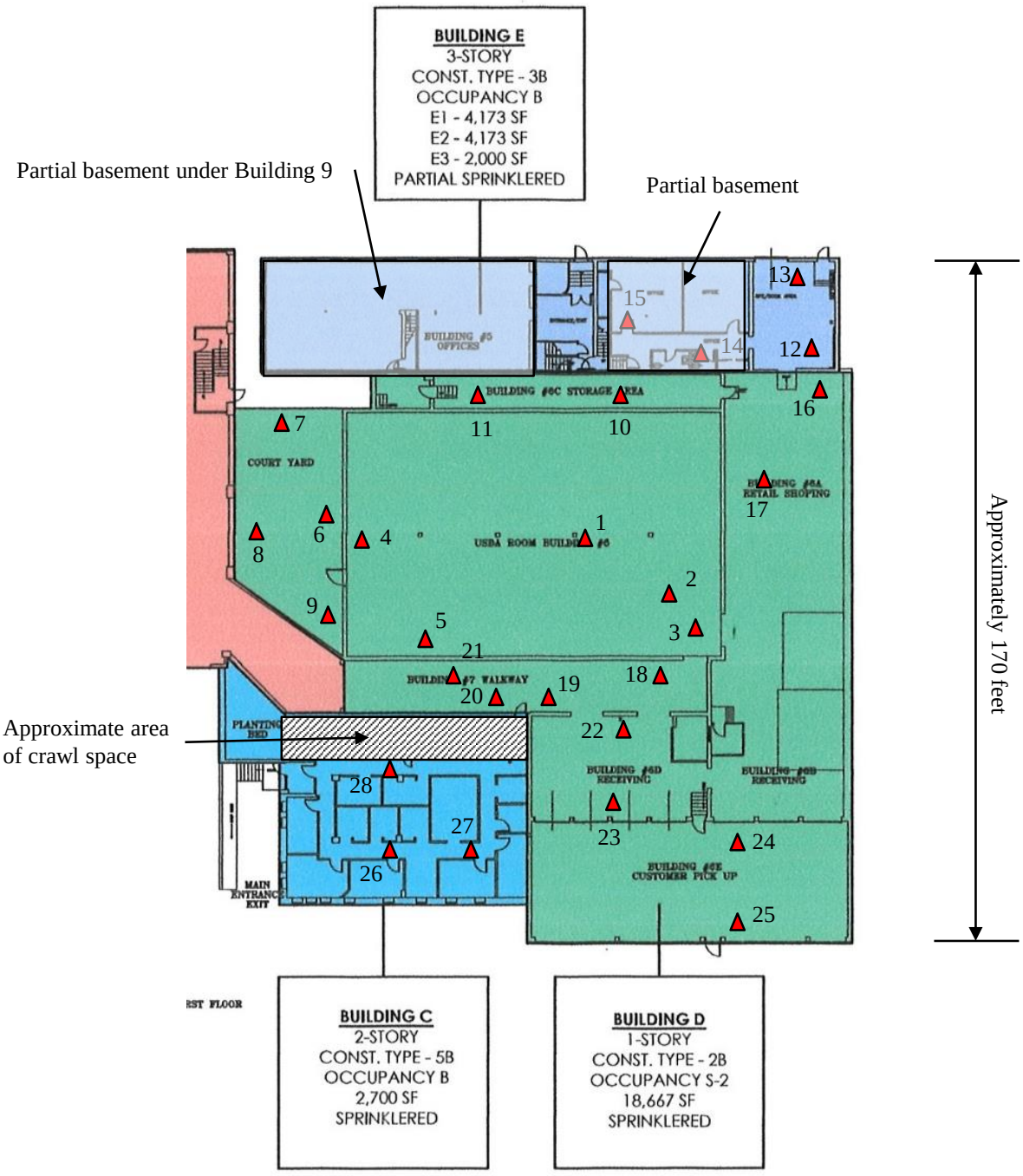
Samples returned via: ☐ UPS ☑ FedEx ☐ Courier ☐ _____
Temp: Amb °C Bottles Received: 7
Date: 6/4/16 Time: 9:00

Condition: (lab use only) GDU
5+x T
COC Seal Intact: ___Y ___N ___NA

pH Checked: NCF:

Appendix 2

Air Flow Results



1 ▲ Test hole # and location

Title: Phase I SSDS Air Flow Testing Locations 936 Exchange Street and 22 Flint Street Rochester, New York 14608	Leader Professional Services, Inc 271 Marsh Road-Suite 2 Pittsford, New York 14534 (585) 248-2413 Fax (585) 248-2834	Project 900.003 Date April 12, 2017 Scale As shown	Drawn PVS Checked MPR File Name Test Locations	Figure 3
Prepared For: Flint Redevelopment LLC 2 State Street Rochester, New York				

Design Testing of Sub-slab Vacuum Response
936 Exhange Street
Phase I Sub-slab Depressization System
Vaccuum Oil Refinery

Extraction Point	Vacuum Monitoring Point	Measurement Inches of Water Vaccuum
1	2	0.027
1	3	0.03
4	4	0.012
6	7	0.001
6	8	0.001
6	9	0.035
10	11	0.001
11	10	0.003
12	13	0.002
14	15	0
15	14	0
16	17	0.005
18	19	0.003
18	20	0.001
21	20	0.035
21	19	0.014
22	23	0.002
18	22	0
24	25	0.004
25	24	0.002
26	27	0.027
26	28	0.035

Appendix 3

Inspection and Testing Forms

Vacuum and Air Flow Measurements from Subslab Depressurization System

Test Location	Vacuum Measurement	Location of Fan	Distance from Fan Extraction Point

Vacuum and Air Flow Measurements from Subslab Depressurization System

Pre-sampling Building Condition and Inventory Notes

Floor	Room	Use	Furnishings	Ducts, cracks, windows, doors	Products/Materials Present	Quantity	Condition	Ingredients	Location	PID Readings	Photo

Appendix 4

Health and Safety Plan

HEALTH AND SAFETY PLAN

Vacuum Oil Refinery
936 Exchange Street and 22 Flint Street Site
New York State Department of Environmental Conservation
Brownfield Cleanup Program
Site # C828193

Prepared for:
Flint Redevelopment, LLC
1400 Crossroads Building
2 State Street
Rochester, New York 14604

Prepared by:
Leader Professional Services, Inc.
271 Marsh Road, Suite 2
Pittsford, New York 14534

900.003

January 2018

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APPENDICES

1.0 Project Personnel Responsibilities

The project organization is presented in Section 1.5.

1.1 Project Director

The Project Director for this project is Evan Dumrese, P.E. Mr. Dumrese will act in a supervisory capacity for all Leader Professional Services, Inc. ("Leader") employees and their subcontractors and the planned site activities with respect to the project site. Mr. Dumrese has the authority to direct site operations including the performance of this health and safety plan. The Project Director will have the required 29 CFR 1910.120 40-Hour Training and have an updated 8-Hour Refresher Training Certificate.

1.2 Project Manager

The Project Manager/QA/QC Manager will be Peter von Schondorf of Leader. If a substitute is required, the Project Supervisor will be an employee of Leader. The Project Manager/Project Supervisor oversees all field and related activities specific to the project when the Project Manager is not on the site. The Project Manager/Project Supervisor will have the required 29 CFR 1910.120 40-Hour Training and have an updated 8-Hour Refresher Training Certificate.

1.3 Health and Safety Officer

Irwin Dobrushin, CIH, CSP, the Leader Site Health and Safety officer ("HSO"). Mr. Dobrushin has the authority to stop work if any operation threatens the health and safety of workers or the public. The HSO may designate a member of the work party for site health and safety responsibilities when the HSO cannot be on site. The HSO will have the required 29CFR 1910.120 40-Hour Training and have an updated 8-Hour Refresher Training Certificate.

1.4 Project Team

Personnel and subcontractors on the project team will be responsible for the completion of the required tasks in the work plan. All personnel on the project team will comply with the site Health & Safety Plan and ensure the site HSO and, or Project Manager is notified of any unsafe conditions. It is anticipated that the project team will consist of one to three individuals. This may vary due to any changes that occur during the actual site work. All personnel on the project team will have the required 29CFR 1910.120 40-Hour Training and participate in daily tailgate health and safety meetings.

1.5 Project Organization

Project Manager – Peter von Schondorf, Leader
Site Supervisor – Matthew Knight, Leader
Health and Safety Officer – Irwin Dobrushin, CIH, CSP, Leader

2.0 Site Standard Operating Safety Procedures

Standard operating and safety procedures include safety precautions and operating practices that all personnel will follow. They include:

2.1 Personal Precautions

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated contaminated.

- Hands and face must be thoroughly washed upon leaving the work area.

- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

- No facial hair, which interferes with a satisfactory fit of the mask-to-face seal, is allowed on personnel required wear respirators. Personnel will use the negative pressure fit test prior to each use of the equipment.

- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, discolored surfaces, kneel on ground, lean, sit or place equipment on drums, containers, or the uncovered ground.

- Medicine and alcohol can enhance or mask the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by field personnel where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages will not be consumed during the work day or breaks.

2.2 Operations

- All personnel going on-site must be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures and communications.

- Any required respiratory protection and chemical protective clothing must be worn by all personnel going into areas designated for wearing protective equipment.

- Personnel on-site must use the buddy system when wearing respiratory protection.

- As a minimum, one person, suitably equipped, is required as safety backup when a working pair does an initial entry of an area where conditions are unknown but have a high probability of encountering impaired air quality. Visual contact must be maintained between individuals and safety personnel during the initial entry. Entry team members should remain together to assist each other during emergencies.

- During continual operations, on-site workers act as safety backup to each other. Personnel outside of the exclusion zone provide emergency assistance.

- Communications using radios, hand signals, signs, or other means must be maintained between team members at all times while in the exclusion zone.

- Wind indicators visible to all site personnel should be strategically located throughout the site.

- Personnel and equipment in the exclusion zone should be minimized to reduce the potential for cross contamination and the generation of decontamination waste.

- Work areas for various operational activities will be established by the Project Manager, or his designee, and the HSO.

- Procedures for leaving the exclusion zone or contaminated area must be planned and implemented prior to going on-site. Work areas and decontamination procedures have been established based on expected site conditions and are described in the project Work Plan.

3.0 Health and Safety Hazards

The potential hazards that may be experienced during the performance of the Work Plan include: chemical exposures from contact with potentially contaminated soil, groundwater, and dust; noise; and hazards inherent to working with drilling equipment and working within an active commercial property where the buildings are loading and receiving trucks, and employees and visitors are coming on to the property.

Slip, trip and fall hazards, and heat stress from performing heavy work while wearing protective clothing are also a concern. The extent of contamination is not fully understood requiring monitoring for the presence of organic vapors and dust. To prevent unnecessary exposures to vapors and dust, and to limit the potential for cross-contamination, work areas will be limited from general access. The presence of organic vapors and dust will be monitored during intrusive work.

Drilling areas whether indoors or outdoors have the potential for cross-contamination through the handling of groundwater and soil and the generation of dust from boring through concrete, asphalt, and dry soil. The formation of distinctive work zones will also assist in reducing the potential hazards that may exist when working at the site.

To further reduce the potential for accidents to involve moving vehicles, Leader, will coordinate field activities and disseminate those plans to the extent possible with the property manager, tenants, and Leader's subcontractors. When needed traffic cones or barricades will be used to direct traffic.

To reduce accidents from occurring that involve slip, trip and fall hazards and hypothermia/heat stress, the work area and work will be monitored by the site HSO and the Project Manager/Project supervisor. All workers will be encouraged to use the "buddy-system" while lifting heavy tools or items to reduce early fatigue while wearing protective clothing. The work sites will be kept as clean as possible and workers limit the amount of equipment and tools in the immediate work area reducing the opportunity of slip, trip and fall incidents.

Table 1 lists potential health and safety hazards that may be encountered at the site based on general site tasks. This list has been compiled based on the scheduled activities and potential site conditions.

4.0 Personal Protective Equipment

The following are general site guidelines. Task specific health and safety plans and worker personal protective equipment ("PPE") needs will be the responsibility of the contractor(s).

4.1 Protective Equipment

All workers engaged in handling or in close proximity to contaminated material personnel will be expected to have their employers provide them with appropriate personal safety equipment and protective clothing. The HSO will provide recommendations for the appropriate levels of PPE.

All workers coming into contact with potentially contaminated materials will be properly trained in the use of safety equipment before the start of field activities. Safety equipment and protective clothing shall be used as directed by the Project

Manager and/or site HSO in concert with their employer's health and safety plan requirements. All PPE will be cleaned and maintained in proper condition by the personnel. The site HSO will monitor the maintenance of personnel protective equipment to ensure proper procedures are followed.

The required personal protective equipment designated by this Health and Safety Plan will be worn at all times. Levels of protective clothing and equipment are not expected to exceed Level C. Results from the previous soil, groundwater, and soil vapor sampling and on-site instrument readings will be used to set action levels and levels of personal protection.

The personal protective equipment levels designated below are in conformance with USEPA criteria for Level A, B, C, and D protection. All respiratory protective equipment used will be approved by National Institute for Occupational Safety and Health ("NIOSH") and Mine Safety and Health Administration ("MSHA"). Although the conditions within the proposed work areas are not well known, thus monitoring will be completed at all times. It is anticipated that the level of respiratory protection will be Level D.

4.2 Level C Protection

A. Personal Protective Equipment

- Half-face, air-purifying, canister-equipped respirator (MSHA/NIOSH approved) for acid/gas/organic vapor with particulate filter
- Chemical-resistant clothing (overalls and long sleeve jacket; coveralls or hooded, one piece or two-piece chemical-splash suit; disposable chemical resistant one-piece suits)
- Work Clothes (long shelve shirt and pants)
- Gloves (outer), chemical resistant
- Gloves (inner), chemical resistant
- Boots (inner), leather work shoe with steel toe and shank
- Boots (outer), chemical resistant (disposable*)
- Hard Hat (face shield*)

- Safety Glasses or goggles

- Taping between suit and gloves, and suit and boots

- High visibility vest

*Optional

B. Criteria for Selection

In order to use Level C protective equipment, the following criteria must be met:

- The measured air concentration of identified substances will be reduced by the respirator to, at, or below the substance's Threshold Limit Value (TLV)/Permissible Exposure Limits (PEL) and the concentration is within the service limit of the canister.

- Atmospheric contaminant concentrations do not exceed IDLH levels.

- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect the small area of skin left unprotected by chemical resistant clothing.

4.3 Level D Protection

A. Personal Protective Equipment

- Work Clothes (long shelve shirt and pants)

- Leather, steel-toed boots

- High visibility vest

- As required:

    - Hard hat
    - Safety glasses/goggles
    - Hearing protection
    - Gloves

B. Criteria for Selection

Meeting all of these criteria permits the use of Level D Protection.

- Measured air concentrations of identified substances are below the substances Permissible Exposure Limit (PEL) or TLV.

- Oxygen content is > 19.5%.

- No unknown substances are present.

5.0 Decontamination

It is expected that the usual level of protection for the site will be Level D. Level C will be used when potential exposures to contaminants justify increased protection. A decontamination zone will be set up at the entrance of each work or exclusion zone or at a specific location on the site. Based on the level of expected exposure to contaminants, the following decontamination protocol will be used.

5.1 Personnel Decontamination

It is expected that a minimum of Level D decontamination will be continually in effect at the site. On the occasions when higher levels of protection are required, appropriate decontamination procedures will be used. The extent of the decontamination procedures will be at the discretion of the site HSO.

In general, decontamination involves removing potentially contaminated soil from gloves and clothing, followed by scrubbing with a non-phosphate soap/water solution and clean water rinses. As a general rule, protective clothing will be removed in the reverse order as it was put on: gloves and boots off first, followed by protective suits and then breathing apparatus. As different types of waste are generated, the team members will segregate the waste into different drums. Potentially contaminated soil will be placed into one drum and decontamination waste fluid into a second drum. All disposable items will be placed into a dry goods drum.

Certain parts of contaminated respirators, harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush. In addition to being decontaminated, all respirators, non-disposable protective clothing and other personal articles must be sanitized before they can be used again unless they are assigned to individuals. The manufacturer's instruction should be followed in sanitizing the respirator masks. The site HSO will be responsible for supervising the proper protective equipment.

All decontamination wastewaters will be collected and disposed of according to applicable regulations. This disposal will be done at the direction of the Project Manager or their designee.

5.2 Equipment Decontamination

Decontamination will be applicable to all activities on site and be completed in the contamination reduction zone ("CRZ") section of the exclusion zone. All equipment (i.e. tools, monitoring equipment, etc.) will receive initial decontamination. All equipment that has been in contact with contaminants shall be stored in an area within the limits of the existing exclusion zone or shall be thoroughly decontaminated prior to leaving the area. Decontamination will consist of cleaning of the entire piece of equipment to the satisfaction of the Site Supervisor or the HSO. Decontamination will be a multi-process task, first all loose dirt or other foreign materials will be removed from the equipment surface. Scrubbing with a synthetic wire brush may be required to remove materials that adhere to the surfaces. After the loose material is removed, the equipment will be washed using a detergent and water solution and a brush followed by successive rinses with clean water. Washing with hot water from a power washer may be substituted for a synthetic wire brush.

All contaminated equipment will be stored on plastic sheeting in such a manner that decontamination fluids can be collected and disposed of in accordance with applicable regulations. Clean equipment not in use will be covered with plastic and stored at a designated storage area.

Air monitoring equipment will be protected with an outer coating (i.e. plastic), if there is a potential for the equipment to come into contact with potentially contaminated materials prior to the initial entry into the exclusion zone. Decontamination will then consist of removal of the protective coating in a manner that will not contaminate the air monitoring equipment.

6.0 Site Air Monitoring

Field activities associated with the work tasks at the Site may pose hazardous conditions, such as the release of hazardous substances into the worker's breathing zone. These substances may be in the form of vapors, dusts, or mists that can enter the body through ingestion, inhalation, or direct skin or eye contact. If the HSO, relying on instrument observations and odor, determines that a condition exists in which workers may be exposed to airborne hazardous materials, the HSO will upgrade the team's level of respiratory protection and complete chemical specific monitoring.

The following paragraphs describe the monitoring parameters to be evaluated during the start of the project. As the project continues, other site-specific monitoring will be required based on site conditions and experience at the site. Because this project will be completed in the spring/summer and the proposed work area is covered with a combination of asphalt, gravel or soil, there is a concern about contaminated dust being an issue. Potential combustible concentrations of petroleum related compounds have not been identified to date as a concern in the soil or groundwater, and soil vapor concentrations do not appear to be an explosive hazard, but if allowed to accumulate in a confined space a different assessment may be made. The soil vapor has been found to contain elevated levels of chlorinated solvents which are not an explosive hazard, but a potential respiratory hazard. Thus, the necessity for oxygen and combustible gas monitors is not supported at this time. All instruments to be used during site activities will meet the established requirements set forth by OSHA, MSHA, NIOSH, and state agencies where applicable for being non-explosive hazard.

Field instrument measurements of VOCs will be made during work progress with a direct reading organic vapor meter. Monitoring will take place in the work zone and workers breathing zone, up and down-wind from the work zone and at the site perimeter. Monitoring within the work zone will be taken at least every 5 to 10 minutes. Monitoring up and downwind of the work zone will be completed at least every 15 to 30 minutes and monitoring at the site perimeter will be completed at least every 60 minutes. If elevated readings are obtained (elevated compared to up-wind readings or compared to site specific action levels), then the frequency of taking measurements will be increased at the monitoring stations. When work areas are within 20-feet of a receptor or building or the work area is indoors in an occupied building, the Community Air Monitoring Plan will preside over the H&SP for air monitoring of VOCs and dust.

Based on preliminary soil and groundwater sampling data, it is anticipated that organic vapors will range from 0 to 100 parts per million (“ppm”) in the sample headspace, but no VOCs were identified in the breathing zone. Nuisance odors are may be an issue in some locations. Organic vapor concentrations will be the primary measure for upgrading or downgrading worker respiratory protective equipment and implementing additional precautions or procedures (See Table 2, Action Levels).

Dust monitoring will be conducted each day as conditions warrant from strategic locations up and down the site’s work areas. Dust monitoring will not be done when it is raining or snowing, or when minimal intrusive work is being conducted. For example, dust monitoring will not be required when sampling monitoring wells. These locations may vary based on where on the site work is being conducted and the wind direction. At least one upwind and one downwind locations will be monitored during intrusive site work. The Project Manager and

HSO may require additional monitoring stations based on the location of the activity, the type of activity and wind conditions.

If dust exceed thresholds at the upwind monitoring location during the investigative activities, the HSO will instruct the contractor to take an appropriate level of corrective action. If dust from the work areas exceed project thresholds at the downwind monitoring locations compared to the upwind monitoring location, the HSO will stop work causing the dust problem, determine what is causing the problem, seek a remedy.

All site monitoring will be conducted by or under the direction of the site HSO or if a concern was raised by a worker, NYSDEC, NYSDOH, or the Monroe County Department of Health. All readings obtained will be recorded in a dedicated site notebook maintained by the Project Manager/HSO or their designee. The site HSO will maintain all monitoring instruments throughout the remedial action to ensure their reliability and proper operation.

7.0 Action Levels

Action levels have been established for the levels of personal protective equipment. Table 2 lists the action levels. Section 8.0 discusses the minimal personal protection required for specific site activities based on current information. Changes to these specified levels are dependent on the result of air monitoring as outlined below.

8.0 Site Activities and Associated Personnel Protective Requirements

The levels of protection have been assigned anticipated site activities (below) and represent a best estimate of exposure potential and protective equipment needed for that exposure. The contractor's HSO in consultation with the site HSO will revise those levels of protection, up or down, based on air monitoring results, and on-site assessments of actual exposures.

- *Level D* - General site work with limited physical contact with contaminated soil by personnel. If workers must handle contaminated tools or handle contaminated soil or groundwater, protective chemical resistant gloves will be worn. Respiratory protection is not required because contaminant action levels cited on Table 2 are not exceeded.

- *Modified Level C* - General site work where personnel will be in direct contact with contaminated soil or groundwater, but respiratory protection is not required because contaminant action levels cited on Table 2 are not exceeded.

- *Level C* - General site work where personnel will be in direct contact with contaminated soil or groundwater, and organic vapor measurements or dust measurements are greater than those action levels cited on Table 2.

9.0 Contingency Plan

The Project Manager or HSO, or their designee is responsible for implementing the Contingency Plan whenever there is either a threat to human health or an environmental hazard. Possible Contingency Plan situations include actual or imminent fires, explosions or spills.

