From: Choi, Christopher <choi.christopher@epa.gov>
Sent: Wednesday, August 29, 2018 1:58 PM
To: Byers, Harris; Paul Braun (PBraun@manitowoc.org)
Cc: Kathleen McDaniel; Dan Koski; Beggs, Tauren R - DNR; Andrew Steimle
Subject: RE: SSSAP for Phase II ESA at the 1110 Buffalo Street Property
Attachments: Discrete Site Areas.pdf

Hi Paul, Harris –

When referring to each of the properties, can we use the names on your attached map in addition to the addresses – or can you create a new map with the addresses for the properties (I thought that originally we didn't have addresses for the properties). It would make it easier for me to track everything.

Thanks,
Chris

From: Byers, Harris [mailto:Harris.Byers@stantec.com]
Sent: Tuesday, August 28, 2018 6:16 PM
To: Choi, Christopher <choi.christopher@epa.gov>; Paul Braun (PBraun@manitowoc.org) <PBraun@manitowoc.org>
Cc: Kathleen McDaniel <kmcdaniel@manitowoc.org>; Dan Koski <dkoski@manitowoc.org>; Beggs, Tauren R - DNR <Tauren.Beggs@wisconsin.gov>; Andrew Steimle <Andrew@steimlebirschbach.com>
Subject: SSSAP for Phase II ESA at the 1110 Buffalo Street Property

Team:

Attached is a site-specific sampling and analysis plan for a Phase II ESA at the former railroad property located at 1110 Buffalo Street in the City of Manitowoc. Please review at your earliest convenience.

I accept this is a large scope of work and implementing the full SSSAP prior to acquisition may not be possible. We will work with you to prioritize the work and balance against the project budget and timeline.

Kathleen/Andy – can you please forward this to the property owner for their review.

Sincerely,

Harris Byers
Brownfields Project Manager

Direct: 414 581-6476
Fax: 262 241-4901
Harris.Byers@stantec.com

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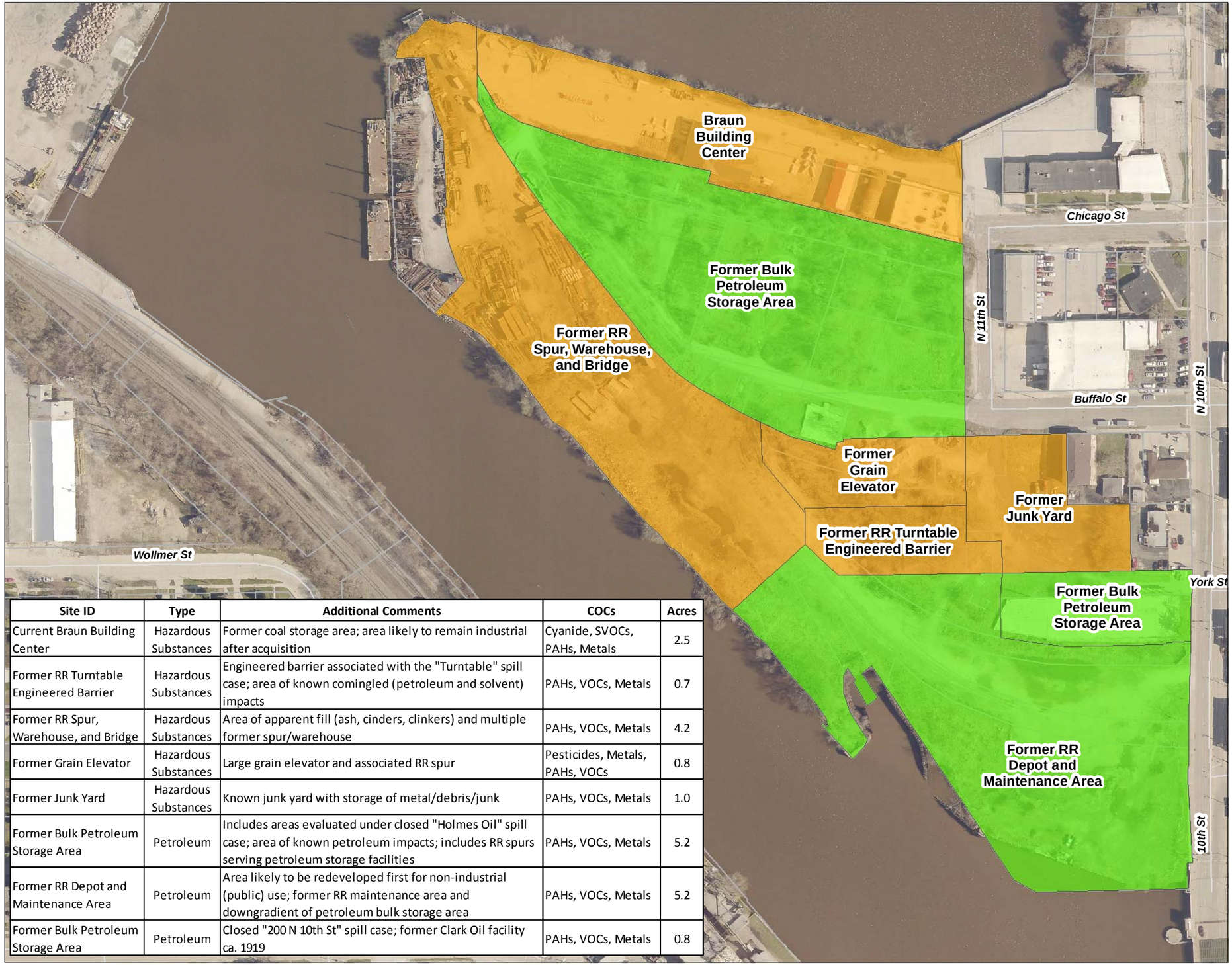


Site ID	Type	Additional Comments	COCs	Acres
Current Braun Building Center	Hazardous Substances	Former coal storage area; area likely to remain industrial after acquisition	Cyanide, SVOCs, PAHs, Metals	2.5
Former RR Turntable Engineered Barrier	Hazardous Substances	Engineered barrier associated with the "Turntable" spill case; area of known comingled (petroleum and solvent) impacts	PAHs, VOCs, Metals	0.7
Former RR Spur, Warehouse, and Bridge	Hazardous Substances	Area of apparent fill (ash, cinders, clinkers) and multiple former spur/warehouse	PAHs, VOCs, Metals	4.2
Former Grain Elevator	Hazardous Substances	Large grain elevator and associated RR spur	Pesticides, Metals, PAHs, VOCs	0.8
Former Junk Yard	Hazardous Substances	Known junk yard with storage of metal/debris/junk	PAHs, VOCs, Metals	1.0
Former Bulk Petroleum Storage Area	Petroleum	Includes areas evaluated under closed "Holmes Oil" spill case; area of known petroleum impacts; includes RR spurs serving petroleum storage facilities	PAHs, VOCs, Metals	5.2
Former RR Depot and Maintenance Area	Petroleum	Area likely to be redeveloped first for non-industrial (public) use; former RR maintenance area and downgradient of petroleum bulk storage area	PAHs, VOCs, Metals	5.2
Former Bulk Petroleum Storage Area	Petroleum	Closed "200 N 10th St" spill case; former Clark Oil facility ca. 1919	PAHs, VOCs, Metals	0.8

Figure No.

Title

Discrete Site Areas

Client/Project

City of Manitowoc
USEPA Brownfield Assessment Grant

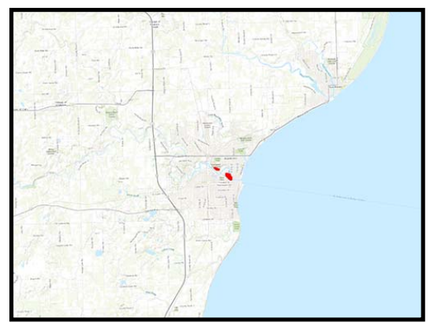
0 120 240 Feet

193703931
Prepared by HLB on 7/11/18

N

Legend

- Hazardous Substances
- Petroleum



Notes

1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet
2. Historic Site features illustrated on this figure were digitized from multiple historic maps/sources, including City Assessor files, WDNR files, and Sanborn (R) Fire Insurance Maps. These features are provided for illustration purposes only; Stantec makes no warranty as to the accuracy of these features.
3. Orthophotograph: Manitowoc County, 2017

Stantec

SITE-SPECIFIC SAMPLING AND ANALYSIS PLAN

PHASE II ENVIRONMENTAL SITE ASSESSMENT

1110 Buffalo Street

Manitowoc, Wisconsin

USEPA Brownfield Cooperative Agreement No.: BF 00E02377-0 (pending)

Harris L. Byers
Brownfields Project Manager

Hiedi A. Waller, P.E.
Environmental Engineer

Richard J. Binder, P.G.
Project QA/QC Manager

August 2018
Project Number 193706269

Stantec

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 General

This Site-Specific Sampling and Analysis Plan (SSSAP) has been prepared on behalf of the City of Manitowoc (hereinafter referred to as the "City") by Stantec Consulting Services Inc. (Stantec) for field sampling and associated laboratory analyses to be performed as part of a Phase II Environmental Site Assessment (ESA) of the former railroad property located at 1110 Buffalo Street in the City of Manitowoc, Wisconsin (herein referred to as the Site or Property). A petroleum brownfield eligibility determination for the Property was submitted to the Wisconsin Department of Natural Resources (WDNR) on August 9, 2018 (Stantec, 2018b) and approved by the agency on August 21, 2018. The project is being performed using funds from an assessment grant for brownfield properties impacted by petroleum awarded to the City by United States Environmental Protection Agency (USEPA) in 2018. The USEPA Assessment, Cleanup and Redevelopment Exchange System site identification numbers are forthcoming.

The Property consists of ten contiguous parcels of land totaling approximately 6 acres and forming the central portion of a larger 21-acre parcel of former railroad land. The location of the 6-acre Property and the larger 21-acre former railroad property relative to nearby topography is illustrated on Figure 1. The ten parcels comprising the Property and current features are shown on Figure 2.

The Property is owned by Wisconsin Central, Ltd. and is currently vacant. As shown on Figure 2 and described in the Stantec (2018c) Phase I ESA, remaining Property features consistent with prior use as a bulk petroleum storage facility include concrete building slabs of former oil houses/pump houses, graded/paved driveways, and abandoned railroad spurs. Surrounding properties are a mix of vacant land, rights-of-way, and industrial land uses.

1.2 Site Description/Background

Site Ownership. The Site appears to have been owned by several railroads since the late 1800s; initially by the Soo Line Minneapolis St. Paul and Sault St. Marie Railroad Company with ownership transferred to the current owner (Wisconsin Central Ltd.) by the late 1980s. As illustrated on Figure 3a and Figure 3b, records suggest large portions of the Site were leased to a variety of bulk fuel storage companies operating under a variety of names during the early/mid 20th Century. Consolidation of bulk petroleum storage operations began at the Site in 1969 by the "Wingfield Oil Company" with continued consolidation through 1975. The Wingfield Oil Company was renamed "Holmes Oil Corporation" on 8/4/1976. The Holmes Oil Corporation appears to have vacated the Site concurrent with reported removal of the final storage tanks by 1997.

Site Development/Operation. Historic Sanborn® fire insurance maps indicate property use for bulk petroleum storage began between 1912 and 1919 when the Standard Oil Company installed four steel tanks, a 20,000-gallon iron oil tank, and a partially inground 20,000-gallon iron oil tank along a railroad spur. Standard Oil Co. expanded operations at the property through 1927 at which point the operation consisted of seven oil tanks and three oil houses. The Stephani-Strupp Oil Co. began operations at the Site by 1927 and the facility consisted of two oil tanks near North 11th Street, an oil house, and a pump house. Bulk petroleum storage in the central portion of the property expanded significantly in the 1940s-1960s, with continued expansion of the Standard Oil Co facility (twelve oil tanks, two pump houses, one oil house), construction of the Shell Oil Co. Inc. facility (five tanks, one oil house, one pump house), and construction of the Sinclair Refining Co. facility (nine oil tanks, two oil houses, one pump house). As noted above, bulk petroleum storage was consolidated by the Wingfield Oil Company (later renamed Holmes Oil Company) who continued to operate through the late 1990s. The Holmes Oil Corporation appears to have vacated the Site concurrent with removal of

the final storage tanks by 1997. Locations of known Site features obtained from a variety of local and state sources are illustrated on Figure 3a and Figure 3b.

Registered Tanks. It would be impractical to document specific fueling/storage operations dating across roughly 80 years of bulk petroleum storage at the Property. The locations of known Site features are illustrated on Figure 3a and Figure 3b. Registered underground storage tanks (USTs) and aboveground storage tanks (ASTs) associated with the Site are summarized in the following tables.

1110 Buffalo St (Facility ID 72466) – UST Records

Tank ID	Size (gallons)	Contents	Status	Date Removed
414536	500	Leaded Gasoline	Closed/Removed	7/15/1996
415121	1500	Unleaded Gasoline	Closed/Removed	7/15/1996
420040	300	Diesel Fuel	Closed/Removed	7/15/1996

1115 Buffalo St (Facility ID 152628) – AST Records

Tank ID	Size (gallons)	Contents	Status	Date Removed
206520	10,000	Fuel Oil	Closed/Removed	12/31/1964
206521	10,000	Fuel Oil	Closed/Removed	12/31/1964
206522	10,000	Fuel Oil	Closed/Removed	12/31/1964
206523	10,000	Leaded Gasoline	Closed/Removed	12/31/1964
206524	18,000	Leaded Gasoline	Closed/Removed	12/31/1964
206525	18,000	Leaded Gasoline	Closed/Removed	12/31/1964
206526	18,000	Leaded Gasoline	Closed/Removed	12/31/1964
206527	18,000	Fuel Oil	Closed/Removed	12/31/1964
206528	18,000	Diesel	Closed/Removed	12/31/1964
206529	9,000	Diesel	Closed/Removed	12/31/1964
206530	20,000	Fuel Oil	Closed/Removed	12/31/1964

1114 Buffalo St (Facility ID 152627) – UST Records

Tank ID	Size (gallons)	Contents	Status	Date Removed
414787	1,500	Waste/Used Motor Oil	Closed/Removed	7/15/1996
414788	300	Diesel	Closed/Removed	7/15/1996
414789	500	Unleaded Gasoline	Closed/Removed	7/15/1996
415118	300	Diesel	Closed/Removed	7/15/1996
415119	500	Unleaded Gasoline	Closed/Removed	7/15/1996
415120	15,000	Waste/Used Motor Oil	Closed/Removed	7/15/1996

1114 Buffalo St (Facility ID 152627) – AST Records

Tank ID	Size (gallons)	Contents	Status	Date Removed
201009	18,000	Unleaded Gasoline	Closed/Removed	7/15/1996
206480	1,000	Kerosene	Closed/Removed	7/15/1996
206481	15,000	Diesel	Closed/Removed	7/15/1996
206482	1,500	Fuel Oil	Closed/Removed	7/15/1996

206483	15,000	Unleaded Gasoline	Closed/Removed	7/15/1996
206484	15,000	Fuel Oil	Closed/Removed	7/15/1996
206485	10,000	Fuel Oil	Closed/Removed	7/15/1996
206486	15,000	Diesel	Closed/Removed	7/15/1996
206487	15,000	Unleaded Gasoline	Closed/Removed	7/15/1996
206488	15,000	Fuel Oil	Closed/Removed	7/15/1996
206489	15,000	Fuel Oil	Closed/Removed	7/15/1996
206490	18,000	Diesel	Closed/Removed	7/15/1996
206491	18,000	Diesel	Closed/Removed	7/15/1996
206492	18,000	Fuel Oil	Closed/Removed	7/15/1996
206493	18,000	Fuel Oil	Closed/Removed	7/15/1996
206494	18,000	Fuel Oil	Closed/Removed	7/15/1996
206495	18,000	Unleaded Gasoline	Closed/Removed	7/15/1996
206496	18,000	Fuel Oil	Closed/Removed	7/15/1996
206497	5,000	Diesel	Closed/Removed	7/15/1996
206498	5,000	Unleaded Gasoline	Closed/Removed	7/15/1996
206499	5,000	Fuel Oil	Closed/Removed	7/15/1996
206500	500	Diesel	Closed/Removed	7/15/1996

Prior Investigation / Remediation Efforts. Site Investigation activities were completed by the current owner between 1996 and 1998. Through the competitive bidding process operated by Wisconsin Department of Commerce (WDCOMM), Northern Environmental Technologies Inc. (later acquired by Stantec) oversaw the excavation 510 tons of petroleum-impacted soil from three locations at the Property (see extents illustrated on Figure 3a and Figure 3b) and completed post-remediation soil and groundwater sampling. Of note, approximately one-inch of free product accumulated in MW-2 following soil removal. The free product was removed from the well with a bailer and reportedly did not reform during two subsequent groundwater monitoring events.

