Revised Corrective Measures Implementation Work Plan

Petro-Chem Processing Group of Nortru, LLC
421 Lycaste Street
Wayne County
Detroit, Michigan
(Operating License MID 980 615 298)

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Prepared for:

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List of Acronyms

AST	above-ground storage tank
AOC	areas of concern
bgs	below ground surface
BVNA	Bureau Veritas North America, Inc.
CAI	Corrective Action Investigation
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
Csat	Soil saturation concentration
DPVE	Dual Phase Vacuum Extraction
DCC	Direct Contact Criteria
EPA	United States Environmental Protection Agency
FESL	Flammable and Explosive Screening Level
GCP	Groundwater Contact Protection
MDEQ	Michigan Department of Environmental Quality
MtBE	Methyl *tert* butyl ether
MS	matrix spike
MSD	matrix spike duplicate
MPE	Multi Phase Extraction
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
PCPG	Petro-Chem Processing Group of Nortru, LLC
PESD	Philip Environmental Services Division
PAH	Polynuclear Aromatic Hydrocarbons
QA	quality assurance
QC	quality control
RC	Restrictive Covenant
RCRA	Resource Conservation and Recovery Act
RIASL	Recommended Interim Action Screening Levels
RRO	Residual range organics
SSVIAC	Site-specific volatilization to indoor air criteria.
SVIAIC	Soil volatilization to indoor air inhalation criteria
TPH	total petroleum hydrocarbons
USCS	Unified Soil Classification System)
VSIC	Volatile soil inhalation criteria
VOC	Volatile Organic Compound
WMRPD	Waste Management and Radiological Protection Division
WMU	Waste Management Unit

1.0 INTRODUCTION

Stericycle Environmental Solutions, Inc. (Stericycle) retained Bureau Veritas North America, Inc. (BVNA) to prepare this Corrective Measures Implementation (CMI) Work Plan for the implementation of the selected remedial alternative presented in the Corrective Measures Study Report (CMS) to the Michigan Department of Environmental Quality (MDEQ) for the treatment of soil and groundwater at the Petro-Chem Processing Group of Nortru, LLC (PCPG) Facility.

1.1 PURPOSE AND OBJECTIVES

The purpose of this CMI Work Plan is to describe design and implementation of measures to address soil and groundwater contamination in the Waste Management Units (WMUs) and areas of concern (AOCs) that were identified in the approved Corrective Action Investigation (CAI) Report as requiring final response activities.

The final corrective measures, presented in the Corrective Measures Study and approved by MDEQ, consist of the following major components:

- Installation and operation of a Dual Phase Extraction system to address VOC concentrations exceeding Site-Specific Volatilization to Indoor Air Criteria (SSVIAC)[1], and to lower concentrations of VOCs in the groundwater.
- Placing a Restrictive Covenant on the property to prevent uses and activities that may result in exposure to concentrations of contaminants above applicable cleanup criteria.
- Continued groundwater monitoring.

One of the main components of the final measures approved by MDEQ is the installation of a Dual Phase Vacuum Extraction System (DPVE)[2] in the Western Berm Area. In the proposed configuration a drop tube is inserted inside an extraction well to extract both liquids and soil vapor, these systems are commonly referred to as Multi Phase Extraction (MPE). The proposed MPE System will be designed for the following:

- To reduce concentrations of VOCs in AOC 1 (Soil Volatilization to Indoor Air Exceedances) to meet the SSVIAC. The subject area is centered around MW-11, known as the Western Berm Area;
- To mitigate the potential of soil vapor intrusion in the occupied areas (i.e., AOC-1 – Soil Volatilization to Indoor Air Exceedances) identified in the western side of the property;
- To reduce or eliminate the potential for lateral migration of affected soil gas from the site;
- To extract residual volatile organic compounds (VOCs) from the on-site soil and groundwater matrices reducing the long-term potential for migration of VOCS, (i.e., source control).

This CMI Work Plan was prepared to provide design and installation details for the proposed pilot study which will be conducted to support full-scale MPE system design. The Pilot Study is designed to be expandable and it will determine the final selection of equipment and well spacing.

The scope of this CMI Work Plan is generally limited to Task I of the Corrective Measures Implementation Scope of Work Guidelines which include: A) Management Plan, B) Community Relations Plan, C)

1 The MDEQ provided the SSVIC Criteria to Stericycle in their correspondence dated October 25, 2018 after receipt of the Revised CMIP dated May 16, 2018 was submitted. This and other sections of this report have been updated to reflect the revised criteria as applicable.

2 Dual Phase Vacuum Extraction (DPVE) is a general term for various types of configurations that can be used to simultaneously extract soil vapor and groundwater. In the specific configuration proposed for the Pilot Test which utilizes a drop tube inside an extraction well, the more specific term Multi Phase Extraction (MPE) is used in this document.

Sampling and Analysis Plan, D) Corrective Measures Permitting Plan; and E) Supplemental Field Investigation Plan). In addition, this CMI Work Plan also addresses the specific conditions provided in MDEQ Conditional Approval letter of the CMS Report dated July 5, 2017, and construction aspects associated with a Pilot Test for MPE, the selected remedy. A copy of the approval letter is included in Appendix A.

1.2 BACKGROUND

PCPG is a Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility. On June 16, 1999, the MDEQ issued a Hazardous Waste Treatment and Storage Facility Operating License (Operating License) for this facility (MID 980 615 298). Under the license, the facility is permitted to store, treat, transfer, and recycle hazardous wastes. PCPG currently operates a fuel blending and solvent recycling plant. Spent solvents, rags, fuel sludge, and tank bottoms are processed and are either cleaned and recycled, or sold as fuel to cement kilns. Materials that cannot be recycled are sent offsite for disposal. Prior to PCPG operations the site was used to store petroleum products and possibly a small refinery.

Environmental studies have been conducted at the Facility since 1982. PCPG began “detection”-based semi-annual groundwater monitoring in September 1999 in compliance with specifications of the Operating License. Based on the results of groundwater monitoring and soil sampling, the Facility is required to conduct corrective action for releases of a contaminant from a WMU to protect human health and the environment in accordance with R 299.9629.

On December 18, 2012, the MDEQ issued a new Operating License for the Facility.

BVNA prepared a CAI Work Plan as part of RCRA Corrective Action proceedings and submitted it to the MDEQ in February 2013. MDEQ approved the final CAI Work Plan in May 2013. From August 2013 to September 2014, the work described in the approved CAI Work Plan, including the drilling of 28 soil borings, was conducted at both onsite and offsite locations. The primary objective of the CAI was to evaluate potential sources of contamination and, if found, to delineate soil and groundwater contamination with respect to MDEQ Generic Nonresidential Cleanup Criteria.

The CAI Work Plan specified that soil and groundwater samples were to be collected and analyzed in locations approved by the MDEQ to address the nature and extent of contamination. Semiannual groundwater sampling events were completed, as specified in the Facility Operating License, and incorporated into the data set utilized to evaluate the nature and extent of contamination addressed in the CAI. The CAI Report, dated February 12, 2015, included a summary of the investigation that was conducted in accordance with the approved CAI Work Plan and Sampling Plan Addendum.

Upon review of the CAI Report by the MDEQ *(Review of Corrective Action Investigation Report*, dated October 27, 2015), it was determined that a Corrective Measures Study (CMS) was required to address the release(s) of contaminants or hazardous substances, and the WMUs and AOCs that were identified in the approved CAI Report as requiring final response activities. Specifically, the MDEQ review indicated that the following areas that had to be addressed by the CMS:

- AOC-1/AOC2 – Soil and groundwater volatilization to indoor air criteria
- AOC-3 – Methyl tert butyl ether (MtBE) in groundwater
- WMU-15 – Former Container Processing Unit
- WMU-17 – Northwest Tank Farm
- WMU-18 – Super Blender/SBS Blending Building (detections of VOCs in BSB-13,36, and 38)

As part of the CMS, MDEQ required that additional borings be advanced on the western adjacent property to address contaminants potentially migrating offsite. Additionally, the potential for non-aqueous

phase liquids (NAPLs) was required to be investigated. A CMS Work Plan was prepared and submitted to the MDEQ on December 23, 2015. MDEQ approved the work plan on January 25, 2016.

BVNA prepared and submitted a CMS Report on November 2016. The MDEQ, Waste Management and Radiological Protection Division (WMRPD) provided approval of the CMS Work Plan in their correspondence dated July 5, 2017 (Appendix A) and required the submittal of a Corrective Measures Investigation (CMI) Work Plan.

The purpose of this CMI Work Plan is to provide a plan for corrective action for the releases identified at the facility in accordance with Part VI, Corrective Action Conditions, of the Operating License for the Facility (EPA ID: MID 980 615 298).

The subject CMI Work Plan was prepared to comply with Operating License conditions VI.H and VI.K for the purpose of developing and evaluating response activity alternatives necessary to address the release of hazardous substances and the waste management units and AOC that are identified in the approved CAI Report as requiring final response activities.

1.3 REPORT ORGANIZATION

The remainder of this CMI Work Plan report is presented in the following sections:

- **Section 2.0** describes the history of activities, previous investigations conducted at the site and the site hydrogeology,
- **Section 3.0** contains the following subsections:
    - CMI Work Plan overview including the construction field activities,
    - Supplemental Field Investigation
    - A Corrective Measures Permitting Plan, including a Restrictive Covenant, Community Relationships Plan, a Dig Plan (Soil Management Plan)
    - Preconstruction Activities
- **Section 4** presents the MPE System Design for the Pilot Test

1.4 PROGRAM MANAGEMENT PLAN

The project team encompasses the facility, the regulators, and the consultants and contractors completing the project. Personnel include:

Facility: Edward C. Burk, Compliance Manager, Stericycle Environmental Solutions

Corporate: Greg Fink, Director SH&C Risk Management, Stericycle Environmental Solutions

State Regulatory Official: Daniel P. Dailey, P.E., Environmental Engineer Specialist, MDEQ, Waste and Hazardous Materials Division

Environmental Consultant: Bureau Veritas North America, Inc. (BVNA)

BVNA has been retained by Stericycle to manage the project and provide quality assurance, as well as, to conduct sampling activities in accordance with the Quality Assurance Project Plan. BVNA will also conduct data validation activities.

Chemical Analytical Services: Fibertec Environmental Services

Fibertec Environmental Services is an independent chemical analytical laboratory familiar with EPA CLP protocols.

1.4.1 Personnel Qualifications

Key personnel include Kellie L. Wing the Project Manager, Derek Wong, Ph.D., P.E. the senior hydrogeologist, Gustavo Valdivia, P.E. the principal engineer, and Trevor Zalewski the Consultant.

1.4.2 Overall Management Approach

Stericycle retains primary responsibility for management of the CMI Work Plan process. Stericycle has retained BVNA to implement the CMI Work Plan process including management of subcontractors, if necessary. Kellie L. Wing is the project manager for BVNA and is responsible for project design, resource allocation, schedule, reporting, and subcontractor selection and coordination. Erin R. Hart is BVNA's safety officer and is responsible for the development of the RFI Safety and Health Plan and implementation, as well as, the quality assurance and data validation. Kellie Wing and Trevor Zalewski are responsible for planning and implementing field activities and reporting tasks.

The BVNA Laboratory Project Manager, Cheri DeLyon, will report directly to the Project Manager and will be responsible for ensuring that resources of the laboratory are available on an as-required basis and for the review of final analytical reports. The Laboratory Quality Assurance Manager will have responsibility for (1) data issued by the laboratory, (2) communicating data issues, (3) overseeing laboratory QA and QA/QC documentation, (4) ensuring that peer and supervisor review of data is conducted, and (5) evaluating if corrective actions need to be implemented.

2.0 SITE DESCRIPTION

The PCPG Facility is located at 421 Lycaste Street, Wayne County, Detroit, Michigan, at the northwestern corner of Lycaste Street and Freud Street. It is situated on an estimated 8-acre parcel in an industrial and residential area approximately 0.5 miles north of the Detroit River. The Facility is surrounded by industrial properties to the north; Lycaste Street to the east, Freud Avenue to the south, and Old St. Jean Avenue to the west. See Figure 1 for site location.

The PCPG facility consists of the following buildings:

- Two-story Office Building
- Laboratory
- Maintenance Office
- Container Management Building
- Electrical Room
- Technical Center
- Employee Locker Room and Restroom
- Electrical Building
- SBS Building
- Operations Building

The site layout, showing the above noted buildings, is shown on Figure 2.

The Facility is secured by a 6-foot-high chain-link security fence topped with barbed wire. A driveway on the east side of the facility is used for incoming and outgoing traffic at the facility. Other facility features

include an employee and visitor parking area, aboveground storage tanks (ASTs), a drum storage area, and support facilities.

PCPG continues to operate a fuel blending and solvent recycling plant in accordance with the current Operating License, dated December 18, 2012. Facility conditions have not changed since the time that the CAI and CMS were conducted.

2.1 GEOLOGY AND HYDROGEOLOGY

This section presents a summary of the geologic and hydrogeologic conditions that currently exist at the Facility and the results of previous investigations that exceed applicable cleanup criteria. A more detailed description of site conditions is presented in the CAI report.

2.1.1 Geology

The stratigraphy beneath the Facility consists of an uppermost layer of sandy silt and silty sand (historic fill material) with some clay to a depth that ranges from one to 13 feet. In some areas, shards of glass and brick fragments were noted in the fill material. A layer of natural peat underlies the uppermost layer of fill material and silty sand layer across the site. The thickness of the peat layer ranges from several inches near the northwest property boundary to four feet along the southern property boundary. In some locations, the peat is underlain by a thin silty sand lens, but at most locations, the peat is underlain by natural silty-clay. Cross-sections showing site stratigraphy are shown on Figures 3 and 4. The water-bearing peat layer overlies a thick, dry, and continuous layer of silty clay till. The silty clay till layer uniformly underlies the site and most of the surrounding Detroit area. Although the onsite thickness of the clay till unit is not known (estimated to be at least 30 feet thick), regionally, soil boring logs from the North Jefferson Chrysler plant (located approximately 0.5 mile to the north) depict the same clay layer at a depth of 10 to 103 feet (WWE, 1991 with revisions, 1993).

During the CAI, soil samples were collected from above the water table and analyzed for grain size, density and porosity. The soil was classified as a fine- to medium-grained sand with silt and trace limestone, and a Unified Soil Classification System (USCS) designation of SP (i.e., poorly graded sand). The density ranged from 93 to 99 pounds per cubic foot, and the porosity ranged from 41 to 45 percent.

2.1.2 Hydrogeology

Groundwater was collected from the shallow water bearing unit contained within the peat and/or underlying silty sand layer. The moist or damp layer is present at depths ranging from approximately 7 to 12 feet. In January 1991, a bail-down slug test was performed at Monitoring Well MW-7. The transmissivity was calculated to be 6×10^{-3} cm^2/sec and the groundwater flow rate was calculated to be 2×10^{-2} cm/sec.

The permeability of the homogeneous clay layer at a depth of 13 to 15 feet in the deep boring DB-1A was measured using the triaxial cell method and was found to be 8.5×10^{-9} cm/sec, indicating a very tight and dense lean clay (WWE, 1991 with revisions in 1993). The ubiquitous silty clay layer acts as an impermeable barrier to infiltrating surface water. All surface water that infiltrates the fill or peat is contained in a thin perched water bearing zone associated with the peat or underlying silty sand.

No aquifer is known to exist at, or near, the Facility. The thick, dry, silty clay layer represents an impermeable barrier that prevents the downward migration of the perched groundwater. The perched water zone does not produce sufficient water to sustain pumping. During semi-annual monitoring, 9 of the 12 monitoring wells (except MW-2D, MW-3 and MW-9) pump dry and do not quickly recharge. This condition indicates that a minimal amount of water (less than 0.5 GPM) will likely be extracted from the extraction well during MPE operations.

Groundwater flow maps have been prepared following each semi-annual compliance monitoring event. Groundwater measurements indicate a divide in the flow direction. A groundwater elevation contour map showing groundwater flow at the site on June 16, 2016 is shown on Figure 5. The highest groundwater

elevations are found near the current Container Management Building, in the location of the former Container Processing System (WMU-15). Groundwater west of the divide generally flows westward and groundwater east of the divide generally flows eastward. The direction and pattern of groundwater flow has remained consistent since 1982 (WWE, 1991 with revisions in 1993).

2.2 EXPOSURE PATHWAYS

During previous investigations at the Site, media with potential migration pathways and known impacts were selected for sampling and included soil and groundwater. Investigations were designed to investigate the nature and extent of volatile organic carbon (VOC) contamination associated with off-site migration at levels exceeding nonresidential cleanup criteria in soil and groundwater in accordance with the Generic Cleanup Criteria Requirements of Response Activity (R299.49).

MDEQ Part 201 Rules provide generic cleanup criteria for residential and nonresidential possible land uses and vapor intrusion exposure pathways. Rule 714 outlines Groundwater Volatilization Indoor Air Inhalation Criteria (GVIIC) and Rule 724 outlines Soil Volatilization Indoor Air Inhalation Criteria (SVIIC) through ambient or indoor air volatilization (effective date, December 30, 2013). However, it should be noted that GVIIC and SVIIC are no longer considered to be protective for human exposures for the indoor air inhalation pathway. The current Part 201 criteria for the indoor air inhalation pathway are less stringent than allowed by the federal Resource Conservation and Recovery Act of 1976 (RCRA) and therefore, can no longer be used to evaluate vapor intrusion. In October 2018, the MDEQ provided Site-Specific Volatilization to Indoor Air Criteria (SSVIAC) for soil, groundwater, and soil gas for the PCPG facility. See Section 2.6 for further information regarding hazardous substances detected onsite and their respective MSSLs.

2.3 SUMMARY OF PREVIOUS INVESTIGATIONS

The following sections summarize each previous investigation to identify specific hazardous substances and locations where one or more of the applicable non-residential soil and groundwater cleanup criteria or screening levels have been exceeded. The hazardous substances that exceed applicable cleanup criteria will be addressed in Section 4.0 when evaluating corrective action alternatives.

2.3.1 2008 Closure of Eight CMUs

In 2008, Tetra Tech conducted concrete and soil sampling to support the closure of eight Container Management Units (CMUs; Tetra Tech, 2008). Tetra Tech collected samples of concrete and shallow soil at 27 locations in accordance with an MDEQ-approved sampling plan. The samples were analyzed for VOCs using USEPA Method 8260B and semi-volatile organic compounds (SVOCs) using USEPA Method 8270C.

Table 1 summarizes the locations where Tetra Tech detected hazardous substances in excess of applicable cleanup criteria.

Table 1
Hazardous Substances Detected in Soil Exceeding Applicable Cleanup Criteria
2008 Soil Sampling for Closure of Eight Container Management Units

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
Benzo(a)pyrene	26,000	DCC	13S, 15S, 21S
Ethylbenzene	370,000	Csat	16S, 24S

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
Tetrachlorethene	1,000,000	GCP, DCC, Infinite Source VSIC, Csat	14S
Toluene	980,000	Csat	16S, 24S
1,2,4-Trimethylbenzene	160,000	Csat	16S, 24S
Xylenes	2,400,000	Csat	14S, 16S, 24S

Since the only soil that was excavated after collection of these 27 soil samples was related to the construction of the footings for the Container Management Building, the 2008 exceedances of applicable criteria remain to be addressed and are discussed below.

Analytical Results Exceeding Applicable Cleanup Criteria. The following hazardous substances were detected above applicable cleanup criteria (dated September 28, 2012). Benzo(a)pyrene at three locations (13S, 15S, 21S) exceeding soil DCC. The Container Management Building (WMU15) overlies the location of two samples (15S and 21S) and concrete pavement overlies the location of the third sample (13S). These exceedances will no longer be applicable as they will be reliably restricted by the Restrictive Covenant presented with this plan (Appendix B).

The following hazardous substances were detected above current applicable cleanup criteria (dated September 28, 2012), but corrective measures are not necessary for reasons provided below:

Ethylbenzene, tetrachloroethene (PCE), toluene, 1,2,4-trimethybenzene, and xylenes in soil at three locations (14S, 16S, and/or 24S) at concentrations exceeding the Csat screening level; but did not exceed any of the applicable health-based cleanup criteria. Corrective actions are not necessary at these locations because:

- Concentrations do not exceed any of the applicable health-based cleanup criteria.
- The Container Management Building overlies the location of two samples (16S and 24S) and concrete pavement overlies the location of the third sample (14S). The presence of pavement prevents water infiltration and minimizes the potential for contaminant migration to groundwater. This is supported by the fact that the same contaminants were not detected in groundwater samples collected from nearby locations BSB19, BSB-20, and MW-4.

PCE above the Infinite Source VSIC at one location (14S). The “infinite source” VSIC is not an applicable criterion for VOCs at this location because the source is small and surficial. BVNA attempted to verify the presence of PCE and TCE in Soil Sample 14S by installing Soil Boring BSB-19 adjacent to this location. Only very low levels of PCE were detected in the 3-5 foot deep soil sample and PCE and TCE were not detected in the 5-7 foot deep soil sample at that location. Based on this finding, the “2-meter source” VSIC (not the infinite source VSIC) is the appropriate cleanup criteria for evaluating the risk of exposure for ambient air inhalation pathway.

Because the extent of PCE is limited and its concentration in soil sample 14S does not exceed the 2 meter source VSIC, no corrective actions are necessary for the ambient air inhalation pathway.

2.3.2 RCRA Facility Investigation

A RCRA Facility Investigation (RFI) was conducted at the Facility in October 2010 in accordance with a MDEQ-approved sampling plan and the RFI report was submitted to the MDEQ on February 16, 2011. The purpose of the investigation was to further evaluate the horizontal extent of VOCs in soil and

groundwater on the property and in the adjacent right-of-ways. The investigation included 10 soil borings (BSB-1 through BSB-10) and the analysis of 20 soil and 10 water samples to evaluate the extent of contamination.

VOCs were detected in soil and groundwater at concentrations exceeding their method detection limits at locations surrounding the Facility and the highest concentrations of contaminants in soil and groundwater were detected in Soil Boring BSB-7, located along the western property boundary. Soil boring and groundwater monitoring well locations are shown on Figure 6.

Tables 2 and 3 summarize the hazardous substances detected during the 2010 investigation that exceed applicable cleanup criteria; however, no hazardous substances were detected above applicable cleanup criteria or screening levels.

Table 2
Hazardous Substances Detected in Soil Exceeding Applicable Cleanup Criteria
2010 RCRA Facility Investigation

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Applicable Criterion (or Screening Level) Exceeded	Locations of Exceedances
None	Not Applicable	None	None

Table 3
Hazardous Substances Detected in Groundwater Exceeding Applicable Cleanup Criteria
2010 RCRA Facility Investigation

Hazardous Substance	Maximum Groundwater Concentration Detected (µg/L)	Applicable Criterion (or Screening Level) Exceeded	Locations of Exceedances
None	Not Applicable	None	None

2.3.3 2013 Corrective Action Investigation

As part of the 2012 Operating License, PCPG was required to conduct a CAI (Bureau Veritas, 2013 and 2014) to determine if a release had occurred from the following:

- WMU-15 (Former Container Processing System)
- AOC-1 (Soil Volatilization to Indoor Air Exceedances)
- AOC-2 (Soil Volatilization to Ambient Air Exceedances)
- AOC-3 (MTBE Release to Site Wide Groundwater)

WMU-15 – Former Container Processing System. To further evaluate the soil contamination previously detected within the Former Container Processing System, groundwater samples were collected from locations surrounding WMU-15. Although significant levels of VOCs were detected in shallow soil samples by Tetra Tech; no contaminants were detected in the surrounding groundwater samples at concentrations exceeding applicable cleanup criteria or screening levels.

AOC-1/AOC-2 – Indoor Air. Soil and groundwater samples were collected from soil borings, temporary monitoring wells, and permanent monitoring wells. At the time that the CAI was conducted, concentrations of contaminants exceeded Csat at several locations (i.e., BSB-12 and BSB-24). The

contamination detected in Soil Boring BSB-12 has been targeted for corrective action. The contamination detected in Soil Boring BSB-24 could not be confirmed during the subsequent Corrective Measures Study Investigation. See Section 2.6 for additional information regarding the indoor air pathway, as the SVIAIC is no longer considered to be protective for human exposures for the indoor air inhalation pathway.

AOC-3 - MtBE. To address AOC-3, soil borings were advanced across the entire Facility and on adjacent properties. Groundwater was collected from temporary monitoring wells when a sufficient volume of groundwater was present for sampling. MtBE was detected above laboratory detection limits at most locations across the Facility. Concentrations ranged from slightly above the detection limit of 1.0 microgram per liter (µg/L) to 27,000 µg/L. The highest concentrations of MtBE were encountered in the western portion of the Facility, in the vicinity of the SBS Solids Building.

Concentrations of MtBE in soils and perched groundwater do not exceed applicable nonresidential cleanup criteria. Groundwater monitoring data collected at the Facility on a semi-annual basis indicate that MtBE is present at three monitoring well locations (MW-4 [upgradient], MW-6 and MW-9); but, the concentrations of MtBE in groundwater do not exceed applicable groundwater criteria.

PCPG will continue to monitor groundwater at established compliance points for evidence of new releases in accordance with the Facility Operating License. Concentrations of VOCs in semiannual groundwater samples have been trending downward since 2009. Current concentration trends in groundwater demonstrate that applicable nonresidential clean up criteria (direct contact or VSIC) have not been exceeded at the Facility.

Analytical Results Exceeding Applicable Cleanup Criteria. See Tables 4 and 5 for a summary of contaminants exceeding applicable cleanup criteria.

The following hazardous substances were detected at concentrations exceeding applicable cleanup criteria and will be addressed for corrective action:

- **Ethylbenzene, toluene, and xylenes** above Csat in soil samples from Soil Boring BSB-12 (adjacent to the Western Berm) will be addressed with corrective actions.
- **Tetrahydrofuran, toluene and xylenes** above FESL in the groundwater samples from BSB-13 (near the Western Berm) will be addressed with corrective actions.
- **1,2,4-Trimethylbenzene** above Csat in Soil Boring BSB-24, but not above any of the applicable health-based criteria. This exceedance will not be addressed because it represents a small area of contamination that could not be verified by subsequent soil sampling. BVNA attempted to verify the concentration of 1,2,4-TMB at BSB-24 by advancing soil boring BSB-39 at an adjacent location and collecting groundwater samples from nearby Monitoring Well MW-12. 1,2,4-TMB was not detected in soil from BSB-39 or in groundwater from Monitoring Well MW-12. Since no health-based criteria have been exceeded and only “slightly positive” NAPL was detected in BSB-39, this contamination will not be addressed by corrective measures.

Table 4
Hazardous Substances Detected in Soil Exceeding Applicable Cleanup Criteria
2013 Corrective Action Investigation

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
Ethylbenzene	180,000	Csat	BSB-12 (10-12)
Toluene	350,000	Csat	BSB-12 (10-12)
1,2,4-Trimethylbenzene	220,000	Csat	BSB-24 (7.5-8.5)

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
Xylenes	750,000	Csat	BSB-12 (10-12)

Table 5
Hazardous Substances Detected in Groundwater Exceeding Applicable Cleanup Criteria
2013 Corrective Action Investigation

Hazardous Substance	Maximum Groundwater Concentration Detected (µg/L)	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
Tetrahydrofuran	85,000	FESL	BSB-13
Toluene	99,000	FESL	BSB-13
Xylenes	91,000	FESL	BSB-13

2.3.4 2015 Corrective Measures Study Investigation

In accordance with MDEQ's request for additional evaluation (MDEQ; October 27, 2015), the CMS investigation was conducted to further evaluate the horizontal extent of soil and groundwater impact on the Facility and western adjacent properties and to further evaluate the potential presence of NAPL (BVNA, 2015).

Results of NAPL Evaluation. Potential evidence of NAPL was noted in samples collected from the following soil borings:

- BSB-39/MW-12 (Near BSB-24) - A soil test kit indicated a "slightly positive hydrocarbon in soil" at a depth of 5 to 7.5 feet.
- BSB-42 (Western Berm) – A soil test kit indicated a "slightly positive hydrocarbon in soil in the saturated zone from 10 to 12.5 feet.
- BSB-43/MW-11 (Western Berm) - A soil test kit indicated a "slightly positive hydrocarbon in soil" in the saturated zone from 12.5 to 15 feet.

Analytical Results Exceeding Applicable Cleanup Criteria. As summarized in Tables 6 and 7, VOCs were detected in soil and groundwater at concentrations exceeding MDEQ nonresidential cleanup criteria and/or screening levels (dated September 28, 2012). The contamination in the Western Berm area (BSB-42, BSB-43, BSB-44, BSB-45, and MW-11) will be addressed with corrective actions.

Table 6
Hazardous Substances Detected in Soil Exceeding Applicable Cleanup Criteria
2015 Corrective Action Investigation

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
Ethylbenzene	490,000	Csat	BSB-43 (10-12), BSB-45 (13-15)
Toluene	930,000	Csat	BSB-43 (10-12)
Xylenes	2,300,000	Csat	BSB-43 (10-12), BSB-45 (13-15)

Table 7
Hazardous Substances Detected in Groundwater Exceeding Applicable Cleanup Criteria
2015 Corrective Action Investigation

Hazardous Substance	Maximum Groundwater Concentration Detected (µg/L	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
Toluene	130,000	FESL	BSB-42, BSB-44 BSB-45, MW-11
Xylenes	85,000	FESL	BSB-42, BSB-44

The highest concentrations of cis-1,2-dichloroethene, PCE, TCE, and vinyl chloride in soil were detected in Soil Boring BSB-48 (3-5 feet), which was located offsite and west of St. Jean Avenue. The highest concentrations of petroleum hydrocarbons were noted in Soil Boring BSB-43, located within the Western Berm.

Potential evidence of NAPL (but not potentially mobile NAPL) was identified in Soil Borings BSB-39, BSB-42, and BSB-43. This evidence consisted of soil test kits indicating “slightly positive hydrocarbon in soil” and sheen on the water in the saturated zone.

Analytical Results Exceeding Applicable Criteria. The following hazardous substances were detected above applicable cleanup criteria and will be addressed with corrective measures:

- Ethylbenzene, toluene, and xylenes above Csat in areas near the Western Berm will be addressed for corrective action because the berm and underlying soil represents the largest and most significant onsite source of contamination.

2.3.5 2016 Semi-Annual Groundwater Monitoring Results

There are currently 12 groundwater monitoring wells (MW-1 through MW-12) that are sampled on a semi-annual basis. The results from the most recent monitoring event were described in the 2017 2nd Semi-Annual Environmental Monitoring Report (Bureau Veritas, 2017). Based on a review of historical analytical results, no hazardous substances have been detected in groundwater at concentrations exceeding the applicable groundwater cleanup criteria (i.e., GCC and FESL). Refer to Table 8.

Table 8
Hazardous Substances Detected in Groundwater Exceeding Applicable Cleanup Criteria
2009 to 2016 Semi-Annual Groundwater Monitoring

Hazardous Substance	Maximum Groundwater Concentration Detected (µg/L	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
None	--	None	None

2.3.6 Summary of Hazardous Substances that Require Corrective Action

Based on the combined results of previous site investigations, the hazardous substances listed in Tables 9 and 10, and shown on Figures 7 and 8, will be addressed for corrective action in Section 4.0. There are two general areas of contamination that will be addressed for corrective action:

- The western soil berm area (where samples from BSB-12, BSB-13, BSB-42, BSB-43, BSB-44, BSB-45, and MW-11 were collected) represents the largest and most significant source of onsite soil and groundwater contamination; exhibiting the highest potential for mobile NAPL.
- The soil near the former CPS Building (WMU-15) has been covered with pavement and buildings will be addressed using controls (recorded in the Restrictive Covenant) to reliably restrict exposure via dermal contact.

Table 9
Summary of Hazardous Substances Detected in Soil that Require Corrective Action

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
Benzo(a)pyrene	26,000	DCC	13S, 15S, 21S
Ethylbenzene	370,000	Csat	16S, 24S, BSB-12 (10-12) BSB-43 (10-12) BSB-45 (13-15)
Tetrachlorethene	1,000,000	GCP, DCC, Infinite Source VSIC, Csat	BSB-48 (3-5)
Toluene	980,000	Csat	16S, 24S, BSB-12 (10-12) BSB-43 (10-12)
1,2,4-Trimethylbenzene	160,000	Csat	16S, 24S BSB-24 (7.5-8.5)
Xylenes	2,400,000	Csat	14S, 16S, 24S BSB-12 (10-12) BSB-43 (10-12) BSB-45 (13-15)

Table 10
Summary of Hazardous Substances Detected in Groundwater that Require Corrective Action

Hazardous Substance	Maximum Groundwater Concentration Detected (µg/L)	Applicable Criterion (or Screening Level) Exceeded	Location of Exceedances
Tetrahydrofuran	85,000	FESL	BSB-13
Toluene	130,000	FESL	BSB-13,BSB-42, BSB-44, BSB-45, MW-11
Xylenes	91,000	FESL	BSB-13, BSB-42, BSB-44, MW-11

2.4 CLEANUP OBJECTIVES

The CMS developed corrective measure alternatives that may be implemented at the site to address releases of hazardous wastes. Each corrective measure alternative was selected and evaluated with the general objective of protecting human health and the environment from exposure to impacted soil and groundwater.

2.4.1 Soil Cleanup Objectives

Based on the relevant exposure pathways identified for this Facility, the applicable non-residential cleanup criteria and screening levels for soil are listed below. The selected numerical cleanup objective for each hazardous substance is italicized and highlighted in green in Table 11.

Table 11
Summary of Non-Residential Soil Cleanup Objectives

Hazardous Substance	Groundwater Contact Protection	Volatilization to Ambient Air (Infinite Source)	Volatilization to Ambient Air (2 Meter Source)	Direct Contact	Soil Saturation Screening Level	Performance Objective
Ethylbenzene	140,000 C	2,400,000	6,500,000	140,000 C	*140,000*	No Visible NAPL
Toluene	250,000 C	3,300,000	36,000,000	250,000 C	*250,000*	No Visible NAPL
Trichloroethene	440,000	*14,000*	58,000	500,000	500,000	None
1,2,4-Trimethylbenzene	110,000 C	25,000,000	600,000,000	110,000	*110,000*	No Visible NAPL
Xylenes	150,000 C	54,000,000	130,000,000	150,000	*150,000*	No Visible NAPL

C = Criterion defaults to soil saturation concentration

2.4.2 Groundwater Cleanup Objectives

Based on the applicable cleanup criteria for the Facility, the applicable non-residential cleanup criteria and screening levels for groundwater are listed below. The selected numerical cleanup objective for each hazardous substance is italicized and highlighted in blue in Table 12.

Table 12
Summary of Non-Residential Groundwater Cleanup Objectives

Hazardous Substance	Groundwater Contact	Flammability and Explosivity Screening Level	Performance Objective
Tetrahydrofuran	1,600,000	*60,000*	No Visible NAPL or Sheen
Toluene	530,000 S	*61,000*	No Visible NAPL or Sheen
Xylenes	190,000 S	*70,000*	No Visible NAPL or Sheen

S = Defaults to water solubility limit Csat

2.5 SUMMARY OF AREAS REQUIRING CORRECTIVE ACTION

Based on the results of previous investigations and the corrective measure objectives outlined in the prior sections, Table 13 is a summary of areas where hazardous substances have been detected above applicable cleanup criteria and whether or not corrective measures are necessary to meet the objectives. See Section 2.6 for additional information in regarding the indoor air inhalation pathway.

Table 13
Areas Where Hazardous Substances Exceed Applicable Cleanup Criteria or Screening Levels

AOC/Target Area	Hazardous Substances Above Applicable Criteria	Applicable Criterion (or Screening Level) Exceeded	Retain for Corrective Action?	Health-Based Cleanup Objective	Other Corrective Action Objectives
AOC-1 and AOC-2 - Volatilization to Indoor Air – Western Berm Area	Tetrahydrofuran, toluene, ethylbenzene, PCE, TCE, xylenes, and other VOCS	Soil: Csat, SSVIAC GW: FESL, SSVIAC	**YES**	None exceeded	Remove/reduce source concentrations Csat; NAPL; FESL; SSVIAC
AOC-1 Volatilization to Indoor Air – Former Container Processing Area	Benzene, ethylbenzene, PCE, TCE	Soil: Csat, (also GCP and DCC), SSVIAC	**YES**	Criteria not applicable after RC is recorded	Restrictive Covenant – Prohibit Habitable Structures over Contamination
AOC-3 – MtBE in Groundwater	None	None	NO	NA	Continued Groundwater Monitoring

AOC/Target Area	Hazardous Substances Above Applicable Criteria	Applicable Criterion (or Screening Level) Exceeded	Retain for Corrective Action?	Health-Based Cleanup Objective	Other Corrective Action Objectives
WMU-15 - PAHs in Soil – Former Container Processing Building	Benzo(a)pyrene	Soil: Direct Contact	**YES**	Criterion not applicable after RC is recorded	Restrictive Covenant – Maintain Existing Exposure Barriers
WMU-15 - VOCs in Soil – Former Container Processing Building	Toluene, ethylbenzene, and xylenes	Csat only	NO	None exceeded	Restrictive Covenant

2.6 INDOOR AIR INHALATION PATHWAY

As indicated in Section 2.2, SVIIC and GVIIC are no longer considered to be protective for human exposures for the indoor air inhalation pathway. Therefore, hazardous substances detected in soil and groundwater during previous investigations were compared to the SSVIAC provided by MDEQ in October 2018.

Tables 1 thru 8 in Appendix I incorporate the SSVIAC criteria to soil and groundwater data for the exposure scenarios applicable to the site: non- residential structures (< 50,000 sq.ft.) with slab on grades, sandy soils and groundwater at 5 feet. Tables 1-4 present the *soil* analytical results and applicable SVVIC criteria for soil. Tables 5 thru 8 present the *groundwater* analytical results and applicable SSVIAC criteria.

Tables 14 and 15 summarize the hazardous substances that were detected above SSVIAC in soil and groundwater respectively. Additionally, Figures 9a and 9b show the sampling locations for which the SSVIAC have been exceeded in soil. Figure 10 shows the SSVIAC exceedances in groundwater.

Table 14
Hazardous Substances Detected in Soil Exceeding SSVIAC

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Location of Exceedances
Benzene	1,100	01S, 02S, 05S, BSB-7 (8-9), BSB-12 (8-10)/(10-12), BSB-13 (5-7), BSB-18 (3-5)/(5-7), BSB-20 (5-7), BSB-25 (3-5), BSB-38 (1.5-2), BSB-42 (8-10), BSB-43 (10-12), BSB-44 (2-4)/(4-6), BSB-45 (13-15)
n-Butylbenzene	69,000	BSB-24 (7.5-8.5)

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Location of Exceedances
t-Butylbenzene	3,500	05S, 09S, BSB-24 (7.5-8.5)
1,1-Dichloroethane	6,700	05S, 11-2C, BSB-12 (8-10)/(8-10), BSB-13 (3-5)/(5-7), BSB-38 (1.5-2), BSB-42 (5-7)/(8-10), BSB-43 (10-12), BSB-44 (2-4)/(4-6), BSB-45 (9-11)
1,2-Dichlorethane	82	BSB-12 (8-10)
cis-1,2-Dichloroethene	18,000	03S, 05S, 14S, 16S, 24S, BSB-7 (8-9), BSB-12 (8-10).(10-12), BSB-13 (3-5)/(5-7), BSB-23 (9-10), BSB-43 (10-12), BSB-44 (2-4), BSB-45 (13-15), BSB-48 (3-5)/(5-7)
trans-1,2-Dichloroethene	350	05S
Ethylbenzene	490,000	02S, 03S, 04S, 05S, 09S, 10S, 11-2C, 14S, 16S, 20S, 21S, 22S, 24S, BSB-7 (8-9), BSB-12 (8-10)/(10-12), BSB-13 (3-5)/(5-7), BSB-18 (3-5)/(5-7), BSB-19 (3-5), BSB-38 (1.5-2), BSB-42 (8-10), BSB-43 (10-12)/(16-18), BSB-44 (2-4)/(4-6), BSB-45 (13-15)
Isopropylbenzene	5,500	BSB-7 (8-9), BSB-12 (10-12), BSB-18 (3-5), BSB-43 (10-12), BSB-45 (13-15)
Methyl tert-butyl ether	4,700	BSB-12 (10-12), BSB-36 (8-10), BSB-38 (4.5-5), BSB-45 (13-15)
2-Methylnaphthalene	88,000	BSB-24 (7.5-8.5)
Naphthalene	70,000	BSB-12 (10-12), BSB-24 (7.5-8.5), BSB-27 (5-7), BSB-44 (4-6)
Tetrachlorethene	1,000,000	04S, 05S, 11-2C, 12S, 13S, 14S, 15S, 16S, 20S, 21S, 23S, BSB-4 (0-2), BSB-5 (0-2)/(4-6), BSB-7 (0.5-2)/(8-9), BSB-12 (8-10)/(10-12), BSB-13 (3-5)/(5-7), BSB-14 (3-5)/(5-7), BSB-19 (3-5), BSB-20 (3-5), BSB-24 (3-5)/(7.5-8.5), BSB-28 (4-5), BSB-30 (4-5), BSB-36 (0-2), BSB-39 (3-5), BSB-42 (5-7)/(8-10), BSB-43 (10-12), BSB-45 (9-11), BSB-47 (3-5)/(5-7), BSB-48 (3-5)/(5-7)
Toluene	980,000	14S, 16S, 24S, BSB-12 (10-12), BSB-43 (10-12), BSB-45 (13-15)
Trichloroethene	78,000	01S, 02S, 03S, 05S, 07S, 09S, 10S, 11-2C, 12S, 13S, 14S, 15S, 20S BSB-12 (8-10)/(10-12), BSB-13 (5-7), BSB-20 (3-5), BSB-23 (3-5), BSB-28 (4-5), BSB-42 (5-7)/(8-10), BSB-43 (10-12), BSB-45 (9-11), BSB-48 (3-5)/(5-7)
1,2,3-Trimethylbenzene	140,000	BSB-24 (7.5-8.5)

Hazardous Substance	Maximum Soil Concentration Detected (µg/kg)	Location of Exceedances
1,2,4-Trimethylbenzene	220,000	01S, 02S, 05S, 09S, 14S, 16S, 22S, 24S, BSB-7 (8-9), BSB-12 (8-10)/(10-12), BSB-24(7.5-8.5), BSB-38 (1.5-2), BSB-42 (8-10), BSB-43 (10-12), BSB-45 (13-15)
1,3,5-Trimethylbenzene	74,000	09S, 14S, 16S, 24S, BSB-7 (8-9), BSB-12 (10-12), BSB-24 (7.5-8.5), BSB-43 (10-12), BSB-45 (13-15)
Vinyl chloride	680	05S, BSB-12 (10-12), BSB-48 (3-5)/(5-7)
Xylenes	2,400,000	05S, 09S, 14S, 16S, 22S, 24S, BSB-7 (8-9), BSB-12 (8-10)/(10-12), BSB-13 (3-5)/(5-7), BSB-18 (3-5)/(5-7), BSB-24 (7.5-8.5), BSB-38 (1.5-2), BSB-42 (8-10), BSB-43 (10-12)/(16-18), BSB-44 (4-6), BSB-45 (13-15)

Table 15
Hazardous Substances Detected in Groundwater Exceeding SSVIAC

Hazardous Substance	Maximum Groundwater Concentration Detected (µg/L)	Location of Exceedances
t-Butyl alcohol	4,000	BSB-7, BSB-18
cis-1,2-Dichloroethene	11,000	BSB-13, BSB-42, BSB-44, BSB-48, MW-11
Ethylbenzene	20,000	BSB-7, BSB-13, BSB-42, BSB-44, BSB-45, MW-11
Vinyl chloride	490	BSB-48, MW-11
Xylenes	91,000	BSB-7, BSB-13, BSB-42, BSB-44, BSB-45, MW-11

In order to address the indoor air inhalation pathway at the Facility, sub-slab and soil gas sampling will be conducted as part of the CMI Work Plan. See Sections 3.2.1 and 3.2.4 for details on the scope of the sampling.

Since the SSVIAC are exceeded, the indoor air inhalation pathway may be reliably restricted by recording a Restrictive Covenant. The vapor intrusion pathway would be reliably restricted because the deed restriction would prohibit the construction of new structures, unless such construction incorporates engineering controls designed to eliminate the potential for subsurface vapor phase hazardous substances to migrate into the new structure at concentrations greater than applicable criteria; or, unless prior to construction of any structure, an evaluation of the potential for any hazardous substances to volatilize into indoor air assures the protection of persons who may be present in the buildings and is in compliance with Section 20107a of the Michigan National Resources and Environmental Protection Act (NREPA). The vapor intrusion pathway may also be addressed via indoor air mitigation.

It should be noted that the chlorinated solvent contamination detected in offsite Soil Borings BSB-28, BSB-30, BSB-47, and BSB-48 will not be addressed because it has been adequately demonstrated that the contamination was caused by the dry cleaner that formerly occupied that property.

3.0 WORK PLAN OVERVIEW

As described in the CMS, MPE is a technology that allows for the simultaneous extraction and treatment of air and water utilizing vacuum to remove VOCs from the soil and groundwater matrix. MPE incorporates the process of soil vapor extraction (SVE), groundwater extraction, and biodegradation and works best for permeable sand-silt mixtures.

In the proposed configuration soil gas and contaminated groundwater liquids are conveyed from the extraction well to the surface within the same conduit (a drop tube or suction pipe) located inside the extraction well and is typically referred to as Multi Phase Extraction (MPE) as it is on the subject report. A single vacuum pump will be used to extract both liquid and gaseous phases. The configuration of the extraction well is depicted on Figure 11.

The proposed pilot MPE System will be installed along the southwestern section of the property (the "western soil berm area"). The western berm area is approximately 25 feet wide by 200 feet long at the toe of the slope (5,000 square feet). The estimated volume based on its trapezoidal cross section and height of 6 feet is 500 cubic yards. The western soil berm area currently contains a stockpile that covers approximately 2,700 sq. ft. of the anticipated remediation area. The stockpiled material will be characterized and removed prior to the system installation. The pilot test will be conducted in the western berm area after the stockpile is removed.

3.1 CONCEPTUAL PILOT SYSTEM DESIGN

Investigation activities conducted at the Facility indicate that on-site soil is impacted by VOCs and MTBE has impacted shallow groundwater as summarized in Section 2.2.6.

The pilot MPE system design was prepared to provide data that can be used to design and optimize the full-scale MPE system. The Pilot MPE system design and installation are described in detail in Section 4. Pilot MPE system performance evaluation details are described in Section 5.

The results of the pilot test will be utilized to select the spacing and number of the extraction wells to conduct a full scale MPE operation across the entire west berm area. A two day duration will be scheduled for the Pilot Test in which a step-rate test and constant-rate tests will be conducted.

3.2 SUPPLEMENTAL FIELD INVESTIGATION

The Conditional Approval by the MDEQ of the Corrective Measures Study indicated that additional measures were needed in order to address potential vapor intrusion to indoor air inhalation at the Site. The following sections address the items that were presented by the MDEQ.

3.2.1 Sub-Slab Sampling

Buildings of standard design, including those with enclosed walls, and with full-time occupants will be investigated for the volatilization to indoor air pathway (VIAP) and include the Office, Laboratory, and Employee Locker Room. The remaining buildings onsite are not of standard design and/or do not have full-time occupants. This will be done via the collection of sub-slab soil vapor samples. Vapor pins will be installed and sampled in accordance with the MDEQ Standard Operating Procedures dated February 1, 2013, as provided in the MDEQ *Guidance Document for the Vapor Intrusion Pathway*, dated May 2013. The following scope of work is proposed for completing this task:

- Install a total of nine (9) sub-slab sampling points, utilizing vapor pins, within various buildings located on the Site. The number of samples within each building will be determined based on the building size. Three (3) sampling points will be installed in each of the following buildings: the Employee Locker Room, the Laboratory, and the Office. Selected locations will be at least 5 feet from the building foundations. See Figure 12 for sub-slab sampling locations.
- The subcontractor will utilize a 1.5-inch-diameter drill bit and hammer drill to make a hole in the concrete floor approximately 1.75 inches deep. A $^{5}/_{8}$-inch drill bit will then be used to continue through the center of the hole through the concrete to the subsurface. A vapor pin sampling port will then be installed in each hole. If the sampling locations are in high traffic areas, stainless steel caps will be installed to allow for subsequent sampling events, if necessary. Sampling ports will be left in-place in the event that additional sampling is needed.
- Use a Helium Chamber to check for leaks at each sampling point location and collect soil gas samples from each of the locations using Bottle Vacs.
- Analyze up to nine (9) soil gas samples for volatile organic compounds (VOCs) using TO-15. The list of compounds to be analyzed and their respective laboratory detection limits are included in Appendix C.

3.2.2 Site-Specific Volatilization to Indoor Air Criteria

With the assistance of the MDEQ, ite-specific VIAC for the indoor air pathway was developed. The site-specific VIAC developed is protective of human health exposures for the indoor air pathway.

3.2.3 Institutional Controls

The SSVIAC pathway for buildings of non-standard design (i.e., partially open to the atmosphere) and with less than full-time occupancy will be reliably controlled through institutional controls. To accomplish this task, the institutional controls will address the following:

- If in the future, buildings with non-standard design are fully enclosed, proper sampling will be conducted to investigate the VIAP, to ensure that there are no harmful exposures to the occupants of the building. If results so indicate, proper precautions will be taken to ensure the safety of the employees.

or

- Buildings with non-standard design and with less than full-time occupancy will never be enclosed and will never be occupied full-time by employees.

Once the CMI Work Plan is approved, the execution of the plan is enforceable through the Facility's License.

3.2.4 MIOSHA Monitoring

The facility currently conducts ambient air monitoring at four locations for a select list of VOCs in conjunction with the requirements of their Part B Hazardous Waste Operating License. The four monitoring locations have been agreed to with the MDEQ and are located along the fence line of the Site and are considered to be representative of ambient air in the proximity of the complex. Samples are collected every sixth day and are collected utilizing sorbent tubes for the following analytes using EPA Method TO-17: benzene, carbon tetrachloride, chloroform, methylene chloride, tetrachloroethene, trichloroethene, vinyl chloride, 1,1,1-trichloroethane, toluene, and xylenes. Written reports are submitted to the MDEQ Air Monitoring Unit within 30 days of the end of each month.