The individual discovering a fire, or a threat of explosion emergency, is to notify the appropriate emergency personnel using 911. The Project Manager or HSO will be notified immediately afterward so buildings occupants can be notified. The Project Manager or HSO will assist the Fire Department, ambulance or HazMat team. The Project Manager or HSO will also notify the NYSDEC. In the event of a spill incident, the NYSDEC will be notified as soon as possible after discovery of the spill. Any other agency or contractor will also be notified to assist with the spill cleanup. The site owner will be notified as soon as possible of an incident. Table 3 provides a contact list for emergencies.

9.1 Assessment

The Project Manager/HSO is responsible initially for assessing any possible health or environmental hazards and determining the need for evacuation and notification of the proper authorities and resources.

9.2 Control Procedures

The team member or site employee discovering a fire, explosion, spill or other emergency situation is responsible for notifying the 911 system/Project Manager or site HSO and as much as possible, provide the information listed in Table 3.0. The Project Manager or HSO will assess the situation and notify the Flint Redevelopment representative.

Before any worker attempts to extinguish a fire, they will call the 911 system and notify the Project Manager. Prior to a cleanup of a spill, the Project Manager will be notified and provide information regarding the spill. The Project Manager will notify the appropriate agencies and resources.

Before attempting a cleanup, the properties of the material involved and its associated hazards must be evaluated. All workers will be familiarized with the potential hazards during the initial tail grate safety meeting and are instructed on the proper protective clothing to be worn in such a situation.

Table 3 includes a list of the organizations that are available to provide emergency assistance.

9.3 Fire and/or Explosion

The most serious emergency that could be faced at the site would be a chemical release or a fire. In the event of a fire or explosion, the 911 system will be notified along with the Project Manager or HSO as described in the preceding section. The Project Manager or HSO are responsible for notifying the property tenants and determining if evacuation is necessary.

The Fire Department should be notified immediately once a fire is detected. Small fires (trash can size) can be extinguished using a fire extinguisher located at the site. Other fires will be handled by the Fire Department. The Fire Department will be informed of the nature of any fire requiring the use of a fire extinguisher or the presence of hazardous wastes at the site.

9.4 Spill and/or Material Releases

The procedure for notification of the Project Manager or HSO are described in Section 9.2. Immediately following the discovery of a spill, the Project Manager or HSO, or their designee, will decide the appropriate action. As soon as possible, the NYSDEC will be notified. In addition, the Federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA", or "Superfund") requires that the National Response Center be notified of any release in excess of the reportable quantity of a listed material.

The decision to proceed with a spill cleanup is dependent on the potential dangers posed by the spill; if the spill poses no little danger (non-combustible/flammable material) and it consists of a few gallons of liquid, the first step is to determine the source of the spill and correct it. This may involve patching a leaking drum, closing a valve or turning off a pump. In the event of a small spill, absorbent granules or sorbent pads will be utilized to soak up the spilled material. The granules will be swept up and containerized in DOT approved drums.

In the event of a large spill or a spill of flammable, reactive or corrosive material, a remedial contractor and/or the Fire Department will be notified for assistance with the spill cleanup. NYSDEC will be notified at the same time. Any spent materials used to contain or cleanup a spill will be placed in DOT approved drums or contained on plastic.

Any contaminated structures and equipment must be properly cleaned before it is returned to service. This procedure will include the use of pressure washers and sorbent materials. All affected floors and equipment, pumps and hoses, will be cleaned with an appropriate detergent and rinsed with clear clean water. Appropriate cleanup verification sampling will be conducted.

10.0 Work Areas

The Project Manager and contractor, will clearly layout and identify work areas in the field and will limit equipment, operations and personnel being used in the applicable areas:

a) "Exclusion Zone" – This area is a sampling location or work area where contamination is suspected, and sampling needs to be conducted to determine if contaminants are present or a work area where contamination is known and additional work needs to be completed. The Exclusion Zone will encompass the entire work area and sufficient area for equipment and material handling. Individuals in working in this area may require PPE to control a potential exposure. The level of PPE required in these areas will be determined by the site HSO. The area will be clearly delineated from the decontamination area. As work within the hazardous zone proceeds, the delineating boundary will be relocated as necessary to prevent the accidental contamination of nearby people and equipment. The Exclusion Zone will be delineated by plastic caution tape, barriers, or fencing (e.g. chain link, snow, or orange plastic fencing).

b) Contamination Reduction Zone (CRZ) - This zone will occur at the interface of "Contaminated" and "Clean" areas and will provide for the decontamination of equipment and materials and the transfer of equipment from the Clean Area to the Exclusion Zone. This area will contain all required emergency equipment, etc. This area will be clearly delineated by plastic tape, barriers or fencing (e.g., chain link, snow, or orange plastic fencing).

c) Support Zone ("Clean" Area) - This area is the remainder of the work site and project site. The "Clean" area will be clearly delineated and procedures implemented to prevent active or passive contamination from the work site.

The function of the "Clean" area includes:

1) An entry area for personnel, material, and equipment to the "Contaminated Zone" area of site operations through the neutral zone.

2) An exit for decontaminated personnel, materials, and equipment from the "CRZ" area of site operations; and

3) A clean storage area for safety and work equipment.

11.0 Safety Equipment and Protective Clothing Specifications

All project team members and environmental contractors will have available the following safety equipment:

- Air purifying respirator with appropriate cartridges
- All protective clothing including, but not limited to:
  - Tyvek and, or washable PVC rain suits
  - Gloves
  - Boots
- Safety glasses
- Hearing protection
- Hard hats
- High visibility vest.

12.0 Air Emissions Control

The Project Manager and environmental contractor shall have on-site all equipment and personnel necessary to monitor and control air emissions.

It is not expected that air emissions will pose a significant risk to health and safety or to the environment due to the nature of the contaminants on this project.

The Project Manager or the HSO will make the determination for requiring monitoring and control of air emissions with the assistance of the following monitoring equipment and the action levels cited on Table 2. It is anticipated that an organic vapor analyzer and dust monitors will be used to measure the concentration of organic contaminants and dust in the air. These two measurement devices will handle the bulk of the real-time contaminant monitoring.

13.0 Additional Health and Safety Comments

1) The site HSO will ensure that all safety equipment and protective clothing is kept clean and well maintained.

2) All prescription eyeglasses in use on this project will be safety glasses and will be compatible with respirators. No contact lenses shall be allowed on-site.

3) All disposable or reusable gloves worn on the site will be approved by the HSO.

4) During periods of prolonged respirator usage in contaminated areas, respirator filters will be changed upon breakthrough and at a minimum, filters will be changed daily.

5) Footwear used on-site will be covered by rubber over-boots when entering or working in the "Exclusion Zone" area or "CRZ." Boots will be washed with water and detergents to remove dirt and contaminated sediment before leaving the "CRZ."

6) All personnel protective equipment used on-site will be decontaminated or disposed of at the end of the workday.

7) All air purifying respirators will be individually assigned and not interchanged between workers without cleaning and sanitizing.

8) Any team member or worker with the environmental contractor unable to pass a fit test because of facial hair or facial configuration shall not enter or work in an area that requires respiratory protection.

9) The environmental contractor will ensure that all workers will have vision or corrected vision to at least 20/40 in one eye.

10) Workers found to be disregarding any provision of this plan will, at the request of the HSO, be barred from the project.

11) Used disposable outerwear will be removed upon leaving CRZ and will be placed inside disposable containers labeled for that purpose. These containers will be stored at the site at the designated staging area. Leader will be responsible for proper disposal of these materials at the completion of the project.

12) Tyvek or PVC rain suits that become torn or badly soiled will be replace immediately.

13) Eating, drinking, chewing gum or tobacco, smoking, etc., will be prohibited in the exclusion zones and CRZ zones.

14) All personnel will thoroughly cleanse their hands, face, forearms, and other exposed areas prior to eating, smoking, or drinking.

15) All personnel will wash their hands, face, and forearms before using toilet facilities.

16) No alcohol, firearms, or drugs (without prescription) will be allowed on-site at any time.

14.0 Miscellaneous Health and Safety Items

14.1 Heat Stress

Pervious Clothing: When the ambient air temperature is above 80^{o} F. and humidity above 40-percent the site HSO will begin to monitor employees for signs of heat stress. Monitoring will take the form of measuring oral temperatures. The air temperature will be measured two times a day when the air temperature is expected to be above 80^{o} F or as determined by the HSO.

Impervious Clothing: When the ambient air temperature is above 70^{o} F. the HSO will begin to monitor employees for signs of heat stress. Monitoring will take the form of measuring oral temperatures and checking an individual's heat rate. As the air temperature rises above 70^{o} F. oral temperatures will be measured at the direction of the HSO and, or every hour during work periods.

In the event that the oral temperature at the beginning of the rest period rises above 99^{o} F. and the heart rate is above 100 beats per minute, the employee will be decontaminated and be advised to proceed to a shaded area or air conditioned vehicle and remove wet clothing and to drink cool fluids. At the end of the rest period, the oral temperature will be taken again to ensure that the employee's temperature is 98.6^{o} F. If the oral temperature has remained above 99^{o} F. and the heart rate is above 100, the employee will be advised to take a shower to lower their temperature. However, if the oral temperature remains above 99^{o} F. and heart rate remains at 100 after the shower, the employee will be immediately sent to consult with a physician.

A fluid/electrolyte replacement will be used as necessary to minimize fluid loss. This liquid supplement will be stored in a cooler or thermos at the edge of the decontamination zone in plastic squeeze bottles. The plastic bottles will be marked with individual's names. Disposable cups with lids and straws may be used in place of the squeeze bottles.

Prior to drinking within the decontamination zone, the project personnel shall follow the following decontamination procedures:

1) Personnel shall wash and rinse their outer gloves and remove them.

2) Personnel shall remove their hard hats and respirators and place on a table.

3) Personnel shall remove their inner gloves and place them on a table.

4) Personnel shall wash and rinse their face and hands.

5) Personnel shall carefully remove their personal bottle or cup from the cooler to ensure that their outer clothes do not touch any bottles, cups, etc.

6) The used bottle or cups will not be returned to the cooler, but will be placed in a receptacle or container to be cleaned or disposed of.

7) Personnel shall replace their respirators, hard hats, gloves, and tape gloves prior to re-entering the hazardous zone.

14.2 Waste Retention On-Site

During the course of the project, it is expected that waste materials will be retained on-site until removed by the identified contractor or Flint Redevelopment. All waste containers will be labeled according to DOT and other regulations where appropriate. Waste materials, both drummed and bulk, will be stored in designated areas. All waste drums will be sealed before they are moved from the exclusion zone.

14.3 Equipment and Material Decontamination

All equipment and material used in this project shall be thoroughly decontaminated using procedures described in the project Work Plan before it is removed from the project site. Debris and contaminated clothing and tools which cannot be decontaminated, shall be disposed of.

14.4 Communications

Telephone communications will be available at all times on the site. A telephone will be maintained with the Project Manager or the environmental contractor.

Communication procedures are outlined in the Contingency Plan in Section 9.0 of the H&SP.

Table 3 contains an emergency call list and will be posted in one of the team member's vehicles, or the general contractor's trailer.

14.5 On-Site Hygiene Facilities

The portable lavatories will be available for use on the site. Water will be available in the CRZ for decontamination.

A first aid kit will be kept in the support zone at the site at all times.

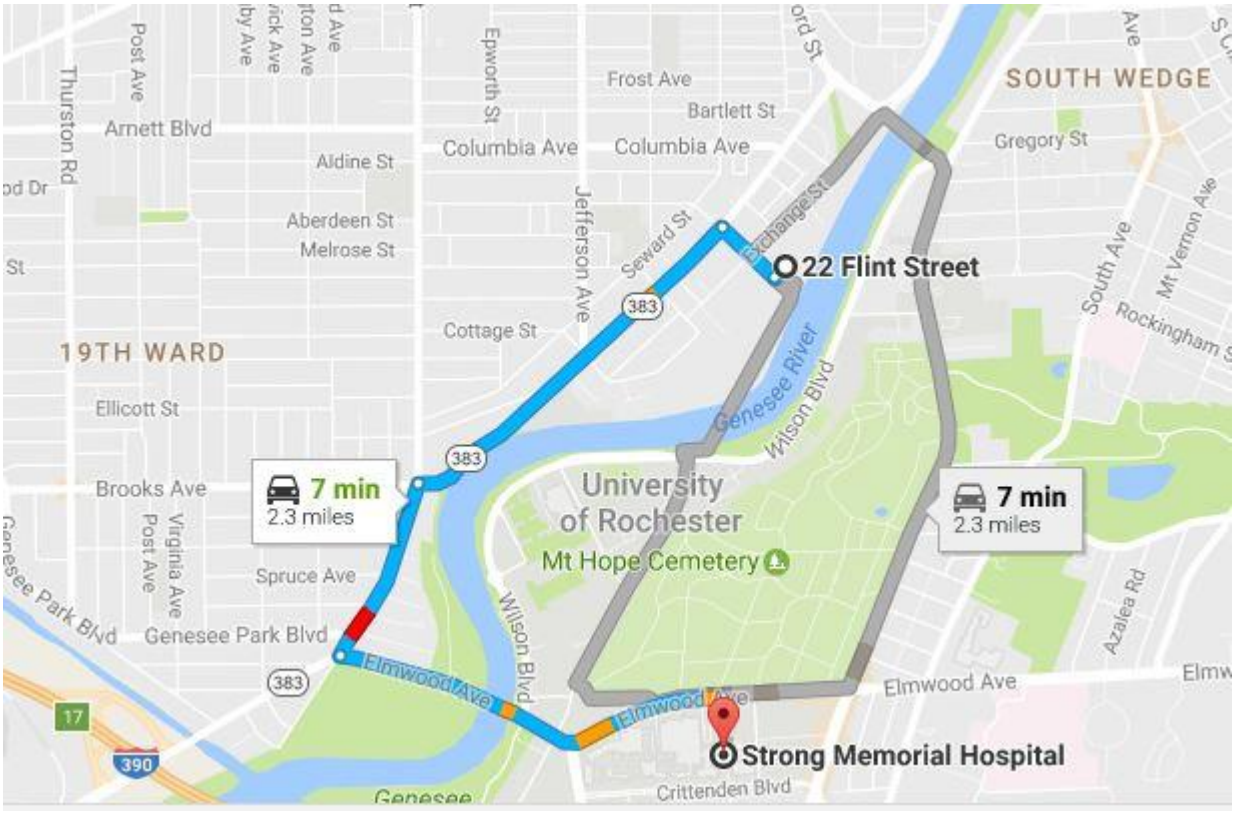
15.0 Tailgate Safety Meetings

The HSO or the designated representative will conduct daily tailgate safety meetings each workday and will be mandatory for all project personnel. The meetings will provide information on the anticipated site conditions and the work to be completed that day. Appendix A contains a form for documenting Safety Meetings. Completed forms will be retained in Leader's project file.

Additional safety meetings will be held on an as required basis.

16.0 Medical Surveillance

All team members and subcontractors that may potentially have contact with hazardous substances at concentrations above the permissible exposure level (PEL) will be part of a Medical Monitoring Program as outlined in 29CFR 1910.134 and 29CFR 1910.120.



1. Head northwest on Flint Street toward Exchange Street.
2. Turn left on to Plymouth Avenue (second intersection)
3. Turn left on to Genesee Street
4. Use two left lanes and turn left on to Elmwood Avenue
5. Hospital is on the right at 601 Elmwood Avenue

Strong Hospital 585-275-2100

Title: Route to Hospital 936 Exchange Street and 22 Flint Street Rochester, NY		Project: 900.003 Date: 2/16/17 Scale: Not to Scale	Drawn: PVS Checked: MPR File Name: Hospital Map	Figure: 1
Prepared For: Flint Redevelopment, LLC 2 State Street Rochester, New York	Leader Professional Services 271 Marsh Road, Suite 2 Pittsford, NY 14534 (585) 248-2413 FAX (585) 248-2834			

TABLE 1

KNOWN AND POTENTIAL HEALTH AND SAFETY HAZARDS
LIGHTHOUSE POINTE RIVERFRONT SITE
IRONDEQUOIT AND ROCHESTER, NEW YORK

Known and Potential Site Hazards: *Chemical* (See Appendix B for information sheets and/or MSDSs)

1) Contaminants

- Petroleum related compounds (xylene, naphthalene, trimethylbenzene, and polynuclear aromatic hydrocarbons)
- Perchloroethylene
- Trichloroethylene
- Arsenic
- Lead
- Mercury
- Zinc

2) Review of Symptoms

Symptoms of exposure to hazardous wastes, in particular to the contaminants above, will be reviewed with all site personnel. Symptoms of both acute and chronic exposures will be covered. In addition, the on-site coordinators will be advised to watch for outward evidence of changes in workers' health. These outward symptoms may include fatigue, tremor, insomnia, skin irritations or discoloration, eye, nose and throat irritation, cough, or abdominal soreness.

Note the number and nature of potential contaminants mandate that contact of waste materials with the exposed skin must not be allowed to occur under any circumstances.

Known and Potential Site Hazards: *Non-Chemical*

- General Physical Hazards. Since the project will take place on vacant land where the adjacent properties include public roads, residential property and boat slips. The work taking place on the Site will initially involve earth moving and later, building construction where the physical hazards include:

  Vehicular traffic
  Sharps (metals and glass)
  Underground and aboveground utilities
  Slip, trip, and fall

TABLE 2

ACTION LEVELS
VACUUM OIL REFINERY SITE
ROCHESTER, NEW YORK

Unknown Organic Vapor Concentrations (ppm)[1]	Level of Protection
< 1	Level D
≥ 1 < 10	Level C
>10	Level B

Anticipated Chemical Contaminants[2]	Time Weight Average (ppm)
Petroleum (Gasoline)	300
Metals (as Mercury dust)	<0.025 mg/cubic meter
Trichloroethylene or Perchloroethylene	100

Note:

1 Unknown organic vapor action levels are based on the lowest known exposure limits for chlorine (PEL = 1 ppm, IDLH = 30 ppm). The air purifying cartridge limitation for chlorine is 10 ppm.

TABLE 3

EMERGENCY CALL LIST
VACUUM OIL REFINERY SITE
ROCHESTER, NEW YORK

Fires - Spills

Rochester City Fire Department	911

Public Services

Rochester City Police Emergency	911

Emergency Medical Services

University of Rochester Medical Center	(585) 273-3937

SPILL NOTIFICATION

Agencies

National Response Center	(800) 424-8802
NYSDEC Spill Hotline	(800) 457-7362

Provide the following information to the agencies:

- Name of person making the call
- Company and location
- Nature of fire (fire calls only)
- Name and estimated amount of chemical released to the environment (spills only)
- Time of release
- Remedial action taken to correct the problem

Site Contacts

Frank Sowers (NYSDEC Project Manager)	(585) 226-5357
Peter von Schondorf (Leader Professional Services-Rochester)	(585) 248-2413
Michael Rumrill (Leader Professional Services – Rochester)	(585) 248-2413

APPENDIX A

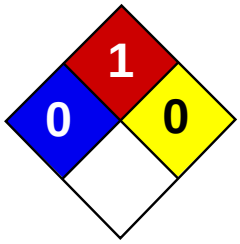
SAFETY MEETING SIGN-OFF SHEETS

SAFETY MEETING ATTENDENCE SIGN-OFF SHEET

Person/Company	Date

APPENDIX B

MSDS



Material Safety Data Sheet
Anthracene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Anthracene

Catalog Codes: SLA3670

CAS#: 120-12-7

RTECS: CA9350000

TSCA: TSCA 8(b) inventory: Anthracene

CI#: Not available.

Synonym:

Chemical Formula: C14H10

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Anthracene	120-12-7	100

Toxicological Data on Ingredients: Anthracene LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of inhalation. Hazardous in case of skin contact (permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Very hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of inhalation. Hazardous in case of skin contact (permeator), of ingestion. CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Clear evidence.) by NTP, + (Proven.) by OSHA. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 540°C (1004°F)

Flash Points: CLOSED CUP: 121°C (249.8°F).

Flammable Limits: LOWER: 0.6%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Slight.

Taste: Not available.

Molecular Weight: 178.22 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 342°C (647.6°F)

Melting Point: 218°C (424.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.25 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 6.15 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Clear evidence.) by NTP, + (Proven.) by OSHA. Causes damage to the following organs: kidneys, lungs, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant, sensitizer), of inhalation. Hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Anthracene Massachusetts RTK: Anthracene TSCA 8(b) inventory: Anthracene SARA 313 toxic chemical notification and release reporting: Anthracene CERCLA: Hazardous substances.: Anthracene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R38- Irritating to skin. R41- Risk of serious damage to eyes. R43- May cause sensitization by skin contact. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 0

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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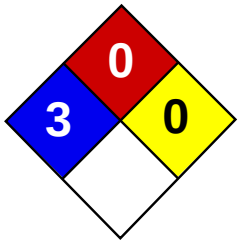
Last Updated: 05/21/2013 12:00 PM



Health	3
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Arsenic trioxide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic trioxide

Catalog Codes: SLA3175, SLA4678

CAS#: 1327-53-3

RTECS: CG3325000

TSCA: TSCA 8(b) inventory: Arsenic trioxide

CI#: Not applicable.

Synonym: Arsenic oxide; Arsenic Trioxide

Chemical Name: Diarsenic trioxide

Chemical Formula: As2O3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic trioxide	1327-53-3	100

Toxicological Data on Ingredients: Arsenic trioxide: ORAL (LD50): Acute: 14.6 mg/kg [Rat.]. 31.5 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, cardiovascular system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When heated to decomposition it emits toxic fumes. Arsenic trioxide + sodium chlorate for a spontaneously flammable mixture. Hydrogen fluoride + Arsenic trioxde react with incandescence.

Special Remarks on Explosion Hazards: Arsenic trioxide + zinc will explode on heating.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Poisonous solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.05 (mg(AS)/m) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Amorphous solid powder or lumps.)

Odor: Odorless.

Taste: Tasteless.

Molecular Weight: 197.84 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: 465°C (869°F)

Melting Point: 312.3°C (594.1°F)

Critical Temperature: Not available.