WDCOMM issued a closure letter on October 17, 2005 and listed the property on the WDNR geographic information system (GIS) registry of closed remediation sites as an institutional control to manage residual petroleum impacts to soil and groundwater. At the time of closure, residual petroleum constituents remained in soil at the property following soil excavation at concentrations greater than applicable ch. NR 720 Wisconsin Administrative Code (WAC) residual contaminant levels (RCLs.)

Continuing Obligations. The current owner provided cap inspection records for the former Holmes Oil Corp release area (BRRTS Case No 03-36-001962). The most recent inspection of the area took place on September 20, 2017 and the inspector noted that "no wells, soil/ground penetrations or excavations were observed in the restrictive areas."

1.3 Environmental Concerns

The Stantec (2018c) Phase I ESA identified 6 recognized environmental conditions (RECs) with respect to the larger 21-acre former railroad property. With respect to the portion of the property to be assessed under this SSSAP, the Phase I ESA recommends completion of a Phase II ESA to determine if the following RECs have resulted in a release to the environment at the Property:

REC 1: **Prior Railroad Use**

REC 2: **Prior Industrial Use**

REC 3: **Residual Impacts to Soil and Groundwater**

REC 4: **Apparent Anthropogenic Fill**

REC 5: **Storage/Dumping by Adjacent Property Owners**

2.0 DATA QUALITY OBJECTIVES

2.1 Problem Statement

Various environmental concerns associated with the Property have been identified, but not yet fully investigated or assessed. The main objective for performing the proposed Phase II ESA is to evaluate the RECs identified in the Stantec (2018c) *Phase I ESA* to facilitate non-industrial reuse of the Property. Specifically, the purpose of the assessment is to confirm the presence of petroleum at the Property in conditions that constitute disposal or release, or provide sufficient information to render a professional opinion that there is no reasonable basis to suspect the presence of petroleum products at the Property. If present and applicable, the extent and magnitude of release will be evaluated to assess appropriate remedial actions. Additional phases of investigation may be required based on the results of the initial Phase II ESA.

2.2 Conceptual Site Model

The "Triad approach" for characterization and remediation of contaminated sites was developed by USEPA and others with a goal of increasing confidence that project decisions about contaminant presence or absence, location, fate, exposure and risk reduction choices, are made correctly and cost effectively. The foundation for site-related decisions that are both correct and optimized (from a cost-benefit standpoint) is the "Conceptual Site Model" (CSM) (Crumbling, 2004). CSM uses all available historical and current information to estimate:

- where contamination is (or might be) located,
- how much is (or might be) there,
- how variable concentrations may be and how much spatial patterning may be present,
- what is happening to contaminants as far as fate and migration,
- who might be exposed to contaminants or harmful degradation products, and
- what might be done to manage risk by mitigating exposure.

The current CSM builds on the environmental concerns outlined in Section 1.3 and acknowledges the following attributes of the Site that are relevant to defining the nature and extent of impacts:

1. The City executed a Letter of Intent on May 16, 2018 to purchase the Property from the current owner. The due diligence period ends on October 15, 2018. A Phase I ESA has been prepared and identified five RECS with respect to the Property. The proposed boring locations and scope of work described herein may be adjusted based on the results of the geophysical survey, which was recommended in the Phase I ESA.
2. The Property was developed for bulk petroleum storage by 1919 with significant expansion through the 20th Century by multiple operators. Bulk petroleum storage was consolidated under a single operator in 1969, who remained at the Property through 1997 when bulk storage operations ceased. Although the Property is currently vacant, historic petroleum related features have included 42 ASTs, twelve USTs, seven pump houses, five oil houses, and associated pipe runs.
3. Records indicate most of the petroleum stored/handled at the Property was fuel oil. However, state records indicate a significant quantity of leaded and unleaded gasoline, diesel fuel, kerosene, and used/waste motor oil may have been stored in bulk at the Property.
4. Although specific operations remain unconfirmed, historic Site features suggest petroleum was delivered by rail and stored in large aboveground and underground storage tanks. Petroleum was then pumped into trucks for local delivery.
5. 510 tons of petroleum-impacted soil were excavated from three locations at the Property and the case was closed by the regulatory authority. Of note, approximately one-inch of free product accumulated in monitoring well MW-2 following soil removal. The free product was

removed from the well with a bailer and reportedly did not reform during two subsequent groundwater monitoring events.

6. The elevation of groundwater at the Property previously ranged from 4 to 9 feet below ground surface (bgs) and the potentiometric surface decreased radially outward from monitoring wells MW-2 and MW-3 towards the Manitowoc River. At the time of closure, the concentrations of multiple petroleum constituents in groundwater exceeded the ch. NR 140 WAC enforcement standards (ESs) at MW-2, MW-8, and MW-10 and exceeded the ch. NR 140 WAC preventive action limits (PALs) at MW-12.
7. Historic fill is commonly encountered at former industrial/railroad properties and may exist the Property
8. The adjacent property owner appears to be using the northern portion of the Property for material storage.
9. WDCOMM issued a closure letter on October 17, 2005 for BRRTS Case No. 0336001962 following excavation of petroleum impacted soil.
10. The Property is listed on the WDNR GIS registry of closed remediation sites as an institutional control to manage residual petroleum impacts to soil and groundwater.
11. Reuse plans have not yet been developed, though likely scenarios include mixed-use residential/commercial, with a significant recreation focus along the Manitowoc River.

The locations of proposed soil borings are illustrated on Figure 3a and Figure 3b. Potential constituents of concern (COC) were determined from the potential sources identified in the Stantec (2018c) Phase I ESA. Potential COCs include volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and Resource Conservation and Recovery Act (RCRA) metals.

3.0 SOIL ASSESSMENT

3.1 General

Proposed soil sampling locations and analyses are based on the environmental concerns and CSM detailed in Sections 1.3 and 2.2, respectively. Diggers Hotline will be contacted to locate and mark the locations of registered utilities in the project area. A private utility locate will be completed as part of the geophysical survey to identify underground anomalies of additional concern. A site-specific Health and Safety Plan to be utilized by Stantec personnel during the assessment activities, is presented in Appendix A.

3.2 Objectives

Stantec will conduct soil sampling activities to characterize the subsurface materials at the Site to plan for future non-industrial redevelopment. This investigation will determine appropriate future actions, if any, to obtain closure from the WDNR per the NR 700 WAC rule series. Standard Operating Procedures (SOPs) for tasks associated with this work plan are presented in the Quality Assurance Project plan (QAPP; Stantec, 2015 a and b) and associated Stantec (2016 a, b, and c; 2018 a) addenda/revisions.

Soil quality data will be compared to ch. NR 720 WAC soil standards for the direct contact pathway at industrial and non-industrial properties and to soil standards for the soil to groundwater exposure pathway.

3.3 Soil Boring and Subsurface Assessment

As illustrated on Figure 3a and Figure 3b, the proposed soil assessment includes advancing up to eighty-one soil borings using direct-push dual-tube Geoprobe® drilling methods. Soil samples will be collected continuously from each borehole, and each borehole will generally extend downward up to 10 feet bgs to facilitate installation of temporary groundwater monitoring wells. Some soil borings may be extended further downward, should site conditions suggest the presence of dense non-aqueous phase liquid. Actual locations may be adjusted based on accessibility, the results of the geophysical survey, and/or locations of underground utilities. Soil borings not completed as temporary wells will be abandoned with bentonite and the surface repaired to match surrounding.

The horizontal locations of each soil boring will be documented using sub-meter global positioning system (GPS) survey equipment per SOP No. 15 (Stantec, 2015). The elevation of the ground surface at each soil boring will be surveyed relative to a static site datum using a laser level per SOP No. 15 (Stantec, 2015).

Soil sampling and field classification will be conducted according to SOP No. 02 (Stantec, 2015). Sample collection and laboratory analytical methods for soil samples, as well as the rational for selecting sample locations and criteria to be used for selection of specific depth intervals for analysis, are presented in Table 1.

Soil samples will be collected continuously with four to five-foot samplers. Soil samples will be visually and physically examined by Stantec field geologists, and observations made of the general soil type (percentages of gravel, sand, silt, and clay), any visible layering, evidence of non-native fill materials (with estimated percentages of these materials contained in the soil matrix), indications of chemical or other staining, odors, and any other distinctive features as described in SOP No. 02 (Stantec, 2015). In addition, pertinent observations noted during installation of the soil borings will be documented on the soil boring logs.

Soil samples will be field screened for the presence of VOCs using a photoionization detector (PID) as described in SOP No. 01 (Stantec, 2015). The PID will be calibrated daily in the field in accordance with the manufacturer's specifications per SOP No. 09. Samples will be further screened using a low-voltage ultraviolet light as described in SOP No. 16 (Stantec, 2015).

The exact quantity of soil samples collected will be determined in the field and will target soils indicative of a suspected release. As summarized on Table 1, a minimum of one soil sample will be collected from the unsaturated zone from each boring and submitted for RCRA metals, VOC, and/or PAH analysis from the depth interval of apparent impact (i.e. PID screening results, visual or olfactory observations, or fluorescence with ultraviolet light) and/or directly above the water table. A second sample may be collected from select borings within the upper 4 feet of the ground surface to evaluate the potential for direct contact. All soil samples will be collected and preserved in accordance with SOP No. 02 and Table 3 of the QAPP. All samples will be placed in laboratory-supplied containers (per SOP No. 02), preserved as appropriate, stored on ice, and submitted under chain-of-custody procedures to TestAmerica (Chicago, Illinois), a Wisconsin-certified laboratory for analysis as described in the QAPP using protocols outlined in SOP No. 07. Samples will be submitted to the laboratory as soon as possible after collection (i.e. daily).

Each soil sample will be assigned a sample identification number (SIN) based on the following format:

Sample Type	Label for Type of Sample	Location Number	Sample Interval (feet bgs)	Sample Round	Sample Identification No. (SIN)	Location ID
Soil boring	SB	1	(0-2)	---	SB1(0-2)	SB1
Field Duplicate	FD	---	---	Number	FD1	---
Trip blank	TB	---	---	Number	TB1	---

bgs = below ground surface

Soil sampling equipment such as drilling tools will be decontaminated prior to arrival on-site and between each sampling location (SOP No. 08). Investigative wastes generated during the Soil Boring and Subsurface Investigation will be managed per SOP No. 10. In general, waste soil cuttings will be collected in United States Department of Transportation (DOT)-approved 55-gallon drums or other appropriate containers, sealed, labeled, and stored on site pending the completion of laboratory analysis and determination of disposal restrictions, if any. As appropriate, waste soil cuttings will be handled, transported, and disposed of by a licensed waste hauler per federal and state requirements. The generator of the waste will be the property owner at the time of the investigation.

3.3.1 Special Handling Considerations and QA/QC Samples

Collection and preservation of soil samples for VOC analysis will be performed in accordance with SOP No. 02 (Stantec, 2015). As summarized on Table 1, quality assurance/quality control (QA/QC) samples to be collected and analyzed will include a trip blank and field duplicate sample. Trip blanks prepared by the analytical laboratory will accompany the sample bottles from the time of shipment from the laboratory through the time the samples are returned for analysis. Trip blanks will be used to document any contamination detected in samples that may be attributable to shipping and field handling procedures, or contaminated sample containers. Trip blanks will be provided by the laboratory and will be subject to the same handling and transportation procedures as the investigative samples.

De-identified field duplicate samples will be collected and analyzed to evaluate sample variability and overall data precision. Duplicate samples will be collected from soil borings and depth intervals representing the range of site conditions. Duplicate samples will be collected and analyzed for constituents at a rate of one sample for every 20 or fewer investigative samples.

Matrix spike/matrix spike duplicate samples will be collected and analyzed for constituents at a rate of one sample for every 20 or fewer investigative samples.

3.3.2 Chain-Of-Custody

Chain-of-custody procedures will be utilized to track possession and handling of individual samples from the time of collection in the field through the time of delivery to the analytical laboratory. The chain-of-custody program will include use of sample labels, custody seals, field logbooks, chain-of-

custody forms and laboratory logbooks. All chain-of-custody procedures will be performed in accordance with SOP No. 07 (Stantec, 2015).

3.3.3 Field Log Book

An up-to-date field log book will be maintained by each sampling team to document daily activities (if more than one group of individuals is sampling). The log book will include a general list of tasks performed, additional data, or observations not listed on field data sheets and document communications with on-site personnel or visitors as these apply to the project.

4.0 GROUNDWATER ASSESSMENT

4.1 General

Proposed temporary groundwater monitoring well sampling locations and analyses are based on the environmental concerns and CSM detailed in Sections 1.3 and 2.2, respectively. A site-specific HASP, to be utilized by Stantec personnel during the assessment activities, is presented in Appendix A.

4.2 Objectives

Stantec will conduct groundwater sampling activities to characterize groundwater quality at the Site as necessary to facilitate proposed redevelopment. In addition, the sampling will determine appropriate future actions, if any, to obtain closure from the WDNR per the Chapter NR 700 WAC rule series. SOPs for tasks associated with this work plan are presented in the QAPP and associated updates and addenda (Stantec, 2015 a and b; 2016 a, b, and c; 2018 a).

Groundwater quality data will be compared to ch. NR 140 WAC groundwater standards. In addition, VOCs detected in groundwater will be used to provide continued screening of the vapor intrusion pathway per WDNR Pub-RR800.

4.3 Groundwater Assessment

As illustrated on Figure 3a and Figure 3b, the groundwater assessment will include the completion of up to twenty-seven soil borings described in Section 3 as one-inch diameter temporary groundwater monitoring wells. The depth for the new wells will depend on the actual depth at which groundwater is encountered beneath the Site. The wells will be constructed in general conformance with ch. NR 141 WAC using 1-inch diameter poly-vinyl chloride casing with 10-foot long 0.010-inch slotted-screens with coarse sand pack. Wells will be placed to intersect the water table surface. It is anticipated that well depths will be approximately 10 feet bgs, though some wells could terminate at a lower depth if conditions suggest the possibility of dense nonaqueous phase liquids.

The horizontal locations of each well will be documented using sub-meter GPS survey equipment per SOP No. 15 (Stantec, 2015). The elevation of the top of each well casing will be surveyed relative to a static site datum using a laser level per SOP No. 15 (Stantec, 2015).

Following installation and recovery, and prior to purging and collection of groundwater samples, the elevation of the groundwater table will be measured and the volume of water present within each well will be calculated using the procedures set forth in SOP No. 04 (Stantec, 2015). Groundwater elevation data will also be used to document the gradient in potentiometric surface.

The depth and thickness of floating (light) and/or sinking (dense) non-aqueous phase liquids, if present, will be measured using an interface probe. SOP No. 04 details the procedures that will be used to detect immiscible layers. The interface probe will be decontaminated in accordance with SOP No. 08 (Stantec, 2015).

Each temporary well will be purged prior to sampling in accordance with SOP No. 04 (Stantec, 2013). If the geologic materials surrounding the well are low yielding, then the wells will be completely evacuated, and groundwater samples collected after the water level recovers sufficiently to provide the volume of water needed to fill sample containers for the desired analyses. Temperature, pH, dissolved oxygen and specific conductance will be measured on the evacuated purge water (SOP No. 04). The well may be purged using any of the following methods: a peristaltic pump, a low-flow Micro-Purge Sampling System (or equivalent), a Voss disposable polyethylene bailer (or equivalent), or a Waterra hand pump (or equivalent) or similar equipment. Non-disposable purging equipment will be decontaminated in accordance with SOP No. 08 (Stantec, 2015).

After purging, groundwater samples will be collected from all temporary groundwater monitoring wells and analyzed for dissolved (field filtered) RCRA metals, VOCs, and/or PAHs per SOP No. 04 (Stantec, 2015). All samples will be placed in laboratory-supplied containers (per SOP No. 04),

preserved as appropriate, stored on ice, and submitted under chain-of-custody procedures to TestAmerica (Chicago, Illinois) for analysis as described in the QAPP using protocols outlined in SOP No. 07. Anticipated sample collection and laboratory analytical methods for groundwater samples are summarized in Table 2.

Each groundwater sample will be assigned a SIN based on the following format:

Sample Type	Label for Type of Sample	Location Number	Sample Round	Sample Identification No. (SIN)	Location ID
Temporary well	TW	1	01	TW1(01)	TW1
Field Duplicate	FD	---	---	FD1	---

Decontamination procedures for any non-dedicated or non-disposable equipment used for collection of groundwater samples will also be performed using the procedures set forth in SOP No. 08 (Stantec, 2015).

All purge water will be collected in DOT-approved 55-gallon drums or other appropriate containers, sealed, labeled, and stored on site pending the completion of laboratory analysis and determination of disposal restrictions, if any per SOP No. 10 (Stantec, 2015). As appropriate, purge water will be handled, transported, and disposed of by a licensed waste hauler per federal and state requirements. The generator of the waste will be the property owner at the time of the investigation.

When appropriate, the groundwater monitoring wells will be decommissioned in accordance with SOP No. 04 (Stantec, 2015) and sealed in accordance with ch. NR 141.25 WAC.