Additionally, employees who are involved in the following activities are required to wear respirators as part of day-to-day activities:

- Laboratory employee, as necessary
- Drum/container sampling
- Tanker sampling
- Bulk storage tank sampling
- De-pack, pour-up
- Bulk consolidation ROB
- Drum load/unload
- Container pump up
- Container de-pack, re-pack
- Container de-pack, pour-up
- Tanker load/unload

See Appendix D for the Respiratory Protection Plan for the Facility.

3.2.5 Soil Gas Sampling

In order to verify that soil gas is not migrating beyond Freud Street and St. Jean Avenue, soil gas sampling will be conducted to investigate the potential for vapor intrusion beyond the Site boundaries. However, due to potential offsite sources (i.e., former drycleaning facility and known site of contamination) continued discussion with MDEQ regarding the scope of work for the soil gas sampling is requested. A soil gas sampling workplan will be prepared following discussion with MDEQ and will be completed within 30 days following submittal of this Revised CMIWP.

3.2.6 Utility Corridor Investigation

In 2016, per the request of MDEQ, a BVNA conducted a study to determine the potential for the storm sewer conduit along the east side of Old St. Jean Avenue to act as a preferential pathway for groundwater contamination. Based on field measurements, including the depth to the top of sewer collected from the catch basins, and the well-documented subsurface soil types (i.e., dry clay till formation at depth of sewers) existing along the western boundary of the Facility, it was determined that the sewer line along St. Jean Avenue was not intercepting groundwater. Additionally, it was determined that the storm sewer conduit is a relevant pathway for exposure to municipal utility workers; however, no cleanup criteria applicable for utility workers have been exceeded. MDEQ agreed with the conclusions of the study. See Appendix E for the study conducted in 2016.

A further review of existing information and/or investigation into the locations, size, depth, etc., of the utility corridors on or immediately adjacent to the site (i.e., Freud Street) will be conducted. Upon completion of the review of existing information and/or investigation, the utility corridors will be investigated for their potential to act as a preferential pathway for offsite migration of contaminated soil gas and groundwater, if applicable.

3.3 CORRECTIVE MEASURES PERMITTING PLAN

3.3.1 Permit to Install Exemption Determination

Prior to the installation of a full-scale MPE system at the Site, a pilot test will be performed to determine full-scale design parameters, including: (1) the soil gas extraction rate for vacuum extraction wells, (2) the anticipated radius of influence in the vadose and saturated zones, and (3) the VOC mass extraction rates, which will include determining the necessity of air permitting and/or implementation of emission controls in the full-scale system design and operation.

Prior to performance of the pilot test, a determination will be made as to whether the Permit to Install (PTI) Exemption can be utilized during the pilot test. Michigan Air Pollution Control Rule 283(2)(a) addresses the exemption for pilot processes or pilot process equipment and states the following: “Pilot processes or pilot process equipment utilizing T-BACT used for any of the following: (i) Chemical analysis. (ii) Physical analysis. (iii) Empirical research. (iv) Theoretical research. (v) The development of process or process equipment design and operating parameters. (vi) The production of a product for field testing.....”

As part of the pilot process, carbon vessels will be utilized to treat the effluent air stream prior to discharge.

The emission rates and permit applicability requirements for the full-scale system will be addressed upon completion of the pilot test.

3.3.2 Restrictive Covenant

As noted in the Corrective Measures Study, Section 2.2, a restrictive covenant will be prepared for the Site and recorded with the Wayne County Register of Deeds, as a legal control to reduce the potential for exposure by limiting land use.

PCPG will record a Restrictive Covenant that limits land-use in the following manner:

- Limit the use of the property for non-residential purposes
- Prohibit the use of shallow water for drinking water purposes
- Prohibit the construction of habitable structures over the top of (or near) contamination that exceeds indoor air inhalation criteria

- Maintain the onsite pavement

Additionally, since the Part 201 cleanup criteria have not been updated as of the date of this Work Plan, language has been added to the draft restrictive covenant which addresses volatilization to indoor air exposure risks. This language may be removed from the draft restrictive covenant, if the Part 201 cleanup criteria are updated prior to the recording of the final restrictive covenant. The draft restrictive covenant is provided in Appendix B.

3.3.3 Monitoring and Maintenance Program

In order to be in compliance with the Restrictive Covenant, a monitoring and maintenance program will be put into place to evaluate the protectiveness of the engineering controls at the facility including the pavement, building floors across the site and other conditions of the restrictive covenant. The program will include, but will not be limited to, the following components:

- Background Site Information
    - Facility Name and Location
    - Person responsible for submitting the annual certification monitoring report
    - All Current Owner, Lessee(s) and Operator(s)
    - MDEQ Case Specific Information, as applicable
    - Existing Site Conditions (i.e., description of the physical characteristics of the Site, Site operations, and description of each engineering control and activities prohibited at the site)
- Protectiveness Evaluation
    - Restrictive Covenant & Engineering Control Information
    - Evaluation of Institutional and Engineering Controls (i.e., condition of asphalt and concrete in all restricted areas) and a summary of the Operation and Maintenance Reports for the Remediation System. This section will evaluate compliance with Land Use or Resource Use conditions identified in the Restrictive Covenant.

      The result of the evaluation will determine if 1) the controls remain unchanged and protective or 2) if a change occurred in the facility and the controls need to be modified to make the control protective.
    - Inspections: A yearly inspection will be conducted to document if any changes have taken place in the property such as new construction, excavation, or deterioration of covered surfaces or monitoring wells. If an excavation or other disturbance activity has taken place within the restricted areas, a description of the disturbance and the method to restore all controls to ensure that exposure to contamination in excess of the applicable remediation standard will be provided. The inspection will ensure that there is no cultivation taking place at the facility, that the conditions of the fence restricting access remains intact, and that any asphalt or concrete patching is conducted to maintain the integrity of the cover, as needed.
- Annual Inspection Report

A yearly Inspection report documenting how the person(s) responsible for monitoring and ensuring the protectiveness of the remedial action have maintained and evaluated the engineering control will be completed. The report will be submitted to MDEQ within 30 days of the inspections.

3.4 COMMUNITY RELATIONS PLAN

A Community Relations Plan was prepared for the planned full scale operations of the system. A copy of the Community Relations Plan is included in Appendix F.

3.5 SOIL MANAGEMENT PLAN (DIG PLAN)

A Soil Management Plan that indicates the procedures to be followed during excavation activities at the facility was prepared. A copy of the Soil Management Plan is included in Appendix G.

3.6 PRECONSTRUCTION ACTIVITIES

3.6.1 Removal of Soil Stockpiled in the Western Soil Berm Area

The stockpiled in the Western Soil Berm area measures approximately 180 feet long by 15 feet wide and 6 feet in height or roughly 500 cubic yards. Prior to conducting MPE pilot test related field activities, the stockpile will be sampled, profiled for disposal and loaded into trucks for transportation to a licensed disposal facility. After removal of the stockpile, the surface contour will be completed to matching the surrounding contours. Monitoring Well MW-11, located in the stockpile area will be protected and cut to adjust for the new surface elevation.

4.0 SYSTEM DESIGN AND INSTALLATION

An MPE Pilot Test system consisting of an extraction well; two soil vapor probes, two groundwater observation wells and a mobile extraction and treatment system will be conducted prior to a full scale operation. Data gathered during the pilot test (Section 5.0) will be used to support full scale system design and operation. Carbon vessels will be utilized to treat (adsorb) VOCs during the Pilot Test and in the full scale evaluation to control air emissions. Groundwater extracted during the Pilot Test will be temporarily stored in a container onsite for analysis and disposal offsite. The amount and chemical characteristics of the groundwater obtained during the Pilot Test will determine the options for the handling of water during the full scale operation.

The Pilot MPE system design details and installation are described below.

4.1 DESIGN OBJECTIVES

The Pilot MPE system design was prepared to provide data that can be used to design and optimize a full scale application.

The effectiveness of the wells to induce a vacuum in the vadose zone will be monitored in two nested soil vapor wells located at approximately 10 and 20 feet, respectively, from the extraction well.

The effectiveness of the well to lower the groundwater table will be evaluated utilizing submersible pressure transducers in existing monitoring well MW-11 and in two 1.5-inch temporary wells to be installed at approximately 5 and 15 feet, respectively, from Extraction Well EXW -1.

4.2 EXTRACTION WELL DESIGN

An MPE Extraction Well (EXW-1) will be installed approximately 10 feet north of Monitoring Well MW-11 near the center (long axis) of the existing stockpile in the approximate location shown on Figure13. The purpose of this well is to evaluate whether MPE is a viable alternative to lower the groundwater level and reduce soil concentrations below the SVII criteria while reducing the potential for lateral migration of impacted soil vapors beyond the site boundaries.

The MPE extraction well will be constructed by drilling a 10-inch diameter hole to a depth of approximately 15 feet bgs or to the top of the clay layer using a hollow-stem auger drilling rig. The well will be constructed using a 4-inch diameter 20-slot (0.020-in) well screen, installed from 5 to 15 feet below grade (10 feet long section). The annular space surrounding the wells screen will be backfilled with #2/12 sand. Bentonite chips/granular bentonite (hydrated in place) will be placed above the pea gravel well screen pack to provide an effective surface seal and to minimize the potential for drawing air from the surface at each extraction well point. A non-shrinking concrete-bentonite grout will fill the remaining annular space.

The extraction well riser pipe will consist of 4-inch diameter schedule 40 PVC, and will extend from the top of the well screen to approximately 12 inches above the surface. A 1-inch diameter solid PVC pipe (i.e. “drop tube”) will be placed in the center of the well casing extending from below the water table to the pipe riser. The top of the drop tube will be connected to flexible polyethylene piping at one end and will extend to the system trailer on the other. Air tight well caps and fittings will be utilized to maintain the seal and vacuum at the well head. Figure 11 shows the extraction well construction details.

4.3 TEMPORARY MULTI LEVEL SOIL-VAPOR AND VACUUM MONITORING WELLS

Two nested wells (VMW-1 and VMW-2) containing temporary subsurface vacuum monitoring probes will be installed at a distance of approximately 10 feet and 20 feet from EXW-1 as shown on Figure 13. Each nested well will contain two vacuum monitoring probes. The deep probe will be installed just above the measured groundwater elevation at a depth of 8 to 8.5 feet bgs (approx.) and the shallow probe will be installed at a depth of 4.5 to 5 feet bgs (approx.). The multi-level vacuum monitoring point design will allow for an assessment of flow patterns within the subsurface soils. The vapor monitoring well construction details are shown on Figure 14.

Each nested pair will be constructed in a single 2.5-inch borehole completed to a depth of 10 feet bgs (approx.) using direct-push drilling technology. Each vapor/vacuum monitoring point will be constructed with a soil vapor probe (Polyethylene implant with ¼-inch speed fitting, or dedicated soil vapor tip with Teflon umbrella and stainless steel screen, or similar) and a length of ¼-inch diameter tubing. Each nested monitoring point pair will be constructed as described below:

- The deep monitoring point (probe) will be installed approximately 6-inches above the bottom of the borehole above the static water table as determined in nearby well MW-11 and/or during borehole completion. For the purpose of this Work Plan the deep probe is estimated to be at 8.5 feet bgs after the stockpile in the western berm area has been removed.
- The annular space surrounding the deep monitoring probe will be backfilled with clean sand No. 2/12 sand to approximately 0.5-foot below and 0.5-foot above the vapor probe (9 to 8 feet bgs).
- Granular bentonite chips will be placed above the sand well screen in 6- to 8-inch lifts to approximately 5 feet bgs (0.5-foot below the bottom of the shallow monitoring point screen). Each lift will be hydrated in place prior to the addition of the next lift to help ensure an effective seal between the shallow and deep monitoring point.
- The shallow monitoring probe will be installed above the sand at approximately 4.5 feet bgs.

- The annular space surrounding the shallow monitoring point screen will be backfilled with clean sand No. 2/12 sand to approximately 0.5-foot below and 0.5-foot above the vapor probe (5 to 4 feet bgs).
- Granular bentonite will be placed above the sand well screen in 6- to 8-inch lifts to approximately 1 foot bgs. Each lift will be hydrated in place prior to the addition of the next lift to help ensure an effective seal between the shallow and deep monitoring point.
- Tubing from nested pairs will extend at least 12-inches above the top of the bentonite. Care will be taken to properly label each monitoring point so that the shallow and deep monitoring points are easy to distinguish.
- Each probe will be capped with a ball valve and equipped with a barbed hose fitting.
- Temporary vacuum monitoring probes will be abandoned following installation and Piot Test.

During pilot testing, a portable vacuum gauge will be connected to each soil vapor probe, and the ball valve will be opened to measure vacuum propagation away from the extraction wells in order to assess zone of vacuum influence. Vacuum measurements will be taken at both shallow and deep probes to assess the distribution of subsurface flow vertically throughout the vadose zone soils.

4.4 TEMPORARY PIEZOMETERS

Two temporary piezometers PZ-1 and PZ-2 will be installed to measure the water table elevation response to the vacuum applied at the extraction well during the Pilot Test. PZ-1 and PZ-2 will be located at 5 and 20 feet from EXW-1 as depicted in Figure 13. MW-11 which will be located at 10 feet from EXW-1 will also be utilized to collect similar data during the Pilot Test.

A submersible pressure transducer (AquisStar® PT2X Smart Sensor or equivalent) equipped with a data logger will be placed in each piezometer and in MW-11 during the Pilot Test to record changes in piezometric head.

Each piezometer will consist of a 1.5-inch diameter schedule 40 PVC with 10 feet of 0.02 machine-slotted screen spanning from 5 feet to 15 feet bgs (the bottom of the piezometer) and solid PVC piping from 5 feet to the surface. The top of the piezometer will be fitted with PVC well caps to prevent preferential pathways of air during the Pilot Test. The construction diagram for the piezometers is shown on Figure 15.

4.5 CONCEPTUAL CONVEYANCE PIPING DESIGN

After the Pilot Test, the location and number of extraction wells required to remediate the Western Berm Area will be determined. The construction of each extraction well will be design in a similar manner as that presented for the EXW-1. The above grade portion of the riser pipe will be secured to provide horizontal support to the conveyance piping from the extraction well(s) from the well heading to a manifold and to the treatment trailer. Conveyance piping will be sloped 0.1 to 0.2 ft. per 100 ft. of pipe run to allow condensation to drain toward the extraction wells. The final selection of the wells will determine the location of the support and connections to a manifold system.

4.6 MPE PILOT TREATMENT SYSTEM

A treatment trailer containing a vacuum blower and ancillary equipment for the pilot test will be housed in a ventilated 8-foot wide by 16-foot long by 7 feet, height insulated trailer

The treatment system is designed to handle 200 cfm @ 28" Hg with a 5 gallon per minute (gpm) water treatment capability. Water/product extracted from the air/water separator (knock-out tank) system will be discharged directly by a transfer pump to a 2,000 gallon tank (to be provided by Sterycicle). The tank will be placed within 100 feet of the trailer location.

The treatment trailer will be equipped with the following equipment:

- 15 HP oil sealed Liquid Ring pump with a (max: capacity 200 ACFM @ 28"-Hg)
- 120 gallon knock out tank w/clean out port
- 5 GPM XP ¾ Hp Moyno pump
- 10 GPM Oil/Water Separator
- 10 GPM XP ½ Hp transfer pump
- 2-200 pound granular activated carbon adsorbers
- Erdco Flow Meter (air)
- Totalizing water flow meter
- Vacuum & pressure gauges, sample ports
- Inlet Connections: Four well manifold including site glass, flow meter, vacuum gage and flow control valve for each
- Program Logic Controller

Electrical power to the system SVE blower will be supplied using the facility's power supply providing 240V, 3 phase, 100 amp service.

5.0 FIELD PROCEDURES AND PERFORMANCE EVALUATION

5.1 FIELD PROCEDURES

Step Rate Test Procedures

The following sequence describes the procedures and data collection requirements for performing a single stepped-rate test.

1. Completely open the blower dilution valve. (Do not turn on the blower yet).
2. Collect baseline readings at all monitoring locations, including the test extraction well, adjacent nested vapor wells, and piezometers to measure depth to water in Monitoring Well-11. Submersible pressure transducers should be in place at each of the piezometers and be in recording mode in in a range of 30 to 60 second intervals before the test is started.

Data requirements to be recorded include:

a. Time of all recorded data

b. Pressure at the blower, test extraction well, vacuum monitoring locations

c. Depth to water in the piezometers and MW-11

3. Turn on the blower and record:

a. Time

b. Air and groundwater flowrate (if any), pressure and temperature at the blower

c. Flow rate, pressure, and temperature at test extraction well

5. Increase the vacuum at the test extraction well by closing the dilution valve at the blower. The dilution valve should be adjusted slowly until a vacuum pressure that allows air flow through the drop tube. Allow the system to stabilize (approx. 10 to 15 minutes) and record:

   a. Time

   b. Flow rate, pressure, temperature, and PID readings at the blower and at adjacent locations, additional locations should be monitored until no influences are observed

6. Repeat Step 5, closing the dilution valve further, increasing the vacuum applied to the test extraction well by an additional 2 inches Hg. Follow the data recording requirements outlined in Step 5.

7. Repeat Steps 5 and 6 in a series of equal 2 inches Hg increments of applied vacuum at the blower until the maximum applied vacuum is achieved at the blower (approx. 28 inches Hg), until to maximum allowable flow rate (approximately 200 SCFM) or until additional flow cannot be obtained from a well at an increased vacuum (i.e., maximum achievable flow of a well is reached). In the event that maximum allowable/achievable flow rates are encountered at low applied vacuum levels, this procedure may be modified to have reduced stepped-rate increases (*i.e.*, 1 inch Hg increases).

Step Rate Test Procedures

After the maximum airflow rate has been observed during the step tests, a constant rate test will be conducted with vacuum corresponding to the maximum airflow observed in the step tests. Data collected should include the same parameters described in the step test.

5.2 PERFORMANCE EVALUATION

Pilot study performance evaluation will be conducted to provide information for the full-scale system.

The proposed performance evaluation will include short-term stepped-rate tests for estimating soil vapor and groundwater extraction well capacities/system curves, as well as a long-term constant rate test utilizing to evaluate the overall area of influence and extraction system performance.

Two field days will be scheduled to set up the equipment and conduct the Pilot Test, one day to set up and conduct the step tests and the second day to conduct a constant rate test.

5.3 PILOT TEST EVALUATION

The purpose of the step-rate test is to evaluate vapor recovery rates obtainable at various applied vacuum rates and observe the changes in flowrates and groundwater elevation. Data collected will be used to determine possible system curves, as well as, well-specific radius of vacuum influences.

A step increase application will be performed using a minimum of four step increases in the applied vacuum/flow, starting from the lowest vacuum that allows the removal of groundwater via the drop tube when the bottom of the drop tube is placed at approximately 0.5 feet above the bottom of the extraction well (14.5 feet bgs).

Once the initial vacuum required to remove water is established, a minimum of three additional tests will be applied, incrementing each test by 2 inches of Hg until a decrease in airflow rates is observed as compared to the prior test. Each test should be conducted for a minimum of 45 minutes or longer if necessary to show steady conditions in the air measurements.

After the maximum airflow rate has been observed during the step tests, a constant rate test will be conducted at the vacuum corresponding to the maximum airflow. The constant rate test should be conducted for a minimum of 8 hours or until conditions have stabilized enough to provide trends and

determine the well spacing, number of wells , blower capacity (flowrate and vacuum), blower motor, and size of carbon and water collection system to be utilized in the full scale system.

6.0 REPORTING

The following reports will be prepared as part of the CMI.

6.1 SUB-SLAB AND SOIL GAS SAMPLING REPORT

A Sub-Slab and Soil Gas Sampling Report will be prepared for submittal to the MDEQ, within 30 days of receipt of the analytical results. The report will include the following:

- A summary of field activities, sampling methods, and site observations
- A site map showing sampling locations
- Summary tables of analytical results of sub-slab and soil gas samples compared to appropriate screening levels
- Detailed analytical results
- Conclusions and recommendations

6.2 PILOT TEST CONSTRUCTION COMPLETION REPORT

A Pilot Test Report will be prepared for submittal to the MDEQ and will include the following:

- Brief MPE technology description
- A summary of field activities, sampling methods, site observations, extraction well and observation well details
- Summary MPE pilot test results
- Step Test and Constant Rate Test Summary: Measurements of air flowrates at the header pipe at different vacuums and estimates of groundwater flow at different vacuums will be tabulated and discussed. The data will also be presented in tabular form. One of the primary objectives of the pilot test will be to determine the vacuum that will result in the maximum flowrate.
- Table showing groundwater depression at the observation wells obtained during the step tests (i.e., at different vacuums) and the constant rate test
- Figures including a Site Location Map, the MPE Process Flow Diagram, and MPE Extraction Test Well Layout,
- Soil boring logs, analytical data, and estimate of mass removed
- The recommended number of extraction wells, location of wells, and blower and activated carbon canisters which will be used for full scale implementation

6.3 FULL-SCALE SYSTEM WORK PLAN

The results of the Pilot Test will allow for the development of a Full-Scale System Work Plan for submittal to the MDEQ and will include the following:

- Design Plans: The Full- Scale System Work Plan will provide the location, design and final number of extraction and observation wells. The plan will include the size of blower, treatment specifications for the extracted air and groundwater, location of treatment system and controls, number and location of extraction and monitoring wells, and process and instrumentation diagrams for the entire MPE system.
- Operation and Maintenance Plan: The Full-Scale System Work Plan will include the operation and maintenance procedures for the system, and the frequency and location of measurements (direct or laboratory readings) that will be utilized to optimize the system performance and comply with permit conditions.
- Monitoring Well Network: The Work Plan will also indicate which wells will be monitored quarterly to evaluate and optimize the system's operation.

6.4 PROGRESS REPORTS

Progress reports will be completed and submitted quarterly to MDEQ within 90 days of implementation of the Work Plan and every 90 days thereafter, as indicated in Petro-Chem's Operating License.

The progress reports will provide a summary of all activities conducted during the prior quarter including the total mass of contaminants removed via the air phase and groundwater phase. Monthly analytical measurements of the air flow concentrations will be collected and reported before, in between the carbon vessels, and after the carbon vessels. The flowrates and concentrations in the influent (before the blower) will be utilized to estimate the total mass of contaminants removed via the air phase, the intermediate sampling (in between the carbon vessels) will be utilized to determine carbon breakthrough and replacement, and the sampling after the second carbon unit will be utilized to determine compliance with the permit conditions. Similarly, extracted water concentrations will be monitored before, in between, and after carbon vessels.

The progress and effectiveness of the treatment system will be evaluated by comparing the concentration trends in the designated monitored groundwater wells over time. The monitoring network will be sampled on a quarterly basis.

7.0 COST ESTIMATE

The following cost estimate has been prepared to account for known tasks up through the design of the full-scale system.

Project Cost Estimates

Task	Estimated Costs
Project Management	$10,000
Semi-Annual Groundwater Monitoring (estimate for 5 years)	$150,000
Utility Corridor Investigation	$5,000
Indoor/Ambient Air Investigation	$20,000
Removal of Stockpiled Soil in Western Berm Area	$45,000

MPE Pilot Study (i.e., design, well installation, field activities, reporting)	$55,000
Corrective Measures Design and Specifications	$35,000
Ongoing Monitoring and Maintenance Program for Pavement and Building Floors/ Annual Review of Compliance with the Restrictive Covenant (estimate for 5 years)	$15,000
Pave Western Berm Area with Asphalt	N/A
Full-Scale System Installation	N/A
System Operation and Maintenance	N/A
Sampling and Report	N/A
Total	**$335,000**

*Additional items will be added to the cost estimate once the nature and scope of the full-scale system has been determined.

8.0 SCHEDULE

The project implementation schedule is provided in Appendix H.

9.0 REFERENCES

Tetra Tech, 2008. Summary of Concrete and Soil Sampling in Waste Management Units, prepared for PCPG Processing Group, May 21, 2008.

Bureau Veritas North America (BVNA), 2013. Corrective Action Investigation Work Plan, prepared for PCPG Processing Group, February 15, 2013.

Bureau Veritas North America (BVNA), 2014. Corrective Action Investigation Work Plan Addendum, prepared for PCPG Processing Group, November 6, 2014.

Bureau Veritas North America (BVNA), 2016. Corrective Measures Study Investigation Report, prepared for PCPG Processing Group, May 13, 2016.

Bureau Veritas North America (BVNA), 2017. First Semi-Annual Environmental Monitoring Report, August 2, 2017.

W-W Engineering and Science, 1991 and revised 1993. Hydrogeological Report and Groundwater Detection Monitoring Program, in PCPG Processing, Inc. Part B Permit Application. March 1, 1991, Revised August 20, 1993.

FIGURES

QUADRANGLE LOCATION

Scale 1:24000

0 1/2 1 MILE

1000 0 1000 2000 3000 FEET

(SOURCE OF MAP IS USGS 7.5 MINUTE QUADRANGLE MAP, BELLE ISLE(1980), MICHIGAN)

CHECK BY	KLW
DRAWN BY	JL
DATE	January 7, 2014
SCALE	AS SHOWN
CAD NO.	109200.02_A
PRJ NO.	11016-000171.00

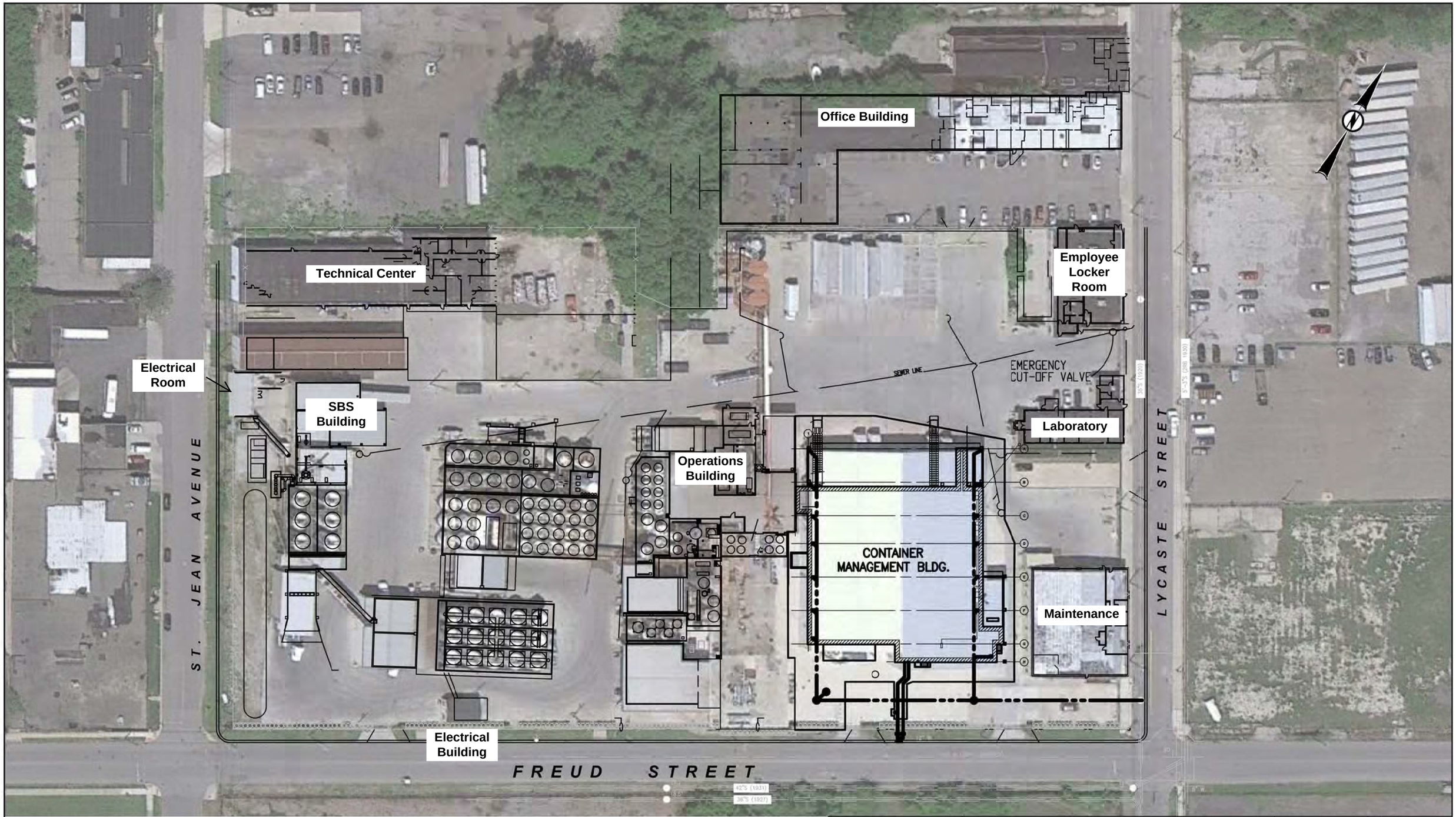
SITE LOCATION MAP

PETRO–CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE

1



SCALE IN FEET

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CHECK BY	KW
DRAWN BY	JL
DATE	11/24/2015
SCALE	AS SHOWN
CAD NO.	11.15.255.00b
PRJ NO.	11015-000255.00

SITE LAYOUT

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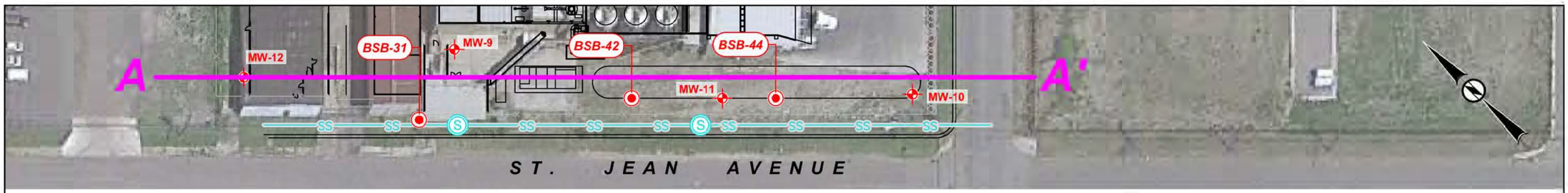
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE

2

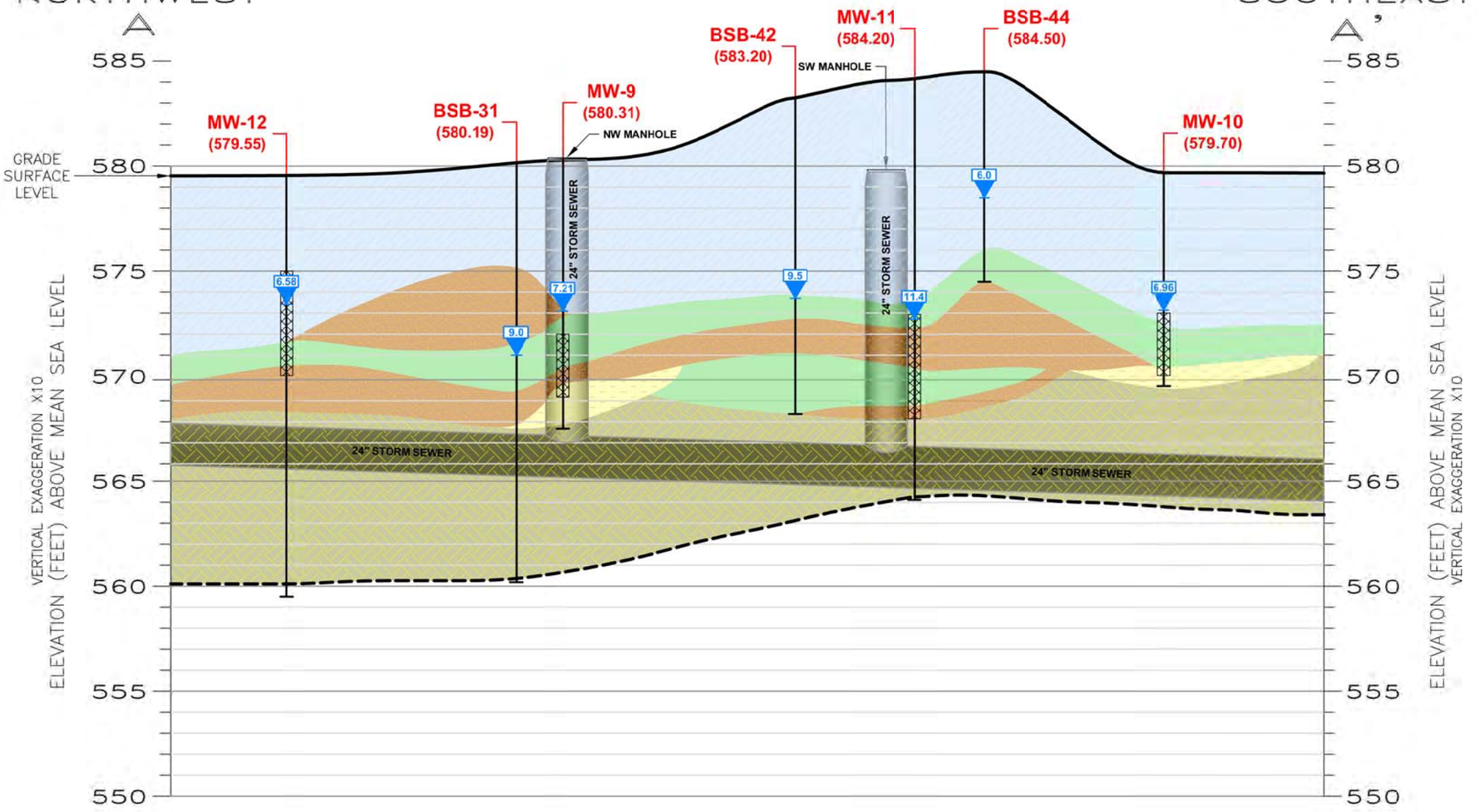


NORTHWEST

A

SOUTHEAST

A'



LEGEND

- ### — WELL/BORING IDENTIFICATION (GROUND ELEVATION LEVEL)
- 6.58 — GROUNDWATER ELEVATION (FT.)
- WELL SCREENING
- WELL/BORING DEPTH
- FILL
- SILT
- PEAT
- SAND
- CLAY

NOTE: CROSS SECTION IS BASED ON BEST PROFESSIONAL JUDGMENT USING AVAILABLE DATA. THE THICKNESS AND EXTENT OF THE LITHOLOGIC UNITS ARE APPROXIMATED AND GEOLOGIC CONTACTS BETWEEN WELL LOCATIONS ARE INFERRED.

LEGEND

- MW-# — MONITORING WELL
- BSB-# — SOIL BORING LOCATION
- SS—S—SS — STORM SEWER/MANHOLE

SCALE IN FEET

0 30 60 120

CHECK BY	KW
DRAWN BY	JL
DATE	9/6/2016
SCALE	AS SHOWN
CAD NO.	11.17.1161x1
PRJ NO.	11017-000116.00

CROSS SECTION A–A'

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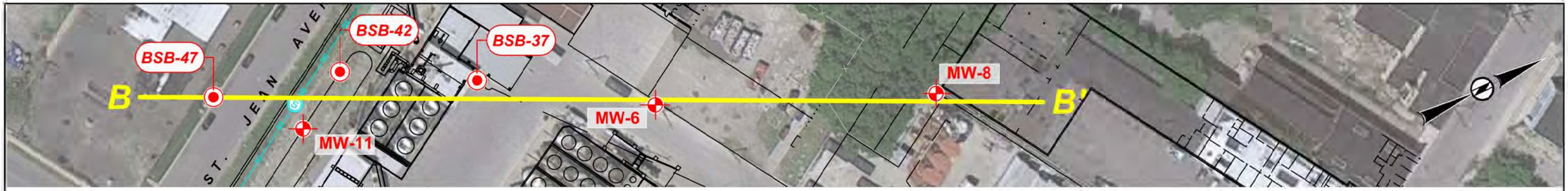
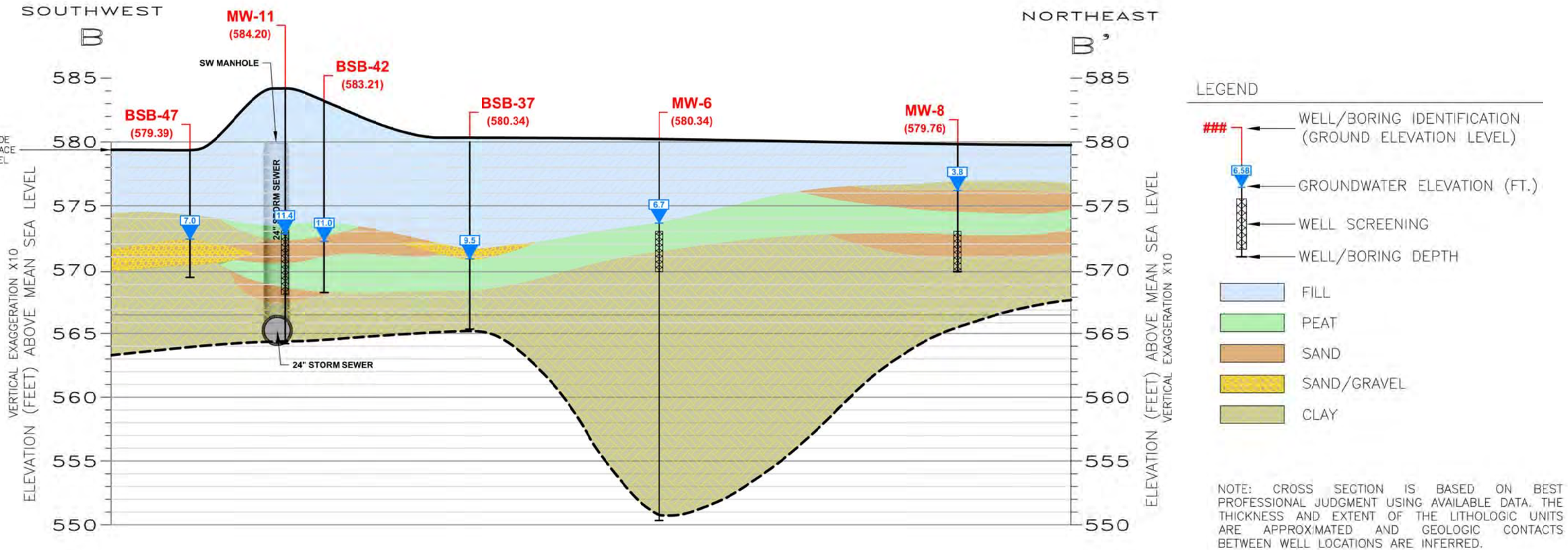
FIGURE 3





NOTE: CROSS SECTION IS BASED ON BEST PROFESSIONAL JUDGMENT USING AVAILABLE DATA. THE THICKNESS AND EXTENT OF THE LITHOLOGIC UNITS ARE APPROXIMATED AND GEOLOGIC CONTACTS BETWEEN WELL LOCATIONS ARE INFERRED.

LEGEND

- MW-# MONITORING WELL
- BSB-# SOIL BORING LOCATION
- SS-S-SS STORM SEWER/MANHOLE

SCALE IN FEET

0 40 80 160

CHECK BY	KW
DRAWN BY	JL
DATE	9/6/2016
SCALE	AS SHOWN
CAD NO.	11.17.116x1
PRJ NO.	11017-000116.00

CROSS SECTION B–B'

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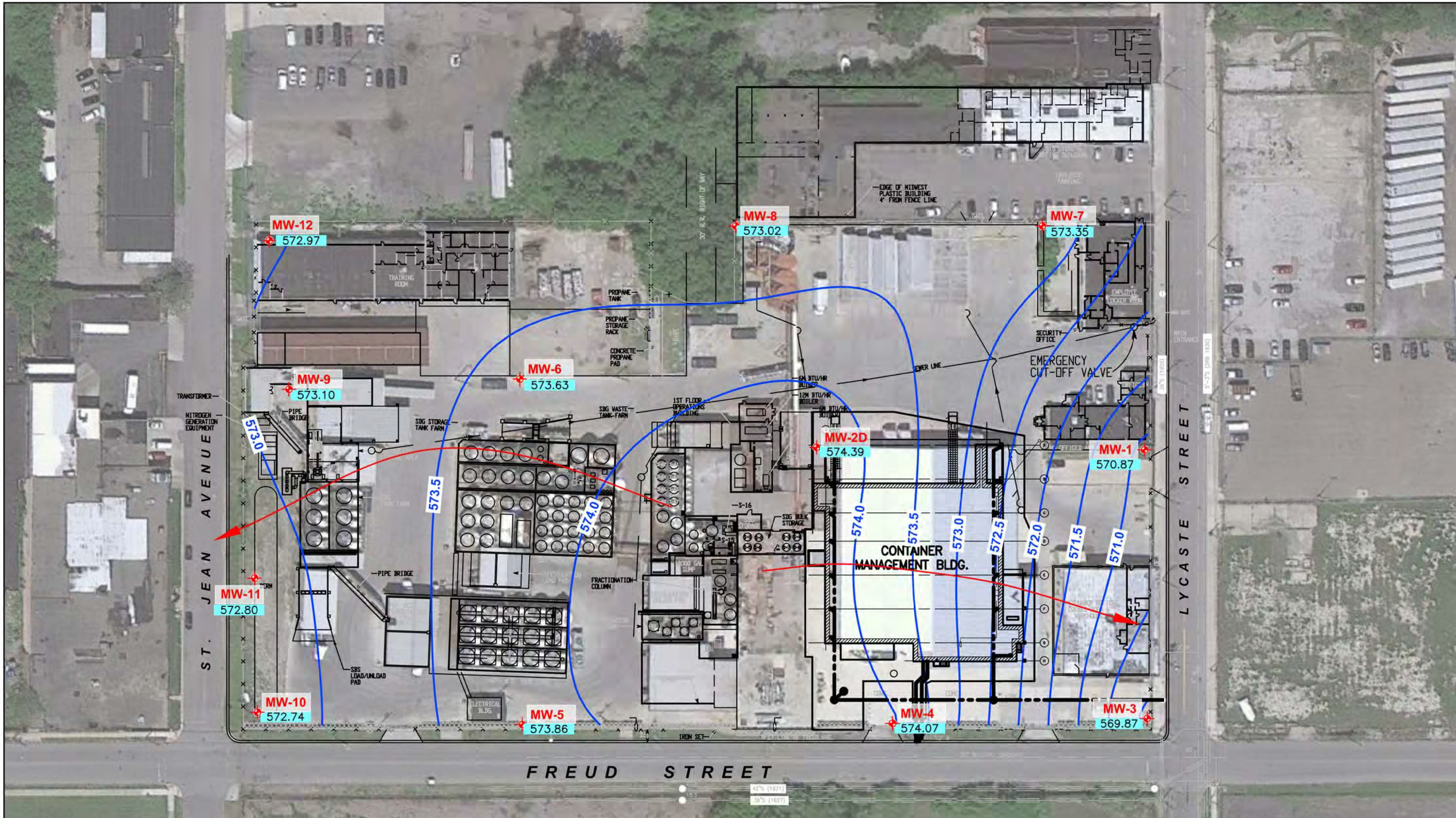
FIGURE 4



LEGEND

-570.0- GROUNDWATER CONTOUR

570.87 GROUNDWATER ELEVATION (FT.)

GROUNDWATER FLOW

SCALE IN FEET

0 40 80 160

CHECK BY	KW
DRAWN BY	JL
DATE	9/26/2016
SCALE	AS SHOWN
CAD NO.	116.00_gw6-16
PRJ NO.	11017-000116.00

GROUNDWATER ELEVATION CONTOURS
JUNE 16, 2016

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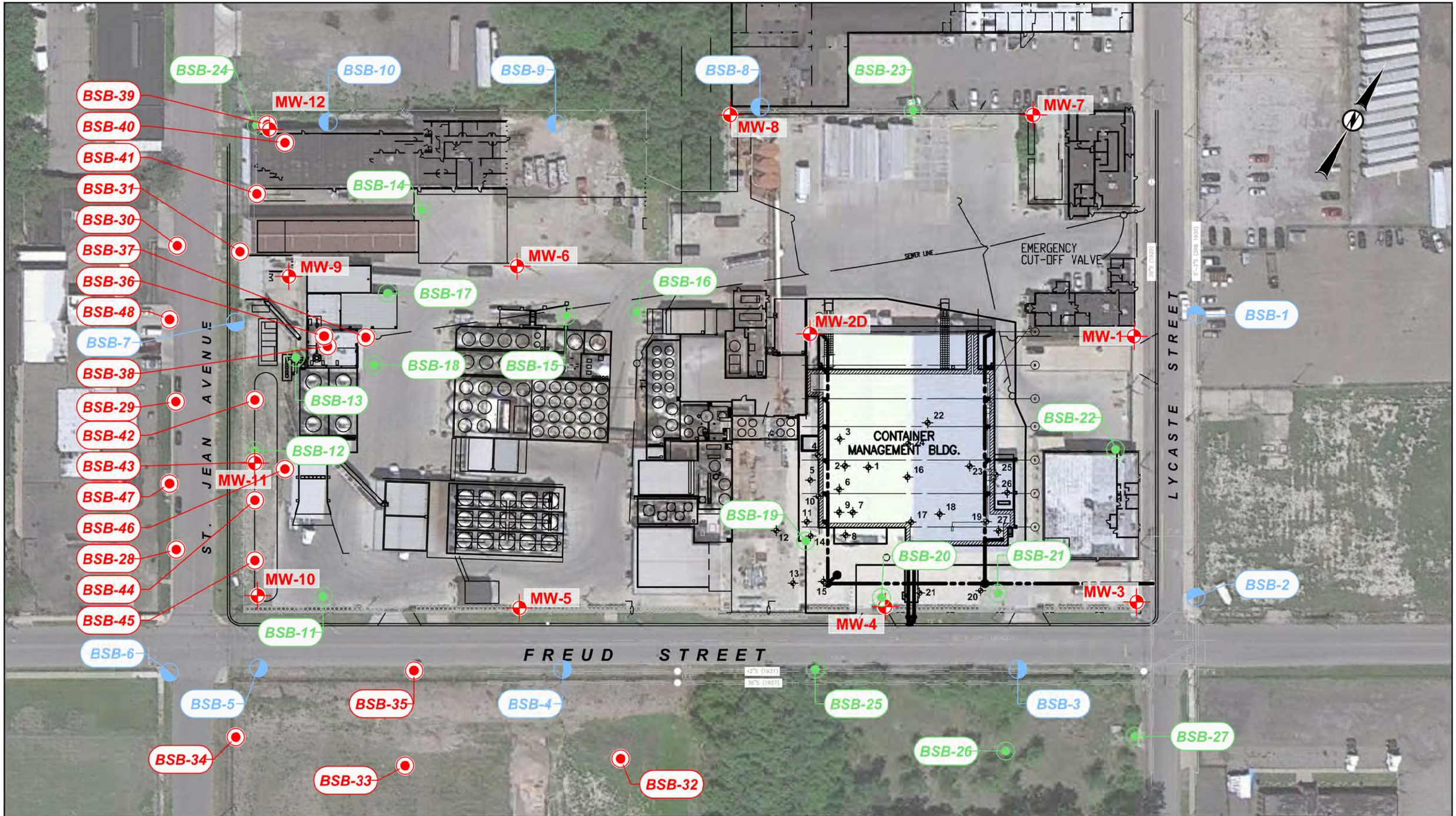
FIGURE

5



LEGEND

MW-# MONITORING WELL

BSB-# 2014 SOIL BORING

BSB-# 2013 SOIL BORING

BSB-# 2010 SOIL BORING

2008 SAMPLE

SCALE IN FEET

0 40 80 160

CHECK BY	KW
DRAWN BY	JL
DATE	10/10/2016
SCALE	AS SHOWN
CAD NO.	11.17.116.00sb
PRJ NO.	11017-000116.00

SOIL BORING AND MONITORING WELL LOCATIONS

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FIGURE 6

BSB-12		
µg/kg	8-10'	10-12'
ETHYLBENZENE	-	180,000
TOLUENE	-	350,000
TRICHLOROETHENE	2,200	-
XYLENES	-	750,000

BSB-43	
µg/kg	10-12'
ETHYLBENZENE	490,000
TOLUENE	930,000
XYLENES	2,300,000

BSB-45	
µg/kg	13-15'
ETHYLBENZENE	260,000
TOLUENE	930,000
XYLENES	1,200,000

24S	
µg/kg	
ETHYLBENZENE	240,000
TOLUENE	650,000
1,2,4-TRIMETHYLBENZENE	130,000
XYLENES	1,400,000

16S	
µg/kg	
ETHYLBENZENE	370,000
TOLUENE	980,000
1,2,4-TRIMETHYLBENZENE	160,000
XYLENES	2,400,000

14S	
µg/kg	
TETRACHLOROETHENE	960,000
TRICHLOROETHENE	78,000
XYLENES	180,000

15S	
µg/kg	
BENZO(a)PYRENE	14,000

21S	
µg/kg	
BENZO(a)PYRENE	26,000

13S	
µg/kg	
BENZO(a)PYRENE	14,000

LEGEND

MW-# MONITORING WELL

BSB-# 2014 SOIL BORING

BSB-# 2013 SOIL BORING

BSB-# 2010 SOIL BORING

2008 SAMPLE

SCALE IN FEET

0 50 100 200

CHECK BY	KW
DRAWN BY	JL
DATE	10/17/2016
SCALE	AS SHOWN
CAD NO.	11.17.116.00s1
PRJ NO.	11017-000116.00

SUMMARY OF HAZARDOUS SUBSTANCES IN SOIL THAT REQUIRE CORRECTIVE ACTION

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DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE 7

BSB-13	
µg/L	
TOLUENE	85,000
TETRAHYDROFURAN	99,000
XYLENES	91,000

BSB-42	
µg/L	
TOLUENE	94,000
XYLENES	85,000

MW-11	
µg/L	
TOLUENE	110,000

BSB-44	
µg/L	
TOLUENE	130,000
XYLENES	85,000

BSB-45	
µg/L	
TOLUENE	84,000

BSB-24 BSB-10 BSB-9 BSB-8 BSB-23
MW-12 MW-8 MW-7
BSB-39 BSB-40 BSB-41 BSB-31 BSB-30 BSB-37 BSB-36 BSB-48 BSB-7 BSB-38 BSB-29 BSB-42 BSB-43 BSB-47 BSB-46 BSB-28 BSB-44 BSB-45 BSB-6
BSB-14
MW-9 MW-6
BSB-17 BSB-16
BSB-18 BSB-15
BSB-13
BSB-12
MW-11
MW-10
BSB-11
MW-5
MW-4
MW-2D
MW-1
MW-3
BSB-1
BSB-2
BSB-22
BSB-19
BSB-20
BSB-21
BSB-5 BSB-35 BSB-4 BSB-25 BSB-3 BSB-27
BSB-34 BSB-33 BSB-32 BSB-26
ST. JEAN AVENUE
LYCASTE STREET
FREUD STREET
SEWER LINE
EMERGENCY CUT-OFF VALVE
CONTAINER MANAGEMENT BLDG.