Specific Gravity: 3.74 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Partially soluble in cold water, hot water. Very slightly soluble in diethyl ether. Soluble in dilute hydrochloric acid, in alkali hydroxide. Soluble in carbonate solution. Practically insoluble in alcohol. Practically insoluble in chloroform. Soluble in gylcerin.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture, dust generation, excess heat

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Dangerous when heated to decomposition. It emits toxic fumes of Arsenic. Dissolves in alkali to form arsenites. Incompatible with tannic acid, infusion of Chincona & other vegetable astringent infusions & decoctions, iron (in solution). Forms toxic volatile halides in contact in contact with halide acids. Forms volatile, highly toxic Arsine when reduced in acid solution. A vigorous reaction occurs between Oxygen Difluoride, Aluminum Chloride and Arsenic Trioxide. Chlorine Trifluoride + Arsenic Trioxide produces a violent reaction without flame. Can generate Arsine, which is an extremely poisonous gas, when arsenic compounds contact acid, alkalies, or water in the presence of an active metal (zinc, aluminum, manganese, sodium, iron, etc.)

Special Remarks on Corrosivity: Corrosive to metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 14.6 mg/kg [Rat.].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Classified POSSIBLE for human. May cause damage to the following organs: blood, kidneys, liver, cardiovascular system, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Passes through the placental barrier in human. May affect genetic material. May cause adverse reproductive (paternal and maternal effects as well as fetotoxicity or post implantation mortality) and birth defects (teratogen). May cause cancer (tumorigenic)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: May cause eye irritation. May also affect vision. Inhalation: May cause respiratory tract irritation with sore throat, coughing, shortness of breath, and delayed lung edema. Ingestion: May be fatal if swallowed. Causes severe digestive tract irritation. Symptoms may include garlic-like odor of breath, garlic taste, possible bloody diarrhea, Mee's Lines (transverse white lines on nails), abdominal pain, nausea, vomiting. May also affect the liver, blood (anemia, hemolysis, pancytopenia), urinary tract (Kidneys), cardiovascular system (lowering of blood pressure and changes in EKG), behavior/Central Nervous System, metabolsim, and brain. Chronic Potential Health Effects: Skin: May cause dermatitis. symptoms may include cracking, thickening, pigmentation and drying of the skin. Eyes: May cause irritation, and affect vision (photophobia, dimness of vision, diplopia).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic trioxide UNNA: 1561 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic trioxide California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Arsenic trioxide California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic trioxide Connecticut hazardous material survey.: Arsenic trioxide Illinois chemical safety act: Arsenic trioxide New York release reporting list: Arsenic trioxide Rhode Island RTK hazardous substances: Arsenic trioxide Pennsylvania RTK: Arsenic trioxide Massachusetts RTK: Arsenic trioxide Massachusetts spill list: Arsenic trioxide New Jersey: Arsenic trioxide New Jersey spill list: Arsenic trioxide Louisiana RTK reporting list: Arsenic trioxide Louisiana spill reporting: Arsenic trioxide California Director's List of Hazardous Substances: Arsenic trioxide TSCA 8(b) inventory: Arsenic trioxide SARA 302/304/311/312 extremely hazardous substances: Arsenic trioxide SARA 313 toxic chemical notification and release reporting: Arsenic trioxide CERCLA: Hazardous substances.: Arsenic trioxide: 1 lbs. (0.4536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R28- Very toxic if swallowed. R36/38- Irritating to eyes and skin. R45- May cause cancer. S1/2- Keep locked up and out of the reach of children. S28- After contact with skin, wash immediately with plenty of [***] S36/37- Wear suitable protective clothing and gloves. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tÃ©ratogÃ¨nes, mutagÃ¨nes, cancÃ©rogÃ¨nes. RÃ©pertoire toxicologique de la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du rÃ¨glement sur le transport des marchandises dangeureuses au canada. Centre de conformitÃ© internatinal LtÃ©e. 1986.

Other Special Considerations: Not available.

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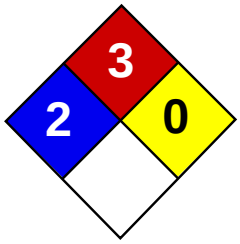

Material Safety Data Sheet
Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powferful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m3) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m3) [Canada] TWA: 0.5 (ppm) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Aromatic. Gasoline-like, rather pleasant. (Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

pH (1% soln/water): Not available.

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

Other Toxic Effects on Humans:
Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia)) Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism,and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Safety Data Sheet

According to Commission Regulation (EU) 2015/830
Revision Date:08/12/2016
www.restek.com

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier 31272 / Benzo(b)fluoranthene Standard

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Uses For Laboratory use only

Uses advised against Uses other than recomended use.

1.3. Details of the supplier of the safety data sheet

Manufacturer	**Supplier**
Restek Corporation 110 Benner Circle Bellefonte, Pa. 16823 USA 00 1 814-353-1300 00 1 814-353-1309 sds@restek.com	Thames Restek UK LTD Units 8-16, Ministry Wharf Wycombe Road, Saunderton Buckinghamshire United Kingdom HP14 4HW 01494 563377 sales@thamesrestek.co.uk

1.4. Emergency telephone number

00 1 800-424-9300 (CHEMTREC within the US)	0870-8200418 (CHEMTREC within the UK)
00 1 703-741-5970 (Outside USA)	+1 703-741-5970 (CHEMTREC International)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 (CLP)

Flammable Liquid Category 2

Serious Eye Damage/Eye Irritation Category 2

Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3

2.2. Label elements

Labelling according to Regulation (EC) No 1272/2008 [CLP]

GHS Hazard Symbols

Signal Word Danger

Hazard Statements
H225 - Highly flammable liquid and vapour.
H319 - Causes serious eye irritation.
H336 - May cause drowsiness or dizziness.

Precautionary Statements

Prevention
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.

Response
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P370+P378 - In case of fire: Use extinguishing media in section 5 to extinguish.

Storage
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.

Supplemental Hazard information (EU) Not applicable

2.3. Other hazards

Does the substance or mixture meets the criteria for PBT or vPvB in accordance with Annex XIII (or handled as if they were PBT/vPvB) The substance or mixture does not meet the required criteria

Water Hazard Class ID Number 6, hazard class 1 - low hazard to waters
ID Number 5926, hazard class 3 - severe hazard to waters

SECTION 3: Composition/information on ingredients

3.1. Substances
Not applicable

3.2. Mixtures

Chemical Name	%	CAS #	(EC) No 1272/2008	M-Factor as found in Annex VI	SCL as found in Annex VI
Acetone	99.900000	67-64-1	Eye Irrit. 2; H319 Flam. Liq. 2; H225 STOT SE 3; H335, H336	No data available.	No data available.
benzo (b) fluoranthene	0.100000	205-99-2	Aquatic Acute 1; H400 Aquatic Chronic 1; H410 Carc. 1B; H350	No data available.	No data available.

Non hazardous components may be present in this table due to their classification as “non-classified vPvB substance” or “a substance with a Union workplace exposure limit”.

SECTION 4: First aid measures

4.1. Description of 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.

4.2. Most important symptoms and effects, both acute and delayed

Symptom See Section 4.1

4.3. Indication of any immediate medical attention and special treatment needed

Note to Doctor No additional first aid information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable 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.

Unsuitable extinguishing media None Known

5.2. Special hazards arising from the substance or mixture

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

Hazardous Combustion Products Carbon dioxide, Carbon monoxide

5.3. Advice for firefighters

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.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel Isolate area. Keep unnecessary personnel away.

For emergency responders 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.

6.2. Environmental precautions No data available.

6.3. Methods and material for containment and cleaning 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.

6.4. Reference to other sections Refer to Section 8 for personal protective equipment and Section 13 for Disposal Information.

SECTION 7: Handling and storage

7.1. Precautions for safe handling 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

7.2. Conditions for safe storage, including any incompatibilities

Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

7.3. Specific end use(s) For Laboratory use only

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational Exposure limit values:

Chemical Name	CAS #	EINECS	WEL-STEL	WEL-TWA	Biological Exposure Limits
Acetone	67-64-1	200-662-2	1500 ppm STEL; 3620 mg/m3 STEL	500 ppm TWA; 1210 mg/m3 TWA	No data available.

Information on monitoring procedures No data available.

8.2. Exposure controls

Appropriate engineering Local exhaust ventilation is recommended when generating excessive levels of

controls	vapors from handling or thermal processing.

Personal protection equipment

Eye/face protection	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
Skin Protection	
Hand protection	Nitrile Neoprene
Other 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
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.
Respirator Type(s)	Not normally required.
Thermal hazards	No data available.
Environmental exposure controls	No data available.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	No data available.
Colour	Depends upon product selection
Odour	Strong
Odour threshold	ND
pH	No data available.
Melting point/freezing point °C	-95
Initial boiling point and boiling range °C	56
Flash Point °C	-20
Evaporation Rate	Not determined
Flammability (solid, gas)	No data available.
Upper Flammabl or Explosive Limit, % in air	No data available.
Lower Flammable or Explosive Limit, % in air	No data available.
Vapour Pressure	2.00
Vapour Density	2.00
Relative density	0.791
Solubility(ies)	Complete; 100%
Partition coefficient: n-octanol/water	No data available.
Auto-ignition Temperature °C	465
Decomposition Temperature °C	No data available.
Viscosity	No data available.
Explosive Properties	No data available.
Oxidizing Properties	No data available.
9.2. Other information	No data available.
Volatiles, % by weight	0
Volatile Organic Chemicals	No data available.
Bulk Density	6.601

SECTION 10: Stability and reactivity

10.1. Reactivity	No data available.
10.2. Chemical stability	Stable under normal conditions.
10.3. Possibility of hazardous reactions	Strong oxidizing agents Strong acids
10.4. Conditions to avoid	No data available.
10.5. Incompatible materials	Strong oxidizing agents Strong acids
10.6. Hazardous decomposition products	Carbon dioxide Carbon monoxide

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity
Based on available data, the classification criteria are not met.

Skin corrosion/irritation
Based on available data, the classification criteria are not met.

Serious eye damage/irritation

pH	No data available.

Classification is based on pH and the components listed in Section 3.

Respiratory or skin sensitisation

Based on available data, the classification criteria are not met.

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Carcinogenicity
Based on available data, the classification criteria are not met.

Reproductive toxicity
Based on available data, the classification criteria are not met.

STOT-single exposure
Classification has been based on toxicological information of the components in Section 3.

STOT-repeated exposure
Based on available data, the classification criteria are not met.

Aspiration hazard
Based on available data, the classification criteria are not met.

SECTION 12: Ecological information

12.1. Toxicity	This material is not expected to be harmful to the ecology.
12.2. Persistence and degradability	No data No data
12.3. Bioaccumulative potential	No data available.
12.4. Mobility in soil	No data
12.5. Results of PBT and vPvB assessment	No data available.
12.6. Other adverse effects	No data available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste Description for Spent Product	Spent or discarded material is a hazardous waste.
Disposal Methods	Dispose of by incineration following Federal, State, Local, or Provincial regulations.

SECTION 14: Transport information

14.1. UN number

ADR - UN number	UN1090
IATA - UN number	UN1090

14.2. UN proper shipping name

ADR – Shipping Name	Acetone
IATA – Shipping Name	Acetone

14.3. Transport hazard class(es)

ADR – Hazard Class	3
IATA – Hazard Class	3

14.4. Packing group

ADR – Packing Group	II
IATA – Packing Group	II

14.5. Environmental hazards

Marine Pollutant	No

14.6. Special precautions for user No data available.

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code No data available.

SECTION 15: Regulatory information

This safety datasheet complies with the requirements of Commission Regulation (EU) 2015/830

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

EINECS

Chemical Name	EINECS Number if Present
Acetone	200-662-2
Benz(e)acephenanthrylene	205-911-9

SVHC - Substance of Very High Concern

Chemical Name	Data listed on SVHC
Not applicable	

15.2. Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

SECTION 16: Other information

Revision Date: 08/12/2016

Indication of changes: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

Abbreviations and acronyms: No data available.

References: No data available.

List of relevant hazard statements and/or precautionary statements used in Section 2 & 3:

Precautionary Statements

Prevention

P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P240 - Ground/bond container and receiving equipment.
P241 - Use explosion-proof electrical/ventilation and lighting equipment.
P242 - Use only non-sparking tools.
P243 - Take precautionary measures against static discharge.
P261 - Avoid breathing dust/fume/gas/mist/vapours/spray.
P264 - Wash hands and skin thoroughly after handling.
P271 - Use only outdoors or in a well-ventilated area.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.

Response

P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 - Call a POISON CENTER/doctor/... if you feel unwell.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P370+P378 - In case of fire: Use extinguishing media in section 5 to extinguish.

Storage

P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P403+P235 - Store in a well-ventilated place. Keep cool.
P405 - Store locked up.

Disposal P501 - Dispose of contents/container according to section 13 of the SDS.

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 08-Nov-2010 **Revision Date** 23-May-2017 **Revision Number** 4

1. Identification

Product Name **Fluoranthene**

Cat No. : **AC119170000; AC119170250; AC119171000; AC119175000**

Synonyms Benzo[j,k]fluorene

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)

Acute oral toxicity	Category 4

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Ingestion

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth

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 %
Fluoranthene	206-44-0	>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. Get medical attention if symptoms occur.

Most important symptoms/effects None reasonably foreseeable.
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 Not applicable
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

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	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation.

Environmental Precautions Should not be released into the environment.

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.

7. Handling and storage

Handling Ensure adequate ventilation. Wear personal protective equipment. Avoid dust formation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.

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 limitsestablished 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 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	Powder Solid
Appearance	Light green
Odor	Odorless
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	109 - 111 °C / 228.2 - 231.8 °F
Boiling Point/Range	384 °C / 723.2 °F
Flash Point	Not applicable
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

Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C16 H10
Molecular Weight	202.25

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 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

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fluoranthene	LD50 = 2 g/kg (Rat)	LD50 = 3180 mg/kg (Rabbit)	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.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Fluoranthene	206-44-0	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 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.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Fluoranthene	Not listed	Oncorhynchus mykiss: LC50=0.0077 mg/L 96h	Not listed	EC50: 0.78 mg/L 20h

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility .

Component	log Pow
Fluoranthene	5.1

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
Fluoranthene - 206-44-0	U120	-

14. Transport information

DOT

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Proper technical name Fluoranthene
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

All of the components in the product are on the following Inventory lists: 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 China Canada TSCA Japan X = listed Australia U.S.A. (TSCA) Canada (DSL/NDSL) Europe (EINECS/ELINCS/NLP) Australia (AICS) Korea (ECL) China (IECSC) Japan (ENCS) Philippines (PICCS) Complete Regulatory Information contained in following SDS's

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Fluoranthene	X	-	X	205-912-4	-		-	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 %
Fluoranthene	206-44-0	>95	1.0 0.1

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	No
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
Fluoranthene	-	-	X	X

Clean Air Act Not applicable

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
Fluoranthene	100 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Fluoranthene	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

Creation Date	08-Nov-2010
Revision Date	23-May-2017
Print Date	23-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

Lead

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Lead - pellets, shot, sheet, foil, rod, wire, target

Formula: Pb

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Acute toxicity, category 4, Carcinogenicity, category 2, Reproductive toxicity, category 2.

GHS Label Elements:

Signal Word: Warning

Hazard Statements: H302 Harmful if swallowed, H332 Harmful if inhaled, H351 Suspected of causing cancer, H361 Suspected of damaging fertility or the unborn child.

Precautionary Statements: P260 Do not breath dust/fume/gas/mist/vapors/spray, P264 Wash hands thoroughly after handling, P281 Use personal protective equipment as required, P301+P304+P312 IF SWALLOWED OR INHALED: Call a POISON CENTER or doctor/physician if you feel unwell.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Lead

CAS#: 7439-92-1

%: 100

EC#: 231-100-4

4 FIRST AID MEASURES

General Measures: Under normal handling and use, exposure to solid forms of this material present few health hazards. Subsequent operations such as grinding, melting or welding may produce hazardous dust or fumes which can be inhaled or come in contact with the skin or eyes. Emergency responders should take care to avoid secondary exposure to lead particulate. Wear appropriate protective equipment.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek immediate medical attention.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek immediate medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, wash affected area with soap and water. Seek medical attention. Wash contaminated clothing before reusing.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention.

Most Important Symptoms/Effects, Acute and Delayed: May cause irritation. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use suitable extinguishing agent for surrounding materials and type of fire.

Unsuitable Extinguishing Media: No information available.

Specific Hazards Arising from the Material: This product does not present fire or explosion hazards as shipped. Fine dust from processing is a weak to moderate fire hazard if allowed to accumulate and subjected to an ignition source. Under fire conditions toxic fumes of lead oxide may be released.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing when necessary.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory

and protective equipment specified in section 8. Avoid creating dusts. Avoid breathing dust or fume. Isolate spill area and provide ventilation.

Methods and Materials for Containment and Cleaning Up: For larger pieces - pick up mechanically. For chips or dust - vacuum using a HEPA filter. Place in properly labeled closed containers. Avoid creating dusts. Do not use compressed air.

Environmental Precautions: Do not allow to enter drains or to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Handle in a well-ventilated area. Avoid creating dust. Avoid exposure to high temperature. Avoid breathing dust or fumes. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage, Including Any Incompatibilities: Store in a sealed container. Store in a cool, dry area. Protect from moisture. Do not store together with strong oxidizers or acids. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Lead

OSHA/PEL: 50 µg/m^3

ACGIH/TLV: 0.05 mg/m^3

Appropriate Engineering Controls: Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air. Clothing worn in areas of exposure to lead dust or fume should be restricted to the workplace and laundered regularly.

Individual Protection Measures, Such as Personal Protective Equipment:

Respiratory Protection: When potential exposures are above the occupational limits, approved respirators must be used.

Eye Protection: Safety glasses

Skin Protection: Wear impermeable gloves, protective work clothing as necessary.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Silvery metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 327.5 ^{O}C

Boiling Point: 1740 ^{O}C

Flash Point: N/A

Evaporation Rate: N/A

Flammability: No data

Upper Flammable Limit: No data

Lower Flammable Limit: No data

Vapor Pressure: 1 mm Hg @ 973 ^{O}C

Vapor Density: N/A

Relative Density (Specific Gravity): 11.34 g/cc

Solubility in H_2O: Insoluble

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: High temperatures will generate toxic lead oxide fumes.

Conditions to Avoid: Avoid creating or accumulating fines or dusts. Avoid high temperatures.

Incompatible Materials: Strong acids, strong oxidizers, halogens and interhalogen compounds.

Hazardous Decomposition Products: Lead oxide fume.

Other: Freshly cut or cast lead surfaces tarnish rapidly due to the formation of an insoluble protective layer of basic lead carbonate.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes. Product as shipped does not present an inhalation hazard; however subsequent operations may create dusts or fumes which could be inhaled.

Symptoms of Exposure: Skin or eye contact with dust or fume may cause local irritation. Inhalation of dust or fumes may cause headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss,

anemia, and pain in legs, arms, and joints. An acute short-term dose of lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposure of this magnitude is rare. Kidney damage, as well as anemia, can occur from acute exposure. Symptoms due to ingestion of lead dust or fume would be similar to those from inhalation. Other health effects such as metallic taste in the mouth and constipation or bloody diarrhea might also be expected to occur.

Acute and Chronic Effects: Lead accumulates in bone and body organs once it enters the body. Elimination from the body is slow. Initial and periodic medical examinations are advised for persons repeatedly exposed to levels above the exposure limits of lead dust or fumes. Once lead enters the body, it can affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal system.

Acute Toxicity: No data

Carcinogenicity: **NTP**: R - Reasonably anticipated to be a carcinogen **IARC**: 2B - Possibly carcinogenic to humans

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

DOT/ADR/IATA/IMDG Regulations: Not regulated

UN Number: N/A

UN Proper Shipping Name: N/A

Transport Hazard Class: N/A

Packing Group: N/A

Marine Pollutant: No

Special Precautions: N/A

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): Acute toxicity, category 4, Carcinogenicity, category 2, Reproductive toxicity, category 2.

Canada WHMIS Classification (CPR, SOR/88-66): Class D, Division 2, Subdivision A - Very toxic material causing other toxic effects.

HMIS Ratings: **Health**: 1 **Flammability**: 0 **Physical**: 0

NFPA Ratings: **Health**: 1 **Flammability**: 0 **Reactivity**: 0

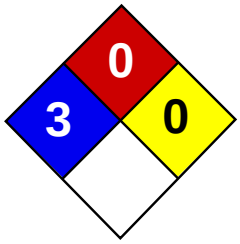
Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The above information is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product.

Prepared by: ESPI Metals

Revised/Reviewed: September 2014



Material Safety Data Sheet
Mercury MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:
A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 0.025 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

pH (1% soln/water): Not available.

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonynickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsiliane, calcium,

Special Remarks on Corrosivity:
The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalga) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:22 PM

Last Updated: 05/21/2013 12:00 PM

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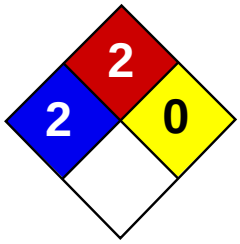

Health	2
Fire	2
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Naphthalene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Naphthalene

Catalog Codes: SLN1789, SLN2401

CAS#: 91-20-3

RTECS: QJ0525000

TSCA: TSCA 8(b) inventory: Naphthalene

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C10H8

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Naphthalene	91-20-3	100

Toxicological Data on Ingredients: Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 567°C (1052.6°F)

Flash Points: CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

Flammable Limits: LOWER: 0.9% UPPER: 5.9%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Israel: TWA: 10 (ppm) TWA: 10 STEL: 15 (ppm) from ACGIH (TLV) [1995] TWA: 52 STEL: 79 (mg/m3) from ACGIH [1995] Australia: STEL: 15 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 128.19 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: 218°C (424.4°F)

Melting Point: 80.2°C (176.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.162 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.038 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in hot water, methanol, n-octanol. Very slightly dispersed in cold water. See solubility in methanol, n-octanol.