4.3.1 Special Handling Considerations and QA/QC Samples

Collection and preservation of groundwater samples for VOC analysis will be performed in accordance with SOP No. 04 (Stantec, 2015). Headspace should not be present in the sample container, thus minimizing the volatilization of organics from the sample. The laboratory will supply the pre-preserved 40-ml glass vials with Teflon™-lined lids.

As summarized on Table 2, QA/QC samples to be collected and analyzed will include a trip blank and a field duplicate sample.

Trip blanks prepared by the analytical laboratory will accompany the sample bottles from the time of shipment from the laboratory through the time the samples are returned for analysis. Trip blanks will be used to document any contamination detected in samples that may be attributable to shipping and field handling procedures, or contaminated sample containers. Trip blanks will be provided by the laboratory and will be subject to the same handling and transportation procedures as the investigative samples. At least one trip blank sample will accompany each shipping container that contains samples for VOC analysis.

De-identified field duplicate samples will be collected and analyzed to evaluate sample variability and overall data precision. For groundwater samples, the duplicate samples will be “field replicate samples” collected at the same time from the same well. To the extent practicable, multiple bottles associated with a set of duplicate samples will be filled in two or three stages such that each bottle receives a portion of the water from each section of the bailer, or each interval of sample pump operation. In recognition that data for duplicate samples are most meaningful when there are detectable concentrations present of constituents of concern, if there are existing groundwater data, or other data by which to anticipate wells with greater levels of contamination, duplicate samples will be preferentially collected from wells where detectable concentrations of constituents of concern are most likely to be present. Otherwise, duplicate samples will be collected from a randomly selected well or wells. Duplicate samples will be collected and analyzed for constituents at a rate of one sample for every 20 or fewer investigative samples.

Matrix spike/matrix spike duplicate samples will be collected and analyzed for constituents at a rate of one sample for every 20 or fewer investigative samples.

4.3.2 Chain-Of-Custody

Chain-of-custody procedures will be utilized to track possession and handling of individual samples from the time of collection in the field through the time of delivery to the analytical laboratory. The chain-of-custody program will include use of sample labels, custody seals, field logbooks, chain-of-custody forms and laboratory logbooks. All chain-of-custody procedures will be performed in accordance with SOP No. 07 (Stantec, 2015).

4.3.3 Field Log Book

An up-to-date field log book will be maintained by each sampling team to document daily activities (if more than one group of individuals is sampling). The log book will include a general list of tasks performed, additional data or observations not listed on field data sheets, and document communications with on-site personnel or visitors as these apply to the project.

5.0 REPORT

The Phase II ESA will enable refinement of the conceptual model of the physical subsurface conditions and contaminant sources at the Site. The Phase II ESA report will include:

- Laboratory Analytical Reports
- Soil Boring Logs
- Monitoring Well Construction Forms
- Field PID Data
- Groundwater Elevation Data
- Tables Summarizing Analytical Results for Soil and Groundwater Samples
- Potentiometric Surface Map of Shallow Groundwater

Recommendations for future actions, if any, to facilitate planned redevelopment of the Site will be provided in the Phase II ESA Report.

6.0 REFERENCES

Crumbling, D. 2004. Summary of the Triad Approach. White Paper, USEPA, Office of Superfund Remediation and Technology Innovation. March 25, 2004.

Stantec, 2015a, Quality Assurance Project Plan (Revision 0), Implementation of USEPA Assessment Grants for Petroleum and Hazardous Substance Brownfields, City of Manitowoc, WI, U.S. EPA Cooperative Agreement Nos. BF- BF-00E01529-0, August 19, 2015.

Stantec, 2015b, Quality Assurance Project Plan (Revision 1), November 12, 2015.

Stantec, 2016a, Quality Assurance Project Plan Update and Addendum 1, June 3, 2016.

Stantec, 2016b, Quality Assurance Project Plan Update and Addendum 2, August 15, 2016.

Stantec, 2016c, Quality Assurance Project Plan Update, October 18, 2016.

Stantec, 2018a, Quality Assurance Project Plan Update and Addendum 3, June 17, 2018.

Stantec, 2018b, Site Eligibility Determination Request for USEPA Community-Wide Brownfields Assessment Grant for Petroleum, August 1, 2018.

Stantec, 2018c, Phase I ESA, 10th Street Railroad Property Manitowoc, Wisconsin, August 16, 2018.

TABLES

Table 1
Proposed Laboratory Analysis for Soil
200 North 10th Street
Manitowoc, Wisconsin

Soil Boring ID	Estimated Soil Boring Depth (ft)	Estimated Sample Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	RCRA Metals (6020 and 7470)
SB-1	10 Feet (or 5 feet into the water table)	Various	SB-1 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-1 will also evaluate soil quality to determine if storage of materials by an adjacent property (identified as REC#5 in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-2	5 Feet (or to the water table)	Various	SB-2 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-3	10 Feet (or 5 feet into the water table)	Various	SB-3 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-4	5 Feet (or to the water table)	Various	SB-4 will evaluate soil quality on the northern portion of the Property adjacent to and north of a former pump house to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-5	10 Feet (or 5 feet into the water table)	Various	SB-4 will evaluate soil quality on the northern portion of the Property adjacent to and north of a former oil house to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-6	10 Feet (or 5 feet into the water table)	Various	SB-6 will evaluate soil quality on the northeastern portion of the Property adjacent to and north of a former oil house to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-7	10 Feet (or 5 feet into the water table)	Various	SB-7 will evaluate soil quality on the northeastern portion of the Property near former product piping to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-8	5 Feet (or to the water table)	Various	SB-8 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-8 will also evaluate soil quality to determine if storage of materials by an adjacent property (identified as REC#5 in the Stantec (2018) Phase I ESA) resulted in a release to soil.		(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-9	5 Feet (or to the water table)	Various	SB-8 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table		
SB-10	10 Feet (or 5 feet into the water table)	Various	SB-10 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.		(1) Visual or Olfactory Indications of Impacts	
SB-11	10 Feet (or 5 feet into the water table)	Various	SB-11 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.			(1) Surface (2) Above Water Table

Table 1
Proposed Laboratory Analysis for Soil
200 North 10th Street
Manitowoc, Wisconsin

Soil Boring ID	Estimated Soil Boring Depth (ft)	Estimated Sample Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	RCRA Metals (6020 and 7470)
SB-12	10 Feet (or 5 feet into the water table)	Various	SB-12 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-12 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table		
SB-13	10 Feet (or 5 feet into the water table)	Various	SB-13 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.		(1) Visual or Olfactory Indications of Impacts	
SB-14	10 Feet (or 5 feet into the water table)	Various	SB-14 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-14 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.			(1) Surface (2) Above Water Table
SB-15	5 Feet (or to the water table)	Various	SB-15 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-15 will also evaluate soil quality to determine if storage of materials by an adjacent property (identified as REC#5 in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-16	5 Feet (or to the water table)	Various	SB-16 will evaluate soil quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-16 will also evaluate soil quality to determine if storage of materials by an adjacent property (identified as REC#5 in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-17	10 Feet (or 5 feet into the water table)	Various	SB-17 will evaluate soil quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-18	10 Feet (or 5 feet into the water table)	Various	SB-18 will evaluate soil quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-19	10 Feet (or 5 feet into the water table)	Various	SB-19 will evaluate soil quality on the southern portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-20	10 Feet (or 5 feet into the water table)	Various	SB-20 will evaluate soil quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-21	10 Feet (or 5 feet into the water table)	Various	SB-21 will evaluate soil quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-22	10 Feet (or 5 feet into the water table)	Various	SB-22 will evaluate soil quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	

Table 1
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Manitowoc, Wisconsin

Soil Boring ID	Estimated Soil Boring Depth (ft)	Estimated Sample Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	RCRA Metals (6020 and 7470)
SB-23	10 Feet (or 5 feet into the water table)	Various	SB-22 will evaluate soil quality on the southern portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-24	10 Feet (or 5 feet into the water table)	Various	SB-24 will evaluate soil quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-25	10 Feet (or 5 feet into the water table)	Various	SB-25 will evaluate soil quality on the southern portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-26	10 Feet (or 5 feet into the water table)	Various	SB-26 will evaluate soil quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-27	10 Feet (or 5 feet into the water table)	Various	SB-27 will evaluate soil quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-28	10 Feet (or 5 feet into the water table)	Various	SB-28 will evaluate soil quality on the southern portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-29	10 Feet (or 5 feet into the water table)	Various	SB-29 will evaluate soil quality on the northern portion of the Property at a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-30	10 Feet (or 5 feet into the water table)	Various	SB-30 will evaluate soil quality on the northern portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-31	10 Feet (or 5 feet into the water table)	Various	SB-31 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-31 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-32	5 Feet (or to the water table)	Various	SB-32will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-32 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-33	5 Feet (or to the water table)	Various	SB-33 will evaluate soil quality on the central portion of the Property at a former storage building to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-34	10 Feet (or 5 feet into the water table)	Various	SB-34 will evaluate soil quality on the central portion of the Property at a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	

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SB-35	10 Feet (or 5 feet into the water table)	Various	SB-35 will evaluate soil quality on the central portion of the Property at a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-36	10 Feet (or 5 feet into the water table)	Various	SB-35 will evaluate soil quality on the central portion of the Property at a (possible) former AST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-37	5 Feet (or to the water table)	Various	SB-37 will evaluate soil quality on the central portion of the Property at a (possible) former AST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-38	10 Feet (or 5 feet into the water table)	Various	SB-38 will evaluate soil quality on the central portion of the Property by the bulk petroleum tanks to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-38 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-39	10 Feet (or 5 feet into the water table)	Various	SB-39 will evaluate soil quality on the central portion of the Property by the bulk petroleum tanks to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-39 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-40	10 Feet (or 5 feet into the water table)	Various	SB-40 will evaluate soil quality on the central portion of the Property by a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-40 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-41	5 Feet (or to the water table)	Various	SB-41 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-41 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-42	10 Feet (or 5 feet into the water table)	Various	SB-42 will evaluate soil quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-42 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-43	10 Feet (or 5 feet into the water table)	Various	SB-43 will evaluate soil quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-43 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-44	10 Feet (or 5 feet into the water table)	Various	SB-44 will evaluate soil quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-44 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	

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Soil Boring ID	Estimated Soil Boring Depth (ft)	Estimated Sample Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	RCRA Metals (6020 and 7470)
SB-45	10 Feet (or 5 feet into the water table)	Various	SB-45 will evaluate soil quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-45 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-46	5 Feet (or to the water table)	Various	SB-46 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-46 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-47	10 Feet (or 5 feet into the water table)	Various	SB-47 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-47 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-48	5 Feet (or to the water table)	Various	SB-48 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-48 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-49	5 Feet (or to the water table)	Various	SB-49 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-49 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-50	10 Feet (or 5 feet into the water table)	Various	SB-50 will evaluate soil quality on the northeastern portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-49 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-51	10 Feet (or 5 feet into the water table)	Various	SB-51 will evaluate soil quality on the central portion of the Property by former ASTs to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-51 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-52	10 Feet (or 5 feet into the water table)	Various	SB-52 will evaluate soil quality on the central portion of the Property by former ASTs to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-52 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-53	10 Feet (or 5 feet into the water table)	Various	SB-53 will evaluate soil quality on the central portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-53 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table

Table 1
Proposed Laboratory Analysis for Soil
200 North 10th Street
Manitowoc, Wisconsin

Soil Boring ID	Estimated Soil Boring Depth (ft)	Estimated Sample Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	RCRA Metals (6020 and 7470)
SB-54	10 Feet (or 5 feet into the water table)	Various	SB-54 will evaluate soil quality on the central portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-54 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-55	10 Feet (or 5 feet into the water table)	Various	SB-55 will evaluate soil quality on the central portion of the Property by former ASTs to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-55 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-56	10 Feet (or 5 feet into the water table)	Various	SB-56 will evaluate soil quality on the central portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-56 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-57	10 Feet (or 5 feet into the water table)	Various	SB-57 will evaluate soil quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-57 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-58	10 Feet (or 5 feet into the water table)	Various	SB-58 will evaluate soil quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-58 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-59	5 Feet (or to the water table)	Various	SB-59 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-59 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table		
SB-60	5 Feet (or to the water table)	Various	SB-60 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-60 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.		(1) Visual or Olfactory Indications of Impacts	
SB-61	10 Feet (or 5 feet into the water table)	Various	SB-61 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.			(1) Surface (2) Above Water Table
SB-62	5 Feet (or to the water table)	Various	SB-62 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table		
SB-63	5 Feet (or to the water table)	Various	SB-63 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.		(1) Visual or Olfactory Indications of Impacts	
SB-64	10 Feet (or 5 feet into the water table)	Various	SB-64 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table

Table 1
Proposed Laboratory Analysis for Soil
200 North 10th Street
Manitowoc, Wisconsin

Soil Boring ID	Estimated Soil Boring Depth (ft)	Estimated Sample Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	RCRA Metals (6020 and 7470)
SB-65	10 Feet (or 5 feet into the water table)	Various	SB-65 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-66	10 Feet (or 5 feet into the water table)	Various	SB-66 will evaluate soil quality on the eastern portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-66 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-67	10 Feet (or 5 feet into the water table)	Various	SB-67 will evaluate soil quality on the eastern portion of the Property at a former product piping to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-67 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-68	10 Feet (or 5 feet into the water table)	Various	SB-68 will evaluate soil quality on the eastern portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-68 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-69	10 Feet (or 5 feet into the water table)	Various	SB-69 will evaluate soil quality on the eastern portion of the Property at a (possible) former AST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-69 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-70	10 Feet (or 5 feet into the water table)	Various	SB-70 will evaluate soil quality on the eastern portion of the Property at a former automotive garage to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-70 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-71	10 Feet (or 5 feet into the water table)	Various	SB-71 will evaluate soil quality on the eastern portion of the Property at former ASTs to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil. SB-71 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	(1) Surface (2) Above Water Table
SB-72	10 Feet (or 5 feet into the water table)	Various	SB-71 will evaluate soil quality on the eastern portion of the Property at a former automotive garage to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Visual or Olfactory Indications of Impacts	
SB-73	5 Feet (or to the water table)	Various	SB-73 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table		
SB-74	5 Feet (or to the water table)	Various	SB-74 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.		(1) Surface (2) Above Water Table	
SB-75	5 Feet (or to the water table)	Various	SB-75 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.			(1) Surface (2) Above Water Table
SB-76	5 Feet (or to the water table)	Various	SB-76 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table		

Table 1
Proposed Laboratory Analysis for Soil
200 North 10th Street
Manitowoc, Wisconsin

Soil Boring ID	Estimated Soil Boring Depth (ft)	Estimated Sample Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	RCRA Metals (6020 and 7470)
SB-77	10 Feet (or 5 feet into the water table)	Various	SB-77 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table	(1) Surface (2) Above Water Table	
SB-78	5 Feet (or to the water table)	Various	SB-78 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.			(1) Surface (2) Above Water Table
SB-79	10 Feet (or 5 feet into the water table)	Various	SB-79 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table		
SB-80	5 Feet (or to the water table)	Various	SB-80 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.		(1) Surface (2) Above Water Table	
SB-81	10 Feet (or 5 feet into the water table)	Various	SB-81 will evaluate soil quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to soil.	(1) Highest PID or (2) Above Water Table		(1) Surface (2) Above Water Table
Estimated number of investigative samples to be analyzed				69	68	42
Trip Blank		-	Field and Laboratory QAQC Sample	1	0	0
Matrix Spike/Matrix Spike Duplicate			Assess the influence of the matrix on lab results	4	4	2
Field Duplicate		-	Assess the quality of the data and collection techniques.	4	4	1
Estimated number of QAQC samples to be analyzed				9	8	3
Estimated number of samples to be analyzed				78	76	45

Notes:
FD = Field Duplicate
QAQC = Quality Assurance Quality Control
VOC = Volatile Organic Compounds
PAH = Polycyclic Aromatic Hydrocarbons
RCRA = Resource Conservation and Recover Act
UST = Underground Storage Tank
AST = Aboveground Storage Tank
(6010) = Laboratory analytical method (SW-846)
Stantec, 2018, Phase I ESA 10th Street Railroad Property, August 2018.