LEGEND

MW-# MONITORING WELL
BSB-# 2014 SOIL BORING
BSB-# 2013 SOIL BORING
BSB-# 2010 SOIL BORING
2008 SAMPLE

SCALE IN FEET
0 50 100 200

CHECK BY	KW
DRAWN BY	JL
DATE	11/3/2016
SCALE	AS SHOWN
CAD NO.	11.17.116.00w1
PRJ NO.	11017-000116.00

SUMMARY OF HAZARDOUS SUBSTANCES IN GROUNDWATER THAT REQUIRE CORRECTIVE ACTION

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DETROIT, MICHIGAN

BUREAU VERITAS 1828

FIGURE 8

BSB-38		
DEPTH	(1.5–2)	(4.5–5)
Benzene	88	<270
1,1–DCA	83	<270
Ethylbenzene	4,000	<270
MTBE	1,000	5,200
1,2,4–TMB	3,000	<270
Xylenes	24,000	<800

BSB-13		
DEPTH	(3–5)	(5–7)
Benzene	<50	110
1,1–DCA	510	530
cis–1,2–DCE	210	290
Ethylbenzene	2,500	15,000
PCE	210	130
TCE	<58	63
Xylenes	7,800	62,000

BSB-18		
DEPTH	(3–5)	(5–7)
Benzene	450	350
Ethylbenzene	22,000	16,000
IPBZ	330	<300
Xylenes	44,000	37,000

BSB-42		
DEPTH	(5–7)	(8–10)
Benzene	<50	110
1,1–DCA	1,000	2,500
Ethylbenzene	<50	36,000
PCE	830	2,600
TCE	290	63
1,2,4–TMB	<120	
Xylenes	<150	62,000

BSB-12		
DEPTH	(8–10)	(10–12)
Benzene	270	750
1,1–DCA	6,700	580
1,2–DCA	82	<71
cis–1,2–DCE	1,100	1,400
Ethylbenzene	11,000	180,000
IPBZ	<400	2,800
MTBE	1,800	4,700
Napththalene	1,900	4,700
PCE	2,900	250
Toluene	14,000	350,000
TCE	2,200	140
1,2,4–TMB	710	14,000
1,3,5–TMB	490	6,200
Vinyl Chloride	<50	320
Xylenes	39,000	750,000

BSB-36			
DEPTH	(0–2)	(8–10)	(12.5–13)
MTBE	<50	8,300	<50
PCE	160	<50	<50

BSB-7		
DEPTH	(0.5–2)	(8–9)
Benzene	<46	100
cis–1,2–DCE	<46	340
Ethylbenzene	<46	17,000
IPBZ	<51	620
PCE	1,100	250
1,2,4–TMB	<51	3,500
1,3,5–TMB	<46	2,000
Xylenes	120	81,800

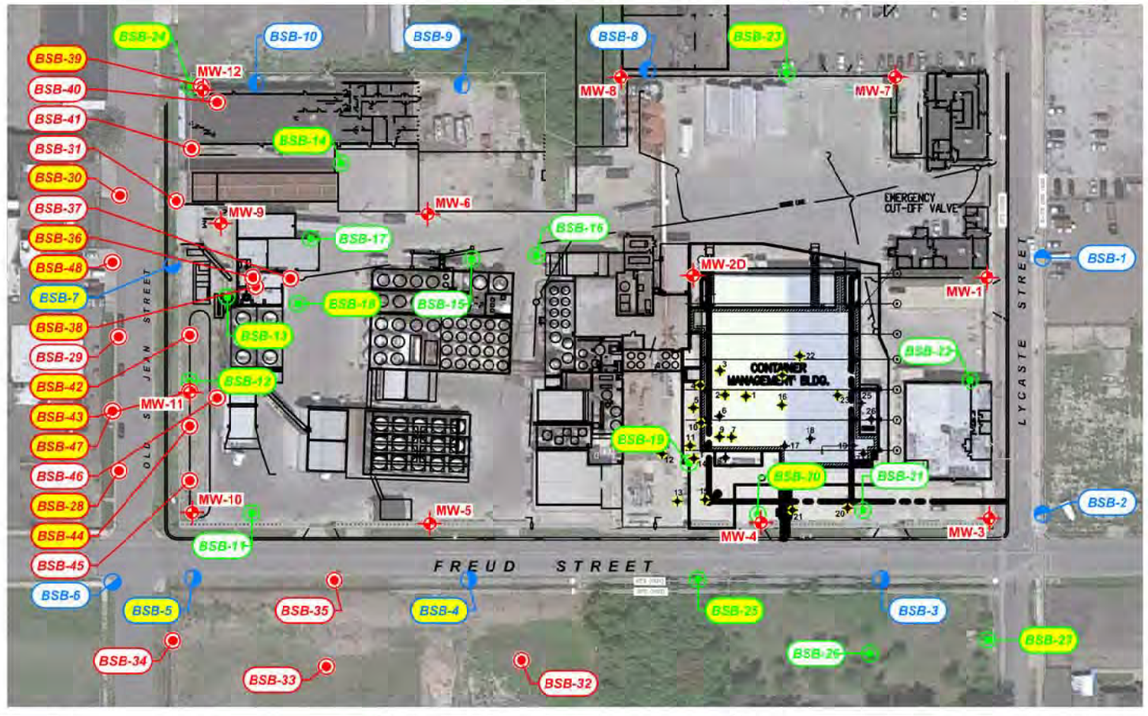
BSB-48		
DEPTH	(3–5)	(5–7)
cis–1,2–DCE	9,400	8,700
PCE	28,000	10,000
TCE	8,500	4,600
Vinyl Chloride	210	680

BSB-30		
DEPTH	(4–5)	(9–10)
PCE	120	<50

BSB-24		
DEPTH	(3–5)	(7.5–8.5)
n–Butylbenzene	<50	69,000
tert–Butylbenzene	<50	3,500
2–Methylnaphthalene	<291	88,000
Naphthalene	<291	70,000
PCE	390	8,000
1,2,3–TMB	<120	140,000
1,2,4–TMB	<120	220,000
1,3,5–TMB	<120	74,000
Xylenes	<174	25,000

BSB-39		
DEPTH	(1–3)	(3–5)
PCE	<50	120

BSB-14		
DEPTH	(3–5)	(5–7)
PCE	760	91



BSB-43		
DEPTH	(10–12)	(16–18)
Benzene	820	<50
1,1–DCA	900	<50
cis–1,2–DCE	5,000	<110
Ethylbenzene	490,000	2,800
IPBZ	5,500	<50
PCE	5,000	<50
Toluene	930,000	7,000
TCE	740	<50
1,2,4–TMB	34,000	280
1,3,5–TMB	13,000	130
Xylenes	2,300,000	13,000

BSB-47		
DEPTH	(3–5)	(5–7)
PCE	990	100

BSB-44		
DEPTH	(2–4)	(4–6)
Benzene	170	230
1,1–DCA	180	93
cis–1,2–DCE	90	<50
Ethylbenzene	4,700	35,000
IPBZ	130	530
Napththalene	<250	4,800
Xylenes	4,500	78,000

BSB-28		
DEPTH	(4–5)	(5–6)
PCE	2,500	<50
TCE	100	<50

BSB-23		
DEPTH	(3–5)	(9–10)
cis–1,2–DCE	<50	110
TCE	93	<59

BSB-27		
DEPTH	(3–5)	(5–7)
PCE	<276	8,600

BSB-20		
DEPTH	(3–5)	(5–7)
Benzene	<50	84
PCE	940	<50
TCE	130	<64

BSB-25		
DEPTH	(3–5)	(5–7)
Benzene	120	<50

BSB-19		
DEPTH	(3–5)	(5–7)
Ethylbenzene	790	74
PCE	520	<50

BSB-4		
DEPTH	(0–2)	(3–5)
PCE	200	<54

BSB-5		
DEPTH	(0–2)	(4–6)
PCE	4,200	1,400

BSB-45		
DEPTH	(9–11)	(13–15)
Benzene	<50	1,100
1,1–DCA	110	<160
cis–1,2–DCE	<50	340
Ethylbenzene	81	260,000
IPBZ	<50	3,700
MTBE	<50	5,600
PCE	300	<160
Toluene	91	98,000
TCE	120	<160
1,2,4–TMB	<130	17,000
1,3,5–TMB	<50	6,700
Xylenes	480	1,200,000

NOTES:

1. ALL CONCENTRATIONS IN PARTS PER MILLION [PPM]
2. 1,2,4-TMB = 1,2,4-TRIMETHYLBENZENE
3. 1,3,5-TMB = 1,3,5-TRIMETHYLBENZENE
4. cis-1,2-DCE = cis-1,2-DICHLOROETHENE
5. DCA = 1,1-DICHLOROETHANE
6. DCE = 1,1-DICHLOROETHENE
7. IPBZ = ISOPROPYLBENZENE
8. PCE = PERCHLOROETHYLENE
9. TBA = TERT-BUTYL-ALCOHOL
10. GREEN HIGHLIGHTED CONCENTRATIONS EXCEEDING SITE-SPECIFIC VOLATILIZATION TO INDOOR AIR CRITERIA (SSVIAC)

LEGEND

MW-# MONITORING WELL
BSB-# 2014 SOIL BORING
BSB-# 2013 SOIL BORING
BSB-# 2010 SOIL BORING
2008 SAMPLE

YELLOW HIGHLIGHTED REFLECT LOCATIONS WHERE ONE OR MORE CONTAMINANTS EXCEED CLEANUP CRITERIA AN/OR SCREENING LEVELS.

SCALE IN FEET
0 75 150 300

CHECK BY	KW
DRAWN BY	JL
DATE	1/22/2019
SCALE	AS SHOWN
CAD NO.	11.17.116.00sb5
PRJ NO.	11017–000116.00

SUMMARY OF HAZARDOUS SUBSTANCES IN SOIL EXCEEDING SSVIAC

PETRO–CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE 9a

04S	
TCE	150

03S	
cis–1,2–DCE	53 J
Ethylbenzene	480
TCE	33 J

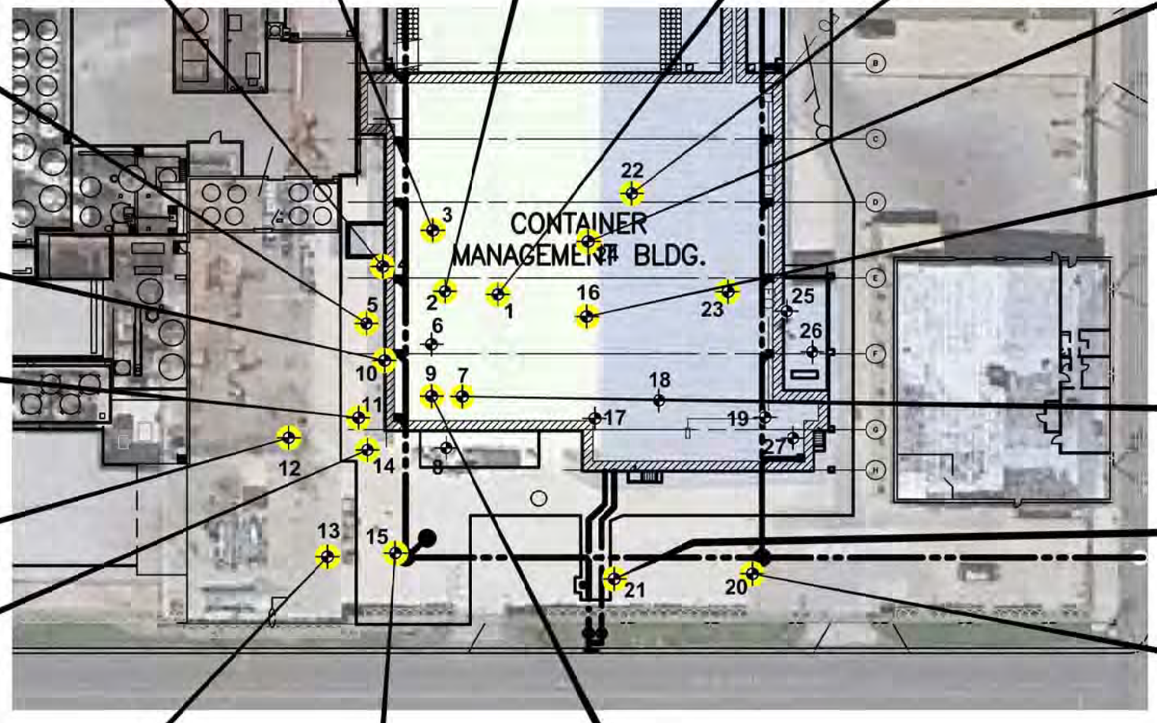
02S	
Benzene	140
IPBZ	750
Naphthalene	9,300
TCE	30 J

01S	
Benzene	150
IPBZ	760
Naphthalene	6,100
TCE	54 J

22S	
Ethylbenzene	930
IPBZ	130
Xylenes	7,300

24S	
cis–1,2–DCE	2,800 J
Ethylbenzene	240,000
IPBZ	14,000
Naphthalene	22,000 J
Toluene	650,000
1,2,4–TMB	130,000
1,3,5–TMB	50,000
Xylenes	1,400,000

05S	
Benzene	140
tert–Butylbenzene	45 J
1,1–DCA	1,100
cis–1,2–DCE	1,100
trans–1,2–DCE	350
Ethylbenzene	1,900
IPBZ	130
PCE	1,500
TCE	430
Vinyl Chloride	610
Xylenes	18,000



16S	
cis–1,2–DCE	16,000
Ethylbenzene	370,000
IPBZ	22,000
2–Methylnaphthalene	150,000J
Naphthalene	200,000
n–Propylbenzene	23,000
PCE	6,600 J
Toluene	980,000
1,2,4–TMB	160,000
1,3,5–TMB	67,000
Xylenes	2,400,000

10S	
TCE	41 J

11-2 C (Subslab of 11C)	
1,1–DCE	110
Ethylbenzene	520
PCE	620
TCE	110

7S	
TCE	29 J

12S	
TCE	59

21S	
PCE	420
TCE	33 J

14S	
cis–1,2–DCE	18,000
Ethylbenzene	38,000
IPBZ	4,500 J
2–Methylnaphthalene	45,000
Naphthalene	190,000
PCE	1,000,000
TCE	78,000
1,2,4–TMB	36,000
1,3,5–TMB	18,000
Xylenes	180,000

20S	
PCE	1,000
TCE	68 J

13S	
TCE	54 J

15S	
PCE	84 J
TCE	120

09S	
tert–Butylbenzene	79
Ethylbenzene	2,500
IPBZ	790
PCE	47 J
1,2,4–TMB	7,400
1,3,5–TMB	4,800
Xylenes	11,000

NOTES:

1. ALL CONCENTRATIONS IN PARTS PER MILLION [PPM]
2. 1,2,4-TMB = 1,2,4-TRIMETHYLBENZENE
3. 1,3,5-TMB = 1,3,5-TRIMETHYLBENZENE
4. cis-1,2-DCE = cis-1,2-DICHLOROETHENE
5. DCA = 1,1-DICHLOROETHANE
6. DCE = 1,1-DICHLOROETHENE
7. IPBZ = ISOPROPYLBENZENE
8. PCE = PERCHLOROETHYLENE
9. TBA = TERT-BUTYL-ALCOHOL
10. GREEN HIGHLIGHTED CONCENTRATIONS EXCEEDING SITE-SPECIFIC VOLATILIZATION TO INDOOR AIR CRITERIA (SSVIAC)

LEGEND

MW-# MONITORING WELL
BSB-# 2013 SOIL BORING
2008 SAMPLE
BSB-# 2014 SOIL BORING
BSB-# 2010 SOIL BORING

YELLOW HIGHLIGHTED REFLECT LOCATIONS WHERE ONE OR MORE CONTAMINANTS EXCEED CLEANUP CRITERIA AN/OR SCREENING LEVELS.

SCALE IN FEET
0 30 60 120

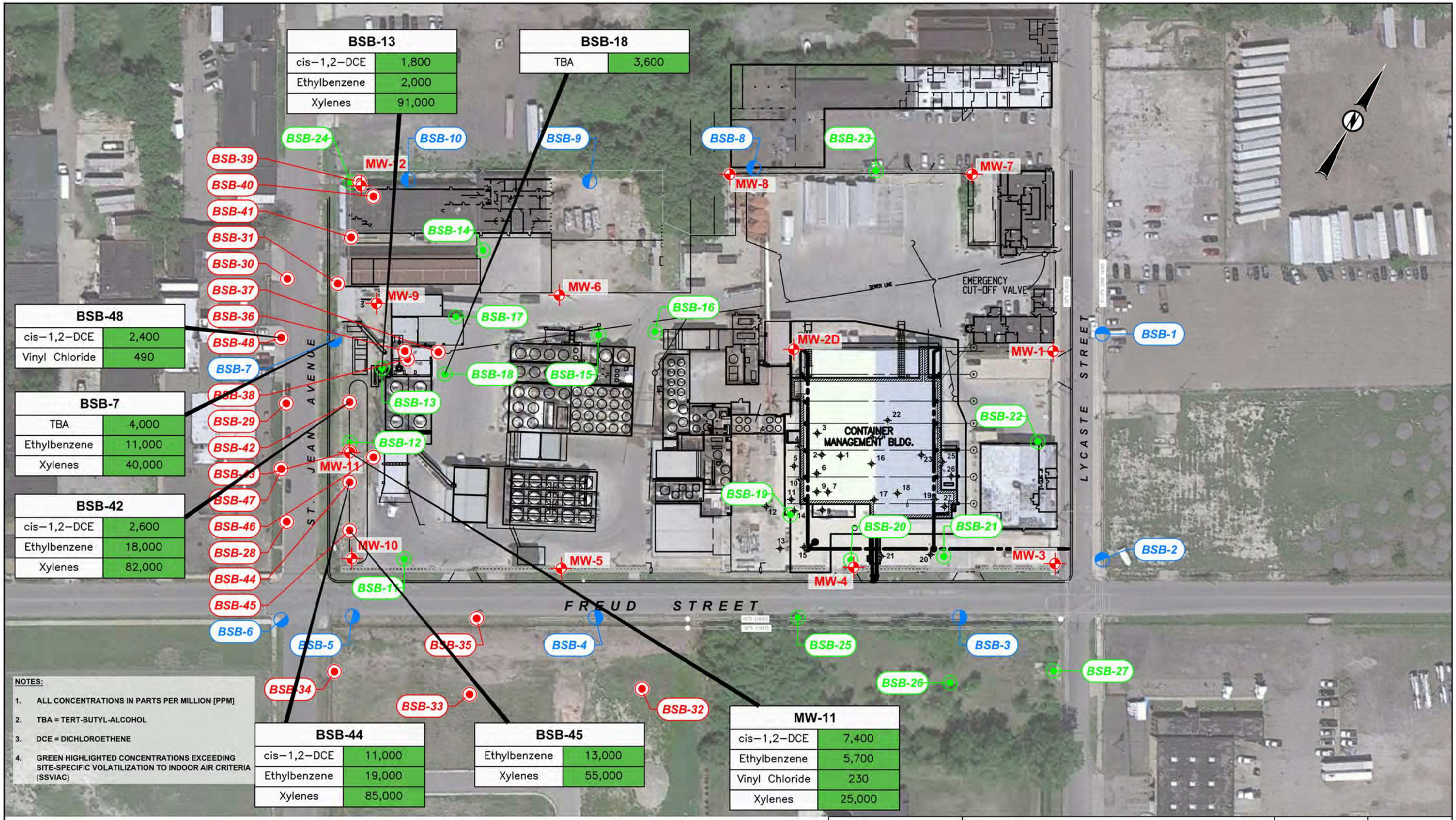
CHECK BY	KW
DRAWN BY	JL
DATE	1/22/2019
SCALE	AS SHOWN
CAD NO.	11.17.116.00sb5
PRJ NO.	11017–000116.00

SUMMARY OF HAZARDOUS SUBSTANCES IN SOIL EXCEEDING SSVIAC

PETRO–CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE 9b



LEGEND

MW-# MONITORING WELL
BSB-# 2014 SOIL BORING
BSB-# 2013 SOIL BORING
BSB-# 2010 SOIL BORING
2008 SAMPLE

SCALE IN FEET
0 50 100 200

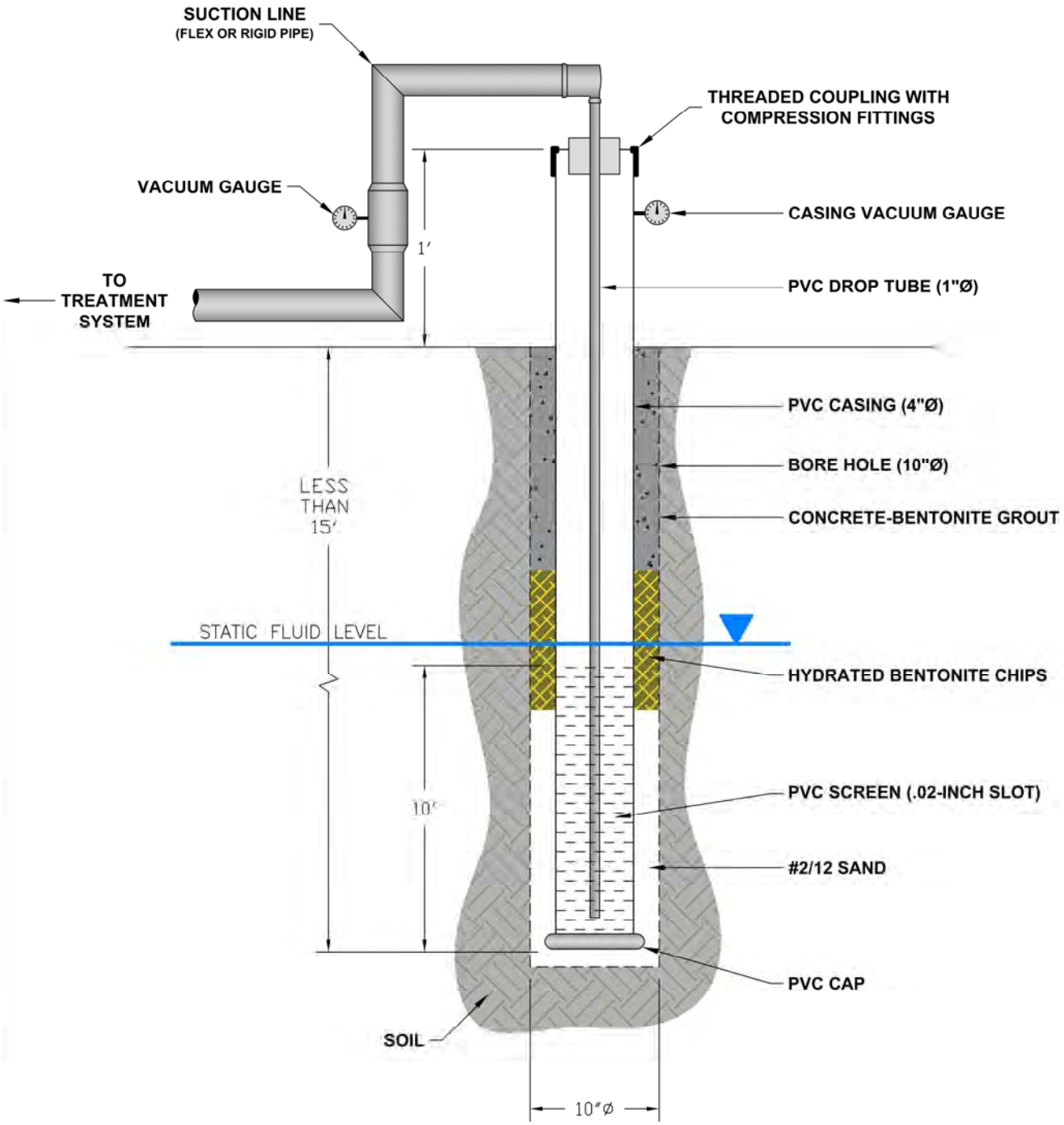
CHECK BY	KW
DRAWN BY	JL
DATE	1/8/2019
SCALE	AS SHOWN
CAD NO.	11.17.116.00sb4
PRJ NO.	11017-000116.00

SUMMARY OF HAZARDOUS SUBSTANCES IN GROUNDWATER EXCEEDING SSVIAC

PETRO–CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE
10



CHECK BY	GV
DRAWN BY	JL
DATE	5/10/2018
SCALE	Not to Scale
CAD NO.	1.17.116.00x
PRJ NO.	11017-000116.00

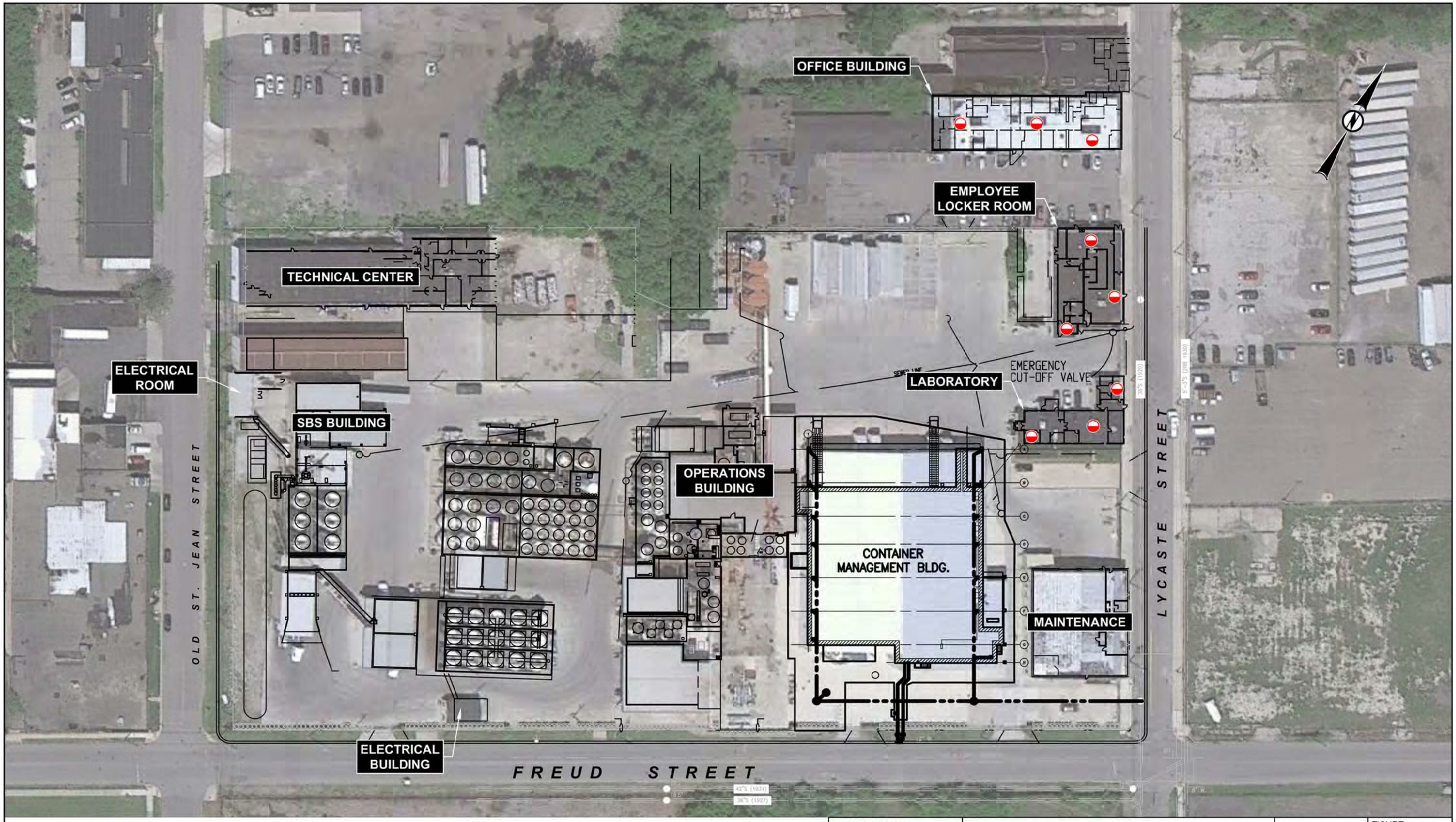
EXTRACTION WELL CONSTRUCTION

PETRO-CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE

11



LEGEND

PROPOSED SUB-SLAB SOIL GAS SAMPLING LOCATION

SCALE IN FEET

0 50 100 200

CHECK BY	KW
DRAWN BY	JL
DATE	2/4/2019
SCALE	AS SHOWN
CAD NO.	11.17.117.00b1
PRJ NO.	11017-000117.00

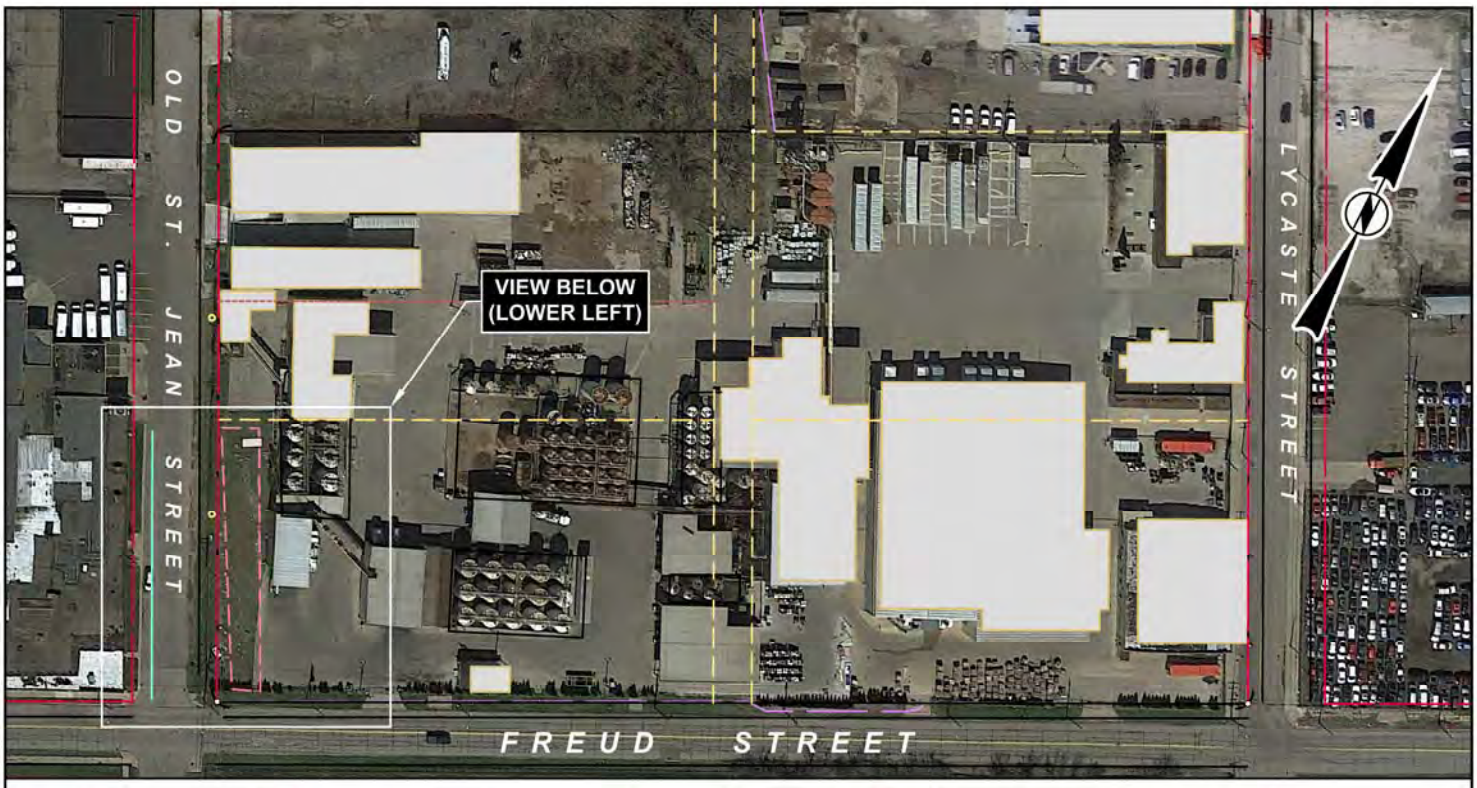
PROPOSED SUB-SLAB SOIL
GAS SAMPLING LOCATIONS

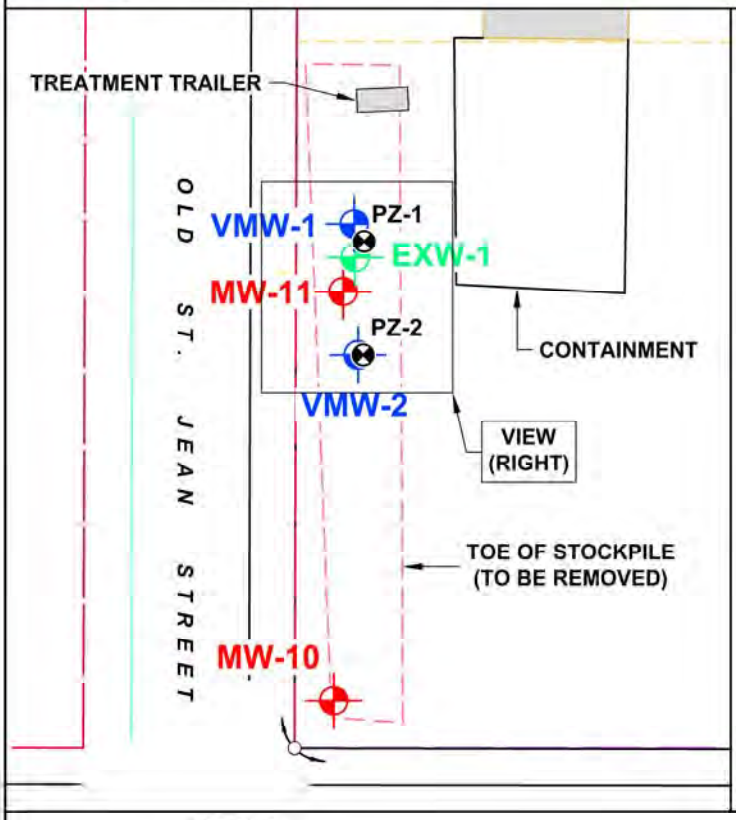
PETRO-CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

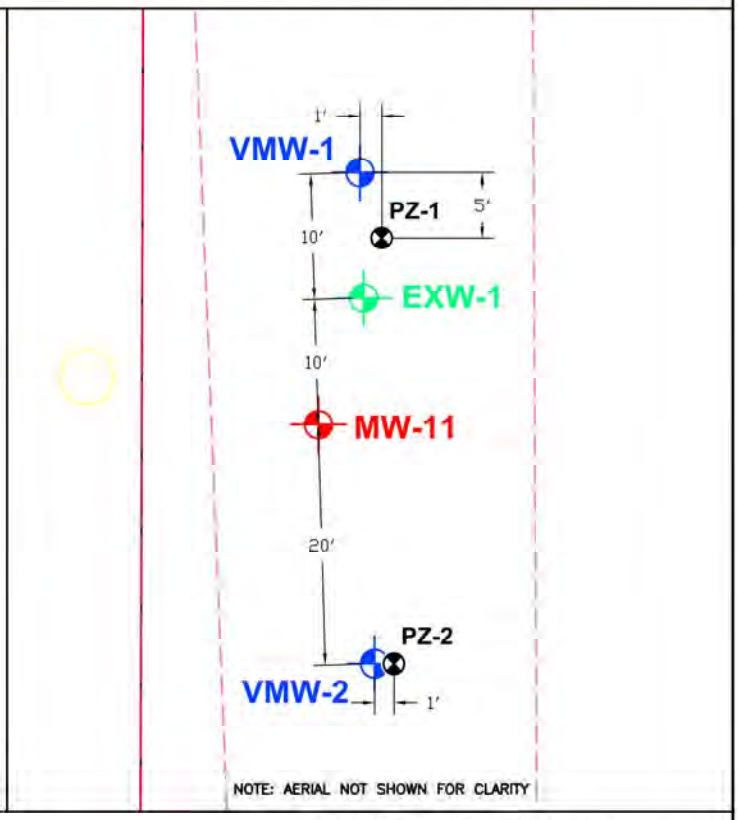
BUREAU VERITAS

FIGURE

12







LEGEND

MW-#	MONITORING WELL LOCATION
EXW-#	EXTRACTION WELL LOCATION
VMW-#	VAPOR MONITORING WELL
PZ-#	PIEZOMETER

TOP INSET MAP SCALE: 1" = 150'

LOWER LEFT INSET MAP SCALE: 1" = 60'

SCALE IN FEET

0 8 16 32

BASE FIGURE; ROWE PROFESSIONAL SERVICES DATED OCTOBER 2, 2017

CHECK BY	GV
DRAWN BY	JL
DATE	5/10/2018
SCALE	AS SHOWN
CAD NO.	11.17.116.00s
PRJ NO.	11017-000116.00

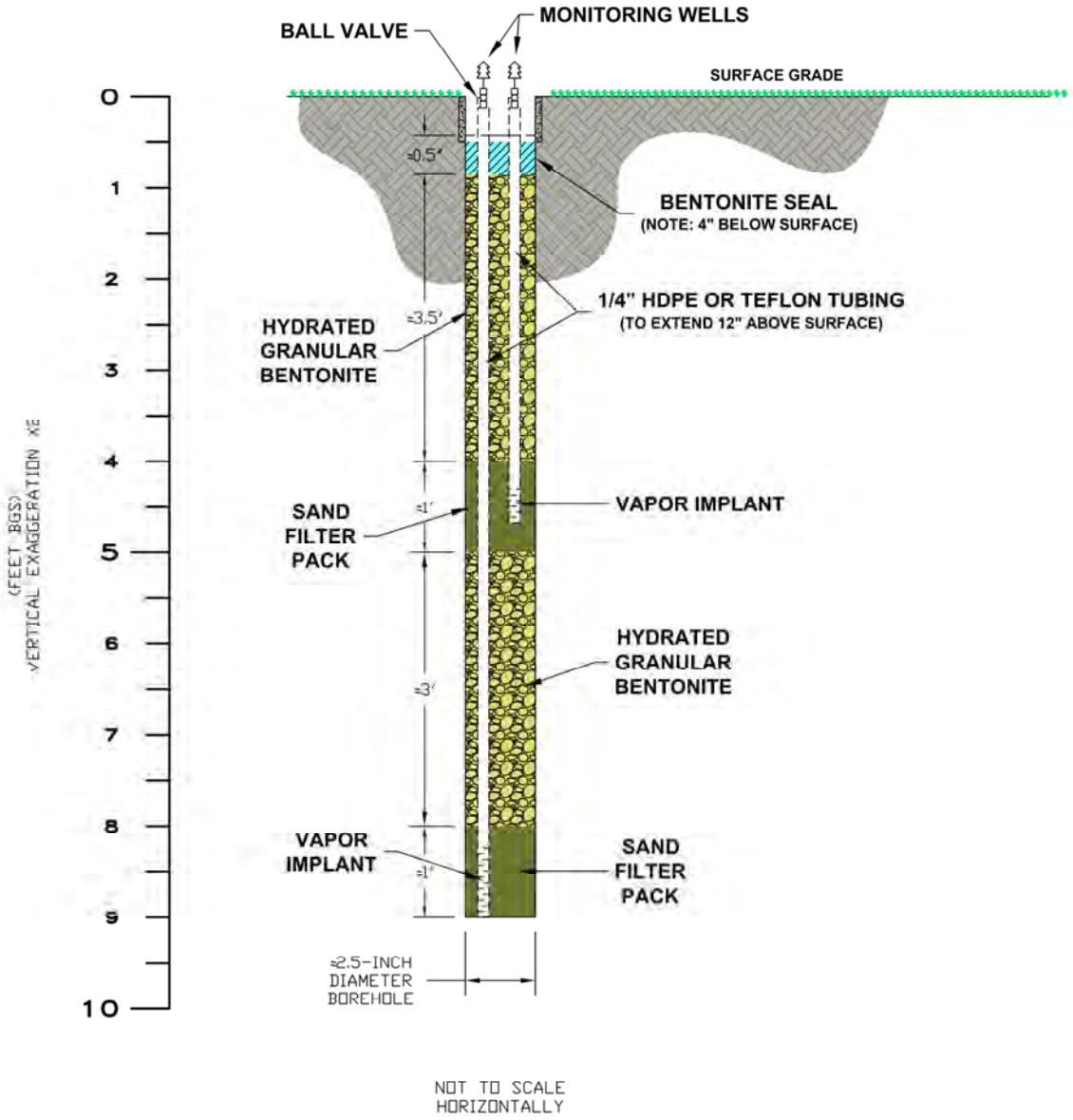
TREATMENT SYSTEM & WELL LOCATIONS

PETRO-CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE

13



CHECK BY	GV
DRAWN BY	JL
DATE	5/10/2018
SCALE	AS SHOWN
CAD NO.	1.17.116.00x
PRJ NO.	11017-000116.00

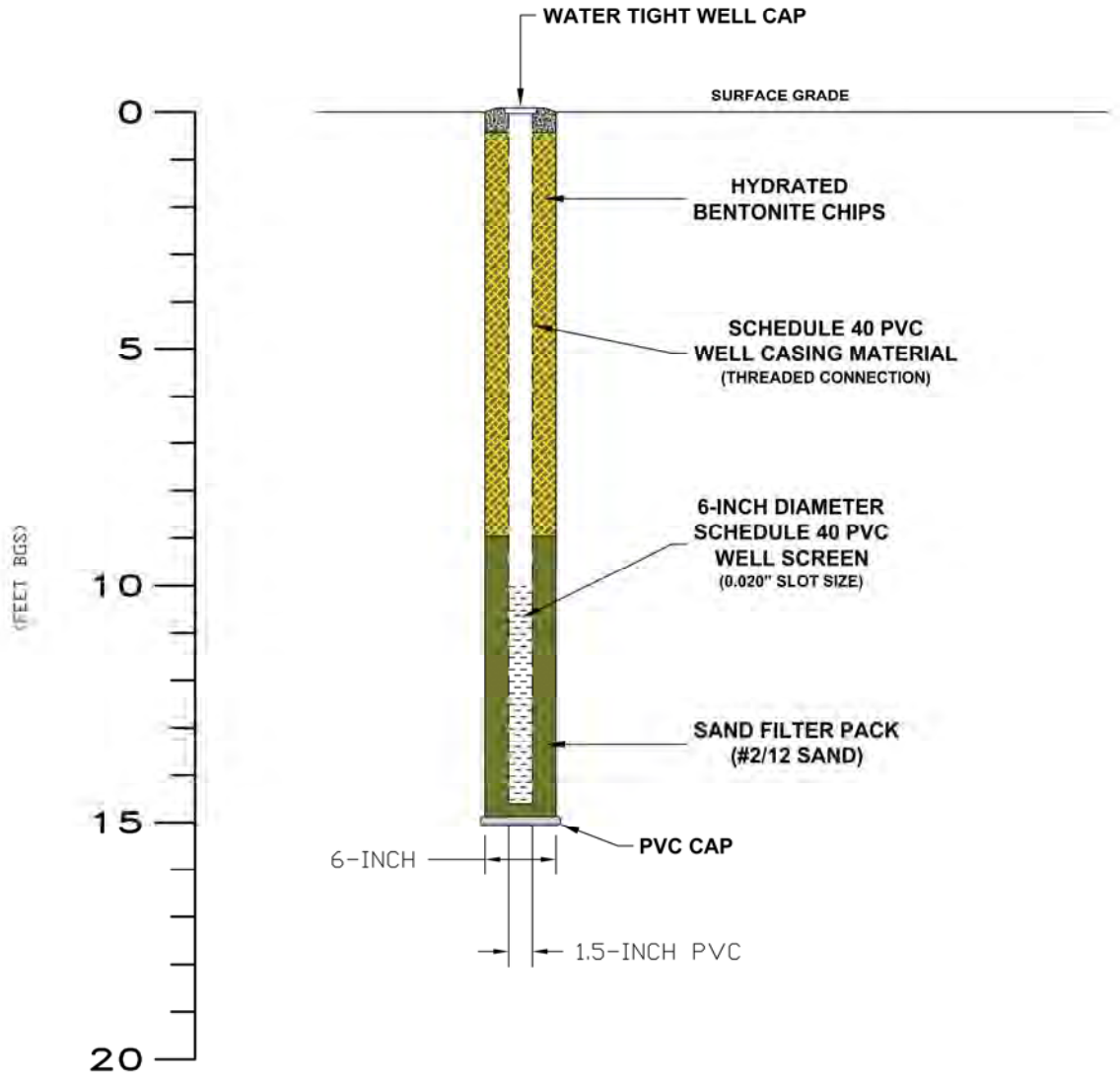
MULTI-LEVEL VAPOR MONITORING WELL CONSTRUCTION

PETRO-CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE

14



CHECK BY	GV
DRAWN BY	JL
DATE	5/10/2018
SCALE	AS SHOWN
CAD NO.	1.17.116.00x
PRJ NO.	11017-000116.00

TEMPORARY PIEZOMETER CONSTRUCTION DIAGRAM

PETRO-CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE
15

APPENDIX A

MDEQ CONDITIONAL APPROVAL OF CORRECTIVE MEASURES STUDY REPORT, JULY 5, 2017

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

July 5, 2017

Mr. Andy Maloy, Director
EH&S Risk Management
Stericycle Environmental Solutions/PSC
18000 72nd Avenue South, Suite 217
Kent, Washington 98032

Dear Mr. Maloy:

SUBJECT: Conditional Approval, Corrective Measures Study Report;
Petro-Chem Processing Group of Nortru, LLC, Detroit, Michigan;
MID 980 615 298

The Michigan Department of Environmental Quality (MDEQ), Waste Management and Radiological Protection Division (WMRPD), has reviewed the Corrective Measures Study report (CMS), dated November 17, 2016, for the Petro-Chem Processing Group of Nortru, LLC facility located at 421 Lycaste Street in Detroit, Michigan (Facility). The WMRPD reviewed the CMS for compliance with the hazardous waste management Facility operating license, effective December 18, 2012 (License), and Part 111, Hazardous Waste Management, of the Michigan Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451). Based on this review, the WMRPD approves the CMS with the following conditions:

1. Section 2.2 Relevant Exposure Pathways and Applicable Criteria – Restrictive Covenant: Before filing the Restrictive Covenant, a draft must be provided to the WMRPD for review and approval. The draft should be included in the required Corrective Measures Implementation Plan (CMIP).

2. Section 2.2, Page 5, Relevant Exposure Pathways and Applicable Criterion, exposure pathways considered relevant – Vapor Intrusion: The United States Environmental Protection Agency and the MDEQ have an emphasis regarding the vapor intrusion to indoor air inhalation exposure pathway. Until the cleanup criteria promulgated pursuant to the provisions of Part 201, Environmental Remediation, of Act 451 (Part 201) are updated to assure that the cleanup criteria applicable to vapor intrusion to indoor air inhalation are adequately protective, any language referencing applicable Part 201 cleanup criteria (i.e. Soil Volatilization to Indoor Air Inhalation and Groundwater Volatilization to Indoor Air Inhalation) may not be adequately protective under Part 111 and the federal Resource Conservation and Recovery Act of 1976, as amended (RCRA).

   In addition, the MDEQ has rescinded Appendix D of the 2013 MDEQ Vapor Intrusion Guidance (please refer to the attached announcement). The vapor intrusion screening values provided in Appendix D.1 (i.e., Residential Vapor Intrusion Screening Values) and in Appendix D.2 (i.e., Nonresidential Vapor Intrusion Screening Values) of the 2013 MDEQ Vapor Intrusion Guidance no longer reflect the

MDEQ's determination of values that represent the best available information regarding the toxicity and volatilization to indoor air exposure risks posed by the hazardous substances as required by Section 20120b of Act 451. Because Appendix D has been rescinded, the values in Appendix D may no longer be utilized to conduct a site-specific evaluation of the volatilization to indoor air pathway (VIAP).

If the Part 201 cleanup criteria are not updated by the time the draft restrictive covenant is developed, then the following alternative language should be used in the draft restrictive covenant:

a. The Owner shall prohibit the construction of new structures, basements and/or the addition to existing structures, unless such construction incorporates engineering controls designed to eliminate the potential for subsurface vapor phase hazardous substances to migrate into the new structure at concentrations greater than appropriate screening levels protective of public health; or, unless prior to construction of any structure, an evaluation of the potential for any hazardous substances to volatilize into indoor air assures the protection of persons who may be present in the buildings.

3. Section 4.3 Identification of Corrective Measure Alternatives: To reliably restrict exposure, the required CMIP must include a Dig Plan for construction or utility workers, if one is not already in place.

4. Section 6.0 Recommended Corrective Measure Alternative and Rationale: Based on the MDEQ's review of the VIAP by screening soil and perched groundwater data, additional corrective measures are needed to address vapor intrusion to indoor air inhalation.

   a. Buildings of standard design with full-time occupants need to be investigated for the VIAP via the collection of sub-slab soil vapor and possibly indoor air samples.

   b. Potential exposure at buildings with non-standard design (i.e., partially open to the atmosphere) and less than full-time occupancy must be reliably controlled through institutional controls implemented via the Facility's License.

   c. The details regarding current Facility operations with respect to compliance with Michigan Occupational Safety and Health Administration (MIOSHA) (i.e., ambient air and/or personnel monitoring) must be incorporated in the CMIP to determine how these may serve to function as exposure controls in buildings where active waste storage, treatment and handling occurs.

   d. Soil gas sample collection points must be installed between the existing known contamination and the residences to the south to investigate the potential for vapor intrusion to be occurring.

   e. Further review of existing information or investigation into the location, size, depth, etc., of the utility corridors on or immediately adjacent to the Facility

must be conducted. Based on the results of this investigation, the utility corridors must then be investigated regarding their potential to act as preferential pathways for the off-site migration of contaminated soil gas and, as applicable, groundwater.

5. CMIP: License Condition VI.K, Summary of Corrective Action Submittals, requires a CMIP to be submitted within 60 days of approval of the CMS Final Report.