Solubility:
Partially soluble in methanol, n-octanol. Very slightly soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Highly reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: May attack some forms of rubber and plastic

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 490 mg/kg [Rat]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Naphthalene, refined : UN1334 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: Naphthalene Pennsylvania RTK: Naphthalene Florida: Naphthalene Minnesota: Naphthalene Massachusetts RTK: Naphthalene TSCA 8(b) inventory: Naphthalene TSCA 8(a) PAIR: Naphthalene TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87 SARA 313 toxic chemical notification and release reporting: Naphthalene: 1% CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid. CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36- Irritating to eyes. R40- Possible risks of irreversible effects. R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed. R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation. R63- Possible risk of harm to the unborn child.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 01:30 PM

Last Updated: 05/21/2013 12:00 PM

SAFETY DATA SHEET

M47014 - ANSI - EN

PERCHLOROETHYLENE, ALL GRADES

SDS No.: M47014 **SDS Revision Date:** 20-Feb-2015

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Company Identification:	Occidental Chemical Corporation 5005 LBJ Freeway P.O. Box 809050 Dallas, TX 75380-9050 1-800-752-5151
24 Hour Emergency Telephone Number:	1-800-733-3665 or 1-972-404-3228 (USA); CHEMTREC (within USA and Canada): 1-800-424-9300; CHEMTREC (outside USA and Canada): +1 703-527-3887; CHEMTREC Contract No: CCN16186
To Request an SDS:	MSDS@oxy.com or 1-972-404-3245
Customer Service:	1-800-752-5151 or 1-972-404-3700
Product Identifier:	**PERCHLOROETHYLENE, ALL GRADES**
Trade Name:	PERCHLOROETHYLENE, TECHNICAL; PERCHLOROETHYLENE, FLUOROCARBON (PTAP); PERCHLOROETHYLENE, INDUSTRIAL; PERCHLOROETHYLENE, VAPOR DEGREASING; PERCHLOROETHYLENE, ISOMERIZATION
Synonyms:	1,1,2,2 TETRACHLOROETHENE, TETRACHLOROETHENE, TETRACHLOROETHYLENE, PERCHLOROETHYLENE, PERCHLOROETHENE
Product Use:	Petroleum industry, Refrigerant manufacturing, Metal cleaning, Paint stripping, Aerosol carrier
Uses Advised Against:	NOT FOR USE IN DRY CLEANING.

2. HAZARDS IDENTIFICATION

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

****

EMERGENCY OVERVIEW:

Color: Colorless
Physical state Volatile liquid
Appearance: Clear liquid
Odor: Mildly sweet odor, Chloroform-like odor

Signal Word: **DANGER**

MAJOR HEALTH HAZARDS: HARMFUL IF INHALED. MAY CAUSE DROWSINESS OR DIZZINESS. MAY BE HARMFUL IF SWALLOWED. MAY BE HARMFUL IF SWALLOWED AND ENTERS AIRWAYS. MAY BE HARMFUL IN CONTACT WITH SKIN. CAUSES SKIN IRRITATION. CAUSES EYE IRRITATION. CAUSES DAMAGE TO CENTRAL NERVOUS SYSTEM (CNS), LIVER, RESPIRATORY SYSTEM. MAY CAUSE DAMAGE TO CENTRAL NERVOUS SYSTEM (CNS), LIVER, KIDNEY, RESPIRATORY SYSTEM THROUGH PROLONGED OR REPEATED EXPOSURE. MAY CAUSE CANCER.

AQUATIC TOXICITY: TOXIC TO AQUATIC LIFE WITH LASTING EFFECTS.

PRECAUTIONARY STATEMENTS: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe mist, vapors, or spray. Use with adequate ventilation and wear respiratory protection when exposure to dust, mist, or spray is possible. Use only outdoors or in a well-ventilated area. Avoid contact with eyes, skin and clothing. Wear protective gloves, protective clothing, eye, and face protection. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment.

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GHS CLASSIFICATION:

GHS: CONTACT HAZARD - SKIN:	Category 2 - Causes skin irritation.
GHS: CONTACT HAZARD - EYE:	Category 2B - Causes eye irritation
GHS: ACUTE TOXICITY - INHALATION:	Category 4 - Harmful if inhaled
GHS: ASPIRATION HAZARD:	Category 2 - May be harmful if swallowed and enters airways
GHS: TARGET ORGAN TOXICITY (SINGLE EXPOSURE):	Category 1 - Causes damage to Central Nervous System (CNS), Liver, Respiratory System
GHS: TARGET ORGAN TOXICITY (SINGLE EXPOSURE):	Category 3 - May cause drowsiness or dizziness
GHS: TARGET ORGAN TOXICITY (REPEATED EXPOSURE):	Category 2 - May cause damage to Liver, Kidney, Central Nervous System (CNS), Respiratory System through prolonged or repeated exposure

PERCHLOROETHYLENE, ALL GRADES

SDS No.: M47014 **SDS Revision Date:** 20-Feb-2015

GHS: CARCINOGENICITY:	Category 1B - May cause cancer.
GHS: HAZARDOUS TO AQUATIC ENVIRONMENT - ACUTE HAZARD:	Category 2 - Toxic to aquatic life
GHS: HAZARDOUS TO AQUATIC ENVIRONMENT - CHRONIC HAZARD:	Category 2 - Toxic to aquatic life with long lasting effects

UNKNOWN ACUTE TOXICITY:
Not applicable. This product was tested as a whole. This information only pertains to untested mixtures.

GHS SYMBOL:
Health hazard, Exclamation mark, Environmental hazard

GHS SIGNAL WORD: **DANGER**

GHS HAZARD STATEMENTS:

GHS - Health Hazard Statement(s)
May be harmful if swallowed and enters airways
Harmful if inhaled
May cause drowsiness or dizziness
Causes eye irritation
Causes skin irritation
Causes damage to organs : (Central Nervous System (CNS), Liver, Respiratory System)
May cause damage to organs through prolonged or repeated exposure: (Central Nervous System (CNS), Liver, Kidney, Respiratory System)
May cause cancer

GHS - Environmental Hazard Statement(s)
Toxic to aquatic life
Toxic to aquatic life with long lasting effects

GHS - Precautionary Statement(s) - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Do not breathe mist, vapors, or spray
Use only outdoors or in a well-ventilated area
Wear eye protection, face protection, protective gloves
Use personal protective equipment as required
Wash thoroughly after handling
Do not eat, drink or smoke when using this product
Avoid release to the environment

GHS - Precautionary Statement(s) - Response
IF INHALED: Remove person to fresh air and keep comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
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 water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash it before reuse
IF exposed or concerned: Get medical advice/attention
Get medical advice/attention if you feel unwell
Specific treatment (see Section 4 of the safety data sheet and/or the First Aid information on the product label)
Collect spillage. Hazardous to the aquatic environment

GHS - Precautionary Statement(s) - Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up

GHS - Precautionary Statement(s) - Disposal
Dispose of contents and container in accordance with applicable local, regional, national, and/or international regulations

Hazards Not Otherwise Classified (HNOC)
None Known

See Section 11: TOXICOLOGICAL INFORMATION

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms: 1,1,2,2 TETRACHLOROETHENE, TETRACHLOROETHENE, TETRACHLOROETHYLENE, PERCHLOROETHYLENE, PERCHLOROETHENE

Component	Percent [%]	CAS Number
Tetrachloroethylene [Perc]	99.0 - 100.0	127-18-4
Carbon Tetrachloride	<0.45	56-23-5

4. FIRST AID MEASURES

INHALATION: If inhaled and adverse effects occur, remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician. See Notes to Physician below and Section 11 for more information.

SKIN CONTACT: If on skin, wash with plenty of water. If skin irritation occurs: Get medical advice/ attention. Take off contaminated clothing and wash before reuse. See Notes to Physician below and Section 11 for more information.

EYE CONTACT: 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, rinse mouth with water (only if the person is conscious). Never give anything by mouth to an unconscious or convulsive person. If feeling unwell, contact a poison center or doctor.physician.

Most Important Symptoms/Effects (Acute and Delayed) :.

Acute Symptoms/Effects: Listed below.
Inhalation (Breathing): Respiratory System Effects: Central Nervous System (CNS) effects are characteristic following inhalation of chlorinated hydrocarbons and can range from lightheadedness at low level exposures to loss of consciousness at high levels. CNS effects are an early warning that exposure to high levels has occurred and there is risk of cardiac effects (palpitations, low blood pressure, arrhythmia, arrest). CNS effects include the following symptoms: abdominal pain, nausea, vomiting, headache, lightheadedness, blurry or double vision, personality changes, weakness, slurred speech, stupor, incoordination (disequilibrium, ataxia), coma, and respiratory arrest. May irritate upper airways.
Skin: Skin Irritation. Skin exposure may cause irritation, rough red, dry skin, edema, blisters.
Eye: Eye Irritation. Eye exposure may cause irritation, tearing, pain, conjunctivitis, clouding of cornea.
Ingestion (Swallowing): Ingesting this material may cause gastrointestinal irritation, nausea. vomiting, headache, breathing difficulty, reduced blood pressure, weak and rapid pulse, Central Nervous System (CNS) depression, and Central Nervous System (CNS) symptoms such as sedation, headache, tremor, nystagmus and memory problems. Ingestion may cause unconsciousness and death.
Other Health Effects: Most people can smell perchloroethylene at levels of 5-50 ppm (OSHA PEL is 100 ppm). Odor is an adequate warning for high dose acute exposures, but might not be adequate for prolonged exposure due to olfactory fatigue. Vapors are heavier than air, can collect in low lying areas and cause asphyxiation. CNS effects have been observed at exposures of 100 to 300 ppm. Exposures of 1000 to 1500 ppm for less than 2 hours have caused symptoms of mood changes, slight ataxia, faintness and dizziness. Exposure to higher concentrations for longer periods can lead to collapse, coma, or death.

Delayed Symptoms/Effects:
- Respiratory System Effects: May cause chemical or irritant induced asthma or bronchoconstriction. May cause a chemical pneumonitis. Reduced renal output (oliguria), elevation of liver enzymes, to renal failure and liver failure
- May cause effects to the skin such as chronic dermatitis, dermal hypersensitivity
- May cause eye damage such as corneal damage, decreased vision
- May cause delayed liver and kidney effects
- Prolonged exposures may result in memory and concentration impairment, vision disturbances, dizziness, irritability, ataxia (difficulty walking), and peripheral neuropathy

Interaction with Other Chemicals Which Enhance Toxicity: May potentiate other agents that cause Central Nervous System (CNS) depression and respiratory system depression. Liver toxicity may be enhanced by other agents that cause liver damage, such as alcohol, acetaminophen. Catecholamine administration MAY pose increased risk of cardiac arrhythmias.

Medical Conditions Aggravated by Exposure: May increase potential for cardiac arrhythmia. Liver disorders, kidney disorders, respiratory system disorders.

Protection of First-Aiders: Protect against vapor/gas exposure. Do not breathe gas, fumes, vapor, mist, or spray. Avoid contact with skin and eyes. Use personal protective equipment. Refer to Section 8 for specific personal protective equipment recommendations. Consider the possibility of high levels of gas in confined/unventilated spaces or low-lying areas.

Notes to Physician: There is no antidote for perchloroethylene poisoning. Treatment consists of support of respiratory and cardiovascular functions. Catecholamine administration after exposure to this compound MAY pose enhanced risk of cardiac arrhythmia. For ingestion, nasogastric aspiration is recommended if volume ingested is of sufficient volume to aspirate. Protect the airway. Epinephrine and other sympatomimetic amines may initiate cardiac arrhythmias in individuals exposed and experiencing symptoms from this material. Absorption from skin is slow, and unless prevented from evaporating, systemic toxicity is unlikely. This compound is absorbed rapidly by oral administration and causes similar effects to inhalation exposure. Activated charcoal may be administered. Liver injury may be delayed several days after exposure.

5. FIRE-FIGHTING MEASURES

Fire Hazard: Negligible fire hazard.

Extinguishing Media: Use media appropriate for surrounding fire.

Fire Fighting: Avoid inhalation of material or combustion by-products. Wear NIOSH approved positive-pressure self-contained breathing apparatus. Stay upwind and keep out of low areas. Move container from fire area if it can be done without risk. Cool containers with water from unmanned hose holder or monitor nozzles until well after the fire is out. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Keep water runoff out of water supplies and sewers (see Section 6 of the SDS).

Component	Immediately Dangerous to Life/ Health (IDLH)
Tetrachloroethylene [Perc] 127-18-4	150 ppm IDLH
Carbon Tetrachloride 56-23-5	200 ppm IDLH

Hazardous Combustion Products: Thermal decomposition or combustion products: hydrogen chloride, chlorine, phosgene, oxides of carbon

Sensitivity to Mechanical Impact: Not sensitive.

Sensitivity to Static Discharge: Not sensitive.

Lower Flammability Level (air): Not flammable

Upper Flammability Level (air): Not flammable

Flash point: Not flammable

Auto-ignition Temperature: Not applicable

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:
Keep unnecessary and unprotected persons away. Isolate hazard area and deny entry. Evacuation of surrounding area may be necessary for large spills. Shut off ventilation system if needed. Do not get in eyes, on skin or on clothing. Do not breathe vapors, mist, or spray. Ventilate closed spaces before entering. Most vapors are heavier than air and will spread along ground and collect in low or confined areas (drains, basements, tanks). Wear appropriate personal protective equipment recommended in Section 8, Exposure Controls / Personal Protection, of the SDS.

Methods and Materials for Containment and Cleaning Up:
Stop leak if possible without personal risk. Ventilate closed spaces before entering. Completely contain spilled materials with dikes, sandbags, etc. Remove contaminated soil or collect with appropriate absorbent and place into suitable container. Keep container tightly closed and properly labeled. Liquid material may be removed with a properly rated vacuum truck. Properly dispose of in accordance with all applicable regulations. See Section 13, Disposal considerations, for additional information.

Environmental Precautions:
Keep out of water supplies, sewers and soil. Avoid discharge into drains, surface water or groundwater. Releases should be reported, if required, to appropriate agencies.

7. HANDLING AND STORAGE

Precautions for Safe Handling:
Most vapors are heavier than air and will spread along ground and collect in low or confined areas (drains, basements, tanks). Use only in well-ventilated areas. Avoid breathing vapor, mist, or spray. Avoid contact with skin, eyes and clothing. Wear personal protective equipment as described in Exposure Controls/Personal Protection (Section 8) of the SDS. Do not taste or swallow. Wash thoroughly after handling. Do not eat, drink or smoke in areas where this material is used.

Safe Storage Conditions:
Store and handle in accordance with all current regulations and standards. Keep container properly labeled and tightly closed. Store in a cool, dry area. Store in a well-ventilated area. Store away from open flames, and combustibles. Do not enter confined spaces without following proper confined space entry procedures. Do not store in aluminum container or use aluminum fittings or transfer lines. Protect from sunlight. Do not reuse drum without recycling or reconditioning in accordance with any applicable federal, state or local laws. Do not use cutting or welding torches, open flames or electric arcs on empty or full containers. Keep separated from incompatible substances (see below or Section 10 of the Safety Data Sheet).

Incompatibilities/ Materials to Avoid:
acids. bases. Strong oxidizing agents. Oxygen. Peroxides. Reactive metals. aluminum.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Regulatory Exposure Limit(s): Listed below for the product components that have regulatory occupational exposure limits (OEL's).

OEL: Occupational Exposure Limit; OSHA: United States Occupational Safety and Health Administration; PEL: Permissible Exposure Limit; TWA: Time Weighted Average; STEL: Short Term Exposure Limit

NON-REGULATORY EXPOSURE LIMIT(S): Listed below for the product components that have non-regulatory occupational exposure limits (OEL's).

- *The Non-Regulatory United States Occupational Safety and Health Administration (OSHA) limits, if shown, are the Vacated 1989 PEL's (vacated by 58 FR 35338, June 30, 1993).*

- The American Conference of Governmental Industrial Hygienists (ACGIH) is a voluntary organization of professional industrial hygiene personnel in government or educational institutions in the United States. The ACGIH develops and publishes recommended occupational exposure limits each year called Threshold Limit Values (TLVs) for hundreds of chemicals, physical agents, and biological exposure indices.

ENGINEERING CONTROLS: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits. Monitoring should be performed regularly to determine exposure limit level(s).

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Wear safety glasses with side-shields. Wear chemical safety goggles with a face-shield to protect against skin and eye contact when appropriate. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin and Body Protection: Wear chemical resistant clothing to prevent skin contact. Contaminated clothing should be removed, then discarded or laundered. Always place pants legs over boots.

Hand Protection: Wear appropriate chemical resistant gloves. Consult a glove supplier for assistance in selecting an appropriate chemical resistant glove.

Protective Material Types: Polyvinyl alcohol (PVA), Teflon®, Viton®, 4H®/Silver Shield®, CPF® 3, Responder®, Trellchem®, Tychem®

Respiratory Protection: Where vapor or mist concentration exceeds or is likely to exceed applicable exposure limits, a NIOSH approved respirator with organic vapor cartridge filter(s) is required. When an air-purifying respirator is not adequate, for exposures above the IDLH, or for spills and/or emergencies of unknown concentrations, a NIOSH approved self-contained breathing apparatus or airline respirator with full-face piece with auxiliary self-contained escape pack is required. A respiratory protection program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

Component	Immediately Dangerous to Life/ Health (IDLH)
Tetrachloroethylene [Perc] 127-18-4	150 ppm IDLH
Carbon Tetrachloride 56-23-5	200 ppm IDLH

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	Volatile liquid
Appearance:	Clear liquid
Color:	Colorless
Odor:	Mildly sweet odor, Chloroform-like odor
Odor Threshold [ppm]:	50 ppm (may cause olfactory fatigue).
Molecular Weight:	165.82
Molecular Formula:	C2-Cl4
Boiling Point/Range:	250 °F (121 °C)
Freezing Point/Range:	-2 °F (-19 °C).
Vapor Pressure:	13 mmHg @ 20 °C
Vapor Density (air=1):	5.8
Relative Density/Specific Gravity (water=1):	1.62 @ 25°C
Water Solubility:	0.015%
pH:	No data available
Volatility:	100%
Evaporation Rate (ether=1):	0.1 (ether=1)
Partition Coefficient (n-octanol/water):	2.88
Flash point:	Not flammable
Flammability (solid, gas):	Not flammable
Lower Flammability Level (air):	Not flammable
Upper Flammability Level (air):	Not flammable
Auto-ignition Temperature:	Not applicable
Viscosity:	No data available

10. STABILITY AND REACTIVITY

Reactivity: Not reactive under normal temperatures and pressures.

Chemical Stability: Stable at normal temperatures and pressures.

Possibility of Hazardous Reactions:
Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Avoid contact with incompatible substances and conditions due to generation of phosgene and other toxic and irritating substances.

Conditions to Avoid:
(e.g., static discharge, shock, or vibration) -. None known.

Incompatibilities/ Materials to Avoid:
acids. bases. Strong oxidizing agents. Oxygen. Peroxides. Reactive metals. aluminum.

Hazardous Decomposition Products: Thermal decomposition or combustion products: hydrogen chloride, chlorine, phosgene, oxides of carbon

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA:

PRODUCT TOXICITY DATA: Perchloroethylene, All Grades

LD50 Oral:	LD50 Dermal:	LC50 Inhalation:
2629 mg/kg oral-rat LD50	>3228 mg/kg skin-rabbit LD50	5200 ppm (4 hr. - Rat)

COMPONENT TOXICITY DATA:

Note: The component toxicity data is populated by the LOLI database and may differ from the product toxicity data given.

Component	LD50 Oral:	LD50 Dermal:	LC50 Inhalation:
Tetrachloroethylene [Perc] 127-18-4	2629 mg/kg (Rat)	2800 mg/kg (Mouse)	27.8 mg/L (4 hr-Rat)
Carbon Tetrachloride 56-23-5	2350 mg/kg (Rat)	5070 mg/kg (Rat)	8000 ppm (4 hr-Rat)

Summary of Toxicity Studies:

Single-dose LD50 values of 3835 and 3005 mg/kg were determined for male and female rats by gavage. Death occurred within 24 hours after dosing and was preceded by tremors, ataxia, and CNS depression. Congestion of the lungs was reported in rats exposed intermittently to 1600 ppm for 13 weeks. In mice exposed intermittently at 100 ppm for 103 weeks, acute passive congestion of the lungs was observed. In animals, hypertrophy, fatty degeneration, and peroxisome proliferation characterize liver effects. Kidney effects, including cancer, have been noted in animals, predominantly male rats. The mechanism for the development of kidney effects in rats (protein droplet nephropathy) may differ from that in humans. The carcinogenicity of perchloroethylene has been documented in certain strains of mice and rats exposed by inhalation or oral routes. Other long-term inhalation studies in rats failed to show tumorigenic response. Human data are limited and have not established an association between perchloroethylene exposure and cancer. Hepatic effects were not detected in workers exposed up to 20 ppm for up to 10 years; however, in 141 workers exposed at an average concentration of 11.3 ppm, total GGT was significantly increased. Workers exposed for up to 14 years at an estimated TWA of 10 ppm had increased urinary enzyme levels suggestive of mild tubular damage. Forestomach ulcers were observed in male rats exposed to intermittently to 400 ppm orally for 103 weeks. Classification as a carcinogen is largely based on animal evidence.

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POTENTIAL HEALTH EFFECTS:

Eye contact: Eye contact may cause tearing, redness, pain, conjunctival irritation, corneal edema, whitening, corneal erosion, decreased vision.

Skin contact: Skin contact may cause irritation, rough, red, dry skin, edema, blisters.

Inhalation: Inhaling this material may cause sedation, bronchospasm, shortness of breath, lightheadedness, loss of consciousness, cardiotoxicity, palpitations, low blood pressure, arrhythmia, arrest, nausea, vomiting, headache, alterations of light perception, weakness, stupor, incoordination (disequilibrium, ataxia), coma, and respiratory arrest. May irritate upper airways.

Ingestion: This material can get into the lungs during swallowing or vomiting. Ingestion of this material may cause gastrointestinal irritation, central nervous system (CNS) depression, central nervous system symptoms such as tremor, ataxia (difficulty walking), and memory problems; nausea, vomiting, headache, difficulty breathing, reduced blood pressure, weak and rapid pulse. Ingestion may cause unconsciousness and death.

Chronic Effects: The carcinogenicity of perchloroethylene has been documented in certain strains of mice and rats exposed by inhalation or oral routes. Other long-term inhalation studies in rats failed to show tumorigenic response. Human data are limited and have not established an association between perchloroethylene exposure and cancer.

SIGNS AND SYMPTOMS OF EXPOSURE:

Inhalation (Breathing): Respiratory System Effects: Central Nervous System (CNS) effects are characteristic following inhalation of chlorinated hydrocarbons and can range from lightheadedness at low level exposures to loss of consciousness at high levels. CNS effects are an early warning that exposure to high levels has occurred and there is risk of cardiac effects (palpitations, low blood pressure, arrhythmia, arrest). CNS effects include the following symptoms: abdominal pain, nausea, vomiting, headache, lightheadedness, blurry or double vision, personality changes, weakness, slurred speech, stupor, incoordination (disequilibrium, ataxia), coma, and respiratory arrest. May irritate upper airways.

Skin: Skin Irritation. Skin exposure may cause irritation, rough red, dry skin, edema, blisters.

Eye: Eye Irritation. Eye exposure may cause irritation, tearing, pain, conjunctivitis, clouding of cornea.