Table 2
Proposed Laboratory Analysis for Groundwater
1110 Buffalo Street
Manitowoc, Wisconsin

Well ID	Estimated Well Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	Dissolved RCRA Metals (6020 and7470)
TW-1	10 Feet (or 5 feet into the water table)	TW-1 will evaluate groundwater quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-1 will also evaluate groundwater quality to determine if storage of materials by an adjacent property (identified as REC#5 in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-3	10 Feet (or 5 feet into the water table)	TW-3 will evaluate groundwater quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-5	10 Feet (or 5 feet into the water table)	TW-4 will evaluate groundwater quality on the northern portion of the Property adjacent to and north of a former oil house to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-6	10 Feet (or 5 feet into the water table)	TW-6 will evaluate groundwater quality on the northeastern portion of the Property adjacent to and north of a former oil house to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-7	10 Feet (or 5 feet into the water table)	TW-7 will evaluate groundwater quality on the northeastern portion of the Property near former product piping to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-10	10 Feet (or 5 feet into the water table)	TW-10 will evaluate groundwater quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-11	10 Feet (or 5 feet into the water table)	TW-11 will evaluate groundwater quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-12	10 Feet (or 5 feet into the water table)	TW-12 will evaluate groundwater quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-12 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-13	10 Feet (or 5 feet into the water table)	TW-13 will evaluate groundwater quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-14	10 Feet (or 5 feet into the water table)	TW-14 will evaluate groundwater quality on the northwestern portion of the Property to determine if prior industrial or railroad activities or placement of fill (identified as REC#2, REC#1, and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-14 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-17	10 Feet (or 5 feet into the water table)	TW-17 will evaluate groundwater quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-18	10 Feet (or 5 feet into the water table)	TW-18 will evaluate groundwater quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-19	10 Feet (or 5 feet into the water table)	TW-19 will evaluate groundwater quality on the southern portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-20	10 Feet (or 5 feet into the water table)	TW-20 will evaluate groundwater quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-21	10 Feet (or 5 feet into the water table)	TW-21 will evaluate groundwater quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-22	10 Feet (or 5 feet into the water table)	TW-22 will evaluate groundwater quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1

Table 2
Proposed Laboratory Analysis for Groundwater
1110 Buffalo Street
Manitowoc, Wisconsin

Well ID	Estimated Well Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	Dissolved RCRA Metals (6020 and7470)
TW-23	10 Feet (or 5 feet into the water table)	TW-22 will evaluate groundwater quality on the southern portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-24	10 Feet (or 5 feet into the water table)	TW-24 will evaluate groundwater quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-25	10 Feet (or 5 feet into the water table)	TW-25 will evaluate groundwater quality on the southern portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-26	10 Feet (or 5 feet into the water table)	TW-26 will evaluate groundwater quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-27	10 Feet (or 5 feet into the water table)	TW-27 will evaluate groundwater quality on the southern portion of the Property at a former petroleum tank farm to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-28	10 Feet (or 5 feet into the water table)	TW-28 will evaluate groundwater quality on the southern portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-29	10 Feet (or 5 feet into the water table)	TW-29 will evaluate groundwater quality on the northern portion of the Property at a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-30	10 Feet (or 5 feet into the water table)	TW-30 will evaluate groundwater quality on the northern portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-31	10 Feet (or 5 feet into the water table)	TW-31 will evaluate groundwater quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-31 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-34	10 Feet (or 5 feet into the water table)	TW-34 will evaluate groundwater quality on the central portion of the Property at a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-35	10 Feet (or 5 feet into the water table)	TW-35 will evaluate groundwater quality on the central portion of the Property at a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-36	10 Feet (or 5 feet into the water table)	TW-35 will evaluate groundwater quality on the central portion of the Property at a (possible) former AST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-38	10 Feet (or 5 feet into the water table)	TW-38 will evaluate groundwater quality on the central portion of the Property by the bulk petroleum tanks to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-38 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-39	10 Feet (or 5 feet into the water table)	TW-39 will evaluate groundwater quality on the central portion of the Property by the bulk petroleum tanks to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-39 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-40	10 Feet (or 5 feet into the water table)	TW-40 will evaluate groundwater quality on the central portion of the Property by a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-40 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1

Table 2
Proposed Laboratory Analysis for Groundwater
1110 Buffalo Street
Manitowoc, Wisconsin

Well ID	Estimated Well Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	Dissolved RCRA Metals (6020 and7470)
TW-42	10 Feet (or 5 feet into the water table)	TW-42 will evaluate groundwater quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-42 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-43	10 Feet (or 5 feet into the water table)	TW-43 will evaluate groundwater quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-43 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-44	10 Feet (or 5 feet into the water table)	TW-44 will evaluate groundwater quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-44 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-45	10 Feet (or 5 feet into the water table)	TW-45 will evaluate groundwater quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-45 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-47	10 Feet (or 5 feet into the water table)	TW-47 will evaluate groundwater quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-47 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-50	10 Feet (or 5 feet into the water table)	TW-50 will evaluate groundwater quality on the northeastern portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-49 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-51	10 Feet (or 5 feet into the water table)	TW-51 will evaluate groundwater quality on the central portion of the Property by former ASTs to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-51 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-52	10 Feet (or 5 feet into the water table)	TW-52 will evaluate groundwater quality on the central portion of the Property by former ASTs to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-52 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-53	10 Feet (or 5 feet into the water table)	TW-53 will evaluate groundwater quality on the central portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-53 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-54	10 Feet (or 5 feet into the water table)	TW-54 will evaluate groundwater quality on the central portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-54 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-55	10 Feet (or 5 feet into the water table)	TW-55 will evaluate groundwater quality on the central portion of the Property by former ASTs to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-55 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-56	10 Feet (or 5 feet into the water table)	TW-56 will evaluate groundwater quality on the central portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-56 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-57	10 Feet (or 5 feet into the water table)	TW-57 will evaluate groundwater quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-57 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1

Table 2
Proposed Laboratory Analysis for Groundwater
1110 Buffalo Street
Manitowoc, Wisconsin

Well ID	Estimated Well Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	Dissolved RCRA Metals (6020 and7470)
TW-58	10 Feet (or 5 feet into the water table)	TW-58 will evaluate groundwater quality on the central portion of the Property by a former UST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-58 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-61	10 Feet (or 5 feet into the water table)	TW-61 will evaluate groundwater quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-64	10 Feet (or 5 feet into the water table)	TW-64 will evaluate groundwater quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-65	10 Feet (or 5 feet into the water table)	TW-65 will evaluate groundwater quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-66	10 Feet (or 5 feet into the water table)	TW-66 will evaluate groundwater quality on the eastern portion of the Property at a former oil house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-66 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-67	10 Feet (or 5 feet into the water table)	TW-67 will evaluate groundwater quality on the eastern portion of the Property at a former product piping to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-67 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-68	10 Feet (or 5 feet into the water table)	TW-68 will evaluate groundwater quality on the eastern portion of the Property at a former pump house to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-68 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-69	10 Feet (or 5 feet into the water table)	TW-69 will evaluate groundwater quality on the eastern portion of the Property at a (possible) former AST to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-69 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-70	10 Feet (or 5 feet into the water table)	TW-70 will evaluate groundwater quality on the eastern portion of the Property at a former automotive garage to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-70 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-71	10 Feet (or 5 feet into the water table)	TW-71 will evaluate groundwater quality on the eastern portion of the Property at former ASTs to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater. TW-71 will also evaluate residual impacts from formerly closed release areas (identified as REC#3 in the Stantec (2018) Phase I ESA.	1	1	1
TW-72	10 Feet (or 5 feet into the water table)	TW-71 will evaluate groundwater quality on the eastern portion of the Property at a former automotive garage to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-77	10 Feet (or 5 feet into the water table)	TW-77 will evaluate groundwater quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-79	10 Feet (or 5 feet into the water table)	TW-79 will evaluate groundwater quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
TW-81	10 Feet (or 5 feet into the water table)	TW-81 will evaluate groundwater quality on the central portion of the Property to determine if prior industrial activities or placement of fill (identified as REC#2 and REC#4, respectively in the Stantec (2018) Phase I ESA) resulted in a release to groundwater.	1	1	1
Estimated number of investigative samples to be analyzed			58	58	58
Trip Blank		Field and Laboratory QAQC Sample	1	0	0
Matrix Spike/Matrix Spike Duplicat		Assess the influence of the matrix on lab results	4	4	2
Field Duplicate		Assess the quality of the data and collection techniques.	2	2	2

Table 2
Proposed Laboratory Analysis for Groundwater
1110 Buffalo Street
Manitowoc, Wisconsin

Well ID	Estimated Well Depth (ft)	Rationale	VOCs (8260)	PAHs (8270)	Dissolved RCRA Metals (6020 and7470)
Estimated number of QAQC samples to be analyzed			7	6	4
Estimated number of samples to be analyzed			65	64	62

Notes:
FD = Field Duplicate
QAQC = Quality Assurance Quality Control
VOC = Volatile Organic Compounds
PAH = Polycyclic Aromatic Hydrocarbons
RCRA = Resource Conservation and Recover Act
UST = Underground Storage Tank
AST = Aboveground Storage Tank
(6010) = Laboratory analytical method (SW-846)
Stantec, 2018, Phase I ESA 10th Street Railroad Property, August 2018.

FIGURES

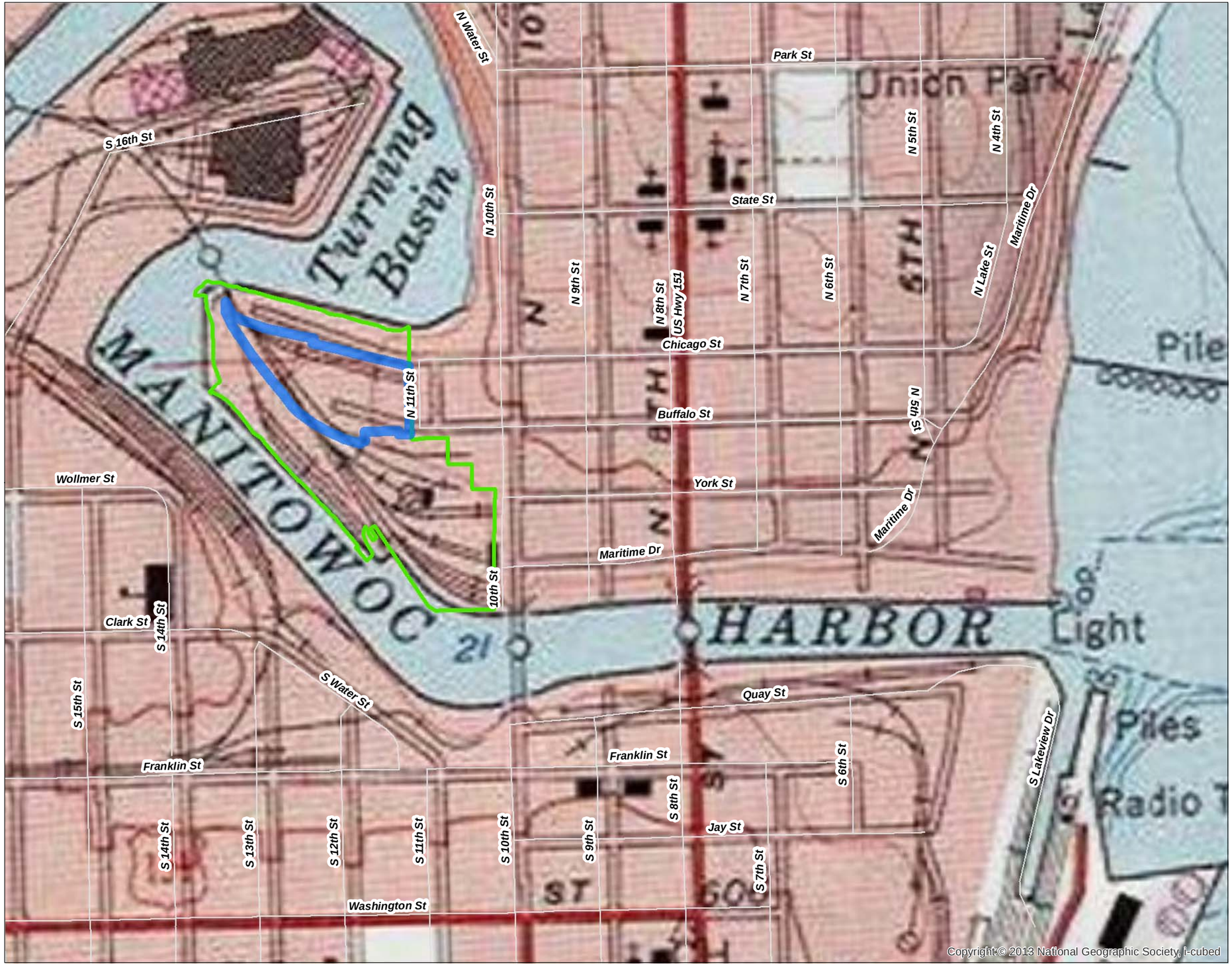


Figure No.
1

Title
Target Petroleum Site and Local Topography

Client/Project
City of Manitowoc
USEPA Brownfield Assessment Grant

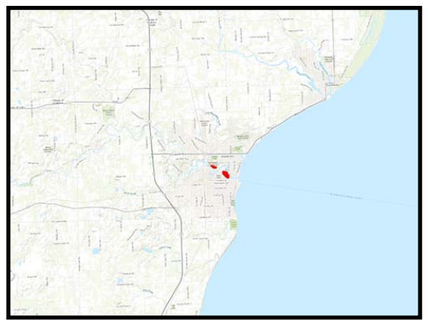
0 315 630 Feet

193703931
Prepared by HLB on 7/11/18

N

Legend

- Target Petroleum Site (1110 Buffalo Street)
- Target Redevelopment Property



Notes

1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet
2. Historic Site features illustrated on this figure were digitized from multiple historic maps/sources, including City Assessor files, WDNR files, and Sanborn (R) Fire Insurance Maps. These features are provided for illustration purposes only; Stantec makes no warranty as to the accuracy of these features.
3. Orthophotograph: Manitowoc County, 2017

Stantec

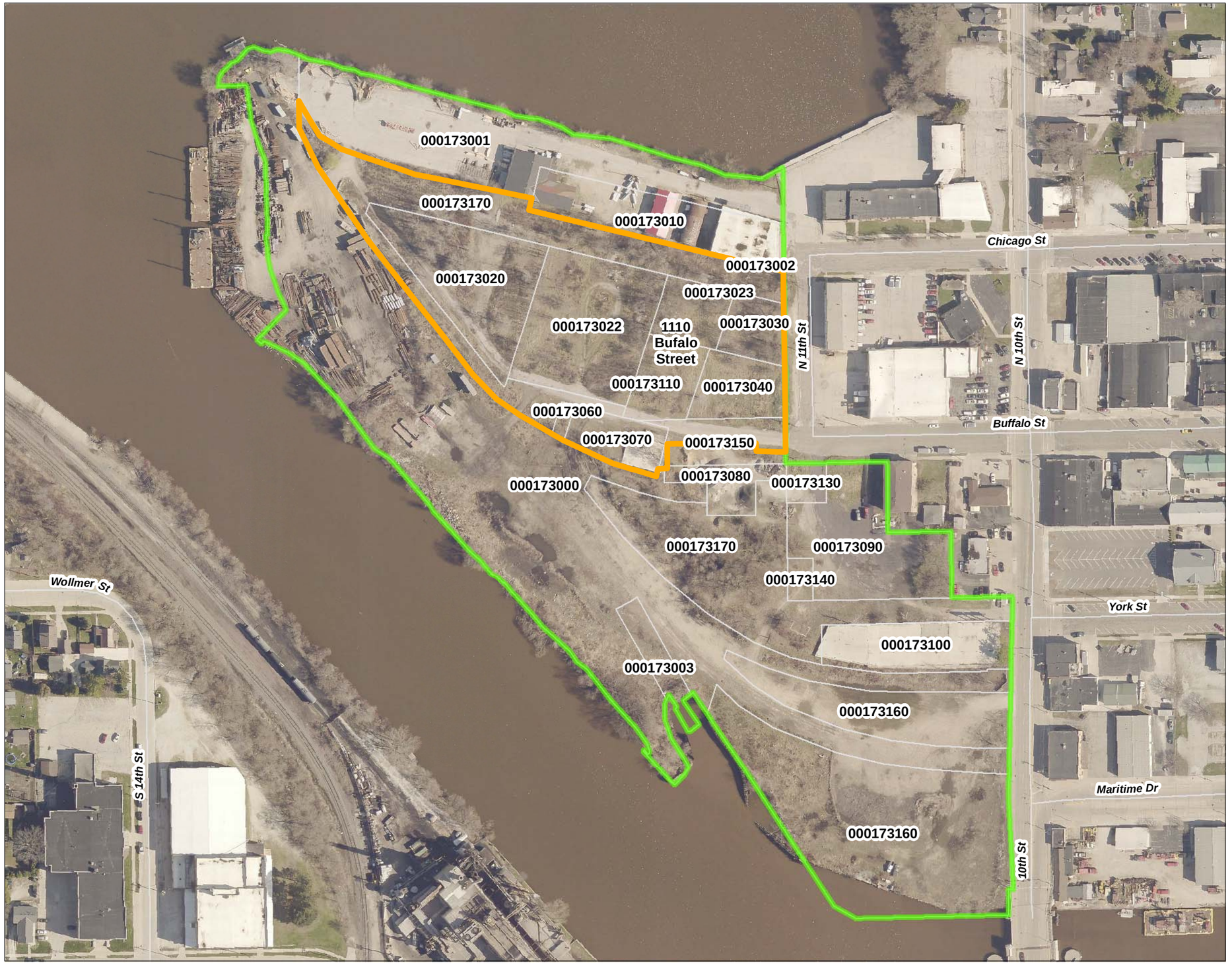


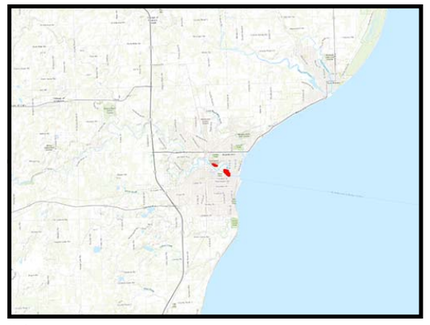
Figure No.
2
Title
Property Location and Property Identification Numbers

Client/Project
1110 Buffalo Street
City of Manitowoc
USEPA Brownfield Assessment Grant

0 120 240 Feet
193703931
Prepared by HLB on 7/11/18

N

Legend
- 1110 Buffalo Street
- Former Railroad Property



Notes
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3. Orthophotograph: Manitowoc County, 2017

Stantec

Figure No.