Should you have any questions regarding this review, please contact me at 517-284-6571; slaytond@michigan.gov; or MDEQ, WMRPD, P.O. Box 30241, Lansing, Michigan 48909-7741.

Sincerely,

David Slayton

David Slayton, Unit Supervisor
Management & Tracking Unit
Hazardous Waste Section
Waste Management and Radiological Protection Division

cc: Mr. Jeffrey Davis, PSC Environmental Services
Ms. Kellie Wing, Bureau Veritas North America, Inc.
Ms. Tracy Kecskemeti/Ms. Virginia Himich, MDEQ
Mr. Jim Day/ Mr. Dan Dailey MDEQ
Mr. John McCabe/Dr. Kristen Kellock MDEQ
Corrective Action File

APPENDIX B

DRAFT RESTRICTIVE COVENANT

DECLARATION OF RESTRICTIVE COVENANT

MDEQ Reference No.: RC-OWMRP-111-18-001
Facility MID Number MID 980 615 298
MDEQ Approval Date_____

This Declaration of Restrictive Covenant is made to protect public health, safety, or welfare, or the environment pursuant to the provisions of Part 111, Hazardous Waste Management, Michigan Compiled Laws (MCL) 324.11101 *et seq.* (Part 111) and the applicable sections of Part 201, Environmental Remediation, MCL 324.20101 *et seq.* (Part 201) of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), MCL 324.101 *et seq*. and the adminstrative rules promulgated pursuant to those Parts, MAC R 299.9101 *et seq.* and MAC R 299.5101 *et seq*. and the Solid Waste Disposal Act, commonly referred to as the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. §§ 6901 *et seq*.

This Declaration of Restrictive Covenant (Restrictive Covenant) is made on _____ (date) by Nortru LLC, a Michigan limited liability company, the Grantor(s), whose address is 28161 N. Keith Drive, Lake Forest, Illinois 60045, for the benefit of the Grantee, Michigan Department of Environmental Quality (MDEQ), whose address is 525 West Allegan Street, PO Box 30473, Lansing, Michigan 48909-7973.

This Restrictive Covenant has been made to prohibit or restrict activities that could result in unacceptable exposure to environmental contamination present at the property located at 515 Lycaste, County of Wayne , Michigan, and legally described in Exhibit 1 (Property).

The Property Numbers (Property's Tax ID Numbers) are 21/043745.001, 21/045236, 21/043744.002L, 21/043744.001, and 21/0452378.

[*NOTE 2: In cases where releases have contaminated areas beyond the facility boundary defined by the Part A Application [EPA Form 8700-23], please ensure that all off-site affected properties are identified in Exhibit Z].*

The Property is associated with Petro-Chem Processing Group of Nortru, LLC MID 980 615 298 for which a Corrective Measure Implementation Plan (CMIP) submitted on _____, __, 20__ was approved by the MDEQ on _____, 20__. The corrective measures being implemented to address environmental contamination are fully described in the CMIP entitled Corrective Measures Implementation Work Plan submitted by *Bureau Veritas* on behalf of *Petro-Chem Processing Group of Nortru, LLC.*

The CMIP requires the recording of this Restrictive Covenant to: 1) restrict unacceptable exposures to hazardous substances and contaminants located on the Property 2) assure that the use of Property is consistent with the exposure assumptions utilized in the development of **nonresidential cleanup criteria** and the exposure control measures relied upon in the CMIP;

and 3) to prevent damage or disturbance of monitoring wells or any other element of the corrective measures constructed on the Property.

The land or resource use restrictions contained in this Restrictive Covenant are based upon information available to the MDEQ at the time the CMIP was approved by the MDEQ. Failure of the corrective measures to achieve and maintain the cleanup criteria, exposure controls, and requirements specified in the CMIP; future changes in the environmental condition of the Property or changes in the cleanup criteria; the discovery of environmental conditions at the Property that were not accounted for in the CMIP; or use of the Property in a manner inconsistent with the restrictions described herein, may result in this Restrictive Covenant not being protective of public health, safety, or welfare, or the environment. Additional restrictions may become necessary. Information pertaining to the environmental conditions at the Property and the corrective actions undertaken at the Property is on file with the MDEQ, Office of Waste Management and Radiological Protection.

Exhibit 2, attached hereto, provides a survey and a map that identifies those portions of the Property that are subject to land use or resource use restrictions as specified herein.

Summary of Corrective Measures

Hazardous substances and contaminants listed in Exhibit 3 have been found in soils or groundwater at the Property in concentrations above the cleanup criteria for unrestricted residential use for relevant exposure pathways. Areas of the Property described in Exhibit 2 may contain **hazardous substances and contaminants** in excess of the concentrations that satisfy the cleanup criteria for unrestricted residential use.

The following corrective measures have been or will be undertaken to minimize the migration of hazardous substances and contaminants, as described in the CMIP:

1. Installation and operation of a dual-phase soil and groundwater treatment system in western portion of the facility property, as indicated in Exhibit 2.
2. _____
3. _____
4. _____
5. _____
6. _____

Despite the corrective measures named above, hazardous substances and contaminants remain present in soils or groundwater at levels that require controls to prevent unacceptable exposures.

Definitions

"Grantee" shall mean the MDEQ and the United State Environmental Protection Agency (USEPA), their respective successor entities, and those persons or entities acting on their behalf.

"Grantor" shall mean Nortru LLC, the title holder of the Property at the time this Restrictive Covenant was executed, any persons or entities authorized to act on the title holder's behalf, and any future title holder of the Property or some relevant sub-portion of the Property.

"MDEQ" means the Michigan Department of Environmental Quality, its successor entities, and those persons or entities acting on its behalf.

"Owner" means at any given time the then current title holder of the Property or any portion thereof, including any lessees and those persons or entities authorized to act on the title holder's behalf.

"Part 111" means Part 111, Hazardous Waste Management, of the NREPA in effect at the time of the recording of this Restrictive Covenant.

All other terms used in this document which are defined in Part 111 of the NREPA and the Part 111 Administrative Rules, or Part 201 of the NREPA and the Part 201 Administrative Rules solely to the extent not inconsistent with the definitions in Part 111 or the Part 111 Administrative Rules, shall have the same meaning in this document as in those statutes and rules as on the date this Restrictive Covenant is made.

NOW THEREFORE,

Declaration of Land Use or Resource Use Restrictions

The Grantor(s) hereby declare(s) and covenant(s) that the Property, shall be subject to those restrictions on use described below and intends that said restrictions and covenants shall run with the land, and may be enforced in perpetuity against the Owner by the following entities: (1) the Grantor, if it is no longer owner; and (2) MDEQ.

1. Land Use Prohibitions. The Owner shall prohibit all uses of the Property that are not compatible or consistent with the exposure assumptions for the nonresidentia**l** cleanup criteria. Uses that are compatible with nonresidential cleanup criteria are generally described in the Description of Allowable Uses, attached hereto as [**Exhibit 4**].

   The following uses allowed under the Detroit Zoning Code, Article X, Division 5, M4 Intensive Industrial District, are prohibited:

   a. Residential use, including loft conversions and residential use combined in structures with permitted commercial uses.

   b. Agricultural use, including urban farms and urban gardens.

2. Activities Prohibited. The Owner shall prohibit activities Property that may result in exposures above levels established in the CMIP. These prohibited activities include:

   a. Use of Groundwater
   b. Excavating soil without complying with the Soil Management Plan included in the CMIP
   c. _____
   d. _____

3. The Owner shall prohibit activities on the property that may interfere with any element of the CMIP, including prohibiting activities that may interfere with the performance of operation and maintenance activities, monitoring, or other measures necessary to ensure the effectiveness and integrity of the CMIP; including but not limited to:

   [NOTE 8: List below all property specific prohibited activities that are necessary to maintain the effectiveness and integrity of the CMIP.]

   a. The Owner shall not remove, disturb, or damage the concrete floor or excavate sub slab soils beneath Building 301 identified in Exhibit 2, Figures 2 and 4 unless the following stipulations are implemented. The Owner shall maintain the concrete floor or its equivalent in place in Building 301 consistent with the exisiting conditions to prevent direct contact with the soils as described in the Building 301 Soil Impact Report. Any removal of the concrete floor requires a Health and Safety Plan, engineering controls/personal protective equipment (PPE) to reduce the risk of exposure during excavation, and replacement of an appropriate cover unless remedial actions (e.g., excavation and off-Property disposal) are completed._____

   b. _____
   c. _____

4. Soil Vapor Management.

   The Owner shall prohibit the construction and/or occupancy of any building or structures on the Property outlined in Exhibit 2, unless such construction and/or occupancy incorporates engineering controls designed to eliminate the potential for subsurface vapor phase contaminants/hazardous substances to migrate into the structure at concentrations greater than the appropriate concentrations protective of public health; or unless prior to construction and/or occupancy of any structure, an evaluation of the potential for any contaminants/hazardous substances to volatilize into indoor air assures the protection of persons who may be present in the buildings. Prior to the potential for any human exposures, documentation of compliance with the above requirements must be submitted to DEQ for approval.

5. Monitoring Wells. The Owner shall not remove, disturb or damage any monitoring wells on the Property except as provided in the CMIP without MDEQ approval.

6. Contaminated Soil Management. The Owner shall manage contaminated soils, media and/or debris and all other soils located on the Property in accordance with the requirements of Part 111, RCRA Subtitle C, the administrative rules promulgated pursuant to Part 111 and the RCRA, and all other relevant state and federal laws, including, but not limited to, MCL 324.20120c. This includes if the Owner elects to remove any slabs, pavement or other impervious surface on the Property.

7. Access. The Owner shall grant to the MDEQ the right to enter the Property at reasonable times for the purpose of determining and monitoring compliance with the CMIP and this Restrictive Covenant, including the right to take samples, inspect the operation of the corrective measures, inspect any records relating thereto, and to perform any actions necessary to maintain compliance with the Part 111 and the CMIP.

8. Transfer of Interest. The Grantor shall provide notice at the address provided in this document to the MDEQ of the Grantor's intent to transfer any interest in the Property, or any portion thereof, at least fourteen (14) business days prior to consummating the conveyance. A conveyance of title, easement, or other interest in the Property shall not be consummated by the Grantor without adequate and complete provision for compliance with the terms and conditions of this Restrictive Covenant. The Grantor shall include in any instrument conveying any interest in any portion of the Property, including, but not limited to, deeds, leases, and mortgages, a notice which is in substantially the following form:

   NOTICE: THE INTEREST CONVEYED HEREBY IS SUBJECT TO A DECLARATION OF RESTRICTIVE COVENANT DATED _____ AND RECORDED WITH THE _____ COUNTY REGISTER OF DEEDS, LIBER_____, PAGE_____.

   A copy of this Restrictive Covenant shall be provided to all future owners, heirs, successors, lessees, easement holders, assigns, and transferees by the person transferring the interest.

10. Notices. Any notice, demand, request, consent, approval, or communication that is required to be made or obtained under this Restrictive Covenant shall be made in writing; include a statement that the notice is being made pursuant to the requirements of this Restrictive Covenant; include the Michigan facility identification number, MID 980-615-298, and the MDEQ Reference No. RC-OWMRP-111-18-001, and shall be served either personally, or sent via first class mail, postage prepaid, as follows:

    Hazardous Waste Section Chief
    Office of Waste Management and Radiological Protection
    Michigan Department of Environmental Quality
    P.O. Box 30241
    Lansing, Michigan 48909-7741

11. Term. This Restrictive Covenant shall run with the Property and shall be binding on the Owner, and all current and future successors, lessees, easement holders, their assigns, and their authorized agents, employees, or persons acting under their direction and control. This Restrictive Covenant may only be modified or rescinded with the written approval of the MDEQ.

12. Enforcement. The Grantor is entitled to enforce the restrictions and covenants of this Restrictive Covenant by specific performance or other legal action in a court of competent jurisdiction against subsequent Owners of all or part of the Property. The Grantor, on behalf of itself, and its successors in title, intends and agrees that MDEQ is entitled to enforce the restrictions and covenants in this Restrictive Covenant by specific performance or other legal action in a court of competent jurisdiction against the Grantor, as Owner, and thereafter against subsequent Owners of all or part of the Property. All remedies available hereunder shall be in addition to any and all other remedies at law or equity.

13. Modification/Release/Rescission. The Grantor or Owner may request in writing to the MDEQ, at the address provided herein, modifications to, or release or rescission of, this Restrictive Covenant as documented and attached hereto as Exhibit W. This Restrictive Covenant may be modified, released or rescinded only with the written approval of the MDEQ. Any approved modification to, or release or rescission of, this Restrictive Covenant shall be filed with the appropriate Registrar of Deeds by the Grantor or Owner and a certified copy shall be returned to the MDEQ at the address provided herein.

14. Severability. If any provision of this Restrictive Covenant is held to be invalid by a court of competent jurisdiction, the invalidity of such provision shall not affect the validity of any other provisions of this Restrictive Covenant and all other provisions shall continue to remain in full force and effect.

15. Authority to Execute Restrictive Covenant. The undersigned person(s) executing this Restrictive Covenant is the Owner(s), or has the express written permission of the Owner(s) and all other holders of a legal interest whose interest is materially affected by this Restrictive Covenant and represent and certifies that he or she is duly authorized and has been empowered to execute and deliver this Restrictive Covenant.

IN WITNESS WHEREOF, _____ has caused this Restrictive Covenant, RC-OWMRP-111-__-___, to be executed on this_____day of_____, 20__.

NORTRU LLC, a Michigan limited liability company By: _____ Name: Daniel V. Ginnetti Its: Vice President	NORTRU LLC, a Michigan limited liability company following conversion from Nortru, Inc., a Michigan corporation successor by merger with Petro-Chem Processing, Inc. a Michigan corporation By: _____ Name: Daniel V. Ginnetti Its: Vice President

STATE OF ILLINOIS)

) ss
COUNTY OFLAKE)

The foregoing instrument was acknowledged before me this _____ (date) by Daniel V. Ginnetti, Vice President of Nortru LLC, a Michigan limited liability company, on behalf of the company.

_____
Notary Public
State of Illinois, County of Lake Acting in the County of Lake
My commission expires: _____

EXHIBIT 1

LEGAL DESCRIPTION OF PROPERTY

[

Parcel 1:

The North 220.75 feet on the West line, being the North 221.02 feet on the East line of Lot 7, and the South half of Lot 8, except the North 20 feet thereof, Terminal Subdivision, as recorded in Liber 26, Page 80 of Plats, Wayne County, Michigan Records.

Common address: 462 and 482 St Jean, Detroit, MI
Tax Identification No. 211043744.001, 21/043744.002L

Parcel 2:

North 1/2 of Lot 8, and North 20 feet of South 1/2 of Lot 8,Terminal Subdivision, as recorded in Liber 26, Page 80, of Plats, Wayne County Records. Together with an easement of right of way to maintain and use the existing side track over the following described property, The North 220.75 feet on the West line being the North 221.02 feet on the East line, lying North of Freud Avenue, of Lot 7 and the South 1/2 of Lot 8, Terminal Subdivision according to the plat thereof as recorded in Liber 26 of Plats, on Page 80, Wayne County Records.

Common address: 500 St. Jean, Detroit, MI
Tax Identification No. 21/043745.001

Parcel 3:

The South 123.28 feet of Lot 15, Terminal Subdivision according to the plat thereof as recorded in Liber 26, Page 80 of Plats, Wayne County Records.

Common address: 515 Lycaste, Detroit, MI
Tax Identification No. 21/045236

Parcel 5:

West 159 feet of the North 221.33 feet of Lot 17 and West 159 feet of the South 31.07 feet as measured on the West line of Lot 16, Terminal Subdivision, as recorded in Liber 26, Page 80 of Plats, Wayne County Records, and being more particularly described as:

Commencing at the intersection of the Westerly line of Lycaste Avenue 60 feet wide, and the Northerly line of Freud Avenue, 60 feet wide, thence South 73 degrees 59 minutes 50 seconds West along the Northerly line of Freud Avenue a distance of 227.87 feet to point of beginning, thence continuing along Northerly line South 73 degrees 59 minutes 50 seconds West 159 feet to a point on the Easterly right of way line of Detroit Terminal Railroad Right of Way 30 feet wide, thence continuing along said Easterly right of way North 25 degrees 55 minutes West a distance of 250 feet; thence North 73 degrees 59 minutes 50 seconds East a distance of 159 feet; thence South 25 degrees 55 minutes East a distance of 250 feet to the point of beginning.

Common address: 421 Lycaste, Detroit, MI
Tax Identification No. 21/045237-8

Parcel 6:

The South 28.67 feet of East 227.87 feet of Lot 16, and the North 221.33 feet on East line being North 220.96 feet on West line of East 227.87 feet of Lot 17, Terminal Subdivision, as recorded in Liber 26, Page 80 of Plats, Wayne County Records.

Common Address: 421 Lycaste, Detroit, MI
Tax Identification No. 21/045237-8

Parcel 7:

The Northerly 196.33 feet of Lot 16, Terminal Subdivision according to the plat thereof as recorded in Liber 26, Page 80 of Plats, Wayne County, Michigan Records.

Common address: 421 Lycaste, Detroit, MI
Tax Identification No. 21/045237-8

Parcel 8:

Part of Lot 36, Terminal Subdivision, according to the plat thereof recorded in Liber 26, Page 80 of Plats, Wayne County Records, more particularly described as: All that part of Lot 36 of Terminal Subdivision lying South of the North line of Lot 16 of Terminal Subdivision, as extended, to the North line of Freud Avenue, 60 feet wide, as opened through Court proceedings on November 19, 1923.

Common address: 421 Lycast, Detroit, MI
Tax Identification No.: 21/045237-8

EXHIBIT 2

LEGAL DESCRIPTION AND SURVEY OF RESTRICTED AREAS OF THE PROPERTY

NOTES:

1. BEARINGS ARE BASED UPON MICHIGAN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE NAD83 (2011).
2. UNITS ARE INTERNATIONAL FEET.
3. DISTANCES SHOWN ARE GRID DISTANCES. CONVERSION TO GROUND DISTANCES IS: GRID DISTANCE/0.999925913 = GROUND DISTANCE
4. PARCEL SURVEYED INCLUDES PART OF LOTS 7, 15, 17 AND 36 AND ALL OF LOTS 8 AND 16 OF TERMINAL SUBDIVISION AS RECORDED IN LIBER 26, PAGE 80 OF PLATS, WAYNE COUNTY RECORDS.
5. MONITORING WELLS AND STORM MANHOLES SHOWN, WERE PREVIOUSLY SURVEYED BY ROWE PROFESSIONAL SERVICES COMPANY ON AUGUST 16, 2016.

STATE OF MICHIGAN
KENNETH J. PERRY
PROFESSIONAL SURVEYOR
No. 63135
LICENSED PROFESSIONAL SURVEYOR

ROWE PROFESSIONAL SERVICES COMPANY
The Rowe Building
540 S. Saginaw St., Suite 200
Flint, MI 48502
O: (810) 341-7500
F: (810) 341-7573
www.rowepsc.com

PLAN DATE: OCTOBER 2, 2017
PROJECT MGR: JJF
REVIEWER: KAP
SCALE: 1" = 50'

PREPARED FOR
BUREAU VERITAS NORTH AMERICA, INC.
LYCASTE STREET - ST. JEAN STREET PARCELS
PART OF TERMINAL SUBDIVISION, LIBER 26, PAGE 80,
CITY OF DETROIT, WAYNE COUNTY, MICHIGAN

REV:

SHT# 1 OF 1
JOB No: 17C0222

PLOTTED: 10/3/2017 10:02 AM
R:\Projects\17C0222\Dwg\Survey\SV-17C0222-TO-01.dwg

EXHIBIT 3

LIST OF HAZARDOUS SUBSTANCES AND CONTAMINANTS ABOVE CRITERIA IN SOILS OR GROUNDWATER

Soil

Hazardous Substance	CAS Number	Applicable Criteria (ppb)
Ethylbenzene	100-41-4	140,000
Toluene	108-88-3	250,000
Xylenes	1330-20-7	150,000
1,2,4 – Trimethylbenzene	95-63-6	110,000
Benzo(a)pyrene	50-32-8	8,000
Tetrachloroethene	127-18-4	88,000

Groundwater

Hazardous Substance	CAS Number	Applicable Criteria (ppb)
Toluene	10888-3	61,000
Tetrohydrofuran	109-99-9	60,000
Xylenes	1330-20-7	70,000

Applicable Criteria are Part 201 Generic Cleanup Criteria and Screening Levels, September 28, 2012

EXHIBIT 4

DESCRIPTION OF ALLOWABLE USES

[NOTE: This exhibit is only necessary when the property is restricted to nonresidential or site-specific land uses. It must be consistent with the zoning of the property and with the generic or alternative exposure assumptions used to develop the cleanup criteria.]

[NOTE: This exhibit must be consistent with the generic exposure assumptions, or alternative exposure assumptions used to derive a site-specific criterion, if one was approved in the CMIP and those uses are consistent with the property zoning.]

Nonresidential Land Use: This land use is characterized by any use which is not residential in nature and is primarily characterized by industrial and commercial uses. Industrial uses typically involve manufacturing operations engaged in processing and manufacturing of materials or products. Other examples of industrial uses are utility companies, industrial research and development, and petroleum bulk storage. Commercial uses include any business or income-producing use, such as commercial warehouses, lumber yards, retail gas stations, auto dealerships and service stations, as well as, office buildings, banks, and medical/dental offices (not including hospitals). Commercial uses also include retail businesses whose principal activity is the sale of food or merchandise within an enclosed building and personal service establishments which perform services indoors, such as health clubs, barber/beauty salons, photographic studios, etc.

Any residential use is specifically prohibited from the non-residential land use category. This would include the primary use of the property for human habitation and includes structures such as single family dwellings, multiple family structures, mobile homes, condominiums, and apartment buildings. Any uses which are intended to house, educate, or provide care for children, the elderly, the infirm, or other sensitive populations, and therefore could include day care centers, educational facilities, hospitals, elder care facilities, and nursing homes, may not fit the nonresidential exposure assumptions. Residential or site specific environmental protection standards may need to be considered. The use of any accessory building or portion of an existing building as a dwelling unit permitted for a proprietor or storekeeper and their families, located in the same building as their place of occupation, or for a watchman or caretaker is also prohibited. Any authority that allows for residential use of the Property as a legal non-conforming use is also restricted per the prohibitions contained in this restrictive covenant.

EXHIBIT W

CONSENT OF OWNER

I, Daniel V. Ginnetti, Vice President of Nortru LLC, the current and legal Owner of the Property, do hereby consent to the recording of this Restrictive Covenant, RC-OWMRP-111-___-____, and authorize Nortru LLC (Grantor) to file the Restrictive Covenant with the Wayne County Register of Deeds for recording.

By: _____
Signature
Name:_____
Daniel V. Ginnetti
Its: Vice President
Title

STATE OF ILLINOIS
COUNTY OF LAKE

_____
Notary Public Signature
State of Illinois
County of Lake
My Commission Expires:_____

APPENDIX C

TO-15 ANALYTES AND DETECTION LIMITS

Routine Reporting Limits for Volatile Organic Compounds in Air by SOP V-263

Compound	Indoor Air RL (ppbv)	Sub Slab RL (ppbv)
1,1,1-Trichloroethane	1.5	6
1,1,2,2-Tetrachloroethane	0.03	0.48
1,1,2-Trichloroethane	0.12	1.2
1,1,2-Trichlorotrifluoroethane	3	6
1,1-Dichloroethane	1.5	6
1,1-Dichloroethene	1.5	6
1,2,4-Trichlorobenzene	3	12
1,2,4-Trimethylbenzene	0.9	6
1,2-Dichlorobenzene	1.5	6
1,2-Dichloroethane	0.12	1.2
1,2-Dichloropropane	0.3	6
1,3,5-Trimethylbenzene	0.9	6
1,3-Butadiene	0.08	0.3
1,3-Dichlorobenzene	0.3	6
1,4-Dichlorobenzene	0.3	6
1,4-Dioxane	1.5	6
2-Butanone	3	12
2-Hexanone	3	12
2-Methylnaphthalene	6	24
4-Methyl-2-pentanone	3	12
Acetone	15	24
Benzene	0.9	6
Benzyl Chloride	0.08	1.2
Bromodichloromethane	0.12	1.2
Bromoform	1.5	6
Bromomethane	0.9	6
Carbon Disulfide	6	12
Carbon Tetrachloride	0.12	1.2
Chlorobenzene	3	6
Chloroethane	1.5	6
Chloroform	0.12	1.2
Chloromethane	6	6
cis-1,2-Dichloroethene	1.5	6
cis-1,3-Dichloropropene	0.3	6
Cyclohexane	3	12
Dibromochloromethane	0.08	0.48
Dichlorodifluoromethane	3	6
Ethyl Acetate	3	12
Ethylbenzene	1.5	12
Ethylene Dibromide	0.03	0.12
Hexachlorobutadiene	0.08	0.48
Isopropanol	6	12
m&p-Xylene	3	12
Methylene Chloride	6	12
MTBE	1.5	6
Naphthalene	0.3	5.3

DCSID: V-413.1 (10/29/17)

If any reporting limits are updated, V-415 reporting limits must also be updated.

n-Heptane	3	12
n-Hexane	3	12
o-Xylene	3	12
Styrene	3	12
Tetrachloroethene	0.9	6
Tetrahydrofuran	1.5	1.2
Toluene	1.5	6
trans-1,2-Dichloroethene	1.5	6
trans-1,3-Dichloropropene	0.3	6
Trichloroethene	0.03	0.3
Trichlorofluoromethane	1.5	6
Vinyl Acetate	3	12
Vinyl Chloride	0.3	6

APPENDIX D

RESPIRATORY PROTECTION PROGRAM

RESPIRATORY PROTECTION PROGRAM

REVISION DATE:
MARCH 6, 2013

Table of Contents

List of Appendicies

INTRODUCTION

The management at Stericycle, Inc., is committed and dedicated to the safety and well being of its employees. Management is providing the leadership and support necessary to develop and maintain a functional respiratory protection program for the employees of Stericycle. Stericycle will provide the resources to make this program work effectively. It is the responsibility of every covered employee to follow the guidelines established in this program to provide the proper respiratory protection to themselves and other employees.

In certain instances, the ability to medically qualify for the use of respiratory protection is a condition of employment and will be evaluated during pre-employment physical screening.

This program covers respirator selection, medical evaluations, fit testing, respirator use for normal and emergency conditions, employee training, maintenance, and recordkeeping.

Covered Stericycle employees are required to participate in a medical evaluation, respiratory protection training, and fit testing, prior to use. It is also the employee's responsibility to use the respirators as instructed and keep the respirators disinfected and in good working condition. Finally, the respirators must be properly stored to prolong the equipment life and maximize effectiveness. Stericycle employees may bring any problems or concerns regarding the respiratory protection program to their immediate supervisor.

The Occupational Safety and Health Administration (OSHA) requires that respirators be used when engineering and/or administrative controls are not feasible, are ineffective in reducing the hazards, or while controls are being utilized to reduce or eliminate airborne hazards. The National Institute Occupational Safety and Health (NIOSH) must certify such respirators and equipment.

This respiratory protection program is designed to protect the health of employees at Stericycle and is based on OSHA Standard 29 CFR 1910.134 and NIOSH Standard 42 CFR 84. Only NIOSH approved respirators are acceptable for use by Stericycle employees. These regulations cover the safe use of respiratory equipment for personal protection against air containing harmful fumes, dusts, mists, vapors, and gases.

PURPOSE

To ensure the protection of all employees from respiratory hazards through the proper use of respirators, engineering controls, training, air monitoring and administrative controls.

Stericycle, Inc. has determined that employees performing certain tasks are exposed to respiratory hazards during routine operations. These hazards include particulates, biological agents and vapors, and in some cases represent Immediately Dangerous to Life or Health (IDLH) conditions. The purpose of this program is to ensure that all Stericycle employees are protected from exposure to these respiratory hazards.

Engineering controls, such as ventilation and substitution of less toxic materials, are the first line of defense; however, engineering controls have not always been feasible for some of the operations, or have not always completely controlled the identified hazards. In these situations, respirators and other protective equipment must be used.

In addition, some employees have expressed a desire to wear respirators during certain operations that do not require respiratory protection. As a general policy, Stericycle will review each of these requests on a case-by-case basis. If the use of respiratory protection in a specific case will not jeopardize the health or safety of the worker(s), Stericycle may provide respirators for voluntary use. As outlined in the Scope section of this program, voluntary respirator use is subject to certain requirements of this program.

SCOPE

Respirators shall be provided when such equipment is necessary to protect the health of the employee. Employees participating in the respiratory protection program do so at no cost to them. The expense associated with training, medical evaluations and respiratory protection equipment will be borne by Stericycle Inc. Respirators shall be provided to affected employees which are applicable and suitable for the purpose intended.

This program applies to all employees who are required to wear respirators during normal work operations. All employees working in these areas and engaged in certain processes or tasks as outlined in the Table 1 must be enrolled in the Stericycle respirator protection program.

TABLE 1: REQUIRED RESPIRATOR USE

Task	JOB TITLE	RESPIRATOR	
		Filtering Face Piece	Full Face Cartridge APR
Pouring or Decanting Formaldehyde - < 15 minute	HWH		FORM
Amalgam Consolidation	HWH		HgCl
Mercury Remediation Project	HWH		HgCl
Aerosol Can Puncturing	HWH		Multi
Emergency Response - Hazwoper	RMS-Sup		Multi
HHW Worker - Solvent-Fuel Pour-off	HWH		Multi
Pouring HHW Pesticides Liquids- In House	HWH		Multi
Pouring or Sample Corrosive Liquids - Conc. > 10%	HWH		Multi
Pouring, or Sample Corrosive Liquids - Dilute < 10%	HWH		Multi
Pumping Corrosive Liquids - Conc & Dilute	HWH		Multi
Pumping Flammable Drums	HWH		Multi
Sampling Drums	HWH		Multi
Spill Clean-Up varies	HWH		Multi
Spill Clean-Up Varies	HWH/D		Multi
Waste Compaction -Non Biological (lab waste)	HWH		P-100
Labpack/Depack Operations	HWH	As Needed	P-100
Non Hazardous Solid Consolidation (w/ mounted Drum Articulator)	HWH	As Needed	P-100
Unload Roll-off or Dump at Landfill***	SWD	As Needed	P-100
Decontaminating Pharma Containers	HWH	P-100	
Sorting Pharmaceuticals	HWH	P-100	
Treating Bio Waste On-Site (Bleaching)	HWH	P-100	
Dismantle or Decon of E-Waste -BBP	HWH	P-100	

PROGRAM MANAGEMENT

The respirator protection program is to be managed by the facility manager with assistance from the Area Manager of Environmental Safety & Health [AMESH]. Management of the program includes, but is not limited to, the following:

- Medical evaluations of employees required to use respirators;
- Procedures for selecting respirators for use;
- Fit testing procedures for tight-fitting respirators;
- Procedures for proper use in routine and reasonably foreseeable emergency situations;
- Procedures and schedules for maintaining respirators (cleaning, storing, disinfecting and inspection, etc.);
- Procedures and schedules to ensure adequate air quality, quantity and flow of breathing air for atmosphere-supplying respirators;
- Training in respiratory hazards and proper use of respirators;
- Procedures for regularly evaluating the effectiveness of the program.

Responsibilities

Facility Manager

Facility Managers are responsible for ensuring that the respiratory protection program is implemented in their particular areas. In addition to being knowledgeable about the program requirements for their own protection, facility managers must also ensure that the program is understood and followed by the employees under their charge. Duties of the facility manager include:

- Designate a Program Administrator that is responsible for administering the respiratory protection program.
- Ensuring that employees under their supervision (including new hires) have received appropriate training, fit testing and annual medical evaluation.
- Ensuring the availability of appropriate respirators and accessories.
- Being aware of tasks requiring the use of respiratory protection.
- Enforcing the proper use of respiratory protection when necessary.
- Ensuring that respirators are properly cleaned, maintained, and stored according to the respiratory protection plan.
- Ensuring that respirators fit well and do not cause discomfort.
- Administering the medical surveillance program.
- Maintaining records required by the program.
- Continually monitoring work areas and operations to identify respiratory hazards.
- Coordinating with the Area Manager of Environmental Safety & Health on how to address respiratory hazards or other concerns regarding the program.
- Arranging for and/or conducting fit testing.

Area Manager of Environmental Safety & Health

Duties of the Area Manager of Environmental Safety & Health include:

- Identifying work areas, processes or tasks that require workers to wear respirators, and evaluating hazards.
- Monitoring respirator use to ensure that respirators are used in accordance with their certifications.
- Evaluating the program.
- Updating written program, as needed.
- Selection of respiratory protection options.

  The Area Manager of Environmental Safety & Health will select respirators based on the hazards and exposures. Stericycle employees collect, process, consolidate and store hazardous waste at customer sites. The need for respiratory protection varies according to the specific conditions at a customer location and in the processing at Stericycle facilities. Several factors were considered during the respirator selection process, including:

  - the conditions of the workplace
  - the composition of the waste being handled
  - the environmental conditions
  - duration of the task
  - physical demand of the work
  - nature of the hazard, according to the following characteristics:
    - oxygen sufficiency,
    - physical properties,
    - chemical properties,
    - physiologic effects on the body,
    - concentration of the air contaminant,
    - OSHA PEL and ACGIH TLV
    - warning properties
    - potential for infection
    - IDLH conditions

Employees

Each employee has the responsibility to wear their respirator when and where required and in the manner in which they were trained. Employees must also:

- Care for and maintain their respirators as instructed, and store them in a clean sanitary location.
- Inform their supervisor if the respirator no longer fits well, and request a new one that fits properly.
- Inform their Facility Manager or the Program Administrator of any respiratory hazards that they feel are not adequately addressed in the workplace and of any other concerns that they have regarding the program.

The Facility Manager will conduct a hazard evaluation for tasks and activities where airborne contaminants may be present in routine operations or during an emergency. The hazard evaluation will include:

1. Identification and development of a list of hazardous substances.
2. Review of work processes to determine where potential exposures to these hazardous substances may occur. This review shall be conducted by some or all of the following; the Facility Manager, Area Manager of ES&H and/or JHA team.
3. Exposure monitoring, safety data sheets, waste profiles and Job Hazard Analysis (JHA) to quantify potential hazardous exposures. Exposure monitoring may be contracted out to a qualified Industrial Hygiene Services firm.

Updating the Hazard Assessment

The Area Manager of ES&H must revise and update the hazard assessment as needed (i.e., any time work process changes may potentially affect exposure). If an employee feels that respiratory protection is needed during a particular activity, they are to contact the Facility Manager or the Program Administrator/ AMESH. The AMESH will evaluate the potential hazard, arranging for outside assistance as necessary. The Program Administrator AMESH will then communicate the results of that assessment back to the employees. If it is determined that respiratory protection is necessary, all other elements of this program will be in effect for those tasks and this program will be updated accordingly.

NIOSH Certification

All respirators acceptable for use by Stericycle employees must be certified by the National Institute for Occupational Safety and Health (NIOSH) and shall be used in accordance with the terms of that certification. Also, all filters, cartridges, and canisters must be labeled with the appropriate NIOSH approval label. The label must not be removed or defaced while it is in use.

Types of Respirators

Filtering Facepiece

Filtering facepieces are tight fitting respirators that look similar to a surgical mask. It is designed to be worn over the nose and mouth. It is constructed of material that will filter out particulates as the wearer inhales. Stericycle employees are approved to wear both the N95 and P-100 as required by the specific task. N95 and P100 respirators and cartridges shall be utilized by the following employees:

- Employees who have the potential for dust or biological exposures – ONLY
- Employees who have been issued and fit tested for an air purifying respirator.
- Employees who have been medically cleared, trained and fit tested.
- Employees who choose to voluntarily wear a filtering face piece.

Voluntary Respirator Use of Filtering Facepieces

The Area Manager of ES&H shall authorize voluntary use of respiratory protective equipment on a case-by-case basis, depending on specific workplace conditions and the results of the medical evaluations. Employees wishing to voluntarily use a filtering face piece, must inform the facility manager and gain approval from the safety department prior to using a dust mask. The Facility Manager will provide all employees who voluntarily choose to wear either of the above respirators with a copy of Appendix D. (Appendix D details the requirements for voluntary use of respirators by employees.) Stericycle will provide filtering facepieces at no charge to employees for voluntary use.

Employees choosing to wear an APR must comply with the procedures for Medical Evaluation, Respirator Use, Cleaning, Maintenance and Storage. Employees who voluntarily wear filtering facepiece respirators (like N-95 respirators) must obtain prior medical clearance to use a filtering face piece from their personal physician.

Voluntary use of a dust mask approval includes the completion of a:

- Respiratory medical questionnaire
- A medical practitioner evaluation and clearance
- Training on the proper usage of filtering face pieces
- Policy statement signature

Employees and visitors may use surgical masks at will to prevent the spread of germs due to coughing. No prior clearance is necessary.

Employees will not be allowed to voluntarily use a filtering face piece if it has to potential to itself present a hazard to the employee.

Air-purifying Cartridge Respirators (Full and Half Face)
Air-purifying respirators, also known as cartridge respirators, are used when oxygen level is >19.5% in the atmosphere, but the concentration of a contaminant is at or above the PEL. Cartridge respirators require a particulate filter and/or a chemical cartridge depending on the hazardous material present.

Powered Air Purifying Respirators (PAPR)
Powered Air Purifying Respirators are motorized systems powered by a battery pack which draw air through a filter or cartridge to provide respiratory protection to the wearer. The blower unit can be mounted on the waist, face, or head, depending on the system selected.

Cartridges and Filters
All air purifying filters and cartridges used with respirators must be labeled and color-coded with the NIOSH approval label. The label must remain legible and never be removed. The particulate filters must have a NIOSH rating of at least N95. The type of filter cartridges used must be compatible with the type of chemicals, materials and their physical properties be handled.

To maintain effectiveness, filters and cartridges must be replaced as recommended by the manufacturer. The maximum use concentration for a cartridge is determined mathematically by multiplying the assigned protection factor specified for a respirator by the required OSHA permissible exposure limit, short-term exposure limit or ceiling limit. When no OSHA exposure limit is available for a hazardous substance, the MUC is based on the safety data available and informed professional judgment.

The cartridge service life of estimations are based on several factors included the following AIHA recommendations:

- If the chemical's boiling point is > 70° C and the concentration is less than 200 ppm, you can expect a service life of 8 hours at a normal work rate.
- Service life is inversely proportional to work rate.
- Reducing concentration by a factor of 10 will increase service life by a factor of 5.
- Humidity above 85% will reduce service life by 50%.

Change Schedules
Stericycle uses and provides air-purifying respirators for use by qualified employees. Cartridge change schedules will be evaluated on a task specific basis, and will be included in the associated SOP. Employees wearing that filter particulates shall change the cartridges on their respirators when they first begin to experience difficulty breathing (i.e., resistance). Employees wearing APRs shall change the cartridges on their respirators at the end of each work day to ensure the continued effectiveness of the respirators.

Self Contained Breathing Apparatus [SCBA] / Supplied Air [SAR]
A Self Contained Breathing Apparatus (SCBA), also known as a positive pressure respirator is used when there is not enough oxygen (<19.5%) in the atmosphere, when working in areas that have chemical concentrations that exceed the capacity of air-purifying respirators, and/or in areas of unknown or IDLH concentrations. To utilize such systems, a tank of supplied air is worn on the back of the user, or using a supplied air system with attached compressed air generators.

Emergency Escape Breathing Apparatus [EEBA]
EEBA is an emergency escape system which is comprised of a 5 or 10 minute bottle of breathing air attached to a hood, to be used for emergency escape only. The EEBA is designed to give workers breathable air they need in an emergency to escape from unsafe areas. This equipment does not require fit testing.

Medical Evaluation

Employees who are either required to wear respirators, or who choose to wear an APR voluntarily, must pass a medical exam before being permitted to wear a respirator on the job. Employees are not permitted to wear respirators until a physician has determined that they are medically able to do so. Any employee refusing the medical evaluation will not be allowed to work in an area requiring respirator use.

A licensed physician will provide the medical evaluations. Medical evaluation procedures are as follows:

- The medical evaluation will be conducted using the questionnaire provided in Appendix C of this program. All affected employees will complete the questionnaire.
- To the extent feasible, Stericycle will assist employees who are unable to read the questionnaire.
- Follow-up medical exams will be granted to employees as required and/or as deemed necessary by a licensed health care professional.
- All employees will be granted the opportunity to speak with the physician about the results of their medical evaluation, upon request.

Stericycle has provided a licensed health care professional with:

- a copy of this program,
- a copy of the Respiratory Protection Standard,
- the list of hazardous substances by work area,

And, for each affected employee requiring evaluation, the following will be provided:

- their work area or job title,
- proposed respirator type and weight, duration of required use
- expected physical work load (light, moderate, or heavy),
- potential temperature and humidity extremes,
- any additional protective clothing required.

Employee required for medical reasons to wear a positive pressure air purifying respirator will be provided with such.

After an employee has received clearance and begun to wear their respirator, additional medical evaluations will be provided under the following circumstances:

- The employee reports signs and/or symptoms relating to their ability to use a respirator, such as shortness of breath, dizziness, chest pains, or wheezing.
- The Facility Manager informs the Area Manager of ES&H that the employee needs to be reevaluated;

Respirator Use

The following Job Classifications are authorized and fit tested on the following equipment as needed.

Job Classification	Approve Respirator
Hazardous Waste Handler	Full Face APR, P100 or PAPR
Hazardous Waste Handler/Driver	Full Face APR, P100 or PAPR
Supervisors/Manager of Hazardous Operations	Full Face APR, P100 or PAPR
Emergency Response Teams	APR, SAR, SCBA, PAPR, or EEBA
Tank Entry Personnel	APR, SAR, or SCBA
RMS Spill Clean-Up Team	Full Face APR

Procedures for Use of Respirators

Prior to entering a hazardous atmosphere the following activities must be done every time a respirator is worn.

Facepiece Inspection

Visually check the respirator for signs of excessive wear or damage including the face piece, straps, valves, filter, cartridge/canister, and connections. This allows for the safe operation of the respirator and finds potential problems before entering a hazardous environment.

Filter Cartridge Inspection

Visually inspect the filter cartridge/canister to make sure that it is intact. Always change filters as recommended by the replacement schedules set forth in the SOP. Cartridge replacement schedules will be determined utilizing manufacturer's tools and recommendations for each JHA and PPE selection certificate and will be incorporated in the task specific SOP.

Facepiece Seal and Leak Check Requirements

Always perform the positive and negative pressure seal checks after putting the respirator on and before entering your work area. These procedures can be found in Appendix A.

Operation

Only use the respirator for their intended function and use the appropriate type of respirator, filter, and cartridge/canister for each unique situation. Normal Work Operations should proceed as follows:

1. Inspect the respirator
2. Put the respirator on and adjust the straps.
3. Perform a seal check of the respirator.
4. Enter the work area.
5. Leave work area.
6. Take respirator off.
7. Clean and dry the respirator.
8. Store the respirator properly.

Respirator Failure Procedures

If a respirator fails, or it is difficult to breathe, immediately leave the work area and take off the respirator. Never, under any circumstances, take off the face piece while in a hazardous area, even for a short period of time.

The employee must then inspect the device to try to determine the cause of the problem. If the respirator can be easily fixed, repairs should be made. If the employee cannot fix the problem, their supervisor should be notified of the problem. The problem must be fixed prior to using the respirator again.

Rules for General Use:

Stericycle employees will abide by the following general rules regard the usage of respirators. Employees will use the assigned respirators accordingly:

- Under conditions specified by this program, and in accordance with the training they receive.
- In the manner for which it is certified by NIOSH and the manufacturer.
- Where it is required, is mandatory.
- P100 air purifying filters will be used in atmosphere that may contain biological hazards.
- SCBA is to be used when sampling unknown materials.
- SCBA is to be used for ER initial entry/site characterization and tank entry
- Emergency Escape Breathing Apparatus [EEBA] – is to be used for escape only
- A loose fitting facepiece with a PAPR is to be used when facial hair or other conditions exist prevent the tight fitting with a tight fitting face mask.
- Employees who have a medical restriction on the usage of respirators must abide by the health care practitioner's recommendation.
- Employees must immediately notify their supervisor of any health status change that may disqualify them from using a respirator.
- Employees are only authorized to wear the type and size respirator for which they have been fitted.
- Air purifying respirators shall not be used in atmospheres that are either unknown, oxygen deficient or IDLH. Supplied air respirators are required in these environments.

All employees shall conduct user seal checks each time that they wear their respirator. Employees shall use either the positive or negative pressure check, depending on which test works best for them.

All employees shall be permitted to leave the work area to go to the locker room to maintain their respirator for the following reasons:

- to clean their respirator if the respirator is impeding their ability to work,
- to change filters or cartridges,
- to replace parts, or
- to inspect the respirator if it stops functioning as intended.

Employees are not permitted to wear tight-fitting respirators if they have any condition, such as facial scars, facial hair, or missing dentures, that prevents them from achieving a good seal.

Employees are not permitted to wear headphones, jewelry, or other articles that may interfere with the facepiece-to-face seal.

Breathing Air Quality and Use

Breathing Air Requirements

Compressed breathing air used in the SCBA shall meet at least the requirements for Type 1-Grade D breathing air described in ANSI/ Compressed Gas Association Commodity Specification for Air, G-7.1-1989. The air must have between 19.5%-23.5% oxygen by volume, a condensed hydrocarbon content of 5 mg/m^3 or less, a carbon monoxide content of 10 ppm or less, a carbon dioxide content of 1,000 ppm or less, and a lack of any noticeable odor. The dew point shall not exceed -50° F at 1 atm. Compressed air with more than 23.5% oxygen by volume must not be used in the SCBA. Respirators used for compressed air may not then be used for compressed oxygen.

Container Requirements

Cylinders used to supply breathing air must be maintained in accordance with Department of Transportation (DOT) regulations 49 CFR parts 173 and 178. Cylinders must have a certificate of analysis from the supplier showing that the air inside meets the requirements for Type 1-Grade D air.

Compressors Certification

Compressors must be constructed to prevent contaminated air from entering the air supply system. The dew point shall be 10° F below ambient conditions at 1 atm. Compressors must have air-purifying filters that are replaced regularly. The documentation for compressors and the SCBA should be kept at the location of the compressor and in the respiratory protection program. Carbon monoxide levels must not exceed 10 ppm in the breathing air.

Marking and Labeling Requirements

Stericycle must use breathing air cylinders marked with the NIOSH seal of certification as required by NIOSH 42 CFR.

Fit Testing

Fit testing is required for employees wearing respirators with a tight-fitting facepiece accordingly:

- Prior to being allowed to wear any respirator with a tight fitting facepiece.
- Annually.
- When there are changes in the employee's physical condition that could affect the respirator's fit (e.g., obvious change in body weight, facial scarring, etc.).
- Employees will be fit tested with the make, model, and size of respirator that they will actually wear.
- If an employee determines the fit of the respirator is unacceptable after passing a fit test, reasonable opportunity will be granted to select a different respirator and be retested.
- Employees will be provided with several models and sizes of respirators so that they may find an optimal fit.

Fit tests Protocol

The fit test shall be administered using an OSHA-accepted fit test procedure. The fit testing will be conducted while all other required personal protective equipment is worn.

HEPA filters will be changed as changes in breathing resistance dictates.

Respirator wearers must leave the operations area (respirator required areas):

- To wash their face and respirator as necessary;
- When changes in breathing resistances, or leakage in facepiece is detected;
- To Replace respirator, filter, cartridge or canister
- When experiencing discomfort;

Cleaning, Maintenance, Change Schedules and Storage

Cleaning

Cleaning and disinfecting will prolong the life, maximize effectiveness and prevent contamination of respirators. The respirator must be cleaned and disinfected in a manner that prevents damage to the respirator.

P-100 or equivalent dust masks will be discarded no less than the end of a work shift. 10-Minute hoods will be discarded and replaced after each use.

Loose-Fitting face pieces will be thoroughly cleaned and dried or discarded after use. Always clean respirators in accordance with manufacturer guidelines and recommendations.

Respirators for routine use during normal operations are issued to each employee for the exclusive use by that employee. Respirator facepieces shall not be shared.

Respirators shared by more than one and emergency use respirators Stericycle employee should be cleaned and disinfected immediately after use. The following procedure is to be used when cleaning and disinfecting respirators:

- Disassemble respirator, removing any filters, cartridges, valves, and speaking diaphragm.
- Wash the facepiece and associated parts with a solution of 1 mL bleach per L of water at 110° F. Do not use organic solvents.
- Rinse completely in clean warm water.
- Wipe the respirator with disinfectant wipes to kill germs.
- Air dry in a clean area.
- Reassemble the respirator and replace any defective parts.
- Place in a clean, dry plastic bag or other air tight container.

Note: The Facility Manager will ensure an adequate supply of appropriate cleaning and disinfection material at the cleaning station.

Maintenance

Respirators are to be properly maintained at all times in order to ensure that they function properly and adequately protect the employee. Maintenance involves a thorough visual inspection for cleanliness and defects. Worn or deteriorated parts will be replaced prior to use. No components will be replaced or repairs made beyond those recommended by the manufacturer. Repairs to regulators or alarms of atmosphere-supplying respirators will be conducted by the manufacturer.

The following checklist will be used when inspecting respirators:
Face piece:
- cracks, tears, or holes
- facemask distortion
- cracked or loose lenses/faceshield

Headstraps:
- breaks or tears
- broken buckles

Valves:
- residue or dirt
- cracks or tears in valve material

Filters/Cartridges:
- approval designation gaskets
- cracks or dents in housing proper cartridge for hazard

Supplied air apparatus must be inspected and documented no less that once per month. Regulators must be tested annually by a service professional. Air bottles shall be inspected and re-certified per the DOT special permit or in accordance with manufactures'' recommendation; specifically inspect:
- breathing air quality/grade
- condition of supply hoses
- hose connections
- settings on regulators and valves

Employees are required to go to an area that is free of respiratory hazards in order to remove and/or perform maintenance on their respirator such as:
- washing their face and respirator facepiece
- replacing the filter, cartridge or canister
- if breakthrough is detected or leakage in the facepiece occurs
- if damage to the respirator or its components is detected

Storage
Respirators must be stored in a clean, dry area, and in accordance with the manufacturer's recommendations. Respirators are stored in bags or rigid containers which will keep the respirator clean between uses. Facility personnel will store respirators outside of the contamination area. Drivers will carry respirators in spill bags or kits either in the cab of the vehicle or in the utility box. They will not be stored inside the waste hauling portion of the vehicle.