Ingestion (Swallowing): Ingesting this material may cause gastrointestinal irritation, nausea. vomiting, headache, breathing difficulty, reduced blood pressure, weak and rapid pulse, Central Nervous System (CNS) depression, and Central Nervous System (CNS) symptoms such as sedation, headache, tremor, nystagmus and memory problems. Ingestion may cause unconsciousness and death.

Other Health Effects: Most people can smell perchloroethylene at levels of 5-50 ppm (OSHA PEL is 100 ppm). Odor is an adequate warning for high dose acute exposures, but might not be adequate for prolonged exposure due to olfactory fatigue. Vapors are heavier than air, can collect in low lying areas and cause asphyxiation. CNS effects have been observed at exposures of 100 to 300 ppm. Exposures of 1000 to 1500 ppm for less than 2 hours have caused symptoms of mood changes, slight ataxia, faintness and dizziness. Exposure to higher concentrations for longer periods can lead to collapse, coma, or death.

TOXICITY:

Chlorinated hydrocarbons can act as simple asphyxiants, posing a risk by their displacement of oxygen in the air, thus causing hypoxic environmental conditions leading to reduced oxygen uptake and hypoxemia. Some direct toxicity is also likely, especially at very high exposure levels. The toxic mechanisms include direct myocardial depression and sensitization of the myocardium to endogenous catecholamines. With very high level, as in inhalation abuse, both direct toxicity and reduced oxygen concentrations may exist and can interact to further increase risk. Sudden death may occur. Effects of low level, accidental exposure to chlorinated aliphatic hydrocarbons are usually limited to mild upper respiratory tract irritation and/or mild CNS effects. Direct pulmonary toxicity is usually of little clinical concern; however, moderate to high levels of exposure may result in significant upper airway irritation, pneumonitis and CNS depressant effects. Very high exposures may result in severe respiratory depression or failure. Cardiac arrhythmias are generally associated with moderate to sever exposures. Exposure to high levels produces direct liver and kidney toxicity. The onset of elevated liver enzymes and indicators of renal impairment may be delayed.

Interaction with Other Chemicals Which Enhance Toxicity: May potentiate other agents that cause Central Nervous System (CNS) depression and respiratory system depression. Liver toxicity may be enhanced by other agents that cause liver damage, such as alcohol, acetaminophen. Catecholamine administration MAY pose increased risk of cardiac arrhythmias.

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GHS HEALTH HAZARDS:

GHS: ACUTE TOXICITY - INHALATION: Category 4 - Harmful if inhaled.

Skin Absorbent / Dermal Route? Yes.

GHS: CONTACT HAZARD - SKIN: Category 2 - Causes skin irritation

GHS: CONTACT HAZARD - EYE: Category 2B - Causes eye irritation

GHS: CARCINOGENICITY:
Category 1B - May cause cancer.

Component	NTP:	IARC (GROUP 1):	IARC (GROUP 2):	OSHA:
Tetrachloroethylene [Perc]	Reasonably Anticipated To Be A Human Carcinogen	Not listed	Group 2	Listed
Carbon Tetrachloride	Reasonably Anticipated To Be A Human Carcinogen	Not listed	Group 2	Listed

SPECIFIC TARGET ORGAN TOXICITY (Single Exposure):
Category 1 - Central Nervous System (CNS), Liver, Respiratory System
Category 3 - Narcotic Effects

SPECIFIC TARGET ORGAN TOXICITY (Repeated or Prolonged Exposure):
Category 2 - Central Nervous System (CNS), Liver, Kidney, Respiratory System

MUTAGENIC DATA:
Not classified as a mutagen per GHS criteria. Overall both in vitro and in vivo genetic toxicity studies showed an absence of genotoxicity.

REPRODUCTIVE TOXICITY:
Not classified as a developmental or reproductive toxicant. In laboratory animal studies, effects on the fetus and reproductive system have been seen only at doses that produced significant toxicity to the parent animal.

ASPIRATION HAZARD:
Category 2 - May be harmful if swallowed and enters airways

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

Fish Toxicity:
LC50 Fathead minnow (96 hr.) = 18.4 ppm
LC50 Bluegill sunfish (96 hr.) = 12.9 ppm
LC50 Rainbow trout (96 hr.) = 5 ppm
LC50 Sheephead minnow (96 hr.) = 29.4-52.2 ppm

Invertebrate Toxicity:
LC50 (Static) Mysid shrimp (96 hr.) = 10.2 ppm
LC50 Daphnia magna (48 hr.) = 18 mg/L

FATE AND TRANSPORT:

BIODEGRADATION: Biodegradation may occur under anaerobic conditions (in the absence of oxygen).

PERSISTENCE: AIR: Vapors in air are subject to photooxidation, but do not contribute to tropospheric ozone formation. Half-life estimates range from 3 months to less than 1 hour. SOIL: Average Koc of 237 suggests moderate mobility in soil. This material can leach rapidly through sandy soil to reach groundwater. Soil adsorption potential is low. Will not significantly hydrolyze in soil or water under normal environmental conditions. WATER: Slow biodegradation may occur in groundwater where acclimated populations of microorganisms exist. Does not readily adsorb to sediment. This material in water is subject to volatilization, with half-life estimates ranging from less than one day to several weeks.

BIOCONCENTRATION: Bioconcentration potential is low to moderate with a BCF of 26-77.

13. DISPOSAL CONSIDERATIONS

Waste from material:
Reuse or reprocess, if possible. Keep out of water supplies, sewers and soil. Recovered liquids may be sent to a licensed reclaimer or incineration facility. Dispose in accordance with all applicable regulations.

Container Management:
Dispose of container in accordance with applicable local, regional, national, and/or international regulations. Container rinsate must be disposed of in compliance with applicable regulations.

14. TRANSPORT INFORMATION

LAND TRANSPORT

U.S. DOT 49 CFR 172.101:

UN NUMBER:	UN1897
PROPER SHIPPING NAME:	Tetrachloroethylene
HAZARD CLASS/ DIVISION:	6.1
PACKING GROUP:	III

LABELING REQUIREMENTS: 6.1
MARINE POLLUTANT: Tetrachloroethylene
RQ (lbs): RQ 100 lbs (Tetrachloroethylene)
RQ 10 Lbs. (Carbon tetrachloride)

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

UN NUMBER: UN1897
SHIPPING NAME: Tetrachloroethylene
CLASS OR DIVISION: 6.1
PACKING/RISK GROUP: III
LABELING REQUIREMENTS: 6.1
CAN. MARINE POLLUTANT: Tetrachloroethylene

MARITIME TRANSPORT (IMO / IMDG) :

UN NUMBER: UN1897
PROPER SHIPPING NAME: Tetrachloroethylene
HAZARD CLASS / DIVISION: 6.1
Packing Group: III
MARINE POLLUTANT: Tetrachloroethylene

15. REGULATORY INFORMATION

U.S. REGULATIONS

OSHA REGULATORY STATUS:
This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200)

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
If a release is reportable under CERCLA section 103, notify the state emergency response commission and local emergency planning committee. In addition, notify the National Response Center at (800) 424-8802 or (202) 426-2675.

Component	CERCLA Reportable Quantities:
Tetrachloroethylene [Perc]	1 lb (final RQ) 100 lb (final RQ)
Carbon Tetrachloride	1 lb (final RQ) 10 lb (final RQ)

SARA EHS Chemical (40 CFR 355.30)
Not regulated

EPCRA SECTIONS 311/312 HAZARD CATEGORIES (40 CFR 370.10):

Acute Health Hazard, Chronic Health Hazard

EPCRA SECTION 313 (40 CFR 372.65):
The following chemicals are listed in 40 CFR 372.65 and may be subject to Community Right-to Know Reporting requirements.

Component	Status:
Tetrachloroethylene [Perc]	0.1 %
Carbon Tetrachloride	0.1 %

OSHA PROCESS SAFETY (PSM) (29 CFR 1910.119):
Not regulated

Safe Drinking Water Act - MCLs: Subject to 40 CFR Part 41 Safe Drinking Water Act (SDWA). A maximum contaminant level 0.005 mg/L. Subject to 40 CFR Part 63 Subsection T: NESHAP's Halogenated Solvent Cleaning

NATIONAL INVENTORY STATUS

U.S. INVENTORY STATUS: Toxic Substance Control Act (TSCA): All components are listed or exempt.

TSCA 12(b): This product is not subject to export notification.

Canadian Chemical Inventory: All components of this product are listed on either the DSL or the NDSL.

STATE REGULATIONS

California Proposition 65:
This product contains a chemical known to the State of California to cause cancer, and/or birth defects, and/or other reproductive harm as listed under Proposition 65 State Drinking Water and Toxic Enforcement Act.

Component	California Proposition 65 Cancer WARNING:	California Proposition 65 CRT List - Male reproductive toxin:	California Proposition 65 CRT List - Female reproductive toxin:	Massachusetts Right to Know Hazardous Substance List	New Jersey Right to Know Hazardous Substance List	New Jersey Special Health Hazards Substance List
Tetrachloroethylene [Perc] 127-18-4	Listed	Not Listed	Not Listed	Listed	1810	carcinogen
Carbon Tetrachloride 56-23-5	Listed	Not Listed	Not Listed	Listed	0347	carcinogen

Component	New Jersey - Environmental Hazardous Substance List	Pennsylvania Right to Know Hazardous Substance List	Pennsylvania Right to Know Special Hazardous Substances	Pennsylvania Right to Know Environmental Hazard List	Rhode Island Right to Know Hazardous Substance List
Tetrachloroethylene [Perc] 127-18-4	Listed	Listed	Present	Present	Listed
Carbon Tetrachloride 56-23-5	Listed	Listed	Present	Present	Listed

CANADIAN REGULATIONS

• This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations

WHMIS - Classifications of Substances:
• D1B - Poisonous and Infectious Material; Materials causing immediate and serious toxic effects - Toxic material
• D2A - Poisonous and Infectious Material; Materials causing other toxic effects - Very toxic material
• D2B - Poisonous and Infectious Material; Materials causing other toxic effects - Toxic material

16. OTHER INFORMATION

Prepared by: OxyChem Corporate HESS - Product Stewardship

Rev. Date: 20-Feb-2015

HMIS: (SCALE 0-4) (Rated using National Paint & Coatings Association HMIS: Rating Instructions, 2nd Edition)

Health Rating: 2* **Flammability Rating:** 0 **Reactivity Rating:** 0

NFPA 704 - Hazard Identification Ratings (SCALE 0-4)

Health Rating: 2 **Flammability:** 0 **Reactivity Rating:** 0

Reason for Revision:
• Changed the SDS format to meet the GHS requirements of the revised 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200}
• Updated the (M)SDS header
• Updated 24 Hour Emergency Telephone Number: SEE SECTION 1
• Product Identifier has been added or updated: SEE SECTION 1
• Updated Uses Advised Against information: SEE SECTION 1
• Added OSHA Status: SEE SECTION 2
• Emergency Overview was revised: SEE SECTION 2
• Added GHS Information: SEE SECTION 2
• Added synonym(s): SEE SECTION 3
• Updated First Aid Measures: SEE SECTION 4
• Modified Fire Fighting Measure Recommendations: SEE SECTION 5
• Revised Accidental Release Measures: SEE SECTION 6
• Revised Handling and Storage Recommendations: SEE SECTION 7
• Revised Exposure Controls/Personal Protection information: SEE SECTION 8
• Updated Physical and Chemical Properties. SEE SECTION 9
• Stability and Reactivity recommendations: SEE SECTION 10
• Toxicological Information has been revised: SEE SECTION 11
• Updated Disposal Considerations. SEE SECTION 13
• Updated Transportation Information: SEE SECTION 14
• Regulatory Information Changes: SEE SECTION 15
• Revised Preparer Information: SEE SECTION 16
• Added SDS Revision Date: SEE SECTION 16
• Added/Updated Revision Log: SEE SECTION 16

PERCHLOROETHYLENE, ALL GRADES

SDS No.: M47014 **SDS Revision Date:** 20-Feb-2015

IMPORTANT:
The information presented herein, while not guaranteed, was prepared by technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTY OR GUARANTY OF ANY OTHER KIND, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, SAFETY, SUITABILITY, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling, storage, disposal and other factors that may involve other or additional legal, environmental, safety or performance considerations, and OxyChem assumes no liability whatsoever for the use of or reliance upon this information. While our technical personnel will be happy to respond to questions, safe handling and use of the product remains the responsibility of the customer. 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.

OSHA Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Safety Data Sheet available to your employees

End of Safety Data Sheet

SAFETY DATA SHEET

Revision Date 24-May-2017 **Revision Number** 2

1. Identification

Product Name **Pyrene, ca 96%**

Cat No. : **AC157651000; AC157655000**

Synonyms Benzo[def]phenanthrene

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
Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements
None required

Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects

3. Composition / information on ingredients

Component	CAS-No	Weight %
Pyrene	129-00-0	96.0

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 °C
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
1	1	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 This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Pyrene		TWA: 0.2 mg/m³		

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	Yellow
Odor	Odorless
Odor Threshold	No information available
pH	
Melting Point/Range	156 °C
Boiling Point/Range	°C @ 760 mmHg
Flash Point	°C
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 mmHg @ 20 °C
Vapor Density	No information available
Specific Gravity	No information available
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	C16H10
Molecular Weight	202.25

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

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Pyrene	LD50 = 2700 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.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Pyrene	129-00-0	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 The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Pyrene	Not listed	Oncorhynchus mykiss: LC50 > 2mg/L 96h	Not listed	EC50 48h 1.8 mg/L EC50 48h 0.002-0.003 mg/L

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

Component	log Pow
Pyrene	4.88

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.

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
Pyrene	X	X	-	204-927-3	-		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 Hazard Categories

Acute Health Hazard	No
Chronic Health Hazard	No
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
Pyrene	-	-	-	X

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Pyrene	5000 lb	5000 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Pyrene	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 24-May-2017
Print Date 24-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

Material Safety Data Sheet

Toluene

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Toluene

OTHER/GENERIC NAMES: Toloul, Methylbenzene

PRODUCT USE: Solvent

MANUFACTURER: Honeywell
1953 South Harvey Street
Muskegon, MI 49442

DISTRIBUTOR: VWR International
1310 Goshen Parkway
West Chester, PA 19380

FOR MORE INFORMATION CALL:
(Monday-Friday, 8:00am-5:00pm)
1-800-932-5000

IN CASE OF EMERGENCY CALL:
(24 Hours/Day, 7 Days/Week)
1-800-424-9300 (USA Only)
For Transportation Emergencies:
1-800-424-9300 (CHEMTREC - Domestic)
1-613-996-6666(CANUTEC- Canada)

NOTE: Emergency telephone numbers are to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure, or accident involving chemicals. All non-emergency questions should be directed to customer service.

2. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT NAME	CAS NUMBER	WEIGHT %
Toluene	108-88-3	100

Component Information/Information on Non-Hazardous Components
This product is considered to be hazardous according to the criteria specified in 29 CFR 1910.1200 (Hazard Communication Standard) and the Canadian Controlled Product Regulations.

Trace impurities and additional material names not listed above may also appear in Section 15 toward the end of the MSDS. These materials may be listed for local "Right-To-Know" compliance and for other reasons.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear, volatile, flammable liquid. Has a sweet, pungent odor. Highly flammable. Vapours may form explosive mixtures with air. The product causes irritation of eyes, skin and mucous membranes. Causes headache, drowsiness or other effects to the central nervous system. Harmful: may cause lung damage if swallowed. Severe exposure may cause respiratory depression, unconciousness, convulsions and death. Do not allow product to contact skin, eyes and clothing. Do not breathe vapours.

POTENTIAL HEALTH HAZARDS

SKIN: Irritating to skin. May be harmful if absorbed through skin. Skin absorption may cause toxic effects similar to those described for inhalation. Repeated or extended contact may cause erythema (reddening of the skin) or dermatitis, resulting from a defatting action on tissue.

EYES: Vapours irritate the eyes. Contact with liquid or mist will irritate the eyes. May cause damage to the cornea.

INHALATION: Harmful: danger of serious damage to health by prolonged exposure through inhalation. Vapours may cause drowsiness and dizziness. Inhalation of high vapour concentrations can cause CNS-depression and narcosis. Symptoms include headache, nausea, dizziness, lack of coordination and anesthesia.

INGESTION: Harmful: may cause lung damage if swallowed. Ingestion causes gastrointestinal disturbances. Ingestion of this product may result in central nervous system effects including headache, sleepiness, dizziness, slurred speech and blurred vision.

DELAYED EFFECTS: Repeated and prolonged exposure to solvents may cause brain and nervous system damage. Repeated or prolonged exposure may cause damage to the liver and kidney. Possible risk of harm to the unborn child.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory diseases, liver or kidney dysfunctions, or blood, cardiovascular or central nervous system disorders may be aggravated by exposure.

HMIS Ratings: Health: 2* **Fire:** 3 **Physical Hazard:** 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

INGREDIENT NAME	NTP STATUS	IARC STATUS	OSHA LIST

No component of this product at levels greater than or equal to 0.1% is identified as a carcinogen by ACGIH, IARC, NTP or OSHA.

4. FIRST AID MEASURES

SKIN: Wash off immediately with soap and plenty of water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Obtain medical attention.

EYES: Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

INHALATION: Move to fresh air in case of accidental inhalation of vapours. If not breathing, give artificial respiration. If breathing is difficult, give oxygen, provided a qualified operator is available. Call a physician immediately.

INGESTION: DO NOT induce vomiting. Immediate medical attention is required. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration.

ADVICE TO PHYSICIAN: Treat symptomatically.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT: 39.2°F (4°C)
FLASH POINT METHOD: Closed Cup
AUTOIGNITION TEMPERATURE: 896°F (480°C)
UPPER FLAME LIMIT (volume % in air): 7.1
LOWER FLAME LIMIT (volume % in air): 1.1
FLAME PROPAGATION RATE (solids): Not applicable
OSHA FLAMMABILITY CLASS: Class 1B Flammable Liquid

EXTINGUISHING MEDIA:
Use alcohol-resistant foam, carbon dioxide (CO2) or dry chemical.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Highly flammable. Vapours may form explosive mixtures with air. Vapours are heavier than air and may travel along the ground to some distant source of ignition and flash back.

Hazardous combustion products may include carbon monoxide, carbon dioxide (CO2) .

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS:
Water may be ineffective. Fire-fighters should wear self-contained, NIOSH-approved breathing apparatus and full protective clothing. Fire or intense heat may cause violent rupture of packages. In the event of fire, cool tanks with water spray. Do not use a solid water stream as it may scatter and spread fire. After fire, flush area with water to prevent re-ignition.

NFPA Ratings: Health: 2 **Fire:** 3 **Reactivity:** 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE:
Containment Procedures: Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Stop flow of material, if this is without risk.
Cleanup Procedures: Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Shovel into suitable container for disposal. Do not use sparking tools. Do not allow product to enter sewer or waterways.
Evacuation Procedures: Keep unnecessary people away. Isolate area.
Special Procedures: Use personal protective equipment. Remove all sources of ignition. Ensure adequate ventilation.

Spills and releases may have to be reported to Federal and/or local authorities. See Section 15 regarding reporting requirements.

7. HANDLING AND STORAGE

NORMAL HANDLING: (Always wear recommended personal protective equipment.)

Ensure all equipment is electrically grounded before beginning transfer operations. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Do not breathe vapours. Keep away from fire, sparks and heated surfaces. Keep container tightly closed in a dry and well-ventilated place.

STORAGE RECOMMENDATIONS:

Keep in a well-ventilated place. Empty containers may retain product residue including Flammable or Explosive vapours. Do not cut, drill, grind, or weld near full, partially full, or empty product containers. Keep away from heat and sources of ignition. Store away from incompatible substances. Re-open used containers with caution. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in area designed for storage of flammable liquids. Outside or detached storage is preferable. Protect containers against physical damage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

Provide local and general exhaust ventilation to effectively remove and prevent buildup of any vapours or mists generated from the handling of this product. Use product only in closed system. Prevent electrostatic charge build-up by using common bonding and grounding techniques.

PERSONAL PROTECTIVE EQUIPMENT

SKIN PROTECTION:

Wear impervious gloves and flame retardant antistatic protective clothing. For leak, spills, or other emergency, use full protective equipment.

EYE PROTECTION:

For handling in closed ventilation system, wear safety glasses with side-shields. For leak, spill or other emergency, use chemical goggles and face-shield.

RESPIRATORY PROTECTION:

When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. For routine operations, wear self-contained breathing apparatus.

ADDITIONAL RECOMMENDATIONS:

Provide eyewash stations and quick-drench shower facilities.

EXPOSURE GUIDELINES

Component Exposure Limits
Toluene (108-88-3)

ACGIH:	50 ppm TWA
	Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA (Final):	200 ppm TWA
	300 ppm Ceiling
OSHA (Vacated):	100 ppm TWA; 375 mg/m3 TWA
	150 ppm STEL; 560 mg/m3 STEL
NIOSH:	100 ppm TWA; 375 mg/m3 TWA
	150 ppm STEL; 560 mg/m3 STEL
Alberta:	50 ppm TWA; 188 mg/m3 TWA
	Substance may be readily absorbed through intact skin
British Columbia:	50 ppm TWA
	Skin notation
Manitoba:	100 ppm TWA; 375 mg/m3 TWA
	150 ppm STEL; 560 mg/m3 STEL
New Brunswick:	50 ppm TWA; 188 mg/m3 TWA
	Skin - potential for cutaneous absorption
North West Territories:	100 ppm TWA; 375 mg/m3 TWA
	150 ppm STEL; 560 mg/m3 STEL
	Skin notation
Nova Scotia:	50 ppm TWA
	Skin - potential significant contribution to overall exposure by the cutaneous route
Nunavut:	100 ppm TWA; 375 mg/m3 TWA
	150 ppm STEL; 560 mg/m3 STEL
	Skin notation
Ontario:	50 ppm TWAEV
Quebec:	100 ppm TWAEV; 377 mg/m3 TWAEV
	150 ppm STEV; 565 mg/m3 STEV
Saskatchewan:	188 mg/m3 TWA; 50 ppm TWA
	235 mg/m3 STEL; 60 ppm STEL
Yukon:	100 ppm TWA; 375 mg/m3 TWA
	150 ppm STEL; 560 mg/m3 STEL
	Skin notation

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear, colorless liquid
PHYSICAL STATE: Liquid
MOLECULAR WEIGHT: 92.14
CHEMICAL FORMULA: C_7H_8
ODOR: Sweet, pungent
SPECIFIC GRAVITY (water = 1.0): 0.867@ 68°F (20°C)

SOLUBILITY IN WATER (weight %): 0.074% @ 68°F (20°C)
pH: Not applicable
BOILING POINT: 231.08°F (110.6°C) @ 760 mm Hg
MELTING POINT: -125°F (-95°C)
VAPOUR PRESSURE: 28.5 @ 68°F (20°C)
VAPOUR DENSITY (air = 1.0): 3.1
EVAPORATION RATE: 4.5 **COMPARED TO:** Ether
% VOLATILES: ~100
FLASH POINT: 39.2°F (4°C)

(Flash point method and additional flammability data are found in Section 5.)