3a

Title

Proposed Sample Locations on West Portion of Property

Client/Project

1110 Buffalo Street
City of Manitowoc
USEPA Brownfield Assessment Grant

0 35 70 Feet

193703931
Prepared by HLB on 7/11/18

N

Legend

Proposed Sample Locations

- Soil Boring
- Soil Boring/Temp Well

Proposed Sample Locations at Nearby Properties

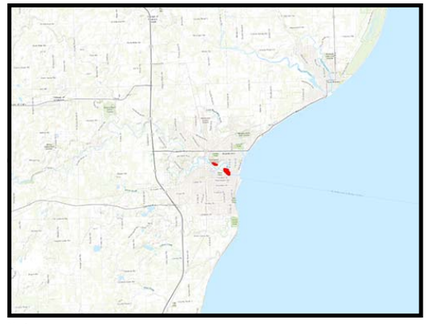
- Soil Boring
- Soil Boring/Temp Well
- 1110 Buffalo Street
- Former Railroad Property

Prior Site Features (City Records)

- Oil House (1)
- Oil Tank (AST) (11)
- Pump House (1)
- Railroad Spurs
- Historic Site Features (see table for details)

Additional Site Features (WDNR Files)

- Former UST (5)
- Product Piping (1)
- Pump House (1)
- Soil Excavation (1)
- Previous Monitoring Well Locations



Notes

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3. Orthophotograph: Manitowoc County, 2017

Stantec

Feature ID	Historic Site Features (Notes)
7	Coal Shed
8	Coal Storage
9	Laird Lumber Company
10	Manitowoc Shipbuilding Company
11	Stephani-Strupp Oil Co. (Bulk Oil Station)
12	William H. Froehlich (Bulk Oil Station)
13	Manitowoc Shipbuilding Company
14	Shell Oil Company (Bulk Oil Station)
15	Standard Oil Company (Bulk Oil Station)
16	CM Shaw (Residential ?)
17	Unk
18	Manitowoc Iron and Metal Company
19	Northern Elevator Company Grain Elevator
20	Valders Stone and Marble, Inc.
21	Garage
24	Storage
25	Unknown
26	Residential Dwelling
27	Lake Park Oil, Inc. (Bulk Oil Station)
28	Unknown Bldg
29	Unk (possible AST?)
30	Unk (possible AST?)
31	Unk (possible AST?)
34	Wisconsin Public Service Commission

Figure No.

3b

Title

Proposed Sample Locations on East Portion of Property

Client/Project

1110 Buffalo Street
City of Manitowoc
USEPA Brownfield Assessment Grant

0 35 70 Feet

193703931
Prepared by HLB on 7/11/18

Legend

N

Proposed Sample Locations

- Soil Boring
- Soil Boring/Temp Well

Proposed Sample Locations at Nearby Properties

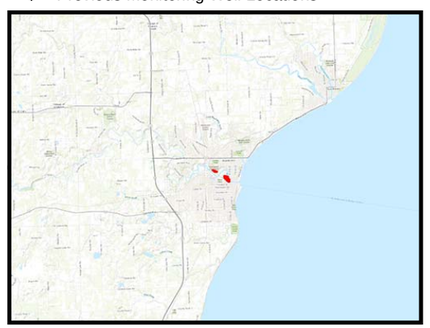
- Soil Boring
- Soil Boring/Temp Well
- 1110 Buffalo Street
- Former Railroad Property

Prior Site Features (City Records)

- Oil House (4)
- Oil Tank (AST) (34)
- Pump House (5)
- UST (2)
- Railroad Spurs
- Historic Site Features (see table for details)

Additional Site Features (WDNR Files)

- Former UST (10)
- Product Piping (2)
- Pump House (2)
- Soil Excavation (3)
- Previous Monitoring Well Locations



Feature ID	Historic Site Features (Notes)
7	Coal Shed
8	Coal Storage
9	Laird Lumber Company
10	Manitowoc Shipbuilding Company
11	Stephani-Strupp Oil Co. (Bulk Oil Station)
12	William H. Froehlich (Bulk Oil Station)
13	Manitowoc Shipbuilding Company
14	Shell Oil Company (Bulk Oil Station)
15	Standard Oil Company (Bulk Oil Station)
16	CM Shaw (Residential ?)
17	Unk
18	Manitowoc Iron and Metal Company
19	Northern Elevator Company Grain Elevator
20	Valders Stone and Marble, Inc.
21	Garage
24	Storage
25	Unknown
26	Residential Dwelling
27	Lake Park Oil, Inc. (Bulk Oil Station)
28	Unknown Bldg
29	Unk (possible AST?)
30	Unk (possible AST?)
31	Unk (possible AST?)
34	Wisconsin Public Service Commission

Notes

1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet
2. Historic Site features illustrated on this figure were digitized from multiple historic maps/sources, including City Assessor files, WDNR files, and Sanborn (R) Fire Insurance Maps. These features are provided for illustration purposes only; Stantec makes no warranty as to the accuracy of these features.
3. Orthophotograph: Manitowoc County, 2017

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APPENDIX A – SITE-SPECIFIC HEALTH AND SAFETY PLAN

Site-Specific Health and Safety Plan

City of Manitowoc, Wisconsin

FORMER RAILROAD PROPERTY ALONG NORTH 10TH STREET MANITOWOC, WISCONSIN

U.S. EPA Brownfield Cooperative Agreement No.: BF-00E02377(pending)

August 28, 2018
Project Number 193706269

Stantec

Stantec

SITE- SPECIFIC HEALTH AND SAFETY PLAN
Former Railroad Property Along North 10th street
Manitowoc, Wisconsin

August 28, 2018

Prepared For:
Paul Braun
Planner and Interim Community Development Department Director
City of Manitowoc
900 Quay Street
Manitowoc, WI 54220-4543

Prepared By:
Stantec Consulting Services Inc.
12075 Corporate Parkway Suite 200
Mequon WI 53092-2649

The information presented in this Site-Specific Health and Safety Plan is intended solely to denote the health and safety measures/guidelines applicable to Stantec personnel engaged in field activities at the above-referenced site. Stantec makes no warranties regarding the accuracy of the Site-Specific Health and Safety Plan, and nothing contained herein shall be construed as providing recommendations or direction, either expressed or implied, regarding health and safety measures to be taken by anyone other than Stantec personnel. Non-Stantec personnel shall be responsible for complying with site safety plans and local, state, and/or federal regulations applicable to non-Stantec personnel.

Stantec Project Number: 193706269

Harris L. Byers
Brownfields Project Manager

Table of Contents

1.0 Introduction

The purpose of this Site-Specific Health and Safety Plan (SHSP) is to anticipate, recognize, evaluate and control the potential safety and health hazards associated with the planned tasks to complete a Phase II ESA at the former railroad property located along North 10th Street in Manitowoc, Wisconsin and ensure the health and safety of all Stantec employees involved. The planned tasks are outlined in the Site-Specific Sampling and Analysis Plan (SSSAP).

All field activities must be conducted in compliance with this SHSP. Personnel covered by this SHSP who cannot or will not comply with the SHSP will be excluded from on-site activities. Anyone who will be on site will be required to sign the SHSP review found in this SHSP.

Contractors and sub-contractors will be given a copy of this SHSP and will sign the review acknowledging that they have read and understood this SHSP. Their signature indicates that Stantec has informed them of the site emergency response procedures and any potential fire, explosion, health, safety or other potential hazards that have been identified at the site. However, Stantec does not assume responsibility for the actions of the contractors or sub-contractor. Contractors will be required to develop and follow their own SHSP related to their on-site activities.

This SHSP was prepared from the best available information concerning site conditions at the time of development. The health and safety specifications in this SHSP are based on reasonably available sampling information and reports. The project manager or site safety officer have the authority to amend any part of this program at any time due to changes to site conditions that may affect the health and safety of on-site personnel.

2.0 Background Information

1. Site Name: Former Railroad Property Along North 10th Street, Manitowoc, Wisconsin
2. Site Location: North 10th Street, Manitowoc, Wisconsin
3. Client Name: City of Manitowoc
4. Client Contact: Paul Braun Phone: (920) 686-6930
5. Stantec Project Manager: Harris Byers Phone: (414) 581-6476
6. Anticipated On-Site Personnel:

NAME	AFFILIATION	FUNCTION

7. Plan Prepared by: Harris Byers Date: 8/28/2018
8. Plan Reviewed by: Richard J. Binder, P.G. Date: 8/28/2018
9. Plan Reviewed by: Dan Feldt, MPH, CIH Date: 8/28/2018

The Project Manager and Site-Safety Officer (SSO) or an alternate designee will be responsible for the implementation of this SHSP. Provided below are the key titles and associated responsibilities for personnel that are involved in the site activities.

PROJECT MANAGER

The Stantec Project Manager provides overall direction for the implementation of field activities in accordance with this SHSP. The Project Manager will also serve as the program liaison to federal, state, and local authorities. Specific program questions will be directed to this individual.

SITE-SAFETY OFFICER

The SSO will be the Stantec field supervisor. She/he will direct the implementation and field evaluation of the SHSP. The SSO will be in charge during any emergency until she/he is relieved by EMS personnel. The SSO will be responsible for:

- Conduct health and safety briefings for Stantec employees based upon potential hazards specific to the designated work tasks scheduled
- Modify SHSP as required to address specific situations
- Investigate and report on-site accidents/incidents

3.0 Site Information

1. Purpose of Investigation/Field Work: This work is being performed as part of a Phase II Environmental Site Assessment (ESA) of the property located along North 10th Street in the City of Manitowoc, Wisconsin (herein referred to as the Site or Property). The location of the Site is illustrated on Figure 1 of the SSSAP.

2a.	Potential Hazard to Personnel	2b.	Protective Equipment Required
	Fire/explosive condition	x	First aid kit
X	Worker exposure/injury	x	Eye wash
	Confined spaces		Ladder
X	Steep/uneven terrain	x	Fire Extinguisher
X	Chemical/contaminant exposure	x	Safety Glasses
X	Traffic/heavy machinery	x	Communication
X	Noise exposure	x	Hard Hat
	Thermal exposure	x	Hearing Protection
X*	Respirator/SCBA	X**	Tyvex™ Suit**
		x	Latex Gloves
		X	Steel Toe Boots
		X**	Boot Covers**

Estimated days on site: three days

* If particulates/dust is visible in the air, a half-faced respirator may be worn for comfort.

** If significant dust is present, a Tyvek suit and boot covers may be worn as an additional level of protection

4.0 Contaminant/Chemical Hazard Assessment

1. The purpose of this work is to conduct a Phase II ESA to determine current Site conditions. The following assessment is related to on-site substances which may potentially be encountered. The following assessment is related to on-site substances which may potentially be encountered.

SUBSTANCE	MAXIMUM CONCENTRATION (UNITS)	MEDIUM[1,2]	PEL/TLV (PPM)[3]	CANCER STATUS[4]	ROUTE[5]
VOCs/sVOCs		S, GW	varies	varies	I, A, C
Heavy Metals		S,GW	varies	varies	A, IN, I
PCBs (42% Cl)		S, GW	1/1	A	I, A, IN, C
PCBs (54% Cl)		S, GW	0.5/0.5	A	I, A, IN, C
Cyanide		S, GW	5/NE	E	I, A, IN, C

VOC – Volatile Organic compound
sVOC – Semi-Volatile Organic Compound (which includes PAH – Polycyclic aromatic hydrocarbon)
PCB – polychlorinated biphenyl
NE – Not established
[1]Environmental Medium: Soil (S), Groundwater (GW)
[2]List the maximum concentration for each medium separately
[3]Use the lower of the two exposure limits (PEL/TLV); HCN = hydrogen cyanide
[4]Cancer status; EPA Classification

Group A: Human carcinogen – Sufficient evidence to support a casual association between exposure and cancer.

Group B1: Probable Human Carcinogen – Limited evidence of carcinogenicity in humans

Group B2: Probable Human Carcinogen – Sufficient evidence of carcinogenicity in animals, inadequate evidence of carcinogenicity in humans.

Group C: Possible Human Carcinogen – Limited evidence of carcinogenicity in animals.

Group D: Not Classified – Inadequate evidence of carcinogenicity in animals.

Group E: No Evidence of Carcinogenicity in Humans – No evidence for carcinogenic in at least two adequate animal tests or in both epidemiologist and animal studies.

[5]Route: (I) – Inhalation, (A) – Skin absorption, (IN) – Ingestion, (C) – Eye/skin contact.

2. The following chemical(s) may be/could be brought to the work site:

Fuel for equipment, sample preservatives (methanol, nitric acid, hydrochloric acid).

5.0 Physical Hazard Assessment

FLAMMABILITY/EXPLOSIVE

It is unlikely that explosive atmospheres will be encountered while performing tasks. However, it is possible that unknown chemicals may be encountered. Therefore, the following standard safety procedures will be implemented.

- All field vehicles and heavy equipment will be equipped with a type-ABC fire extinguisher. Fire extinguishers will be mounted on the vehicles where field personnel can easily access them. A fire extinguisher check, including inspection of gauges, hoses, and tanks, will be conducted before use of the field vehicle to ensure proper operation of the equipment.
- When necessary other appropriate firefighting equipment will be made available.
- Open fires and burning are prohibited. Smoking will be prohibited in all areas where flammable, combustible, or oxidizing materials are stored or are in use and any area containing unknown contaminants.

HEAVY EQUIPMENT

The hazards associated with the operation of heavy equipment can be effectively managed through adequate training and constant awareness. Any subcontractor equipment operators must have had the required training and must demonstrate the necessary skills for the piece of equipment they are operating. Constant visual and verbal contact should be maintained with the operator to facilitate awareness. Equipment will not obstruct roadways, walkways, electrical lines, etc. Proper distance from power lines should be observed. The operator and field personnel should be aware of loose soil or uneven terrain that cannot be driven over or parked on for sake of a roll-over hazard. All personnel working around heavy equipment will wear hard hats and safety-toed boots (at a minimum). Personnel should avoid turning their back to operating machinery.

EXCAVATIONS

Under no circumstances should an employee enter an un-shored excavation greater than 4 feet in depth. Shored excavations may also be considered confined spaces. A soil sample from excavations should be obtained from the backhoe bucket or other means if at all possible. Before entering an excavation the situations should be discussed with the project manager to assess confined space requirements (See Section 8).

SLIPS, TRIPS, AND FALLS

Although it can be difficult to prevent slips, trips, and fall hazards, these hazards can be minimized through good housekeeping, proper site-control measures, and keeping the work area free of obstructions. In the event that only one Stantec field person is on site, that person will inform the on-site subcontractors of where he/she will be working and ask them to accompany him/her for the work. Since it is virtually impossible to eliminate all slip, trip, and fall hazards in the Assessment Area, personnel should always be aware of the terrain they are walking across and have sure footing, taking very deliberate steps and the easiest path of travel. Cones and or caution tape will be used to mark identifiable hazards.

LIFTING

Field operations often require that physical labor tasks be performed. All employees should employ proper lifting procedures. Additionally, employees should not attempt to lift bulky or heavy objects (greater than 40 pounds) without assistance.

TOOLS AND EQUIPMENT

Hazards present during the use of tools and equipment are generally associated with improper tool handling and inadequate maintenance. Management of these hazards requires a rigorous maintenance of tools and equipment and effective training of employees in the proper use of these tools. Electrical cords must have unbroken insulation and should not be exposed to water or other liquids. A ground fault circuit interrupter outlet or cord must be used in any area where water may be present.

MANITOWOC RIVER – SURFACE WATER

The project area is located adjacent to the Manitowoc River. Soil borings should be located no less than 10 feet from the edge of the river bank and under no circumstances should an employee enter the river as part of this scope of work.

6.0 Personal Protective Equipment

However, if site conditions change (e.g., unknown contaminants encountered, employee complaints, etc.) and a higher degree of protection is required, the SSO will consult the Project Manager and the required changes in personal protective equipment (PPE) will be made. A change in the level of PPE will result in this SHSP being amended and reviewed by the Project Manager.