Store respirators to protect against dust, sunlight, extreme temperatures, excessive moisture, or damaging chemicals. The respirators must be stored so that facepieces and exhalation valves will rest in a normal position to prevent the rubber or plastic parts from becoming deformed. Respirators must be stored outside the contaminated areas so they may be put on in a clean area.

Respirator cartridges shall be stored in a sealed bag to prevent cartridges from becoming spent through atmospheric absorption.

Each employee will have their name on the bag and that bag will only be used to store that employee's respirator.

The Facility Manager will manage the storage and supply of respirators and respirator components.

Defective Respirators

Respirators that are defective or have defective parts shall be taken out of service immediately and bring the defect to the attention of the Facility Manager.

Training

Operational Range of Respirators Employed

Affected employees must know the limitations of each respirator and be able to choose the appropriate respirator. To determine the correct respirator for use in a particular situation the types of contaminants, the concentration of contaminants, the size of the particles, and the duration of exposure must be known. Also, Stericycle employees must be able to recognize medical signs and symptoms that reduce the effectiveness of respirators.

The Facility Manager will conduct training to affect employees. Affected Employees will be trained prior to using a respirator in the workplace. Supervisors will also be trained prior to using a respirator and/or prior to supervising employees that must wear respirators.

The training course will cover the following topics:

- Stericycle Respiratory Protection Program
- OSHA Respiratory Protection Standard
- Respiratory hazards and their health effects
- Proper selection and use of respirators
- Limitations and capabilities of respirators
- Respirator donning and user seal (fit) checks
- Fit testing
- Emergency use procedures
- Maintenance and storage
- Medical signs and symptoms limiting the effective use of respirators
- Reasons the respirator is needed;
- Warning properties of chemicals;
- How the respirator works;
- Inspection of the respirator;
- Employee responsibilities;

Frequency

Stericycle will provide comprehensive training to all Stericycle employees conducting operations where respiratory protection may be needed. Training on the program and use will be repeated annually, or more often if necessary. Employees will be trained prior to respirator use, when changes

in the work place or type of respirator render previous training obsolete and/or employee has not retained understanding.

Voluntary Use

The voluntary use of filtering facepiece (dust masks) respirators will be allowed provided the employee first notifies the employer and acknowledges the receipt of information as required by 29 CFR 1910.134 Appendix D.

Respirator training will be documented by the Facility Manager and the documentation will include the type, model, and size of respirator for which each employee has been trained.

Program Evaluation

The Area Manager of ES&H will conduct periodic evaluations of the workplace to ensure that the provisions of this program are being implemented. The evaluations will include regular consultations with employees who use respirators and their supervisors, site inspections, air monitoring, respirator fit, selection, use and maintenance, workplace conditions or regulations and a review of records. Problems identified and the corrective actions will be used to update this respiratory protection program.

Employee Consultation

The Area Manager of ES&H will conduct evaluations of the workplace to ensure that this written respiratory protection program is properly implemented. The Area Manager of ES&H will consult STERICYCLE employees to affirm that they are using the respirators correctly. Recommended changes expressed during this consultation shall be taken into account by STERICYCLE while evaluating the program

Documentation and Recordkeeping

This Respiratory Protection Program is available to all employees who wish to review it.

The Facility Manager maintains the training and fit test records for their employees. STERICYCLE will retain all records involving this respiratory protection program including equipment inspections, inventory, maintenance records, employee medical evaluations, fit testing results, and employee training. Medical evaluations shall be kept reasonably confidential in accordance with OSHA regulation. Fit testing records shall be kept until the subsequent fit testing is administered. Employee training records will retained for at least five years. Non-confidential records held under this program will be made available to STERICYCLE employees upon request

The following records will be maintained

- Medical evaluations in accordance with 29 CFR 1910.1020;
- Record of qualitative and quantitative fit tests to include;
  - Employee name or identification;
  - Specific make, model, style and size of respirator tested;
  - Date of test;
  - The pass/fail results for the fit test or the fit factor and strip chart recording or other recording of the test results for the fit test;
  - Fit test records shall be retained for respirator users until the next fit test is administered.

Appendix A: Fit Testing Procedures

OSHA Positive Pressure Seal Check

Please see the next pages.

OSHA Negative Pressure Seal Check

Please see the next pages.

OSHA Qualitative Fit Test

Please see the next pages.

OSHA Respirator Cleaning Procedures

Please see the next pages.

Appendix A to § 1910.134: Fit Testing Procedures (Mandatory)

Part I. OSHA-Accepted Fit Test Protocols

A. Fit Testing Procedures -- General Requirements

The employer shall conduct fit testing using the following procedures. The requirements in this appendix apply to all OSHA-accepted fit test methods, both QLFT and QNFT.

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.

3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.

5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following item A.6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
(a) Position of the mask on the nose
(b) Room for eye protection
(c) Room to talk
(d) Position of mask on face and cheeks

7. The following criteria shall be used to help determine the adequacy of the respirator fit:
(a) Chin properly placed;
(b) Adequate strap tension, not overly tightened;
(c) Fit across nose bridge;
(d) Respirator of proper size to span distance from nose to chin;
(e) Tendency of respirator to slip;
(f) Self-observation in mirror to evaluate fit and respirator position.

8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks described in Appendix B-1 of this section or those recommended by the respirator manufacturer which provide equivalent protection to the procedures in Appendix B-1. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.

9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

10. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.

11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.

12. Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.

14. Test Exercises.
(a) Employers must perform the following test exercises for all fit testing methods prescribed in this appendix, except for the CNP quantitative fit testing protocol and the CNP REDON quantitative fit testing protocol. For these two protocols, employers must ensure that the test subjects (i.e., employees) perform the exercise procedure specified in Part I.C.4(b) of this appendix for the CNP quantitative fit testing protocol, or the exercise procedure described in Part I.C.5(b) of this appendix for the CNP REDON quantitative fit-testing protocol. For the remaining fit testing methods, employers must ensure that employees perform the test exercises in the appropriate test environment in the following manner:
(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.

(3) Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

(4) Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

(6) Grimace. The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT)

(7) Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

(8) Normal breathing. Same as exercise (1).
(b) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

B. Qualitative Fit Test (QLFT) Protocols

1. General
(a) The employer shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.

(b) The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.
2. Isoamyl Acetate Protocol

Note: This protocol is not appropriate to use for the fit testing of particulate respirators. If used to fit test particulate respirators, the respirator must be equipped with an organic vapor filter.
(a) Odor Threshold Screening

Odor threshold screening, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of isoamyl acetate at low levels.
(1) Three 1 liter glass jars with metal lids are required.

(2) Odor-free water (e.g., distilled or spring water) at approximately 25 deg. C (77 deg. F) shall be used for the solutions.

(3) The isoamyl acetate (IAA) (also known at isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 ml of odor-free water in a 1 liter jar, closing the lid and shaking for 30 seconds. A new solution shall be prepared at least weekly.

(4) The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well-ventilated to prevent the odor of IAA from becoming evident in the general room air where testing takes place.

(5) The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 ml of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.

(6) A test blank shall be prepared in a third jar by adding 500 cc of odor-free water.

(7) The odor test and test blank jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.

(8) The following instruction shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

(9) The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

(10) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

(11) If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.
(b) Isoamyl Acetate Fit Test
(1) The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.

(2) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors.

(3) After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well-ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

(4) A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.

(5) Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.

(6) Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the test exercises; or to demonstrate some of the exercises.

(7) If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

(8) If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure described in (b) (1) through (7) above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

(9) If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.

(10) When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

3. Saccharin Solution Aerosol Protocol
The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.
(a) Taste threshold screening. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.
(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches in diameter by 14 inches tall with at least the front portion clear and that allows free movements of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts # FT 14 and # FT 15 combined, is adequate.

(2) The test enclosure shall have a 3/4-inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

(3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his/her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a sweet taste.

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The threshold check solution is prepared by dissolving 0.83 gram of sodium saccharin USP in 100 ml of warm water. It can be prepared by putting 1 ml of the fit test solution (see (b)(5) below) in 100 ml of distilled water.

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

(7) Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted. If the test subject reports tasting the sweet taste during the ten squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeezes actually completed.

(8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the second ten squeezes, the screening test is completed. The taste threshold is noted as twenty regardless of the number of squeezes actually completed.

(9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted as thirty regardless of the number of squeezes actually completed.

(10) The test conductor will take note of the number of squeezes required to solicit a taste response.

(11) If the saccharin is not tasted after 30 squeezes (step 10), the test subject is unable to taste saccharin and may not perform the saccharin fit test.

Note to paragraph 3. (a): If the test subject eats or drinks something sweet before the screening test, he/she may be unable to taste the weak saccharin solution.

(12) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

(13) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(14) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every four hours.
(b) Saccharin solution aerosol fit test procedure.
(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure described in 3. (a) above.

(3) The test subject shall don the enclosure while wearing the respirator selected in section I. A. of this appendix. The respirator shall be properly adjusted and equipped with a particulate filter(s).

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 ml of warm water.

(6) As before, the test subject shall breathe through the slightly open mouth with tongue extended, and report if he/she tastes the sweet taste of saccharin.

(7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of saccharin fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test. A minimum of 10 squeezes is required.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the original number of squeezes used initially (e.g., 5, 10 or 15).

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected. If the test subject does not report tasting the saccharin, the test is passed.

(11) If the taste of saccharin is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

(12) Since the nebulizer has a tendency to clog during use, the test operator must make periodic checks of the nebulizer to ensure that it is not clogged. If clogging is found at the end of the test session, the test is invalid.

4. Bitrex™ (Denatonium Benzoate) Solution Aerosol Qualitative Fit Test Protocol

The Bitrex™ (Denatonium benzoate) solution aerosol QLFT protocol uses the published saccharin test protocol because that protocol is widely accepted. Bitrex is routinely used as a taste aversion agent in household liquids which children should not be drinking and is endorsed by the American Medical Association, the National Safety Council, and the American Association of Poison Control Centers. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) Taste Threshold Screening.

The Bitrex taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of Bitrex.

(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches (30.5 cm) in diameter by 14 inches (35.6 cm) tall. The front portion of the enclosure shall be clear from the respirator and allow free movement of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts # FT 14 and # FT 15 combined, is adequate.

(2) The test enclosure shall have a \3/4\ inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

(3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his or her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a bitter taste

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the Threshold Check Solution into the enclosure. This Nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The Threshold Check Solution is prepared by adding 13.5 milligrams of Bitrex to 100 ml of 5% salt (NaCl) solution in distilled water.

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely, and is then released and allowed to fully expand.

(7) An initial ten squeezes are repeated rapidly and then the test subject is asked whether the Bitrex can be tasted. If the test subject reports tasting the bitter taste during the ten squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeezes actually completed.

(8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the second ten

squeezes, the screening test is completed. The taste threshold is noted as twenty regardless of the number of squeezes actually completed.

(9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted as thirty regardless of the number of squeezes actually completed.

(10) The test conductor will take note of the number of squeezes required to solicit a taste response.

(11) If the Bitrex is not tasted after 30 squeezes (step 10), the test subject is unable to taste Bitrex and may not perform the Bitrex fit test.

(12) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

(13) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(14) The nebulizer shall be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every four hours.
(b) Bitrex Solution Aerosol Fit Test Procedure.
(1) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure as that described in 4. (a) above.

(3) The test subject shall don the enclosure while wearing the respirator selected according to section I. A. of this appendix. The respirator shall be properly adjusted and equipped with any type particulate filter(s).

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 337.5 mg of Bitrex to 200 ml of a 5% salt (NaCl) solution in warm water.

(6) As before, the test subject shall breathe through his or her slightly open mouth with tongue extended, and be instructed to report if he/she tastes the bitter taste of Bitrex.

(7) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of the fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test.

(8) After generating the aerosol, the test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the number of squeezes used initially (e.g., 5, 10 or 15).

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of Bitrex is detected. If the test subject does not report tasting the Bitrex, the test is passed.

(11) If the taste of Bitrex is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).
5. Irritant Smoke (Stannic Chloride) Protocol

This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.
(a) General Requirements and Precautions
(1) The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

(2) Only stannic chloride smoke tubes shall be used for this protocol.

(3) No form of test enclosure or hood for the test subject shall be used.

(4) The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

(5) The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.
(b) Sensitivity Screening Check

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.
(1) The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

(2) The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

(3) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.
(c) Irritant Smoke Fit Test Procedure
(1) The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).

(2) The test subject shall be instructed to keep his/her eyes closed.

(3) The test operator shall direct the stream of irritant smoke from the smoke tube toward the faceseal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The

operator shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.

(4) If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

(5) The exercises identified in section I.A. 14. of this appendix shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

(6) If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

(7) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

(8) If a response is produced during this second sensitivity check, then the fit test is passed.

C. Quantitative Fit Test (QNFT) Protocols

The following quantitative fit testing procedures have been demonstrated to be acceptable: Quantitative fit testing using a non-hazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; Quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit; Quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

1. General
(a) The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly and ensure that test equipment is in proper working order.

(b) The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.
2. Generated Aerosol Quantitative Fit Testing Protocol
(a) Apparatus.
(1) Instrumentation. Aerosol generation, dilution, and measurement systems using particulates (corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS] or sodium chloride) as test aerosols shall be used for quantitative fit testing.

(2) Test chamber. The test chamber shall be large enough to permit all test subjects to perform freely all required exercises without disturbing the test agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the test agent is effectively isolated from the ambient air, yet uniform in concentration throughout the chamber.

(3) When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high efficiency particulate air (HEPA) or P100 series filter supplied by the same manufacturer.

(4) The sampling instrument shall be selected so that a computer record or strip chart record may be made of the test showing the rise and fall of the test agent concentration with each inspiration and expiration at fit factors of at least 2,000. Integrators or computers that integrate the amount of test agent penetration leakage into the respirator for each exercise may be used provided a record of the readings is made.

(5) The combination of substitute air-purifying elements, test agent and test agent concentration shall be such that the test subject is not exposed in excess of an established exposure limit for the test agent at any time during the testing process, based upon the length of the exposure and the exposure limit duration.

(6) The sampling port on the test specimen respirator shall be placed and constructed so that no leakage occurs around the port (e.g., where the respirator is probed), a free air flow is allowed into the sampling line at all times, and there is no interference with the fit or performance of the respirator. The in-mask sampling device (probe) shall be designed and used so that the air sample is drawn from the breathing zone of the test subject, midway between the nose and mouth and with the probe extending into the facepiece cavity at least 1/4 inch.

(7) The test setup shall permit the person administering the test to observe the test subject inside the chamber during the test.

(8) The equipment generating the test atmosphere shall maintain the concentration of test agent constant to within a 10 percent variation for the duration of the test.

(9) The time lag (interval between an event and the recording of the event on the strip chart or computer or integrator) shall be kept to a minimum. There shall be a clear association between the occurrence of an event and its being recorded.

(10) The sampling line tubing for the test chamber atmosphere and for the respirator sampling port shall be of equal diameter and of the same material. The length of the two lines shall be equal.

(11) The exhaust flow from the test chamber shall pass through an appropriate filter (i.e., high efficiency particulate filter) before release.

(12) When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed 50 percent.

(13) The limitations of instrument detection shall be taken into account when determining the fit factor.

(14) Test respirators shall be maintained in proper working order and be inspected regularly for deficiencies such as cracks or missing valves and gaskets.
(b) Procedural Requirements.
(1) When performing the initial user seal check using a positive or negative pressure check, the sampling line shall be crimped closed in order to avoid air pressure leakage during either of these pressure checks.

(2) The use of an abbreviated screening QLFT test is optional. Such a test may be utilized in order to quickly identify poor fitting respirators that passed the positive and/or negative pressure test and reduce the amount of QNFT time. The use of the CNC QNFT instrument in the count mode is another optional method to obtain a quick estimate of fit and eliminate poor fitting respirators before going on to perform a full QNFT.

(3) A reasonably stable test agent concentration shall be measured in the test chamber prior to testing. For canopy or shower curtain types of test units, the determination of the test agent's stability may be established after the test subject has entered the test environment.

(4) Immediately after the subject enters the test chamber, the test agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed 5 percent for a half mask or 1 percent for a full facepiece respirator.

(5) A stable test agent concentration shall be obtained prior to the actual start of testing.

(6) Respirator restraining straps shall not be over-tightened for testing. The straps shall be adjusted by the wearer without assistance from other persons to give a reasonably comfortable fit typical of normal use. The respirator shall not be adjusted once the fit test exercises begin.

(7) The test shall be terminated whenever any single peak penetration exceeds 5 percent for half masks and 1 percent for full facepiece respirators. The test subject shall be refitted and retested.

(8) Calculation of fit factors.
(i) The fit factor shall be determined for the quantitative fit test by taking the ratio of the average chamber concentration to the concentration measured inside the respirator for each test exercise except the grimace exercise.

(ii) The average test chamber concentration shall be calculated as the arithmetic average of the concentration measured before and after each test (i.e., 7 exercises) or the arithmetic average of the concentration measured before and after each exercise or the true average measured continuously during the respirator sample.

(iii) The concentration of the challenge agent inside the respirator shall be determined by one of the following methods:

(A) Average peak penetration method means the method of determining test agent penetration into the respirator utilizing a strip chart recorder, integrator, or computer. The agent penetration is determined by an average of the peak heights on the graph or by computer integration, for each exercise except the grimace exercise. Integrators or computers that calculate the actual test agent penetration into the respirator for each exercise will also be considered to meet the requirements of the average peak penetration method.

(B) Maximum peak penetration method means the method of determining test agent penetration in the respirator as determined by strip chart recordings of the test. The highest peak penetration for a given exercise is taken to be representative of average penetration into the respirator for that exercise.

(C) Integration by calculation of the area under the individual peak for each exercise except the grimace exercise. This includes computerized integration.

(D) The calculation of the overall fit factor using individual exercise fit factors involves first converting the exercise fit factors to penetration values, determining the average, and then converting that result back to a fit factor. This procedure is described in the following equation:

$$\text{Overall Fit Factor} = \frac{\text{Number of exercises}}{1/ff_1 + 1/ff_2 + 1/ff_3 + 1/ff_4 + 1/ff_5 + 1/ff_6 + 1/ff_7 + 1/ff_8}$$

Where ff_1, ff_2, ff_3, etc. are the fit factors for exercises 1, 2, 3, etc.

(9) The test subject shall not be permitted to wear a half mask or quarter facepiece respirator unless a minimum fit factor of 100 is obtained, or a full facepiece respirator unless a minimum fit factor of 500 is obtained.

(10) Filters used for quantitative fit testing shall be replaced whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media.
3. Ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol.

The ambient aerosol condensation nuclei counter (CNC) quantitative fit testing (Portacount ™) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.
(a) Portacount Fit Test Requirements.
(1) Check the respirator to make sure the sampling probe and line are properly attached to the facepiece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 series 100, series 99, or series 95 particulate filter) per manufacturer's instruction.

(2) Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

(3) Check the following conditions for the adequacy of the respirator fit: Chin properly placed; Adequate strap tension, not overly tightened; Fit across nose bridge; Respirator of proper size to span distance from nose to chin; Tendency of the respirator to slip; Self-observation in a mirror to evaluate fit and respirator position.

(4) Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting facepiece, try another size of the same model respirator, or another model of respirator.

(5) Follow the manufacturer's instructions for operating the Portacount and proceed with the test.

(6) The test subject shall be instructed to perform the exercises in section I. A. 14. of this appendix.

(7) After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

(b) Portacount Test Instrument.
(1) The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.

(2) Since the pass or fail criterion of the Portacount is user programmable, the test operator shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance in this Appendix.

(3) A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.
4. Controlled negative pressure (CNP) quantitative fit testing protocol.

The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators. The CNP instrument manufacturer Occupational Health Dynamics of Birmingham, Alabama also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his or her mouth and holds his/her breath, after which an air pump removes air from the respirator facepiece at a pre-selected constant pressure. The facepiece fit is expressed as the leak rate through the facepiece, expressed as milliliters per minute. The quality and validity of the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half-mask respirator and a minimum fit factor of at least 500 is required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.
(a) CNP Fit Test Requirements.
(1) The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.

(2) The CNP system defaults selected for test pressure shall be set at -- 15 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

(Note: CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.)

(3) The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.

(4) The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstream from the manifold either needs to be temporarily removed or propped open.

(5) The employer must train the test subject to hold his or her breath for at least 10 seconds.

(6) The test subject must don the test respirator without any assistance from the test administrator who is conducting the CNP fit test. The respirator must not be adjusted once the fit-test exercises begin. Any adjustment voids the test, and the test subject must repeat the fit test.

(7) The QNFT protocol shall be followed according to section I. C. 1. of this appendix with an exception for the CNP test exercises.
(b) CNP Test Exercises.
(1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during test measurement.

(3) Turning head side to side. Standing in place, the subject shall slowly turn his or her head from side to side between the extreme positions on each side for 1 minute. The head shall be held at each extreme momentarily so the subject can inhale at each side. After the turning head side to side exercise, the subject needs to hold head full left and hold his or her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his or her breath for 10 seconds during test measurement.

(4) Moving head up and down. Standing in place, the subject shall slowly move his or her head up and down for 1 minute. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his or her head full up and hold his or her breath for 10 seconds during test measurement. Next, the subject shall hold his or her head full down and hold his or her breath for 10 seconds during test measurement.

(5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(6) Grimace. The test subject shall grimace by smiling or frowning for 15 seconds.

(7) Bending Over. The test subject shall bend at the waist as if he or she were to touch his or her toes for 1 minute. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(8) Normal Breathing. The test subject shall remove and re-don the respirator within a one-minute period. Then, in a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject shall hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of a respirator shall be tried.
(c) CNP Test Instrument.
(1) The test instrument must have an effective audio-warning device, or a visual-warning device in the form of a screen tracing, that indicates when the test subject fails to hold his or her breath during the test. The test must be terminated and restarted from the beginning when the test subject fails to hold his or her breath during the test. The test subject then may be refitted and retested.

(2) A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style and size of respirator used; and date tested.
5. Controlled negative pressure (CNP) REDON quantitative fit testing protocol.
(a) When administering this protocol to test subjects, employers must comply with the requirements specified in paragraphs (a) and (c) of Part I.C.4 of this appendix ("Controlled negative pressure (CNP) quantitative fit testing protocol"), as well as use the test exercises described below in paragraph (b) of this protocol instead of the test exercises specified in paragraph (b) of Part I.C.4 of this appendix.

(b) Employers must ensure that each test subject being fit tested using this protocol follows the exercise and measurement procedures, including the order of administration, described below in Table A-1 of this appendix.

Table A-1. -- CNP REDON Quantitative Fit Testing Protocol

Exercises[(1)]	Exercise procedure	Measurement procedure
Facing Forward	Stand and breathe normally, without talking, for 30 seconds.	Face forward, while holding breath for 10 seconds.
Bending Over	Bend at the waist, as if going to touch his or her toes, for 30 seconds.	Face parallel to the floor, while holding breath for 10 seconds
Head Shaking	For about three seconds, shake head back and forth vigorously several times while shouting.	Face forward, while holding breath for 10 seconds.
REDON 1	Remove the respirator mask, loosen all facepiece straps, and then redon the respirator mask.	Face forward, while holding breath for 10 seconds.
REDON 2	Remove the respirator mask, loosen all facepiece straps, and then redon the respirator mask again.	Face forward, while holding breath for 10 seconds.

[1] Exercises are listed in the order in which they are to be administered.

(c) After completing the test exercises, the test administrator must question each test subject regarding the comfort of the respirator. When a test subject states that the respirator is unacceptable, the employer must ensure that the test administrator repeats the protocol using another respirator model.

(d) Employers must determine the overall fit factor for each test subject by calculating the harmonic mean of the fit testing exercises as follows:

$$\text{Overall Fit Factor} = \frac{N}{[1/FF_1 + 1/FF_2 + \ldots 1/FF_N]}$$

Where:
N = The number of exercises;
FF1 = The fit factor for the first exercise;
FF2 = The fit factor for the second exercise; and
FFN = The fit factor for the nth exercise.

Part II. New Fit Test Protocols

A. Any person may submit to OSHA an application for approval of a new fit test protocol. If the application meets the following criteria, OSHA will initiate a rulemaking proceeding under section 6(b)(7) of the OSH Act to determine whether to list the new protocol as an approved protocol in this Appendix A.

B. The application must include a detailed description of the proposed new fit test protocol. This application must be supported by either:

1. A test report prepared by an independent government research laboratory (e.g., Lawrence Livermore National Laboratory, Los Alamos National Laboratory, the National Institute for Standards and

Technology) stating that the laboratory has tested the protocol and had found it to be accurate and reliable; or

2. An article that has been published in a peer-reviewed industrial hygiene journal describing the protocol and explaining how test data support the protocol's accuracy and reliability.

C. If OSHA determines that additional information is required before the Agency commences a rulemaking proceeding under this section, OSHA will so notify the applicant and afford the applicant the opportunity to submit the supplemental information. Initiation of a rulemaking proceeding will be deferred until OSHA has received and evaluated the supplemental information.

Appendix B-1 to § 1910.134: User Seal Check Procedures (Mandatory)

The individual who uses a tight-fitting respirator is to perform a user seal check to ensure that an adequate seal is achieved each time the respirator is put on. Either the positive and negative pressure checks listed in this appendix, or the respirator manufacturer's recommended user seal check method shall be used. User seal checks are not substitutes for qualitative or quantitative fit tests.

I. Facepiece Positive and/or Negative Pressure Checks

A. Positive pressure check. Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

B. Negative pressure check. Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold the breath for ten seconds. The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

II. Manufacturer's Recommended User Seal Check Procedures

The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures provided that the employer demonstrates that the manufacturer's procedures are equally effective.

Respirator Cleaning Procedures (Mandatory) § 1910.134: Appendix B-2

These procedures are provided for employer use when cleaning respirators. They are general in nature, and the employer as an alternative may use the cleaning recommendations provided by the manufacturer of the respirators used by their employees, provided such procedures are as effective as those listed here in Appendix B- 2. Equivalent effectiveness simply means that the procedures used must accomplish the objectives set forth in Appendix B-2, i.e., must ensure that the respirator is properly cleaned and disinfected in a manner that prevents damage to the respirator and does not cause harm to the user.

I. Procedures for Cleaning Respirators

A. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure- demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

B. Wash components in warm (43 deg. C [110 deg. F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

C. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain.

D. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:

1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 deg. C (110 deg. F); or,

2. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43 deg. C (110 deg. F); or,

3. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

E. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

F. Components should be hand-dried with a clean lint-free cloth or air-dried.

G. Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.

H. Test the respirator to ensure that all components work properly.

Appendix B: Respirator Filter/Cartridge Selection Chart

Filter/Cartridge	Description	Chemicals
black	organic vapors	organic vapors
purple and black	organic vapors cartridge plus HEPA filter	organic vapors and solid and liquid aerosol particulates including oils
yellow	organic vapors/ acid gases cartridge	organic vapors, chlorine, chlorine dioxide, hydrogen chloride, hydrogen fluoride, and sulfur dioxide
white	acid gases/formaldehyde cartridge	chlorine, hydrogen chloride, sulfur dioxide, and formaldehyde
green	ammonia/ methylamine cartridge	ammonia and methylamine
purple	P100 filter cartridge	biological hazards, solid and liquid aerosol particulates including oils
purple and yellow	acid gases/ organic vapors cartridge cartridge plus HEPA filter	organic vapors, chlorine, hydrogen chloride, sulfur dioxide, chlorine dioxide, solid and liquid aerosol particulates including oils
purple and green	ammonia/ methylamine cartridge cartridge plus HEPA filter	ammonia and methyamine, solid and liquid aerosol particulates including oils
pre-filter	N95 filter	solid and liquid non-oil based aerosols, dusts, mists, and welding fumes
pre-filter	R95 filter	solid and liquid non-oil based aerosols, dusts, mists, and welding fumes

Appendix C: Respiratory Equipment List

Respirators

3M Full Facepiece series 6800, 6900

3M Full Facepiece series 7800

MSA – Full Facepiece – Model # Ultra Twin

North – Full Facepiece – Model # 7600

Loose Fitting Facepeiece – Make Model#

MSA – SCBA

North 850 - EEBA

Replacement Hoods, Loose-fitting Facepeieces

Cartridges

Pink	P100 Filter (Particulates) Cartridge or Attachment
Black	Multi Gas Organic Vapor Cartridge or Combo
Black/Pink	3M Multi Gas/Vapor Cartridge/P100 Filter (Model 60926) –

Voluntary Use of Dust Masks

OSHA refers to disposable paper respirators (or dust masks) as "filtering facepieces." This type of respirator is defined as a "negative pressure particulate respirator with a filter that is an integral part of the facepiece or with the entire facepiece composed of the filter medium".

Appendix D to 29 CFR 1910.134, Information for Employees Using Respirators When Not Required Under the Standard is as follows:

"Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection of workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If the employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard."

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care and warnings regarding the respirators limitations.

2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.

3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.

4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

I have read the above requirements for the voluntary use of the disposable paper respirator (dust mask). I have had the opportunity to ask questions and have them answered.

_____ _____

Name (Printed) Name (Signature

_____

Date

3M™ Cartridge and Filter Replacement Program

Date: 3/6/2013

See Technical Data Bulletin 142 for more information on the re-use of organic vapor cartridges.

This table is used as a summary only. Keep a record of your 3M Service Life Software calculations.

Work Area	Employee	Contaminant	Exposure (ppm or mg/m3)	Respirator Use Frequency	Estimated Service Life	Storage and Reuse Permitted Yes/No	Cartridge Change Schedule	Cartridge Description	Cartridge Name	Cartridge Order Code	Cartridge Quantity (month)		
Lab Trash Compacting	San Jose	Acetone, Ethyl Alcohol, Methyl Alcohol, Xylene		1 Hour				North Combo + P100				Need IH	
Mercury Amalgam Consolidation	San Jose	Mercury	.035 mg/m3	4 Hours	EOS	YES	EOS indicator	Mercury					
Formaldehyde Pouring	Blaine	Formaldehyde	0.6 ppm	15 minutes	84 Hours	Yes	Monthly	3M Formaldehyde Cartridge	6005			Need to evaluate for 6006	
Formaldehyde Pouring	Los Angeles	Formaldehyde	4 ppm	2 hours									
Sorting Pharmaceuticals		Bacteria, Virus, Pharmaceutical Aerosols		4 - 6 Hours	If filter becomes damaged, soiled or breathing becomes difficult or 40 Hours or 30 Days whichever comes first	NO		P-100					
Pouring Pesticides	Tulsa	Chlordane, Diazanon, Methoxychlor, Lindane, Heptachlor	0.002 mg/m3 Lindane, 0.0004 mg/m3 Heptachlor, .004 mg/m3 Methoxychlor	2 Hours					6006				
Pouring Acids	Tulsa	HCL, HNO3, HF, H2SO4,H3PO4	ND	2 Hours					6006				
Pouring Bases	Tulsa	Sodium, Potassium	ND	2 Hours					6006				
Consolidating Paint Filters	Blaine	Particulates, Barium, Chrome, Copper, Zinc, Vanadium,Manganese		6 Hours	If filter becomes damaged, soiled or breathing becomes difficult or 8 Hours whichever comes first	NO		N-95				Need IH	
Solvent Pour at Customer	Blaine	Xylene, Methanol, IPA, Acetonitrile, Tetrahydrofuran	Ethyl Alchol 9.8 ppm Xylene 5.6 ppm	15 minutes	75 Hours	YES	Monthly	MGV Multi Gas Vapor - Olive	6006			Need IH	
Solvent Pour HHW		VOA, Gasoline											
Pumping Flammables		VOA											
Pouring Flammables in Tulsa	Tulsa	Various	Not Req per IH Studies										

SCBA MONTHLY CHECKLIST

SCBA Serial Number: _____

TEST:		**DATE:**					
Cylinder Check: Cylinder Filled (>30 in)							
High Pressure Alarm: (open cylinder valve, listen)							
Valve Packing not leaking? (listen, close cylinder valve)							
Regulator Pressure Gauge: (reads same as cylinder?)							
Low Pressure Alarm: (open purge, close)							
Straps:							
Complete Set							
Not Frayed or Damaged							
Buckles: Lock Correctly							
Back Plate and Cylinder Lock:							
No Missing Rivets or Screws:							
Strap Tightener and Lock Fully Engaged: **Cylinder:**							
Tightly Fastened to Backplate							
Hydrostatic Test Date: (within 3 years)							
No Cuts in Fiberglass Wrap:							
Gauge Face Clear:							
High-Pressure Hose and Connector Condition:							
Facepiece:							
Lens Clear							
Overall Condition:							

TEST:		DATE:					
Breathing Tube and Connector: Condition							
Storage:							
Re-check gauge: Cylinder Full (>30 in)							
Pressure Bled from Hose and Regulator:							
Cylinder, Purge Valves Closed:							
Straps, Facepiece Reset/ Stored Properly:							
INSPECTION PERFORMED BY: (initial)							

This checklist must be kept where the SCBA(s) and/or emergency use respirator(s) are stored. After each monthly inspection, a copy of the SCBA Checklist must be sent to the HSE Manager for recordkeeping.

APPENDIX E

STORM SEWER CONDUIT EVALUATION, NOVEMBER 17, 2016

RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

C. HEIDI GRETHER
DIRECTOR

December 22, 2016

Mr. Andy Maloy, Director
EH&S Risk Management
Stericycle Environmental Solutions/PSC
18000 72nd Avenue South, Suite 217
Kent, Washington 98032

Dear Mr. Maloy:

SUBJECT: Sewer Evaluation Report; Petro-Chem Processing Group of Nortru, LLC, Detroit, Michigan; MID 980 615 298

The Michigan Department of Environmental Quality (MDEQ), Office of Waste Management and Radiological Protection (OWMRP) has received the Sewer Evaluation report (Report) dated November 17, 2016. The OWMRP reviewed the Report for compliance with the hazardous waste management facility operating license (License) effective December 18, 2012, and Part 111, Hazardous Waste Management, of the Michigan Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

Based on this review, the OWMRP agrees with the conclusions of the Report that the sewer line along St. Jean Avenue is not intercepting groundwater. OWMRP agrees the storm sewer conduit is a relevant pathway, as there is a reasonable potential that a municipal utility worker could be exposed to hazardous substances in soil during sewer repair operations. Known groundwater concentrations along St. Jean Avenue are not above cleanup criteria for utility workers (non-residential).

Thank you for conducting the study. Should you have any questions regarding this review, please contact me at 517-284-6571; slaytond@michigan.gov; or MDEQ, OWMRP, P.O. Box 30241, Lansing, Michigan 48909-7741.

Sincerely,

David Slayton

David Slayton, Chief
Management & Tracking Unit
Hazardous Waste Section
Office of Waste Management and
Radiological Protection

cc: Mr. Jeffrey Davis, PSC Environmental Services
Ms. Kellie Wing, Bureau Veritas North America, Inc.
Ms. Tracy Kecskemeti, MDEQ
Mr. Jim Day, MDEQ
Ms. Virginia Himich, MDEQ
Mr. Dan Dailey, MDEQ
Mr. John McCabe, MDEQ
Dr. Kristen Kellock, MDEQ
Corrective Action File

Stericycle
Environmental Solutions

November 17, 2016

Mr. David Slayton
Michigan Department of Environmental Quality
Permits and Corrective Action Unit
Hazardous Waste Section
PO Box 30241
Lansing, MI 48909

Subject: **Sewer Evaluation**
Petro-Chem Processing Group of Nortru, LLC
Detroit, MI MID 980 615 298

Dear Mr. Slayton:

Bureau Veritas has evaluated the potential for the storm sewer located beneath St. Jean Avenue to influence groundwater flow on the west side of the Petro-Chem facility, and has concluded that the sewer system likely does not act as a preferential pathway for groundwater flow. Please see the attached evaluation for more details.

If you have any questions, please contact me at 425-227-6170.

Sincerely,

Andy Maloy
Director, Environmental Liability Management

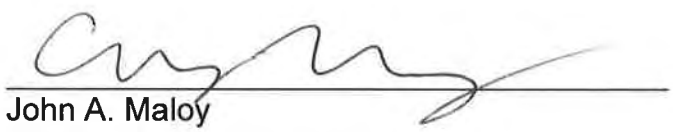
cc: Ed Burke, Stericycle
Kellie Wing, Bureau Veritas

Sewer Evaluation
Nortru, LLC
Petro-Chem Processing Group Facility
421 Lycaste Street, Detroit, MI

November 17, 2016

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



John A. Maloy
Director, EH&S Risk Management

Storm Sewer Conduit Evaluation

Stericycle Environmental Solutions, Inc.,
Petro-Chem Processing Group Facility
421 Lycaste Street
Detroit, Michigan

November 17, 2016
11016-000171.00

Prepared for:
Stericycle Environmental Solutions, Inc.
Detroit, Michigan

BUREAU VERITAS
For the benefit of business and people

Bureau Veritas North America, Inc.
22345 Roethel Drive
Novi, Michigan 48375
248.344.2661

Bureau Veritas North America, Inc. (Bureau Veritas) has evaluated the potential for the storm sewer conduit, located along the eastern side of Old St. Jean Avenue, to act as a preferential pathway for groundwater contamination which could migrate beyond the boundaries of the Petro-Chem Processing Group facility located at 421 Lycaste in Detroit, Michigan. A 24-inch storm water sewer line is present along the western boundary (i.e., downgradient side) of the subject property, within the right-of-way of Old St. Jean Avenue.

The storm sewer along Old St. Jean Avenue originates just to the north of the subject property and flows southward into either the 36-inch or 42-inch storm sewer that runs along the south side of Freud Street. The Old St. Jean Avenue storm sewer and appears to have been installed in 1937, after the larger sewers in the area were installed. Based on field measurements taken at two catch basins along Old St. Jean Avenue, the top of the sewer at the northwest manhole is approximately 12 feet 10-inches below the ground surface, while the top of the sewer in the southwest manhole is approximately 13 feet 3-inches below the ground surface. The measurements corroborate the southward flow (to 20 feet deep) shown on the engineering drawing. See Figure 1.

Based on the well-documented subsurface soil types that exist along the western boundary of the subject property, the storm sewer was installed within the dry clay till formation (i.e., aquitard) that uniformly underlies a perched water-bearing unit consisting of sand, peat, or sand and peat. See Figures 2 and 3 for cross-sections showing the lithology and location of the storm sewer.

Based on typical sewer installation methods from the 1920s and 1930s, it is likely that the sewer installation trench was backfilled with the native clay soil excavated from the trench and not with engineered bedding material (i.e., crushed gravel or sand). The permeability of the native clay is expected to minimize flow along the sewer trench and prevent flow beyond the walls of the sewer trench.

Although unlikely, if contaminated groundwater were to infiltrate into the storm sewer along Old St. Jean Avenue, the exposure pathway is not complete because this storm sewer (and others in the area) are part of a combined sewer system that discharges to a City of Detroit Waste Water Treatment Plant (WWTP).

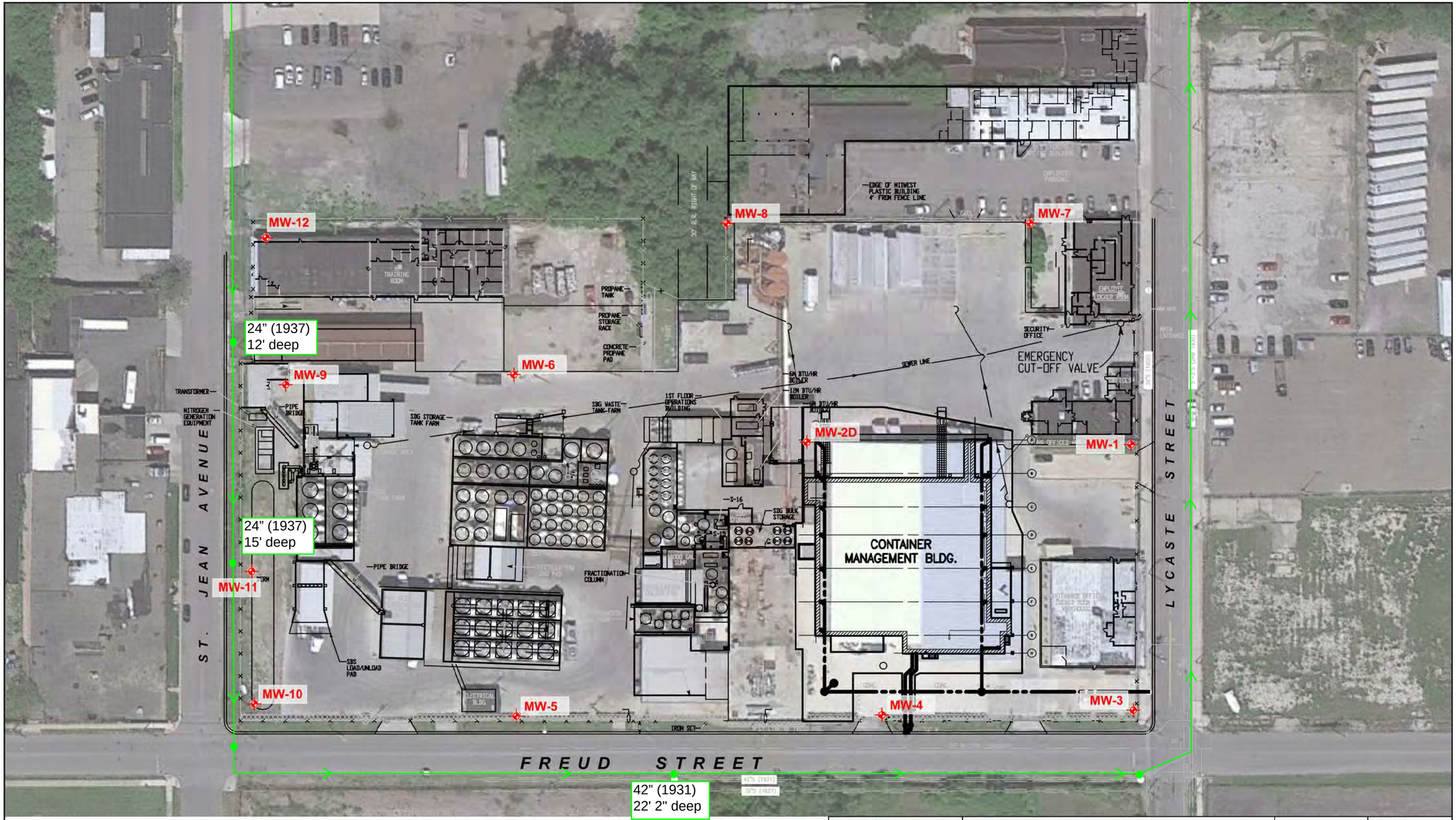
Additionally, the groundwater flow direction was evaluated to determine the potential for the storm sewer to influence the groundwater flow direction due to mounding. Based on the relative uniformity of the groundwater flow gradient (i.e., absence of the stacking of contours) on the west side of the site, as well as, the absence of bending of contours to indicate that groundwater is changing direction to the north or south due to the presence of the sewer line, it does not appear that the sewer line is prohibiting the flow of groundwater or that ground water is infiltrating into the sewer line itself.

Based on Bureau Veritas' interpretation of "relevant pathway[1]" defined in the rules promulgated under Part 201 of Act 451, 1994, as amended, the adjacent storm sewer conduit (i.e., sewer pipe and trench) may be considered a relevant pathway solely on the basis that there is a reasonable potential for a municipal utility worker to be exposed to hazardous substances during sewer repair operations; however, no cleanup criteria that are applicable for utility workers have been exceeded by the concentrations of hazardous substances that have been detected in groundwater.

[1] ***"Relevant pathway" means an exposure pathway that is reasonable and relevant because there is a reasonable potential for exposure to a hazardous substance to occur to a human or nonhuman receptor. The components of an exposure pathway are a source or release of a hazardous substance, an exposure point, and, if the exposure point is not the source or point of release, a transport medium. The existence of a municipal water supply, exposure barrier, or other similar feature does not automatically make an exposure pathway irrelevant.***

The storm sewer conduit is not a relevant pathway for any other types of human or nonhuman exposure because the groundwater in the conduit is (1) not a potable source of water and (2) not hydraulically connected to surface water. The GSI pathway[2] is not relevant pathway (as defined by Part 201) because the storm sewer conduit ultimately discharges to a municipal WWTP and not to surface water.

[2] ***The pathway addressed by GSI criteria under subsection (1) shall be considered a relevant pathway when a remedial investigation or application of best professional judgment leads to the conclusion that a hazardous substance in groundwater is reasonably expected to vent to surface water in concentrations that exceed the generic GSI criteria.***



LEGEND

MW-# MONITORING WELL LOCATION

SCALE IN FEET

0 40 80 160

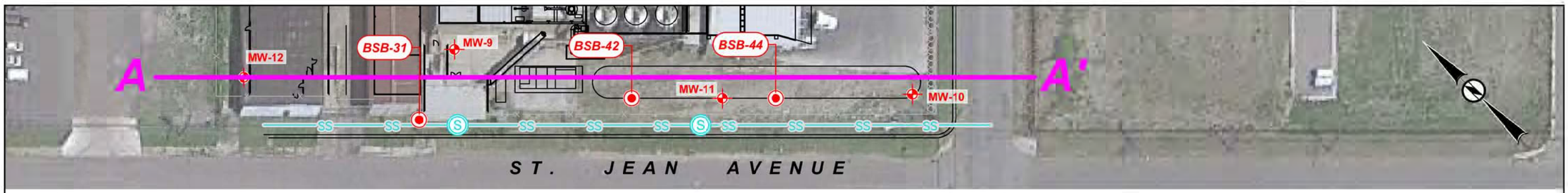
CHECK BY	KW
DRAWN BY	JL
DATE	6/24/2016
SCALE	AS SHOWN
CAD NO.	11.16.143.00b
PRJ NO.	11016-000143.00

STORM SEWER FLOW PATH

PETRO-CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE 1



NORTHWEST

A

SOUTHEAST

A'

MW-12 (579.55)

BSB-31 (580.19)

MW-9 (580.31)

BSB-42 (583.20)

MW-11 (584.20)

BSB-44 (584.50)

MW-10 (579.70)

NW MANHOLE

SW MANHOLE

24" STORM SEWER

GRADE SURFACE LEVEL

585

580

575

570

565

560

555

550

6.58 | 9.0 | 7.21 | 9.5 | 11.4 | 6.0 | 6.96

ELEVATION (FEET) ABOVE MEAN SEA LEVEL
VERTICAL EXAGGERATION X10

LEGEND

— WELL/BORING IDENTIFICATION (GROUND ELEVATION LEVEL)

6.58 — GROUNDWATER ELEVATION (FT.)

WELL SCREENING

WELL/BORING DEPTH

FILL

SILT

PEAT

SAND

CLAY

NOTE: CROSS SECTION IS BASED ON BEST PROFESSIONAL JUDGMENT USING AVAILABLE DATA. THE THICKNESS AND EXTENT OF THE LITHOLOGIC UNITS ARE APPROXIMATED AND GEOLOGIC CONTACTS BETWEEN WELL LOCATIONS ARE INFERRED.

LEGEND

MW-# MONITORING WELL

BSB-# SOIL BORING LOCATION

SS—S—SS STORM SEWER/MANHOLE

SCALE IN FEET

0 30 60 120

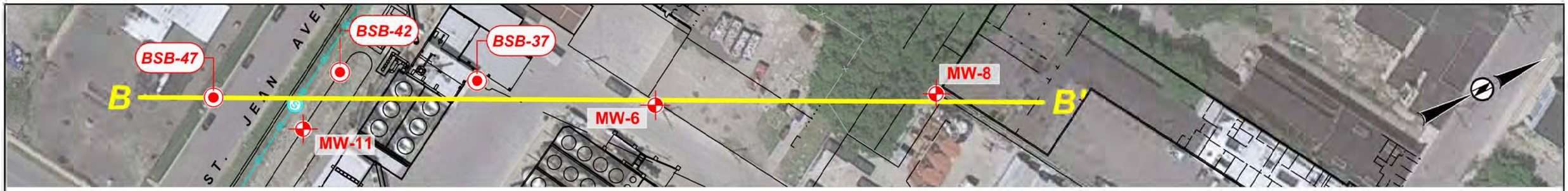
CHECK BY	KW
DRAWN BY	JL
DATE	9/6/2016
SCALE	AS SHOWN
CAD NO.	11.16.171x1
PRJ NO.	11016-000171.00

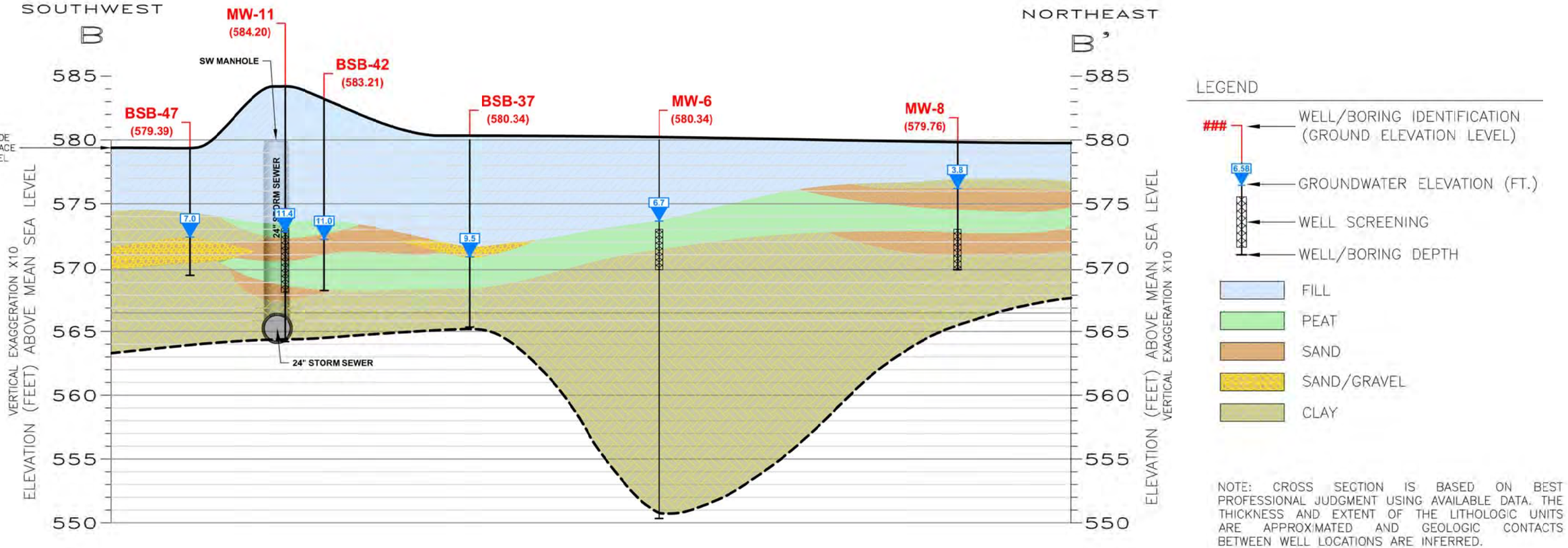
CROSS SECTION A–A'

PETRO–CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS 1828

FIGURE 2





NOTE: CROSS SECTION IS BASED ON BEST PROFESSIONAL JUDGMENT USING AVAILABLE DATA. THE THICKNESS AND EXTENT OF THE LITHOLOGIC UNITS ARE APPROXIMATED AND GEOLOGIC CONTACTS BETWEEN WELL LOCATIONS ARE INFERRED.