10. STABILITY AND REACTIVITY

NORMALLY STABLE? (CONDITIONS TO AVOID):

Stable under recommended storage conditions.
Avoid: Heat, flames and sparks. Incompatible products

INCOMPATIBILITIES:

Keep away from oxidising agents, strongly alkaline and strongly acid materials in order to avoid exothermic reactions.

HAZARDOUS DECOMPOSITION PRODUCTS:

Hazardous decomposition products include carbon monoxide and carbon dioxide (CO_2) .

HAZARDOUS POLYMERISATION:

Hazardous polymerisation does not occur.

11. TOXICOLOGICAL INFORMATION

Component Analysis - LD50/LC50

Toluene (108-88-3)

Rat: LD50 – Route: Inhalation; Dose: 12.5 mg/L/4H
LD50 – Route: Inhalation; Dose: >26700 ppm/1H
LD50 – Route: Oral; Dose: 636 mg/kg
Rabbit: LD50 – Route: Dermal; Dose: 8390 mg/kg

IMMEDIATE (ACUTE) EFFECTS:

The product causes irritation of eyes, skin and mucous membranes. Causes headache, drowsiness or other effects to the central nervous system. Harmful: may cause lung damage if swallowed. Severe exposure may cause respiratory depression, unconsciousness, convulsions and death.

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS:

Possible risk of harm to the unborn child. Repeated and prolonged exposure to solvents may cause brain and nervous system damage. Repeated or prolonged exposure may cause damage to the liver and kidney. Inhalation (rats) of 2500 ppm/6.5h/day for 15 weeks, produced changes in heart, liver, kidney, urethra and bladder.

Mutagenicity:

- Non mutagenic in Ames salmonella/microsome assay
- Non mutagenic in CHO chromosome aberration assay

OTHER DATA:

This material is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP, or EPA.

Component Carcinogenicity
Toluene (108-88-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71, 1999; Monograph 47, 1989 (Group 3 (not classifiable))

12. ECOLOGICAL INFORMATION

Harmful to aquatic organisms. Prevent from entering sewer or waterway.
Component Analysis - Ecotoxicity - Aquatic Toxicity

Toluene (108-88-3)

Test & Species		**Conditions**
96 Hr LC50 fathead minnow (1 day old)	25 mg/L	flow-through
96 Hr LC50 rainbow trout	24.0 mg/L	static
96 Hr LC50 bluegill	24.0 mg/L	static
96 Hr LC50 fathead minnow	31.7 mg/L	flow-through
30 min EC50 Photobacterium phosphoreum	19.7 mg/L	
48 Hr EC50 water flea	11.3 mg/L	
48 Hr EC50 water flea	310 mg/L	

Accumulation in terrestrial organisms is unlikely. Bioaccumulation is unlikely.

13. DISPOSAL CONSIDERATIONS

WASTE INFORMATION: This product is a D001 ignitable waste in supplied form. Dispose of as special waste in compliance with local and national regulations. Waste codes should be assigned by the user based on the application for which the product was used. Incineration of waste material in an EPA-approved facility is recommended, allowing a solid, inert residue to form.

OTHER DISPOSAL CONSIDERATIONS: Observe all Federal, State, and Local Environmental regulations.

The information offered here is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

14. TRANSPORT INFORMATION

US DOT PROPER SHIPPING NAME: Toluene
US DOT HAZARD CLASS: 3 **PACKING GROUP:** II
US DOT ID NUMBER: UN1294

TDG PROPER SHIPPING NAME: Toluene
TDG HAZARD CLASS: 3 **PACKING GROUP:** II
TDG ID NUMBER: UN1294

North American Emergency Response Guide (ERG) Number: 130

For additional information on shipping regulations affecting this material, contact the information number found in Section 1.

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA)

TSCA INVENTORY STATUS: All components are on the U.S. EPA TSCA Inventory List.
OTHER TSCA ISSUES: Additional TSCA information may exist. Contact VWR if you have questions regarding your application or use of this product.

SARA TITLE III/CERCLA

"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

INGREDIENT NAME	SARA/CERCLA RQ (lb)	SARA EHS TPQ (lb)
Toluene	1000	None.

Spills or releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center [(800) 424-8802] and to your Local Emergency Planning Committee.

SECTION 311 HAZARD CLASS: Immediate. Delayed. Fire.

SARA 313 TOXIC CHEMICALS:
The following ingredients are SARA 313 "Toxic Chemicals". CAS numbers and weight percents are found in Section 2.

INGREDIENT NAME	COMMENT
Toluene (108-88-3)	1.0 % de minimis concentration

STATE RIGHT-TO-KNOW

In addition to the ingredients found in Section 2, the following are listed for state right-to-know purposes.

INGREDIENT NAME	WEIGHT %	COMMENT
Toluene (108-88-3)	100	CA, MA, MN, NJ, PA, RI

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

ADDITIONAL REGULATORY INFORMATION:

Toluene is regulated by the Drug Enforcement Administration and appears on List II (21 CFR Section 1310.02(b) and 1310.04(f)(2)). Importation, exportation and domestic sales in excess of the applicable thresholds must comply with the regulations.

WHMIS CLASSIFICATION (CANADA):

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

WHMIS Classification:

B2- Flammable Liquid
D2A- Very Toxic Material
D2B- Toxic Material

FOREIGN INVENTORY STATUS:

Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC	AUST	PHIL	MITI	KOREA	CHINA
Toluene	108-88-3	Yes	DSL	EINECS	Yes	Yes	Yes	Yes	Yes

16. OTHER INFORMATION

CURRENT ISSUE DATE: December 21, 2005
PREVIOUS ISSUE DATE: New MSDS.

CHANGES TO MSDS FROM PREVIOUS ISSUE DATE ARE DUE TO THE FOLLOWING:

New MSDS.

OTHER INFORMATION: As per the OSHA Hazard Communication Standard, 1910.1200, the information contained within this MSDS must be given to those persons using this material. For laboratory use only. Not for food or drug use. Do not store with foodstuffs.

KEY/LEGEND: ACGIH = American Conference of Governmental Industrial Hygienists; CAS = Chemical Abstracts Service; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CFR = Code of Federal Regulations; CPR = Controlled Products Regulations; DOT = Department of Transportation; DSL = Domestic Substances List; EINECS = European Inventory of Existing Commercial Chemical Substances; EPA = Environmental Protection Agency; IARC = International Agency for Research on Cancer; IATA = International Air Transport Association; mg/Kg = milligrams per Kilogram; mg/L = milligrams per Liter; mg/m3 = milligrams per Cubic Meter; MSHA = Mine Safety and Health Administration; NA = Not Applicable or Not Available; NIOSH = National Institute for Occupational Safety and Health; NJTSR = New Jersey Trade Secret Registry; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; SARA = Superfund Amendments and Reauthorization Act; TDG = Transport Dangerous Goods; TSCA = Toxic Substances Control Act; WHMIS = Workplace Hazardous Materials Information System.

End of Sheet #BDH-180

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: TRICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
MTG MSDS 199; ACETYLENE TRICHLORIDE; ETHYLENE TRICHLORIDE; 1-CHLORO-2,2-DICHLOROETHYLENE; 1,1-DICHLORO-2-CHLOROETHYLENE; TCE; ETHINYL TRICHLORIDE; TRICHLOROETHENE; 1,1,2-TRICHLOROETHYLENE; 1,1,2-TRICHLOROETHENE; UN 1710; RCRA U228; C2HCl3; MAT23850; RTECS KX4550000

CHEMICAL FAMILY: halogenated, alkenes

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: TRICHLOROETHYLENE
CAS NUMBER: 79-01-6
PERCENTAGE: >99

COMPONENT: INHIBITORS
CAS NUMBER: Not assigned.
PERCENTAGE: <0.1

COMPONENT: AMINES
CAS NUMBER: Not assigned.
PERCENTAGE: <0.1

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=1 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: colorless
PHYSICAL FORM: liquid
ODOR: sweet odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression, allergic reactions, cancer hazard (in humans)
PHYSICAL HAZARDS: May polymerize. Containers may rupture or explode. May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, changes in blood pressure, nausea, vomiting, stomach pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, mood swings, tremors, loss of coordination, visual disturbances, bluish skin color, lung congestion, kidney damage, liver damage, unconsciousness, coma
LONG TERM EXPOSURE: same as effects reported in short term exposure, loss of appetite, weight loss, blood disorders, brain damage, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation, allergic reactions
LONG TERM EXPOSURE: irritation, allergic reactions, nausea, loss of appetite, weight loss, difficulty breathing, headache, drowsiness, dizziness, joint pain, loss of coordination, visual disturbances, paralysis
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), blurred vision
LONG TERM EXPOSURE: irritation (possibly severe), eye damage
INGESTION:
SHORT TERM EXPOSURE: same as effects reported in short term inhalation
LONG TERM EXPOSURE: same as effects reported in long term inhalation

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For ingestion, consider gastric lavage. Consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Slight fire hazard.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For tank, rail car or tank truck, evacuation radius: 800 meters (1/2 mile).

FLASH POINT: No data available.
LOWER FLAMMABLE LIMIT: 7.8% @ 100 C
UPPER FLAMMABLE LIMIT: 52% @ 100 C
AUTOIGNITION: 770 F (410 C)

6. ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray. Collect runoff for disposal as potential hazardous waste.

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE:
Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Small liquid spills: Absorb with sand or other non-combustible material. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Store in a cool, dry place. Store in a well-ventilated area. Avoid heat, flames, sparks and other sources of ignition. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
TRICHLOROETHYLENE:
100 ppm OSHA TWA
200 ppm OSHA ceiling
300 ppm OSHA peak (5 minutes in any 2 hours)
50 ppm (269 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
200 ppm (1070 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
10 ppm ACGIH TWA
25 ppm ACGIH STEL
25 ppm NIOSH TWA 10 hour(s)
2 ppm NIOSH ceiling 60 minute(s) (used as halogenated anesthetic gas)

VENTILATION: Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
At any detectable concentration -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: sweet odor
MOLECULAR WEIGHT: 131.39
MOLECULAR FORMULA: Cl-C-H-C-Cl2
BOILING POINT: 189 F (87 C)
FREEZING POINT: -99 F (-73 C)
VAPOR PRESSURE: 58 mmHg @ 20 C
VAPOR DENSITY (air=1): 4.53
SPECIFIC GRAVITY (water=1): 1.4642
WATER SOLUBILITY: 0.1%
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: 21 ppm
EVAPORATION RATE: 0.69 (carbon tetrachloride=1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, acetone, chloroform, benzene, vegetable oils

10. STABILITY AND REACTIVITY

REACTIVITY: May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: bases, metals, combustible materials, oxidizing materials

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION: May polymerize. Avoid contact with heat or light and monitor inhibitor content.

11. TOXICOLOGICAL INFORMATION

TRICHLOROETHYLENE:
IRRITATION DATA: 2 mg/24 hour(s) skin-rabbit severe; 20 mg/24 hour(s) eyes-rabbit moderate
TOXICITY DATA: 140700 mg/m3/1 hour(s) inhalation-rat LC50; >20 gm/kg skin-rabbit LD50; 4920 mg/kg oral-rat LD50
CARCINOGEN STATUS: NTP: Anticipated Human Carcinogen; IARC: Human Limited Evidence,

Animal Sufficient Evidence, Group 2A; ACGIH: A2 -Suspected Human Carcinogen
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion
Slightly Toxic: inhalation
Relatively Non-toxic: dermal absorption
TARGET ORGANS: immune system (sensitizer), central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: heart problems
TUMORIGENIC DATA: Available.
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: May cross the placenta. Stimulants such as epinephrine may induce ventricular fibrillation.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 3100 ug/L 96 hour(s) LC50 (Mortality) Flagfish (Jordanella floridae)

INVERTEBRATE TOXICITY: 1700 ug/L 7 hour(s) EC50 (Regeneration) Flatworm (Dugesia japonica)

OTHER TOXICITY: 45000 ug/L 48 week(s) LC50 (Mortality) Clawed toad (Xenopus laevis)

FATE AND TRANSPORT:
BIOCONCENTRATION: 17 ug/L 1-14 hour(s) BCF (Residue) Bluegill (Lepomis macrochirus) 8.23 ug/L

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U228. Hazardous Waste Number(s): D040. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.5 mg/L. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Trichloroethylene
ID NUMBER: UN1710
HAZARD CLASS OR DIVISION: 6.1
PACKING GROUP: III
LABELING REQUIREMENTS: 6.1

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Trichloroethylene
UN NUMBER: UN1710
CLASS: 6.1
PACKING GROUP/CATEGORY: III

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
TRICHLOROETHYLENE: 100 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: Yes
FIRE: No
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
TRICHLOROETHYLENE

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
TRICHLOROETHYLENE
Cancer (Apr 01, 1988)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: D2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

Material Safety Data Sheet
1,2,4-Trimethylbenzene

MSDS# 73581

Section 1 - Chemical Product and Company Identification

MSDS Name:	1,2,4-Trimethylbenzene
Catalog Numbers:	AC140090000, AC140090010, AC140090025, AC140090100, AC140095000
Synonyms:	Pseudocumene.

Company Identification:	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
Company Identification: (USA)	Acros Organics One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	800-ACROS-01
For information in Europe, call:	+32 14 57 52 11
Emergency Number, Europe:	+32 14 57 52 99
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300
CHEMTREC Phone Number, Europe:	703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#:	95-63-6
Chemical Name:	1,2,4-Trimethylbenzene
%:	98
EINECS#:	202-436-9

Hazard Symbols: XN N

Risk Phrases: 10 20 36/37/38 51/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Warning! Flammable liquid and vapor. Harmful if inhaled. Causes eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Target Organs: Blood, central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye:	Causes eye irritation. Causes redness and pain.
Skin:	Causes skin irritation. Causes redness and pain. May be harmful if absorbed through the skin.
Ingestion:	May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May be harmful if swallowed. May cause central nervous system depression.
Inhalation:	Harmful if inhaled. Causes respiratory tract irritation. May cause drowsiness, unconsciousness, and central nervous system depression.
Chronic:	Prolonged or repeated skin contact may cause dermatitis. May cause anemia and other blood cell abnormalities. Prolonged exposure may produce a narcotic effect. Prolonged or repeated exposure may cause nausea,

dizziness, and headache.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion: Do not induce vomiting. Possible aspiration hazard. Get medical aid immediately. Call a poison control center.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Possible aspiration hazard. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Notes to Physician:

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Containers may explode in the heat of a fire. Flammable liquid and vapor.

Extinguishing Media: Use water spray to cool fire-exposed containers. Use water spray, dry chemical, carbon dioxide, or chemical foam.

Autoignition Temperature: 500 deg C (932.00 deg F)

Flash Point: 48 deg C (118.40 deg F)

Explosion Limits: Lower: 0.9 vol %

Explosion Limits: Upper: 6.4 vol %

NFPA Rating: health: 2; flammability: 2; instability: 0;

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood. Keep away from heat, sparks and flame.

Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,2,4-Trimethylbenzene	25 ppm TWA (listed under Trimethyl benzene).	25 ppm TWA; 125 mg/m3 TWA	none listed

OSHA Vacated PELs: 1,2,4-Trimethylbenzene: 25 ppm TWA; 125 mg/m3 TWA (listed under Trimethyl benzene)

Engineering Controls:

Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Personal Protective Equipment

Eyes:	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin:	Wear appropriate protective gloves to prevent skin exposure.
Clothing:	Wear appropriate protective clothing to prevent skin exposure.
Respirators:	A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State:	Clear liquid
Color:	colorless
Odor:	aromatic odor
pH:	Not available
Vapor Pressure:	7 mm Hg @ 44.4 deg C
Vapor Density:	4.15 (air=1)
Evaporation Rate:	Not available
Viscosity:	Not available
Boiling Point:	168 deg C @ 760 mmHg (334.40°F)
Freezing/Melting Point:	-44 deg C (-47.20°F)
Decomposition Temperature:	Not available
Solubility in water:	Insoluble
Specific Gravity/Density:	0.880 g/cm3
Molecular Formula:	C9H12
Molecular Weight:	120.19

Section 10 - Stability and Reactivity

Chemical Stability:	Stable under normal temperatures and pressures.
Conditions to Avoid:	Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials	Strong oxidizing agents.
Hazardous Decomposition Products	Carbon monoxide, carbon dioxide.
Hazardous Polymerization	Will not occur.

Section 11 - Toxicological Information

RTECS#:	CAS# 95-63-6: DC3325000
LD50/LC50:	RTECS: **CAS# 95-63-6:** Inhalation, rat: LC50 = 18000 mg/m3/4H; Oral, mouse: LD50 = 6900 mg/kg; Oral, rat: LD50 = 5 gm/kg; .
Carcinogenicity:	1,2,4-Trimethylbenzene - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.
Other:	See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity:	Fish: Fathead Minnow: LC50 = 77.2 mg/L; 96 Hr; Flow-through at 25 C (pH 7.24)
Other:	Do not empty into drains.

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: FLAMMABLE LIQUIDS, N.O.S. (1,2,4-Trimethylbenzene)
Hazard Class: 3
UN Number: UN1993
Packing Group: III
Canada TDG

Shipping Name: Not available
Hazard Class:
UN Number:
Packing Group:

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN N

Risk Phrases:

R 10 Flammable.

R 20 Harmful by inhalation.

R 36/37/38 Irritating to eyes, respiratory system and skin.

R 51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 95-63-6: 3

Canada

CAS# 95-63-6 is listed on Canada's DSL List

Canadian WHMIS Classifications: B3, D1B, D2B

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

CAS# 95-63-6 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

CAS# 95-63-6 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 5/19/1999

Revision #6 Date 7/20/2009

Ethylbenzene
Safety Data Sheet

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Section 1: Identification

1.1. Product identifier

Product form : Substance

Product Identifier(s) : Ethylbenzene
Ethyl benzene
EB

CAS No : 100-41-4

1.2. Recommended use of the chemical and restrictions on use

Use of the substance/mixture : Industrial use resulting in manufacture of another substance (use of intermediates)
Solvent

1.3. Details of the supplier of the safety data sheet

Total Petrochemicals & Refining USA, Inc.
P O Box 674411
Houston, TX 77267-4411

For non-emergency product information:
Phone: 713-483-5000
Email: product.stewardship@total.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 (Toll Free USA & Canada) / 703-527-3887 (Multiple languages)
Total Petrochemicals & Refining USA, Inc.: 1-800-322-3462 (Language: English only)

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Flammable liquids Category 2
Acute toxicity (inhalation:vapor) Category 4
Germ cell mutagenicity Category 1B
Carcinogenicity Category 2
Reproductive toxicity Category 2
Specific target organ toxicity (single exposure) Category 3 - Respiratory irritation
Specific target organ toxicity (single exposure) Category 3 - Narcotic effects
Specific target organ toxicity (repeated exposure) Category 2
Aspiration hazard Category 1

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

Signal word (GHS-US) : **Danger**

Hazard statements (GHS-US) : **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
May cause genetic defects
Suspected of causing cancer
Suspected of damaging fertility or the unborn child
May cause damage to organs (hearing organ (loss of hearing), kidneys) through prolonged or repeated exposure

Precautionary statements (GHS-US) : Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.

Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical, lighting, ventilating equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe mist, spray, vapors.
Use only outdoors or in a well-ventilated area.
Wear eye protection, flame retardant protective clothing, impermeable protective gloves.
If swallowed: Immediately call a doctor, poison center.
Do NOT induce vomiting.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
If exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.
In case of fire: Use carbon dioxide (CO2), dry chemical, foam, water spray to extinguish.
Store in a well-ventilated place. Keep cool.
Store locked up.
Dispose of contents and container in accordance with all local, regional, national and international regulations.

2.3. Hazards not otherwise classified

Other hazards not contributing to the classification : Product can accumulate electrostatic charges that may cause fire by electrical discharges.

2.4. Unknown acute toxicity (GHS-US)

Not applicable

2.5. Additional information

Based on conditions common to industrial workplace use of this product : May cause mild eye irritation.
May cause mild skin irritation.

Section 3: Composition/information on ingredients

3.1. Substance

Name : Ethylbenzene
CAS No : 100-41-4
Formula : C8H10

Impurities and/or Stabilizing Additives which Contribute to the Classification:

Name	CAS No	%
Benzene (Impurity)	71-43-2	<= 0.2
Toluene (Impurity)	108-88-3	<= 0.2

3.2. Mixture

Not applicable

Section 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If exposed or concerned: Get medical advice/attention.

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after skin contact : Rinse skin with water/shower. Remove/Take off immediately all contaminated clothing.

First-aid measures after eye contact : IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor/physician.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : May cause genetic defects. Suspected of damaging fertility or the unborn child. Causes damage to organs.

Symptoms/injuries after inhalation : May cause drowsiness or dizziness. May cause respiratory irritation.

Symptoms/injuries after skin contact : May cause mild skin irritation.

Symptoms/injuries after eye contact : May cause mild eye irritation.

Symptoms/injuries after ingestion : May be fatal if swallowed and enters airways.

Chronic symptoms : May cause cancer. May cause genetic defects.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Special hazards arising from the chemical

Fire hazard : Highly flammable liquid and vapor.

Explosion hazard : May form flammable/explosive vapor-air mixture.

5.3. Advice for firefighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Emergency procedures for non-emergency personnel : Evacuate unnecessary personnel.

Emergency procedures for emergency responders : Ventilate area.

6.2. Methods and material for containment and cleaning up

For containment : Take up liquid spill into absorbent material, e.g.: sand, earth, vermiculite. Do not allow material to contaminate ground water system.

Methods for cleaning up : Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

6.3. Reference to other sections

See section 8. Exposure controls/personal protection.

Section 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed : Handle empty containers with care because residual vapors are flammable.

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor. No bare lights. No smoking. Use only non-sparking tools. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Eliminate all ignition sources if safe to do so. Avoid breathing vapors, mist, spray. Use only outdoors or in a well-ventilated area.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Proper grounding procedures to avoid static electricity should be followed. Ground/bond container and receiving equipment. Use explosion-proof electrical, lighting, ventilating equipment. All efforts should be made to prevent any leaks or spills. Storage tanks should be engineered to prevent contact with water resources, as this material could contaminate the water resources. Surface spills can reach groundwater through porous soil or cracked surfaces. The storage tanks should be monitored regularly for leaks. Where spills or leaks are possible, a comprehensive response plan should be developed and implemented.