PROJECT TASK	**LEVEL OF PROTECTION HAZ. WASTE & NON-HAZ. SITE (A, B, C, D, [OTHER SPECIFY BELOW])[1]**
Soil Sampling	Modified Level D*
Groundwater Sampling	Modified Level D*

[1] See Attachment C for PPE description by level

* If particulates/dust is visible in the air, an N-95 dust mask may be worn for comfort (i.e. voluntarily, per OSHA 1910.134, Appendix D, attached). If significant dust is present, a Tyvek suit and boot covers may be worn as an additional level of protection.

7.0 Medical Requirements

Stantec personnel, whose presence may be required on a site where exposure to toxic and/or hazardous substances exists, shall be required to participate in any medical monitoring as deemed necessary by Stantec. All medical examinations performed for Stantec personnel shall be conducted in accordance with the requirements of 29 CFR 1910.120, 29 CFR 1910.134. In addition, it may be necessary to require specific clinical tests for certain sites. Any site-specific testing shall be identified below.

SITE-SPECIFIC CLINICAL TESTS

PARAMETER	REQUIRED TESTING	ACTION LEVEL
N/A	N/A	N/A

All Stantec employees will be medically qualified and fit tested for respiratory protection as appropriate.

MEDICAL DATA SUMMARY

Medical examinations are not warranted for the proposed scope of work. Should Site conditions warrant revision, this form shall be completed by Stantec personnel prior to commencement of activities at the site. This form shall be kept at the project site for the duration of applicable project activities. This form must be delivered to the attending physician when medical assistance is required.

Medical Data Summary Forms are provided in Attachment A

8.0 Training Requirements

All Stantec personnel participating in site investigations where the potential exists for toxic and/or hazardous substances to exceed OSHA exposure limits is possible must complete the appropriate hours of health and safety training required by 29 CFR 1910.120. The dates of certification are documented in the following Stantec office:

Stantec
12075 Corporate Parkway Suite 200
Mequon WI 53092-2649
Contact: Mr. Jon Currie

CONFINED SPACE ENTRY

As a general rule, Stantec employees who are engaged in activities at sites covered by 29 CFR 1910.120 are prohibited from entering confined spaces. However, if it becomes absolutely necessary to enter a confined space to accomplish a required task, specific procedures will be established by the Stantec project manager and safety personnel on a task-by-task basis.

9.0 Environmental Monitoring

Service, maintenance, and calibration of monitoring equipment shall be performed in accordance with manufacturers' recommendations.

MONITORING EQUIPMENT CHECKLIST

TYPE OF EQUIPMENT	SERIAL NO.	WRITTEN SOP AVAILABLE	DATE CALIBRATED
PID	To Be Determined	Yes	Daily
4-Gas Meter	To Be Determined	Yes	Daily
Cyanide Meter	To Be Determined	Yes	Daily

SURVEILLANCE METHODS

The monitoring methods to be used at the project site are described below:

The breathing zone and work area will be continuously screened for volatile organic compounds (VOCs) using the PID, for cyanide using the cyanide meter, and other potentially dangerous atmospheres using an RKI GX-6000 meter. If elevated VOCs or cyanide are detected in the breathing zone or four-gas meter indicates a risk exists, Stantec staff will exit the work site, notify the project manager and evaluate appropriate actions (e.g. upgrade to Level C, etc.).

10.0 Site Safety Procedures

A site-specific/pre-entry meeting will be held before the start of any site activities in the Assessment Area. Additional meetings will be held as necessary. The purpose of these safety meetings is to:

- Describe the assigned tasks and their potential hazards.
- Coordinate activities.
- Identify methods and precautions to prevent injuries.
- Plan for emergencies.
- Describe any changes in the Site Safety Plan.
- Solicit worker feedback on conditions affecting safety and health.
- Solicit worker feedback on how well the Site Safety Plan is working.

Safety meetings will also be held at all other times necessary to ensure that all field personnel and visitors are aware of the health and safety hazards at the site. All field personnel and visitors will be required to attend these meetings. The on-site SSO or alternate designee will conduct the meetings.

The SSO will also conduct frequent inspections of site conditions, equipment, and activities to determine whether the SHSP is adequate and being followed. In order to make safety inspections effective, the following guidelines should be observed:

- Review the results of these inspections with supervisors and workers.
- Re-inspect any identified problems to ensure that they have been corrected.
- Document all inspections and subsequent follow-up actions in field notebook kept for this project. Retain these records until site activities are completed and at least 5 years after project has been completed.

The frequency of inspections shall be both at the beginning and the end of each work shift or when site conditions change due to factors such as weather, tasks are performed or new hazards being introduced on-site or discovered during site activities.

PERIMETER ESTABLISHMENT

The property lines will be used as the perimeter.

SITE ENTRY PROCEDURES

Before entering the site all personnel shall don the required personal protective equipment (PPE) and follow the decontamination procedures when exiting site.

SITE CONTROL AND DESIGNATION OF WORK ZONES

The following procedures shall be observed to minimize the potential for contaminant transfer, personnel exposure to hazardous materials, and work place injury.

EXCLUSION ZONE

We do not plan to formally delineate an exclusion zone because of numerous and small work locations involved across the site over a relatively short period of time, and the limited likelihood

of exposure to personnel other than those doing the actual work. The exclusion zone will be determined at each work location.

CONTAMINATION REDUCTION ZONE

We do not plan to formally delineate the contamination reduction zone because of numerous and small work locations involved across the site over a relatively short period of time, and the limited likelihood of exposure to personnel other than those doing the actual work. The contamination reduction zone will be determined at each work location.

SUPPORT ZONE

The support zone will consist of an area outside of the exclusion and contamination reduction zone where field vehicles and equipment will be staged. Eating, drinking, and smoking will only be allowed in this area.

11.0 Decontamination

All non-disposable field equipment will be decontaminated before each use and between samples to avoid cross-contamination between samples and to ensure the health and safety of the field crews. Field personnel must follow the procedures outlined below whenever leaving the exclusion areas. All decontamination procedures will be performed in accordance with the field standard operating procedure for *Equipment Decontamination* and *Management of Investigative Wastes Procedures* included in the Stantec (2015) *Quality Assurance Project Plan.*

PERSONNEL DECONTAMINATION PROCEDURES

Gloves will be placed in a plastic bag and disposed of properly. Re-usable PPE will be decontaminated with an appropriate detergent wash and rinsed with water. Decontamination water will be containerized and disposed of properly.

SAMPLING/MONITORING EQUIPMENT DECONTAMINATION PROCEDURES

Disposable equipment will be placed in a garbage bag and disposed of properly. Re-usable equipment will be washed and scrubbed with an appropriate detergent wash and rinsed with water. Equipment will be decontaminated after each sampling event to prevent cross contamination. Decontamination water will be containerized and disposed of properly.

12.0 Emergency Plan

This emergency action plan can be fully or partially activated depending on the extent of the encountered incident. The plan will be activated whenever an emergency is discovered. Where possible, the emergency will be brought under control by the on-site personnel. The on-site SSO has full responsibility in the event of an emergency and will be required to determine if outside response needs to be contacted.

The personnel who have responsibilities in the event of an emergency are listed below with their area(s) of responsibility. In addition, procedures to be followed in the event of a site evacuation are also outlined.

EMERGENCY PERSONNEL RESPONSIBILITIES

NAME	RESPONSIBILITY
Harris Byers	Supervisor

The SSO is the on-site emergency coordinator who has the responsibility for controlling emergency response operations at the site. In the event of an emergency, the SSO must identify, as best as possible, all hazardous substances or conditions present. She/he must implement appropriate emergency operations in accordance with this plan. In addition, she/he must limit the number of personnel exposed to the emergency, by communicating with all personnel on-site and assuring they get to a safe area.

COMMUNICATION

Before starting field activities, the appropriate representatives of the City of Manitowoc will be notified of the planned activities. Stantec will review the SHSP and Emergency Plan with the City of Manitowoc representatives to inform them of potential emergencies related to the field activities at the site.

If an emergency occurs, fast and effective communication is essential. Without proper communication, the ability to initiate and carry out an appropriate response could be severely hindered. There are three important elements to effective communications. First, the appropriate message to be communicated must be determined. Second, the message then must be transmitted correctly. Finally, the person receiving the message must understand the message onsite. Communication will be accomplished through direct-voice contact, two-way radio dispatch, and cell phones. The SSO will have a cell phone either on person or in the field vehicle at all times while performing tasks at the Site.

In the event of an emergency, the SSO will contact off-site first responders or transport the victim to the hospital following the evacuation/hospital route found in this SHSP. If victim is in distress, 911 can be called immediately by the individual who discovers the emergency. Outside medical assistance should be requested if any of the following conditions occur.

- Cardiac Arrest
- Chest Pain

- Breathing Difficulty
- Burns (2nd or 3rd degree over 10 percent of the body or about the face or neck)
- Diabetic Emergency
- Drug Overdose
- Hypertension
- Multiple Trauma
- Seizure
- Smoke, Heat or Toxic Gas Inhalation
- Uncontrollable Bleeding

Emergency eye wash bottles will be kept in field vehicles in case of any eye emergencies requiring immediate flushing of the eyes to prevent permanent damage to the person's sight. If outside assistance is required, immediately dial 911. Call from a safe area. The following information should be given.

- Inform the dispatcher of the emergency
- Identify yourself
- Indicate if someone is injured
- Describe how to get to the area of emergency

After making the call, evacuate victims to safe area if they can be moved and wait to meet the responders.

EMERGENCY PROCEDURES

INJURY

- All site personnel shall assemble at the decontamination line.
- The SSO shall evaluate the nature of injury and contact outside emergency services if needed.
- Move victim to Contamination Reduction Zone if can be moved.
- Perform emergency decontamination procedures (section below) on victim.
- Transport victim to hospital if needed or inform outside emergency personnel of situation and designated medical facility.
- No persons shall re-enter the Exclusion Zone until the cause of the injury (or symptoms) is determined.
- Perform an accident investigation using Attachment B (Incident Report Sheet).

DECONTAMINATION DURING MEDICAL EMERGENCIES

If emergency life-saving first aid and/or medical treatment are required, decontamination procedures may be limited or omitted. If the contamination does not present a hazard to the rescue personnel, life-saving care may be instituted immediately. If contamination will present a risk to rescue personnel, minimal decontamination should be performed to allow initiation of aid.

If contamination presents a significant risk to rescue personnel, then decontamination will need to be performed until the contamination is no longer a risk.

Medical assistance personnel will be notified before transporting the victim if the victim may be contaminated. Assurance must be made that the medical personnel at the receiving area are able and willing to handle a victim who is contaminated. Site personnel will accompany contaminated victim to the medical facility to advice on matters involving decontamination. A copy of this SHSP, including materials safety data sheets (MSDS) (if known), will be brought along with the victim.

Heat-related illnesses range from heat fatigue to heat stroke. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Less serious forms of heat stress also require prompt attention. Unless the victim is obviously contaminated, decontamination may be omitted or minimized and treatment should begin immediately.

FIRE/EXPLOSION

If fire or explosions occur in the Assessment Area, the following actions will be performed.

- Any personnel who discover a fire should immediately notify 911 to request assistance.
- On-site personnel, under the direction of the SSO, will attempt to control or extinguish fire with fire extinguisher, if possible.
- A 10-second air horn blast shall be sounded.
- All site personnel not involved with fighting the fire shall assemble at the decontamination line.
- Evacuation of the affected area may be necessary in case of major fire or explosion. All personnel will be familiar with excavation procedures and means of exit from their work areas.
- Emergency Response officials will determine the appropriate actions for off-site response actions.

UNKNOWN INTACT DRUMS

It is not anticipated that unknown intact drums will be encountered during the assessment activities, however, if encountered, the following steps will be performed.

- The drum will first be inspected from the surface by the SSO. The SSO will be looking for the following items:
  - Symbols, words or other marks on the drum indicating that its contents are hazardous (e.g., radioactive, explosive, corrosive, toxic or flammable)
  - Symbols, words or other marks on the drum indicating that it contains discarded laboratory chemicals, reagents, or potentially dangerous materials in small volume individual containers
  - Evidence of deterioration such as corrosion, rust, and leaks
  - Evidence that the drum is under pressure such as swelling and bulging
  - Drum type and drum lid
- After surface inspection of the drum, investigative activities will cease, and the drum will remain intact.

SPILL/RELEASE

If a spill or release occurs, the following steps will be performed.

- Report it immediately to the SSO.
- All personnel shall then re-locate upwind and upgradient of the spill to a safe distance (e.g., 1000 feet).
- SSO will assess the spill and inform the drilling contractor to put absorbent material down to try to contain the spill if possible.
- If spill or release cannot be contained and/or cannot be safely characterized, a 10-second blast shall be sounded and all personnel shall be evacuated immediately to the decontamination line.
- Then a safe distance away, upwind and upgradient of spill.
- SSO will contact the site hazardous material spill response contractor and inform them about the spill/release and to coordinate spill cleanup.
- The SSO will contact the Manitowoc County emergency response personnel, and the Wisconsin Department of Natural Resources.

The SSO will coordinate with the spill release contractor and determine through the SSO's/spill contractor's professional opinion if there is a threat to the neighboring community. Should the neighboring community require evacuation, the SSO will contact the local authorities, inform them of the situation, and ask that they contact the affected receptors.

ADVERSE WEATHER CONDITIONS

If the SSO is notified of adverse weather conditions, the following steps shall be performed.

- The SSO will determine if work can continue without endangering the health and safety of the field workers. The SSO will monitor the weather during the a.m. and p.m. hours and will document it in the field logbook. Some of the items to be considered before determining the continuance of work are:
  - Potential for heat stress and heat related injuries
  - Potential for cold stress and frostbite related injuries
  - Dangerous weather related working conditions (high winds)
  - Limited Visibility
  - Potential for electrical storms/lightning. No activities will be permitted during electrical storms
  - Tornado watches and warnings. No activities will be permitted during a tornado warning
  - Winter weather watches and warnings. No activities will be permitted during a snow storm.

In the event of a weather emergency:

- Take appropriate cover in either nearby buildings or vehicles depending on the emergency.
- Work will cease until the conditions clear up and all watches/warnings are lifted.

GENERAL SITE EVACUATION PROCEDURES

Exit exclusion zone, contaminant reduction zone, and support zone. Contact emergency services (911) if necessary.

First Aid procedures for a variety of situations are included in Attachment D.

13.0 Emergency References

EMERGENCY RESOURCES

* Ambulance	**911**
* Hospital Emergency Center	**(920) 433-0111**
* Hospital Life Line	NA
* Hospital Poison Center	NA
* Local Police	**(920) 448-3200 or 911**
***County Sheriff	**(920) 448-4200**
* State Police	**(920) 448-4200**
* Fire Department	**(920) 448-3280 or 911**
* Explosives Disposal Unit	NA
* Radio Channel	NA

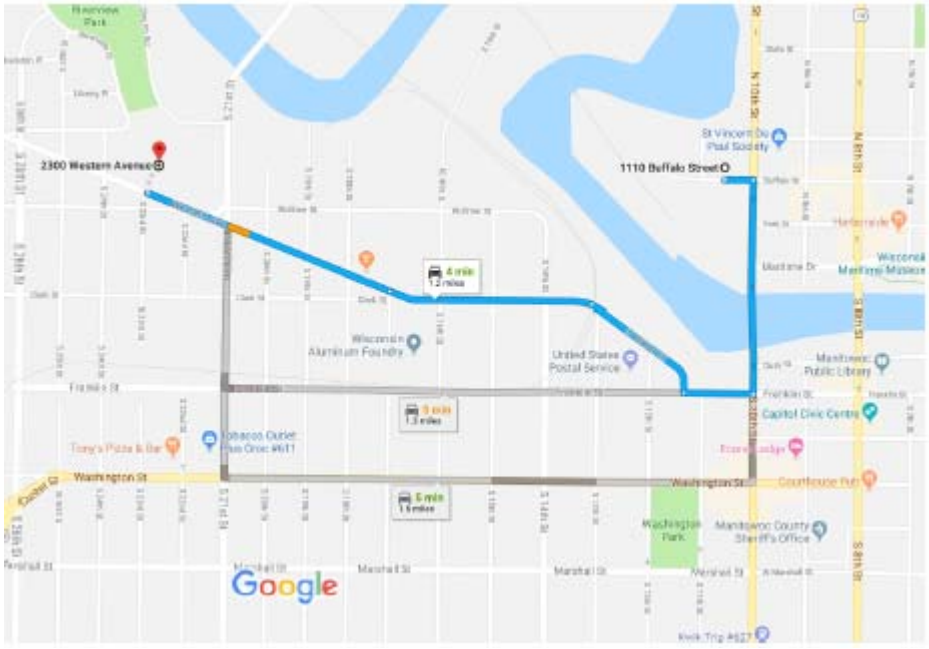
OTHER EMERGENCY CONTACTS

* Stantec Office	(800) 880-4700
* Client/Owner	(920) 686-6930
* National Response Center	(800) 424-8802
* WI Emergency Government	(800) 943-0003

Note: Incident reports are provided in Attachment B.