LEGEND

- MW-# MONITORING WELL
- BSB-# SOIL BORING LOCATION
- SS-S-SS STORM SEWER/MANHOLE

SCALE IN FEET

0 40 80 160

CHECK BY	KW
DRAWN BY	JL
DATE	9/6/2016
SCALE	AS SHOWN
CAD NO.	11.16.171x1
PRJ NO.	11016-000171.00

CROSS SECTION B–B'

PETRO-CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE 3

APPENDIX F

COMMUNITY RELATIONS PLAN

Community Relations Plan

Petro-Chem Processing Group of Nortru, LLC
421 Lycaste Street
Wayne County
Detroit, Michigan
(Operating License MID 980 615 298)

April 26, 2018
Project Number 11017-000116.00

Prepared for:

STERICYCLE ENVIRONMENTAL SOUTIONS/PSC
18000 72nd Avenue South, Suite 217
Kent, Washington 98032

Move Forward with Confidence

Prepared by:

BUREAU VERITAS NORTH AMERICA, INC.
Health, Safety, and Environmental Services
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248.344.1770
www.us.bureauveritas.com/hse

CONTENTS

Section **Page**

1.0 OVERVIEW

The Purpose of the Community Relations Plan (CRP) is to explain the strategies which will address the needs and concerns of the public, particularly the residents and property owners in the vicinity of the subject property, located at 421 Lycaste Road, Detroit, Wayne County, Michigan (Site/Facility). This CRP outlines how information will be exchanged between the interested parties:

- Michigan Department of Environmental Quality (MDEQ)
- Residents and owners of property in the vicinity of the Site
- The City of Detroit and the appropriate local organizations
- Petro-Chem Processing Group of Nortru, LLC (PCPG)
- Bureau Veritas North America, Inc. (environmental consultant)

2.0 SITE LOCATION AND ENVIRONMENTAL HISTORY

2.1 SITE LOCATION

The PCPG Facility is located at 421 Lycaste Street, Wayne County, Detroit, Michigan, at the northwestern corner of Lycaste Street and Freud Street. It is situated on an estimated 8-acre parcel in an industrial and residential area approximately 0.5 miles north of the Detroit River.

2.2 ENVIRONMENTAL HISTORY

On June 16, 1999, the Michigan Department of Environmental Quality (MDEQ) issued a Hazardous Waste Treatment and Storage Facility Operating License (Operating License) for this facility (MID 980 615 298). A new Operating License was issued to PCPG on December 18, 2012. PCPG is permitted to receive a wide range of waste codes that include halogenated and non-halogenated volatile organic compounds (VOCs).

In September 1999, PCPG began “detection”-based semi-annual groundwater monitoring in compliance with specifications of the Operating License. Based on the results of monitoring and soil boring sampling, the Facility is required to conduct corrective action for releases of a contaminant from a Waste Management Unit (WMU) to protect human health and the environment in accordance with MDEQ requirements. Compounds detected at or above the applicable corrective action threshold were limited to:

- Specific VOCs in the groundwater and soil
- Benzo(a)pyrene in the soil at one location

On November 17, 2016, A Corrective Measures Study (CMS) was submitted to the MDEQ. The CMS presents a summary of the impacts. The CMS also provides an evaluation of potential corrective actions and identifies the most appropriate corrective action for the Site.

On July 5, 2017, the MDEQ issued a conditional approval of the CMS. One of the conditions of the CMS is the preparation of a Corrective Measures Implementation Plan (CMIP) for review and approval by the MDEQ. A CRP is part of a CMIP. This CRP has been prepared and submitted to meet this requirement.

3.0 SCOPE OF COMMUNITY RELATIONS PLAN

The objective of the CMIP is to implement a corrective action intended to protect the public health and the environment. This CRP is intended to facilitate the exchange of information between the property owner and interested parties.

Site investigation, assessment and evaluation activities have been conducted following the applicable regulations and guidance. This work has been conducted under the review and approval of the MDEQ. The results of these activities have been documented and are part of the public record.

3.1 MAIN CONTACT PERSONS

The exchange of information is a critical aspect of a successful corrective action. Providing access to documents is essential, as previously outlined.

It is also important to provide feedback, specific questions, concerns, etc. to the project team. The associated correspondence can be directed to one or more of the following contacts:

Michigan Department of Environmental Quality
Daniel P. Dailey, P.E.
Environmental Engineer Specialist
Hazardous Waste Section
Waste Management and Radiological Protection Division
P.O. Box 30241
Lansing, Michigan 48909-7741
Phone: 517.242.7261
Email: daileyd@michigan.gov

Bureau Veritas North America, Inc.
Kellie Wing, Senior Project Manager
Health, Safety and Environmental Services
22345 Roethel Drive
Novi, Michigan 48375
Phone: 248.344.3014 Cell: 248.764.3451
Email: kellie.wing@us.bureauveritas.com

Stericycle Environmental Services / Petro-Chem Processing Group of Nortu, LLC
Greg Fink, Director of Internal Controls
2337 North Penn RdHatfield, PA 19440Phone: 215-822-2676 ext. 262
Email: Greg.Fink@STERICYCLE.com

3.2 PUBLIC INFORMATION REPOSITORY

A public information repository will be created in order to provide the community with access to information, reports, and data associated with ongoing corrective actions at the Site. The repository will provide the public access to final copies of work plans, technical reports, and project fact sheets. The repository will be located at the following location:

Detroit Public Library
Monteith Branch
14100 Kercheval
Detroit, Michigan
313.481.1800

3.3 PROJECT FACT SHEETS

Project fact sheets will be utilized to provide the public with a brief description of the history of the Site, activities planned or being performed at the Site, and a description of the status of the project. Copies of the fact sheets will be available at the Detroit Public Library – Monteith Branch on a periodic basis.

3.4 MAILING LIST

Petro-Chem has an established mailing list used to inform the public about the facility operations, including license modifications and renewals. The mailing list will be used to keep parties informed about activities related to corrective actions associated with the Site. Information on how to join the mailing list will be provided in the project fact sheet.

3.5 PUBLIC COMMENT

Once the final draft of the CMIP is complete, the MDEQ will provide for a 45-day public comment period on the proposed plan and will then make a final decision based on the comments received.

3.6 COMMUNITY SUPPPORT

This CRP is intended to be flexible and to adapt to the corrective action process and community interests. As necessary, appropriate parties will respond to community comments or concerns as they are expressed, and may evaluate the use of additional community relations tools, if appropriate. Public meetings will be conducted on an as-needed basis. The public would be notified in advance of public meetings or other community support activities.

APPENDIX G

SOIL MANAGEMENT/DIG PLAN

Soil Management / Dig Plan

Petro-Chem Processing Group of Nortru, LLC
421 Lycaste Street
Wayne County
Detroit, Michigan
(Operating License MID 980 615 298)

January 7, 2019
Project Number 11017-000116.00

Prepared for:

STERICYCLE ENVIRONMENTAL SOUTIONS
18000 72nd Avenue South, Suite 217
Kent, Washington 98032

Move Forward with Confidence

Prepared by:

BUREAU VERITAS NORTH AMERICA, INC.
Health, Safety, and Environmental Services
22345 Roethel Drive
Novi, Michigan 48375
248.344.1770
www.us.bureauveritashse.com

CONTENTS

Section **Page**

Figures

1.0 INTRODUCTION

Bureau Veritas North America, Inc. (BVNA) prepared this Dig/Soil Management Plan (Plan) on behalf of Stericycle Environmental Solutions, Inc. (Stericycle) and Petro-Chem Processing Group of Nortru, LLC (PCPG). This Plan addresses activities associated with potential future construction at 421 Lycaste Street, Wayne County, Detroit, Michigan (Site).

The Michigan Department of Environmental Quality (MDEQ) is requiring the preparation of a Corrective Measures Implementation Plan (CMIP) to address environmental impacts at the Site. The CMIP, including a Dig/Soil Management Plan, must be submitted to the MDEQ for review and approval. This Plan is submitted to meet the requirement for submission of a Dig/Soil Management Plan.

The purpose of this Plan is to establish the requirements and methods for the proper management and handling of impaired soil that may be encountered during any future facility construction activity that requires excavating soil.

This is not a Health and Safety Plan and does not include detailed guidance regarding construction worker health and safety.

2.0 SETTING

2.1 SITE DESCRIPTION

The Site is an 8-acre parcel (approximately) located in an industrial and residential area, approximately 0.5 miles north of the Detroit River (see Figure 1 - Site Location Map). The following is a description of properties immediately adjacent to the Site:

To the north; industrial properties
To the east; Lycaste Street to the east,
To the south; Freud Avenue to the south
To the west; Old St. Jean Avenue

The Site consists of the following buildings:

- Two-story Office Building
- Laboratory
- Maintenance Office
- Container Management Building
- Electrical Room
- Technical Center
- Employee Locker Room and Restroom
- Electrical Building
- SBS Building
- Operations Building

See Figure 2 for a site layout.

The Site is secured by a 6-foot-high chain-link security fence topped with barbed wire. A driveway, on the east side of the facility, is used for incoming and outgoing traffic at the facility. Other Site features include an employee and visitor parking area, aboveground storage tanks (ASTs), a drum storage area, and support facilities.

2.2 SOIL/LITHOLOGY

The stratigraphy at the Site consists of an uppermost layer of sandy silt and silty sand (historic fill material) with some clay to a depth that ranges from one to 13 feet. In some areas, shards of glass and brick fragments were noted in the fill material.

A layer of natural peat underlies the layer of fill material and silty sand across the Site. The thickness of the peat layer ranges from several inches near the northwest property boundary to four feet along the southern property boundary.

The water-bearing peat layer overlies a thick, dry, and continuous layer of silty clay till. The silty clay till layer has been documented in the surrounding Detroit area. The onsite thickness of the clay till unit is not known, but is thought to be at least 30 feet thick based on soil logs from other locations within 0.5 miles of the Site.

Soil samples were collected from above the water table and analyzed for grain size, density, and porosity. The soil was classified as a fine-to-medium-grained sand with silt and trace limestone, and a Unified Soil Classification System (USCS) designation of SP (i.e., poorly graded sand). The density ranged from 93 to 99 pounds per cubic foot, and the porosity ranged from 41 to 45 percent.

2.3 GROUNDWATER

The thick, dry, silty clay layer represents a barrier that inhibits the downward migration of the perched groundwater. The perched water zone does not produce sufficient water to sustain pumping.

Groundwater samples were collected from the shallow water bearing unit contained within the peat and/or underlying silty sand layer. This moist or damp layer is present at depths ranging from approximately 7 to 12 feet below grade.

3.0 SUMMARY OF ENVIRONMENTAL IMPACTS

There are several areas of concern at the Site which exhibit soil and/or groundwater impacts. The table below provides a summary of this information.

Area of Concern (AOC)	Hazardous Substances Above Applicable Criteria	Applicable Criterion (or Screening Level) Exceeded	Locations of Exceedances	Health-Based Cleanup Objective
AOC-1 and AOC-2 - Volatilization to Indoor Air – Western Berm Area	Tetrahydrofuran, toluene, ethylbenzene, TCE, and xylenes	Soil: Csat, SVIAIC, GW: FESL	Western Berm Area BSB-12, BSB-13, BSB-42, BSB-43, BSB-44, BSB-45, MW-11	None exceeded
AOC-1 - Volatilization to Indoor Air – Former Container Processing Area	PCE and TCE	Soil: Csat, SVIAIC (also GCP and DCC)	14S	Criteria not applicable after RC is recorded
AOC- 3 – MtBE in Groundwater	None	None	None	NA
WMU-15 - PAHs in Soil – Former Container Processing Building	Benzo(a)pyrene	Soil: Direct Contact	13S, 15S, 21S	Criterion not applicable after RC is recorded
WMU-15 - VOCs in Soil - Former Container Processing Building	Toluene, ethylbenzene, and xylenes	Csat only	14S, 16S, 24S	None exceeded

RC = Restrictive covenant
SVIAIC = Soil volatilization to indoor air inhalation criteria
MtBE = Methyl tert butyl ether
DCC = Direct contact criteria (soil)
Csat = Soil saturation concentration screening level
NAPL = Non-aqueous phase liquid
NA = Not Applicable
GCP = Groundwater contact protection
PAHs = Polycyclic aromatic hydrocarbons
GW:FESL = Flammable and explosive screening levels for groundwater

Most of the areas of concern will be addressed by implementation of a groundwater monitoring program or a Restrictive Covenant that will be filed with the Wayne County Register of Deeds. A Restrictive Covenant is a legal control that reduces the potential for exposure by limiting land use in the following manner:

- Limit the use of the property for non-residential purposes
- Prohibit the use of shallow water for drinking water purposes
- Prohibit the construction of habitable structures over the top of (or near) contamination that exceeds indoor air inhalation criteria
- Maintain the onsite pavement
- Manage any excavated soil in compliance with this Soil Management Plan

4.0 SOIL MANAGEMENT

Soil with residual contamination may be encountered during soil-disturbing activities associated with any future construction activities. Contractors, conducting excavation, digging, or other soil-disturbing operations, must be made aware that there is a potential for encountering contamination, and must know the procedures for dealing with contamination. All soil-disturbing activities associated are subject to this Plan (except emergency activities). These contractors, and associated activities, may also be subject to the Site's Health & Safety Plan.

The appropriate management of impacted soil is described within this Plan. It should be assumed that all soil is impacted.

4.1 PRE-EXCAVATION EVALUATION OF SOILS

4.1.1 Control of Work Area

Before any soil-disturbing activities are conducted, the contractor performing the work shall secure the work area to limit access to only those personnel that are appropriately trained and authorized to be in the area. The limits of the work area shall be established and clearly marked. Barriers shall be installed to deter unauthorized personnel from entering the work area.

Excavation activities shall be performed in a manner that minimizes worker exposure, as well as, protects the environment and public from site contaminants.

4.1.2 Training

All personnel who will conduct soil-disturbing activities, or who enter a work area during execution of the activities, is subject to this Plan. All subject personnel must receive appropriate training regarding the contaminants that might be present, the associated health hazards and hazard controls, soil-handling and waste-management requirements, and emergency procedures, etc. as described in the Site's Health and Safety Plan.

4.2 EXCAVATION ACTIVITIES

4.2.1 Sampling for Disposal

Soil sampling and analysis for waste classification must be conducted in accordance with this Plan. This is intended to ensure that samples are collected and analyzed according to MDEQ and soil receiving facility requirements. All sampling must conform to the quality assurance and quality control requirements presented in the RFI Workplan, dated January 18, 2010, which is on file with the MDEQ.

Soil being removed from the site (waste) must be sampled and analyzed to ensure that material is sent to the appropriate disposal facility in accordance with applicable regulations and receiving facility requirements. Likewise, soil to be brought to the Site must be sampled and analyzed to ensure impaired material is not brought onto the property.

All analytical data shall be reviewed by a qualified environmental professional to confirm that the required analysis was conducted, the appropriate quality assurance / quality control protocols were followed, and that the soil may be removed from or delivered to the Site.

4.2.2 Unanticipated Conditions

Impacts not detected by prior investigation and assessment activities may be encountered during construction activities. Evidence of potentially impacted soil may include:

- Discolored soil;
- Odors;
- Readings on monitoring equipment (e.g., organic vapor meter); and
- Debris (i.e. drums, buckets and containers).

If such a condition is encountered, the onsite Project Manager must be immediately notified and all procedures presented in the HASP must be followed.

Suspected impacts may require that the material be segregated and subject to additional sampling to characterize the material.

4.2.3 Dust Control

Soil may be staged onsite during constructin activities. The exposed soil (including stockpiles, areas being regraded, etc.) must be managed in order to mitigate impacts to the environment and human health. This includes implementation of the Best Management Practices (BMPs) noted below.

The work area will be kept clean (to the extent feasible) to minimize tracking soil on to the pavement, resulting in the generation of dust. Actions may include wetting the soil that is tracked on to the pavement, broom-cleaning the work area, etc. Caution must be taken to ensure that wetting the soil does not result in runoff.

4.2.4 Runoff

Construction activities shall be conducted so that soil will not harm the surface water. The following BMPs will be applied to work associated with the activities:

- Protect exposed soil from rainfall and preventing runoff by using heavy-duty plastic and temporary covers and berms;
- Cover exposed soil during dry-weather periods, if possible;
- Protect storm drains, including using berms, straw bales, sandbags, etc. to manage runoff;
- Prevent rainfall/runoff from contacting soil;
- Do not over water during dust suppression (do not generate runoff);
- Designate a completely contained area away from storm drains for refueling or maintenance activities; and
- Cleaning up all spills and leaks.

4.2.5 Decontamination

Procedures for the decontamination of personnel are outlined the Site's Health and Safety Plan. Procedures for the decontamination of sampling and construction equipment are presented in the RFI Workplan.

4.2.6 Imported Backfill Soil

Additional soil may be needed to fill excavations, support site grading, etc. Adequate onsite sources of soil may not be available. Soil may be provided from offsite sources. However, the appropriate precautions must be implemented to ensure that material impacted above the applicable cleanup standard is not brought onto the Site. These precautions include the collection and analysis of samples.

The backfill generator may conduct the required analysis. If so, the generator must provide written confirmation that the material has been analyzed and conforms with the quality requirements. This information must be retained and incorporated into the appropriate project report.

At a minimum, samples will be analyzed for the following parameters:

- Target Analyte List (TAL)/Target Compound List (TCL), and
- Extractable Petroleum Hydrocarbons (EPH)

Additional analytical parameters maybe appropriate based on the knowledge of the source and professional judgement.

All detected constituent concentrations must be at or below the applicable MDEQ nonresidential soil and impact to groundwater cleanup criteria. Also, the soil cannot contain evidence of impact, such as debris, solid waste, free product, etc.

5.0 WASTE SOIL CHARACTERIZATION

This section provides the process for the characterization of waste soils generated during implementation of construction activities.

Samples will be collected from areas to be excavated or disturbed.

Since volatile organic compounds (VOCs) and semi-volatile organic compounds have been identified as a concern at the Site, these parameters must be included in the waste classification analysis. Additionally, Michigan Ten metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc) should be included in the waste classification analysis. The disposal facility will likely have additional soil characterization requirements. The potential disposal facilities will be identified prior to characterization sampling. The disposal facilities' analytical requirements (i.e.; sample frequency, analytical parameters, methods, etc.) will be incorporated into the scope of the sample characterization.

The resulting data shall meet the requirement of the soil disposal facility

6.0 SOIL TRANSPORTATION & DISPOSAL

The analytical results will be provided to the disposal facility. Trucks removing soil from the Site should be covered immediately after loading and should remain covered until offloading at the designated disposal facility. Precautions should be taken to prevent soils from falling off trucks during transport. Any accidental soil releases during transport to a disposal facility should be the responsibility of the transport company. Records of the certificates of disposal and other transport documentation should be retained in the project files.

7.0 LABORATORY

All analysis associated with this Plan shall be conducted by a laboratory accredited by the National Environmental Laboratory Accreditation Counsel (NELAC) Institute. The Method Detection Limit (MDL) shall meet the applicable solid waste classification standards, to the extent feasible.

8.0 RELIANCE

The information and opinions rendered in this Plan are exclusively for use by Stericycle. BVNA will not distribute or publish this Plan without consent except as required by law, court order, regulatory statue, or directive. The information and opinions expressed in this Plan are given in response to a limited assignment and should be considered and implemented only in light of that assignment. BVNA provided these services using its commercially reasonable best efforts consistent with the level and skill ordinarily

exercised by members of the profession currently practicing under similar conditions. No other warranty, expressed or implied, is made.

FIGURES

QUADRANGLE LOCATION

Scale 1:24000

0 1/2 1 MILE

1000 0 1000 2000 3000 FEET

(SOURCE OF MAP IS USGS 7.5 MINUTE QUADRANGLE MAP, BELLE ISLE(1980), MICHIGAN)

CHECK BY	KLW
DRAWN BY	JL
DATE	January 7, 2014
SCALE	AS SHOWN
CAD NO.	109200.02_A
PRJ NO.	11016-000171.00

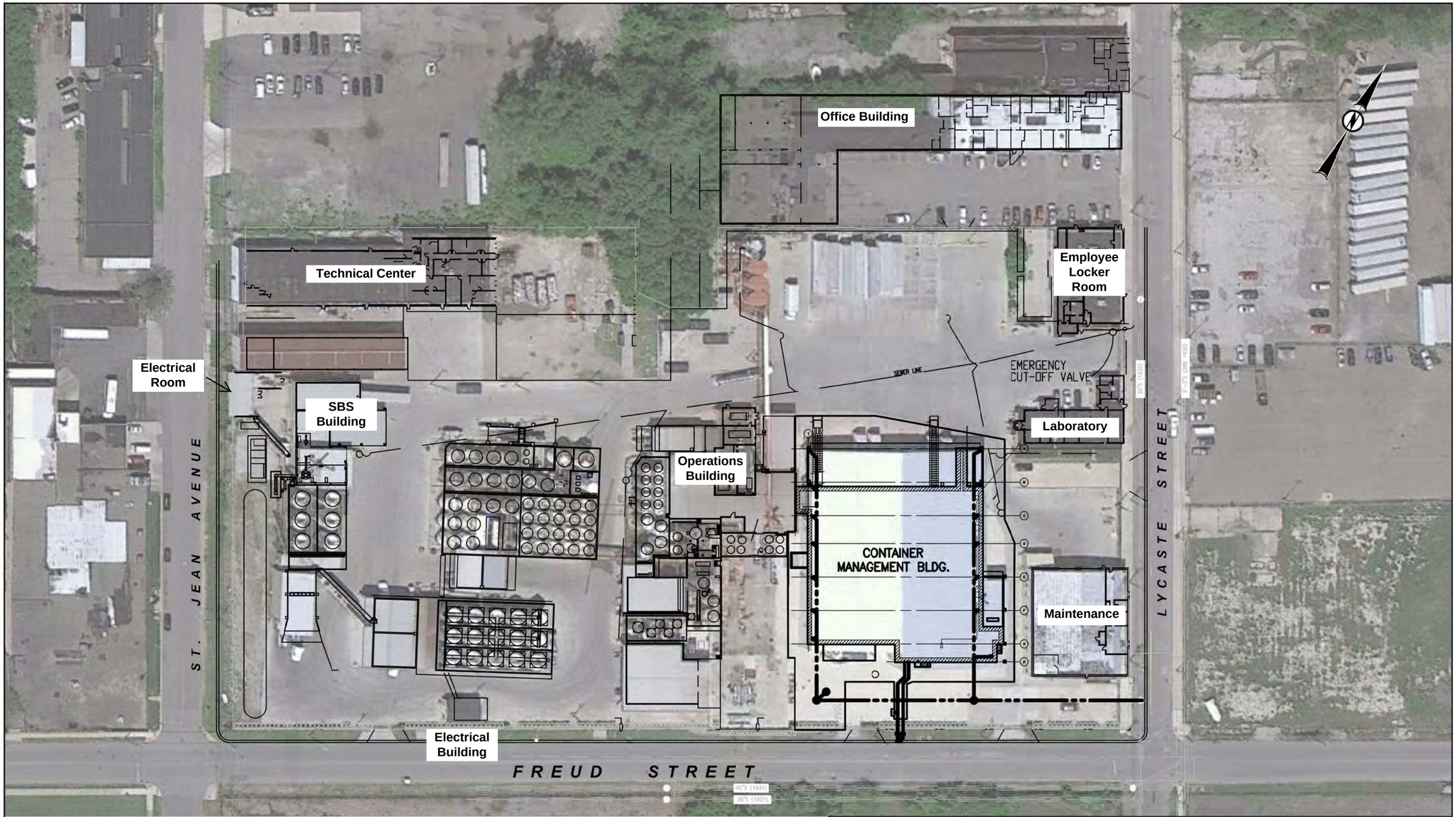
SITE LOCATION MAP

PETRO–CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE

1



SCALE IN FEET

0 50 100 200

CHECK BY	KW
DRAWN BY	JL
DATE	11/24/2015
SCALE	AS SHOWN
CAD NO.	11.15.255.00b
PRJ NO.	11015-000255.00

SITE LAYOUT

PETRO-CHEM PROCESSING GROUP
421 LYCASTE STREET
DETROIT, MICHIGAN

BUREAU VERITAS

FIGURE

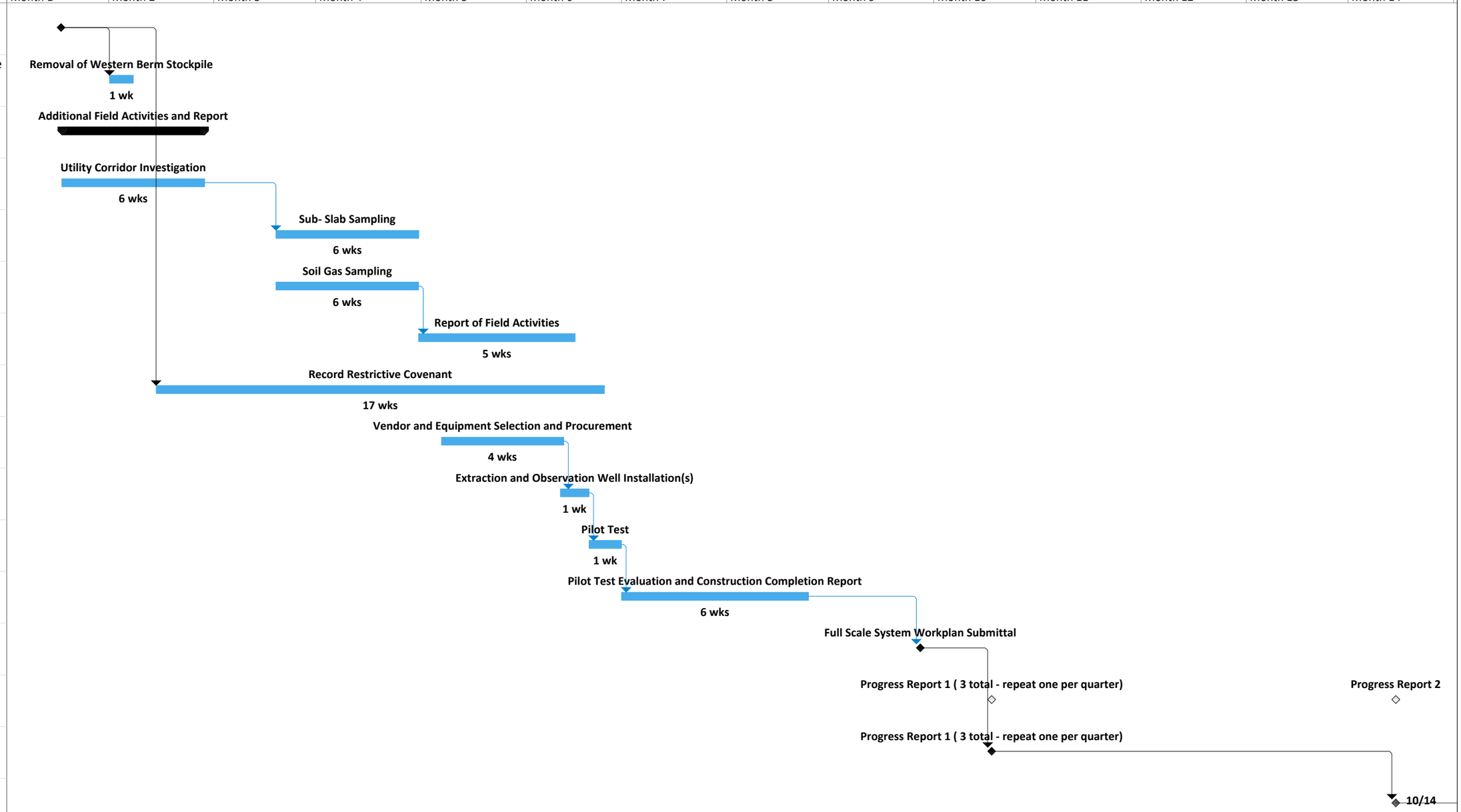
2

APPENDIX H

PROJECT SCHEDULE

Corrective Measures Implementation Workplan Schedule
Petro-Chem Processing Group of Nortu, LLC
421 Lycaste Street, Wayne County, Detroit Michigan

ID	Task Name
1	
2	Removal of Western Berm Stockpile
3	Additional Field Activities and Report
4	Utility Corridor Investigation
5	Sub- Slab Sampling
6	Soil Gas Sampling
7	Report of Field Activities
8	Record Restrictive Covenant
9	Vendor and Equipment Selection and Procurement
10	Extraction and Observation Well Installation(s)
11	Pilot Test
12	Pilot Test Evaluation and Construction Completion Report
13	Full Scale System Workplan Submittal
14	**Progress Report(s)**
15	Progress Report 1 (3 total - repeat one per quarter)
16	**Progress Report 2**
17	Progress Report 3



Project: Petro-Chem Processing Group
Date: Wed 2/6/19

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	Manual Progress
Summary	Inactive Task	Duration-only	Finish-only	

Petro Chem Processing GroupR3.mpp

APPENDIX I

DATA TABLES

Table 1
Remedial Feasibility Investigation
Detectable Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Soil Boring Number (sample interval - feet) Sample Collection Date	**MDEQ TDL 10/2006**	**BSB-1 (3-5) 10/20/10**	**BSB-1 (8-10) 10/20/10**	**BSB-2 (0-2) 10/20/10**	**BSB-2 (2-4) 10/20/10**	**BSB-3 (4-5) 10/20/10**	**BSB-3 (9-10) 10/20/10**	**BSB-4 (0-2) 10/20/10**	**BSB-4 (3-5) 10/20/10**	**BSB-5 (0-2) 10/20/10**	**BSB-5 (4-6) 10/20/10**	**BSB-6 (3-5) 10/20/10**	**BSB-6 (6-8) 10/20/10**	Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to Ambient Air (Infinite Source)	Direct Contact	Soil Saturation Concentration Screening Levels	MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
VOCs																					
1,2,3-Trimethylbenzene	50	<46	<51	<48	<47	<47	<48	<46	<49	<46	<47	<48	<49	NA	NA	NA	NA	NA	NA	4,800	9,600
Benzene	50	<56	<100	<56	<59	<47	<70	<54	<49	<55	<58	<59	<63	100	4,000 X	220,000	45,000	400,000 C	400,000	47 M	94
1,2-Dichlorobenzene	50	<46	<100	<48	<47	<47	<48	<46	<49	<46	<47	<48	<49	14,000	280	210,000 C	46,000,000	210,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	<46	<100	<48	<47	<47	<70	<46	<49	<46	<47	<100	<48	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
cis -1,2-Dichloroethene	50	<56	<100	<56	<59	<47	<70	<46	<49	<46	<47	<48	<63	1,400	12,000	640,000 C	210,000	640,000 C	640,000	37 M	74
Ethylbenzene	50	<46	<100	<48	<59	<47	<70	<46	<49	<46	<47	<48	<63	1,500	360	140,000 C	2,400,000	140,000 C	140,000	340	680
Isopropylbenzene	50	<56	<100	<56	<59	<53	<70	<54	<54	<55	<58	<59	<63	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
2-Methylnaphthalene	250	<230	<250	<240	<240	<240	<240	<230	<250	<230	<240	<240	800	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
Methyl *tert* -butyl ether	50	<46	<100	<48	<47	<47	<70	<46	<49	<46	<47	<48	<49	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	<230	<250	<240	<240	<240	<240	<230	<250	<230	<240	<240	720	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n -Propylbenzene	50	<46	<51	<48	<47	<47	<48	<46	<49	<46	<47	<48	<49	4,600	ID	300,000	ID	8,000,000	10,000,000	21,000 SE	21,000 SE
Tetrachloroethene	50	<56	<100	<56	<59	<53	<70	**200**	<54	**4,200**	**1,400**	<59	<63	100	1,200 X	88,0000 C	210,000	88,0000 C	88,000	74 SE	150
Tetrahydrofuran	250	<230	<250	<240	<240	<240	<240	<230	<250	<230	<240	<240	<250	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000	450,000
Toluene	50	<56	<100	110	<59	<53	<70	<54	<54	<55	<58	<59	<63	16,000	5,400	250,000 C	3,300,000	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trimethylbenzene	50	<56	<100	<56	<59	<53	<70	<54	<54	<55	<58	<59	<63	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	<56	<100	<56	<59	<47	<70	<54	<54	<55	<58	<59	<63	1,800	1,100	94,000 C	19,000,000	94,000 C	94,000	1,800	3,600
o -Xylene	50	<56	<100	<56	<59	<47	<70	<54	<49	<55	<58	<59	<63	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
m,p -Xylene	100	<92	<200	<95	<94	<95	<96	<92	<98	<92	<95	<97	<98	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
Part 201 Generic Cleanup Criteria and Screening Levels, dated September 28, 2012
MDEQ = Michigan Department of Environmental Quality
VIAC = volatilization to indoor air criteria
TDL = Target Detection Limit
VOCs = volatile organic compounds
< = limit of detection for sample
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
NA = Not Available
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
M = Site specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the developed cleanup criterion the criterion is the TDL
ID = means insufficient data to develop criterion
SE = Site-specific criteria based on on single event exposure; therefore, sampling methods should reflect shorter exposure scenarios

Table 1 (continued)
Remedial Feasibility Investigation
Detectable Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Soil Boring Number (sample interval - feet) Sample Collection Date	MDEQ TDL 10/2006	BSB-7 (0.5-2) 10/20/10	BSB-7 (8-9) 10/20/10	BSB-8 (3-5) 10/20/10	BSB-8 (5-7) 10/20/10	BSB-9 (7-9) 10/20/10	BSB-9 (9-11) 10/20/10	BSB-10 (5-7) 10/20/10	BSB-10 (8-10) 10/20/10	DUP-1 (4-5) 10/20/10	DUP-2 (7-9) 10/20/10	FB-1 10/20/10	FB-2 10/21/10	Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to Ambient Air (Infinite Source)	Direct Contact	Soil Saturation Concentration Screening Levels	MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
VOCs																					
1,2,3-Trimethylbenzene	50	<46	530	<50	<48	<48	<48	<47	<50	<51	<49	<50	<50	NA	NA	NA	NA	NA	NA	4,800	9,600
Benzene	50	<46	**100**	<60	<84	<48	<75	<58	<150	<51	<49	<50	<50	100	4,000 X	220,000	45,000	400,000 C	400,000	47 M	94
1,2-Dichlorobenzene	50	<46	**1,100**	<50	<84	<48	<48	<47	<150	<51	<49	<50	<50	14,000	280	210,000 C	46,000,000	210,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	<47	<47	<70	<46	<49	<46	<47	<150	<51	<49	<50	<50	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
cis -1,2-Dichloroethene	50	<46	**340**	<50	<84	<48	<75	<58	<150	<51	<49	<50	<50	1,400	12,000	640,000 C	210,000	640,000 C	640,000	37 M	74
Ethylbenzene	50	<46	**17,000**	<50	<84	69	<75	<58	<150	<51	95	<50	<50	1,500	360	140,000 C	2,400,000	140,000 C	140,000	340	680
Isopropylbenzene	50	<51	**620**	<60	<84	<54	<75	<58	<150	<57	<54	<50	<50	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
2-Methylnaphthalene	250	<230	290	<250	<240	<240	<240	<230	<250	<260	<250	<250	<250	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
Methyl *tert* -butyl ether	50	<46	490	<50	<48	<48	<75	<47	<150	<51	<49	<50	<50	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	<230	700	<250	<240	<240	<240	<230	<250	<260	<250	<250	<250	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n -Propylbenzene	50	<46	960	<50	<48	<48	<48	<47	<150	<51	<49	<50	<50	4,600	ID	300,000	ID	8,000,000	10,000,000	21,000 SE	21,000 SE
Tetrachloroethene	50	**1,100**	**250**	<60	<84	<54	<75	<58	<150	<57	**110**	<50	<50	100	1,200 X	88,0000 C	210,000	88,0000 C	88,000	74 SE	150
Tetrahydrofuran	250	<230	280	<250	<240	<240	<240	<230	<250	<260	<250	<250	<250	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000	450,000
Toluene	50	<51	2,700	<60	<84	230	<75	<58	<150	<57	610	<50	<50	16,000	5,400	250,000 C	3,300,000	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trimethylbenzene	50	<51	**3,500**	<60	<84	91	<75	<58	<150	<57	110	<50	<50	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	<46	**2,000**	<60	<84	<48	<75	<58	<150	<51	82	<50	<50	1,800	1,100	94,000 C	19,000,000	94,000 C	94,000	1,800	3,600
o -Xylene	50	<46	**2,800**	<60	<84	260	<75	<58	<150	<51	**910**	<50	<50	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
m,p -Xylene	100	120	**79,000**	<99	<170	330	<150	<94	<300	<100	**960**	<100	<100	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
Part 201 Generic Cleanup Criteria and Screening Levels, dated September 28, 2012
MDEQ = Michigan Department of Environmental Quality
VIAC = volatilization to indoor air criteria
TDL = Target Detection Limit
VOCs = volatile organic compounds
< = limit of detection for sample
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
NA = Not Available
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
M = Site specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the developed cleanup criterion the criterion is the TDL
ID = means insufficient data to develop criterion
SE = Site-specific criteria based on on single event exposure; therefore, sampling methods should reflect shorter exposure scenarios

Table 2
Corrective Action Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	MDEQ TDL 10/2006	BSB-11		BSB-12			BSB-13		BSB-14		DUP-01	BSB-15		MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
(sample interval - feet)		(3-5)	(5-7)	(8-10)	(10-12)	(18-20)	(3-5)	(5-7)	(3-5)	(5-7)		(3-5)	(5-7)								
Collection Date		8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/23/2013	8/23/2013								
Analysis Date		8/28/2013	8/28/2013	8/28/2013 8/30/2013	8/27/2013 8/28/2013	8/27/2013 8/28/2013	8/27/2013	8/27/2013 8/28/2013	8/27/2013	8/27/2013	8/27/2013	8/27/2013	8/27/2013								
Collection Method		Grab												Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to AmbientAir	Direct Contact	Soil Saturation Concentration Screening Levels		
VOCs																					
Acetone	1,000	<1,000 J,V-	<1,000 J,V-	<1,000 J,V-	1,516	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	42,000	34,000	110,000,000	160,000,000 C	73,000,000	110,000,000	3,100,000	3,100,000
Benzene	50	<50	<50	**270 J,J-**	**750**	<50	<50	**110**	<50	<50	<50	<50	<50	100	4,000 X	220,000	45,000	840,000 C	400,000	47 M	94
2-Butanone	250	<631	<608	<808 J,J-	2,900 J,E1	<583	<588	<613	<609	<592	<644	<685	<693	760,000	44,000	27,000,000	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
n-Butylbenzene	50	<50	<50	<50 J,J-	160	<50	<50	<50	<50	<50	<50	<50	<50	4,600	ID	120,000	880,000,000	8,000,000	10,000,000	9,800	20,000
sec-Butylbenzene	50	<63	<60	<80 J,J-	170	<58	<58	<61	<60	<59	<64	<68	<69	4,600	ID	88,000	180,000,000	8,000,000	10,000,000	49,000 C	49,000 C
tert-Butylbenzene	50	<50	<50	<50 J,J-	<50	<50	<50	<50	<50	<50	<50	<50	<50	4,600	ID	180,000	290,000,000	8,000,000	10,000,000	11 M	23 M
Carbon tetrachloride	50	<63	<60	**390 J,J-**	<71	<58	<58	<61	<60	<59	<64	<68	<69	100	900 X	92,000	12,000	39,000 C	390,000	NA	NA
Chloroethane	250	<315	<304	1,000 J,J-	<359	<291	385	<306	<304	<296	<322	<342	<346	34,000	22,000 X	950,000 C	36,000,000 C	950,000 C	950,000	NA	NA
Cyclohexane	250	330	<304	<404 J,J-	1,300	<291	<294	<306	<304	<296	<322	<342	<346	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	50	<50	<50	<50 J,J-	**3,800**	<50	<50	**610**	<50	<50	<50	<50	<50	14,000	280	210,000 C	46,000,000 C	63,000,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	<63	<60	**6,700 J,J-**	**580**	<58	**510**	**530**	<60	<59	<64	<68	<69	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
1,2-Dichloroethane	50	<63	<60	**82 J,J-**	<71	<58	<58	<61	<60	<59	<64	<68	<69	100	7,200 X	380,000	21,000	420,000	1,200,000	23 M	46 M
1,1-Dichloroethene	50	<63	<60	**200 J,J-**	<71	<58	<58	<61	<60	<59	<64	<68	<69	140	2,600	220,000	37,000	660,000 C	570,000	220	430
cis-1,2-Dichloroethene	50	<50	<50	**1,100 J,J-**	**1,400**	<50	**210**	**290**	<50	<50	<50	<50	<50	1,400	12,000	640,000	41,000	640,000 C	640,000	37 M	74
trans-1,2-Dichloroethene	50	<50	<50	140 J,J-	<63	<50	<50	<50	<50	<50	<50	<50	<50	2,000	30,000 X	1,400,000 C	330,000	1,400,000 C	1,400,000	210	420
Ethylbenzene	50	69	<60	**11,000 J,J-**	**180,000**	**210**	**2,500**	**15,000**	<60	<59	<64	<68	<69	1,500	360	140,000 C	2,400,000 C	140,000 C	140,000	340	680
Isopropylbenzene	50	<320	<300	<400 J,J-	**2,800**	<290	<290	330	<300	<300	<320	<340	<350	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
4-Isopropyltoluene	50	<130	<120	<160 J,J-	410	<120	<120	<120	<120	<120	<130	<140	<140	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	100	<100	<100	**15,000 J,J-**	**2,000**	<100	**468**	**1,100**	<100	<100	<100	<100	<100	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
2-Methylnaphthalene	250	678	<304	1,300 J,J-	2,700	<291	<294	591	<304	<296	<322	<342	<346	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
4-Methyl-2-Pentanone	250	<315	<304	5,400 J,J-	8,200	<291	<294	1,300	<304	<296	<322	<342	<346	100,000	ID	2,700,000 C	53,000,000	2,700,000 C	2,700,000	150,000 SE	290,000 SE
Methyl *tert*-butyl ether (MtBE)	50	<320	<300	**1,800 J,J-**	**4,700**	<290	<290	320	<300	<300	<320	<340	<350	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	459	<304	**1,900 J,J-**	**4,700**	<291	<294	569	<304	<296	<322	<342	<346	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n-Propylbenzene	50	<63	<60	330 J,J-	**5,100**	<58	<58	570	<60	<59	<64	<68	<69	4,600	ID	300,000	590,000,000	8,000,000	10,000,000	21,000 SE	21,000 SE
Tetrachloroethene	50	<63	<60	**2,900 J,J-**	**250**	<58	**210**	**130**	**760**	**91**	<64	<68	<69	100	1,200 X	88,000 C	210,000	88,000 C	88,000	74 SE	150
Tetrahydrofuran	250	<315	<304	1,200 J,J-	4,900	<291	364	1,200	<304	<296	<322	<342	<346	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000	450,000
Toluene	50	310	<50	**14,000 J,J-**	**350,000**	280	1,900	**8,500**	<50	<50	<50	<50	70	16,000	5,400	250,000 C	3,300,000 C	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trichlorobenzene	250	<315	<304	<404 J,J-	<359	<291	<294	<306	<304	<296	<322	<342	<346	4,200	5,900 X	1,100,000 C	34,000,000	1,100,000 C,DD	1,100,000	NA	NA
1,1,1-Trichloroethane	50	<63	<60	**2,300 J,J-**	<86	<58	250	160	<60	<59	<64	<68	<69	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	50	<63	<60	**2,200 J,J-**	**140**	<58	<58	**63**	<60	<59	<64	<68	<69	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 M	8.0 M, SE
1,2,3-Trimethylbenzene	50	<130	<120	<160 J,J-	2,100	<120	<120	190	<120	<120	<130	<140	<140	NA	NA	NA	NA	NA	NA	4,800	9,600
1,2,4-Trimethylbenzene	50	200	<120	**710 J,J-**	**14,000**	<120	<120	**1,300**	<120	<120	<130	<140	<140	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	<130	<120	490 J,J-	**6,200**	<120	<120	590	<120	<120	<130	<140	<140	1,800	1,100	94,000 C	19,000,000 C	94,000 C	94,000	1,800	3,600
Vinyl Chloride	50	<50	<50	<50 J,J-	**320**	<50	<50	<50	<50	<50	<50	<50	<50	40	260 X	20,000	29,000	34,000	490,000	8.2 M	16 M
Xylenes	100	723	<182	**39,000**	**750,000**	**913**	**7,800**	**62,000**	<182	<177	<193	<205	<207	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary	Vary

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated December 30, 2013
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
E1 = the reported value is estimated due to the presence of interference
J = the concentration is an estimated value
J- = the result is an estimated quantity, but the result may be biased low
V- = recovery in the assocated continuin Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
ND = non-detect
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 2 (continued)
Corrective Action Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	MDEQ TDL 10/2006	**BSB-16**		**BSB-17**		**BSB-18**		**DUP-03**	**BSB-19**		**BSB-20**		**BSB-21**		MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
(sample interval - feet)		(3-5)	(5-7)	(3-5)	(5-7)	(3-5)	(5-7)		(3-5)	(5-7)	(3-5)	(5-7)	(3-5)	(5-7)								
Collection Date		8/23/2013	8/23/2013	8/23/2013	8/23/2013	8/23/2013	8/23/2013	8/23/2013	8/26/2013	8/26/2013	8/26/2013	8/26/2013	8/26/2013	8/26/2013								
Analysis Date		8/27/2013	8/27/2013	8/27/2013	8/27/2013	8/27/2013 8/28/2013	8/28/2013	8/27/2013	8/30/2013	8/30/2013	8/30/2013	8/30/2013	8/30/2013	8/30/2013								
Collection Method		Grab													Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to AmbientAir	Direct Contact	Soil Saturation Concentration Screening Levels		
VOCs																						
Acetone	1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<3,602	<1,000	<1,000	<1,000	<1,000	<1,000	42,000	34,000	110,000,000	160,000,000 C	73,000,000	110,000,000	3,100,000	3,100,000
Benzene	50	<50	<50	<50	<50	**450**	**350**	<50	<290	<50	<50	**84**	<50	<50	100	4,000 X	220,000	45,000	840,000 C	400,000	47 M	94
2-Butanone	250	<573	<562	<655	<636	<630	<603	<653	<2,900	<306	<414	<323	<334	<335	760,000	44,000	27,000,000	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
n-Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<290	<50	<50	<50	<50	<50	4,600	ID	120,000	880,000,000	8,000,000	10,000,000	9,800	20,000
sec-Butylbenzene	50	<57	<56	<65	<63	<63	<60	<65	<290	<50	<50	<50	<50	<50	4,600	ID	88,000	180,000,000	8,000,000	10,000,000	49,000 C	49,000 C
tert-Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<290	<50	<50	<50	<50	<50	4,600	ID	180,000	290,000,000	8,000,000	10,000,000	11 M	23 M
Carbon tetrachloride	50	<57	<56	<65	<63	<63	<60	<65	<570	<61	<82	<64	<66	<67	100	900 X	92,000	12,000	39,000 C	390,000	NA	NA
Chloroethane	250	<286	<281	<327	<318	449	514	<326	<2,900	<306	<414	<323	<334	<335	34,000	22,000 X	950,000 C	36,000,000 C	950,000 C	950,000	NA	NA
Cyclohexane	250	<286	<281	<327	<318	535	<301	<326	<571	<250	<250	<250	<250	<250	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	50	<50	<50	<50	<50	<50	<50	<50	<290	<50	<50	<50	<50	<50	14,000	280	210,000 C	46,000,000 C	63,000,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	<57	<56	<65	<63	<63	<60	<65	<570	<61	<82	<64	<66	<67	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
1,2-Dichloroethane	50	<57	<56	<65	<63	<63	<60	<65	<570	<61	<82	<64	<66	<67	100	7,200 X	380,000	21,000	420,000	1,200,000	23 M	46 M
1,1-Dichloroethene	50	<57	<56	<65	<63	<63	<60	<65	<290	<50	<50	<50	<50	<50	140	2,600	220,000	37,000	660,000 C	570,000	220	430
cis-1,2-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<290	<50	<50	<50	<50	<50	1,400	12,000	640,000	41,000	640,000 C	640,000	37 M	74
trans-1,2-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<290	<50	<50	<50	<50	<50	2,000	30,000 X	1,400,000 C	330,000	1,400,000 C	1,400,000	210	420
Ethylbenzene	50	<57	<56	<65	<63	**22,000**	**16,000**	<65	**790**	74	<50	200	<50	<50	1,500	360	140,000 C	2,400,000 C	140,000 C	140,000	340	680
Isopropylbenzene	50	<290	<280	<330	<320	**330**	<300	<330	<290	<50	<50	<50	<50	<62	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
4-Isopropyltoluene	50	<110	<110	<130	<130	<130	<120	<130	<290	<50	<50	<58	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	100	<100	<100	<100	<100	<100	<100	<100	<285	<100	<100	<100	<100	<100	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
2-Methylnaphthalene	250	<286	<281	<327	<318	<315	<301	<326	<285	<250	<250	<250	<250	<250	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
4-Methyl-2-Pentanone	250	<286	<281	<327	<318	<315	<301	<326	<5,700	<613	<828	<647	<668	<670	100,000	ID	2,700,000 C	53,000,000	2,700,000 C	2,700,000	150,000 SE	290,000 SE
Methyl *tert*-butyl ether (MtBE)	50	<290	<280	<330	<320	800	780	<330	<570	<61	<82	<64	<66	<67	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	<286	<281	<327	<318	<315	<301	<326	<285	<250	<250	<250	<250	<250	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n-Propylbenzene	50	<57	<56	<65	<63	240	230	<65	<290	<50	<50	<50	<50	<50	4,600	ID	300,000	590,000,000	8,000,000	10,000,000	21,000 SE	21,000 SE
Tetrachloroethene	50	<57	<56	<65	<63	<63	<60	<65	**520**	<50	**940**	<50	<50	<50	100	1,200 X	88,000 C	210,000	88,000 C	88,000	74 SE	150
Tetrahydrofuran	250	<286	<281	<327	<318	<315	<301	<326	<2,900	615	<414	<323	<334	<335	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000	450,000
Toluene	50	<50	<50	<50	<50	170	300	<50	820	110	340	360	<50	240	16,000	5,400	250,000 C	3,300,000 C	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trichlorobenzene	250	<286	<281	<327	<318	<315	<301	<326	863	<250	<250	<250	<250	<250	4,200	5,900 X	1,100,000 C	34,000,000	1,100,000 C,DD	1,100,000	NA	NA
1,1,1-Trichloroethane	50	<57	<56	<65	<63	<63	<60	<65	<570	<61	<82	<64	<66	<67	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	50	<57	<56	<65	<63	<63	<60	<65	<570	<61	**130**	<64	<66	<67	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 M	8.0 M, SE
1,2,3-Trimethylbenzene	50	<110	<110	<130	<130	<130	<120	<130	350	<50	<50	<50	<50	<50	NA	NA	NA	NA	NA	NA	4,800	9,600
1,2,4-Trimethylbenzene	50	<110	<110	<130	<130	220	270	<130	**1,000**	<89	<50	<50	<50	<50	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	<110	<110	<130	<130	270	260	<130	450	<50	<50	<50	<50	<50	1,800	1,100	94,000 C	19,000,000 C	94,000 C	94,000	1,800	3,600
Vinyl Chloride	50	<50	<50	<50	<50	<50	<50	<50	<290	<50	<50	<50	<50	<50	40	260 X	20,000	29,000	34,000	490,000	8.2 M	16 M
Xylenes	100	<172	<168	<196	<191	**44,000**	**37,000**	<195	**4,400**	625	<150	545	<150	<150	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary	Vary