Storage conditions : Keep only in the original container in a cool, well ventilated place away from : flames, heat sources, Direct sunlight, sparks. Keep in fireproof place. Keep container tightly closed.

Incompatible materials : Sources of ignition. Direct sunlight. Heat sources.

Section 8: Exposure controls/personal protection

8.1. Occupational Exposure Limits

The following constituents are the only constituents of the product which have a PEL, TLV, or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

Ethylbenzene (100-41-4)		
USA ACGIH	ACGIH TWA (ppm)	20 ppm

USA OSHA	OSHA PEL (TWA) (mg/m³)	435 mg/m³
USA OSHA	OSHA PEL (TWA) (ppm)	100 ppm
Benzene (71-43-2)		
USA ACGIH	ACGIH TWA (ppm)	0.5 ppm
USA ACGIH	ACGIH STEL (ppm)	2.5 ppm
USA OSHA	OSHA PEL (TWA) (ppm)	1 ppm
USA OSHA	OSHA PEL (STEL) (ppm)	5 ppm
USA OSHA	Remark (OSHA)	(see 29 CFR 1910.1028)
Toluene (108-88-3)		
USA ACGIH	ACGIH TWA (ppm)	20 ppm
USA OSHA	OSHA PEL (TWA) (ppm)	200 ppm
USA OSHA	OSHA PEL (Ceiling) (ppm)	300 ppm
USA OSHA	Remark (OSHA)	See 29 CFR 1910.1000 TABLE Z-2.

8.2. Exposure controls

Appropriate engineering controls : Ensure adequate ventilation.

Personal protective equipment : Avoid all unnecessary exposure.

Hand protection : Impermeable protective gloves. Choosing the proper glove is a decision that depends not only on the type of material, but also on other quality features, which differ for each manufacturer. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough. The exact break trough time has to be found out by the manufacturer of the protective gloves and has to be observed.

Eye protection : Chemical goggles or safety glasses.

Skin and body protection : Wear fire/flame resistant/retardant clothing.

Respiratory protection : An approved organic vapor respirator/supplied air or self-contained breathing apparatus must be used when vapor concentration exceeds applicable exposure limits.

Other information : Do not eat, drink or smoke during use.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid

Appearance : Clear, colorless, volatile liquid.

Color : Colorless.

Odor : Characteristic. Aromatic. Sweet.

Odor threshold : No data available

pH : Not applicable

Relative evaporation rate (butyl acetate=1) : No data available

Relative evaporation rate (ether=1) : < 94

Melting point : -94.9 °C

Freezing point : -94.9 °C

Boiling point : 136 °C

Flash point : 21 (21 - 23) °C

Auto-ignition temperature : 432 °C

Decomposition temperature : No data available

Flammability (solid, gas) : No data available

Vapor pressure : 9.3 mm Hg @ 25°C

Relative vapor density at 20 °C : 3.7 Air =1

Relative density : 0.9

Solubility : Water: 0.2 g/l
Organic solvent:100 %

Log Kow : 2.2 - 2.7

Viscosity, kinematic : 0.64 cSt @ 40°C

Viscosity, dynamic : No data available

Explosive limits : 1 - 7 vol %

9.2. Other information

VOC content : 100 %

Section 10: Stability and reactivity

10.1. Reactivity

Flammable liquid and vapor.

10.2. Chemical stability

Stable at ambient temperature and under normal conditions of use.

10.3. Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous polymerization will not occur.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures. Open flame.

10.5. Incompatible materials

Strong oxidizing agents.

10.6. Hazardous decomposition products

Hazardous decomposition products formed under fire conditions: carbon monoxide, carbon dioxide, toxic fumes.

Section 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure : Inhalation. Ingestion. Skin and eye contact.

Acute toxicity : Inhalation:vapor: Harmful if inhaled.

Ethylbenzene (100-41-4)	
LD50 oral rat	3500 mg/kg
LD50 dermal rabbit	15354 mg/kg
LC50 inhalation rat	17.2 mg/l/4h

Skin corrosion/irritation : Not classified

Serious eye damage/irritation : Not classified

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : May cause genetic defects.
Classification as a Mutagen 1B is due to the benzene content of this material.

Carcinogenicity : Suspected of causing cancer.

Ethylbenzene (100-41-4)	
Additional information	**IARC has evaluated ethylbenzene as 2B, possibly carcinogenic to humans. In IARC's evaluation, it states that:** **"There is inadequate evidence in humans for the carcinogenicity of ethylbenzene. There is sufficient evidence in experimental animals for the carcinogenicity of ethylbenzene."** **IARC also notes that ethylbenzene typically contains, 0.1 – 0.3 wt % benzene, similar to the benzene content of this product (≤ 0.2 wt %). Benzene is a known human carcinogen.** **Additionally, the types of cancers observed in experimental animals exposed to ethylbenzene are not the same as the types of cancers known to be caused by exposure to benzene.** **There is inadequate evidence that exposure to ethylbenzene containing low levels (≤ 0.2 wt %) of benzene causes carcinogenicity in humans, while there is sufficient evidence that exposure to ethylbenzene causes carcinogenicity in experimental animals. Therefore, ethylbenzene has been US-GHS classified as Carcinogen 2.**

Ethylbenzene (100-41-4)	
IARC group	2B - Possibly carcinogenic to humans
Benzene (71-43-2)	
IARC group	1 - Carcinogenic to humans
National Toxicology Program (NTP) Status	1 - Known Human Carcinogens
OSHA Carcinogen Status	In OSHA Specifically Regulated Carcinogen list
Additional information	**Benzene is a known human carcinogen and is known to cause acute myeloid leukemia & myelodysplastic syndrome (disease that affects the bone marrow and blood) in**

	humans who have been repeatedly exposed to benzene.
Toluene (108-88-3)	
IARC group	3 - Not classifiable

Reproductive toxicity : Suspected of damaging fertility or the unborn child.
Based on animal studies, exposure to high levels of ethylbenzene may cause developmental effects (decreases in growth and increased skeletal variations).

Specific target organ toxicity (single exposure) : May cause respiratory irritation. May cause drowsiness or dizziness.

Specific target organ toxicity (repeated exposure) : May cause damage to organs (hearing organ (loss of hearing), kidneys) through prolonged or repeated exposure.

Aspiration hazard : May be fatal if swallowed and enters airways.

Section 12: Ecological information

12.1. Toxicity

Ecology - general : Harmful to aquatic life with long lasting effects.

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

Ethylbenzene (100-41-4)	
Log Pow	3.6
Log Kow	2.2 - 2.7

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information : Avoid release to the environment.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Dispose of contents and container in accordance with all local, regional, national and international regulations.

Additional information : Handle empty containers with care because residual vapors are flammable.

Ecology - waste materials : Avoid release to the environment. Hazardous waste due to toxicity.

Section 14: Transport information

US Transport (DOT) for Bulk Shipments (Non-Bulk Shipments May Differ)

Transport document description : UN1175, Ethylbenzene, 3, PGII

UN or NA Number : UN1175

Proper Shipping Name : Ethylbenzene

Primary Hazard Class : 3 - Flammable liquid

Packing Group : PGII

Reportable Quantities (RQ)* : Ethylbenzene 1000 lbs (454 kg), Benzene 10 lbs (4.54 kg), Toluene 1000 lbs (454 kg)

*It is the shipper's responsibility to determine whether an RQ must be reported for each individual shipment.

Hazard labels :

Emergency Response Guide (ERG) Number : 130

Transport by sea (IMDG)

Transport document description : UN1175, ETHYLBENZENE, 3, PGII

UN Number : UN1175

Proper Shipping Name : Ethylbenzene

Primary Hazard Class : 3 - Flammable liquids

Packing Group : PGII

Hazard labels (IMDG) :

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Product Name: Ethylbenzene
Pollution Category: Y
Ship Type: 2

Cargo name listed in 46 CFR 30.25, Table 30.25-1 : Ethylbenzene

Cargo name listed in 46 CFR 153, Table 1 : Ethylbenzene

Air transport (IATA)

Transport document description : UN1175, Ethylbenzene, 3, PGII

UN Number : UN1175

Proper Shipping Name : Ethylbenzene

Primary Hazard Class : 3 - Flammable Liquids

Packing Group : PGII

Hazard labels (IATA) :

Section 15: Regulatory information

15.1. US Federal regulations

EPA TSCA Status

All components of this product are listed or excluded from listing on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

SARA Section 313 Supplier Notification

This product contains the following toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372:

CAS number	Chemical name	Concentration
100-41-4	Ethylbenzene	99.5 - 100%
71-43-2	Benzene	<= 0.2%

This information must be included in all Safety Data Sheets that are copied and distributed for this product. For additional information, see 40 CFR §372.45 Notification About Toxic Chemicals.

SARA Section 311/312 Hazard Classes
Fire hazard
Acute health hazard
Chronic health hazard

15.2. International regulations

CANADA

Ethylbenzene (100-41-4)

WHMIS Classification
Class B Division 2 - Flammable Liquid
Class D Division 2 Subdivision A - Very toxic material causing other toxic effects
Class D Division 2 Subdivision B - Toxic material causing other toxic effects

National inventories

(100-41-4)
Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on the Canadian DSL (Domestic Sustances List)
Listed on the China Inventory of Existing Chemical Substances (IECSC)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on the Philippines Inventory of Chemicals and Chemical Substances (PICCS)
Japanese Pollutant Release and Transfer Register Law (PRTR Law)
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations

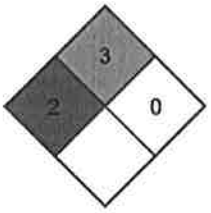
California Proposition 65 - This substance is known to the state of California to cause cancer and/or reproductive toxicity.

Ethylbenzene (100-41-4)	
U.S. - California - Proposition 65 - Carcinogens List	Yes
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
Non-significant risk level (NSRL)	54 µg/day (inhalation)
Benzene (71-43-2)	
U.S. - California - Proposition 65 - Carcinogens List	Yes
U.S. - California - Proposition 65 - Developmental Toxicity	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	Yes
Non-significant risk level (NSRL)	6.4 µg/day (oral)
Toluene (108-88-3)	
U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No

Section 16: Other information

NFPA (National Fire Protection Association)

NFPA health hazard : 2
NFPA fire hazard : 3
NFPA reactivity : 0



HMIS III Rating

Health : 2*
Flammability : 3
Physical Hazard : 0
Personal Protection : See section 8 of SDS

US OSHA LABEL as specified under 29 CFR §1910.1200 (f)

Ethylbenzene

Total Petrochemicals & Refining USA, Inc.
PO Box 674411
Houston, TX 77267-4411 USA
Tel. 713-483-5000 or 1-877-871-2709

Danger

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
May cause genetic defects
Suspected of causing cancer
Suspected of damaging fertility or the unborn child
May cause damage to organs (hearing organ (loss of hearing), kidneys) through prolonged or repeated exposure

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical, lighting, ventilating equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe mist, spray, vapors.
Use only outdoors or in a well-ventilated area.
Wear eye protection, flame retardant protective clothing, impermeable protective gloves.
If swallowed: Immediately call a doctor, poison center.
Do NOT induce vomiting.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
If exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.
In case of fire: Use carbon dioxide (CO_2), dry chemical, foam, water spray to extinguish.
Store in a well-ventilated place. Keep cool.
Store locked up.
Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental Information

Product can accumulate electrostatic charges that may cause fire by electrical discharges.

Version : 2.2
Date of issue : August 17, 2015

MSDS ID: ETHYLBENZENE
SDS REFERENCE NUMBER: BC0003

SDS Template - TOTAL SDS US (GHS HazCom 2012) TPRI Version 4.02

Xylene
Safety Data Sheet

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Section 1: Identification

1.1. Product Identifier

Product form : Mixture

Product Identifier(s) : Xylene

Other means of identification : Xylenes
Xylenes - Mixed Isomers
Xylenes-Ethylbenzene Mixture
Xylene-Ethylbenzene Mixture

1.2. Recommended use of the chemical and restrictions on use

Use of the substance/mixture : Industrial use resulting in manufacture of another substance (use of intermediates)
Solvent
Fuel

1.3. Details of the supplier of the safety data sheet

Total Petrochemicals & Refining USA, Inc.
P O Box 674411
Houston, TX 77267-4411

For non-emergency product information:
Phone: 713-483-5000
Email: product.stewardship@total.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 (Toll Free USA & Canada) / 703-527-3887 (Multiple languages)
Total Petrochemicals & Refining USA, Inc.: 1-800-322-3462 (Language: English only)

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Flammable liquids Category 3

Skin corrosion/irritation Category 2

Serious eye damage/eye irritation Category 2B

Carcinogenicity Category 2

Reproductive toxicity Category 2

Specific target organ toxicity (single exposure) Category 3 - Narcotic effects

Specific target organ toxicity (single exposure) Category 3 - Respiratory irritation

Specific target organ toxicity (single exposure) Category 1

Specific target organ toxicity (repeated exposure) Category 1

Specific target organ toxicity (repeated exposure) Category 2

Aspiration hazard Category 1

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

Signal word (GHS-US) : **Danger**

Hazard statements (GHS-US) : **Flammable liquid and vapor**
May be fatal if swallowed and enters airways
Causes skin irritation
Causes eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer (inhalation)

Suspected of damaging fertility or the unborn child
Causes damage to organs (lung) (inhalation, oral)
Causes damage to organs (nervous system) through prolonged or repeated exposure (inhalation)
May cause damage to organs (kidneys, hearing organ (loss of hearing)) through prolonged or repeated exposure

Precautionary statements (GHS-US) : Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical, lighting, ventilating equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe gas, mist, vapors.
Wash hands, forearms and face thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear eye protection, flame retardant protective clothing, protective gloves.
Specific treatment (see Section 4.1 of SDS or information on this label).
If swallowed: Immediately call doctor, poison center.
Do NOT induce vomiting.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
If on skin: Wash with plenty of water.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If skin irritation occurs: Get medical advice/attention.
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 exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.
Take off contaminated clothing and wash it before reuse.
In case of fire: Use carbon dioxide (CO2), dry chemical, foam, Water spray to extinguish.
Store in a well-ventilated place. Keep cool.
Store locked up.
Dispose of contents and container in accordance with all local, regional, national and international regulations.

2.3. Hazards not otherwise classified

Other hazards not contributing to the classification : Product can accumulate electrostatic charges that may cause fire by electrical discharges.

2.4. Unknown acute toxicity (GHS-US)

Not applicable

2.5. Additional information

No additional information available

Section 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	CAS No	%
Xylenes (o-, m-, p- isomers)	1330-20-7	>= 80
Ethylbenzene	100-41-4	<= 20
Toluene	108-88-3	<= 0.5

Section 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If exposed or concerned: Get medical advice/attention.

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

First-aid measures after skin contact : Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical advice/attention.

First-aid measures after eye contact : 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.

First-aid measures after ingestion : Do NOT induce vomiting. Immediately call a poison center or doctor/physician.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : Suspected of damaging fertility or the unborn child. Causes damage to organs.

Symptoms/injuries after inhalation : Danger of serious damage to health by prolonged exposure through inhalation. Harmful if inhaled. May cause drowsiness or dizziness.

Symptoms/injuries after skin contact : Repeated exposure to this material can result in absorption through skin causing significant health hazard. Harmful in contact with skin. Causes skin irritation.

Symptoms/injuries after eye contact : Causes eye irritation. Redness of the eye tissue.

Symptoms/injuries after ingestion : May be fatal if swallowed and enters airways.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

Section 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Special hazards arising from the chemical

Fire hazard : Flammable liquid and vapor.

Explosion hazard : May form flammable/explosive vapor-air mixture.

Hazardous decomposition products in case of fire : Carbon oxides (CO, CO2). Soot. Toxic fumes.

5.3. Advice for firefighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Emergency procedures for non-emergency personnel : Evacuate unnecessary personnel.

Emergency procedures for emergency responders : Ventilate area.

6.2. Methods and material for containment and cleaning up

For containment : Take up liquid spill into absorbent material, e.g.: sand, earth, vermiculite. Do not contaminate ground and surface water.

Methods for cleaning up : Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

6.3. Reference to other sections

See section 8. Exposure controls/personal protection.

Section 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed : Handle empty containers with care because residual vapors are flammable.

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor. No bare lights. No smoking. Take precautionary measures against static discharge. Use only non-sparking tools. Use only outdoors or in a well-ventilated area. Avoid breathing vapors, mist. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

Hygiene measures : Always wash hands after handling the product. Wash hands, forearms and face thoroughly after handling.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Explosion-proof apparatus have to be used. Proper grounding procedures to avoid static electricity should be followed. Ground/bond container and receiving equipment. Use explosion-proof electrical, lighting, ventilating equipment. All efforts should be made to prevent any leaks or spills. Storage tanks should be engineered to prevent contact with water resources, as this material could contaminate the water resources. Surface spills can reach groundwater through porous soil or cracked surfaces. The storage tanks should be monitored regularly for leaks. Where spills or leaks are possible, a comprehensive response plan should be developed and implemented.

Storage conditions : Keep container tightly closed in a cool, well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Keep only in the original container in a cool, well ventilated place away from : Direct sunlight, flames, sparks, heat sources. Keep container tightly closed.

Incompatible products : Strong oxidizing agents. Strong reducing agents. Strong bases. Strong acids.

Incompatible materials : Sources of ignition. Direct sunlight. Heat sources.

Section 8: Exposure controls/personal protection

8.1. Occupational Exposure Limits

Xylenes (o-, m-, p- isomers) (1330-20-7)		
USA ACGIH	ACGIH TWA (ppm)	100 ppm
USA ACGIH	ACGIH STEL (ppm)	150 ppm
USA OSHA	OSHA PEL (TWA) (mg/m³)	435 mg/m³
USA OSHA	OSHA PEL (TWA) (ppm)	100 ppm
Ethylbenzene (100-41-4)		
USA ACGIH	ACGIH TWA (ppm)	20 ppm
USA OSHA	OSHA PEL (TWA) (mg/m³)	435 mg/m³
USA OSHA	OSHA PEL (TWA) (ppm)	100 ppm
Toluene (108-88-3)		
USA ACGIH	ACGIH TWA (ppm)	20 ppm
USA OSHA	OSHA PEL (TWA) (ppm)	200 ppm
USA OSHA	OSHA PEL (Ceiling) (ppm)	300 ppm
USA OSHA	Remark (OSHA)	See OSHA Table Z-2.

8.2. Exposure controls

Appropriate engineering controls : Use engineering controls, such as enclosed handling systems and local exhaust ventilation, as primary measures to prevent direct exposure to this material. Provide readily accessible eye wash stations and safety showers.

Personal protective equipment : Avoid all unnecessary exposure.

Hand protection : Wear Protective gloves.

Eye protection : Chemical goggles or safety glasses.

Skin and body protection : Wear fire/flame resistant/retardant clothing.

Respiratory protection : Where exposure through inhalation may occur from use, respiratory protection equipment is recommended. Wear respiratory protection.

Other information : Do not eat, drink or smoke during use.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid

Appearance : Clear, colorless liquid.

Color : Colorless.

Odor : Sweet. Aromatic.

Odor threshold : 0.7 - 40 ppm

pH : Not applicable

Relative evaporation rate (butyl acetate=1) : No data available

Relative evaporation rate (ether=1) : 9

Melting point : No data available

Freezing point : -47 °C

Boiling point : 139 °C

Flash point	: 25 °C Closed cup
Auto-ignition temperature	: 500 - 550 °C
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: 8 mm Hg @ 25°C
Relative vapor density at 20 °C	: 3 - 4 Air = 1
Relative density	: 0.86
Specific gravity / density	: 0.87 g/ml @ 20°C
Solubility	: Water: Negligible.
Log Kow	: 3.1
Viscosity, kinematic	: < 20 cSt
Viscosity, dynamic	: 0.6 cP @25°C
Explosive limits	: 1 - 7 vol %

9.2. Other information

VOC content : 100 %

Section 10: Stability and reactivity

10.1. Reactivity

Flammable liquid and vapor.

10.2. Chemical stability

Stable at ambient temperature and under normal conditions of use.

10.3. Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous polymerization will not occur. Violent explosion may occur when chlorinating xylene with 1,3-dichloro-5,5-dimethyl-2, 4-imidazolidindione (dichlorohydrantoin). The haloimide undergoes immediate self accelerating decomposition.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures. Open flame. Overheating. Heat. Sparks. Avoid the build-up of electrostatic charge.

10.5. Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products formed under fire conditions: carbon monoxide, carbon dioxide, toxic fumes.

Section 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure : Inhalation. Ingestion. Skin and eye contact.

Acute toxicity : Not classified

Inhalation at very high concentrations can be fatal.

Intentional misuse involving repeated and prolonged inhalation exposure to high concentrations of vapor can result in central nervous system damage and eventually death.

Xylene	
LD50 oral rat	> 3500 (3500 - 4300) mg/kg as mixed xylenes containing ethylbenzene
LD50 dermal rabbit	> 4200 mg/kg as mixed xylenes containing ethylbenzene
LC50 inhalation rat	21.7 (21.7 - 29.1) mg/l/4h as mixed xylenes containing ethylbenzene

Skin corrosion/irritation : Causes skin irritation.

Serious eye damage/irritation : Causes eye irritation.

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Suspected of causing cancer (inhalation).

Xylenes (o-, m-, p- isomers) (1330-20-7)	
IARC group	3 - Not classifiable
Ethylbenzene (100-41-4)	
IARC group	2B - Possibly carcinogenic to humans

Toluene (108-88-3)	
IARC group	3 - Not classifiable

Reproductive toxicity : Suspected of damaging fertility or the unborn child.

Specific target organ toxicity (single exposure) : May cause drowsiness or dizziness. May cause respiratory irritation. Causes damage to organs (lung) (inhalation, oral).

Specific target organ toxicity (repeated exposure) : Causes damage to organs (nervous system) through prolonged or repeated exposure (inhalation). May cause damage to organs (kidneys, hearing organ (loss of hearing)) through prolonged or repeated exposure.

Aspiration hazard : May be fatal if swallowed and enters airways.

Potential Adverse human health effects and symptoms : Harmful in contact with skin. Harmful if inhaled.

Section 12: Ecological information

12.1. Toxicity

Ecology - general : Harmful to aquatic life with long lasting effects.