14.0 Evacuation/Hospital Routes

From Buffalo Street to Holy Family Memorial Hospital



Driving directions from 1110 Buffalo St to Holy Family Memorial Hospital, 2300 Western Avenue, Manitowoc, Wisconsin 54221

1110 Buffalo St
Manitowoc, WI 54220

1. Head east on Buffalo St toward N 10th St — 200 ft
2. Turn right at the 1st cross street onto N 10th St — 0.3 mi
3. Turn right onto Franklin St — 486 ft
4. Turn right onto S Water St — 0.2 mi
5. Continue onto Clark St — 0.3 mi
6. Continue onto Western Ave
   Destination will be on the right — 0.3 mi

15.0 Site-Specific Health and Safety Plan Review

This document shall be signed by site personnel prior to their first site visit.

"I have read and understand the contents of this Site Safety Plan and will comply with its provisions, requirements, and restrictions."

NAME (PRINT)	SIGNATURE	DATE

16.0 Site-Specific Health and Safety Plan Follow-Up Report

Project Site: _____

1. Was the Site Health and Safety Plan followed?

_____ Yes _____ No

2. If no, explain all changes to the Site Health and Safety Plan:

_____

_____

_____

_____

_____

_____

3. Reason for changes:

_____

_____

_____

_____

_____

_____

4. Report prepared by: _____ Date: ___

5. Report reviewed by: _____ Date: ___

17.0 Addendum to Site-Specific Health and Safety Plan

Use this page to add additional site data or describe any special circumstances that have become apparent after the original preparation of this Site Health and Safety Plan. Include any changes in site conditions, PPE and monitoring modifications and other items as appropriate.

FIGURES

Figure No.
1

Title
Target Redevelopment Area and Topographic Map

Client/Project
City of Manitowoc
USEPA Brownfield Assessment Grant

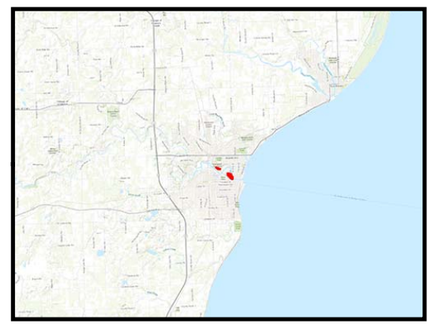
0 500 1,000 Feet

193703931
Prepared by HLB on 7/11/18

Legend

Target Property

N



Notes

1. Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet

Stantec

Attachment A – Medical Data Summary Forms

MEDICAL DATA SUMMARY FORM:

This form shall be completed by Stantec personnel prior to commencement of activities of the site. This form shall be kept at the project site for the duration of project activities. This form must be delivered to the attending physician when medical assistance is required.

Site: _____

Location: _____

Name: _____

Address: _____

Home Phone: _____

Height: _____ Weight: _____ Age: _____ Sex: ___

In case of emergency contact: _____

Address: _____

_____

Phone (_____)_____

Allergies: _____

_____

Recent Illnesses: _____

_____

Previous exposure to hazardous substances?

_____ Yes _____ No

Current medication: _____

Medical restrictions: _____

_____

Name of personal physician: _____

Address: _____

_____

Phone: (_____)_____

Date Completed**:** _____

Attachment B – Incident Report Sheets

INCIDENT REPORT

Project #:_____

Site: _____

Location: _____

Name of Affected Individual: _____

Address: _____

Age: _____ Sex: _____

Description of Incident: _____

Date of Incident: _____ Time of Incident: _____

Was Medical Care Required? ☐ YES ☐ NO

Immediate Family Notified ☐ YES ☐ NO

If Yes, Describe Care Received (attach medical record): _____

Date Care Received: _____ Location: _____

Future Preventative Measures/Corrective Action Taken: _____

_____

_____

_____

Report Prepared By: _____ Date: _____

Report Reviewed By: _____ Date: _____

Attachment C – Personal Protective Equipment

PERSONAL PROTECTIVE EQUIPMENT (PPE)

1. Level A protection should be selected when the highest level of respiratory, skin, eye, and mucous membrane protection is needed.
    - Positive-pressure, self-contained, breathing apparatus (MSHA/NIOSH approved) **(REQUIRED)**
    - Fully encapsulated, chemical resistant suit **(REQUIRED)**
    - Chemical-resistant inner and outer gloves **(REQUIRED)**
    - Chemical-resistant boots with steel toe and shank **(REQUIRED)**
    - Chemical-resistant coveralls
    - Two-way radio communication **(REQUIRED)**
2. Level B protection should be selected when the highest level of respiratory protection is needed, but with a lesser degree of skin and eye protection.
    - Positive-pressure, self-contained, breathing apparatus (MSHA/NIOSH approved) **(REQUIRED)**
    - Chemical-resistant clothing (coveralls, hooded two-piece, chemical resistant splash suit, or disposable chemical-resistant coveralls) **(REQUIRED)**
    - Coveralls (under splash suit)
    - Chemical-resistant inner and outer gloves **(REQUIRED)**
    - Chemical-resistant boots with steel toe and shank **(REQUIRED)**
    - Two-way radio communication
    - Hard hat (REQUIRED)
3. Level C protection should be selected when the type and concentration of hazardous airborne substance is known, the criteria for using air-purifying respirators is met, and skin and eye exposure is unlikely. Monitoring of the air must be performed to comply with OSHA regulations and to ensure respirator effectiveness.
    - Full face, air purifying respirator (MSHA/NIOSH approved) with appropriate cartridges **(REQUIRED)**
    - Chemical-resistant clothing (coveralls, hooded two-piece, chemical resistant splash suit, or disposable chemical-resistant coveralls) **(REQUIRED)**
    - Chemical-resistant inner and outer gloves **(REQUIRED)**
    - Chemical-resistant boots with steel toe and shank **(REQUIRED)**
    - Two-way radio communication
    - Hard hat **(REQUIRED)**
    - Escape respirator
4. Level D is primarily a work uniform. It shall not be worn on-site where respiratory or skin hazards exist.
    - Protective coveralls and protective gloves **(REQUIRED)**
    - Boots with steel toe and shank **(REQUIRED)**
    - Hard hat **(REQUIRED)**
    - Safety glasses **(REQUIRED)**
    - Safety vest **(REQUIRED)**

Attachment D – First Aid

FIRST AID

BITES

ANIMAL BITES

Thoroughly wash the wound with soap and water, flush the area with running water, and apply a sterile dressing. Immobilize affected part until the victim has been attended by a physician. See that the animal is kept alive and in quarantine. Obtain the name and address of the owner of the animal.

INSECT BITES:

Remove "stinger" without squeezing if present; keep affected part below the level of the heart; and apply ice bag. For minor bites and stings, apply soothing lotions such as calamine.

BURNS AND SCALDS

MINOR BURNS:

DO NOT APPLY VASELINE OR GREASE OF ANY KIND. If there are no areas of open skin, apply cold water until pain subsides; cover with a dry, sterile dressing. Do not break blisters or remove tissue. Seek medical attention.

SEVERE BURNS:

Do not remove adhered particles of clothing. Do not apply ice or immerse in water. Do not apply any ointments or grease. Cover burns with thick, sterile dressings. Keep burned feet or legs elevated if possible. May need to treat for shock.

CHEMICAL BURNS:

Wash away the chemical soaked clothing with large amounts of water. Remove victim's chemical-soaked clothing. If dry lime, brush away before flushing. Apply sterile dressing and seek medical attention.

CRAMPS

SYMPTOMS:

Muscle cramps in abdomen and extremities. Heat exhaustion may also be present.

TREATMENT:

Same as for heat exhaustion.

CUTS

Apply pressure with sterile gauze dressing and elevate the area until bleeding stops. Apply bandage and seek medical attention.

EYES

FOREIGN OBJECTS:

Keep the victim from rubbing eyes and flush the eye with water. If flushing fails to remove the object, apply a dry protective dressing to both eyes and seek medical attention.

CHEMICALS:

Flood the eye thoroughly with water for 15 minutes. Cover the eye with a dry sterile pad and seek medical attention.

FAINTING

Keep the victim lying down. Loosen tight clothing. If victim vomits, roll person onto side or turn head to the side. Maintain an open airway. Bathe the person's face gently with cool water. Unless recovery is prompt, seek medical attention.

FRACTURES

Deformity of an injured part usually means a fracture. If a fracture is suspected, splint the part. DO NOT ATTEMPT TO MOVE THE VICTIM. Seek medical attention immediately.

FROSTBITE

SYMPTOMS:

Just before frostbite occurs, skin may be flushed then changes to white or grayish-yellow. Pain may be felt early; then may subside. Blisters may appear; affected part feels very cold and/or may be numb.

TREATMENT:

Bring victim indoors, cover the frozen area; provide extra clothing and blankets. Re-warm frozen area quickly by immersion in warm water—NOT HOT WATER. DO NOT RUB THE PART. Seek medical attention.

HEAT EXHAUSTION

Caused by exposure to heat, either sun or indoor.

SYMPTOMS:

Near-normal body temperature; pale and clammy skin; profuse sweating, tiredness, weakness, headache, perhaps cramps, nausea, dizziness, and possible fainting.

TREATMENT:

Keep victim in lying position and raise feet. Loosen clothing, apply cool wet cloths. If conscious, give sips of water. Seek medical attention immediately.

SUNSTROKE

SYMPTOMS:

High body temperature; hot, red, and dry skin; rapid pulse. Victim may be unconscious.

TREATMENT:

Keep victim in lying position with head elevated. Remove clothing and repeatedly sponge the bare skin with cool water. Seek medical attention immediately.

POISONING

Call the Poison Control Center for instruction on immediate care. If victim becomes unconscious, keep the airway open. If breathing stops, begin rescue breathing. Call Emergency Medical Services (EMS) immediately.

POISON IVY

Remove contaminated clothing. Wash all exposed areas thoroughly with soap and water. If rash is mild, apply calamine lotion or other soothing skin lotion. If a severe reaction occurs, seek medical attention.

PUNCTURE WOUNDS

If puncture wounds is deeper than skin surface, seek medical attention. Serious infection can occur unless proper treatment is received.

SPRAINS

Elevate injured part and apply ice bag or cold packs. Do not soak in hot water. Immobilize affected part and seek medical attention.

UNCONSCIOUSNESS

Never attempt to give anything by mouth. Keep victim lying flat, maintain open airway. If victim is not breathing, perform rescuer breathing and call EMS immediately.

Attachment E – MSDS Sheets

SAFETY DATA SHEET

Revision Date 19-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Arsenic(III) chloride**

Cat No. : **AC190480000; AC190480100; AC190480500**

CAS-No 7784-34-1
Synonyms Trichloroarsine; Arsenic trichloride.; Arsenous chloride

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
Fatal if swallowed

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling

Do not eat, drink or smoke when using this product
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Storage
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Arsenous trichloride	7784-34-1	99.5

4. First-aid measures

Eye Contact Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Immediate medical attention is required.

Inhalation Remove from exposure, lie down. Move to fresh air. If not breathing, give artificial respiration. Immediate medical attention is required.

Ingestion Do not induce vomiting. Call a physician immediately. Clean mouth with water.

Most important symptoms and effects Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Non-combustible. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Hydrogen chloride gas Chlorine arsenic oxides
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. Should not be released into the environment.

Methods for Containment and Clean Up Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Wear self-contained breathing apparatus and protective suit. Do not let this chemical enter the environment.

7. Handling and storage

Handling Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Do not ingest. Use only in area provided with appropriate exhaust ventilation.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from direct sunlight. Corrosives area. Keep under nitrogen. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Arsenous trichloride	TWA: 0.01 mg/m³		IDLH: 5 mg/m³ Ceiling: 0.002 mg/m³	

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State Liquid
Appearance Clear
Odor pungent

Odor Threshold	No information available
pH	No information available
Melting Point/Range	-8.5 °C / 16.7 °F
Boiling Point/Range	130.1 °C / 266.2 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	13 hPa @ 20 °C
Vapor Density	6.3 (Air = 1.0)
Specific Gravity	2.1600
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	As Cl3
Molecular Weight	184.3

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions. Moisture sensitive. Light sensitive.

Conditions to Avoid Excess heat. Exposure to light. Incompatible products. Exposure to moist air or water.

Incompatible Materials Acids, Bases, Water, Metals, Powdered metals

Hazardous Decomposition Products Hydrogen chloride gas, Chlorine, arsenic oxides

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions Contact with water liberates toxic gas.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Arsenous trichloride	LD50 = 48 mg/kg (Rat)	LD50 = 80 mg/kg (Rat)	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Suspected human carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Arsenous trichloride	7784-34-1	Not listed	Known	A1	X	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment. May cause long-term adverse effects in the environment. Do not allow material to contaminate ground water system.

Persistence and Degradability based on information available. May persist

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA
- **UN-No** UN1560
- **Proper Shipping Name** ARSENIC TRICHLORIDE, FORBIDDEN FOR IATA TRANSPORT
- **Hazard Class** 6.1
- **Packing Group** I

IMDG/IMO
- **UN-No** UN1560
- **Proper Shipping Name** ARSENIC TRICHLORIDE
- **Hazard Class** 6.1
- **Packing Group** I

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Arsenous trichloride	X	X	-	232-059-5	-		X	X	X	-	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Arsenous trichloride	7784-34-1	99.5	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Arsenous trichloride	X	1 lb	X	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Arsenous trichloride	X		-

OSHA Occupational Safety and Health Administration
OSHA - United States Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Arsenous trichloride	10 µg/m³ TWA 5 µg/m³ Action Level	-

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Arsenous trichloride	1 lb	1 lb

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Arsenous trichloride	7784-34-1	Carcinogen	0.06 µg/day 10 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Arsenous trichloride	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Arsenous trichloride	0 lb STQ

Other International Regulations

Mexico - Grade No information available

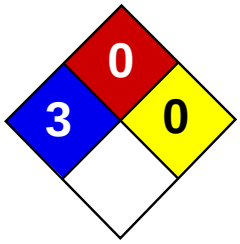
16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 19-Jan-2018
Print Date 19-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS



Material Safety Data Sheet
Sodium Cyanide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium Cyanide

Catalog Codes: SLS2314, SLS3736

CAS#: 143-33-9

RTECS: VZ7525000

TSCA: TSCA 8(b) inventory: Sodium Cyanide

CI#: Not available.

Synonym:

Chemical Name: Sodium Cyanide

Chemical Formula: NaCN

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium Cyanide	143-33-9	100

Toxicological Data on Ingredients: Sodium Cyanide: ORAL (LD50): Acute: 6.44 mg/kg [Rat]. DERMAL (LD50): Acute: 10.4 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator). Corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

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

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

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

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of acids, of moisture.

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

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

Special Remarks on Fire Hazards:
Dangerous on contact with acids, acid fumes, water or stream. It will produce toxic and flammable vapors of CN-H and sodium oxide. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas. When heated to decomposition it emits toxic fumes hydgrogen cyanide and oxides of nitrogen

Special Remarks on Explosion Hazards: Fusion mixtures of metal cyanides with metal chlorates, perchlorated or nitrates causes a violent explosion

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, moisture.

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

Section 8: Exposure Controls/Personal Protection

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

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
STEL: 5 (mg/m3) from ACGIH (TLV) [United States] SKIN CEIL: 4.7 from NIOSH CEIL: 5 (mg/m3) from NIOSHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Granular solid. Flakes solid.)

Odor:
Faint almond-like odor. Odorless when perfectly dry. Emits odor of hydrogen cyanide when damp.

Taste: Not available.

Molecular Weight: 49.01 g/mole

Color: White.

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

Boiling Point: 1496°C (2724.8°F)

Melting Point: 563°C (1045.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.595 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Vapor Density of Hydrogen Cyanide gas: 0.941

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Soluble in cold water. Slightly soluble in Ethanol

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, moisture, incompatibles.

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

Corrosivity:
Corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent reaction with fluorine gas, magnesium, nitrates, nitric acid. Dangerous on contact with acids, acid fumes, water or stream. It wil produce toxic and flammable vapors of CN-H and sodium oxide. Cyanide may react with CO2 in ordinary air to form toxic hydrogen cyanide gas. Strong oxidizers such as acids, acid salts, chlorates, and nitrates. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas.

Special Remarks on Corrosivity: Corrosive to aluminum

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
Acute oral toxicity (LD50): 6.44 mg/kg [Rat]. Acute dermal toxicity (LD50): 10.4 mg/kg [Rabbit].