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated December 30, 2013
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
E1 = the reported value is estimated due to the presence of interference
J = the concentration is an estimated value
J- = the result is an estimated quantity, but the result may be biased low
V- = recovery in the assocated continu Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
ND = non-detect
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 2 (continued)
Corrective Action Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	MDEQ TDL 10/2006	BSB-22		BSB-23		BSB-24		BSB-25		BSB-26		BSB-27		DUP-06	MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
(sample interval - feet)		(3-5)	(9-10)	(3-5)	(9-10)	(3-5)	(7.5-8.5)	(3-5)	(5-7)	(3-5)	(5-7)	(3-5)	(5-7)									
Collection Date		8/26/2013	8/26/2013	8/26/2013	8/26/2013	8/27/2013	8/27/2013	8/27/2013	8/27/2013	8/27/2013	8/27/2013	8/27/2013	8/27/2013	8/27/2013								
Analysis Date		8/30/2013	8/30/2013	8/30/2013	8/30/2013	8/30/2013	8/30/2013	8/30/2013	8/29/2013	8/29/2013	8/29/2013	8/29/2013	8/29/2013 8/30/2013	8/30/2013								
Collection Method		Grab																				
VOCs															Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to AmbientAir	Direct Contact	Soil Saturation Concentration Screening Levels		
Acetone	1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<21,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<21,000	42,000	34,000	110,000,000	160,000,000 C	73,000,000	110,000,000	3,100,000	3,100,000
Benzene	50	<50	<50	<50	<50	<50	<1,100	**120**	<50	<50	<50	<50	<64	<1,100	100	4,000 X	220,000	45,000	840,000 C	400,000	47 M	94
2-Butanone	250	<394	<281	<287	<295	<582	<21,000	<559	<607	<552	<258	<552	<687	<21,000	760,000	44,000	27,000,000	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
n-Butylbenzene	50	<50	<50	<50	<50	<50	**69,000**	<50	<50	<50	<50	<50	<50	**57,000**	4,600	ID	120,000	880,000,000	8,000,000	10,000,000	9,800	20,000
sec-Butylbenzene	50	<50	<50	<50	<50	<58	**28,000**	<55	<60	<55	<50	<55	<68	**24,000**	4,600	ID	88,000	180,000,000	8,000,000	10,000,000	49,000 C	49,000 C
tert-Butylbenzene	50	<50	<50	<50	<50	<50	**3,500**	<50	<50	<50	<50	<50	<50	**3,000**	4,600	ID	180,000	290,000,000	8,000,000	10,000,000	11 M	23 M
Carbon tetrachloride	50	<78	<56	<57	<59	<58	<2,100	<55	<60	<55	<51	<55	<68	<2,100	100	900 X	92,000	12,000	39,000 C	390,000	NA	NA
Chloroethane	250	<394	<281	<287	<295	<291	<11,000	<279	<303	<276	<258	<276	<343	<11,000	34,000	22,000 X	950,000 C	36,000,000 C	950,000 C	950,000	NA	NA
Cyclohexane	250	<250	<250	<250	<250	<291	<11,000	<279	<303	<276	<250	<276	<343	<11,000	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	50	<50	<50	<50	<50	<50	<1,100	<50	<50	<50	<50	<50	<50	<1,100	14,000	280	210,000 C	46,000,000 C	63,000,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	<78	<56	<57	<59	<58	<2,100	<55	<60	<55	<51	<55	<68	<2,100	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
1,2-Dichloroethane	50	<78	<56	<57	<59	<58	<2,100	<55	<60	<55	<51	<55	<68	<2,100	100	7,200 X	380,000	21,000	420,000	1,200,000	23 M	46 M
1,1-Dichloroethene	50	<50	<50	<50	<50	<58	<2,100	<55	<60	<55	<50	<55	<68	<2,100	140	2,600	220,000	37,000	660,000 C	570,000	220	430
cis-1,2-Dichloroethene	50	<50	<50	<50	**110**	<50	<1,100	<50	<50	<50	<50	<50	<50	<1,100	1,400	12,000	640,000	41,000	640,000 C	640,000	37 M	74
trans-1,2-Dichloroethene	50	<50	<50	<50	<50	<50	<1,100	<50	<50	<50	<50	<50	<50	<1,100	2,000	30,000 X	1,400,000 C	330,000	1,400,000 C	1,400,000	210	420
Ethylbenzene	50	<50	<50	<50	<50	<58	<2,100	<55	<60	<55	70	<55	250	<2,100	1,500	360	140,000 C	2,400,000 C	140,000 C	140,000	340	680
Isopropylbenzene	50	<50	<50	<50	<50	<290	<11,000	<280	<300	<280	<66	<280	<340	<11,000	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
4-Isopropyltoluene	50	<50	<50	<50	<50	<120	36,000	<110	<120	<110	<50	<110	<140	32,000	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	100	<100	<100	<100	<100	<100	<2,100	<100	<100	<100	<100	<100	<100	<2,100	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
2-Methylnaphthalene	250	<250	<250	<250	<250	<291	**88,000**	<279	<303	<276	<580	<276	1,400	**85,000**	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
4-Methyl-2-Pentanone	250	<789	<562	<574	<591	<291	<11,000	<279	<303	<276	<517	<276	<343	<11,000	100,000	ID	2,700,000 C	53,000,000	2,700,000 C	2,700,000	150,000 SE	290,000 SE
Methyl *tert*-butyl ether (MtBE)	50	<78	<56	<57	<59	<290	<11,000	<280	<300	<280	<51	<280	<340	<11,000	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	<250	<250	<250	<250	<291	**70,000**	<279	<303	<276	<259	<276	**8,600**	**60,000**	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n-Propylbenzene	50	<50	<50	<50	<50	<58	**17,000**	<55	<60	<55	71	<55	<68	**15,000**	4,600	ID	300,000	590,000,000	8,000,000	10,000,000	21,000 SE	21,000 SE
Tetrachloroethene	50	<50	<50	<50	<50	**390**	**8,000**	<55	<60	<55	<50	<55	<68	**7,400**	100	1,200 X	88,000 C	210,000	88,000 C	88,000	74 E	150
Tetrahydrofuran	250	<394	<281	<287	<295	<291	<11,000	<279	<303	<276	<258	<276	<343	<11,000	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000	450,000
Toluene	50	170	<50	64	<50	<50	<1,100	160	<50	<50	190	<50	240	<1,100	16,000	5,400	250,000 C	3,300,000 C	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trichlorobenzene	250	<250	<250	<250	<250	<291	<11,000	<279	<303	<276	<250	<276	<343	<11,000	4,200	5,900 X	1,100,000 C	34,000,000	1,100,000 C,DD	1,100,000	NA	NA
1,1,1-Trichloroethane	50	<78	<56	<57	<59	<58	<2,100	<55	<60	<55	<51	<55	<68	<2,100	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	50	<78	<56	**93**	<59	<58	<2,100	<55	<60	<55	<51	<55	<68	<2,100	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 M	8.0 M,SE
1,2,3-Trimethylbenzene	50	<50	<50	<50	<50	<120	**140,000**	<110	<120	<110	<58	<110	<140	**120,000**	NA	NA	NA	NA	NA	NA	4,800	9,600
1,2,4-Trimethylbenzene	50	<50	<50	<50	<50	<120	**220,000**	<110	<120	<110	120	<110	230	**190,000**	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	<50	<50	<50	<50	<120	**74,000**	<110	<120	<110	<50	<110	<140	**67,000**	1,800	1,100	94,000 C	19,000,000 C	94,000 C	94,000	1,800	3,600
Vinyl Chloride	50	<50	<50	<50	<50	<50	<1,100	<50	<50	<50	<50	<50	<50	<1,100	40	260 X	20,000	29,000	34,000	490,000	8.2 M	16 M
Xylenes	100	261	<150	<150	<150	<174	**25,000**	<167	<182	<165	387	<165	761	**23,000**	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary	Vary

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated December 30, 2013
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
E1 = the reported value is estimated due to the presence of interference
J = the concentration is an estimated value
J- = the result is an estimated quantity, but the result may be biased low
V- = recovery in the associated continuing calibration verification sample (CCV) exceeds the lower control limit. Results may be biased low.
ND = non-detect
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific
the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 2 (continued)
Corrective Action Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Soil Boring Number	MDEQ TDL 10/2006	**BSB-28**		**BSB-29**		**BSB-30**		**BSB-31**		**DUP-02**	MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure
(sample interval - feet)		(4-5)	(5-6)	(3-4)	(8-9)	(4-5)	(9-10)	(7-8)	(11-12)		Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to AmbientAir	Direct Contact	Soil Saturation Concentration Screening Levels		
Collection Date		4/17/2014	4/17/2014	4/17/2014	4/17/2014	4/17/2014	4/17/2014	4/17/2014	4/17/2014	4/17/2014								
Analysis Date		4/24/2014	4/24/2014	4/24/2014	4/24/2014	4/24/2014	4/24/2014	4/24/2014	4/24/2014	4/24/2014								
Collection Method		Grab																
VOCs																		
Acetone	1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	42,000	34,000	110,000,000	160,000,000 C	73,000,000	110,000,000	3,100,000	3,100,000
Benzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	100	4,000 X	220,000	45,000	840,000 C	400,000	47 M	94
2-Butanone	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	760,000	44,000	27,000,000	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
n-Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	4,600	ID	120,000	880,000,000	8,000,000	10,000,000	9,800	20,000
sec-Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	4,600	ID	88,000	180,000,000	8,000,000	10,000,000	49,000 C	49,000 C
tert-Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	4,600	ID	180,000	290,000,000	8,000,000	10,000,000	11 M	23 M
Carbon tetrachloride	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	100	900 X	92,000	12,000	39,000 C	390,000	NA	NA
Chloroethane	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	34,000	22,000 X	950,000 C	36,000,000 C	950,000 C	950,000	NA	NA
Cyclohexane	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	14,000	280	210,000 C	46,000,000 C	63,000,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
1,2-Dichloroethane	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	100	7,200 X	380,000	21,000	420,000	1,200,000	23 M	46 M
1,1-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	140	2,600	220,000	37,000	660,000 C	570,000	220	430
cis-1,2-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	1,400	12,000	640,000	41,000	640,000 C	640,000	37 M	74
trans-1,2-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	2,000	30,000 X	1,400,000 C	330,000	1,400,000 C	1,400,000	210	420
Ethylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	1,500	360	140,000 C	2,400,000 C	140,000 C	140,000	340	680
Isopropylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
4-Isopropyltoluene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
2-Methylnaphthalene	250	<250	<250	<250	<250	<250	<250	<251	<250	<250	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
4-Methyl-2-Pentanone	250	<328	<308	<299	<312	<283	<313	<339	<301	<250	100,000	ID	2,700,000 C	53,000,000	2,700,000 C	2,700,000	150,000 SE	290,000 SE
Methyl *tert*-butyl ether (MtBE)	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	<250	<250	<250	<250	<250	<250	630	<250	<250	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n-Propylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	4,600	ID	300,000	590,000,000	8,000,000	10,000,000	21,000 SE	21,000 SE
Tetrachloroethene	50	**2,500**	<50	62	<50	**120**	<50	<50	<50	<50	100	1,200 X	88,000 C	210,000	88,000 C	88,000	74 SE	150
Tetrahydrofuran	250	<328	<308	<299	<312	<283	<313	<339	<301	<250	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000	450,000
Toluene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	16,000	5,400	250,000 C	3,300,000 C	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trichlorobenzene	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	4,200	5,900 X	1,100,000 C	34,000,000	1,100,000 C,DD	1,100,000	NA	NA
1,1,1-Trichloroethane	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	50	**100**	<50	<50	<50	<50	<50	<50	<50	<50	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0M	8 M, SE
1,2,3-Trimethylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	NA	NA	NA	NA	NA	NA	4,800	9,600
1,2,4-Trimethylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	1,800	1,100	94,000 C	19,000,000 C	94,000 C	94,000	1,800	3,600
Vinyl Chloride	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	40	260 X	20,000	29,000	34,000	490,000	8.2 M	16 M
Xylenes	100	<150	<150	<150	<150	<150	<150	<150	<150	<150	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary	Vary

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated December 30, 2013
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
E1 = the reported value is estimated due to the presence of interference
J = the concentration is an estimated value
J- = the result is an estimated quantity, but the result may be biased low
V- = recovery in the assocated continuing calibration verification sample (CCV) exceeds the lower control limit. Results may be biased low.
ND = non-detect
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 2 (continued)
Corrective Action Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Soil Boring Number		**BSB-32**		**BSB-33**		**BSB-34**		**BSB-35**		**Dup-03**	MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12 hour Exposure VIAC
(sample interval - feet)		(2-4)	(10-12)	(2-4)	(8-10)	(3-5)	(8-10)	(2-4)	(6-8)									
Collection Date	MDEQ TDL 10/2006	9/18/2014	9/18/2014	9/18/2014	9/18/2014	9/18/2014	9/18/2014	9/18/2014	9/18/2014	9/18/2014	Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to AmbientAir	Direct Contact	Soil Saturation Concentration Screening Levels		
Analysis Date		9/23/2014 9/24/2014	9/23/2014 9/24/2014	9/23/2014 9/24/2014	9/23/2014 9/24/2014	9/23/2014 9/24/2014	9/23/2014 9/24/2014	9/23/2014 9/24/2014	9/23/2014 9/24/2014	9/24/2014								
Collection Method		Grab																
VOCs																		
Acetone	1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	42,000	34,000	110,000,000	160,000,000 C	73,000,000	110,000,000	3,100,000	3,100,000
Benzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	100	4,000 X	220,000	45,000	840,000 C	400,000	47 M	94
2-Butanone	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	760,000	44,000	27,000,000	35,000,000	000,000 C, DD	27,000,000	370,000 SE	740,000 SE
n -Butylbenzene	50	<50	<50	<50	<50	130	<50	<50	<50	170	4,600	ID	120,000	880,000,000	8,000,000	10,000,000	9,800	20,000
sec -Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	4,600	ID	88,000	180,000,000	8,000,000	10,000,000	49,000 C	49,000 C
tert -Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	4,600	ID	180,000	290,000,000	8,000,000	10,000,000	11 M	23 M
Carbon tetrachloride	50	<56	<65	<55	<74	<60	<98	<60	<82	<61	100	900 X	92,000	12,000	39,000 C	390,000	NA	NA
Chloroethane	250	<280	<320	<270	<370	<300	<490	<300	<410	<300	34,000	22,000 X	950,000 C	36,000,000 C	950,000 C	950,000	NA	NA
Cyclohexane	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	14,000	280	210,000 C	46,000,000 C	63,000,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
1,2-Dichloroethane	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	100	7,200 X	380,000	21,000	420,000	1,200,000	23 M	46 M
1,1-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	140	2,600	220,000	37,000	660,000 C	570,000	220	430
cis -1,2-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	1,400	12,000	640,000	41,000	640,000 C	640,000	37 M	74
trans -1,2-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	2,000	30,000 X	1,400,000 C	330,000	1,400,000 C	1,400,000	210	420
Ethylbenzene	50	<50	<50	<50	<50	60	<50	<50	<50	120	1,500	360	140,000 C	2,400,000 C	140,000 C	140,000	340	680
Isopropylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
4-Isopropyltoluene	50	<50	<50	<50	<50	<50	<50	<50	<50	56	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
2-Methylnaphthalene	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
4-Methyl-2-Pentanone	250	<280	<320	<270	<370	<300	<490	<300	<410	<300	100,000	ID	2,700,000 C	53,000,000	2,700,000 C	2,700,000	150,000 SE	290,000 SE
Methyl *tert* -butyl ether (MtBE)	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	<250	<250	<250	<250	410	<250	<250	<250	370	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n -Propylbenzene	50	<50	<50	<50	<50	92	<50	<50	<50	140	4,600	ID	300,000	590,000,000	8,000,000	10,000,000	21,000 SE	21,000 SE
Tetrachloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	100	1,200 X	88,000 C	210,000	88,000 C	88,000	74	150
Tetrahydrofuran	250	<280	<320	<270	<370	<300	<490	<300	<410	<300	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000	450,000
Toluene	50	<50	<50	<50	<50	59	<50	<50	<50	160	16,000	5,400	250,000 C	3,300,000 C	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trichlorobenzene	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	4,200	5,900 X	1,100,000 C	34,000,000	,100,000 C,DD	1,100,000	NA	NA
1,1,1-Trichloroethane	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 (M)	8.0 M, SE
1,2,3-Trimethylbenzene	50	<50	<50	<50	<50	140	<50	<50	<50	220	NA	NA	NA	NA	NA	NA	4,800	9,600
1,2,4-Trimethylbenzene	50	<50	<50	<50	<50	470	<50	<50	<50	**680**	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	<50	<50	<50	<50	86	<50	<50	<50	130	1,800	1,100	94,000 C	19,000,000 C	94,000 C	94,000	1,800	3,600
Vinyl Chloride	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	40	260 X	20,000	29,000	34,000	490,000	8.2 M	16 M
Xylenes	100	<150	<150	<150	<150	420	<150	<150	<150	790	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary	Vary

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated December 30, 2013
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
E1 = the reported value is estimated due to the presence of interference
J = the concentration is an estimated value
J- = the result is an estimated quantity, but the result may be biased low
V- = recovery in the assocated continuing calibration verification sample (CCV) exceeds the lower control limit. Results may be biased low.
ND = non-detect
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 2 (continued)
Corrective Action Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Soil Boring Number	MDEQ TDL 10/2006	**BSB-36**			**BSB-38**		MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
(sample interval - feet)		(0-2)	(8-10)	(12.5-13)	(1.5-2)	(4.5-5)	Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to AmbientAir	Direct Contact	Soil Saturation Concentration Screening Levels		
Collection Date		12/22/2014	12/22/2014	12/22/2014	12/22/2014	12/22/2014								
Analysis Date		12/27/2014	12/27/2014	12/25/2014	12/25/2014	12/25/2014								
Collection Method		Grab												
VOCs														
Acetone	1,000	<1,000 J,L+	<1,100 J,L+	<1,000	<1,000	<5,300	42,000	34,000	110,000,000	160,000,000 C	73,000,000	110,000,000	3,100,000	3,100,000
Benzene	50	<50	<50	<50	**88**	<270	100	4,000 X	220,000	45,000	840,000 C	400,000	47 M	94
2-Butanone	250	<250 J,L+	<250 J,L+	<250	<250	<1,100	760,000	44,000	27,000,000	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
n -Butylbenzene	50	<50	<50	<50	<50	<270	4,600	ID	120,000	880,000,000	8,000,000	10,000,000	9,800	20,000
sec -Butylbenzene	50	<50	<50	<50	<50	<270	4,600	ID	88,000	180,000,000	8,000,000	10,000,000	49,000 C	49,000 C
tert -Butylbenzene	50	<50	<50	<50	<50	<270	4,600	ID	180,000	290,000,000	8,000,000	10,000,000	11 M	23 M
Carbon tetrachloride	50	<50	<56	<58	<62	<530	100	900 X	92,000	12,000	39,000 C	390,000	NA	NA
Chloroethane	250	<260	<560	<250	360	<1,100	34,000	22,000 X	950,000 C	36,000,000 C	950,000 C	950,000	NA	NA
Cyclohexane	250	<250	<250	<250	<250	<270	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	50	<50	<50	<50	180	<270	14,000	280	210,000 C	46,000,000 C	63,000,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	<50	<50	<50	**83**	<270	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
1,2-Dichloroethane	50	<50	<50	<50	<50	<270	100	7,200 X	380,000	21,000	420,000	1,200,000	23 M	46 M
1,1-Dichloroethene	50	<50	<50	<50	<50	<270	140	2,600	220,000	37,000	660,000 C	570,000	220	430
cis -1,2-Dichloroethene	50	<50	<50	<50	<50	<270	1,400	12,000	640,000	41,000	640,000 C	640,000	37 M	74
Diisopropyl ether	250	<250	**2,000**	<250	<250	<270	1,300 C	ID	1,300 C	3,200,000	1,300 C	1,300	2,300 SE	4,700 SE
Ethylbenzene	50	<50	<50	<50	**4,000**	<270	1,500	360	140,000 C	2,400,000 C	140,000 C	140,000	340	680
Isopropylbenzene	50	<100 J,L+	<230 J,L+	<50	370	<270	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
4-Isopropyltoluene	50	<50	<50	<50	<50	<270	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	100	<100	<100	<100	<100	<530	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
2-Methylnaphthalene	250	<250	<250	<250	<250	<530	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
4-Methyl-2-Pentanone	250	<510	3,500	<250	<340	<1,100	100,000	ID	2,700,000 C	53,000,000	2,700,000 C	2,700,000	150,000 SE	290,000 SE
Methyl *tert* -butyl ether (MtBE)	50	<50	**8,300**	<50	**1,000**	**5,200**	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	<250	<250	<250	<250	<270	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n -Propylbenzene	50	<50	<50	<50	440	<270	4,600	ID	300,000	590,000,000	8,000,000	10,000,000	21,000 SE	21,000 SE
Styrene	50	<50	<50	<50	280	<270	2,700	2,100 X	270,000	3,300,000	520,000 C	520,000	NA	NA
Tetrachloroethene	50	**160**	<50	<50	<50	<270	100	1,200 X	88,000 C	210,000	88,000 C	88,000	74 SE	150
Tetrahydrofuran	250	<260	4,500	<290	1,600	<2,700	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000	450,000
Toluene	50	<50	130	<50	1,100	<270	16,000	5,400	250,000 C	3,300,000 C	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trichlorobenzene	250	<250	<250	<250	<250	<270	4,200	5,900 X	1,100,000 C	34,000,000	1,100,000 C,DD	1,100,000	NA	NA
1,1,1-Trichloroethane	50	<50	<50	<50	<50	<270	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	50	<50	<50	<50	<50	<270	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 M	8.0 M, SE
1,2,3-Trimethylbenzene	50	<50	<50	<50	430	<270	NA	NA	NA	NA	NA	NA	4,800	9,600
1,2,4-Trimethylbenzene	50	<50	<50	<50	**3,000**	<270	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	<50	<50	<50	1,000	<270	1,800	1,100	94,000 C	19,000,000 C	94,000 C	94,000	1,800	3,600
Vinyl Chloride	50	<50	<50	<50	<50	<270	40	260 X	20,000	29,000	34,000	490,000	8.2 M	16 M
Xylenes	100	190	<150	<150	**24,000**	<800	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
Other VOCs	NA	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary	Vary

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated December 30, 2013
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
E1 = the reported value is estimated due to the presence of interference
J = the concentration is an estimated value
J- = the result is an estimated quantity, but the result may be biased low
V- = recovery in the associated continuing calibration verification sample (CCV) exceeds the lower control limit. Results may be biased low.
ND = non-detect
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 3
Corrective Measures Study Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	MDEQ TDL 10/2006	BSB-39		BSB-40		BSB-41		BSB-42		BSB-43		MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
(sample interval - feet)		(1-3)	(3-5)	(3-5)	(8-10)	(1.5-3.5)	(3.5-5.5)	(5-7)	(8-10)	(10-12)	(16-18)								
Collection Date		3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016								
Analysis Date		3/22/2016	3/18/2016	3/18/2016	3/18/2016	3/18/2016	3/21/2016	3/18/2016	3/18/2016 3/21/2016	3/18/2016 3/21/2016	3/18/2016								
Collection Method		Grab										Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to Ambient Air (Infinite Source)	Direct Contact	Soil Saturation Concentration Screening Levels		
VOCs																			
Acetone	1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<6,700	<1,000	42,000	34,000	110,000,000 C	160,000,000	73,000,000	110,000,000	3,100,000	3,100,000
Benzene	50	<50	<50	<50	<50	<50	<50	<50	**110**	**820**	<50	100	4,000 X	220,000	45,000	400,000 C	400,000	47 M	94
2-Butanone	250	<250	<250	<250	<250	<250	<250	<250	1,200	<1,300	<250	760,000	44,000	27,000,000 C	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
n-Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	440	<50	4,600	ID	120,000	ID	8,000,000	10,000,000	9,800	20,000
sec-Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	410	<50	4,600	ID	88,000	ID	8,000,000	10,000,000	49,000 C	49,000 C
tert-Butylbenzene	50	<50	<50	<50	<50	<50	<50	<50	<50	<330	<50	4,600	ID	180,000	ID	8,000,000	10,000,000	11 M	23 M
Carbon tetrachloride	50	<50	<50	<50	<50	<50	<50	**120**	**420**	<330	<50	100	900 X	92,000	12,000	390,000 C	390,000	NA	NA
Chloroethane	250	<300	<250	<250	<250	<250	<310	<250	<250	<1,300	<250	34,000	22,000 X	950,000 C	36,000,000	950,000 C	950,000	NA	NA
Cyclohexane	250	<250	<250	<250	<250	<250	<250	<250	330	<330	<250	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	50	<50	<50	<50	<50	<50	<50	<50	**1,100**	**6,800**	<50	14,000	280	210,000 C	46,000,000	210,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	<50	<50	<50	<50	<50	<50	**1,000**	**2,500**	**900**	<50	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
1,2-Dichloroethane	50	<50	<50	<50	<50	<50	<50	<50	<50	<330	<50	100	7,200 X	380,000	21,000	420,000	1,200,000	23 M	46 M
1,1-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<330	<50	140	2,600	220,000	3,700	570,000 C	570,000	220	430
cis-1,2-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<78	**5,000**	<110	1,400	12,000	640,000 C	210,000	640,000 C	640,000	37 M	74
trans-1,2-Dichloroethene	50	<50	<50	<50	<50	<50	<50	<50	<50	<330	<50	2,000	30,000 X	1,400,000 C	330,000	1,400,000 C	1,400,000	210	420
Ethylbenzene	50	<50	<50	<50	<50	<50	<50	<50	**36,000**	**490,000**	**2,800**	1,500	360	140,000 C	2,400,000	140,000 C	140,000	340	680
Isopropylbenzene	50	<50	<50	<50	<50	<50	<50	<50	480	**5,500**	<50	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
4-Isopropyltoluene	50	<50	<50	<50	<50	<50	<50	<50	<60	<330	<50	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	100	<100	<100	<100	<100	<100	<100	<100	**980**	**530**	<100	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
2-Methylnaphthalene	250	<300	<300	<310	<290	<310	<250	<310	<400	<3,300	<290	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
4-Methyl-2-Pentanone	250	<250	<300	<310	<290	<310	<310	<310	2,300	9,400	<290	100,000	ID	2,700,000 C	53,000,000	2,700,000 C	2,700,000	150,000 SE	290,000 SE
Methyl *tert*-butyl ether (MtBE)	50	<50	<50	<50	<50	<50	<50	<50	690	**1,400**	**850**	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	<250	<250	<250	<250	<250	<250	<310	<400	<3,300	<290	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n-Propylbenzene	50	<50	<50	<50	<50	<50	<50	<50	790	**9,700**	80	4,600	ID	300,000	ID	8,000,000	10,000,000	21,000 SE	21,000 SE
Tetrachloroethene	50	<50	**120**	<50	<50	<50	<50	**830**	**2,600**	**5,000**	<50	100	1,200 X	88,0000 C	210,000	88,0000 C	88,000	74 SE	150
Tetrahydrofuran	250	<250	<250	<250	<250	<250	<250	<250	1,600	<670	**7,800**	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000 SE	450,000 SE
Toluene	50	<50	<50	<50	<50	<50	<50	<50	**25,000**	**930,000**	**7,000**	16,000	5,400	250,000 C	3,300,000	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trichlorobenzene	250	<250	<250	<250	<250	<250	<250	<250	<250	<330	<250	4,200	5,900 X	1,100,000 C	34,000,000	1,100,000 C,DD	1,100,000	NA	NA
1,1,1-Trichloroethane	50	<50	<50	<50	<50	<50	<50	720	**2,500**	<330	<50	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	50	<50	<50	<50	<50	<50	<50	**290**	**750**	**740**	<50	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 M	8.0 M, SE
1,2,3-Trimethylbenzene	50	<50	<50	<50	<50	<50	<50	<50	340	3,800	<50	NA	NA	NA	NA	NA	NA	4,800	9,600
1,2,4-Trimethylbenzene	50	<50	<50	<50	<50	<50	<50	<120	**2,700**	**34,000**	280	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	<50	<50	<50	<50	<50	<50	<50	**1,200**	**13,000**	130	1,800	1,100	94,000 C	19,000,000	94,000 C	94,000	1,800	3,600
Vinyl Chloride	50	<50	<50	<50	<50	<50	<50	<50	<50	<330	<50	40	260 X	20,000	29,000	34,000	490,000	8.2 M	16 M
Xylenes	100	<150	<150	<150	<150	<150	<150	<150	**130,000**	**2,300,000**	**13,000**	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary	Vary
Moisture Content (%)		16	16	20	13	20	19	18	37	25	15								

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated September 28, 2012
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
ND = non-detect
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 3 (continued)
Corrective Measures Study Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification		**BSB-44**		**BSB-45**		**BSB-46**		**BSB-47**		**BSB-48**		**Dup-01**	MDEQ Nonresidential Cleanup Criteria**							
(sample interval - feet)		(2-4)	(4-6)	(9-11)	(13-15)	(6-8)	(9-11)	(3-5)	(5-7)	(3-5)	(5-7)									
Collection Date	MDEQ TDL 10/2006	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to Ambient Air (Infinite Source)	Direct Contact	Soil Saturation Concentration Screening Levels	MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
Analysis Date		3/18/2016	3/18/2016 3/22/2016	3/18/2016 3/22/2016	3/21/2016 3/22/2016	3/18/2016	3/18/2016	3/18/2016	3/18/2016	3/18/2016	3/18/2016	3/18/2016								
Collection Method		Grab																		
VOCs																				
Acetone	1,000	<1,000	<1,000	<1,000	3,700	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	42,000	34,000	110,000,000 C	160,000,000	73,000,000	110,000,000	3,100,000	3,100,000
Benzene	50	**170**	**230**	<50	**1,100**	<50	<50	<50	<50	<50	<50	<50	100	4,000 X	220,000	45,000	400,000 C	400,000	47 M	94
2-Butanone	250	<250	<250	<250	<640	<250	<250	<250	<250	<250	<250	<250	760,000	44,000	27,000,000 C	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
n -Butylbenzene	50	<50	<50	<50	<160	<50	<50	<50	<50	<50	<50	<50	4,600	ID	120,000	ID	8,000,000	10,000,000	9,800	20,000
sec -Butylbenzene	50	<50	<50	<50	<160	<50	<50	<50	<50	<50	<50	<50	4,600	ID	88,000	ID	8,000,000	10,000,000	49,000 C	49,000 C
tert -Butylbenzene	50	<50	<50	<50	<160	<50	<50	<50	<50	<50	<50	<50	4,600	ID	180,000	ID	8,000,000	10,000,000	11 M	23 M
Carbon tetrachloride	50	<50	<50	<50	<160	<50	<50	<50	<50	<50	<50	<50	100	900 X	92,000	12,000	390,000 C	390,000	NA	NA
Chloroethane	250	<250	<250	<250	<1,600	<250	<250	<250	<250	<250	<250	<250	34,000	22,000 X	950,000 C	36,000,000	950,000 C	950,000	NA	NA
Cyclohexane	250	<250	330	<250	330	<250	<250	<250	<250	<250	<250	<250	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	50	<50	<93	<50	**6,600**	<50	<50	<50	<50	<50	<50	<50	14,000	280	210,000 C	46,000,000	210,000 C	210,000	26,000	52,000
1,1-Dichloroethane	50	**180**	**93**	**110**	<160	<50	<50	<50	<50	<50	<50	<50	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
1,2-Dichloroethane	50	<50	<50	<50	<160	<50	<50	<50	<50	<50	<50	<50	100	7,200 X	380,000	21,000	420,000	1,200,000	23 M	46 M
1,1-Dichloroethene	50	<50	<50	<50	<160	<50	<50	<50	<50	<50	<50	<50	140	2,600	220,000	3,700	570,000 C	570,000	220	430
cis -1,2-Dichloroethene	50	**90**	<50	<50	**340**	<50	<50	<50	<50	**9,400**	**8,700**	<50	1,400	12,000	640,000 C	210,000	640,000 C	640,000	37 M	74
trans -1,2-Dichloroethene	50	<50	<50	<50	<160	<50	<50	<50	<50	<82	66	<50	2,000	30,000 X	1,400,000 C	330,000	1,400,000 C	1,400,000	210	420
Ethylbenzene	50	**4,700**	**35,000**	81	**260,000**	<50	<50	<50	<50	<50	<50	<50	1,500	360	140,000 C	2,400,000	140,000 C	140,000	340	680
Isopropylbenzene	50	**130**	**530**	<50	**3,700**	<50	<50	<50	<50	<50	<50	<50	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
4-Isopropyltoluene	50	<50	<50	<50	440	<50	<50	<50	<50	<50	<50	<50	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	100	**200**	<100	<100	<320	<100	<100	<100	<100	<100	<100	<100	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
2-Methylnaphthalene	250	<290	1,300	<330	<320	<320	<310	<300	<320	<290	<300	<290	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
4-Methyl-2-Pentanone	250	<290	<360	<330	2,700	<320	<310	<300	<320	<290	<300	<290	100,000	ID	2,700,000 C	53,000,000	2,700,000 C	2,700,000	150,000 SE	290,000 SE
Methyl *tert* -butyl ether (MtBE)	50	<50	<50	<50	**5,600**	<50	<50	<50	<50	<50	<50	<50	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	250	<250	**4,800**	<250	<560	<320	<310	<300	<320	<290	<300	<290	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n -Propylbenzene	50	140	870	<50	4,200	<50	<50	<50	<50	<50	<50	<50	4,600	ID	300,000	ID	8,000,000	10,000,000	21,000 SE	21,000 SE
Tetrachloroethene	50	<50	<50	**300**	<160	73	<50	**990**	**100**	**28,000**	**10,000**	**280**	100	1,200 X	88,0000 C	210,000	88,0000 C	88,000	74 SE	150
Tetrahydrofuran	250	<250	<250	<250	**38,000**	<250	<250	<250	<250	<250	<250	<250	5,400	220,000 X	32,000,000	15,000,000	9,500,000	120,000,000	220,000 SE	450,000 SE
Toluene	50	2,000	2,600	91	**98,000**	<50	<50	<50	<50	<50	<50	<50	16,000	5,400	250,000 C	3,300,000	250,000 C	250,000	64,000 SE	64,000 SE
1,2,4-Trichlorobenzene	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	4,200	5,900 X	1,100,000 C	34,000,000	1,100,000 C,DD	1,100,000	NA	NA
1,1,1-Trichloroethane	50	110	140	200	<160	<50	<50	<50	<50	<50	<50	<50	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	50	<50	<50	**120**	<160	<50	<50	<50	<50	**8,500**	**4,600**	<50	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 M	8.0 M, SE
1,2,3-Trimethylbenzene	50	<50	<120	<50	**2,400**	<50	<50	<50	<50	<50	<50	<50	NA	NA	NA	NA	NA	NA	4,800	9,600
1,2,4-Trimethylbenzene	50	150	**1,600**	<130	**17,000**	<130	<120	<120	<130	<120	<120	<120	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	50	130	**1,100**	<50	**6,700**	<50	<50	<50	<50	<50	<50	<50	1,800	1,100	94,000 C	19,000,000	94,000 C	94,000	1,800	3,600
Vinyl Chloride	50	<50	<50	<50	<160	<50	<50	<50	<50	**210**	**680**	<50	40	260 X	20,000	29,000	34,000	490,000	8.2 M	16 M
Xylenes	100	**4,500**	**78,000**	480	**1,200,000**	<150	<150	<150	<150	<150	<150	<150	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary	Vary
Moisture Content (%)		13	30	24	69	22	18	16	21	15	17	15								

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated September 28, 2012
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
ND = non-detect
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 4
Remedial Feasibility Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Groundwater

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Soil Boring Number Sample Collection Date	MDEQ TDL 10/2006	BSB-2 10/20/10	BSB-3 10/21/10	BSB-4 10/20/10	BSB-5 10/20/10	BSB-6 10/21/10	BSB-7 10/20/10	BSB-8 10/20/10	BSB-9 10/20/10	BSB-10 10/20/10	DUP-1 10/20/10	DUP-2 10/21/10	EB-1 TUBING 10/20/10	EB-2 LINER 10/20/10	Trip Blank 10/20/10	Drinking Water	Groundwater Surface Water Interface	Groundwater Contact	Flamability and Explosivity Screening Level	MDEQ Nonresidentail Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
VOCs																					
1,2,3-Trimethylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	1.1	120	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	13,000	27,000
Diisopropyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**92**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	86	ID	8,000 S	8,000 S	91,000 SE	180,000 SE
tert-Amylmethyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**25**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	190	NA	2,600,000 S	NA	97 ID	190 ID
tert-Butyl alcohol	50	<50	<50	<50	<50	<50	**4,000**	<50	<50	<50	<50	<50	<50	<50	<50	11,000	NA	79,000,000	61,000,000	1,200 ID	2,400 ID
Diethyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**20**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	10	ID	35,000,000	650,000	310,000	620,000
Acetone	20	<20	22	<20	<20	27	**3,200**	<20	<20	35	<20	27	<20	<20	<20	2,100	1,700	31,000,000	15,000,000	150,000,000	150,000,000
Benzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**75**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	200 X	11,000	68,000	380	760
2-Butanone	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**1,900**	<5.0	<5.0	<5.0	<5.0	5.7	<5.0	<5.0	<5.0	38,000	2,200	240,000,000 S	ID	18,000,000 SE	36,000,000 SE
sec-Butylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	230	ID	4,400	ID	18,000 S	18,000 S
Chlorobenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	100 A	25	86,000	160,000	9,100	18,000
1,2-Dichlorobenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**280**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	600 A	13	160,000 S	NA	120,000	160,000 S
1,4-Dichlorobenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	75 A	17		NA	3,200	6,400
1,1-Dichloroethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	32	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2,500	740	2,400,000	380,000	1,800	3,600
1,2-Dichloroethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	360 X	19,000	2,500,000	560	1,100
cis-1,2-Dichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**150**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	70 A	620	200,000	530,000	810	1,600
trans-1,2-Dichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	100 A	1,500 X	220,000	230,000	3,400	6,800
Ethylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**11,000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	74 E	18	170,000 S	43,000	1,200	2,400
Isopropylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**160**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2,300	28	56,000 S	29,000	270	540
4-Isopropyltoluene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	11	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	750	19	25,000 S	ID	21,000	25,000
4-Methyl-2-Pentanone	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**16,000**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5,200	ID	13,000,000	ID	6,700,000 SE	13,000,000 SE
Methyl *tert*-butyl ether (MtBE)	1.0	<1.0	**66**	9.3	<1.0	<1.0	**7,500**	2.1	2.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	40 E	7,100 X	610,000	ID	110,000	220,000
Naphthalene	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**20**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	1,500	11	31,000 S	NA	2,000	4,000
n-Propylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	150	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	230	ID	15,000	ID	46,000 SE	46,000 SE
Tetrachloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**10**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	60 X	12,000	ID	1,100 SE	2,200
Tetrahydrofuran	5.0	<5.0	17	<5.0	<5.0	<5.0	**35,000**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	270	11,000 X	1,600,000	60,000	8,700,000	17,000,000
Toluene	1.0	2.4	3.0	3.1	<1.0	<1.0	**22,000**	1.3	1.8	2.3	3.0	<1.0	<1.0	<1.0	<1.0	790 E	270	530,000 S	61,000	380,000 SE	380,000 SE
Trichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	200 X	22,000	ID	70 DD	140 SE
1,2,4-Trimethylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**560**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	63 E	17	56,000 S	56,000 S	7,400	15,000
1,3,5-Trimethylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**250**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	72 E	45	61,000 S	ID	5,200	10,000
o-Xylene	1.0	<1.0	1.1	1.3	<1.0	<1.0	**9,600**	<1.0	<1.0	1.0	1.4	<1.0	<1.0	<1.0	<1.0	280 E	41	190,000 S	70,000	20,000	41,000
m,p-Xylene	2.0	<2.0	<2.0	2.1	<2.0	<2.0	**40,000**	<2.0	<2.0	<2.0	2.2	<2.0	<2.0	<2.0	<2.0	280 E	41	190,000 S	70,000	20,000	41,000

All groundwater sample results in micrograms per Liter (µg/L) or parts per billion (ppb)
Part 201 Generic Cleanup Criteria and Screening Levels, dated September 28, 2012
MDEQ = Michigan Department of Environmental Quality
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
NS = Not sampled
< = limit of detection for sample
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
NA = Not Available
ID = means insufficient data to develop criterion
S = calculated health based value exceeds the hazardous substance-specific water solubility limit; therefore, the water solubility limit is the criterion
SE = site-specific criteria based on on single event exposure; therefore, sampling methods should reflect shorter exposure scenarios
A = Criterion is the state of Michigan drinking water standard established pursuant to Sceoin 5 of 1976 PA 399, MCL 325.1005
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source

Table 5
Corrective Action Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Groundwater

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	MDEQ TDL 10/2006	**BSB-11**	**BSB-12**	**BSB-13**	**BSB-14**	**DUP-02**	**BSB-15**	**BSB-16**	**BSB-17**	**BSB-18**	**DUP-04**	**BSB-19**	**BSB-20**	**BSB-21**	MDEQ Nonresidential Cleanup Criteria**					MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
(screen depth - feet)		(7-11)	(12-16)	(7-11)	(7-11)		(7-11)	(7-11)	(7-11)	(7-11)		(7-11)	(7-11)	(7-11)							
Collection Date		8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/22/2013	8/23/2013	8/23/2013	8/23/2013	8/23/2013	8/23/2013	8/26/2013	8/26/2013	8/26/2013							
Analysis Date		8/30/2013	8/28/2013 8/31/2013	8/30/2013 8/31/2013	8/30/2013	8/30/2013	8/30/2013	8/30/2013	8/28/2013 8/30/2013	8/29/2013 8/30/2013	8/30/2013	8/30/2013 8/31/2013	8/30/2013 8/31/2013	8/30/2013 8/31/2013							
Collection Method		Screen Point 16													Drinking Water	Groundwater Surface Water Interface	Volatilization to Indoor Air	Groundwater Contact	Flamability and Explosivity Screening Level		
VOCs																					
Acetone	20	<20	**48,000 J,V+**	**160,000**	<20	<20	<50	<20	<200	<1,000	<50	<20	<26	<20	2,100	1,700	1,000,000,000 D,S	31,000,000	15,000,000	150,000,000	150,000,000
Benzene	1.0	<1.0	**130**	<1,000	<1.0	<1.0	**19**	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	5.0 A	200 X	35,000	11,000	68,000	380	760
Bromochloromethane	1.0	<1.0	19	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	50	<50	<10,000	<5,000	<50	<50	750	580	<100	**3,600**	690	<50	180 J,*	87 J,*	11,000	NA	1,000,000,000 D,S	79,000,000	61,000,000	1,200 ID	2,400 ID
2-Butanone	5.0	<5.0	**18,000**	**32,000**	<5.0	<5.0	<25	<5.0	<100	<500	<25	<5.0	9.5	<5.0	38,000	2,200	240,000,000 S	240,000,000 S	ID	18,000,000 SE	36,000,000 SE
n-Butylbenzene	1.0	<1.0	1.1	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	230	ID	ID	5,900	ID	12,000 SE	12,000 S
sec-Butylbenzene	1.0	<1.0	<1.0	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	230	ID	ID	4,400	ID	18,000 SE	18,000 S
Chlorobenzene	1.0	<1.0	2.0	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	100 A	25	470,000 S	86,000	160,000	9,100	18,000
Chloroethane	5.0	<5.0	6.5	<2,000	<5.0	<5.0	<25	<5.0	<40	<500	<25	<5.0	<5.0	<5.0	1,700	1,100 X	5,700,000 S	440,000	110,000	NA	NA
Chloroform	1.0	<1.0	2.1	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	1.5	<1.0	80 A,W	350	180,000	150,000	ID	NA	NA
1,2-Dichlorobenzene	1.0	<1.0	**55**	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	600 A	13	160,000 S	160,000 S	NA	120,000	160,000 S
1,4-Dichlorobenzene	1.0	<1.0	<1.0	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	75 A	17	74,000 S	6,400	NA	3,200	6,400
1,1-Dichloroethane	1.0	<1.0	<2,000	**1,300**	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	2,500	740	2,300,000	2,400,000	380,000	1,800	3,600
1,2-Dichloroethane	1.0	<1.0	**42**	<820	<1.0	<1.0	<5.0	<1.0	<16	<100	<5.0	<1.0	<1.0	<1.0	5.0 A	360 X	59,000	19,000	2,500,000	560	1,100
1,1-Dichloroethene	1.0	<1.0	4.0	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	7.0 A	130	1,300	11,000	97,000	2,900	5,700
cis-1,2-Dichloroethene	1.0	<1.0	<2,000	**1,800**	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	70 A	620	210,000	200,000	530,000	810	1,600
trans-1,2-Dichloroethene	1.0	<1.0	43	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	100 A	1,500 X	200,000	220,000	230,000	3,400	6,800
Diethyl ether	5.0	<5.0	**61**	<1,000	<5.0	<5.0	<10	**47**	<20	<200	<10	<5.0	<5.0	<5.0	10 E	ID	61,000,000 S	35,000,000	650,000	310,000	620,000
Diisopropyl ether	5.0	<5.0	45	<1,000	<5.0	<5.0	5.9	**160**	<20	**180**	11	<5.0	<5.0	<5.0	86	ID	8,000 S	8,000 S	8,000 S	91,000 SE	180,000 SE
Ethylbenzene	1.0	<1.0	<2,000	**20,000**	3.1	3.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	74 E	18	170,000 S	170,000 S	43,000	1,200	2,400
2-Hexanone	5.0	<5.0	14	<2,000	<5.0	<5.0	<25	<5.0	<40	<500	<25	<5.0	<5.0	<5.0	2,900	ID	8,700,000	5,200,000	NA	NA	NA
Isopropylbenzene	1.0	<1.0	24	<850	<1.0	<1.0	<5.0	<1.0	<17	<100	<5.0	<1.0	<1.0	<1.0	2,300	28	56,000 S	56,000 S	29,000	270	540
4-Isopropyltoluene	1.0	<1.0	<1.0	<630	<1.0	<1.0	<5.0	<1.0	<13	<100	<5.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	5.0	<5.0	<5.0	<3,900	<5.0	<5.0	<20	<5.0	<80	<390	<20	<5.0	<5.0	<5.0	750	19	25,000 S	25,000 S	ID	21,000	25,000 S
4-Methyl-2-Pentanone	5.0	<5.0	**84,000 J,V+**	**180,000**	6.2	<5.0	<25	<5.0	<21	<500	<25	<5.0	<5.0	<5.0	5,200	ID	20,000,000 S	13,000,000	ID	6,700,000 SE	13,000,000 SE
Methyl *tert*-butyl ether (MtBE)	1.0	3.1	**14,000**	**27,000 J, V-**	**220 E**	**210**	**740**	28	<40 J,V-	**9,900**	**710**	3.8	13	16	40 E	7,100 X	47,000,000 S	610,000	ID	110,000	220,000
Naphthalene	5.0	<5.0	6.3	<1,000	<5.0	<5.0	<25	<5.0	<20	<500	<25	<5.0	<5.0	<5.0	1,500	11	31,000 S	31,000 S	NA	2,000	4,000
n-Propylbenzene	1.0	<1.0	29	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	230	ID	ID	15,000	ID	46,000 SE	46,000 SE
Styrene	1.0	<1.0	1.1	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	100 A	80 X	310,000 S	9,700	140,000	NA	NA
tert-Amylmethyl ether	5.0	<5.0	120	<1,000 J, V-	<5.0	<5.0	<5.0	<5.0	<5.0	<100	<5.0	<5.0	<5.0	<5.0	190 E	NA	570,000	2,600,000 S	NA	NA	NA
Tetrachloroethene	1.0	<1.0	**36**	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	5.0 A	60 X	170,000	12,000	ID	1,100 SE	2,200
Tetrahydrofuran	5.0	<5.0	**43,000**	**85,000**	7.1	11	170	110	<100	**1,700**	<25	150	<5.0	<5.0	270	11,000 X	16,000,000	1,600,000	60,000	8,700,000	17,000,000
Toluene	1.0	<1.0	**24,000**	**99,000**	8.8	9.5	<5.0	2.2	<20	<100	<5.0	1.3	<1.0	<1.0	790 E	270	530,000 S	530,000 S	61,000	380,000 SE	380,000 SE
1,1,1-Trichloroethane	1.0	<1.0	9.6	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	200 A	89	1,300,000 S	1,300,000 S	ID	NA	NA
Trichloroethene	1.0	<1.0	**29**	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	5.0 A	200 X	4,900	22,000	ID	70 DD	140 SE
1,2,3-Trimethylbenzene	1.0	<1.0	37	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	13,000	27,000
1,2,4-Trimethylbenzene	1.0	<1.0	**200**	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	63 E	17	56,000 S	56,000 S	56,000 S	7,400	15,000
1,3,5-Trimethylbenzene	1.0	<1.0	**62**	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	72 E	45	61,000 S	61,000 S	ID	5,200	10,000
Vinyl Chloride	1.0	<1.0	**14**	<1,000	<1.0	<1.0	<5.0	<1.0	<20	<100	<5.0	<1.0	<1.0	<1.0	2.0 A	13 X	13,000	1,000	33,000	92	180
Xylenes	3.0	<3.0	**15,000**	**91,000**	14	14	**140**	<3.0	<40	<200	<10	<3.0	<3.0	<3.0	280 E	41	190,000 S	190,000 S	70,000	20,000	41,000
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary

All groundwater sample results in micrograms per Liter (µg/L) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated September 28, 2012
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
ND = not detected
E = The analyte was detected at a concentration greater than the calibration range, therefore the result is estimated.
J = the concentration is an estimated value
V- = recovery in the associated continuing calibration verification sample (CCV) exceeds the lower control limit. Results may be biased low.
V+ = recovery in the associated continuing calibration verification sample (CCV) exceeds the upper control limit. Results may be biased high.
* = value reported is outside QA limits
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
ID = insufficient data to develop criterion
A = Criterion is the state of Michigan drinking water standard established pursuant to Sceoin 5 of 1976 PA 399, MCL 325.1005
D = Calculated criterion exceeds 100 percent, hence it is reduced to 100 percent of 1.0E+9 parts per billion (ppb)
E = Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of NREPA, 1994 PA 451, as amended
S = Criterion defaults to the hazardous substance-specific water solubility limit
W = Concentrations of trihalomethanes in groundwaer shall be added together to determine compliance with the Michigan drinking water standard of 80 µg/L.
X = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
NA = not available

Table 5 (continued)
Corrective Action Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Groundwater

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	MDEQ TDL 10/2006	BSB-22	BSB-23	DUP-05	BSB-24	BSB-25	BSB-26	BSB-29	BSB-30	BSB-31	Dup-01	BSB-32	BSB-33	BSB-34	BSB-35	Dup-04	BSB-36	BSB-38	MDEQ Nonresidential Cleanup Criteria**					MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
(screen depth - feet)		(10-14)	(7-11)		(7-11)	(7-11)	(8-12)	(4-9)	(5-10)	(8-13)		(11-16)	(11-16)	(11-16)	(7-12)										
Collection Date		8/26/2013	8/26/2013	8/26/2013	8/27/2013	8/27/2013	8/27/2013	4/17/2014	4/17/2014	4/17/2014	4/17/2014	9/18/2014	9/18/2014	9/18/2014	9/18/2014	9/18/2014	12/22/2014	12/22/2014							
Analysis Date		8/30/2013	8/30/2013 8/31/2013	8/30/2013	8/30/2013 8/31/2013	8/30/2013 8/31/2013	8/30/2013 8/31/2013	4/24/2014	4/24/2014	4/24/2014	4/24/2014	9/23/2014	9/23/2014	9/23/2014	9/23/2014	9/23/2014	12/24/2014	12/24/2014	Drinking Water	Groundwater Surface Water Interface	Volatilization to Indoor Air	Groundwater Contact	Flamability and Explosivity Screening Level		
Collection Method		Screen Point 16										Temporary Monitoring Well													
VOCs																									
Acetone	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	21	<20	<20	<20	<20	<20	<20	<20 J,*	2,100	1,700	1,000,000,000 D,S	31,000,000	15,000,000	150,000,000	150,000,000
Benzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**6.5**	5.0 A	200 X	35,000	11,000	68,000	380	760
Bromochloromethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	NA	NA
tert-Butyl alcohol	50	<50	100 J,*	91 J,*	<50	<50	<50	<50	<50	1,100	<50	<50	<50	<50	<50	<50	1,500	1,400	11,000	NA	1,000,000,000 D,S	79,000,000	61,000,000	1,200 ID	2,400 ID
2-Butanone	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0 J,L+	<5.0 J,L+	<5.0 J,L+	<5.0 J,L+	<5.0 J,L+	<5.0 J,L+	<5.0 J,*	38,000	2,200	240,000,000 S	240,000,000 S	ID	18,000,000 SE	36,000,000 SE
n-Butylbenzene	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	230	ID	ID	5,900	ID	12,000 SE	12,000 S
Chlorobenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	100 A	25	470,000 S	86,000	160,000	9,100	18,000
Chloroethane	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	14	35	1,700	1,100 X	5,700,000 S	440,000	110,000	NA	NA
Chloroform	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	80 A,W	350	180,000	150,000	ID	NA	NA
1,2-Dichlorobenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	600 A	13	160,000 S	160,000 S	NA	120,000	160,000 S
1,1-Dichloroethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2,500	740	2,300,000	2,400,000	380,000	1,800	3,600
1,2-Dichloroethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	360 X	59,000	19,000	2,500,000	560	1,100
1,1-Dichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.0 A	130	1,300	11,000	97,000	2,900	5,700
cis-1,2-Dichloroethene	1.0	<1.0	<1.0	<1.0	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	70 A	620	210,000	200,000	530,000	810	1,600
trans-1,2-Dichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	100 A	1,500 X	200,000	220,000	230,000	3,400	6,800
Diethyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	6.9	**11**	10 E	ID	61,000,000 S	35,000,000	650,000	310,000	620,000
Diisopropyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**140**	**160**	86	ID	8,000 S	8,000 S	8,000 S	91,000 SE	180,000 SE
Ethylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	10	74 E	18	170,000 S	170,000 S	43,000	1,200	2,400
2-Hexanone	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0 J,L+	<5.0 J,L+	<5.0 J,L+	<5.0 J,L+	<5.0 J,L+	<5.0 J,L+	<5.0 J,*	2,900	ID	8,700,000	5,200,000	NA	NA	NA
Isopropylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2,300	28	56,000 S	56,000 S	29,000	270	540
4-Isopropyltoluene	1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	5.0	<5.0	<5.0	<5.0	7.4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	750	19	25,000 S	25,000 S	ID	21,000	25,000 S
4-Methyl-2-Pentanone	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5,200	ID	20,000,000 S	13,000,000	ID	6,700,000 SE	13,000,000 SE
Methyl *tert*-butyl ether (MtBE)	1.0	5.0	**41**	16	<2.0	7.5	<2.0	<1.0	<1.0	**150**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**7,700**	**8,200**	40 E	7,100 X	47,000,000 S	610,000	ID	110,000	220,000
Naphthalene	5.0	<5.0	<5.0	<5.0	6.9	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	1,500	11	31,000 S	31,000 S	NA	2,000	4,000
n-Propylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	230	ID	ID	15,000	ID	46,000 SE	46,000 SE
Styrene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	100 A	80 X	310,000 S	9,700	140,000	NA	NA
tert-Amylmethyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0 J,V-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	7.3	8.6	190 E	NA	570,000	2,600,000 S	NA	NA	NA
Tetrachloroethene	1.0	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	2.5	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	60 X	170,000	12,000	ID	1,100 SE	2,200
Tetrahydrofuran	5.0	<5.0	<5.0	<5.0	<5.0	36	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	24	59	270	11,000 X	16,000,000	1,600,000	60,000	8,700,000	17,000,000
Toluene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.5	<1.0	1.4	3.6	6.4	4.6	5.3	2.6	3.6	<1.0	5.2	790 E	270	530,000 S	530,000 S	61,000	380,000 SE	380,000 SE
1,1,1-Trichloroethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	200 A	89	1,300,000 S	1,300,000 S	ID	NA	NA
Trichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	200 X	4,900	22,000	ID	70 DD	140 SE
1,2,3-Trimethylbenzene	1.0	<1.0	<1.0	<1.0	14	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	13,000	27,000
1,2,4-Trimethylbenzene	1.0	<1.0	<1.0	<1.0	17	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.4	1.2	<1.0	<1.0	<1.0	<1.0	3.3	63 E	17	56,000 S	56,000 S	56,000 S	7,400	15,000
1,3,5-Trimethylbenzene	1.0	<1.0	<1.0	<1.0	4.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	72 E	45	61,000 S	61,000 S	ID	5,200	10,000
Vinyl Chloride	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.0 A	13 X	13,000	1,000	33,000	92	180
Xylenes	3.0	<3.0	<3.0	<3.0	4.6	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	8.3	4.7	4.9	<3.0	3.5	<3.0	**57**	280 E	41	190,000 S	190,000 S	70,000	20,000	41,000
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary	Vary

All groundwater sample results in micrograms per Liter (µg/L) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
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VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
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L+ = Recovery in the assocated laboratory sample (LCS) exceeds the upper control limit. Results may be biased high.
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* = value reported is outside QA limits
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Criteria Footnotes
ID = insufficient data to develop criterion
A = Criterion is the state of Michigan drinking water standard established pursuant to Sceoin 5 of 1976 PA 399, MCL 325.1005
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E = Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of NREPA, 1994 PA 451, as amended
S = Criterion defaults to the hazardous substance-specific water solubility limit
W = Concentrations of trihalomethanes in groundwaer shall be added together to determine compliance with the Michigan drinking water standard of 80 µg/L.
X = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
NA = not available

Table 5 (continued)
Corrective Action Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Groundwater

Petro-Chem Processing Group of Nortru LLC- Detroit, Michigan

Sample Identification	MDEQ TDL 10/2006	**TB-1**	**TB-02**	**TB-03**	**TB-04**	**Trip Blank**	**TB-9/18/14**	**FB-01**	**FB-02**	**FB-01**	**FB-9/18/14**	**RB-01**	**RB-02**	**RB-01**	**RB-9/18/14**	**Trip Blank**	**Rinsate**	MDEQ Nonresidential Cleanup Criteria**				MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
Collection Date		8/22/2013	8/23/2013	8/26/2013	8/27/2013	4/18/2014	9/18/2014	8/22/2013	8/26/2013	4/17/2014	9/18/2014	8/23/2013	8/27/2013	4/17/2014	9/18/2014	12/22/2014	12/22/2014						
Analysis Date		8/29/2013	8/29/2013	8/30/2013	8/30/2013	4/24/2014	9/29/2014	8/30/2013	8/30/2013	4/24/2014	9/29/2014	8/30/2013 8/31/2013	8/30/2013	4/24/2014	9/29/2014	12/26/2014	12/26/2014	Drinking Water	Groundwater Surface Water Interface	Groundwater Contact	Flamability and Explosivity Screening Level		
Collection Method		Grab																					
VOCs																							
Acetone	20	<28	<20	<20	<20	<20	<20	<20	<24	<20	<21	<20	<21	<20	<21	<20 J,L+	<21	2,100	1,700	31,000,000	15,000,000	150,000,000	150,000,000
Benzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	200 X	11,000	68,000	380	760
Bromochloromethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	NA
Bromodichloromethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	80 A,W	ID	14,000	ID	NA	NA
tert -Butyl alcohol	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	250 J,E	11,000	NA	79,000,000	61,000,000	1,200 ID	2,400 ID
2-Butanone	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0 J,L+	<5.0 J,L+	38,000	2,200	240,000,000 S	ID	18,000,000 SE	36,000,000 SE
n -Butylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	230	ID	5,900	ID	12,000 SE	12,000 S
sec -Butylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	230	ID	4,400	ID	18,000 SE	18,000 S
Chlorobenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	100 A	25	86,000	160,000	9,100	18,000
Chloroethane	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	1,700	1,100 X	440,000	110,000	NA	NA
Chloroform	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.7	80 A,W	350	150,000	ID	NA	NA
Dibromochloromethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	80 A,W	ID	18,000	ID	NA	NA
1,2-Dichlorobenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	600 A	13	160,000 S	NA	120,000	160,000 S
1,4-Dichlorobenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	75 A	17	6,400	NA	3,200	6,400
1,1-Dichloroethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2,500	740	2,400,000	380,000	1,800	3,600
1,2-Dichloroethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	360 X	19,000	2,500,000	560	1,100
1,1-Dichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.0 A	130	11,000	97,000	2,900	5,700
cis -1,2-Dichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	70 A	620	200,000	530,000	810	1,600
trans -1,2-Dichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	100 A	1,500 X	220,000	230,000	3,400	6,800
Diethyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**14**	10 E	ID	35,000,000	650,000	310,000	620,000
Diisopropyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	86	ID	8,000 S	8,000 S	91,000 SE	180,000 SE
Ethylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	74 E	18	170,000 S	43,000	1,200	2,400
2-Hexanone	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0 J,L+	<5.0 J,L+	2,900	ID	5,200,000	NA	NA	NA
Isopropylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2,300	28	56,000 S	29,000	270	540
4-Isopropyltoluene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	NA
Methylene Chloride	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**210 J,E**	5.0 A	1,500 X	220,000	ID	NA	NA
2-Methylnaphthalene	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	750	19	25,000 S	ID	21,000	25,000 S
4-Methyl-2-Pentanone	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5,200	ID	13,000,000	ID	6,700,000 SE	13,000,000 SE
Methyl *tert* -butyl ether (MtBE)	1.0	<2.0	<2.0	<2.0	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	40 E	7,100 X	610,000	ID	110,000	220,000
Naphthalene	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	1,500	11	31,000 S	NA	2,000	4,000
n -Propylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	230	ID	15,000	ID	46,000 SE	46,000 SE
Styrene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	100 A	80 X	9,700	140,000	NA	NA
tert -Amylmethyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	190 E	NA	2,600,000 S	NA	NA	NA
Tetrachloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	60 X	12,000	ID	1,100 SE	2,200
Tetrahydrofuran	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	270	11,000 X	1,600,000	60,000	8,700,000	17,000,000
Toluene	1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	790 E	270	530,000 S	61,000	380,000 SE	380,000 SE
1,1,1-Trichloroethane	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	200 A	89	1,300,000 S	ID	NA	NA
Trichloroethene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0 A	200 X	22,000	ID	70 DD	140 SE
1,2,3-Trimethylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	13,000	27,000
1,2,4-Trimethylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	63 E	17	56,000 S	56,000 S	7,400	15,000
1,3,5-Trimethylbenzene	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	72 E	45	61,000 S	ID	5,200	10,000
Vinyl Chloride	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.0 A	13 X	1,000	33,000	92	180
Xylenes	3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	280 E	41	190,000 S	70,000	20,000	41,000
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary

All groundwater sample results in micrograms per Liter (µg/L) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated September 28, 2012
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
ND = not detected
< = limit of detection for sample
E = The analyte was detected at a concentration greater than the calibration range, therefore the result is estimated
J = The concentration is an estimated value
L+ = Recover in the associated laboratory sample (LCS) exceeds the upper control limit. Results may be biased high
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
ID = insufficient data to develop criterion
A = Criterion is the state of Michigan drinking water standard established pursuant to Sceoin 5 of 1976 PA 399, MCL 325.1005
D = Calculated criterion exceeds 100 percent, hence it is reduced to 100 percent of 1.0E+9 parts per billion (ppb)
E = Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of NREPA, 1994 PA 451, as amended
S = Criterion defaults to the hazardous substance-specific water solubility limit
W = Concentrations of trihalomethanes in groundwaer shall be added together to determine compliance with the Michigan drinking water standard of 80 µg/L.
X = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
NA = not available

Table 6
Corrective Measures Study Investigation
Laboratory Analytical Results for Volatile Organic Compounds in Groundwater

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	MDEQ TDL 10/2006	BSB-40	BSB-41	BSB-42	BSB-44	BSB-45	BSB-46	BSB-47	BSB-48	Dup-01	MW-11	MW-12	Trip Blank	Rinsate Blank	MDEQ Nonresidential Cleanup Criteria**				MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
(screen depth - feet)		(8-10)	(8-10)	(10-15)	(8-10)	(10-15)	(10-15)	(8-10)	(8-10)	(8-10)	(10.68-15.68)	(6.35-11.35)								
Collection Date		3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/15/2016	3/18/2016	3/18/2016	3/15/2016	3/18/2016						
Analysis Date		3/18/2016	3/18/2016	3/18/2016	3/18/2016	3/18/2016	3/18/2016 3/21/2016	3/18/2016	3/17/2016	3/17/2016	3/25/2016	3/25/2016	3/22/2016	3/25/2016						
Collection Method		Temporary Monitoring Well									Low-Flow									
VOCs															Drinking Water	Groundwater Surface Water Interface	Groundwater Contact	Flammability and Explosivity Screening Level		
Acetone	20	<20	<20	**24,000**	**20,000**	**17,000**	<20	36	57	22	**34,000**	<20	<20	<20	2,100	1,700	31,000,000	15,000,000	150,000,000	150,000,000
Benzene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	**640**	<1.0	<1.0	<1.0	5.0 A	200 X	11,000	68,000	380	760
Bromochloromethane	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	NA
tert -Butyl alcohol	50	<50	<50	<10,000	<10,000	<10,000	<50	<50	<50	<50	<10,000	<50	<50	<50	11,000	NA	79,000,000	61,000,000	1,200 ID	2,400 ID
2-Butanone	5.0	<5.0	<5.0	**8,100**	**9,100**	**2,600**	<5.0	<5.0	<5.0	<5.0	**17,000**	<5.0	<5.0	<5.0	38,000	2,200	240,000,000 S	ID	18,000,000 SE	36,000,000 SE
n -Butylbenzene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<1,000	<1.0	<1.0	<1.0	230	ID	5,900	ID	12,000 S	12,000 S
sec -Butylbenzene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	230	ID	4,400	ID	18,000 S	18,000 S
Chlorobenzene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	100 A	25	86,000	160,000	9,100	18,000
Chloroethane	5.0	<5.0	<5.0	<2,000	<2,000	<2,000	<5.0	<5.0	<5.0	<5.0	<1,000	<5.0	<5.0	<5.0	1,700	1,100 X	440,000	110,000	NA	NA
Chloroform	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	80 A,W	350	150,000	ID	NA	NA
1,2-Dichlorobenzene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	600 A	13	160,000 S	NA	120,000	160,000 S
1,4-Dichlorobenzene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	75 A	17	6,400	NA	3,200	6,400
1,1-Dichloroethane	1.0	<1.0	<1.0	**1,100**	**1,100**	<1,000	<1.0	<1.0	<1.0	<1.0	**1,300**	<1.0	<1.0	<1.0	2,500	740	2,400,000	380,000	1,800	3,600
1,2-Dichloroethane	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	5.0 A	360 X	19,000	2,500,000	60	1,100
1,1-Dichloroethene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	3.5	<1.0	<500	<1.0	<1.0	<1.0	7.0 A	130	11,000	97,000	2,900	5,700
cis -1,2-Dichloroethene	1.0	<1.0	<1.0	**2,600**	**11,000**	<1,000	<1.0	<1.0	**2,400**	<1.0	**8,700**	<1.0	<1.0	<1.0	70 A	620	200,000	530,000	810	1,600
trans -1,2-Dichloroethene	1.0	<1.0	<1.0	<500	<500	<500	<1.0	<1.0	13	<1.0	<500	<1.0	<1.0	<1.0	100 A	1,500 X	220,000	230,000	3,400	6,800
Diethyl ether	5.0	<5.0	<5.0	<1,000	<1,000	<1,000	<5.0	<5.0	<5.0	<5.0	<500	<5.0	<5.0	<5.0	10 E	ID	35,000,000	650,000	310,000	620,000
Diisopropyl ether	5.0	<5.0	<5.0	<1,000	<1,000	<1,000	<5.0	<5.0	<5.0	<5.0	<500	<5.0	<5.0	<5.0	86	ID	8,000 S	8,000 S	91,000 SE	180,000 SE
Ethylbenzene	1.0	<1.0	<1.0	**18,000**	**19,000**	**13,000**	<1.0	<1.0	6.8	<1.0	**15,000**	<1.0	<1.0	<1.0	74 E	18	170,000 S	43,000	1,200	2,400
2-Hexanone	5.0	<5.0	<5.0	<1,000	<1,000	<1,000	<5.0	<5.0	<5.0	<5.0	<1,000	<5.0	<5.0	<5.0	2,900	ID	5,200,000	NA	NA	NA
Isopropylbenzene	1.0	<1.0 L+	<1.0 L+	<500	<500	<500	<1.0 L+	<1.0 L+	<1.0	<1.0	<500	<1.0	<1.0	<1.0	2,300	28	56,000 S	29,000	270	540
4-Isopropyltoluene	1.0	<1.0	<1.0	<500	<500	<500	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	5.0	<5.0	<5.0	<1,000	<1,000	<1,000	<5.0	<5.0	<5.0	<5.0	<2,000	<5.0	<5.0	<5.0	750	19	25,000 S	ID	21,000	25,000 S
4-Methyl-2-Pentanone	5.0	<5.0	<5.0	**95,000**	**54,000**	**13,000**	<5.0	<5.0	<5.0	<5.0	**89,000**	<5.0	<5.0	<5.0	5,200	ID	13,000,000	ID	6,700,000 SE	13,000,000 SE
Methyl *tert* -butyl ether (MtBE)	1.0	<1.0	7.7	**20,000**	**10,000**	**2,900**	13	<1.0	<1.0	<1.0	**20,000**	<1.0	<1.0	<1.0	40 E	7,100 X	610,000	ID	110,000	220,000
Naphthalene	5.0	<5.0	<5.0	<1,000	<1,000	<1,000	<5.0	<5.0	<5.0	<5.0	<1,000	<5.0	<5.0	<5.0	1,500	11	31,000 S	NA	2,000	4,000
n -Propylbenzene	1.0	<1.0	<1.0	<500	<500	<500	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	230	ID	15,000	ID	46,000	46,000 SE
Styrene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<1,000	<1.0	<1.0	<1.0	100 A	80 X	9,700	140,000	NA	NA
tert -Amylmethyl ether	5.0	<5.0	<5.0	<1,000	<1,000	<1,000	<5.0	<5.0	<5.0	<5.0	<1,000	<5.0	<5.0	<5.0	190 E	NA	2,000,000 S	NA	NA	NA
Tetrachloroethene	1.0	<1.0	<1.0	<500	<500	<500	<1.0	<1.0	**18**	<1.0	<500	<1.0	<1.0	<1.0	5.0 A	60 X	12,000	ID	1,100 SE	2,200
Tetrahydrofuran	5.0	<5.0	<5.0	**35,000**	**22,000**	**12,000**	<5.0	<5.0	<5.0	<5.0	**38,000**	<5.0	<5.0	<5.0	270	11,000 X	1,600,000	60,000	8,700,000	17,000,000
Toluene	1.0	<1.0	<1.0	**94,000**	**130,000**	**84,000**	<1.0	1.0	13	<1.0	**110,000**	<1.0	<1.0	<1.0	790 E	270	530,000 S	61,000	380,000 SE	380,000 SE
1,1,1-Trichloroethane	1.0	<1.0	<1.0	<500	<500	<500	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	200 A	89	1,300,000 S	ID	NA	NA
Trichloroethene	1.0	<1.0	<1.0	<500	<500	<500	<1.0	<1.0	**8.3**	<1.0	<500	<1.0	<1.0	<1.0	5.0 A	200 X	22,000	ID	70 DD	140 SE
1,2,3-Trimethylbenzene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	NA	NA	NA	NA	13,000	27,000
1,2,4-Trimethylbenzene	1.0	<1.0	<1.0	**880**	**990**	<500	<1.0	<1.0	<1.0	<1.0	<1,000	<1.0	<1.0	<1.0	63 E	17	56,000 S	56,000 S	7,400	15,000
1,3,5-Trimethylbenzene	1.0	<1.0	<1.0	<1,000	<1,000	<1,000	<1.0	<1.0	<1.0	<1.0	<500	<1.0	<1.0	<1.0	72 E	45	61,000 S	ID	5,200	10,000
Vinyl Chloride	1.0	<1.0	<1.0	<500	<500	<500	<1.0	<1.0	**490**	<1.0	<500	<1.0	<1.0	<1.0	2.0 A	13 X	1,000	33,000	92	180
Xylenes	3.0	<3.0	<3.0	**82,000**	**85,000**	**55,000**	<3.0	3.2	32	<3.0	**68,000**	<3.0	<3.0	<3.0	280 E	41	190,000 S	70,000	20,000	41,000
Other VOCs	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary	Vary	Vary	Vary	Vary

All groundwater sample results in micrograms per Liter (µg/L) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated September 28, 2012
VIAC - volatilization to indoor air criteria
TDL = Target Detection Limit
VOCs = volatile organic compounds
ND = not detected
L+ = Recovery in the associated laboratory sample (LCS) exceeds the upper control limit. Results may be biased high.
< = limit of detection for sample
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
A = Criterion is the state of Michigan drinking water standard established pursuant to Sceoin 5 of 1976 PA 399, MCL 325.1005
X = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
NA = not available
ID = insufficient data to develop criterion
S = Criterion defaults to the hazardous substance-specific water solubility limit
SE = Site-specific criteria based on on single event exposure; therefore, sampling methods should reflect shorter exposure scenarios
E = Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of NREPA, 1994 PA 451, as amended

Table 7
2017 2nd Semi-Annual Monitoring Event
Laboratory Analytical Results for Volatile Organic Compounds in Monitoring Wells

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Monitoring Well Number	MDEQ TDL	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-9 Dup	Rinsate Blank	Trip Blank	MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12 hour Exposure VIAC
Sample Collection Date	**6/2016**	**12/28/2017**	**12/27/2017**	**12/28/2017**	**12/27/2017**	**12/27/2017**	**12/27/2017**	**12/28/2017**	**12/28/2017**	**12/27/2017**	**12/28/2017**	**12/28/2017**	**12/28/2017**	**12/27/2017**	**12/28/2017**	**12/27/2017**		
Volatile Organic Compounds																		
Acetone	20	<20	<25	<20	**33**	<20	<50	<20	<25	<20	<20	**25,000**	<20	<50	<20	<20	150,000,000	150,000,000
Benzene	1.0	<1.0	**7.7**	<1.0	<5.0	<1.0	<10	<1.0	<5.0	<1.0	<1.0	**360**	<1.0	<5.0	<1.0	<1.0	380	760
tert-Butyl alcohol	50	<50	<50	<50	**860**	<50	**140**	<50	**86**	**220**	<50	<5,000	<50	<500	<50	<50	1,200 ID	2,400 ID
2-Butanone	5.0	<5.0	<10	<5.0	<10	<5.0	<20	<5.0	<10	<5.0	<5.0	**10,000**	<5.0	<20	<5.0	<5.0	18,000,000 SE	36,000,000 SE
Chloroform	1.0	<1.0	<5.0	**2.6**	<5.0	<1.0	<10	<1.0	<5.0	<1.0	<1.0	<50	<1.0	<5.0	<1.0	<1.0	NA	NA
1,1-Dichloroethane	1.0	<1.0	<5.0	<1.0	<5.0	<1.0	<10	<1.0	<5.0	<1.0	<1.0	**780**	<1.0	<5.0	<1.0	<1.0	1,800	3,600
cis-1,2-Dichloroethene	1.0	<1.0	<5.0	<1.0	<2.5	<1.0	<10	<1.0	<5.0	<1.0	<1.0	**7,400**	<1.0	<5.0	<1.0	<1.0	810	1,600
Diethyl ether	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<5.0	<5.0	<5.0	<5.0	**70**	<5.0	<10	<5.0	<5.0	310,000	620,000
Diisopropyl ether	5.0	<5.0	<5.0	<5.0	**6.2**	**6.4**	<10	<5.0	<5.0	<5.0	<5.0	**94**	<5.0	**6.8**	<5.0	<5.0	91,000 SE	180,000 SE
Ethylbenzene	1.0	<1.0	<5.0	<1.0	<5.0	<1.0	<10	<1.0	<5.0	<5.0	<1.0	**5,700**	<1.0	<5.0	<1.0	<1.0	1,200	2,400
4-Methyl-2-Pentanone	5.0	<5.0	<10	<5.0	<10	<5.0	<20	<5.0	<10	<5.0	<5.0	**67,000**	<5.0	<20	<5.0	<5.0	6,700,000 SE	13,000,000 SE
Methyl tert-butyl ether (MtBE)	1.0	**2.7**	<5.0	**3.3**	**88**	**8.0**	**710**	<1.0	**9.0**	**590**	**5.3**	**13,000**	<1.0	**530**	<1.0	<1.0	110,000	22,000
Tetrahydrofuran	5.0	<5.0	**200**	<5.0	<25	<5.0	<50	<5.0	<25	<5.0	<5.0	**38,000**	<5.0	<50	<5.0	<5.0	8,700,000	17,000,000
Toluene	1.0	<1.0	<5.0	<1.0	<5.0	<1.0	<10	<1.0	<5.0	<1.0	<1.0	**40,000**	<1.0	<5.0	<1.0	<1.0	380,000 SE	380,000 SE
1,2,4-Trimethylbenzene	1.0	<1.0	<5.0	<1.0	<5.0	<1.0	<10	<1.0	<1.0	<5.0	<1.0	**220**	<1.0	<10	<1.0	<1.0	7,400	15,000
1,3,5-Trimethylbenzene	1.0	<1.0	<5.0	<1.0	<5.0	<1.0	<10	<1.0	<1.0	<5.0	<1.0	**69**	<1.0	<10	<1.0	<1.0	5,200	10,000
Vinyl Chloride	1.0	<1.0	<5.0	<1.0	<5.0	<1.0	<10	<1.0	<1.0	<2.5	<1.0	**230**	<1.0	<5.0	<1.0	<1.0	92	180
Xylene (total)	3.0	<3.0	<7.5	<3.0	<7.5	<3.0	<15	<3.0	<3.0	<3.0	<3.0	**25,000**	<3.0	<15	<3.0	<3.0	20,000	41,000
Other VOCs	Vary	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Vary	Vary
Semi-Volatile Organic Compounds																		
Bis(2-ethylhexyl)phthalate	5.0	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**35**	<5.0	**5.4**	<11	<5.0	<5.0	<5.0	--	NA	NA
2,4-Dimethylphenol	5.0	--	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**38**	<5.0	<5.0	<5.0	--	NA	NA
Fluoranthene	5.0	--	<1.2	<1.2	<1.1	<1.1	<1.2	<1.0	**1.5**	<1.1	<1.1	<11	<1.0	<1.0	<1.1	--	NA	NA
2-Methylphenol	5.0	--	<5.6	<5.0	<5.3	<5.3	<6.2	<5.0	<5.2	<5.3	<5.8	**170**	<5.4	<5.3	<5.2	--	NA	NA
3&4-Methylphenol	10	--	<10	<10	<10	<10	<10	<10	<10	<10	<10	**290**	<10	<10	<10	--	NA	NA
N-nitrosodimethylamine	5.0	--	<5.6	<5.0	<5.3	<5.3	<6.2	<5.0	<5.2	<5.3	<5.8	**180**	<5.4	<5.3	<5.2	--	NA	NA
Phenol	5.0	--	<5.6	<5.0	<5.3	<5.3	<6.2	<5.0	<5.2	<5.3	<5.8	**650**	<5.4	<5.3	<5.2	--	NA	NA
Other SVOCs	Vary	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	NA	NA
Petroleum Distillates																		
Diesel Range Organics (DRO)	200	--	<200	<200	**1,500**	<200	<200	--	<200	<200	--	**4,000**	<200	<200	<200	--	NA	NA
Oil Range Organics (ORO)	200	--	<200	<200	**340**	**280**	**270**	--	**240**	<200	--	**1,000**	**300**	<200	<200	--	NA	NA
Gasoline Range Organics (GRO)	200	--	<200	<200	<200	<200	<200	<200	<200	<200	<200	**120,000**	<200	<200	<200	--	NA	NA

All groundwater sample results in micrograms per Liter (µg/L) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
VIAC = Volatilization to Indoor Air Criteria
TDL = Target Detection Limit
-- = analyte not analyzed
< = limit of detection for sample
NA = TDL not available
ID = requires further evaluation to determine the appropriate media to sample
SE = site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure scenarios
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ TDL
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Site-Specific VIAC
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Site-Specific VIAC

Table 8
Container Management Unit Partial Closure Sampling
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	01S	02S (Dup 1S)	02S	03S	04S	05S	06S	07S	08S (Dup 3S)	08S	MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
Collection Date	2/19/2008	2/20/2008	2/20/2008	2/19/2008	2/19/2008	2/19/2008	2/19/2008	2/19/2008	2/20/2008	2/20/2008	Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to Ambient Air (Infinite Source)	Direct Contact	Soil Saturation Concentration Screening Levels		
Collection Method	Grab																	
VOCs																		
Acetone	420 J	590 J	380 J	850 J	490 J	650 J	320 J	570 J	380 J	380 J	42,000	34,000	110,000,000 C	160,000,000	73,000,000	110,000,000	3,100,000	3,100,000
Benzene	ND	**150**	**140**	ND	ND	**140**	ND	ND	ND	ND	100	4,000 X	220,000	45,000	400,000 C	400,000	47 M	94
Bromobenzene	ND	ND	ND	540	ND	ND	ND	ND	ND	ND	1,500	NA	360,000	540,000	760,000 C	760,000	NA	NA
n -Butylbenzene	60	130	130	33 J	ND	120	ND	ND	ND	ND	4,600	ID	120,000	ID	8,000,000	10,000,000	9,800	20,000
sec -Butylbenzene	ND	240	230	ND	ND	27 J	ND	ND	ND	ND	4,600	ID	88,000	ID	8,000,000	10,000,000	49,000 C	49,000 C
tert -Butylbenzene	ND	ND	ND	ND	ND	**45 J**	ND	ND	ND	ND	4,600	ID	180,000	ID	8,000,000	10,000,000	11 M	23 M
Dichloromethane (methylene chloride)	85 J	120 J	86 J	100 J	220 J	180 J	67 J	81 J	70 J	85 J	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
1,2-Dichlorobenzene	ND	ND	ND	**1,900**	ND	41 J	ND	ND	ND	ND	14,000	280	210,000 C	46,000,000	210,000 C	210,000	26,000	52,000
1,4-Dichlorobenzene	ND	ND	ND	24 J	ND	ND	ND	ND	ND	ND	1,700	360	140,000	260,000	1,900,000	NA	660	1,300
1,1-Dichloroethane	ND	ND	ND	31 J	ND	**1,100**	ND	ND	ND	ND	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
cis -1,2-Dichloroethene	ND	ND	ND	**53 J**	ND	**1,100**	ND	ND	ND	ND	1,400	12,000	640,000 C	210,000	640,000 C	640,000	37 M	74
trans -1,2-Dichloroethene	ND	ND	ND	ND	ND	**350**	ND	ND	ND	ND	2,000	30,000 X	1,400,000 C	330,000	1,400,000 C	1,400,000	210	420
1,2-Dichloropropane	ND	ND	ND	ND	ND	20 J	ND	ND	ND	ND	100	4,600 X	320,000	30,000	550,000 C	550,000	NA	NA
Ethylbenzene	73	210	200	**480**	100	**1,900**	32 J	84	43 J	46 J	1,500	360	140,000 C	2,400,000	140,000 C	140,000	340	680
Isopropylbenzene	ND	**760**	**750**	53 J	26 J	**130**	ND	ND	ND	ND	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
Methyl ethyl ketone (2-butanone)	46 J	150 J	ND	ND	82 J	740	ND	110 J	ND	ND	760,000	44,000	27,000,000 C	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
Methyl isobutyl ketone (MIBK)	290 J	ND	ND	160 J	120 J	1,400	ND	480 J	ND	ND	100,000	ID	2,7000,000 C	53,000,000	2,7000,000 C	27,000,000	150,000 SE	290,000 SE
2-Methylnaphthalene	46 J	1,700 J	2,700	ND	ND	1,100	ND	ND	ND	ND	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
Methyl *tert* -butyl ether (MtBE)	ND	42 J	50 J	ND	ND	110 J	41 J	ND	ND	ND	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	71 J	**6,100**	**9,300**	140 J	55 J	370 J	ND	ND	70 J	ND	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n -Propylbenzene	54 J	460	460	76	40 J	100	ND	ND	ND	ND	4,600	ID	300,000	ID	8,000,000	10,000,000	21,000 SE	21,000 SE
Styrene	ND	ND	ND	ND	ND	260	ND	ND	ND	ND	2,700	2,100 X	270,000	3,300,000	520,000 C	520,000	NA	NA
Tetrachloroethene	ND	ND	ND	ND	44 J	**1,500**	ND	ND	ND	ND	100	1,200 X	88,0000 C	210,000	88,0000 C	88,000	74 SE	150
Toluene	31 J	97	75	1,600	220	**7,800**	58	120	ND	26 J	16,000	5,400	250,000 C	3,300,000	250,000 C	250,000	64,000 SE	64,000 SE
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	400	ND	ND	ND	ND	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	**54 J**	ND	**30 J**	**33 J**	**150**	**430**	ND	**29 J**	ND	ND	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 M	8.0 M, SE
Trichlorofluoromethane	ND	ND	ND	ND	15 J	ND	ND	ND	ND	ND	150,000	NA	560,000 C	110,000,000	560,000 C	560,000	NA	NA
1,2,4-Trimethylbenzene	660	710	710	410	150	**1,700**	ND	ND	ND	ND	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	200	62 J	59 J	270	84	**1,200**	20 J	ND	ND	ND	1,800	1,100	94,000 C	19,000,000	94,000 C	94,000	1,800	3,600
Vinyl Chloride	ND	ND	ND	ND	ND	**610**	ND	ND	ND	ND	40	260 X	20,000	29,000	34,000	490,000	8.2 M	16 M
Xylenes	330	750	690	**3,500**	510	**18,000**	210	290	ND	ND	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
** = Part 201 Generic Cleanup Criteria and Screening Levels, dated September 28, 2012
TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
ND = non-detect
Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
Gray Shaded indicates that concentrations exceed this MDEQ Generic Nonresidential Cleanup Criteria
Green Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonsresidential Cleanup Criteria and/or MDEQ Site-Specific VIAC, dated October 25, 2018

Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 8
Container Management Unit Partial Closure Sampling
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	**09S**	**10S**	**11-2 C (subslab of 11C)**	**12S**	**13S**	**14S (Dup 2S)**	**14S**	**15S**	**16S**	**17S**	MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
Collection Date	2/20/2008	2/20/2008	2/20/2008	2/20/2008	2/19/2008	2/20/2008	2/20/2008	2/19/2008	2/20/2008	2/20/2008	Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to Ambient Air (Infinite Source)	Direct Contact	Soil Saturation Concentration Screening Levels		
Collection Method	Grab																	
VOCs																		
Acetone	1,500 J	540 J	2100 J	560 J	340 J	18,000 J	25,000 J	1,000 J	**35,000 J**	360 J	42,000	34,000	110,000,000 C	160,000,000	73,000,000	110,000,000	3,100,000	3,100,000
Bromobenzene	230	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,500	NA	360,000	540,000	760,000 C	760,000	NA	NA
n -Butylbenzene	1,800	56	ND	ND	ND	**4,700 J**	3,900 J	ND	**7,800 J**	ND	4,600	ID	120,000	ID	8,000,000	10,000,000	9,800	20,000
sec -Butylbenzene	870	22 J	ND	ND	ND	1,800 J	ND	ND	2,900 J	ND	4,600	ID	88,000	ID	8,000,000	10,000,000	49,000 C	49,000 C
tert -Butylbenzene	**79**	ND	ND	ND	ND	ND	ND	ND	ND	ND	4,600	ID	180,000	ID	8,000,000	10,000,000	11 M	23 M
Chlorobenzene	34 J	ND	60	ND	ND	ND	ND	ND	ND	ND	2,000	500	260,000 C	920,000	260,000 C	260,000	1,400	2,900
Dichloromethane (methylene chloride)	95 J	100 J	**590**	70 J	**110 J**	**9,800 J**	**19,000 J**	**190 J**	ND	44 J	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
1,2-Dichlorobenzene	280	ND	23 J	ND	ND	**7,100**	**7,500**	ND	**14,000**	ND	14,000	280	210,000 C	46,000,000	210,000 C	210,000	26,000	52,000
1,4-Dichlorobenzene	65	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,700	360	140,000	260,000	1,900,000	NA	660	1,300
1,1-Dichloroethane	ND	72	**110**	ND	ND	ND	ND	ND	ND	ND	50,000	15,000	890,000 C	2,500,000	890,000 C	890,000	74	150
1,1-Dichloroethene	ND	ND	20 J	ND	ND	ND	ND	ND	ND	ND	140	2,600	220,000	3,700	570,000 C	570,000	220	430
cis -1,2-Dichloroethene	ND	ND	ND	ND	ND	**13,000**	**18,000**	ND	**16,000**	ND	1,400	12,000	640,000 C	210,000	640,000 C	640,000	37 M	74
Ethylbenzene	**2,500**	200	**520**	48 J	ND	**38,000**	**38,000**	63 J	**370,000**	ND	1,500	360	140,000 C	2,400,000	140,000 C	140,000	340	680
Isopropylbenzene	**790**	25 J	36 J	ND	ND	**4,500 J**	**4,200 J**	ND	**22,000**	ND	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
Methyl ethyl ketone (2-butanone)	290 J	180 J	2,800	1,100	330	ND	ND	1,800	ND	ND	760,000	44,000	27,000,000 C	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
Methyl isobutyl ketone (MIBK)	190 J	110 J	1,400	92 J	ND	13,000 J	13,000 J	130 J	16,000 J	68 J	100,000	ID	2,7000,000 C	53,000,000	2,7000,000 C	27,000,000	150,000 SE	290,000 SE
2-Methylnaphthalene	440 J	ND	ND	85 J	ND	**43,000**	**45,000**	ND	**150,000 J**	ND	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
Methyl *tert* -butyl ether (MtBE)	ND	39 J	ND	ND	ND	ND	ND	ND	ND	ND	800	140,000 X	5,900,000 C	30,000,000	5,900,000 C	5,900,000	2,100	4,200
Naphthalene	890	47 J	180 J	64 J	ND	**190,000**	**190,000**	120 J	**200,000**	ND	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n -Propylbenzene	1,400	37 J	67	ND	ND	**6,200 J**	**5,700 J**	ND	**23,000**	ND	4,600	ID	300,000	ID	8,000,000	10,000,000	21,000 SE	21,000 SE
Styrene	ND	ND	ND	ND	ND	**5,400 J**	**4,100 J**	ND	ND	ND	2,700	2,100 X	270,000	3,300,000	520,000 C	520,000	NA	NA
Tetrachloroethene	ND	ND	**620**	51 J	42 J	**1,000,000**	**960,000**	**84 J**	**6,600 J**	ND	100	1,200 X	88,0000 C	210,000	88,0000 C	88,000	74 SE	150
Toluene	1,600	90	1,600	110	50 J	**42,000**	**44,000**	330	**980,000**	ND	16,000	5,400	250,000 C	3,300,000	250,000 C	250,000	64,000 SE	64,000 SE
1,1,1-Trichloroethane	ND	ND	200	ND	ND	**27,000**	**29,000**	ND	ND	ND	4,000	1,800	460,000 C	4,500,000	460,000 C	460,000	NA	NA
Trichloroethene	**47 J**	**41 J**	**110**	**59**	**54 J**	**66,000**	**78,000**	**120**	ND	ND	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 M	8.0 M, SE
1,2,4-Trimethylbenzene	**7,400**	180	250	23 J	ND	**36,000**	**32,000**	ND	**160,000**	ND	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	**4,800**	110	100	ND	ND	**18,000**	**17,000**	ND	**67,000**	ND	1,800	1,100	94,000 C	19,000,000	94,000 C	94,000	1,800	3,600
Xylenes	**11,000**	380	**2,300**	150 J	ND	**180,000**	**180,000**	250	**2,400,000**	ND	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900

All soil sample results in micrograms per kilogram (µg/kg) or parts per billion (ppb)
MDEQ = Michigan Department of Environmental Quality
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TDL = Target Detection Limit
VIAC = volatilization to indoor air criteria
VOCs = volatile organic compounds
< = limit of detection for sample
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Reporting limits for some analytes may vary depending on the percent moisture content of the sample.
Yellow Shaded/Bold typeface indicates that concentration exceeds MDEQ Generic Nonresidential Cleanup Criteria
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Criteria Footnotes
C = the criterion developed exceeds the chemical-specific soil saturation screening level (Csat)
X = the GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source
M = Site-specific criterion may be below TDL. In accordance with Sec. 20120a(10) when the TDL for a hazardous substance is greater then the the developed cleanup criterion, the criterion is the TDL.
DD = hazardous substance causes developmental effects
SE = Site-specific criteria based on single event exposure; therefore, sampling methods should reflect shorter exposure senarios.
ID = insufficient data to develop criterion
NA = criterion is not available

Table 8
Container Management Unit Partial Closure Sampling
Laboratory Analytical Results for Volatile Organic Compounds in Soil

Petro-Chem Processing Group of Nortru, LLC - Detroit, Michigan

Sample Identification	18S	19S	20S	21S	22S	23S	24S	25S	26S	27S	Trip Soil Blank	MDEQ Nonresidential Cleanup Criteria**						MDEQ Nonresidential Site-Specific VIAC	MDEQ Nonresidential Site-Specific 12-hour Exposure VIAC
Collection Date	2/20/2008	2/20/2008	2/20/2008	2/20/2008	2/20/2008	2/20/2008	2/20/2008	2/20/2008	2/20/2008	2/20/2008	2/20/2008	Drinking Water Protection	Groundwater Surface Water Interface Protection	Groundwater Contact Protection	Volatilization to Ambient Air (Infinite Source)	Direct Contact	Soil Saturation Concentration Screening Levels		
Collection Method	Grab																		
VOCs																			
Acetone	220 J	310 J	490 J	640 J	240 J	220 J	26,000 J	410 J	420 J	380 J	6.3 J	42,000	34,000	110,000,000 C	160,000,000	73,000,000	110,000,000	3,100,000	3,100,000
Bromobenzene	ND	ND	ND	ND	ND	ND	**4,100 J**	ND	ND	ND	ND	1,500	NA	360,000	540,000	760,000 C	760,000	NA	NA
n-Butylbenzene	ND	ND	ND	ND	42 J	ND	**7,700**	ND	ND	ND	ND	4,600	ID	120,000	ID	8,000,000	10,000,000	9,800	20,000
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	2,500 J	ND	ND	ND	ND	4,600	ID	88,000	ID	8,000,000	10,000,000	49,000 C	49,000 C
Chlorobenzene	ND	ND	ND	ND	29 J	ND	ND	ND	ND	ND	ND	2,000	500	260,000 C	920,000	260,000 C	260,000	1,400	2,900
Dichloromethane (methylene chloride)	42 J	ND	**320 J**	**160 J**	32 J	37 J	**4,200 J**	39 J	ND	ND	1.6 J	100	30,000 X	2,300,000 C	700,000	2,300,000 C	2,300,000	NA	NA
1,2-Dichlorobenzene	ND	ND	ND	ND	170	150	**6,500 J**	ND	ND	ND	ND	14,000	280	210,000 C	46,000,000	210,000 C	210,000	26,000	52,000
1,4-Dichlorobenzene	ND	ND	ND	ND	24 J	23 J	ND	ND	ND	ND	ND	1,700	360	140,000	260,000	1,900,000	NA	660	1,300
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	**2,800 J**	ND	ND	ND	ND	1,400	12,000	640,000 C	210,000	640,000 C	640,000	37 M	74
Ethylbenzene	ND	ND	92	100	**930**	18 J	**240,000**	ND	30 J	ND	ND	1,500	360	140,000 C	2,400,000	140,000 C	140,000	340	680
Isopropylbenzene	ND	ND	ND	ND	**130**	ND	**14,000**	ND	ND	ND	ND	260,000	3,200	390,000 C	2,000,000	390,000 C	390,000	110 M	210 M
Methyl ethyl ketone (2-butanone)	ND	ND	66 J	73 J	47 J	ND	ND	68 J	ND	ND	ND	760,000	44,000	27,000,000 C	35,000,000	27,000,000 C, DD	27,000,000	370,000 SE	740,000 SE
Methyl isobutyl ketone (MIBK)	65 J	ND	96 J	170 J	98 J	64 J	10,000 J	75 J	74 J	110 J	ND	100,000	ID	2,7000,000 C	53,000,000	2,7000,000 C	27,000,000	150,000 SE	290,000 SE
2-Methylnaphthalene	ND	ND	ND	490 J	ND	ND	**6,500**	ND	72 J	ND	ND	170,000	4,200	5,500,000	1,800,000	26,000,000	NA	30,000	60,000
Naphthalene	ND	ND	ND	560 J	140 J	65 J	**22,000 J**	ND	ND	ND	ND	100,000	730	2,100,000	350,000	52,000,000	NA	1,900	3,800
n-Propylbenzene	ND	ND	ND	ND	76	ND	**20,000**	ND	ND	ND	ND	4,600	ID	300,000	ID	8,000,000	10,000,000	21,000 SE	21,000 SE
1,1,2,2-Tetrachloroethane	ND	ND	58 J	ND	ND	ND	ND	ND	ND	ND	ND	700	1,600 X	94,000	34,000	240,000	870,000	NA	NA
Tetrachloroethene	ND	ND	**1,000**	**420**	ND	51 J	ND	ND	ND	ND	ND	100	1,200 X	88,0000 C	210,000	88,0000 C	88,000	74 SE	150
Toluene	ND	26 J	640	790	150	28 J	**650,000**	25 J	ND	ND	ND	16,000	5,400	250,000 C	3,300,000	250,000 C	250,000	64,000 SE	64,000 SE
Trichloroethene	ND	ND	**68 J**	**33 J**	ND	ND	ND	ND	ND	ND	0.59 J	100	4,000 X	440,000	14,000	500,000 C,DD	500,000	4.0 M	8.0 M, SE
1,2,4-Trimethylbenzene	ND	ND	36 J	ND	**690**	200	**130,000**	ND	59 J	ND	ND	2,100	570	110,000 C	25,000,000	110,000 C	110,000	2,600	5,200
1,3,5-Trimethylbenzene	ND	ND	42 J	ND	430	150	**50,000**	ND	28 J	ND	ND	1,800	1,100	94,000 C	19,000,000	94,000 C	94,000	1,800	3,600
Xylenes	ND	ND	700	580	**7,300**	310	**1,400,000**	ND	150 J	ND	ND	5,600	820	150,000 C	54,000,000	150,000 C	150,000	5,000	9,900

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