Xylenes (o-, m-, p- isomers) (1330-20-7)	
LC50 fish 1	13.4 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
EC50 Daphnia 1	3.82 mg/l (Exposure time: 48 h - Species: water flea)
LC50 fish 2	2.661 - 4.093 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])
EC50 Daphnia 2	0.6 mg/l (Exposure time: 48 h - Species: Gammarus lacustris)
Ethylbenzene (100-41-4)	
LC50 fish 1	11.0 - 18.0 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])
EC50 Daphnia 1	1.8 - 2.4 mg/l (Exposure time: 48 h - Species: Daphnia magna)
EC50 other aquatic organisms 1	4.6 mg/l (Exposure time: 72 h - Species: Pseudokirchneriella subcapitata)
LC50 fish 2	4.2 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [semi-static])
EC50 other aquatic organisms 2	> 438 mg/l (Exposure time: 96 h - Species: Pseudokirchneriella subcapitata)
Toluene (108-88-3)	
LC50 fish 1	15.22 - 19.05 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
EC50 Daphnia 1	5.46 - 9.83 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])
EC50 other aquatic organisms 1	> 433 mg/l (Exposure time: 96 h - Species: Pseudokirchneriella subcapitata)
LC50 fish 2	12.6 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])
EC50 Daphnia 2	11.5 mg/l (Exposure time: 48 h - Species: Daphnia magna)
EC50 other aquatic organisms 2	12.5 mg/l (Exposure time: 72 h - Species: Pseudokirchneriella subcapitata [static])

12.2. Persistence and degradability

Xylene	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Xylene	
Log Kow	3.1
Bioaccumulative potential	Not established.

Xylenes (o-, m-, p- isomers) (1330-20-7)	
BCF fish 1	0.6 - 15
Log Pow	2.77 - 3.15
Ethylbenzene (100-41-4)	
BCF fish 1	15
Log Pow	3.118
Toluene (108-88-3)	
Log Pow	2.65

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information : Avoid release to the environment.

Section 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Dispose of contents and container in accordance with all local, regional, national and international regulations.

Additional information : Handle empty containers with care because residual vapors are flammable.

Ecology - waste materials : Avoid release to the environment.

Section 14: Transport information

US Transport (DOT) for Bulk Shipments (Non-Bulk Shipments May Differ)

Transport document description	: UN1993, Flammable liquids, n.o.s. (contains xylene isomers, ethylbenzene), 3, PGIII
UN or NA Number	: UN1993
Proper Shipping Name	: Flammable liquids, n.o.s. (contains xylene isomers, ethylbenzene)
Primary Hazard Class	: 3 - Flammable liquid
Packing Group	: PGIII
Reportable Quantities (RQ)*	: Ethylbenzene 1000 lbs (454 kg), Mixed Xylenes 100 lbs (45.4 kg), Toluene 1000 lbs (454 kg)
*It is the shipper's responsibility to determine whether an RQ must be reported for each individual shipment.	
Hazard labels	: 
Emergency Response Guide (ERG) Number	: 128

Transport by sea (IMDG)

Transport document description	: UN1993, FLAMMABLE LIQUID, N.O.S., 3, PGIII
UN Number	: UN1993
Proper Shipping Name	: Flammable liquid, n.o.s.
Primary Hazard Class	: 3 - Flammable liquids
Packing Group	: PGIII
Hazard labels (IMDG)	: 
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	: Product Name: Xylenes/Ethylbenzene (10% or more) mixture Pollution Category: Y Ship Type: 2
Cargo name listed in 46 CFR 30.25, Table 30.25-1	: Xylenes/Ethylbenzene (10% or more) mixture
Cargo name listed in 46 CFR 153, Table 1	: Xylenes, Ethylbenzene (10% or more) mixture

Air transport (IATA)

Transport document description	: UN1993, Flammable liquid, n.o.s., 3, PGIII
UN Number	: UN1993
Proper Shipping Name	: Flammable liquid, n.o.s.
Primary Hazard Class	: 3 - Flammable Liquids
Packing Group	: PGIII
Hazard labels (IATA)	: 

Section 15: Regulatory information

15.1. US Federal regulations

EPA TSCA Status

All components of this product are listed or excluded from listing on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

SARA Section 313 Supplier Notification

This product contains the following toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372:

CAS number	Chemical name	Concentration
1330-20-7	Xylenes (o-, m-, p- isomers)	>= 80%
100-41-4	Ethylbenzene	<= 20%

This information must be included in all Safety Data Sheets that are copied and distributed for this product. For additional information, see 40 CFR §372.45 Notification About Toxic Chemicals.

SARA Section 311/312 Hazard Classes: Fire hazard
Chronic health hazard
Acute health hazard

15.2. International regulations

CANADA

Xylene
WHMIS Classification: Class B Division 2 - Flammable Liquid
Class D Division 2 Subdivision A - Very toxic material causing other toxic effects
Class D Division 2 Subdivision B - Toxic material causing other toxic effects

National inventories

Listed on the Canadian DSL (Domestic Sustances List)

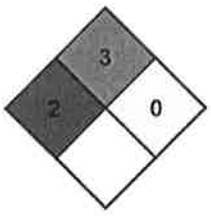
15.3. US State regulations

Ethylbenzene (100-41-4)	
U.S. - California - Proposition 65 - Carcinogens List	Yes
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
No significance risk level (NSRL)	54 µg/day (inhalation)
Toluene (108-88-3)	
U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No

Section 16: Other information

NFPA (National Fire Protection Association)

NFPA health hazard : 2
NFPA fire hazard : 3
NFPA reactivity : 0



HMIS III Rating

Health : 2*
Flammability : 3
Physical Hazard : 0
Personal Protection : See section 8 of SDS

US OSHA LABEL as specified under 29 CFR §1910.1200 (f)

Xylene

Total Petrochemicals & Refining USA, Inc.
PO Box 674411
Houston, TX 77267-4411 USA
Tel. 713-483-5000 or 1-877-871-2709

Danger

Flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer (inhalation)
Suspected of damaging fertility or the unborn child
Causes damage to organs (lung) (inhalation, oral)
Causes damage to organs (nervous system) through prolonged or repeated exposure (inhalation)
May cause damage to organs (kidneys, hearing organ (loss of hearing)) through prolonged or repeated exposure

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical, lighting, ventilating equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe gas, mist, vapors.
Wash hands, forearms and face thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear eye protection, flame retardant protective clothing, protective gloves.
Specific treatment (see Section 4.1 of SDS or information on this label).
If swallowed: Immediately call doctor, poison center.
Do NOT induce vomiting.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
If on skin: Wash with plenty of water.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If skin irritation occurs: Get medical advice/attention.
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 exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.
Take off contaminated clothing and wash it before reuse.
In case of fire: Use carbon dioxide (CO_2), dry chemical, foam, Water spray to extinguish.
Store in a well-ventilated place. Keep cool.
Store locked up.
Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental Information: Other hazards not contributing to the classification

Product can accumulate electrostatic charges that may cause fire by electrical discharges.

Version : 3.1
Date of issue : June 29, 2015

MSDS ID: XYLENE
SDS REFERENCE NUMBER: BC0012

SDS Template - TOTAL SDS US (GHS HazCom 2012) TPRI Version 4.00

The information contained in this Safety Data Sheet (SDS) is believed by Total Petrochemicals & Refining USA, Inc. (TPRI) to be accurate on the date issued. However, materials may present unknown hazards and should be used with caution. Final determination of suitability and use of any material is the sole responsibility of the user. Neither TPRI nor any of its subsidiaries or affiliated companies assumes any liability whatsoever for the accuracy or completeness of the information contained herein or reliance thereto. If the material is repackaged, the user is responsible and must ensure that proper health, safety and other necessary information is included with the material and/or on the container. NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING THE MATERIALS OR THE INFORMATION CONTAINED IN THIS SDS. ALTERATION OF THIS DOCUMENT IS STRICTLY PROHIBITED.

Appendix 5

Community Air Monitoring Plan

Appendix 5
Generic Community Air Monitoring Plan
Vacuum Oil Refinery Site
Site No. C828193
Flint Redevelopment LLC
Rochester, New York

1.0 Overview

This 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 when certain site investigation or remediation activities are in progress. In certain circumstances, additional monitoring will be required, especially where work is being conducted indoors or within 20 feet of occupied buildings or individuals, see Attachment 1.

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 on-site workers not directly involved with the subject work activities and the community (i.e. off-site receptors including residences and businesses) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring and potentially corrective actions to abate emissions and/or the shutdown of those work activities causing the release. Additionally, the CAMP helps to confirm that work activities did not spread contamination away from the work area to other areas of the site or off-site through the air.

The site-specific CAMP presented below will be sufficient to cover many, if not most, site activities. Specific requirements should be reviewed for each situation in consultation with Site Safety Officer (also referred to as the Health and Safety Officer or HSO), New York State Department of Environmental Conservation ("NYSDEC") and the New York State Department of Health ("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 may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Attachment 1 provides special requirements for work within 20 feet of potentially exposed individuals or structures. As conditions change, these requirements may also change and require further consultation with Site Safety Officer, NYSDEC and 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.

2.0 Community Air Monitoring Plan

The limited site information suggests VOCs, semivolatile organic compounds ("SVOCs"), and metals are present in the soil and groundwater, and that VOCs are present in the soil vapor. Based on the known and potential contaminants at the site, real-time air monitoring for VOCs and particulate levels at the perimeter of the exclusion zone and within the work area are required.

2.1 Continuous Monitoring

Continuous air monitoring will be required for all ground intrusive activities conducted during the site investigation, remedial design phase activities, interim remedial measures and remediation. The activities which will require continuous monitoring would include: drilling of boreholes (through the soil, pavement or building floors which lie directly on fill material or soil; development of monitoring wells; test pitting or soil excavation; and handling of non-containerized waste handling. VOC monitoring will be conducted within the work zone and at the perimeter of the work zone. Particulate monitoring will also be conducted but up and downwind of the work zone at the perimeter of the site. Additional requirements for continuous monitoring are provided in Attachment 1 when work areas are within 20-feet of potentially exposed populations or occupied structures.

2.2 Periodic Monitoring

Periodic monitoring for VOCs will be required during non-intrusive site activities such as the collection of groundwater samples from monitoring wells. Periodic monitoring during monitoring well sampling, for example, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap, monitoring during well baling/purging, and taking a reading prior to leaving a sample location.

2.2.1 VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind VOC concentrations will be measured at the start of each workday and periodically (every 15 to 30-minutes) thereafter to establish background conditions, particularly if wind direction changes. The monitoring work will be performed using at least an organic vapor analyzer with a photoionization or flame ionization detector. The equipment will be field checked for calibration at least daily using a gas standard. As the field calibration drifts beyond an acceptable limit, a complete calibration will be performed, or the equipment will be replaced. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of VOCs at the downwind perimeter of the work area or the exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total VOC concentration decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total VOC concentrations at the downwind perimeter of the work area or the 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, and corrective actions taken to abate emissions with continued monitoring. After completing these steps, work activities can resume provided that the total VOC concentration is below 5 ppm over background for the 15-minute average within 200 feet downwind of the exclusion zone or half the distance to the nearest potential individual or residential/commercial structure, whichever is less. In no case will the total VOC concentration be 5 ppm over background less than 20 feet from a structure or

individual not working as a part of the investigation or remediation work activities on the site.

a. If the VOC concentration is above 25 ppm at the perimeter of the work area, activities will be shutdown.

b. All 15-minute readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

2.2.2 Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations during actions where larger areas of the ground surface are disturbed or when non-containerized waste is being handled, or if drilling is occurring within the building space where site workers and occupants may be impacted. For example, when test pitting is being conducted or there is a soil/waste piles being handled.

Disturbing the soil, concrete, or pavement in such a way where nuisance dust will be created, will necessitate particulate monitoring. Short duration events monitoring can be done with either hand held equipment or monitoring equipment set up at temporary locations up and down wind of the activity. Prolonged activities where soil is being moved or when there will be multiple short duration activities, i.e. soil borings; monitoring with stationary monitoring equipment will be completed. Whether a short-term or prolonged activity, monitoring of areas outside of the work zone will also be important. Considerations should be given to areas connected to the work area by way of the heating and ventilation system, connecting hallways and doors, and windows. If monitoring of these "other" areas can be dismissed because other engineering controls, confirmation measurements should be done several times during the work day. Attachments 1 and 2 provide additional requirements for particulate monitoring.

The particulate (dust, mists and aerosols) monitoring equipment will be able to measure in real time the airborne particulate sizes of less than 10 micrometers (PM-10) and capable of integrating the measurements over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will also provide an audible alarm which will average results and exceedances over a real-time of 1 to 60 seconds or the Short-Term Exposure Limit ("STEL") 15-minute exposure limit. The selected instrument will provide the following information: overall average reading; maximum concentrations; time and date of maximum concentration; total number of logged points; start time and date; run duration; STEL concentration and time and date of STEL occurrence; average over logged period; calibration factor; and tag number. Other technical requirements for the selected instrument defined in DER-10 Appendix 1B and presented in the CAMP as Attachment 2.

In addition, a visual assessment of fugitive dust level and migration will be done during all work activities. Action levels for dust and activities to be conducted in the event of elevated levels or visual dust migration include the following:

1. The PM-10 particulate action level is 150 micrograms per cubic meter ("mcg/m^3") for a 15-minute average.

2. If the PM-10 particulate level is greater than 150 mcg/m,3 the upwind concentration will be evaluated immediately. If the working site particulate measurement is greater than 100 mcg/m 3 greater than background (upwind perimeter) dust suppression techniques must be employed and personnel health and safety measures employed (i.e. particulate masks). Work may continue with dust suppression and using personnel safety equipment provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3. If particulate concentrations exceed 150 mcg/m^3; work will stop, NYSDEC will be notified, particulate control measures reviewed, and additional particulate suppression techniques employed to bring the site into compliance with the CAMP.

3. Situations may arise that result in the offsite migration of PM-10 particulate levels that exceed the action level, while in compliance on the site. It may not be feasible to quantify the total suspended particulates on a real time under these circumstances it is nonetheless unacceptable. In addition to the onsite instrument monitoring, visual assessment of fugitive dust must be conducted. In the event particulates are observed to be leaving the site, dust suppression techniques need to be employed to remedy the conditions.

4. All readings must be recorded and be available for NYSDEC, NYSDOH and County Health personnel to review.

Attachment 1
Special Requirements for Air Monitoring

This attachment addresses the special requirements for air monitoring when investigation, design studies, or remediation work is being conducted inside buildings or within 20 feet of potentially exposed individuals (not involved with site work activities), or occupied buildings.

When work areas are within 20 feet of potentially exposed populations or occupied structures, continuous monitoring will be conducted for VOCs, particulates or any other known or suspected hazard (carbon monoxide, carbon dioxide, explosivity, methane, oxygen, etc.). The type of monitoring device and location of the monitoring devices will reflect the hazard and the nearest potentially exposed individuals (whether they are located outdoors or inside buildings) and will consider how the exposure or hazard may occur. Prior to beginning field work outdoors, the location of buildings within 20 feet of the planned activity will be evaluated to locate building ventilation system intakes and windows (and doors) that can be opened, and assessed for locating monitoring devices. Weather conditions and where tenants in the buildings are located during the planned field activities will also be considered.

Prior to conducting activities indoors, the building ventilation system will be evaluated, since ductwork can act as a pathway for contaminants and odors to spread into adjacent rooms and throughout the building. As a result, monitoring will be conducted within the room where activities are being conducted and in adjacent rooms with periodic monitoring of rooms on other floors, stairways, or elevators, if present. In the areas where work will be conducted, all non-project related individuals will be relocated for the duration of the activity.

Depending on the duration of the indoor field activity, different engineering controls will be evaluated. For activities lasting a day or multiple days temporary negative- pressure enclosures may be practical, but for tasks which will take a few minutes or several hours fans or vacuums where the discharge is directed outdoors and, or passed through HEPA filters may be used. The planning stage of the activities will also consider who might be exposed; such as building occupants whose work station is stationary. In such cases where the workers are stationary, scheduling of the work during weekends or nights may be appropriate. Terminating the use of the building's ventilation system and using temporary area wide ventilation systems may also be considered. It is envisioned that for many tasks, small pilot holes can be drilled through the pavement or floor slab to obtain real data to make health and safety decisions on the amount of control that is required. In all cases air monitoring will be conducted regardless of the air quality initially found.

Prior to the start of work involving drilling through pavement, concrete, soil, or floor slabs where the concrete lays on fill or soil, background readings in the occupied spaces will be measured. Any unusual background readings will be recorded and discussed with the on-site NYSDEC or NYSDOH representative prior to commencement of the work. If total VOC concentrations from the environmental activity being conducted exceed 1 ppm outside of, or next to intake vents of an occupied building, monitoring will be conducted within the structure(s) at the nearest window(s), door(s) and at the ventilation ducts nearest to the outdoor air intake.

If total particulate concentrations related to work activities exceed 150 mcg/m^3 (micrograms per cubic meter) outside of the nearest occupied structures or next to intake vents, work activities will be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m^3 or less at the monitoring point.

Depending upon the nature of contamination and the type of remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide, etc.) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each parameter.

Attachment 2
DER-10 Appendix 1B
Fugitive Dust and Particulate Monitoring

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

Appendix 6

Resume for Mary Ellen Holvey

Curriculum Vitae

Mary Ellen Holvey, CIH

ME Holvey Consulting, LLC
P.O. Box 1252
Pittsford, NY 14534
Email: meholvey@gmail.com
Website: www.mehcih.com

A NYS Certified WBE and NYSDOT DBE Business

Education

BS, Biology, St. John Fisher College

MS, Industrial Hygiene, University of Rochester

Professional Affiliations

American Board of Industrial Hygiene

American Industrial Hygiene Association – Professional Member

American Society of Safety Engineers: Past-President, Chapter Delegate, and Professional Member

Certifications

Certified Industrial Hygienist (CIH)

NYS Licensed Mold Assessor

OSHA 40 Hour HAZWOPER

Key Skills

- Industrial Hygiene and Safety
- Chemical Exposure Assessments
- Job Hazard Analysis
- Laboratory Data Review - DUSR
- Expert Witness
- Indoor Air Quality Investigations
- Environmental and Safety Training
- Noise Surveys and Evaluations
- OSHA Regulatory Compliance and Auditing
- Environmental Regulatory Compliance

Experience

Over 25 years of experience as an Industrial Hygienist, Toxicologist and Project Manager conducting Indoor Air Quality ("IAQ") assessments, chemical hazards reviews, noise assessments, fungi evaluations, environmental contaminant analysis, health and safety compliance in industrial, commercial, and residential environments.

Experience includes working in an Environmental Testing Laboratory for eight (8) years. Conducted sample preparation and analysis for air, potable water, wastewater, and soil. Analysis included wet chemistry, metals analysis, and organic analysis.

IAQ assessments in commercial and industrial environments have been conducted to evaluate worker risk to potential and known airborne contaminants and job hazards. The evaluations include walk- through surveys, interviewing employees, air monitoring and source investigation. The results are evaluated and recommendations are made to minimize employee risk to workplace hazards.

Experience includes designing sampling protocols, for industrial, commercial, educational, and residential properties. Sampling includes fungi (mold), asbestos, lead, particulates, carbon monoxide, volatile organic compounds, and comfort parameters such as temperature, relative humidity and carbon dioxide. The data is interpreted and recommendations provided.

Fungi Assessments and Evaluations are conducted to determine conditions of building materials due to water damage and fungi overgrowth. Recommendations for remedial actions are provided to properly remove fungi-affected building materials. Clearance Evaluations are conducted to determine the adequacy of the remedial activities.

Noise assessments and surveys in commercial and industrial environments. Noise evaluations also conducted in Division 1 College Sporting events and National Football League games.

Expert Witness Reviews and Testimony for Workman's Compensation Litigation, OSHA Compliance, and Building Code Assessments.

Managed and performed the Health, Safety, and Environmental Assessment at the Le Roy Junior/Senior High School Building for the Le Roy Central School District. The objective of the assessment was to evaluate the air quality, soil, and surface water in order to address community concerns of adverse health impacts from potential contaminants.

Projects

Data Usability Evaluations

Conducted DUSR for properties involved in site remediation. Several properties are located within New York State and required DUSR and Data Validation for the analytical testing data. These DUSR have been conducted consistently over the past five (5) years.

Power Plant Safety Audits and Compliance Consulting

Conducted Environmental, Health, and Safety Audits and Compliance Consulting for Coal-fired Power Plants, Co-Generation Power Plants, and Landfill-Gas to Energy facilities.

Multinational Printing and Imaging Company - Buffalo, New York

Performance of on-site industrial hygiene and OSHA safety management on an outsource basis. Assessments of employee solvent, particulate, and noise exposures are conducted. This work includes the preparation of numerous written safety programs as well as conducting employee training to meet OSHA regulations. Maintains compliance with European Directives such as REACH and RoHS. SDS authoring for finished products and materials.

Communications Company -Rochester, New York

Many Industrial Hygiene assessments have been performed for several commercial and industrial properties. These assessments included designing sampling protocol and conducting the sampling. Sampling included volatile organic solvents, fungi, particulate, lead, asbestos, and comfort parameters.

Law Firm Support – Expert Witness - New York State

Review of Case Files related to Workman's Compensation and Civil Action of Personal Injury. Provide opinion of compliance with applicable OSHA regulations and Building Codes. Provided Expert Testimony in Workman's Compensation Hearings.

Machine Manufacturer and Tooling Facility Rochester, NY

Designed a noise-monitoring program to determine areas that demonstrated noise levels above the OSHA action limit. Prepared Hearing Conservation Program. Conducted IAQ monitoring in departments throughout facility. Performed respiratory protection fit testing and PPE evaluations. Performed air emissions calculations, air permit application and modification for cap-out, state facility permit. Performed hazardous waste analysis. Manage environmental, health, and safety compliance support.

Property Management Companies - Nationwide

Fungi assessments in apartment complexes prior to property transfer. The investigations involved the inspection of apartment buildings and basements with respect to past and on-going water pipe leaks. The evaluation provided an assessment of the type and extent of contamination, as well as our recommendations for remediation. Clearance Evaluations were also competed to determine the adequacy of the remedial actions.

Universities and Colleges - Statewide

Fungi Assessments and Evaluations for campus housing, educational buildings, and administrative offices. The assessments included the initial assessment, preparation of remedial protocols, and clearance evaluations. The origin and cause of the fungi investigations were due to water pipe leaks/breaks, roof breaches, and flooding.

Industrial Hygiene Assessments for occupational exposure to chemicals and process operations. The projects include developing a sampling protocol, assessing the process, review data, and provide recommends to address contaminants of concern.