Chronic Effects on Humans: May cause damage to the following organs: skin, eyes, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause adverse reproductive effects (maternal and paternal fertility) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health effects: Skin: May cause itching and irritation. May be fatal if absorbed through injured skin with symtpoms similar to those noted for inhalation and ingestion. Eyes: May cause eye irritation and eye damage. Inhalation: May cause respiratory tract irritation. May be fatal if inhaled. The substance inhibits cellular respiration causing metabolic asphyxiation. May cause headache, weakness, dizziness, labored breathing, nausea, vomiting. May be followed by cardiovascular effects, unconciousness, convulsions, coma, and death Ingestion: May be fatal if swallowed. May cause

gastrointestinal tract irritation with nausea, vomiting. May affect behavior and nervous systems(seizures, convulsions, change in motor activity, headache, dizziness, confusion, weakness stupor, aniexity, agitation, tremors), cardiovascular system, respiration (hyperventilation, pulmonary edema, breathing difficulty, respiratory failure), cardiovascular system (palpitations, rapid heart beat, hypertension, hypotension). Massive doses by produce sudden loss of conciousness and prompt death from respiratory arrest. Smaller but still lethal doses on the breath or vomitus. Chronic Potential Health Effects: Central Nervous system effects (headaches, vertigo, insomnia, memory loss, tremors, fatigue), fatigue, metabolic effects (poor appetite), cardiovascular effects (chest discomfort, palpitations), nerve damage to the eyes, or dermatitis, respiratory tract irritation, eye irritation, or death can occur. may prolong the illness for 1 or more hours. A bitter almond odor may be noted

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Sodium cyanide UNNA: 1689 PG: I

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut carcinogen reporting list.: Sodium Cyanide Illinois chemical safety act: Sodium Cyanide New York release reporting list: Sodium Cyanide Rhode Island RTK hazardous substances: Sodium Cyanide Pennsylvania RTK: Sodium Cyanide Minnesota: Sodium Cyanide Massachusetts RTK: Sodium Cyanide Massachusetts spill list: Sodium Cyanide New Jersey: Sodium Cyanide New Jersey spill list: Sodium Cyanide Louisiana RTK reporting list: Sodium Cyanide Louisiana spill reporting: Sodium Cyanide California Director's List of Hazardous Substances: Sodium Cyanide TSCA 8(b) inventory: Sodium Cyanide TSCA 4(a) final test rules: Sodium Cyanide TSCA 8(a) PAIR: Sodium Cyanide TSCA 8(d) H and S data reporting: Sodium Cyanide TSCA 12(b) one time export: Sodium Cyanide SARA 302/304/311/312 extremely hazardous substances: Sodium Cyanide CERCLA: Hazardous substances.: Sodium Cyanide: 10 lbs. (4.536 kg)

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

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material. CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive solid.

DSCL (EEC):
R27/28- Very toxic in contact with skin and if swallowed. R41- Risk of serious damage to eyes. S1/2- Keep locked up and out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of water S36/37- Wear suitable protective clothing and gloves. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

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

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 01:58 PM

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

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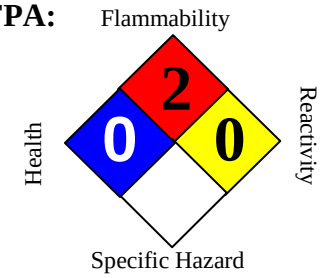
Material Safety Data Sheet
Fuel Oil

NFPA:



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Fuel Oil
Synonyms	:	Bunkers, Black Fuel Oil, MFO, Industrial Fuel Oil, 6 Oil, Slurry Fuel Oil, RFO, Refinery Fuel Oil, High Sulfur Fuel Oil, HSFO, IFO-30, IFO-180, IFO-380, IFO-510, IFO-700, Bunker C, Bunker Fuel Oil, Marine Fuel Oil, Decant Oil, Utility Fuel Oil, LSFO, Six Oil, 888100008793
SDS Number	:	888100008793 **Version** : 1.20
Product Use Description	:	Fuel, Intermediate Stream
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259
Tesoro Call Center	:	(877) 783-7676 **Chemtrec (Emergency Contact)** : (800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications

Flammable Liquid – Category 4
Carcinogenicity – Category 1B
Toxic to Reproduction – Category 1B
Specific Target Organ Toxicity (Repeated Exposure) – Category 2
Acute Toxicity – Inhalation – Category 4
Acute Aquatic Toxicity– Category 3

Pictograms

Signal Word

DANGER

Hazard Statements

Combustible liquid.
May cause cancer from prolonged and repeated skin contact.
May damage fertility or the unborn child.
May cause damage to liver, kidney and nervous system through prolonged or repeated exposure.
Harmful if inhaled.
Harmful to aquatic life
Skin and eye irritant.
May contain and release toxic hydrogen sulfide (H2S) gas.

Precautionary Statements

Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from flames and hot surfaces. No smoking. Wear gloves, eye protection and face protection as needed to prevent skin and eye contact with liquid. Wash hands or liquid-contacted skin thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe vapors or mists. Use only outdoors or in a well-ventilated area
Response	In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish. Get medical advice or attention if you feel unwell, are exposed, or become concerned. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If skin or eye irritation persists, get medical attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call or doctor or emergency medical provider
Storage	Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers.
Disposal	Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	100%
Polycyclic aromatic compounds (PACs or PNAs)		Typically 1.5%
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8	Trace to 0.2%
Hydrogen Sulfide	7783-06-4	Trace to 0.2%
Sulfur (for waters within 25 miles of California shores)	17704-34-9	Trace to 0.1%
Sulfur (for waters within 200 miles of American shores)	17704-34-9	Trace to 1.0%
Sulfur (for International waters)	17704-34-9	Trace to 3.5%

SECTION 4. FIRST AID MEASURES

Inhalation : Move to fresh air. Give oxygen. If breathing is irregular or stopped, administer artificial respiration. Seek medical attention immediately.

Skin contact : Take off all contaminated clothing immediately. Wash off immediately with soap

		and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, call a physician.
Eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists, consult a specialist.
Ingestion	:	Do NOT induce vomiting. Do not give liquids. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.
Notes to physician	:	Symptoms: Dizziness, Discomfort, Headache, Nausea, Disorder, Vomiting, Liver disorders, Kidney disorders, Aspiration may cause pulmonary edema and pneumonitis.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray.
Specific hazards during fire fighting	:	Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.
Special protective equipment for fire-fighters	:	Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.
Further information	:	Flammable vapor production at ambient temperature in the open is expected to be minimal, as the material is generally wet. However, depending on oil content and conditions, it is possible flammable vapors could accumulate in the headspace of storage containers, presenting a flammability and explosion hazard. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas.
Environmental precautions	:	Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material.
Methods for cleaning up	:	Take up with sand or oil absorbing materials. Carefully vacuum, shovel, scoop or sweep up into a waste container for reclamation or disposal.

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling	:	Keep away from fire, sparks and heated surfaces. No smoking near areas where

material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).
(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for storage, including any incompatabilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Hydrogen sulfide may accumulate in tanks and bulk transport compartments. Consider appropriate respiratory protection (see Section 8). Stand upwind. Avoid vapors when opening hatches and dome covers. Confined spaces should be ventilated and gas tested prior to entry.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

No decomposition if stored and applied as directed.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Polycyclic aromatic compounds (or coal tar pitch volatiles – benzene soluble)		PEL	0.2 mg/m3
	Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	PEL	5 mg/m3 (as mineral oil mist)
	Hydrogen Sulfide	7783-06-4	STEL	20 ppm
ACGIH	Hydrogen Sulfide	7783-06-4	TWA	1 ppm
		7783-06-4	STEL	5 ppm

	Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	TWA	0.2 mg/m3 (as mineral oil) Sum of 15 NTP-listed polynuclear aromatic hydrocarbons 0.005 mg/m3
	Polycyclic aromatic compounds (or coal tar pitch volatiles – benzene soluble)		TWA	0.2 mg/m3

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Eye protection : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Hand protection : Gloves constructed of nitrile, neoprene, or PVC are recommended.

Skin and body protection : Chemical protective clothing such as DuPont Tyvek QC, TyChem® or equivalent, recommended based on degree of exposure. The resistance of specific material may vary from product to product as well as with degree of exposure.

Respiratory protection : If hydrogen sulfide concentration may exceed permissible exposure limit, a positive-pressure SCBA or Type C supplied air respirator with escape bottle is required as respiratory protection. If hydrogen sulfide concentration is below H2S permissible exposure limit a NIOSH/ MSHA-approved air-purifying respirator with acid gas cartridges may be acceptable for odor control, but continuous air monitoring for H2S is recommended. Protection provided by air-purifying respirators is limited. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Work / Hygiene practices : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance Dark green to brown or black liquid

Odor Petroleum asphalt odor

Odor threshold	No data available
pH	Not applicable
Melting point/freezing point	32° - 80°C (89.6° - 176°F)
Initial boiling point & range	154 - 372 °C (310° - 702 °F)
Flash point	60°C (140°F) minimum
Evaporation rate	Higher initially and declining as lighter components evaporate
Flammability (solid, gas)	Flammable vapor released by heated liquid
Upper explosive limit	No data available
Lower explosive limit	No data available
Vapor pressure	210 Pa at 25°C
Vapor density (air = 1)	>5
Relative density (water = 1)	>0.9 to 1.2 g/mL
Solubility (in water)	6 to 1400 mg/L at 25°C
Partition coefficient (n-octanol/water)	3.4 to 5 as log Pow at 25°C
Auto-ignition temperature	>176°C (>350 °F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	>300 cST typical at 40°C

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Vapors may form explosive mixtures with air. Hazardous polymerization does not occur.
Chemical Stability		Stable under normal conditions.
Possibility of hazardous reactions		Can react with strong oxidizing agents and peroxides. Keep away from strong acids and bases.
Conditions to avoid		Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers.
Hazardous decomposition products		Carbon monoxide, carbon dioxide and noncombusted hydrocarbons (smoke).

SECTION 11. TOXICOLOGICAL INFORMATION

Inhalation	:	Because of its low vapor pressure, this product presents a minimal inhalation hazard at ambient temperature. Upon heating, fumes may be evolved. Inhalation of fumes or mist may result in respiratory tract irritation and central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death. The burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death. Irritating and toxic hydrogen sulfide gas may be present. Greater than 15 - 20 ppm continuous exposure can cause mucous membrane and respiratory tract

irritation. 50 - 500 ppm can cause headache, nausea, and dizziness. Continued exposure at these levels can lead to loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated. Greater than 1000 ppm can cause immediate unconsciousness and death if not promptly revived. After-effects from overexposure are not anticipated except what would be expected if the victim was without oxygen for more than 3 to 5 minutes (asphyxiation). The "rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm. At high concentrations, the victim may not even recognize the odor before becoming unconscious.

Skin irritation

May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Exposure may cause a phototoxicity reaction: liquid or mist on the skin may produce a painful sunburn reaction when exposed to sunlight. Product may be hot which could cause 1st, 2nd, or 3rd degree thermal burns.

Eye irritation

May cause irritation, experienced as mild discomfort and seen as slight excess redness of the eye.

Ingestion

This material has a low order of acute toxicity. If large quantities are ingested, nausea, vomiting and diarrhea may result. Ingestion may also cause effects similar to inhalation of the product. Could present an aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death.

Further information

This material contains polynuclear aromatic hydrocarbons (PNAs), some of which are animal carcinogens. Studies have shown that similar products produce skin cancer or skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation. The presence of carcinogenic PNAs indicates that precautions should be taken to minimize repeated and prolonged inhalation of fumes or mists. Dermal application of gas oil to rats resulted in limited evidence of liver damage (i.e., increased liver weight and changes in hepatic serum enzyme activity) and bone marrow toxicity (hypoplasia and decreased hemoglobin.) Petroleum industry experience indicates that a program providing for good personal hygiene, proper use of personal protective equipment, and minimizing the repeated and prolonged exposure to liquids and fumes, is effective in reducing or eliminating the carcinogenic risk of high boiling aromatic oils (polynuclear aromatic hydrocarbons) to humans.
Liver and kidney injuries may occur.
Components of the product may affect the nervous system.

Component:

Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	Acute oral toxicity: LD50 rat Dose: 4,320 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation

Carcinogenicity: Animal experiments showed a statistically significant number of tumors.

Carcinogenicity

NTP	Benzo[a]pyrene; Benzo[def]chrysene (CAS-No.: 50-32-8)
IARC	Benzo[a]pyrene; Benzo[def]chrysene (CAS-No.: 50-32-8)
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause cancer. Benzo[a]pyrene; Benzo[def]chrysene (CAS-No.: 50-32-8)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Consult federal, state and local waste regulations to determine appropriate waste characterization of material and allowable disposal methods.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	:	Not regulated if shipped below 140°F (60°C) Elevated temperature liquid, flammable (if shipped above 140°F (60°C)).
UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	9
Packing group	:	III
Hazard inducer	:	(Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil)

TDG

Proper shipping name	:	Not regulated if shipped below 140°F (60°C) Elevated temperature liquid, flammable (if shipped above 140°F (60°C)).
UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	9
Packing group	:	III
Hazard inducer	:	(Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil)

IATA Cargo Transport

UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	Not regulated if shipped below 140°F (60°c) Not permitted for transport (at 140°F (60°C) or higher temperature) 9

IATA Passenger Transport

UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	Not regulated if shipped below 140°F (60°c) Not permitted for transport (at 140°F (60°C) or higher temperature) 9

IMDG-Code

UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Description of the goods	:	Elevated temperature liquid, n.o.s. (Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil)
Class	:	Not regulated if shipped below 140°F (60°c) Not permitted for transport (at 140°F (60°C) or higher temperature) 9
Packaging group	:	III
IMDG-Labels	:	9
EmS Number	:	F-A S-P
Marine pollutant	:	No

SECTION 15. REGULATORY INFORMATION

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

TSCA Status	:	On TSCA Inventory
DSL Status	:	All components of this product are on the Canadian DSL list.
SARA 311/312 Hazards	:	Fire Hazard Acute Health Hazard Chronic Health Hazard

SARA III — US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

Components	CAS-No.
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

SARA III — US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR355, Appendix A)

Components	CAS-No.

PENN RTK — US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Components	CAS-No.
Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

MASS RTK — US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Components	CAS-No.
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

NJ RTK US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Components	CAS-No.
Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

California Prop. 65 : WARNING! This product contains a chemical known in the State of California to cause cancer.

Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 07/26/2012

65, 66, 121, 295, 296, 347, 1003, 1006, 1007, 1009, 1010, 1022, 1054, 1083, 1084, 1085, 1089, 1586, 1886

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades **MSDS No. 9950**

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS (Environment, Health, Safety) Internet Website www.hess.com

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS *

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME).

Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 ^{o}F (-43^{o}C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 ^{o}F (>280 ^{o}C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 “Low Expansion Foam - 1994 Edition.”

FIRE FIGHTING INSTRUCTIONS
Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	1000	--	Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	Skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	20	--	A4
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR
A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 ^{o}F (39 to 200 ^{o}C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 ^{o}F (38 ^{o}C) (275-475 mm Hg @ 68 ^{o}F (20 ^{o}C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %
SOLUBILITY (H_2O):	Non-oxygenated gasoline - negligible (< 0.1% @ 77 ^{o}F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 ^{o}F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS
Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY
Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3

n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)	Date Listed
Benzene	2/27/1987
Ethyl benzene	6/11/2004
Toluene	1/1/1991

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	PHYSICAL:	0	Minimal
			* CHRONIC

SUPERSEDES MSDS DATED: 07/01/06

ABBREVIATIONS:

AP = Approximately	< = Less than	> = Greater than
N/A = Not Applicable	N/D = Not Determined	ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists	CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
AIHA	American Industrial Hygiene Association	DOT	U.S. Department of Transportation [General Info: (800)467-4922]
ANSI	American National Standards Institute (212)642-4900	EPA	U.S. Environmental Protection Agency
API	American Petroleum Institute (202)682-8000	HMIS	Hazardous Materials Information System

IARC	International Agency For Research On Cancer	REL	Recommended Exposure Limit (NIOSH)
MSHA	Mine Safety and Health Administration	SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
NFPA	National Fire Protection Association (617)770-3000	SCBA	Self-Contained Breathing Apparatus
NIOSH	National Institute of Occupational Safety and Health	SPCC	Spill Prevention, Control, and Countermeasures
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)	STEL	Short-Term Exposure Limit (generally 15 minutes)
NTP	National Toxicology Program	TLV	Threshold Limit Value (ACGIH)
OPA	Oil Pollution Act of 1990	TSCA	Toxic Substances Control Act
OSHA	U.S. Occupational Safety & Health Administration	TWA	Time Weighted Average (8 hr.)
PEL	Permissible Exposure Limit (OSHA)	WEEL	Workplace Environmental Exposure Level (AIHA)
RCRA	Resource Conservation and Recovery Act	WHMIS	Workplace Hazardous Materials Information System (Canada)

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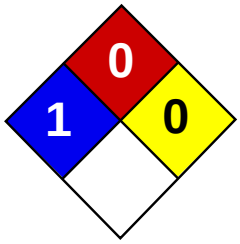
Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.



Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

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

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

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

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

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

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

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

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

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

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

Other Classifications:

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

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

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

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